

BOTANICAL MUSEUM LEAFLETS

HARVARD UNIVERSITY

CAMBRIDGE, MASSACHUSETTS, JUNE 27, 1975

VOL. 24, No. 5

ETHNOBOTANY OF THE WESTERN TARAHUMARA OF CHIHUAHUA, MEXICO

I. NOTES ON THE GENUS *Agave*

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INTRODUCTION

The genus *Agave*, native to Mexico and southwestern United States, has played an important role in the material culture of the peoples who lived in its range. In the Greater Southwest, various species played a part in almost every aspect of aboriginal life (Castetter, Bell and Grove, 1938; Gentry, 1972: 9-11). Even in industrialized Mexico, the maguey plants are important sources of commercial fibre (sisal and henequén) and fermented beverages (pulque).

In southwestern Chihuahua, several species of *Agave* are still important to the Tarahumara Indians, although the intensity of some uses has decreased. From the first European observations to the present, numerous writers

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³ A Western Tarahumara from Municipio of Guazapares who is writing a series of booklets in Tarahumara and Spanish under the direction of Mr. Burgess (cf. Mares, 1972 and 1974).

have commented on the many uses and functions of maguey or the mescal plant. In a future paper, Bye will review these reports with respect to the Tarahumara as a whole. We now propose to review the utilization and significance of the magueys to one group, the Western Tarahumara⁴. This paper is the first part in a series on Western Tarahumara ethnobotany in which we plan to present information on and discussions of plants used by the natives living on the eastern slopes of the Rio Chínipas drainage area in the Municipios of Guazapares, Chínipas and Uruachi in southwestern Chihuahua. The Rio Chínipas, a tributary of the Rio Fuerte, originates west of the Continental Divide near Creel.

Eight species of *Agave* which occur in western Tarahumara region will be discussed⁵. Most of the species are restricted to the northern Sierra Madre Occidental and range from the arid sub-tropical vegetation of the barrancas to the cool pine forests of the sierras. Table I summarizes the range, elevation and ecological association of the Western Tarahumara agaves.

UTILIZATION

Agave is first and foremost a source of food. The common method in preparing the heart (i. e., the secondary thickened stem with compacted nodes) and leaf bases consists of pit-baking, usually by the men. Plants are selected by size and degree of development of the inflorescence bud. The leaves near the centre around the swollen flower stalk bud are usually disposed in a series of smaller leaves contrasting with the previous larger ones. Harvesting the plant just prior to the elongation of the large inflorescence when the concentration of energy-

⁴ Tarahumara Baja, according to Mexico's Instituto Nacional Indigenista.

⁵ Consideration of other species found to the east and not recognized by the Western Tarahumara will be deferred to a later paper.

rich sugars is highest is done by all people who eat maguey hearts. Pit-baked magueys are an important food source at the time of year when food stores of the previous growing season are dwindling and before the arrival of summer rains which are needed for the growth of wild greens and cultivated plants. Occasionally, magueys are pit-baked at other times of the year.

The plants are dug up with a pointed stick, an iron bar or an old ax. Then the outer leaves are trimmed with a machete, leaving the hearts and leaf-bases. A wooden hook is inserted into the bottom of each heart, two of which are tied together and placed over a burro to carry to the pit. If people are carrying the hearts and the distance to the pit is great, the leaf-bases are cut off and carried separately in a basket.

A fire, usually of green oak wood (*Quercus* spp.) is built in the pit with rocks placed on top of the wood. Hard, heavy rocks are chosen, since they hold heat longer. The round pit is usually about three feet deep and five feet wide. The same pit is used year after year. About noon, when the fire has burned down to coals and the smoke, which would give the hearts a bad taste, no longer comes out, the pit is ready for use. If the coals are too hot, a layer of earth is placed over them. Then the mescal hearts with the leaf-bases still intact are placed in the pit. Sometimes a stick of "rolobusi"⁶ (*Bouvardia* sp.) is inserted into each heart to assure sweetness in cooking. If "rolobusi" is not available, leaves of "usabi" (*Prunus Gentryi*) are placed on the hot rocks at the bottom for the same purpose. After the hearts are in the pit, the pit is covered with leaves of a palm (*Sabal uresana*). Then a layer of soil is placed over the top and left for

⁶ Western Tarahumara belongs to the Uto-Aztecan family of languages. It is written here using the Spanish orthography with the addition of the glottal ('). The r's and l's differ from Spanish in that they are retroflexed.

two nights. On the morning after the second night, if the tops of the mescals are not done, the hearts are removed and the fire rebuilt under the rocks. Then the hearts are turned over, replaced in the pit, covered again and left for another day. If still not sufficiently cooked, they may remain in the pit-oven an extra day.

