"More than YOU need to know?"

BAD LINKS REPLACED 9 Jan. 2018

Trout's Notes on

Cactus Chemistry By Species

Assembled by Keeper Trout & friends

Cactus Chemistry By Species

Previously published entitled
Distribution of the Alkaloids & Triterpenoids Reported in CACTACEAE; By Species (1997) and *as Trout's Notes #C-10 Cactus Chemistry Summary: By Species* (1999 and later).
This *intensely illustrated* version merges, updates, corrects and replaces all previous versions.

This is a work-in-progress that is presently still undergoing editing, proofing and active assembly.

Acquiring & processing the references needed for a comprehensive treatment has postponed the planned release date so dramatically that I decided to make the in-proofing version available while the final version takes shape. Please let me know if you spot errors or if you have suggestions to offer about how to make this a better work. I also welcome any contributions of images; especially in habitat.

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Previous editions of this contained links to our former website Largely Accurate Information Media. We lost that domain some time ago and it is apparently now operated by a malware distributor. All previous editions of this work should be destroyed and replaced with this edition.

MydriaticProductions

This series of works are intended to serve the reader with reference material for further research and study.

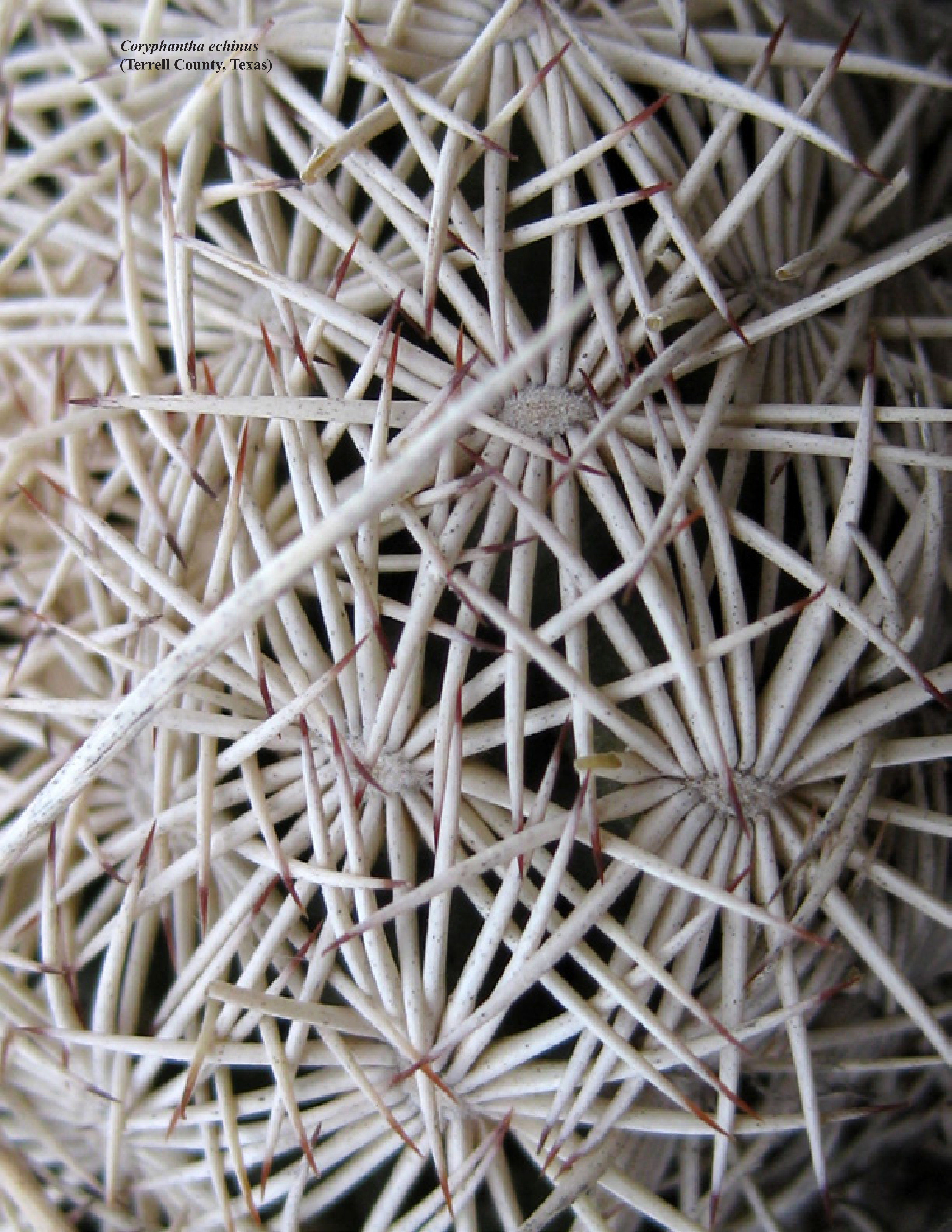
Trout's Notes therefore strongly encourages the dissemination of any and all factual information contained within these pages so long as proper acknowledgment of authorships are maintained. This is not permission to reproduce this work but it is an encouragement to educate.

No one owns facts or factual data.

“ *It is pertinent to mention that all of the Trichocereus species, which have been reported to contain alkaloids, grow in a rather limited geographical area confined to Argentina.*”

Djerassi *et al*. 1956 *JACS* 78: 2312-2315.

Mammillaria heyderi
doing some weight-lifting
(Terrell County, Texas)



Coryphantha echinus
(Terrell County, Texas)

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Opuntia spinosior
(Cactus Country)


More than you *need to know?*


Echinocereus coccineus
var. *paucispinus*
(Val Verde County, Texas)

Distribution of Alkaloids, Triterpenoids & other Compounds Reported in the Cactaceae

Assembled & edited by Keeper Trout

It is important to understand that all alkaloid concentrations can be highly variable. This can be the result of many factors.

Genetics, environment, age, part sampled, weather, health, time of year or time of day, and whether the plants were wild or cultivated, have all been noted as factors potentially capable of influencing the alkaloid content and/or composition in plants.

Substantial variations can be encountered based on the variety, local form, age, growth stage and other factors.

An obvious but frequently overlooked fact is that analysis of a cactus can really only tell us about the actual material in hand undergoing analysis and can serve as no more than a probable guideline for what MIGHT be the case with another specimen within the same species.

Differences might simply be quantitative but are frequently found to be qualitative as well should enough samplings be performed.

The trend in the literature is a look at one sampling, most often using batched materials, and then move on to the next species. Those which have had in-depth workups performed for different collections and at different times of years suggest this should be undertaken for any species that has only one published analysis.

What should always be kept in mind when encountering any species where a single given alkaloid composition and concentration is stated this indicates that said species has only been analyzed that one single time.

Analysis involving different tissues within a single plant have consistently produced divergent results suggesting that distribution within a given specimen is also an avenue worthy of greater in-depth exploration. Mescaline users already utilize this unequal distribution by removing and ingesting only the outer portions of green tissue from the cactus *Trichocereus pachanoi* as, while wasteful of much of its contained alkaloid, it generates material that contains a greater percentage of mescaline by weight than would the intact plant. Sadly much of this work is not published and due to the current illegality of such practices (whether sacramental or recreational) will probably never be published in detail.

In many cases not enough variables are noted to understand the reported differences. We would suggest that detailed information about the actual source, the specific part or parts investigated (young or old tissues can produce quite different results as can different internal structures), the date and time of day they were collected and details about how they were processed PRIOR to investigation become regarded as vital information to include along with the normal procedural workup. The word "*dried*", as an example, can mean a number of things. For instance, freeze-dried material appears to give lower yields than does careful drying and standard extractions but whether this is the NORM remains to be evaluated.

Extraction approach can also generate differing results. Lengthy heating during Soxhlet extraction can cause changes compared to a room temperature soak being used. Similarly the use of acids during extraction, while valuable, can readily hydrolyze or otherwise alter some components.

The concentrations given are as they were reported in the literature. Many were calculated as the final yield of highly purified and repeatedly recrystallized alkaloids and will therefore be low values.

Identification criteria can be found in the occurrence lists under individual alkaloid entries in **C13 *The Cactus Alkaloids.*** (Previously released in an abridged form as C-9 *Appendix A*)

This supplemental listing is primarily of the alkaloids & triterpenoids reported from cacti although we have taken the liberty of including some additional compounds and reports indicating either that alkaloids were present but not identified or else that alkaloids seemed to be absent. Many fruit or flower pigments, carbohydrate, mucilage & polyphenolic studies were omitted.

In every case possible, the original research reports were used for the entries below but in a few instances we relied on second-hand listings when the primary source paper was unavailable. (Instances are indicated in the text.)

(%?) indicates both that the entry was from a second-hand listing and did not include a percentage.

Also included are notes of some errors appearing in the literature (an incomplete list). These are included simply to help the reader evaluate and resolve the conflicts they may find between this list and others. While making no note as to the source for any of these erroneous entries, they (and the reference that was cited) were included in hopes of reducing the number of errors being perpetuated in the future. We do not suggest people simply take us at our word over highly respected authorities and official databases; we do suggest that in these instances they look at the primary references given and determine the truth for themselves.

One point we would like to make concerning some of the disparities between various researchers is that Agurell & coworkers specifically did not look for any quaternary amines and therefore would not have detected any even if present in their material.

It is also important to note that some workers used young cultivated material grown from seed while others used adult field collected specimens. The claim has been presented, without any indication of its basis, that analytical results are identical between these sets of samples but the available work as will be detailed within does not support that assertion beyond a rough qualitative generalization. Both have value for understanding the chemistry of the plants but in no case can the analysis of a given species or specimen be reliably extrapolated to indicate what will be found in anything other than what was analyzed on the day that it was analyzed.

Cacti can sometimes be highly variable in appearances. This work attempts to present multiple images of single species in habitat and grown under different situations or in multiple hands whenever possible. One clear advantage to this being a PDF is the elimination of concerns about minimizing cost through limiting the number of color photos that are included.

Cactus taxonomy and names in this work

Many species have been renamed multiple times; a partial list of synonyms or points of potential confusion is included.

Please see BACKEBERG, BRAVO, BRITTON & ROSE, ANDERSON, HUNT or the specific botanical authority listed for more nomenclatural or taxonomic details.

Some names have been changed so many times over the course of their analytical history that it can be difficult to locate comprehensive information about what has been published. The obscuring of analytical accounts by the proliferation of synonyms precluding effective indexing is an under appreciated problem. This is not limited to plants. In a sweeping revision of Amphibia *Bufo alvarius* had its name changed to *Cranopsis alvaria* in 2006. Later in 2006 the name was changed again, by implication, to *Ollotis alvaria*. In 2008 it became *Incilius alvarius*. Incredibly the only one of its historical synonyms not resurrected in that process was *Phrynoidis alvarius*. Few indexing services of publications can successfully manage to include all known synonyms of either plants or animals causing a fragmented access to the contents of scientific papers.

In many cases chemical work does not reflect the current name *en vogue*. We have often left names as encountered with efforts made only to reduce confusion. In this process we have employed what many may object to as outdated names.

This work is a compendium of published analytical accounts involving cacti rather than being a taxonomic treatment of cacti. Its just as likely that the following are presented however they were analyzed than with what is now their present accepted name.

Please be aware therefore that our use of one specific name over another does not necessarily indicate any agreement with or advocacy of that placement.

In a number of cases older "splitter" synonyms were deliberately preserved in order to prevent lumping from obscuring some interesting analytical results.

A listing of synonyms is also incorporated so this should not cause any problems. Feedback is welcomed.

Comments on color

Every attempt has been made to preserve accurate & realistic color portrayals but caution is needed.

Color images can be highly variable for many reasons including whether the image was shot with 35mm, Polaroid or another film format or if was using a digital camera, whether it was viewed under cloudiness, haze, fogginess, hot sun or other weather conditions, whether the specimen was wet or dry, whether it was taken outdoors or in a greenhouse, whether it was shot in full sun or in shade or under artifical shade in a hot sun situation, or under artificial lighting indoors, whether it used a flash or no flash, whether it used or lacked appropriate filters if 35mm, whether the image was taken at night or during the day, whether it used a low resolution digital camera, whether the master was obtained as a digital file, an online download or a photograph requiring scanning, and many other factors including the time of day and the viewing angle relative to direct sun (a significant factor that is not always within the photographer's control if shooting in a formal botanical garden).

There was no control over the quality of some of the contained images (other than their potential rejection) and it was believed that readers would appreciate their inclusion even if a better image would have been desirable. Sometimes it is simply not possible to obtain a replacement photo.

Color can also vary with browser or monitor if viewing the CD version.

Trichocereus rosei #1 (_T. peruvianus_)
left column

Trichocereus rosei #2 (_T. peruvianus_)
right column
(Field)

cristate *Lophophora* "*echinata*" (above)

new growth on *Cereus peruvianus* (HBG) below

Aviso concerning the results of DJERASSI

It should emphasized that most, if not all, of the triterpenoids investigated by DJERASSI (and other workers) were **primarily** artifacts of their isolation and analytical procedure. With only very few exceptions, it is not made clear if any of them actually exist in the plants and, if so, how much is there. In those few cases where it does appear that they actually may exist in the plant, it is as only a very small portion of the total triterpenoids recovered (The usual source for these triterpenoids & sterols was via acid hydrolysis of the corresponding glycosates.)

While it might therefore be debated as to whether these aglycones are really properly listed as cactus components, since they are products arising from the hydrolysis of the mixed saponin fraction, it was deemed important to include them as they appear to have valuable chemotaxonomic significance.

Lophophora williamsii* nestling with *Coryphantha ramillosa

***Trichocereus atacamensis* in the San Pedro de Atacama Desert of Chile Photo by correspondent requesting anonymity**

Another point concerns DJERASSI's alkaloid investigations. Many species they reported as being devoid of alkaloids were later shown to contain alkaloids (sometimes in appreciable amounts). While not dismissing the possibility of individual variation between samples, we suspect their alkaloid screening technique played a significant role in at least some of the disparate results.

It was specifically flawed with regards to detecting mescaline, substances with similar solubilities or any neutral alkaloids.

DJERASSI's primary criteria for detecting alkaloids:

1) The residue remaining from an initial ethanolic extract would form an alkaline solution when extracted with ether. [Ed.: Not all alkaloids are soluble in ether & not all alkaloids form alkaline solutions.]
2) Alkaloids could be isolated and obtained as crystalline material.
3) Positive Mayer test. (Apparently not used in many cases)

DJERASSI sometimes noted the presence of unidentified materials but in many cases there was obviously material present they did not elaborate on or investigate further.

DJERASSI repeatedly made the claim that alkaloids and triterpenoid glycosides are not found in the same plant. While this is obviously incorrect if made as a blanket statement when considering trace or low amounts, it might prove true that the presence of substantial amounts of either may preclude large amounts of the other simultaneously being present. A systematic overview and evaluation is needed before drawing any firm conclusions.

Many entries based on bioassays of varieties of known active species were omittted from this work.

More details on those and many of the other species that are included can be found in ***Sacred Cacti* Part A** and/or **Part B**

Some useful trivia

0.00X% indicates X milligrams per 100 grams. (i.e. 0.1% indicates 100 milligrams per 100 grams.)

0.01% by dry wt. is ~4.5 grams of alkaloid per 100 pounds dry wt. [i.e. 10 mg per 100 gm]

"*5 to 25+ mg. per 100 grams of fresh*" indicates approximately from ~0.01% to over 0.03% by wet wt.

Reported water content in some cacti has ranged from 62 to 95%. Around 90% water by weight is common.

DJERASSI *et al*., [1954 *JACS* 76: 4089-4091], reported the successful use of a blow torch to deal with spines that caused handling difficulties even with heavy gloves. The qualitative and quantitative analytical results from cacti they despined this way showed no difference from controls. Obviously some care is needed to avoid cooking the flesh.

Wire clippers, needlenose pliers & safety glasses also work.

The Cactus Species

Assembled by Keeper Trout & friends

Acanthocereus pentagonus **(L.) Britton & Rose**

(Now *Acanthocereus tetragonus* (L.) Hummelinck)
"*organo*", "*pitahaya*", "*pitahaya morada*", "*pitahaya naranjadas*", "*night-blooming cereus*", "*barb-wire cactus*" Powell & Weedin 2004 & Standley 1924
See comments in **Activity Notes**

Anhalonium elongata See as ***Ariocarpus trigonus***

Anhalonium jourdanianum Lewin was determined to contain an unidentified but pharmacologically active alkaloid; Lewin 1894b. It cannot be demonstrably linked to *Lophophora jourdaniana* Habermann. [See comment under] Anderson 1980

Anhalonium lewinii Hennings See as ***Lophophora williamsii***
Anhalonium prismaticum Lemaire See as ***Ariocarpus retusus***
Anhalonium williamsii Rümpler See as ***Lophophora diffusa***
Anhalonium williamsii (Lemaire) Lemaire See as ***Lophophora diffusa*** [See Bruhn & Holmstedt 1974 for details]

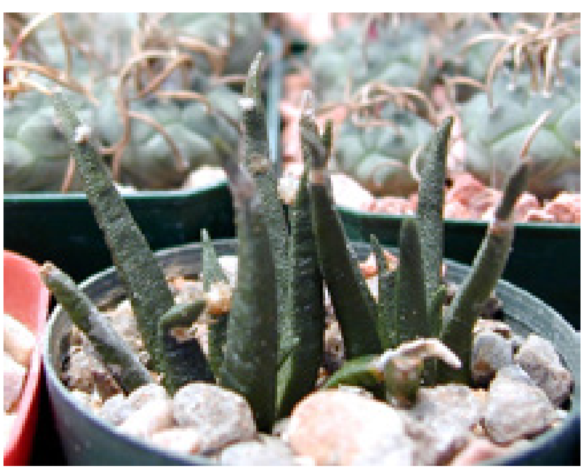
Anisocereus foetidus (MacDougall & Miranda) Marshall
See as ***Pterocereus foetidus***
Anisocereus gaumeri (Britton & Rose) Backeberg
See as ***Pterocereus (?) gaumeri***

Aporocactus flagelliformis **(L.) Lemaire**

"*flor del cuerno*", "*floricuerno*", "*flor del látigo*", "*hierba de la alferecía*", "*junco*", "*junquillo*", "*cuerno*", "*rat-tail cactus*" Standley 1924: 917
Flowers contained Betanin (35.4% of total), Phyllocactin (59.8% of total) & an unidentified Betacyanin. Piattelli & Imperato 1969
See comments in **Activity Notes**

Ariocarpus agavoides **(Castañeda) E.F.Anderson**

3,4-Dimethoxy-N-methylphenethylamine (trace)
N,N-Dimethyl-3-methoxytyramine (trace)
Hordenine (Over 50% of 1-10 mg of total alkaloids/ 100 gm. fresh.) Bruhn & Bruhn 1973



Ariocarpus bravoanus **Hernandez & Anderson**
Lacks published analysis.
See comments in **Activity Notes**.

Ariocarpus bravoanus **(grafted)**

Ariocarpus agavoides
above & left

Ariocarpus denegrii (Fric) Marshall
See as ***Obregonia denegrii***
Ariocarpus disciformis (DeCandolle) Marshall
See as ***Strombocactus disciformis***


Ariocarpus agavoides
(HBG)


Ariocarpus fissuratus
var. *lloydii*
(HBG)

Ariocarpus bravoanus ssp. hintonii **(Stuppy & Taylor) Anderson & Fitz Maurice**
Lacks published analysis.
See comments in **Activity Notes**.

Ariocarpus bravoanus ssp. hintonii

Ariocarpus fissuratus **(Engelmann) K.Schumann**
"*chaute*", "*chautle*", "*peyote cimarrón*", "*peyote*" (said to be erroneous) Standley 1924: 933
Hordenine (200 mg of sulfate from 1 kg dry) Heffter 1894b
N-Methyltyramine (%?) Diaz *et al.* 1977

See comments in the **Activity Notes**.

Ariocarpus fissuratus **var.** ***fissuratus*** **(Rose) Marshall**
3,4-Dimethoxy-N-methylphenethylamine (Major alkaloid. 0.004% dry wt.) Norquist & McLaughlin 1970
Hordenine (0.006% by dry weight.) McLaughlin 1969
N-Methyltyramine (visual estimate of 10 mg from 1.92 kg dry) McLaughlin 1969

Ariocarpus fissuratus **(Top right & lower left)**
fissuratus **intermedius (Photo above by Kamm)**

Ariocarpus fissuratus
(In habitat in Terrell County, Texas)

Ariocarpus fissuratus var. *hintonii see as* ***Ariocarpus bravoanus ssp. hintonii***

Ariocarpus fissuratus
(Presidio County, Texas)

Ariocarpus fissuratus
(Presidio County, Texas)

Ariocarpus fissuratus

Ariocarpus fissuratus intermedius

***Ariocarpus fissuratus* var. *lloydii* (Engelmann) Schumann**
Hordenine (no quantification) McLaughlin 1969
N-Methyltyramine (no quantification) McLaughlin 1969

Ariocarpus fissuratus* var. *lloydii

Ariocarpus fissuratus* var. *lloydii
(Photo by Kamm)

Ariocarpus furfuraceous see ***Ariocarpus retusus*** (most regard as *retusus* var. *furfuraceous*; lacks published analysis)

Ariocarpus hintonii see as ***Ariocarpus bravoanus* ssp. *hintonii***

***Ariocarpus kotschoubeyanus* (Lemaire) Schumann**
"*pezuña de venado*" (Nuevo León) Standley 1924: 933
78% water by weight
Hordenine (0.059% dry wt.) Neal *et al.* 1971b
N-Methyltyramine (0.015% dry wt.) Neal *et al.* 1971b
Reported to contain Betalains as pigments.
Wohlpart & Mabry 1968 cited Dreiding 1961

See **Activity Notes** for additional comments.

Ariocarpus retusus* var. *furfuraceous
Photo by Kamm

***Ariocarpus retusus* Scheidweiller**
"*chaute*", "*chautle*", "*peyote*" (said to be an erroneous name) Standley 1924: 933
86% water by weight. Braga & McLaughlin 1969
3,4-Dimethoxy-N-methylphenethylamine (0.00047% dry wt.) Neal & McLaughlin 1970
Hordenine (0.02% dry wt.: 214 mg from 1.19 kg dry) Braga & McLaughlin 1969
N-Methyl-4-methoxyphenethylamine (0.00045% by dry weight.) Neal & McLaughlin 1970
N-Methyltyramine (0.0016% by dry weight, i.e. 18.5 mg from 1.19 kg.) Braga & McLaughlin 1969
[Neal & McLaughlin 1970, did not report the latter compound.]
Reported with no detectable alkaloids in Smolenski *et al.* 1973.
Retusin (A flavonoid) & β-Sitosterol were recovered by Dominguez *et al.* 1968. This was the first isolation of retusin (tetramethylated quercetrine); formerly known as a synthetic compound (Gomm & Nierenstein 1931).

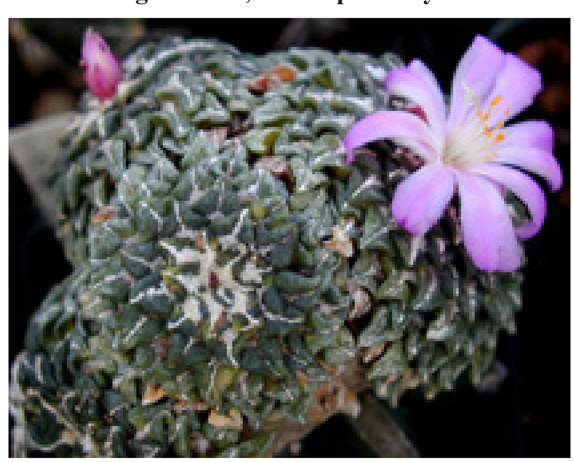
See **Activity Notes** for additional comments.

Ariocarpus kotschoubeyanus

Ariocarpus fissuratus **var.** ***lloydii*** **(fat form)**

Ariocarpus fissuratus **var.** ***lloydii***

Ariocarpus kotschoubeyanus **var.** ***elephantidens***
Both images above; center photo by Kamm



Ariocarpus kotschoubyanus **var.** ***macdowellii***
Lower right

Ariocarpus kotschoubeyanus var. *elephantidens*

Ariocarpus retusus


Photo by Kamm


Ariocarpus retusus monstrosus

Ariocarpus retusus
Entire page

Ariocarpus retusus

Ariocarpus scaphirostris **Boedecker**

(Originally misspelled *Ariocarpus scapharostrus*)

Hordenine (Major alkaloid of 4 in 0.012% total alkaloids)

N-Methyltyramine (no quantification)

3,4-Dimethoxy-N,N-dimethylphenethylamine (no quant.)

3,4-Dimethoxy-N-methylphenethylamine (no quant.)

Bruhn 1975b (Cultivated: California)

Ariocarpus scaphirostris
Upper 3 images

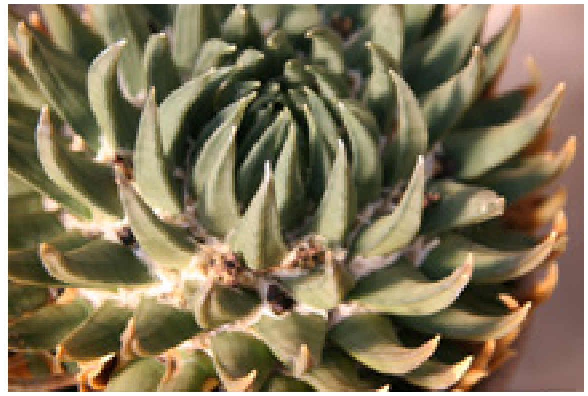
Ariocarpus trigonus
(SS)

Ariocarpus trigonus **(Weber) Schumann**

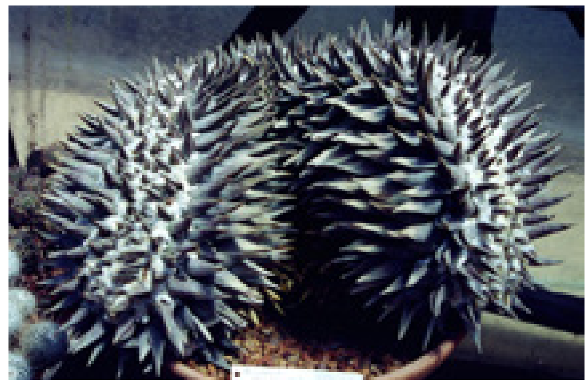
3,4-Dimethoxy-N-methylphenethylamine (0.007% dry)
Hordenine (Major alkaloid. 0.013% dry weight.)
N-Methyltyramine (trace)
Speir *et al.* 1970

[Tyramine has been listed **in error**; the reference cited, Speir *et al.* 1970, did not report it from this species.]

Ariocarpus williamsii (Lemaire) Voss See as ***Lophophora williamsii***



Ariocarpus trigonus
short-leafed form top left; long leaf form top right



Crested photo by Johnny B. Goode

Astrophytum asterias
(Starr County, Texas)

Armatocereus humilis (Britton & Rose) Backeberg
See as ***Lemaireocereus humilis***
Armatocereus laetus (HBK.) Backeberg See as ***Lemaireocereus laetus***

Oddly the entire genus *Astrophytum* lacks published analysis.

Astrophytum asterias (Zuccarini) Lemaire

"*star cactus*", "*peyote*" (Standley 1924: 955)
Unpublished analysis failed to show the presence of alkaloids (Martin Terry 2005; personal communication).

Astrophytum myriostigma Lemaire

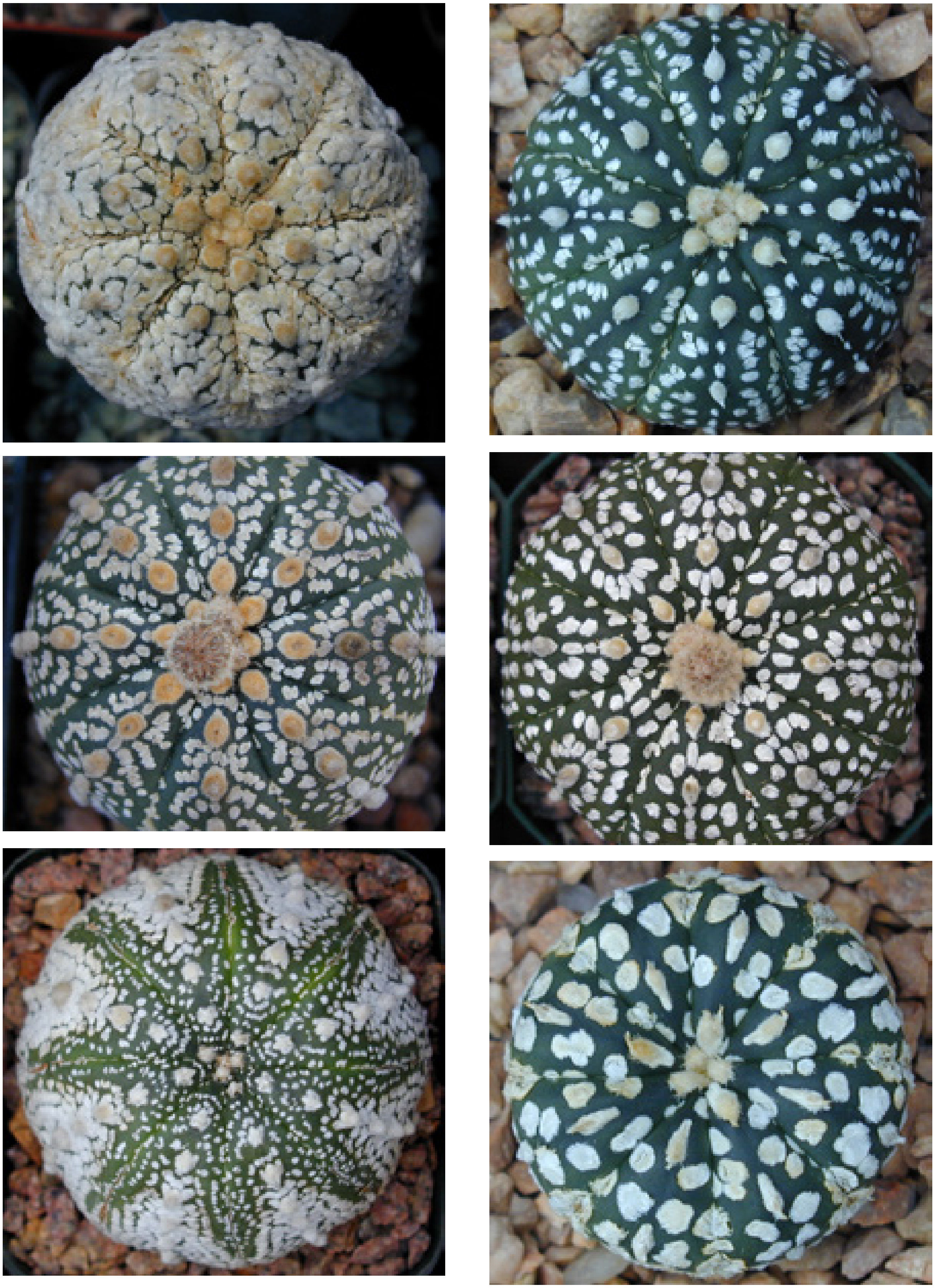
"*mitra*" (San Luís Potosí), "*birreta de obispo*" (Coahuila) "*bonete*", "*peyote cimarrón*" (Durango) Standley 1924: 955
Appears listed as containing unidentified alkaloid(s) but either the entry included no reference (ex. Soulaire 1947) or else the reference that was cited (Brown *et al.* 1968) did not mention the species.

See comments on the *Astrophytum* species in **Activity Notes**.

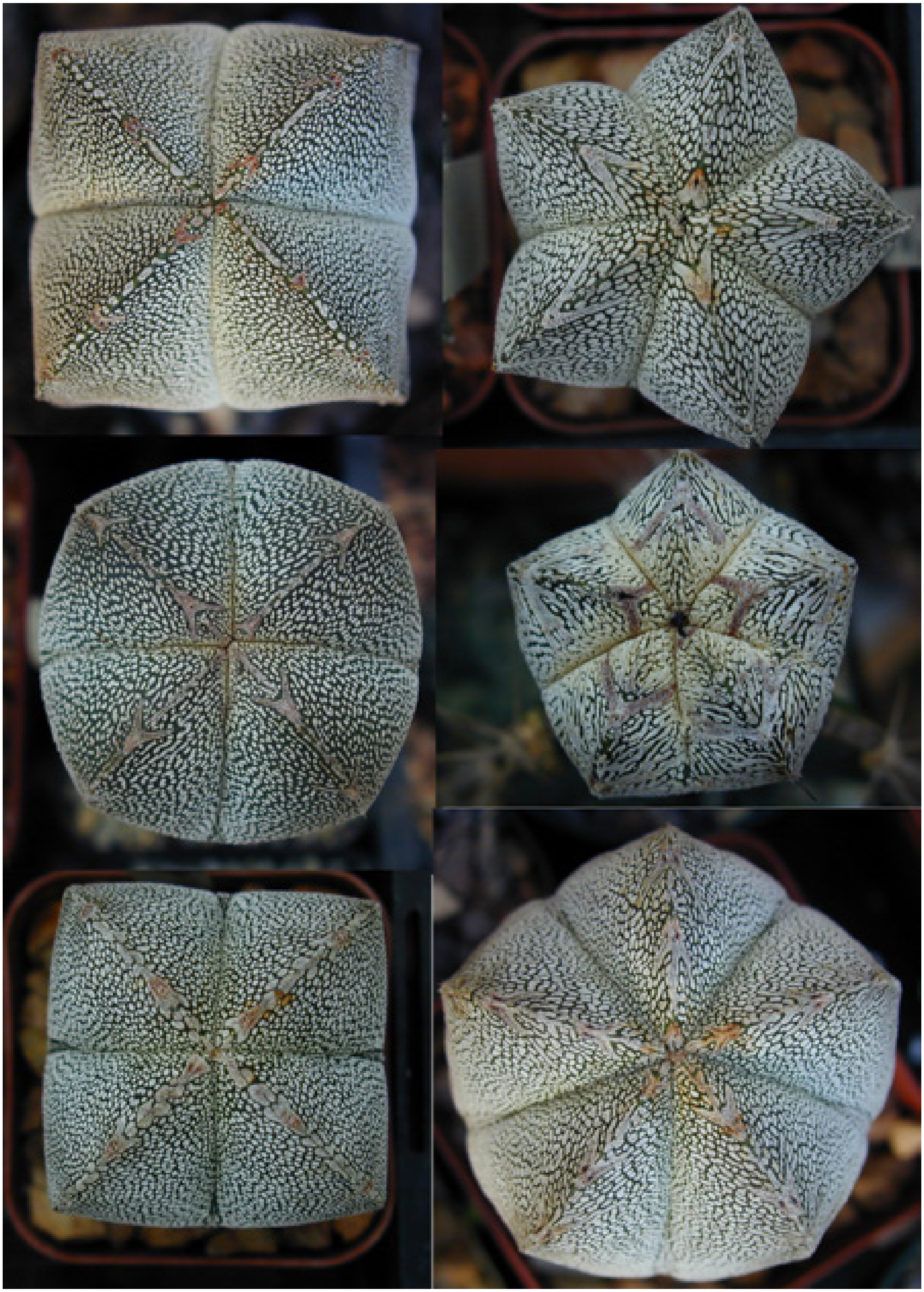
Astrophytum asterias

***Astrophytum myriostigma* above & below**

Astrophytum myriostigma
(BTA)



***Astrophytum* cv. Superkabuto hybrids**



***Astrophytum myriostigma* cv. Onzuka**

Austrocylindropuntia cylindrica **Lamarck**

["*Opuntia cylindrica*" was **erroneously listed** as containing mescaline in the following reports: Coch Frugoni 1956(?), Cruz Sánchez 1948b, Gutiérrez-Noriega & Cruz Sánchez 1947, Marini-Bettòlo & Coch Frugoni 1956, Marini-Bettòlo & Coch Frugoni 1958 and, **almost incredibly**, Turner & Heyman 1960.

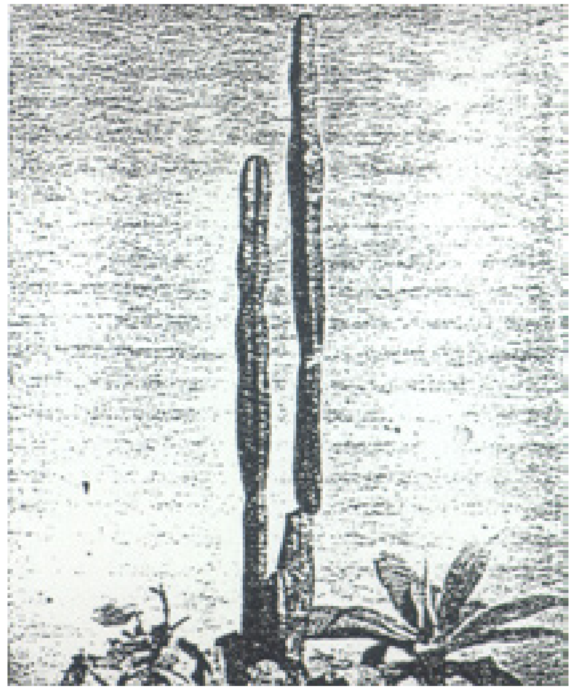
Der Marderosian 1966 indicated that "*correspondence with the original author*" verified that their material had indeed been misidentified. While it was not specifically stated; Turner & Heyman were implied.

All of the above were apparently based on misidentified plants. (Actual identity was almost certainly *Trichocereus pachanoi*.in all instances. It is demonstrably the case in Cruz Sánchez 1948 where an unmistakable *T. pachanoi* photograph was included.

This is also discussed in more detail in **Part B; San Pedro**]

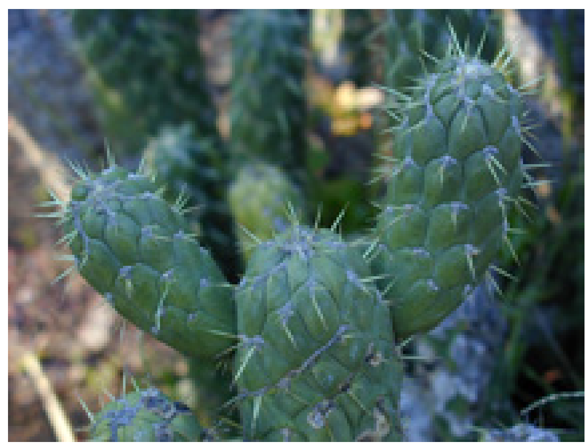
More recently *Opuntia cylindrica* reverted to an older synonym *Austrocylindropuntia cylindrica*.

Authenticated *Opuntia cylindrica* was determined to contain no measurable alkaloid in Agurell 1969b [Obtained via European commercial sources].



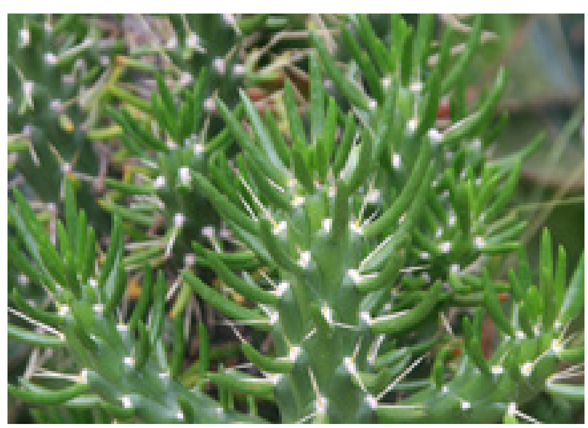
"*Opuntia cylindrica*" (*Trichocereus pachanoi*)
from the 1948 thesis of Guillermo Cruz Sanchez
(image above is a scan of a photocopy of the original)

Opuntia cylindrica
Curtis 1834



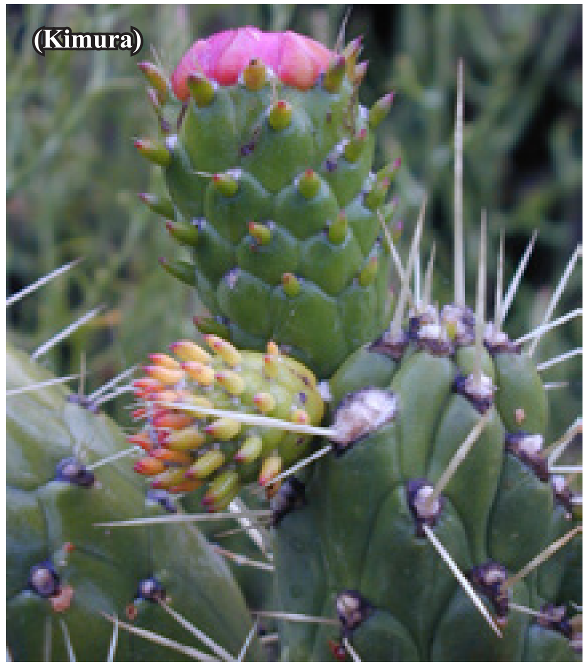
Austrocylindropuntia cylindrica
(Strybig) above

***Austrocylindropuntia cylindrica* flowering**
(Kimura)



Austrocylindropuntia cylindrica
(UC)
hothouse: above; outdoor bed: center right

(Strybig Botanical Gardens)



Austrocylindropuntia cylindrica
all four images

Austrocylindropuntia exaltata **Berger**
[Considered varietal to *Opuntia subulata* in Hunt 2006]
3,4-Dimethoxyphenethylamine (less than 0.01% dry wt.)
4-Hydroxy-3,5-dimethoxyphenethylamine (Less than 0.01% dry wt.) Ma *et al.* 1986 (**Ostolaza #84284**)

Austrocylindropuntia cylindrica
(Strybig)

Austrocylindropuntia pachypus **K.Schumann**

[sic as *Opuntia pachiypus*]

The claim for the presence of Mescaline was made by Caycho Jimenez 1977 (page 91) but no reference was cited and nothing was included to support his assertion.

Austrocylindropuntia pachypus
(California Cactus Center)

Austrocylindropuntia subulata **(Mühlenpfordt) Engelmann**

3-Methoxytyramine (no quantification)

An unidentified alkaloid was also present.

Meyer *et al.* 1980

88% of the daily CO2 uptake occurred through the leaves during the daytime but some occurred at night (under well watered conditions)

Nobel & Hartsock 1986

Austrocylindropuntia subulata
(Los Angeles County Arboretum)

Austrocylindropuntia subulata
(Los Angeles County Arboretum)

Aylostera pseudodeminuta (Backeberg) Backeberg
See as ***Rebutia pseudodeminuta***

Aztekium ritteri (Bödeker) Bödeker

(Plants greenhouse grown in Czechoslovakia.)
N-Methyltyramine (0.0031%)
3-Methoxytyramine (Less than 0.0001%.)
Hordenine (Less than 0.0001%.)
N,N-Dimethyl-3,4-dimethoxyphenethylamine (0.0036%)
Mescaline (0.0009%) (9 mg per kg of dry wt.)
Anhalidine (0.0008%)
Pellotine (0.0026%)
Štarha 1994 (All % above are by fresh wt.)

In the wild this plant typically remains solitary for its entire life. Treatment with fungicides and pesticides in cultivation, and also grafting, commonly produce these multiheaded individuals.

Aztekium ritteri

Aztekium ritteri
(UC)

Azureocereus ayacuchensis **Johns**

Tyramine (0.135% by dry weight as HCl) Lee *et al.* 1975 (cultivated in Arizona)

The genus ***Azureocereus*** needs analysis.

Azureocereus imperator
(UC)
54.0189 Peru

Backebergia militaris **(Andot.) Bravo ex Sanchez Mejorada**

3-Methoxytyramine (0.02% dry wt.) Pummangura & McLaughlin 1981a [Collected in Michoacan, Mexico] [Also in Pummangura *et al.* 1981b]; (Not identified by Ferrigni *et al.* 1984.)

3,4-Dimethoxyphenethylamine (0.025% dry wt. [as HCl]) Mata & McLaughlin 1980b; (Not identified Ferrigni *et al.* 1984.)

3,4-Dimethoxy-N-methylphenethylamine (Detected: No quantification) Ferrigni *et al.* 1984.

3,4-Dimethoxy-N,N-dimethylphenethylamine (0.0588% dry wt.) Pummangura & McLaughlin 1981a; (Trace: Ferrigni *et al.* 1984.)

[3-Methoxyphenethylamine (**Error**. Based on typo in Ferrigni *et al.* 1984.]

[Phenethylamine (**Error**. Based on misreading of typo in Ferrigni *et al.* 1984.]

Also contains some isoquinolines [See Note]; (tetrahydro, dihydro and fully aromatic):

Heliamine (0.75% dry wt. [as HCl]) Mata & McLaughlin 1980b; 1.02% by dry wt. [as HCl]) Pummangura & McLaughlin 1981a; (Identified by ms/ms; but not mentioned in experimental account of isolations: Ferrigni *et al.* 1984)

Lemaireocereine (0.034% by dry wt. [as HCl]) Pummangura & McLaughlin 1981a [Also by Pummangura *et al.* 1981b]; (Not identified in ms/ms by Ferrigni *et al.* 1984)

N-Methylheliamine (Identified by ms/ms; Detected in an impure residue) Ferrigni *et al.* 1984

Dehydroheliamine (Identified by ms/ms; 0.07% by dry wt. isolated) Ferrigni *et al.* 1984

Dehydrolemaireocereine (Identified by ms/ms; 0.006% by dry wt. isolated) Ferrigni *et al.* 1984

Backebergine (Identified by ms/ms; 0.0126% by dry wt. isolated) Ferrigni *et al.* 1984

Isobackebergine (Identified by ms/ms; 0.022% by dry wt. isolated) Ferrigni *et al.* 1984

N-Methyllemaireocereine (possible presence; neither proven nor dismissed) Ferrigni *et al.* 1984

[7,8-Dimethoxy-3,4-dihydroxyisoquinoline is a typographical **error** intending 7,8-Dimethoxy-3,4-dihydroisoquinoline (I.e. Dehydrolemaireocereine) Ferrigni *et al.* 1984 was cited as the reference]

Unger *et al.* 1980 evaluated this species using MIKES and reported detecting 3 alkaloids but it is unclear exactly which isomers they observed. One appeared to be N-Methylheliamine.

tlc examination showed the presence of alkaloids and the absence of triterpene glycosides: Kircher 1982

Kircher reported the same sterols as they had encountered in *L. schottii* and also what they thought was Lauric acid.

Lipid content determined to be 7% by dry weight: Kircher 1982

Backebergia **Note:** One other partially saturated THIQ was depicted in Ferrigni's line diagram key but appears to have been used as a synthetic intermediary and not isolated from the plant. It should be noted that besides having at least one typo in their key, the first two generic line diagrams are switched. [PEA ⇔ THIQ]

Borzicactus sepium **(HBK) Britton & Rose**
Flower contains Betanin, Phyllocactin, Isophyllocactin and traces of Isobetanin Piattelli & Imperato 1969

Cactus grandiflora Linnaeus See as ***Selenicereus grandiflorus***

Carnegiea euphorbioides (Haw.) Backeberg
See as ***Neobuxbaumia euphorbioides***

Brasiliopuntia brasiliensis **(Willdenow) Berger**
Positively identified in Stuart 2003 as "*tchai*".
Mucilage comprised of Arabinose (26.2%), Galactose (49.8%), Galacturonic acid (6.1%), Rhamnose (9.4%) & Xylose (8.6%). Moyna & DiFabio 1978 (**MAM 1308**)

Purportedly used as an ayahuasca admixture and alone as a hallucinogenic. Following that earlier report, Bianchi & Samorini 1993: 38 included an image of the leaves.
The claims were more recently discredited by Stuart 2003.

See more detailed comments in **Activity Notes**.

Borzicactus sepium
(UC)

Brasiliopuntia brasiliensis
collected in Peru by Stuart

Some of the *Browningia* species

Browningia candelaris **(Meyen) Br. & R.**

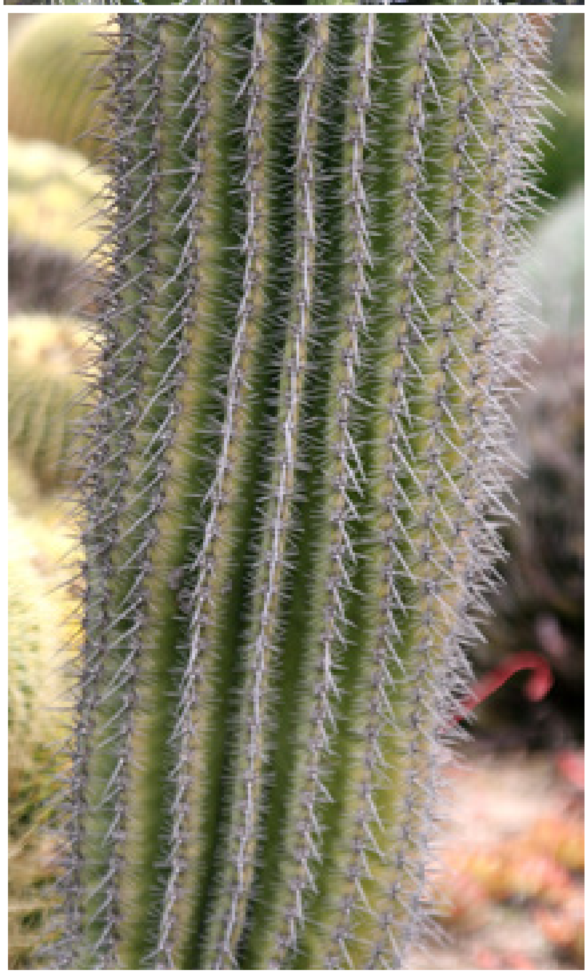
In dried aerial parts:

0.0058%	N-Acetyl-3,4-dimethoxyphenethylamine
0.0245%	N,N-Dimethyl-3,4-dimethoxyphenethylamine
0.0327%	N,N-Dimethyl-4-methoxyphenethylamine
0.0330%	4-Methoxyamphetamine

Echeverría & Neimeyer 2012

Identification was based on a published spectral compendium. 4-Methoxyamphetamine seems most likely to be a gcms misidentification of N-Methyl-4-methoxyphenethylamine.

Also see the interesting conjecture in Ostolaza 1987



The entire genus *Browningia* needs analysis.

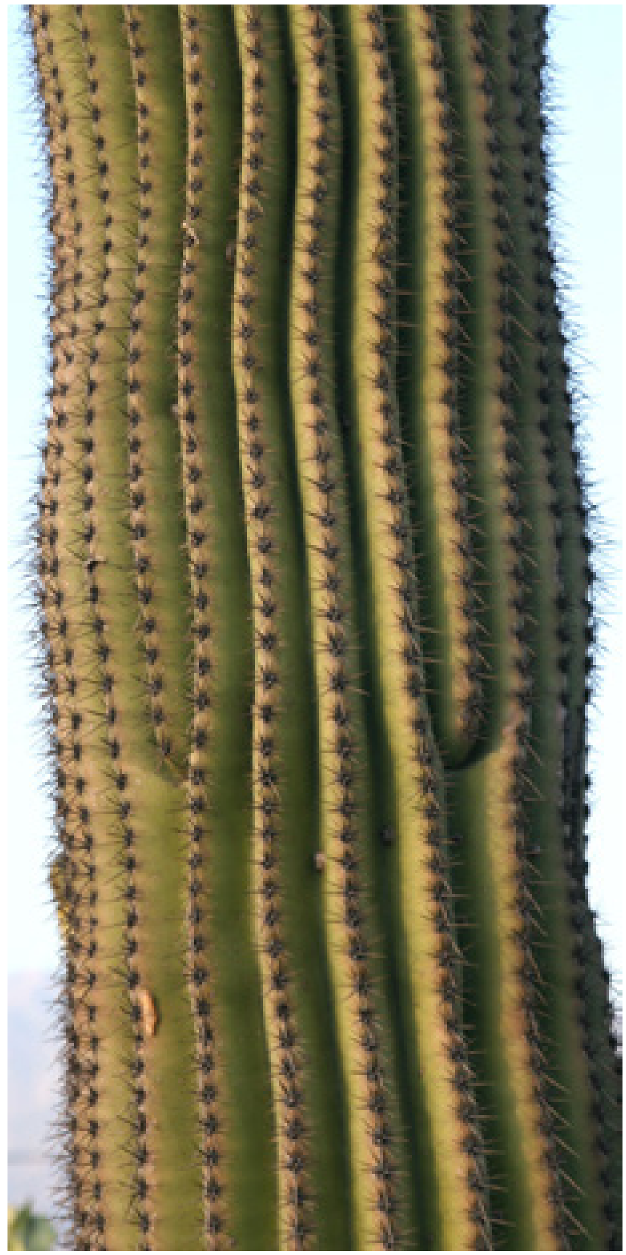
Carnegiea gigantea **(Engelmann) Britton & Rose**

AKA "*saguaro*", "*sahuaro*", "*suwarrow*", "*suwarro*", "*suaharo*", "*suguaro*" Standley 1924: 909

87-88% water by weight Kircher 1982

3,4-Dimethoxyphenethylamine ("*less than*" 0.00145%.) Bruhn & Lundström 1976b (See Note A) & (trace) Bruhn *et al.* 1970

3-Methoxytyramine (trace) Bruhn *et al.* 1970 & (small amounts) Bruhn & Lundström 1976b



Carnegiea gigantea
(California Cactus Center) above
(Saguaro National Forest, Tucson) upper left
(HBG) lower left

Dopamine (0.26%, as HCl, reported from young cultivated plants [Raised in the Netherlands]; not observed in their analysis of wild-collected material [Collected in Arizona]) Bruhn & Lundström 1976b. [Reported in cortical tissue (pulp) at 1%; Callus tissue and adjacent areas had higher dopamine concentrations than healthy tissue (See Note B): Steelink *et al.* 1967 [Collected in Arizona]

[Tyramine, 3,4-DiMeO-5-OH-PEA and 3,5-DiMeO-4-OH-PEA have also been **erroneously** listed for this species but the claims are not supported by Agurell 1969b (the reference that was cited).]

[Mescaline has been **erroneously** listed for this species. The claim is not supported by any of the references that were given. [i.e. Agurell 1969b, Kapadia & Fayez 1970 [See Note C] and Mata & McLaughlin 1976.]

Carnegine Isolated (0.7% dry wt.) & named by Heyl 1928. (0.575% yield by dry weight (As HCl) in Ordaz *et al.* 1983.) Identified in Brown *et al.* 1968; Reported present in decent amounts (70% of total alkaloid content.) in Brown *et al.* 1972b. [Presence also noted in Hodgekins *et al.* 1967] Also by Bruhn *et al.* 1970, who, unlike Brown, suggested presence in young plants but not in larger specimens. I am unable to determine details due to procedural differences. Also; 0.019% by fresh weight (2.9 grams of base from 15 kg fresh) Bruhn & Lundström 1976b [Agurell *et al.* 1971a is also cited but is not presently available.] Also isolated in Späth 1929.

Gigantine (5-Hydroxycarnegine) (Identified) Brown *et al.* 1968 [See Note D]; Only reported in substantial amounts during analysis of **wild** collected **adult** cacti and found to be higher in growing tips (see also Brown *et al.* 1972b who found it composed 25-30% of the total alkaloid content in the whole plant but 50% in the growing tip). [Said to comprise 30% of total alkaloid content in Hodgekins *et al.* 1967] Bruhn & Lundström 1976b reported 0.0016% by fresh wt. (281.6 mg base from 15 kilos of fresh material) Not reported in greenhouse grown plants (Bruhn & Lundström 1976b); nor in young plants grown outdoors in Arizona (Bruhn *et al.* 1970).

Salsolidine (Norcarnegine) Bruhn *et al.* 1970 & Bruhn & Lundström 1976b reported salsolidine to be the major alkaloid (0.02% fresh wt.: 3.2 grams of base from 15 kg fresh), whereas Brown *et al.* 1972b did not find salsolidine in any samples they tested. 0.47% yield by dry weight (As HCl) was reported in Ordaz *et al.* 1983. [See also Agurell *et al.* 1971a; See note above]

Arizonine (0.0036% by fresh wt.; 1.1 grams of base from 15 kg fresh) Bruhn & Lundström 1976b [See also Agurell *et al.* 1971a; See note above]

Dehydrosalsolidine (%?) Lundstrom 1983 cited Pummangura *et al.* (1983) *J. Nat. Prod*. (In press) [S. Pummangura, J.L. McLaughlin, D.V. Davies & R.G. Cooks] Not in 1983 or 1984 author index.

Heliamine (%?) Lundstrom 1983 cited Pummangura *et al.* 1983. [See also Agurell *et al.* 1971a; See note above]

Dehydroheliamine [0.0008% yield by dry weight (As HCl) was reported in Ordaz *et al.* 1983.]

Unger *et al.* 1980 evaluated this species using MIKES and reported detecting 4 (or 5?) quinolines. One was reported to be Salsolidine; another was either Carnegine or else isomeric with it. The exact isomeric identities of the rest was not clear to us. Two appeared to be trimethoxylated.

1-1.7% alkaloid (Carnegine and Gigantine) Kircher 1982

Glucaric acid (tlc by Kringstad & Nordal 1975)

Isocitric acid (tlc & glc by Kringstad & Nordal 1975)

Quinic acid (tlc & glc by Kringstad & Nordal 1975)

Vanillin, Syringaldehyde & *p*-Hydroxybenzaldehyde were found to be higher in healthy tissue than in callus tissue. A glycoside of 4-Hydroxybenzoic acid and Ferulic acid were reported as minor & trace components respectively.

3,4-Dihydroxybenzoic acid, Vanillic acid & *p*-Hydroxybenzoic acid found in callus tissue along with trace amounts of *p*-Coumaric acid & Ferulic acid. Quercetin was also observed at 0.1% of the total callus but was absent from the ribs themselves.

Steelink *et al.* 1967

tlc examination showed the presence of alkaloids and the absence of triterpene glycosides: Kircher 1982

Lipid content determined to be 2.5% by dry weight.

0.1% sterols: Campesterol, Sitosterol and 1 unknown sterol.

Unable to detect any sterol or triterpene glycosides. Kircher 1982

Carbohydrates in healthy cortical tissue were reported to be composed of Glucose, Galactose (31% of all saccharide constituents), Xylose & Arabinose.

Galactose was lacking from the wound tissue. Steelink *et al.* 1968

Carnegiea gigantea
Center

***Carnegiea* Notes:**

A: Concerning my math-work for **Bruhn & Lundström 1976b**:

15 kg of fresh cactus yielded 32 grams of alkaloids. 80% was nonphenolic and 20% was phenolic. When purifying these fractions they only used 1 gram of the nonphenolic and 0.5 grams of the phenolic fractions. The amounts listed in their account is what was obtained from these aliquots rather than totals.

For all compounds except dopamine the yields were calculated, by kt, as if they had used all of their product and then recalculated them in terms of their free bases (Alkaloids were obtained as the hydrochloride salts in all cases except for Arizonine)

B: Dopamine concentrations were reported to increase with exposure to air or to ascorbic acid solutions.

In one case; a sample with 1.4% dopamine was taken. After 1 hour, a second sample, that was taken immediately next to the site of the first, showed 2.1%.

They also noted a a high dopamine content in samples taken near the base (which always has a heavy callus layer).

C: It should be noted that while listing Kapadia & Fayez 1970, they used the volume, and a page number, in Kapadia *et al.* 1969.

D: The unusual substitution at the 5 position has also been observed in several other alkaloids found in *Pachycereus pringlei*, and *Pachycereus weberi*, as well as in *Pachycereus tehuantepecanas*.

(Gigantine is also found in *Pachycereus pecten-aboriginum.*)

The question of whether any of the *Pachycereus* alkaloids are active as visionary compounds is an area overdue for evaluation. Preliminary evaluations depict them as rough and with a heavy body load yet some few people appear to like them. More study is clearly needed.

See also comments in the **Activity Notes**.

Cephalocereus chrysacanthus (Weber) Britton & Rose.
See as ***Pilocereus chrysacanthus***

Cephalocereus columna-trajani (Karw.) K.Schumann
See as ***Cephalocereus hoppenstedtii***

Cephalocereus euphorbioides (Haw.) Br & R.
See as ***Neobuxbaumia euphorbioides***

Cephalocereus gaumeri Britton & Rose is **NOT** synonymous with ***Pterocereus* (?) *gaumeri***

Carnegiea gigantea

Carnegiea gigantea

Carnegiea gigantea

Cephalocereus glaucescens (LABOURET.) BORG

This species was reported to show no detectable alkaloids in the alkaloid screenings of SMOLENSKI *et al.* 1973.

Fruit contains Betanin (major), Phyllocactin and traces of Isophyllocactin & Isobetanin. PIATTELLI & IMPERATO 1969

Cephalocereus guerronis (BACK.) BUXB. See as ***Pilocereus guerreronis***

Cephalocereus hoppenstedtii (A.WEB.) K.SCHUMANN

No detectable alkaloids.

CHALET 1980a cited DOMINGUEZ *et al*. 1969

Cephalocereus leucocephalus (POSELGER) BRITTON & ROSE

"*napisora*" (PENNINGTON 1963: 155)

No detectable alkaloids in the alkaloid screenings of SMOLENSKI *et al.* 1973.

Fruit contains Betanin (major), Phyllocactin, Betanidin and traces of Isophyllocactin & Isobetanin.

PIATTELLI & IMPERATO 1969

See comments in **Activity Notes**.

Cephalocereus maxonii ROSE See as ***Pilocereus maxonii***

Cephalocereus melanostele VAUPEL

Cephalocereus sp. (?) PFEIFFER

Claim purporting the presence of Mescaline is made by CAYCHO JIMENEZ 1977 (page 91) but he cites no reference and does not include anything that support the assertion.

Cephalocereus nobilis (HAWORTH) BRITTON & ROSE

Fruit contains Betanin (major), Phyllocactin and traces of Isophyllocactin & Isobetanin. PIATTELLI & IMPERATO 1969

Cephalocereus senilis (HAWORTH) PFEIFFER

No detectable alkaloids. AGURELL 1969b [Obtained via European commercial sources]. **NOT** synonym for *Mamillopsis senilis*.

Traces of unidentified triterpene(s) DJERASSI 1957 cited unpublished observations by DJERASSI & MARFEY

Cephalocereus tetetzo (A.WEB.) VAUPEL
See as ***Neobuxbaumia tetetzo***

Cereus acranthus (K.SCHUMANN) VAUPEL
See as ***Haageocereus (Weberbauerocereus) acranthus***

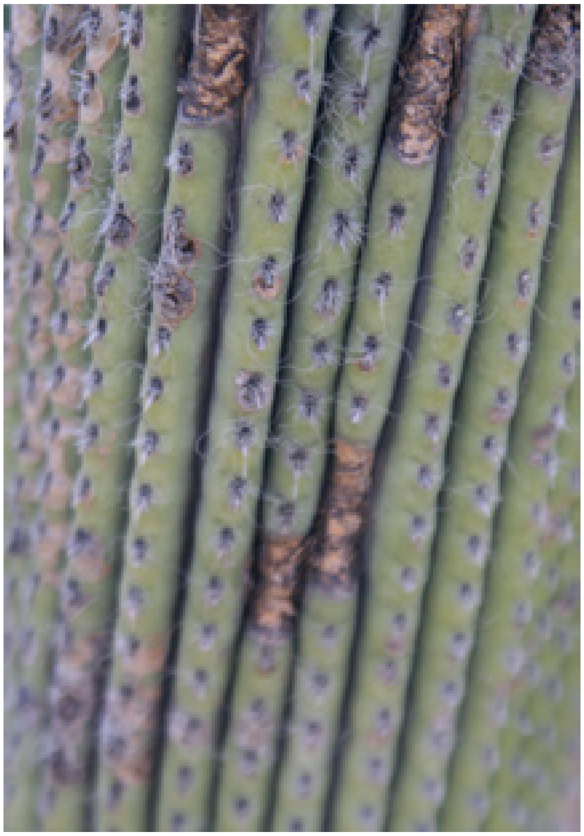
Cephalocereus senilis

(UC Botanical Gardens)

Cephalocereus senilis

(Huntington Botanical Gardens)

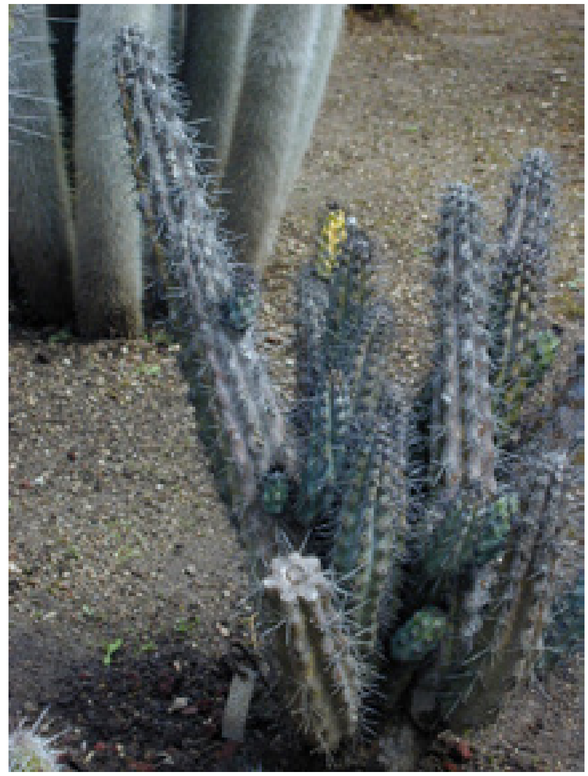
Cephalocereus senilis
(HBG)



Cephalocereus senilis
(HBG)

Cereus alacriportanus
(HBG)

Cereus aethiops **Haworth**
Candicine (%?) Ruiz *et al.* 1973
Hordenine (%?) Ruiz *et al.* 1973
Tyramine (%?) Ruiz *et al.* 1973



Cereus aethiops

Cereus alacriportanus **Pfeiffer**
Hordenine. (Sole alkaloid 1-10 mg/ 100 gm of fresh plant.) Agurell 1969b [European commercial source]

Cereus azureus **Parmentier**
No detectable alkaloids. Agurell 1969b [European commercial source]

Cereus caespitosus Engelmann & A. Gray
= *Echinocereus reichenbachii* subs. *caespitosus*
See comments under *Echinocereus reichenbachii* in **Activity Notes**.

Cereus comarapanus **Cardenas**
Flower contains Isophyllocactin, Betanin, Phyllocactin & Isobetanin. Piattelli & Imperato 1969

Cereus coryne. See as ***Stetsonia coryne***

Cactus divaricatus Lam. non Kuntze = *Cereus divaricatus* (Lam.) De Cand. See as *Harrisia divaricata*.
See comment in **Activity Notes**.

Cereus fimbriatus See as Lemaireocereus hystrix
See comment in **Activity Notes**.

Cereus gummosus See as *Machaerocereus gummosus*

Cactus flagelliformis L. = *Cereus flagelliformis* (L.) Mill. See as *Aporocactus flagelliformis*

Cereus forbesii var. mairanensis
(Huntington)

Cereus forbesii
(Huntington)

Cereus forbesii **O.**

Tyramine (Over 50 mg/ 100 gm of fresh) Agurell 1969b [European commercial source]

Cereus gigantens Engelmann. See as ***Carnegiea gigantea***
Cereus giganteus Engelmann See as ***Carnegiea gigantea***

Cereus jamacaru
(UC)
right hand column

Please note that, in the past, *Trichocereus pachanoi* has been sold (Improperly) under the name *Cereus giganteus* and there is also a Karel Knize *nomen nudum* designated *Trichocereus giganteus* Knize n.n. There is also material in cultivation designated as *Trichocereus peruvianus* var. *giganteus* that is the same Knize *nomen nudum.*

Cereus glaucus **Salm-Dyck**

Hordenine (1-10% of 1-10 mg total alkaloids/ 100 gm of fresh plant.) Agurell 1969b [European commercial sources]
Tyramine (Over 50% of 1-10 mg total alkaloids/ 100 gm of fresh) Agurell 1969b

Cereus grandiflorus Mill. See as ***Selenicereus grandiflorus***

Cereus hirschtianus **K.Schumann**

Citric acid (1.8% in stem juice)
Hegnauer 1964 cited Bergström 1934

The name cactin was assigned to a methionine rich albumin isoated from the seeds of *Cereus jamaracu*. It was found to resemble a protein found in Brazil nuts.
Aragão *et al*. 2000

(Sultan earlier used the name cactine for an uncharacterized alkaloid from *Selenicereus grandiflorus*.)

Cereus macrostibas (K.Schumann) Berger
See as ***Neoraimondia macrostibas***

Adult *Cereus jamaracu*
(Fruit Spirit Botanical Gardens)

Cereus jamacaru **DeCandolle**

"*mandacaru*"

Tyramine (total 0.2% crude but only 0.02% was recovered as the HCl) Bruhn & Lindgren 1976 [Obtained via the Kew]. (second to most abundant for Davet 2005)

N-Methyltyramine Davet 2005 (major alkaloid in Davet 2005)

Tyrosine Davet 2005

Hordenine Davet 2005

beta-Sitosterol Davet 2005

[Caffeine (0.08-0.11%.) was reported in the seeds by Freise 1935 (1936?), and this was iterated in Willaman & Schubert 1961, but Bruhn & Lindgren 1976, reported that they could detect NO caffeine in either the seeds or stems of this plant. Freise apparently reported it in only some samples of seeds but neglected to note how he identified it. No xanthine derivative has ever been demonstrably isolated from **any** cacti despite his claim. Bruhn & Lindgren 1976 reported no alkaloidal material in the seeds.]

[Hordenine appeared listed **in error** but more recently was reported. The reference cited intially, Agurell 1969b, did not investigate this species. Davet 2005 did.]

β-Sitosterol Djerassi 1957 cited unpublished observations by Djerassi & Kan

The list of endophytes in Bezerra et al. 2013 suggests that the potential for bioactivity is worth study.

Alkaloid production of callous tissue culture was studied by de Oliveira & Machado 2003

Reported to contain Betalains as pigments.
Wohlpart & Mabry 1968 cited Dreiding 1961

Below shows lower stem; above is higher on the plant.

Cereus jamacaru
(UC) *above*

***Cereus peruvianus* var.**
(HBG) E. Werdermann (VI) H 5262
Lower right

Cereus peruvianus **(Linnaeus) Miller**
[See note on the next page.]
Hordenine (%?) DeVries *et al.* 1971
Tyramine (trace) Agurell 1969b [Obtained via European commercial sources]
Reported to contain Betalains as pigments.
Wohlpart & Mabry 1968 cited Dreiding 1961

Erroneously listed both as a mescaline containing plant and as a hallucinogen.
See comments in **Activity Notes**.


Cereus peruvianus **var. (H 5262)**


unlabeled
Cereus peruvianus

Mucilage polysaccharide - 1.6% of total weight of fresh plant.
Uronic acid content of polysaccharide: 44%
Rhamnose: arabinose, galactose (1:1:2)
Mindt *et al.* 1975


Cereus peruvianus **var.** ***reclinatus***
(HBG)

Cereus peruvianus is under intensive development for fruit production. The fruit is called *koubo* in Israel.

It "*..can produce fruits 3-4 years after planting from seeds and 2-3 years after planting from cuttings. A 7-year-old plant can bear 60-80 kg of fruits annually*."

Ninio *et al*. 2003

The color of the peel changes from green to violet in the early stages of ripening and then from violet to red at the end of the process. The first appearance of color begins near the perianth scar becoming complete violet color about a week later. As ripening continues, the color of the peel changes to red, which is usually followed by the cracking of the fruit.

All fresh wt.	**Green**	**Purple**	**Red**
Ethanol-insoluble polysaccharides	14 mg/g	4 mg/g	4 mg/g
Ethanol-soluble sugars	20 mg/g	~75 mg/g	110 mg/g

The main sugars that accumulated in the fruit pulp were Fructose and Glucose in a 1:1 ratio. Each one increased from 25 to 275 µmol/g fw during ripening.

Sucrose was present in low concentration (0-10 µmol/g fw) which did not change significantly during ripening.

The decrease in polysaccharide content is too low to account for the increases in soluble sugars so Ninio felt "*it is likely that the observed accumulation of fructose and glucose during ripening is dependent on assimilated transport from the mother plant*. "

Ninio also found that fruits which were harvested at the green stage contained lower levels of soluble sugars than red fruits. Their conclusion:

"*To obtain fruits of high quality with high sugar concentration, it is recommended to postpone fruit harvest as much as possible (before fruit cracks)*."

Malic acid constituted 90% of the fruit's organic acids.

When the mature green fruit turned purple the content of malic acid decreased by half (from 50 to 25 µmol/g fresh weight) and remained constant for the rest of the ripening process.

Concentrations of citric, succinic, and oxalic acids were all lower than 4 µmol/g fw.

During ripening, the composition of the volatile components changed from being comprised of 2-Heptenal, (E,E)-2,4-Decadienal, (E,Z)-2,4-Decadienal, 2-Decenal & Benzoic acid at the mature green stage to being largely Linalool with smaller amounts of Epoxy linalool and 3,7-Dimethyl-1,5-octadiene-3,7-diol when violet, increasing dramatically when completely red. Those three compounds comprise 99% of the total volatiles in the ripe fruit.

Linalool reaches concentrations of 1.5-3.5 µg/g fresh weight in mature red fruits.

Ninio *et al*. 2003

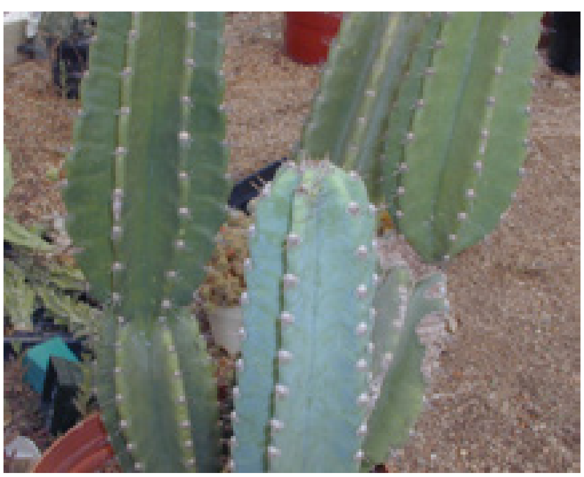
The aroma of the fruit is the product of (S)-linalool and linalool derivatives.

The initial detection of linalool coincides with the development of the purple color and increases during ripening into a cracked red fruit. The highest values were found in fruit ripening in storage. These findings are in line with the reports that higher linalool levels accumulate in fruit ripening in storage compared to fruit ripening on the tree.

Sitrit *et al*. 2004 cited Ninio *et al*. 2003 & 2004.

S-(+)-Linalool was found to be the main volatile accumlating in the ripening fruit and was determined to occur in a remarkably high optical purity of 98%.

Sitrit *et al*. 2004



Cereus peruvianus
(Austin, Texas) above
(HBG) right -- showing splitting ripe fruit

***Cereus peruvianus* var. (H 5262)**





***Trichocereus macrogonus* form mislabelled as a *Cereus* sp.**

Note

Trichocereus macrogonus, T. pachanoi, *T. peruvianus*, *T.* sp. TJG & some material resembling what is known as *Trichocereus argentinensis* have all been improperly sold or published as photos in cactus books under this name. (As are other *Cereus* species)

Similarly "*Cereus*" sp. Peru 68.0235 at the Berkeley Botanical Gardens and the fat blue "*Cereus*" encountered mislabelled are both *Trichocereus*.

It appears probable that *Cereus arequipensis*, *SOME* of the material marked *Cereus argentinensis* (But NOT true *Cereus argentinensis*), *Cereus bolivianus* (No. 6231 in the NY Bot. Garden), some *Cereus colossus* (But NOT true *Cereus coloseus*), *Cereus hempelianus* Bauer, & *Cereus tephracanthus bolivianus* Weber, may prove to be active *Trichocereus* species once analyzed.

unlabeled *Cereus peruvianus* in Balboa Park

Cereus peruvianus *formae* ***monstrosus*** **DECANDOLLE**
Tyramine (over 50% of 10-50mg total alkaloids/ 100 gm of fresh plant.) AGURELL 1969b [From European commercial source]

Cereus pilocereus is somehow a mistaken rendering referring to *Pilocereus Sargentianus* (I.e. *Lophocereus schottii*) that appears in some early medical literature (ex.: REMINGTON *et al.* 1918)

Cereus rosei WERDERMANN See as ***Trichocereus peruvianus***

***Cereus* sp. MILLER**
Claim for the presence of Mescaline is made by CAYCHO JIMENEZ 1977 (page 91) but no reference was cited and he does not include anything to support his assertion.

***Cereus* sp.** (unidentified; Mexico) was reported to show detectable alkaloids in SMOLENSKI *et al.* 1973.

Cereus peruvianus **formae** ***monstrosus***

Chamaecereus silvestrii

Chamaecereus silvestrii

Cereus speciosus **K.Schumann**
Reported to contain Betalains as pigments.
Wohlpart & Mabry 1968 cited Dreiding 1961

Cereus stenogonus **K.Schumann**
Flower contains Betanin, Phyllocactin (30.4% of total), Isophyllocactin & Isobetanin. Piattelli & Imperato 1969

Cereus stenogonus **K.Schumann X *Heliaporus smithii* (Pfeiff.) Rowl.**
Flower contains Betanin, Phyllocactin (60.9% of total), Isophyllocactin & Isobetanin. Piattelli & Imperato 1969

Cereus thouarsii **Weber**
Reported to contain Betalains as pigments.
Wohlpart & Mabry 1968 cited Dreiding 1961

Cereus validus **Haworth**
92.6% water by weight in March (fruiting)/ 88.1% in October (no fruit.). (Argentina)
3-Nitrotyramine (0.19% dry wt.) Neme *et al.* 1977 & (0.19% dry wt. in branches) Nieto *et al.* 1982
Tyramine (0.023%: branches; 0.377%: green fruit; 0.382%: ripe fruit; All by dry wt.) Nieto *et al.* 1982
[2 unidentified bases reported in all samples; Nieto *et al.* 1982]
Choline (0.012%: branches; 0.029%: green fruit; 0.022%: ripe fruit; All by dry wt.) Nieto *et al.* 1982

Chamaecereus silvestrii **(Speg.) Br. & R.**
Reported to contain Betalains as pigments.
Wohlpart & Mabry 1968 cited Dreiding 1961
Weddellite was identified as druses.
Monje & Baran 2002

Cleistocactus baumannii (Lemaire) Lemaire
Weddellite was identified as druses and crystal sand.
Monje & Baran 2002

Cleistocactus jujuyensis **(Backeberg) Backeberg**
Flowers contains Betanin (major) & Phyllocactin Piattelli & Imperato 1969
Reported to contain Betalains as pigments.
Wohlpart & Mabry 1968 cited Dreiding 1961

Cleistocactus parviflorus **(K.Schumann) Gosselin**
Flower contains Betanin (major), Isophyllocactin, Betanidin & traces of Phyllocactin
Piattelli & Imperato 1969

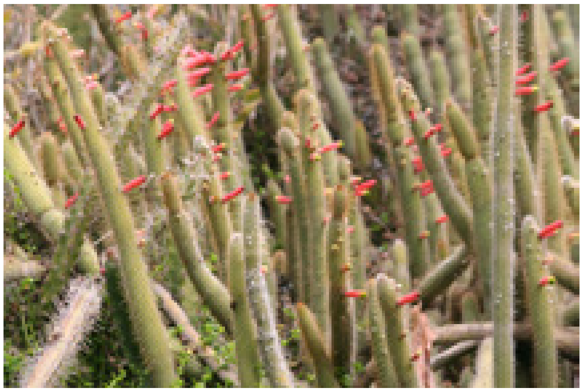
Cleistocactus smaragdiflorus **(Weber) Britton & Rose**
Flowers contains Betanin (minor) & Phyllocactin (major)
Piattelli & Imperato 1969

Cleistocactus strausii **(Heese) Backeberg**
Flower contains Phyllocactin, Isophyllocactin, Betanin & Isobetanin. Piattelli & Imperato 1969

The genus ***Copiapoa*** seemingly lacks analysis

Cereus validus **seedling**

Cleistocactus strausii
(HBG)



Cleistocactus baumannii v. flavispinus **H6816**
"*southern South America*" E. Werdermann

Cleistocactus baumannii **J.N. Rose 20063**
H317 Argentina
(HBG)

Cleistocactus juyjuyensis
Argentina 66.0662
(UC)

Cleistocactus straussii
(HBG)

***Corynopuntia clavata* (Engelmann) Knuth**

N-Methyltyramine (Major base; 0.51%) Vanderveen *et al.* 1974 [collected near Albuquerque, NM. 3 collections made]. Also isolated in Keller 1980

Tyramine (trace) Vanderveen *et al.* 1974

Hordenine (trace) Vanderveen *et al.* 1974.

***Corynopuntia emoryi* (Engelmann) Griffith**

(Analyzed as *Opuntia standlyi* v. *standlyi*)

N-Methyltyramine (no quantification) Meyer *et al.* 1980

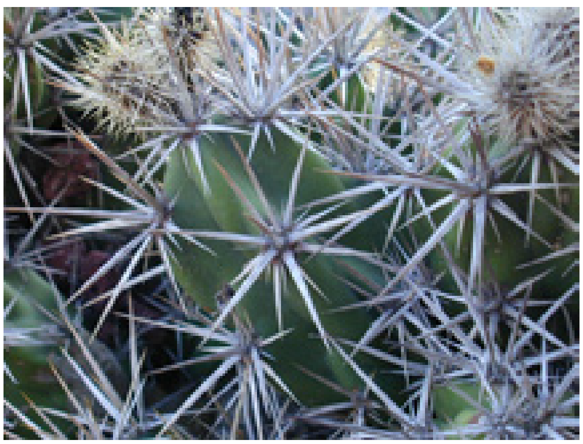
Tyramine (no quantification) Meyer *et al.* 1980

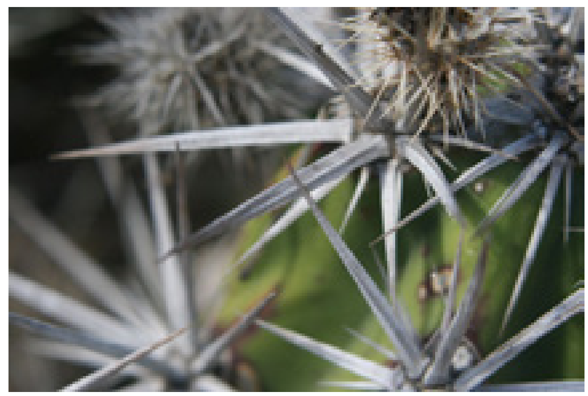
Corynopuntia emoryi
(SRSU) above

Corynopuntia invicta
(HBG)

Corynopuntia invicta Brandegee

Hordenine (%?)
N-Methyltyramine (no quantification)
Tyramine (no quantification)
Meyer *et al.* 1980





Opuntia invicta
entire page

Corynopuntia kunzei **(Rose) Griffith**
(Analyzed as *Opuntia stanlyi* v. *kunzei*)
N-Methyltyramine (0.05%) Meyer *et al.* 1980
Tyramine (no quantification) Meyer *et al.* 1980

Corynopuntia kunzei **J.Bauml et al. 1002**
(HBG)
H 48879

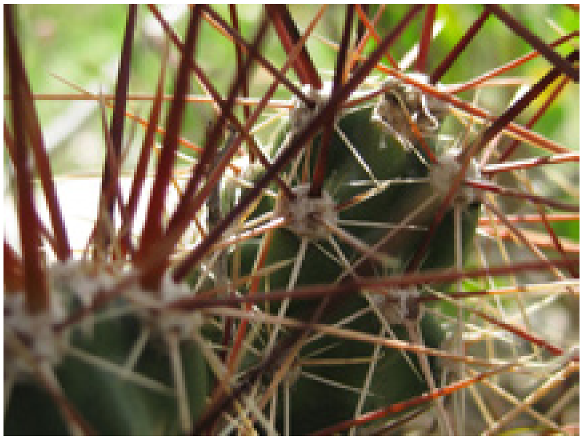

Corynopuntia kunzei
(HBG)

Corynopuntia schottii **Engelmann**

Hordenine (0.049% dry wt)
N-Methyltyramine (0.018%)
Tyramine (no quantification)
Meyer *et al.* 1980

[Brown *et al.* 1968 found no detectable alkaloid in their sample of this species.]

Corynopuntia schottii
(Val Verde County, Texas)



Corynopuntia schottii
(Terrell County, Texas)

Corynopuntia schottii
(Val Verde County, Texas)
entire page except for lower left

Coryphantha bumamma (Ehrenberg) Britton & Rose

3,4-Dimethoxy-N-methylphenethylamine (trace)
Hordenine (Over 50% of 10- 50 mg of total alkaloids/ 100 grams of fresh plant.)
N-Methyl-4-methoxyphenethylamine (trace)
Bruhn *et al.* 1975b [Wild collected; Guerrero, Mexico]

Coryphantha bumamma
(HBG)


Coryphantha cornifera


Coryphantha cornifera
E.F.A. 4950 Mexico
H 56976 A)
PHANTHA CORNI

Coryphantha calipensis **H.Bravo**

β-Methoxy-3,4-dimethoxy-N,N-dimethylphenethylamine (40 mg from 2.56 kg fresh) Bruhn & Agurell 1974; (10-50% of over 50 mg of total alkaloids/ 100 gramsfresh) Bruhn *et al.* 1975b [Wild collected; Puebla, Mexico].
β-Methoxy-3,4-dimethoxy-N-methylphenethylamine [Calipamine] (210 mg from 2.56 kg fresh.) Bruhn & Agurell 1974; (10-50% of over 50 mg of total alkaloids/ 100 grams fresh) Bruhn *et al.* 1975b
3,4-Dimethoxy-N-methylphenethylamine (trace) Bruhn & Agurell 1974 & Bruhn *et al.* 1975b
Hordenine (trace) Bruhn *et al.* 1975b
N-Methyltyramine (trace) Bruhn *et al.* 1975b
Normacromerine (0.005% dry wt.) Bruhn & Agurell 1974.
[N,N-DiMe-3,4-diMeO-PEA has also been listed in an alkaloid summary. One of the references given, Bruhn & Agurell 1974, did not report this alkaloid. The other, Bruhn 1975a, is presently unavailable to us.]
[Macromerine has also been listed. The reference given, Bruhn 1975a, is presently unavailable to us.]
Isocitric acid (tlc, glc & gc-ms by Kringstad & Nordal 1975)

Coryphantha calipensis
71.0699 Puebla State, Mexico top (UC) (top)
Glass & Foster Mexico (H 61162) (HBG) (lower)

Coryphantha compacta (Engelmann) Britton & Rose
Needs an analysis. See **Activity Notes**

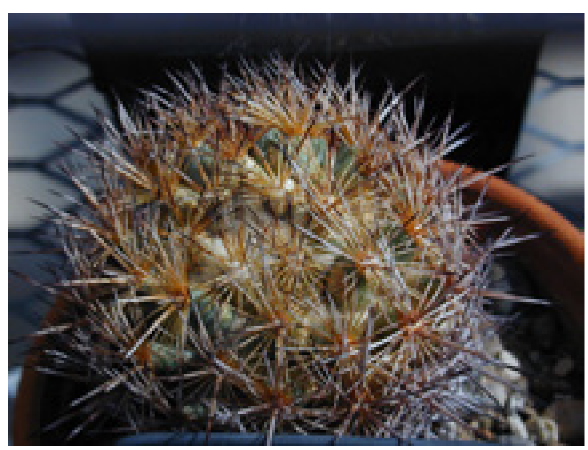
Coryphantha cornifera **(DeCandolle) Lemaire**

β-O-Methylsynephrine (no quantification)
3,4-Dimethoxy-N-methylphenethylamine (no quantification)
4-Methoxyphenethylamine (no quantification)
Hordenine (no quantification)
N-Methyltyramine (no quantification)
Synephrine (no quantification)
Horneman *et al.* 1972
[Macromerine has been listed **in error**. The reference cited, Horneman *et al.* 1972, did not report this alkaloid.]

Coryphantha cornifera

Coryphantha cornifera **var.** ***echinus*** **(Engelmann) L.Benson**

β-O-Methylsynephrine (no quantification)
3,4-Dimethoxy-N-methylphenethylamine (0.0007% dry wt.)
4-Methoxy-β-hydroxyphenethylamine (no quantification)
Hordenine (0.0006% dry wt.)
Macromerine (no quantification) [Macromerine also reported in Habermann 1974a (from Štarha *nd*)]
N-Methyl-4-methoxyphenethylamine (0.0002% dry wt.)
N-Methyltyramine (0.0002% dry wt.)
Synephrine (no quantification)
Horneman *et al.* 1972

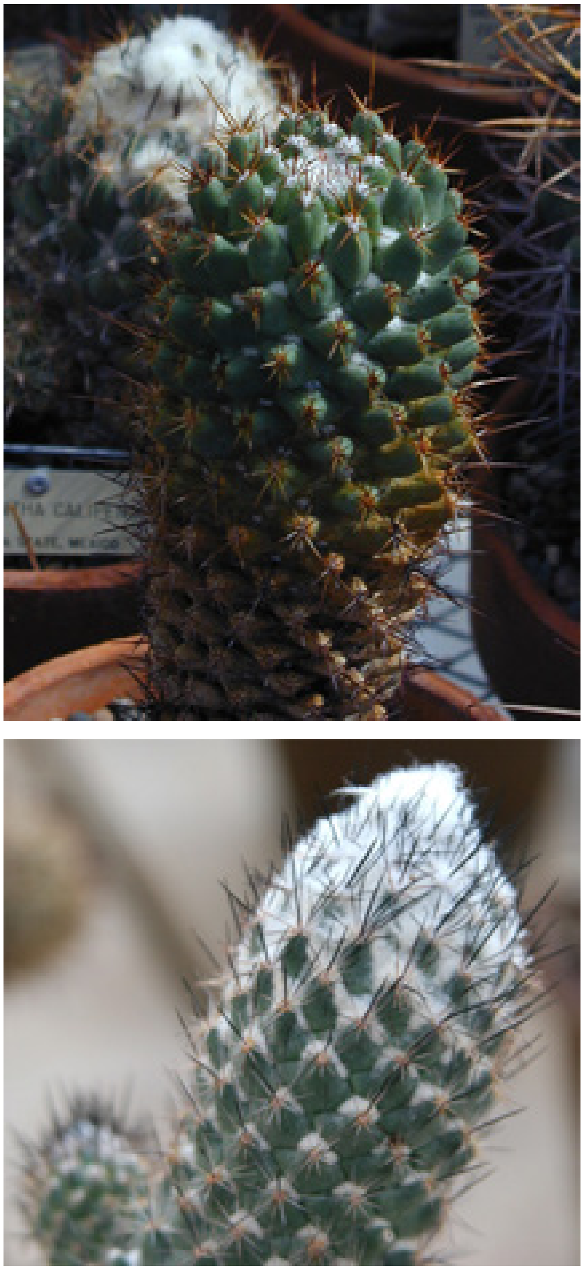


Coryphantha cornifera **var.** ***echinus***
Lower right

Coryphantha compacta
(Cactus Country)

***Coryphantha durangensis* (Rünge) Britton & Rose**

3,4-Dimethoxy-N-methylphenethylamine (no quantification)
Hordenine (no quantification)
N-Methyltyramine (no quantification)
Synephrine (no quantification)
Horneman *et al.* 1972



Coryphantha durangensis

Coryphantha echinus
See as ***Coryphantha cornifera var. echinus***

***Coryphantha elephantidens* Lemaire**

Macromerine (no quantification)
β-O-Methylsynephrine (no quantification)
3,4-Dimethoxy-N-methylphenethylamine (no quantification)
Hordenine (no quantification)
N-Methyltyramine (no quantification)
Synephrine (no quantification)
Horneman *et al.* 1972
[N-Me-4-MeO-PEA has been reported **in error**, the reference cited, Hornemann *et al.* 1972, did not report this alkaloid]

***Coryphantha elephantidens* (UC)**

***Coryphantha greenwoodii* H.Bravo**

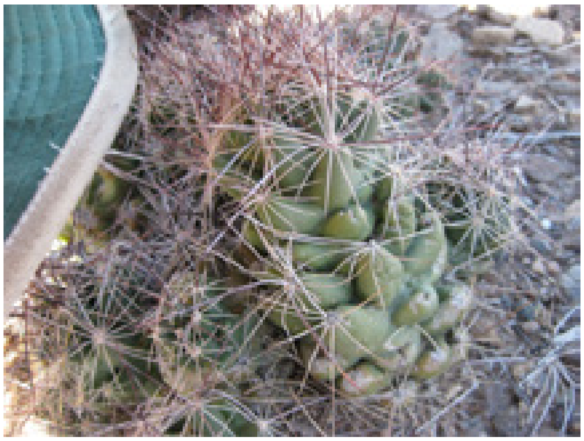
β-Methoxy-3,4-dimethoxy-N,N-dimethyl-phenethylamine (10-50% of over 50 mg of total alkaloids/ 100 grams fresh) Bruhn *et al.* 1975b
β-Methoxy-3,4-dimethoxy-N-methylphenethylamine (Calipamine) (10-50% of over 50 mg of total alkaloids/ 100 grams fresh) Bruhn *et al.* 1975b; (As (-)-form: 0.034% dry wt.) Ranieri *et al.* 1976
β-O-Methylsynephrine (trace) Bruhn *et al.* 1975b and Ranieri *et al.* 1976
3,4-Dimethoxy-N,N-dimethylphenethylamine (trace) Bruhn *et al.* 1975
3,4-Dimethoxy-N-methylphenethylamine. (1-10% of over 50 mg of total alkaloids/ 100 grams fresh) Bruhn *et al.* 1975; (0.0095% by dry weight.) Ranieri *et al.* 1976
3,4-Dimethoxy-N-formyl-β-hydroxy-N-methylphenethylamine Shulgin & Shulgin 1997
Coryphanthine (0.022%.) Meyer *et al.* 1983 Also observed by Davis *et al.* 1983
Hordenine (trace) Bruhn *et al.* 1975
Normacromerine (0.043% dry wt.) Ranieri *et al.* 1976
O-Methylcandicine (no quantification) Meyer *et al.* 1983
Synephrine (trace) Ranieri *et al.* 1976

Coryphantha macromeris **(Engelmann) Lemaire**

"*Doña ana*" "*Big nipple cactus*"

Macromerine (0.16% dry wt.) Brown *et al.* 1972a [Also observed as the major alkaloid in Brown *et al.* 1968] Hodgekins *et al.* 1967 reported it to be the "*main alkaloid*".

Unidentified alkaloids were observed in Brown *et al*. 1968



[All of the many listings, or mention, of other alkaloids reported from this species (Including normacromerine) are apparently **in error** as they all cited references, (such as Keller), that actually analyzed *Coryphantha macromeris* var. *runyonii* (*C. runyonii*).

The equating of analytical reports for different varieties and the assumption that they could be viewed as generalized alkaloid profiles for the entire species, has lead to not a few unfortunate errors in the chemical literature; both in discussions and in tabular summaries.

Normacromerine would not be surprising but someone needs to report it based on an actual analysis.

Mescaline is an erroneous listing. Barceloux 2008 confusedly includes *Coryphantha macromeris* along with "*several South American cactus species* [that] *contain mescaline*"]

Coryphantha macromeris **var.** ***runyonii*** **L.Benson**

3,4-Dimethoxy-N-methylphenethylamine (trace) Agurell 1969b [Obtained via European commercial sources]; (0.0006% fresh) Keller *et al.* 1973.

Epinephrine (14.22 µg/gm fresh), Keller 1978.

Hordenine (trace) Agurell 1969b; (0.0004%.) fresh) Keller *et al.* 1973.

Macromerine (Major alkaloid. 0.07% dry wt.) Below *et al.* 1968; (major alkaloid- over 50% of over 50 mg total alkaloids/ 100 gm fresh) Agurell 1969b; (0.0021% fresh) Keller *et al.* 1973.

Metanephrine (0.0002% fresh) Keller *et al.* 1973.

N-Formylnormacromerine [0.0077% fresh] Keller *et al.* 1973; [0.19% dry wt.] Keller & McLaughlin 1972

N-Methyl-4-methoxyphenethylamine (0.0005% fresh) Keller *et al.* 1973.

N-Methylmetanephrine (trace) Keller *et al.* 1973.

N-Methyltyramine (0.0019% fresh wt.) Keller *et al.* 1973

Norepinephrine (5.54 µg/gm fresh) Keller 1978.

Normacromerine [Major alkaloid. 0.0710% (fresh)] Keller *et al.* 1973. [Also isolated in Keller 1980] Conflicting assays; see Macromerine above in this entry.

Synephrine (0.0001% fresh wt.) Keller *et al.* 1973.

Tyramine (trace) Agurell 1969b; (0.0001fresh wt.) Keller *et al.* 1973

[N-Me-4-OH-tyramine appears in the literature **erroneously**. It is probably a typo meaning N-Me-4-MeO-PEA or N-Me-4-OH-PEA. (Tyramine IS 4-OH-PEA)]

short spined form

Coryphantha macromeris **var.** ***runyonii***

Coryphantha macromeris

Upper & center left: in habitat in Presidio Co, Texas

Lower left: Commercial seedling (CC)

Coryphantha macromeris* var. *runyonii **variant form (Starr Co, Texas)**

Coryphantha macromeris* var. *runyonii
normal form (Starr County, Texas)

Plants on this and the previous page are wild plants that were relocated into a cactus bed

Coryphantha missouriensis **(SWEET.) BRITTON & ROSE**

3,4-Dimethoxy-N-methylphenethylamine (trace)
Hordenine (0.39% dry wt.)
N-Methyltyramine (0.013% dry wt.)
Tyramine (trace)
PUMMANGURA *et al.* 1981

Coryphantha ottonis **(PFEIFFER) LEMAIRE**

4-Methoxyphenethylamine (no quantification)
Hordenine (no quantification).
N-Methyltyramine (no quantification)
Synephrine (no quantification)
HORNEMAN *et al.* 1972

Coryphantha palmeri **BRITTON & ROSE**

β-Sitosterol (0.003% dry wt.)
Dotriacontane
Eicosanol
Galactose
Saccharose
Small amounts of an unsaturated triterpenol (A tetracyclic triterpenoid).
Small amounts of an unidentified alkaloid.
DOMINGUEZ *et al.* 1970
No detectable alkaloid. CHALET 1980a cited DOMINGUEZ *et al*. 1969
[Traces of Mescaline are seemingly implied to have been detected in this species but the account is unclear and does **not** specifically state it. GENNARO *et al.* 1996]
Needs additional analysis.
See comment & image in **Activity Notes**

Coryphantha pectinata **(ENGELMANN) BRITTON & ROSE**

β-O-Methylsynephrine
3,4-Dimethoxy-N-methylphenethylamine
4-Methoxy-β-hydroxyphenethylamine
Hordenine
Macromerine
N-Methyl-4-methoxyphenethylamine
N-Methyltyramine
Synephrine
HORNEMAN *et al.* 1972 (no quantification)

Coryphantha poselgeriana **(DIETRICH) BRITTON & ROSE**

4-Methoxyphenethylamine
Hordenine
N-Methyltyramine
Synephrine
HORNEMAN *et al.* 1972 (no quantification)

Coryphantha radians **(DECANDOLLE) BRITTON & ROSE**

Hordenine (1-10% of over 1-10 mg of total alkaloids/ 100 grams fresh.) BRUHN *et al.* 1975 [Wild collected: Querétaro, Mexico].
N-Methyltyramine (Over 50% of 1-10 mg of total alkaloids/ 100 grams fresh) BRUHN *et al.* 1975
[Traces of Mescaline are seemingly implied to have been detected in this species but the account is unclear and does **not** specifically state it. GENNARO *et al.* 1996]

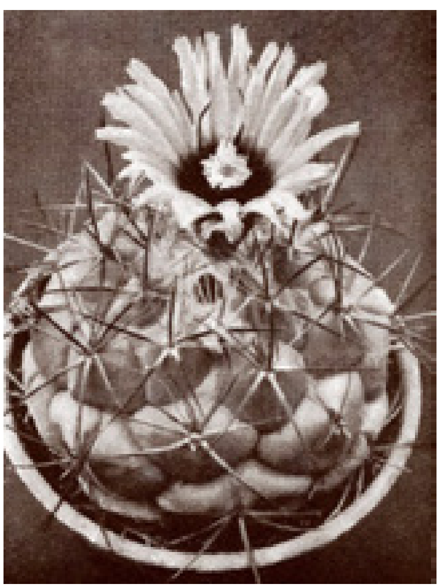
Coryphantha ramillosa **CUTAK**

β-O-Methylsynephrine (0.0015% dry wt. 1.9% of total alkaloid.) SATO *et al.* 1973.
Hordenine (0.73% in dry. 91.8% of total alkaloid.) SATO *et al.* 1973.
N-Methyl-4-methoxyphenethylamine (0.00092% dry wt.: 0.1% of total alkaloid.) SATO *et al.* 1973.
N-Methyltyramine (0.043% by dry weight. 5.5% of total alkaloid) SATO *et al.* 1973
Synephrine (0.0057% dry wt.) SATO *et al.* 1973.

Coryphantha runyonii BRITTON & ROSE See as *Coryphantha macromeris* var *runyonii*

Coryphantha radians **96.0797 Mexico**

Coryphantha **cf** ***radians*** **EFA 4966 (H 56783) (HBG)**



Coryphantha poselgeriana
Normal seedling (top)
Odd seedling (center)
Photo from Kreuzinger catalog (lower image)

Coryphantha ramillosa
(Terrell County, Texas)

Coryphantha ramillosa
Terrell County, Texas

Coryphantha ramillosa
(BTA)

Coryphantha tuberculosa
as *Escobaria tuberculosa* Britton & Rose

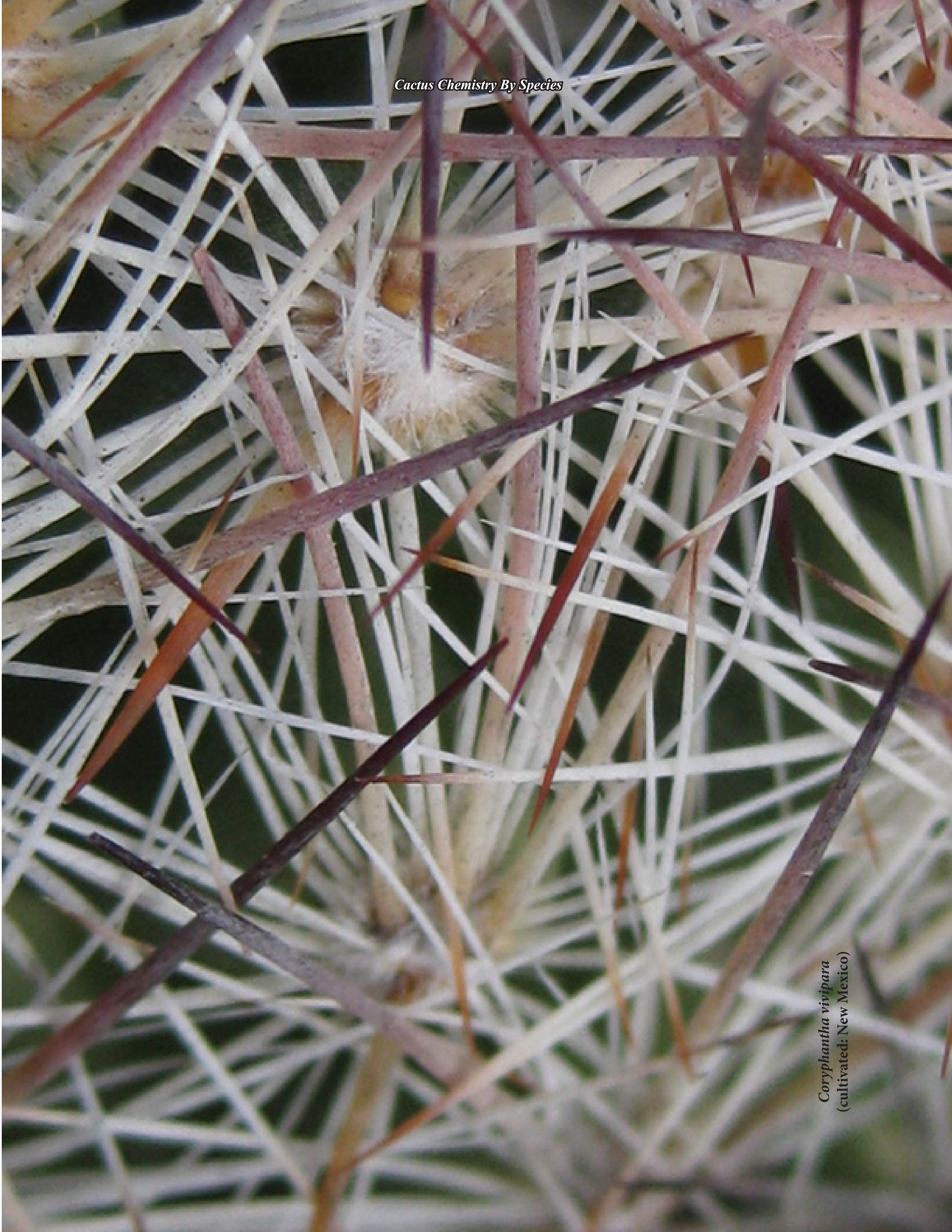
Reported to contain druses of Weddellite.
Rivera & Smith 1979
(collected in the Marathon Basin, West Texas)

Coryphantha tuberculosa
(Presidio County, Texas)

***Coryphantha vivipara* (Nuttall) Engelmann**
Hordenine (Sole alkaloid present. 10-50 mg/ 100 grams of fresh plant.) Bruhn *et al.* 1975 [Cultivated: Switzerland]
CO_2 uptake occurred entirely at night through the stems (under well watered conditions).
Nobel & Hartsock 1986

***Coryphantha vivipara* (cultivated: New Mexico)**

Coryphantha vivipara
(cultivated: New Mexico)



Coryphantha vivipara
(cultivated: New Mexico)

Coryphantha scolymoides **(Scheidweiler) A. Berger [excluded]**
Traces of Mescaline reported (between 4-12 µg/gm fresh)
Gennaro *et al.* 1996

Coryphantha vivipara **(Nuttall) Britton & Rose**
var. *arizonica* (Engelmann) W.T.Marshall
Hordenine (0.017% by dry weight.) Howe *et al.* 1977b
An unidentified quaternary alkaloid was reported by Brown *et al*. 1968

Coryphantha scolymoides
from Backeberg 1937

Coryphantha vivipara
(UC)

Cylindropuntia acanthocarpa
(NMCR)

Cylindropuntia **aff. *acanthocarpa***

Cylindropuntia acanthocarpa **Engelmann & Bigelow**

3,4-Dimethoxyphenethylamine (around 0.01% dry wt.)

4-Hydroxy-3,5-dimethoxyphenethylamine (Less than 0.01% dry wt.)

Mescaline (0.01% dry wt. [ie 10 mg/ 100 gm dry wt]) Ma *et al.* 1986 (Analyzed **F. Zeylmaker #8320**)

[Hordenine has also been listed **in error**, this species is not included by TA Smith 1977; the reference cited.]

[Meyer *et al.* 1980: traces of unidentified alkaloids]

Quercetin-3-rutinoside, Quercetin-3-glucoside and Kaempferol-3-glucoside (flavonoids) were reported in the flowers. Clark *et al*. 1980 [Collected east of Florence, AZ]

Cultivated in Oakland

Cylindropuntia bigelovii **(Engelmann) F.M. Knuth**

(Analyzed **F.Zeylmaker #8508**)

Reported by Ma *et al.* 1986 to contain no detectable alkaloid.

Cylindropuntia acanthocarpa
young greenhouse growth

Cylindropuntia aff. acanthocarpa
(UC) older stem

Cylindropuntia acanthocarpa
(NMCR)

Cylindropuntia acanthocarpa
var. *thornberi*
(BTA)

***Cylindropuntia* aff. *acanthocarpa* (UC)**

Cylindropuntia* aff. *echinocarpa

***Cylindropuntia* cf. *fulgida* (HBG)**

Cylindropuntia fulgida* var. *mamillata

Cylindropuntia echinocarpa **Engelmann & Bigelow**

"silver cholla"

3,4-Dimethoxyphenethylamine (Around 0.01% dry wt.)

4-Hydroxy-3,5-dimethoxyphenethylamine (Around 0.01% dry wt.)

Mescaline (Around or less than 0.01% dry wt.)

Ma *et al.* 1986 (F. Zeylmaker #8327 & 8328)

See comments in **Activity Notes**.

