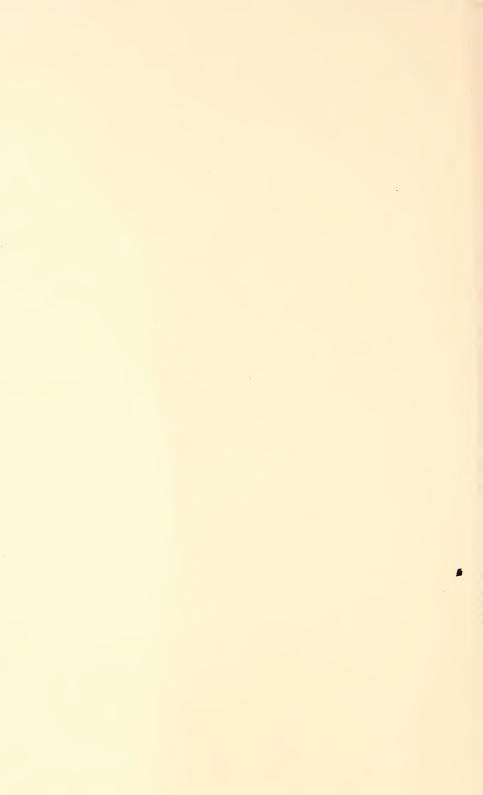


Scotion Tuberarium of the Genus Solanum of North America and Central America

By DONOVAN S. CORRELL



U. E. DEPARTMENT OF AGRICULTURE AGRICULTURE MONOGRAPH NO. 11





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Section Tuberarium of the Genus Solanum of North America and Central America

By DONOVAN S. CORRELL
Botanist

Division of Plant Exploration and Introduction
Bureau of Plant Industry, Soils, and Agricultural Engineering
Agricultural Research Administration



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By Donovan S. Correll, botanist, Division of Plant Exploration and Introduction, Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration ²

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INTRODUCTION

This monograph presents a description and classification of the species in the section Tuberarium of the genus *Solanum* that are found in North and Central America. It includes more than 50 species and varieties that are segregated into 11 series. The indigenous species in our region are, for the most part, confined to high mountains and are found from Colorado and Utah to Panama. The species and variations within species in the section Tuberarium, especially those under cultivation, are much more numerous in northern South America and along the Andes to southern Chile, the region whence the commonly cultivated *S. tuberosum* is thought to have been derived.

From mid-October 1947 to January 10, 1948, the writer explored the mountains of south-central Mexico for indigenous species of tuberous solanums, and his observations in the field and the preliminary results of this expedition formed the basis for two reports published in 1948. As was pointed out in these reports,

¹Report of a study made under the National Cooperative Plant Introduction Program supported by the Research and Marketing Act of 1946.

[·] The writer wishes to make grateful acknowledgment of his indebtedness to the custodians of the herbariums for their courtesies in permitting the study of their Solanum material. He is particularly indebted to Regina O. Hughes, of this Bureau, for the fine diagnostic drawings of the flowers and to R. L. Taylor, also of this Bureau, for taking many of the photographs. The writer appreciates the generous aid and constructive criticism of his colleague, S. F. Blake, and the help of Charles Schweinfurth, of Harvard University, in constructing the Latin diagnoses.

110 collections were made. Tubers or seeds, or both, were obtained for each collection where possible. These are now being used in breeding investigations in the United States, Germany, Canada, and Alaska. As the season was too advanced for collecting serviceable botanical specimens while the writer was in Mexico, very few were obtained in the field. In the meantime, however, specimens have been made from tubers grown under glass in quarantine at the United States Plant Introduction Garden, Glenn Dale, Md., and from tubers and seeds grown in the field at the Inter-regional Potato Introduction Station, Sturgeon Bay, Wis.

Because of the above circumstances, the writer was afforded the opportunity of observing plants growing in nature in Mexico, under glass, or in the field under cultivation. In a number of cases the same collection was observed and studied under all three conditions. In all instances, where possible, herbarium specimens were prepared for comparison. It was thus possible to observe plants from the same collection when grown under differ-

ent day-lengths in dissimilar environments.

After a large series of herbarium specimens was assembled, which obviously represented a goodly number of species and varieties, it was realized that there was no systematist in the United States to whom the material could be referred for identification and classification. Consequently, the writer undertook the task of identifying and classifying his own collections. It was soon evident that in order even to approximate a correct determination of all the collections it would be necessary to become familiar with not only the tuber-bearing series but also all the series in the section Tuberarium found in Mexico. This, of course, necessitated a historical review, which, in turn, eventually led to the preparation of this monograph, relating to the entire section Tuberarium in North and Central America.

Specimens have been borrowed from a number of herbariums. These herbariums and the abbreviations used in citing the specimens deposited in them are as follows:

(Ar) (Cal)

(Cam) (CM) (Co)

(Col)

University of Arizona, Tucson, Ariz.
University of California, Berkeley, Calif.
University of Cambridge, Cambridge, England.
Chicago Natural History Museum, Chicago, Ill.
Cornell University, Ithaca, N. Y.
Colorado A. and M. College, Fort Collins, Colo.
Dudley Herbarium, Stanford University, Stanford, Calif.
Gray Herbarium, Harvard University, Cambridge, Mass.
Iowa State College, Ames, Iowa.
Royal Rotanic Gardens, Kew, England (Dud) (Gray)

(Iowa)

Royal Botanic Gardens, Kew, England. (Kew) C. L. Lundell Herbarium, Renner, Tex. (Lun)

Max-Planck Institut, Voldagsen über Elze, Germany. (Max)

University of Michigan, Ann Arbor, Mich. (Mich) Missouri Botanical Garden, St. Louis, Mo. (Mo) (NA) National Arboretum Herbarium, Beltsville, Md.

(NY) New York Botanical Garden, New York, N. Y. Academy of Natural Sciences of Philadelphia, Philadelphia, Pa. (PA)

(Paris) Museum d'Histoire Naturelle, Paris, France. (US) United States National Herbarium, Washington, D. C. (Vienna)Botanische Abteilung Naturhistorisches Museum, Vienna, Austria.

HISTORICAL REVIEW

The most difficult phase of the classification was the assembling of all the known species in the section Tuberarium. The genus is considered by the best authorities to consist of more than 2,000 species. Since Dunal's monumental work in 1852 no one person has attempted to treat the genus as a whole, and, indeed, no one has yet attempted to monograph the economically important section Tuberarium. To attain a thorough knowledge of so large and difficult a genus would entail a lifetime of research. This would be almost necessary, likewise, before a comprehensive monograph covering the entire area of distribution of the section Tuberarium could be undertaken.

Walpers' "Repertorium," published in 1844–45, included about 10 species. During the intervening years—from the time of Dunal's contribution in 1852, where he maintained as valid 17 tuberous species, to the time of Bitter's invaluable contributions from 1912 to 1914—very few new species were proposed. Also, very little work was undertaken with the section Tuberarium, as such, during this time other than that of Baker, which appeared in 1884, and that of Wittmack, which appeared in 1909. Baker recognized only 6 species out of the almost 30 that had been described up to that time, and Wittmack was even more conservative in recognizing only 4. This was not unusual, as it was the general practice up until the time of Berthault's and Bitter's works in 1911 and 1912 to consider all or most wild potatoes to be either subspecies or varieties of the cultivated Solanum tuberosum.

Bitter attempted to clarify the existing potato synonymy and, in addition to confirming or invalidating previously described species, he alone described as new more than 50 species and varieties.

Following Bitter's work very little was contributed to the section Tuberarium until Rydberg, in 1924, monographed the section Tuberarium in Mexico and Central America, at which time he published 10 new species. Then, from 1929 to about 1940, the Russian workers, including Bukasov and Juzepczuk, described more than 30 wild and 18 cultivated species that they considered to be new. In 1944 Hawkes described 31 wild and 5 cultivated species that he considered to be new.

It should be pointed out that the Russian workers, led by Bukasov, and the English worker Hawkes were concerned entirely with those species, especially tuber-bearing ones, in the subsection Hyperbasarthrum. The present work, however, includes not only the above subsection but also the subsection Basarthrum.

Only an approximation of the number of tuberous solanums can be estimated. Up to the present time there are only about 20 species cultivated and only about 160 known as growing in the wild. The writer is fully in accord with the statement of Hawkes in 1944: "... it is probable that so far as the wild species are concerned, the wealth of variation lies practically untouched. Indeed it is possible that three to four times the quantity of species that we know now has yet to be discovered and described, from

material growing in the more isolated and inaccessible regions of the South American Andes." The same could probably be said about this section in Mexico and Central America.

TAXONOMIC DIFFICULTIES INVOLVED

In most of the series, namely in those that are non-tuber-bearing, the species have fortunately received less attention from untrained taxonomists and are consequently rather clearly defined and not so burdened with synonymy. Such is not the case with the tuber-bearing series, many species of which were born in confusion, with later workers contriving to add even greater confusion.

One of the major difficulties involved, especially in the tuber-bearing series, is the fact that practically all of the historically basic species were founded not upon plants collected in their natural habitat, but solely upon plants cultivated in the North Temperate Zone, i. e., under abnormal conditions; for example, Solanum tuberosum, S. verrucosum, S. demissum. This is also true of a number of species described by later workers, such as those proposed by Hawkes—S. salamanii, S. malinchense, S. tlax-calense.

Coupled with the above difficulty is the inexcusable dabbling in systematics of the Bukasov school. Without any apparent effort to evaluate the nature and extent of the contributions by previous workers, such as the monographer Georg Bitter, they redescribed as new valid species of long standing. These, in some cases, had been accepted by reputable botanists for as long as 100 years. It would appear that the Russian workers never seriously referred to extant types that were readily available to them. It has not been possible to examine the types (if any exist) of the species proposed by the Bukasov school. It is fortunate, however, that all of these proposed species have been illustrated in one way or another so that it has been possible for the writer to place most of them into what he considers to be the correct synonymy.

In the present monograph, the writer has tried to pick up the pieces, as it were, of this exceedingly perplexing group of North and Central American plants belonging to a genus that has been compared by the great English systematist, John Lindley, in complexity with the notorious genera *Crataegus* and *Rubus*. Although many of the types, isotypes or photographs of types, or authentic specimens (either as photographed living plants or as herbarium specimens) have been available to the writer, there are still, and perhaps always will be, some missing links or problems

too complicated to solve in the light of data available.

A number of workers, including Lindley and, most recently, Viirilä in 1949, have either intentionally or unintentionally made clear the behavior and differences in habit of tuber-bearing solanums when grown under varying photoperiodic conditions. The growing of plants from short-day regions in long-day regions usually affects not only their outward morphology but also their

flowering, fruiting, and tuberization. Although this has been common knowledge for some years, it is regrettable that systematic or would-be-systematic botanists have not given it enough serious consideration in naming and describing plants in the past. In view of these considerations, it will be enlightening to illustrate and discuss the effects upon one of the writer's collections when it was cultivated under different environments. This example is identical with many of the other collections obtained by the writer

and others in Mexico and Central America.

On November 5, 1947, the writer made a series of collections in the vicinity of Río Frío, México State, the locality from which tubers had been taken to produce in cultivation the plants Klotzsch described as S. utile (see fig. 4), a synonym of S. demissum. This region is about 3,050 meters in elevation, and the plants, for the most part, were already winterkilled. It was possible, nevertheless, to obtain a mature plant specimen (fig. 1) for one of the writer's collections, as well as a good series of tubers and fruits of all the collections made where herbarium specimens were not obtainable. The tubers of the collection shown in figure 1 were grown under glass at Glenn Dale, Md., and a specimen typical of the plants produced was taken on April 21, 1948 (fig. 2). During the summer and fall of 1949 the tubers of this collection were planted outdoors at Sturgeon Bay, Wis. The specimen illustrated (fig. 3) was taken at Sturgeon Bay within the period August 9 to 13. It is typical of the plants produced from both tubers and seeds.

An examination of these illustrations will be most revealing. Although figures 1, 2, and 3 represent plants grown from tubers of the same collection, these plants show remarkable differences in their habit and general aspect. It will be noted that the low-growing, stocky, much-branched plant found in nature in Mexico is approximated by that grown outdoors at Sturgeon Bay, and that the plant described as S. utile (fig. 4) is somewhat intermediate between them. The leaves of the plant taken in Mexico, however, have large leaflets and are entirely devoid of interstitial leaflets, while the leaves of the plant taken at Sturgeon Bay have small leaflets and prominent interstitial leaflets. The Sturgeon Bay plants closely resemble the South American S. acaule Bitt. It will also be noted that the plants grown under glass at Glenn Dale (fig. 2) are identical in growth and in shape of the flowers with the type of S. demissum (fig. 5), which was grown at Chiswick, England, from Mexican tubers. The Glenn Dale plants also match the plant described as S. semidemissum (cf. fig. 99).

If these three specimens were considered individually they could well be taken for three different species, and, in the writer's opinion, any systematist who thus treated them would be above reproach. However, as the three specimens came from tubers of the same plant, the only course is to consider them as one species, namely, *S. demissum*. As is shown desirable by the above representative findings, the writer has given a broad interpretation to the species treated here, especially the tuber-bearing ones.



FIGURE 1.—Solanum demissum (Correll 14238). Specimen collected above Río Frío, México. About \times $\frac{2}{5}$.



FIGURE 2.—Solanum demissum (Correll 14238a). Specimen grown under glass at Glenn Dale, Md., from tubers of plant shown in figure 1. About × %.



FIGURE 3.—Solanum demissum (Correll 14238b). Specimen grown in the field at Sturgeon Bay, Wis., from tubers of plant shown in figure 2. About × 1/25.



FIGURE 4.—Solanum demissum (Hitchcock s. n.). This specimen was considered by Bitter to be representative of the plant described as S. utile. About \times $\frac{2}{5}$.



FIGURE 5.—Solanum demissum (Uhde 5). Type specimen. About \times $\frac{1}{3}$.

A conclusion one might reach in the light of the above observations would be never describe a plant grown under cultivation as new, especially one known to be out of its natural climate, without knowing what its parent stock is like in nature. Doubtless, the safest rule to follow in treating the tuberous solanums would be to describe as new only those plants collected in nature. For instance, plants found in nature that match or approach the type specimen of *S. demissum* (which was grown in England) are exceedingly rare and, when found at all, are usually at lower, warmer elevations than the Río Frío country. It would appear that in order to identify plants of *S. demissum* in accordance with the type specimen, it would be necessary in most instances to grow tubers collected in nature in long-day (temperate) regions in order to obtain the proper identifiable specimen.

The above demonstration regarding variations in *S. demissum*, when grown under different conditions, is similarly repeated for several other species, such as *S. verrucosum* and *S. stoloniferum*,

where they are treated in the text.

It should be pointed out that in the plants of all species and varieties grown under the three conditions discussed above, there was no evident change in the general aspect and shape of the floral segments. There was, however, some difference in the size of the flowers.

As was exemplified above by *S. demissum* and as others have pointed out, plants found in nature frequently have fewer, less developed interstitial leaflets than those grown under cultivation. This seems to be true not only for *S. demissum* but also for nearly all of the tuberous species. Hawkes, in discussing his new species *S. tlaxcalense* (described from plants cultivated at Cambridge, England), comments that: "*S. tlaxcalense* is closely related to *S. longipedicellatum* Bitt. from which it differs in the smaller habit, the greater degree of pubescence over the whole plant and the smaller number of interjected leaflets (these are completely absent in the original Mexican herbarium specimens)." Hence, in order to identify prospective plants of *S. tlaxcalense* one must keep in mind that the type specimen is one thing while the plant in its native environment is another. The "Mexican herbarium specimens" should have been the type, with supplementary comments to the description, stating that the material cultivated in England differed from the type material.

Many authors have reported various chromosome counts for some of the species or putative species in this section. Although some of the genetical work was doubtless based on correctly named species, so much has apparently been done on material of doubtful identity and without preserved botanical vouchers to support the research that much of the work must be considered as essentially worthless. It cannot be emphasized too strongly that botanical vouchers for checking should always accompany genetical and cytotaxonomic research. Most of the present taxonomic work is based on dried herbarium specimens that, naturally, preclude any possibility of being used in genetical and breeding research. It

would be, however, of immeasurable value if it were possible to go into the field in the localities cited in this monograph and obtain living material of each entity for breeding research. The only possible way to produce an accurate work of utmost value for a breeding program is for the geneticist, cytologist, and systematist

to work together.

Theories regarding the origin of the cultivated potato, S. tuberosum, have been discussed at length by a number of writers. It is not the writer's intention to enter here too deeply into such a controversial subject. Most students are of the opinion that the potato now commonly grown throughout the world had its origin in the Andes of Bolivia and Peru, the center of greatest variability of tuberous solanums. Another school of thought, originating with Darwin, considers that the island of Chiloé, off the coast of southern Chile, might be its place of origin. This region, too, is a center of great variability in tuber-bearing species. It is of interest to note here that Bukasov considered that there were many different species cultivated in Middle America and the South American Andes. He also considered that no S. tuberosum, as such, was cultivated in Mexico and Central America. In the writer's opinion this conclusion is incorrect. Indeed, the writer has not entirely discarded the possibility that S. tuberosum might have originated in Middle America. A fortuitous combination of characteristics derived from S. demissum, S. verrucosum, and S. stoloniferum, all native species in Mexico, could very well have produced plants typical of many strains now found in the cultigen S. tuberosum.

As S. tuberosum apparently has never been found in a wild state (at least not in modern times), it is highly probable that this plant, as the civilized world has known it under cultivation, never occurred as such in nature. According to potato historians, as early as the latter half of the sixteenth century and subsequently, tubers and seeds of potatoes were brought to Europe at different times from various parts of Latin America. From plants grown in Europe (i. e., in long-day regions) from these tubers and seeds, descriptions and illustrations (fig. 6) were prepared by herbalists.

These early descriptions and illustrations provided the historical basis for our present-day concept of the cultivated potato. Recently, the Bukasov school has proposed the segregation of cultivated potatoes into two basic categories; namely, S. tuberosum and S. andigenum. These, however, are so closely related that, as Hawkes pointed out in 1944, they represent such a fluid complex of forms that they can be included in the group species S. tuber-

osum, in the broad sense.

There should probably be a reconsideration of the geographic origin of the common cultivated potato in the light of all the recent observations concerning the effect of day-length on the plants. Since the island of Chiloé as well as a large part of Chile is in the Temperate Zone, having long-day growing conditions similar to those in the North Temperate Zone, and since no wild or ruderal *S. tuberosum* plants have been found in this or any

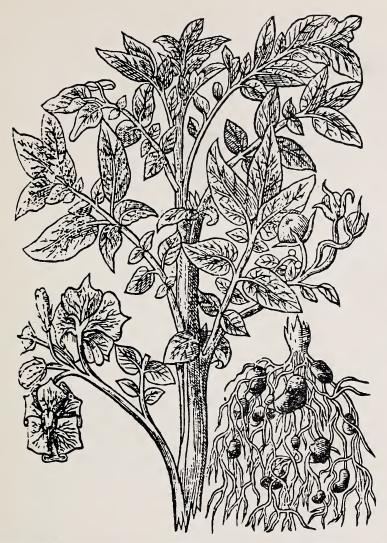


FIGURE 6.—Solanum tuberosum. The first published illustration of this species. It appeared in Gerard's Herbal in 1597 under the misleading name Batata virginiana. Nine years earlier, Clusius, to whom Gerard refers, had received a drawing of this species from Philippe de Sivry, under the name Papas peruanum.

other region, it would appear that more productive results would come by turning to regions having a short-day growing season where *S. tuberosum*, as we have come to know it, may have grown or may even still be growing in a semiwild or ruderal state under the guise of another habit. In other words, the case regarding *S. tuberosum* may be similar to that of *S. demissum* noted earlier (page 5). The primary objection to this premise is that many of

the tuberous species will not produce tubers, or at least do so only poorly, when taken from their short-day habitats to long-day regions. As *S. tuberosum* will produce abundant tubers under practically any day-length conditions, however, it could be an exception to the rule that short-day plants will not produce tubers

abundantly under long-day conditions.