Upon removal, the hearts and leaf-bases are loaded into gunny sacks and baskets and taken to the house. They are either eaten by themselves or oftentimes with a corn drink, "gue'hualí" (Spanish: esquiata), or a corn gruel, "atónali" (Spanish: atole). The sweet flesh of the heart is eaten and the fibres spit out. The heart is sometimes ground and mixed with tortilla dough. The preparation and consumption of agaves have been described for other areas of the Tarahumara region (Pennington, 1963: 129-131; Bennett and Zingg, 1935: 148-149). The hearts of *Agave pacifica*, *A. Shrevei*, *A. multifilifera* and *A. polianthiflora* and the leaf-bases of *A. americana* var. *expansa*, *A. multifilifera* and *A. polianthiflora* are all pit-baked and eaten.

"Suguí" (Spanish: tesgüino), a fermented beverage, can also be made from the well cooked mescal. In areas where agaves are plentiful, only the leaf-bases are used. In other areas, the hearts are also used. The mescal is thoroughly mashed in a trough or hollow rock with a large mallet cut from the limb of an oak (*Quercus* spp.). The juice is collected and strained, first through a coarse basket, then a cloth. After straining, the sweet juice is cooked in a large pot by women, until all of the impurities have come to the top and are skimmed off. Following the cooking, the juice is placed in a large-mouthed pot to cool and then put into a fermenting pot, "sicolí ronela" (Spanish: botija), where it is left for two or three days. The process can be speeded up by adding the juice of sprouted corn (*Zea Mays*) that has been ground, cooked

and strained. Water is added if the "imé" juice is too strong. When the bubbling of the fermenting process begins to slow down, a handful of ground wheat (*Triticum aestivum*) is added. Then, within five to six hours, the "suguí" is ready to drink. If the drink is not to be used for several days, the pot is sealed with a board and mud. This will keep the drink from going bad for six to eight days. *Agave bovicornuta* is said to make a stronger "suguí" than the other species. *A. americana* and *A. vilmoriana* are the only species not used for making the fermented drink.

Tarahumaras also dry the roasted mescal so that it will last five to six months (during the dry season). The outer fibres are removed from the cooked leaf-bases and the meat is mashed, as when making "suguí", and then ground on the "majtá" (Spanish: metate). It is then shaped into a cylindrical cheese form and placed in the sun to dry for a week. This "mesagoli" or "imé cha'poli", mescal bread, is especially good food for long trips. It is carried in a bag of "cobisi" (Spanish: pinole), toasted corn grain that is ground dry into a powder and later mixed with water to drink, and used as a trail food. *A. pacifica* is not used to make "mesagoli", since it is not so sweet, has less meat and the fibres are harder to chew.

The emergent flower stalks, "balilá" (Spanish: quiote), are eaten as well. A young, tender stalk can be cut from the plant and roasted on coals. Then it is peeled and eaten. The taste is similar to that of the squash. It can also be chopped up, boiled, and mixed with the whey left over from making ranch-style cheese. When a stalk has elongated about a yard, the top foot is cut off and the remainder is peeled and roasted in the pit-oven along with mescal hearts and leaf-bases. The decapitated plant is allowed to grow and is cut the following year for pit-baking when it is sweeter. In other parts of the Tara-

humara region, the prepared stalks are eaten with "gue'huali" (Spanish: esquiata), toasted corn ground with water, and "cobisi", but this practice is not common in the western region. The stalks of species of the subgenus *Agave* are eaten, while those of the members of subgenus *Littaea* are not because of their bitterness or small size.

If the stalks be allowed to develop, the unopened flowers with the inferior ovaries removed are cooked and washed to remove the bitter constituent. The cooked flowers can be eaten boiled, fried or made into tortillas. The sweet nectar is likewise gathered with a small tube for consumption. The flowers of *Agave bovicornuta*, *A. pacifica*, *A. Shrevei* and *A. Wocomahi* are eaten. The flowers of *A. bovicornuta* are preferred as food because of their better taste and as they are available when there is little other food. On the other hand, flowers of *A. Wocomahi*, which appear during the rainy season, are not often collected, since there are many other preferred greens (Spanish: quelites) available at that time.

Tortillas made from the perianth of the maguey flowers are especially valued by Western Tarahumara. The unopened flowers are cut from the large inflorescence. Usually a hooked pole is used to gather the flowers, so that the stalk is not broken, and the underdeveloped flower buds are allowed to develop for future gathering. The flowers are put on the house roof and collected early the next morning, when they are much sweeter. They are cooked well and washed overnight in the arroyo to remove the bitterness. The next day they are ground with lime-cooked maize, or "najpili" (Spanish: nixtamal), and made into tortillas. Some cooked flowers are retained for later frying to be eaten with tortillas.

Fibre is extracted from the leaves of *Agave multiflora* and *A. pacifica*. The larger leaves are cut, beaten

and placed in water. The tissue surrounding the fibre bundles rots away. The resulting fibres are washed in the arroyo and commonly used in making lassos and domestic rope.

