

A NARCOTIC MORNING-GLORY

(*Una convolvulácea narcótica*)

Part II

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The name *ololiuqui* seems to have been applied to several different plants amongst the Aztecs, but only one of these plants was a narcotic. A parallel may be cited in the case of the term *peyotl* or *eyote* which, amongst the Aztecs of old and even in modern Mexico, applied to a large number of dissimilar plants (41, 53).

According to Sahagun (46, 47, 48), the Aztecs knew three plants the name *ololiuqui*. Only one of these —*Rivea corymbosa*— was used as a narcotic. The other two have never been identified, but the illustrations of them in the Paso and Troncoso edition of Sahagun's *Historia...* indicate definitely that they are not convolvulaceous. Under the heading *De las hierbas medicinales*, Sahagun stated:

There is an herb called *ololiuqui* or *xixicamatec* which has leaves like miltomate (*Physalis* sp.) and thin, yellow flowers. The root is round and as large as a cabbage.

Doubtless, the plant is not referable to *Rivea corymbosa*, even though for many years it has been so identified (48). Figure 566 in the Paso and Troncoso edition depicts a plant with leaves which could easily be taken for those of a species of *Physalis*. The flowers are figured as gamopetalous, with long exserted stamens, and the habit appears to be herbaceous.

The third *ololiuqui* of which Sahagun speaks was also known as *eytzontecón*. It was medicinal. Its leaves were figured as ternate; flowers lavender or whitish, and its root tuberous. The flowers apparently were gamopetalous and the habit herbaceous. Although *ololiuqui* was reported to be used as a purge and although other characters might suggest the *Convolvulaceae*, the plant is not referable to this family.

Sahagun himself emphasized the fact that *ololiuqui* was a term which designated different plants when he wrote: "En otra parte, se so este nombre ololiuqui, pero son diferentes hierbas".

In Oaxaca, *ololiuqui* (*Rivea corymbosa*) is often called *piule*. *Piule*, the word *peyote*, apparently refers to numerous plants other than *Rivea corymbosa*. In 1919, Reko (31) reported *piule* as one of the names designating *Rivea corymbosa*. Since this time, however, the

same name has been found to refer to several species of *Rhynchosia* in Oaxaca. In 1923, Herrera (16) included *Rhynchosia longeracemosa* Mart & Gal. (*Dolichos longeracemosa* (Mart & Gal.) Rose under the name *piule*. In 1939, Santesson (51) carried out pharmacological and chemical studies with *piule* seeds which were referred to *Rhynchosia phaseoloides* DC. Positive tests for alkaloids and for glucosides were obtained, and extracts of the seeds produced narcosis when injected into animals. The writer found that the Chinantec and Mazatec Indians of Oaxaca both regard these two species of *Rhynchosia* as poisonous, and Reko, in a personal communication to the author, states that the seeds of *Rhynchosia phaseoloides* have been used as a narcotic among the Zapotecs of Oaxaca.

Until recently, nothing was known of the chemical composition of the seeds of *Rivea corymbosa*. Preliminary studies which have been made on the pharmacology and chemistry of *ololiuqui* indicate that its chemical constituents are very complex.

When Urbina identified *ololiuqui* as *Rivea corymbosa*, he recognized that no narcotic substance was known to occur in the *Convolvulaceae*, but he pointed out that the family was rich in glucosides. All doubt as to the narcotic principles of *Rivea corymbosa* was dispelled in 1937, when the late Professor C. G. Santesson of Stockholm discovered active narcotic principles in *ololiuqui* seeds (49, 50).

According to Santesson, a heavy, white precipitate is produced if water is added to an alcoholic extract of the seeds of *Rivea corymbosa*. This is a indication of the presence of a resin. Whether or not this resin contains active principles is a question which must await further research. If an alcoholic extract is freed from its resin content and evaporated and the residue taken up with water, the resulting aqueous solution is cloudy and, after heating, contains a slimy mass. Freed from this slime, the filtrate, a yellow solution, gives strong acid reactions. Santesson believed that the *Schleim* might play a chemical part in the physiological role of the narcotic constituent.

The aqueous solution of the residue from the original alcoholic extract does not give a positive sugar reaction, but if it is heated with hydrochloric acid, a positive Fehling's test is obtained. This indicates, according to Santesson, that a glucoside is set free during treatment with hydrochloric acid, but that prior to this treatment, the glucoside is in some way masked.