Some serious student should try to find the progenitor or progenitors of our common cultivated potato in reverse by growing representative cultivated specimens obtained from widely separated long-day regions throughout the world in various strategic short-day regions of Latin America so as to observe and note their behavior and any differences in growth habits. It might be that, in time, plants would be produced from this cultigen in some optimum region in Latin America that would match or approach indigenous species occurring there in the wild state.

Despite the fact that seed potatoes (tubers) of the cultivated potato are imported into Mexico and Central America from the United States and elsewhere and are grown in those countries in the zone where native species occur, the Russians reported that they observed no S. tuberosum, as such, under cultivation in this region. This would appear to support the possibility that when S. tuberosum is taken into short-day regions a change develops in its habit. It is of interest to note that very few specimens of the broad leaflet S. tuberosum type have been seen from Mexico. Nearly all of the specimens fall into the S. andigenum category, as designated by Juzepczuk and Bukasov.

EXPLANATION OF THE TEXT

This monograph treats the species in a broad sense. The writer is firmly convinced, however, that with further detailed study it should be possible to distinguish and designate forms and variants within the broad species concepts that should be of much breeding and genetical value. Minor variations seem to be the rule instead of the exception. This is especially true of the tuberbearing species. In many of the species the only constant factor appears to be that of variability.

The citations of the writer's collections include specimens taken from the field in Mexico, in which case no suffix, as "a," "b," "c," is used, and those grown in the field at Sturgeon Bay, Wis., or under glass at Glenn Dale, Md. In the case of specimens taken from cultivation, one of the above suffixes accompanies the Mexican field collection number that originally represented only

tubers or seeds or both.

The United States Department of Agriculture Plant Introduction (P. I.) numbers are given after these citations. The numbers refer to living material introduced; in this case, tubers and seeds. The citation of these cultivated specimens is so done with a broad and liberal interpretation of specific delimitations based on the knowledge that a species may vary greatly when grown under different conditions of day-length, altitude, differences in quantity of light and quality of light.

As regards explanation of the terms used in describing the oddpinnate leaves, reference to figure 7 should suffice. In most species having odd-pinnate leaves the terminal leaflet is symmetrical, and the lateral leaflets are usually somewhat oblique, especially at the base. In referring to the descriptions the above differences should

be kept in mind.

In using the drawings of the floral analyses it must be taken into consideration that though they are made from actual specimens they represent the average material of the mass of collections comprising a given species that have been available for this work. The drawings represent the basic floral pattern for a given entity. Variations in abundance may be found, however, such as differences in the length of calyx and corolla lobes; but if sufficient allowance is made for these variations, the drawings, considered with the photographs of the plants, will prove useful in the iden-

tification of the species and varieties.

As the writer has been unable to find any satisfactory descriptive terms for the shapes of the corollas in the species comprising the section Tuberarium, he has arbitrarily adopted the three following terms for the basic shapes of the corollas found in this section: (1) Stellate—where the usually long corolla lobes (longer than broad) are without conspicuous interpetalar tissue and are separated by a prominent V-shaped (see fig. 88), or in some cases U-shaped (see fig. 81), sinus; (2) rotate-stellate—where the corolla lobes, though connected by interpetalar tissue, are prominent (see fig. 122) and usually broader than long (see fig. 90); (3) rotate (see figs. 94, 95, 155)—where the corolla lobes are short and are connected by prominent interpetalar tissue that is sometimes even lobulate (see fig. 42) to give to the corolla a 10-The term "interpetalar tissue" is used here to delobed aspect. note the expanded lateral margins of the petals. It consists of the petals themselves, not of any extraneous tissue.

In the descriptions when the style is said to exceed, equal, or be shorter than the stamens, the reference is to the flower in natural position and not to the dissected floral parts—in other words, their natural position in the complete flower. Also, only the free parts of the filaments are given in the measurements; the part

inserted on the corolla throat is not measured.

Although the inflorescence in *Solanum* is, in a strict technical sense, always lateral and extra-axillary, it has the appearance of being terminal, i. e., at the end of branches, in many species in the section Tuberarium. Superficially, it is often difficult to determine its position on the plant. Because of this and also for convenience, the term "pseudoterminal" is sometimes used here for the position of the inflorescence.

PRESENT AND FUTURE WORK

The collections of living material obtained by the writer in Mexico in 1947-48 are now a part of the large reservoir of potato germ plasm being maintained at the Inter-regional Potato Intro-

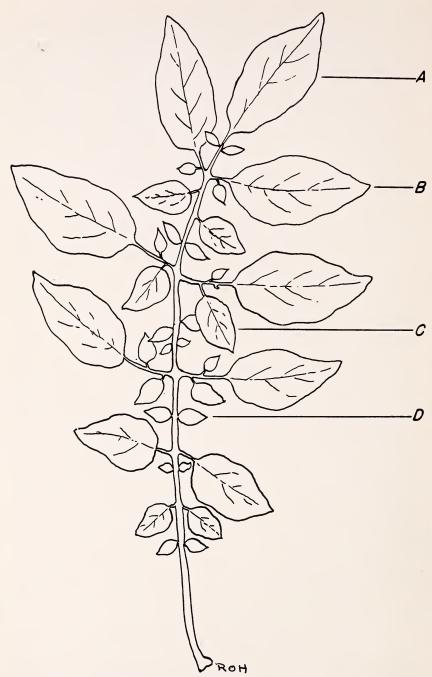


FIGURE 7.—Drawing of odd-pinnate leaf, characteristic of many species of Solanum, to demonstrate leaf terminology, \times 1: A, Terminal leaflet; B, lateral leaflet; C, secondary leaflet; D, interstitial leaflet.

duction Station, Sturgeon Bay, Wis. The maintenance of this material is under the supervision of R. W. Hougas. Through his cooperation J. R. Beaudry has been making preliminary genetical, cytological, and cultural investigations of the writer's collections. F. J. Stevenson, in charge of Federal potato-breeding programs, Donald Reddick, of Cornell University, and J. P. Sleesman, Ohio State University, as well as research workers of the Max-Planck Institut in Germany, have also been making various investigations on the material. As these workers will eventually make available their findings through publications, no attempt has been made to include, except incidentally, any part of the results thus far obtained by any of them.

In 1948 the writer designated and discussed to some extent the areas in the highlands of central Mexico that he thought might yield excellent results with future exploration. He is still of the opinion that the areas noted in 1948 would be exceedingly worth while to explore for species in the section Tuberarium. In addition to these potentially rich areas in central Mexico, the writer would like to emphasize the need for exploring the vast mountain mass and high plateau region of Department Huehuetenango, Guatemala, centering about the Sierra de los Cuchumatanes, as well as the surrounding high country in Departments Quiché and San Marcos, Guatemala, and the State of Chiapas, Mexico. In

these areas there is a strong element of endemism.

Another area where endemism appears to be common is in the northern half of Mexico. In this area the tuber-bearing species, like those of central Mexico, are confined more or less to mesophytic forests on the summits of mountain masses, which are commonly isolated one from the other by extensive intervening plateaus and by valleys exhibiting plants of a xerophytic nature. These plateaus and valleys are formidable barriers to the dissemination of tuberous solanums. Several species that stand far apart from other members in the section Tuberarium are found here and give lise to speculation that tuber-bearing species have existed in this region, independent of the highlands of south-central Mexico, from prehistoric times. It is in such isolated areas as these where one might expect to find valuable breeding material that might provide more disease- and frost-resistant strains and other desirable characteristics which might be bred into our domestic types.

In 1949 J. G. Hawkes made a potato-collecting expedition to Mexico and obtained about 130 samples of wild potatoes. Although Hawkes sent the writer a duplicate set of the herbarium specimens of this collection, they are excluded from this monograph at his request. A cursory examination of Hawkes' collections, however, reveals that, although their inclusion would have admirably supplemented the distribution data for some of the species, there appears to be no species present that is not already

included in this publication.

SYSTEMATIC TREATMENT

SOLANUM [Tourn.] L., Sp. Pl. 1: 184. 1753; Dunal in DC., Prodromus 13 (1): 27-387. 1852.

Perennial herbs, shrubs, or small trees, sometimes climbing, unarmed or spiny, pubescent with simple or often branched hairs or rarely glabrous, with fibrous roots or from a woody rootstock, sometimes stoloniferous and tuber-bearing. Leaves alternate or rarely in subopposite pairs, simple and entire, lobed, or pinnatisect. Peduncle mostly lateral (or becoming lateral) and extraaxillary, sometimes terminal in appearance or opposite the leaves. Inflorescence dichotomous, cymose, racemose, umbellate, paniculate, or rarely a solitary flower. Flowers white, violet, purple, or yellow, sometimes variegated. Calyx campanulate, rotate, or cupular, 4- or 5-toothed or -lobed, rarely 10-parted, sometimes slightly enlarged in fruit. Corolla rotate, rotate-stellate, or stellate, more or less deeply or shallowly 5-parted or -lobed, sometimes appearing to be 10-lobed, the lobes plicate in the bud. Stamens 4 or 5, inserted on the corolla throat, exserted; filaments usually very short, free or rarely united; anthers oblong or lanceolate, usually short and thick, connivent or cohering in a cone around the style, sometimes unequal, opening at the apex by two pores or small slits. Ovary 2- (rarely 3- or 4-) celled, many-ovuled; style simple; stigma usually small. Fruit a berry, usually globose, sometimes ovoid or ellipsoid. Seeds orbicular or subreniform, compressed; testa often minutely pitted; embryo much curved, submarginal; cotyledons semiterete.

This is a polymorphous genus of about 2,000 species, many of which are exceedingly complex. It is found chiefly in tropical and subtropical regions of both hemispheres, with a scattering of species in temperate regions. Some of the species produce edible fruits and others poisonous ones, while the fruits of the great majority are in a dubious category. One section of the genus, Tuberarium, part of which is treated in this monograph, is of incalculable economic importance, as it includes all of the culti-

vated potatoes.

SECTION TUBERARIUM (Dunal) Bitt., Repert. Sp. Nov. 10: 531, 532. 1912; 11: 255. 1912.

Tuberarium Dunal in DC., Prodromus 13 (1): 28. 1852, as Subsection.

Plants unarmed, commonly tuber-bearing. Leaves usually oddpinnate, sometimes simple and entire. Pedicels always distinctly articulate (jointed) either at the base or above the base.

KEY TO SERIES

I. Subsection Basarthrum Bitt., Repert. Sp. Nov. 11: 350. 1912. Pedicels articulate at the base or essentially so; hairs acute,

usually merely 2-celled, the basal cell provided with a thicker wall and longer, the apical cell shorter with a thinner wall (bayonethairs); plants perennial herbs, vines or viny shrubs, probably all non-tuber-bearing.

Leaves odd-pinnate.
 Stem woody, climbing and rooting at the nodes.

Series Appendiculata (p. 19).

2. Stem herbaceous, usually not climbing or rooting at the nodes. Series Suaveolentia (p. 37).

1. Leaves simple, entire Series Muricata (p. 49).

Subsection Hyperbasarthrum Bitt., Repert. Sp. Nov. 11: II. 359. 1912.

Pedicels articulate above the base, often in the middle, rarely only a little below the calyx; hairs usually many-celled, the basal cell not provided with a thickened membrane and not several times longer than the upper cells; plants perennial herbs, rarely suffrutescent, usually tuber-bearing.

Plant shrubby; flowers generally yellow; inflorescence pushed to one side by a branch from the axil of the last leaf; plant non-

tuber-bearing Series Juglandifolia (p. 55). Plant herbaceous; flowers not yellow; inflorescence pushed to one side by a branch from the axil of the penultimate leaf; plant usually tuber-bearing.

Fruit ellipsoid or ovoid-elongate, usually somewhat conical, acute at the apex; stems fistulose; plants may or may not bear tubers.

Series Conicibaccata (p. 56). 4. Fruit orbicular or ovoid, rounded at the apex; plants with stolons and tubers.

5. Corolla stellate, with lobes longer than broad and separated by a prominent V- or U-shaped sinus.

7. Leaflets 3, rarely with an additional minute basal pair; leaves on long, winged petiolesSeries Trifida (p. 91).

7. Leaflets 5 or more; leaves with rather short slender petioles.

Corolla rotate or rotate-stellate, with lobes broader than long and more or less fused together by an interpetalar membrane.

9. Plant densely covered with a glandular pubescence, with an unpleasant odor; corolla rotate-stellate.

Series Polyadenia (p. 127). Plant pubescent to glabrous, sometimes sparsely glandular,

odor not particularly unpleasant; corolla rotate or rotatestellate Series Tuberosa (p. 131).

Series Appendiculata Rydb., Torrey Bot. Club Bul. 51: 146, 174. 1924.

Woody, high-climbing plants that root at the nodes; non-tuberbearing. Leaves odd-pinnate. Pedicels articulate at or near the base. Corolla stellate. Fruits round, commonly reddish.

Style much exceeding the stamens.

2. Anthers acute to aristate (also puberulent) at the apex; leaflets usually 7 or more _______4. S. skutchii.

Anthers rounded and retuse at the apex; leaflets usually 5.
3. Filaments united to base of anthers to form a column.

2. S. connatum.

Style about equal to or shorter than the stamens.

4. Peduncle and rachis sparingly hairy to essentially glabrous.

1. S. appendiculatum.

4. Peduncle and rachis tawny pubescent to somewhat velutinous.

1. Solanum appendiculatum Humb. & Bonpl. ex Dunal, Solan. Syn. v. 5. 1816. (Figs. 8, 9, and 10.)

Solanum galeotti Dun. in DC., Prodromus 13: 82. 1852. ?S. stephanodes Schlecht., Linnaea 19: 290. 1847. Type locality: Mexico.—Cumbre del Opispo, Schiede.

A perennial woody vine, creeping and climbing, more or less pubescent, rarely subglabrous. Stem rooting at the nodes; branches (especially when young) somewhat pilose. Leaves oddpinnate, up to 15 cm. long, usually less than 8 cm., pubescent above with short subulate hairs to glabrescent in age, less pubescent beneath, without interstitial leaflets; petioles up to 10 cm. long, usually much shorter. Leaflets 5, rarely 3 or 7; lateral leaflets ovate to ovate-lanceolate or elliptic-lanceolate, occasionally ellipticoblanceolate, obtuse to acuminate, cuneate to rounded at the slightly oblique base, subsessile to shortly petiolulate (petiolules up to 6 mm. long), up to 7 cm. long and 3 cm. wide, the lowermost pair much reduced; terminal leaflet symmetrical and larger than the lateral leaflets. Pseudostipular leaves small, semiovate. up to 8 mm. long and 4 mm. wide. Inflorescences pseudoterminal on leafy branches, sometimes lateral, cymose or paniculate, rarely racemose; peduncles usually short, rarely as much as 2 cm. long, more or less pilose to glabrous in age. Pedicels 5 to 8 mm. long, about 1 cm. long in fruit, articulate at the base, thickened above the middle, glabrous to sparsely pilose. Flowers white or purpletinged, rarely almost purple. Calyx 2.0 to 2.5 mm. long, more or less pilose to glabrescent in age, divided somewhat irregularly to above or about the middle into broadly ovate to triangularovate lobes that are acute to obtuse and apiculate, marginate. Corolla stellate, 4 to 7 mm. long, deeply lobed to near the base; lobes elliptic-lanceolate to broadly triangular-lanceolate, obtuse to acute at the pubescent apex. Anthers elliptic to elliptic-lanceolate in outline, 2 to 3 mm. long; filaments about 0.5 mm. long, rarely up to 1 mm. long, hirsute. Style equal to or shorter than the stamens. Fruits globose, red, about 1 cm. in diameter.



Figure 8.—Solanum appendiculatum (Pringle 4922). About \times %.

Range: Mountains from south-central Mexico (Veracruz to Jalisco) south to southeastern Guatemala (Dept. Chiquimula),

rarely below 2,000 m.

This species is variable in the degree of pubescence. Some plants are rather densely pubescent, and others are essentially glabrous. The calyx is hirsute or pilose, or sometimes glabrous, with short ovate apiculate marginate lobes. The style is shorter than or about equal to the stamens, and the 3 or 5 leaflets are similar to those of *S. inscendens*. Sterile or older parts of some plants frequently have leaves with petioles up to 10 cm. in length.

Although herbarium specimens were borrowed from the Museum d'Histoire Naturelle in Paris, the type of S. appendiculatum

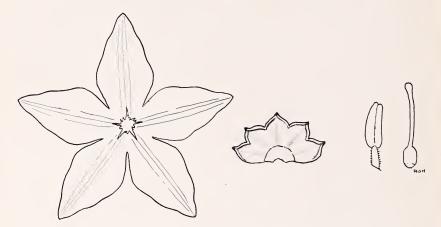


FIGURE 9.—Solanum appendiculatum (Pringle 4922): corolla, calyx, stamen, pistil. All about \times 4.

deposited there was inadvertently omitted from the loan. A photograph, however, of the type is included here (fig. 10). The plant described as *S. galeotti* is more pubescent than most material examined; also, the peduncle is somewhat larger and the inflorescence more lax than in most specimens.

In Guatemala, Steyermark states that this plant is called tomatillo in the vicinity of Miramundo, Jalapa, and Standley records

that it is known as mapix in Quezaltenango.

It has not been possible to place accurately *S. stephanodes*, especially since the type has not been seen. It appears from the description, however, that this plant is referable to *S. appendiculatum*.

Specimens examined:

MEXICO.—CHIAPAS: cold region, growing about oaks, plant climbing, flowers white, flowering in September and October, 1864-70, Ghiesbreght 637 (Gray); without data, Ghiesbreght s. n. (Mo); Fraylesca, near Siltepec, 2,000 m., March 12, 1945, Matuda 5249 (Lun, NA). Jalisco: La Palma, June 8, 1892, Jones 38 (US). México: Amecameca, 2,440 m., July 26, 1924, Fisher s. n. (CM, Mo); same locality, vine 20 ft., Fisher 253 (US); Temascaltepec, Ocotepec, vine on stone fence, 1,500 m., December 10, 1932,



FIGURE 10.— $Solanum\ appendiculatum$. Type collection from near La Puente de la Madre de Dios, Mexico, Schiede. About $\times\ \%_3$.

Hinton 2912 (Ar, CM, Mo, NA, NY, US); Temascaltepec, El Crucero, vine, 2,880 m., July 19, 1932, Hinton 1101 (Gray); Vallee de Mexico, San Nicolás, September 27, 1865-66, Bourgeau 981 (Kew). MICHOACÁN: white-flowered vine, pedregal lava flow 2 miles south of Tancitaro, 1,980 m., July 22, 1940, Leavenworth 312 (Ar, CM, Gray, Lun, Mo, NA, NY); Tancitaro, Mount San

Miguel, vine, moist soil, 2,000 m., July 21, 1941, Leavenworth 1084 (CM); oaks at Ario, flowers white, climbing undershrub, 1,220 m., August 1840, Galeotti 1184 [type collection of S. galeotti] (Kew, Paris, Vienna). Oaxaca: eighteen miles southwest of the city of Oaxaca, 2,400-2,890 m., September 10 to 20, 1894, Nelson 1356 (Gray, US); Sierra de San Felipe, climbing on trees to 20 or 30 ft., 3,050 m., September 26, 1894, Pringle 4922 (Cal, Gray, Iowa, Mo, NY, PA, US, Vienna). Veracruz: Acultzinco, May 1, 1937, Matuda 1155 (Mo, NY); region of Orizaba, "Bario nuevo," "parasite," flowers white, September 3, 1866, Bourgeau 3018 (Kew); without data, Bourgeau 3370 (Kew); San Miguel, Jalapa, flowers small, white with faint touches of purple, in pendent bunches, fruits brilliant orange-colored, globular, ½ inch in diameter, climbing woody vines to 25 ft. long, hedgerows, among dense shrubs and rank vegetation, 1,830 m., September 17, 1938, Balls B5473 (Cal, US). STATE UNKNOWN: Plantae Novae Hispaniae, 1787, 1795, 1804, Sessé, Mociño, and Maldonado 1522, 5364 (CM).

