

A PRELIMINARY STUDY OF AN ALKALOID-LIKE  
MATERIAL OBTAINED FROM CUNDEAMOR OR  
*MOMORDICA CHARANTIA*, L.\*

By LUIS TORRES DÍAZ

(Contribution of the College of Pharmacy of the University of Puerto Rico)

Notwithstanding the large variety of plants in the Puerto Rican flora to which medicinal properties have been empirically attributed, we have been unable to find in the available literature any systematic or scientific work in connection with the active principles which might be present in such plants, and their pharmacological properties.

Very interesting is the work of D. Renato de Grosourdy<sup>1</sup> of the Faculty of Medicine of Paris, published in the year 1864 in four volumes, two of which are the result of a study of the flora of the Antilles, including Puerto Rico, and the other two treating of the phytotherapeutics in these islands. In our opinion this work may serve as a guide for the investigators in the field of plant therapy, although a large part of the information given in connection with this matter is based on hearsay or was obtained from doubtful sources.

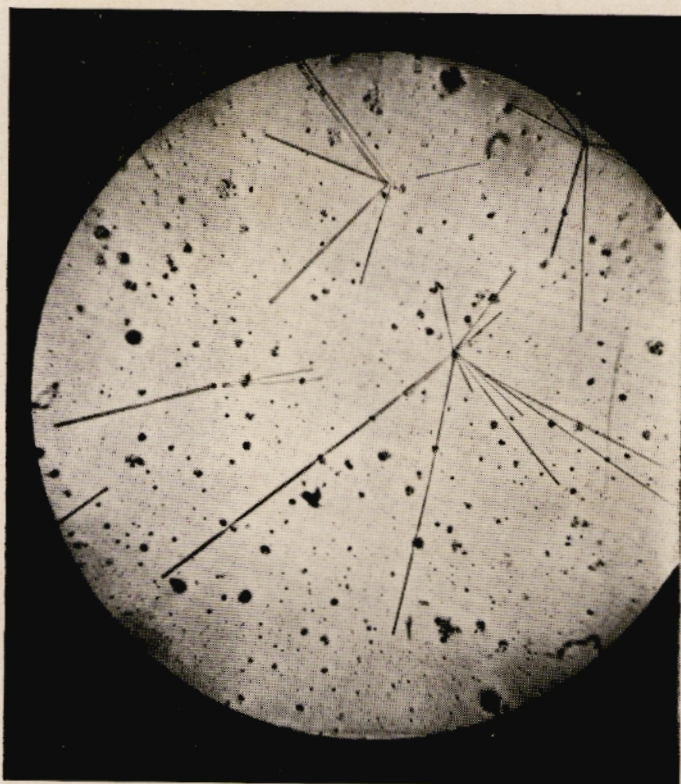
Don J. Federico Legrand also, published several papers about the useful plants of Puerto Rico in the "*Revista de Agricultura de Puerto Rico*"<sup>2</sup>.

The study of the active principles and pharmacological properties of the medicinal plants of Puerto Rico offers a wide and unexplored field of research for the phytochemist and the pharmacologist. We are now beginning a series of experiments with the object of establishing upon scientific bases the medicinal values, if any, of some of these plants.

The present paper is a report of the work accomplished by the author in the study of Cundeamor or *Momordica Charantia* L. The isolation of an alkaloid-like material and its quantitative determination in the leaves of the plant will be considered here. More work is under way for the final identification of this substance and for the study of its pharmacological properties. The qualitative and quantitative determination of other active principles that might be present

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Sulphate crystals of the alkaloid like substance isolated from *Momordica charantia* L.

*Cristales de sulfato de la substancia alcaloidea aislada del Cundeamor (Momordica charantia L.)*



in the different parts of the plant will also be attempted in the future.

#### BOTANICAL CHARACTERS

This plant is one of the *Momordicas* belonging to the Cucurbitaceae or Gourd Family. The botanical characters of the *Momordica* in general, and of the plant in particular, are quoted below from Britton's Botanical Survey of Puerto Rico and the Virgin Islands.