Stupefying fish with agaves is well known among the Tarahumara (cf. Gentry, 1972: 11, 89). The Western Tarahumara use *Agave Vilmoriniana*, which is rich in sapogenins, and *A. bovicornuta* and *A. Wocomahi*, the toxic constituents of which are unknown, to stupefy fish trapped in rock enclosures in the rivers. The plants are mashed on a rock, the juices are allowed to drain into the river and, finally, the mashed plants are thrown into the water. Several plants are needed rapidly to stupefy the trapped fish which, upon reaching the surface, are collected and prepared.

The crushed leaves of *Agave Vilmoriniana*, which is rich in the sapogenin smilagenin, are prized as soap for bathing and washing clothes, wool, blankets and dishes. Not all "ahué" leaves are good for washing. The whiter leaves are chosen over the greener ones which produce too strong a soap, especially for washing hair. Another method of selection is to twist the end of the leaf. If it breaks, that leaf is not used.

Ritual curing with agaves is important to the Tarahumara ceremonies (Lumholtz, 1902: 321-322, 363). Small plants of *Agave Shrevei* are placed in pots of water in front of the cross during fertility rites for sheep and goats and in ceremonies for the dead.

DISCUSSION

About 300 years ago, the Tarahumara retreated westward and assimilated various tribes of close cultural and linguistic affiliations (Pennington, 1936: 8, 9, 229, 230, Map I). Today they number about 50,000 (Pennington, 1963: preface). The Western Tarahumara are geographi-

cally isolated from the mainstream Tarahumara and live east of the Guarijio (Warihio). They number fewer than 10,000 (Burgess, 1970: 64).

The Western Tarahumara recognize two groups of *Agave*⁷. They recognize the group "imé" (subgenus *Agave*) through its leaf with terminal and marginal spines and through the paniculate inflorescence. The "imé" group includes: "galime" (*A. americana* var. *expansa*), "sa'puli" (*A. bovicornuta*), "gusime" (*A. pacifica*), "o'tosá" (*A. Shrevei*), and "ojcome" (*P. Wocomahi*). The introduced succulent, *Aloe vera* (Liliaceae), superficially resembling the maguey plant, is not widely considered an "imé" although it is called "imé me'tagochi". The second group (subgenus *Littaea*) is recognized through its leaf with a terminal spine and smooth margin and its racemose inflorescence. This group includes "chahuí" (*A. multiflora*), "ri'yéchili" (*A. polianthiflora*) and "ahué" (*A. vilmoriana*). The group carries no generic term. Some Western Tarahumara include "chahuí" and "ra'yéchili" in the "imé" group because they are pit-baked and eaten.

There is a striking similarity and contrast in the recognition of the species of *Agave* among the Western Tarahumara, the Guarijio to the west and the Tarahumara to the east. It may be explained by the geographical distribution of the magueys and, in part, by the historical past. Table II summarizes the names of the eight species of *Agave* occurring in the Western Tarahumara region.

In subgenus *Littaea*, *Agave multiflora* and *A. Vilmoriniana* are similarly recognized and domestically used by all three groups. One possible explanation is that the

⁷The Spanish word, "mescal", is locally used for the plants of *Agave*, but in other parts of Mexico this term is applied to a distilled beverage made from the *Agave* plant.

leaves and fibres of "chahuí" and the sapogenin-rich leaves of "ahué" can be easily transported and traded throughout the area. On the other hand, food and fermented beverage made from the members of subgenus *Agave* are prepared and consumed near dwellings and can not easily be transported (except mescal bread). *A. polianthiflora* is presently known only from Western Tarahumara region and adjacent Sonora. *A. americana* var. *expansa* is not reported from the Guarijio or Tarahumara regions.

Another significant point is that the species of *Agave* here discussed are commoner on the western slopes and barrancas of the Sierra Madre Occidental. The diversity of species of subgenus *Agave* is greater toward the west (cf. Gentry, 1972). The increased diversity of "imé" encountered by the westward moving ancestors of Western Tarahumara could be handled by an expanded nomenclature borrowed from an assimilated tribe, such as the Guazapar. The language of the Guazapar was said to be the same as Guarijio, although it resembled Tarahumara (Pennington, 1963: 9).

BOTANICAL LIST OF *Agave*

Subgenus *Agave*

Agave americana L. var. *expansa* (Jacobi) Gentry,
U.S.D.A., Agric. Handbook no. 399, p. 80. 1972.
Western Tarahumara: GALIME (house maguey)
Mexican: mescal maguey

This large maguey, cultivated near houses, produces easily transplanted sucker shoots or "ranala" (Spanish: hijos). Its antiquity among the Western Tarahumara is unknown, and it is not reported from any other nearby regions of southwestern Chihuahua and adjacent Sonora. Gentry (1972: 84) suggests that it was introduced north-

ward into Sonora and southwestern United States, probably as an ornamental, after 1850.

