

A LITTLE-KNOWN CULTIVATED PLANT FROM NORTHERN SOUTH AMERICA

BY
RICHARD EVANS SCHULTES

It is not often that an important economic plant, cultivated over a wide area, hides out from the eyes of plant-explorers, anthropologists, missionaries and travellers—even in an area with such a poorly understood agriculture as the Amazon Valley. Yet that has apparently come to pass in the case of *Solanum Topiro* HBK.

I

During my travels in the northwestern part of the Amazon basin, principally in Colombian territory, it was my custom always to study the plants cultivated by the Indian inhabitants of the region.

It is possible, in general, to arrange the plants which the natives of this tropical forest-region grow into two large categories on the basis of the manner in which they are cultivated. Native agriculture in the western Amazon has been called, and I think perhaps erroneously, "primitive." Whether or not it be primitive, it is true that no machinery is employed, and little or no formal planning underlies agricultural practices. Plants are either set out in fields devoted to a single crop or else they are put in or allowed to spring up individually at random mingled with several or many different species.

The first of these two categories can claim, at least, in the northwestern part of the vast Amazon, only two species: *yuca* (*Manihot esculenta* Crantz) and *coca* (*Erythroxylon Coca* Lam.). All other cultigens grow singly

or in groups of several individuals scattered through fields of yuca or coca, along the edges of these fields, in clearings or close to house-sites. Many species of economic plants fall into this second category. We might cite, as a few examples, the following: *Phyllanthus* spp., *Tephrosia toxicaria* Pers. and *Clibadium asperum* (Aubl.) DC. (fish-poisons); *Nicotiana Tabacum* L. and *Banisteriopsis* spp. (narcotics); *Capsicum frutescens* L. (spice); and *Herrania nitida* (Poepp.) R. E. Schult. (food).

In wellnigh every Indian agricultural plot in the Colombian Amazonia, especially along their margins and in the immediate vicinity of dwellings, two shrubby species of *Solanum* are grown for their edible fruits. The more abundant of these has been determined as *Solanum Topiro*. We have still not been able satisfactorily to identify the second, and, common though it be in the areas of Indian agriculture, it may well represent a concept hitherto undescribed. The present paper, however, treats only of *Solanum Topiro*.

It is with pleasure that I acknowledge the very helpful interest of Mr. and Mrs. Kendal Morton of the Morton Collectanea (University of Miami) in my attempts to identify specimens of this plant which I had brought back from Colombia. I have also here to thank Mr. Elmer W. Smith, artist at the Botanical Museum of Harvard University, who has seen *Solano Topiro* in its native state in garden-plots in the Colombian Vaupés, for his outstanding drawing which was made possible through a grant from the National Science Foundation. This is the first time that *Solanum Topiro* has been illustrated.

II

It may be well to outline what little we know of the history and recent introduction into horticulture of this species.

A scrutiny of the major works on tropical fruit plants indicates that *Solanum Topiro* has been completely neglected and probably unknown as a cultigen. It does not, for example, appear in Wilson Popenoe's "Manual of tropical and subtropical fruits" (1920), in F. C. Hoehne's "Frutas indígenas" (1946) nor in Adolfo Ducke's "Plantas da cultura precolombiana na Amazônia brasileira. . ." in Bol. Técn. Instit. Agron. Norte, no. 8 (1946). Furthermore, standard anthropological and botanical papers on Indian agriculture in the American tropics fail to mention it: Robert H. Lowie, "The tropical forests: an introduction" and Carl O. Sauer, "Cultivated plants of South and Central America" in Handbook of South American Indians [ed. J. H. Steward], Bur. Am. Ethnol. Bull. 143, 3 (1948) 2 and 6 (1950) 487, respectively. As Fennell (Fennell, Joseph L. "Cocona—a desirable new fruit" in For. Agric. 12 (1948) 181) has written: "To what extent, if any, the *cocona* [*Solano Topiro*] may have reached the gardens of the outside world is difficult to say. That it appears even now to be essentially unknown to horticulture leads me to believe, in light of its impressive appearance and apparent usefulness, that it may never have previously left its secluded habitat as a recognized fruit of value."

So far as I have been able to ascertain, the first serious attention paid by botanists to *Solano Topiro* as a cultigen dates from the middle of the 1940's. During this period, seeds of the plant were collected "from the little-explored reaches of the upper Amazon" (presumably in Peru) and established in the Experiment Station at Tingo María in Peru. Eventually, it was introduced to the Instituto Interamericano de Agricultura Tropical in Turrialba, Costa Rica (Fennell, loc. cit.; Ochse, J. J. "*Solanum hyporhodium* or *cocona*" in Proc. Fla. State Hort. Soc. 66 (1953) 211) from which centre it began to attract horticultural attention.