Experiments which Santesson conducted suggest that the condition which *ololiuqui* induces is, in his own words, "eine partielle Lähmung des Gehirns, eine Art Narkose oder Halbnarkose". The extracts containing the unsplit glucoside and those containing the split glucoside

produced comparable effects. The only difference between the two extracts is that the one containing the split glucoside seems to be slightly more narcotic in lower animals than the one with the unsplit glucoside. Inasmuch as the splitting of the glucoside did not seem to be of importance in rendering the narcotic active, Santesson suspected that the active principle might not be the glucoside but something else which is masked under ordinary circumstances. The results of a number of tests indicated that, when the glucoside was split, an alkaloid was set free.

Neither the glucoside nor the alkaloid of *Rivea corymbosa* is known chemically. Their peculiar properties seem to suggest that they are new. The chemical and pharmacological studies of this interesting hypnotic narcotic are still in preliminary stages and it is not unreasonable to anticipate even more significant discoveries when thorough investigations of *Rivea corymbosa* are undertaken.

The chemical composition of a number of species of the related genus *Ipomoea* and its segregates is known and presents certain similarities to that of *Rivea corymbosa*.

A number of official drugs of this family are useful because of their purgative properties. Among these may be mentioned the following: Radix Jalapae or Jalapa root (*Ipomoea Purga* (Wend.) Hayne); Caladana or Pharbitis seeds (*Ipomoea Nil* (L.) Roth); Turpeth root (*Operculina Turpethum* (L.) Silva Manso); and Mexican Scammony (*Ipomoea orizabensis* (Pell.) Ledénois). Other species find rather extensive uses in the native materia medica of a number of countries.

In possessing a peculiar group of resins of a glucosidal character, the *Convolvulaceae* are unique in the plant kingdom. There are several resins of this nature, all very closely related, which are known as the glucoretines. When hydrolyzed, they yield a sugar. This is a parallel condition to that in *Rivea corymbosa*, but in this plant it is an alkaloid that is combined with the sugar.

According to Tschirsch & Stock in the most recent and comprehensive treatment of the chemistry of the resins (*Die Harze* 2 (1936) 618-1634), eight species of convolvulaceous plants are known to contain glucoretines: *Ipomoea Purga* (Wend.) Hayne; *I. orizabensis* (Pell.) Ledénois; *I. simulans* Hanb.; *I. triflora* Maria & Velasco; *I. Nil* (L.) Roth; *Convolvulus Scammonia* L.; *Operculina macrocarpa* (L.) Urb.; and *O. Turpethum* (L.) Silva Manso. Some of these plants contain as much as twenty per cent of resin. Undoubtedly further chemical research will reveal the presence of glucoretines in many more, if not in most, of the convolvulaceous plants.

Although there is as yet considerable disagreement amongst chemists concerning the constitution of the glucoretines, Tschirsch & Stock

suggest that there are two basic resins in the group: *jalapin* (*orizabin*, *turpethin*, *scammonin*) and *convolvulin* (*rhodeoretin*, *jalapurgin*, *tempicin*). These authorities also suggest that the substances which have been called *alpha* and *beta-turpethin*, *pharbitisin*, and *ipomoein* are impure mixtures of simpler glucoretines. The purgative properties of the *Ipomoea* drugs are attributed to the glucoresins which they contain.

Standley (in Field Mus. Nat. Hist. Bot. Ser. 10 (1931) 329) (Publ. 283) reports that *Stictocardia campanulata* (L.) Standl. (*Rivea campanulata* (L.) House) is used in Panama to coagulate rubber—the sap of the *Stictocardia* being added to the latex from species of *Castilla*. This use is of interest since the rubber—coagulating properties of *Stictocardia campanulata* may possibly be the result of the glucosidal resin content which it may, like its near relatives, contain.

In Morelos, Mexico, *Ipomoea arborescens* (Humb. & Bonpl.) G. Don is believed to cause insanity and cerebral disorders if taken internally and to be poisonous to domestic animals (Standley in Contrib. U. S. Nat. Herb. 23 (1924) 1205). An investigation of the chemical constitution of this species might reveal the presence of a principle similar to the narcotic gluco-alkaloid of *Rivea corymbosa*. It is very suggestive that *Ipomoea arborescens*, like *Rivea corymbosa*, can act physiologically on the human brain.