The bases of large leaves, pit-baked and eaten or prepared as mescal bread, are sweet, bland and lack fibres. One large plant usually provides sufficient material to fill a large baking-pit. Since other parts of the plant—the stalk, flowers and heart—are bitter, they are not consumed.

SPECIMEN: CHIHUAHUA: Municipio de Guazapares, Rocoroibo, ca. 6000 ft. Cultivated plants about 6–8 feet high near governor's house, associated with spineless *Opuntia*, apple and peach trees. Nov. 10, 1973. Bye and Burgess 5827.

OBSERVATION (by R. Bye):

CHIHUAHUA: Municipios de Guazapares y Chinipas, Wasachi, ca. 6000 ft. A recently transplanted linear plantation near walls of a ranchito in the open flat above arroyo. July 23, 1974.

Agave bovicornuta Gentry, Carnegie Inst. Wash.
Pub. 527, p. 92. 1942.

Western Tarahumara: SA'PULÍ (meat barranca: meaning uncertain)

Mexican: mescal lechuguilla

This attractive maguëy is found in the middle zone of the barrancas associated with oaks (*Quercus* spp.). The flowers, well washed to remove the bitterness, are eaten cooked or in the form of tortillas and are preferred to those of other species in making tortillas. The hearts are baked and used in preparing a strong "suguí" which is said to be similar to "pisto", the local Mexican distilled alcohol from *Agave* and *Yucca*. The caustic juice of the leaves causes a burning irritation, followed by white blisters, on sensitive skin. The plant is employed to stupefy fish.

SPECIMEN: CHIHUAHUA: Municipios de Guazapares y Chinipas, between Cusárare and Nopalero, ca. 3500 ft. Scattered plants on rocky slopes of the barranca associated with oaks (*Quercus* spp.) and below the mixed oak and pine forests. Nov. 8, 1973. Bye, Burgess and Mares 5806.

OBSERVATION (by R. Bye):

CHIHUAHUA: Municipios de Guazapares y Chinipas, between Wasachi and La Paz, ca. 5000. Scattered plants in the lower section of the mixed oak and pine forest. The leaves are a light yellow-green. July 23, 1974.

Agave pacifica Trel., U.S. Natl. Herb. Contrib. 23: 118. 1920.

Western Tarahumara: GUSIME (maguey of the woods or stick maguey)

Mexican: mescal del monte (wild plant)
mescal casero (cultivated plant)

Found in the lower parts of the arid sub-tropical barrancas in short thorn forest, *Agave pacifica* produces sucker shoots which are transplanted near dwellings in the lower oak (*Quercus albocincta*) zone of the middle barranca zone. Considered the most delicious and difficult to collect in the field, this species is often grown near the houses. It also became popular with the Spaniards and Mexicans who settled in the deep canyons and later transplanted and cultivated it.

The hearts of the cultivated plants are larger than those of the wild plants. The baked hearts are sweet and consumed baked or in the form of fermented drink. The flowers are eaten cooked or in the form of tortillas. The fibres from the leaves provide cordage and thread.

SPECIMEN: CHIHUAHUA: Municipios de Guazapares y Chinipas, Cusárare, ca. 3000 ft. Cultivated plants, whose suckers originated from the wild in the lower parts of the barranca, in a hollow at the base of a field "trinchera" or stone retaining wall near a ranchito. Plants about 5 feet high with the "quiotes" cut off. Associated with such woody plants as *Ipomoea arborescens* and *Randia* sp. Nov. 8, 1973. Bye, Burgess and Mares 5796.

OBSERVATION (by R. Bye):

CHIHUAHUA: Municipios de Guazapares y Chinipas, below La Paz, ca. 3500 ft. Cultivated plants along a stone fence and margin of field near house surrounded by a peach orchard. In the lower oak (*Quercus albocincta*) zone. July 25, 1974.

Agave Shrevei Gentry, Carnegie Inst. Wash. Pub.
527, p. 95. 1942.

Western Tarahumara: o'tosá (white, plural form)
Mexican: mescal blanco

This whitish appearing plant is scattered in open areas in the middle and upper zones of the barrancas in the oak and mixed oak and pine vegetation. The hearts are pit-baked for eating or are employed in making mescal bread or a fermented drink. The stalks are also cooked for food. Small plants are used in curing and in death ceremonies.

SPECIMEN: CHIHUAHUA: Municipios de Guazapares y Chinipas, Nopalero, ca. 4000 ft. Small scattered plants on open, rocky slope with mixture of oaks (*Quercus* spp.), pines (*Pinus* spp.) and *Nolina matapensis*. Some plants with "quiotes" removed. Nov. 9, 19373. Bye and Burgess 5813.