GUATEMALA.—Dept. Alta Verapaz: Chucaneb, 1,830 m., April 1889, Smith 1836 (US). DEPT. AMATITLAN: Volcán Pacaya, 2,135 m., January 6, 1907, Kellerman 6526, 6539 (CM). DEPT. CHIMALTENANGO: Chichavac, vine with woody stem, attaching by roots, flower white, stamens yellow, in ravine by waterfall, 2,400 to 2,700 m., July 7, 1933, Skutch 349 (US); Cerro de Tecpám, region of Santa Elena, Cupressus forest, creeping on tree trunk, corolla purplish white, 2,400 to 2,700 m., December 26, 1938, Standley 61001 (CM, US); above Las Calderas, moist forest, creeping on tree or soil, abundant, fruit red, 1,800 to 2,100 m., December 15, 1938, Standley 60047 (CM); Chichavac, climbing by roots, corolla white often tinged with purple, fruit a globular drupe, orange at length turning black, 2,400 to 2,700 m., November and December 1930, Skutch 121 (US). DEPT. CHIQUIMULA: upper slopes of Montaña Tajurán, in vicinity of El Barriol, creeping plant around base of tree, 1,200 to 1,700 m., October 28, 1939, Steyermark 30811 (CM). DEPT. GUATEMALA: 1942, Aguilar 653 (CM). DEPT. HUEHUETENANGO: moist cool mixed cloud forest with Pinus ayacahuite and Abies guatemalensis around Rancho de Teja, 3 miles west of San Mateo Ixtatán, Sierra de los Cuchumatanes, climbing, corolla white, anthers yellow, 3,333 m., July 9, 1942, Steyermark 48494 (CM); south slope of the Sierra de los Cuchumatanes above Chiantla, woody vine, climbing on rock in open, flowers white, 3,200 m., September 16, 1934, Skutch 1273 (US); El Mirador, at the summit of the road leading from Huehuetenango to Sierra de los Cuchumatanes, among limestone rocks, corolla white, about 3,300 m., December 31, 1940, Standley 81850 (CM). DEPT. JALAPA: Montaña Miramundo, near Miramundo, twining from ground along base of tree, leaves dark green. thin, corolla lobes white, forested area along quebrada, called "tomatillo," 2,000 m., December 6, 1939, Steyermark 32834 (CM, US). DEPT. QUEZALTENANGO: slopes of Volcán de Zunil, at and above Aguas Amargas, moist forest climbing on tree trunk Zunil, at and above Aguas Amargas, moist forest, climbing on tree trunk, 2,430 to 2,850 m., February 17, 1939, Standley 65442 (CM); slopes of Volcán de Santa María, above Palojunoj, in forest at 3,300 m., creeping on tree trunk, corolla white, common, called mapix, March 6, 1939, Standley 67609 (CM); densely forested damp white sand quebrada, El Pocito, south of San Martín Chile Verde, on road to Colomba, creeping on tree, fruit bright red, 2,200 m., January 27, 1941, Standley 84902 (CM). DEPT. SACATEPÉ-QUEZ: slopes of Volcán de Agua, above Santa María de Jesús, damp forest, climbing on tree trunk, corolla purple, 2,250 to 3,000 m., February 11, 1939, Standley 65067 (CM). DEPT. SAN MARCOS: garden of Señora Dolores Arriaga, 1 km. southeast of San Sebastián, climbing, fruit green then orange, spherical, 3,900 m., February 16, 1940, Steyermark 35941 (CM); El Boquerón, near border of Dept. Quezaltenango, Cupressus forest, creeping on tree trunk, corolla white, about 2,700 m., February 22, 1939, Standley 66317 (CM). Dept. Suchitepequez: Volcán Santa Clara, between Finca El Naranjo and upper slopes, climbing, 1,250 to 2,650 m., May 23, 1942, Steyermark 46642 (CM). Dept. Totonicapán: near Cumbre del Aire, on road between Huehuetenango and Sija, Cupressus forest, creeping on tree trunk, 3,000 to 3,450 m., February 20, 1939, Standley 65898 (CM). DEPARTMENT UNKNOWN: Volcán de Fuego, 1873-74, Salvin s. n. (Vienna); mountains near Hacienda of Chaucol, 3,355 m., January 2, 1896, Nelson 3644 (CM, US).

2. Solanum connatum Correll sp. nov.³

(Figs. 11 and 12.)

A perennial woody vine. Stem with spreading hairs, becoming glabrous with age; branches (especially when young) densely spreading-pilose to subvelutinous. Leaves odd-pinnate, up to 10 cm. long, rather densely pilose on both surfaces when young, becoming glabrescent with age, somewhat granulose on both sides. without interstitial leaflets; petioles (and rachis) pilose, up to 4 cm. long. Leaflets 5; lateral leaflets elliptic to elliptic-oblanceolate or elliptic-obovate, obtuse to shortly and rather abruptly acuminate, cuneate to somewhat rounded at the slightly oblique base. up to 5 cm. long and 2 cm. wide, the lowermost pair much reduced; terminal leaflet symmetrical and much larger than the lateral leaflets. Inflorescences pseudoterminal on usually short leafy branches, less than 6-flowered, very short, less than 3 cm. long (including the abbreviated peduncle), 1- to several-branched; peduncles (and rachis) subvelutinous. Pedicels stout, about 5 mm. long, articulate at the base, thickened upward, sparsely pilose to glabrescent. Flowers probably white (no color notes available). Calyx 1.5 to 2.0 mm. long, pilose, divided for about one-third the distance to the base into short triangular acute lobes. Corolla stellate, 4 to 5 mm. long, divided to below the middle into broadly ovate obtuse lobes. Anthers oblong in outline, about 2 mm. long; filaments about 1 mm. long, hirsute, united their entire length. Style 5 mm, long, much exceeding the stamens; stigma capitate. Fruits globose, apparently red, a little less than 1 cm. in diameter.

Range: Apparently endemic in the high mountains of San Mar-

cos, Guatemala.

This species differs from *S. subvelutinum* not only in that the style exceeds the stamens but that the anthers are sessile on the column formed by the united, or connate, filaments. The filaments of *S. subvelutinum* are not united. *Solanum connatum* is closely related to *S. tacanense*, but the style is twice as long as in that species. *Solanum connatum* consistently has only 5 leaflets.

Specimens examined:

GUATEMALA.—DEPT. SAN MARCOS: slopes of barrancas tributary to and bordering Río Vega, between San Rafael at northeast portion of Volcán Tacaná and Guatemala-Mexico line, climbing 2,500 to 3,000 m., February 21, 1940, Steyermark 36294 [type in Chicago Natural History Museum, No. 1039948; isotype in U. S. National Herbarium]; along Quebrada Canjulá,

³ Herba perennis lignosa vitinea. Caulis cum pilis patentibus, glabrescens; rami (immaturi praesertim) dense patenti-pilosi vel subvelutini. Folia imparipinnata, usque ad 10 cm. longa, inter foliola sine foliolis parvis. Foliola quinque, elliptica vel elliptico-oblanceolata vel elliptico-obovata, obtusa vel breviter et satis abrupte acuminata, basi cuneata vel rotundata. Inflorescentiae in ramis vulgo brevibus foliatis terminales, pedunculo abbreviato incluso minus quam 3 cm. longae; pedunculus rhachisque subvelutina. Pedicelli basi articulati. Calyx 1.5–2.0 mm. longus, pilosus, per tertiam partem usque ad basim in lobos breves triangulares acutos divisus. Corolla stellata, 4–5 mm. longa cum lobis late ovatis et obtusis. Antherae oblongae, circiter 2 mm. longae; filamenta circiter 1 mm. longa, hirsuta, omnino unita. Stylus 5 mm. longus, stamina multo excedens. Fructus globosus, circiter 1 cm. in diametro.



FIGURE 11.—Solanum connatum (Steyermark 36294). Type collection. About × %.

between Sibinal and Canjulá, Volcán Tacaná, epiphyte on tree, wooded slopes, February 18, 1940, $Steyermark\ 36015$ (CM).

The following sterile collection probably represents a new species closely allied to *S. connatum*. It differs vegetatively from that species primarily in the typically 7 leaflets being an elliptic shape, tapering to the narrow, scarcely oblique base. It is cited here to call attention to its existence in the hope that collectors may be on the lookout for it in the future:

GUATEMALA.—DEPT. SAN MARCOS: between towns of Tajumulco and Tecutla (9 miles south and west of Tajumulco), northwestern slopes of Volcán Tajumulco, climbing, leaves membranaceous, olive, dull-green above, paler green beneath, stem gray-green, 1,800 to 2,500 m., February 27, 1940, Steyermark 36834 (CM).

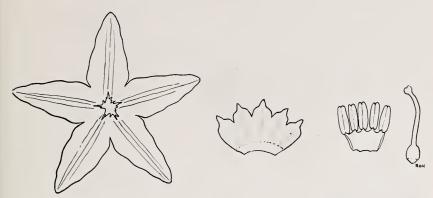


FIGURE 12.—Solanum connatum (Steyermark 36294): corolla, calyx, stamens, pistil. All about \times 4.

3. Solanum inscendens Rydb., Torrey Bot. Club Bul. 51: 175. 1924. (Figs. 13 and 14.)

Solanum ovandense Lundell, Amer. Midl. Nat. 29: 490. 1943.

A perennial woody vine. Stem brown and glabrous when mature, rooting at the nodes; branches rather densely and finely pilose when young. Leaves odd-pinnate, 3 to 8 cm. long, without interstitial leaflets; petioles glabrescent or pubescent above with short flattened subulate hairs, thinly pilose beneath, slender, up to 4 cm. long. Leaflets 5, very rarely 3 or 7; lateral leaflets ovate to elliptic-lanceolate or rarely elliptic-oblanceolate, obtuse to acuminate, rounded to cuneate at the slightly oblique base, subsessile or shortly petiolulate, 1.5 to 4.0 cm. long and up to 1.5 cm. wide, the lowermost pair much reduced or sometimes minute; terminal leaflet symmetrical and somewhat larger than the lateral leaflets. Pseudostipular leaves auriculiform, up to 1 cm. long and 5 mm. wide. Inflorescences pseudoterminal on leafy branches, few- to many-flowered, paniculate or rarely racemose; peduncles usually short, rarely up to 3 cm. long, finely pilose to glabrescent. Pedicels 7 to 12 mm. long, articulate at the base, thickened somewhat above the middle, glabrous or sparsely pilose. Flowers white. Calyx about 2 mm. long, sparingly hirsute to nearly glabrous, with obsolescent or short triangular-ovate rounded to acute lobes; lobes marginate. Corolla stellate, 5.0 to 6.5 mm. long, deeply lobed to near the base; lobes elliptic to broadly elliptic-lanceolate, obtuse to acute at the puberulent apex. Anthers broadly elliptic in outline, 2.0 to 2.5 mm. long, cordate at each end; filaments about 0.5 mm. long, hirsute. Style 5 to 7 mm. long, conspicuously exceeding

FIGURE 13.—Solanum inscendens (Purpus 1733). Type collection, About X

1733

FLORA OF MEXICO. Solanum appendiculation de the stamens, curved in age; stigma capitate. Fruits globose, vernicose, less than 1 cm. in diameter.

Range: Mountains from south-central Mexico to central Guate-

mala, usually above 2,000 m.

The inflorescences of this species are always borne at the tip of leafy branches. The calyx is pubescent and has rounded, apiculate, marginate lobes. Other distinctive characteristics are: Style longer than the stamens; leaflets 3 to 7, typically ovate to ellipticanceolate, obtuse to acuminate, and pubescent on the upper surface at maturity.

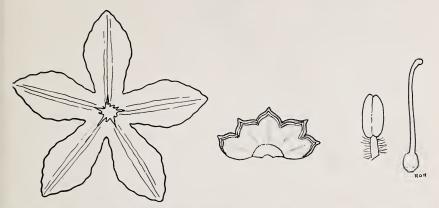


FIGURE 14.—Solanum inscendens (Purpus 1733): corolla, calyx, stamen, pistil. All about \times 4.

Natives in the vicinity of La Llorona, Jalisco, Mexico, told the writer that they called this plant pinguraca and ate the ripe fruits. In the writer's opinion the fruits are not appetizing.

Specimens examined:

MEXICO.—CHIAPAS: Mount Ovando, near Escuintla, 1,500 m., July 16, 1940, Matuda 4182 [type collection of S. ovandense Lundell] (Mich). Jalisco: growing in tree up to 20 ft. in length, near La Llorona, vine long and trailing, flowers small, white, and tinged with purple, fruits orange red, eaten by natives, commonly called pinguraca, December 22, 1947, Correll 14372 [P. I. No. 162071] (NA). México: Ixtaccihuatl, climbing trees, rocks, etc., along brooks, 2,440 m., January 1906, Purpus 1733 [type collection of S. inscendens] (Cal, CM, Gray, Mo, NY, US). OAXACA: vicinity of Cerro San Felipe, 2,890 to 3,355 m., 1894, Nelson 1102 (Gray, US). State unknown: 1839, Ehrenberg 368 (Cal).

GUATEMALA.—Dept. Chimaltenango: Volcán Acatenango, 2,440 m., February 8, 1907, Kellerman 6658 (CM). Dept Guatemala: Aguilar 688 (CM). Dept. Huehuetenango: Sierra de los Cuchumatanes along road beyond La Pradera, km. 32, dense limestone Juniperus forest, about 3,300 m., December 31, 1940, Standley 81797 (CM). Dept. Quezaltenango: slopes of Volcán de Santa María, above Palojunoj, in forest at 3,000 m., slender herbaceous vine, corolla white, March 6, 1939, Standley 67642 (CM).

A woody high-climbing or trailing vine, climbing up to 25 feet, sparsely pubescent to essentially glabrous in age, probably nontuber-bearing. Stem slender, branched, somewhat hirsute or pilose when young, becoming glabrous in age, rooting at the nodes. Leaves odd-pinnate, 4 to 6 cm. long, somewhat granulose on both surfaces, sparsely pilose when young, sometimes densely pubescent on the lower surface, without interstitial leaflets; petioles up to 8 cm. long. Leaflets 7 to 11, very rarely 5; lateral leaflets commonly elliptic-oblong to elliptic-obovate or elliptic-oblanceolate, sometimes ovate to elliptic-lanceolate, rounded to shortly acuminate at the apex, truncate to narrowly cuneate at the base, up to 7 cm. long and 2.5 cm. wide, usually much smaller, the lowermost pair reduced; petiolules up to 3 mm. long; terminal leaflet symmetrical and somewhat larger than the lateral leaflets. Pseudostipular leaves semiovate, obtuse to acute, up to 1.5 cm. long and 5 mm. wide. Inflorescences pseudoterminal on leafy branches and on the stem in the axils of leaves, few- to severalflowered, cymosely paniculate or racemose; peduncles usually essentially lacking, rarely up to 3.5 cm. long. Pedicels 1.0 to 2.5 cm. long, articulate at the base, thickened above the middle, glabrous. Flowers white. Calyx 2.5 to 4.0 mm. long, glabrous, subtruncate to unequally and shallowly lobed at the apex; lobes broadly orbicular-ovate to somewhat quadrate, broadly rounded to apiculate and somewhat dorsally umbonate at the apex, conspicuously marginate. Corolla stellate, 7 to 9 mm. long, deeply lobed to near the base; lobes prominently reflexed at maturity, elliptic-lanceolate, acute, ciliate above. Anthers elliptic in outline, deeply cordate at the base, incurved and acute to aristate (also puberulent) at the apex, 3 to 4 mm. long; filaments about 1 mm. long, sparsely hirsute, united more than half their length. Style 8 mm. long, much exceeding the stamens. Fruits ovoid to orbicular, orange red to orange, about 1.5 cm. in diameter.

Range: Mountains of northwestern Mexico (Tamaulipas) to

southeastern Guatemala (Dept. Jalapa), 900 to 2,850 m.

The inflorescences of *S. skutchii* are almost always in the axils of leaves on the stem or at the apex of stems, or they are subtended by a solitary leaf. This separates it, in part, from *S. inscendens*, a close ally. The usual 7 leaflets are typically ellipticoblong to elliptic-obovate or elliptic-oblanceolate, sometimes broadly elliptic-lanceolate, rounded to shortly acuminate at the apex, and essentially glabrous on the upper surface at maturity. The calyx is glabrous and almost truncate or only slightly lobed, and the style is longer than the stamens. The aristate to acute anther tips are unique in the section Tuberarium.

Steyermark states that this plant is called chumuchumutella in the vicinity of Finca El Porvenir, San Marcos, Guatemala, where

the leaves are boiled and eaten as greens.

Specimens examined:



FIGURE 15.—Solanum skutchii (Skutch 1772). Type collection. About × %. 956658—52—3

MEXICO.—HIDALGO: an herbaceous vine, in second growth on mountain side, Chapulhuacan, July 1937, C. L. Lundell and Amelia A. Lundell 7185 (Ar, Lun, NY, US). MICHOACÁN: trailing in shade of thicket along stream bank, about 15 miles from Morelia on Mexico City road, vines long and trailing, non-tuber-bearing, and not in flower or fruit, November 12, 1947, Correll 14251 (NA). TAMAULIPAS: near San Lucas, January 1932, Rozynski (63i) (CM). VERACRUZ: near Cataract, Orizaba, "Journey to Mexico and California, February, May 1885," Asa Gray (Gray); Cantón de Córdoba, 1,200 m., December 27, 1897, Conzatti and Gonzáles 631 (Gray).

GUATEMALA.—Dept. Alta Verapaz: climber, up to 25 ft., flowers white, fruit orange red, oval, ½ inch long, in forest, Finca Moccá, 915 m., January 17, 1920, Popenoe 936 (US). Dept. Chimaltenango: Cerro de Tecpám, region of Santa Elena, dense Cupressus forest, creeping on tree trunk, sterile, about 2,700 m., December 4, 1938, Standley 58795 (CM). Dept. Guatemala: Volcán de Pacaya, above Las Calderas, moist forest, creeping on tree trunk, sterile, 1,800 to 2,400 m., November 30, 1938, Standley 58409 (CM). Dept.

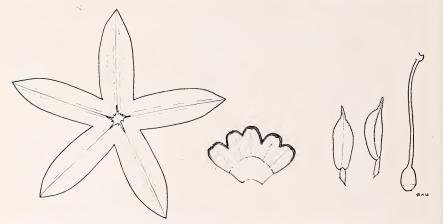


FIGURE 16.—Solanum skutchii (Skutch 1772 and Lundell 7185): corolla, calyx, stamen (dorsal view), stamen (side view), pistil. All about × 4.