The vernacular name for *Solanum Topiro* in Peru is reported to be *cocona*. This is borne out by notes on herbarium specimens (*Killip & Smith 27367, 27323*) collected in the Amazonian part of Peru in 1929. This convenient epithet followed the plant in its several introductions and has now, in the literature, been accepted as a standard common name. Unfortunately, however, *cocona* has been erroneously identified and has, in agricultural institutions as well as in the scientific and popular literature (Fennell, loc. cit.; "Cocona" (abstract of foregoing article) in *Econ. Bot.* 3 (1949) 216; Ochse, loc. cit.; [Bischoff, William] "The Peach Tomato" in *Miami Daily News* (March 7, 1954)) been determined as *Solanum hyporhodium* A. Br. et Bouché.

It has not been possible for me to ascertain where this erroneous identification was made, nor do I find in any of our larger herbaria a specimen-voucher upon which it could have been based. In the card-file at the Subtropical Experiment Station in Homestead, Florida, the following data relative to *cocona* are to be found: "*Solanum hyporhodium* A. Br. & Bouché. Native to Australia. In 1948, seeds were received from F. B. Harrington, Natal; all plants dead by 1950 from nematodes."

That there must have been a sudden and widespread distribution of seeds of this species is evidenced by the fact that the Subtropical Experiment Station, believing the plant to be native to the Old World, made an introduction from South Africa. Ochse (loc. cit.) brought the species into cultivation at the University of Miami apparently directly from Costa Rica. In July, 1958, I found it growing experimentally at the Imperial College of Tropical Agriculture in Trinidad, the result of a relatively recent introduction but with no record of the provenience of the seed.

Identification of the material of *Solanum Topiro* which

I had gathered in the northwest Amazon puzzled me for a number of years. I was finally able to match my material collected in Colombia under the name *lulo* with *cocona* through illustrations of *cocona* found in the Morton Collectanea and to learn that *cocona* had been determined as *Solanum hyporhodium*. In trying to check the accuracy of this determination, I discovered that there was no material representative of *Solanum hyporhodium* in our American herbaria. The type, and, apparently the only specimen of this species, was preserved in the Berlin Herbarium and, of course, is no longer extant. There is, nevertheless, a photograph of the type of *Solanum hyporhodium* in the Gray Herbarium. It is at once obvious that *cocona* cannot be referred to *Solanum hyporhodium*, for the photograph indicates that there are differences in the leaf and that *S. hyporhodium* has stems and petioles which are heavily spinose. The *cocona* collected originally in Peru, as well as all of my own specimens from Colombia and recent Venezuelan material, is entirely without spines and has the petioles clad with a soft mottled indumentum. Fennell's published notes (loc. cit.), indeed, stress the lack of spines.

It was possible for me finally to identify *cocona* or *lulo* by using one of the common Venezuelan names of the species. The non-Indian population of the Colombian Amazonia know the plant as *lulo*, because of its strong resemblance to the highland *Solanum quitoense* Lam., which, in the Andes of Colombia, is called *lulo*. Along the border between Colombia and Venezuela, however, the non-Indian inhabitants refer to the plant by its Venezuelan name *topiro* or *tupirú*. In H. Pittier's "Manual de las plantas usuales de Venezuela" (1926) 385, there is an entry under the common name *topiro*: "*Solanum Topiro* Dunal, Synops. 10. 1810. Sin. *tupiro*. Especie herbácea, tomentosa, inerme, las hojas ovales, más o

menos angulosas, las flores verduscas en glómérulos opuestos a las últimas y los frutos ovoideos, grandes y comestibles. Es del Alto Orinoco." Sturtevant ("Sturtevant's notes on edible plants" [ed. U. P. Hedrick], (1919) 545) had reported *Solanum Topiro*, a species growing on the "banks of the Orinoco," as having an edible fruit known as the "turkey berry," attributing his sources to G. Don Hist. Dichl. Pls. 4 (1838) 410.

An excellent photograph of the type of *Solanum Topiro* from the Paris Herbarium enabled me to authenticate the identification. The type, from the Humboldt and Bonpland Herbarium, was collected at San Fernando de Atabapo on the Río Orinoco, Venezuela (*Humboldt et Bonpland* 918). There is, further, in Paris a reproduction of an unpublished drawing of *Solanum Topiro* (No. 192) for Dunal's Solanaceae, ed. 2. There can be no doubt that *cocona* from Peru and the *lulo* from Amazonian Colombia refer to the same species as *topiro* in Venezuela and that all three are *Solanum Topiro*. We are now able to offer an amplified description and extended distribution for this species, as well as sundry ethnobotanical notes appertaining to its cultivation and use.

