Turbinicarpus lophophoroides

Turbinicarpus lophophoroides *(Werderm.) F. Buxb. & Backebg.* in Jahrbuch Deutsche Kakteengesellschaft 1937 :27 (Buxbaum & Backeberg. 1937).

Basonym : Thelocactus lophophoroides *Werderm.* in Kakteenkunde 1934 : 176-177 with fig. (Werdermann 1934).
Synonyms : Strombocactus lophophoroides *(Werderm.) F.Knuth* in Kaktus-ABC, 356 (Backeberg & F. Knuth, 1935). ***Toumeya lophophoroides*** *(Werderm.) H.Bravo-H. & W.T.Marshall* in Saguaroland Bull. 1956 :119 (Bravo-Helia & Marshall, 1956). ***Neolloydia lophophoroides*** *(Werderm.) E.F.Anderson* in Bradleya 4 : 1-28 (Anderson, 1986). ***Pediocactus lophophoroides*** *(Werderm.) Halda* in Acta Mus. Richnov. 5 (1) : 21 (1998).

124. A beautiful specimen is ready to flower, note the colour of the very salty soil.

General comments

This turbinicarpus, one of the first discovered, almost a century ago, has remained little known for a long time, due to the difficulty, for a long period, to find it in the wild. The difficulty was probably due to the fact that the only known population at that time, located near Las Tablas, was undoubtedly subject to heavy collecting, limiting the number of individuals. Currently with the massive increase of the road network and the increase of explorations, there are many known localities where it's possible to find *T. lophophoroides* and, with the decrease of collecting of wild material, it's not too difficult to find this interesting species.
T. lophophoroides is one of the most interesting *Turbinicarpus sensu stricto* species, due to its peculiar characters: even if its seed structure is typical of the ***Lophophoroides*** **Series**, it has very large flowers, with scarcely irritable stamens, straight but thin, with a low insertion of the primary filaments, while in all the other species, (including the *Gymnocactus* and *Viereckii* Series) the insertion is high and the stamens are very irritable.
This indicates that this species has some primitive characters, lacking a strategy to maximize the pollination success. The low insertion positions make almost all the anthers at the same level, decreasing the probability of contact with pollinating insects, also because of the limited irritability.
The lack of a strategy to maximize the pollination success, can be explained by the fact that the type of environment where this taxon lives, allows insects to visit many flowers, since the plants are not hidden in crevices on sloping terrains and the flowers are very visible, so the essential mechanisms used by the other *Turbinicarpus sensu stricto* species are not necessary. Also, the *T. lophophoroides* populations, are, if left undisturbed, relatively prolific (a less advanced evolution isn't a synonym of scarce populations, otherwise pereskias and opuntias would be very rare indeed). In effect, the ecological niche occupied by *T. lophophoroides* is not linked to a particularly impervious and hostile environment (from the water availability point of view), like that of the majority of the other turbinicarpi, in fact *T. lophophoroides* is found in numerous populations located on deep and horizontal ground, and seems to replace, in the plain that extends from Cerritos and C. del Maiz to Rio Verde, the various *Stenocactus (Echinofossulocactus) spp.* that are very common, on the plain too, in the rest of S.Luis Potosì.
These peculiarities are matched at genetic level too, in fact it is one of the species (*sensu stricto*) which generally manifests the most evident hybridization problems with the other members of the genus.
From all this, it's possible to hypothesize that *T. lophophoroides* is (excluding the members of the *Kadenicarpus* subgenus) the turbinicarpus form closer, on the higher number of aspects, to that the genus' ancestor, from which all the other members have differentiated more markedly, probably due to an ancient isolation of *lophophoroides*, as hypothesized on chapter two. Even its habitat seems to confirm

Description Table

1. SEEDS	
size (mm)	1,2
shape	rounded
crest	yes
appearance of testa cells	convex
size of testa cells	medium
shape of testa cells	rounded
cuticle sculpture	striped
hilum size	medium
expansions of hilum border	2 light, lateral, toward the interior
hilum neck	medium
hilum shape	oval/rhomboidal
hilum inclination	0°
internal micropyle	no
micropyle on the border	yes
external micropyle	no
visible micropyle	yes
micropyle ext. on hilum plane	no
micropyle in a depression	yes
antimicropylar narrowing	no
2. SEEDLING	
2.1 phase 1 (f1)	
feathery radial spines	very feathery
number of radial spines	from 8 to 10
stem shape	cylindrical
distinguishable radials	yes/no
central spines	no
2.2 phase 2 (f2)	
feathery radial spines	no
radial spines	from 5 to 7
distinguishable radials	yes
radials length (mm)	from 1,5 to 3
lower radials longer than upper radials	no
central spines	no
centrals length (mm)	/
stem shape	globular/cylindrical
stem colour	green/purple
pectinate areoles	no
radials colour	white/gray - black tipped
centrals colour	/
2.3 phase 3 (f3 - preflowering)	
feathery spines	no
radial spines	4 cruciform
radials length (mm)	from 3 to 4
central spines	no
centrals length (mm)	/
stem shape	globular
pectinate areoles	no
radials colour	white - black tipped
centrals colour	/
imbibing capacity of spines	low

