

The *Trichocereus* Species: Taxonomic delineations

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Trichocerei containing mescaline are said to all be candelabra like, stem forming and generally branching from the base.

Trichocerei that are columnar & branch higher up, or are creeping / low forms contain only N-methylated tyramines & 3,4-disubstituted-b-phenethylamines

(Pardanani et al. 1977; citing Agurell 1969b and Mata et al. 1972).

While this is largely true, exceptions such as the monstrose *T. bridgesii*, *T. vollianus* and *T. strigosus* do exist.

Trichocereus is said to be derived from the Greek meaning “Thread-Cereus” in reference to the hairy flower areoles. Britton & Rose 1920 2: 130. (It is a “bastard” word combining *Trichos*, from Greek *trix* (*Trix*), with the Latin *Cereus*, meaning wax or candle)

Echinopsis comes from the Greek meaning “having the aspect of a hedgehog” (*echinos* (*Echinos*) + *opsis* (*opsis*): Hedgehog + Aspect).

An assay of many *Trichocereus* and *Echinopsis* species is in order. While most of the *Trichocerei* assayed to date do not show the presence of mescaline, it has proved to be a genus with a high frequency of alkaloid occurrence. The few *Echinopsis* species that have been assayed show a similar tendency.

Trichocereus and *Echinopsis* intergrade so there appears to be no possible line of division between them that can be agreed upon by all experts.

There are also commercially available hybrids of *Trichocereus* X *Echinopsis*. Often referred to as X *Trichonopsis* (One, produced from a hybrid raised by the “American plant breeder Hummel”, is thought by Backeberg to most probably be from *E. eyriesii*).

We will return to the subject of hybrids later.

A number of cactus experts insist that San Pedro is now properly referred to as *Echinopsis pachanoi*.

The unity of *Trichocereus* and *Echinopsis* was suggested by Berger in 1905, when proposing *Trichocereus* as a subgenus of *Echinopsis*, but this was rejected by Riccobono, Britton & Rose, Backeberg and others.

In a major revision incorporating a number of genera including *Lobivia*, *Echinopsis* and *Trichocerei*, all were merged into *Echinopsis* a few years ago by Friedrich and associates. Undoubtedly we have not heard the last on this. Considering that the results of taxonomic study are used for identification, the constant battle between those who want to further delineate new genera (the “splitters”) versus those who tend towards the reductionist view of having as few as possible (the “lumpers”), introduces more confusion than it alleviates.

While agreeing that the actual dividing line drawn between *Trichocereus* and *Echinopsis* is purely arbitrary, I would hope that revisions would clarify the relationships and the descriptions, as well as better enabling ease of recognition.

I am unconvinced that their proposal clarifies ANYTHING beyond confirming a similarity between seed surfaces within a very limited number of cactus species. It does, however, introduce a lot of potential and real confusion into an already confused area.

Granted, taxonomists exist in a constrained world of ultra-specialization and don't have to care how their decisions affect horticulturists but it IS important to know a specific name for a plant if attempting to communicate about it.



Figure 1. Flower of *Trichocereus peruvianus* (Eltzner).

What is interesting about their proposal is that if *Trichocereus* is to be preserved for any use, they argue it should be reserved for the “northern” species; which include *T. pachanoi*, *T. validus*, *T. taquimbalensis*, *T. werdermannianus*, *T. peruvianus*, *Echinopsis lageniformis* (Foerst.) Friedr. & Rowley, ie *T. bridgesii*), *T. tacaquirensis* (Vpl.) Card., and the descriptionless and holotypeless *Echinopsis gigantea* Knize (Oddly they included *Trichocereus giganteus* Knize (despite it being not *nomen nudum* but rather a *nomen confusum*) without altering the author designation or describing it.)

Since they apparently consider these species closely related and all of the first 5 or 6 are known mescaline containing species, perhaps an analysis of the last couple are also in order.

A note to those who plan to consult this piece, concerns *Trichocereus bridgesii* Salm-Dyck and *Echinopsis bridgesii* Salm-Dyck. Both occur in Bolivia but these are very different plants. The first grows to 2-5 meters in height and the second forms short clusters.