Agave Wocomahi Gentry, Carnegie Inst. Wash. Pub.
527, p. 96. 1942.

Western Tarahumara: OJCOME (pine maguey)
Mexican: mescal verde

A small maguey, *Agave Wocomahi* is found scattered in rock crevices in the sierras among pines. Baked hearts can be used to make "suguí" and "mesagoli", although some hearts are said to have a bad taste and are not ingested. The flowers are an acceptable food but are not eaten, as they appear at a time when there is an abundance of other greens.

SPECIMENS: CHIHUAHUA: Municipios de Guazapares y Chinipas, Nopalero, ca. 4000 ft. Few scattered plants on open, rocky slope with a mixture of oaks (*Quercus* spp.) and pines (*Pinus* spp.). The plants are commoner above. Nov. 9, 1973. Bye and Burgess 5812.—Municipio de Guazapares, Rocoroibo, ca. 6000 ft. On rocky, open slope above arroyo with mixed oaks (*Quercus* spp.), pines (*Pinus Engelmannii* and *P. ponderosa*) and madroños (*Arbutus* spp.). This plant was more robust than usual because of the moist site. Nov. 10, 1973. Bye and Burgess 5835.

Subgenus *Littaea*

Agave multifilifera Gentry, U.S.D.A., Agric. Handbook no. 399, p. 46. 1972.

Western Tarahumara: CHAHUÍ

A medium sized plant, "chahuí" grows in rock outcrops in the upper zone of the barrancas in the mixed oak and pine vegetation. The hearts and leaf bases are pit-baked, eaten or made into "mesagoli" and "suguí". The leaves are an important source of fibre.

SPECIMENS: CHIHUAHUA: Municipios de Guazapares y Chinipas, near Nopalero, ca. 4000 ft. In crevices of rocks in the mixed oaks (*Quercus* spp.) and pines (*Pinus* spp.). Nov. 8, 1973. Bye, Burgess and Mares 5783. —Municipio de Guazapares, along ridge above Nopalero, ca. 5000 ft. Few scattered plants in rock crevices on outcrops in mixed oaks (*Quercus* spp.), pines (*Pinus* spp.) and *Arctostaphylos pungens*. Nov. 9, 1973. Bye and Burgess 5819.

Agave polianthiflora Gentry, U.S.D.A., Agric. Handbook no. 399, p. 51. 1972.

Western Tarahumara: RI'YÉCHILI

This small, attractive and infrequent maguey grows on partially open rocky slopes and outcrops in the mixed oak and pine forest in the upper zone of the barrancas. The hearts and leaf bases were formerly eaten as food and employed to make a fermented drink.

SPECIMENS: CHIHUAHUA: Municipios de Guazapares y Chinipas, above Nopalero, ca. 4500 ft. Few scattered plants in whiterock crevice in open spots with oaks (*Quercus* spp.), pines (*Pinus* spp.) and *Arctostaphylos pungens*. "Quiotes" about one foot high. Nov. 7, 1973. Bye, Burgess and Mares 5779. — Below Wasachi, ca. 5500 ft. Few scattered plants on open, moist rocky surface with mixed oaks (*Quercus* spp.) and pines (*Pinus* spp.). "Quiote" about one foot high with flowers rose. July 23, 1974. Bye, Burgess and Mundy 6414.

Agave Vilmoriniana Berger, in Fedde Repert. Spec. Nov. Reg. Veg. 12: 503. 1913.

Western Tarahumara: AHUÉ

Mexican: amole

These spider-like plants cling to the vertical rock walls of the barrancas from the lower arid sub-tropical region to the higher cooler region. The plant is not eaten. The leaves provide a soap for bathing and washing clothes, wool blankets and utensils, while the macerated plants are used as a fish poison.

SPECIMEN: CHIHUAHUA: Municipios de Guazapares y Chinipas, between Nopaleño and Cusárare, ca. 3500 ft. Scattered plants found on protected vertical walls. Nov. 8, 1973. Bye, Burgess and Mares 5805.

CONCLUSIONS

Eight species of *Agave* are recognized and used by the Western Tarahumara. The members of subgenus *Agave*, generically called "imé", are distinguished from the members of subgenus *Littaea*. The two groups are differentiated on gross morphology of leaves and inflorescences. Some Western Tarahumara include all of the magueys that are pit-baked under "imé".

Each species of "imé" has a name which reflects the habitat preference or a characteristic of the species. Although the Tarahumara to the east also recognize subgenus *Agave*, "mé", as different from that of subgenus *Littaea*, the Western Tarahumara recognize a greater diversity of species, and their names are similar to Guarijio names. In subgenus *Littaea*, two of the three species on the eastern slopes of the Rio Chinipas area have names in common with Guarijio names to the west and Tarahumara names to the east. The third species, *A. polianthiflora*, has not been reported east of the Western Tarahumara region.