##### *MOMORDICA* L:

"Herbaceous, climbing or prostrate vines, with slender or forked tendrils and dioecious or monoecious mostly yellow flowers, the staminate solitary or clustered, the pistillate solitary. Staminate flowers with a 5-lobed calyx, a nearly rotate, 5-parted corolla, and usually 3 stamens with short distinct filaments, born at the calyx mouth, the anther-sacs flexuous. Pistillate flowers with calyx and corolla like those of the staminate, a 1-celled ovary with 3 placentae, the numerous ovules horizontal, the style slender, the stigmas 3. Fruit ovoid to cylindric, 3 valved or indehiscent (Latin, of uncertain application). About 25 species, of the old-world tropics. Type species; *Momordica Balsamica* L."

##### *MOMORDICA CHARANTIA* L.

*MOMORDICA zeylamica*. Mill. Gard. De. ed. 8. 17868.

*MOMORDICA charantia abbreviata*. Ser. in DC Bodr. 3: 311. 1828.

Stem slender, more or less pubescent 1-8 m. long with simple filiform tendrils opposite the leaves. Leaves thin, ramiform or suborbicular in outline, 4-12 cm. broad, deeply pedately 5-7 lobed, glabrate or pubescent, the lobes dentate, acute or obtuse, the slender petioles 3-6 cm. long; peduncles of the staminate flowers with an ovate entire cordate bract at or below the middle; sepals oval or ovate, 3-4 mm. long; corolla-segments, obtuse or emarginate, 1.5-2 cm. long, yellow; fruit, yellow tubercled, 2-12 cm. long; seeds, flat, 12-16 mm. long.

HABITAT: "Fields, hedges, thickets and waste grounds at lower elevations, Puerto Rico, Vieques; Culebra, St. Croix; St. Thomas; St. John, Tortola:—Southern United States; West Indies; continental tropical America and Old World tropics. Probably native of the Old World. Cundeamor Wild Balsam Apple."

The plant is not cultivated in Puerto Rico. It grows wild along fields, hedges, thickets and waste ground at lower elevations. It is cultivated throughout India, and the cultivated forms, which are several, differ in the shape and size of the fruit. The two chief varieties cultivated in that country are known by the names of "Kareli" and "Karela." The former is the rainy season kind, and although it bears a rather smaller fruit it is more esteemed by the natives than the latter or hot-weather variety. This hot-weather variety produces a longer and more oblong fruit. The smaller or



rainy season kind is more ovate, muricated and tubercled. The fruit is of a bright yellow color and is from 1 to 6 inches long <sup>4</sup>.

As to the method of cultivation of the hot-weather variety, Mr. Gollen, of Saharampur <sup>3</sup> gives the following directions:

"It should be sown at the end of February and all through March in rich soil. The ground should be laid out in beds, and the same distance allowed between each seed. Water should be given twice a week until the ground is covered, afterwards once a week will be sufficient. The first sowing will come into use about the middle of April, and successive sowings made in March will keep up the supply until the beginning of the rains."

The rainy season variety is usually sown in June, and supports for it to climb on should be provided.

#### CUNDEAMOR AS A FOOD

In Puerto Rico, cundeamor is not used as a food except for birds, although children find pleasure in sucking the seeds of the ripe fruit which are sweetish in tast. The rind is bitter but it is claimed to be wholesome. The natives of India use it as a food, steeping it in salt water before cooking <sup>4</sup>. The fruit is offered for sale in the Indian markets and is eaten cooked in curry or sliced and fried. It remains in good condition for many months when sliced, dried and kept in an airy place. It is said that the leaves were eaten in the Khandesh District, Bombay, during the famine of 1877-78 <sup>4</sup>.

#### EMPIRICAL USES OF CUNDEAMOR FOR MEDICINAL PURPOSES

An infusion of cundeamor leaves is claimed by some to be effective in the cure of diabetes and even practicing physicians have personally informed the author that they have obtained good results in the cure of this disease by using the plant in one form or the other.

