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ETHNOBOTANICAL SEARCH FOR HALLUCINOGENIC CACTI¹

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Summary

The Mexican "peyote" cactus, *Lophophora williamsii*, is one of the best known of hallucinogenic plants. Several botanical, chemical and pharmacological studies have centered on this small cactus. In view of this great interest it is surprising to find a large problem complex closely connected with the peyote cactus, but much less studied. This "peyote complex" covers all the other Mexican cacti with supposed hallucinogenic or psychoactive properties.

We have performed a literature search for cacti which are either ritually employed, used for their stimulant or narcotic properties, or called peyote. *Pachycereus pecten-aboriginum*, *Mammillopsis senilis* and *Mammillaria beyderi* have been reported in the literature as being used by the Tarahumara Indians of northern Mexico, but these reports seem to have been largely overlooked.

Screening for alkaloids and chemical studies provide further starting points for the ethnobotanist. A *Lophophora* population in Querétaro, Mexico, has been shown to produce predominantly tetrahydroisoquinoline alkaloids and almost no mescaline. Has this "peyote" been used ceremonially by the Indians? We don't know as yet.

Carnegiea gigantea and *Coryphantha macromeris* have yielded psychoactive alkaloids, but in our search for the ethnobotany of these cacti, we have so far not found them used aboriginally as hallucinogens. Recent lay publications have however suggested *Coryphantha macromeris* as a "natural and legal" psychoactive drug.

To further our understanding of cactus hallucinogens, more studies should be performed by botanists and chemists working together. Above all, however, there is a great need for ethnobotanical field studies of this interesting group of plants.

A member of the cactus family, *Lophophora williamsii*, is one of the best known of hallucinogenic plants. This Mexican cactus, called peyote, has been used for centuries by the Indians to induce visions and as a medicine, and several botanical, chemical and pharmacological studies have centered on this small plant. In view of this great interest it is surprising to find a large problem complex closely connected with the peyote cactus, but much less studied. This "peyote complex" covers

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all the other Mexican cacti with supposed hallucinogenic or psychoactive properties.

I would like here to discuss some different approaches that can be, and have been followed in the ethnobotanical search for these plants. Some additions will be made to the published lists of psychopharmacologically interesting cacti, and the need for ethnobotanical and phytochemical research will be pointed out.

Few field studies of the peyote complex have been published. Such studies may however still be the best way to learn about the native uses of these cacti. Two Indian tribes in Mexico, the Tarahumaras and the Huicholes, still gather and use *Lophophora williamsii* in a living tradition. Recently an American anthropologist studying the Huicholes reported that the Indians have a knowledge of "other cactus plants which resemble the true peyote - *Lophophora williamsii* - but which have undesirable psychological effects". One of these "false peyotes" known to the Huicholes and now discovered is *Ariocarpus retusus* [4]. Further investigations will certainly reveal more facts and probably also other species which are considered evil by these Indians.

Compared with the Huicholes, the Tarahumara Indians seem to recognize a wider variety of sacred and magical cacti [8]. Their main psychoactive species is also *Lophophora williamsii*, but Humboldt [cf. 7, 11] tells of several cacti that are used in the same way or avoided because of their properties. Some of these cacti are still unidentified, others seem to have been largely overlooked by botanists and chemists alike.

I have for some time now been scrutinizing all cactus publications that have come to my attention, and it is my firm belief that much is left to do in the literature search for hallucinogenic cacti. To exemplify this, I would like to draw attention to three of these overlooked cactus species which have been used by the Tarahumara Indians. The plants in question are *Mammillopsis senilis*, *Mammillaria heyderi* and *Paubycereus pecten-aboriginum*.

Mammillopsis senilis was described as a "sacred cactus" of the Tarahumaras by J. N. Rose, outstanding botanist and co-author of the classic work "The Cactaceae". In an 1899 publication, entitled "Notes on useful plants of Mexico", Rose writes: "Considerable has been written of a more or less fanciful character regarding plant worship among the Mexican Indians. While I obtained no special information along this line, I succeeded in obtaining specimens which have enabled me to identify accurately some of the plants reported to be used for this purpose". One of these plants was *Mammillopsis senilis*, but the information was not repeated in the later work "The Cactaceae", and I have not seen it mentioned anywhere else [9].