Henry (*The plant alkaloids*, ed. 3 (1937) 95) reports that recently Orekhov & Konavalova (Arch. Pharm. 271 (1933) 814; Brit. Chem. Abstr. a2 (1937) 311) have found four alkaloids in the species *Convolvulus pseudocantabricus* Schrenk: *convolvine*; *convolvamine*; *convolvidine*; and *convolvicine*. Convolvine is said to possess local anaesthetic properties (Nolle: Khim. Farm. Prom. 5 (1934) 35). This discovery of anaesthetic properties in a convolvulaceous plant coincides in a striking manner with several 17th century Spanish reports that *ololiuqui* seeds were used by Aztec priests to deaden pain and to numb the flesh. These reports will be considered in greater detail in a later section of this paper.

Without any doubt, the most important use of *Rivea corymbosa* was and is as a narcotic for divination. The seeds were widely used for this purpose amongst the ancient Aztecs and are still used for divination amongst many Indians of southern Mexico. In three hundred years, the methods and purposes of using *ololiuqui* have undergone but slight changes.

It is indeed significant that all of the reports of the use of *ololiuqui* in modern times come from the State of Oaxaca. In this State, large tribes of Indians still live in comparative isolation and carry out a number of their ancient rites, influenced little or not at all by Chris-

tianity. There are reports of ololiuqui from several groups of Zapotec Indians as well as from the Chinantecs, Mazatecs and Mixtecs. All of these tribes were in contact with the Aztecs in pre-Hispanic times. Whether narcotization with ololiuqui is a practice which the Aztecs learned from the Oaxacan tribes or whether the Oaxacans borrowed it from the Aztecs is uncertain. The writer believes, however, that further investigation along botanical, ethnological and ethnographical lines will prove that the more southern of these peoples (the Oaxacans) became acquainted with the properties of this plant long before their Aztec neighbours to the north.

The use of *Rivea corymbosa* as a narcotic has not been reported from the Maya area, although the plant is well known there and is called *xtabentun*. (Standley in Field Mus. Nat. Hist. Bot. Ser. 3, 2 (1930) 394; Berendt: *Noticias de varias plantas y sus virtudes* (mss.) (1864) 24).

In 1917, Reko (33) found the Zapotecs in Amatlán, District of Miahuatlán, Oaxaca, employing a narcotic seed in divination. Amongst the natives, this seed was called *piule* or *la señorita*. When specimens were sent to Safford, they were identified as the seeds of *Rivea corymbosa*. Reko also stated that piule seeds were used amongst the Zapotecs of the Sierra Juárez where they were known as *bitoo* ("the god"). Amongst the Mixtecs, this narcotic was called *yucu-yaha*, a name which means "chili-plant", probably in allusion to the hotness to the taste of ololiuqui seeds. Reko further stated that this narcotic was used in Tehuantepec and in the Chinantla in Oaxaca.

During her study of the Zapotecs in Mitla, Elsie Clews Parsons (29) discovered that a small, narcotic seed was used commonly in divination. Description of the plant and of the type of intoxication which it induces indicates that these seeds, which the Zapotecs of Tlacolula call *bador*, are doubtless those of *Rivea corymbosa*. According to Reko (34), this Zapotec name is *badoo*, *bidoo* or *bitoo* and refers to *Rivea corymbosa*. This conclusion is strengthened by the fact that Zapotecs in four nearby parts of Oaxaca are known to use *Rivea corymbosa*. According to Parsons:

"...divination about recovery in sickness is also practiced by means of a plant which is described as a narcotic. This plant, *bador*, little children, the only plant of its kind in town, grows in the yard of a family who sells its leaves and seeds to two or three *curanderos* to administer to patients. After drinking the infusion, the patient, who must be alone with the curer if not in a solitary place where he cannot hear even a cock's crow, falls into a sleep during

which the little ones, male and female, the plant children (*bador*), come and talk. These plant spirits will also give information about lost objects"⁽¹⁾

Parsons also states:

"...vine of the clematis-like *bador* climbs over the cactus hedge. It is a small capital for the family because the leaves and seeds are bought by... the *curanderos* for a few centavos. They put a leaf on the forehead of one who has lost something and give him thirteen seeds to take in water. He has to be alone with the *curandero*. His eyes will close... and the little ones of the plant will come to him in a vision and show him the whereabouts of his lost property."