Jalapa: Volcán Jumay, north of Jalapa, liana, at base of tree on north-facing slope in cloud forest (leaves thin, dark green above, paler green beneath), 1,300–2,200 m., December 1, 1939, Steyermark 32366 (CM). Dept. Quezaltenango: Fuentes Georginas, western slope of Volcán de Zunil, wet forest, creeping on tree trunk, about 2,850 m., March 4, 1939, Standley 67477 (CM); climbing over tree, leaves membranaceous, dull green above, silvery gray green beneath, fruit orange red, Volcán de Santa María, between Santa María de Jesús, Los Mojadas, and summit of volcano, 1,500 to 3,000 m., January 12, 1940, Steyermark 34030 (CM); mountains southeast of Palestina, oak forest, scandent on tree trunk, about 2,700 m., February 22, 1939, Standley 66368 (CM). Dept. Quiché: slender-stemmed woody vine, flowers white, berry spherical, 5% inch in diameter, orange-colored, scrambling over stony bank in moist shady valley, 1,700 m., November 22, 1934, Skutch 1772 [type collection of S. skutchii] (US). Dept. San Marcos: Finca El Porvenir along Río Chopal, south-facing slopes of Volcán Tajumulco, climbing on trees along river, also on ground, leaves membranaceous, rich grass green above, paler green beneath, edible when boiled for greens, "chumuchumutella," 1,300 to 1,500 m., March 11, 1940, Steyermark 37479 (CM, US); above Río Tacaná, near San Antonio, creeping on tree trunk, 2,700 m., February 22, 1939, Standley 66175 (CM). Dept. Sololá: Volcán San Pedro, north-facing slope toward Lago de Atitlán, above village of San Pedro, climbing on tree trunk in damp cloud forest dripping with mosses and hepatics, between 2,500 to 2,890 m., June 7, 1942, Steyermark 47241 (CM).



Figure 17.—Solanum subvelutinum (Palmer 183). Type collection. About $\times~\%.$

5. Solanum subvelutinum Rydb., Torrey Bot. Club Bul. 51: 175. 1924. (Figs. 17 and 18.)

A perennial woody vine. Stem brown, glabrate in age, rooting at the nodes; branches shortly pilose, subvelutinous when young. Leaves odd-pinnate, 5 to 15 cm. long, more or less pilose on both surfaces, without interstitial leaflets; petioles (and rachis) subvelutinous, up to 6 cm. long. Leaflets 5 to 9; lateral leaflets broadly elliptic to elliptic-oblanceolate or elliptic-lanceolate, acute to shortly acuminate, cuneate at the slightly oblique base, subsessile to shortly petiolulate, up to 6 cm. long and 2 cm. wide, the lowermost pair reduced; terminal leaflet symmetrical and larger than the lateral leaflets. Pseudostipular leaves auriculiform, about 1

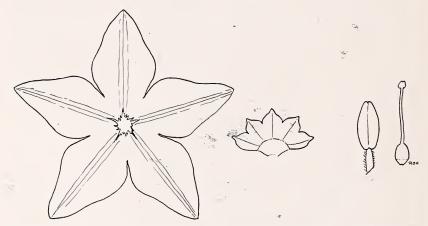


FIGURE 18.—Solanum subvelutinum (Palmer 183): corolla, calyx, stamen, pistil. All about × 4.

cm. long and 5 mm. wide. Inflorescences pseudoterminal on leafy branches, few- to many-flowered, cymosely paniculate; peduncles (and rachis) up to 2 cm. long, subvelutinous. Pedicels articulate at the base, glabrous or sparsely pilose when young, 6 to 10 mm. long, gradually thickened upward. Flowers white. Calyx 1.5 to 2.0 mm. long, pubescent with long, loose spreading hairs, irregularly lobed to about the middle; lobes triangular-ovate, obtuse and apiculate. Corolla stellate, 4 to 5 mm. long, divided to below the middle into broadly ovate obtuse lobes, pubescent at the apex of the lobes. Anthers oblong in outline, 2.5 to 3.0 mm. long; filaments about 0.5 mm. long, hirsute at the base. Style shorter than the stamens; stigma capitate. Fruits said to be green.

Range: Apparently endemic in the mountains of Durango and

Sinaloa, Mexico, at about 2,000 m.

This species differs from S. appendiculatum, a close ally pri-

marily in its typical 7 leaflets that are conspicuously pubescent and the densely pilose or tomentose peduncle and leaf rachis. Other identifying characteristics of this species are: calyx pubescent with long loose spreading hairs, the lobes short and somewhat marginate; style shorter than the stamens.

Specimens examined:

MEXICO.—Durango: San Ramón, April 21-May 18, 1906, Palmer 183 [type collection of S. subvelutinum] (Gray, Mo, US); same locality and date, Palmer 87 (CM). SINALOA: Ocurahui, Sierra Surotata, pine-forested area, 1,830 to 2,135 m., steep moist shady canyon slope with mixed dominants, vine clinging on tree trunks, flowers white, fruit green, September 1 to 10, 1941, Gentry 6235 (Gray, Mo, NY, PA).

6. Solanum tacanense Lundell, Amer. Midl. Nat. 29: 490. 1943. (Figs. 19 and 20.)

A woody or rarely somewhat herbaceous vine. Stem rooting at the nodes; branches densely pubescent with simple tawny hairs. Leaves odd-pinnate, up to 14 cm. long, sparsely pubescent on both surfaces, the hairs thicker along the veins; rachis densely pubescent with tawny hairs; petioles up to 4.5 cm. long. Leaflets 5, elliptic-lanceolate to elliptic or obovate-lanceolate, subobtuse to shortly acuminate at the apex, 1.0 to 6.5 cm. long and up to 2.5 cm. wide, petiolules up to 1 cm. long; terminal leaflet larger than the lateral leaflets. Inflorescences pseudoterminal on leafy branches, cymosely paniculate; peduncles very short, up to 3.5 cm. long, densely pubescent with tawny hairs. Pedicels up to 7 mm. long, usually much shorter, articulate at the base, thickened upward, sparsely pilose. Flowers probably white. Calyx scarcely 2 mm. long, sparsely pilose, shallowly lobed; lobes triangular, obtuse and apiculate, about 0.6 mm. long, marginate. Corolla deeply lobed to below the middle; lobes up to 5.5 mm. long, ovate to oblonglanceolate, obtuse to subacute at the puberulent apex. Anthers oblong in outline, 2.0 to 2.5 mm. long; filaments very short, pilose. Ovary glabrous; style about 2 mm. long, shorter than the stamens. Fruits orbicular, tomato red, about 1 cm. in diameter.

Range: Apparently endemic in the mountains of Chiapas, Mex-

ico, and Dept. San Marcos, Guatemala, at about 2,100 m.

This species is closely allied to *S. connatum*. The free filaments and style shorter than the stamens, however, are characteristics that readily separate it from that species. It differs from *S. subvelutinum* in having typically fewer leaves, shorter pilose pedicels, and usually longer calyx and corolla.

Specimens examined:

MEXICO.—CHIAPAS: Volcán de Tacaná 2,100 m., April 2, 1939, Matuda 2958 [type collection of S. tacanense] (CM, Gray, Mo, NA, NY, US).

GUATEMALA.—DEPT. SAN MARCOS: Barranca Eminencia, above San Rafael Pie de la Cuesta, creeping on tree trunk, fruit tomato red, 2,100 to 2,400 m., March 14 and 15, 1939, Standley 68611 (CM).



FIGURE 19.—Solanum tacanense (Matuda 2958). Type collection. About × 2/5.

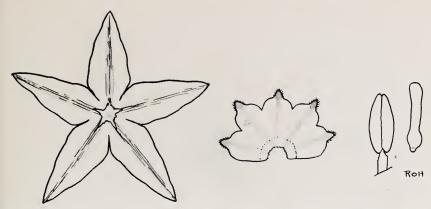


FIGURE 20.—Solanum tacanense (Matuda 2958): corolla, calyx, stamen, pistil. All about \times 5.

Series Suaveolentia Rydb., Torrey Bot. Club Bul. 51: 146, 173. 1924.

Herbaceous plants with fibrous roots, apparently non-tuberbearing. Leaves odd-pinnate. Pedicels articulate at or near the base. Corolla rotate to stellate. Fruits round.

1. Peduncle simple or very rarely once-branched.

- 2. Leaves without interstitial leaflets; terminal leaflet usually much larger than the lateral leaflets; plants more or less pilose. 8. S. grossularia.
- Leaves with few minute interstitial leaflets; terminal leaflet not much larger than the lateral leaflets; plant lightly strigose.

 9. S. suaveolens.
- Peduncle always bifurcate or much-branched.
 Leaves without interstitial leaflets; corolla rotate; peduncle much-branched; calyx with ovate-lanceolate acuminate lobes. 10. S. taeniotrichum.
 - Leaves usually with numerous interstitial leaflets; corolla stellate; peduncle bifurcate; calyx with rounded apiculate lobes. 7. S. canense.
- 7. Solanum canense Rydb., Torrey Bot. Club Bul. 51: 174. 1924. (Figs. 21 and 22.)

Solanum suaveolens var. pliophyllidium Bitt., Repert. Sp. Nov. 11: 353. 1912.

Plant weak and straggly, 4 to 15 dm. tall. Stem slender, somewhat angular, simple or branched, subglabrous or sparsely pilose with incurved hairs. Leaves odd-pinnate, 11 to 34 cm. long, subglabrous to appressed-pilose (especially the upper surface); petioles usually short, up to 5 cm. long. Leaflets 9 to 15, ellipticlanceolate to narrowly lanceolate, obtuse to long-acuminate and attenuate, somewhat cordate to rounded at the oblique base, up to 11 cm. long and 3 cm. wide (occasionally minute leaflets developed on the petiolules), the lowermost pairs much reduced;





Figure 21.—Solanum canense (Tonduz 13048). Type collection of S. suaveolens var. pliophyllidium. About \times %.

petiolules slender, 2 to 12 mm. long. Interstitial leaflets usually numerous (very rarely lacking), ovate to ovate-elliptic or ovate-lanceolate, obtuse to acuminate, rounded to cordate at the base, with short slender petiolules, up to 3.5 cm. long and 1.5 cm. wide. Pseudostipular leaves obliquely auriculate-reniform, up to 2.5 cm. long and 1.2 cm. wide. Inflorescences lateral, several-flowered, bifurcately racemose; peduncles slender, 2- to rarely 3-forked near the summit, the branches 5 to 10 cm. long, subtended somewhat above the base by a pair of pseudostipular leaves, 4.5 to 18.0 cm. long. Pedicels slender, 5 to 10 mm. long, articulate at the base, puberulent. Flowers usually 10 or more, white. Calyx 1.5 to 2.5

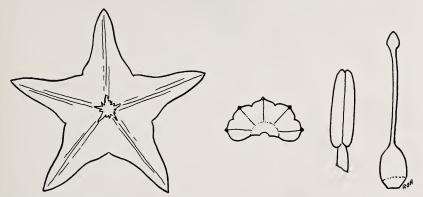


FIGURE 22.—Solanum canense (Skutch 4862). Corolla and calyx, about \times 3; stamen and pistil, about \times 6.

mm. long, with short rounded or apiculate lobules less than 1 mm. long. Corolla stellate, 6 to 8 mm. long, divided to about or just below the middle into ovate-lanceolate to triangular-lanceolate acute puberulent lobes. Anthers oblong in outline, cordate at the base, 2.0 to 3.5 mm. long; filaments 1 mm. long or less. Style 4.0 to 4.5 mm. long, slightly exceeding the stamens. Fruits orbicular to broadly ellipsoid, green, striped with pale or dark green, about 1.5 cm. in diameter.

Range: Low mountains from southern Guatemala (Dept. Santa

Rosa) to Panama, usually below 1,000 m.

Solanum canense has a subglabrous bifurcate peduncle, stellate corolla, ovate rounded to apiculate calyx lobes, and usually prominent interstitial leaflets that readily separate it from the closely allied S. suaveolens.

Bitter recognized this plant as being distinct from *S. suaveolens* and gave it the varietal name *pliophyllidium*. In the writer's opinion, Rydberg was correct in designating it as a separate species.

Specimens examined:

GUATEMALA—DEPT. SANTA ROSA: Río Panal, lower slopes of Volcán de Tecuamburro, along the road between Cuilapa and Chiquimulilla, wet shaded bank by river, weak herb 60 cm. tall, corolla white, November 28, 1940,

Standley 78562 (CM). DEPT. UNKNOWN: San Rafael, 1841, Friedrichsthal 1165 (Vienna).

EL SALVADOR.—Dept. LIBERTAD: Colina de Santa Tecla, July 1923, Calderón 1730 (Gray, NY, US). Dept. Sonsonate: vicinity of Armenia, in sand along stream, flowers white, April 18, 1922, Standley 23507 (Gray, NY).

HONDURAS.—DEPT. SANTA BÁRBARA: San Pedro Sula, 250 m., April 1889, Thieme 5370 (CM, US).

NICARAGUA.—Dept. Unknown: Volcán Mombacho, in shady forests, 1 to 2 ft., much branched and broadly spreading, February 10, 1903, Baker 809 (US), Baker 34 (Dud, Gray, Mich, Mo, NY, US); Sierra de Managua, 600 to 900 m., April 1932, Garnier 1031 (US).

COSTA RICA.—Prov. Cartago: El Muñeco, south of Rio Narvarro, wet forest, weak herb, corolla white, fruit green, about 1,400 m., February 8, 9, 1924, Standley 33477 (US). Prov. Guanacaste: vicinity of Tilarán, wet forest, weak ascending or subscandent herb 3 to 5 ft., corolla white, fruit striped with pale and dark green, 500 to 650 m., January 10 to 31, 1926, Standley and Valerio 44322 (US), Standley and Valerio 44453 (US); La Tejona, north of Tilarán, moist forest, decumbent herb 3 to 4 ft., corolla white, 600 to 700 m., January 25, 1926, Standley and Valerio 45829 (US); vicinity of Tilarán, May 30, 1932, Brenes 15621 (CM); Quebrada, Serena, southeast of Tilarán, moist forest, decumbent herb 2 to 3 ft., corolla white, common, about 700 m., January 27, 1926, Standley and Valerio 46250 (US). Prov. San José: Basin of El General, 90 cm. high, on gravelly bar beside stream in sun, flowers white, 675 to 900 m., March 1940, Skutch 4862 (CM, NA, NY, Mo, US). Prov. Unknown: Madre de Dios, June 18, 1874, Kuntze 2053 (NY); in woods of the valley of the Tuis river, 600 m., September 1893, Tonduz 8152 (US); cleared land on the edge of the Zhorquin river, March 1894, Tonduz 8503 (US); coffee plantations in Tuis, 650 m., November 1897, Tonduz 11495 (US); in forest clearing in Las Vueltas, Tucurrique, 635–700 m., January 1899, Tonduz 13048 [type collection of S. suaveolens var. pliophyllidium] (Paris, US, Vienna); Juan Vinás, Reventazon Valley, flowers white, 1,000 m., April 25, 1903, Cook and Doyle 329 (US).

PANAMA.—PROV. UNKNOWN: Cana and vicinity, lax branches spreading 4 or 5 ft. over the ground, flowers white, 760 m., April 17 to June 8, 1908, Williams 844 [type of S. canense] (NY); Cerro Campana, scandent herb 1½ m., flowers white, fruit green, striped, December 31, 1939, Allen 2087 (CM, Gray, NY, US).

8. Solanum grossularia Bitt., Repert. Sp. Nov. 10: 537. 1912. (Figs. 23, 24, and 25.)

Plant a vinelike herb, low, decumbent, trailing or climbing, more or less densely pilose throughout with spreading hairs (the hairs unicellular or inconspicuously few-celled), up to 15 dm. or more in length. Stem slender, somewhat angular, branched or sometimes simple. Leaves odd-pinnate, 9 to 23 cm. long, without interstitial leaflets; petioles up to 5 cm. long. Leaflets 5 to 7; lateral leaflets elliptic-lanceolate to ovate-lanceolate or elliptic, obtuse to long-acuminate, rounded to subcordate at the oblique base, subsessile or shortly petiolulate, up to 9 cm. long and 4.5 cm. wide, the lowermost pair much reduced; terminal leaflet larger than the lateral leaflets, acuminate. Pseudostipular leaves semi-orbicular or broadly reniform, up to about 1.5 cm. long and 8 mm. wide. Inflorescences lateral, usually laxly 6- to 10-flowered, a simple raceme or very rarely forked once; peduncles, pedicels, and calyx with spreading pilose hairs; peduncles subtended at or near



FIGURE 23.—Solanum grossularia (Skutch 3159). About × 3/5.

the base by a pair of pseudostipular leaves, slender, up to 7 cm. long. Pedicels slender, up to about 1 cm. long, articulate at or near the base. Flowers white, with outer midrib of the petals usually tinged pale violet. Calyx dark green, 4 to 6 mm. long, divided to below the middle into lanceolate or broadly rounded and abruptly acuminate to acute lobes; lobes sometimes dark purplish. Corolla rotate, 1.3 to 1.8 cm. in diameter, with small lobules about 1 mm. long, pilose on the outer surface. Anthers yellow, oblong in

outline, 3 to 4 mm. long; filaments about 1 mm. long. Style 6 to 7 mm. long, exceeding the stamens. Fruits ovoid to ovoid-ellipsoid. somewhat compressed, green with darker green or purplish stripes, 1.5 to 2.0 cm. long, 1.0 to 1.3 cm. in diameter.

Range: Low mountains from central Guatemala (Dept. Alta Verapaz) to western Panama (Prov. Chiriquí), rarely above 2,000

This species is characterized by the typical simple raceme being more or less covered with tawny or whitish sharp spreading hairs, lanceolate calvx lobes, no interstitial leaflets, and style much exceeding the stamens.

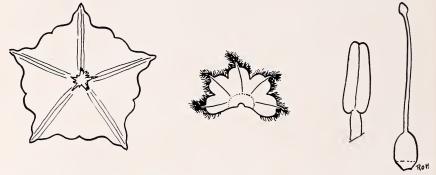


Figure 24.—Solanum grossularia (Skutch 2981). Corolla and calyx, about \times 3; stamen and pistil, about \times 6.

The writer's concept of this species is based on an examination of a photograph (fig. 25) and a fragment of the type in the Chicago Natural History Museum (No. 621124). The type in the

Berlin-Dahlem Herbarium was destroyed during World War II. According to Antonia Echeverria and Claude Hope the fruits are eaten in Costa Rica. Rubén Torres Rojas states that in the Province of Cartago, Costa Rica, this plant is commonly called chiverrillo.

Specimens examined:

GUATEMALA.—Dept. Alta Verapaz: hillside above Tactic, growing up through shrubs along roadside, scandent herb, 2 to 4 ft. high, berry green with dark purplish mottlings, flowers white, April 29, 1920, Johnson 168B (US). DEPT. ZACAPA: between Cerro de Monos and upper slopes of Monte Virgen, climbing herbaceous, leaves membranaceous, dull green above, paler beneath, corolla white, calyx dull pale green with dull-purple lobes, stems pale green, 2,000 to 2,600 m., January 17, 1942, Steyermark 42863 (CM).

COSTA RICA.—Prov. ALAJUELA: flowers white, La Palma de San Ramon, 1,050 to 1,100 m., July 7, 1926, *Brenes 336* (CM); Palmares, shaded thickets, 5 ft. high, 1,700 m., September 1, 1937, *Smith A279* (CM); near Volcán Poás, tomatolike plant with edible fruits, decumbent, collected in rain-forest conditions at 1,220 m., fruits 2 cm. in diameter, July 15, 1946 [only seeds collected, specimen obtained from plants grown at Glenn Dale, Md., November 2, 1950], Claude Hope s. n. (NA). Prov. Cartago: Cartago, 1,300 m., December 1887, Cooper 5871 (CM); San Rafael de Cartago, 1,600 m., August 1895, Pittier 9733 (US); Cartago, 1899, Wercklé s. n. (NA, US); Las Cóncavas, August 1919, Lankester K12 (CM); vicinity of Cartago, in hedge, shrub 5



FIGURE 25.—Solanum grossularia. Type collection, brought from Cartago by Wercklé and cultivated in Zeledon's Amparo garden. Fruits edible according to Wercklé, San José, Costa Rica (communication in 1920 by *Tonduz 131*). About \times ½.