The juice of the whole plant is also used as an external application in scabies and other cutaneous diseases in Puerto Rico.

In India the fruit is considered tonic, stomachic and cooling and is used in rheumatism, gout, and diseases of the spleen and liver <sup>4</sup>. According to Rumphius <sup>4</sup> it was much esteemed in Amboina, where it was supposed to purify the blood, and to dissipate melancholy and gross humors. The



fruit and leaves are both administered internally in leprosy, piles, jaundice, and as an anthelmintic. Rumphius says also that Indian obstetricians use it to purify the blood and to generate milk in the puerperal condition<sup>4</sup>. Dymock informs us that the leaf-juice is given in bilious affections as an emetic and purgative, alone or combined with aromatics<sup>5</sup>. It is also used in India in external applications for burning of the soles of the feet, and round the orbit as a cure for night blindness<sup>4</sup>. The fruit of the uncultivated form is said to act as a febrifuge. The root is also used medicinally, being considered astringent and warm, and in the Punjab, is according to Honigberger<sup>4</sup>, applied externally to piles. The whole plant, combined with cinnamon, long pepper, rice and the oil of *Hydnocarpus wightiana* Blume, is employed by the Hindus as an external application in scabies and other cutaneous diseases<sup>4</sup>, a usage similar to that applied in Puerto Rico.

#### EXPERIMENTAL

The leaves and petioles of the wild variety of the plant that grows in Puerto Rico were sundried and reduced to a fine powder (No. 60); 500 gms. of the powder were moistened with 95 per cent alcohol and allowed to stand for several hours. The moistened material was then packed in a percolator and the extraction continued in the usual manner<sup>6</sup> using 95 per cent alcohol. The alcoholic extract was concentrated almost to dryness and the residue was extracted repeatedly with .50 per cent sulphuric acid. The acid liquor was set aside to deposit resin, etc. After filtering, the solution was made alkaline with sodium carbonate and was extracted with chloroform. The solution was extracted again in the presence of sodium hydroxide using chloroform as a solvent for the alkaloid. The crude alkaloid thus obtained was partly used for qualitative tests, a part was further purified and different salts were prepared with it. A second extraction of 200 gms. of the powdered leaves and petioles was made by the above described method and the amount of crude alkaloid was gravimetrically determined.

#### OBSERVATIONS

On microscopical examination of the alkaloid it was observed that it crystallizes out in beautiful transparent needles,



that very soon change to crystalline masses. The sulphate invariably crystallizes out in the form of long and thin transparent needles. The same crystalline form is shown by the nitrate. The picrate forms somewhat shorter needles.

Meyer's Reagent, Phosphomolybdic and Phosphotungstic acid, and iodine in potassium iodide solution are good precipitants for the alkaloid. Picric acid is not as good a precipitant, although some precipitation is obtained with it.

As the quantity of the alkaloid obtained in this preliminary experiment was insufficient, the alkaloid has not as yet been identified; neither its physical constants nor physiological action has as yet been studied. Work is in progress toward this end.

The quantitative determination of the crude alkaloid in the leaves and petioles of the plant shows that they contain .038 per cent.

#### CONCLUSIONS

The presence of an alkaloid-like substance in the leaves and petioles of Cundeamor or a wild variety of *Momordica charantia* L. that grows in Puerto Rico, has been discovered. The amount of the crude alkaloid has been gravimetrically determined and is set at .038 per cent of the powdered drug.

A short study of its precipitants has been made. The crystalline structure of the alkaloid and also of its sulphate, nitrate and picrate has been observed. The author points out the importance of further study of the active principles of this plant and their pharmacological action, as well as of the cultivation of the plant, which would make possible an increase in the yield of the alkaloid, supposing that it is found to be of medicinal value.

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\* NOTE: References 3, 4 and 5 were obtained through the courtesy of the Bureau of Plant Industry, Dept. of Agriculture, Washington, D. C.