3. ADULT PLANT	
stem	globular/depressed
clumping	no
epidermis colour	greenish/bluish
basal section of tubercles	oval/rhomboidal
shape of tubercles	rounded
radial spines	from 4 to 5
radials length (cm)	0,5 - 1,7
radials characteristics	almost rigid
radials colour	white - black tipped
translucent radials	no
central spines	no
centrals length (cm)	/
centrals characteristics	/
centrals colour	/
imbibing capacity of spines	low
translucent centrals	/
cracked spines	no
longitudinally striped spines	yes
root	taproot
thin neck	no
4. FLOWER	
width (cm)	from 2 to 5
colour of inner segments	white/pink
colour of outer segments	white/pink with green stripe
petals shape	acute/obtuse
petals margin	regular
stamens colour	white
stamens posture	erect
irritable stamens	yes
primary filaments insertion	low
stigma colour	white
style colour	white
flowering period	May - October
early flowering	yes
flower shape	infundibuliform
self-fertile	no
5. FRUIT	
vertically dehiscent	yes
colour	brown/pinkish
ripen fruit visible	no
persistent dry perianth	no
wide scar remaining	no
relatively fleshy fruit	no
6. HABITAT	
distribution range	very wide
soil type	clay plains and salty deposits
ground inclination	none
sympatric with Turbinicarpus	no
sympatric with Neolloydia	yes
hybrids present	no

this, as it's much more unlikely that an entity specialized to a rocky and very drained, hilly environment, could adapt to an alluvial plain than vice-versa. Furthermore, while in a hilly environment, just by moving a little, it's possible to find a completely different species living in apparently similar environment, *T. lophophoroides* maintains its characters almost the same in all its distribution range. This thesis can also be backed by statistics: if each turbinicarpus species is taken as a possible ancestor of the genus, and all the possible distinct evolution paths that depart for its habitat are considered, it would be possible to note that the number of paths that originate from the area of distribution of *T. lophophoroides* is much higher than all the rest of the genus' members; in addition, the farther we move from its habitat, the more the points in common with the other turbinicarpi during the juvenile phases, decrease.

125. A habitat of *Turbinicarpus lophophoroides* south of Las Tablas. Here the soil is clayish mixed with calcareous gravel.

Habitat

The habitat can be a sparse grassland with herbs like *Sporobolus spp*, adapted to salty soils, or very open woodland with *Huizache* and *Mezquite*, small trees that often bear on their branches *Selenicereus spinulosus*, and open land where several opuntias are found. *T. lophophoroides* is the only taxon of the genus specialized to growing on salty plains with mostly gypsum soil, that are seasonally flooded with great concentration of salts and pH that can in some areas exceed 9, thriving in large numbers in some areas, at an altitude between 800 and 1150 m above sea level.

126. Left, two young specimens of *Turbinicarpus lophophoroides*, the smaller in f1; note the cruciform spines of the other one (in f3).
127. Right, an old specimen fissured by the heavy rains.

It's also possible to find it south of Las Tablas on clay soil with limestone gravel, where the quantity of gypsum and salts is very low.
Generally the cactus that is often found in association with *T. lophophoroides* is *Coryphantha maiz-tablasensis,* since it can live in the same soil type, while in the immediate vicinity, where the concentration of salts is lower, it's possible to find *Lophophora viridescens (Peyotl viridescens), Ariocarpus kotskoubeyanus* and *Ancistrocactus uncinatus.*
However, it's also possible to find it south and west of Las Tablas, even on clayish soils and calcareous gravel, with a very low quantity of gypsum and salts, and here it lives, in addition to the above mentioned cacti, with members of the genus *Mammillaria, Thelocactus*, etc.

Distribution

The distribution range of *T. lophophoroides* is very large and extends over the big central depression of the State of San Louis de Potosì, making it a zone no less than 1700 square kilometres wide (Sotomayor et al.), situated between the counties of Ciudad del Maiz on the north, and Cerritos-Villa Juarez on the west and Rio Verde on the south.