44

ft., corolla white, fruit green with dark-green stripes, about 1,425 m., February 1924, Standley 33356 (Gray, US); La Estrella, wet forest, weak herb, fruit green, March 26 to 27, 1924, Standley 39210 (US), 39366 (US); vicinity of Orosi, moist forest, suberect herb, corolla white, March 30, 1924, Standley 39789 (US); "enredadora," 1,600 m., "montroso," common name "chiverrillo," August 24, 1924, Torres 20 (US); El Muñeco, on the Río Navarro, moist potrero, ascending herb 2 ft. tall, corolla white, 1,400 to 1,500 m., March 6 and 7, 1926, Standley and Torres 51305 (US); Las Cóncavas, near Cartago, 1,140 to 1,260 m., December 17, 1927, Cooper 29 (CM); Volcán Irazu, southwest slope, about Guayabillos, in woods "in fauce 'parva'," climbing, flowers white violet on the outer surface near anex, 2,250 m., May 26, 1930, Cufadorwhite, violet on the outer surface near apex, 2,250 m., May 26, 1930, Cufodontis 352 (Vienna); La Pitahaya, 1931, Torres R. 195 (CM); Tablazo, 1,800 m., January 23, 1935, Valerio 1047 (CM); El Tablazo, fruit edible, October 25, 1947, Echeverria 1109 (CM). PROV. HEREDIA: Yerba Buena, northeast of San Isidro, wet thicket, procumbent herb 2 to 3 ft., fruit green, corolla white, about 2,000 m., February 22, 28, 1926, Standley and Valerio 49645 (US); same locality and date, fruit green with dark-purple stripes, corolla purplish white, Standley and Valerio 491130 (US); Vara Blanca de Sarapiqui, north slope of Central Cordillera, edge of forest, flowers white, 1,500 to 1,750 m., July to September 1937, Skutch 3159 (Mo, NY, US). PROV. SAN JOSÉ: San José, 1899, Wercklé s. n. (US); La Hondura, wet forest, erect flowers purplish, 1,300 to 1,700 m., March 16, 1924, Standley 37595 (US); La Palma, purplish, 1,300 to 1,700 m., March 16, 1924, Standley 3/393 (US); La raima, wet forest, erect herb 3 to 4 ft., corolla white, anthers yellow, about 1,600 m., March 17, 1924, Standley 38164 (US); Las Nubes, erect herb 2 ft., corolla purplish white, 1,500 to 1,900 m., March 20 to 22, 1924, Standley 38552 (US); between Asseri and Tarbaca, brushy bank, decumbent, corolla white, 1,200 to 1,700 m., December 6, 1925, Standley 41376 (US); Laguna de la Chonta, northeast of Santa María de Dota, in clearing, weak herb, corolla white, 2,000 to 2,100 m., December 18, 1925, Standley 42197 (US); vicinity of Santa María de Dota, moist forest procumbent, corolla white, 1,500 to 1,800 m. December Dota, moist forest, procumbent, corolla white, 1,500 to 1,800 m., December 26, 1925, to January 3, 1926, Standley and Valerio 44099 (US); La Hondura de San José, 1,300 m., August 15, 1933, Valerio 739 (CM); vicinity of El General, trailing over cliff, flowers white, 1,220 m., December 1936, Skutch 2981 (Gray, Mo, NY, US); Zarcero, in semishade in forest, 1,525 m., August 23, 1937, Smith H201 (CM); same locality, upper tropical zone, low herb, decumbent stems 3 ft., Pacific watershed, fruit oval-ovate but flattened on two sides, dark green, paler at tip with very dark green more or less obscure stripes, 1,372 m., January 9, 1938, Smith H34 (CM, Mo); Las Nubes de Coronado, growing in the shade at the base of trees, fruit shaped like an egg,

PANAMA.—Prov. Chiriquí: Chiriquí, R. Chiriquí Viejo Valley, vine 15 dm. long, April 5, 1938, White 68 (Gray, US).

August 27, 1938, Orozco 274 (CM).

The following collection unquestionably represents a new species in this series, related to *S. grossularia*. Since, however, the material is scarcely adequate for a type specimen it is merely cited in the hope that collectors will take note of it and will eventually obtain adequate material:

PANAMA.—Prov. Chiriquí: Volcán de Chiriquí, Potrero Muleto, herb 3 to 7.5 dm. tall, 3,150 m., [no date], Davidson 1017 (CM).

9. Solanum suaveolens Kunth & Bouché, Ind. Sem. Hort. Berol. 1848: 14. 1848. (Figs. 26 and 27.)

Solanum suaveolens var. chalarophyces Bitt., Repert. Sp. Nov. 11: 354. 1912.

S. ervendbergii Rydb., Torrey Bot. Club Bul. 51: 153. 1924.

S. belizense Lundell, Mich. Univ. Herb. Contrib. 7: 48. 1942.

S. huastecanum Lundell, Mich. Univ. Herb. Contrib. 7: 50. 1942.

Plant lax, straggly, up to 7.5 dm. or more tall, usually about 4 dm., more or less strigose throughout. Stem weak, somewhat angular, branched or sometimes simple. Leaves odd-pinnate, 10 to 25 cm. long, rather densely short-strigose on both surfaces, with few interstitial leaflets; petioles up to 4 cm. long. Leaflets 7 to 11, usually 9, elliptic-lanceolate, acute to long-acuminate. rounded to broadly cuneate at the oblique base, sessile or with a slender petiolule up to 1 cm. long, 3 to 9 cm. long and 1 to 3 cm. wide, the lowermost pair much reduced. Interstitial leaflets small. subsessile to shortly petiolulate, obovate to elliptic or ovate, obtuse to subacute, up to 8 mm. long and 5 mm. wide. Pseudostipular leaves semiovate with a semicordate base, up to 12 mm, long and 7 mm. wide. Inflorescences lateral, several, a raceme; peduncles simple or very rarely forked once, up to 9 cm. long, slender, subtended near the base by a pair of pseudostipular leaves, sparsely appressed-pilose to subglabrous. Pedicels filiform, 7 to 10 mm. long, articulate at the base. Flowers usually 10 or more, white, fragrant. Calyx up to 4 mm. long, strigose, divided to about the middle into ovate-lanceolate to narrowly lanceolate acuminate Corolla rotate, 1 to 1.3 cm. in diameter, with short lobules 1 mm. or less long and more or less shortly strigose on the outer Anthers oblong in outline, cordate at the base, about 3 mm. long; filaments obsolescent, about 0.5 mm. long. Style about 3.5 mm. long, slightly exceeding the stamens. Fruits ovoid to globose, green striped with dark purplish green, about 2 cm. long and 1.5 cm. in diameter.

Range: Lowermost slopes of the eastern escarpment from southern San Luis Potosí, Mexico, to British Honduras, with a possible

disjunct area in Costa Rica; rarely up to 1,000 m. Characteristics that readily separate this species from S. canense, its nearest ally, are a simple peduncle that is provided with appressed tawny hairs; lanceolate acute calyx lobes; and leaves without or with very few minute interstitial leaflets.

This is a comparatively rare species, whereas S. canense is quite

common and widespread.

Rydberg, in describing S. ervendbergii, stated that the plant produced tubers and that "It has nothing to do with S. appendiculatum which is a climbing vine with subbasal articulation on the pedicels." He placed the plants in the series Tuberosa, characterized by bearing tubers and by having pedicels articulate some distance above the base. An examination of the type in the Gray Herbarium reveals that no tubers are present (the plant was apparently assumed to bear tubers) and that the pedicel is articulate at the base. The plant is clearly referable to S. suaveolens.

In reference to Rydberg's statement above, it is of interest to note that in collecting this species in Veracruz, Mexico, the writer made an unsuccessful effort to find tubers. Numerous fine roots

were found, but no tuber-bearing stolons were present.

An examination of the types of S. belizense and S. huastecanum shows that they do not differ from typical material. The plant described as var. chalarophyces is only a lax, luxuriant form,



Figure 26.—Solanum suaveolens (Conzatti 13). About \times %.

According to C. L. Lundell, this plant is known as tomate cimarron in Tamazunchale, San Luis Potosí, Mexico, and the fruits are edible.

Specimens examined:

MEXICO.—SAN Luis Potosf: Tamazunchale, on limestone cliff along roadside, 200 m., herbaceous vine, corolla white, fruits edible, "tomate cimarron," July 1937, C. L. Lundell and Amelia A. Lundell 7206 [type collection of S. huastecanum] (Lun, Mich); along roadside, above Tamazunchale, 300 m., herbaceous vine, flowers white, fruits globose, green-striped, June 23, 1943, C. L. Lundell and Amelia A. Lundell 12167 (Lun, NA). Veracruz: Wartenberg, near Tantoyuca, Prov. Huasteca, 1858, Ervenderg 175 [type of S. ervendbergii] [this collection might possibly be from San Luis Potosí] (Gray); Jalapa, Galeotti s. n. (Kew); Valley of Cordova, old walls, December 30, 1865–66, Bourgeau 1678 (Paris); region of Orizaba, scandent, August 20, 1866,

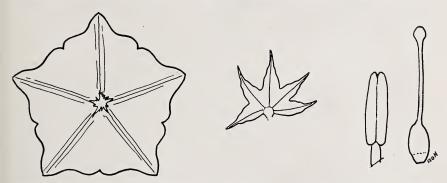


FIGURE 27.—Solanum suaveolens (Correll 14296). Corolla and calyx, about \times 3; stamen and pistil, about \times 6.

Bourgeau 2864 (Gray, Kew, Paris); Colonia Melchor Ocampo, Cerro del Chuiquihuite, 915 m., December 6, 1895, Conzatti 13 (Gray); Zacuapan, Barranca de Tenampa, January 1913, Purpus 6329 (Gray, Mo, NY, US); Zacuapan, on rocks, June 1926, Purpus 10714 (US); Zacuapan, moist localities, April 1933, Purpus 10766 (CM); shaded rocky bank of trail above Tuxpango, 1,060 m., November 19, 1944, Sharp 441691 (NA); on wet cliffs in deep gorge near Teocelo, plant weak and sprawling, flowers white, fruits striped with purple, December 3, 1947, Correll 14296 [P. I. No. 161368] (NA); Mirador, November 1841, Liebmann 1387 [type collection of S. suaveolens var. chalarophyces] (CM, US). STATE UNKNOWN: plants cultivated at the Vienna Botanic Garden from seeds sent from Mexico by Heller [type of S. suaveolens] (Vienna); without data, Kotschy s. n. (Paris).

BRITISH HONDURAS.—EL CAYO DISTRICT: near Vaca, on hillside, herb, corolla white, March 10, 1938, *Gentle 2319* [type collection of *S. belizense*] (Mich, US).

COSTA RICA.—Prov. unknown: flowers white, Endres 196 (Vienna).

10. Solanum taeniotrichum Correll, Texas Res. Found. Contrib. 1: 6, fig. 2. 1950. (Figs. 28 and 29.)

Plant coarse, vinelike, tomentose (except the older stems) with spreading tawny, conspicuous several-celled hairs, probably non-tuber-bearing. Stem stout, terete. Leaves odd-pinnate, about 15 cm. long, without interstitial leaflets. Leaflets 5; lateral leaflets



FIGURE 28.—Solanum taeniotrichum (Pittier 10646). Type collection. About × 2/4.

elliptic-lanceolate, acute to shortly acuminate, cuneate to rounded at the oblique base, shortly petiolulate, 5 to 7 cm. long and 1.5 to 2.2 cm. wide; terminal leaflet somewhat larger than the lateral leaflets, symmetrical. Pseudostipular leaves obliquely

elliptic-lanceolate, obtuse to acute, about 2 cm. long and 8 mm. wide. Inflorescences lateral, many-flowered, cymosely paniculate; peduncles, pedicels, and calyx densely glandular-pubescent; peduncles rather stout, up to 10 cm. long. Pedicels about 1.5 cm. long, articulate at the base. Flower color unknown. Calyx 5 to 6 mm. long, divided to about or below the middle into ovate-lanceolate acuminate lobes; lobes with scarious hyaline margins below. Corolla rotate, about 1.5 cm. in diameter, with short obtuse lobules about 2 mm. long, pubescent on the outer surface. Anthers oblong in outline, 4.5 to 5.0 mm. long; filaments 1 mm. long, with a

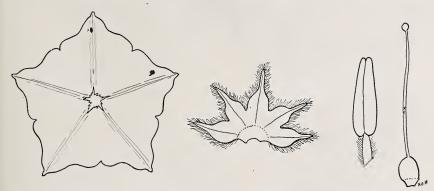


FIGURE 29.—Solanum taeniotrichum (Pittier 10646): corolla, calyx, stamen, pistil. All about × 4.

pubescent crown beneath. Style 8 mm. long, exceeding the stamens. Fruits orbicular, about 1.5 cm. in diameter.

Range: Costa Rica.

Solanum taeniotrichum is most closely allied to S. grossularia. The present species, however, is a much coarser plant and has a paniculate inflorescence that is densely covered with prominently articulate glandular hairs, whereas S. grossularia has a racemose inflorescence that is less densely covered with unicellular or obscurely articulate eglandular hairs. The leaves of S. taeniotrichum are also densely tomentose on the lower surface.

Specimens examined:

COSTA RICA: Cueva del Tigre, I. 1897, Pittier 10646 [type collection] (US).

Series Muricata Correll ser. nov.4

Plants from woody rootstocks, bushy, much-branched or rarely simple, non-tuber-bearing. Leaves simple, entire. Pedicels articulate at the base. Corolla rotate. Fruits rather large, ovoid to ellipsoid, edible.

⁴ Herba cum rhizomate lignoso, fruticosa, multo ramora vel raro simplex, non tuberifera. Folia simplicia, margine integro. Pedicellus basi articulatus. Corolla rotata. Fructus satis magni, ovoidei vel ellipsoidei, esculenti.



FIGURE 30.—Solanum muricatum (Cook and Doyle 98). A little less than natural size.

11. Solanum muricatum Ait., Hort. Kew. 1: 250. 1789. (Figs. 30, 31, 32, and 33.) locality: native of Peru.

Plant an ascending shrub with woody base and fibrous roots, 3 dm. or more tall, appressed-pilose throughout. Stem branched or sometimes simple. Leaves simple, entire, ovate-lanceolate to oblong-lanceolate, rather abruptly contracted at the oblique base into the petiole, obtuse to tapering and acute or acuminate, up to 15 cm. long and 4 cm. wide; petiole 3.0 to 6.5 cm. long. Inflorescences pseudoterminal on leafy branches, few- to many-flowered (as many as 12); peduncles forked once just below the flowers or

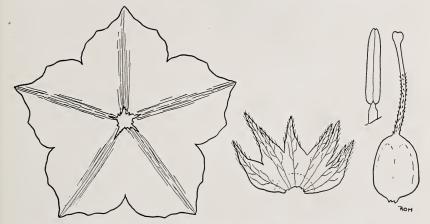


FIGURE 31.—Solanum muricatum (Standley 22849). Corolla and calyx, about \times 1½; stamen and pistil, about \times 3.

rarely simple, 5.0 to 7.5 cm. long. Pedicels 5 to 15 mm. long, increasing noticeably in length and size in the fruiting stage, articulate at or near the base. Flowers violet purple or white marked with purple. Calyx 4 to 7 mm. long, divided to about or below the middle into irregular, unequal, lanceolate acuminate lobes. Corolla rotate, up to 4 cm. in diameter, with lobes broadly rounded above and apiculate at the apex, strigose on the outer surface. Anthers linear to linear-lanceolate, 4.5 to 6.0 mm. long; filaments about 1.5 mm. long. Style 7 to 9 mm. long, exceeding the stamens, puberulent; stigma clavellate, somewhat bifid. Fruits ovoid to ellipsoid, white or pale green and purple-variegated, pendent, edible, the flesh yellow, up to 20 cm. long and about 1.5 cm. in diameter.

Range: Cultivated in temperate and cold regions for its edible

fruit. In Middle America it is usually grown below 2,000 m. Solanum muricatum is believed to be a native of the Andean region of South America, but is probably known only in cultivation. Fruits of the cultivated plants are usually seedless (fig. 33). The green fruits are cooked and eaten, the ripe ones eaten raw. It is commonly known as pepino,

A collection by Standley (No. 22849) has some monstrous flowers in which 2 pistils, 10 stamens, and 7 calyx lobes are to be found.

Specimens examined:

MEXICO.—State unknown: Plantae Novae Hispaniae, 1787, 1795, 1804, Sessé, Mociño, Castillo, and Maldonado 1407 (CM).

GUATEMALA.—Dept. Alta Verapaz: Senahu, flower purple, fruit eaten green, "pepino," December 14, 1904, Goll 184 [determined as S. muricatum var. teleutogenum Bitt. by Bitter] (US). Dept. Guatemala: 1,500 m., cultivated in garden of Dirección General de Agricultura, herb 2 to 3 ft., "pepino," January 20, 1939, Standley 63089 (CM); La Aurora, December 28, 1925,



FIGURE 32.—Solanum muricatum (Cook and Doyle 98). Two mature plants in fruit. About × 1/8.

Bossé 8073 (CM). DEPT. JALAPA: Cerro Alcoba, just east of Jalapa, herb 2 ft. tall, corolla dark purple as also on stem and petioles and midnerve beneath, leaves dark green, fruit pale green, 1,300 to 1,700 m., December 2, 1939, Steyermark 32576 (CM). Dept. Quezaltenango: Zunil, fruit sweet, tastes like melon, flowers violet, anthers yellow, stem and petiole dark brown purple, leaves deep dull green, "pepito," 2,500 m., January 20, 1940, Steyermark 34461 (CM). Dept. Sacatepéquez: San Antonio, near Antigua, "Pepino," June 5, 1914, Cook and Doyle 98 (US).

EL SALVADOR.—Dept. San Salvador: Volcán de San Salvador, herb 1 to 2 ft., flowers purple, fruit egglike, purple and green, "pepino," cultivated, 1,000 to 1,800 m., April 7, 1922, Standley 22849 (US); Volcán de San Salvador, "pepino," cultivated, April 1922, Calderon 535 (NY, US).

HONDURAS.—Dept. Morzan: Zamorano, 800 m., May 30, 1945, Juvenal Valerio Rodriguez 3041 (CM).

COSTA RICA. Prov. unknown: Campo de ensayos de Guadalupe, 1,200 m., February 1, 1909, Biolley f. 17299 (US).



Figure 33.—Solanum muricatum. Top, whole fruit; bottom, fruit sliced through center longitudinally to show seedless pulp. About \times 1.



Figure 34.—Solanum juglandifolium var. oerstedii (Oersted 1465). Type collection. About \times ½.

Series Juglandifolia Rydb., Torrey Bot. Club Bul. 51: 146, 173. 1924.

Plants somewhat woody climbing shrubs, non-tuber-bearing. Leaves odd-pinnate. Inflorescence pushed to one side by a branch from the axil of the last leaf. Flowers usually yellow. Pedicels articulate at about the middle. Corolla stellate. Fruits orbicular.