As it is a given that the revision is accepted, due to the rules of priority *Trichocereus bridgesii* finds itself renamed as *Echinopsis lageniformis*, rather than *Echinopsis bridgesii* reverting to *Echinopsis salmiana* and *Trichocereus bridgesii* becoming *Echinopsis bridgesii*.

Currently *lageniformis* is used only as a varietal name that evidently will become *Echinopsis lageniformis* var. *lageniformis*.

Similarly, readers should be aware that *Trichocereus werdermannianus* was stated by the 2nd edition of the CITES Cactaceae Checklist to no longer exist.

Echinopsis werdermannia was apparently absorbed into *Echinopsis terscheckii* by David Hunt but I have not yet been able to determine any published justification or rationale. Dr. Hunt sadly did not include any reference that was meaningful; citing instead only Friedrich & Rowley; a paper which actually accepted them both as separate species.

Friedrich & Glaetzle not only preserved them as separate species but placed them in two separate groups (Ib & Iib respectively) based on their seed coat morphology. (They also preserved *E. deserticola* and *E. fulvilana* as separate species based on seed coat morphology.)

In Hunt’s “New” Lexicon both species reappear as separate accepted species, still with only reference to Friedrich & Rowley, which is true enough of course.

Sadly that occurred after publication of Anderson’s The Cactus Family which relied heavily on Hunt’s advice on what was currently accepted, including this one. Some sources such as UC Berkeley who respect Anderson have already begun changing the labelling in their botanical garden to eliminate the name *werdermannianus*.

Please stay aware that *Echinopsis werdermannii* still exists but is a completely different plant.

Consider the following, fairly widely cultivated plants in light of the proposal to merge *Trichocereus*, *Helianthocereus* and *Echinopsis*.

- *Echinopsis grandiflora* Link 1857 (white flowers)
- *Echinopsis grandiflora* Hort? (Flowers various shades of red)
- *Echinopsis grandiflora* R. Mey (deep pink flowers)
- *Helianthocereus grandiflorus* (Br. & R.) Backbg. (flowers brilliant red; variable)
- *Trichocereus grandiflorus* Backbg. n. sp. (white flowers)
- *Trichocereus grandiflorus* (plants in cultivation are variously said to have red or white flowers)
- *Trichocereus grandis* Hort.? (orange flowers)

Some plants have been transferred or renamed so many times it can sometimes make even locating information about them difficult.



Figure 2. *Trichocereus scopulicola* flowering in Oz. Photo by Anonymous.

Of course, now that the boys at the Kew have accepted this merger it conveniently eliminates many problems by simply transferring them into nomenclatural limbo. This, at best, is a lazy (even lame) way of addressing a real problem.

It literally reminds me of former Ronald Reagan's 'elimination' of many thousands of impoverished people by redefining the definition of the poverty level to a lower value.

It's not as though verifiable material is not presently in wide cultivation on at least 4 continents.

(Even the experts get confused sometimes; an otherwise authoritative recent text was encountered that described *Anhalonium williamsii* as a former name for *Lophophora williamsii* and *Anhalonium lewinii* as the previous name for *Lophophora diffusa*, and based their rationale on the fact that *A. lewinii* was described as yellow green in color. Exactly the opposite of what actually occurred. Perhaps they assumed Heffter had mislabelled his original colored plates? See a discussion under *L. diffusa*).

It often seems that it is a matter of, as the English say, "picking the fly-shit out of the pepper" in an attempt at achieving dubious fame and immortality by linking one's name to a plant's formal designation. It might be stressed that there was evidently no attempt to publish descriptions of the included species and that many of the previously published descriptions are impoverished at best.

Rejecting some differences used to divide them as being purely morphological, G. Rowley, H. Friedrich & W. Glaetzle relied on purely morphological characteristics to introduce further complication into the recognition and classification of these plants. I will stick to referring to them as *Trichocerei* until someone can be bothered to create a proper treatment of the genus or genera involved.