Commenting on the antiquity of the use of these seeds in divination, Parsons writes:

"The divinatory function of the *curandero*, whether by corn or by the giving of the narcotic *bador*, was undoubtedly a function of the early Zapotecan doctor".

It seems very probable that the Zapotecs, amongst whom the use of *ololiuqui* is widespread at the present time, used *Rivea corymbosa* in pre-Hispanic times as did their Aztec neighbours to the north.

In 1938 and 1939, Reko and I heard numerous reports amongst the Mazatecs of the use of the seeds of a convolvulaceous plant for purposes of divination. Descriptions of this plant and its use indicate that it is probably *Rivea corymbosa* even though specimens were not found in cultivation or growing wild in the Mazatec country. There can be no doubt, however, that the plant occurs there. Johnson (19, 20), working on the ethnology and linguistics of the Mazatecs, has found these Indians using the *semilla de la Virgen* for divination in addition to *teonanacatl* (*Panecolus campanulatus* L. var. *sphinctrinus* (Fr.) Bresadola) and the *hierba María*, an unidentified plant. In a letter to the writer, Johnson reports that amongst the Mazatecs, there are *curanderos* who grind the flowers (*flor de la Virgen*) on a metate and eat them before divination and before attempting to find lost articles. He reports the Mazatec name as *na-so-le-na*, the literal translation of which he gives as "flower-her-mother".

The name *semilla de la Virgen* or *yerba de la Virgen*, as well as the synonymous *semilla de la señorita*, is applied to *Rivea corymbosa* in many other parts of Oaxaca.

(1) The passages from Parsons (29) are quoted with the permission of the University of Chicago press.

In 1939, in the Chinantec-Zapotec town of Santo Domingo Latani, District of Choapam, Reko and I encountered under cultivation an extremely large vine of *Rivea corymbosa* the seeds of which were utilized as a narcotic amongst the Indians.

In Latani, this appeared to be the only plant of *Rivea corymbosa*. It was heavily laden with fruit and must have supplied sufficient seeds for the needs of the local *curanderos*. This situation—the monopoly of the supply of ololiuqui in a village—closely parallels that which Parsons (29) described for the Zapotec town of Mita, where there was one *bador* plant, "...the only plant of its kind in town, (which) grows in the yard of a family who sells its leaves and seeds..."

In Latani, knowledge of the plant and its properties is common to all the townspeople. Indeed, several natives who were not *curanderos* had had personal experience with its narcotic properties. There was no hesitation in answering questions about the use of the seeds and the nature of the intoxication induced. Amongst the Zapotecs of this town, the plant is called *hwan-la-si*; amongst the Chinantecs, *a-mu-kiá* ("medicine for divination"). In Santiago Yaveo, a Zapotec settlement south of Latani, the plant is known as *hwan-do-a* ("children's medicine") reported by Reko (34) as *cuan bdoá*; *cuan-lace* is also used in Yaveo. The Zapotec names in these two towns as well as the Chinantec name indicate that *Rivea corymbosa* is considered as a medicine. In Latani the seeds are used in small quantities to counteract flatulency just as the Aztecs, according to Hernández (15), were accustomed to use them.

The Chinantecs of the village of San Juan Teotalcingo, District of Choapam, employ a narcotic seed for divination. I was unable to procure specimens when I visited this village, but descriptions of the seeds and the plant which produces them suggest that it is *Rivea corymbosa*. In Teotalcingo, according to my native assistants, this plant is called *hwan-men-ha-sei* which is said to mean "vine bearing brown (red?) seeds".

In the western Chinantec town of San Juan Tepetotutla, I learned that both teonanacatl and ololiuqui are used in divination by the *curanderos*. Twenty-three seeds of *Rivea corymbosa* were procured in Tepetotutla, although there is apparently no plant of this species under cultivation in the vilalge. The supply of seeds is said to come from the neighbouring Chinantec village of San Pedro Yolox. The inhabitants of Tepetotutla call the ololiuqui plant *hwan-mei* and use the seeds medicinally for rheumatism.

In recapitulation, we may say that at the present time ololiuqui is known to the Zapotecs of Mita, Amatlán, Tehuantepec, the Sierra Juárez, and the District of Teotitlán; and to the Chinantecs of the Districts of Choapam, Ixtlán, and Cuicatlán.