There is a greater specific diversity of *Agave* on the western slopes of the Sierra Madre Occidental than on the eastern slopes. The similarity of the Western Tarahumara names to those of the Guarijio for the members of subgenus *Agave* may be explained, in part, by the western movement of ancestors of the Tarahumara from

the eastern foothills and uplands to the western uplands and barrancas. Subsequent assimilation of former tribes of that region may have included additions to Tarahumara *Agave* nomenclature. The similar names for *A. multiflifera* and *A. Vilmoriniana* may reflect the wide familiarity of the leaf, fibre and soap products of the plants. These plants and products would probably be encountered in travel, transport and trading. The other species provide food and beverage prepared and generally eaten near dwellings and usually not traded or offered to strangers.

Two species of *Agave* produce sucker shoots, and the Western Tarahumara have used this characteristic to advantage in their propagation. The antiquity of propagation of *A. americana* var. *expansa* is unknown, but its presence in northwestern Mexico is thought to be only a century old. The much valued *A. pacifica* has been propagated closer to the locality of its preparation and consumption and at higher elevations than its normal range.

SPECIMENS AND PHOTOGRAPHS

Voucher specimens were collected, prepared and identified by R. Bye. Dr. H. S. Gentry was very helpful in instructing him in the preparation and identification of sterile and fertile plants and specimens. The specimens are deposited in the Economic Botany Herbarium of Oakes Ames in the Botanical Museum, Harvard University (ECON). Duplicates will be distributed to the Universidad Nacional Autónoma de México (MEXU), Gray Herbarium of Harvard University (GH), and the Herbarium of H. S. Gentry in Phoenix, Arizona.

All photographs were taken by Don Burgess.

TABLE I
Western Tarahumara *Agave*

	<i>Range</i>	<i>Elevation</i>	<i>Ecological Association</i> ¹
subgenus <i>Agave</i>			
<i>americana</i>	w Mexico to sw U.S.	(100)–6000 ft.	cult. (PO)
var. <i>expansa</i>	Jalisco to Ariz. & Calif.		
<i>bovicornuta</i>	nw Sierra Madre Occidental Son., Chih. & Sin.	3000–6000 ft.	O–PO
<i>pacifica</i>	nw Mexico Son., Chih. & Sin.	(0)–3500 ft.	sT (cult.sT–O)
<i>Shrevei</i>	nw Mexico Son. & Chih.	3000–6000 ft.	O–PO
<i>Wocomahi</i>	nw Sierra Madre Occidental Son., Chih., Sin. & Dgo.	5000–7500 ft.	PO–P
subgenus <i>Littaea</i>			
<i>multiflifera</i>	nw Sierra Madre Occidental Chih.	5000–6000 ft.	O–PO
<i>polianthiflora</i>	nw Sierra Madre Occidental Son. & Chih.	4000–6000 ft.	O–PO
<i>Vilmoriniana</i>	w Mexico Son. & Chih. to Jalisco & Aguascalientes	2000–4000 ft.	sT

¹—cult.=cultivated; O=oak forest (*Quercus* spp., e.g. *Q. albocincta*); P=pine forest (*Pinus* spp., e.g. *P. Engelmannii*, *P. arizonica*, *P. ponderosa*); PO=pine-oak forest; sT=arid sub-tropical forest with *Ipomoea arborescens*, *Bursera* spp. and various woody Leguminosae.

TABLE II
Nomenclature of Western Tarahumara *Agave*

Species	Guarijio ¹	W. Tar.	Tarahumara ²
subgenus <i>Agave</i>	—	imé	mé
<i>americana</i> var. <i>expansa</i>	0	galime	0 ³
<i>borvicornuta</i>	sapuri	sa'pulí	— ³
<i>pacifica</i>	—	gusime	ku'urí
<i>Shrevei</i>	totosá	o'tosá	mé ⁴
<i>Wocomahi</i>	wocomahi	ojcome	mésagori mé
subgenus <i>Littaea</i>			
<i>multiflifera</i>	chahuí	chahuí	chawí (or chahuí)
<i>polianthiflora</i>	taiehcholi	ri'yéchili	0 ³
<i>Vilmoriniana</i>	hauwé	ahué	awé (or ahué)

¹—Guarijio (or Warihio) names, from Gentry (1942 and 1963).

²—Tarahumara names collected by R. Bye in the region of Creel-Barranca del Cobre-Barranca de Batopilas.

³—Western Tarahumara names, plant photographs and specimens not recognized by native informants.

⁴—One informant, who grew up west of Cerocahui near Western Tarahumara region but now lives in Barranca de Batopilas, recalled "retosá" as the name used for this maguey in his youth.