Cylindropuntia fulgida **Engelmann**

Unidentified alkaloids reported by Meyer *et al.* 1980

Quercetin-3-rutinoside, Quercetin-3-glucoside and Kaempferol-3-glucoside (flavonoids) were reported in the flowers. Clark *et al*. 1980 [Collected east of Florence, Arizona]

Cholla gum was determined to contain Arabinose (51.6%), Galactose (31.7%), Galacturonic acid (11.2%), Rhamnose (2 or 3%) & Xylose (15.0%). (Gum degradation products were studied) Parikh & Jones 1966. [Sands & Klass 1929 found: Arabinose (53.2%), Galactose (8.4%), Galacturonic acid (11.5%) & Rhamnose (5.5%) They did not detect Xylose; Brown *et al*. 1949 reported *L*-Arabinose (6 parts), *D*-Galactose (3 parts), *D*-Galacturonic acid (1 part), *L*-Rhamnose (traces) & *D*-Xylose (2 parts)] See also Anderson *et al*. 1925

Cylindropuntia* aff. *echinocarpa

Cylindropuntia imbricata **HAWORTH**
3-Methoxytyramine (no quantification)
3,4-Dimethoxyphenethylamine (no quantification)
Mescaline (Not quantified)
Tyramine (no quantification)
Unidentified alkaloid also present.
MEYER *et al*. 1980
Reported to contain druses of Whewellite.
RIVERA & SMITH 1979
(collected on the campus of the University of Texas at Austin)

Cylindropuntia imbricata

Cylindropuntia kleiniae
(SRSU) lower left & right column

Cylindropuntia imbricata
(Cactus Country) top left
(Travis County, Texas) center left

Cylindropuntia kleiniae **DeCandolle**
N-Methyltyramine (no quantification)
Tyramine (no quantification)
Meyer *et al*. 1980

Cylindropuntia leptocaulis **DC**
(AKA "*tasajillo*")

Most often appearing in the literature as *Opuntia leptocaulis*.

Reported by Meyer et al. 1980 to contain traces of unidentified alkaloids.

It was reported to show no detectable alkaloids in the screenings of Smolenski et al. 1973.

Betacyanins reported as pigments.
Mabry et al. 1963

A number of compounds were isolated from *Chaetomium globosum*. This fungus was found inhabiting the rhizosphere of *Opuntia leptocaulis*.

Globosuxanthone A (a new dihydroxanthenone)
Globosuxanthone B (a new tetrahydroxanthenone)
Globosuxanthone C (a new xanthone)
Globosuxanthone D (a new xanthone)
2-Hydroxyvertixanthone
Chrysazin (anthraquinone)
1,3,6,8-Tetrahydroanthraquinone
Wijeratne *et al*. 2006a

Five new isocoumarins were isolated from cultures of *Paraphaeosphaeria quadriseptata*, a fungal strain living in association with *Opuntia leptocaulis*.

Paraphaeosphaerin A, B & C
and
Chaetochiversins A and B

Along with a new chroman-4-one, Aposphaerin C.
Wijeratne *et al*. 2006b

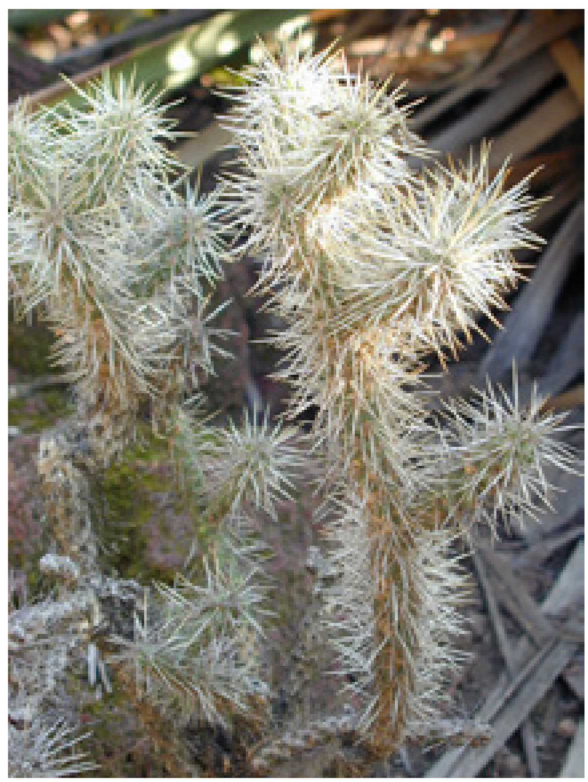
See comments in **Activity Notes**.

Cylindropuntia ramosissima **(Engelmann) F.M. Knuth**

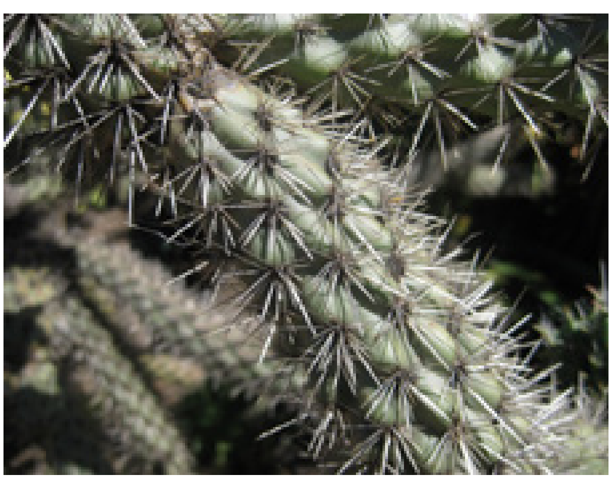
3,4-Dimethoxyphenethylamine (less than 0.01% dry wt.)
Ma *et al.* 1986 (F. Zeylmaker #8501)

Cylindropuntia ramosissima

Cylindropuntia ramosissima
monstrose form
(HBG)

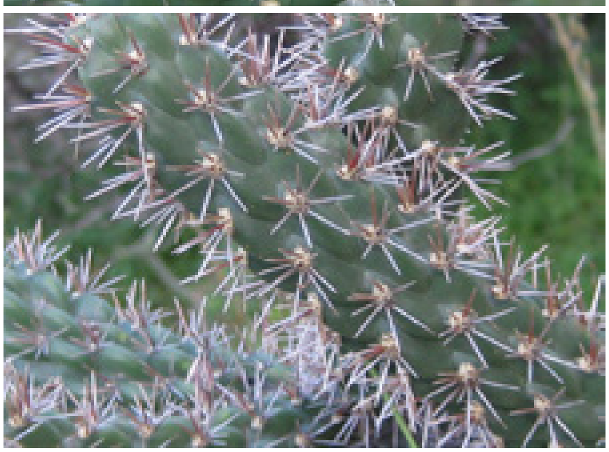


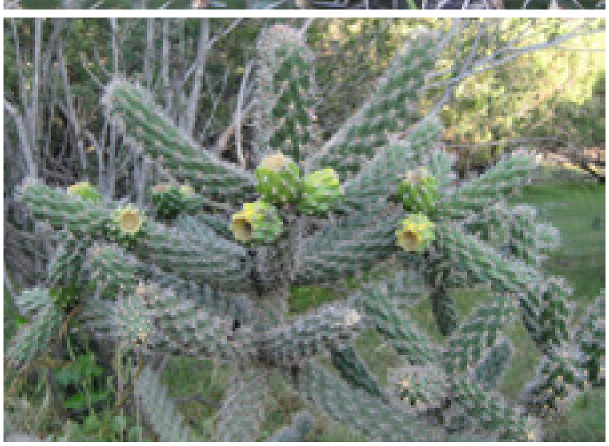
Cylindropuntia ramosissima
normal form
(HBG)



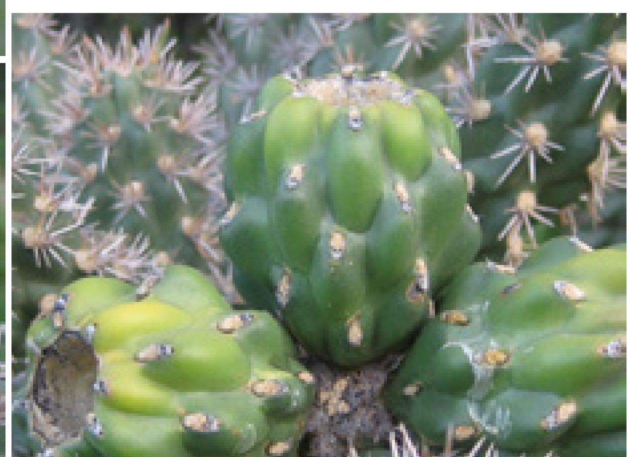
Cylindropuntia spinosior
(Cactus Country)

Cylindropuntia spinosior
(SRSU) above
(Cactus Country) below





***Cylindropuntia spinosior-imbricata* intermediate**
(Silver City, New Mexico, USA)



Cylindropuntia spinosior **(Engelmann) Toumey**

Tyramine (0.0018% dry wt.)
3-Methoxytyramine (0.0011% dry wt.)
3,4-Dimethoxyphenethylamine. (trace)
Mescaline (0.00004% dry wt.) [Initially detected by Kruger *et al.* 1977] This is 40 µg per 100 grams of dried material.
Pardanani *et al.* 1978

Quercetin-3-rutinoside, Quercetin-3-glucoside and Kaempferol-3-glucoside (flavonoids) were reported in the flowers.
Clark *et al*. 1980 [Collected east of Florence, Arizona]

Cylindropuntia spinosior
(eastern Arizona near I-10)

Cylindropuntia versicolor **(Engelmann ex J.M. Coulter) F.M. Knuth**

Hordenine (no quantification)
N-Methyltyramine (no quantification)
Tyramine (no quantification)
Unidentified alkaloids were also present.
Meyer *et al.* 1980

Chemical studies have been performed on *Aspergillus terreus*. This fungus was found inhabiting the rhizosphere of *Opuntia versicolor*.
Asterredione (a novel cyclopentenedione)
(+)-5(6)-Dihydro-6-methoxyterrecyclic acid A (a new terrecyclic acid A derivative)
(+)-5(6)-Dihydro-6-hydroxyterrecyclic acid A (a new terrecyclic acid A derivative)
(+)-Terrecyclic acid A
(–)-Quadrone
Betulinan A
Asterriquinone D
and
Asterriquinone C
Wijeratne *et al.* 2003
See comments in **Activity Notes**.

Cylindropuntia versicolor
(Huntington)

***Cylindropuntia whipplei* (Engelmann & Bigelow) F.M. Knuth**

3,4-Dimethoxyphenethylamine (no quantification)
Unidentified alkaloids were also present.
Meyer *et al.* 1986

Cylindropuntia versicolor
(Saguaro National Park)

Cylindropuntia stanlyi Engelmann var. *kunzei* (Rose) L.Benson
See as ***Corynopuntia kunzei***
Cylindropuntia stanlyi var. *stanlyi* Engelmann
See as ***Corynopuntia emoryi***

***Denmoza rhodacantha* (Salm-Dyck) Britton & Rose**

Candicine (%?) Nieto 1987

***Denmoza rhodacantha* (UC) 72.0479**

***Dolichothele baumii* (Boedecker) Werdermann & Buxbaum**

Dolichotheline (An imidazole)
6 unidentified alkaloids (tentatively)
Dingerdissen & McLaughlin 1973b
Dehydrogeosmin - Minor volatile in the floral scent.
Sesquiterpene alcohol 1 - Trace volatile in the floral scent.
Sesquiterpene alcohol 2 - Minor volatile in the floral scent.
Schlumberger *et al*. 2004 (In tepals; gc-ms)

Denmoza rhodantha
(UC)

Dolichothele longimamma
(UC)

Dolichothele longimamma longimamma
(BTA) 88.409

Dolichothele longimamma
(Cactus Country)

Dolichothele melaleuca
(California)

Dolichothele longimamma (DeCandolle) Britton & Rose

N-Methyl-4-methoxy-β-hydroxyphenethylamine (Longimammine: O-Methylsynephrine) (0.00037% dry wt.) Ranieri & McLaughlin 1976. [Reported in Ranieri & McLaughlin 1975b]

Normacromerine (0.012% dry wt.) Ranieri & McLaughlin 1976. [Reported in Ranieri & McLaughlin 1975b]

Synephrine (0.43% dry wt.) Ranieri & McLaughlin 1976. [Reported in Ranieri & McLaughlin 1975b]

Also contains a few tetrahydroisoquinolines (If you ever doubted there are chemists with a twisted sense of humor…)

Longimammosine [6-Hydroxy-2-methyl-THIQ] (0.0019% dry wt.) Ranieri & McLaughlin 1976. [Reported in Ranieri & McLaughlin 1975b]

Longimammidine [8-Hydroxy-2-methyl-THIQ] (0.0019% dry wt.) Ranieri & McLaughlin 1976. [Reported in Ranieri & McLaughlin 1975b]

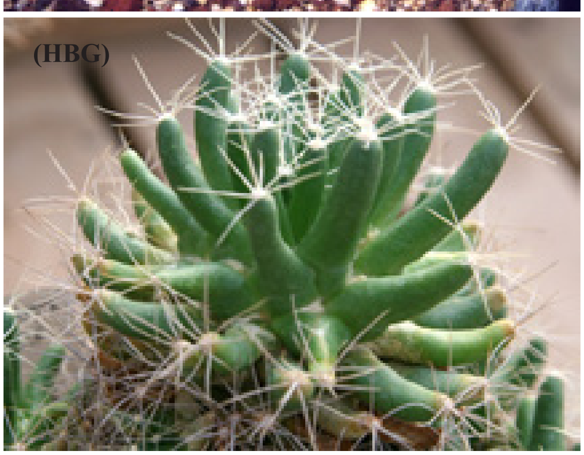
Longimammatine [6-Methoxy-THIQ] (0.0028% dry wt.) Ranieri & McLaughlin 1976. [Reported in Ranieri & McLaughlin 1975b]

Longimammamine [4,8-Dihydroxy-2-methyl-THIQ] (0.0008% dry wt.) Ranieri & McLaughlin 1976. [Reported in Ranieri & McLaughlin 1975b] **Note: Do not confuse with Longimammine which is a phenethylamine.**

Ubine (no quantification) Kruger *et al.* 1977; **NOT** reported in Ranieri & McLaughlin 1976

And

Dolichotheline (An imidazole) (Identified) Dingerdissen & McLaughlin 1973b (Also noted "*...large number of unusual compounds that were unidentified...*")



Natural occurrence in the plant of lauric, myristic and other fatty acids esterified to the C-3 hydroxyl groups of assorted 12-Oleanene series triterpenes, including:

β-Amyrin, Erythrodiol, Longispinogenin, Methyl oleanolate, Maniladiol, Oleanonate, Oleanolic aldehyde.

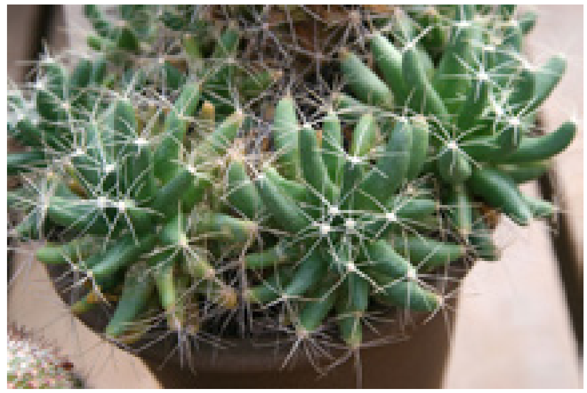
Spencer *et al.* 1983

Dehydrogeosmin - Minor volatile in floral scent.

Sesquiterpene alcohol 1 - Minor volatile in floral scent.

Sesquiterpene alcohol 2 - Minor volatile in floral scent.

Schlumberger *et al*. 2004 (in tepals; gc-ms)



Dolichothele longimamma
(HBG)

Dolichothele melaleuca (Dietrich) Britton & Rose

Dolichotheline (An imidazole)

(Tentatively) 6 unidentified alkaloids

Dingerdissen & McLaughlin 1973b

Dolichothele sphaerica (Dietr.) Britton & Rose

Phenethylamine (traces) Keller 1982

β-O-Ethylsynephrine (0.0038% dry wt.) Dingerdissen & McLaughlin 1973a. Recovered via preparative tlc but said to have been shown to be an extraction artifact of Synephrine. Dingerdissen & McLaughlin 1973c

β-O-Methylsynephrine (0.0060% dry wt.) Dingerdissen & McLaughlin 1973a. Recovered via preparative tlc: Dingerdissen & McLaughlin 1973c

N-Methylphenethylamine (0.0411% by dry weight.) Dingerdissen & McLaughlin 1973a. Recovered via preparative tlc: Dingerdissen & McLaughlin 1973c

N-Methyltyramine (0.0115% by dry weight.) Dingerdissen & McLaughlin 1973a. Recovered via preparative tlc: Dingerdissen & McLaughlin 1973c. Also reported in Keller 1982.

Synephrine (0.0033% dry wt.) Dingerdissen & McLaughlin 1973a. Recovered via preparative tlc: Dingerdissen & McLaughlin 1973c

Dolichotheline (N-Isovalerylhistamine) 0.7% by dry wt: (no mention of other alkaloids) Rosenberg & Paul 1969 & 1970; (0.65%: major alkaloid) Dingerdissen & McLaughlin 1973b (reported presence of other, mainly trace, alkaloids). [0.65% also reported in Dingerdissen & McLaughlin 1973a [Also said to be reported in Habermann 1974a (from Štarha *nd*)] Detected in tlc in Dingerdissen & McLaughlin 1973c.

Dolichothele longimamma
upper left photo by Johnny B. Goode

Dolichothele melaleuca

Dolichothele sphaerica
in habitat
(Jim Hogg County, Texas)

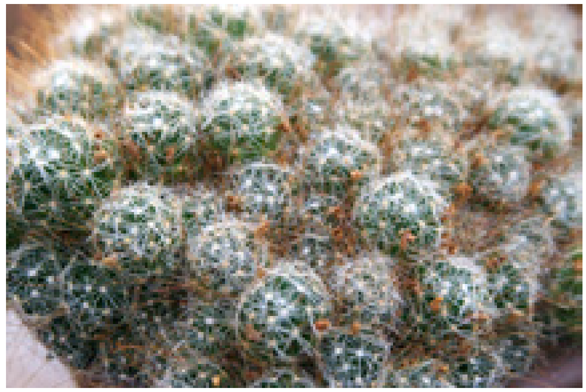
Dolichothele surculosa
(HBG)

Dolichothele sphaerica
(Jim Hogg County, Texas)

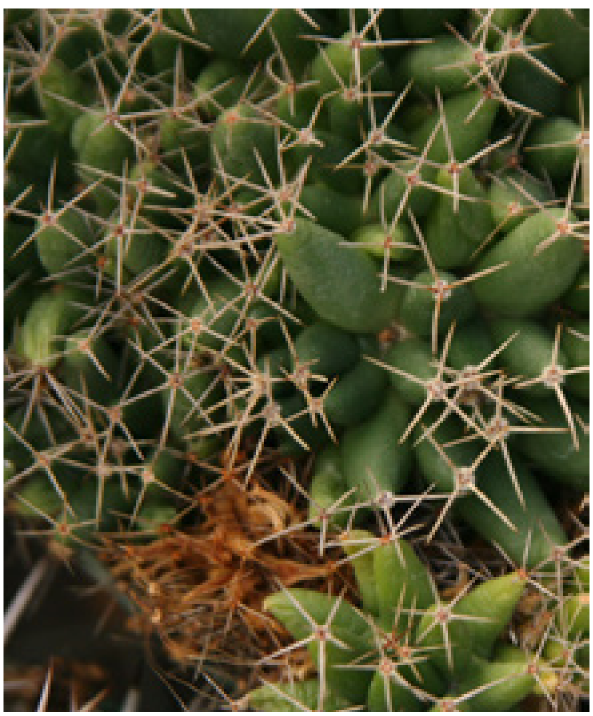
Dolichothele surculosa **(Boedecker) F.Buxbaum**
Hordenine (0.178% dry wt.)
N-Methyltyramine (0.134% dry wt.)
N-Methylphenethylamine (0.25% by dry weight.)
Synephrine (0.017% dr wt.)
The imidazole, Dolichotheline was also identified.
[An unidentified imidazole was also reported]
Dingerdissen & McLaughlin 1973b
[Dingerdissen & McLaughlin 1973a is also cited as a reference but they DID NOT analyze this species]

Reported to contain Betalains as pigments (As *Mammillaria surculosa*). Wohlpart & Mabry 1968 cited Dreiding 1961

Volatile components of the floral scent have been studied.
Dehydrogeosmin - Minor volatile in floral scent.
Sesquiterpene alcohol 1 - Trace volatile in floral scent.
Sesquiterpene alcohol 2 - Minor volatile in floral scent.
Schlumberger *et al.* 2004 (In tepals; gc-ms)



Dolichothele surculosa



Dolichothele uberiformis **(Zuccarini) Britton & Rose**
3,4-Dimethoxy-N-methylphenethylamine (0.007% dry wt.)
Hordenine (trace) [Also in Kruger *et al.* 1977]
N-Methyl-4-methoxyphenethylamine (0.004% dry wt.)
N-Methyltyramine (trace) [Also in Kruger *et al.* 1977]
Normacromerine (0.068% dry wt.) Synephrine (0.12%+ dry wt.)
Ubine (N,N-diMe-β-OH-PEA) (Major alkaloid. 0.24% dry wt.)
(-)-Longimammine (0.016% dry wt.)
Longimammatine (trace)
Uberine (5-MeO-7-OH-2-Me-THIQ) (0.002% dry wt.) [Also in Kruger *et al.* 1977]
Ranieri & McLaughlin 1977.
Dolichotheline (An imidazole) Dingerdissen & McLaughlin 1973b (Also noting a "*...large number of unusual compounds that were unidentified...*")
[Agurell 1969b is cited as a reference by **DID NOT** analyze this species. Wheaton & Stewart 1970 also appears cited as a reference but **DOES NOT** mention this species.]
Longimammamine was reported in error. Ranieri & McLaughlin 1977 did **NOT** observe this alkaloid.
See comments in **Activity Notes.**

Echinocactus arechavaletai Schumann.
See as ***Wiggensia arechavaletai***

Echinocactus caespitosus was reported to contain an unidentified alkaloid by Brown *et al*. 1968

Echinocactus concinus Monville. See as ***Notocactus concinus***

Echinocactus grandis **Rose**
β-Sitosterol (0.005% by dry wt.)
Galactose, Rhamnose, traces of an aliphatic saturated tetrol & small amounts of a polyhydroxylated steroid. Dominguez *et al.* 1970
Reported to contain no detectable alkaloid. Chalet 1980a cited Dominguez *et al*. 1969
Synonym of *Echinocactus platyacanthus* Link & Otto according to Hunt 1999.

Dolichothele uberiformis
(HBG) top left
(California Cactus Center) bottom left

Echinocactus horizonthalonius
Presidio County, Texas

Echinocactus horizonthalonius
in Hudspeth County, Texas

Echinocactus horizonthalonius
in Terrell County, Texas

Echinocactus horizonthalonius
in Hudspeth County, Texas

Echinocactus ingens

Echinocactus ingens

***Echinocactus visnaga* above**

Echinocactus viznaga, *Echinocactus ingens* and *Echinocactus grandis* are all considered to be synonyms of *Echinocactus platyacanthus*.

***Echinocactus ingens* juvenile form below**

Echinocactus texensis **Hopf**
AKA the "*Horse Crippler*" or "*Devil's Head*" or "*Viznaga*"

Reported to contain unidentified quaternary alkaloid(s) by Brown *et al.* 1968.

Echinocactus* (*Homalocephala*) *texensis

In Jim Hogg County, Texas growing at the base of an *Acacia rigidula.*

***Echinocactus* (*Homalocephala*) *texensis* in Texas: Terrell County (above) & Starr County (below)**

Echinocactus horizonthalonius **Lemaire**
No detectable alkaloid. Brown *et al*. 1968
Reported to contain druses of Weddellite. Rivera & Smith 1979. See comments on the **Biominerals** page.

Echinocactus hystrix Haw.
See as ***Lemaireocereus hystrix***
Echinocactus ingens Pfeiffer
See as ***Echinocactus platyacanthus***
Echinocactus lewinii K.Schumann
See as ***Lophophora williamsii***

Echinocactus platyacanthus was reported to contain unidentified alkaloids. (from Soulaire 1947)

Echinocactus polycephalus **Engelmann & Bigelow** Mescaline was **NOT** observed at the levels they were capable of detecting. Gennaro *et al.* 1996

Echinocactus polycephalus **Engelmann & Bigelow var. *xeranthoides*** **Coulter**
Brown *et al*. 1968 reported to contain unidentified alkaloid.

Echinocactus pruinosus O.
See as ***Lemaireocereus pruinosus***
Echinocactus ritteri Böd.
See as ***Aztekium ritteri***
Echinocactus texensis Hopffer
See as ***Homalocephala texensis***

Echinocactus visnaga **Hooker**
Appears in the literature for a report of an unidentified alkaloid.
Synonym of *Echinocactus platyacanthus* Link & Otto according to Hunt 1999.

Echinocactus williamsii Lemaire ex Salm-Dyck
See as ***Lophophora williamsii***

Echinocereus acifer **(Otto) Lemaire**
Dominguez *et al*. 1969 reported an unidentified alkaloid.

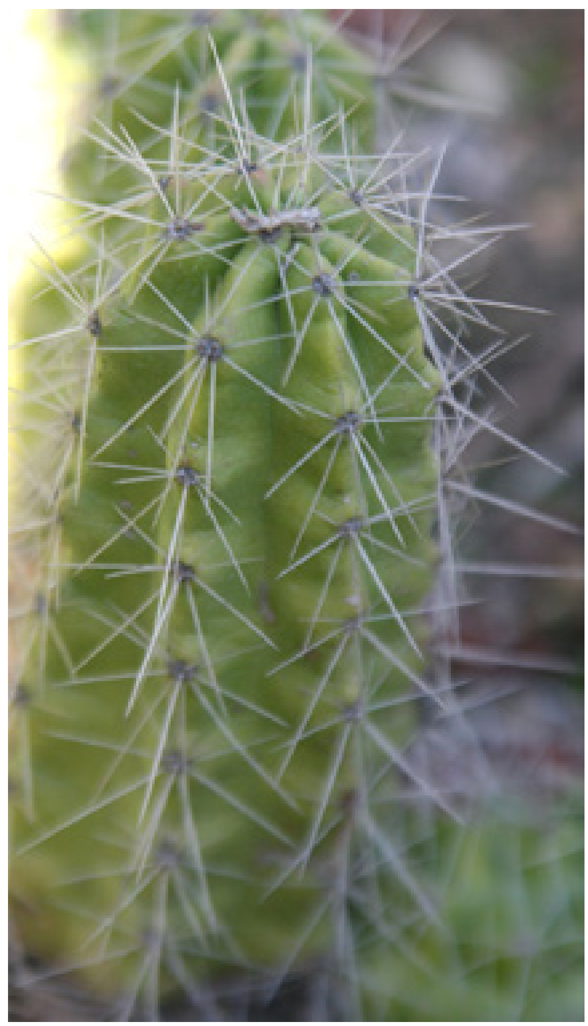
Echinocereus cinerascens **(HBG) Lower row**

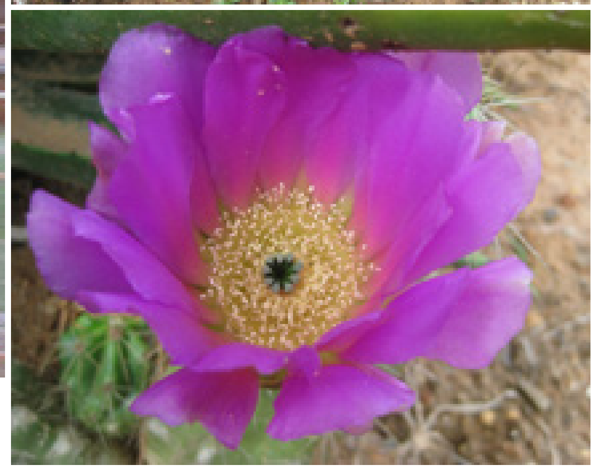
Echinocereus blanckii **Poselger ex Rümpler**
Has 94% water by weight
N,N-Dimethylhistamine (0.016% by fresh wt/ 0.285% by dry wt. (As 2HCl))
3,4-Dimethoxyphenethylamine (0.0065 % by fresh wt/ 0.114% by dry wt. (As HCl) Wagner & Grevel 1982b
[N-Me-3,4-DiMeO-PEA has been listed **in error.** The reference, Wagner & Grevel 1982b, did not report this compound.]
Citric acid (7.6% in stem juice) Hegnauer 1964 cited Bergström 1934

Echinocactus polycephalus Mescaline **NOT** observable at the levels they were capable of detecting. Gennaro *et al.* 1996

Echinocereus chloranthus **Engelmann**
Brown *et al*. 1968 reported to contain unidentified alkaloid.

Echinocereus cinerascens **(DeCandolle) Rümpler**
3,4-Dimethoxy-N,N-dimethylphenethylamine (0.01% fresh) Bruhn & Sánchez-Mejorada 1977 [Wild collected: Hidalgo, Mexico].
3,4-Dimethoxy-N-methylphenethylamine (0.0002%; 1.95×10^{-4} % fresh) Bruhn & Sánchez-Mejorada 1977
Glucaric acid (tlc by Kringstad & Nordal 1975)





Echinocereus enneacanthus* var. *enneacanthus
(Cactus Country) "*strawberry cactus*" Standley 1924

Echinocereus enneacanthus var. _stramineus_ (Engelmann) L.Benson

"*pitahaya*" Standley 1924

Brown *et al*. 1968 reported to contain unidentified alkaloids.

Contains large amounts of some form of Calcium oxalate. See a photo on the biomineral page in this work.

Echinocereus enneacanthus var. _stramineus_
Upper two images

Echinocereus merkerii

Echinocereus merkerii Hildm.

3,4-Dimethoxy-N,N-dimethylphenethylamine (no quantification) Agurell *et al.* 1969

3,4-Dimethoxy-N-methylphenethylamine (no quantification) Agurell *et al.* 1969

3,4-Dimethoxyphenethylamine (no quantification) Agurell *et al.* 1969 and McFarlane & Slaytor 1972

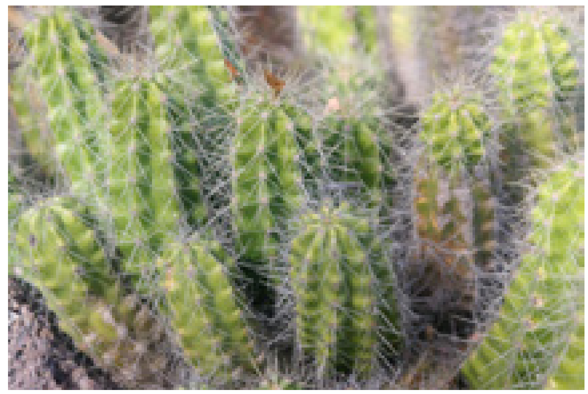
3-Methoxytyramine (no quantification) Agurell *et al.* 1969

Tyramine (no quantification) McFarlane & Slaytor 1972b

Hordenine (no quantification) Agurell *et al.* 1969 and McFarlane & Slaytor 1972b

Candicine (no details) Shulgin & Shulgin 1997

Salsoline (no quantification) Agurell *et al.* 1969; (no details) Shulgin & Shulgin 1997



Echinocereus merkerii

Echinocereus pectinatus **(Scheidweiler) Engelmann** has been listed ***in error*** as containing hordenine. Agurell 1969b, the reference cited for the claim, did not examine this species.

Echinocereus triglochidiatus **Engelmann var. *gurneyi*** **Benson**

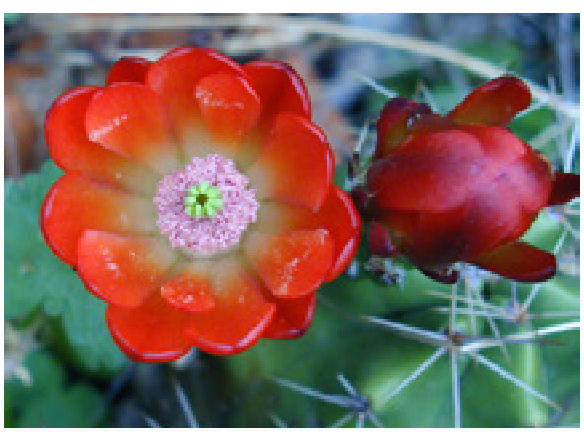
Dihydroquercetin
Dihydroquercetin 7-O-glucoside
Dihydrokaempferol
Dihydrokaempferol 7-O-glucoside
Dihydromyricetin
Dihydromyricetin 7-O-glucoside
Quercetin 7-O-glucoside
Quercetin 3-O-glucoside
Quercetin 3-O-rhamnosylglucoside
Kaempferol 3-O-glucoside
Kaempferol 3-O-rhamnosylglucoside

Present in perianth parts; in particular the tepals. Epidermis & spines contained traces only. Absent from the cortex. Miller & Bohm 1982. (Wild collected: Marathon, Texas)

Echinocereus triglochidiatus var. gurneyi
(SRSU, Alpine, Texas)

Echinocereus triglochidiatus **Engelmann var. *neomexicanus*** **(Standley) Standley ex W.T.Marshall**

N,N-Dimethylhistamine (no quantification; tlc) Ferrigni *et al.* 1982.



Echinocereus triglochidiatus
(Central Texas)

Echinocereus triglochidiatus **Engelmann var. *paucispinus*** **Engelmann ex W.T.Marshall**

N,N-Dimethylhistamine (no quantification) Mata & McLaughlin 1982 citing Ferrigni & McLaughlin 1981: unpublished results; (0.11% dry wt; isolation, tlc, mp, mmp, pmr) Ferrigni *et al.* 1982.

Echinocereus triglochidiatus var. paucispinus
(Val Verde, Texas)

Echinocereus triglochidiatus has been listed as containing 5-Methoxy-N,N-dimethylhistamine but there is no basis for that assertion. (This compound was nowhere mentioned in the reference cited: i.e. Bye 1979. It does not appear to have ever been reported in nature.)

This species has also had a report of 5-Methoxy-N,N-dimethyltryptamine or what was suspected to be 5-MeO-DMT (first mentioned as a possibility in Bye 1979, citing personal communication with JL McLaughlin, and later repeated as fact many other places.) Schultes & Hofmann 1979 & 1980 also mentioned the possibility that a tryptamine derivative may have been observed.

In some retellings the identity was inexplicably recreated as DMT.

This was never proven. More importantly, Ferrigni *et al*. made a comment that whatever indole(s) they observed was present in trace amounts and was unstable in their extraction procedure. Unknown(s) were suspected of being indolic due to reacting with Ehrlichs reagent and forming a blue chromophore in TLC.

Had unknown been DMT or 5-MeO-DMT, they would have been both stable and easily been recovered using their approach so, whatever the identity of their unidentified compound(s) turns out to be, it was decidedly **NEITHER** 5-MeO-DMT **NOR** DMT. They determined the main alkaloid present was dimethylhistamine.

Some imidazoles are reactive with Ehrlichs reagent but Dimethylhistamine is not, suggesting that more investigation might be warranted.

To risk adding more confusion to the issue the plants being discussed are actually *E.* ***coccineus*** (tetraploid)**, var. *paucispinus*** & **var. *gurneyii***, and not *E. triglochidiatus* (which is diploid) This is also true for part of ***neomexicanus***, but I do not know which Ferrigni used. See Powell & Weedin 2004. **Every image on THIS page is *Echinocereus coccineus*.** The name *"triglochidiatus"* is preserved on this page only to aid keyword efficacy.

See comments in the **Activity Notes**.

Echinocereus viridiflorus Engelmann var. *chloranthus* Backeberg
See as ***Echinocereus chloranthus***

Echinofossulocactus multicostatus **(Hildm.) Br. & R.**

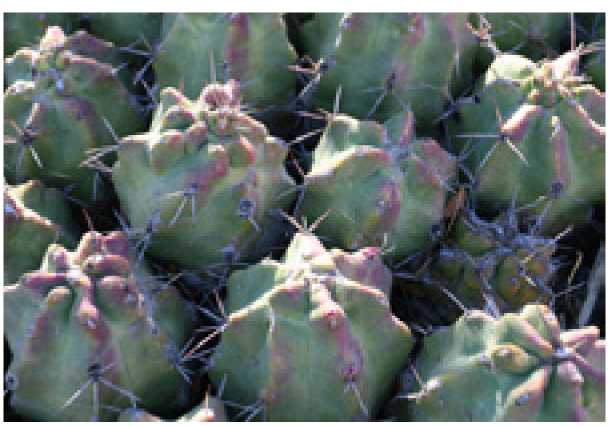
No detectable alkaloid.
Chalet 1980a cited Dominguez *et al*. 1969

Echinocereus coccineus
var. *gurneyi*

Echinocereus triglochidiatus
var. *neomexicanus*

Echinocereus coccineus inermis

counterclockwise from top
***Echinocereus coccineus* var. *gurneyii* (Sul Ross)**
***Echinocereus coccineus* var. *coccineus* (Sul Ross)**
Echinocereus coccineus* var. *paucispina
(Judge Roy Bean Visitors Center)
***Echinocereus coccineus* var. *inermis* (SS)**



Echinomastus dasyacanthus Britton & Rose; See as ***Neolloydia intertexta* var. *dasyacantha***
Echinomastus intertextus Engelmann var. *dasyacanthus* Engelmann See as ***Neolloydia intertexta* var. *dasyacantha***

Echinopsis ancistrophora ssp. *ancistrophora*

Abra Santa Laura, Jujuy, Argentina
(% given is percentage of the total scent fraction)
limonene 0.43
linalool 0.07
(E,E)-2,6-dimethyl-3,5,7-octatriene-2-ol 2.33
all monoterpenoids 2.82
β-copaene 0.11
β-elemene na
(E)-caryophyllene 0.66
germacrene D 13.14
bicyclogermacrene 0.28
(Z,E)-α-farnesene 0.22
(E)-nerolidol 71.3
unknown sesquiterpenoids 3.25
all sesquiterpenoids 88.96
nonanal 3.49
hexadecane 1.38
unknown fatty acid derivatives 0.48
all fatty acid derivatives 5.35
benzaldehyde 0.13
unknown aromatics 0.24
all aromatics 0.37
methyl-anthranilate 0.12
indole 2.37
all nitrogenous compounds 2.49
Schlumpberger & Raguso 2008

Echinopsis ancistrophora ssp. *ancistrophora*

Calderilla, Salta, Argentina
(% given is percentage of the total scent fraction)
limonene 0.02
1,8-cineole 0.06
6-methyl-5-heptene-2-one 0.05
(E,E)-2,6-dimethyl-1,3,5,7-octatetraene 0.74
geranial 0.06
(E,Z)-2,6-dimethyl-3,5,7-octatriene-2-ol 0.35
(E,E)-2,6-dimethyl-3,5,7-octatriene-2-ol 3.13
geraniol 0.61
geranyl acetate 0.07
unknown monoterpenoids 0.1
all monoterpenoids 5.18
α-copaene 1.37
β-copaene 0.62
β-elemene 0.09
(E)-caryophyllene 0.57
germacrene D 32.58
bicyclogermacrene 0.07
(Z,E)-α-farnesene 0.31
δ-cadinene 0.06
(E)-nerolidol 47.64
(E,E)-farnesyl acetate 3.33
(E,E)-farnesol 1.79
unknown sesquiterpenoids 4.93
all sesquiterpenoids 93.35
nonanal 0.08
unknown fatty acid derivatives 0.03
all fatty acid derivatives 0.11
methyl benzoate 0.4
methyl salicylate 0.1
phenethyl alcohol 0.08
all aromatics 0.55
Schlumpberger & Raguso 2008

Echinopsis ancistrophora ssp. *ancistrophora*

Cuesta del Cebilar, Salta, Argentina
(% given is percentage of the total scent fraction)
limonene 0.08
6-methyl-5-heptene-2-one 0.12
geranyl acetate 0.07
unknown monoterpenoids 0.12
all monoterpenoids 0.39
α-copaene 1.12
β-bourbonene 0.48
β-copaene 0.16
β-elemene 0.04
(E)-caryophyllene 0.13
humulene 0.03
germacrene D 5.52
bicyclogermacrene 0.06
(Z,E)-α-farnesene 0.07
(Z)-nerolidol 0.83
(E)-nerolidol 87.52
unknown sesquiterpenoids 1.84
all sesquiterpenoids 97.8
nonanal 0.07
methylhexadecanoate 1.06
unknown fatty acid derivatives 0.68
all fatty acid derivatives 1.82
Schlumpberger & Raguso 2008

Echinopsis ancistrophora ssp. *ancistrophora*

El Fuerte, Jujuy, Argentina
(% given is percentage of the total scent fraction)
6-methyl-5-heptene-2-one 8.55
all monoterpenoids 8.55
(E,E)-α-farnesene 10.23
(E)-nerolidol 35.6
spathulenol 35.9
unknown sesquiterpenoids 7.97
all sesquiterpenoids 89.7
nonanal 0.33
unknown fatty acid derivatives 0.75
all fatty acid derivatives 1.08
benzaldehyde 0.18
methyl benzoate 0.49
all aromatics 0.67
Schlumpberger & Raguso 2008

Echinopsis ancistrophora* ssp. *ancistrophora

La Caldera, Campo Alegre, Salta, Argentina

(% given is percentage of the total scent fraction)

limonene	0.14
1,8-cineole	1.27
6-methyl-5-heptene-2-one	4.8
linalool	0.01
geranyl acetate	2.33
unknown monoterpenoids	0.39
all monoterpenoids	8.95
α-copaene	0.35
β-copaene	0.07
α-santalene	0.1
β-santalene	0.07
germacrene D	2.32
(Z,E)-α-farnesene	0.17
(E,E)-α-farnesene	0.09
δ-cadinene	0.01
β-sesquiphellandrene	0.1
dehydrogeosmin	1.37
(Z)-nerolidol	0.75
(E)-nerolidol	73.64
(E,E)-farnesyl acetate	0.07
(E,E)-farnesol	2.18
unknown sesquiterpenoids	3.62
all sesquiterpenoids	84.89
nonanal	0.88
hexadecane	0.93
unknown fatty acid derivatives	0.4
all fatty acid derivatives	2.22
benzaldehyde	1.14
methyl benzoate	0.04
benzyl alcohol	1.13
phenethyl alcohol	0.59
unknown aromatics	1.04
all aromatics	3.94

Schlumpberger & Raguso 2008

Echinopsis ancistrophora* ssp. *ancistrophora

Quebrada de Escoipe, Escoipe, Salta, Argentina

(% given is percentage of the total scent fraction)

limonene	0.17
1,8-cineole	0.14
6-methyl-5-heptene-2-one	0.09
dodecatriene	0.25
geranyl acetate	0.22
unknown monoterpenoids	0.18
all monoterpenoids	1.04
α-cubebene	0.17
α-copaene	0.95
β-bourbonene	0.63
β-copaene	0.53
β-elemene	0.08
(E)-caryophyllene	0.62
α-santalene	0.06
β-santalene	0.08
humulene	0.20
germacrene D	13.12
bicyclogermacrene	0.26
(Z,E)-α-farnesene	0.61
(E,E)-α-farnesene	0.08
δ-cadinene	0.78
β-sesquiphellandrene	0.04
dehydrogeosmin	0.28
(Z)-nerolidol	1.82
(E)-nerolidol	71.18
α-cadinol	0.25
(E,E)-farnesol	0.08
unknown sesquiterpenoids	6.6
all sesquiterpenoids	98.42
nonanal	0.02
unknown fatty acid derivatives	0.12
all fatty acid derivatives	0.14
methyl benzoate	0.01
benzyl alcohol	0.07
phenethyl alcohol	0.01
all aromatics	0.09

Schlumpberger & Raguso 2008

Echinopsis ancistrophora* ssp. *ancistrophora

Quebrada de Escoipe, Huayra Huaso, Salta, Argentina

(% given is percentage of the total scent fraction)

limonene	0.51
1,8-cineole	5.02
geranyl acetate	0.51
unknown monoterpenoids	0.02
all monoterpenoids	6.06
β-copaene	0.1
α-santalene	0.38
β-santalene	0.27
germacrene D	0.73
(Z,E)-α-farnesene	0.61
(E,E)-α-farnesene	0.16
δ-cadinene	0.02
β-sesquiphellandrene	0.38
dehydrogeosmin	0.17
(Z)-nerolidol	0.09
(E)-nerolidol	83.75
(E,E)-farnesyl acetate	0.28
(E,E)-farnesol	0.56
unknown sesquiterpenoids	4.19
all sesquiterpenoids	91.69
nonanal	0.49
all fatty acid derivatives	0.49
benzaldehyde	0.13
methyl benzoate	0.14
benzyl alcohol	1.42
phenethyl alcohol	0.07
all aromatics	1.76

Schlumpberger & Raguso 2008

Echinopsis ancistrophora* ssp. *ancistrophora
Quebrada de Humahuaca, Volcán, Jujuy, Argentina
(% given is percentage of the total scent fraction)
limonene 0.11
1,8-cineole 1.4
all monoterpenoids 1.51
α-cubebene 0.28
α-copaene 3.28
β-bourbonene 8.03
β-copaene 2.18
β-elemene 0.17
(E)-caryophyllene 1.65
humulene 0.29
germacrene D 50.75
bicyclogermacrene 1.44
(Z,E)-α-farnesene 2.48
δ-cadinene 0.91
dehydrogeosmin 0.67
(E)-nerolidol 2.16
α-cadinol 0.72
unknown sesquiterpenoids 21.58
all sesquiterpenoids 96.59
nonanal 0.40
all fatty acid derivatives 0.4
benzyl alcohol 0.29
all aromatics 0.29
Schlumpberger & Raguso 2008

Echinopsis ancistrophora* ssp. *ancistrophora
Quebrada de Toro, El Mollar, Salta, Argentina
(% given is percentage of the total scent fraction)
limonene 0.01
6-methyl-5-heptene-2-one 3.28
geranyl acetate 1.92
unknown monoterpenoids 0.06
all monoterpenoids 5.27
α-copaene 0.17
β-copaene 0.06
β-elemene 0.01
(E)-caryophyllene 0.03
germacrene D 1.35
bicyclogermacrene 0.02
(Z,E)-α-farnesene 0.04
(E,E)-α-farnesene 0.11
δ-cadinene 0.01
(Z)-nerolidol 0.9
(E)-nerolidol 81.22
spathulenol 3.25
(E,E)-farnesol 0.24
unknown sesquiterpenoids 2.92
all sesquiterpenoids 90.34
nonanal 1.10
hexadecane 0.03
unknown fatty acid derivatives 2.32
all fatty acid derivatives 3.45
benzaldehyde 0.03
methyl benzoate 0.01
benzyl alcohol 0.05
unknown aromatics 0.02
all aromatics 0.11
methyl-anthranilate 0.01
indole 0.8
all nitrogenous compounds 0.81
Schlumpberger & Raguso 2008

Echinopsis ancistrophora* ssp. *ancistrophora
Quebrada de Toro, Puente del Toro, Salta, Argentina
(% given is percentage of the total scent fraction)
limonene 0.04
6-methyl-5-heptene-2-one 1.71
geranyl acetate 1.11
unknown monoterpenoids 1.16
all monoterpenoids 4.02
α-cubebene 0.35
α-copaene 0.81
β-bourbonene 0.32
β-copaene 0.19
(E)-caryophyllene 0.21
humulene 0.02
germacrene D 2.8
bicyclogermacrene 0.16
(Z,E)-α-farnesene 0.11
(E,E)-α-farnesene 0.24
δ-cadinene 0.06
dehydrogeosmin 0.15
(Z)-nerolidol 1.31
(E)-nerolidol 82.43
spathulenol 0.24
(E,E)-farnesol 0.56
unknown sesquiterpenoids 4.95
all sesquiterpenoids 94.9
nonanal 0.41
hexadecane 0.17
Unknown fatty acid derivatives 0.22
all fatty acid derivatives 0.81
benzaldehyde 0.03
benzyl alcohol 0.24
phenethyl alcohol 0.01
all aromatics 0.28
Schlumpberger & Raguso 2008

Echinopsis ancistrophora* ssp. *ancistrophora
Quebrada de Toro, south Puente Toro, Salta, Argentina
(% given is percentage of the total scent fraction)
limonene 0.16
unknown monoterpenoids 0.43
all monoterpenoids 0.59
α-copaene 0.04
β-bourbonene 0.09
β-copaene 0.04
(E)-caryophyllene 0.03
germacrene D 0.14
(E)-nerolidol 94.28
spathulenol 0.27
(E,E)-farnesol 0.49
unknown sesquiterpenoids 2.45

all sesquiterpenoids 97.82
nonanal 0.44
unknown fatty acid derivatives 0.48
all fatty acid derivatives 0.92
methyl benzoate 0.24
methyl salicylate 0.1
phenethyl alcohol 0.33
all aromatics 0.68

Schlumpberger & Raguso 2008

Echinopsis ancistrophora ssp. *ancistrophora*

Quebrada de Toro Rio Blanco, Salta, Argentina

(% given is percentage of the total scent fraction)

limonene 0.06
1,8-cineole 0.07
6-methyl-5-heptene-2-one 0.37
geranyl acetate 0.1
unknown monoterpenoids 0
all monoterpenoids 0.6
α-cubebene 0.04
α-copaene 2.84
β-bourbonene 0.27
β-copaene 0.89
β-elemene 0.05
(E)-caryophyllene 0.29
humulene 0.20
germacrene D 19.13
bicyclogermacrene 0.56
(Z,E)-α-farnesene 0.18
(E,E)-α-farnesene 0.17
δ-cadinene 0.22
dehydrogeosmin 0.2
(E)-nerolidol 68.53
α-cadinol 0.03
(E,E)-farnesol 0.42
unknown sesquiterpenoids 4.47
all sesquiterpenoids 98.5
nonanal 0.27
hexadecane 0.05
all fatty acid derivatives 0.32
benzaldehyde 0.08
methyl benzoate 0.06
benzyl alcohol 0.17
unknown aromatics 0.01
all aromatics 0.32

Schlumpberger & Raguso 2008

Echinopsis ancistrophora ssp. *ancistrophora*

Termas de Reyes, Jujuy, Argentina

(% given is percentage of the total scent fraction)

limonene 0.64
1,8-cineole 0.4
trans-β-ocimene na
6-methyl-5-heptene-2-one 0.83
geranial 0.11
(E,E)-2,6-dimethyl-3,5,7-octatriene-2-ol 0.38
geranyl acetate 3.77
unknown monoterpenoids 0.25
all monoterpenoids 6.37
α-copaene 1.3
β-bourbonene 0.15
β-copaene 0.05
(E)-caryophyllene 0.08
germacrene D 5.12
bicyclogermacrene 0.09
(Z,E)-α-farnesene 1.05
(E,E)-α-farnesene 22.43
(E)-nerolidol 11.79
spathulenol 13.86
unknown sesquiterpenoids 3.37
all sesquiterpenoids 59.28
nonanal 2.25
hexadecane 0.38
unknown fatty acid derivatives 30.33
all fatty acid derivatives 32.96
benzaldehyde 0.7
methyl benzoate 0.12
methyl salicylate 0.07
benzyl alcohol 0.44
all aromatics 1.27

Echinopsis ancistrophora ssp. *arachnacantha*

Samaipata & Torrecillas & cultivated, Santa Cruz, Bolivia

(% given is percentage of the total scent fraction)

limonene 0.25
1,8-cineole 15.41
6-methyl-5-heptene-2-one 1.6
geranyl acetate 1.06
all monoterpenoids 18.33
β-bourbonene 0.11
(E)-caryophyllene 2.00
(Z,E)-α-farnesene 0.12
β-sesquiphellandrene 0.03
(Z)-nerolidol 0.04
(E)-nerolidol 53.38
spathulenol 0.04
unknown sesquiterpenoids 8.3
all sesquiterpenoids 64.02
nonanal 4.49
unknown fatty acid derivatives 10.36
all fatty acid derivatives 14.85
benzaldehyde 0.6
methyl benzoate 1.9
unknown aromatics 0.1
all aromatics 2.6
indole 0.2
all nitrogenous compounds 0.2

Schlumpberger & Raguso 2008

Echinopsis ancistrophora ssp. *cardenasiana*

Cultivated plants, Tarija, Bolivia

(% given is percentage of the total scent fraction)

limonene 4.92
trans-β-ocimene 2.14

(E,E)-2,6-dimethyl-1,3,5,7-octatetraene 0.22
(E,Z)-2,6-dimethyl-3,5,7-octatriene-2-ol 2.49
octadecatetraene 0.13
geraniol 0.74
geranyl acetate 1.23
all monoterpenoids 6.94
(E,E)-α-farnesene 4.21
dehydrogeosmin 0.13
(E)-nerolidol 1.82
unknown sesquiterpenoids 0.77
all sesquiterpenoids 6.92
nonanal 3.94
9-octadecenal isomer 49.00
unknown fatty acid derivatives 32.32
all fatty acid derivatives 85.26
methyl benzoate 0.04
all aromatics 0.04
methyl-anthranilate 0.01
indole 0.84
all nitrogenous compounds 0.85

Schlumpberger & Raguso 2008

Echinopsis ancistrophora ssp. *pojoensis*

Cultivated plants, Cochabamba, Bolivia
(% given is percentage of the total scent fraction)
6-methyl-5-heptene-2-one 12.23
all mono terpenoids 17.16
germacrene D 7.93
(E)-nerolidol 3.5
spathulenol 9.44
unknown sesquiterpenoids 4.88
all sesquiterpenoids 25.76
nonanal 17.17
9-octadecenal isomer 4.71
unknown fatty acid derivatives 3.1
all fatty acid derivatives 24.97
methyl benzoate 30.7
benzyl alcohol 1.41
all aromatics 32.11

Schlumpberger & Raguso 2008

Echinopsis andalgalensis (Weber) Friedrich & Rowley
See as ***Trichocereus andalgalensis***
***Echinopsis bridgesii* SD** lacks an analysis
Echinopsis camarguensis (Card.) Friedrich & Rowley
See as ***Trichocereus camarguensis***
Echinopsis candicans Weber See as ***Trichocereus candicans***
Echinopsis chiloensis (Colla) Friedrich & Rowley
See as ***Trichocereus chilensis***

Echinopsis eyriesii (Turpin) Zuccarini

93.8% water by weight (pH of juice: 4.6-5)
Herrero-Ducloux 1930a
Hordenine (10-50% of 1-10 mg total alkaloids/ 100 gm fresh) Agurell 1969b [European commercial sources]
[Small amounts of unidentified alkaloids were reported to be present by Herrero-Ducloux 1930a.]

Soulaire 1947 was of the opinion, that the photograph in Herrero-Ducloux showed an erroneous identification had been made and that Herrero-Ducloux had actually examined either *Echinopsis oxygona* or *E. multiplex.*

Echinopsis fulvilana (Ritt.) Friedrich & Rowley
See as ***Trichocereus fulvilanus***
Echinopsis gigantea Knize n.n. (In Friedrich & Glaetzle 1983) = *Trichocereus giganteus* **Hort.** Knize See in ***San Pedro***

Echinopsis hybrid

Dehydrogeosmin - Minor volatile in floral scent.
Sesquiterpene alcohol 1 - Trace volatile in floral scent.
Sesquiterpene alcohol 2 - Minor volatile in floral scent.
Schlumberger *et al.* 2004 (In tepals; gc-ms)

***Echinopsis eyriesii* both images above**

Echinopsis huascha (Web.) Friedrich & Rowley
See as ***Helianthocereus huascha***
Echinopsis kermesina (Krainz) Krainz
See analysis under ***Pseudolobivia kermesina***
Echinopsis lamprochlora (Weber) Friedrich & Glaetzle
See as ***Trichocereus lamprochlorus***
Echinopsis lageniformis (Foerst.) Friedrich & Rowley
See as ***Trichocereus bridgesii***
Echinopsis macrogona (Salm-Dyck) Friedr. & Rowley
See as ***Trichocereus macrogonus***
Echinopsis manguinii (Backeberg) Friedr. & Rowley
See as ***Trichocereus manguinii***

Echinopsis eyriesii
(Field)

This is a nice example of how the filaments of the inner stamens on an *Echinopsis* flower are adhered more tightly together in comparison to what can be seen elsewhere here on flowers of *Trichocereus*.

Echinopsis mamilosa **Guerke**
See potential analysis under ***Pseudolobivia kermesina.***
Hunt recognizes these as synonyms but, even if true, it should not be taken for granted that the chemistry of synonyms are the same without some analytical work. Material recognized as *Echinopsis mamilosa* should be analyzed and compared to that of material identified as *Echinopsis kermesina*.

Echinopsis multiplex (Pfeiffer) Pfeiffer & Otto
Showed antitumor & antineoplastic activity.
See **Activity Notes.**
This species presently appears to lack any published analysis.

Echinopsis obrepanda (Salm-Dyck) K. Schumann
Dehydrogeosmin - Trace volatile in floral scent.
trans-Nerolidol - Major volatile in floral scent.
Sesquiterpene alcohol 1 - Trace volatile in floral scent.
Sesquiterpene alcohol 2 - Trace volatile in floral scent.
Schlumberger *et al*. 2004 (In tepals; gc-ms)

Echinopsis pachanoi (Britton & Rose) Friedrich & Rowley
See as ***Trichocereus pachanoi***
Echinopsis pasacana (Weber) Friedrich & Rowley
See as ***Trichocereus pasacana***
Echinopsis peruviana (Britton & Rose) Friedrich & Rowley
See as ***Trichocereus peruvianus***
Echinopsis peruviana spp. *puquiensis* (Rauh & Backeberg) Ostolaza
See as ***Trichocereus puquiensis***

Echinopsis rhodotricha K.Schumann
Hordenine (Major alkaloid in the traces present.)
Tyramine (10-50% of the traces of alkaloid present.) Agurell *et al.* 1971b [Commercial source: Netherlands]
[Agurell 1969b reported no detectable alkaloid. European commercial sources]

Echinopsis obrepanda
(HBG) H 6679

Echinopsis mamilosa **Bolivia 68.0679 (UC)**

Echinopsis schickendantzii Weber
See as ***Trichocereus schickendantzii***
Echinopsis scopulicola (Ritter) Mottram
See as *Trichocereus scopulicola*
Echinopsis spachiana (Lemaire) Friedrich & Rowley
See as ***Trichocereus spachianus***
Echinopsis strigosa (Salm-Dyck) Friedrich & Rowley
See as ***Trichocereus strigosus***
Echinopsis taquimbalensis (Cardenas) Friedrich & Rowley
See as ***Trichocereus taquimbalensis***
Echinopsis terscheckii (Parmentier) Friedrich & Rowley
See as ***Trichocereus terscheckii***
Echinopsis thelegonoides (Spegazzini) Friedrich & Rowley
See as ***Trichocereus thelegonoides***
Echinopsis thelegona (Weber) Friedrich & Rowley
See as ***Trichocereus thelegonus***

Echinopsis triumphans **R.Mey** was reported to contain Isocitric acid (tlc & glc by Kringstad & Nordal 1975)

Echinopsis tubiflora (Pfeiffer) Zuccarini
24ς́-Methylcholesterol (33.1% of total)
Sitosterol (66.9% of total)
Salt *et al.* 1987

Echinopsis valida Monv. See as ***Trichocereus validus*** but please be aware that 2 or 3 different plants are sometimes called *E. valida.*

Echinopsis multiplex
above
Echinopsis triumphans
right-hand column

Echinopsis werdermanniana (Backeberg) Friedr. & Rowley See as ***Trichocereus werdermannianus*** [Please note that while the **CITES Cactaceae Checklist** gave the opinion that this species no longer existed as it had been absorbed by ***Trichocereus*** *terscheckii*, the **New Cactus Lexicon** once again regards them to be separate species. Apparently the split involved the recognition that their ranges in the wild did not overlap but the cause for the merger is still unclear.]

Epiphyllum anguliger **(Lemaire) Britton & Rose**
Reported to contain Kaempferol & Quercetin (Flavonols) Richardson 1978 (based on acid hydrolysis)

Epiphyllum truncatum Haworth See as ***Schlumbergera truncata***

Epiphyllum oxypetalum **(DC)** Haworth

In leaves:
Allyldimethyl(prop-1-ynyl)silane
Cyclohexylmethyl hexyl ester of sulfurous acid
2,5-Dihydroxy-4-isopropyl-2,4,6-cycloheptatrien-1-one
4,4-dimethyl-cholesta-22,24-dien-5-ol
3,7-dimethyl-6-octen-1-ol
Hentriacontane
Heptacosane
2,3,5,5,8,8-hexamethyl-cycloocta-1,3,6-triene
1-(2-hydroxy-5-methylphenyl)-ethanone
4-Hydroxy-2-methylacetophenone
4-((1E)-3-Hydroxy-1-propenyl)-2-methoxyphenol
Megastigmatrienone
2-methyl-eicosane
2-methyl-nonadecane
2-methyl-octadecane
n-Hexadecanoic acid
Octadecanoic acid
Phytol
Spinasterone
Stigmast-4-en-3-one
4,22-Stigmastadiene-3-one
22-Stigmasten-3-one
Stigmasterol
Testosterone cypionate
Tetracosane
2,6,10,14-tetramethyl-hexadecane
Dandekar *et al*. 2015

See entry in the **Activity Notes.**

Echinopsis oxypetalum
above

Floral "head-space" molecules:
trans-Allocimene
n-Amyl salicylate
Benzaldehyde
Benzyl alcohol
Benzyl benzoate
Benzyl isovalerate
Benzyl salicylate
Benzyl tiglate
(E)-iso Citral
n-Decanal
Dodecane
2,3-Epoxy geraniol
Ethyl benzoate
Eugenol
Farnesol
2E-6E-Farnesol
Geraniol
Geranyl acetate
Geranyl acetone
Geranyl isobutyrate
n-Hexanal
Indole
Isoeugenol
Limonene
Melonal
p-Mentha-1(7),2,8-triene
Methyl benzoate
6-Methyl-5-hepten-2-one
Methyl salicylate
Myrcene
α-Myrcene
Neral
Nerol
Neryl acetate
Nonadecane
allo-Ocimene
cis-β-ocimene
trans-Ocimene
2-Oxo-citronellol
2-(1'Pentenyl)-furan
α-Phellandrene
Phenol
Phenylethyl alcohol
Phenylethyl benzoate
α-Terpinene
1,3,5-Trimethyl benzene
Terpinolene
Tetradecane
Marsili 2002

Essential oil:
Benzyl salicylate (9.7%)
Methyl linoleate (21.1%)
Maia & Andrade 2009 citing Zoghbi 2001

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lower: https://commons.wikimedia.org/w/index.php?curid=23284887

Echinopsis oxypetalum
both of the above

Epiphyllum phyllanthus **(**L.**)** HAWORTH See **Activity Notes.**

Epiphyllum phyllanthoides (DC) Sweet
See as ***Nopalxochia phyllanthoides***

Epiphyllum **sp.**

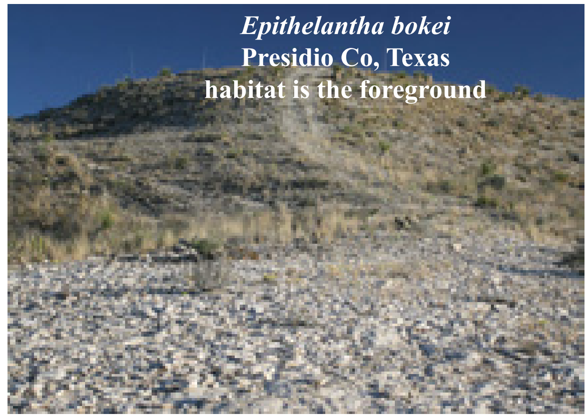
Unsubstantiated and referenceless claim for the presence of mescaline is made by Caycho Jimenez 1977 (page 91). He does not include anything supporting his assertion.

Sterols isolated from leaves:
Avenasterol (8.4% of total)
24¢-Methylcholesterol (9.4% of total)
Stigmasterol (2.5% of total)
Sitosterol (75.5% of total)
24¢-Methylcholestenol (traces)
Sitostanol (4.2% of total)
Salt *et al*. 1987

Epithelantha micromeris **var.** ***greggii***
Upper right

Epiphylllum **hybrid (Kartuz)**
Photo upper left by Geoffrey

Cristate ***Epithelantha micromeris*** **var.** ***micromeris***
Bottom



Epithelantha bokei
Presidio Co, Texas
habitat is the foreground

***Epithelantha micromeris* (Engelmann) Weber**

Tyramine (Less than 0.001%.) Štarha 1995b; (0.0003%.) Štarha 1994 [All of Štarha's *Epithelantha* specimens were seed grown in Czechoslovakian greenhouses]

N-Methyltyramine (Less than 0.001%.) Štarha 1995b; (0.0004%.) Štarha 1994

Hordenine (0.003%.) Štarha 1995b; (0.0026%.) Štarha 1994

3-Methoxytyramine (0.006%.) Štarha 1995b; (0.0059%.) Štarha 1994

3,4-Dimethoxyphenethylamine (0.440%.) Štarha 1995b [Note from Dr. Štarha, rec'd. Jan. 1999 indicates this to be a typo intending 0.004% by fresh weight]; (0.0042%.) Štarha 1994

N-Methyl-3,4-dimethoxyphenethylamine (Less than 0.001%.) Štarha 1995b; (0.0010%.) Štarha 1994 (All values above are % by fresh weight.)

[Both Dominguez *et al.* 1969 and McLaughlin (unpublished) detected trace amounts of alkaloids.]

It should also be noted that West & McLaughlin 1977 isolated and crystallized the following (As acid hydrolysis products of the corresponding saponins):

Epithelanthic acid ($\Delta^{9(11)}$-12-oxo-oleane) (0.00008% dry wt.)

Methylepithelanthate (A triterpene) (0.0004% dry wt.)

Methylmachaerinate (A triterpene diol) (0.0003% dry wt.)
(Thought to possibly be an artifact arising from machaeric acid)

Oleanolic acid (A triterpene) (0.58% (crude) dry wt.)

β-Sitosterol (A sterol) (0.001% dry wt.)

An unidentified triterpene lactone (0.0002% dry wt.)

Methyl oleanate (As 5% of oleanolic acid content; thought to possibly be an artifact.)

See **Activity Notes.**

The several varieties of this plant appear to lack analysis

Epithelantha micromeris* var. *unguispina
(above & lower right)

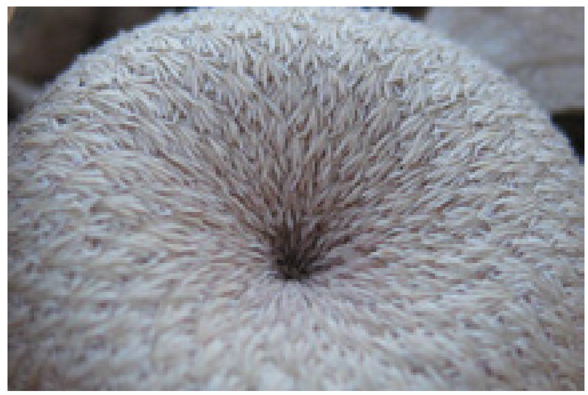
Escobaria aguirreana (Glass & Foster) Taylor
See as ***Gymnocactus aguirreanus***

Escobaria missouriensis (Sweet) Hunt
See as ***Coryphantha missouriensis***

Escobaria roseanus (Bödekker) Taylor
See as ***Gymnocactus roseana*** Buxbaum

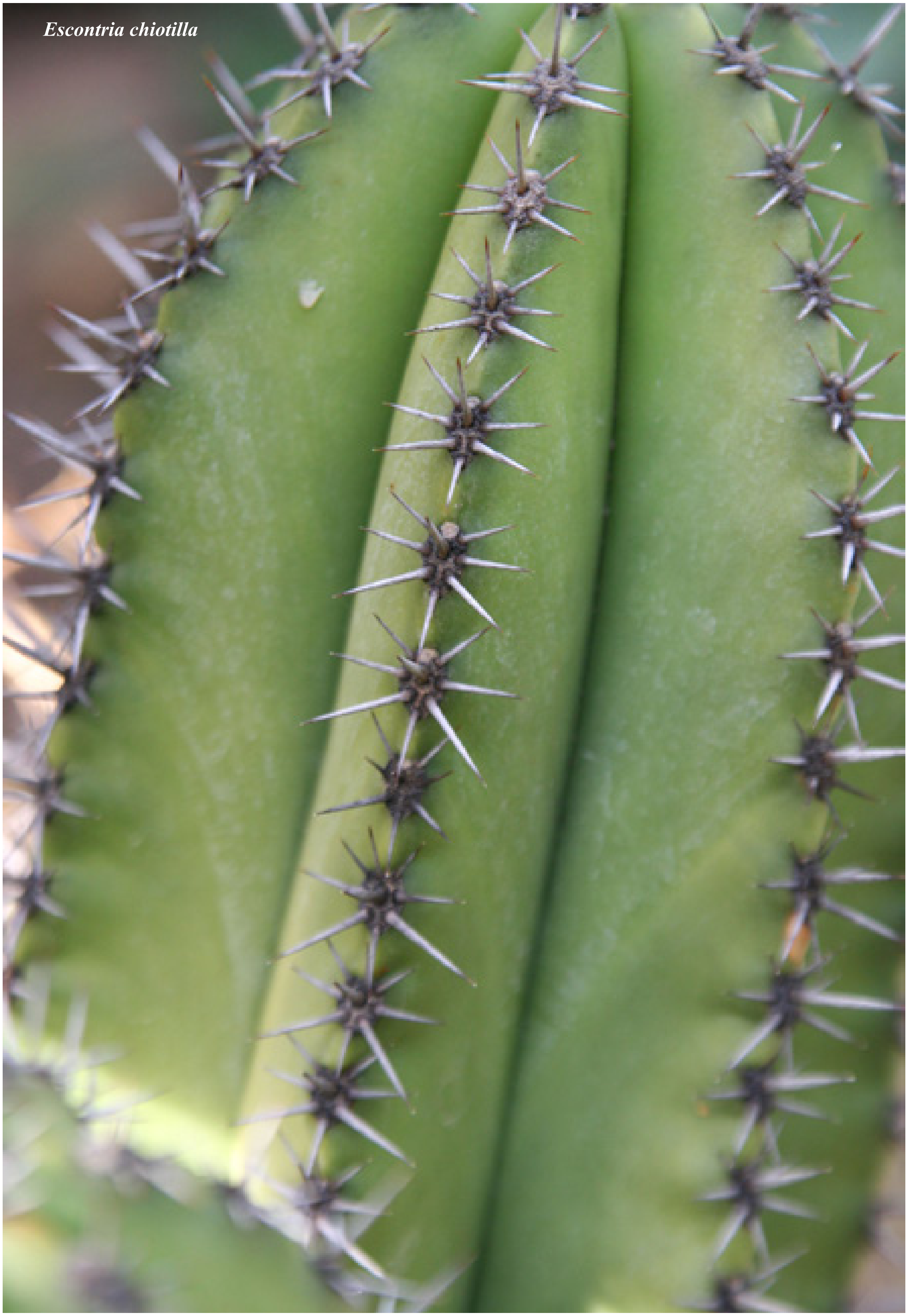
Escobaria tuberculosa
See as ***Coryphantha tuberculosa***

***Epithelantha micromeris* var. *micromeris* [var. *greggii*?]**



Epithelantha bokei

Escobaria vivipara (Nuttall) Buxbaum
See as ***Coryphantha vivipara***


Escontria chiotilla


Escontria chiotilla

Eriocereus guelichii (Spez.) Berg.

Fruit contains Phyllocactin, Betanin, Isobetanin & Isophyllocactin. Piattelli & Imperato 1969

Eriocereus spp. This genus seriously needs some analysis.

Escontria chiotilla (Weber) Rose

86.3% water by weight
4-Hydroxy-3,5-dimethoxyphenethylamine (Around 0.01% dry wt.) Ma *et al.* 1986
Longispinogenin [0.29% yield; dry wt.]
Maniladiol [0.1% yield; dry wt.]
Djerassi *et al.* 1956a [Collected at marker km 368 along Mexico City-Oaxaca Hwy, Puebla, Mexico]

Escontria gaumeri See as ***Pterocereus gaumeri***

Escontria chiotilla
(HBG) above

Espostoa lanata
(UC) upper right

Espostoa huanucensis Ritter

Hordenine (0.002% dry wt.)
N-Methyltyramine (0.002% by dry weight.)
Tyramine (0.004% by dry weight.)
Mata *et al.* 1976a [Also Mata *et al.* 1976b]
Unidentified trace alkaloid detected in Mata *et al.* 1976a.

Espostoa lanata (HBK) Br. & R.

Reported to be alkaloid negative (Based on Mayer's test showing no detectable alkaloid); also reported to lack triterpenes. Djerassi *et al.* 1955b [Wild collected in Peru]
[Mata & McLaughlin 1976 also appears listed as a reference but they simply mentioned Djerassi's work.]

***Ferocactus hamatocanthus* flowering**
(SRSU)

Ferocactus hamatocanthus
(near Sanderson, Texas) above
(Sull Ross State University) right
(Presidio Co, Texas) left & below

Ferocactus acanthodes **(Lemaire) Britton & Rose**
CO_2 uptake occurred entirely at night through the stems (under well watered conditions)
Nobel & Hartsock 1986

Ferocactus hamatocanthus **(Muehlenpfordtii) Britton & Rose**
No detectable alkaloids.
Chalet 1980a cited Dominguez *et al*. 1969

Ferocactus latispinus **(Haworth) Britton & Rose**
No detectable alkaloids in the screenings of Fong *et al.* 1972

Ferocactus hamatocanthus
left and above

Ferocactus recurvus **(Mill.) Berg.**
No detectable alkaloids.
Chalet 1980a cited Dominguez *et al*. 1969

Ferocactus stainesii **(Andot.) Britton & Rose var.** ***pringlei*** **(Coulter) Britton & Rose**
Reported to contain unidentified alkaloid(s). Chalet 1980a cited Dominguez *et al*. 1969

Ferocactus wislizeni **(Engelmann) Britton & Rose**
Unidentified alkaloids indicated. Brown *et al.* 1968

Glandulicactus crassihamatus **(Weber) Marshall**
Reported to contain unidentified alkaloid(s). Chalet 1980a cited Dominguez *et al*. 1969

Ferocactus wislizeni
normal & cristate adults

Ferocactus recurvus

***Ferocactus wislizeni* var. *herrerae* short-spined form**

Ferocactus wislizeni (Cactus Country, VIC - top; Tucson Arizona - bottom)

Grusonia bradtiana
(SRSU)
above & right

Ferocactus wislizeni
(Cactus Country)
below

Grusonia bradtiana **(Coulter) Britton & Rose**

Reported to contain unidentified alkaloid(s). Chalet 1980a cited Dominguez *et al*. 1969

Grusonia clavata (Engelmann) H.Robinson
see as ***Corynopuntia clavata***

Grusonia emoryi (Engelmann) Pinkava
see as ***Corynopuntia stanlyi var. stanlyi***

Grusonia invicta (T.Brandegee) E.F.Anderson
see as ***Corynopuntia invicta***

Grusonia kunzei (Rose) Pinkawa
see as ***Corynopuntia stanlyi var. kunzei***

Grusonia schottii (Engelmann) H.Robinson
see as ***Corynopuntia schottii***

Grusonia bradtiana
(SRSU)

Gymnocactus aguirreanus **Glass & Foster**
Hordenine (2.26% dry wt.)
N-Methyltyramine (trace)
N-Methylphenethylamine (trace)
West *et al.* 1974


Gymnocactus aguirreanus

Gymnocactus beguinii **(Weber) Backeberg**
Hordenine (trace)
N-Methyltyramine (trace)
N-Methylphenethylamine (trace)
West *et al.* 1974
Traces of Mescaline (Between 4-12 µg/gm fresh) Gennaro *et al.* 1996

Gymnocactus horripilus **(Lemaire) Backeberg**
Hordenine (trace)
N-Methylphenethylamine (0.17% dry weight.)
West *et al.* 1974


Gymnocactus beguinii

Gymnocactus knuthianus **(Boedecker) Backeberg**
N-Methylphenethylamine (trace) West *et al.* 1974

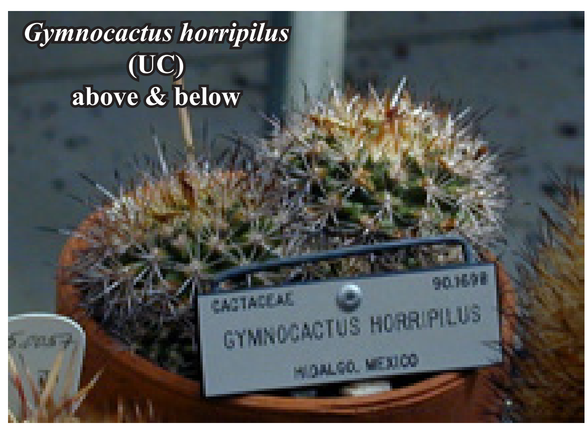
Gymnocactus mandragora **(Fric) Backeberg**
N-Methylphenethylamine (trace)
N-Methyltyramine (trace)
West *et al.* 1974.

Gymnocactus roseanus **(Boedecker) Glass & Foster**
Hordenine (2.39% dry wt.)
N-Methylphenethylamine (trace)
N-Methyltyramine (trace)
West *et al.* 1974

Gymnocactus **sp.** (Thought to be a variety of *G. roseanus.)*
N-Methylphenethylamine (0.04% dry wt.)
Hordenine (1.89% dry wt.)
West *et al.* 1974 [Collected from El Chiflon, Mexico.]

Gymnocactus viereckii **(Werdermann) Backeberg**
N-Methylphenethylamine (trace) West *et al.* 1974

Gymnocactus roseanus



Gymnocactus horripilus (UC) above & below

Gymnocalycium achirasense **Till & Schatzl**
Tyramine (0.00159% [± 0.00008])
N-Methyltyramine (0.00045% [± 0.00006])
Hordenine (0.00129% [± 0.00006])
Mescaline (0.00007% [± 0.00001])
N-Methylmescaline (0.00013% [± 0.00001])
N,N-Dimethylmescaline (0.00025% [± 0.00002])
Anhalamine (0.00097% [± 0.00001])
Štarha *et al.* 1998 (% by fresh weight.)
Starha used cultivated plants; gc or gcms to identify.

Gymnocactus aguirreanus (UC)

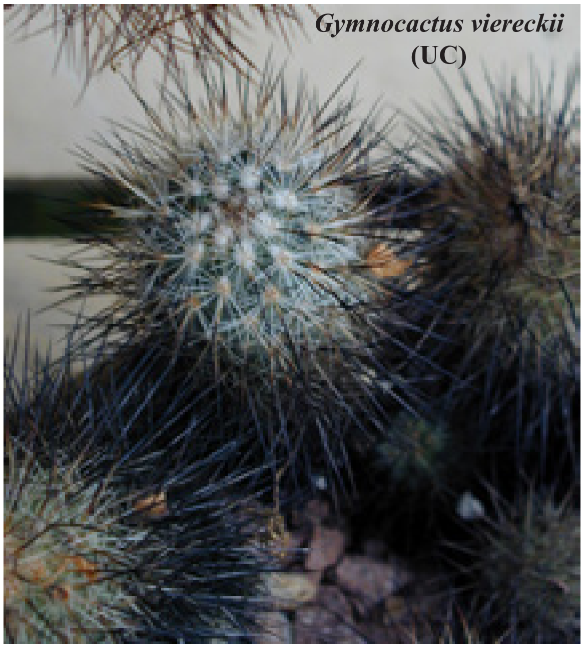
72.0435 Coahuila State, Mexico

Gymnocactus aguirreanus (UC)

Gymnocactus beguinii (SRSU)

Gymnocalycium asterium

Gymnocactus aguirreanus (BTA)



***Gymnocactus viereckii* (UC)**

Gymnocalycium albispinum **Backeberg**

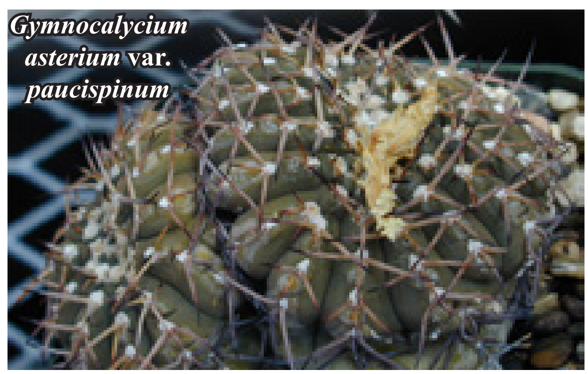
Tyramine (Between 0.0001-0.001%.)
N-Methyltyramine (Less than 0.0001%.)
Hordenine (Between 0.0001-0.001%.)
Anhalinine (Less than 0.0001%.)
O-Methylanhalonidine (Less than 0.0001%.)
Anhalonidine (Less than 0.0001%.)
Pellotine (Less than 0.0001%.)
Anhalonine (Less than 0.0001%.)
Lophophorine (Less than 0.0001%.)
Štarha *et al.* 1997 (% by fresh weight.)

Gymnocalycium andreae **(Böd.) Backeb. & F.M.Knuth**

Betalains. Wohlpart & Mabry 1968 cited Dreiding 1961
trans-β-Ocimene - Minor volatile in floral scent, absent in some
Dehydrogeosmin - Minor volatile, major or absent in some; present in 73%, absent in 15%, questionable in 12%.
Heptadecene - Minor volatile, trace in some.
Bergamotene - Minor volatile.
β-Farnesene - Major volatile, trace or absent in some.
Sesquiterpene alcohol - Trace volatile, absent in some.
Alkane - Trace volatile, absent in some.
Eudesman-3,7-dien? - Minor volatile, absent in some.
trans-Nerolidol - Major volatile, trace or absent in some.
Alkene 1 - Minor volatile, trace in some.
Sesquiterpene alcohol 1 - Minor volatile, trace in some.
Sesquiterpene alcohol 2 - Minor volatile.
Alkene 2 - Minor volatile, absent in some.
Alkene 3 - Minor volatile, trace in some.
Highly variable among cultivated individuals. 19 of 20 showed floral scent dominated by either β-Farnesene or *trans*-Nerolidol; 1 specimen had Dehydrogeosmin as the largest peak.
Six wild specimens from Argentina had a uniform floral scent composed almost entirely of β-Farnesene.
Schlumberger *et al.* 2004 (In tepals; gc-ms)

Gymnocalycium anisitsii **(K.Schumann) Br. & R.**

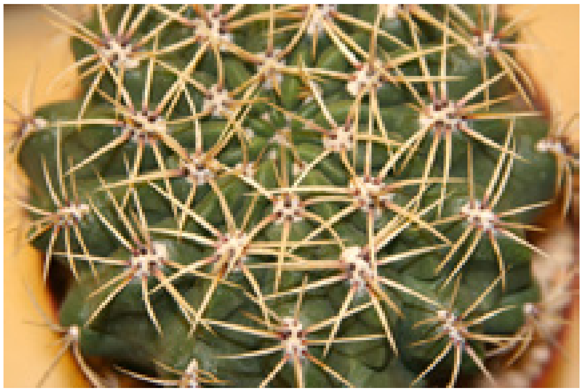
Tyramine (Less than 0.0001%.)
Hordenine (Approximately 0.001%.)
N-Methylmescaline (Less than 0.0001%.)
Anhalinine (Between 0.0001-0.001%.)
Anhalidine (Between 0.0001-0.001%.)
Anhalonidine (Less than 0.0001%.)
Štarha 1996 (% by fresh weight.)



Gymnocalycium asterium* var. *paucispinum

Gymnocalycium asterium **Ito**

Tyramine (0.00089% [± 0.00013])
N-Methyltyramine (0.00012% [± 0.00004])
Hordenine (0.00105% [± 0.0001])
Mescaline (0.00013% [± 0.00002])
N-Methylmescaline (0.00031% [± 0.00004])
N,N-Dimethylmescaline (0.0005% [± 0.00004])
O-Methylanhalidine (0.00011% [± 0.00002])
Anhalidine (Trace)
Anhalamine (0.00054% [± 0.00002])
Anhalonidine (Trace)
Pellotine (Trace)
Anhalonine (Trace)
Lophophorine (Trace)
Štarha *et al.* 1998 (% by fresh weight.)



Gymnocalycium achirense
(California Cactus)

Gymnocalycium achirasense

Gymnocalycium baldianum

Gymnocalycium baldianum
(Great Petaluma Desert)

Gymnocalycium baldianum **(Spegazzini) Spegazzini**

Tyramine (Less than 0.0001%.)
Hordenine (Approximately 0.001%.)
Mescaline (Less than 0.0001%.)
Anhalinine (Less than 0.0001%.)
Anhalidine (Less than 0.0001%.)
Anhalamine (Less than 0.0001%.)
Anhalonidine (Less than 0.0001%.)
Pellotine (Less than 0.0001%.)
Anhalonine (Less than 0.0001%.)
Lophophorine (Less than 0.0001%.)
Štarha 1996 (% by fresh weight.)

Reported to contain Betalains as pigments. Wohlpart & Mabry 1968 cited Dreiding 1961

Gymnocalycium baldianum
(Great Petaluma Desert)

Gymnocalycium bayrianum **Till**

Tyramine (Between 0.0001-0.001%.)
Hordenine (Between 0.0001-0.001%.)
N-Methyltyramine (Less than 0.0001%.)
Anhalinine (Less than 0.0001%.)
Anhalonidine (Less than 0.0001%.)
Pellotine (Less than 0.0001%.)
Anhalonine (Between 0.0001-0.001%.)
Lophophorine (Less than 0.0001%.)
Štarha 1996 (% by fresh weight.)

Gymnocalycium bayrianum
(SS)

Gymnocalycium bruchii
(HBG)

Gymnocalycium bodenbenderianum* ssp. *intertextum
Dehydrogeosmin - Major volatile in the flower scent.
Sesquiterpene alcohol 1 - Minor volatile in floral scent.
Sesquiterpene alcohol 2 - Major volatile in floral scent.
Scent emission from the apical half of tepal was dominated by Dehydrogeosmin and Sesquiterpene alcohol 1; basal half was dominated by β-Farnesene.
SCHLUMBERGER *et al*. 2004 (in tepals; gc-ms)

Cristate *Gymnocalycium bodenbenderianum*
(HBG) H 72769

Gymnocalycium bruchii
(SS)

***Gymnocalycium boszingianum* SCHÜTZ**
Tyramine (Between 0.0001-0.001%.)
Hordenine (Approximately 0.001%.)
Anhalinine (Between 0.0001-0.001%.)
N-Methylmescaline (Less than 0.0001%.)
N-Methyltyramine (Less than 0.0001%.)
Anhalonidine (Less than 0.0001%.)
Pellotine (Approximately 0.001%.)
Anhalonine (Less than 0.0001%.)
Lophophorine (Less than 0.0001%.)
ŠTARHA 1996 (% by fresh weight.)

***Gymnocalycium bruchii* (SPEGAZZINI) HOSSEUS**
trans-β-Ocimene - Minor volatile in floral scent.
Dehydrogeosmin - Major volatile, minor in some.
trans-Nerolidol - Major volatile, absent in some.
Sesquiterpene alcohol 1 - Minor volatile, trace in some.
Sesquiterpene alcohol 2 - Minor volatile, major in some.
SCHLUMBERGER *et al.* 2004 (In tepals; gc-ms)

***Gymnocalycium calochlorum* (BOEDECKER) Y.ITO**
Mescaline (Between 0.0001-0.001%.)
Tyramine (Between 0.0001-0.001%.)
N-Methyltyramine (Less than 0.0001%.)
Hordenine (Approximately 0.001%.)
N-Methylmescaline (Less than 0.0001%.)
Anhalinine (Less than 0.0001%.)
Anhalidine (Less than 0.0001%.)
Anhalamine (Less than 0.0001%.)
Anhalonidine (Between 0.0001-0.001%.)
Pellotine (Less than 0.0001%.)
ŠTARHA 1996 (% by fresh weight.)

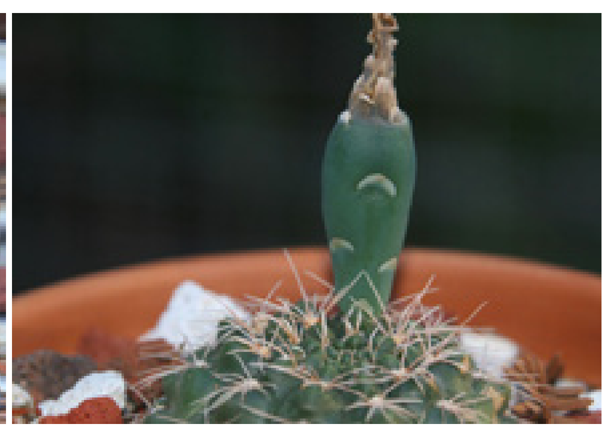
Gymnocalycium bruchii
(HBG)

Gymnocalycium boszingianum
(Cactus Data)
top row

Gymnocalycium calochlorum **seedling**
(Mesa Garden)

Gymnocalycium boszingianum
(Cactus Data)
below

Gymnocalycium calochlorum
entire page



***Gymnocalycium cardenasianum* Ritter**
Tyramine (Between 0.0001-0.001%.)
N-Methyltyramine (Less than 0.0001%.)
Hordenine (Between 0.0001-0.001%.)
Anhalinine (Less than 0.0001%.)
Anhalonidine (Less than 0.0001%.)
Pellotine (Less than 0.0001%.)
Štarha 1996 (% by fresh weight.)

***Gymnocalycium carminanthum* Borth & Koop**
Tyramine (0.00007% [± 0.00003])
N-Methyltyramine (Trace)
Hordenine (0.00016% [± 0.00005])
Mescaline (0.00006% [± 0.00005])
N-Methylmescaline (Trace)
N,N-Dimethylmescaline (0.00008% [± 0.00002])
O-Methylanhalidine (0.00007% [± 0.00002])
Anhalamine (0.00088% [± 0.00003])
Anhalonidine (Trace)
Štarha *et al.* 1998 (% by fresh weight.)

***Gymnocalycium chubutense* Spegazzini**
Tyramine (Between 0.0001-0.001%.)
N-Methyltyramine (Between 0.0001-0.001%.)
Hordenine (Approximately 0.001%.)
N-Methylmescaline (Between 0.0001-0.001%.)
O-Methylanhalidine (Less than 0.0001%.)
O-Methylanhalonidine (Less than 0.0001%.)
Anhalonidine (Less than 0.0001%.)
Pellotine (Between 0.0001-0.001%.)
Anhalonine (Between 0.0001-0.001%.)
Lophophorine (Between 0.0001-0.001%.)
Štarha *et al.* 1997 (% by fresh weight.)

***Gymnocalycium comarapense* Backeberg**
Tyramine (Between 0.001-0.001%.)
N-Methyltyramine (Less than 0.001%.)
Hordenine (Less than 0.001%.)
Mescaline (Less than 0.001%.)
N-Methylmescaline (Less than 0.001%.)
Anhalamine (Less than 0.001%.)
Pellotine (Less than 0.001%.)
Štarha 1995 (% by fresh weight.)

***Gymnocalycium cardenasianum* adult**

***Gymnocalycium cardenasianum* seedling**

***Gymnocalycium curvispinum* Fric**
Tyramine (Between 0.0001-0.001%.)
N-Methylmescaline (Less than 0.0001%.)
Hordenine (Less than 0.0001%.)
Anhalinine (Between 0.0001-0.001%.)
Anhalonidine (Less than 0.0001%.)
Pellotine (Less than 0.0001%.)
Anhalonine (Less than 0.0001%.)
Štarha 1996 (% by fresh weight.)

***Gymnocalycium delaetii* Backeberg**
Tyramine (Less than 0.0001%.)
N-Methyltyramine (Less than 0.0001%.)
Hordenine (Approximately 0.001%.)
N-Methylmescaline (Less than 0.0001%.)
Anhalinine (Less than 0.0001%.)
Anhalonidine (Less than 0.0001%.)
Pellotine (Less than 0.0001%.)
Štarha 1996 (% by fresh weight.)

Gymnocalycium denudatum

***Gymnocalycium eytianum* Cárdenas**

Weddellite was identified as druses.
Monje & Baran 2002

Gymnocalycium denudatum (L.&O.) Pfeiff.

Tyramine (0.00066% [± 0.00006])
N-Methyltyramine (0.00061% [± 0.00002])
Hordenine (0.00052% [± 0.00005])
Mescaline (Trace)
N-Methylmescaline (0.00008% [± 0.00001])
N,N-Dimethylmescaline (0.00073% [± 0.00005])
O-Methylanhalidine (0.00025% [± 0.00003])
Anhalinine (0.00006% [± 0.00002])
O-Methylanhalonidine (0.0001% [± 0.00002])
Anhalidine (Trace)
Anhalamine (0.00048% [± 0.00002])
Anhalonidine (Trace)
Štarha *et al.* 1998 (% by fresh weight.)

Gymnocalycium denudatum
cv. Pink Beauty H60685 (HBG)

Gymnocalycium fleischerianum Backeberg

Tyramine (0.0001-0.001% dry wt.)
N-Methyltyramine (0.001% dry wt.)
Hordenine (0.0001-0.001% dry wt.)
Mescaline (0.0001-0.001% dry wt.)
N-Methylmescaline (0.0001-0.001% dry wt.)
N,N-Dimethylmescaline (0.0001-0.001% dry wt.)
Anhalamine (0.0001-0.001% dry wt.)
Anhalonidine (0.00001-0.0001% dry wt.)
Štarha 2001c did not include a citation for his information. (*G. fleischerianum* is included only in the table on page 91 and not in the by species breakdown)

Gymnocalycium friedrichii Paz.

Tyramine (Between 0.0001-0.001%.)
Hordenine (Less than 0.0001%.)
Štarha 1996 (% by fresh weight.)

Gymnocalycium gibbosum (Haworth) Pfeiffer

92.1% water by weight (pH of juice: 4.6-5.0) Herrero-Ducloux 1930b
Tyramine (Less than 0.0001%.) Štarha *et al.* 1997
N-Methyltyramine (Approximately 0.001%.) Štarha *et al.* 1997
Hordenine (Approximately 0.001%.) Štarha *et al.* 1997
Mescaline (unquantified and tentatively identified. Colorless birefringent crystals, *n* 1.544, mp 160-162º were claimed to show the "*reactions of mescaline*") Herrero-Ducloux 1930b. **Not** observed by Štarha *et al.* 1997.
N-Methylmescaline (Between 0.0001-0.001%.) Štarha *et al.* 1997
N,N-Dimethylmescaline (Less than 0.0001%.) Štarha *et al.* 1997
O-Methylanhalidine (Approximately 0.001%.) Štarha *et al.* 1997
Anhalinine (Approximately 0.001%.) Štarha *et al.* 1997
O-Methylanhalonidine (Approximately 0.001%.) Štarha *et al.* 1997
Anhalidine (Between 0.0001-0.001%.) Štarha *et al.* 1997
Anhalamine No quantification (or accurate identification). attempted; Herrero-Ducloux 1930b [Our source was Reti; *CA* gives this as Anhalonine. We presently lack the primary paper.] (Approximately 0.001%.) Štarha *et al.* 1997
Anhalonidine (Less than 0.0001%.) Štarha *et al.* 1997
Pellotine (Between 0.0001-0.001%.) Štarha *et al.* 1997
Anhalonine (Between 0.0001-0.001%.) Štarha *et al.* 1997
Lophophorine No quantification (or accurate identification) attempted; Herrero-Ducloux 1930b (Between 0.0001-0.001%.) Štarha *et al.* 1997
[All of Štarha's values are % by fresh wt]

Gymnocalycium fleischerianum
Lower left & right

Gymnocalycium friedrichii
Entire page

Gymnocalycium gibbosum

***Gymnocalycium horridispinum* Frank**

Mescaline (Between 0.0001-0.001%.)
Tyramine (Approximately 0.001%.)
N-Methyltyramine (Less than 0.0001%.)
Hordenine (Approximately 0.001%.)
N-Methylmescaline (Less than 0.0001%.)
Anhalinine (Less than 0.0001%.)
Pellotine (Less than 0.0001%.)
Štarha 1996 (% by fresh weight.)

***Gymnocalycium leeanum* (Hooker) Br. & R.**

Anhalonine (Unconfirmed) Herrero-Ducloux 1930b
Not observed by DeVries *et al.* 1971
Hordenine (%?) DeVries *et al.* 1971
Lophophorine (Unconfirmed) Herrero-Ducloux 1930b
Not observed by DeVries *et al.* 1971
Mescaline (Unconfirmed) Herrero-Ducloux 1930b
Not observed by DeVries *et al.* 1971
N-Methyltyramine (?%.) DeVries *et al.* 1971
Tyramine (0.00583%.) DeVries *et al.* 1971

Gymnocalycium leeanum

***Gymnocalycium marsoneri* (Fric) Ito**

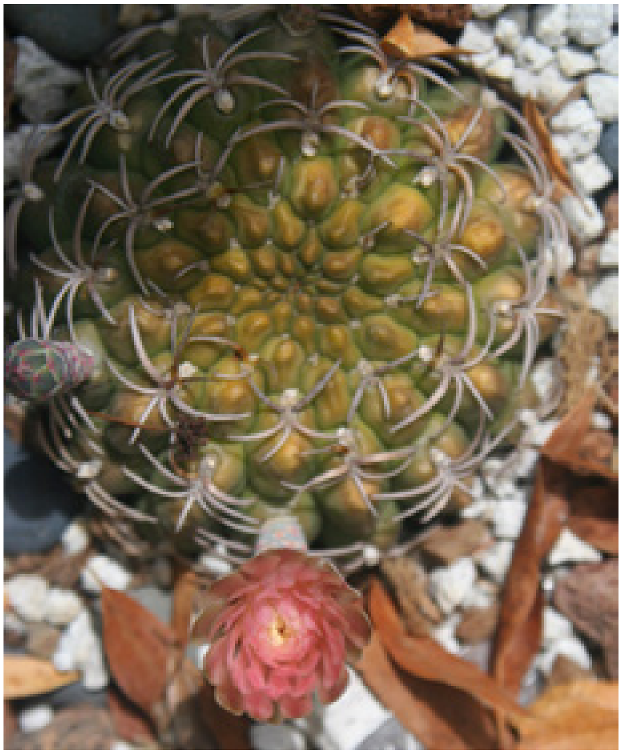
Tyramine (Less than 0.0001%.)
N-Methyltyramine (Less than 0.0001%.)
Hordenine (Approximately 0.001%.)
N-Methylmescaline (Between 0.0001-0.001%.)
Štarha *et al.* 1997 (% by fresh weight.)

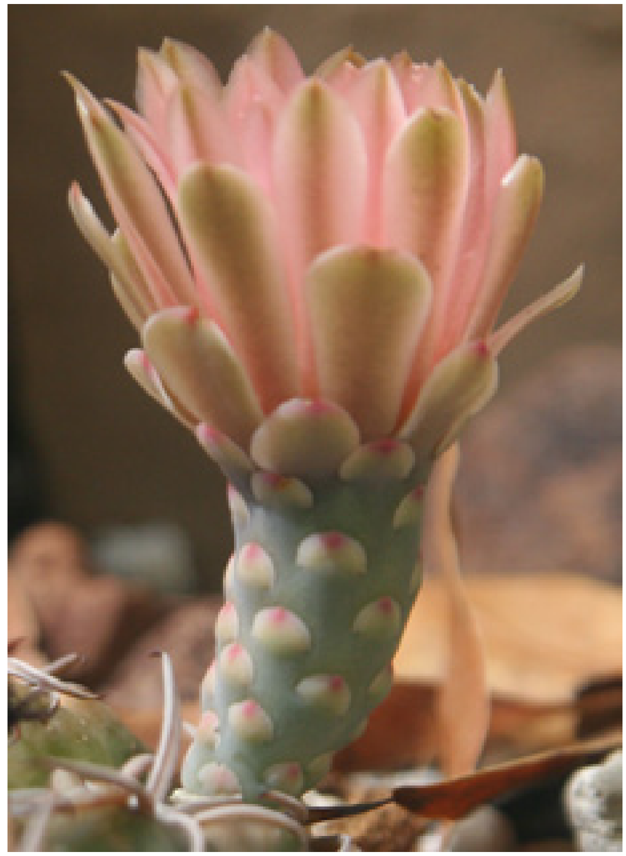
***Gymnocalycium mazanense* Backeberg**

N-Methyltyramine (Less than 0.0001%.)
Tyramine (Between 0.0001-0.001%.)
Hordenine (Approximately 0.001%.)
Štarha 1996 (% by fresh weight.)

Gymnocalycium marsoneri
Lower left

Gymnocalycium mazanense
Lower right





Gymnocalycium marsoneri
(California)

Gymnocalycium gibbosum
(HBG)
Lower right

Gymnocalycium mazanense

Gymnocalycium megalotheles **(Sencke) Britton & Rose**
Tyramine (Approximately 0.001%.)
Hordenine (Between 0.0001-0.001%.)
N-Methyltyramine (Less than 0.0001%.)
Anhalinine (Less than 0.0001%.)
Anhalonidine (Less than 0.0001%.)
Štarha 1996 (% by fresh weight.)

Gymnocalycium mesopotamicum **Kiessling**
Tyramine (Trace)
N-Methyltyramine (Trace)
Hordenine (Trace)
Mescaline (Trace)
N-Methylmescaline (Trace)
N,N-Dimethylmescaline (0.00279% [± 0.0005])
Anhalamine (0.0019% [± 0.00028])
Anhalonidine (0.00005% [± 0.00003])
Štarha *et al.* 1998 (% by fresh weight.)

Gymnocalycium mesopotamicum
(HBG)

Gymnocalycium mihanovichii **(Fric & Gürke) Britton & Rose**
Hordenine (Less than 0.0001%.)
Tyramine (Between 0.0001-0.001%.)
Štarha 1996 (% by fresh weight.)
Reported to contain Betalains as pigments. Wohlpart & Mabry 1968 cited Dreiding 1961

Gymnocalycium monvillei **(Lemaire) Britton & Rose**
Tyramine (Between 0.0001-0.001%.)
N-Methyltyramine (Between 0.0001-0.001%.)
Hordenine (Approximately 0.001%.)
Mescaline (Less than 0.0001%.)
N-Methylmescaline (Less than 0.0001%.)
N,N-Dimethylmescaline (Less than 0.0001%.)
O-Methylanhalidine (Less than 0.0001%.)
Anhalinine (Less than 0.0001%.)
O-Methylanhalonidine (Less than 0.0001%.)
Anhalidine (Less than 0.0001%.)
Anhalamine (Less than 0.0001%.)
Anhalonidine (Between 0.0001-0.001%.)
Pellotine (Between 0.0001-0.001%.)
Anhalonine (Between 0.0001-0.001%.)
Lophophorine (Less than 0.0001%.)
Štarha *et al.* 1997 (% by fresh weight.)

Dehydrogeosmin - Major volatile in floral scent, minor or absent in some.
Sesquiterpene alcohol 1 - Minor volatile, trace in some.
Sesquiterpene alcohol 2 - Minor volatile.
Dehydrogeosmin present in 85% of their samples, absent in 5%, questionable in 10%.
Schlumberger *et al.* 2004 (In tepals; gc-ms)

Gymnocalycium monvillei

cristate *Gymnocalycium mihanovichii*

Gymnocalycium mihanovichii* var. *friedrichii
AKA *Gymnocalycium friedrichii*
This is a "color form" at HBG

Gymnocalycium monvillei
above & below
(Cactus Country)

Gymnocalycium monvillei

***Gymnocalycium moserianum* Schutz**
Tyramine (0.00077% [± 0.0001])
N-Methyltyramine (0.0001% [± 0.00003])
Hordenine (0.00011% [± 0.00003])
Mescaline (0.00007% [± 0.00001])
N-Methylmescaline (0.00151% [± 0.00015])
N,N-Dimethylmescaline (0.00071% [± 0.00006])
O-Methylanhalidine (0.00007% [± 0.00001])
Anhalinine (0.00007% [± 0.00001])
O-Methylanhalonidine (0.00007% [± 0.00001])
Anhalidine (0.00007% [± 0.00001])
Anhalamine (0.00215% [± 0.00014])
Anhalonidine (0.00014% [± 0.00003])
Pellotine (0.00012% [± 0.00003])
Anhalonine (Trace)
Lophophorine (Trace)
Štarha *et al.* 1998 (% by fresh weight.)

***Gymnocalycium multiflorum* (Hooker) Br. & R.**
Herrero-Ducloux 1932a reported the recovery of small quantities of a '*mescaline-like*' alkaloid but did not identify it. This species is now considered *G. monvillei.*

***Gymnocalycium netrelianum* Britton & Rose**
Tyramine (Less than 0.001%.)
Hordenine (Between 0.0001-0.001%.)
Mescaline (Between 0.0001-0.001%.)
N-Methylmescaline (Less than 0.001%.)
Pellotine (Less than 0.001%.)
Štarha 1995a (% by fresh weight.)

***Gymnocalycium nigriareolatum* Backeberg**
Tyramine (0.00047% [± 0.00005])
N-Methyltyramine (0.00008% [± 0.00002])
Hordenine (0.0014% [± 0.00006])
Mescaline (0.00006% [± 0.00002])
N-Methylmescaline (0.00006% [± 0.00001])
N,N-Dimethylmescaline (0.00009% [± 0.00002])
O-Methylanhalidine (0.00012% [± 0.00006])
Anhalamine (0.00019% [± 0.00004])
Anhalonidine (0.00008% [± 0.00002])
Štarha *et al.* 1998 (% by fresh weight.)

***Gymnocalycium oenanthemum* Backeberg**
Tyramine (Between 0.0001-0.001%.)
N-Methyltyramine (Less than 0.0001%.)
Hordenine (Approximately 0.001%.)
Mescaline (Less than 0.0001%.)
N-Methylmescaline (Less than 0.0001%.)
N,N-Dimethylmescaline (Less than 0.0001%.)
O-Methylanhalidine (Less than 0.0001%.)
O-Methylanhalonidine (Less than 0.0001%.)
Anhalidine (Less than 0.0001%.)
Anhalamine (Less than 0.0001%.)
Anhalonidine (Between 0.0001-0.001%.)
Pellotine (Between 0.0001-0.001%.)
Anhalonine (Less than 0.0001%.)
Lophophorine (Less than 0.0001%.)
Štarha *et al.* 1997 (% by fresh weight.)

***Gymnocalycium oenanthemum* growing outdoors**

***Gymnocalycium paraguayense* Schutz**
Tyramine (0.00047% [± 0.00004])
N-Methyltyramine (0.00104% [± 0.00014])
Hordenine (0.00043% [± 0.00008])
Mescaline (0.00011% [± 0.00006])
N-Methylmescaline (0.00041% [± 0.0001])
N,N-Dimethylmescaline (0.00427% [± 0.00032])
Anhalamine (0.00505% [± 0.0005])
Anhalonidine (0.00017% [± 0.00006])
Štarha *et al.* 1998 (% by fresh weight.)

***Gymnocalycium multiflorum* (Both images above)**
(UC - upper; HBG - lower [ID?])

Gymnocalycium pflanzii* var. *albopulpa

Gymnocalycium platense

Gymnocalycium multiflorum **(UC)**

Gymnocalycium pflanzii **(Vaupel) Werdermann**
Tyramine (Approximately 0.001%.)
Hordenine (Between 0.0001-0.001%.)
N-Methyltyramine (Less than 0.0001%.)
N-Methylmescaline (Less than 0.0001%.)
Anhalinine (Less than 0.0001%.)
Anhalamine (Less than 0.0001%.)
Anhalonidine (Less than 0.0001%.)
Pellotine (Between 0.0001-0.001%.)
Anhalonine (Between 0.0001-0.001%.)
Lophophorine (Between 0.0001-0.001%.)
Štarha 1996 (% by fresh weight.)

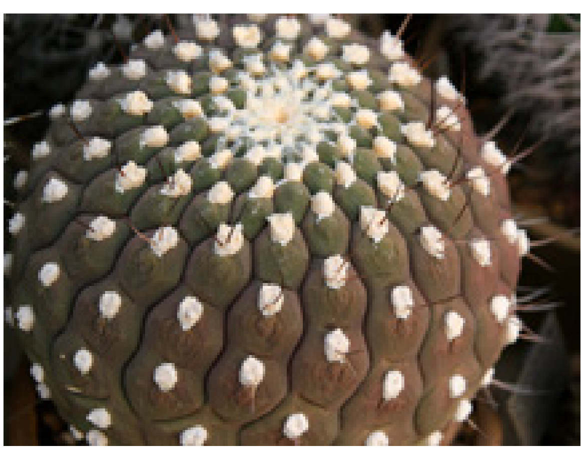
Gymnocalycium platense **(Spegazzini) Britton & Rose**
Weddellite was identified as druses.
Monje & Baran 2002

Gymnocalycium pungens **Fleischer**
Hordenine (Approximately 0.001%.)
Tyramine (Between 0.0001-0.001%.)
Štarha 1996 (% by fresh weight.)

Gymnocalycium quehlianum **(Haage) Berg.**
Tyramine (Between 0.0001-0.001%.)
N-Methyltyramine (Between 0.0001-0.001%.)
Hordenine (Approximately 0.001%.)
Mescaline (Less than 0.0001%.)
N-Methylmescaline (Less than 0.0001%.)
N,N-Dimethylmescaline (Less than 0.0001%.)
Anhalinine (Less than 0.0001%.)
O-Methylanhalonidine (Between 0.0001-0.001%.)
Anhalonidine (Less than 0.0001%.)
Pellotine (Less than 0.0001%.)
Anhalonine (Less than 0.0001%.)
Lophophorine (Less than 0.0001%.)
Štarha *et al.* 1997 (% by fresh weight.)