***Solanum Topiro* Humboldt, Bonpland & Kunth ex Dunal** Sol. gen. aff. syn. (1816) 10.


ORIGINAL DESCRIPTION:

37. *S. Topiro*. S. caule herbaceo tomentoso, foliis ovato-oblongis sinuatis basi inaequalibus subtus leviter tomentosis supra sericeis, floribus aggregatis extra-axillaribus, baccis ovatis.—*Humb. et Bonpl. ined.*—*Dun. Sol. Ed. 2 ined. tab. 921 f. 1* Hab. ad Orenocum (v. s. h. H. et B.).

Shrub unarmed, robust, rank, up to about 5 feet (1.5 m.) tall. Branches stout, terete, scurfy-pubescent, grey-green in life. Twigs densely white-stellate-tomentose. Leaves coarsely membranaceous, ovate in outline, at maturity

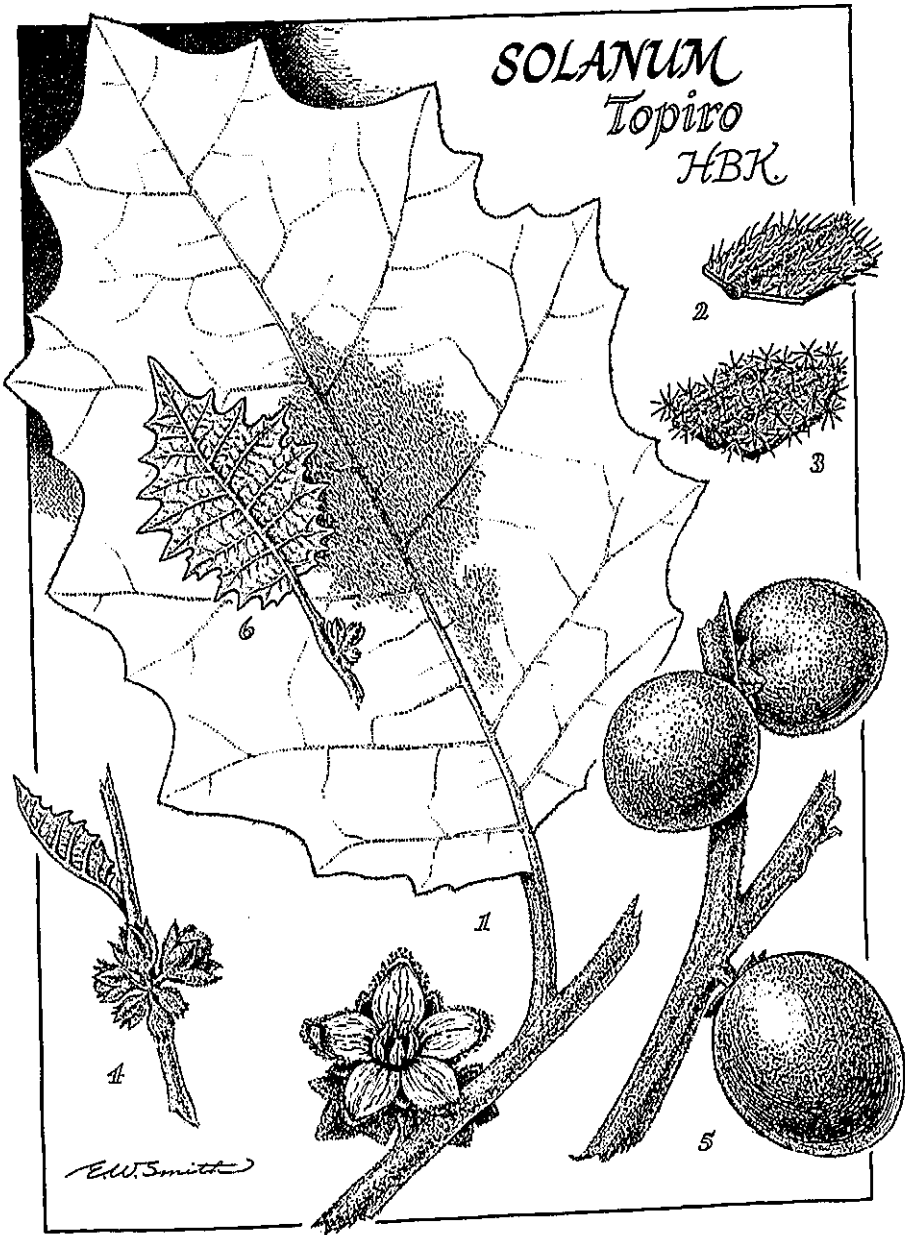
up to about 48 cm. long, 36 cm. wide, basally inequilaterally truncate, apically abruptly acute, marginally very distantly and very deeply sinuate, strongly petiolate (petiole up to 12 cm. long, densely white-stellate-tomentose); upper surface coarsely tomentose and densely clad with somewhat stiff sericeous white hairs (some of which have basally a stellate formation) sparsely interspersed with white stellate hairs; nether surface very softly and densely white-stellate-tomentulose; veins strong and conspicuous above and below, extremely densely white-stellate-tomentose. Inflorescence a lateral, very short-peduncled, few-flowered cyme. Flowers pedicellate; pedicels up to 6 mm. long, 1.5–2 mm. in diameter, very densely stellate-tomentulose. Calyx lobes somewhat crassulent, more or less triangular-ovate, apically subacute, up to about 15 mm. long, very densely and softly greyish brown-stellate-tomentose without, glabrous but with minute white scabs within. Corolla membranaceous, white or greenish white, lobes oblong-ovate, up to about 20 mm. long, apically subacute, glabrous within, densely stellate-tomentulose without. Anthers yellow, erect, linear, about 9–10 mm. long. Style terete, 7–8 mm. long. Ovary globose, very densely long-white-sericeous. Fruit subglobose to ovoid, ripening orange-red, sometimes tomato-red, densely and minutely stellate-tomentulose (hairs easily caducous upon handling), becoming subglabrous upon ripening. Pulp acidulous. Seeds very numerous, flat, oval in outline, 3–4 mm. long, 2–2.5 mm. wide, pale yellowish.