"0" = species not recorded from the area.

"—" = data uncertain.

ACKNOWLEDGMENTS

We would like gratefully to acknowledge the help and encouragement of our families and friends in the United States and Mexico who generously supported our studies. A special thanks is extended to those Tarahumara who through friendship shared their knowledge. Without the continual encouragement and critical evaluation of Professor C. W. Pennington, Department of Geography, Texas A & M University, the research upon which these notes are based might have faltered. Professor Richard Evans Schultes, Botanical Museum, and Dr. Bernice Schubert, Arnold Arboretum, kindly read the manuscript and offered suggestions. Robert Bye would like personally to thank Dr. Margaret A. Towle, Curator of the Ethnobotanical Laboratory of the Botanical Museum, for her support and valuable suggestions. Financial support between 1971 and 1974 was generously extended to Robert Bye by the Botanical Museum and the Department of Biology, Harvard University, the National Geographic Society and the National Science Foundation Grant GB-35047 for Improvement of Doctoral Dissertation Research.

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ILLUSTRATIONS

PLATE XVII



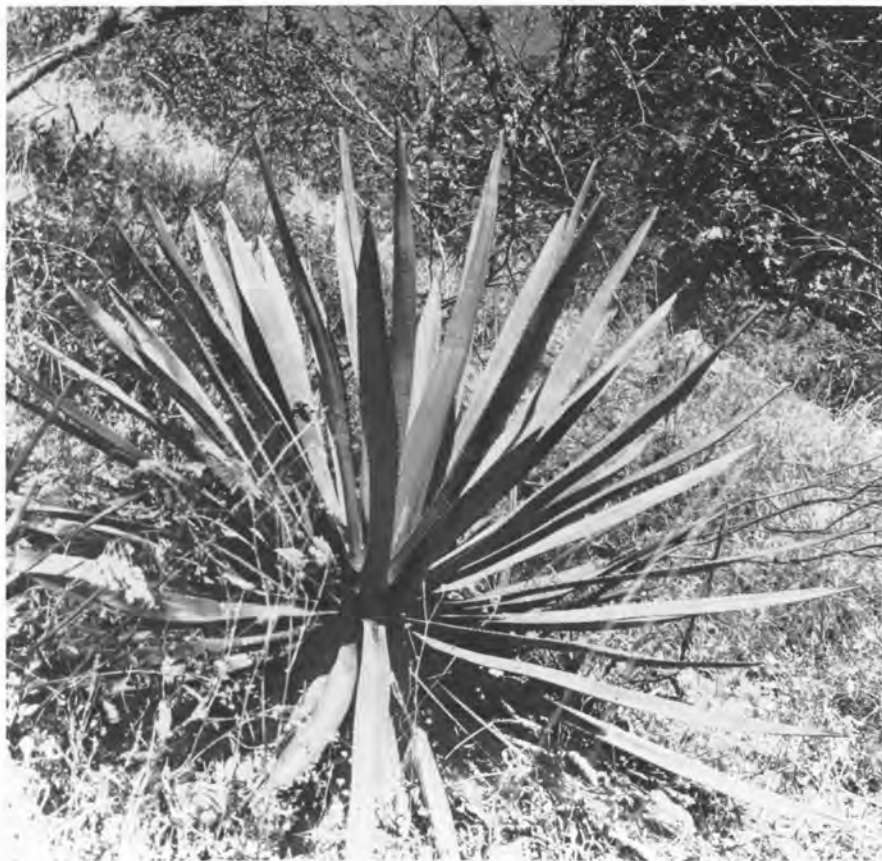
Agave americana var. *expansa* ("galime")
Mature leaves about $4\frac{1}{2}$ feet long.