Gymnocalycium ragonesii **Cast.**
Tyramine (0.00009% [± 0.00002])
N-Methyltyramine (0.00005% [± 0.00001])
Hordenine (0.0035% [± 0.00014])
Mescaline (Trace)
N-Methylmescaline (Trace)
N,N-Dimethylmescaline (Trace)
O-Methylanhalidine (0.00048% [± 0.00003])
Anhalinine (0.00109% [± 0.00018])
O-Methylanhalonidine (0.00007% [± 0.00001])
Anhalidine (0.00006% [± 0.00001])
Anhalonidine (Trace)
Pellotine (Trace)
Štarha *et al.* 1998 (% by fresh weight.)

Gymnocalycium lagunillasense **Card. (Now just a synonym of *Gymnocalycium pflanzi v. pflanzii*)**



Gymnocalycium pflanzii **var. *albopulpa***
(HBG)

H 52932
(HBG)

Gymnocalycium pflanzii
(Field)

Gymnocalycium riojense **Frič ex H.Till & W.Till**

Tyramine
0.001% dry wt.
Štarha 2001c cited Štarha 2001a
Not observed.
Štarha 2002
N-Methyltyramine
0.00001-0.0001% dry wt.
Štarha 2001c cited Štarha 2001a
Less than 0.0001% fresh wt.
Štarha 2002
Hordenine
0.001% dry wt.
Štarha 2001c cited Štarha 2001a
Not observed.
Štarha 2002
Mescaline
0.00001-0.0001% dry wt.
Štarha 2001c cited Štarha 2001a
Less than 0.0001% fresh wt.
Štarha 2002
N-Methylmescaline
0.00001-0.0001% dry wt.
Štarha 2001c cited Štarha 2001a
Less than 0.0001% fresh wt.
Štarha 2002
Anhalinine
0.00001-0.0001% dry wt.
Štarha 2001c cited Štarha 2001a
Less than 0.0001% fresh wt.
Štarha 2002
O-Methylanhalonidine
0.00001-0.0001% dry wt.
Štarha 2001c cited Štarha 2001a
Less than 0.0001% fresh wt.
Štarha 2002
Pellotine
0.00001-0.0001% dry wt.
Štarha 2001c cited Štarha 2001a
Less than 0.0001% fresh wt.
Štarha 2002
Anhalonidine
0.00001-0.0001% dry wt.
Štarha 2001c cited Štarha 2001a
Less than 0.0001% fresh wt.
Štarha 2002

Gymnocalycium riojense **Frič ex H.Till & W.Till ssp. *kozelskyanum* Schütz ex H.Till & W.Till**

Tyramine
0.002% fresh wt.
N-Methyltyramine
Less than 0.0001% fresh wt.
Hordenine
0.004% fresh wt.
Mescaline
Less than 0.0001% fresh wt.
N-Methylmescaline
Less than 0.0001% fresh wt.
Anhalinine
Less than 0.0001% fresh wt.
O-Methylanhalonidine
Less than 0.0001% fresh wt.
Pellotine
Less than 0.0001% fresh wt.
Anhalonidine
Less than 0.0001% fresh wt.
Štarha 2002

Gymnocalycium riojense **Frič ex H.Till & W.Till ssp. *paucispinum* Backeberg ex H.Till & W.Till**

Tyramine
0.002% fresh wt.
N-Methyltyramine
Less than 0.0001% fresh wt.
Hordenine
0.004% fresh wt.
Mescaline
Less than 0.0001% fresh wt.
N-Methylmescaline
Less than 0.0001% fresh wt.
Anhalinine
Less than 0.0001% fresh wt.
O-Methylanhalonidine
Less than 0.0001% fresh wt.
Pellotine
Less than 0.0001% fresh wt.
Anhalonidine
Less than 0.0001% fresh wt.
Štarha 2002

According to Hunt 1999, *Gymnocalycium triacanthum* was lumped into *Gymnocalycium riojense* Frič ex H.Till & W.Till.

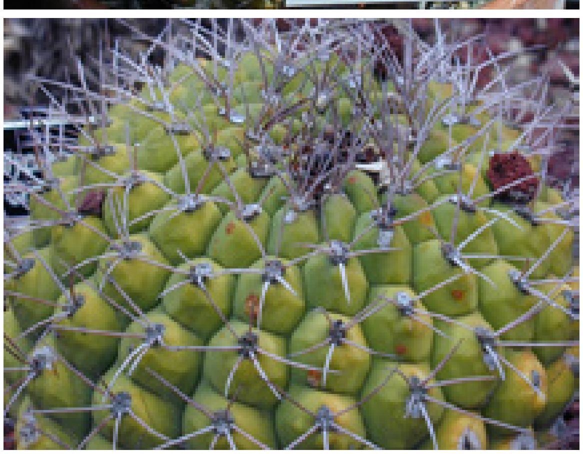
Hunt 2006 mentions that Till & Till recognized four subspecies within *G. riojense* with three varieties within each of three of the four.

Hunt 2006 also notes that *G. riojense* has more recently been absorbed into *Gymnocalycium bodenbenderianum* (Bgr.) Hill.

See also the synonym list of Ulrich Creutzberg 2010 and Creutzberg's informational website.

***Gymnocalycium riograndense* Cardenas**
Tyramine (Between 0.0001-0.001%.)
N-Methyltyramine (Less than 0.001%.)
Hordenine (Less than 0.001%.)
Mescaline (Between 0.0001-0.001%.)
N-Methylmescaline (Less than 0.001%.)
Anhalinine (Less than 0.001%.)
Anhalidine (Less than 0.001%.)
Anhalonidine (Less than 0.001%.)
Pellotine (Less than 0.001%.)
Anhalonine (Less than 0.001%.)
Lophophorine (Less than 0.001%.)
Štarha 1995a (% by fresh weight.)

***Gymnocalycium saglione* (Cels) Britton & Rose**
Tyramine (0.027% dry wt.) Nieto *et al.* 1982.
Also; Less than 0.001% [fresh wt] in Štarha 1995a
Hordenine (0.008% dry wt.) Nieto *et al.* 1982.
Also; Less than 0.001% [fresh wt] in Štarha 1995a
Anhalidine (Less than 0.001%.) Štarha 1995a
Anhalonidine (Between 0.0001-0.001%.) Štarha 1995a
Pellotine (Less than 0.001%.) Štarha 1995a
Anhalonine (Less than 0.001%.) Štarha 1995a
Lophophorine (Less than 0.001%.) Štarha 1995a
Candicine (0.041% dry wt.) Nieto *et al.* 1982.
[3 unidentified bases reported; Nieto *et al.* 1982]



Gymnocalycium riograndense

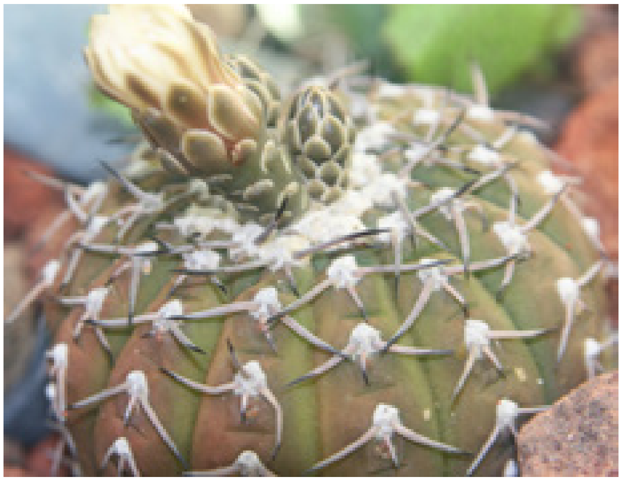
***Gymnocalycium schickendantzii* (Weber) Britton & Rose**
Tyramine (Approximately 0.001%.)
N-Methyltyramine (Between 0.0001-0.001%.)
Hordenine (Approximately 0.001%.) Štarha 1996; Also (%?) Ruiz *et al.* 1973
Anhalinine (Between 0.0001-0.001%.)
Anhalidine (Less than 0.0001%.)
Anhalamine (Less than 0.0001%.)
Pellotine (Less than 0.0001%.)
Anhalonine (Less than 0.0001%.)
Lophophorine (Less than 0.0001%.)
All above by Štarha 1996 (% by fresh weight.)
Candicine (%?) Ruiz *et al.* 1973

***Gymnocalycium stellatum* Spegazzini**
Tyramine (Between 0.0001-0.001%.)
N-Methyltyramine (Less than 0.0001%.)
Hordenine (Approximately 0.001%.)
Mescaline (Less than 0.0001%.)
N-Methylmescaline (Between 0.0001-0.001%.)
N,N-Dimethylmescaline (Less than 0.0001%.)
Anhalinine (Between 0.0001-0.001%.)
O-Methylanhalonidine (Less than 0.0001%.)
Anhalamine (Less than 0.0001%.)
Anhalonidine (Between 0.0001-0.001%.)
Pellotine (Between 0.0001-0.001%.)
Anhalonine (Between 0.0001-0.001%.)
Lophophorine (Less than 0.0001%.)
Štarha *et al.* 1997 (% by fresh weight.)

Gymnocalycium saglione
(Both images on lower left)


Gymnocalycium stellatum


Gymnocalycium tillianum var. turecek

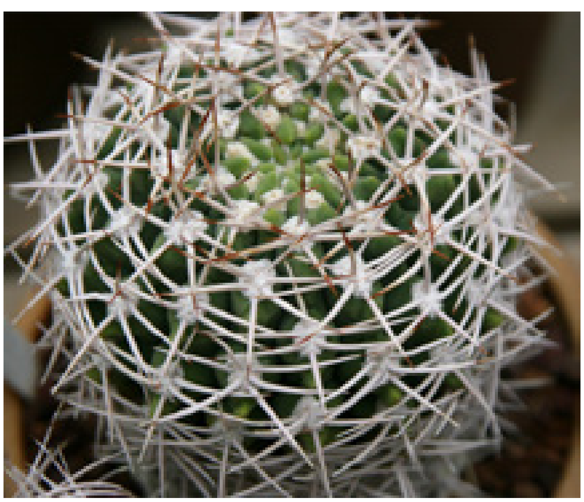



Gymnocalycium triacanthum

Gymnocalycium stellatum

Gymnocalycium striglianum JEGGLE
Tyramine (Less than 0.001%.)
Hordenine (Less than 0.001%.)
Mescaline ("*readily apparent*" at around 0.001%.)
N-Methylmescaline ("*readily apparent*" at around 0.001%.)
Anhalinine (Less than 0.001%.)
Anhalidine (Less than 0.001%.)
Anhalamine ("*readily apparent*" at around 0.001%.)
Anhalonidine (Less than 0.001%.)
Pellotine ("*readily apparent*" at around 0.001%.)
Anhalonine (Less than 0.001%.)
Lophophorine (Less than 0.001%.)
ŠTARHA 1995a (% by fresh weight.)

Gymnocalycium tillianum RAUSCH
Tyramine (Less than 0.001%.)
N-Methyltyramine (Less than 0.001%.)
Hordenine (Between 0.0001-0.001%.)
Anhalinine (Between 0.0001-0.001%.)
Anhalidine (Less than 0.001%.)
Anhalonidine (Less than 0.001%.)
Pellotine (Between 0.0001-0.001%.)
ŠTARHA 1995a (% by fresh weight.)



Gymnocalycium tillianum

Gymnocalycium triacanthum BACKEBERG
Tyramine (Trace)
N-Methyltyramine (0.00005% [± 0.00001])
Hordenine (0.00054% [± 0.00004])
Mescaline (Trace)
N-Methylmescaline (Trace)
N,N-Dimethylmescaline (Trace)
O-Methylanhalidine (0.00015% [± 0.00001])
Anhalinine (0.00014% [± 0.00001])
Anhalidine (Trace)
Anhalonidine (0.0006% [± 0.00001])
ŠTARHA *et al.* 1998 (% by fresh weight.)

Gymnocalycium triacanthum

Gymnocalycium uebelmannianum RAUSCH
Tyramine (Between 0.0001-0.001%.)
N-Methyltyramine (Between 0.0001-0.001%.)
Hordenine (Between 0.0001-0.001%.)
Mescaline (Between 0.0001-0.001%.)
N-Methylmescaline (Less than 0.0001%.)
N,N-Dimethylmescaline (Less than 0.0001%.)
O-Methylanhalidine (Less than 0.0001%.)
Anhalinine (Between 0.0001-0.001%.)
O-Methylanhalonidine (Between 0.0001-0.001%.)
Anhalidine (Less than 0.0001%.)
Anhalamine (Between 0.0001-0.001%.)
Anhalonidine (Between 0.0001-0.001%.)
Pellotine (Between 0.0001-0.001%.)
Anhalonine (Less than 0.0001%.)
Lophophorine (Less than 0.0001%.)
ŠTARHA *et al.* 1997 (% by fresh weight.)

Gymnocalycium valnicekianum JAJÓ
Tyramine (Between 0.0001-0.001%.)
N-Methyltyramine (Less than 0.001%.)
Hordenine ("*readily apparent*" at around 0.001%.)
Mescaline (Less than 0.001%.)
Anhalinine (Less than 0.001%.)
Anhalonidine (Between 0.0001-0.001%.)
Pellotine (Less than 0.001%.)
Anhalonine (Less than 0.001%.)
Lophophorine (Less than 0.001%.)
ŠTARHA 1995a (% by fresh weight.)

Gymnocereus altissima
Looks like it might be interesting to analyze.

Gymnocalycium vatteri **Buining**
Mescaline (Between 0.0001-0.001%.)
Tyramine (Approximately 0.001%.)
N-Methyltyramine (Between 0.0001-0.001%.)
Hordenine (Approximately 0.001%.)
N-Methylmescaline (Between 0.0001-0.001%.)
Anhalinine (Approximately 0.001%.)
Anhalidine (Less than 0.0001%.)
Anhalonidine (Between 0.0001-0.001%.)
Pellotine (Between 0.0001-0.001%.)
Anhalonine (Less than 0.0001%.)
Lophophorine (Less than 0.0001%.)
Štarha 1996 (% by fresh weight.)

Gymnocalycium vatteri

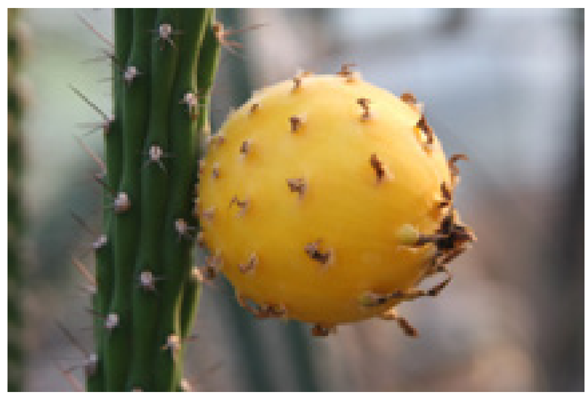
Haageocereus acranthus **(Vpl.) Backeberg**
Flower contains Phyllocactin, Isophyllocactin, Betanin & Isobetanin. Piattelli & Imperato 1969

Claim for the presence of mescaline is made by Caycho 1977 (page 91 as *Cereus acranthus* Vaupel) but no reference was cited and he does not include anything to support his assertion.
See comment in **Activity Notes**.

Hamatocactus hamatocanthus (Mühlenpf.) Borg See as ***Ferocactus hamatocanthus***

Hariota salicornioides **DC**
Citric acid (5.2% in stem juice)
Hegnauer 1964 cited Bergström 1934
Reported to contain Betalains as pigments. Wohlpart & Mabry 1968 cited Dreiding 1961

Harrisia adscendens (Gürke) Br. & R.
"*rabo de raposa* "
Unconfirmed report of caffeine (0.12-0.2%.) in the seeds. Hegnauer 1964 & Mata & McLaughlin 1982 cite Freise 1935.
As was mentioned elsewhere here, Freise's reports of caffeine from cactus seeds have never been confirmed by anyone.



***Harrisia fernowii* lacks reported analysis**

Haseltonia columna-trajani (Karw.) Backeberg
See as ***Cephalocereus hoppenstedtii***

Heliabravoa chende (Gosselin) Backeberg
See as ***Polaskia chende***

Helianthocereus andalgalensis (Weber) Backeberg
See as ***Trichocereus andalgalensis***
Helianthocereus atacamensis (Phil.) Backeberg
See as ***Trichocereus atacamensis***
Helianthocereus huascha (Weber) Backeberg
See as ***Trichocereus huascha***
Helianthocereus pasacana (Weber) Backeberg.
See as ***Trichocereus pasacana***
Helianthocereus poco (Backeberg) Backeberg
See as ***Trichocereus poco***
Helianthocereus speciosus (Cavan.) Br. & R.
See as ***Cereus speciosus***

Hertrichocereus beneckei (Ehrenberg) Backeberg
See as ***Stenocereus beneckei***

Homalocephala texensis Britton & Rose
See as ***Echinocactus texensis***

Haageocereus* (*Weberbauerocereus*) *acranthus **(Field & Cactus Country)**

Hylocereus costaricensis **(Weber) Britton & Rose**
Total betacyanin
Phyllocactin was present at several times the betanin content.
Total 0.39 ± 0.041 mg/g in fruit pulp.
Betanin (17.9 ± 1.4% of total)
Phyllocactin (63.9 ± 4.1% of total)
Hylocerenin (6.4 ± 0.72% of total)
Isobetanin (2.8 ± 0.32% of total)
Isophyllocactin (7.4 ± 0.66% of total)
Isohylocerenin (1.0 ± 0.15% of total)
(% = relative percent of total peak in HPLC)
Wybraniec & Mizrahi 2002

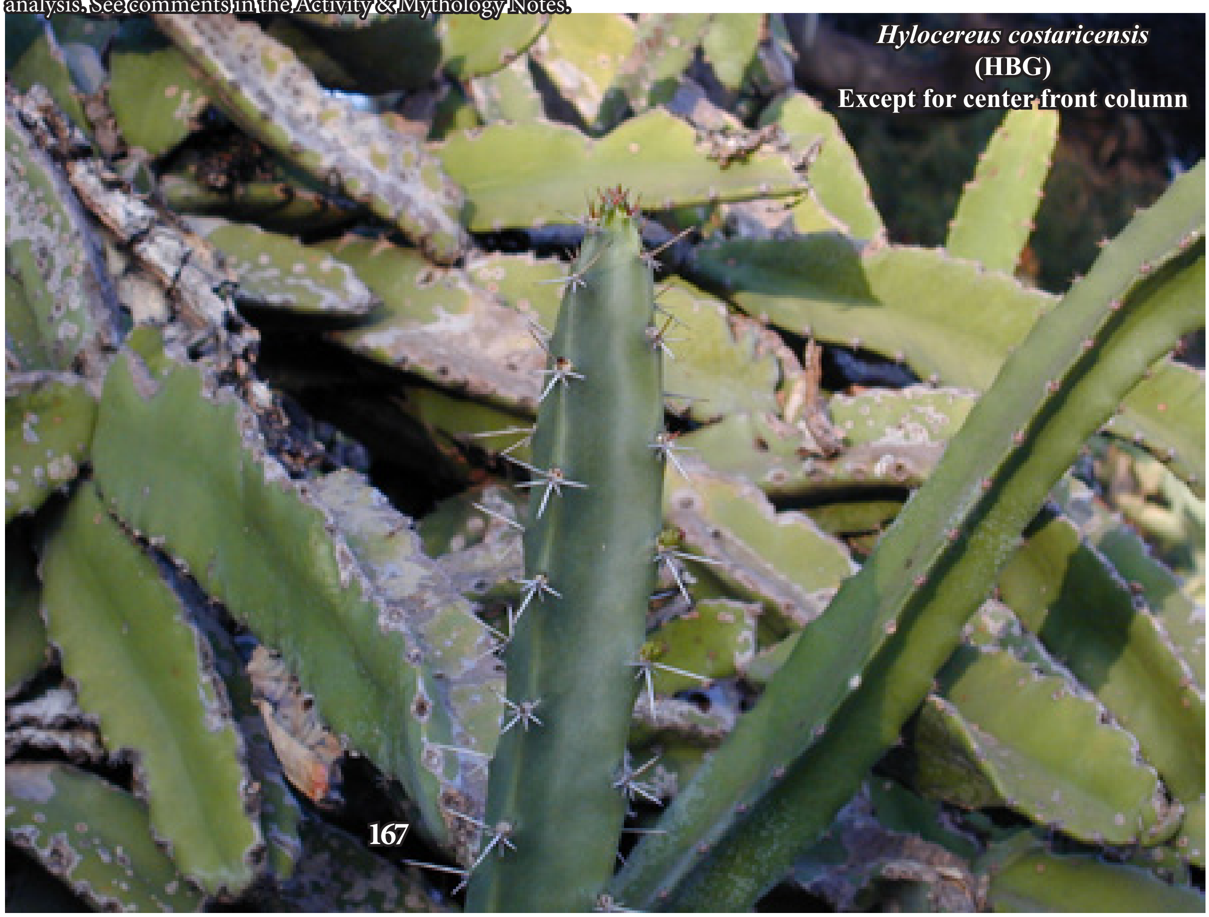
Hylocereus costaricensis **X** ***purpusii***
Fruit contained:
Betanidin 5-O-β-sophoroside
Betanin & Isobetanin
2’-Apiosyl-betanin & 2’-Apiosyl-isobetanin
Phyllocactin & Isophyllocactin
4’-Malonyl-betanin & 4’-Malonyl-isobetanin
Hylocerenin & Isohylocerenin
2’-Apiosyl-phyllocactin & 2’-Apiosyl-isophyllocactin
Peel contained same and additionally
5”-O-E-Feruloyl-2’-apiosylbetanin
5”-O-E-Feruloyl-2’-apiosylisobetanin
5”-O-E-Sinapoyl-2’-apiosylbetanin
5”-O-E-Sinapoyl-2’-apiosylisobetanin
5”-O-E-Feruloyl-2’-apiosylphyllocactin
5”-O-E-Feruloyl-2’-apiosylisophyllocactin
Wybraniec *et al.* 2007 (hplc)

Hylocereus monacanthus (Lemaire) Britton & Rose lacks a analysis. See comments in the Activity & Mythology Notes.

Hylocereus **hybrid 1 (*Hylocereus undatus*** (whiteflesh) **X sp. 487)**
Total 0.28 ± 0.024 mg/g in fruit pulp.
Betanin (76.2 ± 5.7% of total)
Phyllocactin (12.0 ± 1.0% of total)
Hylocerenin (1.3 ± 0.12% of total)
Isobetanin (9.6 ± 0.79% of total)
Isophyllocactin (0.7 ± 0.09% of total)
Isohylocerenin (0.2 ± 0.03% of total)
(% = relative percent of total peak in HPLC)
Wybraniec & Mizrahi 2002

Hylocereus **Hybrid 35 (*Hylocereus* sp. 487 X *polyrhizus*)**
Total 0.33 ± 0.031 mg/g in fruit pulp.
Betanin (60.6 ± 4.2% of total)
Phyllocactin (19.5 ± 1.9% of total)
Hylocerenin (4.1 ± 0.34% of total)
Isobetanin (13.6 ± 1.3% of total)
Isophyllocactin (1.9 ± 0.17% of total)
Isohylocerenin (0.2 ± 0.04% of total)
(% = relative percent of total peak in HPLC)
Wybraniec & Mizrahi 2002

Hylocereus **Hybrid 95 (*Hylocereus polyrhizus* X sp. 487)**
Total 0.30 ± 0.023 mg/g in fruit pulp.
Betanin (57.9 ± 3.8% of total)
Phyllocactin (19.7 ± 1.5% of total)
Hylocerenin (3.6 ± 0.44% of total)
Isobetanin (11.3 ± 1.1% of total)
Isophyllocactin (6.4 ± 0.53% of total)
Isohylocerenin (1.0 ± 0.11% of total)
(% = relative percent of total peak in HPLC)
Wybraniec & Mizrahi 2002


Hylocereus costaricensis
(HBG)
Except for center front column

Hylocereus ocamponis (Salm-Dyck) Britton & Rose
Fruit contained:
Betanidin 5-O-β-sophoroside
γ-Aminobutyric acid
Betaxanthin
Indicaxanthin
Betanin & Isobetanin
2'-Apiosyl-betanin & 2'-Apiosyl-isobetanin
Phyllocactin & Isophyllocactin
4'-Malonyl-betanin & 4'-Malonyl-isobetanin
Hylocerenin & Isohylocerenin
2'-Apiosyl-phyllocactin & 2'-Apiosyl-isophyllocactin
Peel contained the same and additionally
5"-O-E-Feruloyl-2'-apiosylbetanin
5"-O-E-Feruloyl-2'-apiosylisobetanin
5"-O-E-Sinapoyl-2'-apiosylbetanin
5"-O-E-Sinapoyl-2'-apiosylisobetanin
5"-O-E-Feruloyl-2'-apiosylphyllocactin
5"-O-E-Feruloyl-2'-apiosylisophyllocactin
Wybraniec *et al.* 2007 (hplc)

Hylocereus polyrhizus (Weber) Britton & Rose
(now *Hylocereus monacanthus* (Lemaire) Britton & Rose
"pitaya" Commercial fruit in Israel.
Total 0.28 ± 0.019 mg/g in fruit pulp.
Betanin (18.9 ± 1.3% of total)
Phyllocactin (36.1 ± 2.2% of total)
Hylocerenin (11.7 ± 1.1% of total)
Isobetanin (7.2 ± 0.55% of total)
Isophyllocactin (19.2 ± 1.5% of total)
Isohylocerenin (5.8 ± 0.32% of total)
(% = relative percent of total peak in HPLC)
Wybraniec & Mizrahi 2002

Fruit pulp was reported to contain:
Betanin
Phyllocactin (= 6'-O-malonylbetanin)
Betanidin 5-O-[6'-O-(3"-hydroxy-3"-methyl-glutaryl)-β-D-glucopyranoside] (New compound named Hylocerenin.)
Isobetanidin 5-O-[6'-O-(3"-hydroxy-3"-methyl-glutaryl)-β-D-glucopyranoside] (New compound Isohylocerenin)
Isobetanin
Isophyllocactin
(electrospray MS/MS, HPLC, and NMR)
Wybraniec *et al.* 2001

Fruit contained:
Betanidin 5-O-β-sophoroside
Betanin & Isobetanin
2'-Apiosyl-betanin & 2'-Apiosyl-isobetanin
Phyllocactin & Isophyllocactin
4'-Malonyl-betanin & 4'-Malonyl-isobetanin
Hylocerenin & Isohylocerenin
2'-Apiosyl-phyllocactin & 2'-Apiosyl-isophyllocactin
Peel contained the same and additionally
5"-O-E-Feruloyl-2'-apiosylbetanin
5"-O-E-Feruloyl-2'-apiosylisobetanin
5"-O-E-Sinapoyl-2'-apiosylbetanin
5"-O-E-Sinapoyl-2'-apiosylisobetanin
5"-O-E-Feruloyl-2'-apiosylphyllocactin
5"-O-E-Feruloyl-2'-apiosylisophyllocactin
Wybraniec *et al.* 2007 (hplc)

Hylocereus polyrhizus X *undatus*
Fruit contained:
Betanidin 5-O-β-sophoroside
Betanin & Isobetanin
2'-Apiosyl-betanin & 2'-Apiosyl-isobetanin
Phyllocactin & Isophyllocactin
4'-Malonyl-betanin & 4'-Malonyl-isobetanin
Hylocerenin & Isohylocerenin
2'-Apiosyl-phyllocactin & 2'-Apiosyl-isophyllocactin
Peel contained the same and additionally
5"-O-E-Feruloyl-2'-apiosylbetanin
5"-O-E-Feruloyl-2'-apiosylisobetanin
5"-O-E-Sinapoyl-2'-apiosylbetanin
5"-O-E-Sinapoyl-2'-apiosylisobetanin
5"-O-E-Feruloyl-2'-apiosylphyllocactin
5"-O-E-Feruloyl-2'-apiosylisophyllocactin
Wybraniec *et al.* 2007 (hplc)

Hylocereus purpusii (Weingart) Britton & Rose
Lupeone & Lupeol (In a 4:1 ratio in the surface wax)
[Grown in Germany]
Wollenweber & Dörr 1995

Total 0.23 ± 0.018 mg/g in fruit pulp.
Betanin (66.9 ± 4.1% of total)
Phyllocactin (21.3 ± 1.4% of total)
Hylocerenin (2.0 ± 0.18% of total)
Isobetanin (7.2 ± 0.73% of total)
Isophyllocactin (2.4 ± 0.17% of total)
Isohylocerenin (0.1 ± 0.03% of total)
(% = relative percent of total peak in HPLC)
Wybraniec & Mizrahi 2002

Fruit contained:
Betanidin 5-O-β-sophoroside
Betanin & Isobetanin
2'-Apiosyl-betanin & 2'-Apiosyl-isobetanin
Phyllocactin & Isophyllocactin
4'-Malonyl-betanin & 4'-Malonyl-isobetanin
Hylocerenin & Isohylocerenin
2'-Apiosyl-phyllocactin & 2'-Apiosyl-isophyllocactinl contained the same and additionally
5"-O-E-Feruloyl-2'-apiosylbetanin
5"-O-E-Feruloyl-2'-apiosylisobetanin
5"-O-E-Sinapoyl-2'-apiosylbetanin
5"-O-E-Sinapoyl-2'-apiosylisobetanin
5"-O-E-Feruloyl-2'-apiosylphyllocactin
5"-O-E-Feruloyl-2'-apiosylisophyllocactin
Wybraniec *et al.* 2007 (hplc)

Hylocereus sp. 487
Total 0.30 ± 0.023 mg/g in fruit pulp.
Betanin (57.2 ± 4.2% of total)
Phyllocactin (34.2 ± 2.1% of total)
Hylocerenin (1.5 ± 0.11% of total)
Isobetanin (3.4 ± 0.41% of total)
Isophyllocactin (2.0 ± 0.18% of total)
Isohylocerenin (0.2 ± 0.04% of total)
(% = relative percent of total peak in HPLC)
Wybraniec & Mizrahi 2002

Hylocereus undatus (Haworth) Britton & Rose

"*pitahaya*" (Jalisco, Yucatan, Costa Rica, El Salvador, Puerto Rico), "*pitahaya orejona*" (Oaxaca), "*tasajo*" (Durango) "*junco*", "*juco tapatío*", "*chacoub*", "*zacoub*" (Yucatan) "*caliz*" (Phillippines) Standley 1924: 913

From leaves:
Cholesterol (traces)
24ç-Methylcholesterol (18.5% of total)
Stigmasterol (8.3% of total)
Sitosterol (73.2% of total)
Salt *et al*. 1987

Total 0.29 ± 0.027 mg/g in redfleshed fruit pulp.
Betanin (61.2 ± 4.3% of total)
Phyllocactin (28.0 ± 2.1% of total)
Hylocerenin (2.2 ± 0.17% of total)
Isobetanin (6.0 ± 0.51% of total)
Isophyllocactin (1.9 ± 0.17% of total)
Isohylocerenin (0.6 ± 0.07% of total)
(% = relative percent of total peak in HPLC)
Wybraniec & Mizrahi 2002

Fruit contained:
Betanidin 5-O-β-sophoroside
Betanin & Isobetanin
2'-Apiosyl-betanin & 2'-Apiosyl-isobetanin
Phyllocactin & Isophyllocactin
4'-Malonyl-betanin & 4'-Malonyl-isobetanin
Hylocerenin & Isohylocerenin
2'-Apiosyl-phyllocactin & 2'-Apiosyl-isophyllocactin
Peel contained the same and additionally
5"-O-E-Feruloyl-2'-apiosylbetanin
5"-O-E-Feruloyl-2'-apiosylisobetanin
5"-O-E-Sinapoyl-2'-apiosylbetanin
5"-O-E-Sinapoyl-2'-apiosylisobetanin
5"-O-E-Feruloyl-2'-apiosylphyllocactin
5"-O-E-Feruloyl-2'-apiosylisophyllocactin
Wybraniec *et al.* 2007 (hplc)

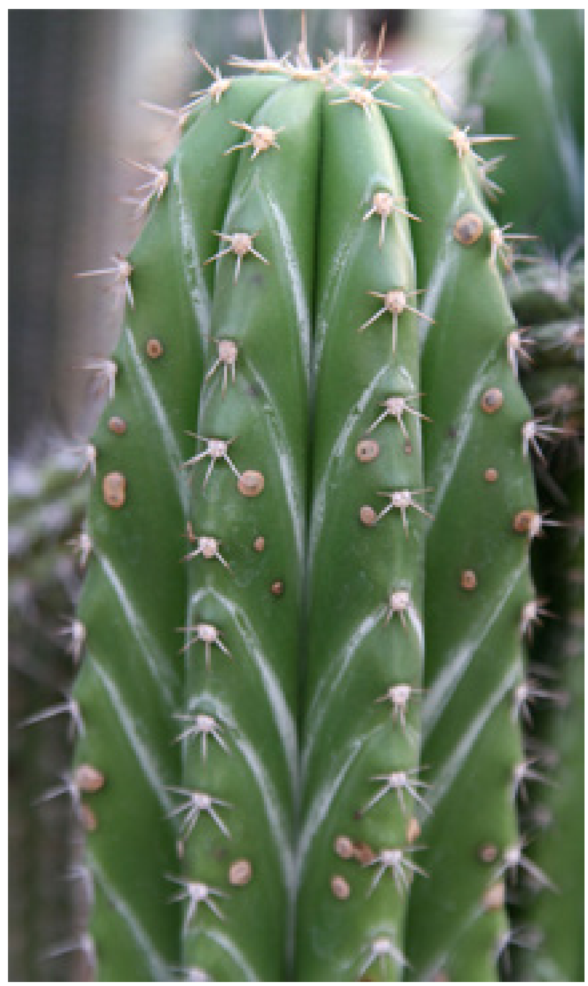
Flowers reported to contain:
isorhamnetin,
isorhamnetin 3-O-β-*D*-glucopyranoside
isorhamnetin 3-O-α-*L*-rhamnopyranosyl-(1→6)-β-*D*-galactopyranoside.
isorhamnetin 3-O-β-*D*-rutinoside
kaempferol
kaempferol 3-O-α-*L*-arabinfuranoside
kaempferol 3-O-β-*D*-galactopyranoside
...kaempferol 3-O-β-*D*-glucopyranoside
kaempferol 3-O-α-*L*-rhamnopyranosyl-(1→6)-β-*D*-galactopyranoside
kaempferol 3-O-β-*D*-rutinoside
quercetin
quercetin 3-O-β-*D*-galactopyranoside
quercetin 3-O-β-*D*-glucopyranoside
Yi *et al*. 2011
Wu *et al*. 2011 added three glycosides they named - Undatusides A-C.

See comments in **Activity Notes**.

Islaya minor Backeberg (T.)
Phenethylamine (no quantification)
Tyramine (no quantification)
N-Methyltyramine (no quantification)
Hordenine (no quantification)
3-Methoxytyramine (no quantification)
3,4-Dimethoxyphenethylamine (0.0038% dry wt.)
Mescaline (0.0017% dry wt.)
Corypalline (7-Hydroxy-6-methoxy-2-methyl-tetrahydroisoquinoline)
Pellotine (no quantification)
Doetsch *et al.* 1980

Isolatocereus dumortieri (Scheidw.) Backeberg
See as ***Lemaireocereus dumortieri***

Lemaireocereus aragonii (Weber) Britton & Rose
This is now *Stenocereus aragonii*
91.3% water by weight
Thought to contain an Amyrin mixture but never fully investigated due to insufficient material.
No ether soluble alkaloids.
Djerassi *et al.* 1955b [Wild collected; Costa Rica]



***Lemaireocereus aragonii* MK2423 (HBG) H 59651**

Lemaireocereus aragonii **MK2423 (UC) H 59651**

Lemaireocereus beneckei (Ehrenberg) Berger See as ***Stenocereus beneckei***

Lemaireocereus chende (Gosselin) Britton & Rose
See as ***Polaskia chende***

Lemaireocereus chichipe (Gosselin) Britton & Rose
See as ***Polaskia chichipe***

Lemaireocereus deficiens (O. & Dietr.) Br. & R.

No saponins or terpenes. Hegnauer 1964

Traces of unidentified terpene(s). Djerassi 1957 cited unpublished observations by Djerassi & Mitscher.

Lemaireocereus deficiens **H 811**
Lower photo is new growth

Lemaireocereus deficiens
(HBG) H 811
entire page

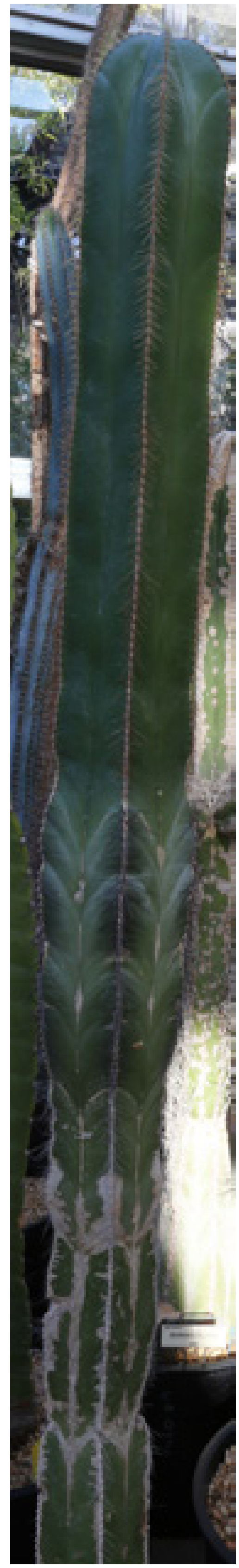
Lemaireocereus dumortieri **Britton & Rose**

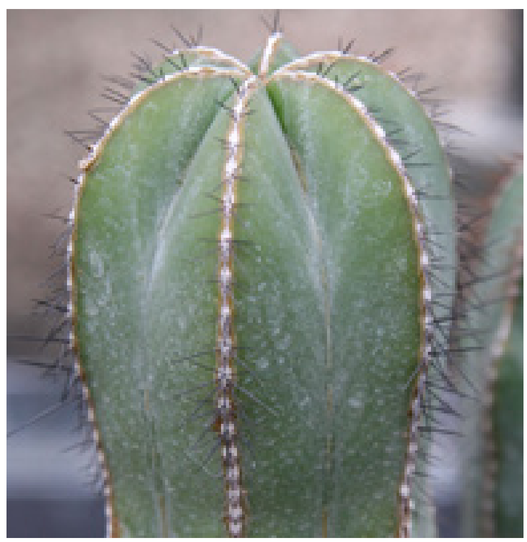
This is now *Stenocereus dumortieri.*
Dumortierigenin (A triterpene lactone)
0.21% by dry wt.
No detectable alkaloid.
Djerassi *et al.* 1954b
[Wild collected; Hildago, Mexico]

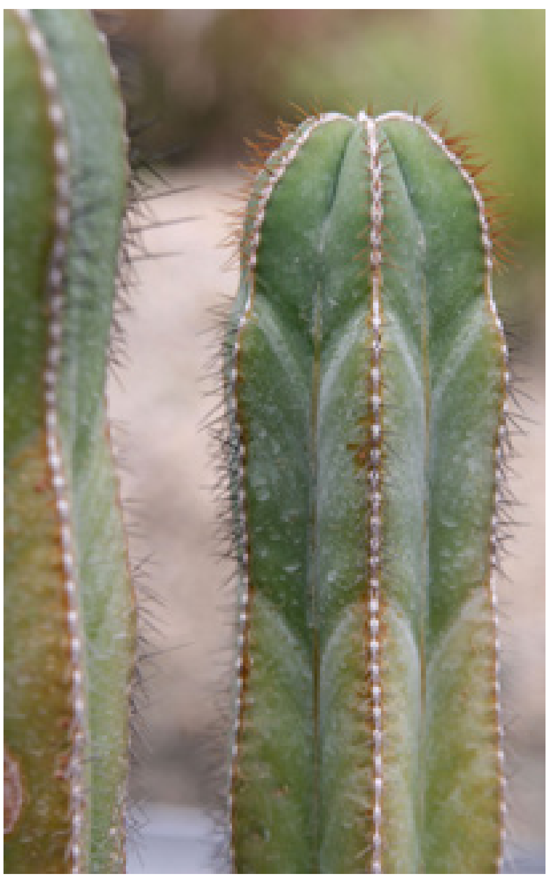
Two triterpene sapogenins,
Dumortierigenin
Pachanol D (New triterpene sapogenin with a new skeletal type. They named it pachanane.)
Kinoshita *et al.* 1998

Dumortierinoside A (A new triterpenoid saponin) i.e. Dumortierigenin 3-O-α-L-rhamno-pyranosyl(1→2)-β-D-gluco-pyranosyl-(1→2)-β-D-glucuronopyranoside
Kinoshita *et al.* 2000

Three new triterpenoid saponins
(As *Isolatocereus dumortieri* Backeberg)
Dumortierinoside A methyl ester
Pachanoside I1 (Aglycon was pachanol I: new pachanane-type triterpene skeleton.)
Pachanoside D1 (Aglycon was pachanol D)
Kakuta *et al.* 2012







Lemaireocereus dumortieri
(UC) notice the variations

53.1153
Jalisco State, México

Lemaireocereus dumortieri
(UC)
53.1153 Jalisco State, México

Lemaireocereus dumortieri
(UC)
53.1153 Jalisco State, México

Lemaireocereus griseus
65.0387 Colombia

Lemaireocereus griseus
65.0387 Colombia

Lemaireocereus eruca Britton & Rose
See as ***Stenocereus eruca***
Lemaireocereus euphorbioides (Haw.) Werd.
See as ***Neobuxbaumia euphorbioides***

Lemaireocereus griseus **(Haworth) Britton & Rose**

"*Cardon dato*", "*Mexican organ pipe*", "*dagger cactus*", "*pitaya*", "*pitayo de mayo*", "*yato*" (Netherland Antilles)
"*No alkaloids*"
Erythrodiol (0.58% dry wt.)
Longispinogenin (0.82% dry wt.)
Oleanolic acid (Isolated via acetate methyl ester as 2% dry wt.)
Betulin (Isolated via the acetate methyl ester as 4% dry wt.)
Unidentified lactone 0.12% [Thought identical with material from *L. hystrix*; i.e "*hystrix lactone*")
Djerassi *et al.* 1956a [Venezuela]

Lemaireocereus griseus
(UC)
65.0387 Colombia

Lemaireocereus gummosus Britton & Rose
See as ***Machaerocereus gummosus***

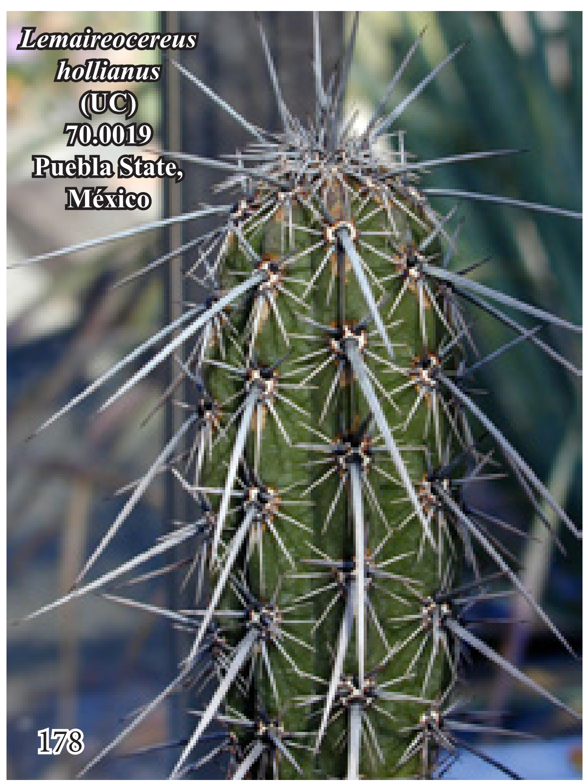
Lemaireocereus hollianus **(WEB.) BRITTON & ROSE**

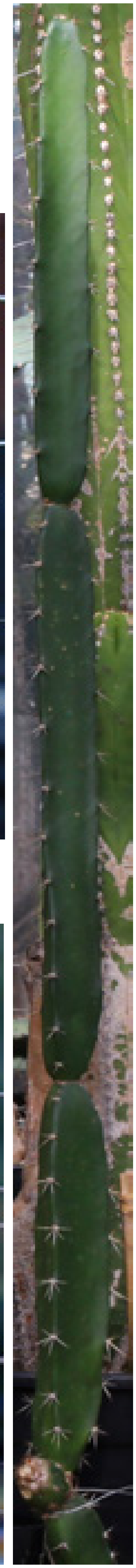
This is now *Pachycereus hollianus.*
"*baboso*"
86.5% water by weight. DJERASSI *et al.* 1956a
No alkaloids present. UNGER *et al.* 1980
Yielded only small amounts of a nonpolar substance that they believed was "*probably similar*" to the "*aromatic*" [?] alcohol they encountered with *T. chiloensis* and *T. cuzcoensis*. No triterpenes detected.
DJERASSI *et al.* 1956a [Collected on Tehuacán-Puebla road 7 km from Zapotitlán, Mexico.]

Lemaireocereus humilis **BRITTON & ROSE**

This is now *Stenocereus humilis.*
No saponins or terpenes. HEGNAUER 1964
Traces of unidentified terpene(s).
DJERASSI 1957 cited unpublished observations by DJERASSI & MITSCHER.

Lemaireocereus humilis
(UC) above & right



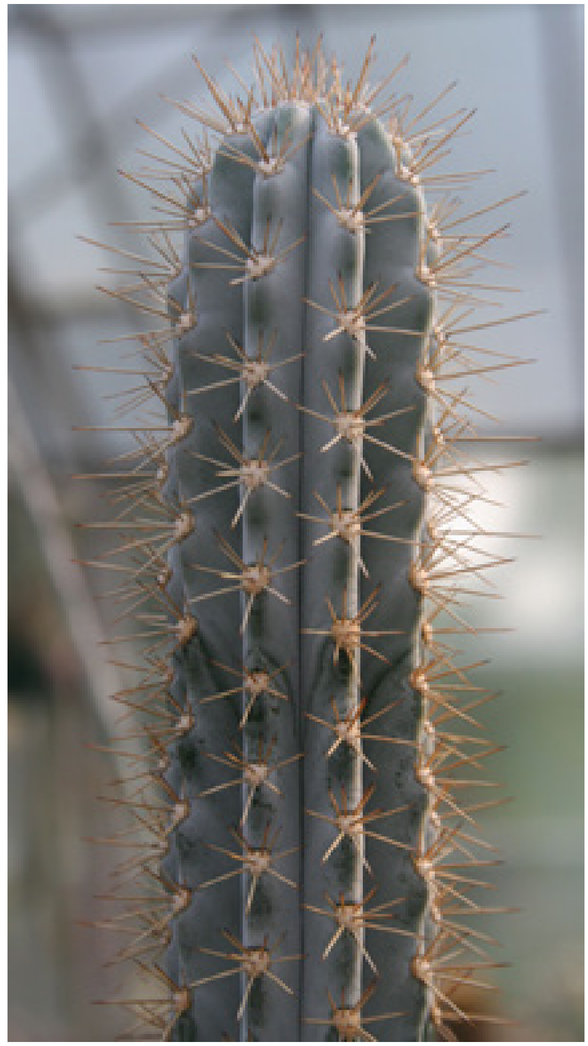



Lemaireocereus hollianus
(HBG)
H 10526 México

Lemaireocereus hystrix **(Haw.) Britton & Rose**
79.7% water by weight
Unidentified neutral triterpene lactone ("***hystrix lactone***"; possibly isomeric with thurberogenin) [0.025% by dry wt]
Erythrodiol [0.067% by dry wt]
Oleanolic acid [(crude) 0.95% by dry wt]
Longispinogenin [0.17% by dry wt]
Betulinic acid (0.025% by dry wt) [isolated via its methyl ester])
No detectable alkaloid.
Djerassi & Lippman 1954 [Collected in Mona district, Jamaica]
Noted an almost identical qualitative composition as *L. longispinus*
See **Activity Endnote** for a more recent curiosity.

Lemaireocereus laetus
(UC)

Lemaireocereus laetus **Britton & Rose**
This is now *Armatocereus laetus*
82.3% water by weight
[Concluded it was almost devoid of alkaloids or triterpenes. (Unable to resolve and separate. No ether soluble alkaloids. Much unidentified oily material (All neutral).]
Djerassi *et al.* 1955b [Wild collected; Peru].
This species needs an analysis. E. Wade Davis purportedly encountered it being used on a local basis as a *T. pachanoi* substitute.
See **Activity Notes** for more comments.

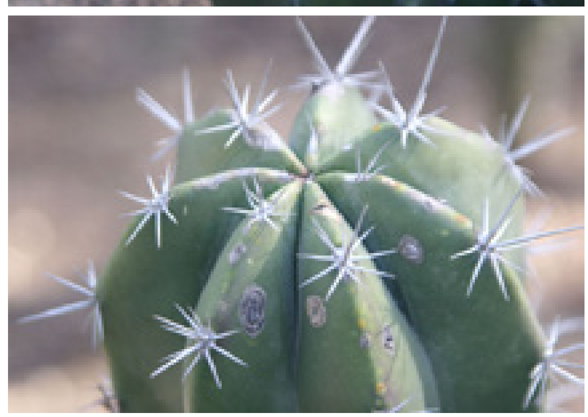


Lemaireocereus hystrix **H 49153**
(Puerto Rico) Collected by C. Fleming
(HBG)

This is now *Stenocereus fimbriatus*

Spine on an adult *Lemaireocereus matucanense*.
Hunt 2006: **"***doubtfully distinct from Armatocereus laetus***"**
See additional comments in the **Activity Notes**.

Lemaireocereus longispinus **Britton & Rose**
This is now *Stenocereus eichlamii.*
81.5% water by weight
Alkaloid devoid.
"*Rich source*" of triterpenoid glycosides.
Erythrodiol [0.33% by dry wt]
Oleanolic acid [(crude) 2.76% by dry wt]
Longispinogenin [0.4% by dry wt]
Djerassi *et al.* 1953c [Guatemala; cultivated: Guatemala City]



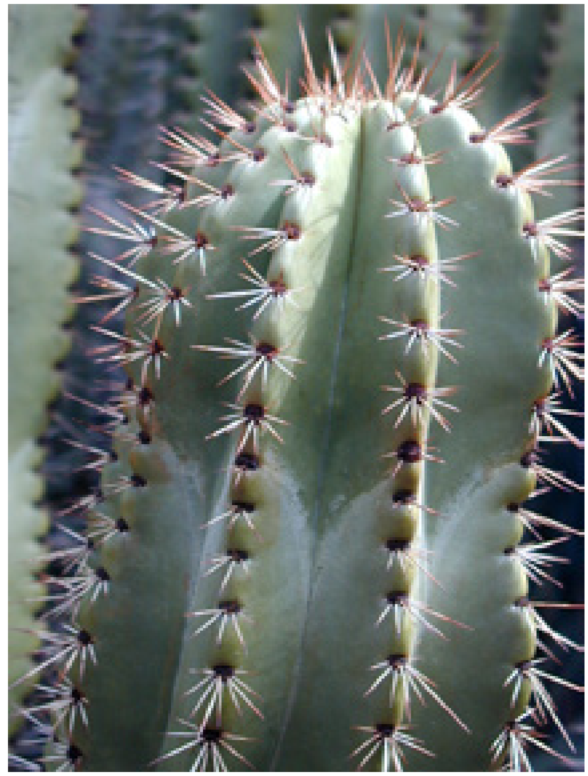
Lemaireocereus longispinus
(HBG) H 49920
Lower left & right hand column

Lemaireocereus marginatus (DC) Berg. See as ***Pachycereus marginatus***
Lemaireocereus mixtecensis (Purpus) Britton & Rose See as ***Polaskia chichipe***

Lemaireocereus montanus
(HBG)
H 49921 México

Lemaireocereus montanus **Britton & Rose**
"*pithaya*" [sp?]
Oleanolic acid
Queretaroic acid
β-Sitosterol
Djerassi 1957 cited unpublished observations by Djerassi & Kan.

This is now *Stenocereus montanus*.



Lemaireocereus montanus
(HBG)
H 49921 México (K.Sabo *s.n.*)
Entire page

Lemaireocereus pruinosus **(Otto) Britton & Rose**

AKA "*Pitayo*"

89% water by weight. Djerassi *et al.* 1955b

Reported to show no detectable alkaloids in the screenings of Fong *et al.* 1972.

Unidentified alkaloids detected by Brown *et al.* 1968

Oleanolic acid (An acidic triterpene; single component: 0.2% fresh wt/ 1.8% dry.)

Djerassi *et al.* 1955b [Cultivated: California]

First analyzed by L.H. Liu (unpublished observation from Djerassi's lab) according to Djerassi & Lippman 1954.

This is now *Stenocereus pruinosus.*

Lemaireocereus pruinosus **seedling**

Lemaireocereus pruinosus **(HBG) H 72996 México**


Lemaireocereus pruinosus
(HBG)
H 72996 México

***Lemaireocereus queretaroensis* (Weber) Safford**

"*pitahaya*" Standley 1924: 900

Queretaroic acid (A dihydroxy triterpene acid) No isolation details included.

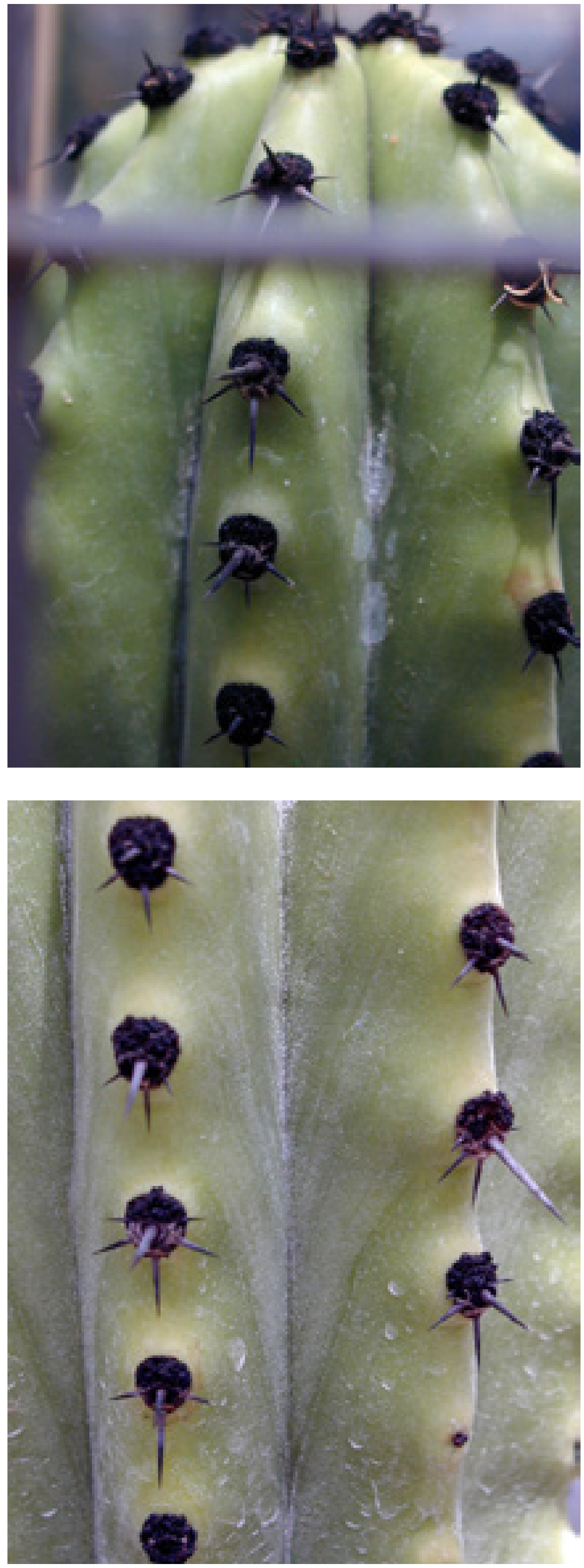
Djerassi *et al.* 1955a. Also in Djerassi *et al.* 1956b.

Oleanolic acid Djerassi *et al.* 1956b

See comments in **Activity Notes**.

Lemaireocereus quevedonis **G.Ortega**
This is now *Stenocereus quevadonis.*
87.2% water by weight
"*hystrix lactone*" (~0.4% yield dry wt)
Longispinogenin (1.42% yield dry wt.)
Oleanolic acid
Betulinic acid
Djerassi *et al.* 1956a [Collected near Aculpulco, Mexico]

Sinaloa State, México
68.0138 on left; 59.1463 on right



Lemaireocereus quevedonis
(UC)

Lemaireocereus stellatus (Pfeiffer) Br. & R. See as ***Stenocereus stellatus***

Lemaireocereus thurberi **(Engelmann) Britton & Rose**

This is now *Stenocereus thurberi.*

"*Pitahaya dulce*" or "*Organ pipe*" or "*Pitahaya*" Standley 1924

84.9% water by weight Djerassi *et al.* 1953a [Kirscher 1972 reported 85%; Kirscher 1982 reported 77-80%]

No alkaloids- Based on negative Mayer test Djerassi *et al.* 1953a [Collected: Sonora, Mexico]

tlc examination showed the absence of alkaloids and the strong presence of triterpene glycosides: Kircher 1982.

Oleanolic acid (An acidic sapogenin) 1.8% dry wt. Djerassi *et al.* 1953a (Also reported in Kirscher 1977.)

Thurberogenin (A neutral triterpenoid lactone: first reported occurrence) 0.46% dry wt. Djerassi *et al.* 1953a. (This paper was the first report of triterpenes in cacti.) (It was also reported in Kirscher 1977 & in Jolad & Steelink 1969.)

Queretaroic acid (No details) Gibson & Horak 1978 cited H.W. Kircher (unpublished data); (also reported in Kirscher 1972).

Thurberin (A pentacyclic triterpene; a lupenediol) Jolad & Steelink 1969 See comment under **Calenduladiol** below

Betulin Jolad & Steelink 1969

Calenduladiol (A triterpene diol; Δ-20,30-lupen-3β,12β -diol) Shown to be identical with Thurberin. Kasprzyk *et al.* 1970 [Previously isolated from the Composite *Calendula officinales* (Marigold) by Kasprzyk & Pyrek 1968]

Kircher 1980 isolated the following (See also in Kircher 1982):

Lupeol
Betulin
Betulinic aldehyde
Methyl betulinate
Calenduladiol
Longispinogenin
Lupenetriol (Lup-20(29)-en-3β,16β,28-triol)
Oleanolic aldehyde
Methyl oleanolate

(3β,6αSterol diols were isolated as 2.6% of dry wt. Kircher 1980)

The following 5 sterol diols were isolated and identified in Kircher & Bird 1982. (No concentrations included.)

Cyclostenol (14α-Methyl-9,19-cyclo-5α-cholestan-3β,6α-diol)
Stenocereol (14α-Methyl-5α-cholesta-8,24-dien-3β,6α-diol)
Macdougallin (14α-Methyl-5α-cholest-8-en-3β,6α-diol)
Thurberol (5α-Cholesta-8,14-dien-3β,6α-diol)
Peniocerol (5α-Cholest-8(9)-en-3β,6α-diol)

Lipids determined to compose 10-17% of the dry weight (comprised of neutral Oleanene and Lupene mono-, di- and triols, 0.07% Phytosterols [Cholesterol, Campesterol & Sitosterol] and a large proportion of Dihydroxysterols.) Kircher & Bird 1982 cited Bird 1974.

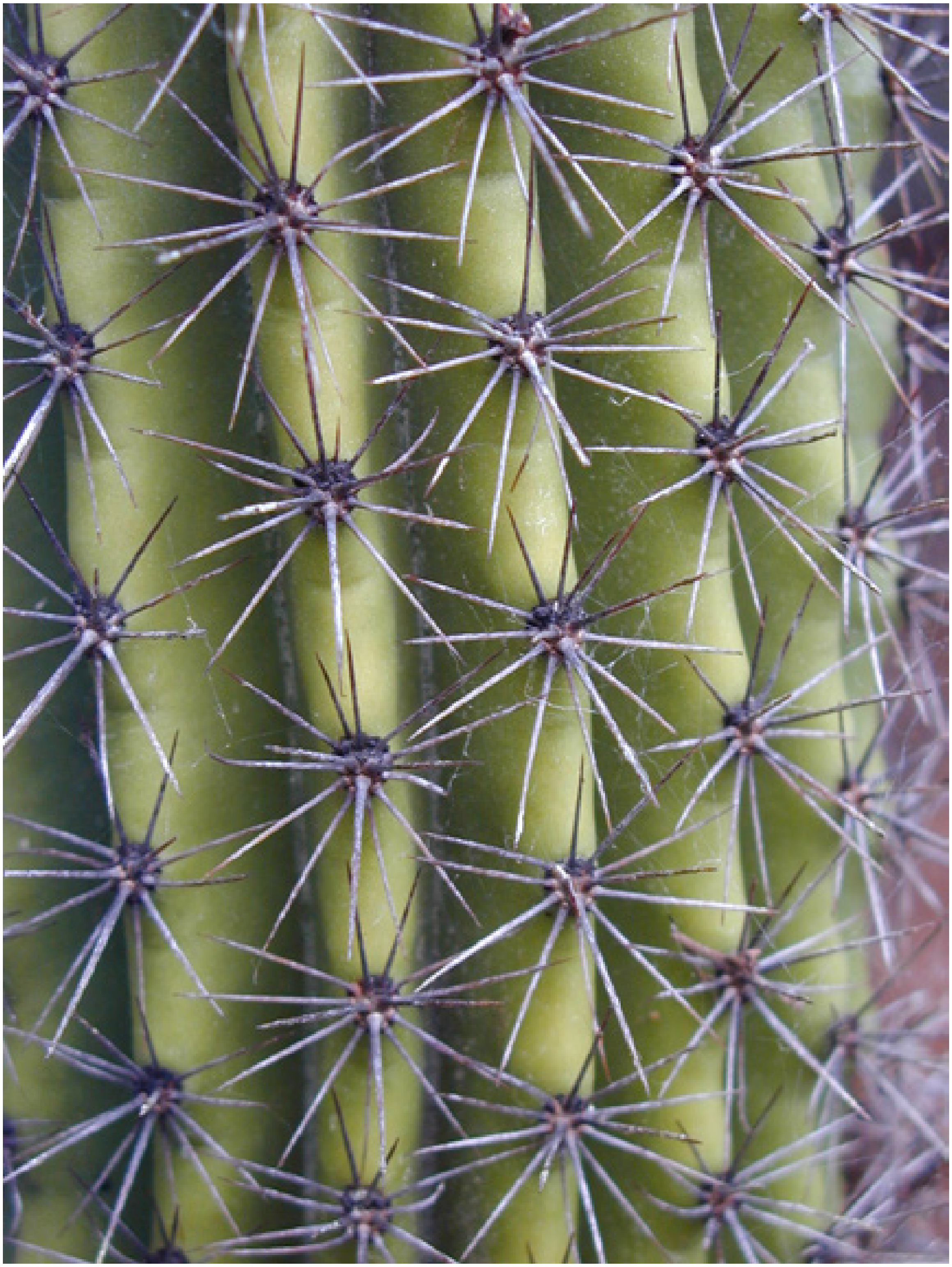
Lipid content determined to be 11% by dry weight: Kircher 1982.

See comments in **Activity Notes**.

Lemaireocereus treleasei Br. & R.
See as ***Stenocereus treleasei***

Lemaireocereus weberi (Coulter) Br. & R.
See as ***Pachycereus weberi***

Lemaireocereus thurberi
(HBG)
BDV 1008 top; H 20446 bottom



Lemaireocereus thurberi
(SRSU)

Lemaireocereus thurberi
(BTA)

Lemaireocereus thurberi
(HBG) H 20446

Lemaireocereus thurberi* f. *monstrosus
(UC)
Sonora State, México 65.0848

Leocereus bahiensis Br. & R.
Unconfirmed report of caffeine (0.10-0.35%.) in seeds. Hegnauer 1964 & Mata & McLaughlin 1982 cited Freise 1935.

Leocereus bahiensis
(UC)
67.0175 Brazil

Lepidocoryphantha macromeris (Engelmann) Backeberg See as ***Coryphantha macromeris***
Lepidocoryphantha runyonii (Britton & Rose) Backeberg See as ***Coryphantha macromeris*** var. ***runyonii***

Leuchtenbergia principis Hooker
Reported to contain unidentified alkaloid(s). Chalet 1980a cited Dominguez *et al*. 1969.
See comments in **Activity Notes**.

Leuchtenbergia principis

Lobivia allegriana **Backeberg**
Hordenine (trace) Follas *et al.* 1977
N-Methyltyramine (trace) Follas *et al.* 1977
Tyramine (trace) Follas *et al.* 1977

Lobivia andalgalensis (Weber) Br. & R. **IS NOT *Trichocereus andalgalensis*** Probably is synonymous with *Trichocereus huascha* See Ritter 1980.

Lobivia aurea **(Britton & Rose) Backeberg**
Hordenine (trace) Follas *et al.* 1977
N-Methyltyramine (trace) Follas *et al.* 1977
Tyramine (trace) Follas *et al.* 1977

Lobivia backebergii **(Werdermann) Backeberg**
Hordenine (0.011% dry wt.) Follas *et al.* 1977.
N-Methyltyramine (0.0008% dry wt.) Follas *et al.* 1977.
Tyramine (trace) Follas *et al.* 1977

Lobivia binghamiana **Backeberg**
Hordenine (0.004% dry wt.) Follas *et al.* 1977
N-Methyltyramine (0.0003% dry wt.) Follas *et al.* 1977
Tyramine (trace) Follas *et al.* 1977

Lobivia chlorogona **Wessn.**
Reported to contain Betalains as pigments.
Wohlpart & Mabry 1968 cited Dreiding 1961

Lobivia famatimensis **(Speg.) Br. & R.**
Reported to contain Betalains as pigments.
Wohlpart & Mabry 1968 cited Dreiding 1961

Lobivia formosa **(Pfeiffer) Dodds**
Candicine (0.268% [column chromatography] & 0.242% [via precipitation of picrate] All dry wt.)
Nieto *et al.* 1982

Lobivia huashua (Weber) W.T.Marshall = *Lobivia huascha*
Lobivia huascha (Weber) W.T.Marshall See as ***Helianthocereus huascha***

Lobivia pentlandii **(Hooker) Britton & Rose**
Hordenine (0.012% dry wt.) Follas *et al.* 1977.
N-Methyltyramine (trace) Follas *et al.* 1977.
Tyramine (trace) Follas *et al.* 1977

Lophocereus australis **(K.Brandegee) Borg**
[Considered a local variant of *L. schottii* by some; *Lophocereus schottii* var. *Australis*]
92% water (Inaccurate due to prior removal of core)
Pilocereine [(crude) 0.5% by dry wt; 0.27% yield after purification)
Djerassi *et al.* 1954c
Lophenol (A sterol) present both free and esterified. Djerassi 1957 cited unpublished analysis by Djerassi, Marfey & Liu

Lophocereus gatesii **M.E.Jones**
91% water by weight
Pilocereine (0.5% by dry wt.)
[Unidentified alkaloids present]
Djerassi *et al.* 1954c
[Agurell 1969b also appears listed as a reference but only mentions pilocereine. Did not analyze this species.]
Lophenol (A sterol) present both free and esterified. Djerassi 1957 cited unpublished analysis by Djerassi, Marfey & Liu

Lophocereus mieckleyanus (Wgt.) Backeberg
See as ***Lophocereus schottii*** *forma* ***mieckleyanus***
Lophocereus sargentianus (Orcutt.) Britton & Rose
See as ***Lophocereus schottii***

Lophocereus gatesii
(HBG)
H 43974 Baja California


Lophocereus
gatesii
(HBG)
H 43974
Baja California

***Lophocereus schottii* (Engelmann) Britton & Rose**

"*sinita*", "*senita*", "*cina*", "*zina*" (Sonora) "*garambullo*", "*hombre viejo*", "*cabeza de viejo*", "*pitahaya barbona*" (Baja) Standley 1924

91.29% & 92.25% water by weight reported by Heyl 1901. (Kircher 1969 found it to range from 80-90%; Kircher 1982 listed it with 81% water by weight.)

3.7% total alkaloid isolated according to Hegnauer 1964 **[See Note A]**

Pilocereine (novel cactus alkaloid) Djerassi *et al.* 1958c); (0.5% yield by dry wt: Djerassi *et al.* 1953b) (Observed in tlc West *et al.* 1975); (Noted as present: O'Donovan & Horan 1968 & 1969 & O'Donovan *et al.* 1971); (Not extracted but pharmacologically evaluated by Powell & Chen 1956) Wani *et al*. 1980 recovered 0.016% [Heyl 190 isolated 5.8% (Amorphous) & named Pilocereine.]

Lophocerine 0.19% by dry wt. Djerassi *et al.* 1958c; (Observed in tlc: West *et al.* 1975); (Noted as present: O'Donovan & Barry 1974, O'Donovan & Horan 1968 & 1969 & O'Donovan *et al.* 1971)

Piloceredine 1.456% by dry wt. Djerassi *et al.* 1958c.

Unidentified alkaloids ((Observed in tlc West *et al.* 1975)

[Lophocine was reported by Wani *et al*. 1980 at 0.004% dry weight but it is believed to be an artifact]

[Agurell 1969b is cited as a reference but only mentions a previous report of pilocereine and lophocereine and did not analyze this species. Lundstrom 1971 is also cited; he mentions lophocereine but did not analyze this species. Dingerdissen & McLaughlin 1973b also appears listed as a reference but does not mention this species.]

[Unger *et al.* 1980 reported the presence of two alkaloids using MIKES. Both were presented as dimethoxylated THIQs. They suggested the identities as N-Methylheliamine and another THIQ that was either isomeric or identical with Heliamine, Lemaireocereine or Uberine. This report needs confirmation. Unless MIKES fails entirely for the 1-*Iso*butyl-substituted THIQs, their results stand in direct and complete conflict with the rest of the work published for this species.]

Reported to be devoid of glycosides in Djerassi *et al.* 1958a

n-Octyl-alcohol (0.9%.) Djerassi *et al.* 1958b

Lupeol (0.02% via its acetate) Djerassi *et al.* 1958b [Was also reported in Kircher 1969 & Campbell & Kircher 1980. Noted to be isolated from neutral nonglycosidic fraction Djerassi 1957 cited unpublished analysis by Djerassi, Mills, Krakower, Liu & Lemin]

Lophenol (A neutral alcohol; 4α-Methyl-Δ^7-cholesten-3β-ol [AKA 4α-Methyl-5α-cholest-7-en-3β-ol]) (0.23% dry wt.) Djerassi *et al.* 1958b [Also isolated in Djerassi *et al.* 1958a & Kircher 1969 (the latter finding it higher in older stems and in the cortex than in the epidermis) & reported in Kircher & Heed 1970 & Campbell & Kircher 1980. Present both free and esterified Djerassi 1957 cited unpublished analysis by Djerassi, Mills, Krakower, Liu & Lemin]

Schottenol (Δ^7-Ergosten-3β-ol [AKA Δ^7–Stigmasten-3β-ol and 5α-Stigmast-7-en-3β-ol]) (0.13%.) Djerassi *et al.* 1958b [Also reported by Kircher 1969 & Kircher & Heed 1970 & Campbell & Kircher 1980]

In addition, the following sterols were later reported:

Lathosterol (5α-Cholest-7-en-3β-ol)

5α-Campest-7-en-3β-ol

α-Spinasterol (5α-Stigmasta-7,22*E*-dien-3β-ol)

5α-Cholesta-8,14-dien-3β-ol [First isolation from plants]

Locereol (4α-Methylcholesta-8,14-dien-3β-ol) [First isolation from plants]

24-Methylenelophenol (4α-Methyl-5α-ergosta-7,24(28)-dien-3β-ol)

Campbell & Kircher 1980

Palmitic acid, Oleic acid, Linoleic acid and Linolenic acid were the main fatty acids in all specimens tested. Kircher 1969

***Lophocereus schottii* notes:**

A: There appears to be a typo in one of these papers. Djerassi *et al.* 1953b determined that the majority of this was in the green epidermis (6.7% crude alkaloid); a minor portion in the cortex (1.1% crude alkaloid) and almost no alkaloid in the core & pith (0.2% crude alkaloid).

See comment in **Activity Notes**.

Lophocereus schottii

(HBG)
H 47600 (BL & JD 687)

Lophocereus schottii
(HBG)
H 47600 (BL & JD 687)

Lophocereus schottii* var. *schottii
and
Lophocereus schottii* var. *tenuis

Determined to have no significant differences in their overall phytochemistry.

[Differences however were seen when comparing mature stems with young stems on a single plant or when comparing the nonalkaloidal chemistry of the cortex and epidermis.]

The young stems contained higher proportions of phenolic alkaloids despite having lower alkaloid levels overall.

***L. schottii* variety**	***schottii***	***tenuis***	
Phenolic alkaloid fraction:			% are dry weight
Young stem	0.4%	0.5%	
Mature stem	0.7%	0.6%	
Total alkaloid fraction:			
Young stem	1.1%	1.2%	
Mature stem	8.7%	9.1%	

KIRCHER 1969

tlc examination showed the strong presence of alkaloids and the absence of triterpene glycosides.

In general, younger stems contained more Linolenic acid than mature stems.

Lipid content determined to be 6-7% by dry weight: KIRCHER 1982

***Lophocereus schottii* *forma* mieckleyanus G.LINDSEY**

Pilocereine (0.005% yield by dry wt.)
Lophocereine (Observed)
Unidentified alkaloids
WEST *et al.* 1975 [WEST *et al.* commented that this form proved to be quantitatively the richest in alkaloids but this claim is directly in conflict with their experimental details.]

***Lophocereus schottii* (ENGEL.) BR. & R. *forma* monstrosus GATES**

AKA "*Totem pole cactus*"
Pilocereine (0.01% yield by dry wt.)
Lophocereine (Observed)
Unidentified alkaloids
WEST *et al.* 1975

Lophocereus schottii (ENGEL.) BR. & R. var. *Australis* (K.BRAND.) BORG See as ***Lophocereus australis***

Lophocereus schottii* forma *monstrosus
(HBG) Both images


Lophocereus schottii
forma *monstrosus*

Lophocereus schottii **forma** ***mieckleyanus*** **(HBG)** **H 296 Baja California**

Lophocereus schottii
forma *mieckleyanus*
(HBG)
H 296
Baja California

Lophocereus schottii
forma *spiralis*
(UC)
65.0817
Baja California Sur, Mexico

Lophophora

Detailed entries for the known species, some horticultural forms and and what may be several varietes can be found in Part A of *Sacred Cacti*.

Lophophora williamsii

Lophophora diffusa

Lophophora diffusa **(Croizat) H.Bravo**

0.9% total alkaloid (whole plants; dry wt) 98% phenolic. Bruhn & Holmstedt 1974

Tyramine 0.1% of total alkaloid: Štarha 1997 [Cultivated material: **GR 1086**]

N-Methyltyramine 0.1% of total alkaloid: Štarha 1997

Hordenine (trace) Bruhn & Holmstedt 1974; 0.5% of total alkaloid [from Štarha 1997]; (In contrast to Todd 1969 who had not observed it in tlc.)

Mescaline (As traces or absent entirely.) Traces in tops & roots (tlc) Todd 1969; Minor base: Habermann 1977, 1978a & 1978b (from Anderson 1980 & Štarha *nd*); 0.018% (± 0.012) Habermann 1978a (from Štarha 1997); 0.003% by dry weight (isolated): Siniscalco 1983 **[See Note A]**; **1.2% of total alkaloid:** Štarha 1997; (Not observed by Bruhn & Holmstedt 1974.)

N-Methylmescaline (traces) Bruhn & Holmstedt 1974; 0.1% of total alkaloid: Štarha 1997

Anhalinine 0.6% of total alkaloid [from Štarha 1997] (Not detected; Todd 1969 [Wild material: collected Queretaro, Mexico])

O-Methylanhalidine 0.7% of total alkaloid: Štarha 1997 **[See Note B]**

Anhalamine (no quantification [tlc]- in tops only, not in roots) Todd 1969; 5% of total alkaloid. Štarha 1997

Anhalidine (trace) Bruhn & Holmstedt 1974; 0.1% of total alkaloid. Štarha 1997

Anhalonidine (trace) Bruhn & Holmstedt 1974; (tlc showed in tops & roots: Todd 1969); 3.8% of total alkaloid. Štarha 1997

Anhalonine 0.1% of total alkaloid. Štarha 1997 (Not detected; Todd 1969)

Lophophorine (no quantification, [tlc] present in tops & roots: Todd 1969); 0.1% of total alkaloid Štarha 1997

O-Methylpellotine (trace) Bruhn & Agurell 1975.

Pellotine (0.75-0.89% [fresh wt]) Heffter 1894b. [Also observed as the major base by Habermann 1977, 1978a & 1978b (from Anderson 1980 & Štarha *nd*)]; 2.105% (± 0.108) Habermann 1978a (from Štarha 1997); (Todd 1969 reported it to be the major alkaloid but did not quantify); **86.2% of total alkaloid:** Štarha 1997

[Ed.:? Please note that Štarha (in Grym) 1997 cited Štarha & Kuchyna 1996 but some included entries are not in Štarha & Kuchnya 1996. They may refer to otherwise unpublished material but we lack details; most likely due to our lack of understanding of Czechoslovakian.]

Glucaric acid (tlc by Kringstad & Nordal 1975)

Quinic acid (tlc, glc & gc-ms by Kringstad & Nordal 1975)

L. diffusa **Notes:**

A: Analyzed as *L. echinata*. This is an incorrect designation for *L. diffusa* that is not uncommonly, but unfortunately, encountered in European collections.

This began when Croizat described *L. echinata* as being from Texas and then went on to describe *L. diffusa* as *L. echinata* var. *diffusa*. *L. echinata* (*L. williamsii* var. *echinata*) is most commonly used for the greyish, larger & higher alkaloid material found in southern Trans-Pecos Texas and southward into Coahuila. It is probably synonymous with the Coahuilan material NOW being called *L. decipiens* by some European cactophiles. More comments are farther below.

B: Possible error on my part. Štarha 1997 lists this as O-Methylanhalinine which I *assumed* is a typo (as a compound cannot exist with this name)

Lophophora diffusa

Lophophora diffusa **var.** ***koehresii*** **Říha [See Note A]**

(Wild-collected in Mexico) Sample was 2.4 gm dry (Total alkaloid concentration not included)

Tyramine (0.04% [± 0.01] of the total alkaloid content) Štarha & Kuchyna 1996; [0.1% of total alkaloid: Štarha 1997]

N-Methyltyramine (Trace of the total alkaloid content) Štarha & Kuchyna 1996; [0.1% of total alkaloid: Štarha 1997]

Hordenine (0.37% [± 0.05] of the total alkaloid content) Štarha & Kuchyna 1996; [0.4% of total alkaloid; Štarha 1997]

N-Methyl-3,4-dimethoxyphenethylamine (0.01% [± 0.01] of the total alkaloid content) Štarha & Kuchyna 1996

Mescaline (**1.32% [± 0.35] of the total alkaloid content**) Štarha & Kuchyna 1996; [1.3% of total alkaloid: Štarha 1997]

N-Methylmescaline (0.07% [± 0.02] of the total alkaloid content) Štarha & Kuchyna 1996; [0.1% of total alkaloid: Štarha 1997]

3,5-Dimethoxy-4-hydroxyphenethylamine (0.10% [± 0.02] of the total alkaloid content) Štarha & Kuchyna 1996

O-Methylanhalidine (0.07% [± 0.01] of the total alkaloid content) Štarha & Kuchyna 1996; [? 0.8% of total alkaloid: Štarha 1997] **[See Note B]**

Anhalinine (0.44% [± 0.07] of the total alkaloid content) Štarha & Kuchyna 1996; [0.5% of total alkaloid: Štarha 1997] **[See Note C]**

O-Methylpellotine (Trace of the total alkaloid content) Štarha & Kuchyna 1996; [0.1% of total alkaloid: Štarha 1997]

Anhalidine (Trace of the total alkaloid content) Štarha & Kuchyna 1996; [0.1% of total alkaloid: Štarha 1997]
Anhalamine (4.74% [± 0.32] of the total alkaloid content) Štarha & Kuchyna 1996; [4.7% of total alkaloid: Štarha 1997]
Anhalonidine (3.45% [± 0.82] of the total alkaloid content) Štarha & Kuchyna 1996; [3.5% of total alkaloid: Štarha 1997]
Pellotine (**88.39% [± 2.12] of the total alkaloid content**) Štarha & Kuchyna 1996; [88.4% of total alkaloid: Štarha 1997]
Anhalonine (0.12% [± 0.02] of the total alkaloid content) Štarha & Kuchyna 1996; [0.1% of total alkaloid: Štarha 1997]
Lophophorine (Trace of the total alkaloid content) Štarha & Kuchyna 1996; [0.1% of total alkaloid: Štarha 1997]

***L. diffusa* var *Koehresii* Notes:**

A: Also described as *Lophophora* ***williamsii*** var. *koehresii* (Říha) Grym. See Grym 1997.

B: Possible error. Štarha 1997 lists as O-Methylanhalinine See comment in earlier footnote

C: In Štarha & Kuchyna 1996 this appears as a typo (anhalamine is listed twice). We based our assignment on a comparison of the gc value with those in Starha's other papers.

Lophophora fricii Habermann

"*Ginkangyoku*"

[See Note A]

Pellotine (Major) Habermann 1978a (From Štarha *n.d.*); Anderson 1980 cited Habermann 1977 & Habermann 1978a; [1.819% (± 0.212) (from Štarha 1997 citing Habermann 1978a)]; (**65.2% & 65.5% of total alkaloid [See Note B]** [Štarha 1997 cited Štarha & Kuchyna 1996])
Mescaline (Minor) Habermann 1978a (From Štarha *n.d.*); Anderson 1980 cited Habermann 1977 & Habermann 1978a; [0.014% (± 0.009) (from Štarha 1997 citing Habermann 1978a)]; (**0.9% & 1.1% of total alkaloid** Štarha 1997);
Tyramine (0.1% & 0.1% of total alkaloid Štarha 1997)
N-Methyltyramine (0.1% & 0.1% of total alkaloid Štarha 1997)
Hordenine (0.3% & 0.4% of total alkaloid Štarha 1997)
N-Methylmescaline (0.1% & 0.1% of total alkaloid Štarha 1997)
Anhalinine (2.7% & 2.2% of total alkaloid Štarha 1997)
O-Methylanhalidine (?) (2.3% & 1.9% of total alkaloid Štarha 1997) **[See Note C]**
Anhalidine (1.0% & 1.0% of total alkaloid Štarha 1997)
Anhalamine (0.2% & 0.7% of total alkaloid Štarha 1997)
Anhalonidine (25.9% & 24.9% of total alkaloid Štarha 1997)
Anhalonine (0.2% & 0.2% of total alkaloid Štarha 1997)
Lophophorine (0.1% & 0.1% of total alkaloid Štarha 1997)
Ed.:? Please note that Štarha (in Grym) 1997 only cited Štarha & Kuchyna 1996 but some entries are not in our copy of Štarha & Kuchnya 1996. They may refer to otherwise unpublished material but we lack details.

***L. fricii* Notes:**

A: Published in Habermann 1974b & 1975a..
Specific name is not widely accepted and needs more work to clarify its status and placement.

B: The 2 figures refer respectively to **GR 1086** & **PR 3293**; both were cultivated

C: Possible error. Štarha 1997 lists this as O-Methylanhalinine. See comment in earlier footnote.

See comments in **Activity Notes**.

Details from both Aragane and Sasaki papers still need to be inserted as finding no mescaline in this species. They also assigned a mistaken identification of *Lophophora williamsii* var. *decipiens* despite obtaining them labelled as **Ginkangyoku** (i.e. *L. fricii*). Those particular specimens that they reported to contain no mescaline should have been identified as *Lophophora fricii.*

***Lophophora koehresii* (upper left)**
***Lophophora fricii* (rest of the left hand row)**
The photo on left is courtesy of Pierre Gambart

Lophophora koehresii
from Koehre's seeds

Lophophora fricii **Parras de la Fuente, Coahuila, Mexico**

Lophophora koehresii
from Koehre's seeds

Lophophora jourdaniana Habermann
[Note A]

Mescaline (Major) Habermann 1978a (From Štarha *n.d.*): Anderson 1980 cited Habermann 1977 & 1978a; [0.690% (± 0.105) Štarha 1997 cited Habermann 1978a **(See Note B)**]; (**31% of total alkaloid** Štarha 1997); See comments in **Activity Notes**.

Pellotine (Minor) Habermann 1978a (From Štarha *n.d.*): Anderson 1980 cited Habermann 1977 & Habermann 1978a; [0.710% (± 0.089) Habermann 1978a (from Štarha 1997) **(See Note C)**]; (**17.8% of total alkaloid** Štarha 1997)

Tyramine (0.6% of total alkaloid Štarha 1997)

N-Methyltyramine (0.5% of total alkaloid Štarha 1997)

Hordenine (2.9% of total alkaloid Štarha 1997)

N-Methylmescaline (3.2% of total alkaloid Štarha 1997)

Anhalinine (0.6% of total alkaloid Štarha 1997)

O-Methylanhalidine (?) (0.8% of total alkaloid Štarha 1997) **[See Note D]**

Anhalidine (3.1% of total alkaloid Štarha 1997)

Anhalamine (1.7% of total alkaloid Štarha 1997)

Anhalonidine (20.1% of total alkaloid Štarha 1997)

Anhalonine (1.1% of total alkaloid Štarha 1997)

Lophophorine (1.4% of total alkaloid Štarha 1997)

Ed.:? Please note that Štarha 1997 only cited Štarha & Kuchyna 1996 but some entries are not in our copy of Štarha & Kuchnya 1996. They may refer to otherwise unpublished research but we lack details. The values refer to work performed with material cultivated in Germany

***L. jourdaniana* Notes:**

A: Published in Habermann 1975a & 1975b

The use of the specific name "*jourdaniana*" is potentially misleading (and should be rejected as invalid) as it was previously used, including for horticultural offerings (initially 'jourdaniana' appeared as a specific name in an old Pierre Rebut catalog) and had already been published in several vague and unclear accounts (as *Anhalonium jourdanianum* Lewin, *Echinocactus jourdaniana* Rebut ex Maass, *Echinocactus lewinii* (Hen.) Schum. var. *jourdaniana* Michaelis & *Lophophora jourdaniana* Kreuz)

None of these can be linked with Habermann's with any degree of certainty.

Habermann's assignment referred to a rose-violet flower color appearing in European imported & cultivated plants (arising from within lots of material identified as *L. williamsii*), while his actual description (and type) was based on a Mexican plant purchased from K.H. Uhlig (as *L. williamsii*) that he felt looked like the same material as was already in European collections, and thus this name, as Habermann described it, cannot be reliably extrapolated to include any of the earlier material referred to by the same name.

Habermann's comment on his inability to cross-pollinate this "*species*" with *L. williamsii*, its varieties, *L. fricii* or *L. diffusa* is countered by other horticulturalists who have noted no such difficulty. [See MS Smith 1998 for example.]

Lophophora jourdaniana is not widely accepted and was rejected by Anderson. See Anderson 1980.

The presence of readily visible persistent spines in the available horticultural material may support a separate varietal status or at least indicates this "*species*" needs additional investigation and, if specific status is warranted, a legitimate name assignment.

B: There appears to be some discrepancy as this is not the major alkaloid with regards to the pellotine present.

C: There appears to be some discrepancy as this is not a minor alkaloid with regards to the mescaline present.

D: Possible error. Štarha 1997 lists this as O-Methylanhalinine.

See comment in earlier footnote.

Lewin 1894 commented that Hildman isolated an alkaloid in 1889.

***Lophophora jourdaniana* (from European seed)**

Lophophora lutea is another invalid name. It was given by Croizat to material that was said to be yellow in flower, hair and body color. Presently it is used for yellow flowering specimens of *L. diffusa* as are known in cultivation in European collections.

See more comments in ***Sacred Cacti* Part A**

Lophophora williamsii
Growing wild at Wirikuta in Mexico.
Photo by Hjeron

(Presidio County, Texas) left
(Mexico - now in cultivation) above-
Notice the abudant ripe seeds!

(Jim Hogg County, Texas)

Lophophora sp. var. Viesca (Vieska), Mex.

(Wild-collected in Mexico) Sample was 7.6 gm dry (Total alkaloid concentration not included)

Tyramine (0.03% [± 0.01] of the total alkaloid content) ŠTARHA & KUCHYNA 1996; (0.1% of total alkaloid ŠTARHA 1997)

N-Methyltyramine (0.08% [± 0.01] of the total alkaloid content) ŠTARHA & KUCHYNA 1996; (0.1% of total alkaloid ŠTARHA 1997)

Hordenine (6.47% [± 0.29] of the total alkaloid content) ŠTARHA & KUCHYNA 1996; (6.5% of total alkaloid ŠTARHA 1997)

N,N-Dimethyl-3-methoxy-4-hydroxyphenethylamine (0.02% [± 0.01] of total alkaloid content) ŠTARHA & KUCHYNA 1996

N-Methyl-3,4-dimethoxyphenethylamine (0.04% [± 0.01] of the total alkaloid content) ŠTARHA & KUCHYNA 1996

Mescaline (**1.01% [± 0.25] of the total alkaloid content**) ŠTARHA & KUCHYNA 1996; (1.0% of total alkaloid ŠTARHA 1997)

N-Methylmescaline (0.09% [± 0.01] of the total alkaloid content) ŠTARHA & KUCHYNA 1996; (0.1% of total alkaloid ŠTARHA 1997)

3,5-Dimethoxy-4-hydroxyphenethylamine (0.77% [± 0.09] of the total alkaloid content) ŠTARHA & KUCHYNA 1996

O-Methylanhalidine (0.07% [± 0.01] of the total alkaloid content) ŠTARHA & KUCHYNA 1996 **[See Note A]**; (0.9% of total alkaloid ŠTARHA 1997)

Anhalinine (0.45% [± 0.06] of the total alkaloid content) ŠTARHA & KUCHYNA 1996; (0.5% of total alkaloid ŠTARHA 1997) **[See Note B]**

O-Methylpellotine (Trace of the total alkaloid content) ŠTARHA & KUCHYNA 1996

Anhalidine (0.14% [± 0.in] of the total alkaloid content) ŠTARHA & KUCHYNA 1996; (0.1% of total alkaloid ŠTARHA 1997)

Anhalamine (6.94% [± 0.30] of the total alkaloid content) ŠTARHA & KUCHYNA 1996; (6.9% of total alkaloid ŠTARHA 1997)

Anhalonidine (5.32% [± 0.32] of the total alkaloid content) ŠTARHA & KUCHYNA 1996; (5.2% of total alkaloid ŠTARHA 1997)

Pellotine (**76.28% [± 1.92] of the total alkaloid content**) ŠTARHA & KUCHYNA 1996; (76.3% of total alkaloid ŠTARHA 1997)

Anhalonine (0.10% [± 0.02] of the total alkaloid content) ŠTARHA & KUCHYNA 1996; (0.1% of total alkaloid ŠTARHA 1997)

Lophophorine (0.08% [± 0.02] of the total alkaloid content) ŠTARHA & KUCHYNA 1996; (0.1% of total alkaloid ŠTARHA 1997)

A: Possible error. ŠTARHA 1997 lists this as O-Methylanhalinine. See comment in earlier footnote.

B: In ŠTARHA & KUCHYNA 1996 this appears as a typo (anhalamine is listed twice). The listed identity was inferred from their GC.

Lophophora williamsii (LEMAIRE) COULTER

AKA *Peyote* and many other names

89% water by weight.

Total alkaloid reported: 8.41% in dried "buttons"; 0.47% in fresh whole plants; 0.2% in fresh roots and 0.93% in fresh tops. BRUHN & HOLMSTEDT 1974.

82.5% of the alkaloid total in tops and 75.2% in roots: ANONYMOUS 1959 cited ROUHIER 1927a.

1,2-Dimethyl-6,7-dimethoxy-8-hydroxy-3,4-dihydro-isoquinolinium inner salt (0.00008% fresh wt.)

2-Methyl-6,7-dimethoxy-8-hydroxy-3,4-dihydroisoquinolinium inner salt (0.001% fresh wt.)

1-Methyl-6,7-dimethoxy-8-hydroxy-3,4-dihydroisoquinoline (0.0001% fresh weight)

6,7-dimethoxy-8-hydroxy-3,4-dihydroisoquinoline (0.0008% fresh weight)

FUJITA *et al.* 1972 (above 4 as ***L. williamsii* var. *caespitosa***).

3,4-Dihydroxy-5-methoxyphenethylamine (trace) LUNDSTRÖM 1971a

3,4-Dimethoxy-N-methylphenethylamine (trace) LUNDSTRÖM 1971a.

3,4-Dimethoxyphenethylamine (trace) LUNDSTRÖM & AGURELL 1968 and LUNDSTRÖM 1971a. [ŠTARHA *nd cf* HABERMANN 1978b]

[3,4,5-trimethoxyphenylalanine [i.e. (3,4,5-Trimethoxy-phenethyl)glycine] reported **in error** (Used only as reference material- Did not observe in plant). See SETHI *et al.* 1973. Please note that N-[3,4,5-Trimethoxyphenethyl]-glycine and N-[3,4,5-Trimethoxyphenethyl]-alanine are synonyms for Mescaloxylic acid and Mescaloruvic acid (respectively); See KAPADIA & HUSSAIN 1972a.]

3-Hydroxy-4,5-dimethoxyphenethylamine [AKA 5-OH-3,4-diMeO-PEA or **3-Demethylmescaline**] (5% of total alkaloid: AGURELL & LUNDSTRÖM 1968); (1-5% of total alkaloid content in fresh material: LUNDSTRÖM & AGURELL 1971b) Also (identified) by KAPADIA *et al.* 1969 and AGURELL & LUNDSTRÖM 1968

3-Methoxytyramine (trace) LUNDSTRÖM 1971a

Anhalamine (0.1-0.7% dry wt. has been reported) SPÄTH & BECKE 1935b and LUNDSTRÖM 1971b. [Also in HABERMANN 1974a (from ŠTARHA *nd*)] [8% of total alkaloid content: LUNDSTRÖM 1971b]

Anhalidine (trace) (0.001% dry wt.) SPÄTH & BECKE 1935b; (0.16% dry wt. i.e. 2% of 8% total alkaloid content) LUNDSTRÖM 1971b

Anhalinine (0.01% dry wt.) SPÄTH & BECKE 1935b; (0.04% dry wt.) [0.5% of total alkaloid content: LUNDSTRÖM 1971b]

Anhalonidine (1.12% dry wt.) [14% of total alkaloid content: LUNDSTRÖM 1971b] [ŠTARHA *nd cf.* HABERMANN 1974a]

Anhalonine (0.24% dry wt.) [3% of total alkaloid content: LUNDSTRÖM 1971b]

Anhalotine (0.0003% dry wt. KAPADIA *et al.* 1968

[Candicine. (Presence is unconfirmed and questionable. Detection by MCLAUGHLIN & PAUL 1966 relied entirely on tlc. All other workers were unable to detect it. Ex.: See KAPADIA *et al.* 1968 & DAVIS *et al.* 1983)]

Lophophora sp. Viesca RS 404
(SRSU)
This is now considered to be a form of _L. fricii_

Lophophora williamsii
In Val Verde County (above); In Terrell County (below)

Lophophora williamsii (Lemaire) Coulter (cont.)

Choline (0.005% dry wt.) Kapadia *et al.* 1968

Dopamine (trace) Lundström 1971a.

Epinine (trace) Lundström 1971a.

Hordenine (0.6-0.7% dry wt.) Lundström 1971b; (0.008% dry wt.) McLaughlin & Paul 1966; Todd 1969 found it **only in roots** (tlc). [Also in Habermann 1978b (from Štarha *nd*)] [**8% of total alkaloid content:** Lundström 1971b]

Isoanhalamine (trace) Lundström 1972

Isoanhalidine (trace) Lundström 1972 & 1971b

Isoanhalonidine (trace) Lundström 1972

Isopellotine (0.04% dry weight) [0.5% of total alkaloid content: Lundström 1971b]

Lophophorine (0.4% dry wt.) Lundström 1971b; (0.5% dry wt.) Heffter 1898b. [Also in Habermann 1974a (from Štarha *nd*)] [5% of total alkaloid content: Lundström 1971b] (Appeared to be the major alkaloid in 2 varieties of summer collected plants: Todd 1969)

Lophotine (0.0002% dry weight) Kapadia *et al.* 1968

Mescaline ([0.10-]0.9-6.0[-6.3]% dry wt. has been reported **[See Note A]** [Anonymous 1959, Heffter 1896a, Lundström 1971b, Martin & Alexander 1968 & Siniscalco 1983); Anderson 1980 cited Kelsey 1959 (0.9%), Bergman 1971 (1.5%), Fischer 1958 (3%), Heffter 1896a (4.6-5.6 %[-6.3%])];

2.4-2.7 % dry (~400 mg. per 16 grams of dried cactus) Ott 1993 citing Bruhn & Holmstedt 1974 and Lundström 1971b; [Crosby & McLaughlin 1973 stated peyote can reach 6% mescaline but rarely exceeds 1% (dry wt.)]; [Tops>>Roots; Todd 1969 **(See Note B)**] ;

Siniscalco 1983 reported the isolation of 0.10% (well irrigated), 0.93% (grafted) and up to 2.74% dry weight (after 6 months of dry conditions) from plants cultivated in Italy; 0.1 to 0.2% by fresh weight is common; Friends with extraction experience found fresh Texas plants to average 0.2% mescaline content during 1970s; 75-125 mg of HCl was recovered from 70-140 gm plants greenhouse grown in northern Europe. Lundström & Agurell 1971b (This approaches 0.1% by fresh weight) [Also in Habermann 1978a & 1978b (from Štarha *nd*)] [**30% of total alkaloid content**: Lundström 1971b]; 0.255% by fresh weight (2.55 mg/gm fresh: average of two specimens; estimated using HPLC) They also reported an average of 1.75% by dry weight. (Ed.: Note the obvious discrepancy) [Container grown in Italy] Gennaro *et al.* 1996;

[As ***L. williamsii* var. *typica* Croizat**: 0.709% (± 0.032) dry wt. Habermann 1978a (from Štarha 1997)]

Starr Co.: 2.77%; Jim Hogg Co: 3.2%; Val Verde Co: 3.5%; Presidio Co: 3.52%. (Averaged % by dry weight.) Hulsey et al. 2011.

3.80% mature crowns, 2.01% small regrowth crowns. (Jim Hogg Co. - Batched samples. Averaged % was by dry weight.) Kalam et al. 2012 & 2013.

1.82-5.50% in crown tissue, 0.125-0.376% in subterranean stem tissue, and 0.0147-0.0520% in root tissue. (Starr Co.; Analyzed individually. All % by dry wt.). Klein et al. 2013.

Lophophora williamsii

***Lophophora williamsii* flowering**
with
mature fruit showing abundant seeds

Lophophora williamsii (Lemaire) Coulter (cont.)

Mescaline citrimide (trace) Kapadia *et al.* 1970
Mescaline isocitrimide lactone (trace) Kapadia *et al.* 1970
Mescaline maleimide (trace) Kapadia & Fales 1968
Mescaline malimide (trace) Kapadia & Fales 1968
Mescaline succinamide (trace) Kapadia & Highet 1968
Mescaloruvic acid (trace) Kapadia & Hussain 1972
Mescalotam (trace) Kapadia & Fales 1968
Mescaloxylic acid (trace) Kapadia & Hussain 1972
N,N-Dimethyl-3-hydroxy-4,5-dimethoxyphenethylamine (0.04% dry weight i.e. 0.5% of 8% total alkaloid content) Lundström 1971c. [0.5% of total alkaloid content: Lundström 1971b]
N,N-Dimethyl-3-methoxytyramine (trace) Lundström 1971a. [0.5-2% of total alkaloid content: Lundström 1971b]
N-Acetyl-3-hydroxy-4,5-dimethoxyphenethylamine (trace) Kapadia & Fales 1968
N-Acetylanhalamine (trace) Kapadia & Fales 1968
N-Acetylanhalonine (trace) Kapadia & Fales 1968
N-Acetylmescaline (trace) Späth & Bruck 1938 and Kapadia & Fales 1968
N-Formyl-3-hydroxy-4,5-dimethoxyphenethylamine (trace) Kapadia & Fales 1968
N-Formyl-O-methylanhalonidine (trace) Kapadia & Fales 1968
N-Formylanhalamine (trace) Kapadia & Fales 1968
N-Formylanhalinine (trace) Kapadia & Fales 1968
N-Formylanhalonidine (trace) Kapadia & Fales 1968
N-Formylanhalonine (trace) Kapadia & Fales 1968
N-Formylmescaline (trace) Kapadia & Fales 1968
N-Methyl-3-hydroxy-4,5-dimethoxyphenethylamine (trace) Lundström 1971c
N-Methyl-3-methoxytyramine (trace) Lundström 1971a. [<0.5% of total alkaloid content: Lundström 1971b]
N-Methylmescaline (0.24% dry wt.) [3% of total alkaloid] Lundström 1971b. See also Späth & Bruck 1937.
N-Methyltyramine (0.012% dry wt.) McLaughlin & Paul 1966. (trace) Lundström 1971a.
O-Methyl-anhalonidine (0.04% dry wt.) [<0.5% of total alkaloid content] Lundström 1971b
[O-Methylpellotine (**Probable** erroneous listing. We cannot locate any primary or substantiating source.)]
O-Methylpeyoruvic acid (trace) Kapadia *et al.* 1973.
O-Methylpeyoxylic acid (trace) Kapadia *et al.* 1973.
Pellotine (1.36% dry weight) Lundström 1971b [Also (%?) Habermann 1974a, 1978a & 1978b (from Štarha *nd*)]
[**17% of total alkaloid content**: Lundström 1971]
[As ***L. williamsii* var. *typica***: 0.296% (± 0.065) Habermann 1978a (from Štarha in Grym 1997)]
Peyoglunal (trace) Kapadia *et al.* 1970
Peyoglutam (trace) Kapadia & Fales 1968
Peyonine (trace) Kapadia & Highet 1968
Peyophorine (trace) Kapadia & Fales 1968; (0.04% dry wt.) Lundström 1971b. [0.5% of total alkaloid content: Lundström 1971b]
Peyoruvic acid (trace) Kapadia *et al.* 1970
Peyotine (0.00015% dry wt.) Kapadia *et al.* 1968
Peyoxylic acid (trace) Kapadia *et al.* 1970

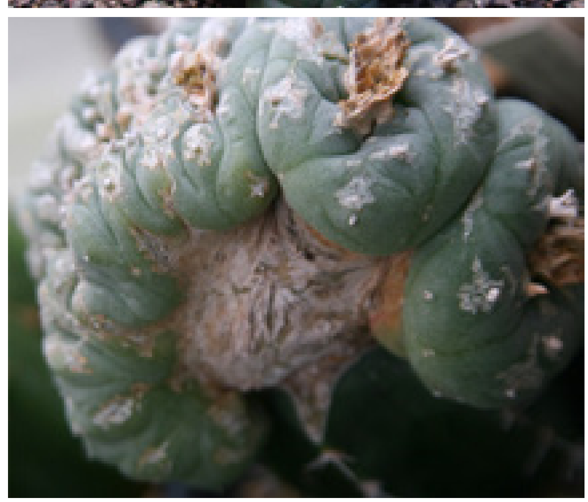
[Serotonin (a tryptamine) was thought to be observed (but was neither isolated nor the identity actually proven); via ion-interaction HPLC: Gennaro *et al.* 1996]
Tyramine (0.001% dry wt.) McLaughlin & Paul 1966; (trace) Lundström 1971a. [Also in Habermann 1978b (from Štarha *nd*)]

Bruhn *et al*. 2008 reported Lophophine, 3,4-Methylenedioxyphenethylamine (Homopiperonylamine), and N,N-Dimethyl-3,4-methylenedioxyphenethylamine (Lobivine) as new minor alkaloids both this species and in San Pedro. This paper and these three identifications need to be questioned or at least viewed with serious reservations.

See comments in **Activity Notes.**

Glucaric acid (tlc by Kringstad & Nordal 1975)

Oxalate druses are present in abundance.
Rouhier 1927



Lophophora williamsii
Normal growth above & grafted crest below

Lophophora williamsii williamsii
(Jim Hogg County, Texas)

Lophophora williamsii echinata
(Terrell County, Texas)

L. williamsii notes:

A: Note that this is 63X from min to max.

Peyote plants, collected from the wild in the late 19th century, have been reported that were 63 times stronger than other peyote plants, cultivated and well watered.

B: Todd 1969 presented an interesting tlc assessment of two distinct populations of *L. williamsii*.

His Coahuilan specimens were far more potent than those collected in San Luis Potosí lending support to the claim that the Coahuilan populations are a higher alkaloid form, designated by most as *L. echinata* or *L. williamsii* var. *echinata*.

Lophophora williamsii var. *caespitosa* Y.Ito n.n.

[Varietal name is wisely rejected by most authorities as simply being a multi-headed form that normal growth can take. See Anderson or Benson. Bottom image is a normal wild caespitose plant.]

Mescaline 0.701% (± 0.085) [dry wt?]

Pellotine 0.300% (± 0.095)[dry wt?]

Habermann 1978a (from Štarha in Grym 1997)]

Another analysis of this variety was published (in Japanese) by Fujita *et al*. 1972. In this paper they reported the four new alkaloids listed under *L. williamsii* above (first 4 on our list) and also Pellotine (0.01%), Anhalidine (0.005%), Anhalonidine (0.001%), Anhalamine (detected), & Lophophorine (detected); All % by fresh wt. They apparently did not detect ANY mescaline (a caespitose *diffusa*?) but we have some distrust of our translator's accuracy so mention this with reservations. They analyzed plants grown in Japan. And apparently named one of their new compounds, Peyotine. Shulgin & Shulgin 1997 have pointed out that this is certain to cause confusion at some point down the road due to its use for another compound entirely.

"var. *caespitosa*" in cultivation (Oz) top right; (California) center

***Lophophora williamsii* (Val Verde Co., Texas) below**


Lophophora williamsii echinata


Lophophora williamsii echinata

Lophophora williamsii var. *decipiens* Croizat

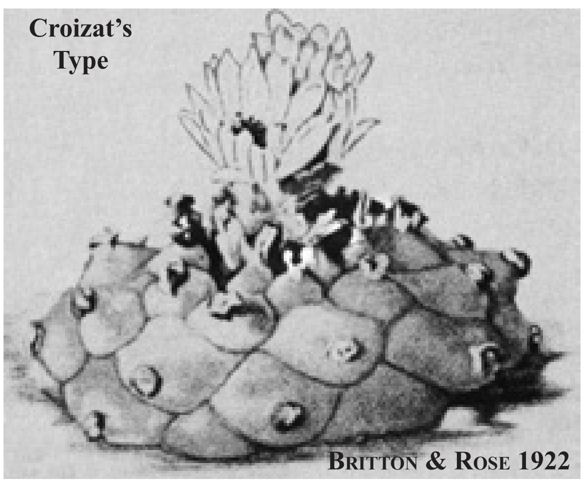
Varietal name that is wisely rejected by most authorities.

Croizat's designated type specimen was a **drawing** (in Britton & Rose 1922), made from a **photograph** taken of a peyote plant, **obtained via France, with no collection or locality information available**. His description was additionally based on a plant furnished to him with no origin information. It was apparently identified as being synonymous with the drawing based on it lacking ribs, instead being basally tubercled, and having more prominent flowers. He claims *decipiens* possesses flowers that "*freely reaches out of the top of the plant*". See Anderson and/or Benson and/or Bravo.

Modern attempts to describe the Coahuilan material by this name seem to lack published descriptions that can be demonstrably linked to the type. It is said to have an ashen grey color, light pink flowers and expressing tubercles rather than ribs (the latter form is not infrequently observable as individuals within large populations of normal *L. diffusa, L. fricii* and *L. williamsii*) These features (ashen grey coloration, a tuberculate appearance and pink or reddish flowers) can actually be considered to be fairly common for *fricii*. In fact Koehres & others now logically recognize their "*decipiens*" as *L. fricii* var. *decipiens.*

So far as we can determine the purported synonymity is based entirely on inferences from a couple of points of simple morphology and suppositions based on reported geographical distribution rather than proof. There is no doubt *fricii* expressed this form though.

Lophophora williamsii echinata in Presidio County, Texas



Croizat's Type

Britton & Rose 1922

The novel characteristics (including an unusually high number of seeds in the fruit) that are now mentioned in the newer description of var. *decipiens* were NEVER mentioned by Croizat. It MAY eventually be proven to be synonymous but this is presently still in need of work.

Croizat's ENTIRE Latin diagnosis: "Culta pusilla ca. 5-6 cm. lata. Costis primum ca. 1.1, subtus in tuberculis conicus solutis. Flore roseo, in anthesi tubo elongato primo intuitu peculiari."

Due to its prior usage, *decipiens* is AT BEST an invalid name.