This after all IS one of the functions of taxonomy. Namely, describing and classifying plants in such a way that we can identify them and know for certain what specific plant we are talking about when referring to one by a specific name. Certainly their proposal will not help clarify the matter anymore than the (fortunately mostly ignored) attempts to transfer all existing *Coryphantha* species back into *Mammillaria*. I hope that this is accepted similarly.

This scheme merges the following into *Echinopsis*:

- *Chamaecereus*
- *Echinopsis*
- *Helianthocereus*
- *Hymenorebutia*
- *Pseudolobivia*
- *Soehrensia*
- *Trichocereus* (They commented that if the genus or name is preserved at all that it should be used for the northern columnar forms)
- Portions of *Lobivia* (They believe the northernmost species had a "separate and very primitive origin" and thus should be excluded from *Echinopsis*)
- Possibly some portions of *Rebutia*
- Possibly *Acanthocalycium* but they felt this questionable and left it for future workers to sort out.

(And this is only a partial list of what are now considered to be the *Echinopsis* species!)

(A discussion of synonymy can be found in the 1986 *Bradleya* 4:72 and the 1974 *IOS Bulletin* 3(3): 93-99.)

Their distinguishing features for the genus include (Although exceptions can be found for each!)

1. Hairs but no spines in the axils of the floral scales
2. Stamens arranged so that the upper series forms a dense ring in the flower throat
3. Absence of a well defined nectar-chamber
4. Seed testa is hard black to dark brown but sometimes obscured by projecting cuticular fold giving them the appearance of being rough and light colored

They reject the following as inconstant and hence inapplicable:

1. Habit (globose versus short-columnar)
2. Possession of flowers suitable for hawkmoths (night versus day bloomers)

(It might be added that the majority of *Trichocereus* and *Echinopsis* can be divided within these two discriminants.)

In this attempted revision, they used “Seed morphology as an aid to classifying the genus *Echinopsis* Zucc.”, (the title of their article describing their rationale; published in the (1983) *Bradleya* 1: 91-104). While their arguments have little more substance than those presented elsewhere, pro or con, their article does feature some very nice pictures, using scanning electron microscopy, of the seeds and seed surfaces of several *Trichocerei* of interest.

Oddly they do not include seed pictures of *T. pachanoi* (but considered it renamed *Echinopsis pachanoi* (Br. & R.) Friedrich & Rowley, *T. bridgesii* (renaming it *Echinopsis lageniformis* despite *lageniformis* NEVER having had anything remotely resembling an acceptable description published) or *T. werdermannianus* (renaming it *Echinopsis werdermanniana* (Backeberg) Friedrich & Rowley)

They do include very nice microphotographs of seeds of:

- *Trichocereus macrogonus* as *E. macrogona* (Salm-Dyck) Friedrich & Rowley
- *Trichocereus peruvianus* as *E. peruviana* (Britton & Rose) Friedrich & Rowley
- *Trichocereus validus* as *E. valida* Monville
- *Trichocereus terscheckii* as *E. terscheckii* (Parmentier) Friedrich & Rowley

(For those who were wondering; yes, this is the same Gordon Douglas Rowley who attempted to saddle peyote with the very odd purportedly ‘common name’ of the “L.S.D. cactus”.)

Interestingly they make the note that their system of classifying *Echinopsis* species into clearly defined groups based on their seed morphology works within those species they believe are *Echinopsis* but fails for the rest of the *Cactaceae*.

In other words, their proposed system cannot even be relied upon to reliably distinguish *Echinopsis* seeds from those from some other genera!

A quote from Friedrich & Glaetzle may be helpful here,

“In their general characters the seeds of all *Echinopsis* species are referable to a type which is common in the subfamily *Cereoideae*. It is thus scarcely possible to recognize with certainty that some unfamiliar seed definitely belongs to *Echinopsis*. Similar seed forms also occur in quite unrelated genera. To this extent, therefore, seed forms are unsuited for determination beyond the genus.”

They also stress the importance of subdividing the genus into sections since so many differing plants are being combined.

Does this clear up the confusion or simply add to it? Who volunteers to flip a coin?