12. Solanum juglandifolium var. oerstedii Bitt., Repert. Sp. Nov. 11: 461. 1912. (Figs. 34 and 35.)

Plant climbing and shrubby, probably non-tuber-bearing. Stem branched, the stem, branches, petioles, rachis, peduncles, and pedicels with stipitate glands and spreading hairs. Leaves odd-pinnate, 25 to 27 cm. long, with very few small interstitial leaflets; petioles up to 6 cm. long. Leaflets 7, elliptic-lanceolate, acuminate, rounded at the very oblique base, up to 9 cm. long and 4 cm. wide, somewhat scabrous above, densely pilose beneath, prominently reticulate-veined; petiolules up to 1 cm. long. Pseudostipular leaves not present. Inflorescences lateral and projecting at right angles to the stem, corymbosely paniculate, dichotomously branched; peduncles stout, up to 6.5 cm. long. Pedicels 1.0 to 1.5 cm. long, articulate at about the middle. Flowers laxly disposed, yellowish or whitish. Calyx 5.5 to 6.0 mm. long, divided to about the middle into lanceolate-acuminate lobes. Corolla stellate, about 2.8 cm. in diameter, with lobes ovate-lanceolate and acute. Anthers 6.0 to 6.5 mm. long; filaments 2 to 3 mm. long, pilose near the base. Style erect, about 1.1 cm. long. Fruits orbicular, 1 cm. or more in diameter.

Range: This plant is represented in our region only by the type of var. *oerstedii*, which is purported to have been collected in Cen-

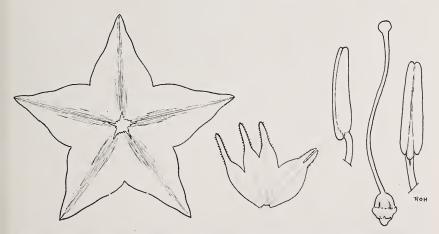


FIGURE 35.—Solanum juglandifolium var. oerstedii (collected in Prov. Antioquia, Colombia, by Kalbreyer and Veiteh, No. 1554, in 1879-80). Corolla and calyx, about \times 1½; stamen (side view), pistil and stamen (dorsal view), about \times 3.

tral America, probably Costa Rica, by Oersted (No. 1465). The illustration used here is of the type specimen in the Copenhagen Herbarium.

Series Conicibaccata Bitt., Repert. Sp. Nov. 11: 381. 1912.

Oxycarpa Rydb., Torrey Bot. Club Bul. 51: 146, 172. 1924.

Herbs with fibrous roots and stolons; non-tuber-bearing or very rarely with tubers. Leaves odd-pinnate. Pedicels articulate some distance above the base. Corolla rotate or rotate-stellate. Fruits elongate-ovoid, ellipsoid, or subconical, acute at the apex.

1. Leaves with numerous prominent interstitial leaflets.

56

2. Leaflets broadly elliptic to elliptic-ovate, subobtuse to acute.

16. S. guerreroense.

Leaves without interstitial leaflets or with very few minute ones.
 Interpetalar tissue prominently raised, with an acute or notched apex; calyx lobes abruptly constricted at the apex to form an anicule.

13. Solanum agrimonifolium Rydb., Torrey Bot. Club Bul. 51: 154. 1924. (Figs. 36 and 37.)

Plant erect or ascending, 2.5 to 12.0 dm. tall, subglabrous to rather densely pubescent (especially the younger parts), apparently non-tuber-bearing. Stem angular, simple or branched, often purple-tinged. Leaves odd-pinnate, thin, up to 45 cm. long, usually less than 30 cm.; petioles short, usually less than 3 cm. long. Leaflets 9 to 15, elliptic-lanceolate to narrowly lanceolate, acute to long-acuminate, frequently attenuate, rarely obtuse, oblique (especially at the rounded to cuneate base), sessile or with a short (usually less than 5 mm. long), winged petiolule, nearly glabrous to rather densely pubescent with pustulate hairs, up to 16 cm. long and 4 cm. wide, the lowermost pair much reduced. Interstitial leaflets usually numerous (rarely lacking), ovate to elliptic or rarely ovate-lanceolate, acute to obtuse, sessile, up to 1.5 cm. long and 7 mm. wide (rarely up to 3.5 cm. long and 1.5 cm. wide). Pseudostipular leaves auriculiform or semiovate, falcate, obtuse to acute, up to 1.5 cm. long and 7 mm. wide. Inflorescences pseudoterminal or pseudoterminal and lateral, few- to many-flowered (as many as 17), laxly cymose or sometimes racemose; peduncles up to 10 cm. long. Pedicels up to 4 cm. long, articulate at or somewhat above the middle. Flowers bright purple to lavender to rarely whitish. Calyx 6 to 12 mm. long, glabrous or with incurved articulate hairs (especially on the lobes), divided to well below the middle into ovate-lanceolate to lanceolate-acuminate lobes;



Figure 36.—Solanum agrimonifolium (Steyermark 49938). About × %.

lobes often long-attenuate. Corolla rotate, up to 2 cm. or more in diameter, with short puberulent lobes up to about 3 mm. long. Anthers deep yellow, oblong to ellipsoid in outline, cordate at the base, 3.5 to 5.0 mm. long; filaments broad, 1 to 2 mm. long, glabrous or sometimes pubescent, often lilac-colored. Style 7 to 8

mm. long, exceeding the stamens. Fruits ellipsoid-conical, acute, pale green, up to 4 cm. long and near the base 1.3 cm. in diameter.

Range: Mountains of southern Mexico and western Guatemala,

usually above 2,000 m.

In the original description, Rydberg stated that the fruits of this plant were unknown. He placed it in the series *Tuberosa*, which comprises tuber-bearing species with globose fruits. It is strange that Rydberg overlooked the fruits of a plant he was describing as new, especially since the type specimen has two fruits which, though immature, are so well developed as to show

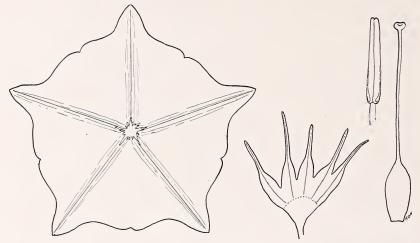


FIGURE 37.—Solanum agrimonifolium (Standley 68461). Corolla and calyx, about \times 1½; stamen and pistil, about \times 3.

that they are conical and pointed at the apex. One of the fruits on the type specimen is 1.5 cm. long. It is here placed in the

series Conicibaccata, where it correctly belongs.

Solanum agrimonifolium resembles very closely in habit S. canense (series Suaveolentia). The interstitial leaflets, however, are always sessile and the leaflets are also sessile or subsessile, whereas the leaflets and interstitial leaflets of S. canense have a distinct slender petiolule. These characters readily separate ster-

ile plants.

The plants collected in Guatemala are usually more luxuriant, being larger in all their parts and less pubescent at maturity than Mexican plants, but there are so many intergradations that it is impracticable to segregate these plants, even on a geographical basis. It seems more feasible to include all the plants in an all-inclusive category, noting, however, that they are variable. According to Steyermark, this plant is known as papa de marrana or tis-botch in Dept. Huehuetenango, Guatemala.

Specimens examined:

MEXICO.—CHIAPAS: Cerro del Boqueron, September 1913, Purpus 6977 [type collection of S. agrimonifolium] (CM, Gray, Mo, NY, US); Fraylesca

Siltepec, March 11, 1945, Matuda 5246 (CM, Lun, NA). OAXACA: Yotao, July 184—, Galeotti 1225P (Gray, NY, US, Vienna).

GUATEMALA.—DEPT. HUEHUETENANGO: cloud forest between Xoxlac and Nucapuxlac, Sierra de los Cuchumatanes, herb 2 to 4 ft. tall, leaves thin, rachis and stem deep purple, stem spotted pale green and with slight wings on angles, corolla deep purple, filament lilac, anther golden yellow, 1,650 to 2,500 m., July 17, 1942, Steyermark 48961 (CM); trail between Todos Santos and San Juan Atitán, Sierra de los Cuchumatanes, corolla lavender, "tis-botch" or "papa de marrana," 2,600 to 2,700 m., September 7, 1942, Steyermark 51942 (CM); Cerro Pixpix, above San Ildefonso Ixtahuacán, on forested summit, herb 2 to 3 feet tall, corolla violet, 1,600 to 2,800 m., August 15, 1942, Steyermark 50555 (CM): ton of Cerro Chemalito, Sierra m., August 15, 1942, Steyermark 50555 (CM); top of Cerro Chemalito, Sierra de los Cuchumatanes, 3½ miles west of Santa Eulalia, alpine thicket with Juncus, herb, stem winged, pale green with purple blotches throughout, corolla purple, anthers yellow, 3,100 to 3,150 m., August 2, 1942, Steyermark 49938 (CM). DEPT. QUEZALTENANGO: above Mujuliá between San Martín Chile Verde and Colomba, in damp dense mixed forest on white sand slopes, scarce, weak herb 8 dm. tall, corolla purple, about 1,800 m., February 1, 1941, Standley 85459 (CM); Volcán Santo Tomás, herbaceous, 1 to 2 ft. tall, 1941, Standley 85459 (CM); Volcán Santo Tomás, herbaceous, 1 to 2 ft. tall, leaves membranaceous, grass or dull green above, paler beneath, corolla lilac to lavender, rarely whitish, fruit 1½ inches long, ½ inch wide at base, oblong-lanceolate, pale green, pine-balsam clay ridge, slopes, 2,500 to 3,700 m., January 22, 1940, Steyermark 34822 (CM); Fuentes Georginas, western slope of Volcán de Zunil, wet forest, erect succulent herb 4 ft., about 2,850 m., March 4, 1939, Standley 67499 (CM). DEPT. SAN MARCOS: Barranco Eminencia, above San Rafael Pie de la Cuesta, along brook, succulent erect herb 3 to 4 ft., corolla bright purple, 2,100 to 2,400 m., March 14 and 15, 1939, Standley 68461 (CM); Barranco Eminencia, road between San Marcos and San Rafael Pie de la Cuesta, in upper part of the barranco between Finca La Lucha and Buena Vista, wet thicket, weak herb 7.5 dm. tall, corolla Finca La Lucha and Buena Vista, wet thicket, weak herb 7.5 dm. tall, corolla bright purple, 2,500 to 2,700 m.. February 6, 1941, Standley 86448 (CM); between La Vega ridge along Río Vega and northeast slopes of Volcán Tacaná, to 3 miles from Guatemala-Mexican boundary, in vicinity of San Rafael, herbaceous, 2 to 3 ft. tall, leaves rich bright green, membranaceous, corolla lilac, along stream in narrow shaded barranco, 2,500 to 3,000 m., February 20, 1940, Steyermark 36178 (CM); along road between San Sebastian at km. 21 and km. 8, 8 to 18 miles northwest of San Marcos, moist thickets near waterfall, 2,700 to 3,800 m., February 15, 1940, Steyermark 35728 (CM).

14. Solanum brachycarpum Correll comb. nov.

(Figs. 38, 39, and 40.)

Solanum oxycarpum var. brachycarpum Correll, Texas Res. Found. Contrib. 1: 8, fig. 3. 1950.

Plant slender, erect, up to 5.5 dm. tall, rather sparsely pilose throughout, stoloniferous and tuber-bearing. Stem simple or rarely branched. Leaves odd-pinnate, up to 25 cm. long, usually about 15 cm. long. Leaflets 7 to 11; lateral leaflets narrowly elliptic-lanceolate to oblanceolate, rather abruptly acuminate, rounded to tapering at the slightly oblique base, up to 8.5 cm. long and 3 cm. wide, with short petiolules up to 6 mm. long; terminal leaflet usually much broader than the lateral leaflets, sometimes obovate to suborbicular. Interstitial leaflets few and weak, ovate to elliptic, sessile, usually less than 3 mm. long, rarely longer. Pseudostipular leaves semiorbicular to semiovate, falcate, obtuse to subacute, up to 1.5 cm. long. Inflorescences pseudoterminal or pseudoterminal and lateral, few- to many-flowered, cymosely paniculate; peduncles usually short, up to 6 cm. long, sometimes glandular.



Figure 38.—Solanum brachycarpum (Hinton 14438). About \times %.

Pedicels up to 2.5 cm. long, articulate at about the middle. Flowers light to deep purple or bluish. Calyx 5 to 6 mm. long, divided to about the middle or slightly above into ovate to ovate-lanceolate lobes that are rather abruptly constricted above the middle to form an apiculate, somewhat pilose apex. Corolla 2 to 3 cm. in diameter, commonly appearing to be 10-lobed because of the raised angular interpetalar tissue; lobes triangular, acute, ciliolate. Anthers oblong in outline, 4 to 5 mm. long; filaments up to 3 mm.

long, slender. Style slender, 8 to 10 mm. long, much exceeding the stamens; stigma thickened. Fruits (immature) ovoid-ellipsoid.

Range: Apparently endemic in the high mountains of Michoacán and Guerrero, Mexico, in cloud forests between 1,830 and 3,355 m. Leavenworth states that this plant is most common at about 2.745 m.

This species is most nearly related to *S. oxycarpum*, but the differently shaped calyx and corolla and apparently shorter and more ovoid, not ellipsoid, fruits separate this species from *S. oxycarpum*. The plant, especially the younger parts, is also more

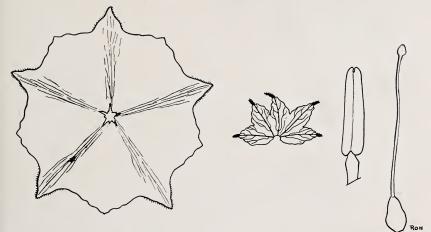


FIGURE 39.—Solanum brachycarpum (Hinton 13995). Corolla and calyx, about \times 2; stamen and pistil, about \times 4.

densely pubescent. Solanum oxycarpum is also concentrated in Costa Rica, whereas this species is apparently endemic in Mexico. When this species was originally published as S. oxycarpum var. brachycarpum, only one sheet of the type was in hand. Since then, however, additional sheets of the type collection, as well as several other collections, have been made available, and further study has convinced the writer that this is a species in its own right.

Specimens examined:

MEXICO.—GUERRERO: Galeana District, Teotepec, pine forest, succulent, 5 dm. tall, flowers purple, 2,750 m., July 16, 1939, Hinton 14438 (Ar, CM, Gray, Mo, NA, NY, PA, US); near Los Tojocodes, summit of mountains above Mazátlan, about rock ledge in deep barranca, plants all dead but large, tubers rather large and whitish, December 27, 1947, Correll 14408a [P. I. No. 161745] (NA). México: Las Cruces, District of Temascaltepec, pine and fir forest, called "papa cimarrona," 3,350 m., July 15, 1932, Hinton 1047 (Gray). Michoacán: common in cloud forest, Mount Tancitaro, 2,280 m., July 5, 1941, Leavenworth and Hoogstraal 4021 (CM, Gray, Mo, NY); Barroloso, pine and fir forest, from Cerro de las Conchas, highest point in the district of Coalcomán, flowers blue, 2,900 m., August 10, 1939, Hinton 15096 (CM, Gray, Mo, NA, NY, PA, US); Coalcomán District, S. Torricillas, pine forest, flowers light purple, 2,350 m., July 25, 1939, Hinton 13995 [type of S.



Figure 40.—Solanum brachycarpum (Hinton 13995). Type of S. oxycarpum var. brachycarpum. About \times %.

oxycarpum var. brachycarpum] (CM, Gray, Mo, NA, NY, PA, US); purple-flowered herb, south slope of Mount Tancitaro, in clouds much of the time, 1,830 to 3,355 m., most common about 2,745 m., July 25, 1940, Leavenworth 360 (CM); moist, sunless pine forest, flower purple, Zitacuaro-Cerro Pelón, June 17, 1938, Hinton 11969 (CM, US); in mountains near Capacuaro, plants all dead, December 16, 1947, Correll 14339a [P. I. No. 161707A (in part)] (NA); mountains south of Cruce de Caminos, plants all dead, December 24, 1947, Correll 14380a [P. I. No. 161716 (in part)] (NA).

15. Solanum confusum Correll sp. nov.⁵ (Figs. 41 and 42.)

Plant low, bushy, much-branched, about 2.8 dm. tall, somewhat pilose throughout, apparently non-tuber-bearing. Stem slender. Leaves odd-pinnate, up to 13 cm. long, without interstitial leaflets. Leaflets 7 to 9, elliptic to oblong-elliptic or sometimes ellipticobovate, obtuse to shortly acuminate, tapering at the somewhat oblique base, 3.5 to 5 cm. long and up to 2 cm. wide, the lowermost pair or pairs much reduced; terminal leaflet larger than the lateral leaflets. Pseudostipular leaves dolabriform, falcate, about 12 mm. long. Inflorescence pseudoterminal, few-flowered, cymosely paniculate; peduncles about 4 cm. long. Pedicels up to 2 cm. long, articulate at about or a little above the middle. Flowers purple. Calyx about 6 mm. long, pilose, divided to about the middle into ovate lobes that are rather abruptly constricted near the apex or above the middle to form a short apiculate lobule. Corolla rotate, about 2 cm. in diameter, with short triangular obtuse ciliate petal lobes, the interpetalar tissue prominently raised and deeply notched. Anthers oblong-lanceolate in outline, about 5 mm. long; filaments broad, 1.5 mm. long. Style slender, 9 mm. long, much exceeding the stamens; stigma slightly swollen. Fruits (immature) ovoid, pointed at the apex.

Range: Apparently endemic in high mountains (above 2,000 m.)

of Oaxaca, Mexico.

The corolla of this species and those of *S. guerreroense* and *S. brachycarpum* have a somewhat similar pattern, but the shape of the interpetalar tissue and the calyx and differences in habit read-

ily separate these three species.

Solanum confusum is vegetatively most closely related to S. oxycarpum, but the floral differences easily separate these species. It is a more pubescent plant than S. oxycarpum. The inflorescences also terminate the main stems instead of being nearly always lateral on short branches as in S. oxycarpum.

⁵ Planta herbacea, fruticosa, ramosissima, circiter 2.8 dm. alta, omnino satis pilosa, non tuberifera ut videtur. Folia imparipinnata, usque ad 13 cm. longa, inter foliola sine foliolis parvis. Foliola septem usque ad novem, elliptica vel obongo-elliptica vel aliquando elliptico-obovata, obtusa vel breviter acuminata, infra angustata, 3.5 ad 5 cm. longa. Inflorescentia pseudoterminalis pauciflora, cymoso-paniculata. Pedicelli circiter in medio vel paulo supra medium articulati. Flores purpurei. Calyx circiter 6 mm. longus, pilosus, cum lobis ovatis apiculatisque. Corolla rotata, circiter 2 cm. in diametro cum petalorum lobis brevibus triangulis obtusis ciliatis et cum spatiis inter petala conspicue elevatis profunde retusisque. Anthera oblongo-lanceolata, 5 mm. longa. Stylus gracilis, 9 mm. longus, stamina multo superans. Fructus ovoideus, apice acutus.



FIGURE 41.—Solanum confusum (Nelson 1319, in part). Type specimen. About \times %.

The following note was written on the type sheet on December 19, 1895, by J. M. Greenman, then working at the Gray Herbarium: "This sheet, being the only duplicate of No. 1319, I have retained for the Gray Herbarium." The sheet returned to the U. S. National Herbarium is a specimen of *S. verrucosum*, with mature and immature orbicular fruits and flowers. The two plants, however, superficially resemble one another.

Specimen examined:

MEXICO.—OAXACA: eighteen miles southwest of the city of Oaxaca, 2,280 to 2,890 m., September 10 to 20, 1894, E. W. Nelson 1319 (in part) [type] (Gray).

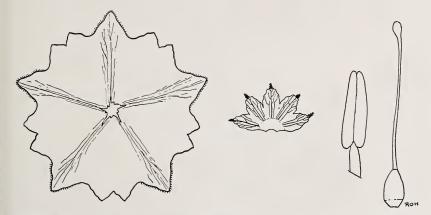


Figure 42.—Solanum confusum (Nelson 1319, in part). Corolla and calyx, about \times 2; stamen and pistil, about \times 4.