It is also possible that this material could be synonymous with that referred to by US authors as ***Lophophora echinata*** or ***Lophophora williamsii* var. *echinata*** (a good amount of which does form ribs). Be aware that in Europe material labeled *L. echinata* is often *L. diffusa.*]

Mescaline 0.724% (± 0.092) [dry wt?]
Pellotine 0.288% (± 0.066)[dry wt?]
Habermann 1978a (from Štarha in Grym 1997)]

Composite of online *L. fricii* var. *decipiens* images. Cluster photographed at El Amparo by Koehres.

***Lophophora diffusa* from Bravo 1937**

***Lophophora williamsii* var. *pentagona* Croizat**

[Varietal name is wisely rejected by most authorities as simply being a 5-ribbed form that normal growth can take and it can be found occurring in any *Lophophora* species. It is not even correct to describe it as a proper form since it is typically transitory. It is common in juveniles but does infrequently persist into adulthood. See Anderson or Benson]

Mescaline 0.714% (± 0.049) [dry wt?]

Pellotine 0.296% (± 0.065)[dry wt?]

Habermann 1978a (from Štarha in Grym 1997)]

***Lophophora williamsii* "var. *pentagona*"**
Or at least it is a plant which was grown from European seed stock sold under this name.

Lophophora diffusa

Lophophora williamsii echinata


Lophophora williamsii
echinata

cristate *Lophophora* "*echinata*"
in habitat (Terrell Co., Texas) above
in cultivation below

Machaerocereus eruca (BRANDEGEE) BRITTON & ROSE
See as ***Stenocereus eruca***

***Machaerocereus gummosus* G.L. 6**
(HBG) H 18748 Baja California

***Machaerocereus gummosus* (UC) 68.0984 Baja California**
normal growth above; cristate right

Machaerocereus gummosus (ENGELMANN) BR. & R.

89.5% (DJERASSI) & 74.09% (HEYL 1901) water by weight [KIRCHER 1982 reported 80% water by weight]

Gummosogenin (a new triterpene; Δ^{12}-18β-oleanene-3β,16β-diol-28-al) 0.76% dry weight; 0.08% fresh weight. DJERASSI *et al.* 1954d. First report was DJERASSI *et al.* 1953c citing future publ. [Also in DJERASSI *et al.* 1954a & 1955b.]

Longispinogenin (Reported in DJERASSI *et al.* 1954a.)

Machaeric acid [21-Keto-oleanolic acid; first isolation] 0.125% dry wt. (Isolated via its Methyl ester) DJERASSI *et al.* 1955b

Machaerinic acid (a 21-hydroxy-oleanolic acid) Traces. DJERASSI & LIPPMAN 1955. [Also in 1954]

HEYL 1901 isolated a hemolytic principle from *Machaerocereus gummosus* and believed it responsible for its activity as a traditional fish poison. He named it Cereinic acid but it was apparently never actually characterized. HEYL reported the dried plant material to have a total saponin content of 24%.

tlc examination showed the absence of alkaloids and the strong presence of triterpene glycosides: KIRCHER 1982

Lipid content 6.5% by dry weight: KIRCHER 1982

See comment in **Activity Notes**.

Machaerocereus gummosus
(HBG)

***Maihuenia poeppigii* (Pfeiffer) Schumann**
All CO_2 uptake occurred entirely during the day through the stems (under well watered conditions)

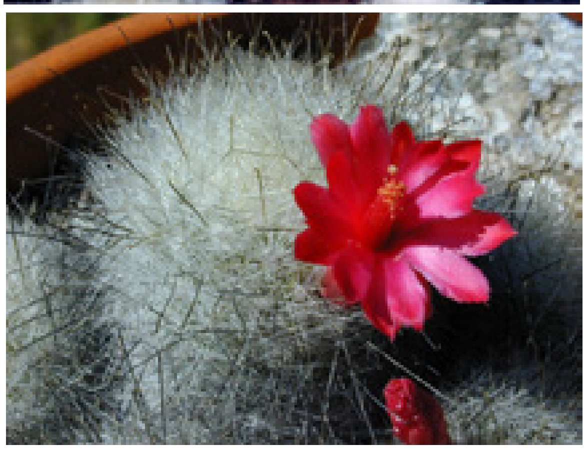
Maihueniopsis darwinii (Henslow) Ritter see as ***Opuntia hickenii***

***Maihuenia poeppigii* (UC)**

Mamillopsis senilis (Loddiges) Weber ex Br. & R.
= ***Mammillaria senilis* Loddiges ex Salm-Dyck**
AKA "*Cabeza de viejo*".
Rose 1899 calls it the "*Sacred Cactus*"
No analysis reported
Rose 1899 suggested this may be an active species based entirely on the fearful reluctance of a Tarahumara to assist Nelson while collecting this cactus and the respectful treatment they applied to the spot where said cacti was harvested.

See comments in the **Activity Notes**

Photo by Kamm



Mammillaria aselliformis W.Watson
See as ***Pelecyphora aselliformis***

Maihueniopsis clavaroides
AKA *Puna clavaroides*

Mammillaria centricirrha **Lemaire**

Fruit contains Phyllocactin (63.9% of total), Betanin (26.2% of total), Isophyllocactin & Isobetanin. Piattelli & Imperato 1969

The betacyanin Mammillarinin (Betanidin 5-O-(6'-O-malonyl)-beta-sophoroside) was identified as a fruit pigment. Wybraniec & Nowak-Wydra 2007

Listed as containing unidentified alkaloid(s) but either the entry included no reference or else the reference that was cited (Brown *et al.* 1968) did not mention the species.

Mammillaria coronata **Scheidweiler**

A new betacyanin (Betanidin 5-O-(6'-O-malonyl)-beta-sophoroside) was reported and named Mammillarinin. Wybraniec & Nowak-Wydra 2007

Mammillaria craigii **Lindsay** Needs an analysis.
See comments in the **Activity Notes**

Mammillaria crinita DC
See as ***Mammillaria wildii* (?)**

Mammillaria dactylithele Labouret
See as ***Coryphantha macromeris***

Mammillaria dioica **K.Brandegee**

CO_2 uptake occurred entirely at night through the stems (under well watered conditions) Nobel & Hartsock 1986

Mammillaria disciformis DC See as ***Strombocactus disciformis***

Mammillaria donatii **Berge ex Schumann**

A new betacyanin (Betanidin 5-O-(6'-O-malonyl)-beta-sophoroside) was reported and named Mammillarinin. Wybraniec & Nowak-Wydra 2007

Mammillaria craigii

Mammillaria craigii

Mammillaria craigii

Mammillaria dioica

Mammillaria elongata
(SRSU)

Mammillaria elongata **DeCandolle**
β-O-Methylsynephrine (trace)
Hordenine (0.0005% dry wt.)
N-Methyltyramine (trace)
Synephrine (0.0009% dry wt.)
Tyramine (trace)
West & McLaughlin 1973

Mammillaria elongata
above normal; below cristate
(cristate form lacks published analysis)

Mammillaria elongata **DeCandolle var. *rufrocrocea*** **K.Schumann**
Reported to contain Kaempferol & Quercetin (Flavonols)
Richardson 1978 (based on acid hydrolysis)

Mammillaria elongata **var. *echinaria***
(HBG)
Variety lacks published analysis.

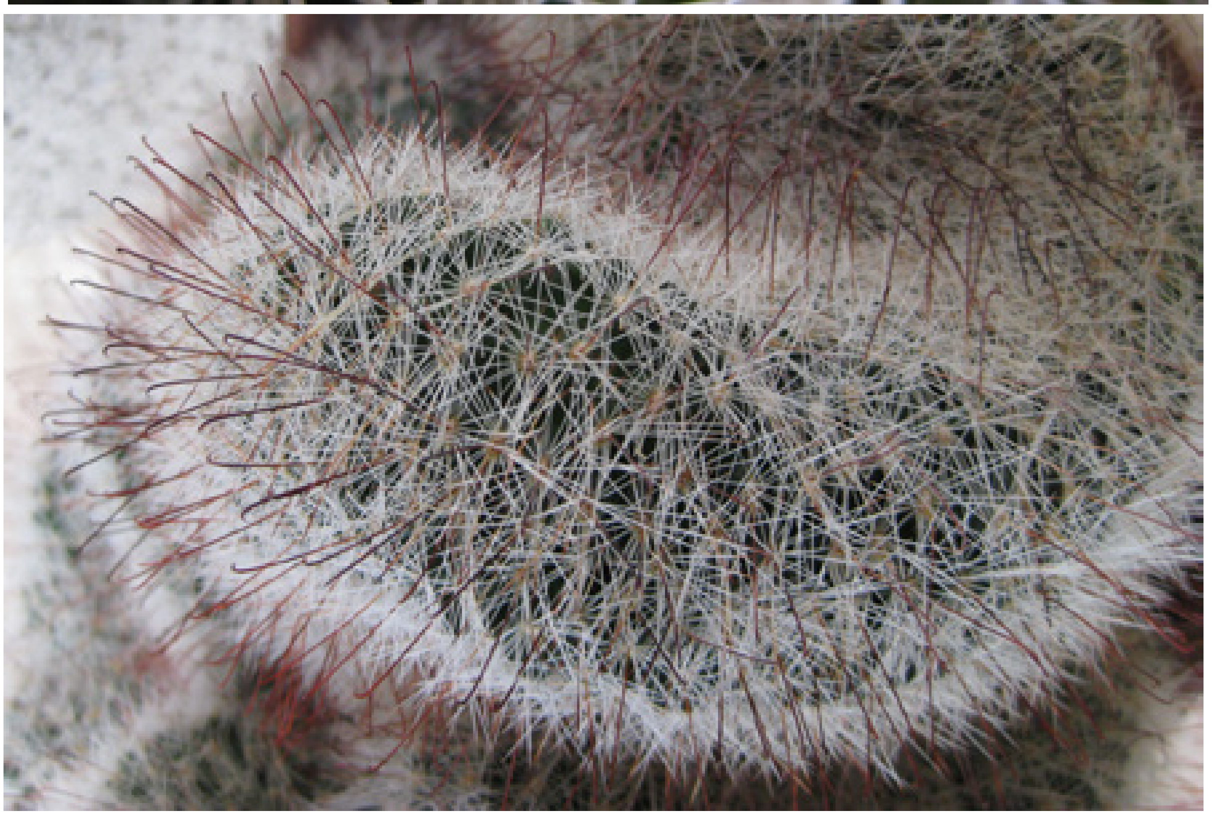
Mammillaria gracilis **Pfeiffer**
Structures of protein linked N-glycans in different tissues of this cactus was studied by Balen *et al*. 2006
Balen *et al.* 2007 looked on how environmental factors influenced their structure.

Mammillaria grahamii **Engelmann** Needs an analysis
Mammillaria grahamii **Engelmann var. *olivae*** **(Orcutt) L.Benson** Needs an analysis
See **Activity Notes.**

Mammillaria gummifera **Engelmann**
A new betacyanin was reported and named Mammillarinin (Betanidin 5-O-(6'-O-malonyl)-β-sophoroside).
Wybraniec & Nowak-Wydra 2007

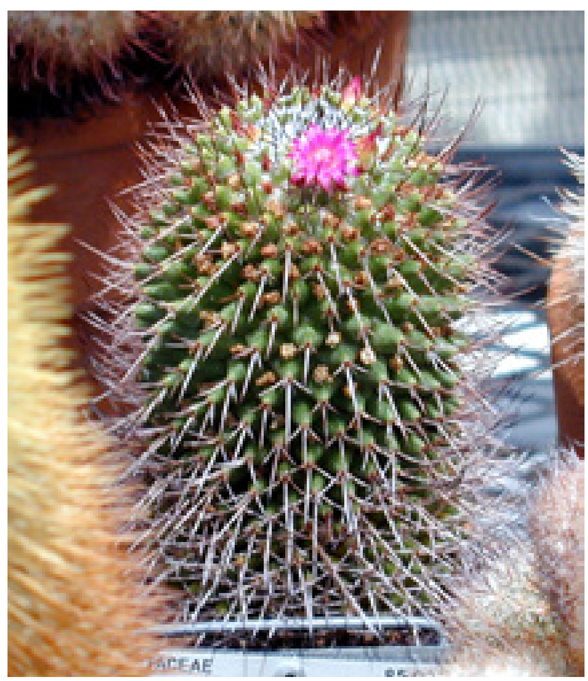
I have encountered disgreement in splitting up the *heyderi* complex. In particular dividing *hemisphaerica* and *gummifera* from *heyderi*. I like to try to recognize *hemisphaerica* but that one needs better separators than spine count and felt. *M. heyderi* in Texas only works if features Hunt ascribes to *gummifera* are applied for what Powell regards as *heyderi*. I'm following Powell on this last one.

Mammillaria gracilis v. fragilis
(HBG)
Variety lacks published analysis.



cristate *Mammillaria grahamii*
(SRSU) lower image

Mammillaria gracilis v. fragilis
(HBG) upper image
Variety lacks published analysis.



Mammillaria grahamii
(Saguaro National Park, Arizona)
(Crest at SRSU)

Mammillaria hidalgensis
(UC)


Mammillaria heyderi hemisphaerica
(Hidalgo County, Texas)


Mammillaria heyderi
(Val Verde County, Texas)


Mammillaria heyderi
(Terrell County, Texas)
both images

Mammillaria heyderi
(Terrell County, Texas)

Mammillaria heyderi MUEHLENPFORDT

3,4-Dimethoxy-N-methylphenethylamine (Over 50% of the 10-50 mg of total alkaloid/ 100 grams fresh) BRUHN & BRUHN 1973 (Also mentioned in BRUHN 1973)

Reported to contain Betalains as pigments. WOHLPART & MABRY 1968 cited WOHLPART 1967

Reports of ethnopharmacological use appear to be **in error**. See **Activity Notes** for more details.

***Mammillaria heyderi* flower**
(Germany) Photo by Evil Genius

Mammillaria hidalgensis J.PURPUS

Reported to contain Betalains as pigments. WOHLPART & MABRY 1968 cited DREIDING 1961

Mammillaria meiacantha
(Field-collected on a ranch near Alpine, Texas)

Mammillaria heyderi* var. *heyderi
(in habitat: Enchanted Rock, Texas) top left
Appearing in a 1990 field survey as *M. gummifera*.

Mammillaria heyderi* var. *heyderi
(Terrell County, Texas) center left & bottom right

Mammillaria karwinskiana
ssp. nejapensis
(BTA)

Mammillaria infernillensis **Craig**

A new betacyanin (Betanidin 5-O-(6'-O-malonyl)-β-sophoroside) was reported and named Mammillarinin.
Wybraniec & Nowak-Wydra 2007

Mammillaria karwinskiana **Martius**

A new betacyanin (Betanidin 5-O-(6'-O-malonyl)-β-sophoroside) was reported and named Mammillarinin.
Wybraniec & Nowak-Wydra 2007

Mammillaria karwinskiana
(HBG)
above

Mammillaria karwinskiana
(BTA)
below

Mammillaria karwinskiana
(HBG)

Mammillaria lenta
(UC)

Mammillaria krameri **Mühlenpfordt**
A new betacyanin (betanidin 5-O-(6'-O-malonyl)-beta-sophoroside) was reported and named mammillarinin.
Wybraniec & Nowak-Wydra 2007

Mammillaria lenta **K.Brandegee**
Reported to contain unidentified alkaloid(s).
Chalet 1980a cited Dominguez *et al*. 1969

Mammillaria lenta
(BTA)

Mammillaria lewinii KARSTEN See as ***Lophophora williamsii***

Mammillaria longimamma DECANDOLLE See as ***Dolichothele longimamma***

Mammillaria longimamma sphaerica K.BRANDEGEE See as ***Dolichothele sphaerica***

Mammillaria longimamma uberiformis SCHUMANN See as ***Dolichothele uberiformis***

Mammillaria macromeris ENGELMANN See as ***Coryphantha macromeris***

Mammillaria magnimamma HAWORTH

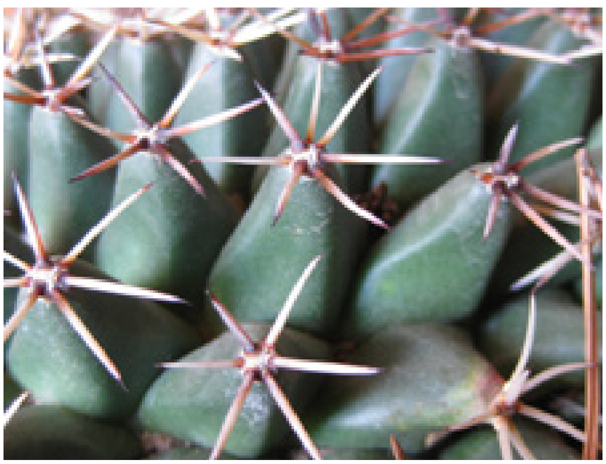
Unidentified alkaloid(s) reported. HEFFTER 1898a

Fruit contains Phyllocactin (65.2% of total), Betanin (34.8% of total) and traces of Isophyllocactin & Isobetanin. PIATTELLI & IMPERATO 1969

A new betacyanin (betanidin 5-O-(6'-O-malonyl)-β-sophoroside) was reported and named mammillarinin. WYBRANIEC & NOWAK-WYDRA 2007

Mammillaria magnimamma var. *divergens* HAWORTH

Fruit contains Phyllocactin (80.0% of total), Betanin (10.2% of total), Isobetanin (9.8% of total) and traces of Isophyllocactin. PIATTELLI & IMPERATO 1969



Mammillaria meiacantha
(in habitat: Brewster Co., Texas) right
Commonly confused with *M. heyderi* but a spine count (above: SRSU) can readily & easily separate the two species.

Mammillaria meiacantha BRITTON & ROSE

Positive Mayer's test. GC showed one alkaloid present but it was not identified. BRUHN & BRUHN 1973.

An unidentified alkaloid was reported by BROWN *et al.* 1968.

Mammillaria melaleuca KARWINSKY ex SALM-DYCK See as ***Dolichothele melaleuca***

Mammillaria melanocentra POSELGER

Acetovanillone (Apocynine) (0.11367% dry wt.)

Mammillarol (a partially characterized triterpenoid) (0.0069% dry wt.)

ACl-9 (A new steroid) (0.0043% dry wt.)

DOMINGUEZ & PUGLIESE 1967 [Collected Nuevo Leon, Mexico. Analyzed under synonym *Mammillaria runyonii* (BR. & R.) BÖD.]

2 forms of *Mammillaria magnimamma* - lower row

This particular paper by Dominguez is in reference to *Mammillaria melanocentra* rather than to *Coryphantha runyonii* as is sometimes presented in alkaloid listings.

Confusion on synonymy is not just easy but easy to locate.

Nomenclatural synonyms:

Mammillaria melanocentra Poselger var. *runyonii* (Britton & Rose) R.T.Craig in the *Mammillaria* Handbook 65. 1945

= *Mammillaria runyonii* Boed. Mammillarien-Vergleichs-Schluessel 52. 1933

= *Mammillaria runyonii* (Britton & Rose) Boed.

= ***Neomammillaria runyonii* Britton & Rose**; Britton & Rose Cactaceae 4: 81. 1923 [24 Dec 1923]

There are many references to *Mammillaria runyonii* Britton & Rose being a synonym for *Coryphantha runyonii*. Including some authoritative databases.

Often this is given as *Coryphantha runyonii* (Britton & Rose) Cory which was published In: *Rhodora* 38(455): 407. 1936.

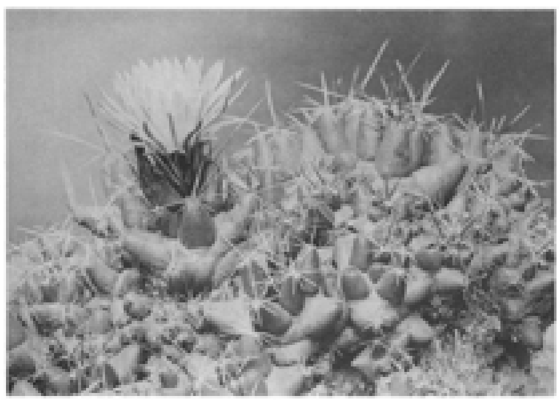
***Coryphantha runyonii* Britton & Rose**:

Coryphantha macromeris subsp. *runyonii* (Britton & Rose) N.P. Taylor

Coryphantha macromeris var. *runyonii* (Britton & Rose) L.D. Benson

Lepidocoryphantha runyonii (Britton & Rose) Backeberg.

Incredibly, Britton & Rose 1923 actually used "*runyonii*" for two different new species; both of which were discovered by Runyon. However, neither one was as *Mammillaria runyonii*. Hence Cory's use of *Mammillaria runyonii* in 1936 to refer to Britton & Rose's *Coryphantha runyonii* and Boedekker's use of *Mammillaria runyonii* in 1933 to refer to *Mammillaria melanocentra* (Britton & Rose's *Neomammillaria runyonii*) has resulted in some persistent confusion.



2. Coryphantha runyonii sp. nov.

Forming low clumps, sometimes 5 dm. in diameter, grayish green, with a thick, elongated taproot; tubercles rather short, 1 to 2 cm. long, terete or somewhat flattened, grooved on the upper half, rarely more, but never to the base; radial spines 6 or more, spreading, acicular, very variable in length, 3 cm. long or less, sometimes all yellow or sometimes one or more in a cluster brown, otherwise yellow; central spines on young plant solitary, dark brown to black but in old plants sometimes 2 or 3, somewhat angled, up to 6 cm. long; flowers large, purple, 5 cm. broad; outer perianth-segments ciliate; inner perianth-segments spatulate, oblong, acute; fruit green; seeds brown.

2. *Neomammillaria runyonii*, from Monterey, Mexico.

17. Neomammillaria runyonii sp. nov.

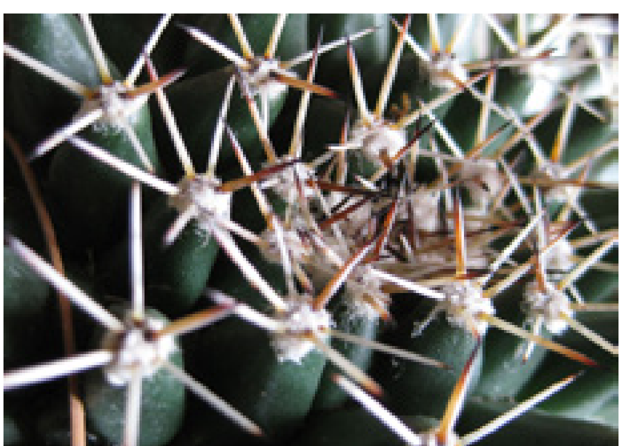
Plants deep-seated, depressed; tubercles milky, elongated, 1.5 cm. long, strongly 4-angled, their tips widely separated from each other, their axils long-woolly (never setose), especially when young, sometimes permanently so; young spine-areoles long-woolly, but in age glabrate; radial spines 6 to 8, slightly ascending, the outer ones stouter and often dark brown in color, the inner ones about half the length of the outer and nearly white; central spine solitary, brown to black, erect, 10 to 14 mm. long; flowers about 2 cm. long, purple; perianth-segments oblong; fruit red, clavate, 12 to 16 mm. long; seeds brown.

The two entries from Britton & Rose

Mammillaria magnimamma
(UC)

Forms of *Mammillaria magnimamma*
(HBG) top row
(Oasis) center left

Mammillaria meiacantha
(SRSU)
bottom row



Mammillaria microcarpa Engelmann

3,4-Dimethoxyphenethylamine (0.0015% (± 0.0006) in chlorophyllous tubercles, 0.0035% (± 0.0027) in cortex tissue, 0.0007% (± 0.0002) in vascular tissue and 0.0008% (± 0.0004) in the root.) Knox *et al.* 1983. [Knox & Clark 1986 found it to be present in only 64% of their samples.]

Hordenine (0.0017% by dry weight) Howe *et al.* 1977; (0.0035% (± 0.0017) in chlorophyllous tubercles, 0.017% (± 0.0053) in cortex tissue, 0.019% (± 0.012) in vascular tissue and 0.036% (± 0.023) in the root.) Knox *et al.* 1983. [Knox & Clark 1986 found it to be present in 95% of their samples]

N-Methyltyramine (0.0019% dry wt.) Howe *et al.* 1977; (0.0094% (± 0.0028) in chlorophyllous tubercles, 0.025% (± 0.006) in cortex tissue, 0.014% (± 0.0073) in vascular tissue and 0.014% (± 0.0023) in the root.) Knox *et al.* 1983. [Knox & Clark 1986 found it to be present in all of their samples]

Tyramine 0.0064% (± 0.0033) in chlorophyllous tubercles, 0.014% (± 0.0099) in cortex tissue, 0.004% (± 0.0028) in vascular tissue and 0.0029% (± 0.0017) in the root.) Knox *et al.* 1983. [Knox & Clark 1986 found it to be present in all of their samples]

[Knox & Clark 1986 looked at 129 individuals from 15 Arizona populations. The occurrences of particular alkaloids showed no clear associations with the geographical distribution.]

Mammillaria microcarpa is considered variously either synonymous with *Mammillaria grahamii* or a variety of it. Toss a coin.

For sake of aiding keyword searches we kept them separate.

Mammillaria microcarpa
(SS)

Mammillaria multiceps Salm-Dyck

Reported to contain unidentified alkaloid(s). Chalet 1980a cited Dominguez *et al*. 1969

Mammillaria neumanniana Lemaire

Fruit contains Phyllocactin (50.2% of total), Betanin (30.9% of total), Isophyllocactin (18.9% of total) and traces of Isobetanin. Piattelli & Imperato 1969

Mammillaria pilcayensis Bravo

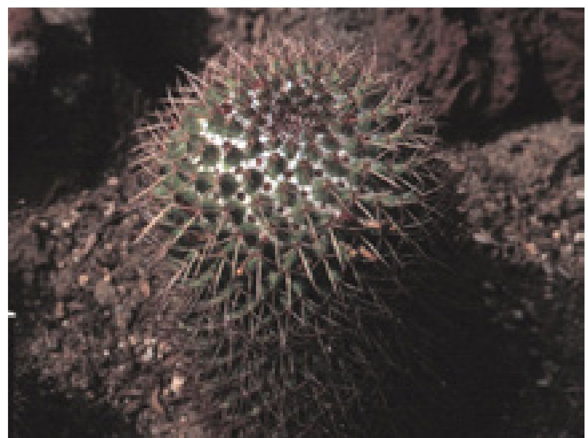
Seed coats reported to contain guaiacyl/syringyl lignins. Chen *et al.* 2012

Mammillaria pusilla (DC) Sweet

Reported to contain Betalains as pigments.
Wohlpart & Mabry 1968 cited Dreiding 1961

Mammillaria rhodantha Link & Otto

Reported to contain Betalains as pigments.
Wohlpart & Mabry 1968 cited Dreiding 1961



Mammillaria rhodantha

Mammillaria microcarpa
(SS)

Mammillaria grahamii v. microcarpus
(Saguaro National Park, Arizona)
Compare to images under *M. grahamii*

Mammillaria roseo-alba Boedecker

A new betacyanin (Betanidin 5-O-(6'-O-malonyl)-β-sophoroside) was reported and named Mammillarinin. Wybraniec & Nowak-Wydra 2007

Mammillaria runyonii (Britton & Rose) Boedecker
See as ***Mammillaria melanocentra***
Mammillaria runyonii (Britton & Rose) Boedecker **IS NOT** synonymous with *Mammillaria runyonii* Cory
Mammillaria runyonii Cory
See as ***Coryphantha macromeris var. runyonii***
Mammillaria runyonii Hort
See as ***Coryphantha macromeris var. runyonii***

Mammillaria saffordii (Britton & Rose) Bravo

Reported to have no detectable alkaloids in Dingerdissen & McLaughlin 1973b

Mammillaria senilis is not the same plant as *Mamillopsis senilis* but the equating of them appears in the literature. (ex.: Bye 1979, p 35)

Mammillaria seitziana Martius

Fruit contains Phyllocactin (60.1% of total), Betanin (24.9% of total), Isobetanin (15.0% of total) and traces of Isophyllocactin. Piattelli & Imperato 1969

Mammillaria setigera (*M. saetigera*? if so = *M. hahniana*)

Betalains as pigments. Wohlpart & Mabry 1968 cf Dreiding 1961

Mammillaria sphaerica Dietrich ex Poselger
See as ***Dolichothele sphaerica***

Mammillaria tetrancistra Engelmann

Hordenine (0.0038% (± 0.0023) in chlorophyllous tubercles, 0.013% (± 0.0027) in cortex tissue, 0.026% (± 0.017) in vascular tissue and 0.047% (± 0.03) in the root.) Knox *et al.* 1983

N-Methyltyramine (0.012% (± 0.0034) in chlorophyllous tubercles, 0.06% (± 0.017) in cortex tissue, 0.022% (± 0.004) in vascular tissue and 0.0094% (± 0.0028) in the root.) Knox *et al.* 1983 (Wild collected: Arizona)

Mammillaria uberiformis Zuccarini ex Pfeiffer
See as ***Dolichothele uberiformis***

Mammillaria wildii **A.Dietrich** had 1 unidentified alkaloid reported [$C_{13}H_{13}NO_3$] Rätsch 1998 cited Lüthy 1995.

Mammillaria williamsii Coulter See as ***Lophophora williamsii***

Mammillaria woodsii R.T.Craig

Reported to contain Betalains as pigments. Wohlpart & Mabry 1968 cited Dreiding 1961

Mammillaria zeilmanniana Böd.

Reported to contain Betalains as pigments. Wohlpart & Mabry 1968 cited Dreiding 1961

Mammillaria zuccariniana Martius

Fruit contains Phyllocactin (45.2% of total), Betanin (25.3% of total), Isophyllocactin (19.6% of total) & Isobetanin (9.9% of total). Piattelli & Imperato 1969

Mammillaria zuccariniana
(HBG)

Mammillaria zeilmanniana

Mammillaria zuccariniana
(Field)

Mammillaria zeilmanniana

Marginatocereus marginatus (DC) Backeberg
See as ***Pachycereus marginatus***

Marshallocereus aragonii (Web.) Backeberg
See as ***Lemaireocereus aragonii***
Marshallocereus thurberi (Engelmann) Backeberg
See as ***Lemaireocereus thurberi***

Matucana madisoniorum is **erroneously** rumored to contain mescaline.
Analysis of it could detect no alkaloid (unpublished GC-MS by Shulgin; personal communication)
See additional comments in **Activity Notes.**

Melocactus bellavistensis has been purported to have use.
It needs study and an analysis.
See additional comments in **Activity Notes.**

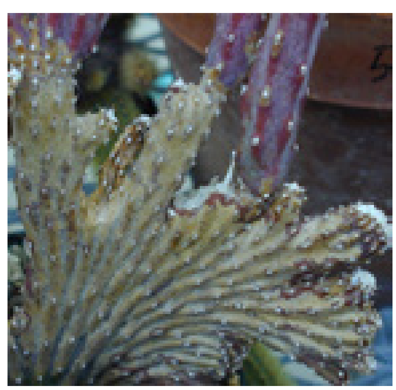
Melocactus delessertianus Lemaire
Tyramine (no quantification) Doetsch *et al.* 1980

Melocactus maxonii (Rose) Gürke
3,4-Dimethoxyphenethylamine (less than 0.01% dry wt.) Ma *et al.* 1986
4-Hydroxy-3,5-dimethoxyphenethylamine (Around 0.01% dry wt.)[?] Ma *et al.* 1986 (Commercial: CA)
Tyramine (no quantification) Doetsch *et al.* 1980

Melocactus obtusipetalis Lemaire
Seed coats reported to contain a homopolymer of cafeyl alcohol as C-lignins. Chen *et al.* 2012

Melocactus peruvianus Vaupel
Reported to contain Betalains as pigments. Wohlpart & Mabry 1968 cited Dreiding 1961
Caycho Jimenez 1977 (page 91) asserted that it contains Mescaline but did not offer any supportive reference.

See additional comments in the **Activity Notes.**




Monvillea spegazzinii
crested horticultural form

***Monvillea spegazzinii* (A.Weber) Britton & Rose**

Reported to contain Betalains as pigments.

Wohlpart & Mabry 1968 cited Dreiding 1961

Monvillea spegazzinii
(HBG)

Myrtillocactus cochal **(Orcutt) Britton & Rose**

"*cochal*" Standley 1924: 911

92.6% water by weight [Sandoval *et al*. 1957 found that 70% water weight was lost when drying 7 days at 35º C.]

Cochalic acid (A triterpene acid; 16-*epi*-echinocystic acid) 0.56% dry wt. Djerassi *et al.* 1955c and Djerassi & Thomas 1954; (1.25% by dry wt Djerassi *et al.* 1957 [a portion of this was via its methyl ether])

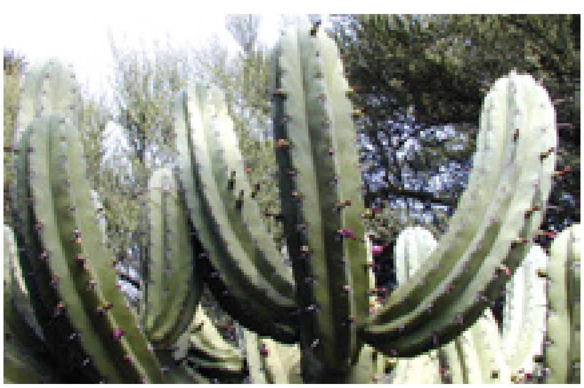
Chichipegenin (A triterpene) 2.47% by dry wt: Djerassi *et al.* 1957; 0.83% by dry wt: Sandoval *et al*. 1957 [Collected near Tehuacán, Puebla]

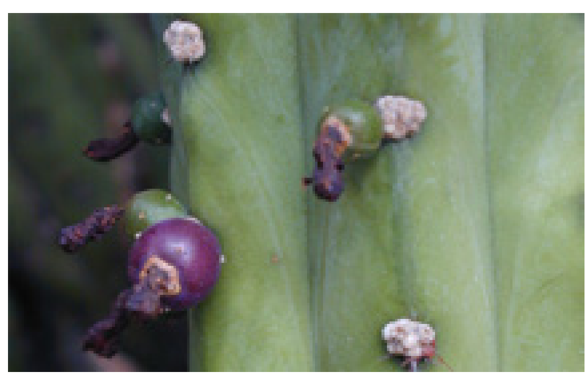
Myrtillogenic acid (A β-Amyrin-type terpene: 3β, 16β,28-trihydroxy-Δ^{12}-oleanen-29-oic acid [Djerassi & Monsimer 1957]) (0.19% dry wt. via the methyl ether) Djerassi *et al.* 1957. [Cultivated: Corona, California]

Longispinogenin (0.157% dry wt) Djerassi *et al.* 1957

Oleanolic acid (via the methyl ether) Sandoval *et al*. 1957

Djerassi 1957 presents almost the same list but omits oleanolic acid; citing unpublished observations by Djerassi, Monsimer & Thomas





Myrtillocactus cochal
(UC & HBG)

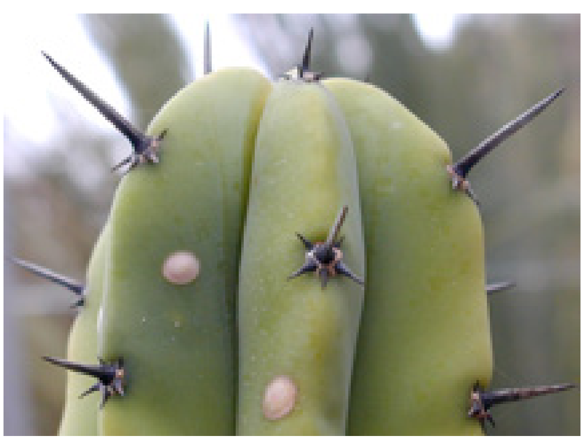
Myrtillocactus cochal

Myrtillocactus eichlamii **Britton & Rose**

Cochalic acid (0.37% by dry wt via the methyl ether)
Chichipegenin (?This is listed in their discussion in the text but does not appear in the experimental account)
Myrtillogenic acid (0.028% dry wt. via the methyl ether)
Longispinogenin (0.83% dry wt)
Oleanolic acid (0.16% dry wt. via the methyl ether)
β-Sitosterol (detected)
Maniladiol (0.14% dry wt)\

Djerassi *et al.* 1957 [Collected near Guatemala City] citing unpublished observations by Djerassi & Burstein

Myrtillocactus eichlamii



Myrtillocactus geometrizans
bottom row

Myrtillocactus geometrizans **(vonMartius) Console**

"*garambullo*" or "*padre nuestro*" or "*blue myrtle*" or "*billberry cactus*"

[Mescaline was apparently reported **in error**. Weak presence [0.30% by dry weight] was only isolated from plants previously used as grafting stocks for *L. williamsii*. However, directly in conflict with his experimental account, Siniscalco also includes a closing comment that suggests one of his controls contained mescaline. Siniscalco 1983]

[Alkaloids were only detected in one of the preliminary screenings of this species by Fong *et al.* 1972. All other tests indicated no alkaloid. All were from Mexico.]

Cochalic acid (0.25% by dry wt via the methyl ether)
Chichipegenin (0.62% by dry wt via the methyl ether)
Myrtillogenic acid (0.14% dry wt. via the methyl ether)
Longispinogenin (0.0025% dry wt)
No detectable alkaloid.

Djerassi *et al.* 1957 [Material was collected at km 205 of Mexico-Laredo Hwy]

Djerassi 1957 cited unpublished observations by Djerassi, Lippman & Monsimer

Chichipegenin, Peniocerol, Macdougallin were reported from an extract of plant and roots.

Céspedes *et al*. 2005

A study of the flavor of the "*berrycactus*" decided that nine volatile compounds were the most important components: Furfural, 5-Methyl-2-furancarboxaldehyde, 2(5H)-Furanone, 5-Acetoxymethyl-2-furaldehyde, 2-Cyclohexen-1-ol, Octanoic acid ethyl ester, Decanoic acid ethyl ester, Octanoic acid and Phenylethyl alcohol.

Vazquez-Cruz *et al*. 2012

See comments in **Activity Notes**.

cristate *Myrtillocactus geometrizans*

Myrtillocactus geometrizans

Myrtillocactus geometrizans

Myrtillocactus geometrizans var. *grandiareolatus* (Bravo) Backeberg
See as ***Myrtillocactus grandiareolatus.*** Hunt 1999 considers this to be synonymous with ***Myrtillocactus geometrizans***

Myrtillocactus grandiareolatus Bravo

[See Bravo 1932]
Chichipegenin (nearly 1% by dry wt)
Oleanolic acid (0.2% dry wt. via the methyl ether)
Djerassi *et al.* 1957 [Collected near Zapotitlán, Mexico]
Djerassi 1957 cited unpublished observations by Estrada & Manjarrez

***Myrtillocactus schenckii* (Purpus) Britton & Rose**
AKA "*vichishovo*" or "*garambullo*"
Stellatogenin (0.052% by dry wt)
Oleanolic acid (0.136% dry wt. via the methyl ether)
Djerassi *et al.* 1957 [Collected in Oaxaca, Mexico]
Djerassi 1957 cited unpublished observations by Manjarrez

Myrtillocactus schenckii
Above

Myrtillocactus schenckii
Probable ID; no label.
Top right

***Neobuxbaumia euphorbioides* (Haworth) Buxbaum**
Reported to show no detectable alkaloids (with MIKES) in Unger *et al.* 1980

Neobuxbaumia euphorbioides
Lower right

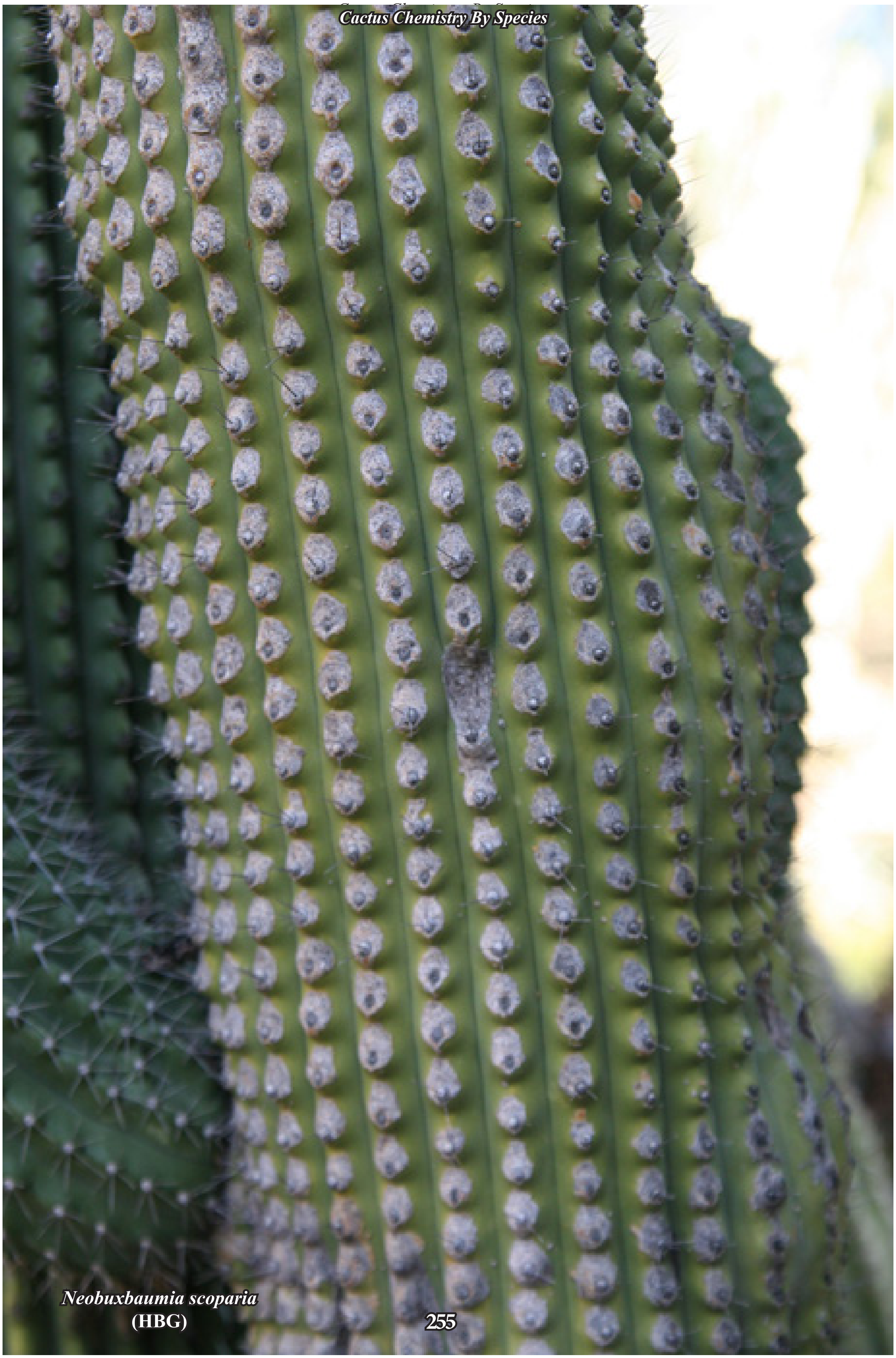
Neobuxbaumia euphorbioides
(HBG)

Neobuxbaumia euphorbioides
(HBG)

Neobuxbaumia multiareolata **(E.Y. Dawson) Bravo** ***et al.***

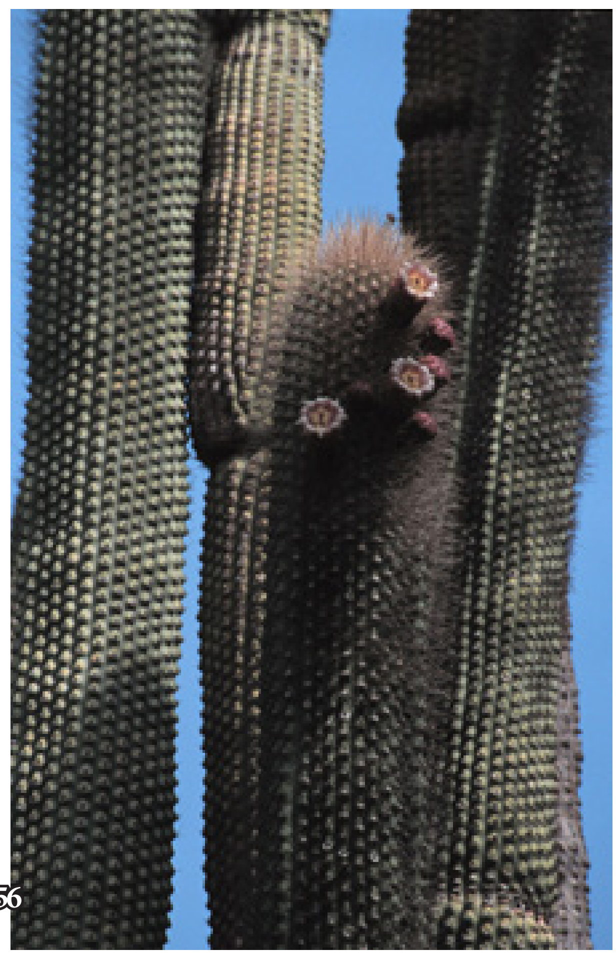
Salsolidine, Anhalidine and Arizonine in trace amounts. Flores Ortiz *et al.* 2003 (gc-ms)


Neobuxbaumia scoparia
(HBG)



Neobuxbaumia scoparia
(HBG)

Neobuxbaumia scoparia
(HBG)



Neobuxbaumia scoparia **(Poselger) Backeberg**

Salsolidine, Anhalidine and Arizonine in trace amounts. Flores Ortiz *et al.* 2003 (gc-ms)

Neobuxbaumia tetetzo **(Weber ex Coulter) Backeberg**

No detectable alkaloids.

Chalet 1980a cited Dominguez *et al*. 1969 (analyzed as *Cephalocereus tetetzo* (A.Weber) Vaupel)

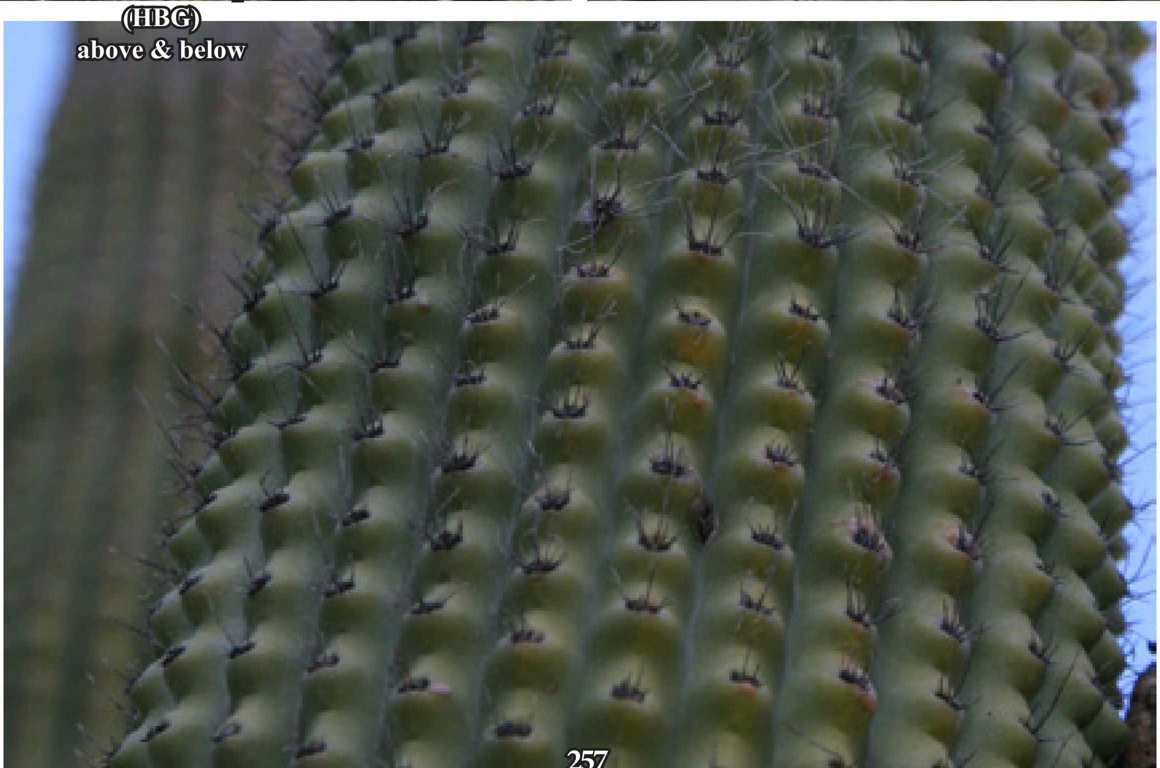
Salsolidine, Anhalidine and Arizonine in trace amounts. Flores Ortiz *et al.* 2003 (gc-ms)

Neogomesia agavioides Castañeda. See as ***Ariocarpus agavoides***

Neobuxbaumia tetetzo
(UC)
upper right


Neobuxbaumia tetetzo
(UC)

Neobuxbaumia scoparia
(HBG)
above & below



Neobuxbaumia tetetzo

Neolloydia intertextus **(Engelmann) Kimnach**
[as *Echinomastus intertextus* Engelmann]

Reported to contain druses of Weddellite.

These druses appeared to be comprised of symmetrical tetragonal crystals that were piled onto one another.

They were found to possess a $^{13}C/^{12}C$ ratio that was 1% higher than the ratio of its environmental atmosphere (the ratio was also richer than was found within its woody tissues).

The cortex of older regions within the stem was found to contain up to 50% of its dry weight as the oxalate.

Rivera & Smith 1979

(Collected in Paradise Canyon, West Texas)

Neolloydia intertextus
(SRU)

Neolloydia intertextus
(SRU)

***Neolloydia intertexta* var. *dasyacantha* (Engelmann) L.Benson**

Reported to contain a single unidentified alkaloid when harvested in Spring and no alkaloid when harvested in the Fall. Brown *et al*. 1968.

Neolloydia odorata was reported to show no detectable alkaloids. Chalet 1980a cited Dominguez *et al*. 1969

Neomammillaria anything. See under ***Mammilllaria***

Neomammillaria runyonii Britton & Rose See as ***Mammillaria melanocentra*** [**Not** a synonym for *Coryphantha runyonii*]

***Neolloydia intertexta* var. *dasyacantha* (SRSU)**

Neoporteria ebenacantha

Betalain pigments. Wohlpart & Mabry 1968 cited Dreiding 1961

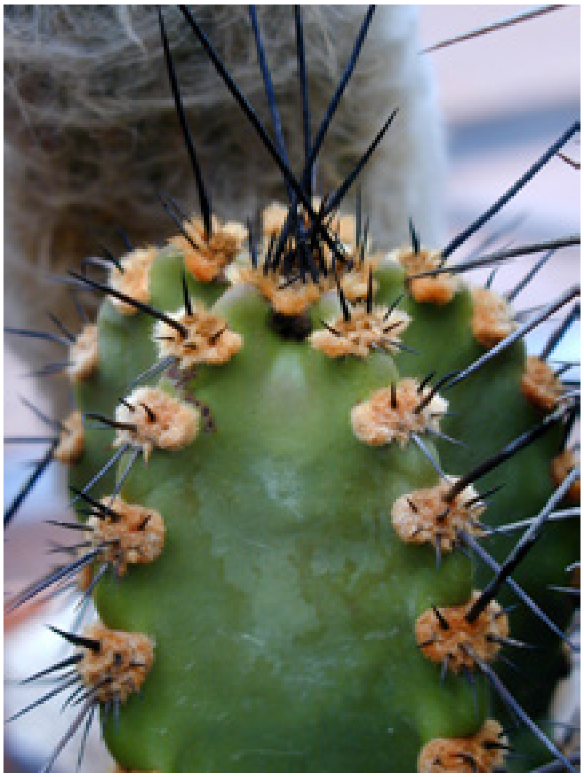
We are unclear if this was *Neoporteria ebenacantha* (Hort. non Monv.) Y.Ito or *Neoporteria ebenacantha* (Monv.) Berg.

***Neoraimondia arequipensis* var. *roseiflora* (Werdermann & Backeberg) Rauh**

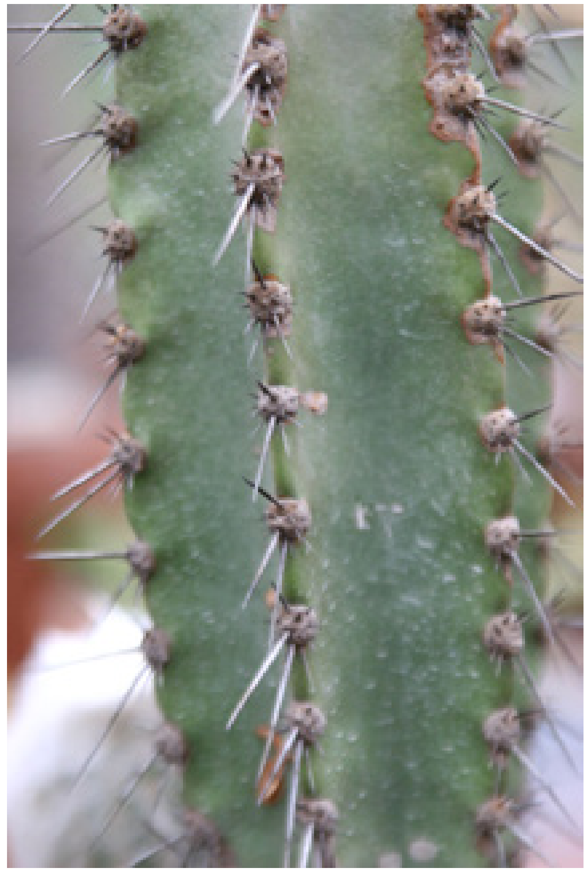
3,4-Dimethoxyphenethylamine (less than 0.01% dry wt.)

4-Hydroxy-3,5-dimethoxyphenethylamine (Less than 0.01% dry wt.)

Ma *et al.* 1986 (Collected by Ostolaza #85055)



Neoraimondia arequipensis



Neoraimondia arequipensis

***Neoraimondia macrostibas* (Schumann) Britton & Rose**

86% water by weight

"*no alkaloid*"

A basic, partially crystalline material was obtained. It showed multiple components: all unidentified; ethanol soluble & ether insoluble. Also noted was a gummy 'non-glycosidic' neutral material and substantial amounts of an unidentified neutral material (oily or amorphous)

[No saponins or terpenes observed]

Djerassi *et al.* 1955b [Wild collected; Peru]

This species is in need of further analysis.

See more comments in **Part B *San Pedro***

A claim purporting the presence of mescaline is made by Caycho Jimenez 1977 (page 91) but he cites no reference and does not include anything that supports his assertion.

See comments in **Activity Notes.**

Neoraimondia gigantea

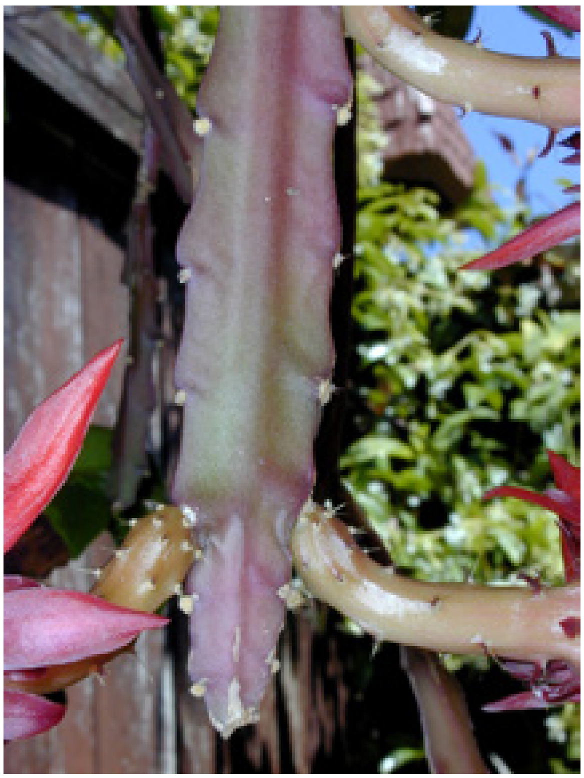
Nopalea cochenillifera (L.) Salm-Dyck

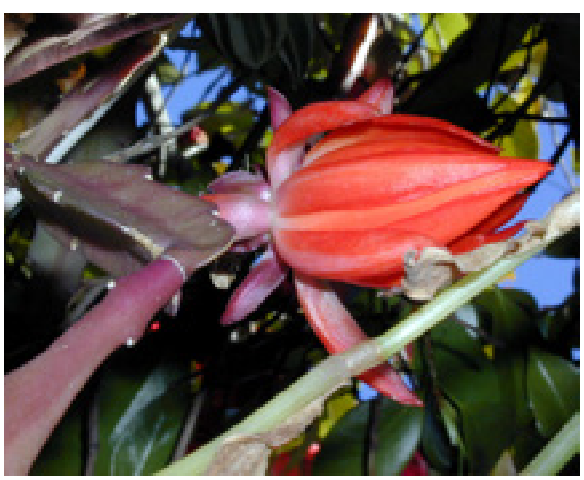
Mucilage polysaccharide was 0.48% of total weight of the fresh plant.
Uronic acid content of polysaccharide: 20%
Rhamnose, arabinose, galactose, xylose (1:4.7:2.1:1.8)
Mindt *et al*. 1975

See comments in **Activity Endnotes**.

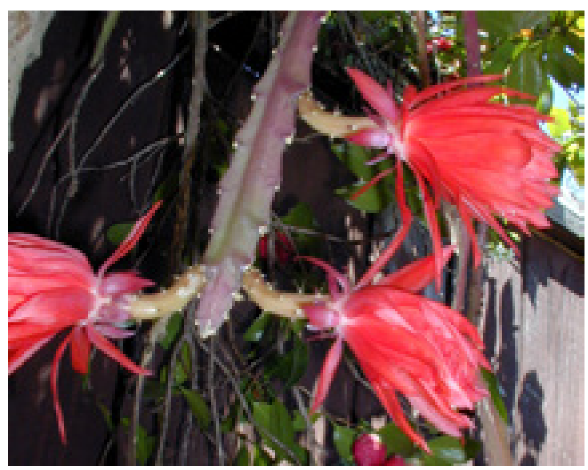
Nopalxochia ackermannii (Haworth) F.M.Knuth

Appears listed as containing an unidentified alkaloid but either the entry included no reference or else the reference that was cited (Brown *et al.* 1968) did not mention the species. The intended reference was Heffter 1898; who included no additional information.





According to Hortus, the plants propagated under this name are actually a hybrid of this species with a *Heliocereus*



Nopalxochia ackermannii
(GF)
This is now in *Disocactus*.

The genus *Nopalxochia* is now lumped into *Disocactus* along with some former members of *Epiphyllum*, *Phyllocactus* and *Heliocereus*.

Nopalxochia phyllanthoides (DC) Br. & R.

Reported to contain Betalains as pigments.
Wohlpart & Mabry 1968 cited Dreiding 1961.
Betacyanin first reported by Kryz.
Piattelli 1981 cited Kryz 1919 & Kryz 1920.

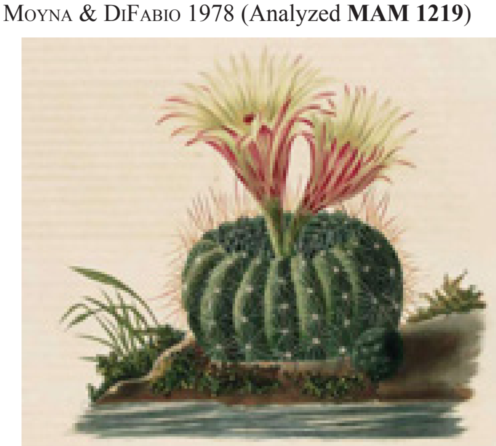
Nopalxochia phyllanthoides (Now in *Disocactus*)

Normanbokea pseudopectinata (Backeberg) Kladiwa & Buxbaum.
See as ***Pelecyphora pseudopectinata***

The former *Notocactus* are now in the genus *Parodia.*

Notocactus concinnus (Monville) Berger

Mucilage determined to be comprised of Arabinose (22.0%), Galactose (42.7%), Galacturonic acid (14.1%), Rhamnose (7.6%) & Xylose (13.7%).
Moyna & DiFabio 1978 (Analyzed **MAM 1219**)



***Notocactus concinnus* from Lemaire 1841-1847 (as *Echinocactus concinna*)**

Notocactus mammulosus (Lemaire) A.Berger

Hunt lists as *Notocactus mammulosus* (Lemaire) Backeberg
Reported to contain Betalains as pigments.
Wohlpart & Mabry 1968 cited Dreiding 1961

unlabeled *Notocactus* sp.

Notocactus ottonis (Lemaire) Berger ex Bacekberg & Knuth

Hordenine (%?) DeVries *et al.* 1971
[N-Me-3,4-DiMeO-PEA has been listed **in error**. It is not supported by the reference that was cited: Smith 1977.]
Reported to contain Betalains as pigments.
Wohlpart & Mabry 1968 cited Dreiding 1961

Notocactus uebelmannianus
Lacks reported analysis

Nyctocereus guatemalensis Britton & Rose

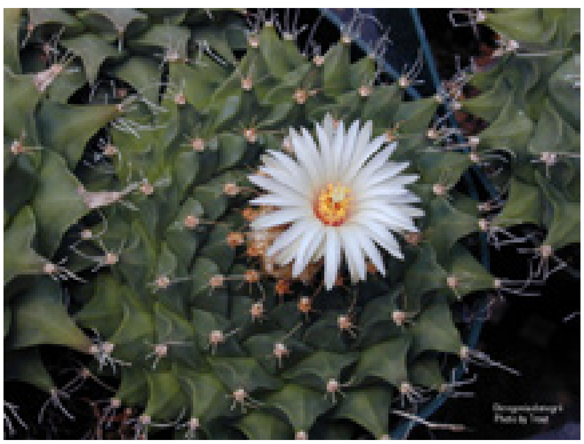
Devoid of glycosides
Djerassi *et al.* 1953c [Guatemala; cultivated Guatemala City]
Most members of this genus, including this species, have been transferred elsewhere. (In this case to *Peniocereus* and absorbed into *Peniocereus hirschtianus* (Schumann) Hunt)
The work of Arias *et al.* 2005 indicates that *Nyctocereus* should be preserved only as a monotypic genus (*N. serpentinus*).

Notocactus scopa **(Sprengler) Berg.**

From leaves:
Cholesterol (2.6% of total)
24¢-Methylcholesterol (12.5% of total)
Stigmasterol (2.8% of total)
Sitosterol (73.9% of total)
24¢-Methylcholestenol (traces)
Sitostanol (8.2% of total)
Salt *et al*. 1987

Obregonia denegrii **Frič**

Hordenine (0.002% dry wt.) Neal *et al.* 1971a; (1-10% of 1-10 mg total alkaloids/ 100 gm. fresh.) Bruhn & Bruhn 1973.
N-Methyltyramine (0.0002% dry wt.) Neal *et al.* 1971a; (trace) Bruhn & Bruhn 1973.
Tyramine. (Over 50% of 1-10 mg of total alkaloids/ 100 gm. of fresh) Bruhn & Bruhn 1973
[All 3 reported in Habermann 1974a (from Štarha *nd*)]
Quinic acid (tlc & glc by Kringstad & Nordal 1975)
β-Sitosterol (tentative ID) Dominguez et al. 1969
Anderson 1967 & Dominguez et al. 1969 reported unidentified alkaloids.



Obregonia denegrii

This is believed to be *Lophophora*'s closest living relative

Opuntia

More detailed entries for the mescaline containing species can be found in Part A of Sacred Cacti.

In Yácovleff & Herrera 1934, on page 321, in figure 39 **[Note 35]**, is what appears to be a small jointed Opuntioid species. **[Note 36]**

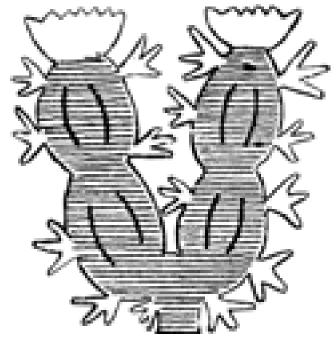
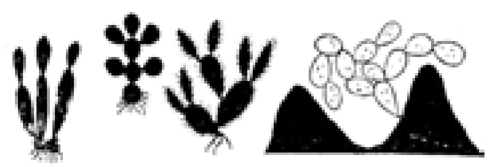
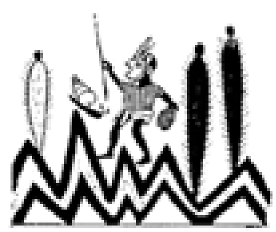


Figure 39 from Yacovleff & Herrera 1934

It is impossible to accurately determine most species of plants from such ornamental designs but some seem clearly to represent several different species of *Opuntias* with very different pads and configurations.



Columnar cacti are also represented, as are what appear to us suggestive of maps of occurrence (assuming one knows the point of origin for reference).



Rätsch 1998 shows a quite similar scene on page 507 and assigns San Pedro as a specific identification. Careful examination of the images is suggestive of spinier cacti intended not for ingestion but possibly for basic ash preparation indicating that another species may have been intended. (Note the apparent lime stick and coca bag in the hands of the figures pictured here and in Rätsch)

Opuntia acanthocarpa Engelmann & Bigelow
see as ***Cylindropuntia acanthocarpa***
Opuntia articulata Pfeiffer see as ***Tephrocactus articulatus***

Opuntia basilaris
(southern California)

***Opuntia basilaris* Engelmann & Bigelow**

Also appears spelled *basilaria*. We went with Benson 1982.
4-Hydroxy-3,5-dimethoxyphenethylamine (Less than 0.01%)
Mescaline (0.01% dry wt.) [i.e. 100 mg/ 1 kg. dry wt]
Ma *et al.* 1986 (Analyzed **F. Zeylmaker #8504**)

***Opuntia bergeriana* Weber**

Fruit contains Betanin (major), Isobetanin, Betanidin and traces of Phyllocactin & Isophyllocactin: Piattelli & Imperato 1969
Betanin in fruit (biosynthetic study) Miller *et al*. 1968
Flower contains betacyanins: Betanin (major) & Isobetanin. Piattelli & Minale 1964b

Opuntia bigelovii Engelmann see as ***Cylindropuntia bigelovii***

***Opuntia boldinghii* Britton & Rose**

Fatty acids composition of seed oil (relative percents).
Linoleic acid 67.2±0.1%
Oleic acid 18.0±0.1%
Palmitic acid 10.4±0.1%
Stearic acid 3.0±0.1%
Palmitoleic acid 0.5±0.1%
Linolenic acid 0.3±0.1%
Arachidic acid 0.3±0.1%
Gadoleic acid 0.4±0.1%
García Pantaleón *et al.* 2009

Fruits shown to contain betalains by Viloria-Matos *et al.* 2002. Proximate analyses was performed on fruits and on cladodes by Moreno-Alvarez *et al.* 2003 & 2006. [from García Pantaleón *et al.* 2009]

Opuntia chlorotica **Engelmann & Bigelow**

Quercetin-3-glucoside, Quercetin-3-rutinoside, Iso-rhamnetin-3-glucoside, Isorhamnetin-3-rutinoside, Isorhamnetin-3-rhamnosylgalactoside, and Kaempferol 3-galactoside (all flavonoids) in flowers.

Clark & Parfitt 1980

Opuntia brasiliensis (Willdenow) Haworth
See as ***Brasiliopuntia brasiliensis***
Opuntia bradtiana (Coulter) K. Brandegee
see as ***Grusonia bradtiana***
Opuntia clavata Engelmann
see as ***Corynopuntia clavata***

Opuntia comonduensis (Coulter) Britton & Rose

Cholesterol (4.4% of total)
24ç-Methylcholesterol (8.8% of total)
Sitosterol (86.7% of total)
Salt *et al.* 1987

Opuntia curvispina Griffiths

Quercetin-3-glucoside, Quercetin-3-rutinoside, Iso-rhamnetin-3-glucoside, Isorhamnetin-3-rutinoside, Iso-rhamnetin-3-rhamnosylgalactoside, and Kaempferol 3-galactoside (all flavonoids) in flowers.
Clark & Parfitt 1980
This name is considered unresolved.

Opuntia decumbens Salm-Dyck

Fruit determined to contain betalains. Fischer & Dreiding 1972 & Miller *et al*. 1968 (Both studied the biosynthesis of Betanin)

Opuntia dejecta Salm-Dyck

Fruit contains Betanin (major), Isobetanin and traces of Phyllocactin. Piattelli & Imperato 1969

Opuntia diademata Lemaire

Citric acid (3.0% in stem juice)
Hegnauer 1964 cited Bergström 1934

Opuntia dillenii Haworth See as ***Opuntia stricta* var. *dillenii***

Opuntia ellisiana Griffiths

Crystalline material isolated from the stems shows a very complex mineral composition that includes:
Whewellite (monohydrated calcium oxalate)
Opal (SiO2)
Calcite (CaCO3)
Glushinskite (dihydrated Magnesium oxalate).
Monje & Baran 2005

Opuntia engelmannii Salm-Dyck

Flower contains Betanin (major), and an unidentified Betacyanin.
Fruit contains Betanin (major), Phyllocactin & Isobetanin.
Piattelli & Imperato 1969
Reported to contain druses of Whewellite.
Rivera & Smith 1979
(collected on the campus of the University of Texas at Austin)

Opuntia elatior Mill.

β-Sitosterol
Opuntiol (0.05% dry wt) (2-Hydroxymethyl-4-methoxy-α-pyrone)
Gangul *et al.* 1965 (Collected in India)
Narcissin (a flavone) was found in the flowers.
Shabbir & Zaman 1968

Opuntia elatior

Opuntia engelmannii
(Hays County, Texas)


Opuntia ellisiana
(UC)

Opuntia engelmannii
(BTA)

Opuntia engelmannii
(Hays County, Texas)

Opuntia engelmannii* var. *linguiformis

Opuntia erinacea* var. *ursina
(Lower left & right)

Opuntia erinacea **Engelmann & Bigelow var. *hystricina* (Engelmann & Bigelow) L.Benson**

Reported by Meyer *et al.* 1980 to contain traces of unidentified alkaloids.

Opuntia ficus-indica (Linnaeus) Miller

Pads determined to contain 87.4% (young) and 85.4% (mature) water by weight. Kircher 1982

Mescaline (% not given)

N-Methyltyramine (% not given)

Tyramine (% not given)

Four additional unidentified bases present as trace amounts. El-Moghazy *et al.* 1982 (Material growing in Egypt.)

Unidentified lactone-forming acid (tlc by Kringstad & Nordal 1975)

In cladodes:

Glucose and Galacturonic acid were found to be the primary sugars

Kaempferol and Isorhamnetin glycosides were also detected (as glucosides and rhamnosides).

Calcium oxalate crystals were present in large amounts.

Reported no observable antimicrobial activity.

Mandalari *et al*. 2009

Myrcene, Limonene & γ-Terpinene (terpenes: small amounts in the *de Castilla* variety fruit) Flath & Takahashi 1978. [Also reported the presence of other volatile compounds in the fruit including many alcohols, aldehydes, ketones, esters & hydrocarbons such as Toluene & Methylcyclohexane]

β-Sitosterol Dawider & Fayez 1961; (0.04% dry wt. in flowers) Arcoleo 1966

var. saboten (leaf & stem): 2 triterpenoids and eight flavonoids.

(6S,9S)-3-oxo-ceionol-[3-*D*-glucopyranoside

Corchoionoside C

(+)-Dihydrokaempferol (Aromadendrin)

(+)-Dihydroquercetin (Taxifolin)

Eriodictyol

Kaempferol

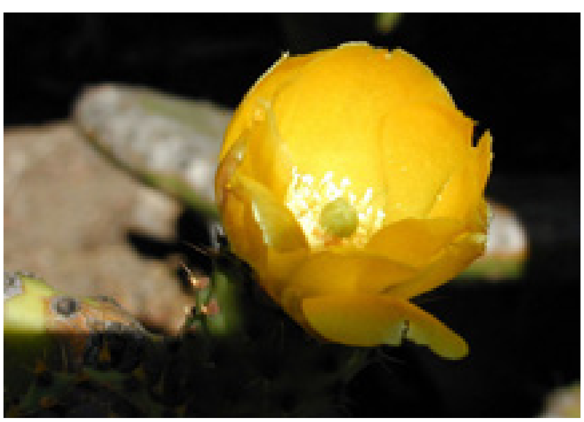
Kaempferol 3-methyl ether

Narcissin

Quercetin

Quercetin 3-methyl ether

Lee *et al*. 2003



Opuntia ficus-indica
(Strybig Botanical Gardens) entire page

CO_2 uptake occurred entirely at night through the stems (under well watered conditions while leafless)
Nobel & Hartsock 1986

Flowers were found to contain the flavonoids: Penduletin, Luteolin, Kaempferol, Quercetin, Quercitrin & Rutin
El-Moghazy *et al.* 1982

Mucilage was determined to be comprised of D-Glucose, D-Galactose, L-Arabinose, D-Xylose, L-Rhamnose and D-Galacturonic and D-Glucuronic acids.
El-Moghazy *et al*. 1982

free Lauric acid, Myristic acid, Palmitic acid, Stearic acid and Oleic acid & also the esters of Myristic, Palmitic, Stearic, and Oleic acids. Arcoleo 1966

Reported to contain Betalains as pigments. Wohlpart & Mabry 1968 cited Piattelli & Minale 1964

Fruit contains betacyanins: Betanin (major) & Isobetanin. Piattelli & Minale 1964

Indicaxanthin (a betaxanthin) was reported in mature fruit (orange - yellow variety) by Impellizzeri & Piattelli 1972 (Also in Piattelli *et al.* 1964a & 1964b)

Indicaxanthin & Betanin in fruit. Minale *et al.* 1965

tlc examination showed a small amount of unidentified alkaloid and the absence of triterpene glycosides: Kircher 1982

Lipid content determined to be 2.5% by dry weight: Kircher 1982

Isorhamnetin was found in the hydrosylate of flower pigments. Arcoleo *et al.* 1961.

Fruit was found to contain Maleic, Malonic, Malic, Succinic, Tartaric, Oxalic & Ascorbic acids. Ascorbic acid content determined to be 0.094% by fresh weight.
El-Moghazy *et al.* 1982

Malic acid, Citric acid, Piscidic acid, Piscidic acid monoethyl ester (0.0433%), Piscidic acid diethyl ester (0.0333%) and several other nonvolatile acids in fruit. Nordal *et al.* 1966.

1-Methylcitrate, 1,3-Dimethylcitrate, Trimethylcitrate & 1-Methylmalate were isolated from the fruit of *Opuntia ficus-indica* var. *saboten* 'Makino':
Han *et al.* 2001

Betalain distribution for three Sicilian cultivars of *Opuntia ficus indica* was studied by Butera .

These cultivars differ by producing either yellow, red, or white fruits due to the combination of two betalains, namely betanin (purple-red) and indicaxanthin (yellow-orange)

They found that the yellow cultivar exhibited the highest amount of betalains, followed by the red and white ones.

White fruit:
Indicaxanthin comprised about 99% of the betalains.
Also found polyphenolic pigments.

Yellow fruit:
The ratio of betanin to indicaxanthin was 1:8 (w:w)
Also found polyphenolic pigments.

Red fruit:
The ratio of betanin to indicaxanthin was 2:1 (w:w)
Found that polyphenol pigments were negligible components.
Butera *et al.* 2002

Eight flavonoids were isolated from the stems and fruits of Opuntia ficus-indica var. saboten:
Kaempferol
Quercetin
Kaempferol 3-methyl ether
Quercetin 3-methyl ether
Narcissin
(+)-Dihydrokaempferol (Aromadendrin)
(+)-Dihydroquercetin (Taxifolin)
Eriodictyol
along with two terpenoids:
(6S,9S)-3-Oxo-α-ionol-β-D-glucopyranoside
Corchoionoside C
Lee *et al.* 2003

Dok-Go *et al.* 2003 reported:
Quercetin
(+)-Dihydroquercetin
Quercetin 3-methyl ether
These flavonoids were isolated from the ethyl acetate fractions of an extract of the fruits and stems of *Opuntia ficus-indica* var. *saboten* .

	Pulp	Skin	Seeds	
Glucose	35%	21%	–	
Fructose	29%	–	–	
Protein	5.1%	8.3%	11.8%	
Starch	yes	yes	yes	
Cellulose	14.4%	29.1%	45.1%	(in fibers)
Calcium	–	2.09%	–	
Potassium	–	3.4%	–	

El-Kossori *et al.* 1998. (All as dry weight)

Fruit sugars were found to include D-Glucose, D-Galactose, L-Arabinose, Fructose, & D-Glucuronic and D-Galacturonic acids prior to hydrolysis and showed D-Xylose, L-Rhyrcose (? - I cannot locate this name) & L-Rhamnose after hydrolysis.
El-Moghazy *et al.* 1982.

El-Moghazy mentioned that Awad *et al.* 1970 & Haralambs 1979 had reported Galactose, Arabinose, Xylose, Rhamnose and Galacturonic acid.

de Castilla fruit showed pH 4.85-6.3.

Citric acid was reported at levels of 0.084-0.12% according to Flath & Takahashi 1976

Fruit juice of Sicilian cultivars of *Opuntia ficus indica*:
pH 6.4-6.5
Sugar content of 11-12% (mainly glucose and fructose)
L-ascorbic acid content of 31-38 mg/100 grams.
Manganese(II) (1.7-2.9 ppm)
Iron(III) (0.6-1.2 ppm)
Zinc(II) (0.3-0.4 ppm)
The metal ions appeared to be present mainly in the skin of the fruit or were "trapped" inside of the pulp.
Gurrieri et al. 2000

Linoleic acid was determined to be the major fatty acid in the seed oil (61.01%), with Oleic (25.52%) and Palmitic (12.23%) acids. Myristic, Stearic and Arachidonic acids were also present in low concentrations.
Özcan & Al Juhaimi 2011

Similar results were reported for oil extracted from *Opuntia ficus-indica* seeds. The oil constituted 13.6% of the whole seed. 16% saturated fatty acid, with a linoleic acid content of 63.66% followed by oleic 18.34%, palmitic 12.84% and stearic acid 2.81%. el Finti *et al.* 2013

See comments in **Activity Notes**.

Fruit fragrance has been studied:
"In cactus pear, R-(–)-linalool is present in an enantiomeric excess of 36%."
Sitrit *et al*. 2004 cited Weckerle *et al*. 2001

E-2-hexenal, 1-hexanol, E-2-hexen-1-ol, E-2-nonenol and E,Z-2,6-nonadienol are considered to be responsible for the melon-like character.
Weckerle *et al*. 2001

Also, reported by Wu *et al.* 2008:
Aspergiketal (A new spiroketal)
Physcion
Asterric acid
All three of which were isolated from a culture broth of *Aspergillus terreus* (An endophytic fungus found associated with the stems of *Opuntia ficus-indica*)

Volatile compounds identified in the fruit of *Opuntia ficus indica* by HRGC-MS

Methyl butanoate	Methyl 2-methyl-butanoate
2-Methyl-3-buten-2-ol	Hexanal
3-Pentanol	1-Butanol
1-Pentene-3-ol	3-Pentene-2-ol
Z-3-Hexenal	1, 8-Cineol
E-2-Hexenal	2-Pentylfuran
3-Methyl-3-butene-1-ol	1-Pentanol
Methyl 3-hexenoate	Hexyl acetate
Acetoin	E-2-Pentene-1-ol
E-2-Heptenal	Z-2-Pentene-1-ol
E-2-Hexenyl acetate	1-Hexanol
E-3-Hexen-1-ol	Z-3-Hexen-1-ol
Nonanal	Methyl 2-(methylthio)-acetate
E-2-Hexen-1-ol	Z-2-Hexen-1-ol
E-2-Octenal	Acetic acid
1-Octene-3-ol	1-Heptanol
Methyl 3-hydroxy-butanoate	E,E-2,4-Heptadienal
E-2-Hepten-1-ol	Linalool
1-Nonene-3-ol	1-Octanol
E, Z-2, 6-Nonadienal	Methyl benzoate
E-2-Octen-1-ol	1-Nonanol
2-Methylbutanoic acid	γ -Hexalactone
E-2-Nonenol	Methyl salicylate
E, Z-2,6-Nonadienol	1-Phenylethanol
Hexanoic acid	Geraniol
Benzyl alcohol	Perillalcohol
Octanoic acid	γ-Nonalactone
Methyl cinnamate	γ-Decalactone
Nonanoic acid	Decanoic acid
γ-Dodecalactone	Dodecanoic acid

Weckerle *et al.* 2001

Compound	**Enantiomeric ratio**	
	R	**S**
1-Phenylethanol	74%	26%
Linalool	68%	32%
Methyl 2-methylbutanoate	2%	98%
Methyl 3-hydroxybutanoate	73%	27%
γ -Nonalactone	35%	65%
γ -Decalactone	79%	21%
γ-Dodecalactone	99.5%	0.5%

Weckerle *et al.* 2001

Opuntia glomerata See as ***Tephrocactus articulata.***

Opuntia guatemalensis Britton & Rose

Fruit contains Betanin (major), and an unidentified Betacyanin. Piattelli & Imperato 1969

Opuntia hickenii Britton & Rose

Candicine (%?) Nieto 1987

Opuntia humifusa Rafinesque-Schmaltz

No detectable alkaloid reported by Meyer *et al.* 1980

Lutein (A carotenoid: Xanthophyll), Carotene & possibly Rhodoxanthin (in pads). Romariz 1946.

Quercetin was reported from the pads.

See comments in **Activity Notes**.

Cho *et al.* 2006

(Wild collected in New Jersey)

Cholesterol (5.0% of total)

24ξ-Methylcholesterol (8.0% of total)

Sitosterol (87.0% of total)

Salt *et al.* 1987

Opuntia humifusa

Opuntia leuchotricha DC

Reported to contain Isorhamnetin, Quercetin & Kaempferol (Flavonols) Richardson 1978 (based on acid hydrolysis)

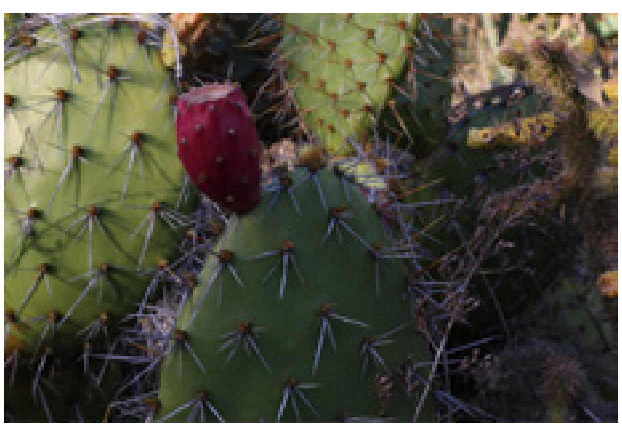
Opuntia humifusa **(=** ***Opuntia compressa*****)**
(UC) 56.0585 Georgia
above & center left

Originally wild collected in Georgia.
Photographed in December after hard freezing conditions.
This plant will recover just fine.

Opuntia littoralis
(UC) 85.1239
Santa Cruz Island, Santa Barbara Co, California
right & below

Originally wild collected in southern coastal California

Opuntia littoralis
(UC) 85.1239



Opuntia lindheimeri
(BTA)

Opuntia lindheimeri Engelmann

Meyer *et al.* 1980 reported to contain unidentified alkaloids.

Reported to contain Betacyanins as pigments. Mabry *et al.* 1963

Isorhamnetin 3-rutinoside, Isorhamnetin 3-rhamnosylgalactoside, Quercetin, and Isorhamnetin 3-galactoside (all flavonoids) in flowers. Clark & Parfitt 1980

Hyperin (Quercetin-3-galactoside), Narcissin (Isorhamnetin-3-rutinoside), Isorhamnetin-3-galactoside, Isorhamnetin-3-rhamnogalactoside (flavonol glycosides; pigments from flowers) Rösler *et al.* 1966

Del Weniger 1984 related an amusing tale concerning this species. Apparently Engelmann based this species' description on the pads of one species and the fruit of another. When discovering his error he corrected the description to being partly *O. engelmannii* and partly what he thought was a hybrid. The latter became *O. leptocarpa* "*so there is nothing left to be O. lindheimeri*"

Opuntia littoralis
(HBG)

Opuntia littoralis (Engelmann) Cockerell var. *littoralis*

Quercetin-3-glucoside, Quercetin-3-rutinoside, Isorhamnetin-3-glucoside, Isorhamnetin-3-rutinoside, Isorhamnetin-3-rhamnosylgalactoside, and Kaempferol 3-galactoside (all flavonoids) in flowers. Clark & Parfitt 1980

Opuntia littoralis (Engelmann) Cockerell var. *martiniana* (L.Benson) L.Benson

Quercetin-3-glucoside, Quercetin-3-rutinoside, Isorhamnetin-3-glucoside, Isorhamnetin-3-rutinoside, Isorhamnetin-3-rhamnosylgalactoside, and Kaempferol 3-galactoside (all flavonoids) in flowers. Clark & Parfitt 1980

Opuntia longispina Haworth

Whewellite was identified as druses. Monje & Baran 2002

Opuntia macrocentra
(Hudspeth County, Texas)

Opuntia littoralis* var. *austrocalifornica
(HBG)

Opuntia macrocentra Engelmann

Meyer *et al.* 1980 reported as containing unidentified alkaloids.

Reported to contain Betalains as pigments. Wohlpart & Mabry 1968 cited Wohlpart 1967

(as *Opuntia violaceae*) Flavonol production was found to be largely reduced when grown in the absence of UV rather than in sunlight. Berger *et al*. 2007.

Opuntia maldonadensis Arechavaleta

Hordenine (%?) DeVries *et al.* 1971

Opuntia matudae Scheinvar cv. Cuaresmeño

"Xoconostle"

Gallic, Vanillic, 4-Hydroxybenzoic acids, Catechin, Epicatechin, and Vanillin were detected in the soluble phenolic fractions of the fruit.
Guzmán-Maldonado *et al*. 2010

Opuntia megacantha

Most view as a spiny wild *Opuntia ficus-indica*.

See comments in **Activity Notes**.

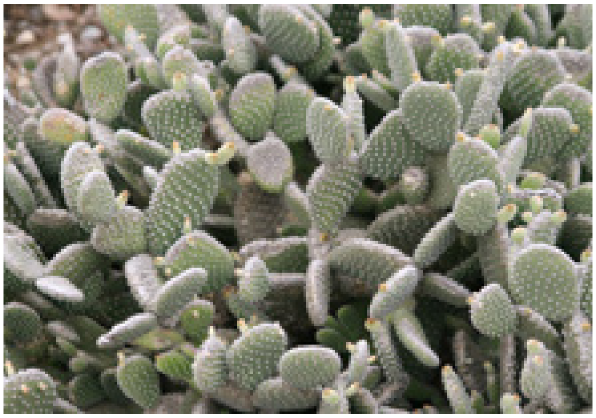
Opuntia macrocentra
(BBNP) upper left; photo by Suzie
(HBG) center left
(near Sanderson, Texas) above
(near Terlingua, Texas) below

Opuntia macrocentra
(near Sanderson, Texas)

Opuntia microdasys **(Lehmann) Pfeiffer**

Whewellite was identified as druses.

Monje & Baran 2002



Opuntia microdasys **v. *albispina***
(HBG)

Opuntia microdasys
86.1310 San Luís Potosí, México
(UC)
Even wet with rain those glochids mean trouble.

Opuntia microdasys
(Mendocino Coast Gardens)
left

variegated *Opuntia monacantha*
(Cactus Country)

variegated *Opuntia monacantha*
(Cactus Country)

Opuntia monacantha **Haworth**
Flower contains Betanin (major), and Isobetanin.
Fruit contains Betanin (30.2% of total), Isobetanin (24.8% of total), an unidentified Betacyanin, Betanidin and Isobetanidin. Piattelli & Imperato 1969
Mucilage polysaccharide - 0.53% of total weight of fresh plant.
Uronic acid content of polysaccharide: 25%
Rhamnose: arabinose, galactose, xylose (1:3:3.5:1.5)
Mindt *et al.* 1975

Opuntia penicilligera **Spegazzini**
Whewellite was identified as druses. Monje & Baran 2002

Opuntia pachypus K.Schumann
see as ***Austrocylindropuntia pachypus***

Opuntia paraguayensis **K.Schumann**
Fruit contains Betanin (major), Isobetanin, and Phyllocactin. Piattelli & Imperato 1969

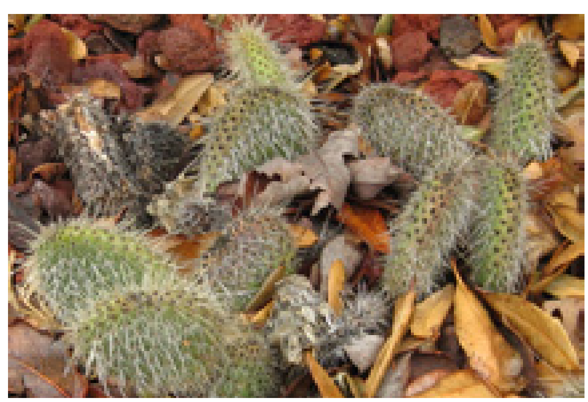
Opuntia phaeacantha **Engelmann** was reported by Meyer *et al.* 1980 to contain unidentified alkaloids.

Opuntia phaeacantha **Engelmann var. *discata* (Griffiths) L.Benson & Walkington** and **var. *major* Engelmann**
Quercetin-3-glucoside, Quercetin-3-rutinoside, Isorhamnetin-3-glucoside, Isorhamnetin-3-rutinoside, Isorhamnetin-3-rhamnosylgalactoside, and Kaempferol 3-galactoside (all flavonoids) in flowers. Clark & Parfitt 1980

Opuntia polyacantha
(SRSU)
above & lower right

Opuntia pilifera **Weber** was reported to contain no detectable alkaloids in the screenings of Fong *et al.* 1972

Opuntia phaeacantha var. _discata_ (HBG)



Opuntia monacantha
(UC) 50.2013 Argentina & Uruguay

Opuntia polyacantha **var.** ***erinacea***
(UC) 86.0921
Santa Rosa Mountains, Riverside Co., California

Opuntia polyacantha **var.** ***erinacea***
(UC) 86.1634
White Mountains, Inyo County, California

Opuntia polyacantha Haworth

Approximately 90% water by weight.

Opuntiol (0.007% dry wt) (an α-pyrone: See *O. elatior*)

Positive Mayer's test for alkaloids but none identified. Telang 1973 [Collected at Drumheller, Alberta, Canada]

Fruit contains Betanin (major), Isobetanin & Betanidin. Piattelli & Imperato 1969

***Opuntia phaeacantha* (Presidio County, Texas)**

Opuntia phaeacantha
(Hudspeth Co, Texas)

Opuntia pubescens Wendl. ex Pfeiffer See comments in Activity & Mythology notes

***Opuntia ritteri* Berger**

Fruit contains Betanin (major), Isobetanin and Phyllocactin.
Piattelli & Imperato 1969

Opuntia phaeacantha
(UC)
collected from a wild population at Cuyama,
Santa Barbara County, in southern California.

Opuntia robusta **Wendl.**

Reported to contain Isorhamnetin, Quercetin & Kaempferol (Flavonols) Richardson 1978 (based on acid hydrolysis)

Opuntia robusta
(Mendocino Coastal Gardens)

Opuntia robusta
(UC)

Opuntia **spp. hybrids**

Variable amounts of Quercetin-3-rutinoside, Quercetin-3-glucoside and Kaempferol-3-glucoside (flavonoids) were comparatively reported in the flowers of 6 hybrids (and 3 species). Clark *et al*. 1980 [Collected east of Florence, Arizona]

Opuntia streptacantha **Lemaire**

Fruit contains Betanin (major), Isobetanin, Phyllocactin & Isophyllocactin Piattelli & Imperato 1969

See comment in **Activity Notes**.

Opuntia stricta **(Haw.) Haw. (var. ?)** was reported by Meyer *et al.* 1980 to contain unidentified alkaloids.

"*Opuntia stricta*" extract. Stable as a natural food pigment. Was suggested to be a good commercial choice due to betanin concentrations and low pH.
Castellar *et al*. 2006.

Castellar *et al*. 2003 had reported 80 mg betanin /100 g fresh fruit.

Opuntia streptacantha
(BTA)

Opuntia stricta (Haw.) Haw. var. *dillenii* (Ker-Gawler) L.Benson

Unidentified alkaloids reported by Meyer *et al.* 1980.

Malic acid & Succinic acid. Meyer & McLaughlin 1982 cited Hajanarvis 1964.

Arabinogalactan (a polysaccharide composed of L-Arabinose & D-Galactose 1:3) isolated from dried fruit in 0.5% yield. Srivastava & Pande 1974

Known as Xian Ren Zhang in Chinese.

Qiu isolated (from aqueous ethanolic extract of fresh stems):
- Opuntiol (0.0032%)
- *p*-Hydroxybenzoic acid (0.0023%)
- *L*-(–)-Malic acid (0.00019%)
- Opuntioside I (0.078%) [an α-pyrone]
- 3,3'-Dimethylquercetin (0.00019%)

仙人掌 (***Opuntia dillenii***)
仙人掌 seems to be given for several *Opuntia* species.

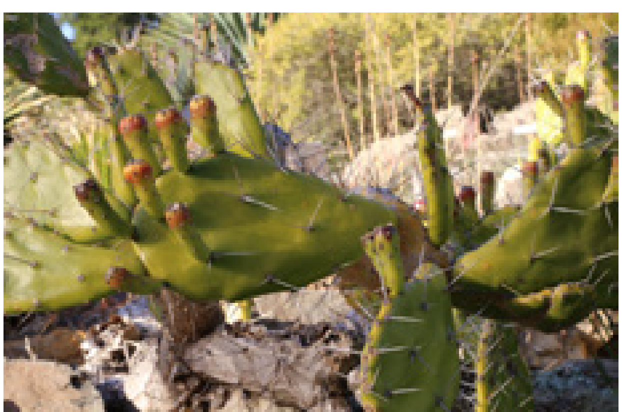
- Ferulic acid (0.00053%)
- 4-Ethoxyl-6-hydroxymethyl-α-pyrone (0.00013%)
- 1-Heptanecanol (0.0019%)
- Vanillic acid (0.00035%)
- Isorhamnetin-3-O-rutinoside (0.0070%)
- Rutin (0.00014%)
- Kaempferol 7-O-β-D-glucopyranosyl-(1→4)-β-D-glucopyranoside (0.0001%) [a flavonol glycoside]
- 3-O-Methyl quercetin 7-O-β-D-glucopyranoside (0.00015%)
- Kaempferol 7-O-β-D-glucopyranoside (0.00019%)
- Manghaslin (0.003%)
- Ethyl 3,4-dihydroxybenzoate (0.00014%)
- 3,4-Dihydroxybenzoic acid (0.00041%)

(all % as dry weights)

Plant material was harvested in Hainan, China
Qiu *et al*. 2002

Earlier (in 2000) Qiu had isolated:
- Quercetin
- 3-O-Methyl quercetin
- Kaempferol
- Kaempferide
- Isorhamnetin
- β-Sitosterol

(from Qiu *et al.* 2002 citing Qiu *et al.* 2000)



Opuntisterol [(24R)-24-ethyl-5β-cholest-9-ene-6β,12α-diol] (a novel C29-5β-sterol)
- Opuntisteroside [(24R)-24-ethyl-6β-[(β-D-glucopyranosyl)oxy]-5β-cholest-9-ene-12α-ol] (a novel C29-5β-sterol)
- β-Sitosterol
- Taraxerol
- Friedelin
- Methyl linoleate
- 7-Oxositosterol
- 6β-Hydroxystigmast-4-ene-3-one
- Daucosterol
- Methyl eucomate
- Eucomic acid

Jiang *et al*. 2006
Isolated from stems collected in Guizhou Province, China.

- Isorhamnetin-3-O-galactoside
- Isorhamnetin-3-O-glucoside
- Orientin (Luteolin 8-C-glucoside)
- Quercetin-3-O-rhamnoside (Quercetrin)
- Vitexin (Apigenin 8-C-glucoside)

Gupta *et al*. 202
Isolated from stems growing in India.

Flavonoid glycosides isolated from the combined flowers, fruit & stems were identified as :
- Kaempferol 3-O-α-arabinoside
- Isorhamnetin-3-O-glucoside
- Isorhamnetin-3-O-rutinoside

Ahmed *et al*. 2005
Material was harvested in Egypt.

Compound	pulp	peel	seed
	mg/100gm		
Betanin	18.2 ± 1.8	15.7 ± 1.8	*nd*
Isobetanin	19.1 ± 0.1	19.2 ± 1.0	*nd*
Ascorbic acid	15.1 ± 0.6	1.2 ± 0.1	*nd*
Catechin	22.7 ± 0.7	18.0 ± 0.2	35.6 ± 3.7
p-Coumaric acid	*nd*	0.6 ± 0.0	2.2 ± 0.1
Epicatechin	10.9 ± 0.2	17.1 ± 0.1	31.8 ± 1.1
Ferulic acid	*nd*	4.0 ± 0.1	10.2 ± 1.2
Gallic acid	2.7 ± 0.03	4.0 ± 0.6	2.6 ± 0.1
Quercetin	*nd*	4.6 ± 0.1	33.5 ± 1.6
Rutin	*nd*	*nd*	0.3 ± 0.0
Sinapinic acid	*nd*	*nd*	26.8 ± 1.4
nd = below detection limits		Chang *et al.* 2008	

Opuntia tomentella Berger

Fruit contains Betanin (major), Isobetanin, Phyllocactin and traces of Isophyllocactin Piattelli & Imperato 1969

Opuntia dillenii
(UC)

Opuntia stricta* var. *dillenii
(UC) 50.1999 "USA, West Indies, Venezuela"

Opuntia vulgaris

***Opuntia tomentosa* Salm-Dyck**
Citric acid (1.2% in stem juice)
Hegnauer 1964 cited Bergström 1934
Fruit contains Betanin (major), Isobetanin, Phyllocactin and traces of Isophyllocactin Piattelli & Imperato 1969

Opuntia violacea Engelmann var. *macrocentra* (Engelmann) L.Benson
See as ***Opuntia macrocentra* Engelmann**

***Opuntia vulgaris* Miller**
Hordenine (%?) DeVries *et al.* 1971
Opuntin B (new alkaloid)
4-Hydroxyproline
Tyrosine
Jiang *et al*. 2003
β-Sitosterol (used whole plant) Anjaneyulu *et al*. 1965.
Ascorbic acid & Dehydroascorbic acid.
Meyer & McLaughlin 1982 cited Giral & Alvarez 1943.
Friedelin (0.01% dry wt.), Friedelan-3α-ol (0.001% dry wt.), Taraxerone (0.0025% dry wt.) & Taraxerol (0.005% dry wt.): (triterpenoids). Chatterjee *et al.* 1976.
Fruit contains betacyanins: Betanin (major) & Isobetanin.
Piattelli & Minale 1964
Reported to show the presence of waxy materials and some sort of a rubber in the studies of De Graffe 1896.
Hobschette 1929
See comment in **Activity Notes**.

Opuntia wilcoxii

Flavonol production in was found to be largely reduced when grown in the absence of UV rather than in sunlight.
BERGER *et al.* 2007

Pachycereus calvas (WATSON) BRITTON & ROSE
See as ***Pachycereus pringlei***

Pachycereus chrysomallus (LEMAIRE) BRITTON & ROSE

Traces of unidentified triterpene(s). DJERASSI 1957 cited unpublished observations by DJERASSI & MARFEY

Pachycereus gaumeri BRITTON & ROSE
See as ***Pterocereus* (?) *gaumeri***
Pachycereus gigas (BACKEBERG) BACKEBERG
See as ***Pachycereus weberi***

Pachycereus grandis ROSE

Glucaric acid (a lactone-forming acid) (tlc)
Isocitric acid (a lactone-forming acid) (tlc & glc)
KRINGSTAD & NORDAL 1975

Pachycereus hollianus (WEBER) BUXBAUM
See as ***Lemaireocereus hollianus***

Pachycereus marginatus
(HBG)

Pachycereus marginatus
(Cactus Country)

Interestingly, if we compare the reported chemical profiles as concerns *Lemaireocereus*, *Lophocereus*, *Marginatocereus*, *Pachycereus*, *Stenocereus* and similar giant Ceroids, it suggests that this species should probably be renamed *Lophocereus marginatus*.

Pachycereus marginatus (DeCandolle) Britton & Rose

AKA "*órgano*"

Pilocereine Over 0.076% [fresh wt] (Additional alkaloid was obtained but it is unclear how much was pilocereine and what was unidentified material) Djerassi *et al.* 1954c [Collected from wild: State of Hidalgo, Mexico]
[Agurell 1969b also appears listed as a reference. He mentioned this species in passing but did not analyze it.]

Lophocereine was reported in mass fragmentography by Lindgren et al. 1971 [Djerassi *et al.* 1954c, also appears listed as a reference but did not report this alkaloid.]

Unidentified alkaloids also present. Djerassi *et al.* 1954c (Djerassi reported no detectable triterpenes)

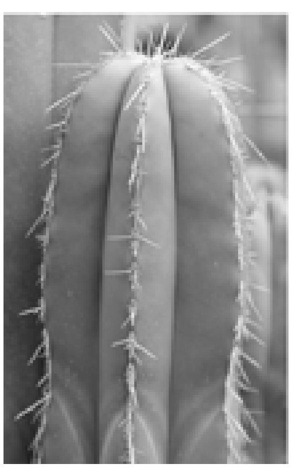
Isocitric acid (tlc & glc by Kringstad & Nordal 1975)

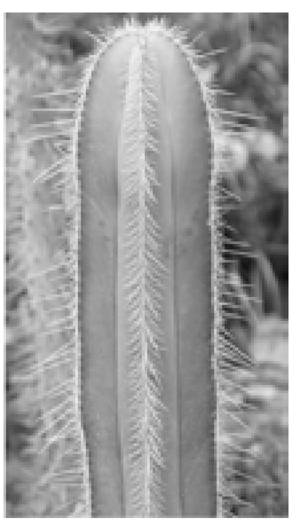
Quinic acid (tlc & glc by Kringstad & Nordal 1975)

[Unger *et al.* 1980 reported the presence of Salsolidine and N-Methylheliamine but their conclusion needs questioning. A similar discrepancy exists for *L. schottii*. See comments under its entry.]

[Cereine, Pachycereine and Ochoterenine were reported by Roca 1930. Djerassi *et al.* 1954c felt all three names should be removed from the literature due to their lack of characterization. See more details in Roca 1931 & 1932]

Pachycereus marginatus (HBG) entire page





Pachycereus marginatus
(HBG)

Pachycereus marginatus
(SRSU)

Pachycereus pecten-aboriginum (DC) Britton & Rose

Notice the discrepancies between the published accounts. Additional work is needed to adequately explain the details.

3,4-Dimethoxyphenethylamine (trace) Bruhn & Lindgren 1976 [Material from Michoacan, Mexico].

3-Hydroxy-4-methoxyphenethylamine (1-10% of 1-10 mg of total alkaloid/ 100 gm fresh) Agurell *et al.* 1971b; [Obtained via commercial sources in Germany & the Netherlands]; Strömbom & Bruhn 1978 could not detect this alkaloid; nor did Bruhn & Lundström 1976b [Both used material collected from wild: Michoacán, Mexico].

3-Methoxytyramine (detected) Strömbom & Bruhn 1978 [Sole phenethylamine they reported (major alkaloid in the phenolic fraction).]

Arizonine (detected) Strömbom & Bruhn 1978

Carnegine [Heyl 1928 isolated and named Pectenine (*pectenin*); it was shown by Späth & Kuffner 1929 to be identical to Carnegine] (However, Agurell *et al.* 1971b & Bruhn & Lindgren 1976 & Strömbom & Bruhn 1978 could NOT detect carnegine.) [Possibly detected by Unger *et al.* 1980 but MIKES does not differentiate between aromatic isomers.]

Heliamine (Minor: 22 mg from 4.3 kg fresh [as HCl]) Strombom & Bruhn 1978

Isosalsoline (detected) Strömbom & Bruhn 1978

Salsoline (detected) Strömbom & Bruhn 1978

Salsolidine (Major alkaloid: (at 282 mg from 4.3 kg fresh) by Bruhn & Lindgren 1976 & by Strömbom & Bruhn 1978 [Unger *et al.* 1980 DID NOT detect Salsolidine (using MIKES)]

Agurell *et al.* 1971b noted that other alkaloids were present but reserved presenting details for a later paper that we have not been able to locate (citing it as "*Kapadia & Agurell*")

Quinic acid (tlc & glc by Kringstad & Nordal 1975)

Unger *et al.* 1980 reported N-Methylheliamine, Weberidine & N-Methylpachycereine using MIKES. They also reported 4 other isoquinoline alkaloids but it is unclear which isomers were actually detected.

Pachycereus pecten-aboriginum

In the alkaloid screenings of SMOLENSKI *et al.* 1973, this species showed strongly positive results in the ribs, weaker results in the roots and negative results in the stem (with ribs removed?)

Pachycereus pecten-aboriginum

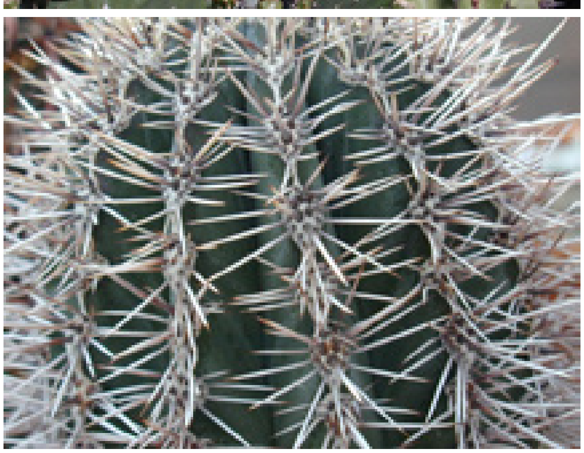
Pachycereus pecten-aboriginum

Pachycereus pringlei **(S.Wats) Br. & R.**

AKA "*saguesa*" or the "*elephant cactus*"

This species is most commonly called "*cardon*" (a name that is also used for several other Mexican Cereoids)

3,4-Dimethoxyphenethylamine (gc-ms) ["*not yet rigidly proven*"]
Carnegine (gc-ms)
N-Methylheliamine (gc-ms)
Crockett & Shulgin 1999 (Personal communication; unpublished findings)
N-Methylmescaline (gc-ms) Shulgin 2001 (Personal conversation)
Heliamine (0.017% by dry wt)
Lemaireocereine (Detected)
Tehuanine (0.05% dry wt.)
Weberine (Detected)
Mata & McLaughlin 1980d
Tehuanine-N-oxide (0.014% yield by dry wt.) Pummangura *et al*. 1982b
Glucaric acid (tlc by Kringstad & Nordal 1975)
Isocitric acid (tlc & glc by Kringstad & Nordal 1975)



[Unger *et al.* 1980 reported 5, possibly 6, quinoline alkaloids. Two were identified, as N-Methylheliamine and Weberidine, but we could not determine the isomeric identities of the others. All by MIKES.]

See comments in **Activity Notes**.

Pachycereus pringlei

Pachycereus pringlei
(BTA)

Pachycereus pringlei
The form determined to be active by Earl Crockett

Pachycereus queretaroensis (Weber) Britton & Rose See as ***Lemaireocereus queretaroensis***
Pachycereus schottii (Engelmann) Hunt See as ***Lophocereus schottii***

***Pachycereus* sp.** (unidentified; collected in Mexico) was reported to show a very strong preliminary alkaloid screening but only gave positive results in the confirmatory tests for quaternary alkaloids.
Smolenski *et al.* 1972

Pachycereus tehuantepecanus T.MacDougall & H.Bravo

[Backeberg considered this species to be synonymous with *Pachycereus pecten-aboriginum*.]
Tepenine (no details)
Tehuanine (no details)
Lundstrom 1983 & Mata & McLaughlin 1980d cited Weisenborn (personal communication 1978: Unpublished data). Kapadia *et al.* 1970c mentions that J. Weisenborn (at Squibb) first presented this in a discussion during the 5th *Ann. Meeting of the American Society of Pharmacognosy* June 22-25, 1964 (Pittsburgh, PA) and that it was planned for publication submission. It evidently never was.

Pachycereus tetetzo (A.Web.) Ochot. See as ***Cephalocereus tetetzo***
Pachycereus thurberi Britton & Rose See as ***Lemaireocereus thurberi***

Pachycereus pringlei

Pachycereus weberi (Coulter) Backeberg

AKA "*candelabro*" & "*cardon*"

Anhalidine (no quantification) Roush *et al.* 1985

Anhalonidine (0.01% dry wt.) Djerassi *et al.* 1954c. (traces) Mata & McLaughlin 1980c; (**NOT** observed by Roush *et al.* 1985)

O-Methylpellotine (no quantification) Roush *et al.* 1985; Unger *et al.* 1980

Pellotine (0.0005% dry wt.) Mata & McLaughlin 1980c; (no quantification) Roush *et al.* 1985.