This area is not uniformly populated, the species is rather distributed in island whose populations range from a few individuals up several tens of thousands of specimens, normally linked with salty soil, recognizable by the gray-white colour and the different type of vegetation to which it's associated, generally low and sparse. The concentration can reach the 60 specimens/sq meter (Sotomayor et al.), but it's generally much lower.

Variability and adaptations

Generally speaking, *T. lophophoroides* doesn't exceed a diameter of 4.5-5 cm and appears globular-depressed retracting heavily into the ground during the dry season, so much that it can disappear until the following rains don't bring it to its original dimension and make it reappear on the surface.

The flower, as already said, is rather large, even though there are populations (S. Bartolo), that produce a flower often no larger than 2-2.5 cm of diameter. This could be explained by the fact that in this populations the plants rarely exceed a diameter of 3 cm, while the larger specimens are often victims of insects larvae. More interesting populations are found SE of Cerritos, where the plants attain exceptional dimensions, almost 10 cm of diameter, coupled with a very high morphological variability, with 2 or even 6 spines per areole; very interesting is the northernmost population, near La Morita, especially for the number of individuals, made by approximately several thousands of individuals, that can be sometimes larger that 7 cm of diameter, but are equipped with rather small tubercles, so small that they look similar to *S. disciformis.*

128. Flowering *Turbinicarpus lophophoroides* in cultivation.

Situation

T. lophophoroides is, as already mentioned, still very abundant, and thus doesn't appear to be in immediate danger of extinction. However, there are some factors that can bring to the reduction or elimination of certain populations, resulting in a serious loss from the point of view of the intraspecific variability: with the recent construction of the supercarretera that connects Rio Verde with Cerritos, a whole population has been wiped out, while other road works strongly threaten the populations near them; urban expansion and excavation of construction material can also cause heavy losses, as well as the illegal collection of plants, an event that has become rather limited, due to the abundant production of specimens by many nurseries worldwide, while in the past it would have seriously limited the few known populations. Many plants are prey of insects larvae, but this is part of the natural selection process, and wouldn't cause much damage if external factors wouldn't amplify its effect.

Cultivation

T. lophophoroides is probably the most difficult turbinicarpus in cultivation, since it's a plant strictly adapted to a specific type of soil and to an alternation of very dry periods and short periods almost submerged by water.

This is reflected in cultivation by a high sensibility to rot, particularly the plants that descend from southern populations, and especially after the first flowering.

The following are then the suggested techniques:

- A percentage between 10 and 30% of natural gypsum could be added to a very well drained soil, since it's a well accepted material and it helps strengthen the tissues. It's also essential to have a very low humus content in the soil.
- Watering should be rather infrequent, no more than once a month for adults plants during the hot

season, but abundant, so that the soil becomes completely soaked. The fact that the plant retracts into the soil and assume a gray-green colouring between waterings, is perfectly natural and doesn't cause any damage. Watering should absolutely be suspended during the winter months or when night temperatures remain below 10° C, a good compromise in the Italian climate is to suspend watering at the end of September and to resume them at the beginning of May, giving just periodic nebulizations with deionized water during the rest period.

- *T. lophophoroides* is well adapted to full sun exposure for the entire day, where it obtains a flat natural looking; during the summer months, very hot in Italy, it could be beneficial to mimic the natural conditions e position sparse branches above the plants, in order to create an alternation between sun exposure and shadow. It is also important for this species to assure a good ventilation, especially during the summer months, whereas it's suggested to keep it outside.
- For feeding, phytosanitary treatments and repotting, follow the generic tips.

Notes for the neophyte

Even if this species is easily distinguishable from the other turbinicarpus, when young it can be confused with *T. jauernigii* and *T. bonatzii* from which it differs by the fact that the first has (sub)rigid spines, much thinner and gray, and almost flat tubercles, while the second has rather flexible, gray-yellowish sub-papery spines, and slightly pointed tubercles, while *T. lophophoroides* has white black-tipped, rather prickly, rigid spines, and well in relief, rounded tubercles.

The epidermis' colour too helps in separating them, since there's a chromatic difference, even more marked during the winter rest season: in *T. lophophoroides* it's bluish-gray, while in *T. jauernigii* it's olive-green (with a reddish tinge), and in *T. bonatzii* it's violet-.green.

When adult, *T. jauernigii* looks rather different than *lophophoroides* particularly because of the single short and rigid spine on each areole, while *T. bonatzii* can be recognized at a first glance, the flowers' colour and the flowering period, as shown in the table, don't leave any doubt.