More information regarding the Tarahumara Indians can be found in the Tarahumara English dictionary compiled by the Swedish explorer Ivar Thord-

Gray [13]. Among other things, we are told that "only the shaman is umeru-ame (powerful) enough to locate wizards and witches. To do this he will make medicine from ball-cactus wichu-ri-ki (*Mammillaria heyderi*, Mex. biznaga), which is greatly feared for its magical powers. This medicine will clear his vision. It matters not how well the suku-ru-ame [wizard, witch] is hidden, the shaman can see him clearly."

Mammillaria heyderi is also used as a medicine to cure or relieve headaches [13]. "This medicine will also make the foot light and increase the speed of a runner in a race." The known cactus alkaloid N-methyl-3,4-dimethoxyphenethylamine has now been identified by us in extracts of this plant.²

According to Pennington, young branches of *Pachycereus pecten-aboriginum* are crushed and the expressed juice is mixed with water. This mixture is drunk in ceremonies and is said to produce "dizziness and visions" [8]. Tetrahydroisoquinoline and phenethylamine alkaloids have been found in *Pachycereus pecten-aboriginum* [1], but much more ethnobotanical and chemical information is needed on this and all the other cacti employed by the Tarahumara Indians.

Valuable data may also be hidden in unpublished field notes. We have been told by cactus botanists that *Pelecyphora pseudopectinata* is sometimes called "peyote" in Mexico [5]. This cactus is not included in the published lists of peyote cacti [10, 11], and ethnobotanically we know nothing about it. The main alkaloid, however, is hordenine, wellknown from several other cacti.²

The name "peyote" alone must not lead us to believe that all plants so called are true hallucinogens. An example is *Obregonia denegrii*, which has been repeatedly published as a peyote cactus [10]. When we collected this plant in the valley of Jaumave, Mexico, our native guide explained very clearly that "peyote" is a different plant and that *Obregonia denegrii* is not employed in folk medicine.

Obviously the older literature reports need a critical reevaluation. Also, the name "peyote" may be given to a plant not only on account of its toxic properties, but just because it looks like *Lophophora*.

Peru has long had its counterpart to the Mexican "peyote" in "San Pedro", known to botanists as *Trichocereus pachanoi* [11]. This plant is the chief ingredient in a mixture of several plants, called "cimora", which is used medicinally and for divination. Among the ingredients in this mixture are two other cacti, *Neoraimondia macrostibas* and a member of the genus *Cactus* [3]. These plants should be interesting objects for phytochemical studies. Our limited knowledge of the

² Bruhn, J. G. and C. Bruhn, To be published.

psychoactive cacti of Peru may indicate that the "San Pedro" complex is smaller than its Mexican equivalent, but it could also point to the lack of field studies.

Screening for alkaloids and chemical studies provide further starting points for the ethnobotanist. Analysis of Mexican populations of *Lophophora* has shown that the most southern population, sometimes called *Lophophora diffusa*, produces predominantly tetrahydroisoquinoline alkaloids and almost no mescaline [14]. Mescaline is so far the only peyote alkaloid that is visually hallucinogenic, and so there may be a difference in "hallucinogenic value" between various populations. It would be an interesting problem, trying to verify whether *Lophophora diffusa* has been ritually employed or is regarded as inferior to the mescaline-producing northern "peyote".

On the other hand, mescaline is the main alkaloid not only of *Lophophora williamsii* and *Trichocereus pichanoi*, but of other *Trichocereus* species as well [1]. So far we don't know if these other species have been utilized by South American Indians for their psychoactive properties. Among these mescalinerich *Trichocereus* species are *Trichocereus taquimbalensis*, *Trichocereus validus* and others.

Two cactus alkaloids that have been reported to cause hallucinations in test animals are gigantine and macromerine [6]. Gigantine was isolated from *Carnegiea gigantea*, the giant cactus of Arizona, which has been extensively used by the natives for many purposes. A wine is fermented from the fruits of this cactus and used in the Rain Ceremonies of the Papago Indians. The alkaloids, however, are apparently not involved in any ceremonial or drug use [2].

In our search for the ethnobotany of *Coryphantha macromeris*, the source of macromerine, we have as yet not encountered any aboriginal use. After the publication of the phytochemical reports, this cactus was suggested in lay publications as a "natural and legal" hallucinogenic drug [12].

As seen from the above, there is a great need for ethnobotanical field studies of this interesting group of plants. More studies should also be performed by botanists and chemists working together. The best way to find and understand the cactus hallucinogens is probably through such integrated research.

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