5,6,7-TriMeO-THIQ (Nortehuanine) (0.0095% [as HCl] dry wt.) Mata & McLaughlin 1980c; (no quantification) Roush *et al.* 1985

7,8-DiMeO-THIQ (Lemaireocereine) (0.003% [HCl] dry wt.) Mata & McLaughlin 1980c; (no quantification) Roush *et al.* 1985 [Pummangura & McLaughlin 1981a used this species as the source of their reference material for Lemaireocereine]

7-MeO-THIQ (Weberidine) (0.00024% dry wt.) Mata & McLaughlin 1980c; (no quantification) Roush *et al.* 1985

6,7-Dimethoxy-THIQ (Heliamine) (0.0155% dry wt.; also 0.05% [all HCl]) Mata & McLaughlin 1980c; (no quantification) Roush *et al.* 1985

Backebergine (no quantification) Roush *et al.* 1985

Carnegine (no quantification) Roush *et al.* 1985

Dehydroheliamine (no quantification) Roush *et al.* 1985

Dehydrolemaireocereine (no quantification) Roush *et al.* 1985

Dehydronortehuanine (no quantification) Roush *et al.* 1985

Dehydropachycereine (no quantification) Roush *et al.* 1985

Dehydrosalsolidine (no quantification) Roush *et al.* 1985

Dehydronorweberine (no quantification) Roush *et al.* 1985

Isobackebergine (no quantification) Roush *et al.* 1985

Isonortehuanine (no quantification) Roush *et al.* 1985

Isopachycereine (no quantification) Roush *et al.* 1985

Salsolidine (detected with MIKES) Unger *et al.* 1980

Isosalsolidine (no quantification) Roush *et al.* 1985

Isonorweberine (no quantification) Roush *et al.* 1985

Norweberine (no quantification) Roush *et al.* 1985

2-Methyl-6,7-dimethoxy-THIQ (N-Methylheliamine: O-Methylcorypalline) [Detected by MIKES Unger *et al.* 1980] (0.0012% [HCl] dry wt.) Mata & McLaughlin 1980c; (no quantification) Roush *et al.* 1985

Pachycereus weberii

Pachycereus weberii
(Mesa Garden)

N-Methylpachycereine (no quantification) Roush *et al.* 1985

Pachycereine (no quantification) Roush *et al.* 1985

2-Methyl-5,6,7-triMeO-THIQ (Tehuanine) (0.105% & 0.1% [HCl] dry wt.) Mata & McLaughlin 1980c; (no quantification) Roush *et al.* 1985; Detected with MIKES (?) Unger *et al.* 1980

2-Methyl-5,6,7,8-tetraMeO-THIQ (Weberine) (0.0012 [HCl] dry wt.) Mata & McLaughlin 1980c; (no quantification) Roush *et al.* 1985; Detected with MIKES Unger *et al.* 1980

Four other THIQs were reported by Roush *et al.* 1985 but they were uncertain of the positions of the methoxy groups on the aromatic ring due to the identification by MIKES. Similarly, for the same reason, it does not appear possible to assign precise isomeric identity to several of the THIQs reported in Unger *et al.* 1980 (2 appeared to be O-Methylanhalonidine and O-Methylpellotine but we cannot state this with certainty).

Pachycereus weberi was reported to show positive results in the alkaloid screenings of Fong *et al.* 1972

[3-OH-4-MeO-PEA is listed **in error**, the reference cited, Smith 1977, does not mention this species.]

Djerassi *et al.* reported no detectable triterpenes.

Lemairin (0.018% yield by dry wt.) (a glucoside) Mata & McLaughlin 1980a

Glucaric acid (tlc by Kringstad & Nordal 1975)

Isocitric acid (tlc & glc by Kringstad & Nordal 1975)


Pachycereus weberii

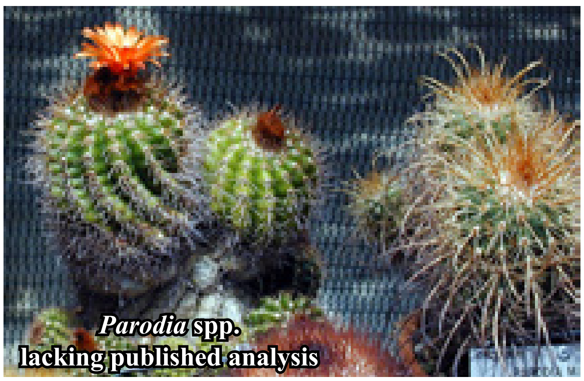
Parodia mutabilis Backeberg
Betalain pigments. Wohlpart & Mabry 1968 cited Dreiding 1961.

Parodia procera Ritter
Volatile compounds in floral scent have been studied.
Dehydrogeosmin - Minor volatile in floral scent.
Sesquiterpene alcohol 1 - Trace volatile in floral scent.
Sesquiterpene alcohol 2 - Minor volatile in floral scent.
Schlumberger *et al*. 2004 (in tepals; gc-ms)

Parodia sanguiniflora Backeberg
Betalain pigments. Wohlpart & Mabry 1968 cited Dreiding 1961.

Parodia stuemeri (Werdermann) Backeberg
Betalain pigments. Wohlpart & Mabry 1968 cited Dreiding 1961.

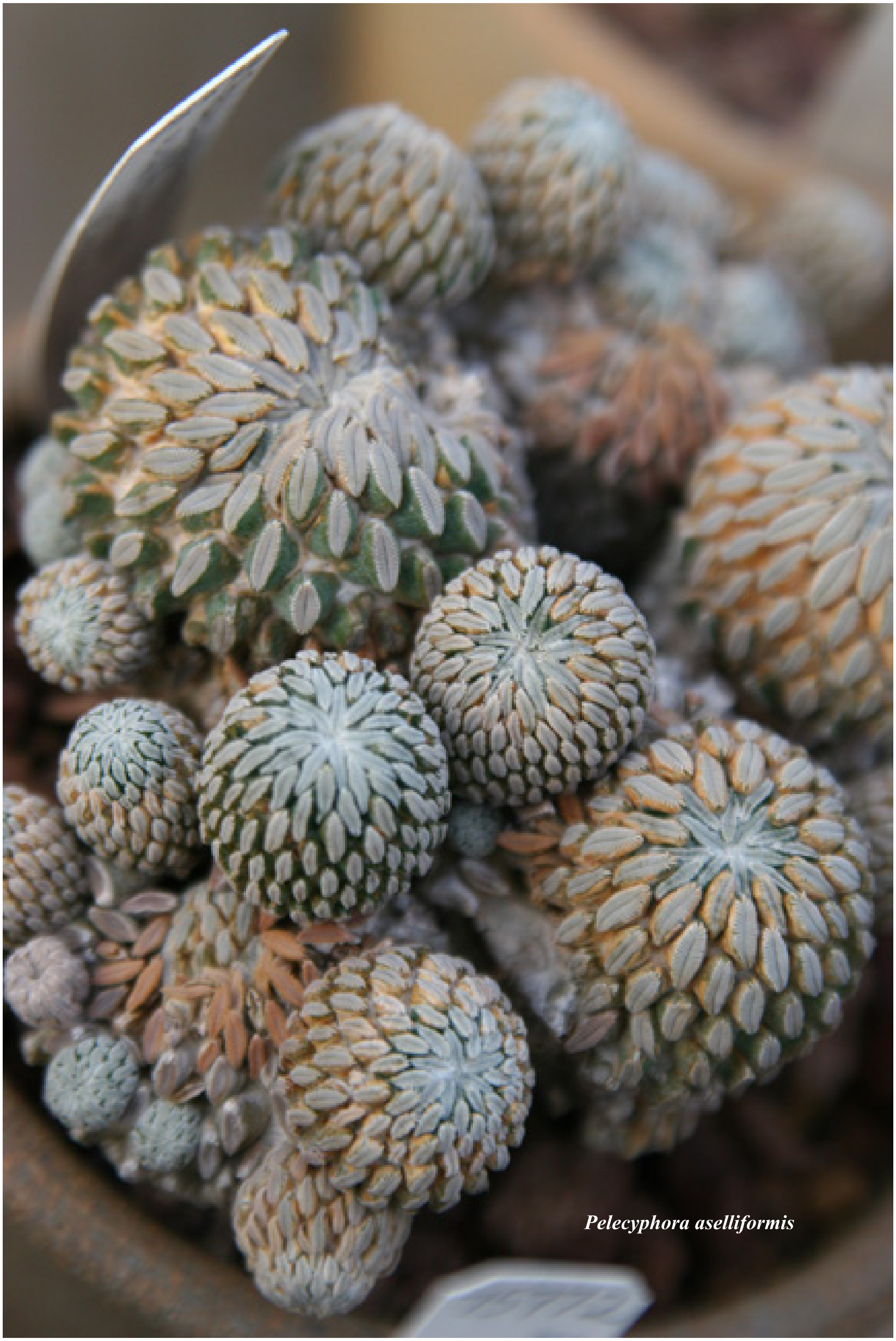
Parodia tuberculosa Cárdenas
Dehydrogeosmin - Major volatile in floral scent.
Sesquiterpene alcohol 1 - Trace volatile in floral scent.
Sesquiterpene alcohol 2 - Minor volatile in floral scent.
Schlumberger *et al*. 2004 (in tepals; gc-ms)


***Parodia* spp.**
lacking published analysis


Parodia maasii
(Kumara)

Pelecyphora aselliformis Ehrenberg
"*peyote*", "*peyotillo*" Standley 1924: 973
62% water by weight. Neal *et al.* 1972 [300 dried plants weighed 5.5 kg]
Tyramine (Less than 0.0001% [fresh wt]) Štarha 1994 [Seed grown in Czechoslovakian greenhouses]
N-Methyltyramine (0.0002% [fresh wt]) Štarha 1994
Hordenine (10-50% of the 1-10 mg of total alkaloids/ 100 grams fresh) Agurell *et al.* 1971b [Obtained via commercial source in the Netherlands]; (10-50% of 10-50 mg of total alkaloids/ 100 gm. fresh. Not major alkaloid.) Bruhn & Bruhn 1973; (Major alkaloid. 0.00063% dry wt.) Neal *et al.* 1972; (0.0007% [fresh wt]) Štarha 1994
3,4-Dimethoxyphenethylamine (trace) Neal *et al.* 1972; (0.0002% [fresh wt]) Štarha 1994
N-Methyl-3,4-dimethoxyphenethylamine (trace) Neal *et al.* 1972
N,N-Dimethyl-3-hydroxy-4,5-dimethoxy-phenethylamine (0.00018% dry wt.: Minor alkaloid) Neal *et al.* 1972; (10-50% of 10-50 mg of total alkaloids/ 100 gm. fresh: Major alkaloid) Bruhn & Bruhn 1973.
Mescaline (Less than 0.00002% dry wt.) Neal *et al.* 1972 [Plants obtained commercially. Not indicated if field collected or seed grown]; (0.003% dry wt.) Siniscalco 1983 [Plants was cultivated in Italy]; (Less than 0.0001% [fresh wt]) Štarha 1994. Not observed by other workers (including Agurell *et al.* 1971b [Material cultivated in Europe] & Bruhn & Bruhn 1973 [Material was field collected in Mexico]).
N-Methylmescaline (trace) Neal *et al.* 1972
Anhalidine (0.000067% dry wt.) Neal *et al.* 1972; (10-50% of 1-10 mg total alkaloids per 100 grams of [fresh wt]) Agurell *et al.* 1971b & Bruhn & Bruhn 1973; (Less than 0.0001% [fresh wt]) Štarha 1994
Pellotine (0.000009% dry wt.) Neal *et al.* 1972; (Less than 0.0001% [fresh wt]) Štarha 1994
[PEA, N-Me-PEA, 4-MeO-PEA and N-Me-4-MeO-PEA have been **erroneously** listed for *Pelecyphora aselliformis*. The cited reference, Neal *et al.* 1972, ran these 4 alkaloids as their dansyl-derivatives using pure reference compounds. They were **NOT** found in the plant.]
Unidentified alkaloids reported by Reko 1928.
Quinic acid (tlc & glc by Kringstad & Nordal 1975)


Pelecyphora aselliformis


Pelecyphora aselliformis

Pelecyphora aselliformis
(Living Desert)

Pelecyphora pseudopectinata Backeberg
See as ***Turbinicarpus pseudopectinatus***

Peniocereus fosterianus Cutak

Chichipegenin (a triterpene) (in stem)
Peniocerol (1% by dry wt. in root) (a sterol: cholest-8-en-3β,6α-diol)
Djerassi *et al.* 1961 [From State of Colima, Mexico]

Peniocereus greggii & *Peniocereus striatus*

See comment under **Activity Notes**.

Peniocereus greggii
(both above) lacks reported analysis

Peniocereus fosterianus

***Pereskia aculeata* Miller**
"*grosellero*" (Cuba),"*Barbados gooseberry*",
"*Spanish Gooseberry*" Standley 1924
Tyramine (no quantification) Doetsch *et al.* 1980
Citric acid (2.3% in stem juice) Hegnauer 1964 cited Bergström 1934
Betalains. Wohlpart & Mabry 1968 cited Dreiding 1961.
All CO_2 uptake occurred during the day through the stems (under well watered conditions) Nobel & Hartsock 1986
Cholesterol (2.5% of total sterols)
24ḉ-Methylcholesterol (18.7% of total sterols)
Stigmasterol (6.3% of total sterols)
Sitosterol (72.5% of total sterols)
Salt et al. 1987

Pereskia aculeata

***Pereskia autumnalis* (Eichlam) Rose**
Phenethylamine (no quantification)
Tyramine (no quantification)
Doetsch *et al.* 1980

***Pereskia bleo* DC**
Reported to contain Quercetin & Kaempferol (Flavonols)
Richardson 1978 (based on acid hydrolysis)

***Pereskia corrugata* Cutak**
Tyramine (no quantification)
3,4-Dimethoxyphenethylamine (0.0009%)
3-Methoxytyramine (no quantification)
Mescaline (0.0005% dry wt.)
Doetsch *et al.* 1980

***Pereskia cubensis* Britton & Rose**
Tyramine (no quantification) Doetsch *et al.* 1980

***Pereskia godseffiana* (Sandwith) Knuth**
Tyramine (no quantification) Doetsch *et al.* 1980

***Pereskia grandiflora* Hort.**
Tyramine (no quantification)
β-Hydroxymescaline (no quantification)
Doetsch *et al.* 1980
Betalamic acid in flowers. Piattelli 1981 cited Chang *et al.* 1974 but this reference is incorrect as they only investigated *Portulaca grandiflora*. [A number of color forms and F1 hybrids have been surveyed for betalains. Piattelli 1981 cited Ootani & Hagiwara 1969. This reference has not been located but it too may also be suspect]

***Pereskia grandifolia* Haworth**
Tyramine (no quantification)
3-Methoxytyramine (no quantification)
4-Methoxy-β-hydroxyphenethylamine (no quantification)
Doetsch *et al.* 1980
Flowers contains Betanin (major), and an unidentified Betacyanin. Also traces of Isobetanin & Phyllocactin Piattelli & Imperato 1969 [As *Rhodocactus grandifolius* (Haw.) Knuth].
Reported to contain Quercetin & Kaempferol (Flavonols) Richardson 1978 (based on acid hydrolysis)
All CO_2 uptake occurred entirely during the day through the leaves (under well watered conditions)
Nobel & Hartsock 1986

Pereskia grandifolia
(HBG)

Pereskia grandifolia
(HBG)

Pereskia grandiflora
(Gardens)

Pereskia grandifolia
(Nature's Curiosity)

Pereskia grandiflora
(Logee's)

Considered to be synonyms

Seeds of *Pereskia grandiflora* (L) next to *Pereskia grandifolia* (R)

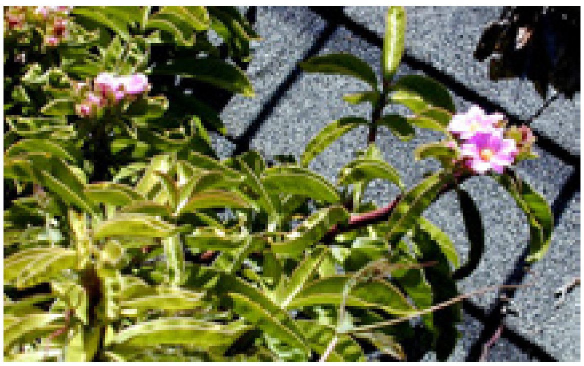
Pereskia grandifolia fruit reported to contain a saponin of oleanolic acid. Methyl oleanolate was found to be the sapogenin with D-Glucose and D-Glucuronic acid as the sugars. SAHU *et al*. 1974

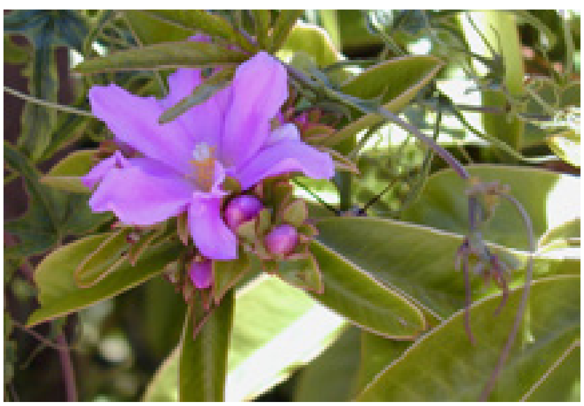
Pereskia grandifolia
(HBG)

cristate
Pereskia grandifolia

***Pereskia pititache* (Karwinsky) Britton & Rose**
Phenethylamine (no quantification)
Tyramine (no quantification)
Doetsch *et al.* 1980

***Pereskia tampicana* Weber**
Phenethylamine (no quantification)
Tyramine (no quantification)
3,4-Dimethoxyphenethylamine (0.0025%)
4-Methoxy-β-hydroxyphenethylamine (no quantification)
Mescaline (0.0013% dry wt.)
Doetsch *et al.* 1980
[3-MeO-β-hydroxy-PEA has been listed **in error**. The cited reference, Doetsch *et al.* 1980, did not report this compound.]





***Pereskia tampicana* Mexico 59.0652**

***Pereskiopsis porteri* above & right**

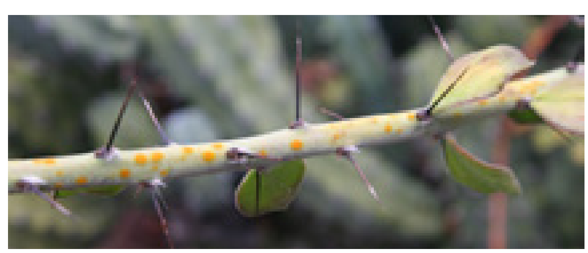
***Pereskia tampicana* Mexico 59.0652**

***Pereskiopsis chapistle* (Weber) Britton & Rose**
"*chapiztli*" Standley 1924
Phenethylamine (no quantification)
Tyramine (no quantification)
4-Methoxy-β-hydroxyphenethylamine (no quantification)
3-Methoxytyramine (no quantification)
Doetsch *et al.* 1980

***Pereskiopsis porteri* (Brandegee) Britton & Rose**
"*alcajer*" (Baja California) Standley 1924
Reported to contain Kaempferol (a Flavonol)
Richardson 1978 (based on acid hydrolysis)
88% of the CO_2 uptake occurred during the day through the leaves (under well watered conditions)
Nobel & Hartsock 1986

***Pereskiopsis scandens* Britton & Rose**
Tyramine (no quantification)
3,4-Dimethoxyphenethylamine (0.0029%)
Mescaline (0.0022% dry wt.)
Doetsch *et al.* 1980

Phyllocactus ackermannii Link See as ***Nopalxochia ackermannii***



Phyllocactus hybridus

Flower contains betacyanins: Betanin (major), Isobetanin, Phyllocactin & Isophyllocactin. PIATTELLI & MINALE 1964a & 1964b (Also MINALE *et al*. 1966 [Collected near Naples, Italy])

Pilocereus chrysacanthus WEBER

N-Methyl-3,4-dimethoxyphenethylamine (Major alkaloid. 0.006% fresh) BRUHN & SÁNCHEZ-MEJORADA 1977 [Wild collected; Puebla, Mexico]

Reported as showing no detectable alkaloids in the screenings of FONG *et al.* 1972

Quinic acid (tlc, glc & gc-ms by KRINGSTAD & NORDAL 1975)

Pilocereus chrysomallus LEMAIRE See as ***Backebergia militaris***

Pilocereus euphorbioides (HAW.) RÜMPLER See as ***Neobuxbaumia euphorbioides***

Pilocereus chrysacanthus
entire page

Pilocereus gaumeri (BR. & R.) KNUTH is **NOT** synonymous with ***Pterocereus* (?) *gaumeri***

Pilocereus giganteus RÜMPLER See as ***Carnegiea gigantea***

Pilocereus glaucescens LABOURET See as ***Cephalocereus** glaucescens*

Pilocereus gounellei (WEBER) BYLES & ROWLEY

"*alastrado*"

Unconfirmed report of caffeine (0.15-0.22%) in its seeds. HEGNAUER 1964 & MATA & MCLAUGHLIN 1982 cited FREISE 1935. This alkaloid identification is highly questionable.

Pilocereus guerreronis (BACKEBERG) BYLES & ROWLEY

N-Methyl-3,4-dimethoxyphenethylamine (~ 0.042% (~60% of 0.07% total alkaloid) [fresh wt] Recovered 0.012%.)

N,N-Dimethyl-3,4-dimethoxyphenethylamine (approximately 0.025% fresh wt. (~35% of 0.07% total alkaloid) Recovered 0.0044% as pure compound.)

O-Methylcorypalline (i.e. N-Methylheliamine) (trace)

LINDGREN & BRUHN 1976 [Wild collected; Guerrero, Mexico]

Pilocereus leucocephalus Poselger See as ***Cephalocereus leucocephalus***

***Pilocereus maxonii* (Rose) Knuth**

Tyramine (trace)
N-Methyltyramine (trace)
N-Methyl-3-methoxytyramine (0.002% dry wt.)
N,N-Dimethyl-3-methoxytyramine (0.004% dry wt.)
3,4-Dimethoxyphenethylamine (trace)
N-Methyl-3,4-dimethoxyphenethylamine (trace)
Pummangura *et al.* 1977.

Pilocereus nobilis Haworth See as ***Cephalocereus nobilis***
Pilocereus pasacana Weber See as ***Trichocereus pasacana***
Pilocereus sargentianus Orcutt See as ***Lophocereus schottii***
Pilocereus schottii (Engelmann) Lemaire See as ***Lophocereus schottii***
Pilocereus schottii Lemaire See as ***Lophocereus schottii***
Pilocereus senilis (Haw.) Pfeiffer See as ***Cephalocereus senilis***
Pilocereus thurberi Rümpler See as ***Lemaireocereus thurberi***

Pilosocereus chrysacanthus (Weber) Byles & Rowley See as ***Pilocereus chrysacanthus***
Pilosocereus gaumeri (Br. & R.) Backeberg is **NOT** synonymous with ***Pterocereus (?) gaumeri***
Pilosocereus glaucescens (Lab.) Byles & Rowley See as ***Cephalocereus** glaucescens*
Pilosocereus guerronis (Backeberg.) Byles & Rowley See as ***Pilocereus guerreronis***
Pilosocereus leucocephalus (Poselger) Byles & Rowley See as ***Cephalocereus leucocephalus***
Pilosocereus maxonii (Rose) Byles & Rowley See as ***Pilocereus maxonii***
Pilosocereus nobilis (Haw.) Britton & Rose See as ***Cephalocereus nobilis***

Pilocereus maxonii
(Entire page)

Pilosocereus pachycladus
(Cactus Country)

Trichocereus* sp mislabeled *Pilosocereus pachycladus
(Altman)

Polaskia chende **(Gosselin) Gibson & Horak**

"*chende*", "*chente*", "*chinoa*" Standley 1924: 899

3,4-Dimethoxyphenethylamine (less than or around 0.01% dry wt.) Ma *et al.* 1986

4-Hydroxy-3,5-dimethoxyphenethylamine (Around 0.01% dry wt.) Ma *et al.* 1986

Mescaline (Around or less than 0.01%.) Ma *et al.* 1986

Oleanolic acid

Oleanolic aldehyde

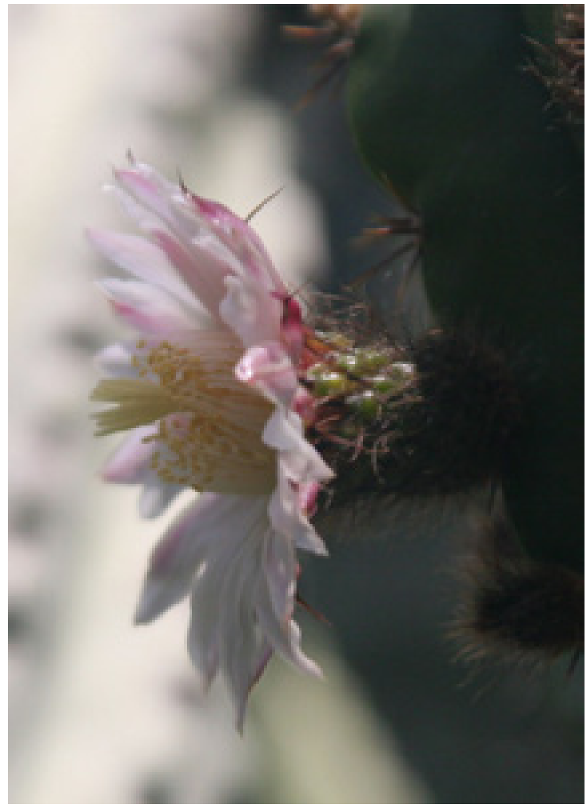
Erythrodiol

Shamma & Rosenstock 1959 (didn't include starting weight)

Strongly positive in alkaloid screening of Fong *et al.* 1972

Oleanolic acid & Chichipegenin were reported to be present. Gibson & Horak 1978 cited Bravo & Cox 1958

Polaskia chende



Polaskia chende

Polaskia chende

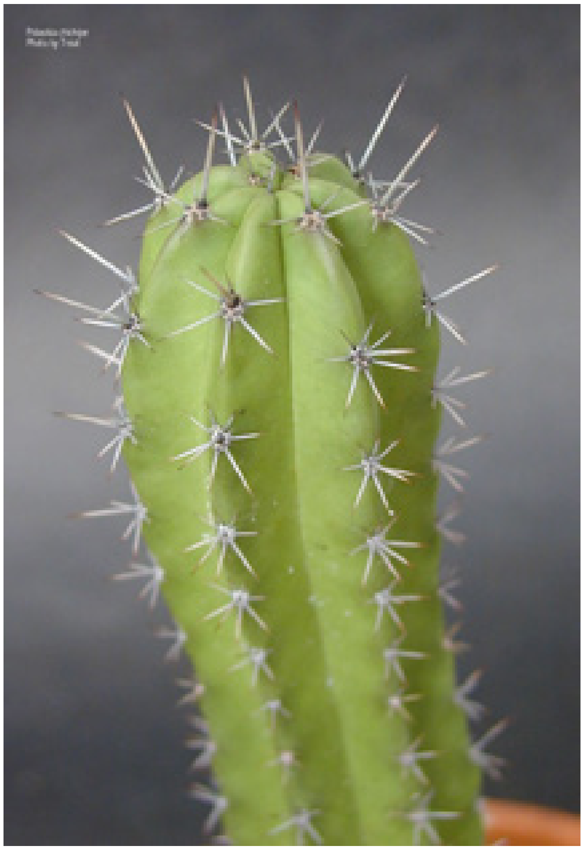
Polaskia chende

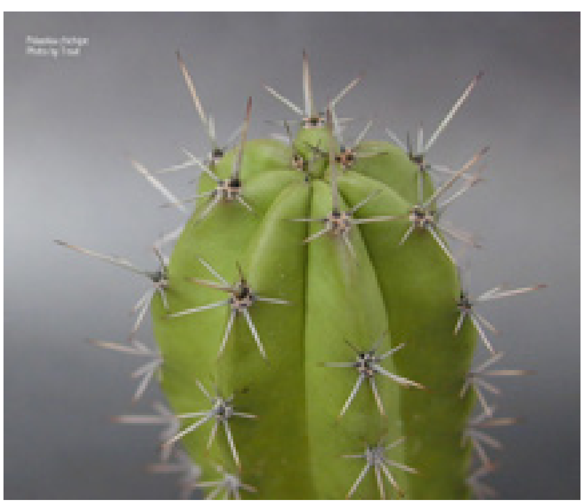
Polaskia chichipe

Polaskia chichipe
right-hand column

***Polaskia chichipe* (Gosselin) Backeberg**

"*chichipe*", "*chichibe*" Standley 1924: 898
69.8% water by wt.
Reported no detectable alkaloids.
Oleanolic acid (as 0.008% dry wt via its methyl ester)
Chichipegenin (a triterpene & tetrol) (0.083% dry wt.)
Sandoval *et al.* 1957 [Wild collected; Puebla, Mexico]
Longispinogenin Gibson & Horak 1978 cited Djerassi 1957





Polaskia chichipe

***Pseudolobivia kermesina* Krainz**

Tyramine (0.0002% dry wt.)
3,4-Dimethoxyphenethylamine (trace)
Follas *et al.* 1977

Pseudolobivia kermesina
(Berkeley Botanical Gardens)
(i.e. *Echinopsis kermesina* Argentina 68.0681)

(Photo by Johnny B. Goode)
Labeled *Echinopsis kermesina*

Pterocereus foetidus Th.MacDougall & F.Miranda

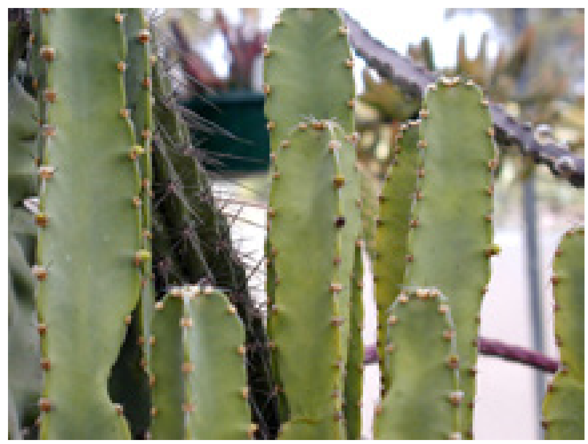
3,4-Dimethoxyphenethylamine (around 0.01% dry wt.)
4-Hydroxy-3,5-dimethoxyphenethylamine (Less than 0.01% dry wt.)
Ma *et al.* 1986

Pterocereus (?) *gaumeri* (Britton & Rose) Th.MacDougall & F.Miranda

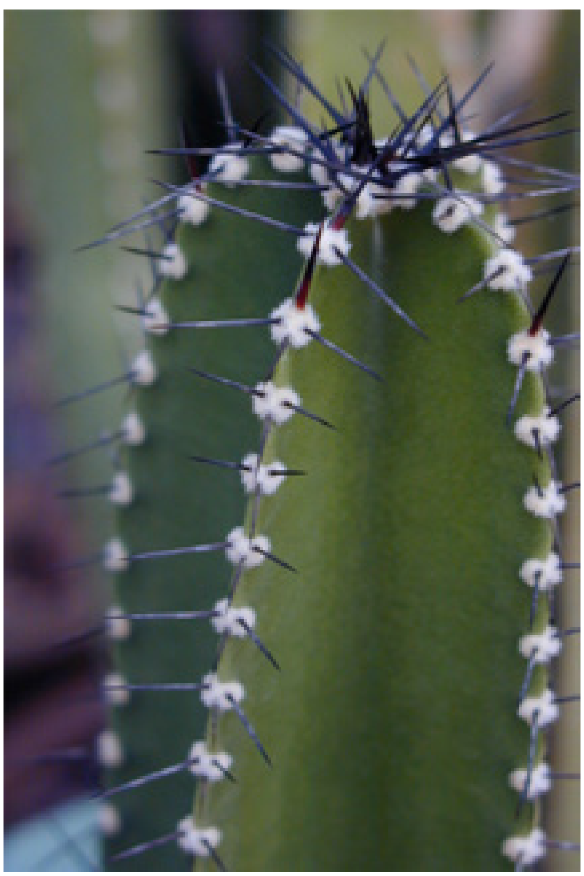
[Given by MacDougall & Miranda as a provisional name]
3,4-Dimethoxyphenethylamine (less than or around 0.01% dry wt.) Ma *et al.* 1986
4-Hydroxy-3,5-dimethoxyphenethylamine (Around or less than 0.01% dry wt.) Ma *et al.* 1986
Mescaline (Less than 0.01%) Ma *et al.* 1986
Pterocereine [a unique glucosylated cactus THIQ] (0.062% by dry wt) Mohamed *et al.* 1979
Also reported to contain the tetrahydroisoquinoline Deglucopterocereine. (yield of 0.164% dry wt) Mohamed *et al.* 1979 [This compound appears to be potentially pharmacologically active but lacks any published evaluation. It is formed via acid hydrolysis of Pterocereine so it is probable that at least part (and perhaps all) of their product was an extraction artifact.]
Unidentified alkaloids reported to present. Mohamed *et al.* 1979
Deglucopterocereine-N-oxide (0.038% yield by dry wt.) Pummangura *et al.* 1982b

Puna clavarioides (Pfeiffer)

Whewellite was identified as druses.
Monje & Baran 2002



Pterocereus gaumeri **labeled as** ***Anisocereus gaumeri*** **(HBG)**



Pterocereus foetidus **(HBG)**

Quiabentia chacoensis **(SRSU)**

***Pyrrhocactus strausianus* (Schumann) Backeberg**

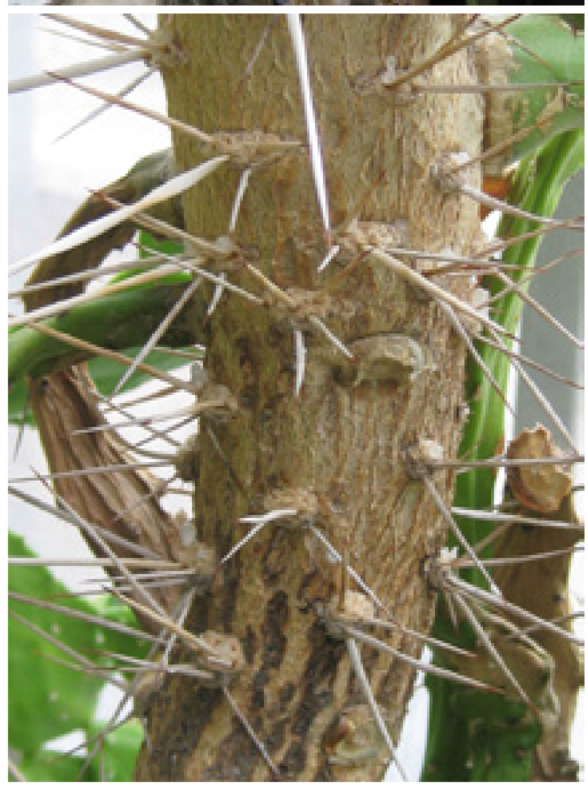
Weddellite was identified as druses, prisms & crystal sand.
Monje & Baran 2002

***Quiabentia chacoensis* Backeberg**

Reported to contain Quercetin (a Flavonol)
Richardson 1978 (based on acid hydrolysis)

88% of the daily CO_2 uptake occurred through the leaves during the daytime but some occurred at night (under well watered conditions)
Nobel & Hartsock 1986

Quiabentia chacoensis
(SRSU) entire page



Rauhocereus riosaniensis **Backeberg** needs an analysis.

Rathbunia alamosensis (Coulter) Britton & Rose See as ***Stenocereus alamoensis***

Rebutia arenacea CÁRDENAS
Dehydrogeosmin - Major volatile in floral scent.
Sesquiterpene alcohol 1 - Minor volatile in floral scent.
Sesquiterpene alcohol 2 - Minor volatile in floral scent.
SCHLUMBERGER *et al*. 2004 (in tepals; gc-ms)

Rebutia fabrisii **RAUSCH**
Emission rates varied up to 12-fold between individuals
Dehydrogeosmin - Major volatile in floral scent.
Sesquiterpene alcohol 1 - Minor volatile in floral scent.
SCHLUMBERGER *et al*. 2004 (in tepals; gc-ms)

Rebutia krainziana **W.KESSELRING**
Betalain pigments. WOHLPART & MABRY 1968 cited DREIDING 1961.

Rebutia margarethae **RAUSCH**
Weddellite was identified as druses.
MONJE & BARAN 2002

Rebutia marsoneri **WERDERMANN**
Betalain pigments. WOHLPART & MABRY 1968 cited DREIDING 1961.
Dehydrogeosmin - Major volatile in floral scent.
Sesquiterpene alcohol 1 - Minor volatile in floral scent.
Sesquiterpene alcohol 2 - Minor volatile in floral scent.
SCHLUMBERGER *et al*. 2004 (in tepals; gc-ms)

Rebutia **species upper left**
(UC Botanical Gardens)
Largely lacking published analysis

Rhipsalis baccifera **fruit**

Rebutia miniscula **K.SCHUMANN**
Betalain pigments. WOHLPART & MABRY 1968 cited DREIDING 1961.

Rebutia pseudodeminuta **BACKEBERG**
AKA "*Wallflower-crown*"
Betalain pigments. WOHLPART & MABRY 1968 cited DREIDING 1961.

Rebutia senilis **BACKEBERG**
AKA "*Fire-crown cactus*"
Betalain pigments. WOHLPART & MABRY 1968 cited DREIDING 1961.

Rhipsalis baccifera
ssp. mauritiana

***Rhipsalis baccifera* (SRU)**

Rhipsalis baccifera* ssp. *mauritiana

Rhipsalis baccifera (JS Mueller) Stearn is listed as containing unidentified alkaloid(s) by Shulgin & Shulgin but no reference was included.

***Rhipsalis capilliformis* Weber**
Citric acid (3.5% in stem juice) Hegnauer 1964 cited Bergström 1934

***Rhipsalis cassytha* Gaertner**
Citric acid (2.2% in stem juice) Hegnauer 1964 cited Bergström 1934
Listed as containing unidentified alkaloid(s) by Shulgin & Shulgin but no reference was included.
See comment in **Activity Notes**.

***Rhipsalis conferta* Salm-Dyck**
See comment in **Activity Notes**.

***Rhipsalis gaertneria* var. Mackoy**
Citric acid (2.9% in stem juice)
Hegnauer 1964 cited Bergström 1934

***Rhipsalis juengeri* Barthlott & N.P.Taylor**
(% = Relative percent of total fruit volatiles)
10-Methylundecan-2-one (36.0%)
Undecan-2-one (26.95%)
Unidentified: possibly Methyl undecenone (12.3%)
8-Methylnonan-2-one (1.918%)
Linalool (1.86%)
Styrene (2.4%)
Heptan-2-one (1.2%)
6-Methylheptan-2-one (0.4%)
9-Methyldecanal (0.217%)
Nonanal (0.2%)
Nonanone-2 (0.86%)
2-Undecanol (0.53%)
8-Methylnonanol (0.494%)
Benzaldehyde (0.352%)
6-Methylhept-5-en-2-one (0.19%)
Hexadecane (0.133%)
Decanal (0.12%)
Tetradecane (0.115%)
Octan-2-one (0.1%)
Benzyl acetone (0.097%)
Octanal (0.072%)
Benzyl acetate (0.067%)
Benzyl alcohol (0.064%)
Oct-1-en-3-ol (0.059%)
Tridecan-2-one (0.48%)
7-Methyloctan-2-one (0.035%)
Octanol (0.035%)
Dodecane (0.034%)
Naphthalene (0.03%)
Decan-2-one (0.023%)
trans-Anethole (trace)
α-Cedrene (trace)
Coumarin (trace)
p-Cymene (trace)
Limonene (trace)
3-Methylbut-2-enyl acetate (trace)
Methyl decanoate (trace)
Methyl salicylate (trace)
Phenoxyethanol (trace)
α-Pinene (trace)
α-Selinene (trace)
Schlumpberger *et al.* 2006

***Rhipsalis mesembryanthemoides* Standl.**
Mesembryanthemoidigenic acid (0.36%) (A dihydroxy triterpene acid) Tursch *et al.* 1965 [Collected in the State of Guanabara, Brazil]

***Rhipsalis paradoxa* Salm-Dyck**
Citric acid (2.3% in stem juice)
Hegnauer 1964 cited Bergström 1934

***Rhipsalis regnellii* Lindb.**
Citric acid (4.5% in stem juice)
Hegnauer 1964 cited Bergström 1934

Rhipsalis rhombea **Pfeiffer**
Citric acid (1.6% in stem juice) Hegnauer 1964 cf. Bergström 1934

Rhipsalis teres **(Vellozo) Steudel**
Appears listed as containing unidentified alkaloid(s) but either the entry included no reference or else the reference that was cited (Brown *et al.* 1968) did not mention the species.

Rhipsalis virgata **Weber**
Citric acid (1.8% in stem juice) Hegnauer 1964 cf. Bergström 1934

Rhipsalis warmingiana **K. Schumann**
Citric acid (3.1% in stem juice) Hegnauer 1964 cf. Bergström 1934
Listed as containing unidentified alkaloid(s) by Shulgin & Shulgin but no reference was included.

Rhodocactus spp. See as ***Pereskia* spp.**

Ritterocereus griseus (Haworth) Backeberg
See as ***Lemaireocereus griseus***
Ritterocereus hystrix (Haworth) Backeberg
See as ***Lemaireocereus hystrix***
Ritterocereus montanus (Britton & Rose) Backeberg
See as ***Stenocereus montanus***
Ritterocereus pruinosus (Otto) Backeberg
See as ***Lemaireocereus pruinosus***
Ritterocereus queretaroensis (Weber) Backeberg
See as ***Lemaireocereus queretaroensis***
Ritterocereus weberi (Coulter) Backeberg
See as ***Pachycereus weberi***

Rooksbya euphorbioides (Haworth) Backeberg
See as ***Neobuxbaumia euphorbioides***

Roseocactus fissuratus See as ***Ariocarpus fissuratus***

Roseocereus tephracanthus (Lab.) Backeberg = *Trichocereus tephracanthus* No analysis reported but one seems needed.

Schlumbergera bridgesii **(Lemaire) Lofgren**
Cholesterol (traces)
Avenasterol (8.5% of total)
24ç-Methylcholesterol (10.2% of total)
Sitosterol (81.3% of total)
Salt *et al*. 1987
Listed as containing unidentified alkaloid(s) by Shulgin & Shulgin but no reference was included.

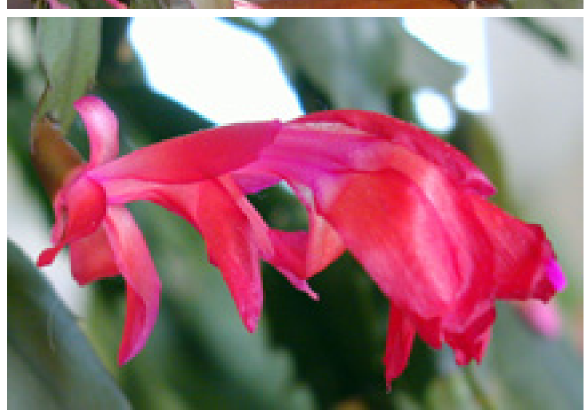
Schlumbergera russelliana **(Hooker) Britton & Rose**
Listed as containing unidentified alkaloid(s) but either the entry included no reference or else the reference that was cited (Brown *et al.* 1968) did not mention the species.

Schlumbergera truncata **(Haworth) Moran**
Analyzed as *Zygocactus truncatus* (Haworth) Schumann
"*Christmas Cactus*"
Report of "*unknown amine*" in Wheaton & Stewart 1970.
Citric acid (1.3% in stem juice) Hegnauer 1964 cf. Bergström 1934.
[It was found to contain no Isocitric acid by Sodestrom 1962.]
Reported to contain Betalains as pigments. Wohlpart & Mabry 1968 cited Dreiding 1961.
Also caffeic acid. Aardvark 2006 cf. Schultes & Raffauf 1990

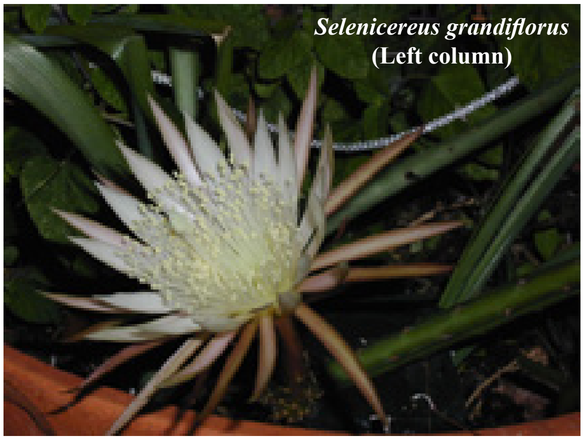
Schlumbergera* x *buckleyi **(T. Moore) Tjaden**
"*Christmas cactus*"
The betalains:
Betalamic acid
Betanidin 5-O-(2'-O-β-D-apiofuranosyl-6'-O-malonyl)-β-D-glucopyranoside
Betanidin 5-O-[(5'-O-E-feruloyl)-2'-O-β-D-apiofuranosyl-6'-O-malonyl)]-β-D-glucopyranoside
Betanin
Phyllocactin (6'-O-malonylbetanin)
Isophyllocactin
Iso-2'-apiosyl-betanin
Vulgaxanthin I
and 7 others were detected in the flowers.
Kobayashi *et al.* 2000
William Buckley produced this hybrid in the late 1840s between *S. russelliana* and *S. truncata*.

Kobayashi *et al.* 2000 made the comment that the pigments of ***Schlumbergera truncata***'s petals showed "almost the same betalain pattern as that of *Schlumbergera* x *buckleyi* petals".
Kobayashi did not include any actual details.

Selenicereus coniflorus **(Weingart) Britton & Rose**
See comment in **Activity Notes**.



Schlumbergera truncata
Plant shown may be a hybrid.
MAYBE cv. 'Firecracker'?



Selenicereus grandiflorus **(Left column)**

Selenicereus grandiflorus **(Linnaeus) Britton & Rose**
"*gigante*" (Durango), "*organillo*" (Tamaulipas) Standley 1924
Tyramine (0.3% dry wt.) Wagner & Grevel 1982a
Hordenine (0.001% dry wt.) Petershofer-Halbmeyer *et al.* 1982
[N-methyltyramine appears to be an **erroneous** entry in the literature. EAMP 1999. See comments in **Activity Notes**.]
Unidentified alkaloid(s) reported in Brown *et al.* 1968 (3 major and 4 minor alkaloids; one of which had a MW of 330+-25.)
[An uncharacterized alkaloid named Cactine was previously reported by Sultan 1891.]
Claims of digitalis-like cardioactive glycosides, appearing in the literature, are ALL unsupported errors.
See additional comments in **Activity Notes**.
Reported to contain Betalains as pigments. Wohlpart & Mabry 1968 cited Dreiding 1961.
Flavonol-3-glycoside, and two glycosides of Isorhamnetin (Isorhamnetin-3-β-galactoside AKA Cacticin: 0.02% dry wt. & Isorhamnetin-3-β-rutinoside AKA Narcissin & Lycorine: 0.05% dry wt.) were isolated from flowers by Hörhammer *et al*. 1966.

Selenicereus pteranthus **(Lk. & O.) Br. & R.**
Hordenine (0.002% dry wt.) Petershofer-Halbmeyer *et al.* 1982

Soehrensia bruchii (Br. & R.) Backeberg see as ***Trichocereus bruchii***

Solisia pectinata **(B.Stein.) Britton & Rose**
N-Methyltyramine (10-50% of 10-50 mg of total alkaloids/ 100 gm. fresh.)
Hordenine (Over 50% of 10-50 mg of total alkaloids/ 100 gm. fresh.)
Bruhn & Bruhn 1973

Solisia pseudopectinata Backeberg
See as ***Pelecyphora pseudopectinata***

Stenocactus multicostatus (Hildmann) A.Berger
See as ***Echinofossulocactus multicostatus***

Stenocereus alamosensis

Stenocereus alamosensis (COULTER) A.GIBSON & HORAK

AKA "*cina*" or "*sina*"

Interestingly, this analysis suggests that this species might be better grouped with the species we have listed under *Lemaireocereus*.

Oleanolic acid was reported to be present. GIBSON & HORAK 1978 cited BIRD 1974

Gummososide A methyl ester

Gummososide A

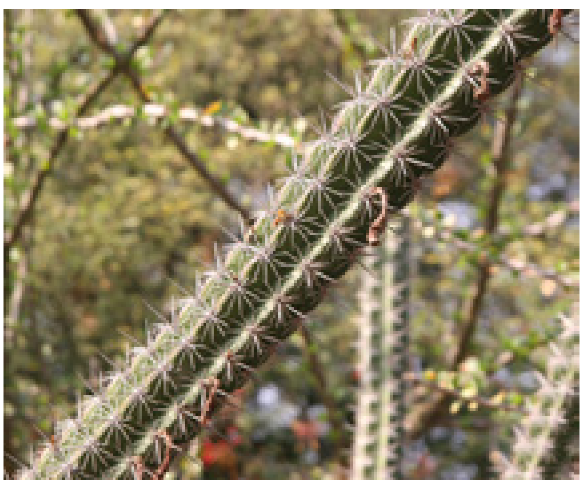
KAKUTA *et al*. 2012

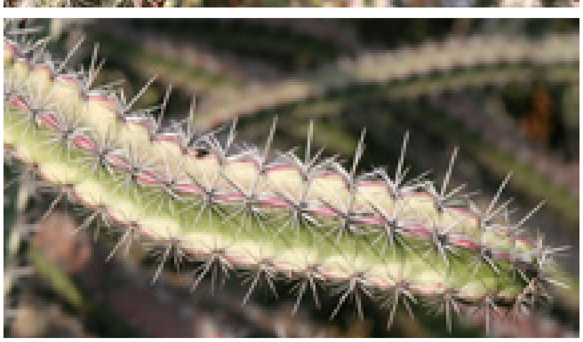
KIRCHER 1982 lists Longispinogenin as being present in higher concentrations than in *Machaereocereus gummosus* and the sterol diols being lower. Gummosogenin, Machaeric acid and Machaerinic acid also present but no details included.

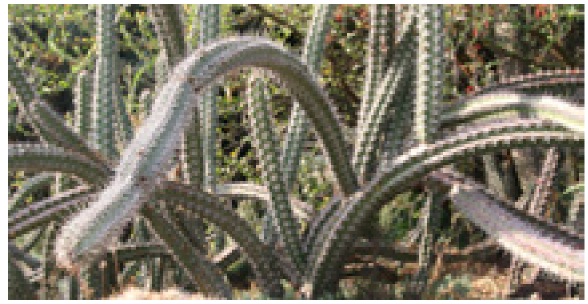
tlc examination showed no detectable alkaloids and the very strong presence of triterpene glycosides: KIRCHER 1982

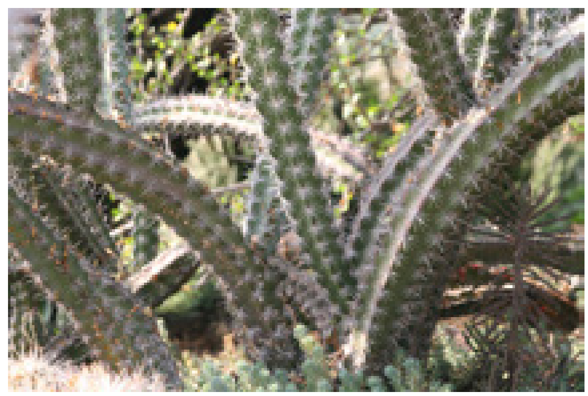
Lipid content was 5.6% by dry weight: KIRCHER 1982

See comment in **Activity Notes.**

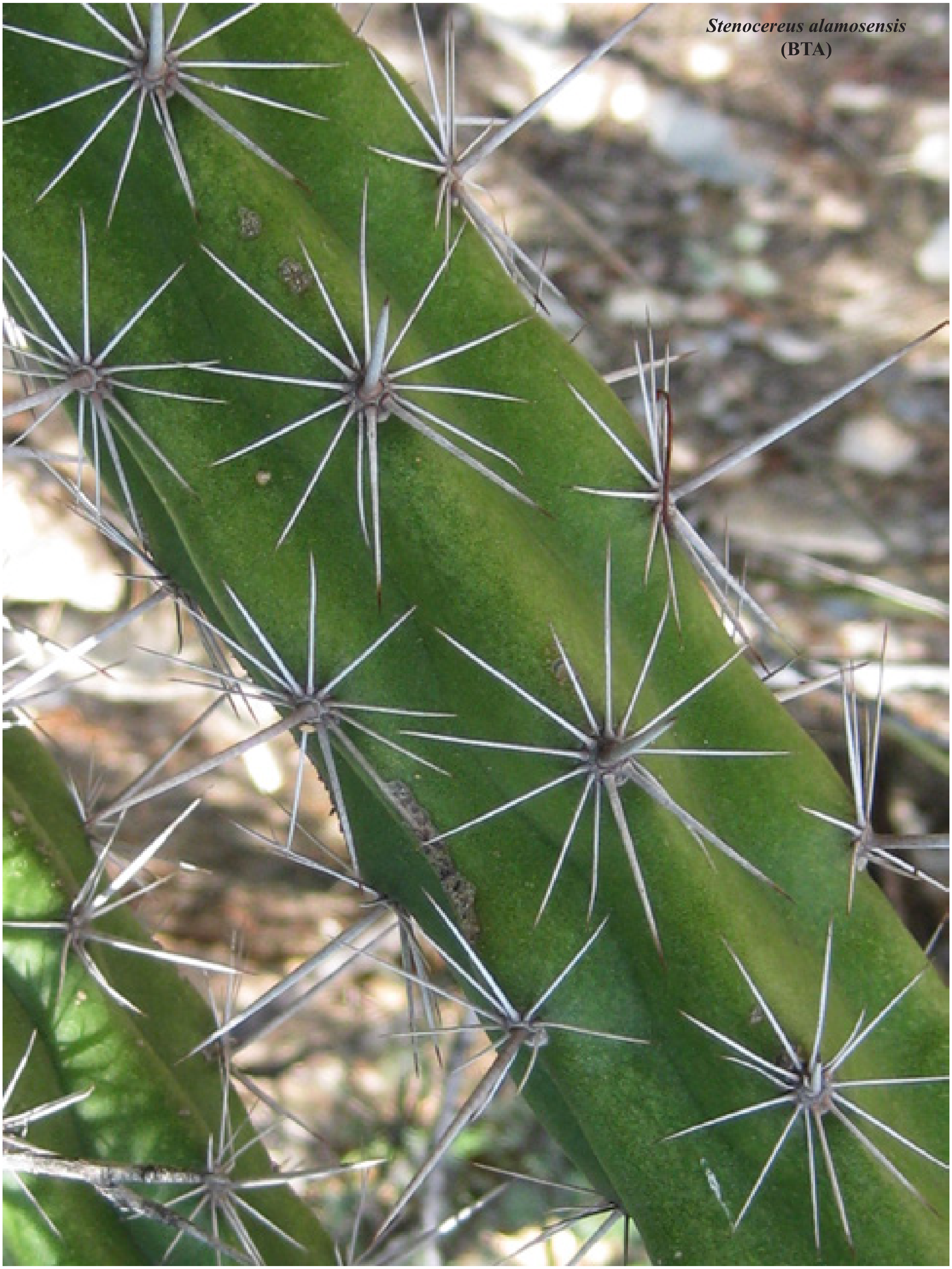








Stenocereus alamosensis


Stenocereus alamosensis
(BTA)

Stenocereus beneckei **(Ehrenberg) Buxbaum**

3,4-Dimethoxyphenethylamine (less than or around 0.01% dry wt.) Ma *et al.* 1986 (HBG 32973)

4-Hydroxy-3,5-dimethoxyphenethylamine (Around 0.01% dry wt.) Ma *et al.* 1986

Mescaline (Less than 0.01%.) Ma *et al.* 1986

Queretaroic acid (A dihydroxy triterpene acid; in hydrolyzed saponin) No isolation details included. Djerassi *et al.* 1955a. [Also isolated by Djerassi *et al.* 1956b]

Lupenone (wax component) (0.12% by dry wt) Kinoshita *et al.* 1992 (Also by Wollenweber & Dörr 1995)

Lupeol (wax component) (0.04% by dry wt) Kinoshita *et al.* 1992 (Also by Wollenweber & Dörr 1995)

Oleanolic acid (detected; in hydrolyzed saponin) Djerassi *et al.* 1956b

β-Amyrin (In the surface wax; in a 1:1:3 ratio with Lupeol & Lupeone) [Grown in Germany] Wollenweber & Dörr 1995

Stenocereus beneckei
(Entire page)

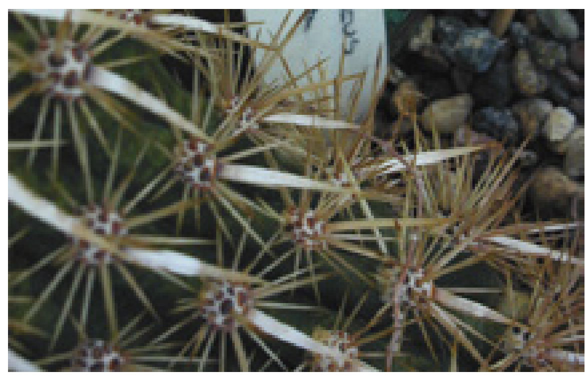
Stenocereus chende (Gosselin) Byles & Rowley See as ***Polaskia chende***
Stenocereus chichipe (Gosselin) Byles & Rowley See as ***Polaskia chichipe***
Stenocereus dumortieri (Scheidw.) Buxbaum See as ***Lemaireocereus dumortieri***

Two lectins (MEAI and MEAII) were isolated and partially characterized. They were the first lectins to be isolated from cacti.
Zenteno *et al*. 1988
Zenteno described the purified lectins as being "*glycoproteins containing 36% (MEA$_I$) and 24% (MEA$_{II}$) of total carbohydrate, respectively. They do not contain sialic acid, but are rich in glucose, galactose, L-rhamnose and xylose; in addition, mannose is present as well as some L-arabinose in MEA1.*"

Stenocereus eruca
(All HBG except for top left image at Cactus Country)

Stenocereus eruca (Brandegee) Gibson & Horak

"*chirinola*", "*chirinole*", "*chilenola*" Standley 1924:
3,4-Dimethoxyphenethylamine (less than 0.01% dry wt.) Ma *et al.* 1986 (Baja, Mexico; AC Gibson 3625)
4-Hydroxy-3,5-dimethoxyphenethylamine (Around 0.01% dry wt.)[?] Ma *et al.* 1986
Mescaline (Less than 0.01% [?]) Ma *et al.* 1986
Stellatogenin (a triterpene) 0.07% [fresh wt] (3.1 gm from 4.5 kg [fresh wt]) Djerassi *et al.* 1955b
Betulinic acid (a triterpene) (Identified as present via the methyl ester) Djerassi *et al.* 1955b.
Other compounds appeared to be present: Djerassi *et al.* 1955b.
(Analysis usually as *Machaerocereus eruca*)



Betulinic acid
Machaerogenin (new) 111 mg from 67.8 g dry
Oleanolic acid
Stellatogenin
Thurberogenin
Koyama *et al.* 1993 (aerial parts)

A germanicane derivative:
3α,19*R*-dihydroxygermanican-28-oic acid (They named Machaeroceric acid.)
Three new lupane derivatives:
21-Ketobetulinic acid
16α-Hydroxybetulinic acid
22α-Hydroxystellatogenin
Four new triterpenes,
Morolic acid
Queretaroic acid
27-Desoxyphillyrigenin
Treleasegenic acid (3α-hydroxytaraxastan-28,20α-olide)

Stenocereus eruca

and four known triterpenes
Betulinic acid
Oleanolic acid
Stellatogenin
Thurberogenin
YE *et al*. 1998

Oleanolic acid
Thurberogenin
Queretaroic acid
Treleasegenic acid
Machaerogenin
Morolic acid
Machaeroceric acid
21-Ketobetulinic acid
16*β*-Hydroxybetulinic acid
22*β*-Hydroxystellatogenin
Desoxyphyllyrigenin
Stellatogenin
Betulinic acid
YANG *et al.* 1998

Two new triterpene saponins:
3-O-β-D-xylopyranosyl-(1→2)-β-D-glucopyranosyl-(1→2)-β-D-glucuronopyranosyl stellatogenin (They named it Stellatoside B.)
3-O-α-L-rhamnopyranosyl-(1→2)-[a-L-rhamnopyranosyl-(1→3)]-β-D-glucuronopyranosyl betulinic acid 28-O-α-L-rhamnopyranosyl ester (They named it Erucasaponin A.)
OKAZAKI *et al*. 2007

Stellatoside C, D & E
Stellatoside B methyl ester
Stellatoside C methyl ester
Thurberoside A
Phillyriside A
Treleaseside A
KAKUTA *et al*. 2012 (all new triterpene saponins)

See comments in **Activity Notes**.

Stenocereus griseus (HAWORTH) BUXBAUM See as ***Lemaireocereus griseus***
Stenocereus gummosus (BRANDEGEE) A.GIBSON & HORAK See as ***Machaerocereus gummosus***
Stenocereus hystrix (HAWORTH) BUXBAUM See as ***Lemaireocereus hystrix***
Stenocereus longispinus (BR. & R.) BUXBAUM See as ***Pachycereus marginatus***
Stenocereus marginatus (DECANDOLLE) BUXBAUM See as ***Pachycereus marginatus***
Stenocereus montanus (BRITTON & ROSE) BUXBAUM See as ***Lemaireocereus montanus***
Stenocereus pruinosus (OTTO) BUXBAUM See as ***Lemaireocereus pruinosus***
Stenocereus queretaroensis (WEBER) BUXBAUM See as ***Lemaireocereus queretaroensis***
Stenocereus quevedonis (G.ORTEGA) BUXBAUM See as ***Lemaireocereus quevedonis***

Stenocereus eruca
(Cactus Country)

Stenocereus stellatus **(Pfeiffer) Riccobono**

"*tuna*", "*joconostle*" Standley 1924: 899

87.4% water by weight Djerassi *et al.* 1955b

3,4-Dimethoxyphenethylamine (around 0.01% dry wt.)

4-Hydroxy-3,5-dimethoxyphenethylamine (around 0.01% dry wt.)

Mescaline (0.01% dry wt.) Ma *et al.* 1986 (**HBG 34963**)

Stellatogenin (a neutral triterpene lactone (80% of neutral fraction); first isolation but not clear if *S. eruca* or *S. stellatus* was first) (2.2% by dry weight) [In another experiment in same paper they obtained 1.7% (crude)] Also in Koyama *et al*. 1993

Thurberogenin 15% of neutral fraction [Djerassi 1957 thought this might be an artifact] Also in Koyama *et al*. 1993

Oleanolic acid (0.009% by dry wt) (Isolated via the methyl ester) [Also in Koyama *et al*. 1993]

Betulinic acid (0.376% by dry wt) (Isolated via the methyl ester) Djerassi *et al.* 1955b [Collected: Mexico] Also Koyama *et al*. 1993

16-β-Hydroxystellatogenin (new) 24 mg from 52.9 gm dry.

Machaerogenin (new) 31 mg from 52.9 gm dry.

Koyama *et al*. 1993 (aerial parts)

Stellatogenin 3-O-α-L-rhamnopyranosyl(1→4)-α-L-rhamnopyranosyl-(1→2)-β-D-glucuronopyranoside (They named it Stellatoside) 0.01% in cultivated plants and 0.22% in wild ones (dry weight).

Oleanolic acid 3-O-α-L-rhamnopyranosyl(1→3)-β-D-glucuronopyranosyl 28-O--D-glucopyranoside (0.10% in cultivated plants and 0.02% in wild ones).

Imai *et al*. 2006

Species was reported as containing triterpenoid saponins but devoid of alkaloid; according to Djerassi & Lippman 1954 & Djerassi *et al.* 1954c; citing L.H. Liu (unpublished observation from Djerassi's lab)

Flower contains Betanin, Phyllocactin, Isobetanin, 2 unidentified Betacyanins & traces of Isophyllocactin. Piattelli & Imperato 1969

Stenocereus thurberi (Engelmann) Backeberg
See as ***Lemaireocereus thurberi***

Stenocereus thurberi (Engelmann) Buxbaum
See as ***Lemaireocereus thurberi***

Stenocereus stellatus
(Huntington Botanical Gardens)
entire page

Stenocereus treleasei **(Britton & Rose) Backeberg**

"*tunillo*" Standley 1924: 899

82.6% water by weight

3,4-Dimethoxyphenethylamine (around 0.01% dry wt.)

4-Hydroxy-3,5-dimethoxyphenethylamine (Around 0.01% dry wt.)

Mescaline (0.01% dry wt.) Ma *et al.* 1986

Stellatogenin 0.64% dry wt. [Also observed in Djerassi & Mills 1958]

Thurberogenin 0.02% dry wt. [Djerassi 1957 thought this might be an artifact]

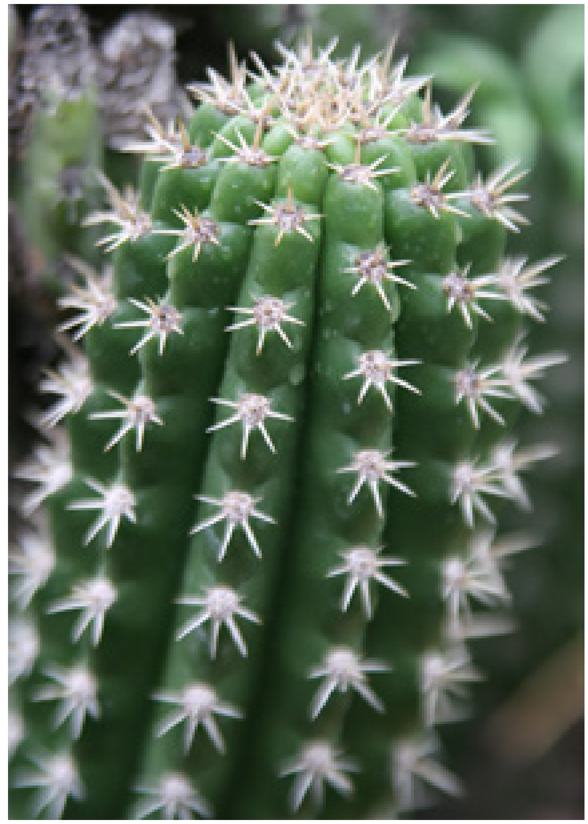
Oleanolic acid 0.1% (via its methyl ester) [Also observed in Djerassi & Mills 1958]

Would not rule out possibility of traces of Betulinic acid.

Djerassi *et al.* 1956a [Collected in Oaxaca, Mexico].

Treleasegenic acid (a triterpene) Djerassi & Mills 1958

Oxyallobetulin was also listed in Djerassi 1957 who thought this might be an artifact.



Stenocereus weberi (Coulter) Riccobono. See as ***Pachycereus weberi***

Stenocereus weberi (Coulter) Buxbaum See as ***Pachycereus weberi***

Stenocereus treleasei
(HBG) entire page

Stenocereus treleasei
(HBG)

Stetsonia coryne **(Salm-Dyck) Britton & Rose**

Tyramine (10-50% of 1-10 mg of total alkaloids/ 100 grams fresh.)
N-Methyltyramine (1-10% of 1-10 mg of total alkaloids/ 100 grams fresh.)
3-Methoxytyramine (Over 50% of the 1-10mg of total alkaloids/ 100 grams fresh.)
3,4-Dimethoxyphenethylamine (trace)
Mescaline (0.1-1.0 mg. per 100 grams fresh.)
Anhalonidine (trace)
Anhalidine (trace)
Agurell *et al.* 1971b [Obtained via commercial sources in Germany & the Netherlands] (Did not analyze for 4° amines such as coryneine.)
Coryneine (1% dry wt.) Reti *et al.* 1935 [Collected from the wild in Argentina.]
[Oxycandicine is simply a synonym for Coryneine.]

Stetsonia coryne
(HBG)
above & right column

Stetsonia coryne
(LA Arboretum)

Stetsonia coryne
(maybe var. *procera*?)
(LA Arboretum)

Stetsonia coryne
(HBG)

Stetsonia coryne
(LA Arboretum)

Strombocactus disciformis **(DC) Br. & R.**
Reported to contain Isocitric acid (tlc & glc by Kringstad & Nordal 1975)

Strombocactus disciformis

monstrose *Strombocactus disciformis*

Tephrocactus articulatus (Pfeiffer) Hunt

Whewellite was identified as druses.

Monje & Baran 2002 [Examined as *Tephrocactus articulatus* and seperately as *Tephrocactus glomeratus*)

Tephrocactus aurantiaca Lindley

Hordenine (%?) DeVries *et al.* 1971

Mucilage determined to be comprised of Arabinose (30.8%), Galactose (38.3%), Galacturonic acid (6.6%), Rhamnose (10.3%) & Xylose (14.0%). Moyna & DiFabio 1978 (Analyzed **MAM 1307**)

Tephrocactus articulata

Tephrocactus glomeratus
(HBG) considered synonymous with *T. articulata*

Thelocactus bicolor
(Cactus Country)
lower right two images

Tephrocactus soehrensii (**Britton & Rose) Rowley**

Reported to contain Betalains as pigments.
Wohlpart & Mabry 1968 cited Dreiding 1961.

Tephrocactus soehrensii
(HBG)

Thelocactus bicolor **(Galeotti) Britton & Rose**
AKA *Glory of Texas*
Reported to contain unidentified alkaloids. Chalet 1980a cited Dominguez *et al*. 1969
Itesmol (a steroid; 0.15% dry wt.) Dominguez *et al*. 1968
Eisacol (a triterpenoid) Dominguez *et al*. 1968
Two unidentified components. Dominguez *et al*. 1968
Reported to contain Betalains as pigments. Wohlpart & Mabry 1968 cited Dreiding 1961.

Thelocactus bicolor

Thelocactus pseudopectinatus (Backeberg) Anderson & Boke See as ***Pelecyphora pseudopectinata***

Thelocactus **spp.** A number of *Thelocactus* species were said to have been found devoid of alkaloid but their specific identities were not included. West *et al*. 1974

Thelocactus lophothele

Thelocactus lophothele

Thelocactus rinconensis

Two names appeared that seem to have created a divergent mess involving the name "*bicolor*".

Terán & Berlandier, 1832 published *Cactus bicolor* (now *Thelocactus setispinus*) This appears to be what Johnson decided to name *Hamatocactus bicolor* despite what many other authors seem to make of it. (Benson called this *Ferocactus setispinus*.)

Galeotti ex Pfeiff. 1848 published *Echinocactus bicolor* (now *Thelocactus bicolor*) Taylor called it *Ferocactus bicolor* in 1979.

I am not sure how Anderson or Hunt merged I.M. Johnson's *bicolor* with *Thelocactus bicolor*'s history. It is listed as renaming Galeotti ex Pfeiffer's plant but according to others Johnson renamed Terán & Berland's plant (*setispinus*).

The declarations of synonymity go much farther in terms of apparent errors in both directions with *T. bicolor* descriptions being lumped with *setispina* being declared a synonym while others have Teran & Berlandier included with *bicolor* while preserving *setispina* on its own. Its totally schizoid.

***Thelocactus bicolor* subsp. *bicolor* :**

Echinocactus bicolor Galeotti ex Pfeiffer, 1848
Echinocactus bicolor var. *pottsii* Salm-Dyck, 1850
Echinocactus bicolor var. *schottii* Engelmann, 1856
Echinocactus bicolor var. *tricolor* K. Schumann, 1898
Echinocactus wagnerianus A. Berger, 1929
Ferocactus bicolor (Galeotti ex Pfeiff.) N.P. Taylor, 1979
Thelocactus bicolor subsp. *commodus* (R.Haas) Doweld, 1999
Thelocactus bicolor subsp. *zwakii* Chvastek & Halda, 2000
Thelocactus bicolor var. *commodus* R. Haas, 1988
Thelocactus bicolor var. *pottsii* (Salm-Dyck) Backeberg, 1961
Thelocactus bicolor var. *schottii* (Engelmann) Krainz, 1961
Thelocactus bicolor var. *tricolor* (K. Schumann) Y. Ito, 1952
Thelocactus bicolor var. *wagnerianus* (A. Berger) Krainz, 1961
Thelocactus schottii (Engelmann) Kladiwa & Fittkau, 1975
Thelocactus wagnerianus A. Berger, 1929

***Thelocactus setispinus*:**

Cactus bicolor Terán & Berlandier, 1832
Echinocactus hamatus Muehlenpfordt, 1848
Echinocactus muehlenpfordtii Fennel, 1847
Echinocactus setispinus Engelmann, 1845
Echinocactus setispinus var. *cachetianus* Labouret, 1853
Echinocactus setispinus var. *hamatus* (Muehlenpfordt) Engelmann, 1850
Echinocactus setispinus var. *mierensis* K. Schumann, 1898
Echinocactus setispinus var. *orcuttii*
Echinocactus setispinus var. *setaceus* Engelmann, 1850
Ferocactus setispinus (Engelm.) L.D. Benson, 1969
Hamatocactus bicolor (Terán & Berlandier) I.M.Johnston, 1924
Hamatocactus setispinus (Engelmann) Britton & Rose, 1922
Hamatocactus setispinus var. hamatus (Muehlenpfordt) Borg, 1937
Thelocactus setispinus (Engelmann) E.F. Anderson, 1987
Thelocactus setispinus var. cachetianus (Labouret) Pilbeam, 1996
Thelocactus setispinus var. hamatus (Muehlenpfordt) Pilbeam 1996
Thelocactus setispinus var. mierensis (K. Schumann) Pilbeam 1996
Thelocactus setispinus var. muehlenpfordtii (Fennel) Pilbeam 1996
Thelocactus setispinus var. orcuttii (K. Schumann) Pilbeam 1996

Thelocactus setispinus
(East of Rio Grande City, Starr County, Texas) left
(SRSU) right


Thelocactus bicolor
(Cactus Country)

Thelocactus sausseri
(HBG)
above

Thelocactus rinconensis
(Cactus Country)

Thelocactus* sp. unlabeled possible *hexaedrophorus
(Cactus Country)
below

Trichocereus* aff. *huanucoensis

It would be quite surprising if this, not atypical, *pachanoi* did not contain mescaline.

Trichocereus andalgalensis (Weber) Kreuzinger

Hordenine (%?) Nieto 1987
Candicine (%?) Nieto 1987

Great confusion exists in horticulture concerning this plant. Several combinations have been made under this name involving at least two separate plants. See Ritter for a discussion.

Trichocereus andalgalensis
Above: probably = *T. huascha* (see also) (UC)
Below: probably = *Lobivia andalgalensis* (SS)

Trichocereus argentinensis n.n. Hort. B.Ressler

A stout *peruvianoid-macrogonoid* said to reach up to 8-9-(10?) inches in diameter. Initially mislabeled *Cereus argentinensis*, it is assumed to have originated in northern Argentina.

In pictures it looks very bluish-blushed (See Ressler's website) and interestingly similar to what is pictured on page 41 in Innes & Glass 1991 mislabeled *Cereus peruvianus* with its origin given as Argentina! Roberto Kiesling, in correspondence, insists that nothing like this occurs in Argentina and the origin information is mistaken.

Needs an analysis and taxonomic study. It is diffucult to imagine this does nto contain mescaline.

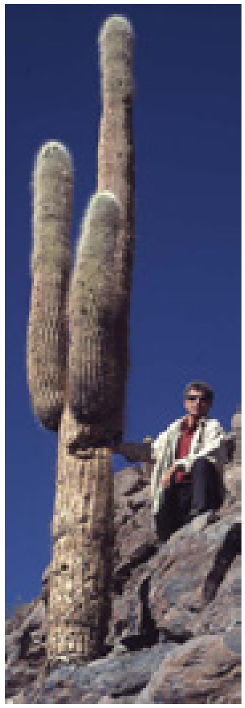
Also see an authentic *Cereus argentinensis* in Innes & Glass 1991

***Trichocereus argentinensis sensu* Bob Ressler**

Trichocereus atacamensis
Photo by Jon Hanna

Trichocereus atacamensis
(PHILIPPI) MARSHALL
(San Pedro de Atacama, Chile)

Needs an analysis.
See comment in **Activity Notes**.



Trichocereus atacamensis
San Pedro de Atacama, Chile

Photos by correspondent requesting anonymity

Trichocereus bridgesii
(Bolivia)
Photo by correspondent requesting anonymity

Trichocereus macrogonus **(GF) above**
Trichocereus bridgesii **f.** ***brevispinus*** **(Field) right**
Trichocereus macrogonus giganteus **(NMCR) below**

Trichocereus peruvianus **form (Matucana)**
Photo by Grizzly (wild plant)

Trichocereus bridgesii **Bolivia 53.0162**

Trichocereus bridgesii **(Salm-Dyck) Britton & Rose**

AKA *San Pedro* & *achuma* (Bolivia)

Tyramine (1-10% of over 50 mg total alkaloids/ 100 gm of fresh)

3-Methoxytyramine (1-10% of over 50 mg total alkaloids/ 100 gm fresh)

3,4-Dimethoxyphenethylamine (1-10% of over 50 mg total alkaloids/ 100 gm fresh)

[3,4-diMeO-5-OH-PEA and 3,5-diMeO-4-OH-PEA are also listed **in error** for *T. bridgesii*. The reference cited, Agurell 1969b, did not report either compound.]

Mescaline (Over 25 mg. per 100 grams fresh.)

Agurell 1969b [Obtained via European commercial sources]

0.56% (dry green outer tissues) Serrano 2008 (Wild harvested; La Paz, Bolivia)

0.18% (dry outer green tissues) Ogunbedede 2009 (Bob Gillette commercial nursery stock in California)

[All forms & varieties of this species are said to contain levels of mescaline ranging from nearly inactive to potent: Conversations with friends, Davis 1983, Davis 1997, Davis 1999 & also the 1998 *Entheogen Review* 7 (3): 70-71.]

See additional comments in **Activity Endnotes**.

Two forms growing in Australia
Photo by Zariat

Trichocereus bridgesii **in California (above & left)**
(from Knize seeds labeled *Trichocereus peruvianus* KK242)

Trichocereus bridgesii **Bolivia 53.0162 (from Ritter's seeds)**
Bottom row

Trichocereus bridgesii
(RS)

***Trichocereus bridgesii* "San Pedro (Amsterdam)"**

Plant is designated thusly for being found sold as "*San Pedro*" in an Amsterdam smartshop. We do not know its original source.

***Trichocereus bridgesii* Bolivia 53.0162**
(Above & lower left)

Trichocereus bridgesii
(Field)

Trout's Notes on Cactus Chemistry

My best guess is that ***Trichocereus* sp. SS02** will prove to be synonymous with ***Trichocereus* aff. *bridgesii* (H 79960)**.

***Trichocereus* sp. SS02**
Originally from a large adult growing in the remnants of Ed & Mary Gay's collection


Trichocereus bridgesii
H70760
(HBG)

Trichocereus bridgesii **(Field)**

Bridgesigenin A (a triterpene: 0.0378% dry wt.)
Bridgesigenin B (a triterpene: 0.00657% by dry wt)
Both triterpenes by Kinoshita *et al.* 1992 [Both triterpenes arose via acid hydrolysis of the saponin fraction]
Reported to contain Kaempferol & Quercetin (Flavonols) Richardson 1978 (based on acid hydrolysis)
The degree of sliminess for *T. bridgesii* is claimed by growers to range from extreme to almost lacking.

Standard

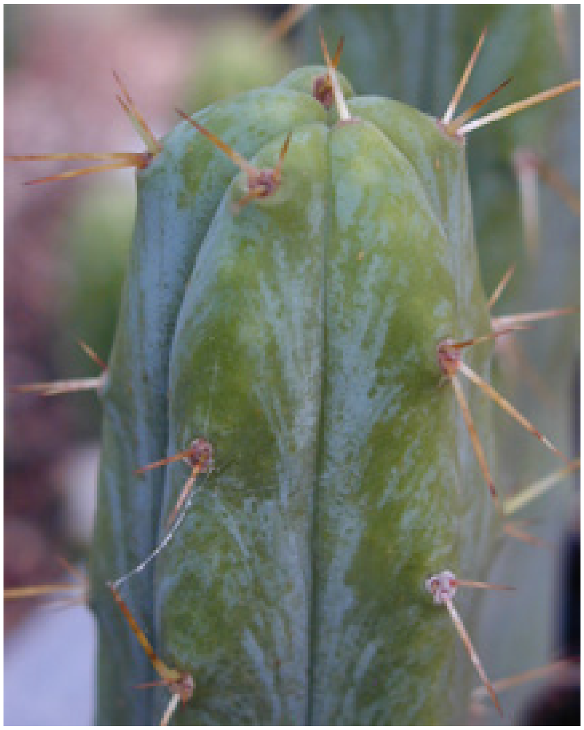
Trichocereus sp. Standard

Originally known as "*standard peruvianus*" this appears to be an excellent *bridgesii* form.
Presence of mescaline is proven in multiple human bioassays.
Specifically raised as sacramental species but lacks an analysis.

Trichocereus sp. W. Baker 5452

Collected by Julio Cruz at Murillo, Jayuri Province, Bolivia, on 20 March, 1983.
The original herbarium vouchers were submitted as *Trichocereus pachanoi* but it is clearly a form of *bridgesii*.

Presence of Mescaline was proven both through human bioassays and unpublished analysis (Anonymous sources; personal communication.)
Purported to have indigenous use but that claim lacks details or a reference.
Lacking a published analysis.



W. Baker 5452

short spined form of *Trichocereus bridgesii* (Field)

The monstrose forms of *T. bridgesii* have been purported to be especially active in human bioassays.
Ogunbedede 2010 analyzed the short jointed monstrose form and determined it to contain only 0.48% mescaline in the dried outer green tissues.

short formshort form monstrose *Trichocereus bridgesii*

monstrose
Trichocereus bridgesii
long-form
(left column
& upper right)

short-form

Photo by Patrick Noll

Trichocereus bruchii **(Britton & Rose) Ritter**
Flower contains Betanin (major), Phyllocactin, Isobetanin, Isophyllocactin & an unidentified Betacyanin.
Piattelli & Imperato 1969

variegated *Trichocereus bruchii*
(Huntington)
Photo by Kamm

Trichocereus bruchii **Argentina 74.0146**
(UC)
Left-hand column

Trichocereus bruchii **Argentina 74.0146**
(UC)

Trichocereus camaraguensis **Cardenas**
Tyramine (trace)
N-Methyltyramine (trace)
3-Methoxytyramine (trace)
3,4-Dimethoxyphenethylamine (trace)
Agurell 1969b [European commercial sources]

Trichocereus camaraguensis
Photos above by Joylene Sutherland

Trichocereus camaraguensis
Photos by Joylene Sutherland
Note the two flower forms. The second one is suspected of being a possible hybrid.

Trichocereus camaraguensis
(UC)

Trichocereus camaraguensis
(Field)

Trichocereus cephalomacrostibas

Trichocereus candicans **(Gill.) Britton & Rose**

Tyramine (trace) Mata *et al.* 1976a. Also reported in Mata *et al.* 1976b

N-Methyltyramine (0.004% by dry weight) Mata *et al.* 1976a; Also isolated in Mata *et al.* 1976b. Not observed by Agurell 1969b

Hordenine (over 50% of over 50 mg total alkaloids/ 100 gm fresh) Agurell 1969b [Obtained via European commercial sources]; (Variable from 0.5 to 5%) Reti 1950; also Castrillón 1950 & Reti 1933.

Candicine (Variable. 0.5 to 5%) Reti 1950 also Reti 1933 and Castrillón 1950

2 unidentified trace alkaloids detected Mata *et al.* 1976

Trichocereus candicans

Trichocereus candicans
Photo above by Johnny B. Goode

Trichocereus candicans

Trichocereus cephalomacrostibas **Rauh & Backeberg**

Needs an analysis (Also called a *Haageocereus.* Now it is considered to be a *Weberbauerocereus*)

This was purported to contain mescaline by Caycho Jimenez but no reference was included with the claim.

See comments in the **Activity Notes.**

Trichocereus candicans
(HBG)

Trichocereus candicans
(Field)

Trichocereus candicans
(Field)

Trichocereus chalaensis **Rauh & Backeberg**

Needs an analysis

See images in the San Pedro book.

Trichocereus chiloensis (Colla) Br. & R. See as ***Trichocereus chilensis***

Trichocereus chilensis (Colla) Britton & Rose

AKA *buisco*

Candicine (trace) Cortes *et al.* 1972

"*no triterpenes or alkaloids*" "*essentially devoid of alkaloids*"

β-Sitosterol

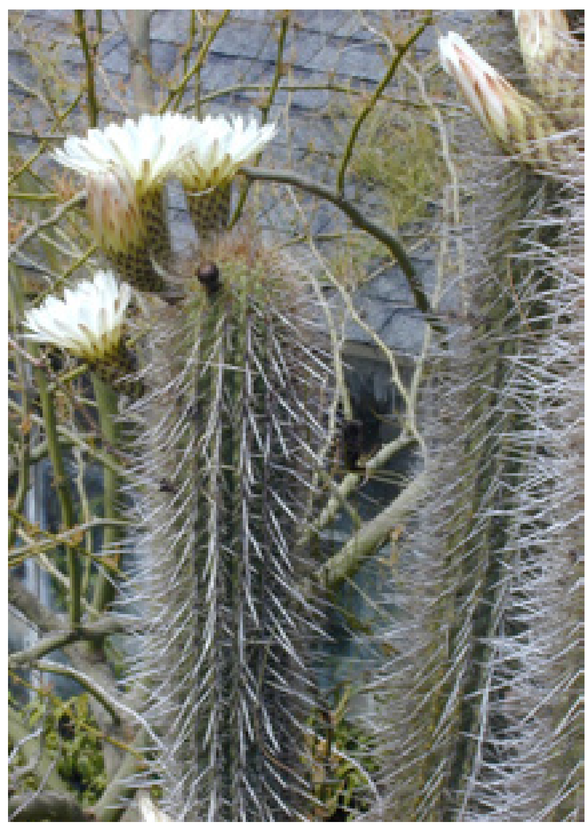
Unidentified material believed to be a straight chain alcohol [mp 82-82.5° $[\alpha]_D$ −11°] (also described in this paper as a long chain aliphatic alcohol and an aromatic alcohol.) It was thought to resemble *n*-Nonacosan-10-ol but mmp was depressed.

Djerassi *et al.* 1956a [Material from Chile]

β-O-Palmityl longispinogenin (Olean-12-ene-3β,16β,28-triol-3-palmitate) in 1% yield. Morales & McLaughlin 1989 (Collected in Chile)

[Agurell 1969b (Obtained via European commercial sources) reported it devoid of alkaloids but specifically did not look for quaternary amines like Candicine]

This species is variable and has a number of known forms



Trichocereus chilensis **Chile 52.1507 (UC)**

Trichocereus chilensis **Chile 52.1507**
(UC)

Trichocereus chilensis **H 20932**
(HBG)

Trichocereus chilensis **Chile 52.0568**
(UC)


Trichocereus chilensis
Chile 52.0568
ElquiProvince
(UC)

Trichocereus chilensis **Chile 55.0643**
Curico Province
(UC)




Trichocereus chilensis
Chile 55.0643 Curico Province (left column)
Chile 52.0555 (right column)
(UC)

Trichocereus courantii (K.Schumann) Backeberg

Tyramine (trace)

3,4-Dimethoxyphenethylamine (1-10% of 1-10 mg of total alkaloids/ 100 grams fresh)

3-Methoxytyramine (1-10% of the 10-50 mg of total alkaloids/ 100 grams fresh)

N-Methyl-3-methoxytyramine (10-50% of 10-50 mg of total alkaloids/ 100 grams fresh)

N-Methyltyramine (Over 50% of 10-50 mg of total alkaloids/ 100 grams fresh)

Agurell *et al.* 1971b [Obtained via commercial source in the Netherlands]

[The **typo** 2-Methoxytyramine has been published.]

Trichocereus cuzcoensis
(Eltzner field collection from near Cuzco)

Trichocereus crassicostata **Ritter**

Needs an analysis & taxonomic study

Trichocereus cuzcoensis Britton & Rose

Common names: "*Giganton*" and "*Jahuackollai*"

Tyramine (trace) Agurell *et al.* 1971b

3-Methoxytyramine (Over 50% of the over 50 mg of total alkaloids/ 100 grams fresh) Agurell *et al.* 1971b

3-Hydroxy-4,5-dimethoxyphenethylamine (trace) Agurell *et al.* 1971b [Obtained via commercial source in Germany] and Lindgren *et al.* 1971

Mescaline (0.5-5 mg. per 100 grams fresh) Agurell *et al.* 1971b. [Also identified by Lindgren *et al.* 1971]

0.0% Cotaruse, Arequipa

0.0% Huaytampo, Cuzco

0.0% Huacarpay, Cuzco

0.0% Capacmarca, Cuzco

Serrano 2008 (All were wild collections)

[4-MeO-PEA appears listed in error. The claim is not supported by any of the references cited.]

Trichocereus cuzcoensis
(Eltzner field collection from near Cuzco)

Trichocereus cuzcoensis
(BBG)
Hutchison field collection (PCH 1812) from near Cuzco

See also ***T. peruvianus*** **var. *cuzcoensis*** (under *T. peruvianoids*) which appears to be simply an undescribed synonym for *T. cuzcoensis.* They ALL appear to have originated with Karel Knize who has offered "*peruvianus var. Cuzco KK340*" & "*peruvianus var. cuzcoensis KK340*" "*no triterpenes or alkaloids*" [Ran with a second procedure and reported traces of non-phenolic basic material] Djerassi *et al.* 1956a [Material from Cuzco, Peru]

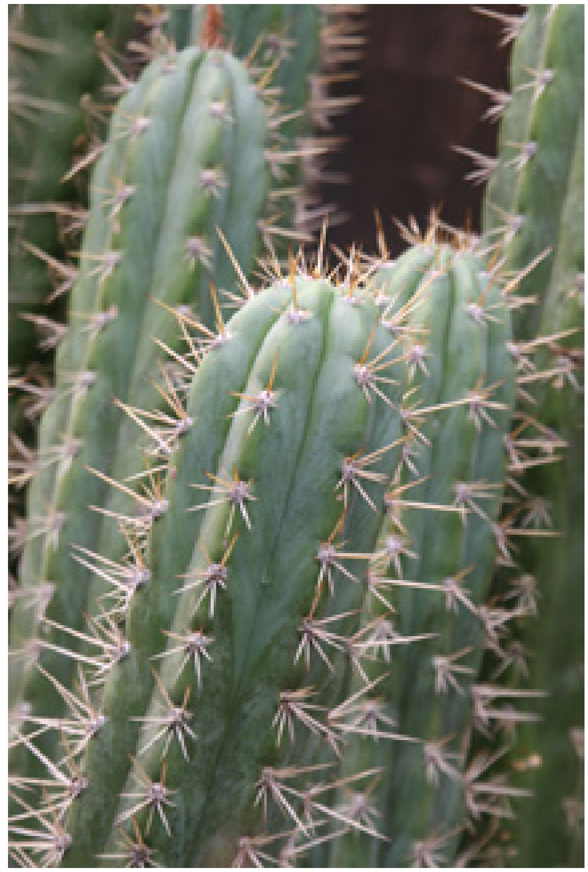
β-Sitosterol (a sterol) Djerassi *et al.* 1956a

Unidentified alcohol that was also reported in *T. chiloensis* (see under). Djerassi *et al.* 1956a

Trichocereus cuzcoensis **PCH 1812**

Collected in 1957 by Paul C. Hutchison, on 11 November, on the road to Puno, 35 km. north of Cuzco, Province Quispicanchis, Department Cuzco, Peru. 3100 m.

Color differences reflect whether the plant receives adequate shade during the day.



Trichocereus escayachensis needs an analysis.

Trichocereus escayachensis

Trichocereus fulvilanus **Ritter**

Tyramine (10-50% of over 50 mg of total alkaloids/ 100 grams fresh)

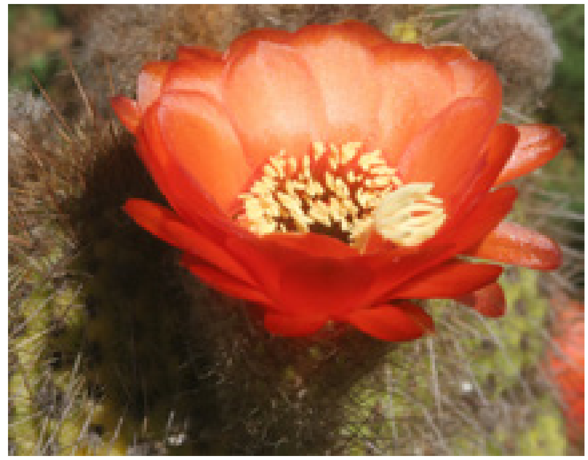
N-Methyltyramine (10-50% of over 50 mg of total alkaloids/ 100 grams fresh)

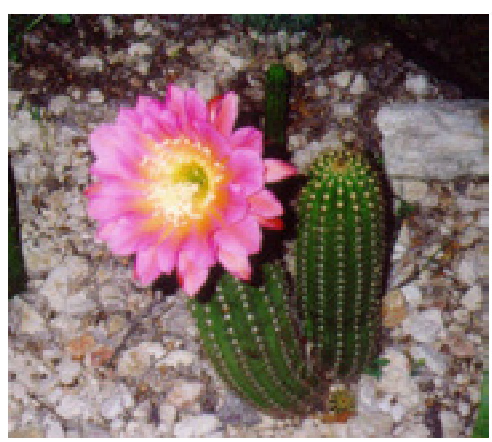
Mescaline (trace)

Agurell *et al.* 1971b [Commercial German source]

Backeberg 1959 viewed this as possibly synonymous with *T. deserticolus* but, based on seed coat morphology, Friedrich & Glaetzle 1983 considered the two to be separate species. Hunt sided with Backeberg. See **Part B *San Pedro***

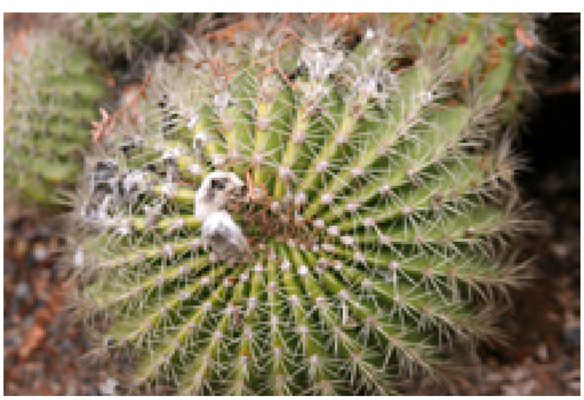
Trichocereus fulvilanus





Trichocereus grandiflorus
Lower right two photos by Mark

Top photo by Tania



***Trichocereus grandiflorus* Argentina 74.0151 (UC)**

Trichocereus grandiflorus

***Trichocereus grandiflorus* (the yellow flowering version that was found DMT-devoid when tested by Sasha)**

This appears presented as a DMT container in both the underground literature and on the Internet. This arose from a preliminary report by Sasha Shulgin that he had observed what he suspected was DMT in GC-MS. He was unable to duplicate his observation but, upon flowering, discovered that he had used a yellow flowered form rather than the red-flowered one used in his initial analysis. It is unclear whether this was the cause for the disparate results or if a contaminated GC-MS was the culprit. Sasha suspects the latter.

All of the various forms of plants known in horticulture within and around this name are in need of further investigation; both as chemical investigation and taxonomic study. (Masochists only need apply.)

See comments on synonyms under ***T. huascha***

Trichocereus grandiflorus **(red-flowered) see** *Trichocereus huascha*

***Trichocereus grandiflorus* (white-flowered)**

There have been anecdotal reports of activity or the claim for mescaline in material called *Trichocereus grandiflorus*. While purely speculative, perhaps the mislabeled material depicted on page 78 of **Part B *San Pedro*** might provide one suggestion as to a possible source for this rumor?

***Trichocereus huanucoensis* H.Johnson**

[Ex: UC Botanical Gardens (H. Johnson; Peru 56.1153; also in the Huntington as **HBG18568.** Released into horticulture by Johnson as *T. huanucoensis* and by HBG as **HBG18562**.]

Needs an analysis. One human bioassay using 500 gm fresh wt of 1 version of the horticultural material sold under this name reported a pronounced stimulant but not hallucinogenic action. Anonymous 2000

It has conflicting bioassay reports with at least one claiming the presence of mescaline. Anonymous

It should be stressed that there appears to be 3 distinct versions in botanical gardens bearing this name and at least one additional offering in horticulture. The source for the material at both the Huntington & Berkeley Botanical Gardens was Harry Johnson, Sr., of Paramount California (better known as the source for the Paramount hybrids).

Harry Johnson, Sr. field collected the seeds in Peru (in 1956) so a possibility exists that the seeds produced F1 hybrids.

See **Part B *San Pedro*** for images

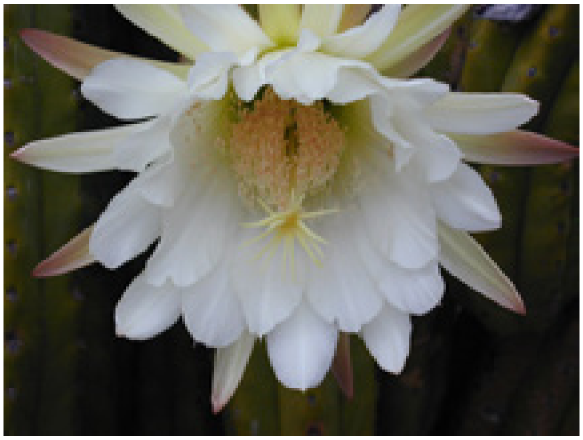
Trichocereus huanucoensis

The plant growing at UC depicted on this page is sometimes proposed to be a mislabeled *pachanoi*.

If it is correctly identified there are two forms at UC. One is located in a bed in front of the arid greenhouse and also in the a bed in the desert garden near *Opuntia cylindrica*. Another form shown on the next page exists in the desert garden as well.

Both are distinct from the form growing at the Huntington - also from Johnson's seeds.

See comments and more images in San Pedro.





Trichocereus huanucoensis

***Trichocereus huanucoensis* (UC) Form present in the main desert garden**


Notice the odd
straplike growth
of tissue.
Trichocereus
huanucoensis
(HBG)

Trichocereus huascha (Weber) Britton & Rose

Hordenine (Sole alkaloid. 10-50 mg/ 100 gm of fresh plant) Agurell 1969b [Obtained via European commercial sources]; (trace) Follas *et al.* 1977 [Follas analyzed as *Lobivia huashua* (Weber) W.T.Marshall.]

N-Methyltyramine (trace) Follas *et al.* 1977

Tyramine (trace) Follas *et al.* 1977

Note on *T. huascha*:

In partial contrast to Ritter, Hunt considers the following to be synonyms of *Echinopsis huascha* (Weber) Friedrich & Rowley (and this summation ignores all purely horticultural and ill-defined material such as the orange flowered "*grandis*")

Chamaecereus grandiflorus (Britton & Rose) Fric

***Echinopsis huascha* (Weber) Friedrich & Rowley** This is the name most commonly accepted at the present time.

Echinopsis lobivioides Backeberg

Echinopsis pecheretiana (Backeberg) Friedrich & Rowley [In horticulture this has lemon-yellow flowers]

Echinopsis rowleyi (Friedrich) Kiesling

Helianthocereus andalgalensis (Weber) Backeberg

Helianthocereus grandiflorus (Britton & Rose) Backeberg

Helianthocereus huascha (Weber) Backeberg

Helianthocereus hyalacanthus (Spegazzini) Backeberg

Helianthocereus pecheretianus Backeberg

Lobivia andalgalensis (Weber ex Schumann) Britton & Rose (See photos under ***T. andalgalensis*** and under ***T. grandiflora***)

Lobivia grandiflora Britton & Rose

Lobivia huascha (Weber) W.T.Marshall

Lobivia hyalacantha Spegazzini

Lobivia purpureominiata Ritter

Pseudolobivia lobivioides (Backeberg) Backeberg ex Krainz

Trichocereus andalgalensis Hosseus

Trichocereus catamarcensis Ritter

Trichocereus grandiflorus Backeberg

Trichocereus huascha (Weber) Britton & Rose

Trichocereus lobivioides Graeser & Ritter ex Ritter

Trichocereus rowleyi Friedrich

Friedrich & Glaetzle 1983 kept *huascha* and *rowleyi* separate based on their seed-coat morphology.

(Note also that we disregard much of this; pending the location of some sort of published research or clarifications. Ideally this would take the form of a Monograph for the supergenus *Echinopsis*.)

Trichocereus huascha
entire page

Also note that any *Trichocereus lobivioides grandiflorus* is likely to be a hybrid. These are commercially available in red and other colorful flowers.

T. huascha, as available in horticulture, is offered in both a yellow and red flowered form.

Trichocereus huascha **(red flowered)**
HBG: above; LA Arboretum: below

Trichocereus knuthianus
(Field)

Trichocereus knuthianus Backeberg

Tyramine (10-50% of 10-50 mg of total alkaloids/ 100 grams fresh)

3-Methoxytyramine (10-50% of 10-50 mg of total alkaloids/ 100 grams fresh)

Agurell *et al.* 1971b [Obtained via commercial source in the Netherlands]

This species needs additional analysis. Some of the material bearing this label is reported to be hallucinogenically active.

At least part of the commercial material available under this name is something else. The latter is sometimes referred to as *T. peruvianus* var. *knuthianus* which appears to lack any published description.

Trichocereus knuthianus (SS)

See also ***T. peruvianus* v. *knuthianus*** also (under *T. peruvianoids*) It is unclear but likely that this is only an undescribed synonym for *T. knuthianus* -- more study of the chemistry is needed.

***Trichocereus knuthianus* (Field)**

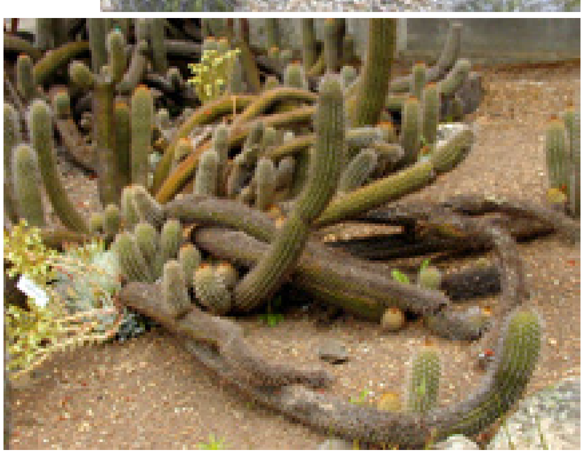
***Trichocereus lamprochlorus* (UC)**


Trichocereus lamprochlorus
(UC)

Trichocereus lamprochlorus
(UC)

Trichocereus litoralis (Johow) Looser

Lacks an analysis



Trichocereus litoralis

Trichocereus lamprochlorus (Lemaire) Backeberg

Hordenine (over 50% of 10-50 mg total alkaloids/ 100 gm fresh) Agurell 1969b [Obtained via European commercial sources]

Candicine (trace) Reti 1933, Reti & Arnolt 1935 & Reti 1950

Trichocereus macrogonus (Salm-Dyck) Riccobono

Tyramine (1-10% of 10-50 mg total alkaloids/ 100 gm of fresh) Agurell 1969b

3-Methoxytyramine (1-10 % of 10-50 mg total alkaloids/ 100 gm fresh.) Agurell 1969b

3,4-Dimethoxyphenethylamine (1-10% of 10-50 mg total alkaloids/ 100 gm fresh) Agurell 1969b [Obtained via European commercial sources]

Mescaline (5-25 mg. per 100 grams fresh.) Agurell 1969b [Human bioassays suggest that this value might be low for many specimens. Conversations with friends & the 1998 *Entheogen Review* 7 (3): 71. MANY horticultural offerings appear to be quite potent while others are demonstrably weak. It is unclear how much of this is strain related and how much reflects variability within a given strain. Great confusion, or at least disagreement, apparently exists concerning what is and what is not this species.]

[3,4-diMeO-5-OH-PEA and 3,5-diMeO-4-OH-PEA are also listed, in error, for this species. The reference cited, Agurell 1969b, did not report either compound.]

Trichocereus macrogonus
(Huntington Botanical Gardens)

A more detailed discussion of *Trichocereus macrogonus* and its forms can be found in **Part B *San Pedro***


Trichocereus macrogonus
(Huntington Botanical Gardens)

Trichocereus macrogonus
(Huntington Botanical Gardens)

Trichocereus macrogonus
(Huntington Botanical Gardens)

No mucilage studies have been located thus far but it should be noted that some strains are exceedingly slimy and other much less so.

Amazingly, Albesiano & Kiesling merged *T. macrogonus* and *T. peruvianus* as *T. macrogona* subsp. *macrogona.*♫

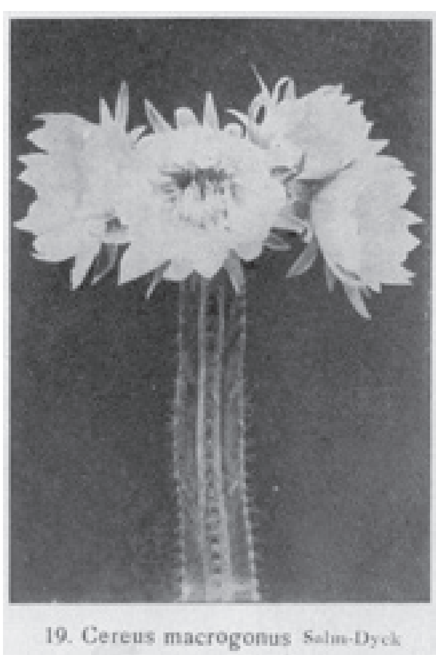
A number of triterpene saponins have been reported.
Pachanol A (the hydrolyzed sapogenin) by Takizawa *et al* 1993
Bridgesides A1, C1, C2, D1, D2, E1 & E2 (oleanane type)
Pachanosides C1, E1, F1 and G1 (pachanane type)
[Revised structure of Pachanol C to 21β-acetyloxy-3β,14β, 30-trihydroxypachan-12-en-28-oic acid 14β,28-lactone]
by Okazaki *et al.* 2011.

Trichocereus macrogonus
(Field)

Trichocereus macrogonus (NMCR)
At NMCR in 2010

Trichocereus macrogonus (NMCR)
Cutting in 2011

Trichocereus macrogonus monstrosus
This name appears listed in Kreuzinger 1935.
Is this plant in Germany of the same lineage? Who knows?
Photo by Evil Genius



macrogonus from Schelle 1929

Watch for a far more detailed account of this name in the forthcoming works "**The *Macrogonus* Onus**" (2014) and ***Sacred Cacti* 4th edition. Part B. *San Pedro*.**

Some of the names associated with *macrogonus*

All of the images below appear to be out-of-copyright. If I am in error and the use of any is objectable, please contact me for immediate removal and replacement of this PDF.

Salm-Dyck circa 1840

Schumann circa 1900

Berger in 1906

Backeberg circa 1930

"Berol." in 1909

Trichocereus sp. SS01
Originally encountered unlabelled growing in someone's garden

Trichocereus pachanoi
(Cactus Country)

Trichocereus manguinii Backeberg

3-Methoxytyramine (1-10% of 10-50 mg of total alkaloids/ 100 grams fresh)

Hordenine (10-50% of the 10-50 mg of total alkaloids/ 100 grams fresh)

N-Methyltyramine (10-50% of 10-50 mg of total alkaloids/ 100 grams fresh)

Tyramine (10-50% of 10-50 mg of total alkaloids/ 100 grams fresh)

Agurell *et al.* 1971b [Commercial source in the Netherlands]

Trichocereus pachanoi Britton & Rose

AKA "*San Pedro*", "*achuma*", "*aguacolla*", "*huachuma*", "*giganton*" & many other common names

93.5% water by weight according to Poisson 1960.