COLOMBIA: Comisaría del Amazonas, Río Caquetá, vicinity of La Pedrera. "Fruit dark red-rust, hairy. Flowers white. Bush." April 1944, *R. E. Schultes 5881*.—Comisaría del Amazonas, Río Loretoyacu. Altitude about 100 m. September 1946, *R. E. Schultes & G. A. Black 8394*.—Comisaría del Amazonas, Río Apaporis, Soratama, near mouth of Río Kananari. "Cultivated. Fruit edible. Flowers whitish with yellow anthers. Fruit ovoid, orange, covered with hair in unripe stage. *Lulo. Tupirú*." March 1951, *R. E. Schultes 12081*.—Comisaría del



EXPLANATION OF THE ILLUSTRATION

PLATE XLVI. *Solanum Topiro* HBK. 1, flowering branch, with medium-sized leaf, about one half natural size. 2, portion of the upper surface of the leaf, greatly enlarged. 3, portion of the nether surface of the leaf, greatly enlarged. 4, inflorescence, about one half natural size. 5, fruits, about one half natural size. 6, young leaf, about one half natural size.



EXPLANATION OF THE ILLUSTRATION

PLATE XLVII. Fruit of *Solanum Tomiro* represented by the collection *Schulles 12081* from the Colombian Amazonas.

Photograph by RICHARD EVANS SCHULTES

PLATE XLVII



EXPLANATION OF THE ILLUSTRATION

PLATE XLVIII. Habit photograph of *Solanum*
TOPIRO represented by the collection *Schultes 12081*
from the Colombian Amazonas.

Photograph by RICHARD EVANS SCHULTES

PLATE XLVIII



Amazonas, Río Apaporis, Soratama, between Río Pacoa and Río Kanari. Altitude about 250 m. "Flowers greenish. Anthers yellow. Bush. Fruit green, turning orange. Kubeo = *be-tá-ka*; Taiwano = *de-twá*; Tatuya = *de-twá*. Cultivated." September 1, 1951, *R. E. Schultes & I. Cabrera 13842*.—Comisaría del Vaupés, Río Vaupés, Mitú. "Flowers yellow-green. Fruit edible." June 22, 1958, *H. García-Barriga, R. E. Schultes & H. Blohm 15771*.

PERU: Departamento de Junin, Puerto Yessup. Altitude about 400 m. "Coarse, erect herb 2-3 ft. Corolla light green, anther yellow. July 10-12, 1929, *E. P. Killip & A. C. Smith 26363*.—Departamento del Loreto, Iquitos. Altitude about 100 m. "Local name *cocona*. Coarse herb 3-5 ft. Corolla greenish white. Anthers yellow. Fruit light red, edible. Clearing." August 2-8, 1929, *E. P. Killip & A. C. Smith 27367*.—Departamento del Loreto, Yurimaguas, lower Río Huallaga. Altitude about 135 m. "Coarse herb, 3-4 ft. tall. Corolla greenish white. Anthers yellow. Clearing." *E. P. Killip & A. C. Smith 27999*.—Departamento del Loreto, Puerto Arturo, lower Río Huallaga, below Yurimaguas. Altitude about 135 m. "*Cocona*. Fruit edible. Coarse herb 2-4 ft. Corolla green; fruit red. Clearing." August 24-25, 1929, *E. P. Killip & A. C. Smith 57823*.