Despite his utter failure to prepare vouchers, a comment made in Backeberg 1977 springs to mind:

“The choice is clearly between the narrowly conceived genus, or a continuation without demarcations of the “lumping” process, whereby the concept of a “type-species of a genus” loses all meaning. These attempted combinations start an unwarranted series of chain-reactions.”

In few cases is this so painfully true as with the devil-may-care expansion of *Echinopsis*.

It is a shame that taxonomists seem to exist at one extreme or another with seemingly no middle ground.

I do not suggest their attempts don't have merit, what I object to is the selective rejection and acceptance of some morphological characteristics over others. Plants vary substantially from individual to individual, which is one reason that morphological classifications have such problems.

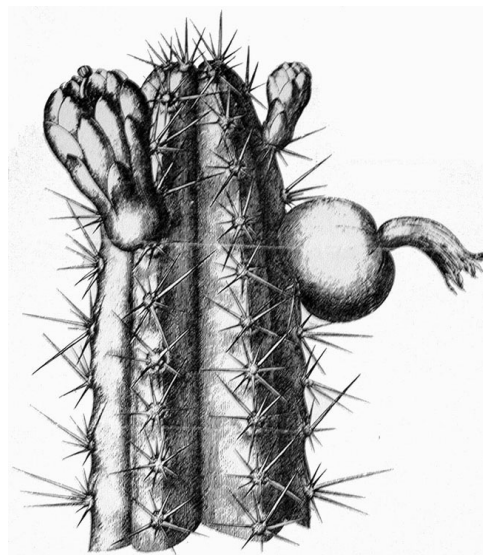


Figure 3. Schumann's confused drawing of *Trichocereus macrogonus*.

Seeds may be more consistent but they still can vary. To demonstrate this, one has only to pour a couple dozen *Trichocereus* seeds out of a single seed pack for any given species and carefully compare them using a 10X hand lens.

They also do not always agree with taxonomists (for instance *T. fulvilanus* synonymy with *T. deserticolus*).

Chemotaxonomy suffers the same problems.

However, it is suggested that taxonomists consider utilizing the two and delineating ranges of characteristics for both, to better enable accurate classification and relationship studies. If an attempt was made to better define the parameters of alkaloid expression based on such obvious things as approximate age, available nutrients, plant part and season of sampling, I suspect that most conflicting data would resolve itself nicely.

If additionally combined with actual DNA typing such is now routinely performed on a rudimentary and crude scale for forensics work, surely far more solid sets of standards could be reached and agreed upon.

Nothing new is being proposed, the technology exists for all of this. Some taxonomists fear that the conflicting data they encounter because of local variability will cause only more confusion and upset their previously accepted order.

While quantitative percentages of alkaloids may vary, it is rare that actual qualitative expression is radically changed by environmental differences when seasonal fluctuations and plant part or age variances are taken into account (There are known exceptions.) Alkaloid expression is a product of the enzymes that are present and hence mirrors elements of genetic makeup far better than simple morphology as the synthetic machinery (enzymes) is coded for by the DNA. (Terpenoids, flavonoids and unusual amino acids are also valuable markers for chemotaxonomy)

Chemotaxonomic work in the genus *Acacia* has not only supported the previously proposed major divisions but has provided new and valuable information about the evolutionary divergence and origin of some of the Pacific species. The previously proposed major divisions were supported not only by chemotaxonomic profiles based on unusual seed amino acids but also in a similar approach evaluating wood flavans.

I do not suggest that *Trichocereus* and *Echinopsis* are not allied, they clearly are, and quite closely, based on their flowers and seeds. I also agree that there is no clear dividing point between them. I would urge more thorough taxonomic work before establishing yet another point of confusion.

On balance, the absorption of *Trichocereus* into *Echinopsis* creates far more problems than it solves.

It can easily be argued that despite those species which do not cleanly fit into one or the other genus when viewed separately, the merger of the genera does not actually contribute anything of true value beyond neatly solving the otherwise problematic placement of these few species.



Figure 4. Predominate cultivar of *Trichocereus pachanoi* in Western horticulture

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