Tyramine (trace) Agurell 1969a and Agurell 1969b

3-Methoxytyramine (0.01% by dry weight) Crosby & McLaughlin 1973 [Obtained via Californian commercial sources]; (1-10% of over 50 mg total alkaloid/ 100 gm fresh) Agurell 1969b; (Less than 0.01% fresh) Agurell 1969a. [Also reported in Agurell & Lundström 1968]

Hordenine (trace) Agurell 1969b

3,4-Dimethoxyphenethylamine (1-10% of over 50 mg total alkaloids/ 100 gm fresh) Agurell 1969b [Obtained via European commercial sources]

3-Hydroxy-4,5-dimethoxyphenethylamine (trace) Agurell 1969b

4-Hydroxy-3,5-dimethoxyphenethylamine (trace) Agurell 1969a and 1969b. Also reported in Agurell & Lundström 1968

Mescaline (Highly variable) 0.025%+ (over 25 mg per 100 gm) [Agurell 1969b] to 0.12% [Poisson 1960 (Collected in Peru)] reported by fresh weight. [Also 0.04% fresh/ ~ 0.67% dry: Agurell 1969a & 0.067-0.079% fresh: Bruhn & Lundström 1976a];

Recoveries from 0.331% [Crosby & McLaughlin 1973] up to 2.0 % [Poisson 1960] have been reported from dry plants. [See also Turner & Heyman 1960 (Collected in Peru) who reported 0.9% by dry weight in misidentified plants] From 0.109%-2.375% dry wt. (6 specimens) was estimated photometrically in Swiss cultivated plants by Helmlin & Brenneisen 1992 **[See Note below]**;

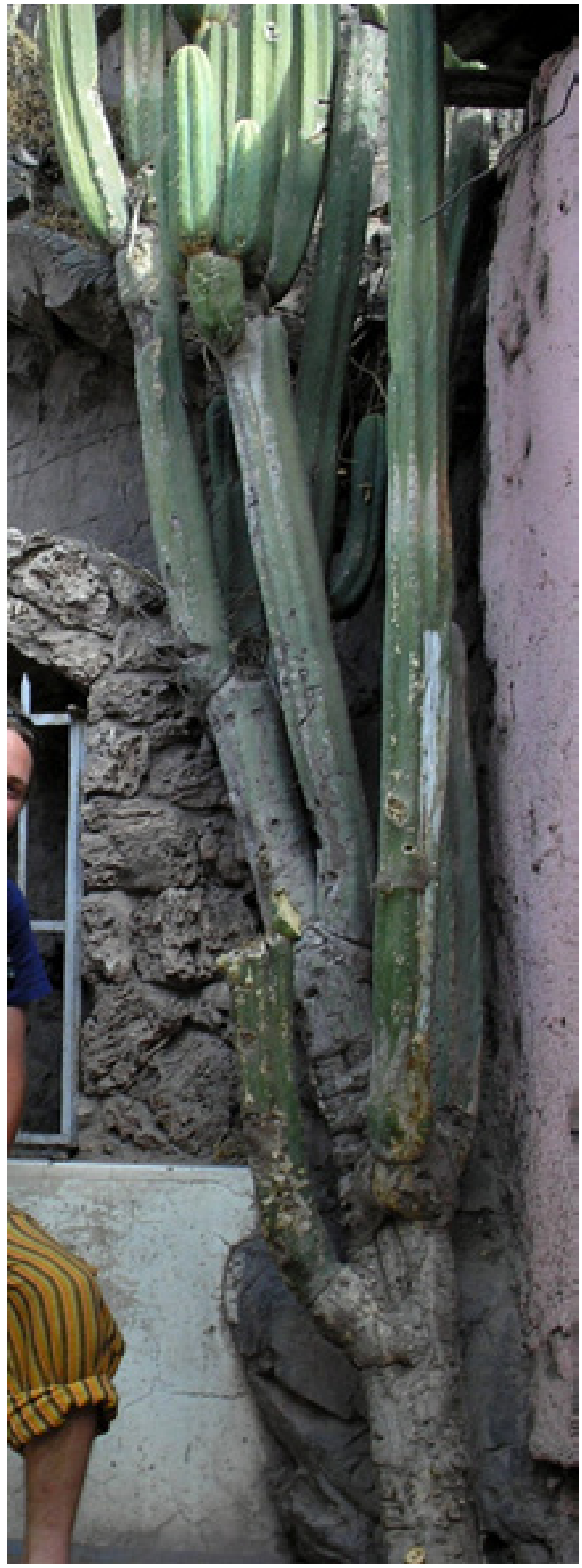
0.310% mescaline by fresh weight (3.10 mg/gm fresh as the average of three specimens; estimated using HPLC) They also reported an average of 2.06% by dry weight. (Ed.: Notice the obvious discrepancy.) Grown in Italy. Gennaro *et al.* 1996;

Gonzales Huerta 1960 recovered 4.5% mescaline from the outer tissues of correctly identified Peruvian plants. She reported being able to obtain this yield only when using the approach of Folkers & Koniuszy 1939 rather than that described in Cruz Sanchez 1948.

Cruz Sanchez 1948 reported recovering 5% dry wt; using only the outer layer of flesh (misidentified as *Opuntia cylindrica*).

[Alkaloid values are often very low in many cultivated plants but the controlling factors are not clear. Species appears highly variable in potency & palatability.]

See comments in **Activity Notes**.



Trichocereus pachanoi
(cultivated in Matucana, Peru)
Photo by Grizzly

Trichocereus pachanoi (Strybig clone)

[A gc estimate of 0.155% mescaline free base by dry wt. was made on a nongrafted control vs. 0.15% ten months after being used for grafting (with the mescaline-free *T. spachianus*). (Initially 2" by 12" plants) PUMMANGURA *et al.* 1982a];

[Alkaloid values are commonly low in many cultivated plants.]

Anhalonidine (0.01% of total alkaloid) AGURELL 1969a; (trace) AGURELL 1969b

Alkaloids were detected in BROWN *et al.* 1968 but none were identified.

[Anhalinine has been listed **in error**. The reference cited, AGURELL 1969b did not report this alkaloid.]

[Pellotine has been listed **in error**. The reference cited, LUNDSTROM 1970 did not report this alkaloid.]

Unidentified lactone-forming acid (tlc by KRINGSTAD & NORDAL 1975)

Aglycones isolated after acid or enzymatic hydrolysis of the isolated corresponding sapogenins:

Pachanols A & B

Bridgesigenins A, B & C

KINOSHITA *et al.* 1995

Some modern analytical reports for Peruvian *pachanoi*

Specimens not obviously being cultivated:

0.00% Cataratas, Otuzco, La Libertad
0.00% El Alisal, San Marcos, Cajamarca
0.45% KunturWasi, San Pablo, Cajamarca
1.14% Laquipampa, Ferreñafe, Lambayeque
0.23% Moyán, San Vincente, Lambayeque
0.28% Puykate, Ferreñafe, Lambayeque
0.94% Tocmoche, Chota, Cajamarca
0.38% Yanasara, Sánchez Carrión, La Libertad

Specimens obviously maintained as cultivated plants

0.55% Arequipa, Arequipa
0.80% Arequipa, Arequipa
0.86% Quequeña, Arequipa
1.13% Pueblo Libre, Lima

All of the above were reported in CJUNO *et al*. 2009 (Using dried outer green tissue)

No note included as to whether under cultivation

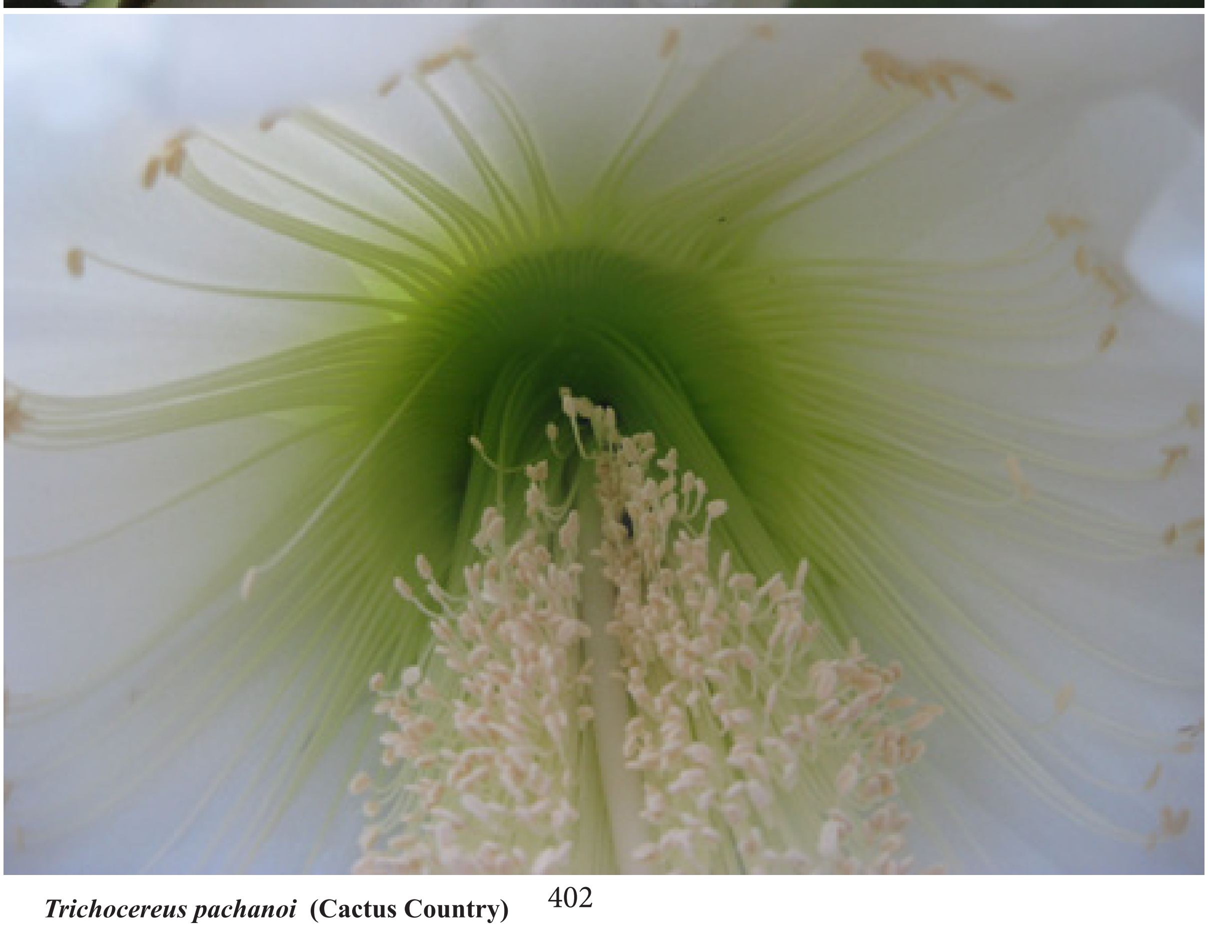
1.4% Barranca
0.78% Chiclayo

Both reported by REYNA PINEDO & FLORES GAÉRCS 2001

4.7% Matucana (harvested in Peru; analyzed in USA)

OGUNBEDEDE 2010 (Using dried outer green tissue)

***Trichocereus pachanoi* above & below**
(collected near Matucana; analyzed by OGUNBEDEDE)
***Trichocereus pachanoi* (Arequipa, Peru) left**



Trichocereus pachanoi **(Cactus Country)**

T. pachanoi notes:

Note that this is nearly 23X from max to min (i.e A San Pedro specimen was observed that was almost 23 times stronger than another San Pedro that was simultaneously being evaluated) Notice also that Gennaro's estimation was even higher.

A far more detailed look at this species (and many more images) can be found in **Part B *San Pedro***

Bruhn *et al.* 2008 reported lophophine, 3,4-methylenedioxyphenethylamine (homopiperonylamine), and N ,N-dimethyl-3,4-methylenedioxyphenethylamine (lobivine) to be new minor alkaloids in this species and in peyote. This paper needs to be viewed with reservations. See comments in **Activity Notes**.

***Trichocereus pachanoi* (front)**
compared to
***Trichocereus peruvianus* (back)**
Both cultivated by GF in USA (Upper right image)

Trichocereus pachanoi
(from Karel Knize in Lima, Peru)
Above & lower right

Albesiano & Kiesling renamed *T. pachanoi* as ***Trichocereus macrogonus*** **subsp.** ***pachanoi***.

Trichocereus pachanoi
(Cactus Country)

Trichocereus pachanoi
(Field)

Trichocereus pachanoi
(Field)

MS Smith commented that the description for *pachanoi* gives the hairs of the flower and ovary as black (See example below - we would call these dark brown rather than black but they are darker and sparser).

MOST *pachanoi* in U.S. cultivation on the other hand has woolly white to brown hairs on both ovary/fruit and flower tube.

US material also has much more indentation compared to the smoother edged appearance of wild material commonly encountered in Peru & Ecuador (and elsewhere).

Clarification is needed.

Trichocereus pachanoi
USA (GF) above
Oz left

Lower photo by Zariat

Trichocereus pachanoi

growing in a shaman's garden in southern Peru.

Trichocereus pachanoi **KK591**
(Knize)

Trichocereus pachanoi **from Karel Knize in Peru.**
Above was labeled KK339; Upper right was unlabeled;
Cutting below was provided by Knize as
Trichocereus peruvianus **KK242 *f.* Matucana**

Another cactus that appears to be a spinier variant of *Trichocereus pachanoi* (lower right) was encountered by Grizzly in Mendoza, Argentina.

He commented that it was extensively cultivated in private gardens and often showed signs of heavy harvesting.

Trichocereus pachanoi **in Mendoza, Argentina.**
Photograph by Grizzly

Trichocereus pachanoi

Cultivated under the mistaken name ***Trichocereus peruvianus*** **Huancabamba.**

0.54% mescaline by dry wt.

Grown by Oasis from seeds collected at Huancabamba.

(Image on next page)

Ogunbedede 2010 (Using dried outer green tissue)

1.2% mescaline by dry wt.

Grown by SS from the same seed lot.

(Images on this page)

Ogunbedede 2010 (Using outer green tissue)

Trichocereus pachanoi
("*peruvianus* Huancabamba")

***Trichocereus peruvianus* (*pachanoi*) Huancabamba**
(Oasis from Mesa Garden seeds)

Trichocereus pachanoi
(Field)

Trichocereus pachanot?

This is by far the most commonly represented horticultural form of *pachanoi* in commerce in the USA and possibly also Australia (far more abundance of genetic diversity exists in Oz than in the USA)

My present suspicion is that this may be a hybrid that has displaced bona fide *pachanoi* as the predominate cultivar in the US. I do not suspect malice or deliberate deception just simple displacement over time due to the vast numbers generated by both individual growers and by commercial propagation operations due to its far greater growth rate & overall vigor, cold/heat tolerances and rot resistance when compared to a bona fide *Trichocereus pachanoi*.

My present GUESS based on its flowers, habit and intense vigor is that this may be a *bridgesii* crossed with a *pachanoi* or something similar but whether work is ever done that is capable of establishing this one way or another remains to be seen. It might be a product of horticulture but there is some, presently anecdotal, evidence to suggest it *might* have entered cultivation as a Bolivian collection during Harry Blossfeld's Andean expedition.

An error that I (Trout) have helped to widely propagate is referring to this cultivar as **Backeberg's clone**. Whether there really is such a thing as a clone line from Backeberg's hands that can be identified in horticulture **cannot presently be established despite the best efforts of friends in Germany**. IF Backeberg did bring a clone line into horticulture it would be a *bona fide pachanoi* and not the cultivar I have so often in past years mistakenly called Backeberg's clone.

See the growing summary of thoughts and photos at: "*pachanoi* or pachanot?"
http://troutsnotes.com/pdf/Pachanoi_Pachanot.pdf
The main body of this thought is also now attached to the *San Pedro* PDF also located at the same website.

Presence of mescaline is established through innumerable human bioassays despite it not being clear if it has ever seen formal published analysis.

Pummangura's 0.155% material may also have been this plant but I cannot determine this one way or the other. It is tempting to think of other low values in the literature as being from the same source but is is clear that at least some came as seedlings which were produced by one or more of the many Western greenhouses supplied from known commercial collectors of wild seeds such as Karel Knize or Friedrich Ritter or Harry Johnson and others AND there are two Peruvian samples that produced 0.00% mescaline for Cjuno so only more questions arise if looking closely at what little is known.

It IS clear that its mescaline content is generally low: typically it is less than 0.2% by dry weight. In the otherwise unpublished isolations appearing online values for mescaline concentrations falling in the range of 0.1% to less than 0.05% are the most common.

Based on their bioassay results it is believed by several anonymous correspondents that other alkaloids such as 3-Methoxytyramine and DMPEA may also be present.

'*Trichocereus pachanot*' (RBG)

Trichocereus pachanoi
(A typical Western cultivar)

Trichocereus pachanoi “Super Pedro”
Wild collected in Ecuador in the late 1930s; now in cultivation in Australia

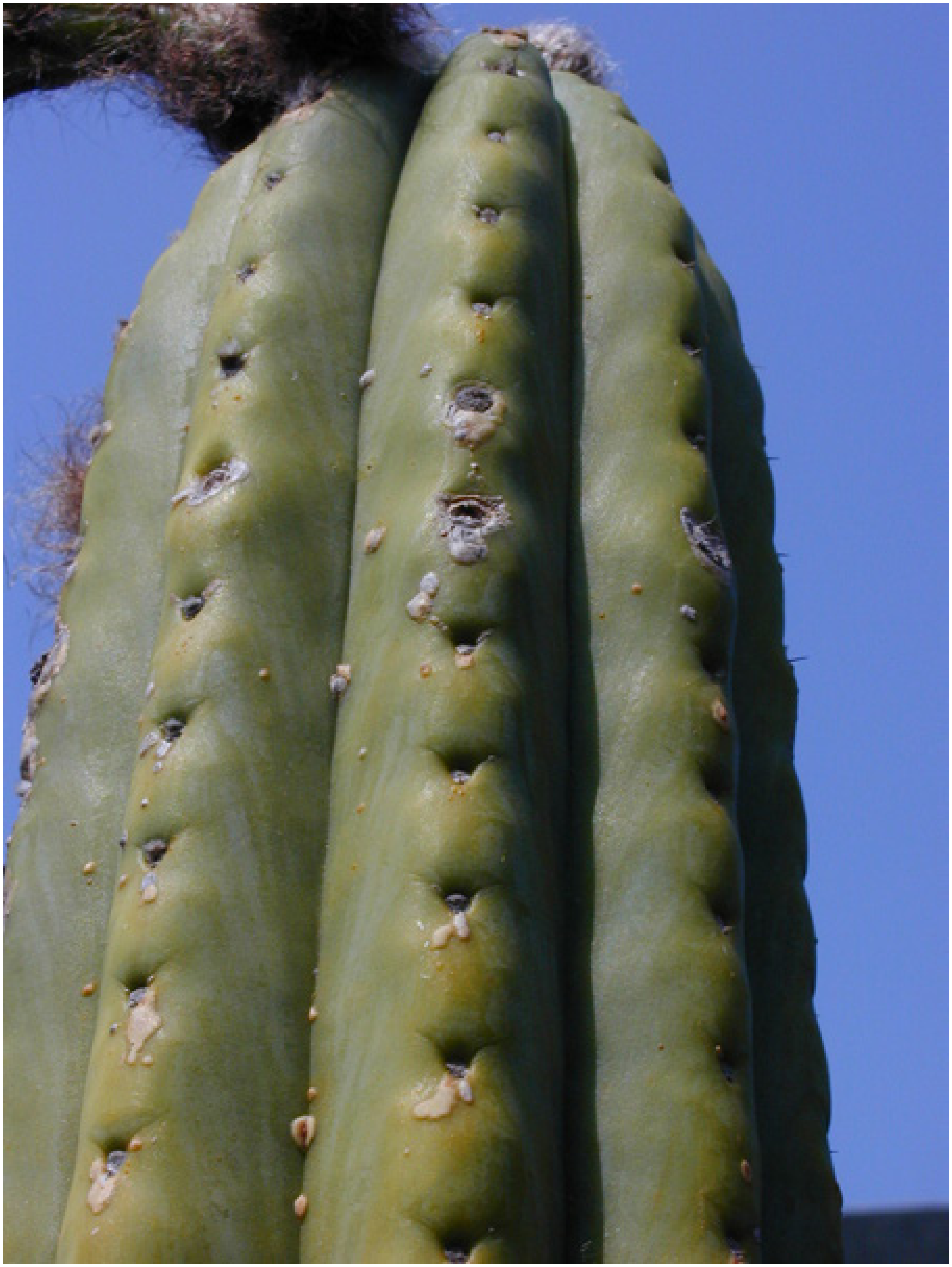
Trichocereus** aff.* ***pachanoi **(Peru 64.0762)**
(Clone wild collected by Paul C. Hutchison, Jerry K. Wright & R.M. Straw on August 8, 1964 as **PCH *et al.* 6212**)
0.82% mescaline by dry weight. (HPLC)
Ogunbedede 2010 (using green outer tissue)
Originally collected from shaded canyon of Rio Marañon, Chagual, Huamachuco, La Libertad, above Chagual, 5 km below Aricapampa. Elev. 2740 m.

Trichocereus** aff.* ***pachanoi **PCH *et al.* 6212**
regrowth after its analysis by Ogunbodede

Trichocereus** aff.* ***pachanoi **PCH *et al.* 6212**
fruit

Trichocereus** aff.* ***pachanoi **PCH *et al.* 6212**
flower

Trichocereus** aff.* ***pachanoi **PCH *et al.* 6212**
(UC)



Trichocereus** aff.* ***pachanoi **PCH** ***et al.*** **6212**
closer view

***Trichocereus* cv. 'Tom Juul's Giant'** **[Note 6]**

Unclear in origin prior to Tom Juul. Peru seems probable.

1.4% Ogunbedede 2010 (using dried green outer layer)

Presence of Mescaline was both demonstrated by human bioassay and confirmed previously by gc-ms. but it should be emphasized that there are conflicting reports ranging from full activity at 4-6 inches to powerful trips with 1 foot to complete inactivity with 2 feet.) See the 1998 *Entheogen Review* [7 (3): 70] and [7 (4): 99-100] Bioassay information came from various friends.

See more details and lots of images in **Part B *San Pedro***

***Trichocereus pachanoi* cv. Juul's Giant**

Upper left was in Tom Juul's garden

Juul's Giant appears to be highly variable in potency with some apparently being completely inactive.
It is purported by some users to contain additional alkaloids and this has been supported in some but not all gc-ms.

At least 2 forms are in cultivation.
GC-MS by Shulgin showed them to be distinct from each other chemically even though the original source was believed to be identical (Jim Daniel)

Juul's Giant (A):
Unknown Isoquinoline was 90%
Mescaline less than 10%
minor Isoquinoline (not identified)
3 trace Isoquinolines (not identified)
[In a second sampling mescaline was the major alkaloid]

Juul's Giant (JM):
Major alkaloid was an Unknown compound
Second largest peak in the graphs appears to be a lab artifact.
Also observed some sort of phenylethanol

See more details in **Part B *San Pedro***.

It actually gets more complicated as Sasha commented he had thusfar run gc-ms on 5 samples, several of which were from the same form, and came up with 5 different results.

Trichocereus pachanoi **cv. Juul's Giant**

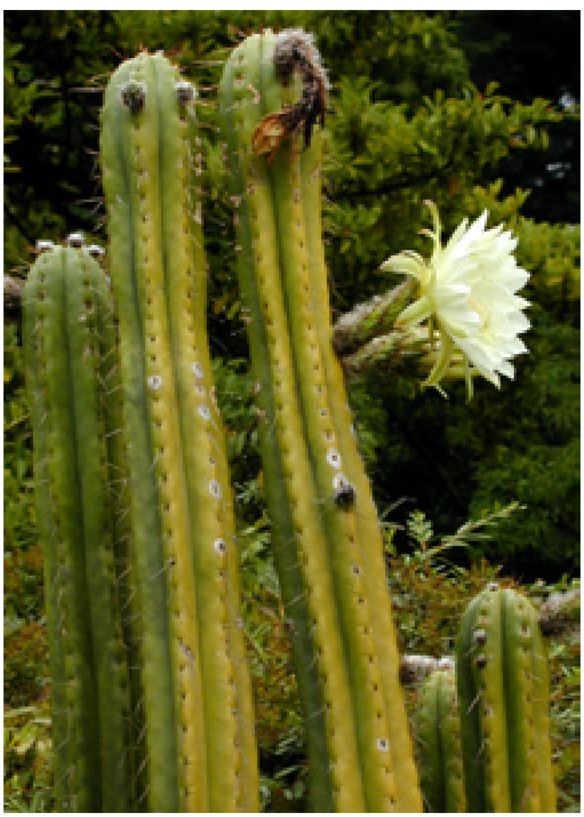
Trichocereus pachanoi
cv. Juul's Giant
(Tom Juul's SF garden)

Trichocereus pallarensis

Trichocereus pallarensis Ritter

0.47% (dry outer green tissues) Ogunbedede 2010 (From F. Ritter seed obtained from Winter in 1960; also depicted on entire page.)

Presence of Mescaline previously established through human bioassays. See 1998 *Entheogen Review* 7 (3): 70-71.



Trichocereus pallarensis
Now relabelled *Echinopsis* sp.

Trichocereus pallarensis
Now relabelled *Echinopsis* sp.

Trichocereus pallarensis
Now relabelled *Echinopsis* sp.

Trichocereus pasacana **(Weber) Britton & Rose**

Candicine (0.08% dry wt.) Meyer & McLaughlin 1980; (0.075% dry wt.) Davis *et al*. 1983

Hordenine (no quantification) Meyer & McLaughlin 1980; (over 50% of 1-10 mg total alkaloids/ 100 gm fresh) Agurell 1969b

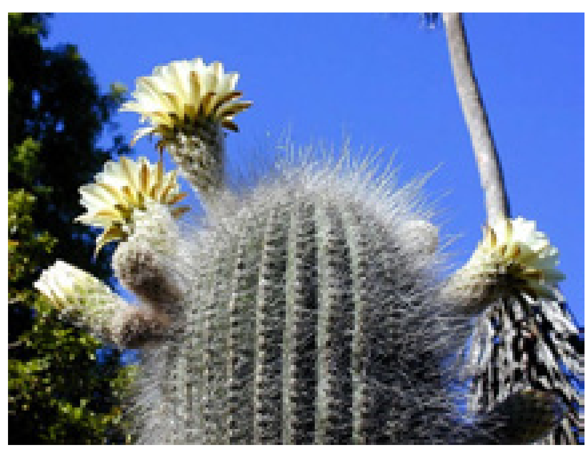
N-Methyltyramine (no quantification) Meyer & McLaughlin 1980

Tyramine (no quantification) Meyer & McLaughlin 1980

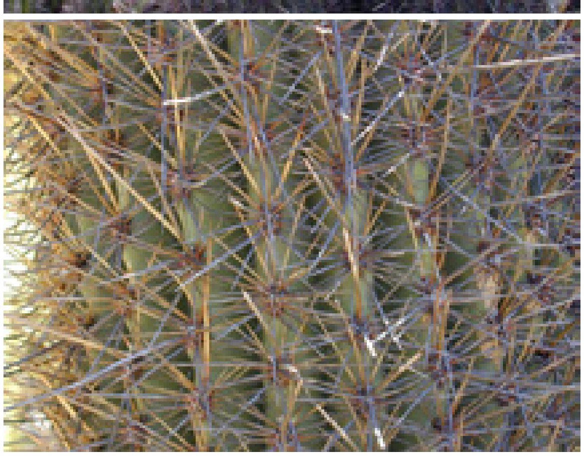
Has been reported to have stimulant activity in human bioassays. Anonymous source (via Voogelbreinder)

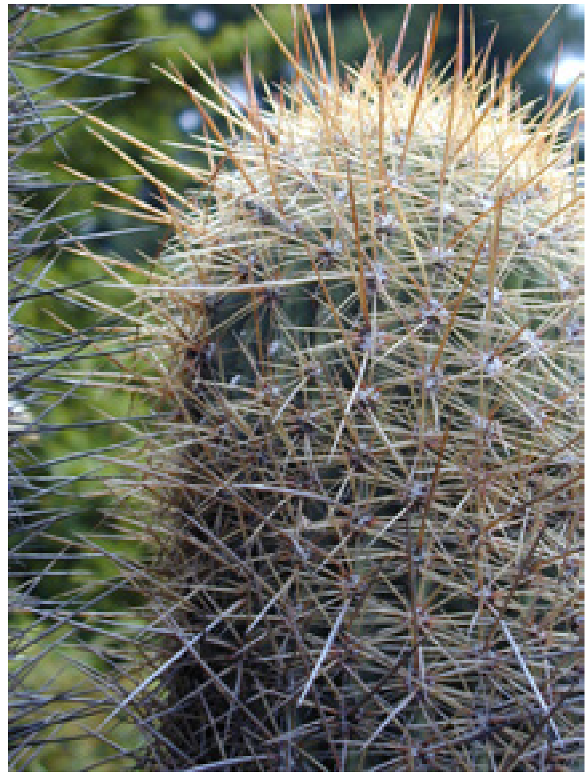
Trichocereus pasacana **(Arg 32.3056) in the foreground**
T. pasacana **(Bol 55.0259) is behind it and to the left**
Flowering plant in background, on right, is *T. pallarensis*

Trichocereus pasacana **Argentina 32.3056**



Trichocereus pasacana **Argentina 32.3056**





Trichocereus pasacana **Bolivia 55.0259**
(Above & left hand column)

Trichocereus pasacana **Argentina 90.0989**

Trichocereus pasacana inermis **Frič 1928** was said to be a synonym for *Echinopsis valida* Monville in Kreuzinger 1935.

Trichocereus pasacana **Argentina 32.3056**

***Trichocereus pasacana* (HBG)**

Trichocereus pasacana
(Cactus Country: top left; Field: rest of page)

Trichocereus peruvianoids see in **Part B *San Pedro***

Trichocereus peruvianus Britton & Rose

AKA "*San Pedro*", "*San Pedro Macho*", "*cuchuma*", "*Peruvian Torch*" and a number of other common names.

Appears to be 90% water by weight **(See Note A)**.

Tyramine (over 50% of 1-10 mg total alkaloids/ 100 gm fresh - mescaline was not reported but two minor unknowns were present.) Agurell 1969b [Obtained via European commercial sources]; (0.0085% dry wt.) Pardanani *et al.* 1977 [Grown from seed in California]

3-Methoxytyramine (trace) Agurell 1969b; (0.01% dry wt.) Pardanani *et al.* 1977.

3,4-Dimethoxyphenethylamine (trace) Pardanani *et al.* 1977.

4-Hydroxy-3,5-dimethoxyphenethylamine (0.0035% dry wt.) Pardanani *et al.* 1977.

Mescaline (0.817% dry wt.) Pardanani *et al.* 1977 **(See Note B)** [Underground mythology claiming that 1) this species has 10X the concentration of *T. pachanoi* & 2) that it is comparable to peyote in potency, appears to have **no basis in fact (See Note C)**. We have been *told* that a half inch slice of a large fresh stem would yield 500 milligrams of mescaline but this lacks any sort of confirmation. [Turner 1998 (*Entheogen Review* 7 (1): 18.) recommended 4 inches of a 4-1/2 inch diameter plant for the same amount. The amount used in Turner's dose would indicate no more than 0.8% dry or 0.08% fresh wt. **(See Note D)** Other human bioassays (Anonymous) indicated that twice this much was required for the same dosage] Many appear to be weaker than this. 0.05% fresh weight may be a better estimate of an average value for good peruvianus strains

Mescaline was not detected by all investigators including **BOTH** Agurell 1969b and Djerassi *et al.* 1955 **(Note E)**

2-Chloro-mescaline (0.016% dry wt.) Thought to be an extraction artifact. Pardanani *et al.* 1977

Traces of an unidentified triterpene lactone Djerassi *et al.* 1955b [Wild collected: Peru]

Unidentified waxy solid (0.22% by dry wt) Djerassi *et al.* 1955b

T. peruvianus notes:

A: Based on one evaluation of a basal slice taken from *T. peruvianus* 'Blue Form'.

B: Pardanani *et al.* 1977 reported the material they analyzed as being KK242 grown in California by Abbey Garden (from Knize seed) What they specifically analyzed is therefor really anyone's guess at this point but an educated guess would be that it was one of the spiny forms of KK242 as these are what ***predominately*** has been produced from Knize's KK242 seeds. See the assorted KK242 images included in **San Pedro** for an illuminating look.

C: This only *approaches* being a true statement if selectively comparing the only published isolation of mescaline from *T. peruvianus* with the lowest testing *T. pachanoi* reported to date.

The highest *T. pachanoi* with a mescaline isolation reported is well over twice Pardanani's value and an additional estimate exists that is nearly 3 times higher (Please remember that *T. pachanoi* exists which is many times stronger than other *T. pachanoi.*)

Similarly, the lowest published value for *T. pachanoi* [0.109%] is greater than the lowest published value for *L. williamsii* [0.1%]


Peru 49.1579


Peru 52.0762

Both images are *Trichocereus peruvianus*

D: Approximation based on a fresh weight determination of 128.5 grams per inch for a 3.75 inch in diameter *Trichocereus* specimen.

E: The material did give a positive Mayer test, but the ether soluble fraction tested neutral and they were unable to isolate any crystalline material so Djerassi concluded it contained no alkaloid.

Agurell on the other hand WOULD have observed even traces of mescaline had they been present.

Important comment:

Every horticultural form and variety of *T. peruvianus* lacks a published analysis; except for two versions of "KK242", one from Knize seed and one from a Knize cutting, the undefined commercial European material was examined by AGURELL and the Peruvian material that was screened by Djerassi.

Species appears to be highly variable in potency & palatability.

To complicate matters further; even material from the same origin appears highly variable in alkaloid content. Whether this is the result of differences in season, environment, water or time of day of harvest has not been established.

To complicate matters even further still; material from a single clone has been reported to be highly variable in alkaloid content when bioassayed repeatedly.

More study is clearly needed.

Many more images of can be viewed in **Part B San Pedro** at http://troutsnotes.com/pdf/SanPedro_2006_with_pachanoi_pachanot_addendum.pdf

A negative alkaloid analysis was also reported by a friend working with 1.5 year old material grown from seed in New Zealand but this however turned out to be material misnomered *Trichocereus peruvianus trujilloensis*. This was a Dick Van Geest collection that is not a *Trichocereus*. See more comments in *San Pedro*.

Trichocereus peruvianus
(growing in Australia)

Trichocereus peruvianus
Peru 48.1540
(UC)
(Above)

Trichocereus peruvianus
Peru 52.0752
(UC)

Trichocereus peruvianus **Peru 48.1540**
(BBG)

Lower 2 photos by Grizzly

Trichocereus peruvianus
(GF)

Trichocereus peruvianus
(GF)

Trichocereus peruvianus
(GF)

***Trichocereus rosei* #2 (*peruvianus*)**
(Field)

Trichocereus rosei **#2 (*peruvianus*)**
(Field)






***Trichocereus rosei* #1 (*T. peruvianus*)**
left column
***Trichocereus rosei* #2 (*T. peruvianus*)**
right column
(Field)


Trichocereus peruvianus
cv. "Blue form"

Trichocereus peruvianus
f. Ancash

Trichocereus peruvianus
cv. KK338
above

***Trichocereus peruvianus* KK242**

0.817% Mescaline. Seed grown by Abbey Garden using KK242 seeds from Karel Knize.
PARDANANI *et al*. 1977 (Using intact plant)

0.24% K242 propagated from a live cutting sent by Karel Knize.
OGUNBEDEDE 2010 (Using dried outer green tissue)

Widely asserted to be nearly useless or totally inactive according to anecdotal bioassay accounts.

Some of this is believed to be the result of some confusion between *peruvianus* and *cuzcoensis* in some commercial seeds originating from Karel Knize in Peru. See MS SMITH online for comments and the photograph at the bottom of this page. While it is certainly true that there are abundant occurrences of *cuzcoensis* produced from Knize seeds that were mislabelled KK242 this does not include a huge number of KK242 specimens worldwide which are *peruvianus* or *pachanoid*. There are also unmistakable *Trichocereus bridgesii* specimens which have been grown from Knize's KK242 seeds.

A plant obtained as a live cutting from Karel Knize in Peru as ***Trichocereus peruvianus* KK242 Matucana** has been shown to be as active as many *pachanoi* plants according to its grower.

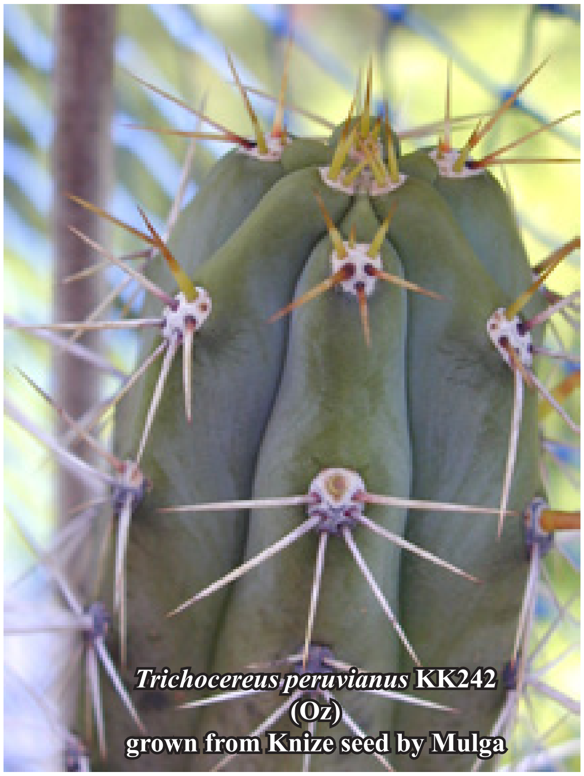
Trichocereus peruvianus [or **aff. *pachanoi***?]

0.25% Mescaline. Chavin de Huantar, Huari, Ancash
CJUNO *et al*. 2009 (Using dried outer green tissue)

Images can be found online of the cacti growing at Chavin de Huantar.

***Trichocereus peruvianus* KK242**
Regrowth on cutting analyzed by Ogunbodede

Grown from seeds sold by Knize as
***Trichocereus peruvianus* KK242**



Trichocereus peruvianus **KK242 (Oz) grown from Knize seed by Mulga**

Trichocereus peruvianus **KK242 cutting obtained from Knize via AH**

Trichocereus peruvianus **KK242 cutting obtained from Knize via AH**

Trichocereus peruvianus **KK242 as seen by Karel Knize**

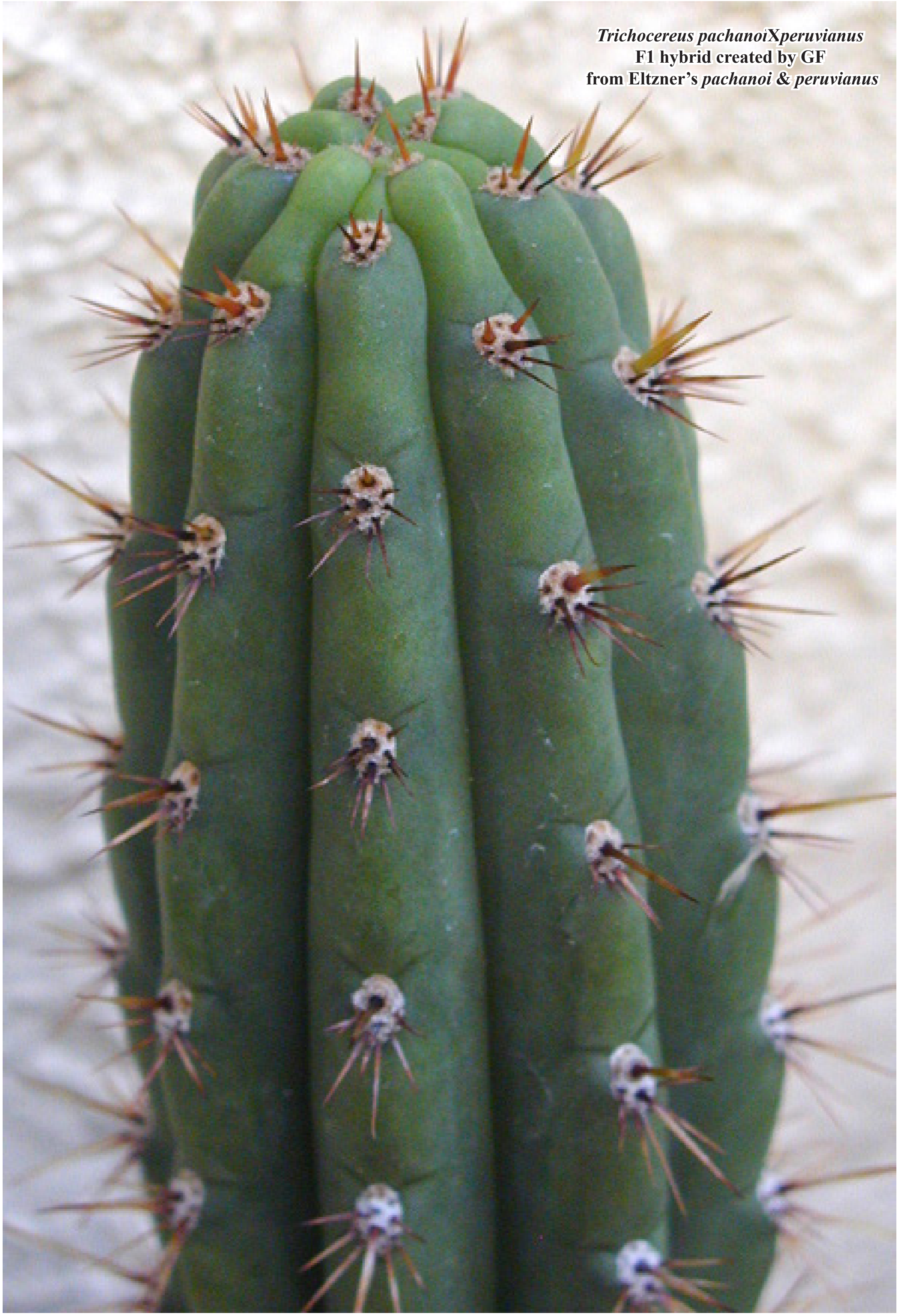
Trichocereus peruvianus **KK242 Rio Chillon cutting obtained from Knize**

Trichocereus peruvianus **KK242 f. Matucana cutting obtained from Knize**

Trichocereus peruvianus **KK242 Rio Chillon**
Obtained as a cutting from Knize

Originally from a large adult growing in the remnants of Ed & Mary Gay's collection.

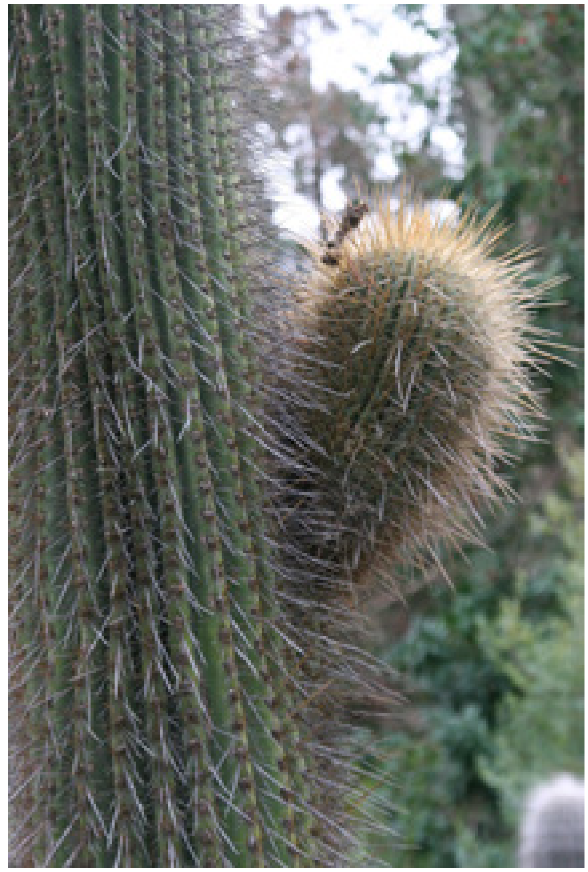

*Trichocereus pachanoi*X*peruvianus*
F1 hybrid created by GF
from Eltzner's *pachanoi* & *peruvianus*


*Trichocereus pachanoi*X*peruvianus*
F1 hybrid created by GF
from Eltzner's *pachanoi* & *peruvianus*

***Trichocereus peruvianus*X Juul's Giant**

Trichocereus poco **Backeberg**

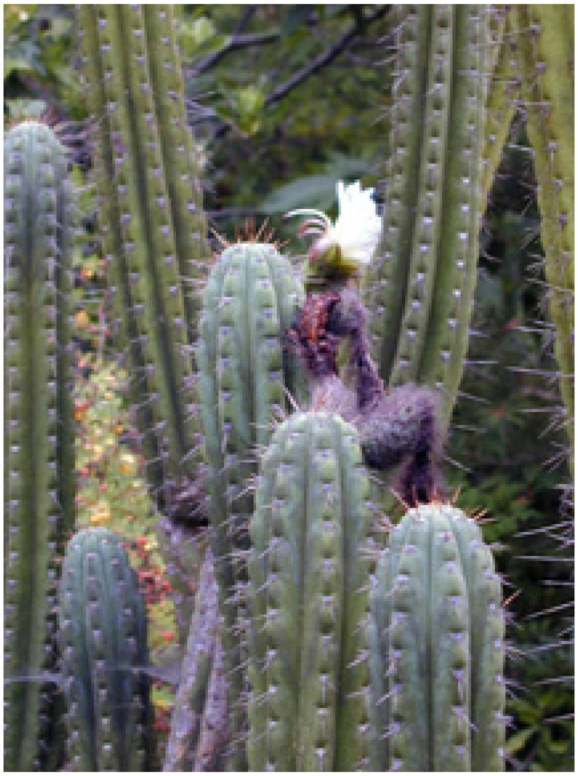
Hordenine (over 50% of 1-10 mg total alkaloids/ 100 gm of fresh plant) Agurell 1969b [European commercial sources]



Trichocereus poco **Bolivia 55.0261**
(UC)
entire page

Trichocereus poco

Trichocereus puquiensis RAUH & BACKEBERG
Determined to contain Mescaline. (Details farther below.)

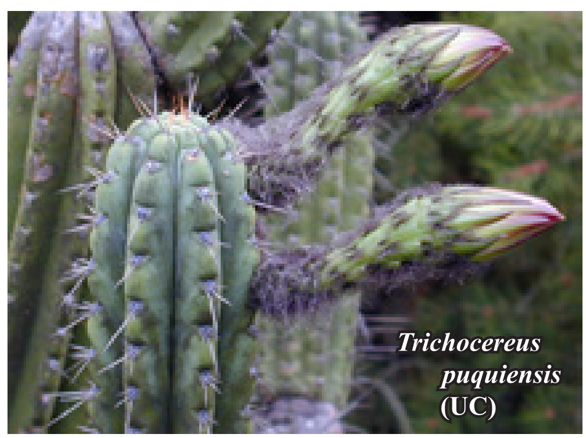


Trichocereus puquiensis
(UC)
entire page

0.28% Chaviña, Lucanas, Ayacucho
0.13% Chumpi, Parincochas, Ayacucho
0.11% Incuyo, Parincochas, Ayacucho
0.50% Vado, Lucanas, Ayacucho
Serrano 2008 & Cjuno *et al*. 2009 (Wild Peruvian collections)

Trichocereus puquiensis
(BR)

Trichocereus puquiensis
(UC)



Trichocereus puquiensis
(UC)

0.13% mescaline (From a clone collected by Paul Hutchison)
Ogunbedede 2010
[Both accounts above analyzed dried outer green tissues.]

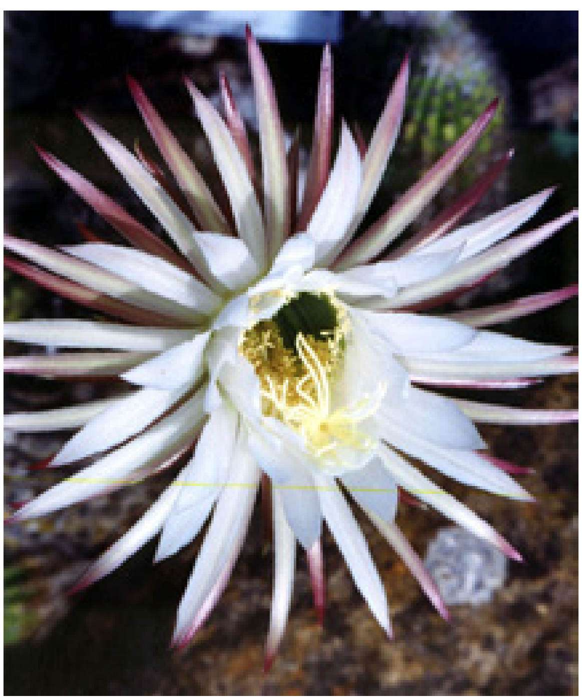
The monstrose form has been reported to be mescaline containing in human bioassay.

20 inches was described as being of "*medium strength*" (Correspondent requesting anonymity)

Trichocereus purpureopilosus Wgt.

Tyramine (10-50% of 10-50 mg of total alkaloids/ 100 grams fresh) Agurell *et al.* 1971b

N-Methyltyramine (10-50% of 10-50 mg of total alkaloids/ 100 grams fresh) Agurell *et al.* 1971b [Obtained via commercial source in the Netherlands]



Trichocereus purpureopilosus
(UC)
Flower picture by Jon R. Hanna

Trichocereus purpureopilosus
Seedling photos by Evil Genius

Trichocereus riomizquiensis Ritter

0.40% grown from Ritter's seed (**FR 856**) Ogunbedede 2010 (dried outer green tissue)

***Trichocereus riomizquiensis* motherplant in 2010**
(NMCR)

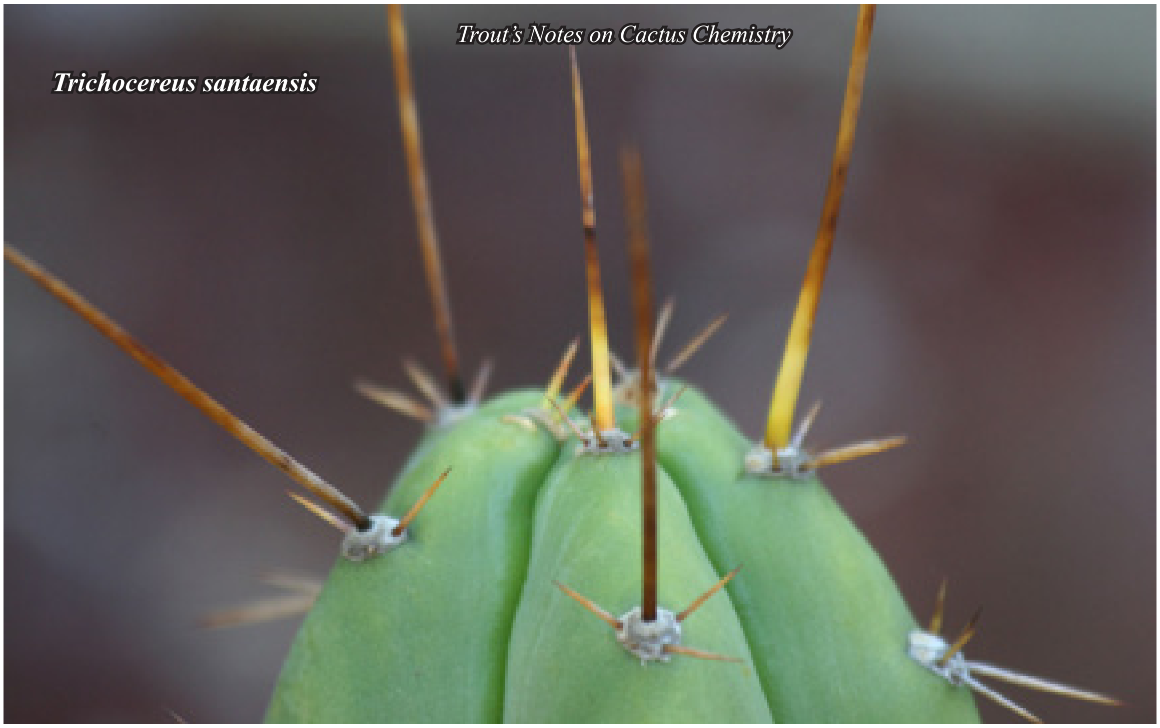
Trichocereus riomizquiensis Ritter
aka *Echinopsis pachanoi* subsp. *riomizquiensis* sensu Nigel Taylor

Trichocereus riomizquiensis
regrowth on the cutting analyzed by Ogunbedede
(The mother was grown at NMCR from "FR856" seeds that Horst obtained from Fernando Caralt de Riviere.)

***Trichocereus santaensis* OST 92701**
top shows an older column with much sun
above shows new growth in very little sun
(This specimen was analyzed by Ogunbedede)


Trichocereus santaensis
H 76747 (FK 873) ISI 97-37
FK 873 was collected by Fred Kattermann at 7900 ft. altitude, 3 km south of Mancos, Carhuaz Prov., Ancash Dept., Peru.
Trichocereus santaensis
(HBG)

Trichocereus santaensis
(HBG via SS)
Ostolaza collected seeds ca. 3000 m
in the Santa Valley of Peru

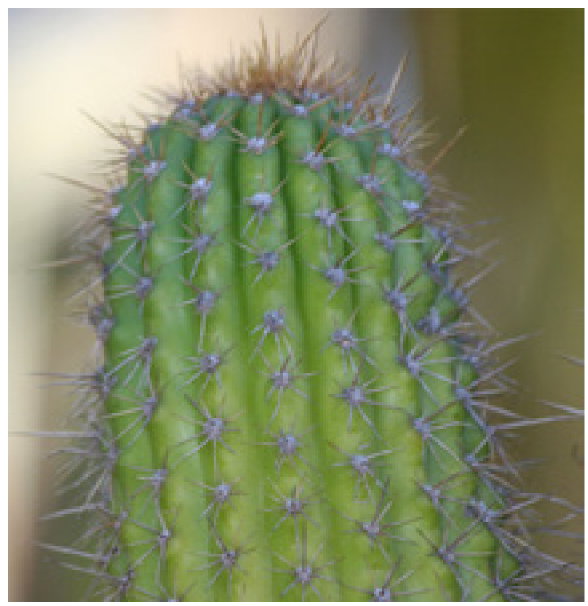


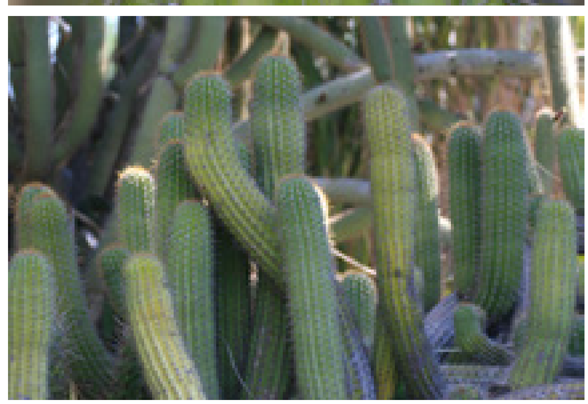
Trichocereus santaensis **Rauh & Backeberg**
Successful bioassay reported by source requesting anonymity.
0.31% Mescaline. Mancos, Yungay, Ancash
Cjuno *et al*. 2009 (Wild Peruvian collection.)
0.32% (using **OST 92701** seed-grown in cultivation.)
Ogunbedede 2010
(Everything above using dried outer green tissue.)

Palomino's 1972 dissertation details the process he used for isolating alkaloids and describes their physiological effects on mice (with results that were strongly reminiscent of the comments in Cruz Sanchez 1948)

He described *Trichocereus santaensis* as being of "*low toxicity.*" (Meaning low alkaloid?) Oddly, it never mentioned how he identified the plant or what the alkaloids were.

Our thanks to Dr. Carlos Ostolaza for completing the details concerning this obscure paper.

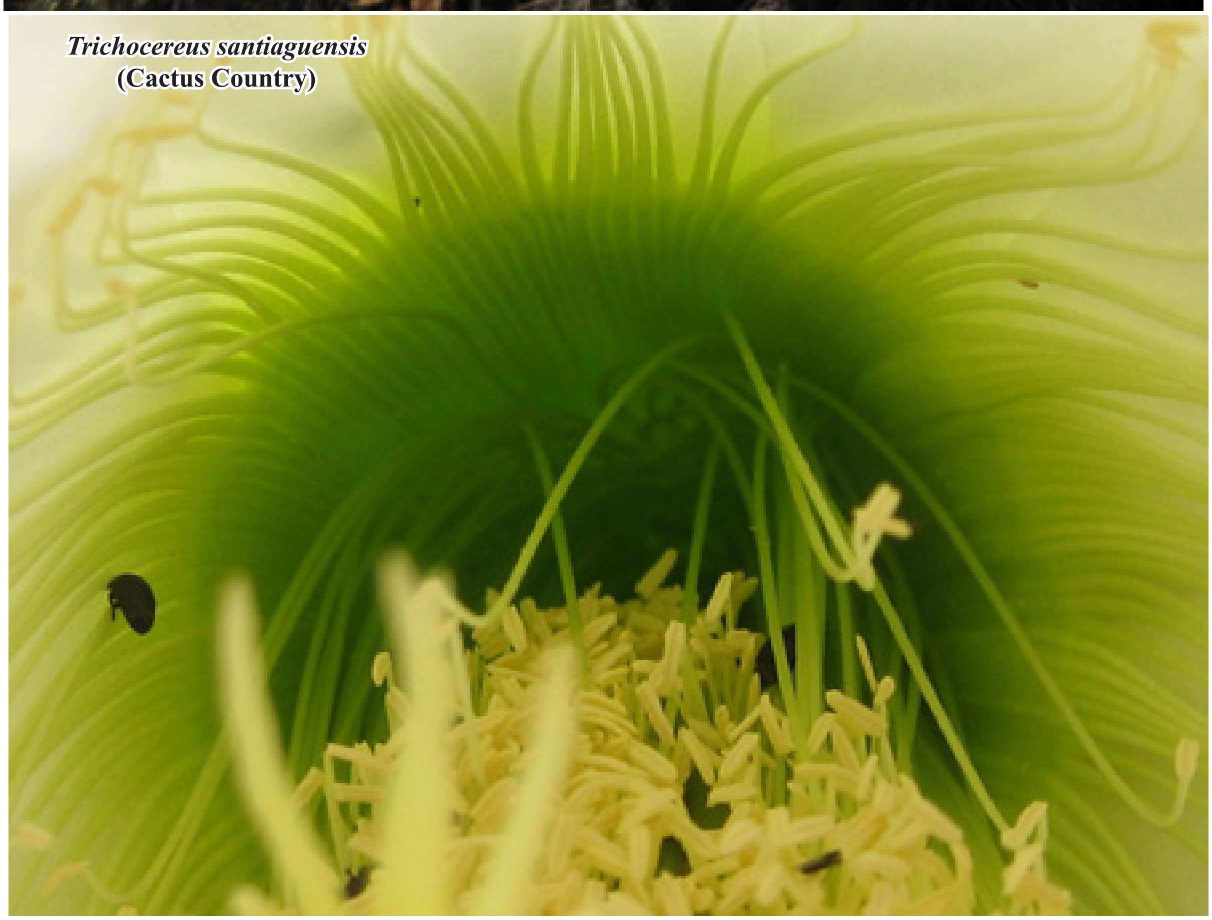


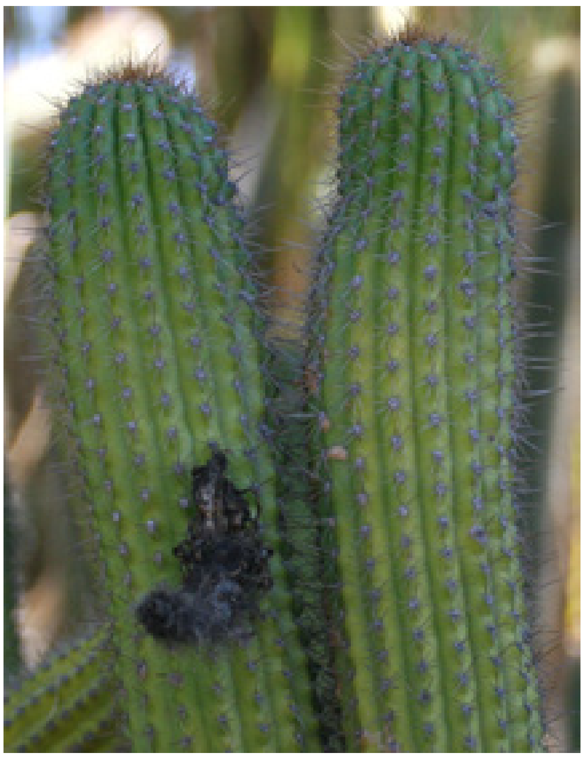


Trichocereus santiaguensis
lower three images

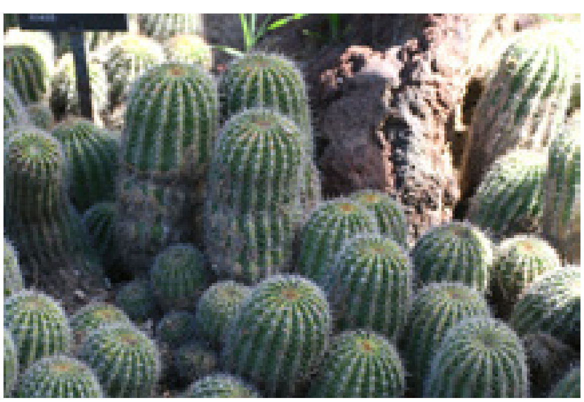
Trichocereus santiaguensis
(Cactus Country)

Trichocereus santiaguensis
(Cactus Country)





Trichocereus santiaguensis
above
Considered to be conspecific with *T. spachianus*. Hunt 2006

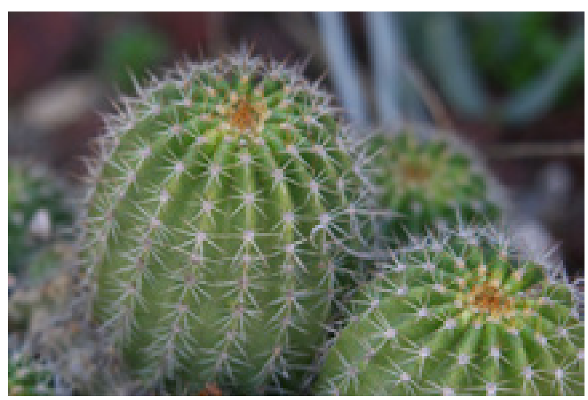


***Trichocereus schickendantzii* Argentina 61.0827 (UC) lower left & right column**

***Trichocereus santiaguensis* (Spegazzini) Backeberg**

Hordenine (10-50% of the 1-10 mg of total alkaloids/ 100 grams fresh) Agurell *et al.* 1971b [commercial sources in Germany & the Netherlands]

Tyramine (10-50% of 1-10 mg of total alkaloids/ 100 grams fresh) Agurell *et al.* 1971b



***Trichocereus schickendantzii* (Weber) Britton & Rose**

N-Methyltyramine (trace) Agurell 1969b

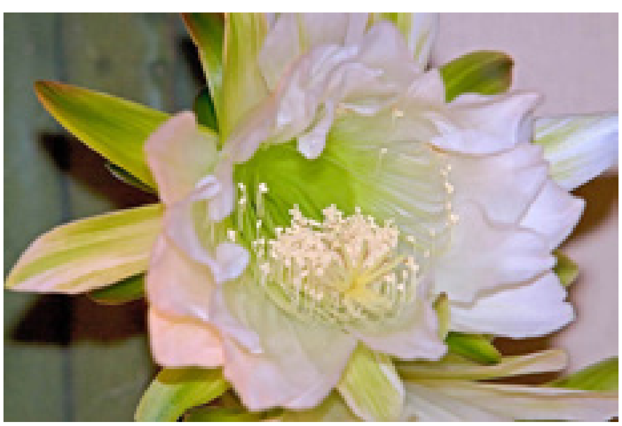
Hordenine (over 50% of 1-10 mg total alkaloids/ 100 gm fresh) Agurell 1969b [Obtained via European commercial sources

Trichocereus schickendantzii* f. *cristata is listed as an available horticultural offering in Kreuzinger 1935.

Trichocereus schoenii **Rauh & Backeberg**
Mescaline was isolated from three wild Peruvian collections:
0.22% Cotahuasi, La Unión, Arequipa (June)
0.20% Pampacola, Castilla, Arequipa (July)
0.14% Huambo, Arequipa (April)
All of above from Serrano 2008 & Cjuno *et al*. 2009 (dried outer green tissue; all percentages by dry weight)
See also the work of Choquenaira *et al*. 2007
Trichocereus schoenii is now merged with *T. cuzcoensis*.

Trichocereus schoenii
(Colca Canyon, near Arequipa, Peru)
Photo by Grizzly

Trichocereus schickendantzii **(Field)**



Trichocereus scopulicola
(Cactus Country)
above
Flower photo on left is copyright by Bit

Trichocereus scopulicola **Ritter**

0.85% Grown from **FR 991** seed by NMCR

Ogunbedede 2010 (dried outer green tissue)

Despite some earlier attempts to reject this as an invalid species, Hunt recognizes it as a valid *Echinopsis* species: *Echinopsis scopulicola* (Ritter) Mottram - presenting as the describer someone who has neither written nor published a taxonomic description! [Personal communication with Roy Mottram]

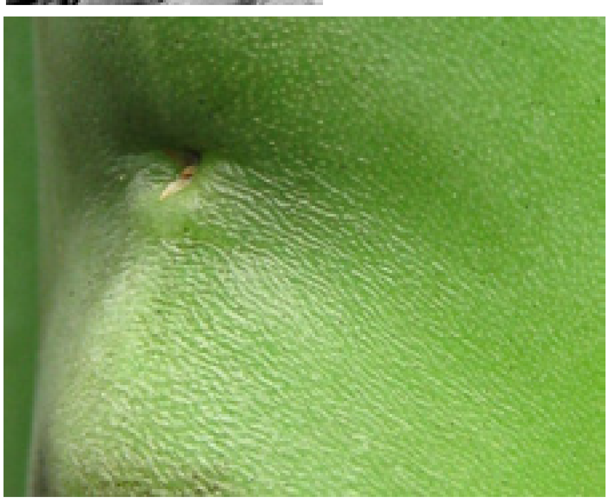
First demonstrated to contain mescaline based on human bioassays.

See **Activity Notes**.

Trichocereus scopulicola
(Australia)
Flower photo by Anonymous

Trichocereus scopulicola
(Australia)
Tall column on left pictured with *pachanoi*

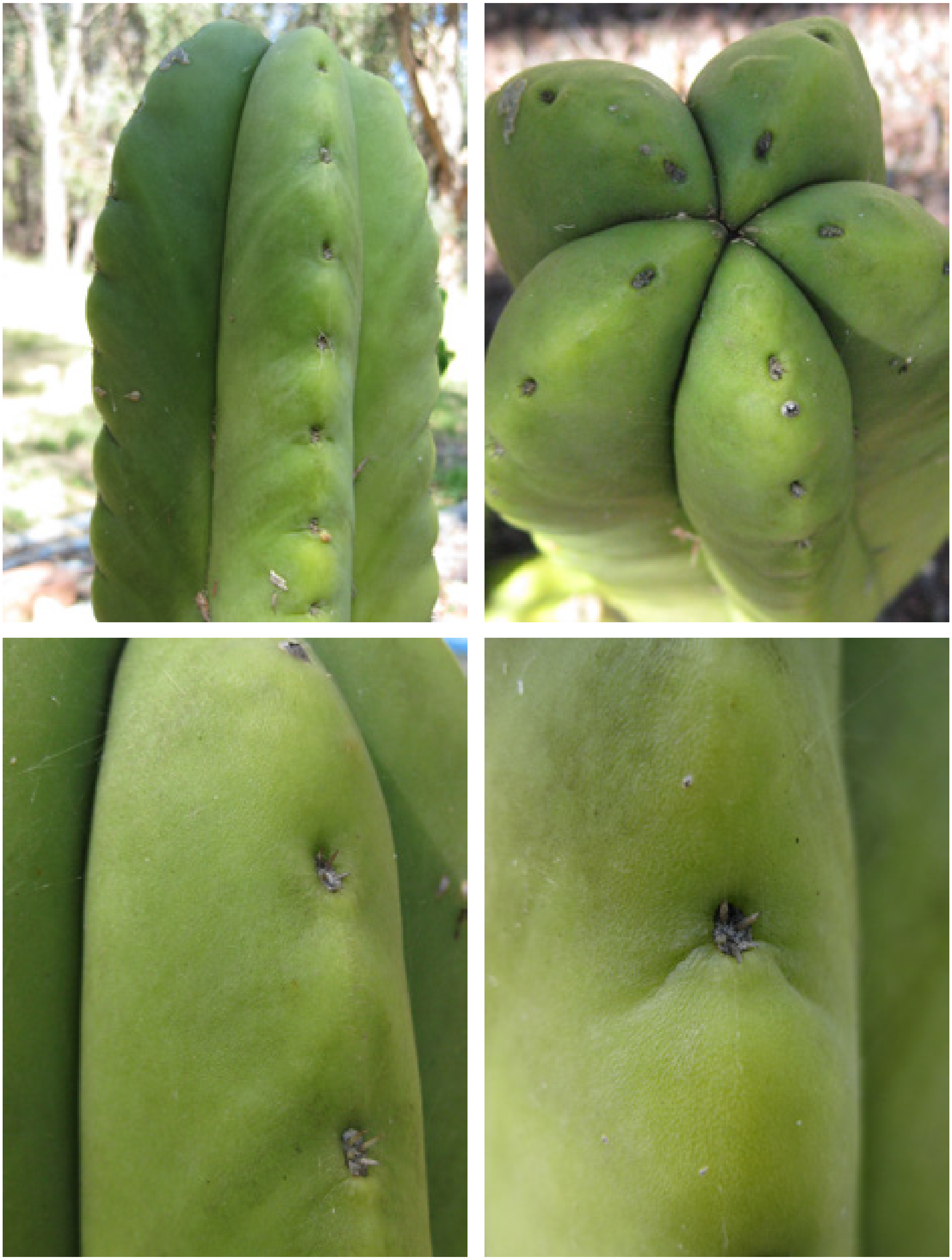
Trichocereus scopulicola
(Cactus Country)
areole & skin detail below



Trichocereus scopulicola
(grafting stock from England)
right

Trichocereus scopulicola
(Cactus Country)

Trichocereus scopulicola
(Cactus Country)
Next to a *bridgesii* column on the left.



Trichocereus scopulicola **(Cactus Country)**


Trichocereus scopulicola
(NMCR)

Trichocereus scopulicola
(Australia)

Trichocereus scopulicolus Ritter See as ***Trichocereus scopulicola* Ritter**.

This descriptionless name appeared in Backeberg's *Cactus Lexicon*, seemingly to bring the spelling into line with the other *Trichocereus* species. Backeberg commented that no description was available. Evidently his dislike/hatred of Ritter caused him to not obtain any of Ritter's three published descriptions.

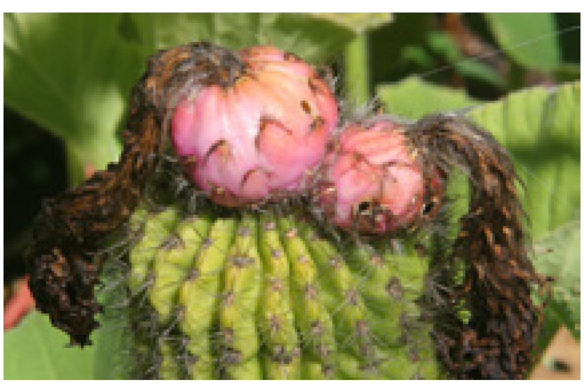
T. scopulicola is presently suspected of being extinct in the wild.

Trichocereus skottsbergii Backeberg

N-Methyltyramine (1-10% of 10-50 mg of total alkaloids/ 100 grams fresh) Agurell *et al.* 1971b

Hordenine (Over 50% of the 10-50 mg of total alkaloids/ 100 grams fresh) Agurell *et al.* 1971b [Obtained via commercial source in Germany]

Trichocereus smrzianus Reported to be *"psychoactive"* but *"different than San Pedro"* Anonymous in correspondence 1998. Needs an analysis.



Trichocereus smrzianus

Trichocereus spachianus (Lemaire) Riccobono

AKA "*White torch*"

Tyramine (trace) Mata *et al.* 1972, also reported in Mata & McLaughlin 1976. Not observed by Agurell 1969b.

N-Methyltyramine (0.007% dry wt.) Mata *et al.* 1972, also reported in Mata & McLaughlin 1976; Not observed by Agurell 1969b

Hordenine (over 50% of 1-10 mg total alkaloids/ 100 gm fresh) Agurell 1969b [Obtained via European commercial sources]. Also reported in Mata & McLaughlin 1976 [The cited reference Mata *et al.* 1980 (which appears listed for this compound) actually intended to indicate Mata & McLaughlin 1980 but it does not include this species]

Candicine (%?) Reti 1950, Reti 1954 & Reti & Castrillon: all citing private communication from Haagen-Smit & Olivier. [Agurell 1969b & Mata & McLaughlin 1976 have been listed with regards to this compound but neither detected it. Agurell specifically did not look for quaternary compounds; both simply mentioned a prior report.]; 0.093% by dry weight: Davis *et al*. 1983

[Mescaline has been **erroneously** listed for this species; the reference cited, Pummangura & McLaughlin 1982, [i.e. Pummangura *et al.* 1982a] specifically stated that they DID NOT detect the presence of mescaline.]

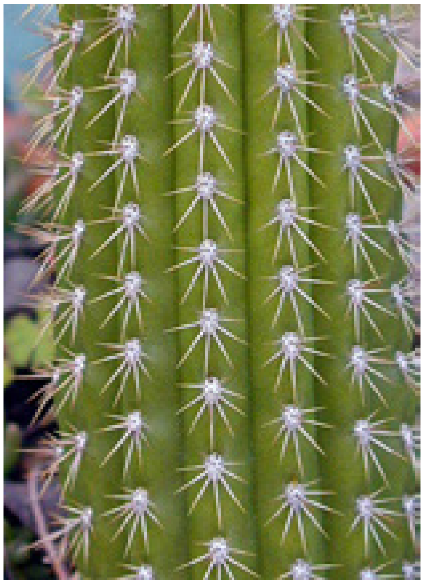
Reported to contain Kaempferol & Quercetin (Flavonols) Richardson 1978 (based on acid hydrolysis).

See comments in **Activity Notes**.

Trichocereus spachianus

Trichocereus skottsbergii **in Bolivia**
Photo by correspondent requesting anonymity

Trichocereus spachianus
(Field)



Trichocereus spachianus
(Cultivated in California)
entire page

There are many named and unnamed *Trichocereus* cultivars, forms or maybe even some species that are in need of analysis and/or have been determined to be active in human bioassays. Several are on the pages that follow but most are omitted from this work due to it being unnecessarily redundant with the contents of the San Pedro book.

See **Part B *San Pedro*** for details and many images.

There is a pdf available at

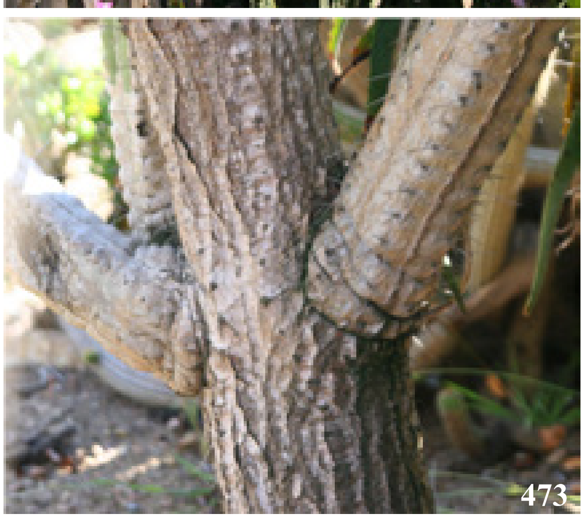
http://troutsnotes.com/pdf/SP.html

***Trichocereus* sp.**

We presently do not know the correct identification of this plant. It resembles *bridgesii*, *uyupampensis* and *knuthianus* (and several other species) but does not seem to be an exact fit for any.

These photos were taken of a plant that used to be in Tom Juul's garden.

This plant has been proven to be a mescaline container through human bioassay. Correspondent requesting anonymity in 2005.



***Trichocereus* sp.**
entire page

Trichocereus **sp. Peru 65.0715**
(UC)
Wild collected as cuttings; known locally in Peru as "San Pedro".
Lacks an analysis.
More recently this SPECIMEN was relabeled *Echinopsis macrogona* Ecuador 58.1079.
Go figure as to how a name, point of origin AND an accession number can change after so many years.

***Trichocereus* sp. N.Chile (Torres & Torres)**
Presence of Mescaline has been proven by human bioassay
Torres & Torres 1995
Lacking published analysis.

***Trichocereus* sp. N.Chile (Torres & Torres)**
(this is a *pachanoi*)

***Trichocereus* sp. SS02** (a *T. bridgesii* form) Reported to be a reliably effective form in multiple human bioassays; presence of mescaline demonstrated in GC-MS (seemingly as sole alkaloid?) Needs taxonomic study and an analysis.
Anonymous 1999 & 2000. **3 images on this page.**

Trichocereus strigosus **(Salm-Dyck) Britton & Rose**

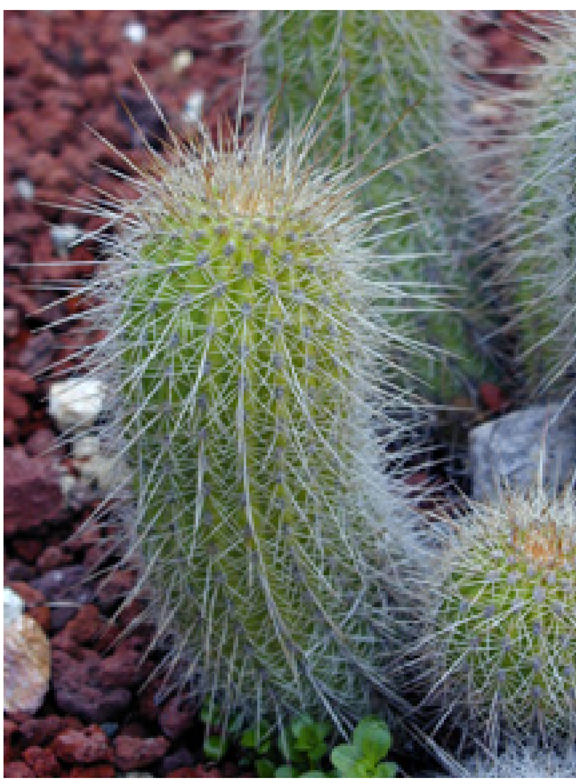
Tyramine (trace) Nieto *et al.* 1982

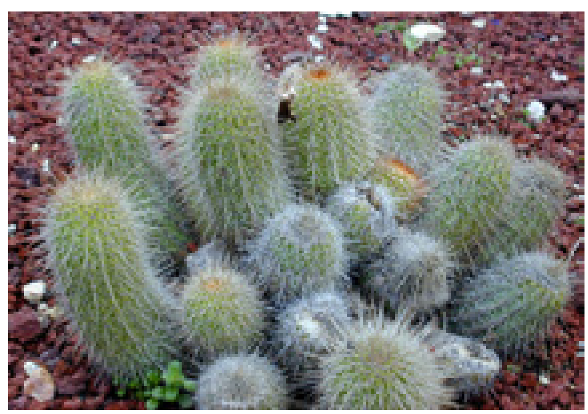
Hordenine (Sole alkaloid present. 10-50 mg/ 100 grams fresh: Agurell *et al.* 1971b [Commercially obtained greenhouse material grown in Germany]. (0.139% dry wt.: Nieto *et al.* 1982)

Mescaline (trace) Nieto *et al.* 1982

Candicine (0.11% dry wt.) Nieto *et al.* 1982 [Material from Argentina; Medoza and San Juan provinces]

[One unidentified base also reported. Nieto *et al.* 1982]





Trichocereus strigosus

Trichocereus tacnaensis Ritter **Needs** an analysis Considered a synonym of *T. peruvianus* by Hunt

Trichocereus tacaquirensis (Vaupel) Cardenas ex Backeberg

Needs an analysis. *Trichocereus taquimbalensis* Cardeñas is now considered a subspecies of *E. tacaquirensis* by Hunt.

Probably *Trichocereus tacaquirensis* (Bolivia)
Photo by correspondent requesting anonymity

Trichocereus taquimbalensis (Mesa Garden)

***Trichocereus taquimbalensis* (Kimnach via HBG)**
lower row

Trichocereus taquimbalensis **Cardenas**
3-Methoxytyramine. (trace)
Hordenine (1-10% of 10-20 mg total alkaloid/ 100 gm)
3,4-Dimethoxyphenethylamine (trace)
Mescaline (5-25+ mg. per 100 grams)
Agurell *et al.* 1971b [Obtained via commercial source in the Netherlands] (all % are as **fresh** weight)

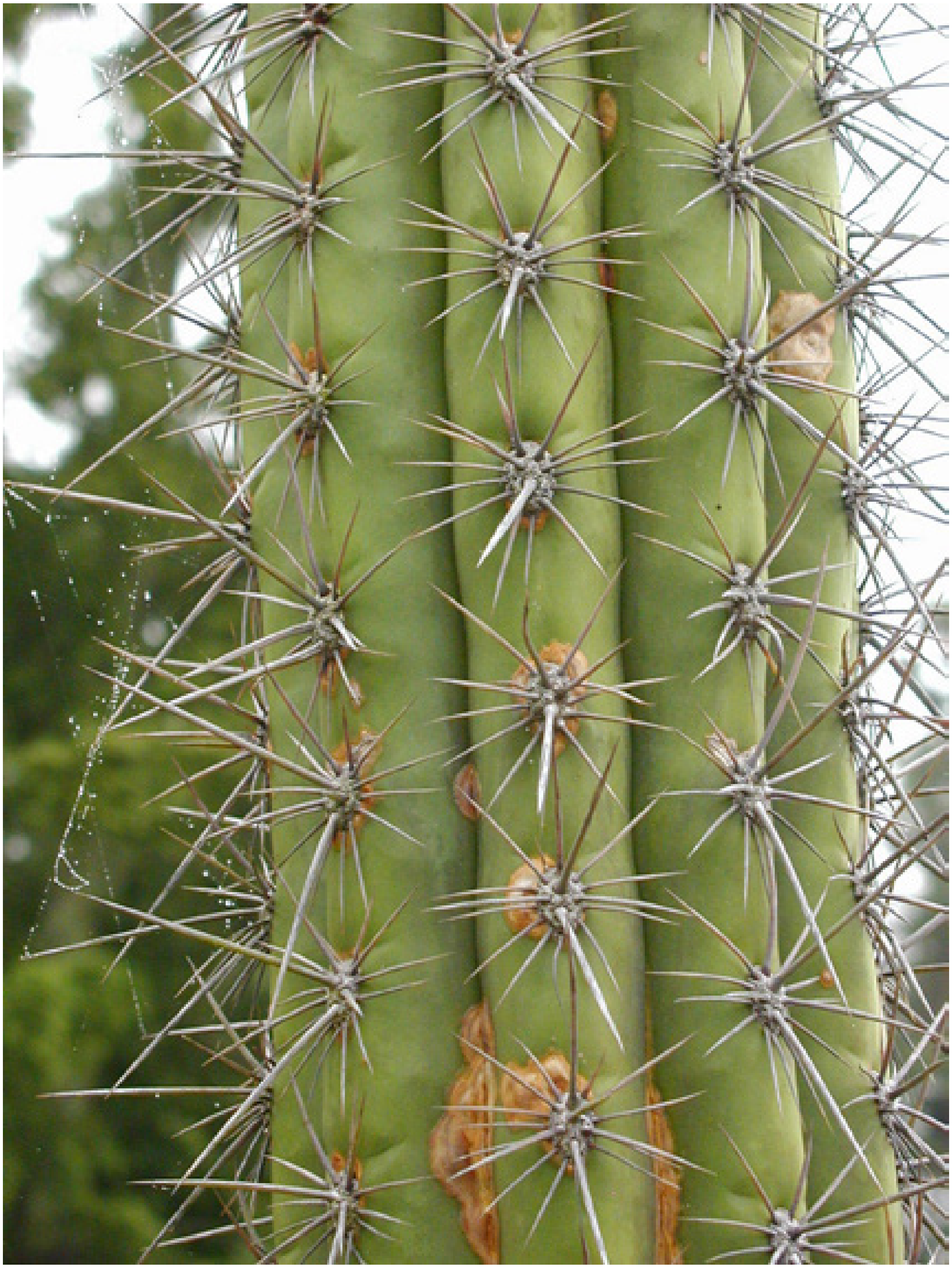
See comments in **Activity Notes**.

Trichocereus taquimbalensis
(HBG) H 68146 Kieseling

Trichocereus taquimbalensis

Trichocereus taquimbalensis **(HBG)**
R. Kiesling *s.n.*
(H 68146; ISI 98-21)
Collected in southern Bolivia.

Trouts Notes on Cactus Chemistry



Trichocereus taquimbalensis
(HBG)

Trichocereus tarmaensis
needs an analysis.

See more images
in *San Pedro*

Trichocereus tarmaensis
(UC)
entire page

Trichocereus tarmaensis
(UC)

Trichocereus tephracanthus
(Field)
Needs an analysis. Now considered *Harrisia tetracantha*.

Trichocereus terscheckii **(Parmentier) Britton & Rose**

92-95% water by weight Reti & Castrillón 1951

Total alkaloid content varied between 0.25-1.2% dry wt. Reti & Castrillón 1951 [Collected from the wild in Argentina]

3,4-Dimethoxyphenethylamine Observed as minor alkaloid by Shulgin in GC-MS

N-Methyl- 3,4-dimethoxyphenethylamine Observed as minor alkaloid by Shulgin in GC-MS

N,N-Dimethyl-3,4-dimethoxyphenethylamine Observed as minor alkaloid by Shulgin in GC-MS

Mescaline (5-25+ mg. per 100 grams fresh.) (Major alkaloid) Agurell 1969b [Obtained via European commercial sources]; [Also noted in Agurell 1969a: "*contains rather exclusively mescaline*"] (Minor alkaloid [Reported a yield of 4 gm. from 10 kg. dry: 0.04% dry wt]; sometimes entirely absent in higher alkaloid material) Reti & Castrillon 1951. Found to be the major alkaloid by Shulgin in GC-MS (material from NW Argentina)

N-Methylmescaline Observed by Shulgin in GC-MS

N,N-Dimethylmescaline (Trichocereine) Major alkaloid (5:1 ratio with mescaline). Reti & Castrillon 1951. [Not observed by Agurell 1969b. Observed by Shulgin in GC-MS.]

Anhalonine (trace detected) Reti & Castrillon 1951. Shulgin unable to detect in GC-MS

Needs further analysis. Unpublished GC-MS has variously shown mescaline as the only alkaloid, the major of multiple alkaloids or only a minor alkaloid.

(Conflicting analysis seems to be the norm. An hplc example taken from the Internet: 0.061% [sic] mescaline content by dry wt. Of 0.72% total alkaloid: 16% was mescaline [0.11%], 44% was Anhalonine or some PEA 0.32[%], 30% was either methyl or dimethyl mescaline [0.22%] and 10% was an unidentified PEA [0.07%]. There appears to be mathematical errors in this account so it should all be viewed with caution. For instance 16% of 0.72 is 0.11 not 0.061)

The claim of DMT being in this cactus resulted from an unfortunate **typo** by Schultes & Hofmann; intending N,N-Dimethylmescaline ***not*** N,N-Dimethyltryptamine. This **error** has sadly taken on a life of its own via the counterculture rumor mills.

See comments in **Activity Notes**.

Trichocereus terscheckii
(Huntington)

Trichocereus terscheckii
(Kimura)

Trichocereus terscheckii
(UC) Planted by Myron Kimnach more than 50 years before this image was taken. Myron has now outlived this gigantic plant.

Trichocereus terscheckii
(UC) from the southern part of its range

Trichocereus thelegonoides (Spegazzini) Britton & Rose

Hordenine (Sole alkaloid; 10-50 mg/ 100 grams fresh) Agurell *et al.* 1971b [Obtained via commercial source in Germany]

Mescaline (traces) Siniscalco 1983. **Not** detected by Agurell *et al.* 1971b.

Trichocereus thelegonus (Weber) Britton & Rose

N-Methyltyramine (trace) Agurell *et al.* 1971b

Hordenine (Over 50% of the 10-50 mg of total alkaloids/ 100 grams fresh) Agurell *et al.* 1971b [Obtained via the Kew Royal Botanical Gardens & a commercial source in Germany]

Trichocereus torataensis Ritter **Needs** an analysis Considered a synonym of *T. peruvianus* by Hunt

Trichocereus tulhuayacensis Ochoa

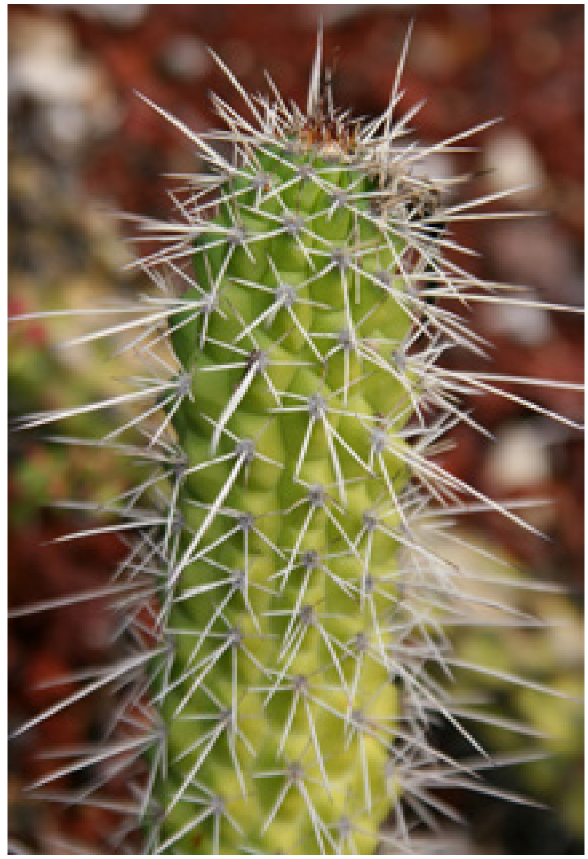
Claim for the presence of mescaline is made by Caycho Jimenez 1977 (page 91) but he cites no reference to support his assertion.

See comments in **Activity Notes**.

Trichocereus tunariensis Cardenas

Tyramine (10-50% of 10-50 mg of total alkaloids/ 100 grams fresh) Agurell *et al.* 1971b

Hordenine (10-50% of the 10-50 mg of total alkaloids/ 100 grams fresh) Agurell *et al.* 1971b [Obtained via commercial source in the Netherlands]

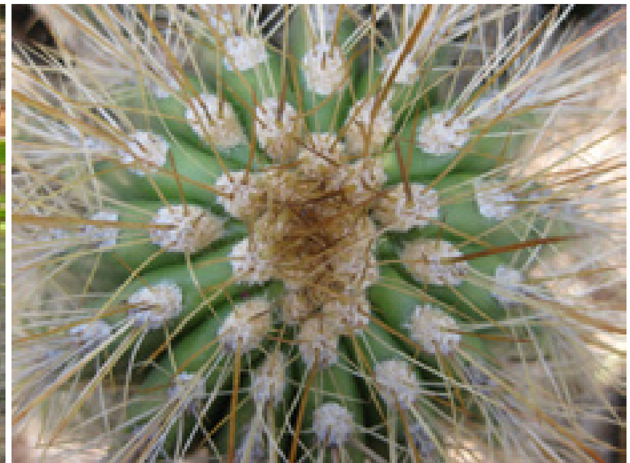


Trichocereus thelegonoides
(UC) 56.0227 Argentina

Trichocereus thelegonus
(HBG)

Trichocereus thelegonus
(HBG)

Trichocereus thelegonus
(Field)



Trichocereus totorensis
(Field)

This species presently lacks an analysis.

Trichocereus uyupampensis Backeberg

0.053% Ogunbedede 2010

UC records indicated this was grown from a clone deposited at Monaco by Backeberg. (Analysis using dried outer green tissue) I presently (2012) believe this plant to be misidenified. The results of the analysis performed by Ogunbodede were accurate but the identification of this species by Monaco was not.

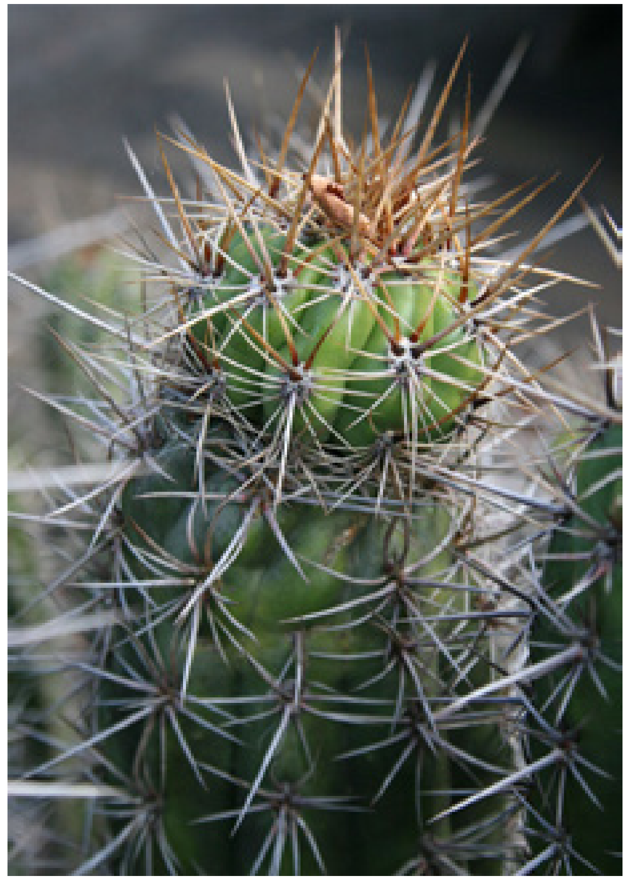
"Trichocereus uyupampensis"

Said to be *Trichocereus uyupampensis*
(UC)

Trichocereus validus (Monville) Backeberg

Mescaline (Over 25 mg. per 100 grams fresh.) Agurell *et al.* 1971b [Obtained via the Kew Royal Botanical Gardens]

Note that there are SEVERAL unrelated plants stuffed into this name as represented in horticulture. NOT synonymous with *Echinopsis valida* which is short and clumping. It has been uselessly redesignated as *Echinopsis* sp. by Hunt. The stout, taller columnar form apparently rarely offsets, and is MOST LIKELY what was analyzed by Agurell. Its not possible to know with any certainty.



Trichocereus validus
Entire page

Seemingly without further comment or a reference, Hunt inexplicably refers to this as **= ?*T. uyupampensis***.

Echinopsis forbesii was said to be synonymous with *Echinopsis valida* Monville by Britton & Rose

Trichocereus terscheckii was said to be synonymous with *Echinopsis valida* Monville in Kreuzinger 1935

Trichocereus validus
(SS)

Trichocereus validus
(Field)
from Blossfeld's Andean expedition

Trichocereus validus
(Field: top left; Cactus Country: other two)

Trichocereus vollianus
(Cactus Country)

Trichocereus vollianus
(Cactus Country & Field)

Trichocereus vollianus Backeberg

Mescaline (traces by dry weight) Siniscalco 1983

Trichocereus vollianus
Photos by Joylene Sutherland

Trichocereus volcanensis Lack an analysis

***Trichocereus volcanensis* Arg. 56.0508**
(dying specimen at UC BBG; should be green)

Trichocereus werdermannianus Backeberg

Tyramine (trace) Agurell 1969a and 1969b
3-Methoxytyramine (trace) Agurell 1969b
3,4-Dimethoxyphenethylamine (1-10% of 10-50 mg total alkaloids/ 100 gm fresh) Agurell 1969b [Obtained via European commercial sources]
4-Hydroxy-3,5-dimethoxyphenethylamine (trace) Agurell 1969b; (0.1% of total alkaloid) Agurell 1969a
Mescaline (5 to 25+ mg. per 100 grams fresh.) Agurell 1969a and 1969b

[3,4-diMeO-5-OH-PEA is also listed, **in error**, for this species. Neither Agurell 1969 nor T.A. Smith 1977, the references cited, reported this compound.]

Human bioassays have found this species to be highly variable; it is claimed that some are active and others are not. Anonymous source relayed via MS Smith 1998

Reported in some human bioassays to be 2-3X as strong as *T. pachanoi*. 1998 *Entheogen Review* 7 (3): 70-71.

***Trichocereus werdermannianus* Bolivia 50.1998**

According to David Hunt's CITES Cactaceae Checklist *werdermannianus* no longer existed and was absorbed into *terscheckii*. This was done apparently without further comment and with no reference to any source that did not keep them separated.

In Hunt's Cactus Lexicon they reappeared as separate species.

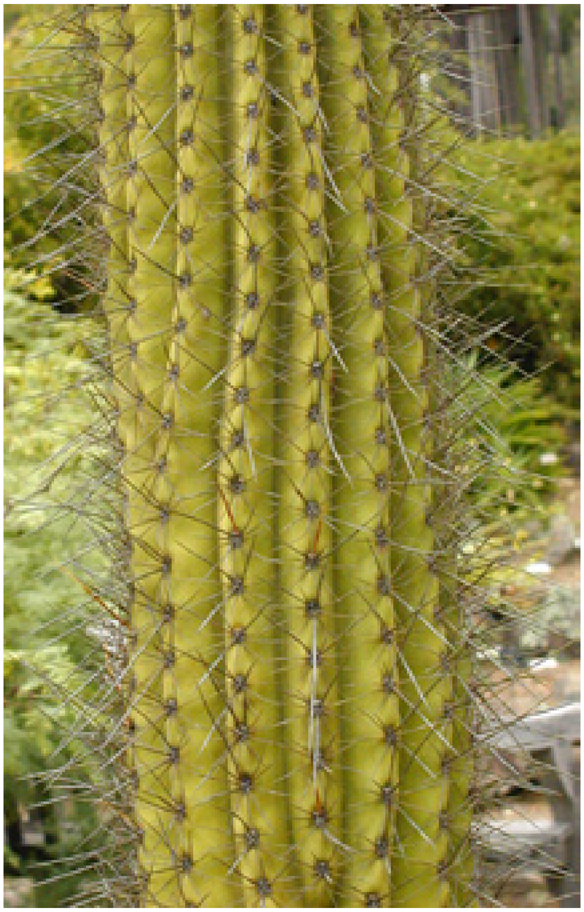
Patching the hole in the Rules of Nomenclature which permits this type of casual publication of taxonomic nomenclatural decision making will be required if cactus taxonomy is ever to become a branch of science. It is often regarded as science but the reality is that taxonomy needs to require the same proofs or reference to published reasoning that is demanded by good science.

In this case I can only scratch my head and wonder.

Amusingly, almost as fast as Anderson published the merger in *The Cactus Family*, some botanical gardens such as UC changed the name tags on their *werdermannianus* specimens.

Trichocereus werdermannianus
Bolivia 71.0083

Relabelled *T. terscheckii* following the publication of Anderson's *The Cactus Family*.



Trichocereus werdermannianus **Bolivia 71.0083**
entire page

Everything on this page was relabelled *T. terscheckii* following the publication of Anderson's *The Cactus Family*.

Tunilla soehrensii (BRITTON & ROSE) D.R.HUNT & ILIFF
See as ***Tephrocactus soehrensii***

A comment on the state of the genus Turbinicarpus.

Many members of this genus has been repeatedly shuffled and recombined as various varieties, subspecies and forms of each other with seemingly little to no agreement with earlier workers.

This seemingly constant revision with its novel recombinations of former species within one species or another (and the repetition of the same but with totally different subspecific assignments) is a major source of the confusion in horticulture; (especially among those growers who disdain the use of trinomials).

It is also a major source of the assorted labeling inconsistencies that the careful reader will notice below. We have left all *Turbinicarpus* depicted **AS** they were labeled (altering only their subspecific placements for the sake of uniformity) since all are either in the collections of serious *Turbinicarpus* collectors/growers or botanical gardens. We are certainly not qualified to sort out the taxonomic mess known as the genus *Turbinicarpus* but look forward to the day that DNA work begins to help set it on a more sound basis.

Our choices of synonyms used do not indicate our agreement with them, we have simply attempted to present this in a manner enabling the reader to see what analytical work has been done. We suggest that any taxonomic treatments of the genus or relationships within it be viewed with a healthy dose of caution pending DNA work.

Another problematic issue regards the fact that most of the Turbos are highly variable based on conditions of growth and that European labelings frequently conflict with the presented identifications of North American horticultural material.

We therefore present the following, largely, as they were labeled. *Caveat lector!*

Photo by Kamm

Turbinicarpus alonsoi

Turbinicarpus alonsoi **Glass & Arias**

(% dry weight)

N-Methyltyramine (0.0052 ± 0.0008%)

Hordenine (0.0048 ± 0.0008%)

N-Methyl-3,4-dimethoxyphenethylamine (0.0020 ± 0.0005%)

Pellotine (0.0075 ± 0.0009%)

Štarha *et al.* 1999b

[All *Turbinicarpus* species analyzed by Dr. Štarha were seed grown in Czechoslovakian greenhouses.]

Turbinicarpus bonatzii G.Frank Needs an analysis.

Turbinicarpus dickisoniae (Glass & Foster) Glass & Hofer See as ***Turbinicarpus schmiedickeanus*** **ssp.** ***dickisoniae***

Turbinicarpus flaviflorus G.Frank & Lau See as ***Turbinicarpus schmiedickeanus*** **ssp.** ***flaviflorus***

Turbinicarpus gracilis Glass & Foster See as ***Turbinicarpus schmiedickeanus*** **ssp.** ***gracilis***

Turbinicarpus bonatzii

Turbinicarpus hoferi Luethy & Lau Needs an analysis.

cristate *Turbinicarpus hoferi*

Turbinicarpus laui Glass & Foster Needs an analysis.
Turbinicarpus jauernigii G.Frank Needs an analysis.

Turbinicarpus lauii

Turbinicarpus klinkerianus Backeberg & H.J.Jacobsen See as ***Turbinicarpus schmiedickeanus* ssp. *klinkerianus***

Turbinicarpus krainzianus (G.Frank) Backeberg See as ***Turbinicarpus pseudomacrochele* ssp. *krainzianus***

Turbinicarpus krainzianus var. *minimus* **See as *Turbinicarpus pseudomacrochele* ssp. *krainzianus* f. *minima***

Turbinicarpus jauernigii

Turbinicarpus lausseri Needs an analysis.

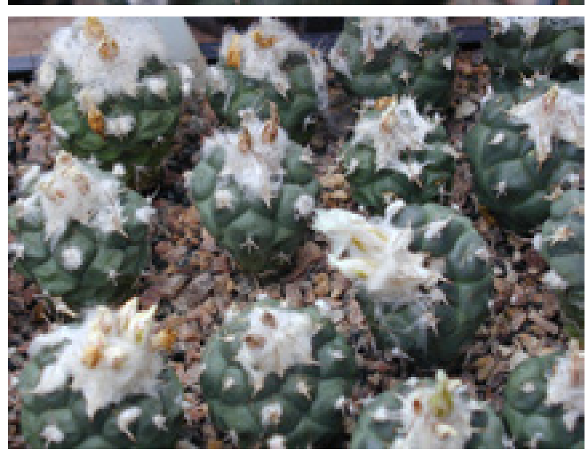
Turbinicarpus lausseri
Photo by Johnny B. Goode

Turbinicarpus lilinkeudus Needs an analysis.

Turbinicarpus lilinkeudus

Turbinicarpus lophophoroides (Werdermann) Buxbaum & Backeberg

Phenethylamine (1.04% [± 0.27] of total alkaloid fraction of Over 500 mg total alkaloids per 100 gm of fresh plant)
Tyramine (1.82% [± 0.17] of total alkaloid fraction of Over 500 mg total alkaloids per 100 gm of fresh plant)
N-Methyltyramine (0.13% [± 0.11] of total alkaloid fraction of Over 500 mg total alk./ 100 gm of fresh)
Hordenine (91.69% [± 0.54] of total alkaloid fraction of Over 500 mg total alkaloids per 100 gm of fresh plant)
Mescaline (Trace detected)
N-Methylmescaline (0.51% [± 0.11] of total alkaloid fraction of Over 500 mg total alk./ 100 gm of fresh)
N,N-Dimethylmescaline (Trace detected)
O-Methylanhalidine (0.55% [± 0.02] of total alkaloid fraction of over 500 mg total alk./ 100 gm of fresh)
Anhalinine (0.15% [± 0.08] of total alkaloid fraction of Over 500 mg total alkaloids per 100 gm of fresh plant)
Anhalonidine (2.37% [± 0.12] of total alkaloid fraction of Over 500 mg total alkaloids per 100 gm of fresh plant)
Pellotine (0.46% [± 0.08] of total alkaloid fraction of Over 500 mg total alkaloids per 100 gm of fresh plant)
Štarha *et al.* 1999c



Turbinicarpus lophophoroides

Turbinicarpus pseudomacrochele

Turbinicarpus lophophoroides ssp. *jauernigii* (Frank) Battaia & Zanovello See as ***Turbinicarpus jauernigii***
Turbinicarpus macrochele (Werdermann) Buxbaum & Backeberg See as ***Turbinicarpus schmiedickeanus* ssp. *macrochele***
Turbinicarpus macrochele ssp. *macrochele* var. *polaskii* P.Lechner & Jantschgi See as ***Turbinicarpus schmiedickeanus* f. *polaskii***
Turbinicarpus macrochele var. *schwarzii* f. *polaskii* Kladiwa See as ***Turbinicarpus schmiedickeanus* f. *polaskii***
Turbinicarpus polaskii Backeberg See as ***Turbinicarpus schmiedickeanus* f. *polaskii***

Turbinicarpus panarito Needs an analysis.

Turbinicarpus panarito

Turbinicarpus pseudomacrochele (Backeberg) F.Buxbaum & Backeberg

Hordenine (Sole alkaloid. 1-10 mg of total alkaloids/ 100 gm. fresh.) Bruhn & Bruhn 1973

Turbinicarpus pseudomacrochele

Turbinicarpus pseudomacrochele ssp. *krainzianus* (G.Frank) Glass & Foster

Phenethylamine (1.12% [± 0.13] of total alkaloid fraction of 250-500 mg total alkaloids per 100 gm of fresh plant)
Tyramine (0.98% [± 0.18] of total alkaloid fraction of 250-500 mg total alkaloids per 100 gm of fresh plant)
N-Methyltyramine (Trace detected) [Not listed in Štarha 2001c]
Hordenine (49.60% [± 0.55] of total alkaloid fraction of 250-500 mg total alkaloids per 100 gm of fresh plant)
Mescaline (2.48% [± 0.19] of total alkaloid fraction of 250-500 mg total alkaloids per 100 gm of fresh plant)
N-Methylmescaline (3.27% [± 0.09] of total alkaloid fraction of 250-500 mg total alk./ 100 gm of fresh)
N,N-Dimethylmescaline (2.89% [± 0.15] of total alkaloid fraction of 250-500 mg total alk./ 100 gm of fresh)
[Candicine is also listed in Štarha 2001c but the only citation given is Štarha *et al.* 1999c which does not support it.]
O-Methylanhalidine (0.77% [± 0.04] of total alkaloid fraction of 250-500 mg total alk./ 100 gm of fresh)
Anhalinine (29.24% [± 0.04] of total alkaloid fraction of 250-500 mg total alkaloids per 100 gm of fresh plant)
Anhalonidine (2.44% [± 0.13] of total alkaloid fraction of 250-500 mg total alkaloids per 100 gm of fresh plant)
Pellotine (0.36% [± 0.08] of total alkaloid fraction of 250-500 mg total alkaloids per 100 gm of fresh plant)
Štarha *et al.* 1999c

Dehydrogeosmin - Minor volatile in floral scent.
Sesquiterpene alcohol 1 - Trace volatile in floral scent.
Sesquiterpene alcohol 2 - Minor volatile in floral scent.
Schlumberger *et al.* 2004 (in tepals; gc-ms)

Turbinicarpus pseudomacrochele* ssp. *krainzianus* f. *minimus

***Turbinicarpus pseudomacrochele* ssp. *krainzianus* seedling Mesa Garden 1288.7**

Turbinicarpus pseudopectinatus (**Backeberg**) **Glass & Foster**

Hordenine (Over 50% of over 50 mg of total alkaloids/ 100 gm. fresh.) Bruhn & Bruhn 1973

Phenethylamine (0.98% [± 0.12] of total alkaloid fraction of over 500 mg total alkaloids per 100 gm of fresh plant)

Tyramine (3.18% [± 0.19] of total alkaloid fraction of over 500 mg total alkaloids per 100 gm of fresh plant)

N-Methyltyramine (25.15% [± 1.21] of total alkaloid fraction of over 500 mg total alkaloids per 100 gm of fresh plant)

Hordenine (62.11% [± 2.42] of total alkaloid fraction of over 500 mg total alkaloids per 100 gm of fresh plant)

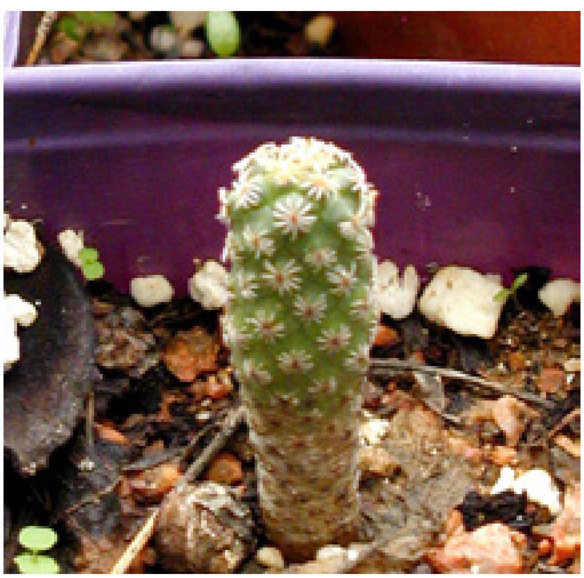
N-Methylmescaline (1.11% [± 0.13] of total alkaloid fraction of over 500 mg total alkaloids per 100 gm of fresh plant)

N,N-Dimethylmescaline (Trace detected)

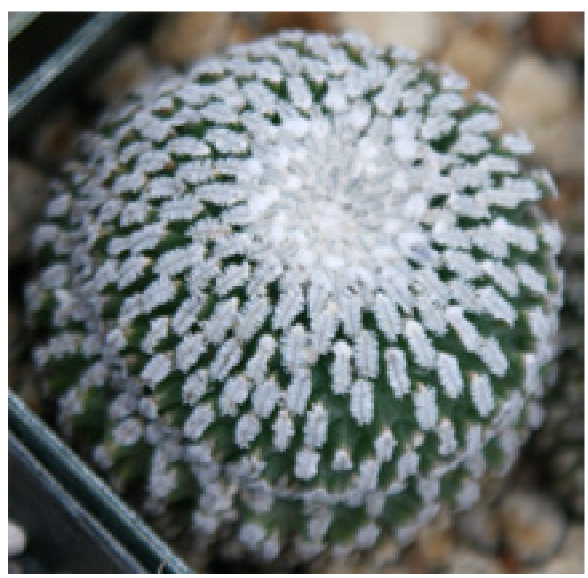
O-Methylanhalidine (1.92% [± 0.15] of total alkaloid fraction of over 500 mg total alkaloids per 100 gm of fresh plant)

Anhalinine (2.88% [± 0.15] of total alkaloid fraction of over 500 mg total alkaloids per 100 gm of fresh plant) Štarha *et al.* 1999 (*P. pseudopectinata* was analyzed as *Turbinicarpus* synonym. Seed grown in Czechoslovakia)

***Turbinicarpus pseudopectinatus* crest**



***Turbinicarpus pseudopectinatus* seedling (Mesa Garden)**



Turbinicarpus pseudopectinatus* var. *roseiflorus

Turbinicarpus schmiedickeanus

Turbinicarpus pseudomacrochele

Turbinicarpus schmiedickeanus* ssp. *flaviflorus
(HBG)

Turbinicarpus roseiflorus (Backeberg) G.Frank Needs an analysis.