VENEZUELA: Territorio del Amazonas, Río Orinoco, San Fernando de Atabapo. *A. Humboldt & Bonpland 918*.—State of Bolivar, lower portion of Quebrada Oparuma, tributary of Río Pacairao, below Santa Teresita de Kavanayen. Altitude 915-1065 m. "Camarata Indian name: *bo-pó*. In conuco. Herb 2 feet tall. Leaves membranaceous, rich grass-green above, grey-green below. Fruit yellow, edible, made into preserves." November 25, 1944, *J. Steyermark 60531*.

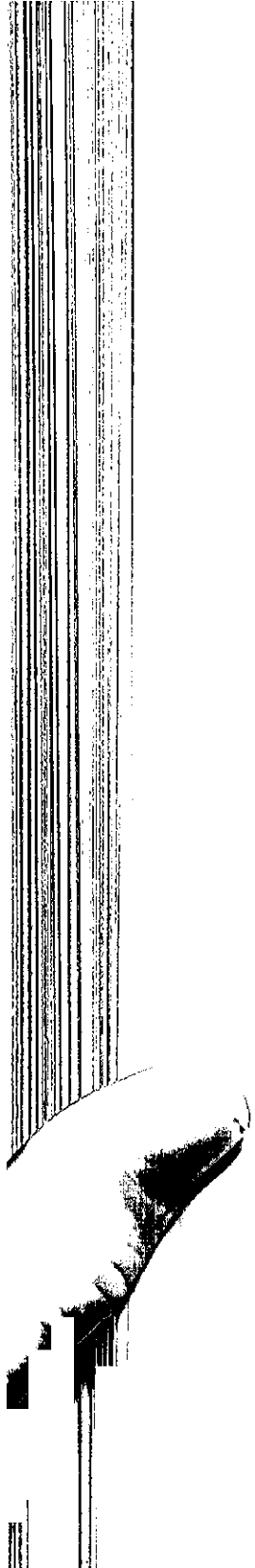
Solanum Topiro has never apparently been collected from the wild and, in more than twelve years in the northwest Amazon, I have never seen it outside of agricultural plots or abandoned house-sites which obviously had been the scene of cultivation. I believe that we have at hand in this plant a species so long in association with man that it may nowadays exist only because of this association. The fruit yields viable seeds in great abundance, but the plants seem to reproduce themselves only in highly disturbed and sunny sites.

The Indians eat the ripe fruit as a tomato. The civilized inhabitants of the region use the fresh fruits to prepare, with sugar, a rather acidulous, thirst-quenching drink. To my knowledge, the plant is never set out de-

PLATE XLIX



PLATE XLIX. Flowering branch of *Solanum topiro*.
Photograph by RICHARD EVANS SCHULTES



liberately but springs up from seeds adhering to the rind when this is cast into refuse heaps or when inedible parts of the fruit are spat out in the process of eating. The species is grown over a wide area which includes much of forested eastern Peru, most of the Amazon drainage-area of Colombia, the upper reaches of the Orinoco system in Venezuela and probably adjacent parts of Brazil. I have never encountered it in Brazil, however, but it may be grown there on a much reduced scale because of the sparsity in the westernmost Amazon of Brazil of unacculturated Indian tribes.

The type and flavor of the fruit and the heavy bearing characteristics of *Solanum Topiro* make the plant rather promising as a new subtropical fruit-crop, especially to residents in Florida. As Fennell wrote (loc. cit.): "As an economic commodity, from the long-range viewpoint, obviously the cocona offers much in the way of improvement potential. The complementary values afforded by the various closely related species of this section of the genus are not commonly available to most crop-improvement projects. It now remains for us to devise a way to blend and proportion these values satisfactorily toward developing the end product of superior hybrid combinations." In any crop-improvement program, the value of having living material of this rather variable species from all or many parts of its range should not be overlooked. Since Ochse's notes (loc. cit.) in 1958, apparently nothing has appeared which would point to further horticultural work in Florida with *Solanum Topiro*. At that time, Ochse pointed out that nematodes were an important enemy of the plant. The situation is well summarized, I believe, by Fennell (loc. cit.) when he states that ". . . a safe assumption is that even in its present unimproved state the cocona is a permanent acquisition as a valuable horticultural plant."