PLATE XVIII



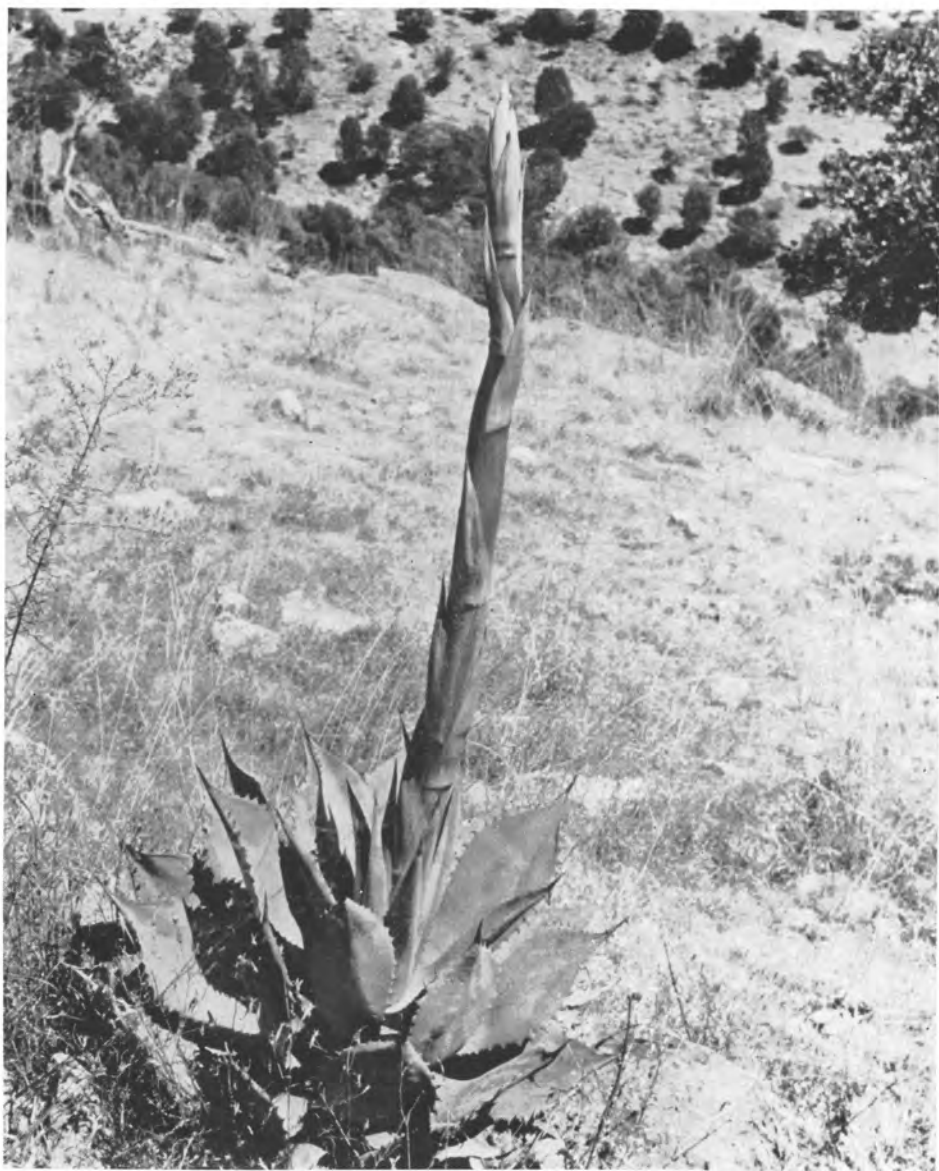
Agave bovicornuta ("sa'puli")
Mature leaves about 2 feet long.

PLATE XIX



Agave pacifica ("gusime")
Mature leaves about 3 feet long.

PLATE XX



Agave Shrevei (‘‘o’tosá’’)
Mature leaves about $1\frac{1}{2}$ feet long.

PLATE XXI

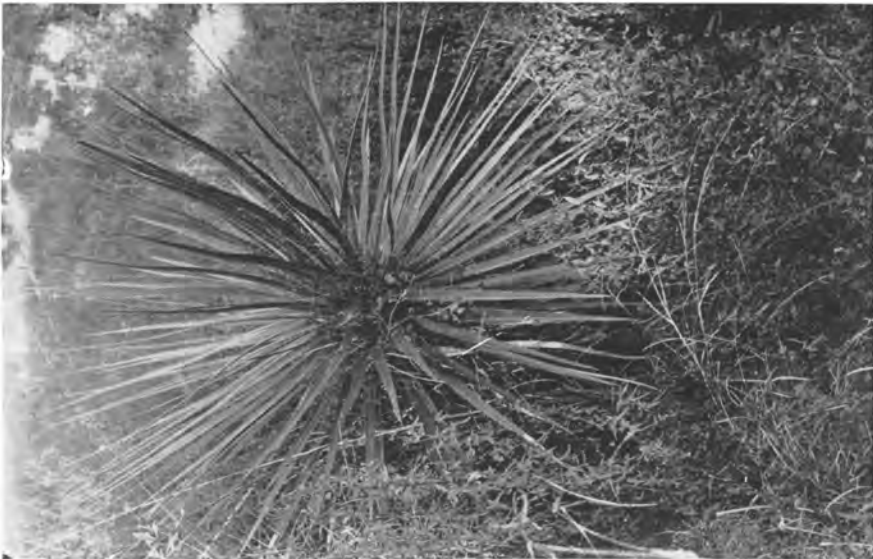


Agave Wocomahi ("ojcome")
Mature leaves about 1 foot long.

PLATE XXII



Agave polianthiflora ("ri'yéehili")
Mature leaves about 4 inches long.



Agave multiflora ("chahui")
Mature leaves about 2½ feet long.

PLATE XXIII



Agave Vilmoriniana (“ahué”)
Mature leaves about 5 feet long.