Turbinicarpus schmiedickeanus (Bödeker) Buxbaum & Backeberg

Also encountered *schmiedeckianus*; we used the spelling of Glass & Foster 1977

Phenethylamine (1.1% [± 0.12] of total alkaloid fraction of 100-250 mg total alkaloids per 100 gm of fresh plant)

Tyramine (5.46% [± 0.14] of total alkaloid fraction of 100-250 mg total alkaloids per 100 gm of fresh plant)

N-Methyltyramine (Trace detected) [Not listed in Štarha 2001c]

Hordenine (43.02% [± 1.86] of total alkaloid fraction of 100-250 mg total alkaloids per 100 gm of fresh plant)

N-Methylmescaline (1.02% [± 0.21] of total alkaloid fraction of 100-250 mg total alkaloids per 100 gm of fresh plant)

N,N-Dimethylmescaline (Trace detected)

O-Methylanhalidine (2.76% [± 0.42] of total alkaloid fraction of 100-250 mg total alkaloids per 100 gm of fresh plant)

Anhalinine (17.19% [± 1.00] of total alkaloid fraction of 100-250 mg total alkaloids per 100 gm of fresh plant)

Anhalonidine (19.86% [± 1.41] of total alkaloid fraction of 100-250 mg total alkaloids per 100 gm of fresh plant)

Pellotine (9.02% [± 0.06] of total alkaloid fraction of 100-250 mg total alkaloids per 100 gm of fresh plant)

Štarha *et al.* 1999c

Turbinicarpus schmiedickeanus

Turbinicarpus schmiedickeanus* ssp. *dickisoniae
(Glass & Foster) N.P.Taylor

Phenethylamine (1.70% [± 0.15] of total alkaloid fraction of 250-500 mg total alkaloids per 100 gm of fresh plant)
Tyramine (2.59% [± 0.13] of total alkaloid fraction of 250-500 mg total alkaloids per 100 gm of fresh plant)
N-Methyltyramine (0.51% [± 0.02] of total alkaloid fraction of 250-500 mg total alkaloids per 100 gm of fresh plant) [Not listed in Štarha 2001c]
Hordenine (42.45% [± 0.45] of total alkaloid fraction of 250-500 mg total alkaloids per 100 gm of fresh plant)
[Mescaline is also listed in Štarha 2001c but the only citation given is Štarha *et al.* 1999c]
[N-Methylmescaline is also listed in Štarha 2001c but the only citation given is Štarha *et al.* 1999c]
O-Methylanhalidine (1.42% [± 0.30] of total alkaloid fraction of 250-500 mg total alkaloids per 100 gm of fresh plant)
Anhalinine (2.78% [± 0.31] of total alkaloid fraction of 250-500 mg total alkaloids per 100 gm of fresh plant)
Anhalonidine (22.70% [± 1.14] of total alkaloid fraction of 250-500 mg total alkaloids per 100 gm of fresh plant)
Pellotine (19.33% [± 0.28] of total alkaloid fraction of 250-500 mg total alkaloids per 100 gm of fresh plant)
Štarha *et al.* 1999c

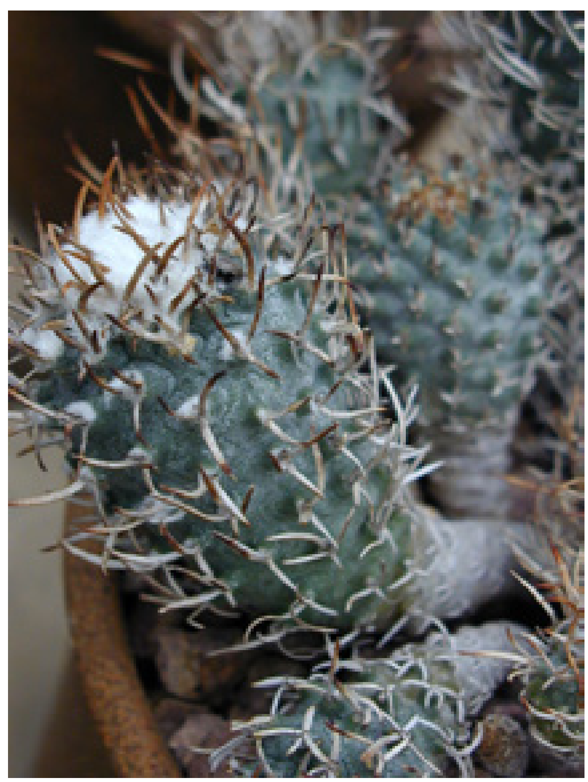
Turbinicarpus schmiedickeanus* ssp. *dickisoniae

Turbinicarpus schmiedickeanus* ssp. *dickisoniae

Turbinicarpus schmiedickeanus* ssp. *flaviflorus

Turbinicarpus schmiedickeanus* ssp. *flaviflorus
(Frank & Lau) Glass & Foster

Phenethylamine (1.01% [± 0.21] of total alkaloid fraction of 100-250 mg total alkaloids per 100 gm of fresh plant)
Tyramine (3.08% [± 0.08] of total alkaloid fraction of 100-250 mg total alkaloids per 100 gm of fresh plant)
N-Methyltyramine (Trace detected) [Not listed in Štarha 2001c]
Hordenine (92.05% [± 0.71] of total alkaloid fraction of 100-250 mg total alkaloids per 100 gm of fresh plant)
Mescaline (Trace detected)
N-Methylmescaline (Trace detected)
O-Methylanhalidine (2.89% [± 0.46] of total alkaloid fraction of 100-250 mg total alkaloids per 100 gm fresh)
Anhalinine (Trace detected)
Anhalonidine (0.88% [± 0.12] of total alkaloid fraction of 100-250 mg total alkaloids per 100 gm of fresh plant)
Pellotine (0.15% [± 0.07] of total alkaloid fraction of 100-250 mg total alkaloids per 100 gm of fresh plant)
Štarha *et al.* 1999c

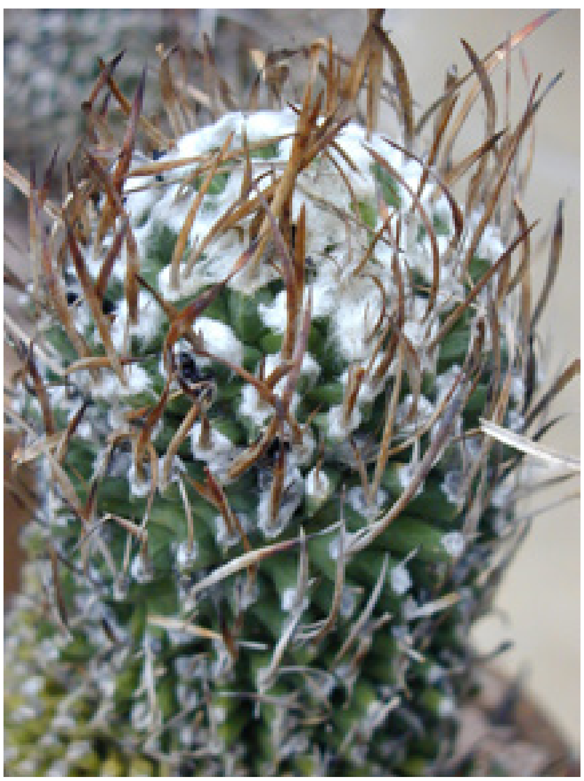


Turbinicarpus schmiedickeanus* ssp. *dickisoniae
(HBG)

Turbinicarpus schmiedickeanus* ssp. *flaviflorus
Field collected in Mexico H 61445
(HBG)

***Turbinicarpus schmiedickeanus* ssp. *gracilis* (Glass & Foster) Glass**

Tyramine (4.98 ± 0.28% of total alkaloid content)
N-Methyltyramine (trace)
Hordenine (48.15 ± 0.97% of total alkaloid content)
O-Methylanhalidine (2.48 ± 0.42% of total alkaloid content)
Anhalinine (20.69 ± 1.12% of total alkaloid content)
Pellotine (7.92 ± 0.56% of total alkaloid content)
Anhalonidine (trace)
Štarha 2001c cited Štarha 2001b



Turbinicarpus schmiedickeanus* ssp. *gracilis
H 60025 Mexico (specimen collected by Dickson) (Huntington)

Turbinicarpus schmiedickeanus ssp. *gracilis* f. *dickisoniae* Panarotto See as ***Turbinicarpus schmiedickeanus* ssp. *dickisoniae***

***Turbinicarpus schmiedickeanus* ssp. *klinkerianus* (Backeberg & Jacobson) N.P.Taylor**

Tyramine (2.95 ± 0.15% of total alkaloid content)
N-Methyltyramine (trace)
Hordenine (52.15 ± 0.40% of total alkaloid content)
N-Methylmescaline (trace)
O-Methylanhalidine (2.78 ± 0.40% of total alkaloid content)
Anhalinine (37.15 ± 0.90% of total alkaloid content)
Pellotine (0.43 ± 0.15% of total alkaloid content)
Anhalonidine (trace)
Štarha 2001c cited Štarha *et al*. 2000

Turbinicarpus schmiedickeanus* ssp. *klinkerianus

Turbinicarpus schmiedickeanus ssp. *klinkerianus* f. *schwarzii* (Shurly) Panarotto ***See as Turbinicarpus schmiedickeanus* ssp. *schwarzii***

***Turbinicarpus schmiedickeanus* ssp. *macrochele* (Werdermann) Glass & Foster**

Tyramine (2.90 ± 0.15% of total alkaloid content)
N-Methyltyramine (trace)
Hordenine (49.01 ± 1.38% of total alkaloid content)
O-Methylanhalidine (2.50 ± 0.30% of total alkaloid content)
Anhalinine (35.42 ± 0.85% of total alkaloid content)
Pellotine (0. 03 ± 0.10% of total alkaloid content) [Given on p. 89 but not included in its by-species listing on p. 52)
Anhalonidine (trace)
Štarha 2001c cited Štarha 2001b

Turbinicarpus schmiedickeanus* ssp. *macrochele

Turbinicarpus schmiedickeanus* ssp. *macrochele

Our suspicion is that the photo on the bottom left may be a *polaskii* (which has been a variety of *macrochele* and also a form of *schwarzii*) Careful reading of the various descriptions for its assorted name proposals is urged for any who aren't already confused enough.

Turbinicarpus schmiedickeanus* f. *polaskii

Tyramine (2.93 ± 0.20% of total alkaloid content)
N-Methyltyramine (trace)
Hordenine (49.11 ± 1.18% of total alkaloid content)
O-Methylanhalidine (2.58 ± 0.25% of total alkaloid content)
Anhalinine (36.88 ± 0.92% of total alkaloid content)
Pellotine (0. 38 ± 0.10% of total alkaloid content) [Given on p. 89 but not included in its by-species listing on pp. 51-52)
Anhalonidine (trace)
Štarha 2001c cited Štarha 2001b

Turbinicarpus schmiedickeanus* f. *polaskii

Turbinicarpus schmiedickeanus ssp. *rubriflorus* (Shurly) Panarotto ***See as Turbinicarpus schmiedickeanus* ssp. *schwarzii* f. *rubriflorus***

Turbinicarpus schmiedickeanus **ssp.** ***schwarzii*** **(Shurly) N.P.Taylor**

Phenethylamine (1.07% [± 0.42] of total alkaloid fraction of 250-500 mg total alkaloids per 100 gm of fresh plant)
Tyramine (2.92% [± 0.25] of total alkaloid fraction of 250-500 mg total alkaloids per 100 gm of fresh plant)
N-Methyltyramine (Trace detected) [Not listed in Štarha 2001c]
Hordenine (48.81% [± 2.72] of total alkaloid fraction of 250-500 mg total alkaloids per 100 gm of fresh plant)
Mescaline (1.26% [± 0.21] of total alkaloid fraction of 250-500 mg total alkaloids per 100 gm of fresh plant)
N-Methylmescaline (0.98% [± 0.24] of total alkaloid fraction of 250-500 mg total alkaloids per 100 gm fresh)
N,N-Dimethylmescaline (Trace detected) [Not listed in Štarha 2001c]
O-Methylanhalidine (2.82% [± 0.41] of total alkaloid fraction of 250-500 mg total alkaloids per 100 gm fresh)
Anhalinine (39.57% [± 1.14] of total alkaloid fraction of 250-500 mg total alkaloids per 100 gm of fresh plant)
Anhalonidine (0.52% [± 0.11] of total alkaloid fraction of 250-500 mg total alkaloids per 100 gm of fresh plant)
Pellotine (0.41% [± 0.11] of total alkaloid fraction of 250-500 mg total alkaloids per 100 gm of fresh plant)
Štarha *et al.* 1999c

Turbinicarpus schmiedickeanus **ssp.** ***schwarzii***

Turbinicarpus schmiedickeanus **ssp.** ***schwarzii***

Turbinicarpus schmiedickeanus ssp. _schwarzii_

Turbinicarpus schmiedickeanus ssp. _schwarzii_
(HBG)
Both photos are of the same specimen.

Turbinicarpus schmiedickeanus ssp. _schwarzii_ f. _rubriflorus_

Tyramine (2.90 ± 0.12% of total alkaloid content)
Hordenine (48.99 ± 0.40% of total alkaloid content)
O-Methylanhalidine (2.51 ± 0.25% of total alkaloid content)
Anhalinine (37.58 ± 1.83% of total alkaloid content)
Pellotine (0.33 ± 0.10% of total alkaloid content)

Štarha 2001c: the actual primary source citation is unclear to me. (It was not given separately in the by-species listing. The data above appears on page 89. The by-species listing for *schwarzii* appears to imply that Štarha 1999 and/or Štarha *et al.* 1999c was the reference(s) BUT neither one is listed for O-Methylanhalidine or for Pellotine in the by-species entry on page 52.)

Turbinicarpus schmiedickeanus f. _polaskii_
(seedling from Mesa Garden: catalog #1293)
lower left

Turbinicarpus valdezianus
Lacks analysis

Turbinicarpus schwarzii (Shurly) Backeberg
See as ***Turbinicarpus schmiedickeanus* var. *schwarzii***
Turbinicarpus swobodae Diers & Esteves Pereira
Needs an analysis.
Turbinicarpus valdezianus (Moeller) Glass & Foster
Needs an analysis.

Wigginsia arechavaletai
Mucilage determined to be comprised of Arabinose (2.1%), Galactose (18.3%), Galacturonic acid (20.8%), Rhamnose (51.6%) & Xylose (2.7%).
Moyna & DiFabio 1978 (Analyzed MAM 1694)

Wigginsia erinacea (Haworth) D.M.Porter
Hordenine (%?) DeVries *et al.* 1971
Mucilage polysaccharide was found to be 0.31% percentage of total weight of fresh plant.
Uronic acid content of polysaccharide: 51%
Rhamnose: arabinose, galactose (3.7:1:2.7)
Mindt *et al.* 1975

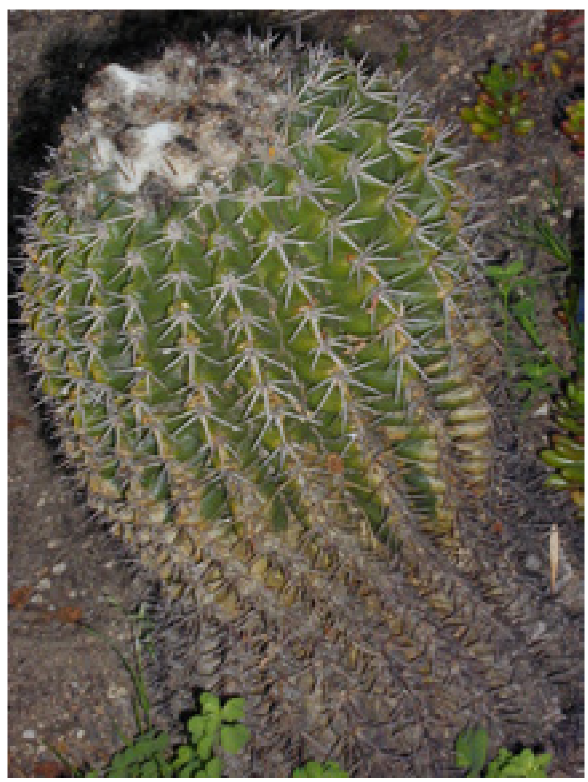
Wigginsia macrocantha (Arechavaleta) D.M.Porter
Hordenine (%?) DeVries *et al.* 1971

Wigginsia tephracantha
bottom row

Zygocactus species See under ***Schlumbergera***

Wigginsia paucicostata
This species and all *Wigginsia* on this page, other than *W. arechavaletai***,** are now lumped into *Parodia sellowii.*

Wigginsia tephracantha (Link & Otto) D.M.Porter
Hordenine (%?) DeVries *et al.* 1971
Weddellite & α-quartz were identified as druses, bipyramids (few) & crystal sand (abundant).
Monje & Baran 2002



The former members of *Wigginsia* have been placed in *Parodia.*

The 4th edition of ***Sacred Cacti*** **is now online!**
http://SacredCacti.com/

San Pedro
http:troutsnotes.com/pdf/SP.pdf

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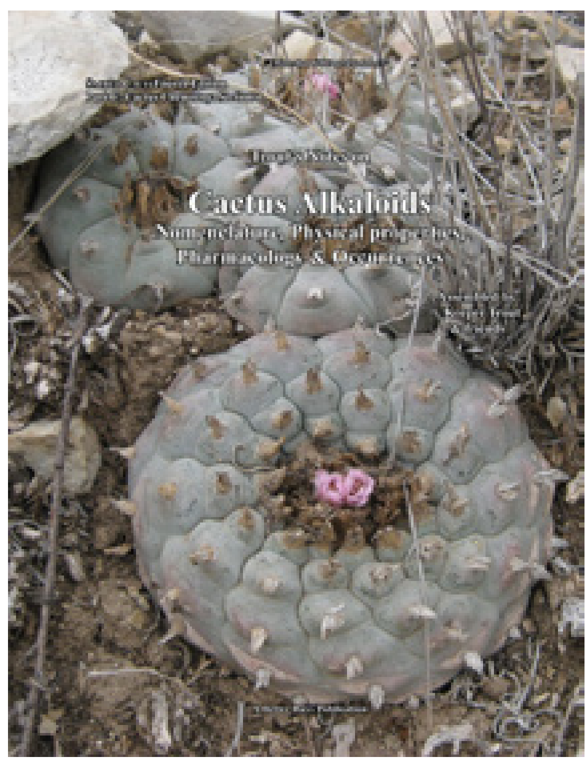
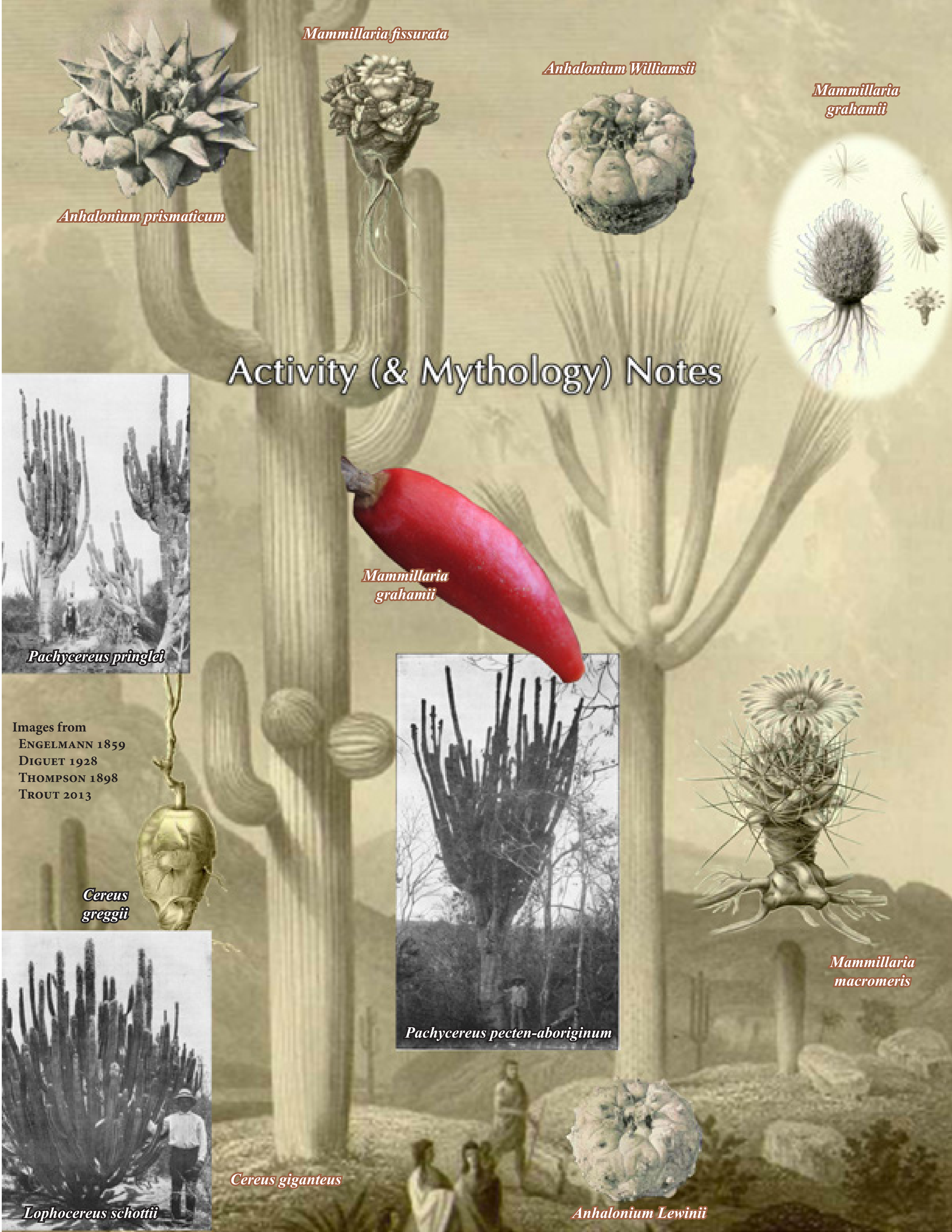
Opening comments from *Sacred Cacti*



The Cactus Alkaloids
http:troutsnotes.com/pdf/C13.pdf
formerly known as
Appendix A

Activity (& Mythology) Notes



Images from
Engelmann 1859
Diguet 1928
Thompson 1898
Trout 2013

5 San Pedros

The **"5 San Pedros"** purportedly recognized by some Peruvian shamans (Personal communication with a correspondent in South America requesting anonymity)

Photos to the immediate right & occurring later herein were used with permission.

These plants were said to have been collected in the vicinity of Matucana, Peru except for the one on the far right which was purported to be a *bridgesii* from Huanuco.

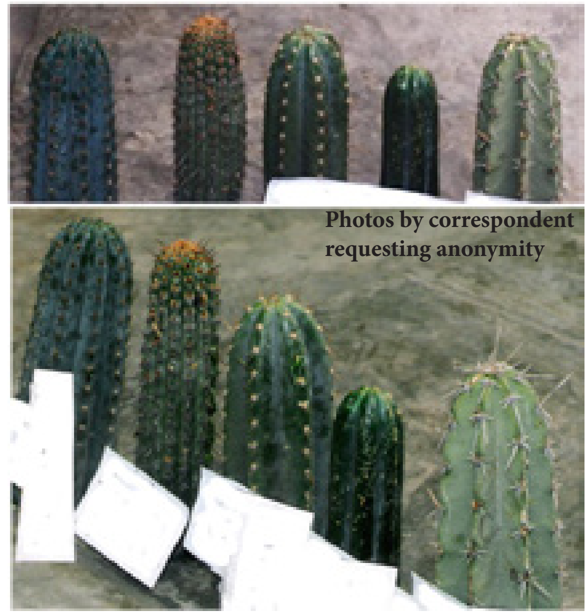
Attempts to obtain live cuttings including the dark *pachanoi* second from the right procured the specimen that was analyzed by Ogunbodede.

See comments and images for the one second from the far left under *Haageocereus acranthus*

See comments and images for the one on the far right under *Lemaireocereus laetus* and *Lemaireocereus matucanense.*

I know little about them beyond the unconfirmed claim that they are said to be used by shamans in Peru as San Pedro.

Additional photographs of the plants that were shipped from Peru are on the previous page.



Photos by correspondent requesting anonymity

Finally unpacked after spending months in the mail.

The word 'mythology' appears in the title for an important reason. In the section that follows many medical and ethno-medicinal applications are mentioned. This is historical information that has been collected from the literature and the inclusions should not be assumed to mean that they are accurate or appropriate or effective in their recorded applications. None of this should this be regarded as a recommendation to employ any of these for any application or taken as a suggestion about how to treat any medical conditions. Ethnographic and anthropological accounts in particular may actually be mistakenly overlaying linear Western concepts onto comments made by nonlinear thinkers; especially when they assert hallucinogenic activity.

If no bioassay was performed or recorded by the worker reporting those particular claims it needs to be regarded as only anecdotal hearsay.

Acanthocereus pentagonus

(This is now ***Acanthocereus tetragonus***)

Antihelminthic activity (no detail or reference). Soulaire 1947

Has an edible fruit. Standley 1924: 906-907

Aporocactus flagelliformis

Dried flowers are used for "*heart affections*" in the form of an infusion.

The juice of the stems is caustic and used internally as a vermifuge. This application is claimed to be dangerous. Standley 1924: 917

Pronounced antihelminthic activity.

Flower infusion is used in Mexico against eclampsia.

Flowers are sold in markets under the name *flor del cuerno* (horn flower.) Comments lacked details or references. Soulaire 1947

Acanthocereus pentagonus
(domesticated in Starr County, Texas) above

Acanthocereus pentagonus
flowering in Austin, Texas

Ariocarpus bravoanus
Lacks any published analysis.
Used for medicinal purposes Miller 2000
Ethanolic extract is used externally as analgesic in Mexico.
Anonymous 2000

A***riocarpus bravoanus ssp. hintonii***
Lacks published analysis.
Used as an externally applied analgesic in Mexico.
Anonymous 2000

Acanthocereus pentagonus
(HBG) above; (Austin, Texas) below

Ariocarpus fissuratus
(Terrell County, Texas)

Ariocarpus fissuratus

"*peyote cimarron*" (see comments below)
"*sunami*" (Tarahumara),

Lumholtz 1902 claimed that an intoxicating drink was prepared from this species by the Tarahumares. The plant was said to be "*even more powerful than wanamé*" and used similarly. In the region of the headwaters of the Río Concho, Pennington 1963 (p. 159) includes it as a "*narcotic*" cacti and noted that the expressed juice from *Ariocarpus fissuratus* was sometimes added to *tesguino* by the Tarahumana to "*make the corn beer more enjoyable*."

Calling it "*peyote*" Havard 1896 made a similar comment that it was eaten raw or added to liquor to increase the effects. It is not adequately clear though that Havard was not confusing this plant with West Texas peyote. Standley 1924 also refers to the use of this name but says it is incorrect.

Older tubercles are said to be smoked in Mexico for "*mildly hallucinogenic effects*" lasting several hours. Anonymous 2000.

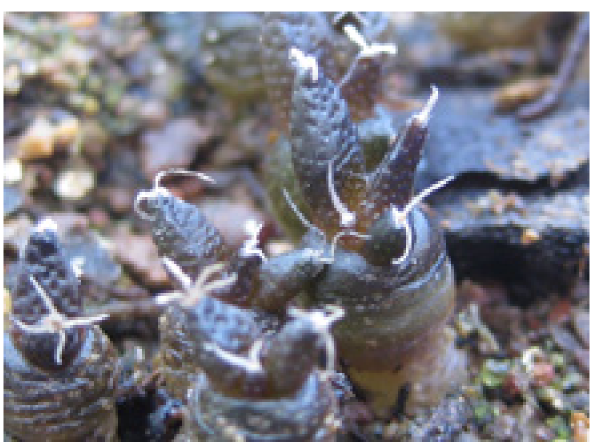
" *Consumed fresh or ground in water, it was taken in the same manner as Lophophora. This "hikuli" was also used as a stimulant by the runners*." Bye 1979

While peyote cimarron *sensu* Thord-Gray would appear to be a different plant, this has become its common name both in Mexico and among Western drug users. (Standley 1924 also gave this name) As recently as the late 1970s a person could find this cacti being offered for sale under that name by street vendors in Austin, Texas. While the anecdotal accounts of friends said they were the wrong plants that did not have the same activity as peyote, they were being sold specifically intended for drug use purposes.

Lumholtz 1902 also made the comment "*Robbers are powerless to steal anything where Sunami calls soldiers*"

Chewed and placed upon bruises, bites and wounds. Pennington 1963:186

Ariocarpus fissuratus
As seedlings (left) & wild in Presidio County, Texas



Ariocarpus kotschoubeyanus

Ethanolic extract of whole plant used externally as analgesic for blows & bruises. Posted at http://www.ariocarpus.tsnet.co.net & www.brunt.demon.co.uk/cactus/mexico/img2054-55.html

Said to show some type of activity in human bioassay but to be "*more mild*" than *A. fissuratus*. ER 1999

Ariocarpus retusus

Used for fever. Johnson 1999

Reported to be smoked as a recreational inebrient similarly to *Ariocarpus fissuratus*.

The rare Huichol shaman is said to use 2 tubercles as an oral dose after a 5 year apprenticeship. Anonymous 2000

Standley 1924 notes the use of "*peyote*" as a common name but says that it is incorrect.

Soulaire 1947 commented that this species enjoys the same reputation in Mexico as *peyotl* but did not include a reference.

Huichol: *tsuwíri*

Furst comments that a person with an impure heart, meaning a person who has not properly purified themselves prior to their peyote journey may be tricked into thinking this plant was peyote "*because it is capable of sorcery and deception*."

Furst was told by Huichols it was "*very dangerous*" to eat. Interestingly saying a person "*who had a "Huichol heart*" would not be fooled into doing so."

Furst described the effects as being *Datura*-like and characterized by unpleasant delusions ranging from terrifying hallucinations to obsessions with sexual partners who had not been properly confessed prior to the pilgrimage.

"*Afterwards they become more afflicted and frightened. Because they begin to see many things. Terrible, crazy things. Animals they see, animals which are poisonous…There before them a deep pit, very large, very dark. They jump into this pit, escaping from those animals. It is as if one had thrown these animals at them, great heaps of those snakes, great heaps of those scorpions, as if from a basketful of those animals. But no, there are no animals. There are no snakes. There are no scorpions. There is no pit. There is where he jumped, where he fell in his terror, there is no pit. Only the ground, only the sand with the cactus thorns which pierce him*."

Furst 1971

Ariocarpus kotschoubeyanus

Ariocarpus retusus

Astrophytum asterias

Called "*peyote*" according to Standley 1924

Sometimes collected by South Texas peyote distributors and given as good luck fetish to NAC members. Occasionally reported to be eaten by NAC members. Terry 2007. Anecdotal accounts from drug users report this species to be inactive. One of several cactus species sold by Austin, Texas street vendors in the 1970s as "*peyote cimarrón.*"

Astrophytum capricorne

Antimicrobial activities studied in Garza Padrón 2010.

Astrophytum capricorne

Astrophytum asterias X *myriostigma* both were '*nudum*'

Astrophytum myriostigma

Called "*peyote cimarrón*" (in Durango) Standley 1924

Antimicrobial activities studied in Garza Padrón 2010.

Jackrabbits are said to become visibly intoxicated from eating this plant and to develop a taste for it. Entheogen Review 1998

Astrophytum myriostigma

Astrophytum myriostigma

Brasiliopuntia brasiliensis

Roots have antipyretic properties.
The fruit gives a refreshing drink that is effective against scurvy.
Branches are used as a calming poultice for sciatica
Sap has been used for swelling of eyelids.
Soulaire 1947

An unidentified *Opuntia* species was claimed by Rivier & Lindgren to be incorporated into ayahuasca as an admixture called *tchai*. More recently Antonio Bianchi & Giorgio Samorini presented it to only be used alone, as a hallucinogen, due to the mixture being "*too strong*". Bianchi & Samorini 1993 included an image of the leaves on page 38 that suggested to this author that it was possibly a *Brasiliopuntia*.

Field work by R. Stuart in 2001 proved that the identity was *Brasiliopuntia brasiliensis*. (Bob Wallace funded the research.)

Stuart had been provided with the source's contact information by Antonio Bianchi. Stuart went to Peru and undertook a course of introduction to the plant that was guided by the shaman. Stuart collected live material for propagation, and prepared herbarium vouchers - positively establishing the identity of the plant.

While in Peru Stuart also bioassayed it multiple times; first under guidance of the shaman and later independently. After repeated failures while working directly with the shaman, Stuart concluded anything he was experiencing was entirely due to the green tobacco that was being added to the expressed juice of the *tchai* leaf. Stuart tested this by secretly ingesting a much larger amount of the plant without tobacco and in combination with an MAOI.

Stuart proposed that the story may have been created to satisfy the questions of ethnobotanists desiring to be told of even more ayahuasca admixtures. Perhaps bolstered by noticing the ethnobotanists were not checking the claims with bioassays.

The interesting and entertaining account of his adventure can be found in the 2002 *Entheogen Review*.


Stuart's collection from Peru.


tchai
Bianchi & Samorini 1993:page 38


Curtis 1834

Flora Brasiliensis

Two artist's views of *Opuntia brasiliensis*

Carnegiea gigantea

The saguaro is one of three plants that the Seri people of northwestern Mexico believe used to be human (Felger & Moser 1991).

There are ethnological reports of the saguaro being fermented into an intoxicating brew but none that reported it as hallucinogenic.

Bruhn 1971b discussed this 5% ***alcoholic*** drink made by the Papagos. Earlier in this century, Densmore 1929 was told by one native informant that the drink enabled him to receive songs but his other informants denied this.

Bruhn 1973 made a comment that it contains a potentially active alkaloid but that any indication of or reference to its use as a drug was lacking. Despite that, *Carnegiea gigantea* has been rumored for many years to be a psychedelic plant.

A typical example is Lemmo 1977 which is clearly asserting claims about something that author has never actually tried. Reckless rhetoric is common in what few accounts exist; like Lemmo's comment that a single fallen limb could feed an army of trippers.

Apparently very few people have tried it or else almost no one is reporting on what it did.

One exception is a youtube video asserting that a foot-long section of a rib holds enough of a dose for "*myself and some friends to enjoy the magic*".

That quote was from among the comments made by a person who appears to have first hand experience. It was taken from a youtube video posting on the "sugaro" by Daniel Vitalis. http://www.youtube.com/watch?v=6_-kNjwVO2g.

Incredibly Vitalis urges viewers to preserve the secret:

"*So the Arizona state tree is a psychoactive plant. Shhhh!*"

"*We want to keep this kinda private*."

If wanting to keep something private, posting a youtube video to the masses would seem like a counterproductive approach?.

There were two positive accounts posted in response to that video but only one included details of the dose ingested. 2.5 tablespoons of the outer green layer sounded like a strong dose for that person and the physical distress he reported was echoed by several people on-line. One person at an on-line drug forum related a second-hand referenceless comment that 1 tablespoon of the green outer layer was believed to be a dose but included no more details.

Many aspects are reminiscent of Earl's account of the cardon. In particular, almost no one, in this case except Vitalis, sounded like they had more than one experience with it.

In an article on his website entitled "*Ever Tried This PsychoActive Cactus?*" Vitalis comments: "*So, I was hesitant to leak this news…. but I just couldn't hold it in any longer!*

"*Yes, its true… the Arizona State Flower grows atop a Psychedelic Cactus!*"

" *This is one of those interesting Herbal Secrets that has been, all along, hidden right under our noses! When I was first told about this I could hardly believe it. The very Symbol of the Desert is a Mind Altering Herb!* "

The responses to his on-line video are intriguing.

The most common are people who insist the saguaro is not active (seemingly based only on never having heard this before); some are so certain of this they are aggressive, rude and hostile.

The second most common response is outrage for his cutting on a cactus that many people love.

Among the replies to Vitale's youtube video are two bioassay comments:
(typos left intact)
"I'm going to let everyone know, I ate the green inner bark. I felt the effects about 45 minutes after. It came on all at one and was so powerful it knocked me off my feet. Patterns of color everywhere, I saw my soul from the future if you can imagine. My spirit was young, playful, and charming to say the least. My spirit and I didn't communicate with words.... But we were communicating. And the information he gave me was that life after death is by far the grandest adventure that could ever be experienced. He came to me out of a yellow void. He could have been easy to miss amongst all the colors and swirling patterns he was jumping up and down waiving his arms so that I could notice him!!! I had this experience today in the desert. Ate about two and a half tablespoons, threw up an hour later, had an anxiety attack, tried to walk back to my truck that was 2 miles away, took five steps and collapsed on all fours. I crawled to the nearest palo verde tree for shade and laid down. The effects were so nauseating I didn't care if I laid on a rattlesnake, scorpion, or cholla. I will always remember this experience."

Itsjames1

"I tried eating a couple tablespoons of the dark inner bark a year ago after seeing this video and reading the page on your website. I definetely noticed strong effects within half an hour of consumption. The world became extremely dreamlike and I drifted in and out of conciousness into a lucid dream state. (my first experience with lucid dreaming). Overall it was like no other psychoactive I've ever experienced, but the taste is worse than anything I've ever eaten."

pigmie1

Posted on an on-line drug forum:
"tried it once never again. My eye was twitching and I could feel if wiggle in a bad way when I looked around. Coordination totally fucked up. Felt like if was toxic to the nerves. My body was tense and shaking. Felt like I was starving but couldn't eat. I was completely restless and couldn't find a comfortable position. Kept getting the hiccups and feeling the cactus coming up. Finally puked. It feels like you have Parkinson's or something. Mild visuals with some weird auditory hallucinations. Feels toxic overall it's not worth it. Just thinking of that taste turns my stomach, that sandy textured bitter flesh."

Eek

In Vooglebreinder a comment in Ratsch (1998, 155) is noted:
"The Seri refer to saguaro as a peyote substitute, suggesting a possible psychoactive use for the plant, although no specifics concerning such a use are available."
Unfortunately Ratsch employs this dubious statement as a photo caption without any comment or a pertinent reference.

Psychotropia had "The sap, which flows from the cactus when it has been wounded, is very bitter. When ingested, it typically produces nausea and dizziness (Bruhn & Lundstrom 1976, 197)." but their cited source does not say that.

Carnegiea gigantea
younger areoles (Sul Ross) top
older areoles (Tucson, AZ) bottom

Conflict seemingly exists surrounding analytical reports concerning the alkaloids that are present in Saguaro (Suggesting a high degree of variability based on presently undefined factors). It may just be a matter of age and part analyzed but the question is one for a future worker to resolve.

For a summarized overview:

Gigantine was only reported in substantial amounts during analysis of wild collected adult cacti and was found to be higher in the growing tips. (see BROWN *et al.* 1972)

Carnegiea gigantea
(near Tucson, Arizona)

Bruhn & Lundström 1976b reported isolating 22 mg of gigantine from 15 kilos of fresh material. It was not reported in greenhouse grown plants, nor in young plants grown outdoors in Arizona. (see Bruhn *et al.* 1970).

Bruhn *et al.* 1970 and Bruhn & Lundström 1976) found salsolidine to be the major alkaloid, whereas Brown *et al.* 1972 did not observe salsolidine in any samples they tested. They did agree that carnegine was present in decent amounts.

Carnegiea gigantea
(near Tucson, Arizona)

Cereus peruvianus

There are references to this plant as being hallucinogenic and as containing Mescaline.
Both of those assertions are clearly in error.

Rouhier 1927 is thus far the earliest instance of the mistaken claim that I can locate.
From page 73:
" Le Cereus peruvianus est le seul représentant de la famille des Cactacées, à côté naturellement du Peyotl, qui ait été utilisé par les Indiens dans le sorcellerie."
=
"*Cereus peruvianus* is the only representative of the family of the Cactaceae, next to of course peyote, which has been used by the Indians in witchcraft"

The reference to Cobo 1653: 451 on page 90 in Rouhier where he equates this species with *"la diabolique huachuma"* clearly indicates that this was based entirely on confusion with San Pedro (*T. pachanoi*).
Rouhier's mistake was repeated in Hobschette 1929, Jacquet 1934 and also in Soulaire 1947. Hobschette and Soulaire both included Cobo's description which leaves no doubt that Cobo was discussing San Pedro.

Cereus quadrangularis
Duke cited Hartwell for its use in cancers.

Cereus peruvianus
From Schumann 1921 *Bluhende Kakteen*

This same image, cropped slightly & presented in b/w, appeared without credit in Soulaire 1947

Cephalocereus leucocephalus
Fruit used for producing *tesgüino*.
Pennington 1963

Corynopuntia reflexispina
Used traditionally for treating diarrhea. Johnson 1999

Cereus hexagonus
Duke cites Pittier for its use as diuretic and for enterrhagia.

Cereus jamaracu
Davet 2005 reported some antimicrobial and antifungal activity.

***Cereus peruvianus* var.**
(HBG)

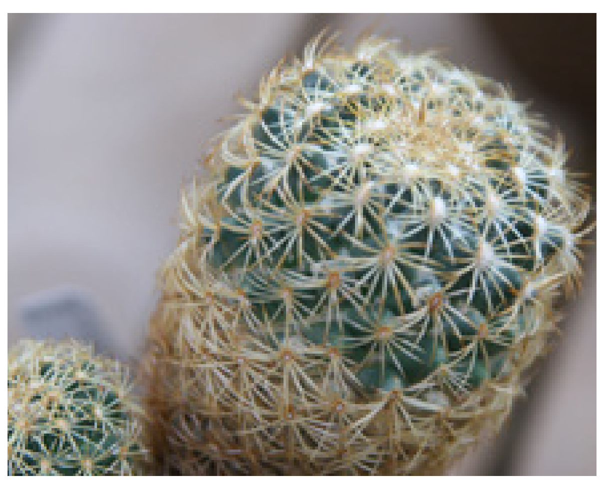
Cereus repandus

Duke lists uses for diarrhea and as shampoo or soap.

Cereus repandus
(HBG)
left column & upper right

Corynopuntia reflexispina (Wiggers & Rollinson) Backeberg

Diarrhea. Duke



Coryphantha compacta
(Cactus Country) center right
(Huntington) bottom right

Coryphantha compacta

Tarahumara names:

"bakana"; "bakánawa"; "wichuri"; "Santa Poli" (Bye 1979)

Bye reported finding this to be a powerful medicinal plant employed by Tarahumara shamans and feared by some of the Tarahumara. It was regarded as a form of hikuri and Bye suspects it to be referable to bakanawa in Bennett and Zingg.

While an analysis of the Tarahumara "bakana" was said to be underway in Bye 1979, the results were either not published or the analysis was not performed.

Thord-Gray 1955 described "baka-nawa" as the most feared plant next to hi-kuri (p. 573)

"This is a quite a common small ball-cactus, apparently inoffensive but considered very "powerful medicine""

"In certain sections of Tarahumaraland this plant is used in place of peyote." (Thord-Gray 1955: 84)

"..baka-nori has a ball shaped root and is used the same way. It may be the same plant." (Thord-Gray 1955: 84)

The roots of both of these cacti are said to be "chewed and then rubbed on the legs of the runners to make them light of foot." (Thord-Gray 1955: 345) Its application is often topical.

Bennett & Zingg commented that it was a common ball cactus they were cautioned not to touch. Their informant said it was second only to hikuli in power. Later in their account they say "The users consider this root more powerful than peyote."

It was said to be used as a cure by shamans but that it could not be kept for more than three years by any one individual and needs to be sold or hidden after that point.

"The whole root is stirred in boiling water and used as a drink or application for many diseases. It is applied to the back for sickness in the lungs."

"The small ball is chewed by the shaman, and the patient anointed with it wherever he feels pain." "During a race the shaman continually chews a bit to have it ready for the runners who tire."

"The plant is so strong that runners anoint themselves with it three days before an important race."

The plant is said to be used by shamans, not peyoteros. The shamans make special trips to obtain it. Bennett & Zingg were told that the plant must be harvested on Friday and smoked with incense. Anyone is permitted to harvest or carry the cactus but it is mostly used by the shamans. The shamans carry small bits of the root in their bags. The root has many uses.

"Losing or burning one of the plants makes it very angry, and the offender is apt to become sick, turn crazy, or die. When one sleeps near the roots, he may hear singing as it moves about. By chewing it a bit, the singing becomes clearer."

Coryphantha compacta
(Cactus Country)

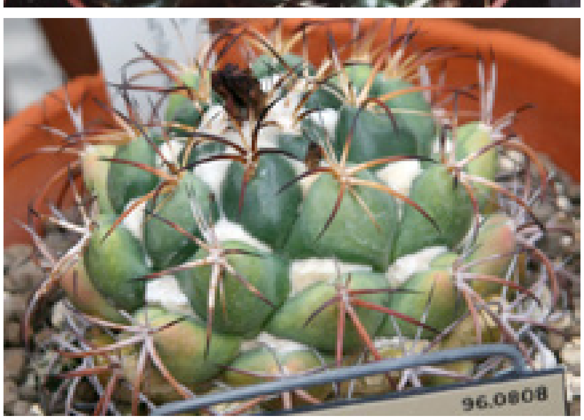
Coryphantha macromeris
(Judge Roy Bean Visitors' Center)

Coryphantha elephantidens

MS Smith 2002 related that "A personal correspondent had observed *C. elephantidens* sold under the title of peyote in a Mexico City market. With a note of caution, my acquaintance went on to mention the possibility that many cacti, medicinal or not, are considered peyote to indigenous groups."

http://www.cactus-mall.com/mss/old.html

Photo by Johnny B. Goode



Coryphantha elephantidens
(UC)

Coryphantha macromeris

RE:
Coryphantha macromeris (Engelmann) Lemaire
&
Coryphantha runyonii Britton & Rose

Claims for mescaline's presence in these two species appear in the literature **erroneously**.

Barceleux presents *C. macromeris* as a mescaline containing cacti for no clear reason other than perhaps thinking rumors of use indicate that mescaline is present.

This species is purported to be a mild hallucinogen in its own right for reasons other than mescaline.

The claim purporting hallucinogenic activity first appeared in Ott 1976 who cited his own unpublished lab notes and Jerry McLaughlin, unpublished data, as his references. Schultes & Hofmann included Ott's observation in *Botany & Chemistry*... and in *Plants of the Gods*. However, in his later works Ott began citing Schultes & Hofmann's secondary reference (to him!) and ceased to cite either himself or Dr. McLaughlin.

Coryphantha runyonii appears to be listed seemingly for nothing more than being considered to be a varietal form of *Coryphantha macromeris*. Its reported analysis is commonly merged with that of *C. macromeris* in phytochemical databases.

Neither species has ever been found to contain mescaline.

Counterculture 'new age' churches (such as "*Crystal*") have been established declaring *Coryphantha macromeris* as their sacrament. The literature we have seen suggests that they might be less than informed. We have been unable to locate even a single person who has actually tried it.

The plant is also rumored to be one fifth as strong as the peyote cactus. Which I suspect is due to a comparison of the mg/kg figures in the literature. This would place an effective dose in excess of two pounds of plant material; ***if*** thought of in terms of weight for weight equivalence of cacti.

However, this is likely to be **in error** as it must be remembered that, while macromerine has been reported to be one-fifth the potency of mescaline, the reported percentage of occurrence is around one tenth that normally encountered in peyote for mescaline.

This implies that, IF it were active as a hallucinogen, **50 times** more plant material would be required, not 5. There is also the reality that this plant lacks a thorough analysis and one of the alkaloids noted as present but unidentified possesses MAOI capabilities. Shulgin proposed a "*cactihuasca*" potential for *Coryphantha* species based on reported MAOI properties of some of the *Coryphantha* alkaloids. (Shulgin in a personal conversation during 2005)

We have, so far, been unable to find any other person who has sampled this plant. Surely there must be someone which implies that either every single person who tried it found that it was so incredibly good they didn't want to share it and independently suppressed the knowledge or else it was not worth bothering to recount. I'd lean towards the latter notion myself.

Mescaline would seem obvious as a preferable alternative, especially as current law potentially considers macromerine to be a controlled substance thanks to the modern blanket of illegality.

My only bioassay involved around half a pound (nearly half of one large and very old plant) harvested while frozen in mid-winter.

Nausea was pronounced and lengthy (far worse on both counts than with peyote), there was a distinct pharmacological action but it was an insufficient dose to enable a hallucinogenic experience.

There were persistent side effects such as a weird feeling of unreality and a strange shiny plastic appearance to objects which lasted for several weeks after ingestion.

I found it more weird than anything else with an underlying sense of borderline irritability that reminded me more of ephedrine or Catha edulis leaf.

While it is clearly in need of further evaluation, there are no plans or desire to evaluate it at a higher level. [Its worth recalling that J.R. Briggs felt similarly after sampling a partial peyote button.]

The lengthy after effects causes some empathy for the assertion that permanent insanity could result from the use of *Coryphantha* species by people who weren't prepared. While thinking it unlikely, the possibility of prolonged effects or after effects had been considered before hand, due to the warnings, and so, while concerned and in some spots challenged, I was not overly worried. If a person experienced this and was not prepared, or was unstable to begin with, the duration and weirdness of the side-effects might potentially cause them some problems.

Its important to mention that if either macromerine or normacromerine is indeed a hallucinogenic alkaloid, or if normacromerine is, they would be the **ONLY** N-methylated phenethylamines that are known to be hallucinogenic.

N-methylation normally ameliorates hallucinogenic activity, doing so **even on DOM** (STP). If *any* activity remains on an N-methylated phenethylamine it is generally that of an amphetamine type stimulant.

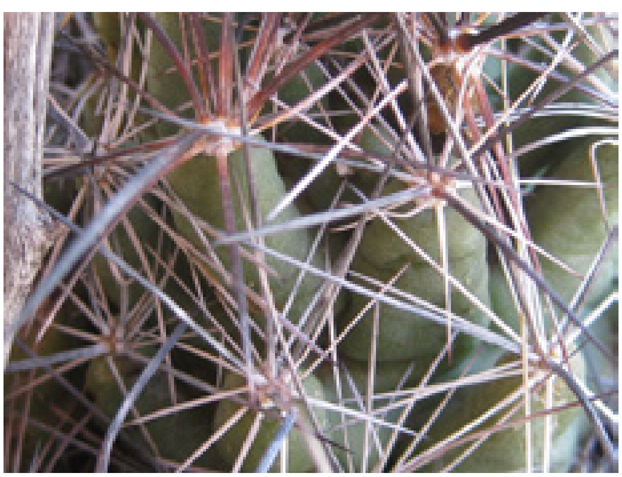
As is noted under normacromerine in ***The Cactus Alkaloids***, the conjecture by Shulgin (personal communication) concerning potential interactions of this alkaloid with known MAOI *Coryphantha* alkaloids needs some study.

Coryphantha palmeri

There is an odd report by Domínguez *et al.* 1970 that seems to have been left uninvestigated by later workers.

In this paper they mention that *Coryphantha palmeri* was employed as a"*narcotic*". They observed 4 spots during tlc but were unable to get the alkaloid they isolated to crystallize and never identified it. (They did identify other nonalkaloidal components by mp, tlc, IR, UV, MS and NMR.) This is often cited as a report finding no alkaloid in this species. We do not think the issue is settled yet. More work is needed.

Coryphantha palmeri
(HBG)
upper right



Coryphantha macromeris
(Presidio County, Texas)
Above & center right & lower right

Cylindropuntia acanthocarpa

Ingested for gastrointestinal disturbances. Johnson 1999

Cylindropuntia bigeloviii (Engelmann) Knuth

Used as a diuretic. Johnson 1999 & Duke

Cylindropuntia leptocaulis

Mexico: "*tasajillo*", "*tasajulla*", "*garumbulo*"

Castetter & Opler 1936 reported a claim purporting psychoactivity from fruit consumption but I am unable to find anyone who can reproduce these results in their bioassays.

They were said to have such "*pronounced narcotic effects that the Indians will not walk close to plants which bear them, and they claim that eating a single fruit will make one "drunk and dizzy."* " [Never mind that the fruit have tiny glochids.]

I would suspect that this might have arisen out of a Mescalero's sense of humor. I can almost hear the words "*Hey cowboy, ...*"

They are commonly included on the lists of the cactus species fruit eaten as food by the indigenous southwestern peoples.

***Coryphantha runyonii* seedlings (SRSU)**

***Cylindropuntia leptocaulis* fruit (BTA)**

Cylindropuntia versicolor

Chemical studies performed on *Aspergillus terreus* yielded interesting products. (It was inhabiting the rhizosphere of *Opuntia versicolor*.)

Among them was (+)-Terrecyclic acid A which was found to be "*capable of disrupting the cell cycle through an apparent arrest to progression at the G(1) and G(2)/M phases in this p53 competent cell line*. "
WIJERATNE *et al.* 2003

Terrecyclic acid A (TCA) was also determined to be active as a small-molecule inducer of the heat shock response and showed anticancer activity. It was suggested that it affects pathways involved with oxidative and inflammatory cellular stress responses.
TURBYVILLE *et al*. 2005

***Cylindropuntia versicolor* fruit (Saguaro National Park)**

Cylindropuntia whipplei

Used to treat diarrhea. JOHNSON 1999

Dolichothele uberiformis

The juice from this cactus injected into a frog rapidly caused its death. (from SOULAIRE 1947) This refers to a brief comment made in LEWIN 1894.

***Dolichothele uberiformis* (California Cactus Center)**

***Dolichothele uberiformis* (HBG)**

Echinocereus enneacanthus

Employed in Dropsy; Used as Piscicide & Vermifuge.
DUKE cited KROCHMAL & KROCHMAL1973

Called the "*strawberry cactus*" due to its fruit. STANDLEY 1924

Echinocereus stramineus

"*pitahaya*"
Prized for its edible fruit, STANDLEY 1924

Echinocereus coccineus
Echinocereus salm-dyckianus
Echinocereus triglochidiatus

Bennett & Zingg 1935 do not mention any drug use of any *Echinocereus* despite making comment on their commonness.

Tarahumara name: "*hikuri*"; "*wichuri*"
Mexican name: "*pitallita*"

Bye reported that *Echinocereus triglochidiatus* Engelm. and *E. salm-dyckianus* Scheer *"are "hikuri" of the sierras and can be used in the same manner as the preceding types although they are not as powerful.*"

Bye 1979

"*High mental qualities are ascribed especially to all species of Mammillaria and Echinocactus, small cacti, for which a regular cult is instituted. The Tarahumares designate several varieties as hikuli, though the name belongs properly only to the kind most commonly used by them. These plants live for months after they have been rooted up, and the eating of them causes a state of ecstasy. They are therefore considered demi-gods, who have to be treated with great reverence, and to whom sacrifices have to be offered.*"

Lumholtz (1902: 303) uses the name *Echinocactus* but his accompanying illustration is very clearly that of an *Echinocereus*.

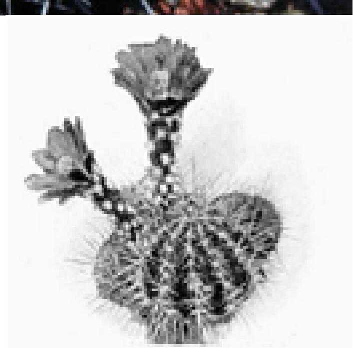
It seems certain that what Bye referred to as ***Echinocereus triglochidiatus*** was ***Echinocereus coccineus.*** Confusion between the two species is quite common but *Echinocereus triglochidiatus* has a more northerly distribution.

I am only aware of one person bioassaying this plant. He told me he experienced something vague and weird but was unable to obtain any interesting results despite subsequently isolating pure alkaloids and ingesting them alone and combined with an MAOI.

Echinocereus salm-dyckianus
(Cactus Country)

Echinocereus coccineus* v. *rosei
(Hudspeth Co., Texas) above

***Echinocereus* in Lumholtz 1902 Compare this to the *Echinocereus coccineus* images.**



Echinocactus.

Echinocereus coccineus* v. *gurneyi
(Sul Ross) center image on left

Echinocereus coccineus* v. *rosei
(Sul Ross) upper right

Echinocereus coccineus
(cultivated Austin, Texas) lower right

Echinocereus coccineus* var. *paucispinus
(Val Verde Co., Texas) above & right

Echinocereus coccineus* v. *rosei
(Hudspeth Co., Texas) above

Arizona hedgehog cactus (***Echinocereus triglochidiatus* var. *arizonicus***) was reported by Crosswhite 1992 as being under threat of illegal poaching for its purported DMT content. One has to wonder how much incidence of this actually existed before this report and how much, if any, has occurred after it.

Speculations by Crosswhite that its "[...] *evolutionary history may be linked to trading by the prehistoric Salado culture, implying that the species may actually be an early cultivar* " does not seem to be based on anything that is real.

See USFWS 2001.

Echinocereus chrysocentrus (golden spined strawberry)
Echinocereus coccineus (hedgehog cactus)
Echinocereus fendleri (desert strawberry)
Echinocereus leeanus (salmon-flowered hedgehog)
Echinocereus rigidissimus (rainbow cactus)
were all valued for their fruit by the Mescalero.
Castetter & Opler 1936: 41

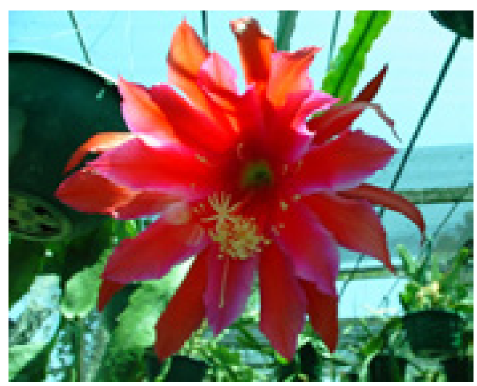
The Isleta in New Mexico ate the pulp of *Echinocereus triglochidiatus* after baking it or making it into a candy with sugar. *Echinocereus fendleri* and *Echinocereus gonacanthus* were roasted and used as food by the Cochiti.

Several species are valued as food but more are highly regarded for their fruit.
Castetter 1935: 26

Echinopsis multiplex

An aqueous decoction of *Echinopsis multiplex* showed *in vivo* tumor growth inhibition activity and increased the survival time of rats with solid tumor S180 and Lewis pulmonary carcinoma. (p.o. 30 g/kg and 60 g/kg). *In vitro* study of their plasma showed that it inhibited DNA synthesis in YAC-1 tumor cells and significantly suppressed the proliferation of EAC tumor cells (antineoplastic effect). Chen *et al.* 1999

variegated *Echinopsis multiplex*
(SS) above



***Epiphyllum* cv. (hybrid)**
(Kartuz)

Photo by
Geoffrey

cristate
(Oasis) left below; (Cactus Country) right below

Echinocereus mamillosus Rümpler

Soulaire 1947 says it has a "*narcotic*" action and, in animals, a lethal dose causes death by respiratory depression.

Echinocereus reichenbachii

Remington *et al*. 1918 appears to have *somehow* confused this with *Pachycereus pecten-aboriginum* when saying:

"*From* ***Cereus Caespitosus*** *Engl. and A. Gray, Heyl separated an alkaloid, pectenine, which, according to Heffter (A. Pharm., 1901, ccxxxix, s. 462), produced both in cold and warm blooded animals tetanic convulsions with heightened reflexes. According to the experiments of Mogilewa, the alkaloid acts upon the isolated frog's heart as a depressant*."

Grieve 1931 appears to draw from this source when writing: "***Cereus caespitosus***. *An alkaloid separated from this variety, called Pectenine, produces tetanus convulsions in animals*."

Cereus caespitosus became *Echinocereus reichenbachii*. The comments by Heffter appear within the pages of Heyl 1901 but this paper does not discuss *Cereus caespitosus*.

All of the varieties of bona fide *Echinocereus reichenbachii* appear to lack any analysis?

Epiphyllum oxypetalum

A comment appeared in the *Entheogen Review* that a large doses of a water extract cause "*hallucinations*" (DeKorne 1997).

In checking the purported reference (Huson 2001) Aardvark 2006 discovered not only was the claim taken from Grieve 1931 but it actually referred to *Selenicereus grandiflorus* rather than to *Epiphyllum oxypetalum*!

Epiphyllum oxypetalum apparently has some type of pharmacological/physiological actions.

All in isolated tissue preparations:

"*decreased the flow rate of perfusion fluid in isolated guinea-pig lungs*."

"*shortened the guinea-pig tracheal chain*."

"*increased the spontaneous activity of the rat and mouse jejunum and elicited contraction of the guinea-pig ileum*"

The responses of the tracheal chain and the ileum were similar to the responses produced by acetylcholine or by histamine. Chow found this could be blocked or reversed by atropine and by chlortrimeton.

"*caused a shortening of the rat aortic strip which was antagonized by phentolamine*."

"*exhibited both inotropic and chronotropic effects on isolated rat auricles and hearts, which could be blocked by propanolol*."

"*produced slow contraction of the nictating membrane in anesthetized cats. This response was readily abolished by phentolamine*."

Chow *et al*. 1977 (Above was from the English abstract.)

Duke's database lists *Epiphyllum oxypetalum* being used for "*Longevity*" citing Burkill 1966.

I have not yet obtained that paper.

Epiphyllum phyllanthus

Duke's database lists this species being used as "cardiac" & "tonic" citing Duke 1972

Serves as a bandage for burns & wounds. Soulaire 1947

Tested in animals for possible antidepressant effects. Choice based on "*being traditionally used for the treatment of bad dreams, witchcraft, or madness*", according to a Guaymí Indian informant. Aardvark 2006 cited Anderson 2004a

Epiphyllum spp.

Culina: "Wamapanako" (Rivier & Lindgren 1977)
Sharanahua: "Pukara" (Pinkley 1969)
"Pokere" (Rivier & Lindgren 1977)

An unspecified *Epiphyllum* species is said to be used by the Peruvian Sharanahua as an ayahuasca admixture. (appearing in Rivier & Lindgren's 1972 listing)

Only one leaf of the *Epiphyllum* species is added to ayahuasca or else its unboiled juice is consumed along with the prepared *hoasca*.

Homer Pinkley 1969 commented that there is an herbarium voucher of the *Epiphyllum* (made by L. Rivier & I. Rüff) present in the Economic Herbarium of Oakes Ames at Harvard.

Duke's database lists an unspecified *Epiphyllum* species being used for "*intestine*"; citing Altschul 1973.

An unspecified *Epiphyllum* species is said to be used as an appetite stimulant in Costa Rica.

Aardvark 2006 cited Anderson 2004b.

WORLDS WONDER REMEDY

Report of the Council on Pharmacy and Chemistry

Worlds Wonder Remedy is said to be prepared by macerating "the leaves of certain cactus plants, among them being the 'Alligator Tail Cactus,' the 'Philo' cactus and several other species of cactus" in brandy. No evidence is submitted in regard to the possible properties of the "Alligator Tail," the "Philo" cactus or the identity and properties of the "other species." Neither are the quantities of the leaves in a given amount of the wonder remedy declared. It is claimed "We have also found this medicine to be a very good cure for nervousness, headache and all pains of the body, especially stomach trouble, indigestion, cancer of the stomach and we have also given it to people sick at this time of the year and they did not know what ailed them but it made them feel fine."

The Council has no evidence that this preparation has therapeutic virtues, and in the absence of such proof declares the claims unwarranted and preposterous.

American Medical Association 1918

Maybe "Philo cactus" intended *Phyllocactus* but I do not have a guess for "Alligator tail cactus". *Aloe vera*, several other *Aloe* species, and a rampant *Kalanchoe* amazingly all are known by the common name 'Alligator cactus'.

Epiphyllum oxypetalum
(SRSU)

Epithelantha micromeris

Asserted hallucinogenic based on some intriguing statements but this may be a cross-cultural conceptual force-fitting?

"*Mulato*" (Tarahumara)
"*This is believed to make the eyes large and clear to see sorcerers, to prolong life and to give speed to the runners.*"
Lumholtz 1902

Thord-Gray 1955 purported this to be the Tarahumara's "*peyote mulato*": "*…credited with great intellectual and moral qualities. A small dose of this plant will open the busi-ra (eyes). One can then clearly see the evil wizards and witches. It will prolong life and increase the speed of a runner in a race.*"

Epithelantha micromeris
(California) above; (Prague) right
Image on right courtesy of Martin Terry

Mentioned by Pennington 1963: 166 as a "*narcotic*" cactus with use similar to *Lophophora*. Said to not be available at that time in Tarahumara country. "*Specimens of Epithelantha micromeris in possession of Indians near Guaguachic and Nararachic are claimed to have been brought from slopes of ranges northeast of Valle de Allende, beyond the Rio Florido.*"

"*The whole plant, as well as the fruit (although it is considered less effective), is used to stimulate and protect runners (Lumholtz 1902- Pennington, 1963). "... use appears to be restricted to the upper regions of the Rio Conchos.*"
Bye 1979

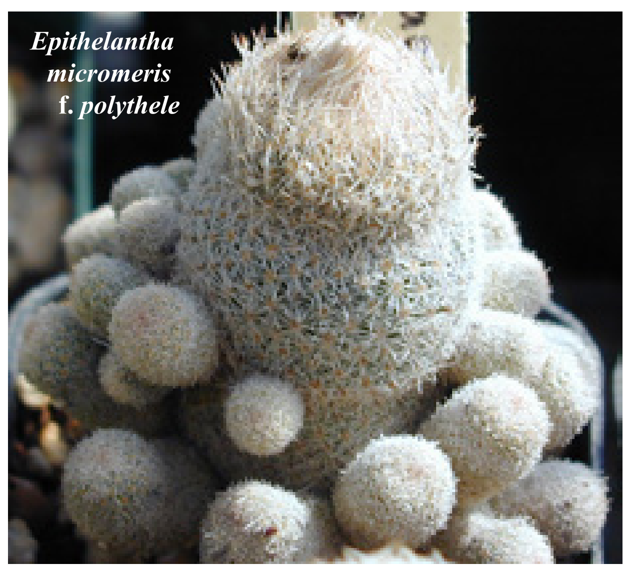
The phrase "*much less effective*" is interesting. This author has eaten the fruit of this cactus many times and never experienced stimulation, or any other effect, even faintly.

Standley noted that they are considered edible in México and called *chilotes*. Standley 1924: 933

"*Rosapara*"

Described as a "*more advanced vegetative stage of the preceding species—though it looks quite different, being white and spiny. This, too, must only be touched with very clean hands, in the moral sense.*"

Lumholtz comments that the only people who are allowed to handle it are those "*well baptised*" and that "*It is a good Christian and keeps a sharp eye on the people around it; and when it sees anyone doing some wrong, it gets very angry, and either drives the offender mad or throws him down precipices. It is therefore very effective in frightening off bad people, especially robbers and Apaches.*"
Lumholtz 1902



West & McLaughlin 1977 demonstrated the (rather consistent) toxicity of the saponin extract when injected into mice. Toxicity ranged from death within 24 hours at 100 mg/kg to death within 1 hour at 1 gram per kg.]

Ferocactus covillei
= Ferocactus emoryi

Used for treating sores. Duke.

***Ferocactus* sp**

Used for headaches, chest and women's complaints. Duke

***Ferocactus covillei* (Cactus Country)**

Haageocereus (*Weberbauerocereus*) *acranthus*

This species appears to lack published analysis.

It was asserted to contain mescaline in Caycho Jimenez who made this claim without including a reference.

This first image was sent to me to illustrate material that was purportedly being used by shamans in Peru.

Photo by correspondent requesting anonymity

***Trichocereus spachianus* is a clear mislabel.**
The spines were said to be badly damaged when transported.

Haageocereus acranthus
The two cuttings which were shipped from Peru.
The visible grey fungus and black rot rapidly consumed them.

Haageocereus (*Weberbauerocereus*) *cephalomacrostibas*
AKA *Trichocereus cephalomacrostibas*

This species also lacks any published analysis.

Asserted to contain mescaline in Caycho Jimenez who made this claim without including a reference.

***Weberbauerocereus cephalomacrostibas* (UC)**

Harrisia divaricata (Lamark) Lourteig

Antihelmintic (no reference included)
Remington *et al.* 1918

Harrisia nashii Britton (now *H. gracilis*)

Vermifuge (Haiti) - Štarha 2001

Hylocereus monacanthus (Lemaire) Britton & Rose

The fresh juice extracted from leaves and fruits was said to taken orally and purported to be used in "sorcery" and for the "liver" in Vilcabamba, Ecuador. Beiar et al. 2002.

This putative entry into the literature appeared under the name of the unrelated columnar cactus *Cephalocereus royenii* (aka *Pilosocereus royenii*. However, the herbarium voucher shown is of a *Hylocereus* rather than a *Pilosocereus*. Similarly the common names listed (Pitayo, Pitaya, Pitahaya) are commonly applied to *Hylocereus* species but not for *P. royenii.*

Beiar et al. (2002: 248-249) also included as synonyms *Hylocereus lemairei* (now *Hylocereus monacanthus*), *Hylocereus ocamponis*, and *Hylocereus polyrhizus* which are three completely different plants that are all presently recognized as separate species.

There is clearly much confusion within that account as to what plant is actually used.

Hylocereus ocamponis (Salm-Dyck) Britton & Rose See comment above under ***Hylocereus monacanthus***

Hylocereus polyrhizus (F.A.C.Weber ex K.Schum.) Britton & Rose See comment above under ***Hylocereus monacanthus***

Harrisia martinii
(Cambridge Botanical Garden)
Analysis not yet reported.

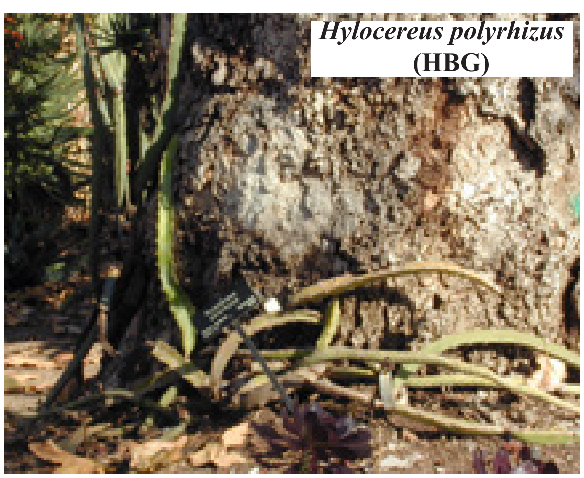
Hylocereus undatus

Caustic stem juice employed internally and externally for a vermicide. The internal use is said to be dangerous.

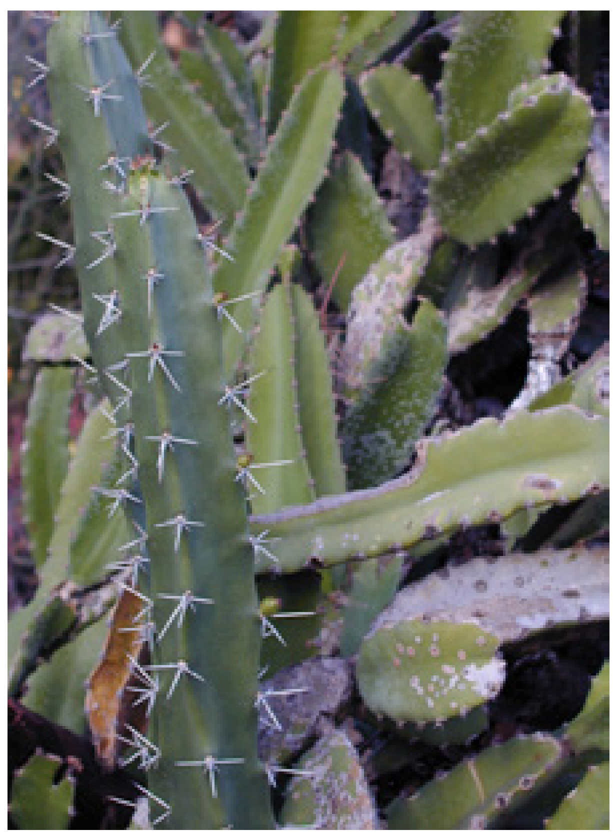
Widely cultivated for its fruit.

Standley 1924: 913

Hylocereus undatus
(HBG) all four of the above



Hylocereus polyrhizus
(HBG)



***Hylocereus costaricensis* (HBG) lower right** (Not including the *Acanthocereus* on the left in front.)

Lemaireocereus hystrix

[Name accepted as *Stenocereus fimbriatus* --
commonly encountered as synonym *Stenocereus hystrix*]

Duke cites Hartwell for "*Cereus fimbriatus"* being used for warts.

This species appears in the analytical literature only under the more commonly encountered synonym *Lemaireocereus hystrix*.

Lemaireocereus hystrix from Jamaica was analyzed by Carl Djerassi in the 1950s and was reported to be devoid of alkaloid. It was found to contain an uncharacterized triterpene lactone that he termed the hystrix lactone. This lactone also showed up in several other species of *Lemaireocereus*.

More recently one ethnobotanical supplier has been claiming this plant to at least sometimes be potent with mescaline.

The material being sold under this name as live cuttings and dried outer flesh first appeared labeled *Trichocereus cuzcoensis*. It then was renamed as a *peruvianus* variety and then a *peruvianus* hybrid before settling on *Stenocereus hystrix*.

When I asked the owner about the name and identification he said the name was assigned by a botanist who examined the vegetative material.

The first cutting I obtained did resemble the material growing in the greenhouse at the Huntington. (The Huntington material was collected from Puerto Rico).

He also commented that only material growing in one stand on the Dominican Republic was active and not the others growing elsewhere on the island. How this was determined, how it was first determined to be active and why it was suspected of being a hybrid (and with what), were not known to him.

The claim is that this material is mescaline containing and found to be active in human bioassay at 20 grams of dried material but it was commented on by the vendor that too much rain had reduced the potency in at least one harvest so he changed the estimated dosage range to 20-40 grams.

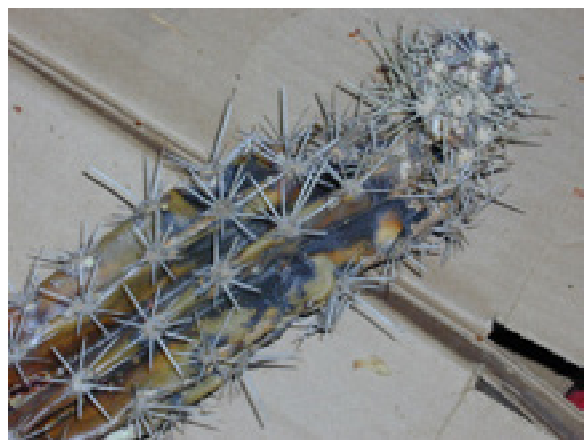
I have been unable to locate anyone bioassaying anything except for pre-prepared dried commercial flesh.

It needs an analysis starting with a living cactus. My two attempts to obtain live material proved problematic.

Lemaireocereus hystrix
(Dominican Republic)

Lemaireocereus hystrix H 49153
(Puerto Rico) Collected by C. Fleming
(HBG)

Lemaireocereus (Stenocereus) hystrix **(Dominican Republic)**
Lower image above & the upper right 2 images show the first attempt being unpacked (2 cuttings); one cutting arrived alive but rapidly rotted -- looking similar to how the other had arrived. The ID is correct as the areole shape demonstrates.



The second shipping attempt of Ethnogardens.

Freshly cut plants shipped wrapped in plastic and dripping liquid. A matching set intended for analysis was delivered inside of a trash bag inflated with the gases produced. Dr. Terry directed it to their microbiology people rather than analyze what was felt to be a compromised sample.

Lemaireocereus laetus
[Name accepted as *Armatocereus laetus*]

Over 20 years ago, Wade Davis purported that cactus was used as a San Pedro substitute by a shaman near Huancabamba. It was purportedly called pishicol by Davis' informant although our contact said it was locally called San Pedro.

Human bioassays of cultivated material have thus far been without results although I am only aware of two attempts neither of which included the amount used or the form of preparation.

In his 1983 paper on "Plants of the San Pedro Cult" Davis claimed that herbarium vouchers had been prepared and that an analysis was ongoing but did not mention the results in either Davis 1997 or 1999. Correspondence with Davis & D.M. McKenna established that an analysis was never performed.

Lemaireocereus matucanense
[Name accepted as *Armatocereus matucanense*]

This is listed as a good species in Hunt 2006, yet Hunt also comments: **"***doubtfully distinct from Armatocereus laetus***"**

This cactus is purported to be employed as a type of San Pedro in parts of Peru. (Information from Grizzly; personal communication) It is claimed to be "strong".

Independent confirmation of that activity has not been performed. As was also the case with Davis, Grizzly and friends did not bioassay the plant so the claim remains anecdotal.

That particular population needs analysis.

The cacti on this page came from Peru.

After unpacking

***Lemaireocereus matucanense* new growth**
New growth a year later: lower left

Wild *Lemaireocereus matucanense* above Matucana, Peru.
All four photos by Grizzly

Leuchtenbergia principis

Purported to be used for treating wounds in "*beasts of burden*". STANDLEY 1924: 934

It may be unrelated but in a massive rat invasion of my cactus nursery many years ago this was one of a very few species left completely untouched even as seedlings.

Nopalea cochenillifera
(Hebbronville, Texas)
lower image

Leuchtenbergia principis
(UC) 85.1428 México
upper image

Lemaireocereus thurberii

Fruit used by the Tarahumara for producing *tesgüino*. Pennington 1963

Fruit colors the urine like blood. Standley 1924: 901

Lemaireocereus queretaroensis

Called "*pitahaya*" due to edible fruit. Standley 1924

Used in Mexico as a purgative. Soulaire 1947

Lophocereus schottii

Felger & Moser 1991 mention that the *senita* is one of the three plants that the Seri believe was once a human.

Traditionally used for cancer. Duke (Hartwell)

Antimicrobial & other biological activities studied in:
Fimbres & García 1998
Morales 2006
Rico-Bobadilla *et al*. 2001

Lack of the appropriate enzyme for converting cholesterol into 7-dehydrocholesterol (termed the "Neverland" gene) makes this plant an obligate food source for *Drosophila pachea*. Without consumption of Lathosterol it would be unable to successfully mature.
Lang *et al*. 2012

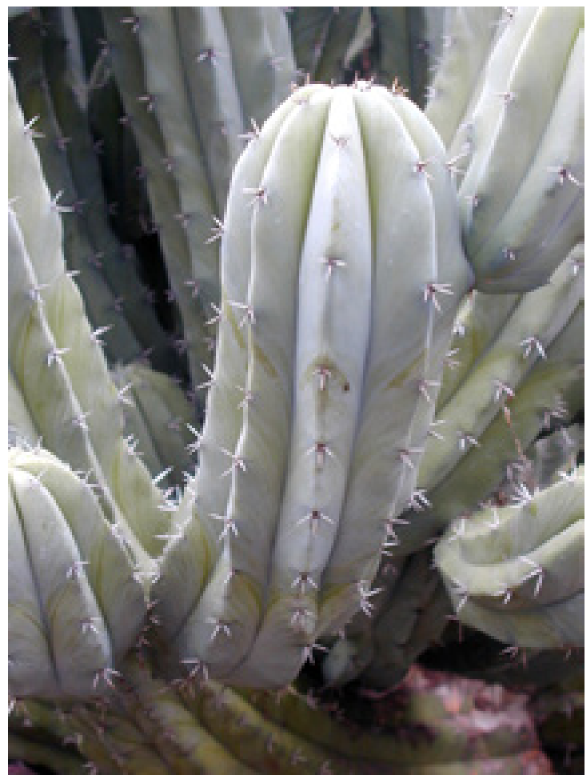
Lophophora fricii

Cultivated *Lophophora fricii* were reported nonhallucinogenic at 3 gm/kg in Habermann 1978a.

Lophophora jourdaniana

Cultivated *Lophophora jourdaniana* were bioassayed successfully (for mescaline) at 3gm/kg in Habermann 1978a.

Lewin 1894 commented that "Hildman" isolated an alkaloid in 1889 and showed that it caused convulsions in frogs. This was apparently personal communication with Lewin rather than published work.



Lophocereus schottii
cephalium - (SRSU) left
new growth - (HBG) upper right
spine detail - (SRSU) lower right

Lophophora williamsii

"*The dried plants have been in use among the native people* [in Mexico] *since precolumbian times, and are still employed, although their use is forbidden by law*."
"[…] *the general effects are somewhat like those resulting from the use of hashish*."
Standley 1924
"*…used by Rio Grande Indians to produce intoxication -- similar to cannabis, during religious ceremonies*;"
"*Heart and respiratory stimulant, tonic, adjuvant to digitalis, narcotic, slightly slows pulse, produced mental and physical weariness, sleep without untoward symptoms; excessive quantities produce spasms resembling strychnine poisoning; pneumothorax, tuberculosis, angina pectoris, asthmatic dyspnea, hysteria*."
Culbreth 1927
The equating of peyote's activity with that of either opium or hashish is common in the early literature.

Green plants are "*chewed and placed upon bruises, bites and wounds*." (Pennington 1963)

"*anodyne, antirheumatic, bitter, cardiac, cardiotonic, emetic, entheogen, febrifuge, intoxicant, lactogogue, narcotic, panacea*"
Johnson 1999 ref#6
"*arthritis, backache, common cold, corns, diabetes, fever, gastrointestinal disturbances, headache, infection, influenza, orthopedic ailments, sunstroke, tuberculosis, venereal ailments, wounds*"
Johnson 1999 ref#7
"*...many uses in folkloric medicine including the treatment of arthritic, consumption, influenza, intestinal disorders, diabetes, snake and scorpion bites and datura poisoning*."
"*The Huichol rub the juices of fresh peyote into wounds to prevent infection and to promote healing*."
"*It is used to gain knowledge, prophesize the future, and for almost every type of illness. It is also applied externally to painful joints*."
Johnson 1999

Extract is used externally for bruises, fractures, rheumatism, swellings and joint pain in the form of liniment, ointments and cremes. Used orally or topically as an analgesic.
Commercially produced and marketed on-line there is also a cottage industry that exists producing *pomada de peyote*.

In the region of the headwaters of the Río Concho, Pennington 1963:159 noted that the expressed juice from *Lophophora williamsii* was sometimes added to *tesgüino* to "*make the corn beer more enjoyable*."
Havard had made a very similar claim.

The plant has many folk medicinal applications. See ***Sacred Cacti*** or Anderson or McLaughlin for a listing of additional uses.

Pomada de Peyote
(from an on-line ad in 2013)

young *Lophophora williamsii echinata*
(mother was wild harvested in Mexico)
Closer view of its epidermis in center.

Machaerocereus gummosus

" *pitaya agria*", "*pitahaya agria*", "*pitahaya*", "*agria*"
Crushed stems sometimes thrown into water to stupefy fish.
Bears a popular fruit called *tajuá* (Cochimí).
Standley 1924
Antimicrobial & antineoplastic activities studied in Morales 2006
General phytochemical screening in Garza Padrón 2005

Mamillopsis senilis

Bruhn 1973a noted that Dr. J.N. Rose mentioned *Mamillopsis senilis* as a "*sacred cactus*" of the Tarahumara in his article entitled "*Notes on useful plants of Mexico*" [Rose 1899]

Bye 1979 refers to the plant as "*Mammillaria senilis"* and mentions than that Rose "*related an incident of Nelson who, while collecting in southern Chihuahua, reported encountering a Tarahumara who was fearfully reluctant to assist in collecting a similar cactus*"

Rose had given the name as "*Mamillaria senilis"* stating the potential of deferring to Weber's new *Mamillopsis* once he had seen it flower.

Rose speculated that this could be the "*hikora rosapara*" mentioned by Lumholtz.

He related an account of E.W. Nelson in 1898:

"*This is one of the sacred plants of the Tarahumari Indians and I was informed that the Indians who have had little intercourse with the Mexicans can not be induced to touch one of them. The specimens I secured were gathered by a Tarahumari man living on the ranch where I stopped. When I told the Indian to gather the plants from the top of a great rock he hesitated and only did it when I insisted upon his compliance. In pulling the specimen loose he tore on another plant and before descending he raised the fallen plant and replacing its root in position he packed the soil very carefully about it. This little incident illustrates the respect in which these people hold this plant*." (Rose 1899: 258)

The Genus *Mammillaria*

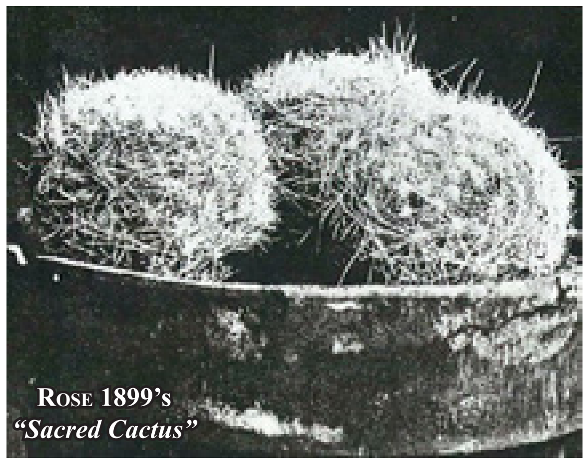
The milky sap of some species were used to remove warts.
Standley 1924: 975

Duke/ Martínez mentions use for earaches, dysentery, insecticidal, poison (not indicated whether as poison or for treating poisoning), pulicide, purgative, snake repellent.

Mammillaria grahamii (sunset cactus)
Mammillaria grahamii var. *olivae* (snowball pincushion)
Mammillaria mainae (horned toad cactus)
all have fruit that were valued by the Mescalero.
Castetter & Opler 1936: 41

With the three notable exceptions of the analysis of *Mammillaria microcarpa* (considered either synonymous with or varietal of *Mammillaria grahamii*), and of *M. heyderi* (which was determined to contain no hallucinogenic alkaloids), and of the related *M. meiacantha*, which was reported to contain one unidentified alkaloid, there has been no chemical work performed for *Mamillopsis senilis* or any the species of *Mammillaria* claimed to be held in high respect by the Tarahumara (such as *Mammillaria grahamii* var. *olivae*). Unless one wants to also count Lewin 1894b reporting several *Mammillaria* species to be nontoxic,

Amusingly, entirely based on Bruhn's comments that *Mammillaria heyderi* had been reported to have been used ethnobotanically and that he had found that it contained N-methyl-DMPEA, this alkaloid found itself mistakenly listed in Usdin & Efron (and beyond) as a known hallucinogenic compound.



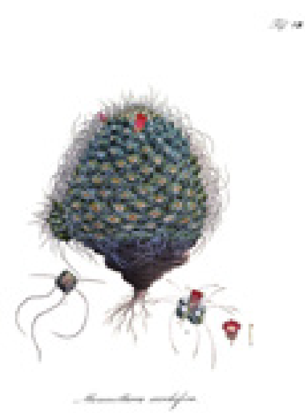
Rose 1899's "Sacred Cactus"

Mammillaria arietina Lemaire

Lewin 1894 commented that this species was found to be nontoxic. [Now considered a synonym of *Mammillaria magnimamma* var. *arietina* (Lem.) Salm-Dyck]

Mammillaria centricirrha var. pachythele

Lewin 1894 commented that this species was found to be non-toxic. [*Mammillaria centricirrha* Lemaire is now considered a form of *Mammillaria magnimamma*]



Mammillaria centricirrha
from Pfeiffer & Otto 1843

Mammillaria craigii

"Tarahumara names: "wichuri"; "witculiki" (Bennett & Zingg 1935), "wichuriki" (Thord-Gray 1955)
Mexican names: "peyote de San Pedro"; "biznaga" (Bennett & Zingg 1935; Thord-Gray 1955)
" *In the Barranca de Batopilas, M. craigii is respected by all Tarahumara.*

Mistreating it, such as making botanical specimens of it, is considered very ' dangerous and terrifies many natives who may see it being collected by a botanist."

Bye 1979

Field work by Bye established that *M. craigii* Lindsay and not *M. heyderii* was the cactus discussed by Bennett & Zingg 1935 & Thord-Grey 1955 under the name *"wichu-ri-ki"*.

This is commonly implied to have hallucinogenic activity or even to have fruit which is hallucinogenic but careful reading is suggested as the comments from Bennett & Zingg clearly said "*The small, red fruit is sweet and casually eaten*." And what was said by Thord-Grey 1955: **"***It has a small red fruit which is eaten. This plant is greatly feared, as it is supposed to have magical powers.* [...] *The shaman also uses this plant as a very important medicine to clear his vision so that he can see sorcerors and prolong life. The medicine will also make the foot light and increase the speed of a runner in a race."*

Thord-Gray also commented "*…It matters not how well the suku-ru-ame* [witch] *is hidden, the shaman can see him clearly*."

"*The heart of the cactus is used to cure or relieve headaches. After the spines are removed, the plant is cut up into two or more pieces, roasted for a few minutes and then part of the stuff is pushed into the ear.* "

Thord-Grey 1955: 483

After similarly discussing its application for a headache remedy Bye goes on to comment "*The upper portion of the plant is said to be the most effective. The top, with the spines removed, is ingested and is said to put one to sleep soon. During this sleep, the person "travels" to distant places and sees brilliant colors. If the person is not prepared, it will drive him crazy. Its effects are said to be similar to "hikuli"*."

It is unclear where this comment came from. I'm assuming from Bye's informants rather than a confusion with his account for *M. grahamii* v. *olivae*.

Mammillaria craigii currently lacks any published analysis.

It has however been reported to be used in Oz as recreational drug. The dose is said to be a single specimen 4 inches or so in diameter. The spines are first removed and the entire body of the plant eaten. Fortunately there are a large number of large seed grown specimens available.

Friends with first-hand experience describe it as being MDMA-like. Whether this is realistic or if it just an expression of the "*tastes-like-chicken*" phenomenon, where people describe something new by comparison to the closest thing in their experience, I do not know.

It is said by different bioassayists to be only mildly or not particularly hallucinogenic but with a euphoric component and pleasant stimulation causing it to become popular in at least some small subsets of the many Australian dance circles.

Clearly more work is needed.

Mammillaria geminispina

Employed for excrescence. Duke (Hartwell)

Mammillaria geminispina **(HBG)**

Mammillaria grahamii
(SRSU) cristate - lower two images

Mammillaria craigii
(SS)

Mammillaria grahamii
(BTA)

Mammillaria grahamii var. *oliviae*

"Tarahumara name: "hikuri"
Mexican name: "peyote"
" *Small clusters of this cactus (Fig. 3) are found on the slopes of Barranca de Batopilas and are reported to be the actual "hikuri" of this region. It is said to be distinguished from similar species of Mammillaria by the reddish central spines and the reddish vascular tissue in the plant stem. The fruit and top of the plant with the spines removed are eaten and are said to cause drowsiness followed by "travel" with brilliant colors. It is taken by the shaman and participants during special ceremonies. If improperly used, the plant can cause a person to go crazy. Specimens of this Tarahumara "peyote" are awaiting analysis.*" "

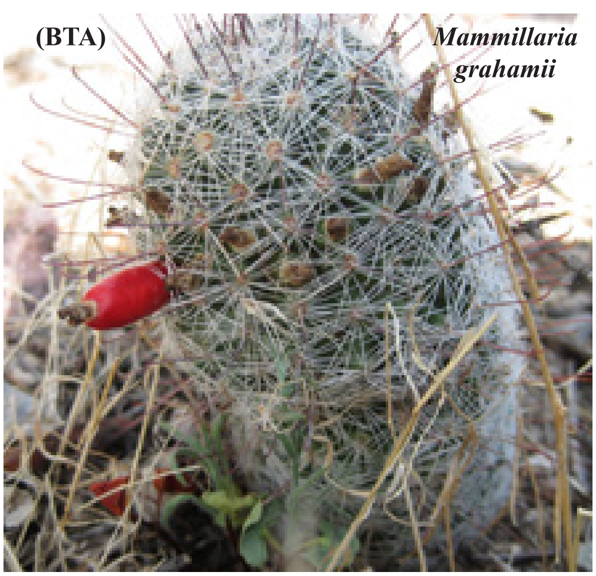
Bye 1979

I have been unable to locate the results of that analysis or determine if it occurred.

Somehow *M. grahamii* found itself added to the list.

Castetter & Opler 1936 mention *Mammillaria grahamii* and var. *olivae* as having fruit which are eaten as food.

(Saguaro National Park)



(BTA) *Mammillaria grahamii*

Mammillaria heyderi

In 1935 Bennett & Zingg reported on the use of *Mammillaria heyderi* by the Tarahumara.

Thord-Gray & Robert A. Bye Jr. later published comments that among its many magical powers the plant was used for locating wizard and increasing speed in runners. It was also said to be used for inducing sleep during which time shamans would travel to distant places and see brightly colored things.

"*…greatly feared for its magical powers. This medicine will clear his vision. It matters not how well the suku-ru-ame [witch] is hidden, the shaman can see him clearly*."

Thord-Gray 1955

These assertions were apparently considered by later workers to be conclusive proof of hallucinogenic use. Perhaps noteworthy is the fact that no Western workers ever bioassayed the plant.

In 1973 Jan Bruhn commented on the results of an analysis reporting the presence of N-Methyl-DMPEA while repeating the claim of those earlier workers.

Interestingly, as a result of that paper (Bruhn & Bruhn 1973) a person can find this substance listed as a hallucinogen in a number of academic and on-line resources based entirely on that single report of its occurrence in this species. It is even common to find this plant discussed as a hallucinogen and that activity attributed to this alkaloid despite there being no report of a bioassay and the pure compound apparently never having seen any pharmacological evaluation.

Most pertinently, but incredibly having no impact on the persistence of the above accounts, in Bye's 1979 report on the hallucinogenic plants used by the Tarahumara it was determined that the species employed by the Tarahumara was not *Mammillaria heyderi* but *Mammillaria craigii*.

Pennington 1963:118 mentions *Mammillaria heyderi* only in regards to its fruit being used as food..

Mammillaria heyderi* & *Lophophora williamsii
(Starr County, Texas)
right

Duke lists uses for earache, headache, deafness and longevity. He also reiterates the erroneous claim it is used as a hallucinogen.

Mammillaria magnimamma

Lactogogue. Duke

Mammillaria microcarpa

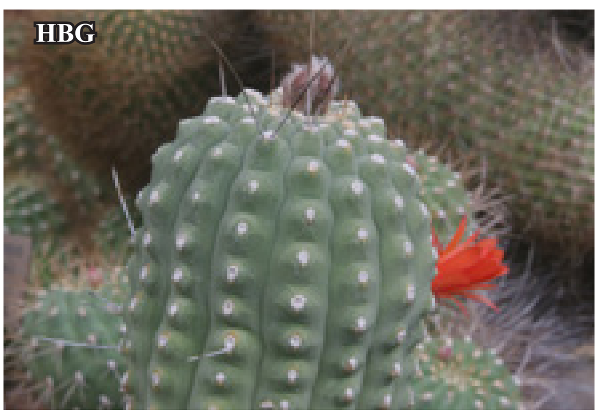
Earache. Duke (Unclear if this is in reference to its synonymity with *Mammillaria grahamii* and that species described use or if this was as independent claim.)

Mammillaria polythele Martius

Lewin 1894 commented that this species had been found to be nontoxic.

Mammillaria pulchra Haworth

Lewin 1894 commented that this species was found to be nontoxic. *M. pulchra* is not currently recognized.



Matucana madisoniorum
(HBG & UC)
Material collected by Hutchison.

Matucana madisoniorum (Hutchison) Rowley

Matucana madisoniorum is rumored variously to be used in Peruvian native medicine and to contain mescaline.

It presently appears that rumors of this species as either 1) a hallucinogen or 2) a mescaline container are erroneous.

Until fairly recently this species was rare in cultivation, When it was discovered it was a rare cacti in the wild suggesting that any medicinal usage would have to be very localized. Furthermore when Hutchison returned to the original type locality he was unable to locate any plants remaining. Their absence was suspected to be the result of an abundance of local goats. Other occurrences have been found.

It is unclear why Paul Hutchison thought it contained mescaline or why he believed it to have ethnomedical applications or if these are mistaken conclusions reached by others.

It would also be valuable to track down any actual field reports of use and determine what application they actually had. Cacti are used for MANY purposes by native cultures; hallucinogenesis is only one. An anti-infective topical agent seems every bit as likely.

Additionally analysis of it has produced no evidence of evidence of mescaline or of any other alkaloid (unpublished GC-MS by Shulgin; personal communication) Shulgin's analysis was performed on a specimen provided to him by one of Hutchison's former students and was a clone from a plant from the original type collection. I saw the specimens that were extracted (and helped him mince the fresh plants with heavy scissors) so can say they were very typical looking, nearly bald with a few weak spines. Sasha kept live plants for voucher material.

Rumors of that particular material being a mescaline container are clearly erroneous.

Regardless, this entire genus deserves a detailed analysis.

Matucana madisoniorum

Melocactus bellavistensis

Melocactus bellavistensis has been purported to have hallucinogenic use in Catamayo Valley in Ecuador. Kvist & Moraes R. 2006.

There are many problems with the claims around this plant. Most notably the apparent unavailability of its primary reference: Vivanco 2000. It probably merits an analysis but needs some published primary work that is not made of unobtainium.

Claims about this plant presently should be regarded with some reservation. There were some additional comments on it made by Peter Gorman (who refers to it as the "*moon cactus*") that really do not deserve even this much of a mention. (In *High Times* and on his webpage.)

Melocactus depressus Hooker

An arabinogalactan from this species was reported to show activity at stimulating phagocytosis.
da Silva & Parente 2002

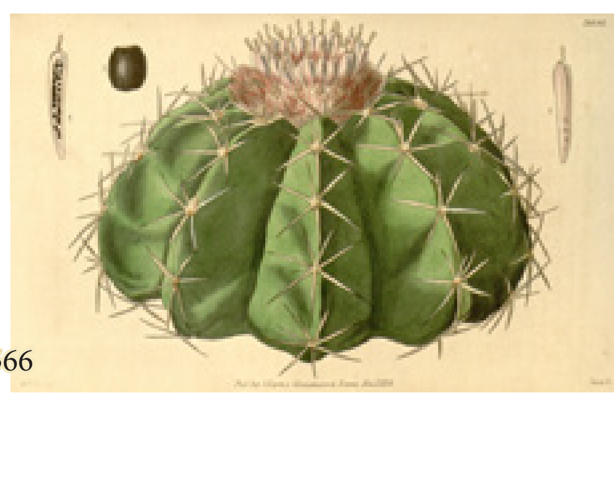
Melocactus peruvianus
(Modified from Ritter 1981; figure 1171)

Melocactus peruvianus Vaupel

Caycho Jimenez 1977 (page 91) asserted that it contains mescaline but did not offer any supportive reference.

An analysis may be indicated but the origin for the claim seems questionable.

Melocactus peruvianus
(BTA)



Melocactus depressus
from
CURTIS 1839 *The Botanical Magazine*

Myrtillocactus geometrizans

"garambullo"

Pulp is used in Mexico as a diuretic & antipyretic.
SOULAIRE 1947.

Peniocerol, Macdougallin and Chichipegenin from an extract of plant and roots were all reported to have insecticidal and insect growth regulation activity.
CÉSPEDES *et al*. 2005

Sometimes called the *berry cactus* or the *billberry cactus*.
Fruit is popular and sold fresh or dried in local Mexican markets.
Fruit are referred to as *garambullos* or *billberries*.

Neoraimondia macrostibas

Said to be incorporated into the drink known as *cimora*.
CRUZ SANCHEZ 1948 (as *Cereus macrostibas*)
This is presented as being in combination with other cacti and plants.
See a more detailed discussion in OTT 1993 & in ***Sacred Cacti* Part B. *San Pedro*** pages 110-112;.

To locate a color PDF of the San Pedro book:
http://troutsnotes.com/pdf/SP.pdf

Neoraimondia macrostibas* v. *roseiflora
Tucume, Peru
Photograph by N. Logan

Myrtillocactus geometrizans
flowering & fruit
(HBG)

Nopalea cochenillifera (L.) Salm-Dyck

"*nocheznopalli*" (Nahuatl), "*nopal de San Gabriel*" (Oaxaca)
"*tuna mansa*" (Puerto Rico), "*tuna*", "*nopal*" (El Salvador)
Joints used as poultice for articular rheumatism, erysipelas, ophthalmia, earache and toothache. Standley 1924
Pink or red floral tissues used as refreshing tea. Soulaire 1947
An important host plant for cochineal insects (hence its name).

Nopalea karwinskiana (Salm-Dyck) Schumann

"*nopalillo de flor*" (Jalisco), "*nopalillo*"
Root said to be used as remedy for dysentery.
Standley 1924

Obregonia denegrii

Duke lists as used for Antibiotic, Poison (unclear if used as a poison or as a remedy for poisoning), Sympathomimetic.

Nopalea cochenillifera
(HBG) H 48668 Upper left
(Hebbronville, Texas) Upper right & below

The cochineal insect was also commercially cultivated on *Opuntia elatior* Mill., *Opuntia horrida* SD, *Opuntia nopalilla* Karw., *Opuntia Hernandezii* DC, *Opuntia tuna* Mill, & *Pereskia bleo* DC. Soulaire 1947

Opuntia basilaris

Used as an analgesic.
Employed to treat skin ailments and warts.
JOHNSON 1999
Warts - HARTWELL

Opuntia dillenii see as Opuntia stricta var. *dillenii*

Opuntia echinocarpa

An ethyl acetate extract derived from a strain of *Fusarium oxysporum* (mitosporic Hypocreales; an endophytic fungi inhabiting the stem tissue of *Opuntia echinocarpa* AKA "silver cholla") were reported, using bioassays, to possess activity for the inhibition of metastasis [Using the wound-healing assay (WHA)] and proliferation/survival [MTT assay].
BASHYAL *et al*. 2007

Opuntia elatior

Antiseptic, Biliousness, Boils, Coughs, Expectorant, Guinea-worms, Inflammation, Ophthalmia, Pertussis, Sores & Spasms.
DUKE

Opuntia elatior
(UC)

Opuntia engelmannii

"*Cactus apple*"

"Arizona cactus pear extracts effectively inhibited cell growth in several different immortalized and cancer cell cultures, suppressed tumor growth in nude mice, and modulated expression of tumor-related genes. These effects were comparable with those caused by a synthetic retinoid currently used in chemoprevention trials." ZOU *et al.* 2005

The owner of the company making this product told me that it is obtained from ***Opuntia** engelmannii.*

Used to treat "women's ailments". JOHNSON 1999

Opuntia ficus-indica

Used as a diuretic and for treating diarrhea.
Flowers employed for dysentery.
SOULAIRE 1947
Poultice used for "*various painful conditions*", ulcers, sores & boils. EL-MOGHAZY *et al.* 1982
Used as an emollient.
Used to treat calluses, corns, leprosy, measles, tumors.
Also for kidneys.
JOHNSON 1999
DUKE lists uses as: Burn (Radiation), Callus, Corns, Decongestant, Diabetes, Diarrhea, Diuretic, Emollient, Internal ulcer, Kidney, Leprosy, Measles, Piles, Scald, Sore, Sunburn, Tumor & Wounds.

Anti-hyperglycemic effects were only evident in temporarily hyperglycemic mice.
ALARCON-AGUILAR *et al*. 2003

The betalain distribution and antioxidant activity for three Sicilian cultivars of *Opuntia ficus-indica* was studied by Butera.
The antioxidant activities of methanolic extracts from the edible pulp of the three cultivars were investigated as was the amount of reducing capacity for purified betanin and indicaxanthin.
The yellow cultivar exhibited the highest amount of betalains, followed by the red and white ones.
The methanolic fruit extracts showed a marked antioxidant activity (measured as 6-hydroxy-2,5,7,8-tetramethylchroman-2-carboxylic acid (Trolox) equivalents per gram of pulp), dose-dependently inhibited the organic hydroperoxide-stimulated red cell membrane lipid oxidation, and inhibited metal-dependent and metal-independent low-density lipoprotein oxidation.
The extract from the white fruit showed the highest protection in all models of lipid oxidation.
Purified betanin and indicaxanthin were both reported to be more effective at scavenging the [2,2'-azinobis(3-ethylbenzothiazoline-6-sulfonic acid)] diammonium salt cation radical than Trolox.
BUTERA *et al*. 2002

The 8 flavonoids isolated from the ethyl acetate fractions of an extract of the fruits and stems of *Opuntia ficus-indica* var. *saboten* had antioxidant activity and neuroprotective effects studied. All found to be active at inhibiting lipid peroxidation and free radical scavenging. Quercetin and its 3-methyl ether were found to inhibit XO activity (in vitro).
Quercetin was more active than (+)-dihydroquercetin. Quercetin 3-methyl ether was the most active.
LEE *et al*. 2003

Opuntia fragilis

Used for skin ailments & throat ailments. JOHNSON 1999

Opuntia fulgida

DUKE lists for: Toothache, Diarrhea & Short-windedness.

Opuntia humifusa (= *Opuntia compressa*)

Used to treat skin ailments. Johnson 1999

Extract of the pads was shown to possess potent anti-oxidant, radical scavenging and anti-inflammatory activity.

One of the active radical scavengers was determined to be quercetin. Cho *et al.* 2006

Lloyd Brothers (1903, 1908) says *Opuntia rafinesquei* (now *Opuntia humifusa*) has been "*inexcusably substituted*" for *Selenicereus grandiflorus*.

Opuntia imbricata

Decoction of fruit used to set cochineal dye. Standley 1924

Opuntia lindheimeri

Used for bruises (veterinary), dyspepsia, mumps, swelling. Johnson 1999, Duke

Opuntia megacanthus

Showed activity at reducing plasma glucose but was suggested to demonstrate possible kidney toxicity (in rodents). Bwiti *et al*. 2000

Employed as a laxative. Johnson 1999

Used for inflammation, pregnancy. Johnson 1999

Pads used as a poultice. Duke

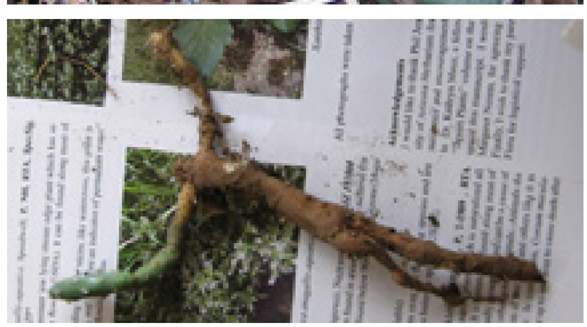
Standley 1924: the "*best edible tunas*" come from this species.