16. Solanum guerreroense Correll sp. nov.⁶ (Figs. 43 and 44.)

Plant rather low, spreading and much-branched, about 25 cm. tall, more or less sparsely pilose throughout, tuber-bearing. Stem purplish, thick. Leaves odd-pinnate, up to 15 cm. long, somewhat short-pilose. Leaflets 9, broadly elliptic to elliptic-ovate or sometimes obovate, obtuse to acute at the apex, broadly rounded to somewhat cuneate at the slightly oblique base, about 4 cm. long and 2 cm. wide, with a petiolule up to 7 mm. long. Interstitial leaflets numerous, ovate to suborbicular, sessile or essentially so,

⁶ Planta herbacea, fruticosa, patens et multum ramosa, circiter 25 cm. alta, omnino plusminusve sparsim pilosa, tuberifera. Folia imparipinnata, usque ad 15 cm. longa, inter foliola cum foliolis parvis ovatis vel suborbicularibus. Foliola novem, late elliptica vel elliptico-ovata vel aliquando obovata, obtusa vel acuta, basi rotundata vel cuneata, circiter 4 cm. longa. Inflorescentia lateralis, cymoso-paniculata. Pedicelli circiter in medio articulati. Flores albi, cum petalorum apicibus purpureo-tinctis. Calyx 8 ad 9 mm. longus, cum lobis lanceolatis. Corolla rotata, circiter 2.3 cm. in diametro, cum petalorum lobis brevibus, triangulis acutis ciliatis et spatiis interpetala late rotundatis et leviter retusis. Anthera 4 mm. longa. Stylus 8 ad 9 mm. longus, stamina multo superans. Fructus ellipsoideus vel ellipsoideo-ovoideus, acutus, intense viridis et nitens, usque ad 3 cm. longus.



Figure 43.—Solanum guerreroense (Correll 14410a). Type specimen. About \times %.

up to 12 mm. long and 7 mm. wide. Pseudostipular leaves semiovate, falcate, about 1 cm. long. Inflorescences lateral, cymosely paniculate; peduncles 5.5 cm. long. Pedicels up to 2.5 cm. long, articulate at about the middle. Flowers white, with the tip of the petals tinged pink lavender. Calyx purple-tinged with purple veins, 8 to 9 mm. long, divided to below the middle into lanceolate acute pilose lobes. Corolla rotate, about 2.3 cm. in diameter, with short triangular acute ciliate petal lobes, the interpetalar tissue broadly rounded and slightly notched. Anthers about 4 mm. long; filaments 1 mm. long. Style 8 to 9 mm. long, much exceeding the

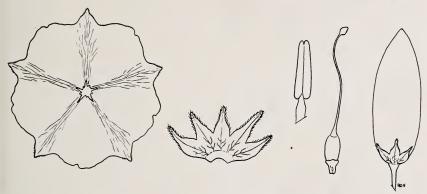


FIGURE 44.—Solanum guerreroense (Correll 14410a). Corolla and calyx, about \times 1 %; stamen and pistil, about \times 3 %; fruit, about \times 1.

stamens; stigma thickened. Fruits ellipsoid to ellipsoid-ovoid, acute, deep green and shining, up to 3 cm. long.

Range: Apparently endemic in high mountains of Guerrero and

Michoacán, Mexico.

This species, S. confusum, and S. oxycarpum are closely related. The habit of this species, however, is quite different from those

species.

Although contrary to the writer's convictions, this species is here proposed based on cultivated plants. However, since the ellipsoid acute fruits, collected in Mexico, place it in this series (*Conicibaccata*) and the cultivated plant differs so markedly from

other species in the series, it is here described as new.

R. W. Hougas grew the seeds in a greenhouse at the University of Wisconsin in 1948. The tubers were harvested and subsequently used for field plantings at Sturgeon Bay, Wis., from which material the type specimen was obtained. Similarly to several other introductions, the plants failed to tuberize before frosts killed the vines.

Specimens examined:

MEXICO.—Guerrero: in pine-oak forest on summit of mountain above Chilpancingo (to the north), fruits long, ellipsoid-ovoid, deep green and shining, up to 3 cm. long (plants all dead), December 27, 1947, Correll 14410a (P. I. No. 161730) [type specimen grown at Sturgeon Bay, Wis., August 9-13, 1949] (NA). MICHOACÁN: Zitacuaro-Cacique Mountain, 2,700 m., oak forest, flower light purple, June 6, 1938, Hinton 11929 (US).

Solanum longiconicum Bitt., Repert. Sp. Nov. 10: 534. 1912. Type locality: Costa Rica, La Palma del Irazú, Prov. Cartago, 1,800 m., Wercklé 65.

S. manoteranthum Bitt., Repert. Sp. Nov. 11: 383. Type locality: Costa Rica, Volcán Barba, Prov. San José, communication from $Roesl\ s.\ n.$

? S. jamesii var. grandifrons Bitt., Repert. Sp. Nov. 12: 151. 1913. (See discussion of this plant under S. jamesii.)

Plant ascending or essentially erect, slender, lax, 1.5 to 9.0 dm. tall, stoloniferous, non-tuber-bearing or rarely with small Stem flexuous and glabrous or sparsely pubescent. Leaves odd-pinnate, 6 to 26 cm. long (including the petiole), without interstitial leaflets or very rarely with several minute isolated ones; petioles up to 10 cm. long. Leaflets 7 to 11; lateral leaflets ovate-lanceolate to narrowly lanceolate or broadly elliptic-lanceolate, oblique, acute to long-acuminate, rarely obtuse, broadly rounded to cuneate at the oblique base, sessile or with a short winged petiolule, 2 to 9 cm. long and 0.7 to 3.5 cm. wide, the lowermost pair frequently much reduced; terminal leaflet usually larger than the lateral leaflets and with a longer petiolule, usually with scattered pustulate hairs on the upper surface and with finer shorter hairs on the lower surface. Pseudostipular leaves semiovate, with a semicordate base, up to 1 cm. or more long. Inflorescences pseudoterminal or pseudoterminal and lateral, laxly few- to many-flowered, cymose; peduncles slender, up to 10 cm. long. Pedicels 1.3 to 2.3 cm. long, articulate at or somewhat above the middle, shortly pilose to glabrous. Flowers pale or deep purple to occasionally white. Calyx 3 to 7 mm. long, sparsely pilose (especially when young) to glabrous, divided to about the middle into ovate to elliptic or narrowly lanceolate acute to acuminate lobes; lobes rarely subobtuse, often recurved above. Corolla rotate, 1.6 to 2.2 cm. in diameter, with short densely pubescent lobes up to 4 mm. long; lobes 8 to 12 mm. wide at the widest point. Anthers oblong in outline, cordate at the base, 3 to 5 mm. long; filaments 1.0 to 1.5 mm. long, glabrous or rarely puberulent. Style 5 to 8 mm. long, exceeding the stamens; stigma clavellate. Fruits ovoid-cylindric, tapering to the acute apex, green, up to 3 cm. long, usually about 2 cm. long and 7 mm. in diameter.

Range: High mountains of eastern Mexico (Veracruz) to Panama (Prov. Chiriquí), usually between 2,000 and 4,000 m.

This species, which is rather frequent and widespread in Costa Rica, is based on a plant collected at Malpays de la Joya, Veracruz, Mexico. As far as the writer knows, it had never been collected again in Mexico until Balls and Gourlay obtained specimens between Perote and La Joya, Veracruz, in September 1938. This was apparently from the area where the type collection was obtained by Schiede about 100 years before.



FIGURE 45.—Solanum oxycarpum (from Hort. Hal. v. 1: pl. 3. 1841). About $\times \frac{1}{3}$.

It is of interest to note that in 1884 Baker wrote the following regarding the type collection of *S. oxycarpum*: "It was collected by Schiede in stony ground at Malpays de Joya, fruiting in the month of September, and its tubers are said to be called 'Papa cimarrona' by the natives."

Claude Horn stated that he observed one tuber in the plant he collected in Costa Rica. A photograph of this collection, showing

the solitary basal tuber, is reproduced here (fig. 47). Another collection obtained by Wercklé (No. 17296) in Costa Rica in 1908 has a note to the effect that the fruits are eaten and that the plant had roots like the common potato, although no tubers were included with the specimen. Wercklé also states that the plant is called papa-ciruela in Cartago Province, Costa Rica. His collection from this locality is rather an atypical collection in that it is a more robust plant than usual and one specimen sheet has some leaves with as many as five rather prominent interstitial leaflets while another has leaves without interstitial leaflets.

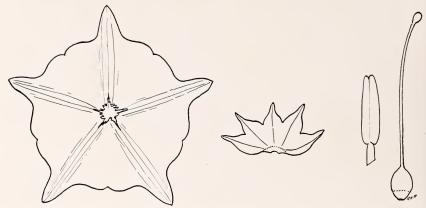


FIGURE 46.—Solanum oxycarpum (Standley and Valerio 49931). Corolla and calyx, about × 2; stamen and pistil, about × 4.

Apparently the species comprising the series *Conicibaccata* may or may not produce tubers. Because of this, the above observations are of more than passing interest. They would appear to support the present phylogenetic arrangement of the series in the section Tuberarium in which the series *Conicibaccata* is probably a connecting series between the definite tuber-bearing and the non-tuber-bearing series.

Examination of a photograph of the type (now destroyed) of *S. longiconicum* that was in the Berlin-Dahlem Herbarium and an examination of a duplicate specimen from Costa Rica (*Tonduz 4235*) that was cited by Bitter when he described this plant reveal

that it is typical S. oxycarpum.

In describing S. manoteranthum, Bitter compared it with S. colombianum Dun., a South American plant that is closely allied to, if not identical with, S. oxycarpum. Although the writer has not seen the type of S. manoteranthum, or a photograph of it, a study of the original description shows that it is probably referable to S. oxycarpum. The type of S. manoteranthum was questionably cited from Panama. In the United States Department of Agriculture copy of Repert. Sp. Nov. (v. 11), the place of original publication, there is a correction, in the hand of the late Henry Pittier, of the type locality assigned to this plant as from "Pan-



Figure 47.—Solanum oxycarpum (Horn 1). Lower part of plant to show solitary tuber. About \times 1.

ama? Vulkan Barba Volu" to "Costa Rica, Vulcan Barbu." As Volcán Barba is in Costa Rica and Dr. Pittier was most familiar with that country, we are here considering Costa Rica as the type

locality.

The following collection from Guatemala, although having shorter and broader fruits, is probably a form of this species: Dept. El Progreso: between Finca Piamonte and top of Montaña Piamonte, along Joya Pacayal, Sierra de Las Minas, vine, leaves membranous, rich deep green above, pale green beneath, fruit ovoid, deep rich green, sulcate on both sides near top, 1.5 cm. broad, 2 cm. long, stem pale green spotted purple, 2,500 to 3,000 m., February 7, 1942, Steyermark 43672 (Cal, CM).

Specimens examined:

MEXICO.—VERACRUZ: Perote, La Joya, among shrubs and in disused enclosure, old lava, 1,982 m., September 22, 1938, N. and E. K. Balls and Gourlay 5513 (Cam). State unknown: Sallé (communication from W. W. Saunders, October 1874), Coulter 1242 (Kew).

COSTA RICA.—Prov. ALAJUELA: "Clairieres de l'Achiote (Poás)," 2,200 m., November 1896, Tonduz 10801 (US); Volcán Poás, 2,678 m., January 30, 1922, J. M. Greenman and M. T. Greenman 5374 (Gray); collected in small clearing in rain forest at 2,135 m., on southeast shoulder of Volcán Poás, flowers violet and white, "only one small tuber found," plants decumbent and stoloniferous, March 26, 1947, Horn 1 (NA). Prov. Cartago: "papa-ciruela," it has roots like the common potato, the fruit is eaten, Cartago, 1,400 m., September 1908, Werckle 17296 (Gray); slopes of Volcán Irazú, bank of a stream, plant 4 ft. high, flowers pale blue, 2,745 m., June 28, 1920, Popenoe 1015 (NA, NY, US); Río Birrís, southern slope of Volcán de Irazú, wet thicket, erect herb 3 ft., corolla violet, February 23, 1924, Standley 35400 (US); moist bank by road, Cartago to Volcán Irazú, corolla mauve, August 23, 1940, Chrysler 5552 (CM); southern slope of Volcán de Turrialba, near the Finca del Volcán de Turrialba, 2,000 to 2,400 m., wet forest, erect herb 3 to 4 feet, corolla white, anthers yellow, February 22, 1924, Standley 34993 (US); north of Irazú, in oak forest, shrub 3 feet, nontuberous, 3,050 m., March 28, 1928, Stork 1281 (CM). PROV. HEREDIA: Vera Blanca, between Poás and Barba volcanoes, 1,600 to 1,700 m., weedlike, in brushy potrero, July 22, 1923, Maxon and Harvey 8274 (US); Cerro de Las Lajas, north of July 22, 1923, Maxon and Harvey 82/4 (US); Cerro de Las Lajas, north of San Isidro, 2,000 to 2,400 m., wet forest, ascending herb, 2 to 3 feet, corolla purple, fruit green, March 7, 1926, Standley and Valerio 51583 (CM, US); Yerba Buena, northeast of San Isidro, 2,000 m., wet forest, plant erect, February 22, 28, 1926, Standley and Valerio 29948 (US), same locality and date, Standley and Valerio 49973 (US); same locality and date, corolla pale purple, fruit green, Standley and Valerio 49982 (US); Vara Blanca de Serapiquí, north slope of Central Cordillera, between Poás and Barba volgances, 1,020 m., stans, prostrata flowers lavander-tinted on hare exposed canoes, 1,920 m., stems prostrate, flowers lavender-tinted, on bare exposed soil, February 1938, Skutch 3580 (Mo, NY, US). Prov. SAN José: "Defrichements du Roble (massif del 'Irazú)," 2,000 m., July 1891, Tonduz 4235 (US); Las Nubes, 1,500 to 1,900 m., wet forest, erect, corolla purplish, March 20 to 22, Standley 38666 (US), same locality and date, corolla white, Standley 38818 (US); same locality and date, corolla violet, Standley 38614 (US), same locality and date, corolla pale purple, fruit green, Standley 38756 (US); Cerro de Las Vueltas, 2,700 to 3,000 m., wet forest, suberect, 2 to 3 feet, common, corolla purplish white, December 29, 1925, to January 1, 1926, Standley and Valerio 43591 (US); same locality and date, corolla white, Standley and Valerio 43661 (US); same locality and date, ascending, corolla purplish white, Standley and Valerio 43759 (US); same locality and date, erect herb, 3 feet, corolla pale violet; Standley and Valerio 43913 (US); Irazú on road to Roble, 3,050 m., May 16, 1928, Stork 1999 (CM); Potreros of Rancho Redondo, 2,220 to 2,600 m., November 9 to 18, 1929, *Dodge* and *Thomas 4926* (CM); Cerro Gallito, 2,000 m., February 3, 1935, *Valerio 1048* (CM); new

road from La Estrella to Copey, 2,450 m., February 15, 1935, Valerio 1050 (CM). Prov. UNKNOWN: San Cristobal, Wercklé (US); San Cristobal road, weak herb in deep forest, corolla white, stamens yellow, resembles S. tuberosum flower, 2,440 m., May 27, 1928, "only small tubers of 5 mm. & 1 cm. long observed," Stork 2213 (CM) [Note: the rather woody underground part has some swellings; otherwise there appear to be no tubers].

PANAMA.—Prov. Chiriquí: Potrero Muleto to summit, Volcán de Chiriquí, flowers pale purple, 3,500 to 4,000 m., July 13 to 15, 1940, R. E. Woodson, Jr., and Schery 399 (Gray); Boquete District, Bajo Chono, rain forest, 1,830 m., herb 2 to 3 ft. high, flower light heliotrope, February 18, 1938, Davidson 314 (CM).

Series Bulbocastana Rydb., Torrey Bot. Club Bul. 51: 146, 172. 1924.

Herbs with fibrous roots and stolons, tuber-bearing. Leaves simple, entire. Pedicels articulate some distance above the base.

Corolla stellate, deeply lobed. Fruits round.

The series *Bulbocastana* is a highly artificial one in that the species which comprise it are strikingly different one from the other. The simple, entire leaves and stellate corolla are the basic characters that hold this group together, although their individual habits are quite dissimilar.

leaves ovate to lanceolate, broadly to narrowly cuneate at the base.

2. Plant very slender, usually epiphytic; stem zigzag above; anther

cordate at the base.
3. Corolla usually lobed to about or below the middle but not to near the base.

4. Style always noticeably longer than the stamens.

- 5. Pedicels above the articulation and calvx glabrous.
 20. S. bulbocastanum var. glabrum.
- Pedicels and calvx more or less pilose....18. S. bulbocastanum.
 Style about equal to or only slightly exceeding the stamens.
 S. bulbocastanum var. dolichophyllum.

3. Corolla deeply lobed to near base.

- 6. Petals with a claw; styles about twice as long as the stamens.
 23. S. longistylum.
- 6. Petals without a claw; style about equal to or only slightly exceeding the stamens 21. S. bulbocastanum var. partitum.
- 18. **Solanum bulbocastanum** Dun. in Poir., Encycl. Suppl. 3: 749. 1813. (Figs. 48, 49, 50, and 51.)

Solanum bulbocastanum var. latifrons Bitt., Repert. Sp. Nov. 11: 447. 1912.

Plant slender or stout, grayish green in color, simple or muchbranched, 3 to 10 dm. tall, densely pubescent throughout with multicellular erect-spreading hairs to rarely subglabrous, producing long slender tuber-bearing stolons. Tubers clear white to creamy white, orbicular to ellipsoid, up to 7 cm. or more long, the flesh somewhat crisp. Leaves simple, broadly ovate to ovate-



Figure 48.—Solanum bulbocastanum (Pringle 9340). About \times %.

lanceolate or narrowly elliptic-lanceolate, obtuse to acute or shortly acuminate, tapering into the petiole at the narrowly to broadly cuneate base, with the margins entire or somewhat undulate, 4 to 14 cm. long and 2 to 6 cm. wide; petioles up to 5 cm. long, usually much shorter. Pseudostipular leaves auriculiform, up to 1.5 cm. long and 7 mm. wide. Inflorescences pseudoterminal or pseudoterminal and lateral, cymose, with the branches often scorpioid, few- to 20-flowered (sometimes more); peduncles short, up to 3 cm. long. Pedicels 5 to 10 mm. long, articulate at about or slightly below the middle. Flowers white to light yellow or greenish yellow. Calyx 3.0 to 4.5 mm. long, with the short obtuse to acute

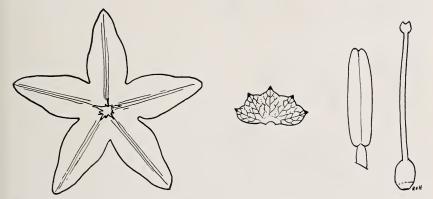


FIGURE 49.—Solanum bulbocastanum (Arsène (1907)). Corolla and calyx, about \times 3; stamen and pistil, about \times 6.

lobes about 2.5 mm. long. Corolla stellate, 6 to 15 mm. long, divided to well below the middle; lobes elliptic-lanceolate to ovate-lanceolate or lanceolate, subobtuse to acute, densely pilose at the margins, up to 11 mm. long and 4.5 mm. wide. Anthers oblong in outline, cordate at the base, 4 to 6 mm. long; filaments 1 to 2 mm. long, thick, often somewhat connate. Style 7 to 11 mm. long, glabrous, exceeding the stamens. Fruits orbicular, greenish, about 7 mm. in diameter.