Opuntia megarhiza

Employed for treating fractures & inflammation. Johnson 1999

Palmer reported the fleshy roots to be used as poultices for fractures and inflammation. Standley 1924

Opuntia humifusa **(UC) native to Georgia**



Young *Opuntia megarhiza* (Silver City, NM) white tufts, occasional on pads above, are cochineal

Opuntia moniliformis (L.) Steudel

Used to treat tumors. Johnson 1999 (from Hartwell)

Opuntia phaeacantha Engelmann

"*Tulip prickly pear*"
Use in "*women's ailments*" Johnson 1999

Opuntia plumbea Rose

Used for skin ailments & "*women's ailments*". Johnson 1999

Opuntia polyacantha Haworth

Used in folk medicine for backache, diarrhea, moles, warts, & wounds Johnson 1999 (Hart was source for the first two.) The word "*poison*" is listed in Johnson 1999 but it is not clear if that means being used ***as*** a poison or ***for*** treating poisoning.

Opuntia pseudo-tuna Salm-Dyck

Used for treating tumors. Johnson 1999 (from Hartwell)

Opuntia rafinesquei Engelmann
See under *Opuntia humifusa*.

Opuntia reflexispina Wiggers & Rollinson
See as *Corynopuntia reflexispina*

Opuntia reticulata

A semimonstrose plant known as *Opuntia zebrina, Opuntia zebrina* forma *reticulata* and *Opuntia dillenii* forma *reticulata*

Purgative & antihelminthic.
Root has dental application.
Soulaire 1947

Opuntia spp.

Young joints are applied as poultices to reduce inflammation. Standley 1924

Duke lists as being used for:
Astringent, Boils, Diarrhea, Diuretic, Dysentery, Dysuria, Expectorant, Eye, Hair-Tonic, Hallucinogen [erroneous], Headache, Inflammation, Insomnia, Lactogogue, Poultice, Snakebite, Swelling, Thirst, Tuberculosis, Tumors & Wounds.

Opuntia phaeacantha
(Hudspeth County, Texas) left
(Presidio County, Texas) right

Opuntia pubescens

AKA Gorondilla, Golondrina

Boiled aqueous extract of leaf pulp is used to remove obstructions from the urinary tract (in combination with other herbs)

Beiar *et al*. 2002. (Vilcabamba, Ecuador)

Opuntia pubescens
(LA Arboretum)
entire page

Opuntia pubescens
(LA Arboretum)

Opuntia streptacantha
(BTA)

Opuntia streptacantha

An extracted fraction believed to be proteinaceous in nature was found to inhibit replication of a number of DNA and RNA viruses in vitro and in vivo.
AHMAD *et al*. 1996

Administration of a stem extract to mice, horses, and humans was reported to inhibit replication of a number of RNA- and DNA-viruses including Equine herpes virus, Herpes simplex virus Type 2, HIV-1, influenza virus, pseudorabies virus, and respiratory syncitial disease virus. The active component was not identified but was suspected to be proteinaceous. AHMAD *et al*. 1996

A "*highly stable trypsin-like proteinase inhibitor*" was isolated from the seeds and characterized. TORRES-CASTILLO *et al*. 2009

No anti-hyperglycemic effects observed, except in alloxan-diabetic mice. ALARCON-AGUILAR *et al.* 2003

Opuntia stricta var. *dillenii*

most often analyzed as *Opuntia dillenii*

Used to treat pimples. JOHNSON 1999
Guineaworms, Ophthalmia, Pimples, Sores, Syphilis. DUKE
"Actions: Promotes the flow of *ch 'i*, invigorates blood circulation, clears up heat, removes toxin."
Chest & abdominal pain due to nervousness, dysentery, hemorrhoids, cough, sore throat, lung abscess, mastitis, snakebite.
30-60 grams fresh stem is given as a dose HSU *et al.* 1986

Employed in Chinese folk medicine for diabetes, gastric ulcer & inflammatory conditions.
An aqueous ethanolic extract of stems showed significant radical scavenging activity.
QIU *et al*. 2002

LORO *et al.* 1999 reported that the aqueous extract of *Opuntia dillenii* fruit exhibited central analgesic properties associated with an anti-inflammatory action.
Analgesic & anti-inflammatory effects were found to be present in the fruit, flowers & stem but were the most pronounced in the alcohol extract of the fresh flowers.
AHMED *et al*. 2005

Methanolic extract of cladodes and also purified Opuntioside-I, an α-pyrone glycoside that had been isolated from the cladodes, showed potent hypotensive activity *in vivo.*
SALEEM *et al*. 2005

Opuntia tuna (L.) MILL.

Used to treat asthma, diarrhea, gonorrhea, rheumatism. JOHNSON 1999 (from KROCHMAL & KROCHMAL 1973)
Stems are boiled and used as poultice for rheumatism. JOHNSON 1999
Fruit for asthma, diarrhea, gonorrhea. JOHNSON 1999

Pachycereus marginatus

"*hair black*", "*inflammation*" MARTINEZ 1969

***Opuntia stricta* var. *dillenii* (UC)**

p. 33
Cactus (*Opuntia vulgaris)* is called "thorny, useless." The author was told that black people in Oklahoma burn off the spines and apply a slice of the pad to corns to relieve pain.

p. 55-56
One treatment said to be used for removing warts "is that of rubbing them with prickly pear (*Opuntia vulgaris*). A split joint of the same plant is also applied to relieve inflammation from insect stings or bites."

Tantaquidgeon 1942. A study of Delaware Indian medicine practice and folk beliefs.

A familiar problem arises here in that this claim is being voiced by a nonbotanist; *Opuntia vulgaris* does not occur in that part of the world. This might be assumed to be in reference to *Opuntia polyacantha* but it might also mean *Opuntia fragilis* or *Opuntia macrorrhiza* or another species.

Pereskia weberiana
(Cambridge Botanical Garden)

Pachycereus pringlei
(Cambridge Botanical Garden)

Pachycereus pecten-aboriginum

Tarahumara: "*cawe*", "*cawé*", "*chawe*", "*wichowaka*", "*wichowáka*", "*bitaya mawali*"
Mexican: "*cardon*", "*hecho*"
One Tarahumara name, *wichowaka*, appears to be derived from *wichuwa-ka*; a term meaning "*crazy*" or "*demented*".

The plant is said to be used by crushing young branches to yield a juice which is added to 3 times as much water and then consumed. A fermented version is said to be purgative.

Bye described the juice expressed from its stems as being "*occasionally used by the Tarahumara of the western barrancas to induce visions, along with quick intoxication during "tesguinadas".*"
Bye 1979

Pennington 1963:166-167 mentions this as being one of the "*narcotic*" cacti used similarly to *Lophophora***.**
"*There is some minor utilization of juice from young branches of cawe (Pachycereus pecten-aboriginum) in ceremonies held in western canyons. A piece of the branch is crushed in a hollow rock and the expressed juice is added to water, about one part of juice to three parts of water. This mixture is claimed to produce the same effect as drinking a "mixture of jíkuri and water, and results in dizziness and visions.*" Pennington 1963

In spite of long reported accounts of *Pachycereus pecten-aboriginum* (and others) being used ritually, and chemical evaluations being done, there has apparently been no published pharmacological assessment concerning which, if any, of its contained alkaloids are entheogenically active.

Bruhn & Lindgren 1976 found the main alkaloid to be salsolidine in the wild plants they tested. This physiologically active alkaloid is not a hallucinogenic compound although it is thought to play a role in perceptual disturbances experienced by alcoholics.

This certainly is an area both ripe and long overdue for an evaluation. [Reti 1950 notes that both Carnegine and Pilocereine are known to be fairly toxic in mammals.]

Pennington's ethnological account mentioned that young branches are used, as opposed to young plants or older branches. Gigantine was found to be most prevalent in the growing tips of saguaro branches and was not observed in younger cultivated plants, so perhaps may be some rationale to the selection of this part of adult plants of *P. pecten-aboriginum*. Alkaloids often vary in levels and actual composition between plant parts and it is not uncommon for active growth to have an entirely different composition in some plants.

The chemical evaluations concerning this particular plant (at least those we have seen) have not taken this into account. Native people who have an intimate familiarity with plants rarely do anything without purpose. Such things are often overlooked or dismissed as trivial or unimportant. They may be, and sometimes are, but one cannot automatically assume they can be disregarded.

Used in Mexican folk medicine:
Gastric ulcers (Citing Bravo 1964)
Cancer remedy (Citing Hartwell 1968)
(Both of which mention rather than being a primary account.)
Heliamine was reported to inhibit the growth of sarcoma 45 in rats by 60-79%, in Chachoyan et al. 1973.
Strombom & Bruhn 1978

Pachycereus pecten-aboriginum **(Oz)**

Pachycereus pringlei

One of the three cactus that the Seri believe used to be human. Felger & Moser 1985

Earl Crockett concluded elements in Baja cave art represented the cardon in a supernatural context.

Using a unique combination of Baja cave art, literature searches, intuitive guidance and personal courage Earl eventually harvested a section of cactus, cooked it into a tea in his hotel room, returned to the rock shelter that had been his inspiration, and ingested it. In doing so, Earl uncovered the activity of the cardon. He presented a story of his experience that he believed put him in contact with both the plant and the people who once used it. He described hearing their language, seeing their dress, manners & customs, and watching their lives.

Following his adventure Earl sought out Sasha Shulgin in an attempt to stimulate more research into this plant and its bioactivity.

A nice account of the next part of the story appears at: http://www.mdma.net/alexander-shulgin/professor-x.html

" So Shulgin dissolved the extract of the cactus into fruit juice, then poured a 4-ounce cup for each person. But his experiment went awry. "*At about the two-hour point, my visual experiences became totally swamped by an overwhelming fear of moving,*" recalls Shulgin, the 77-year-old chemist who introduced ecstasy to the world. His wife, Ann, had an even more severe reaction. Out on the deck, she remembers, "*I could see the full moon shining down on me with what felt like chilling contempt, and I thought, What an awful, stupid way to die.*" With her pulse racing, she went inside to check on her husband, who was upstairs in one of the bedrooms, lying still in the dark. "*He said he was OK as long as he didn't move.*" Early the next morning, Shulgin assembled his test group, still in pajamas, to assess the effects of the cactus extract. All 12 of them had taken the same compound, but half had become violently ill, while the other six had the kind of pleasant but unremarkable experience Shulgin expected. The results, he decided, were inconclusive."

Pachycereus pringlei and the extract bioassayed by Crockett & Shulgin, with Earl's "cardon man" as a label.

In a series of personal conversation between 2001-2005 Shulgin commented on his observation of N-Methylmescaline in the plant and its possible significance. He said that he suspected, despite its established lack of interesting properties, it was probably the active compound, enabled to be active orally by due to the presence of one or more MAOIs. Sasha referred to the combination as *cactihuasca*. He also lamented about the difficulty of finding bioassayists for completing this research. Apparently this was due to a heavy body load for both the plant and pure compound combinations.

This is essentially where the matter still stands today, a decade later.

Pachycereus pringlei

Pachycereus pringlei has been reported to be used for:

Aches	Earache	Rabies
Blood clotting	Evil eye	Sores
Bruises (Johnson 1999)	Fever	Tumors
Burns	Hemorrhoids	Ulcer
Digestive problems	Headache	Vaginal bleeding
Cancer: stomach	Kidney problems	Varicose veins
Cancer: uterus (Johnson 1999)	Pimples	Venereal disease
Cough	Poor circulation	Wound healing
Cramps	Poisonous snake bites	
Diabetes	Rheumatism (also in Johnson 1999)	Dimayuga 1996 (Except where noted)

Suspected of being the plant Clavigero 1789 described being used by missionaries for creating a balsam for wounds and bruises by boiling down the juice of its branches. Standley 1924: 895

Pelecyphora aselliformis

"*peyote*", "*peyotillo*"
Used in San Luís Potosí for treating fevers. Standley 1924: 973
Duke lists also used for anodyne, antibiotic, rheumatism.

Peniocereus greggii (Engelmann) Britton & Rose

"*night-blooming cereus*", "*reina de noche*", "*ho'o'k iwa*", "*huevo de venado*"
Fruit mixed with deer grease is used as a salve for sores. Castetter & Underhill 1935: 65
Used as a plaster for lung inflammation, similarly to *P. striata* below. Castetter & Bell 1937: 42

Peniocereus striatus (Brandegee) Buxbaum
as *Wilcoxia striata* (T. S. Brandegee) Britton & Rose

"*cardoncillo*", "*dahlia-rooted cereus*", "*pitahayita*", "*jarramatraca*", "*racamatraca*", "*sacamatraca*"
Valued medicinally in Baja California.

"*The tubers are sometimes crushed and a cloth saturated with the juice applied to the chest for lung troubles*" Goldman 1916: 356

"*A cloth saturated with the juice of the crushed roots is sometimes applied to the chest to relieve inflammation of the lungs*." Standley 1924: 903

"*A cloth saturated with juice of the crushed roots was applied to the chest to relieve inflammation of the lungs.*" Castetter & Bell 1937: 42

Pereskia aculeata

Fruits expectorant and antisyphilitic. Soulaire 1947

Pereskia bleo

Known as expectorant and antisyphilitic. Used in the treatment of yellow fever. Its sap is used to clarify water. Soulaire 1947

Used in local Malaysian folk medicine for the treatment of cancer & tumors, atopic dermatitis, diabetes, gastric pain, headache, inflammation, rheumatism and ulcers. The fresh leaves are usually consumed raw or as a decoction. Sim *et al.* 2010a cited Goh 2002, Rahmet 2004 & Tan *et al*. 2005.

Whole plant is used to treat gastrointestinal problems (Panama) Sim *et al.* 2010a cited Gupta *et al*. 1996.

Cytotoxic effects (apoptosis) on various cancer cell lines. Sim *et al*. 2010a cited Er *et al.* 2007, Sri Nurestri *et al*. 2008 & Tan *et al.* 2005. Tan *et al.* 2005 had demonstrated a cytotoxic activity against the human breast carcinoma T47-D cell line. Er *et al.* 2007 reported some degree of antiproliferative activity against some cell lines under some conditions but also noted a mutagenic potential in the presence of liver enzymes.

Acute toxicity studies for this & *P. grandifolia* produced no deaths so the LD_{50} of the methanolic extract was estimated to be in excess of 2.5 grams/ kg of body weight. Sim *et al.* 2010a

Pereskia grandifolia

"*Jarum Tujuh Bilah*" (Malaysia)
Used in local Malaysian folk medicine for the treatment of cancer & tumors, atopic dermatitis, diabetes, gastric pain, headache, high blood pressure, inflammation, rheumatism, ulcers and "*for revitalizing the body*".
The fresh leaves are usually consumed raw or as a decoction. Sim *et al.* 2010 cited Goh 2002 & Rahmet 2004.
Cytotoxic effects on various cancer cell lines. Sim et al. 2010 cited Sri Nurestri *et al*. 2009 & Tan *et al*. 2005
Fruit reportedly used to reduce swellings. Sahu *et al*. 1974 (citing Anonymous 1969: 309)

Pereskia guamacho

Gum used in lung disorders and catarrh.
Leaves used in enemas or as flavoring in herbal teas.
Fruit are refreshing, diuretic and produce a pleasant drink. Soulaire 1947
Used as cicatrizant, refrigerant, suppurative. Used for inflammation, sores, syphilis. Johnson 1999

Pilosocereus royenii

"Royen's Tree Cactus" lacks any published analysis.
(As *Cephalocereus royenii*) Fresh juice extracted from leaves and fruits was purportedly taken orally and used in "sorcery" and for the "liver" in Vilcabamba, Ecuador. Beiar *et al*. 2002.

However, this seems likely to be in error. Beiar *et al.* 2002 (248-249) also includes as synonyms three completely different plants that are presently recognized as *Hylocereus* species. Furthermore all of the common names that are given are common for *Hylocereus* rather than *Pilosocereus* species AND their photograph of an herbarium voucher clearly appears to be of a dried *Hylocereus* rather than a *Pilosocereus*. See additional comments under *Hylocereus monacanthus*.

Hylocereus monacanthus

Entry into the literature appeared as the unrelated columnar cactus *Cephalocereus royenii* (aka *Pilosocereus royenii*. However, Beiar et al. (2002: 248-249) also included as synonyms *Hylocereus lemairei* (now *Hylocereus monacanthus*), *Hylocereus ocamponis*, and *Hylocereus polyrhizus* which are three completely different plants that are all presently recognized as separate species.

There is clearly much confusion within that account as to what plant is actually used as the herbarium voucher shown is of a *Hylocereus* rather than a *Pilosocereus*. Similarly the common names listed (Pitayo, Pitaya, Pitahaya) are commonly applied for *Hylocereus* species but not for *P. royenii*

The fresh juice extracted from leaves and fruits was said to taken orally and purported to be used in "sorcery" and for the "liver" in Vilcabamba, Ecuador. Beiar et al. 2002.

Rhipsalis cassytha

Antihelmintic activity. Soulaire 1947

Rhipsalis conferta

The juice from this cactus caused death by cardiac arrest when injected. (from Soulaire 1947)

This refers to comments made by Lewin in 1894 concerning the results of his experiments on cold blooded animals. (I am unaware of any ***good*** or useful outcomes ever being reported after injecting cactus juice into an animal.)

Rhipsalis pachyptera Pfeiffer

Fruit is used for fevers in Brazil. Soulaire 1947

Pilosocereus royenii
Peter Island
Photograph copyright by Bill Linton

Pereskia aculeata
(SRSU)

Selenicereus witti
(Cambridge Botanical Garden)

Cereus Bonplandii J.Parmentier ex Pfeiffer

This is an old name that is usually considered to be a synonym or a variety of ***Selenicereus grandiflorus***.

It is claimed to posses the same properties as *S. grandiflorus* but the Lloyd Brothers' *Drug Treatise* dismisses this.

"Fitch" was mentioned as regarding this to be an "*antipsoric of remarkable power*" and purported curing eczema, deposits in urine, dropsy of cardiac and renal origin, neuralgia & insanity. Clarke also indicates the stem tincture for emaciation, affections of the heart and of the kidneys.

Clarke 2002 (1900)

Selenicereus coniflorus

"*…gathered in large quantities in Veracruz and shipped to the United States for use in preparation of medicine*."

Standley 1924: 914

The intended application was not mentioned.

Selenicereus grandiflorus

Drug extracted from plant used to treat rheumatism.

Standley 1924: 914

Used for dropsy according to Johnson 1999.

"*Cardiac stimulant (tonic), diuretic, similar to digitalis, but non-cumulative, counter-irritant; cardiac palpitation and weakness, heart failure from valvular disease, angina pectoris, aortic regurgitation, dropsies, low fevers, Grave's disease, tobacco toxemia, sexual exhaustion.*"

Culbreth 1927

From the Lloyd Brothers 1903/1908 "*Drug treatise*" :

Used in Jamaica & in Mexico for fevers, breathing difficulties,

In excess amounts acts as an irritant producing diarrhea, increases size of pulse, calming to stomach, raises blood pressure and body temperature, useful for cases of impotency in young men, as a sexual tonic for women, dyspepsia, Grave's disease, angina, anti-tobacco smoking aid, aortic hypertrophy, nerve sedative, relieves symptoms of menopause, emmenogogue, neuritis, nerve tonic & restorative

More widely reknown as a cardiotonic. More words on that follow.

A thoughtfully concerned comment cautioning that *Selenicereus grandiflorus* contained cardiac glycosides appeared at the Cactus_etc chat group.

An on-line search reveals no shortage of claims asserting the presence as well as claims of the absence of cardioactive glycosides in *Selenicereus grandiflorus* but none find it necessary to include a reference to an actual evaluation.

Vogel *et al*. 2005 asserts it to be "*Digitalis-like*" in either its effects or application (said table did not differentiate them) and warned: "*Increases effects of hypoglycemics; may enhance effects of cardiac glycosides, angiotensin-converting enzyme inhibitors, antiarrhythmics, beta-blockers, and calcium channel blockers.*"

Ernst 2003 and "Data extracted from" Fugh-Berman 2000 were given as the references. The 2003 article cited Ernst 2000 as his source. When contacted, Dr. Ernst very graciously provided me with a copy of that elusive paper. This proved to contain a previous presentation of the aforementioned information.

The 2000 article cited Fetrow & Avila 1999.

Fetrow & Avila were pharmacists who assembled what they intended to serve as a medical & health professional's reference work on this subject.

Fetrow & Avila flatly stated: "*The plant contains a digitalis-like glycoside, either cactine or hordenine (N,N-dimethyl-4-hydroxy-beta-phenethylamine).*"

Fetrow & Avila might have gleaned their assertion from elsewhere or it might reflect merely a bad verbal assemblage or translation of what they encountered elsewhere.

However, let's consider that rather densely inaccurate line that states *Selenicereus grandiflorus* to contain a cardioactive glycoside, either cactine or hordenine.

Cactine is generally believed to be synonymous with at least one of the known phenethylamines, usually it is said to be a synonym of hordenine. One must, however, ask the question of whether it was this or tyramine, or if it was one or more alkaloids. So far as I can tell, new plant material or medicinal preparations were what was always extracted for analysis and no actual samples of Sultan's 'cactine' were ever analyzed by later workers.

While hordenine, tyramine and N-methyltyramine are thought to be mild stimulants with an indirect action on the heart, they are all simple phenethylamine alkaloids and they are not glycosides. And none of them possess any digitalis-like activity.

Hordenine and tyramine have been reported to be present in at least potentially pharmacologically significant amounts for someone brewing a tea from dried stems (See respectively Petershofer-Halbmeyer *et al.* 1982 and Wagner & Grevel 1982a) but, as mentioned in an earlier post, the reports of these two alkaloids in this species have always been at odds with each other rather than their being reported as co-occurring.

I can also locate a referenceless claim on-line for the occurrence of N-methyltyramine in this species but not an analytical account that reported its presence. This claim was encountered within a summary report on the veterinary use of a homeopathic solution of *Selenicereus grandiflorus* that was posted in 1999 by "*The European Agency for the Evaluation of Medicinal Products. Veterinary Medicines Evaluation Unit.*" My request for clarification, emailed to their posted contact address, was returned as undeliverable.

These alkaloids are also not thought to be particularly active as cardiotonics. In a referenceless claim in Fetrow & Avila it was asserted that the believed mechanism of action of *Selenicereus grandiflorus* had not been supported in humans and that earlier work had found its preparations inert. While one can find at least assertions to the contrary in medical literature stretching back into the 1800s. It is just as easy to locate agreements with their conclusions.

Even if however the contained alkaloids turn out to be effective cardiotonics (which most workers consider doubtful), the most commonly used - and studied - form appears to be a

1:100 homeopathic dilution; which should not be expected to contain pharmacologically meaningful amounts of alkaloid. Many workers have used dried and prepared stems for making a tincture.

The Lloyd Brothers 1903/1908 "*drug treatise*" insisted that in addition to high quality and an adequate dosage (not homeopathic), the use of fresh plant juice for preparing the tincture was crucial for it retaining good activity. Finley Ellingwood, writing in that treatise (p.6), claims that the accounts of ineffectuality revolve around heated, poorly prepared or otherwise inactive versions.

Their account of its actions bear reading as they do not suggest it to be particularly toxic or *Digitalis*-like although they do include descriptions of many actions on cardiac function. (That work is available on-line in PDF format.)

Fetrow & Avila continued and pointed to a more recent study in rats and dogs reporting "*a positive inotropic effect on the heart with increased systolic and diastolic pressures and peripheral blood flow volume.*" (This was in reference to Hapke 1995 who evaluated pure hordenine using very high dosages.)

They ended their entry with an 'analysis' beginning with the peculiar statement "*Although night-blooming cereus contains a digitalis-like glycoside, its use as a substitute for digitalis preparations (digoxin or digitoxin) or treatment of heart-related disorders has not been evaluated in humans.*"

Fetrow & Avila 's only references were Hapke 1995 and Wadworth & Faulds 1992 .

The first paper discusses a pharmacological evaluation of hordenine and makes no mention of cardioactive glycosides, digitalis-like alkaloids or *Selenicereus grandiflorus*. The second paper appears to have only marginal connectiveness, at best, to the pharmacology of *Selenicereus grandiflorus* and none to the subject of digitalislike cardioactive glycosides. As was true for Hapke 1995, it does not even mention these compounds or *Selenicereus grandiflorus*.

While the glycosides cacticin, narcissin and flavonol-3-glycoside were reported as being isolated from its flowers by Horhammer *et al.* 1966, I cannot determine that any of the three other than narcissin has ever seen pharmacological evaluation. Whatever evaluation narcissin has seen is apparently limited to a Chinese language article so I am presently unable to glean more. As its concentration in *Selenicereus grandiflorus* is believed to be 0.05% by dry weight and its activity appears to revolve around decreased capillary permeability, it seems unlikely to make a significant contribution toward a purported digitalis-like action.

My present GUESS is that someone somewhere saw that "*glycosides*" were reported from the flowers of the plant, noticed that the species was considered to be cardioactive in application and assumed there was a connection between the two that is, so far as I can determine, unwarranted. It could simply be that casual reading caused someone to mistakenly link the words "*cardioactive*" and "*glycoside*" together into the familiar phrase "*cardioactive glycosides*". Whatever the case this appears to have occurred fairly early in its clinical history.

Melero 2000 includes a very nice discussion of cardioactive steroids and glycosides that clearly shows that these particular compounds are quite different from any of the steroids or glycosides reported as occurring within any member of the Cactaceae, including *Selenicereus*.

Most glycosides have little or no discernible pharmacological activity of any type.

Several other earlier claims asserting that cardioactive glycosides occur in this species have been encountered but I have not yet obtained their purported references, when references are included. (For instance Petershofer-Halbmeyer *et al.* 1982 made a unclearly referenced statement purporting a digitalislike substance -- "[...] *digitalisähnliche Stoffe zurüchgeführt werden*." In their listed references we did find another source that similarly made the claim ""[...] "*digitalisähnliche*" *Stoffe enhalten soll.*". Interestingly, that paper by Frohne 1977 enclosed digitalislike in quotation marks. Frohne did not include any references but did comment that any newer work on the pharmacology or establishing the structures of what is responsible was not known to him.)

Standley 1924 also makes the unreferenced statement "*Action similar to digitalis*" which no doubt lodged in some people's mind.

Part of this topic achieving life that it was not warranted was probably due to the fact that medical professionals helped propagate the line both on-line and in prestigious peer reviewed journals. Peer review only works when said peers take the time to review the details of published data.

If it concerns something deemed trivial, such as in this case a plant species that was not in use by modern medicine, it is easy for no one to care enough to look deeper, especially if the mistake appears in a commentary supporting the lack of use.

My thanks go to Dr. Edzard Ernst for graciously providing a copy of his paper from *Perfusion*, also to Leo Martin for providing several very pertinent references and to Dr. Martin Terry for his help in obtaining some obscure papers.

***Selenicereus grandiflorus* (Austin, Texas)**
Obtained from a consumer who combines with *T. pachanoi*

Stenocereus alamosensis

Anti-type I allergy activity of the saponins with RBL-2H3 (Rat basophilic leukemia) cells was studied by measuring the β-hexosaminidase release inhibitory activity.

Gummososide A methyl ester was found to show activity (IC_{50} = 99.5 lM)

Kakuta *et al.* 2012

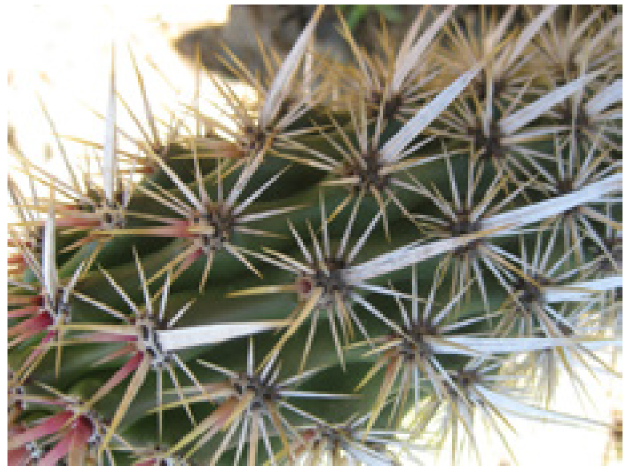
Stenocereus eruca

Anti-type I allergy activity of the saponins with RBL-2H3 (Rat basophilic leukemia) cells was studied by measuring the β-hexosaminidase release inhibitory activity.

Thurberoside A exhibited mild activity (IC_{50} = 166.9 lM).

Kakuta *et al.* 2012

Machaerogenic acid was reported to be an antagonist of the CCR6 receptor in a biological screening by Roth 2011.



Stenocereus eruca
aka
Machaerocereus eruca
(Cactus Country) above

Stenocereus alamosensis
(BTA) left

Trichocereus atacamensis

Trichocereus atacamensis (San Pedro de Atacama, Chile) has been reported to have mild stimulant activity in human bioassays. [Dosage was 6-8" of a single rib. Anonymous]. Analysis is lacking.

Trichocereus bridgesii

Mescaline estimates based on isolations that have been posted on-line by anonymous sources in Oz have largely been between 0.12% to 0.23% with the occasional strain giving 1-2%

The common reports of potency greater than seems to be able to be accounted for by the reported mescaline content (based on human bioassays) has lead a number of people to speculate that an MAOI or some other interactive alkaloid may also be present. More research seems warranted.

Bridgesii is not just potent but apparently used at the folk level

For example, one correspondent requesting anonymity has reported that *bridgesii* was used commonly, but privately, in Bolivia and was abundant both in the wild and cultivation. He found numerous examples of intensive propagation as well as heavily harvested plants, The reported potency was described as "*phenomenal*".

While Miguel Kavlin has claimed he could not find it in use by anyone other than himself in Bolivia, Darylene Dickson reported it being used there and sold in La Paz. However she misidentified it as *T. pachanoi* due to its name San Pedro.

Part of this may stem from an eradication campaign aimed at *bridgesii* stands around major urban areas, conducted by the Bolivian military around the end of the 1970s. This was apparently in response to an influx of "*hippies*". One individual recalled seeing soldiers shaving the head of a long haired man in public by during that time period. (Personal communication with Bolivian correspondent requesting anonymity)

Murple also made an interesting comment that he was unable to locate any stands of *bridgesii* in the La Paz area that did not show signs of heavy harvesting. He claimed to have encountered a quarter mile hedge of *bridgesii* in which he was unable to find a single stem that had not seen a harvest.

Trichocereus bridgesii
Said to have been collected from Huanuco, Peru. Its spines were said to have been lost during rough transportation in the back of a truck.

Trichocereus chiloensis

Used to treat tumors. Johnson 1999 (i.e. Hartwell)

Trichocereus cuzcoensis

Sold in Cuzco as a hair rinse. Kamm personal communication.
Used for treating cancer. Johnson 1999 (i.e. Hartwell)

Plant shown on lower right was sold as ***Trichocereus cuzcoensis*** but was obviously misidentified. The dried commercial material purported to be from this plant that was field collected at Huamanga near Cuzco in Peru is proven to contain mescaline in human bioassays. Doses of 20 grams are reported by bioassayists.
It may not be a *Trichocereus*.
An identification and an analysis is needed.

This is not a *Trichocereus cuzcoensis*

Trichocereus grandiflorus

This species has a report of activity purportedly due to its mescaline content. It is my belief that this involved a misidentified plant and that no bona fide *T. grandiflorus* contains any mescaline.

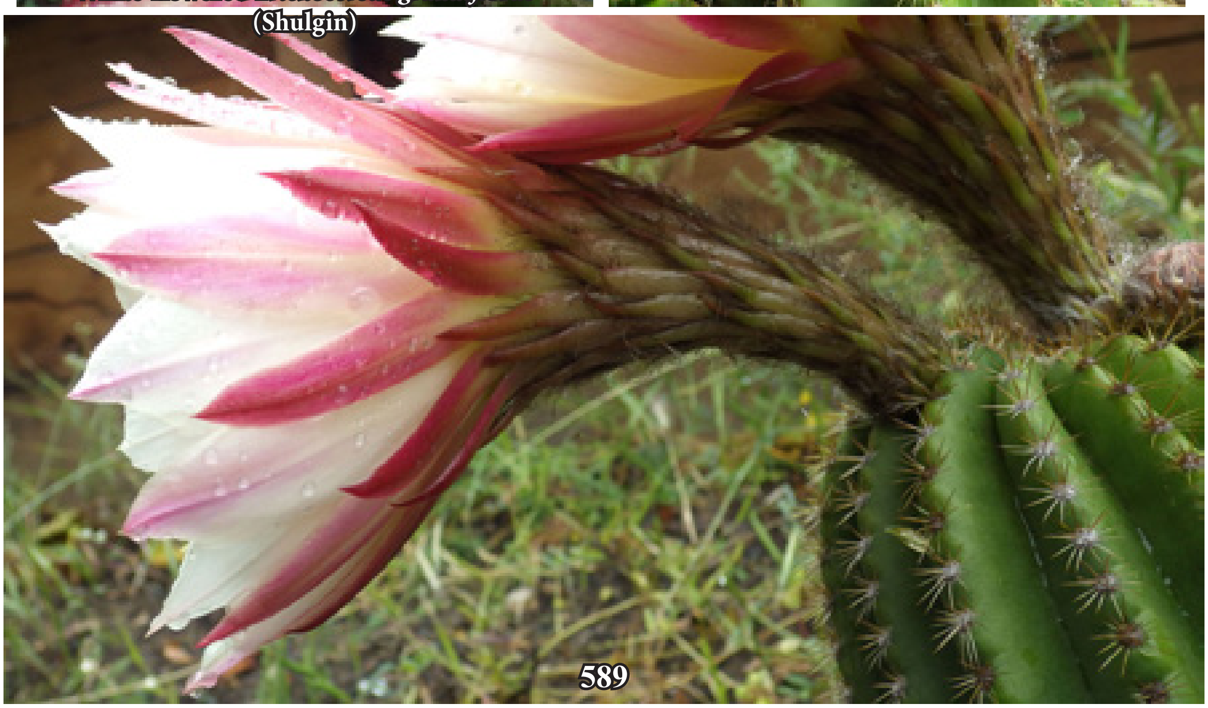
Possibly it was the result of the plant shown to the right that was once sold by NMCR. The cactus depicted is almost certainly a mescaline container.

I have not been able to track that list back to its origin but the account gives it as having white flowers. The *T. macrogonus/peruvianus* shown will certainly have white flowers.

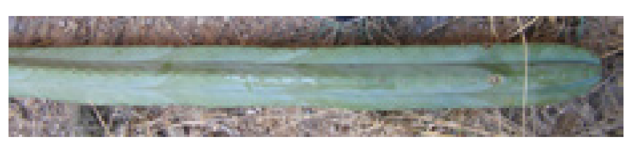
Below are three images of an actual white-flowered *T. grandiflorus.*

Sold misidentified as *T. grandiflorus* (NMCR) Photos by MS Smith

White-flowered *Trichocereus grandiflorus* (Shulgin)



***Trichocereus* growing near Huanuco, Peru**
Photos by Grizzly



Trichocereus **growing in and around Huanuco, Peru**
Photos by Grizzly

Trichocereus huallanca or *huayanca.*

This name is not published. Nor is published with its variant spelling *T. huayanca***.**

This is not simply not a good *Trichocereus* species name, this plant is not a *Trichocereus***.**

In fact it is unmistakably an *Opuntia* of some sort, most likely in what is now termed the *Austrocylindropuntia*. It does not appear to be *Opuntia cylindrica* despite the general resemblance.

A number of similar appearing species are known, for instance *Opuntia kuehrichiana*, but I have no clue about the actual identity of this *Opuntia* species.

More information and an analysis would be nice but perhaps a waste of time? My present suspicion is this claim is a scam as the dried material on the right is sold by the same vendor represented as being as flesh from this plant. Despite a cutting being organized, no live material was included in the shipment.

Notice that those dried pieces came from a columnar cactus with straight ribs and not from this plant which is imbricate? There seems to be too much wrong with this picture to encourage me to waste much more time on it.

Trichocereus growing around Huanuco, Peru
Photo by Grizzly

Photo by correspondent requesting anonymity

Photo by correspondent requesting anonymity

Image from the same source:

Labeled as ***Trichocereus macrogonus*** but appearing different from most ***macrogonus*** so far encountered.

It does resembles the ***macrogonus*** that I obtained from Abbey Garden in 1980 (which was grown from Knize's seeds).

A shortish-spined *Trichocereus pachanoid* cutting sent from Peru starting to grow longer spines.

Plant below (a *pachanoi*) was not identified but was said to be employed as *San Pedro* in Peru. Cutting sent from Peru is on page 593.

Trichocereus pachanoi

Widely employed as a sacramental brew for treating and diagnosing illnesses.
Used for spiritual, shamanic & religious purposes; credited with enhancing precognition & health. Heaven 2013
Employed as emetic, entheogen & hypnotic Johnson 1999
Used for enteritis, evil-eye, gastritis, pneumonia, sterility. Johnson 1999

Monstrose forms are rumored to be especially active in human bioassays. (Anecdotal claim made by vendors in the Lima plant drug market)
Ostolaza 1996 illustrated the cristate form being depicted in a supernatural context by the Paracas culture in Peru. See more in ***Sacred Cacti* Part B *San Pedro***.

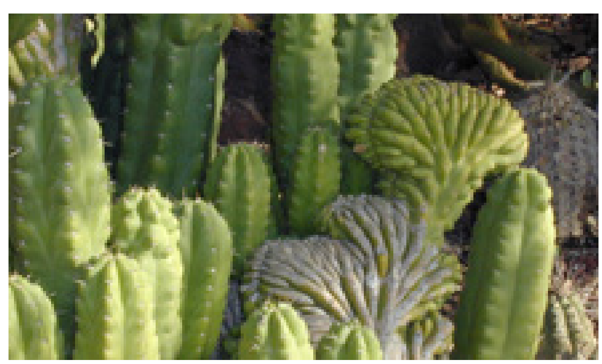
Trichocereus schoenii

Grizzly encountered specimens in Colca Canyon, Peru showing evidence of intensive repeated harvesting suggesting its use for brew preparation. (Personal communication 2005)

Trichocereus scopulicola

First proven to contain Mescaline based on human bioassays.
In the US this was using NMCR grown material but no actual details were included beyond an opinion of substantially greater potency than *Trichocereus pachanoi*. (Personal communication from Margadarsi.)
In Oz this was using material that was seed grown from Ritter FR991 seeds initially but by the late 1960s Australian commercial cactus producers in Victoria began successfully producing and distributing their own seeds.
Personal communication from Snu Voogelbreinder reported good results with 800-1000 gm fresh wt. of Australian material.
Voogelbreinder also determined that modern human sacramental usage was wider and older than suspected; by people mistakingly thinking it was *T. pachanoi*!
It might be suspected that this may eventually prove to be true for any indigenous users as well since *bridgesii* and *pachanoi* are apparently used interchangeably in Bolivia by people who would not consider this to be substantially different.
As the species is currently believed to be extinct in the wild this is rather a moot point.

cristate *Trichocereus pachanoi*
(SS)



cristate *Trichocereus pachanoi*
(HBG)
Specimen field-collected in Ecuador

seed-grown *Trichocereus scopulicola*
(Seeds from SS)

Trichocereus spachianus

Reported to be *"psychoactive"* but *"different than San Pedro"* Anonymous in correspondence 1998.

Another correspondent claims to have determined it to be utterly inactive based on their bioassays.

Another reported becoming "*deathly*" ill for a few hours.

Needs further analysis.

Trichocereus taquimbalensis

D.M. Turner asserted successful bioassays but included no details.

Grizzly reported encountering specimens in Bolivia showing evidence of harvesting on a scale suggestive of brew preparation. (Personal communication 2005)

Trichocereus terscheckii

Reported fully active in human bioassays conducted in California. Some were stronger than others while others had simple stimulant effects. Anonymous; in correspondence 1998.

Forms with simple stimulant action were described by one user as feeling like "*'dirty' speed*". Anonymous; in correspondence 2006.

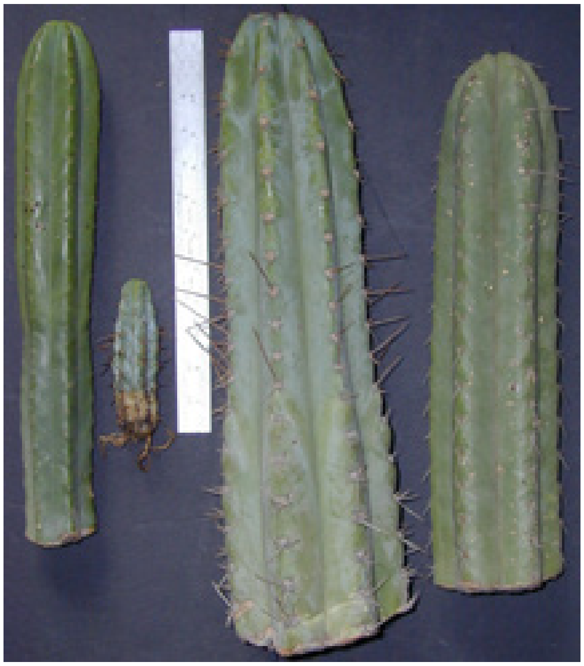
***Trichocereus spachianus* (Field)**
lower row

***In habitat* image at top left was from a correspondent requesting anonymity**

Trichocereus tulhuayacensis

A claim for the presence of mescaline is made by CAYCHO JIMENEZ 1977 (page 91) but he cites no reference to support his assertion.

The presence of mescaline would not be surprising in this species.



***Trichocereus* mailed from Peru by Knize: *pachanoi* L; no label; *tulhuayacensis*; *peruvianus* R. *tulhuayacensis* was sold as a red flowered peruvianus.**

Trichocereus tulhuayacensis

Unidentified cactus species:

Encountered for sale in the Chiclayo, Peru market. Photo by Hubie Smidlock

Detail on CD cover of Smithsonian Folkways Recordings
Traditional Music of Peru 5.
Celebrating divinity in the high Andes.

It is likely to be entirely coincidental but I found the patterns on these two girl's headdresses somewhat reminiscent of the pattern on the cut end of a fat columnar cactus.

Cacti, mostly San Pedro encountered in Chiclayo, Peru market.
Notice in particular the intriguing non*Trichocereus* cuttings.
Photo by Hubie Smidlock

In considering these cacti, it is important to keep in mind that cacti have many folk uses -- not just use as hallucinogens.

They are common and popularly used as hair rinses, in healing baths, for washing clothing, for treating fevers, stomach or intestinal complaints, as poultices and for "purifying water". The latter I am assuming is in reference to removing heavy metal contamination as is now being done industrially using *Opuntia* cuticle? See Barrera-Díaz *et al.* 2005 & 2006 & Fox *et al.* 2012.

A future entry on this subject is coming to this book.

Drinking water polluted by toxic metal run-off from mining activities and/or volcanic soils is common in the Andes.

Opuntia epidermis has proven to be highly effective at adsorbing heavy metals.

Traditional ethanol-sources

Cephalocereus leucocephalus

See comments within *Lemaireocereus thurberi* below.

Carnegiea gigantea

Fruit syrup is used to prepare an intoxicating beverage.
Standley 1924: 909

The only important intoxicating beverage used by the Papago is said to be a cider made from the fruit of the saguaro.

In its habitat, the brew making process is a matter of elaborate ceremony for every village with the brewing, the drinking and the intoxication itself being vital parts of the annual ritual for bringing rain.

While individual families brew their own at home, there is a communal co-creation of the ceremonial brew and the council house is kept warm by a small fire to aid the fermentation process. Each family contributes a jar of boiled juice.

As soon as the juice is decanted from its air-tight container into a large jar, it is mixed with four times as much water. Sometimes a starter from a previous batch may be added if the fermentation is too slow.

Fermentation is allowed to proceed for seventy-two hours.

"*The resulting drink, called **navai't**, is a crimson-colored sort of cider with a slightly nauseating taste, which, when drunk in the ritual quantity induces vomiting. This beverage is almost impossible to keep, therefore the tradition is that the whole supply must be consumed within twenty-four hours*."
Castetter & Underhill 1935: 26

Lemaireocereus thurberi

In the southern part of their territory, the Papago made a drink similar to *navai't* using the fruit of *Lemaireocereus thurberi.* It was the ceremonial drink for that region.
Castetter & Underhill 1935: 26

"*Fruits of cawe (Lemaireocereus Thurberi) and naplsora (Cephalocereus leucocephalus), are used in preparing a fruit tesgüino in western canyons. Pulp from ripe fruit is mashed upon a mataka or upon any convenient rock. The juice is collected and mixed with water which is boiled for several hours and set aside to ferment. The common catalyst is batari, bark of kakwari (Randia echinocarpa, R. Watsoni and R. laevigata) and kaya (Coutarea pterosperma), which is readily available in the canyons*."
Pennington 1963: 155.

Standley suggested the early accounts of a *cardon* that created a brew which turned the urine red-like-blood referred to *Lemaireocereus Thurberi*.

Pachycereus pecten-aboriginum

Bye described the fresh juice expressed from young branch tips of the stems of this plant as finding occasional use "[...] *by the Tarahumara of the western barrancas to induce visions, along with quick intoxication during "tesguinadas". The sap may be added to corn "tesguino" or cooked and fermented alone, although this last preparation is said to act as a strong purgative.*"
Bye 1979

Other cactus fruit

Ferocactus and *Opuntia* species provide fruit to the Tarahumara that, when they are available in sufficient quantities, are mashed and strained free from seeds. This juice is then diluted with water and boiled in the same manner as the other *tesgüinos*.

Pennington comments that in the Urique Canyon strained but undiluted and unboiled juice obtained from fruits of any of the local cactus species is put in the sun to ferment for several hours. "*It is said to turn to "wine" very quickly and when drunk produces a heady sensation that does not last as long as that caused from drinking boiled tesgüino. There is a tradition in the canyons that the setting aside of fruit juice for quick fermentation was formerly a widespread practice*."
Pennington 1963: 155.

The Papago once made a fermented drink from *Opuntia engelmannii* fruit but this was never extensively used and lacked any ceremonial significance.
Castetter & Underhill 1935: 26

Colonche is boiled and fermented *Opuntia* fruit juice. *Nochote* or *nochocle* is a fermented brew made from *Opuntia* fruit juice, pulque and water.
Standley 1924: 865

Ripe *Opuntia engelmannii* fruit (near Rio Grande City in Starr County, Texas)

LEGUMINOSAE

These 3 plants are included simply because they are, **so far**, the only reported occurrences appearing in the literature for simple mescaline derivatives & a number of peyote alkaloids outside of the CACTACEAE. Be sure to read to the very end of this.

Leaves, petioles & tender stems; samples fresh frozen. Collected Zavala County, Texas

Acacia berlandieri BENTHAM

Compound (all via gc-ms)	Spring ppm	Late fall ppm
Phenethylamine	991.3	1390.0
N-Methyl-phenethylamine	1702.7	3742.2
N,N-Dimethyl-phenethylamine	99.1	604.4
N,N,N-Trimethylphenethylammonium hydroxide*	nd	23.6
Amphetamine	3.1	10.1
Methamphetamine	20.1	11.5
N,N-Dimethyl-α-methyl-phenethylamine	45.6	229.7
p-Hydroxyamphetamine	8.0	7.3
p-Methoxyamphetamine	nd	35.7
Tyramine	367.2	1263.4
N-Methyltyramine	188.5	745.7
Hordenine	9.2	333.1
Candicine*	nd	35.1
Dopamine	3.6	25.3
N-Methyldopamine	1.9	10.8
N,N-Dimethyldopamine	nd	nd
3-Methoxytyramine	2.6	15.3
Mescaline	**4.9**	**35.7**
N-Methylmescaline	**3.2**	**30.2**
Trichocereine	**nd**	**28.1**
3,4,5-Trimethoxyphenethyl-N,N,N-trimethylammonium hydroxide*	nd	13.2
3,5-Dimethoxytyramine	2.7	43.4
3,4-Dimethoxy-5-hydroxyphenethylamine	11.4	40.9
β-Methoxy-3,4-dihydroxy-5-methoxy-phenethylamine	nd	30.2
3,4-Dimethoxy-α-methyl-5-hydroxy-phenethylamine	2.0	47.2
Nicotine	39.6	108.3
Nornicotine	19.2	72.5
Anhalamine	4.9	39.6
Anhalidine (N-Methylanhalamine)	2.9	40.9
Anhalonidine	2.7	46.8
Mimosine, methyl ester	10.6	24.2
3α-Cumyl-1,3,4-oxadiazolidine-2,5-dione	308.4	420.9
Nortriptyline	19.8	71.5
Musk ambrette	26.5	27.3

CLEMENT *et al.* 1997

*Identity and amount present was inferred from the corresponding styrene

Acacia rigidula BENTHAM

Compound (all via gc-ms)	Spring ppm	Late fall ppm
2-Cyclohexylethylamine	0.8	35.2
N-2-Cyclohexylethyl-N-methylamine	1.2	47.1
Phenethylamine	872.3	1135.7
N-Methylphenethylamine	2314.6	5264.8
N,N-Dimethylphenethylamine	123.6	724.5
Amphetamine	6.7	11.8
Methamphetamine	nd	12.4
N,N-Dimethyl-α-methylphenethylamine	57.6	394.2
p-Hydroxyamphetamine	2.1	6.9
p-Methoxyamphetamine	nd	15.7
Tyramine	459.1	1699.2
N-Methyltyramine	237.4	1237.6
Hordenine	6.4	533.8
Dopamine	8.9	36.1
N-Methyldopamine	0.5	8.2
N,N-Dimethyldopamine	11.2	44.6
3-Methoxytryamine	1.8	12.9
N-Methyl-3-methoxytyramine	3.4	28.4
3-Hydroxy-4-methoxy-phenethylamine	15.8	163.2
N-Methyl-3-hydroxy-4-methoxy-phenethylamine	19.2	184.7
3,4-Dimethoxyphenethylamine	1.3	6.5
N-Methyl-3,4-dimethoxyphenethylamine	7.6	28.3
3,4,5-Trihydroxyphenethylamine	1.6	12.4
N-Methyl-3,4,5-trihydroxyphenethylamine	0.3	1.9
Mescaline	**3.4**	**27.5**
N-Methylmescaline	**1.8**	**35.3**
Trichocereine	**0.2**	**13.8**
3,5-Dimethoxytyramine	1.6	21.6
3,4-Dimethoxy-5-hydroxyphenethylamine	15.6	57.1
β-Methoxy-3,4-dihydroxy-5-methoxyphenethylamine	4.6	22.1
3,4-Dimethoxy-α-methyl-5-hydroxy-phenethylamine	5.3	61.4
Nicotine	45.8	152.4
Nornicotine	23.4	84.3

Acacia rigidula Bentham continued

Compound	ppm	ppm
Tryptamine	0.8	21.2
N-Methyltryptamine	4.6	54.9
N,N-Dimethyltryptamine	323.8	568.4
Anhalamine	9.6	48.7
Anhalidine (N-Methylanhalamine)	5.6	51.2
Anhalonidine	2.3	15.7
Peyophorine	3.8	43.4
Pipecolamide	872.8	978.2
p-Hydroxypipecolamide	241.6	353.1
1,4-Benzenediamine	104.8	129.6
4-Methyl-2-pyridinamine	341.5	567.3

Clement *et al*. 1998

Acacia berlandieri

Alhagi pseudalhagi (Bieberstein) Desvaux

Phenethylamine (0.0017%; 180 mg from 10.3 kg dry wt.)
N-Methylphenethylamine (0.0007%; 72 mg from 10.3 kg dry wt.)
N-Methylmescaline (8.7x10^{-5}%; 9 mg from 10.3 kg dry wt.)
Hordenine (0.00037%; 38 mg from 10.3 kg dry wt.)
N-Methyltyramine (0.00011%; 11 mg from 10.3 kg dry wt.)
Coryneine (the N-trimethyl cation of Dopamine) [3,4-Dihydroxyphenethyltrimethyl ammonium (isolated as chloride/hydroxide)] (0.00027%; 28 mg from 10.3 kg dry wt.)
Salicifoline (the N-trimethyl cation of 3-methoxytyramine) [3-Methoxy-4-hydroxyphenethyltrimethylammonium (isolated as chloride)] (0.00012%; 12 mg from 10.3 kg dry wt.)
dl-Salsolidine (0.00041%; 42 mg from 10.3 kg dry wt.)
Choline (0.002%; 222 mg from 10.3 kg dry wt.)
Betaine (Traces detected)
All % listed reflect the amount of base isolated from air dried and milled **stems** (Varanasi, India)
The roots were said to contain "*essentially the same alkaloids but in different proportions*"
Details were not included.
Ghosal *et al.* 1974
See also Ghosal & Srivastava 1973a.

Acacia rigidula **(both images on left)**

It was brought to my attention by Sasha Shulgin that there were some odd discrepancies in the accounts of Clement.

Despite repeated attempts to learn answers, apparently no one connected with authorship of this paper has been willing to respond to several professional researchers attempting to obtain clarification. Most glaring : not all the novel compounds that their paper claimed were synthesized as reference materials have a published synthesis (personal communication with Sasha).

More recent work, published in Pawal *et al*. 2013, was unable to detect the presence of mescaline, mescaline derivatives or any of the purported amphetamines but it supported the prior analytical work by Camp *et al.* All of the other novel results in Clement's accounts need a confirmation by someone or they should similarly be considered to be suspect.

See a review and commentary at http://sacredcacti.com/blog/acacia/

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[Brackets around a title indicates it is likely an English translation of the actual title.]

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On Schlumpberger's relativistic rankings:
Major= Greater than 10% of total volatiles

Minor= Greater than 1% but less than 10% of total volatiles
Trace = Less than 1% of total volatiles

All of the volatiles were found to be emitted by the perianth. Strongest emission was from the inner and middle tepals and the weakest was from the outer tepals.

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Trichocereus giganteus
obtained as a cutting from Knize

Echinocereus rigidissimus var. rubrispinus
(NM) cultivated

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***Trichocereus macrogonus* (RS)**

Trichocereus huanucoensis
(HBG)

Echinopsis mamillosa ritteri

Cactus Phenethylamines: A Tabular Key to their Structural Formulas

	Phenyl					Ethyl		Amine		
Position:	**2**	**3**	**4**	**5**	**6**	β	α	**N1**	**N2**	**N3+**
Compound										
Phenethylamine	H	H	H	H	H	na	na	H	H	na
Amphetamine*	H	H	H	H	H	na	Me	H	H	na
N-Methylphenethylamine	H	H	H	H	H	na	na	Me	H	na
Methamphetamine*	H	H	H	H	H	na	Me	Me	H	na
N,N-Dimethylphenethylamine	H	H	H	H	H	na	na	Me	Me	na
Ubine	H	H	H	H	H	HO	na	Me	Me	na
Coryphanthine	H	H	H	H	H	MeO	na	Me	Me	Me+
Tyramine	H	H	HO	H	H	na	na	H	H	na
Octopamine	H	H	HO	H	H	HO	na	H	H	na
N-Methyltyramine	H	H	HO	H	H	na	na	Me	H	na
Synephrine	H	H	HO	H	H	HO	na	Me	H	na
β-O-Methylsynephrine	H	H	HO	H	H	MeO	na	Me	H	na
β-O-Ethylsynephrine	H	H	HO	H	H	EtO	na	Me	H	na
Hordenine	H	H	HO	H	H	na	na	Me	Me	na
Candicine	H	H	HO	H	H	na	na	Me	Me	Me+
4-Methoxyphenethylamine	H	H	MeO	H	H	na	na	H	H	na
4-Methoxy-β-hydroxyphenethylamine	H	H	MeO	H	H	HO	na	H	H	na
N-Methyl-4-methoxyphenethylamine	H	H	MeO	H	H	na	na	Me	H	na
Longimammine	H	H	MeO	H	H	HO	na	Me	H	na
N,N-Dimethyl-4-methoxyphenethylamine	H	H	MeO	H	H	na	na	Me	Me	na
N,N-Dimethyl-4-methoxy-β-hydroxyphenethylamine	H	H	MeO	H	H	HO	na	Me	Me	na
O-Methyl-candicine	H	H	MeO	H	H	na	na	Me	Me	Me+

* Not reported as a cactus alkaloid; included for structural comparison

PEA cont.	Phenyl					Ethyl		Amine		
Position:	**2**	**3**	**4**	**5**	**6**	**β**	**α**	**N1**	**N2**	**N3+**
Compound										
Dopamine	H	HO	HO	H	H	na	na	H	H	na
Norepinephrine	H	HO	HO	H	H	HO	na	H	H	na
Epinine	H	HO	HO	H	H	na	na	Me	H	na
Epinephrine	H	HO	HO	H	H	HO	na	Me	H	na
N-Methyladrenaline	H	HO	HO	H	H	HO	na	Me	Me	na
Coryneine	H	HO	HO	H	H	na	na	Me	Me	Me+
3-Hydroxy-4-methoxyphenethylamine	H	HO	MeO	H	H	na	na	H	H	na
3-Methoxytyramine	H	MeO	HO	H	H	na	na	H	H	na
Normetanephrine	H	MeO	HO	H	H	HO	na	H	H	na
N-Methyl-3-methoxytyramine	H	MeO	HO	H	H	na	na	Me	H	na
Metanephrine	H	MeO	HO	H	H	HO	na	Me	H	na
NAMT	H	MeO	HO	H	H	na	na	C(O)Me	H	na
N,N-Dimethyl-3-methoxytyramine	H	MeO	HO	H	H	na	na	Me	Me	na
Salicifoline*	H	MeO	HO	H	H	na	na	Me	Me	Me+
N-Methylmetanephrine	H	MeO	HO	H	H	HO	na	Me	Me	na
3,4-Dimethoxyphenethylamine	H	MeO	MeO	H	H	na	na	H	H	na
3,4-Dimethoxy-β-hydroxyphenethylamine	H	MeO	MeO	H	H	HO	na	H	H	na
3,4-Dimethoxy-N-methylphenethylamine	H	MeO	MeO	H	H	na	na	Me	H	na
Normacromerine	H	MeO	MeO	H	H	HO	na	Me	H	na
Calipamine	H	MeO	MeO	H	H	MeO	na	Me	H	na
N-Acetyl DMPEA	H	MeO	MeO	H	H	na	na	C(O)Me	H	na

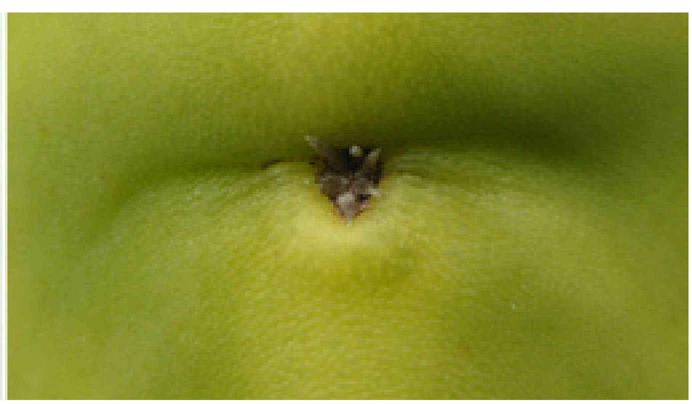
* Not reported as a cactus alkaloid; included for structural comparison

PEA cont.	**Phenyl**					**Ethyl**		**Amine**		
Position:	**2**	**3**	**4**	**5**	**6**	**β**	**α**	**N1**	**N2**	**N3+**
Compound										
3,4-Dimethoxy-N,N-dimethylphenethylamine	H	MeO	MeO	H	H	na	na	Me	Me	na
Macromerine	H	MeO	MeO	H	H	HO	na	Me	Me	na
β-Methoxy-3,4-dimethoxy-N,N-dimethylphenethylamine	H	MeO	MeO	H	H	MeO	na	Me	Me	na
3-Nitrotyramine	H	NO2	HO	H	H	na	na	H	H	na
3,4,5-Trihydroxyphenethylamine*	H	OH	OH	OH	H	na	na	H	H	na
3,4-Dihydroxy-5-methoxyphenethylamine	H	HO	HO	MeO	H	na	na	H	H	na
3-Hydroxy-4,5-dimethoxyphenethylamine	H	HO	MeO	MeO	H	na	na	H	H	na
N-Methyl-3-hydroxy-4,5-dimethoxyphenethylamine	H	HO	MeO	MeO	H	na	na	Me	H	na
N-Formyl-3-hydroxy-4,5-dimethoxyphenethylamine	H	HO	MeO	MeO	H	na	na	C(O)H	H	na
N-Acetyl-3-hydroxy-4,5-dimethoxyphenethylamine	H	HO	MeO	MeO	H	na	na	C(O)Me	H	na
N,N-Dimethyl-3-hydroxy-4,5-dimethoxyphenethylamine	H	HO	MeO	MeO	H	na	na	Me	Me	na
4-Hydroxy-3,5-dimethoxyphenethylamine	H	MeO	HO	MeO	H	na	na	H	H	na
Mescaline	H	MeO	MeO	MeO	H	na	na	H	H	na
N-Methylmescaline	H	MeO	MeO	MeO	H	na	na	Me	H	na
N-Formylmescaline	H	MeO	MeO	MeO	H	na	na	C(O)H	H	na

* Not reported as a cactus alkaloid; included for structural comparison

Trichocereus pachanoi **(VIC)**

Trichocereus scopulicola **(VIC)**

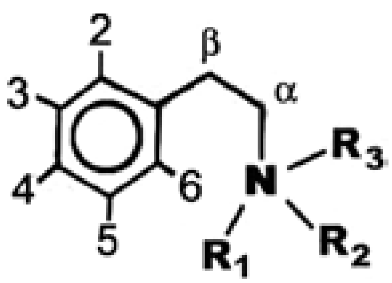


Images not to scale

PEA cont.			Phenyl			Ethyl		Amine		
Position:	2	3	4	5	6	β	α	N1	N2	N3+
Compound										
N-Acetylmescaline	H	MeO	MeO	MeO	H	na	na	C(O)Me	H	na
β-Hydroxy-mescaline	H	MeO	MeO	MeO	H	HO	na	H	H	na
Trichocereine	H	MeO	MeO	MeO	H	na	na	Me	Me	na
3,4,5-Trimethoxyphenylalanine*	H	MeO	MeO	MeO	H	na	$-CO_2H$	H	H	na
2-Chloro-mescaline**	Cl	MeO	MeO	MeO	H	na	na	H	H	na
2,6-Dichloro-mescaline*	Cl	MeO	MeO	MeO	Cl	na	na	H	H	na

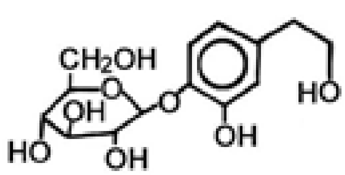
* Not reported as a cactus alkaloid; included for structural comparison
** Believed to be extraction artifact

Generic structural diagram for phenethylamine table



Phenethylamine Key:

Abbreviations
α: Carbon adjacent to the nitrogen.
β: Carbon adjacent to the phenyl ring.
Cl: Chlorine
C(O)H: Formyl
C(O)Me: Acetyl
CO_2H: COOH: Carbonyl
EtO: Ethoxy
H: Hydrogen
HO: Hydroxy
Me: Methyl
Me+: Methyl cation
MeO: Methoxy
na: Not applicable.
NO_2: Nitrate
PEA: Phenethylamine



Structure of Lemairin

short-spined *Trichocereus bridgesii* (Field)

Cactus Isoquinolines: A Tabular Key to their Structural Formulas

(The following includes related isoquinolines that do not occur in cacti; these are included for comparative purposes)

Compound	R5	R6	R7	R8	R1	R2a	R2b	R4	unsat
mono-ring-sub									
1. Longimammatine	H	MeO	H	H	H H	H	na	H	na
2. Weberidine	H	H	MeO	H	H H	H	na	H	na
3. Longimammosine	H	OH	H	H	H H	Me	na	H	na
4. Longimammidine	H	H	H	OH	H H	Me	na	H	na
5. ?-Mono-MeO-1-Me-THIQ (MIKES)	MeO (position?)				Me	H	na	H	na
6. Longimammamine	H	H	H	OH	H H	Me	na	OH	na
7. Arizonine	H	H	H	MeO	OH H	Me	na	H	na
di-ring-sub									
8. Heliamine	H	MeO	MeO	H	H H	H	na	H	na
9. Dehydroheliamine	H	MeO	MeO	H	H	H	na	H	1,2
10. Backebergine	H	MeO	MeO	H	H	H	na	H	1,2 3,4
11. Lemaireocereine	H	H	MeO	MeO	H H	H	na	H	na
12. Dehydrolemaireocereine	H	H	MeO	MeO	H	H	na	H	1,2
13. Isobackebergine	H	H	MeO	MeO	H	H	na	H	1,2 3,4
14. Uberine	MeO	H	OH	H	H H	Me	na	H	na
15. Corypalline	H	MeO	OH	H	H H	Me	na	H	na
16. Salsolinol*	H	OH	OH	H	Me	H	na	H	na
17. Salsoline	H	OH	MeO	H	Me	H	na	H	na
18. Isosalsoline	H	MeO	OH	H	Me	H	na	H	na
19. Salsolidine	H	MeO	MeO	H	Me	H	na	H	na
20. Dehydrosalsolidine	H	MeO	MeO	H	Me	H	na	H	1,2

* Not reported as a cactus alkaloid; included for structural comparison

Isoquinoline cont.	**R5**	**R6**	**R7**	**R8**	**R1**	**R2a**	**R2b**	**R4**	**unsat**
21. N-Methylheliamine (O-Methyl-corypalline)	H	MeO	MeO	H	H	Me	na	H	na
22. Hydrohydrastinine*	H	–O–CH–O–	H	H	H H	Me	na	H	na
23. N-Methylisosalsoline	H	MeO	OH	H	Me	Me	na	H	na
24. Lophocereine	H	MeO	OH	H	*i*-butyl	Me	na	H	na
25. Carnegine	H	MeO	MeO	H	Me	Me	na	H	na
26. Tepenine	H	H	MeO	MeO	Me	Me	na	H	na
27. Calycotomine*	H	MeO	MeO	H	-MeOH	H	na	H	na
28. Isosalsolidine	H	MeO	MeO	H	Me	H	na	H	1,2 3,4
29. Dehydrosalsolidine	H	MeO	MeO	H	Me	H	na	H	1,2
tri-ring-sub									
30. HydrocotarnineH	–O–Me–O–		MeO	Me	Me	na	H	na	
31. Anhalamine	H	MeO	MeO	OH	H	H	na	H	na
32. Isoanhalamine	H	OH	MeO	MeO	H	H	na	H	na
33. Anhalinine	H	MeO	MeO	MeO	H	H	na	H	na
34. Nortehuanine	MeO	MeO	MeO	H	H	H	na	H	na
35. Anhalidine	H	MeO	MeO	OH	H	Me	na	H	na
36. Isoanhalidine	H	OH	MeO	MeO	H	Me	na	H	na
37. Anhalonine	H	MeO	–O–Me–O–		Me	H	na	H	na
38. Anhalonidine	H	MeO	MeO	OH	Me	H	na	H	na
39. Iso-anhalonidine	H	OH	MeO	MeO	Me	H	na	H	na
40. Lophophorine	H	MeO	–O–Me–O–		Me	Me	na	H	na
41. O-Methyl-anhalonidine	H	MeO	MeO	MeO	Me	H	na	H	na
42. Tehuanine	MeO	MeO	MeO	H	H	Me	na	H	na
43. Tehuanine-N-oxide	MeO	MeO	MeO	H	H	Me	®O	H	na
44. Gigantine	Me	Me	Me	na	na	H	OH	na	na
Incorrect proposal	OH	H	MeO	MeO	MeO	MeO	H	H	Me
45. Pellotine	H	MeO	MeO	OH	Me	Me	na	H	na
46. Isopellotine	H	OH	MeO	MeO	Me	Me	na	H	na 3,4

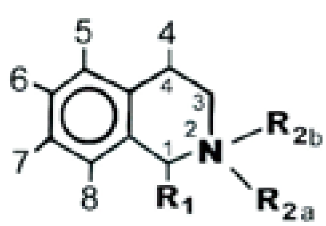
* Not reported as a cactus alkaloid; included for structural comparison

Isoquinoline cont.	**R5**	**R6**	**R7**	**R8**	**R1**	**R2a**	**R2b**	**R4**	**unsat**
tri-ring-sub cont.									
47. O-Methylpellotine	H	MeO	MeO	MeO	Me	Me	na	H	na
48. Pterocereine	glucose–O–	MeO	MeO	H	-MeOH	Me	na	H	na
49. Deglucopterocereine	OH	MeO	MeO	H	-MeOH	Me	na	H	na
50. Deglucopterocereine-N-oxide	OH	MeO	MeO	H	-MeOH	Me	®O	H	na
51. Anhalotine (Iodide)	H	MeO	MeO	OH	H	Me	I	H	na
52. Lophotine (Iodide)	H	MeO	–O–Me–O–		Me	Me	I	H	na
53. Peyotine (Iodide)	H	MeO	MeO	MeO	Me	Me	I	H	na
54. 3,4-Dihydro-6,7-diMeO-8-OH-IQ	H	MeO	MeO	OH	H	H	na	H	1,2
55. 3,4-Dihydro-6,7-diMeO-8-OH-2-Me-isoquinolinium inner salt	H	MeO	MeO	O^-	H	Me^+	na	H	1,2
56. 3,4-Dihydro-6,7-diMeO-8-OH-1-Me-isoquinoline	H	MeO	MeO	OH	Me	H	na	H	1,2
57. 3,4-Dihydro-6,7-diMeO-8-OH-1,2-diMe-isoquinolinium inner salt	H	MeO	MeO	O^-	Me	Me^+	na	H	1,2
58. Pycnarrhine*	H	MeO	OH	H	H	Me^+OH^-	na	H	1,2
59. N-Methyl-6,7-dimethoxy-isoquinolinium chloride*	H	MeO	MeO	H	H	Me^+Cl^-	na	H	1,2
60. Peyoglutam	H	MeO	MeO	OH	$–CH_2$-CH_2-C(O)–		na	H	na
61. Mescalotam	H	MeO	MeO	MeO	$–CH_2$-CH_2-C(O)–		na	H	na
62. Peyoxylic acid	H	MeO	MeO	OH	$–CO_2H$	H	na	H	na
63. O-Methyl-peyoxylic acid	H	MeO	MeO	MeO	$–CO_2H$	H	na	H	na
64. Peyoruvic acid	H	MeO	MeO	OH	–Me $–CO_2H$	H	na	H	na
65. O-Methylpeyoruvic acid	H	MeO	MeO	MeO	–Me $–CO_2H$	H	na	H	na
66. Isonortehuanine	MeO	MeO	MeO	H	H	H	na	H	1,2 3,4
67. Dehydronortehuanine	MeO	MeO	MeO	H	H	H	na	H	1,2
68. Peyophorine	H	MeO	–O–Me–O–		Me	Et	na	H	na

* Not reported as a cactus alkaloid; included for structural comparison

Isoquinoline cont.	**R5**	**R6**	**R7**	**R8**	**R1**	**R2a**	**R2b**	**R4**	**unsat**
tetra-ring-sub									
69. ?-Mono-OH-tri-MeO-2-Me-THIQ (MIKES)	(MeO)$_3$ & OH (positions?)				H	Me	na	H	1,2 3,4
70. ?-Tri-MeO-1-Me-1,2,3,4-dehydro-IQ (MIKES)	(MeO)$_3$ (positions?)				Me	H	na	H	1,2 3,4
71. ?-Tri-MeO-1-Me-1,2-dehydro-IQ (MIKES)	(MeO)$_3$ (positions?)				Me	H	na	H	1,2
72. Norweberine	MeO	MeO	MeO	MeO	H	H	na	H	na
73. Dehydronorweberine	MeO	MeO	MeO	MeO	H	H	na	H	1,2
74. Isonorweberine	MeO	MeO	MeO	MeO	H	H	na	H	1,2 3,4
75. Pachycereine	MeO	MeO	MeO	MeO	Me	H	na	H	na
76. Dehydropachycereine	MeO	MeO	MeO	MeO	Me	H	na	H	1,2
77. Isopachycereine MeO	MeO	MeO	MeO	Me	H	na	H	1,2	 3,4
78. Weberine	MeO	MeO	MeO	MeO	H	Me	na	H	na
79. N-Methylpachycereine	MeO	MeO	MeO	MeO	Me	Me	na	H	na
trimeric									
80. Pilocereine	H	MeO	OH	X	i-butyl	Me	na	H	na
	H	MeO	XO	Y	i-butyl	Me	na	H	na
	H	MeO	YO	H	i-butyl	Me	na	H	na

Generic structural diagram for isoquinoline table



Isoquinoline key:

Abbreviations

1,2: 1,2-Dehydro
3,4: 3,4-Dehydro
CO_2H: COOH: Carbonyl
H: Hydrogen
Me: Methyl
MeO: Methoxy
na: Not applicable
OH: Hydroxy
-O-Me-O-: Methylenedioxy
X: Point of attachment (X-X)
Y: Point of attachment (Y-Y)

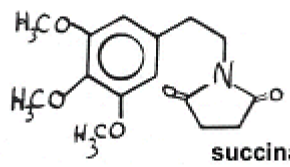
Lophocereus schottii* forma *spiralis
(UC)

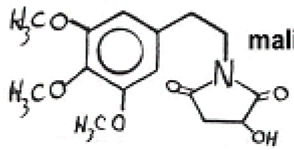
Structural table Isoquinolines in alphabetical order

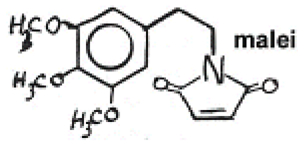
Name	List #
?-Mono-MeO-1-Methyl-THIQ	5
?-Mono-OH-tri-MeO-2-Methyl-THIQ	69
?-Tri-MeO-1-Methyl-1,2,3,4-dehydro-isoquinoline	70
?-Tri-MeO-1-Methyl-1,2-dehydro-isoquinoline	71
3,4-Dihydro-6,7-dimethoxy-8-hydroxy-1,2-dimethyl-isoquinolinium inner salt	57
3,4-Dihydro-6,7-dimethoxy-8-hydroxy-1-methyl-isoquinoline	56
3,4-Dihydro-6,7-dimethoxy-8-hydroxy-2-methyl-isoquinolinium inner salt	55
3,4-Dihydro-6,7-dimethoxy-8-hydroxy-isoquinoline	54
Anhalamine	31
Anhalamine, Iso-	32
Anhalidine	35
Anhalidine, Iso-	36
Anhalinine	33
Anhalonidine	38
Anhalonidine, Iso-	39
Anhalonidine, O-Methyl-	41
Anhalonine	37
Anhalotine (Iodide)	51
Arizonine	7
Backebergine	10
Backebergine, Iso-	13
Calycotomine	27
Carnegine	25
Corypalline	15
Corypalline, O-Methyl-	21
Deglucopterocereine	49
Deglucopterocereine-N-oxide	50
Dehydroheliamine	9
Dehydro-lemaireocereine	12
Dehydronortehuanine	67
Dehydronorweberine	73
Dehydropachycereine	76
Dehydrosalsolidine	20
Dehydrosalsolidine	29
Gigantine	44
Heliamine	8
Heliamine, Dehydro-	9
Heliamine, N-Methyl-	21
Hydrocotarnine	30
Hydrohydrastinine	22
Isoanhalamine	32
Isoanhalidine	36
Isoanhalonidine	39
Isobackebergine	13
Isonortehuanine	66
Isonorweberine	74
Isopachycereine	77
Isopellotine	46
Isosalsolidine	28
Isosalsoline	18
Isosalsoline, N-Methyl-	23
Lemaireocereine	11
Lemaireocereine, Dehydro-	12
Longimammamine	6
Longimammatine	1
Longimammidine	4
Longimammosine	3
Lophocereine	24
Lophophorine	40
Lophotine (Iodide)	52
Mescalotam	61
N-Methyl-6,7-dimethoxy-isoquinolinium chloride	59
N-Methylheliamine	21
N-Methylisosalsoline	23
N-Methyl-pachycereine	79
Nortehuanine	34
Nortehuanine, Dehydro-	67
Nortehuanine, Iso-	66
Norweberine	72
Norweberine, Dehydro-	73
Norweberine, Iso-	74
O-Methyl-anhalonidine	41
O-Methylcorypalline	21
O-Methylpellotine	47
O-Methylpeyoruvic acid	65
O-Methylpeyoxylic acid	63
Pachycereine	75
Pachycereine, Dehydro-	76
Pachycereine, Iso-	77
Pachycereine, N-Methyl-	79
Pellotine	45
Pellotine, Iso-	46
Pellotine, O-Methyl-	47
Peyoglutam	60
Peyophorine	68
Peyoruvic acid	64
Peyoruvic acid, O-Methyl-	65
Peyotine (Iodide)	53
Peyoxylic acid	62
Peyoxylic acid, O-Methyl-	63
Pilocereine	80
Pterocereine	48
Pterocereine, Degluco-	49
Pycnarrhine	58
Salsolidine	19
Salsolidine, Dehydro-	20
Salsolidine, Dehydro-	29
Salsolidine, Iso-	28
Salsoline	17
Salsoline, Iso-	18
Salsoline, N-Methyl-iso-	23
Salsolinol	16
Tehuanine	42
Tehuanine, Dehydronor	67
Tehuanine, Isonor-	66
Tehuanine, Nor-	34
Tehuanine-N-oxide	43
Tepenine	26
Uberine	14
Weberidine	2
Weberine	78
Weberine, Dehydro-nor-	73
Weberine, Isonor-	74
Weberine, Nor-	72

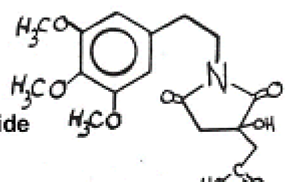
***Turbinicarpus roseiflorus* (SS)**

Mescaline Krebs acid conjugates & other compounds:

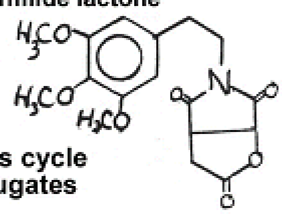

succinamide

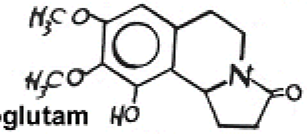

malimide

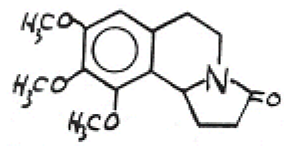

maleimide

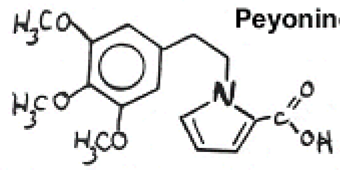

citrimide

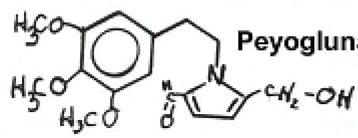
isocitrimide lactone


Krebs cycle conjugates

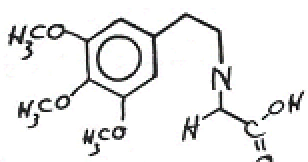

Peyoglutam


Mescalotam

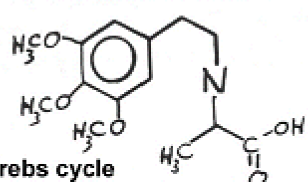

Peyonine


Peyoglunal

Peyonine and Peyoglunal are pyrrole derivatives rather than Krebs cycle conjugates;
they are included on this page only for convenience.


mescaloxylic acid

mescaloruvic acid


Krebs cycle conjugates

The remaining Krebs acid conjugates include Peyoxylic acid,
O-Methylpeyoxylic acid,
Peyoruvic acid &
O-Methylpeyoruvic acid.
These are included in the tables above.


***Trichocereus scopulicola* fruit**
Photo by Erik

Some Cactus Triterpenoids, Sterols & Similar Molecules

A Tabular Key to their Structural Formulas

(The following includes several related compounds that do not occur in cacti; these are included for comparative purposes)

Compound	**Ring**	**R1**	**R2**	**R3**	**R4**	**R5**	**R6**	**R7**	**R8**	**R9**
β-Amyrin	C	OH	Me	H H	H H	H	Me H	H H	Me	Me
α-Sitosterol C8=C9	B	OH	Me	H	H	Et	Me	na	na	na
β-Sitosterol C5=C6	B	OH	H	H	H	Et	Me	na	na	na
α-Spinasterol C7=C8 C22=C23	B	OH	H	H	H	Et	Me	na	na	na
3-β-Hydroxy-11α,12α-epoxyoleanan-28,13B-olide C11-O-C12	C	OH	Me	H H	H H	-O-C(O)- (to C13)	H H	H H	Me	Me
Alamosenogenin	C	OH	Me	H H	OH H	CHO	H H	H H	CH_2OH	Me
Betulin	A	OH	Me	Me	H	CH_2OH	H H	H	$=CH_2$	H
Betulinic acid	A	OH	Me	Me	H	CO_2H	H H	H	$=CH_2$	H
Bridgesigenin A	C	OH	Me	-O-C(O)- (to R5)	H H	(from R3)	H H	H H	CH_2OH	Me
Bridgesigenin B	C	OH	Me	-O-C(O)- (to R5)	H H	(from R3)	H OH	OH H	CH_2OH	Me
Bridgesigenin C	C	OH	Me	-O-C(O)- (to R5)	H H	(from R3)	H OH	AcO H	CH_2OH	Me
Calenduladiol acc. to Kircher 1980	A	OH	Me	Me	OH	Me	H	H H	$=CH_2$	H
Calenduladiol acc. to Kasprzyk et al 1970	A	OH	Me	Me	OH	Me	H	H H	$=CH_2$	OH
Campesterol **C5=C6**	**B**	**OH**	**Me**	**H**	**H**	**Me**	**Me**	**na**	**na**	**na**
Chichipegenin	C	OH	Me	H H	OH H	CH_2OH	OH H	H H	Me	Me
Cholestane (all saturated)	B	H	H	H	H	H	Me	na	na	na
Cholestanol (all saturated)	B	OH	H	H	H	H	Me	na	na	na
Cholesterol C5=C6	B	OH	H	H	H	H	Me	na	na	na
Cochalic acid	C	OH	Me	H H	OH H	CO_2H	H H	H H	Me	Me

Compound	**Ring**	**R1**	**R2**	**R3**	**R4**	**R5**	**R6**	**R7**	**R8**	**R9**
Cyclostenol (all saturated)	B	OH	H	OH	Me	H	-C(H$_2$) - (to C9)	na	na	na
Dumortierigenin	C	OH	Me	-O-C(O)- (to R5)	H H	(from R3)	OH H	H H	Me	Me
Epithelanthate	D	OH	Me	na	na	na	na	na	na	na
Erynginol A	C	OH	Me	H H	OH H	CH$_2$OH	OH H	OH H	CH$_2$OH	Me
Erythrodiol	C	OH	Me	H H	H H	CH$_2$OH	H H	H H	Me	Me
Friedelan-3α-ol No Me at C1 Me at C4, C13 & C18	C	OH	Me	H H	H H	Me	H H	H H	Me	Me
Friedelin No Me at C1 Me at C4, C13 & C18	C	=O	Me	H H	H H	Me	H H	H H	Me	Me
Gummosogenin	C	OH	Me	H H	OH H	CHO	H H	H H	Me	Me
Longispinogenin	C	OH	Me	H H	OH H	CH$_2$OH	H H	H H	Me	Me
Lophenol **7=8**	**B**	**OH**	**H**	**H**	**H**	**H**	**Me**	**na**	**na**	**na**
Lupenetriol	A	OH	Me	Me	OH	CH$_2$OH	H	H	=CH$_2$	H
Lupeol	A	OH	Me	Me	H	Me	H H	H	=CH$_2$	H
Macdougallin **8=9**	**B**	**OH**	**Me**	**OH**	**Me**	**H**	**Me**	**na**	**na**	**na**
Machaeric acid	C	OH	Me	H H	H H	CO$_2$H	H H	=O	Me	Me
Machaerinic acid	C	OH	Me	H H	H H	CO$_2$H	H H	OH	Me	Me
Machaerogenin 12=13	C	OH	Me	H H	H H	-C(O)-O- (to R7)	H H	(from R5) H	CH$_2$OH	Me
Maniladiol	C	OH	Me	H H	OH H	Me	H H	H H	Me	Me
Methyl betulinate	A	OH	Me	Me	H	COOMe	H H	H	=CH$_2$	H
Methyl epithelanthate	D	OH	Me	na	na	na	na	na	na	na
Methyl machaerinate	C	OH	Me	H H	H H	COOMe	H H	=O	Me	Me

Compound	Ring	R1	R2	R3	R4	R5	R6	R7	R8	R9
Methyl oleanolate	C	OH	Me	H H	H H	COOMe	H H	H H	Me	Me
Methyl queretaroate	C	OH	Me	H H	H H	COOMe	H H	H H	CH_2OH	Me
Myrtillogenic acid	C	OH	Me	H H	OH H	CH_2OH	H H	H H	CH_2OH	Me
Oleanolic acid	C	OH	Me	H H	H H	CH_2OH	H H	H H	Me	Me
Oleanolic aldehyde	C	OH	Me	H H	H H	CHO	H H	H H	Me	Me
Pachanol A C12=C13 C14=C15	E	OH	Me	Me	H H	-C(O)-O- (to R7)	H H	(from R5) H	CH_2OH	Me
Pachanol B C11=C12 C13=C18	E	OH	Me	Me	H H	-C(O)-O- (to R7)	OH H	(from R5) H	CH_2OH	Me
Pachanol C C12=C13 OH at 14	E	OH	Me	Me	H H	-C(O)OH	H H	OAc H	CH_2OH	Me
Pachanol D C12=C13	E	OH	Me	Me	H H	-C(O)-O- (to C14)	OH H	H H	CH_2OH	Me
Peniocerol C8=C9	B	OH	H	OH	H	H	Me	na	na	na
Queretaroic acid	C	OH	H	H H	H H	CO_2H	H H	H H	CH_2OH	Me
Queretarol	C	OH	H	H H	H H	CH_2OH	H H	H H	CH_2OH	Me
Stellatogenin	A	OH	Me	Me	H	-C(O)-O- (to R7)	H H	(from R5)	Me OH	H
Stenocereol C8=C9 C22=C23	**B**	**OH**	**H**	**OH**	**Me**	**H**	**Me**	**na**	**na**	**na**
Stenocereol C8=C9 C22=C2	**B**	**OH**	**H**	**OH**	**Me**	**H**	**Me**	**na**	**na**	**na**
Stigmasterol C5=C6 C22=C23	B	OH	H	H	H	H	Me	na	na	na
Taraxerol C14=C15 No Me at C14 Me at C13 & C18	C	OH	Me	H H	H H	Me	H H	H H	Me	Me

Compound	**Ring**	**R1**	**R2**	**R3**	**R4**	**R5**	**R6**	**R7**	**R8**	**R9**
Thurberin	A	OH	Me	Me	H	Me	H H	H	$=CH_2$	H
Thurberogenin acc to Hegnauer	A	OH	Me	Me	H	-C(O)-O- (to R7)	H H	(from R5)	$=CH_2$	H
Thurberogenin acc to Kircher	A	OH	Me	Me	H	-C(O)-O- (to R6)	(from R5) H	H	$=CH_2$	H
Thurberol C8=C9 C14=C15	**B**	**OH**	**H**	**OH**	**H**	**H**	**Me**			
Treleasegenic acid	C	OH	Me	H H	H H	CO_2H	H H	OH H	CH_2OH	Me

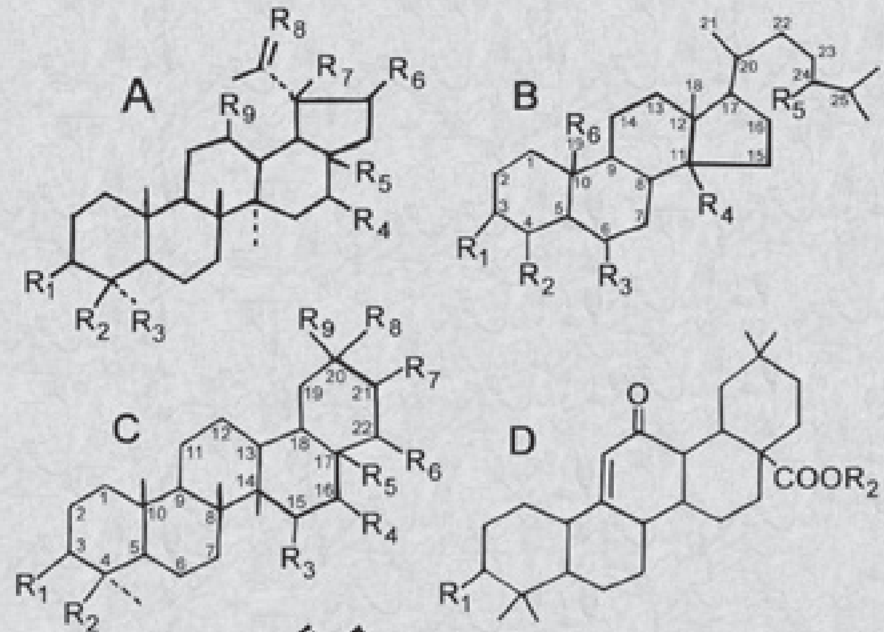
Triterpenoids Key:

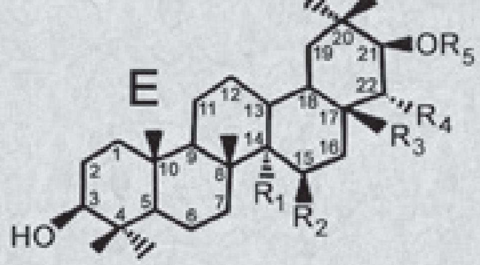
Abbreviations:

Stereochemistry is not reflected in table unless indicated in structural diagram

=: Indicates position of a double bond	**COOMe:** Methyl ester	**-O-:** Epoxy
A, B, C, or D: Ring structure (see diagrams)	**Et:** Ethyl: C_2H_5	**OH:** Hydroxy
C#: Indicates specific carbon atom to	**H:** Hydrogen	**"to R#":** Indicates the place it is bonded
CHO: formyl	**Me:** Methyl	**"from R#":** Indicates where it is linked
CO_2H: COOH: Carbonyl	**na:** Not applicable	

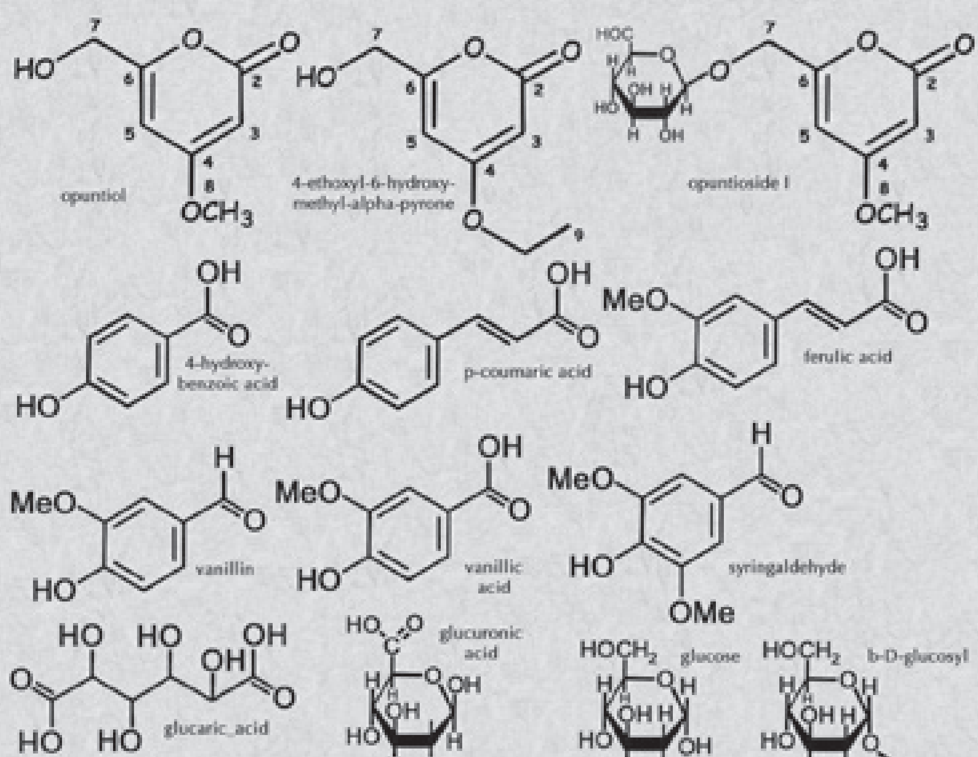
Trichocereus candicans
(HBG)





Generic Ring Skeletons to accompany the key to Triterpenoid & Sterol structural tables

Some other nonalkaloidal molecules



Betalains

Betalains are water soluble pigments that are typically associated with cacti and other members of the Caryophyllae.

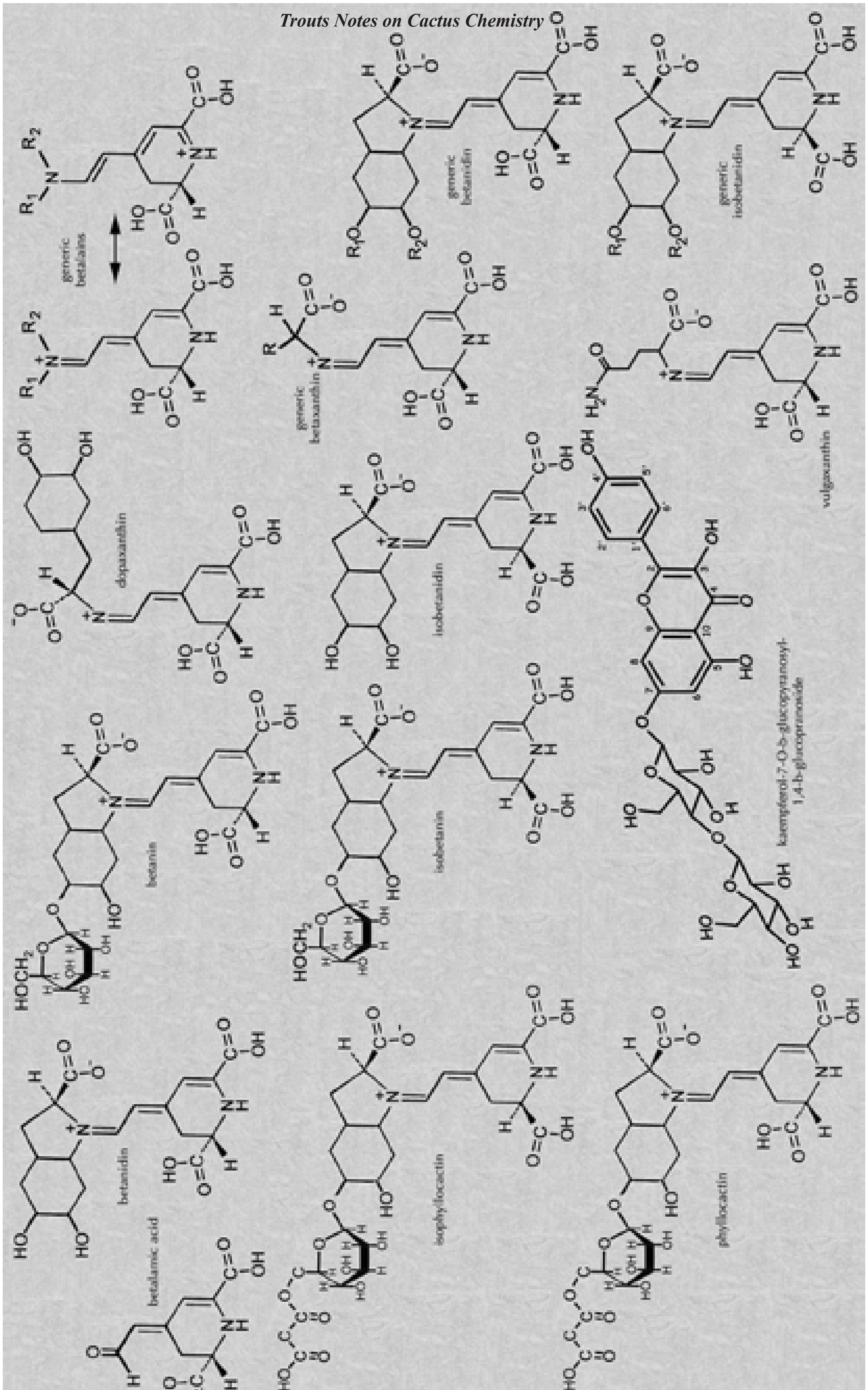
Betacyanins are red-violet and are the immonium conjugates of betalamic acid with cyclodopa. They are often glycosides.

Betaxanthins are yellow and are the **non**glycosidic immonium conjugates of betalamic acid with various amino acids or amines.

These are the pigments in cactus fruit & flowers rather than anthocyanins.

***Oroya peruviana* (CCC) right**

***Opuntia* sp. (Grant Co., NM) below**


generic betalains
dopaxanthin
betanin
betanidin
betalamic acid
generic betaxanthin
isobetanidin
isobetanin
isophyllocactin
generic betanidin
generic isobetanidin
vulgaxanthin
kaempferol-7-O-b-glucopyranosyl-1,4-b-glucopyranoside
phyllocactin

Biominerals

Remnants of a couple of dead ‘eagle’s claw cactus’ (right), AKA *Echinocactus horizonthalonius,* in Hudspeth County, Texas visiblyshow abundant biominerals deposited in the form of hydrated calcium oxalate. This material is the most important way that cacti sequester atmospheric carbon dioxide. Stored in the form of the oxalate they slowly decompose to calcium carbonate.

The cortex of older regions within the stem was found to contain up to 50% of its dry weight as the oxalate (in the form of druses of Weddellite) Rivera & Smith 1979

A similar picture is true for *Echinocereus stramineus* (see the carcass below, also in Hudspeth County.)

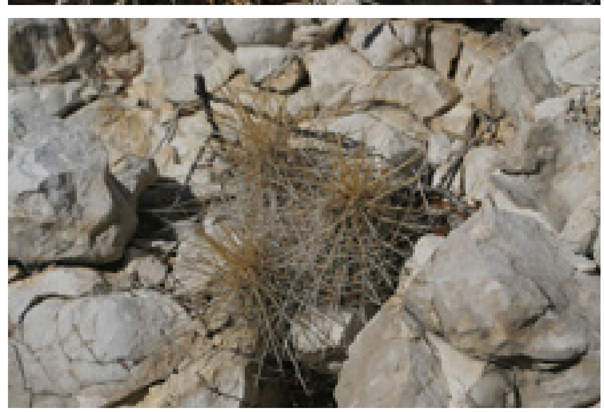
There are many species of minerals which can form and some of them have taxonomic value. There may be dynamic biotransformations during both the life and decay of the plant.

Two trends may interest readers:

Trichocereus species produce druses of Weddellite (Calcium oxalate dihydrate $CaC_20_4 \cdot (2+x)\ H_20$ [with $x \leq 0.5$]). These look like small white drusy crystalline spheroids (this is the white ‘sand’ in the bottom of San Pedro tea). It can be ‘readily’ biotransformed into Whewellite.

Opuntia species mainly produce Whewellite (Calcium oxalate monohydrate $CaC_20_4 \cdot H_20$) Commonly forms acutely pointed radiating druses. These look like jagged 3-D stars.

The reported occurrences of biominerals are scattered through the text.

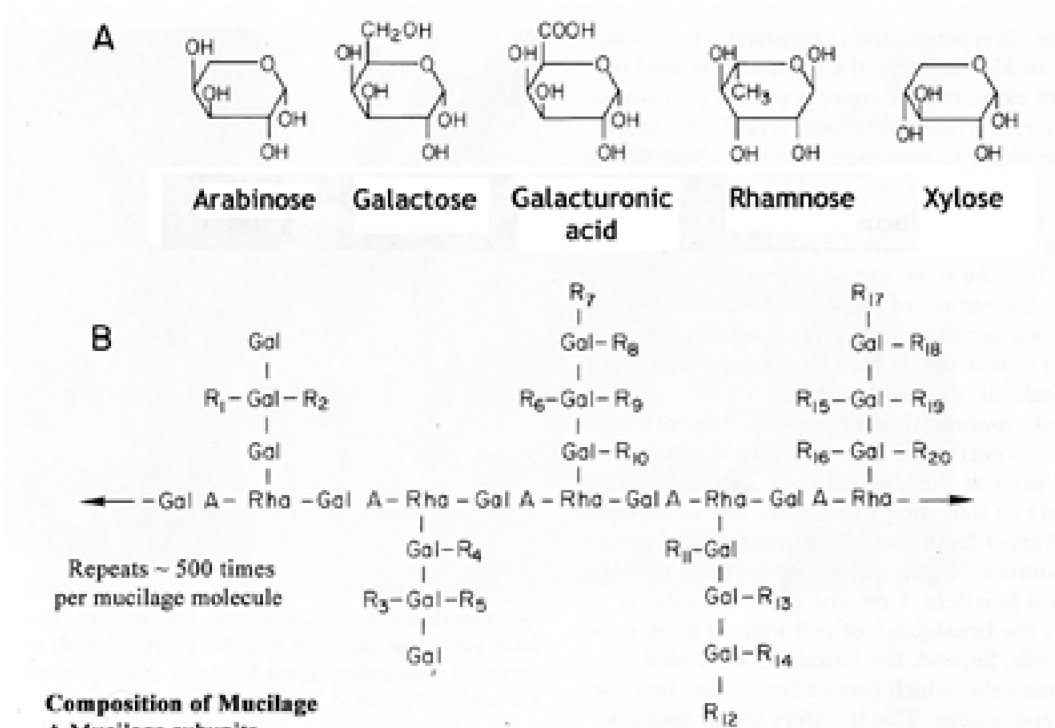


Echinocereus horizonthalonius
(top 2 right; closer views on the next page)
***Echinocereus stramineus* (rest of page)**
A living *Echinocereus stramineus* is on the lower right

This used to be inside of a cactus!

What is Cactus Slime?

Mucilage



Composition of Mucilage
A Mucilage subunits
B Tentative proposal for repeating units in Opuntia ficus-indica mucilage.
The 20 side chains (R) contain around 15 xylose and 25 arabinose residues in total.
Adapted from McGarvie & Parolis 1981a-c

Mucilage is often used to describe an aqueous solution of gums.
Mucilages are different from gums however in that gums are usually produced in response to injury and are secreted into cavities whereas mucilage is produced inside of highly specialized cells that accumulate it between the cell wall and the cell membrane.

Mucilages are water soluble complex acidic or neutral polysaccharides of high molecular weight. Some components are related to cell wall components such as galactose, arabinose, xylose, rhamnose and galacturonic acid.

Mucilages are highly branched and fibrous. This makes them not just large but very sticky and troublesome to handle.

Most cactus mucilages have not been studied except for some of the Opuntias

In Opuntia ficus-indica the mucilage consists of alternating rhamnose and galacturonic acid residues to which are attached side chains composed of three galactose residues.
Arabinose and xylose residues branch from the galactose. It is believed that arabinose is attached to the galatose and xylose is attached to the arabinose.
Some galactose side chains have only arabinose and some others have two arabinose residues and one xylose.
Other Opuntia species were found to have different ratios of these sugar residues.

In Opuntia they were found to act as a calcium storage reservoir. As much as 20% of the plant's calcium may be associated with its mucilage.
This is due to the carboxylic acid moeity of galacturonic acid creating a strongly negative charge (causing the whole molecule to have a net negative charge)

See:
Amin *et al.* 1970
McGarvie & Parolis 1979
Medina-Torres 2000
Mindt *et al.* 1975
Techtenberc & Mayer 1981

Spines

The glochids of at least two species were said to be composed of pure crystalline cellulose.
MEYER & MCLAUGHLIN 1982 cited PRITCHARD & HALL 1976.

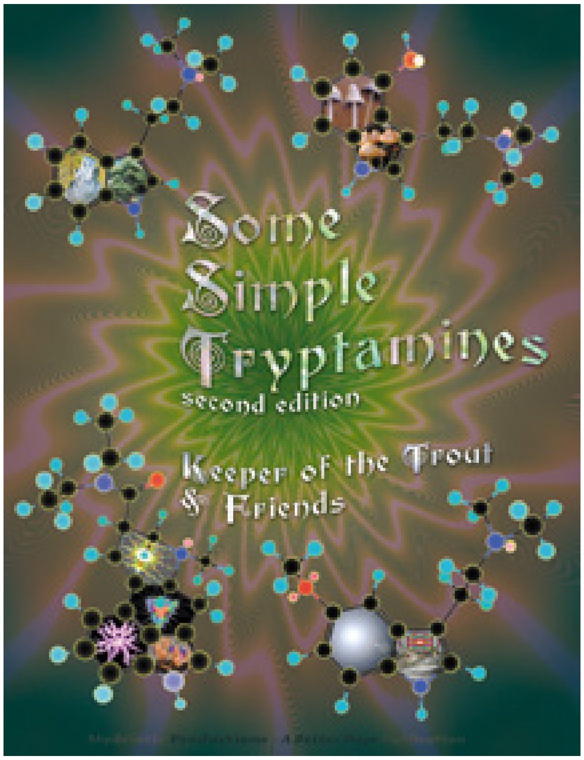
Spines consist of an "intimate composite " of a compact arrangement of slender cellulosic microfibrils (0.4mm x 6–10µm) embedded in a matrix of arabinan.
VIGNON *et al*. 2004

Spines were described as a nanofiber composite that consists of roughly 50% cellulose and 50% arabinan.
The strength values of *Opuntia ficus-indica* under three point bending stress was greater than several composite materials (more than double carbon fiber reinforced polycarbonate (13 GPa)[3] but less than half an individual E-glass fiber (72 GPa)[3].
Also measured % of crystallinity and found there was no correlation between percent crystallinity of the spines and flexural stress.
Pilosocereus pachycladus had the strongest spines of the species they examined.
COOPER *et al* 2013

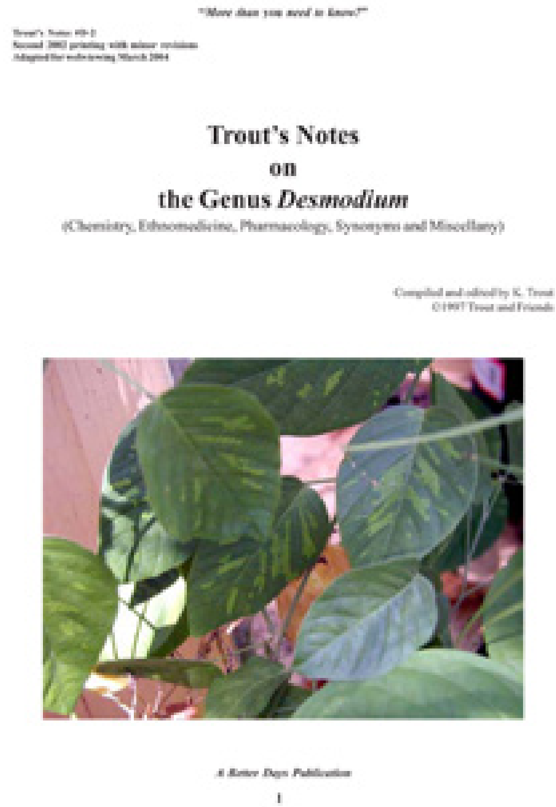
Species	% Crystalinity
Echinocactus platyacanthus	53.4
Echinocactus grusonii	54.7
Echinopsis terscheckii	75.9
Myrtillocactus geometrizans	48.0
Pilosocereus languinosus	72.9
Pachycereus pringlei	65.6
Pilosocereus ulei	75.8
Pilosocereus pachycladus	75.9
Stenocactus crispatus	64.7
Stenocactus multicostatus	51.4
Stenocactus vaupelianus	57.6
Stenocereus thurberi	76.3
COOPER *et al* 2013	

Echinocactus horizonthalonius
(Presidio County, Texas)

Want some more Trout?

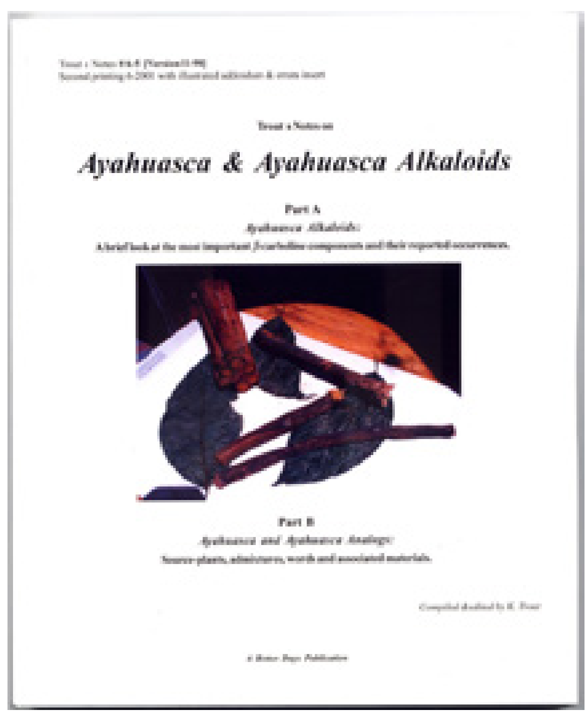


Some Simple Tryptamines
http://troutsnotes.com/PDF/SST.html



The Genus *Desmodium*
http://troutsnotes.com/PDF/D2_2004_Trout.pdf

Some Other Succulents
http://troutsnotes.com/PDF/SoS_2004_Trout.pdf



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Trichocereus pasacana
(HBG)

Acknowledgements

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