Range: Endemic in the highlands of central Mexico, from Vera-

cruz to Jalisco, usually above 2,000 m.

In the original description of this species the simple leaves were said to be velvety, oval, and undulate. Reference was also made to the Mociño and Sessé plate of this plant. Later, in Dunal's monograph of the genus Solanum (in De Candolle's Prodromus), the style was stated to be longer than the anthers. At the time this description was given of this plant it was sufficient to distinguish it readily from other known species in the series Bulbocastana. In the meantime, however, additional closely allied species and varieties have been described that make the correct identity of the original $S.\ bulbocastanum$ more difficult to ascertain.

It has not been possible to see the Mociño and Sessé plate referred to by Dunal. The only set of these plates in the United





Figure 50.—Solanum bulbocastanum (Correll 14376a). Upper part of the plant grown at Glenn Dale, Md. About \times ¼.

States is at the Gray Herbarium. According to Reed C. Rollins, Director, the plate of S. bulbocastanum is not included in their set. An examination, however, of a collection of Mociño and Sessé (No. 1515) reveals that, although the leaves are narrower than in most material, the flowers have a style longer than the stamens and are almost identical to flowers of a collection of Arsène (August 8, 1907) from Puebla State, Mexico. The Arsène collection is an excellent match of the broad-leaved plant described by Bitter as var. latifrons, from Mexico. At the time he described var. latifrons, Bitter gave a description of what he considered to be typical S. bulbocastanum and cited, among other specimens, a collection of Türckheim (No. II 2316) from Baja Verapaz, Guatemala. A duplicate specimen in the National Herbarium of the abovementioned Türckheim collection differs considerably from what the writer considers to be typical S. bulbocastanum and in this work typifies the var. partitum.

In accordance with the above, the writer's concept of this species is based on the Mociño and Sessé collection (No. 1515) and on that of Arsène (August 8, 1907) from Puebla, Mexico. Typical S. bulbocastanum is characterized by having the style always exceeding the stamens, sometimes as much as a third longer; corolla divided to below the middle, but not to the base; and leaves broadly ovate to ovate-lanceolate or lanceolate, with a broadly rounded to shortly acuminate apex and narrowly to broadly cuneate base.

As may be noted, *S. bulbocastanum* is extremely variable in leaf shape. Also, the degree of pubescence is most variable. Some plants are coarsely and densely pubescent, whereas others are rather slender and subglabrous. Several collections have been seen where some of the flowers have six parts instead of the normal five.

An examination of the type of var. *latifrons* reveals that it has broader leaves (4 cm. wide) than most plants of S. bulbocastanum. Specimens examined:

MEXICO.—DISTRITO FEDERAL: Pedregal, Salazar s. n. (US); Tizapan, lava fields, 2,280 m., August 24, 1900, Pringle 9136 (CM, Co, Gray, Mo, US); San Angel, July 17, 1901, Rose and Hay 5513 (US); Valley of Mexico, hills, 2,280 m., August 19, 1901, Pringle 9340 (Gray, NY, Mich, US); hillside, 2,340 m., flowers whitish yellow, Cerro de Estrella, September 9, 1930, Russell and Souviron 159 (US); Pedregal de San Angel, July 1929 and September 1932, Lyonnet 515 (Gray, Mo, NY, US); Tlalpam, Pyramid of Cuicuilco, 2,200 m., August 15, 1935, MacDaniels 39 (CM); 23 miles south of Mexico City, dry rocky soil among maguey plants, plants erect, solitary and scarce, with simple leaves, tubers crystal white and very smooth, November 5, 1947, Correll 14241b [P. I. No. 161119] (NA); Indios Verdes, at city limit of Mexico City, in loose rocks on dry talus slope (plants all dead), November 7, 1947, Correll 14242c [P. I. No. 161120 (in part)] (NA). Guerrero: Taxco, petals white, July 15, 1937, Abbott 257 (Gray); Taxco, July 20, 1938, Kenoyer A303 (CM). Jalisco: near Guadalajara, moist banks, September 29, 1891, Pringle 5177 (Gray); near Guadalajara, cool banks of ravines, September 13, 1893, Pringle 5518 (Gray). México: Tenancingo, in red clay and roadside stones, plant 3 to 6 dm. high, fruit globular, whitish at first with darker green longitudinal streaks or splotches finally becoming mostly dark green with some darker streaks and a few white specks, tubers white, oval, 2,500 m., November 13, 1930, Reddick 344 (Co); Temascaltepec, 1,800 m., July 25, 1933, Hinton 4246 (US). MICHOACÁN: Morelia, talus, April 1903, Arsène 28 (CM); Mayorazgo, 2,120 m., July 4, 1907, Arsène s. n. (US); Punguato, vicinity

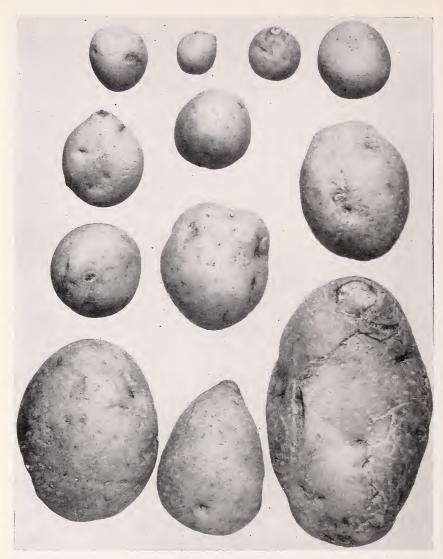


FIGURE 51.—Solanum bulbocastanum (Correll 14376). Tubers collected on Mount Punguato, Michoacán, Mexico. About \times 1.

of Morelia, 2,100 m., June 26, 1909, Arsène 3472 (Mo, US); same locality, August 11, 1910, Arsène 6927 (Mo, Paris, US), same locality, August 18, 1910, Arsène 6949 (Gray, US); near Zamora, open ground, flowers light yellow, July 17, 1941, Schery 181 (Mo); on slopes of Mount Punguato, near Morelia, in cornfield, plants dead, natives state that they are abundant here earlier in the year, November 13, 1947, Correll 14254b [P. I. No. 161130] (NA); same locality, December 23, 1947, Correll 14376b [P. I. No. 161712] (NA); near Río Belo, in and about old field, plants all dead, tubers white, December 13, 1947, Correll 14254b [P. I. No. 161130] (NA), same locality, December 23, 1947, Correll 14254b [P. I. No. 161711] (NA); on Mount Punguato, near Morelia, in and near old cornfields, plants all dead, December 13, 1947,

Correll 14335a and 14335b [P. I. No. 161739 (in part)] (NA); in vicinity of Pino Gordo, upper slopes of mountains, plants all dead, tubers variously shaped, December 24, 1947, Correll 14379c [P. I. No. 161715 (in part)] (NA). MORELOS: El Parque, along railroad, sunny ground, flowers pale lilac, August 24, 1940, Langman 2781 (NA); Cuernavaca, canyon, 1,370 m., July 10, 1941, Mr. and Mrs. W. C. Leavenworth 910 (CM). Puebla: Mayorazgo, "sur l'Atoyac," vicinity of Puebla, 2,120 m., May 20, 1907, Arsène 10132 (US); same locality, September 10, 1907, Arsène s. n. (US); Cerro Tepaxuchil, vicinity of Puebla, 2,330 m., July 11, 1907, Arsène s. n. (US); vicinity of Puebla, Cimetiere de la Pièdad, 2,175 m., July 16, 1907, Arsène 1980 (US); Barranca de l'Alseseca, Hacienda Batan, near Totimehuacan, vicinity of Puebla, 2,120 m., August 8, 1907, Arsène s. n. (US); Cholula (Teocali), July 14, 1910, Nicolás s. n. (Paris). VERACRUZ: Orizaba, 1855, Müller s. n. (NY). STATE UNKNOWN: no locality given, 1834, Andrieux 305 (Paris); no locality given, Schmitz 280 (Vienna); no locality given, Schmitz s. n. [type of S. bulbocastanum var. latifrons] (Vienna 125669); Zapan, Valley of Mexico, fallow field, June 18, 1865. Bourgeau 345 (Gray, Kew, Paris); Plantae Novae Hispanae, 1787, 1795, 1804, Sessé, Mociño, and Maldonado 1515, 5362 (CM). Correll 14335a and 14335b [P. I. No. 161739 (in part)] (NA); in vicinity of Maldonado 1515, 5362 (CM).

Solanum bulbocastanum var. dolichophyllum Bitt., Repert. 19. Sp. Nov. 11: 447. 1912. (Fig. 52.)

This plant, as the varietal name implies, has narrower than usual leaves—a characteristic that does not hold constant. As the style in all the Pringle collection, however, is only equal in length to or rarely exceeding the stamens, it appears to the writer that this variety should be based on this characteristic rather than on that of the leaves.

Specimens examined:

MEXICO.—Morelos: moist hillsides near Cuernavaca, 1,525 m., July 23, 1896, Pringle 6397 [type collection] (Cal, CM, Gray, Mo, NY, PA, US, Vienna).

Solanum bulbocastanum var. glabrum Correll var. nov.⁷ 20. (Figs. 53 and 54.)

This variety differs from the typical form in that the pedicel above the articulation and the calvx are glabrous; the corolla is usually less deeply lobed; and the lobes are somewhat broader. In the type collection the leaves are characteristically deltoid in outline and are conspicuously long-petioled.

Variety glabrum appears to be confined to southern Mexico and Guatemala, where only plants with glabrous pedicels are to be found.

Specimens examined:

MEXICO.—OAXACA: upper slopes of Cerro San Felipe Mountains, above Cerro San Felipe, in weedy thicket, plants tall and straggly, no tubers found but plants with fruits, October 31, 1947, Correll 14226 [specimen from nature] (NA) [specimen from plants grown at Sturgeon Bay, Wis., Correll 14226a] [type collection] [P. I. No. 161156] (NA); Hacienda de Aguilera, 1,550 m., August 15, 1931, Lelia Conzatti 77 (US).

Haec varietas pedicello supra articulum et calyce glabro, corolla vulgo minus profunde lobata cum lobis satis latioribus a plante typica differt. In collectione typica sunt folia vulgo in circuitu deltoidea et conspicue longe petiolata.



Figure 52.—Solanum bulbocastanum var. dolichophyllum (Pringle 6397). Type collection. About \times %.



Figure 53.—Solanum bulbocastanum var. glabrum (Correll 14226a). Type specimen grown at Sturgeon Bay, Wis. About \times %.

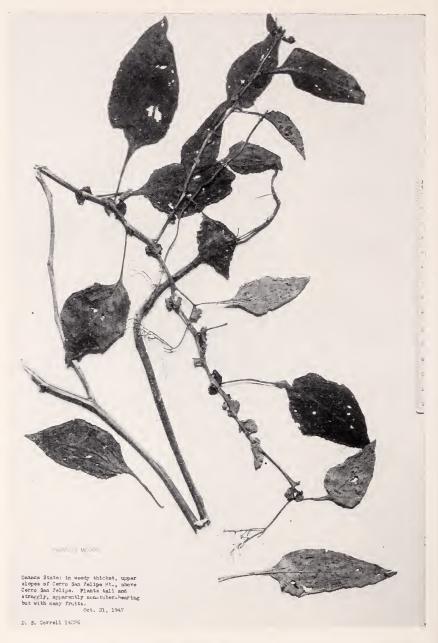


Figure 54.—Solanum bulbocastanum var. glabrum (Correll 14226). Specimen collected in Oaxaca, Mexico. About \times %.

GUATEMALA.—Dept. Guatemala: 1939, Aguilar 221 (CM), without date, Aguilar 564 (CM). Dept. Huehuetenango: along road between Huehuetenango and San Sebastián H., 2,000 m., corolla pale yellow, anthers golden, leaves pale green, August 12, 1942, Steyermark 50404 (CM).

21. Solanum bulbocastanum var. partitum Correll var. nov.8 (Fig. 55.)

Some of the collections from Guatemala and extreme southern Mexico have, on the whole, longer petioles; and some of the plants are less pubescent than the more northern plants and are characteristically more branched. The basic characteristic of this variety is the deeply lobed corolla that is cleft essentially to the base

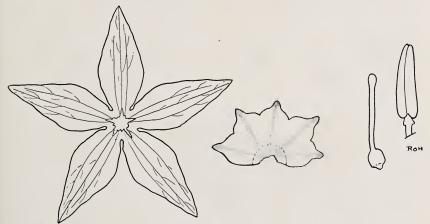


FIGURE 55-Solanum bulbocastanum var. partitum (Rojás 83). Corolla, calyx, pistil, stamen. All about $\times \frac{1}{2}$.

instead of somewhat below the middle as in the typical form. Also the pedicel above the articulation and the calyx are glabrous, showing the relationship of this variety to var. glabrum. The rather thick style, too, is about equal to the anthers or only slightly exceeding them. In this respect it is similar to var. dolichophyllum.

Bitter in 1912 (Repert. Sp. Nov. 11: 446) published a description of what he considered to be typical S. bulbocastanum and cited, among other specimens, a collection of Türckheim (No. II 2316) from Baja Verapaz, Guatemala. A duplicate specimen of the Türckheim collection in the U.S. National Herbarium is here

cited as the type of var. partitum.

Range: Mountains of southern Mexico (Chiapas) and Guatemala, usually below 2,000 m.

Specimens examined:

MEXICO.—CHIAPAS: temperate region, plant 2 to 3 feet high, flowers white, September 1864-70, Ghiesbreght 895 (Gray).

⁸ In hac varietate corolla usque fere ad basim non paulo infra medium lobata, pedicillus supra articulum et calyx glaber, stylus satis crassus et antheras subaequans.

GUATEMALA.—Dept. Baja Verapaz: Gebüsche in Patal, 1,600 m., July 1908, Türckheim No. II 2316 [type, U. S. Natl. Herb. 1324466]. Dept. Guatemala: Chilloni, 1,500 m., June 21, 1921, Rojās 83 (US). Dept. Huehuetenango: dry slopes between San Ildefonso Ixtahuacán and Cuilco, 1,350 to 1,600 m., corolla greenish yellow, "yerba mora," August 16, 1942, Steyermark 50687 (CM). Dept. Sololá: trail between village of San Pedro, via San Juan, San Cristóbal Buena Vista, and northwestern slopes of Volcán Santa Clara, 1,800 to 2,300 m., stems erect, corolla white, anthers dull orange yellow, June 8, 1942, Steyermark 47308 (CM).



Figure 56.—Solanum clarum (Skutch 858). Type collection. About × 3.

22. **Solanum clarum** Correll, Texas Res. Found. Contrib. 1: 10, fig. 4. 1950. (Figs. 56 and 57.)

Plant gregarious, small, herbaceous, erect, 1.5 to 2.5 dm. tall, somewhat sparsely pubescent throughout, stoloniferous and tuberbearing. Tubers small, ellipsoid, apparently purplish, less than 2 cm. long. Leaves simple, petiolate, ovate, truncate to cordate at the base, obtuse to acute at the apex, up to 4.5 cm. long, usually about as wide as long; petioles up to 2.5 cm. long. Pseudostipular leaves ovate, obtuse, up to 7 mm. long. Flowers as many as 8. Inflorescences pseudoterminal on naked slender peduncles in shortbranched cyme; peduncles up to 7 cm. long. Pedicels up to 1 cm. long, articulate at about or below the middle. Calyx purple-tinged, 3 to 4 mm. long, with short triangular-ovate obtuse to subacute lobes about 1 mm. long. Corolla stellate, up to 1.2 cm. long, lobed to below the middle, purple at the tip of the lobes, becoming white basally; lobes broadly lanceolate, tapering to the acute to subobtuse apex, the free part 4 to 5 mm. wide at the base. Anthers orange yellow, lanceolate in outline, 3 to 4 mm. long; filaments about 1 mm. long, stout, connate below the middle. Style slender, filiform, up to 7.5 mm. long, exceeding the anthers. Fruits apparently globose [immature fruits seen].

Range: Apparently endemic in the high mountains of north-

western Guatemala; at about 3,700 m.

Specimens examined:

GUATEMALA.—Dept. Huehuetenango: Cerro Chémal, summit Sierra de los Cuchumatanes, 3,700 to 3,800 m., corolla pale lavender in upper half, tinged whitish below with greenish at base, anthers golden, leaves membraneous, deep green above, in shade of Juniperus standleyi, August 8, 1942, Steyermark 50294 (US). Dept. Quezaltenango: Volcán Santa María, terrestial, herbaceous plant, gregarious, petals purple at the tip, becoming white basally, 3,600 m., July 27, 1934, Skutch 858 [type collection] (Gray, US).

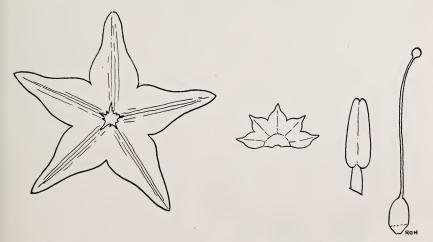


FIGURE 57.—Solanum clarum (Skutch 858). Corolla and calyx, about \times 3; stamen and pistil, about \times 6.



FIGURE 58.—Solanum longistylum (Orcutt 3833). Type collection. About $\times \%$.

23. Solanum longistylum Correll sp. nov.9 (Figs. 58 and 59.)

Plant erect, much-branched, up to 4.5 dm. or more tall (the top broken off), probably tuber-bearing (none present); stem slender, shortly pilose with curved articulate hairs. Leaves elliptic, obtuse to acute, cuneate at the base, up to 6.5 cm. long and 2.5 cm. wide, shortly pilose; petioles slender, up to 2 cm. long. Pseudostipular leaves small, auriculiform, about 5 mm. long. Inflorescences pseudoterminal on leafy branches, few-flowered; peduncles simple or branched, about 1.5 cm. long, laxly pilose and glandular. Pedicels 7 mm. long, articulate at about the middle. Flower color not

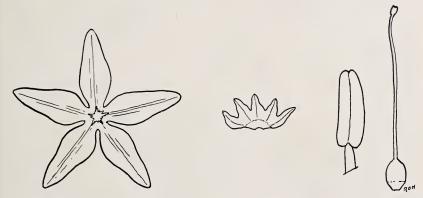


FIGURE 59.—Solanum longistylum (Orcutt 3833). Corolla and calyx, about × 3; stamen and pistil, about × 6.

known. Calyx 3 to 4 mm. long, shortly pilose, divided to the middle into triangular obtuse lobes. Corolla stellate, deeply lobed to near the base; petals reflexed, with a short broad claw, ovatelanceolate to elliptic-lanceolate, obtuse, pilose at the margins, 8 to 9 mm. long, 3 to 4 mm. wide below the middle. Anthers oblong in outline, about 4 mm. long; filaments 1.0 to 1.5 mm. long. Style filiform, 9 to 10 mm. long, about twice as long as the stamens. Fruits unknown.

The deeply lobed corolla with clawed petals and style twice as long as the stamens are characteristics that readily separate this species from *S. bulbocastanum* and its var. *dolichophyllum*, which it superficially resembles. The rather evenly elliptic leaves, without dilation near the base, are also distinctive.

⁹ Herba erecta, multum ramosa, usque ad 4.5 dm. alta; caulis gracilis, breviter pilosus cum pilis arcuatis articulatis. Folia simplicia, elliptica, obtusa vel acuta, basi cuneata, breviter pilosa, usque ad 6.5 cm. longa; petiolus usque ad 2 cm. longus. Inflorescentia terminalis vel prope ramorum finem lateralis, pauciflora. Pedicelli circiter in medio articulati. Calyx 3 ad 4 mm. longus, cum lobis triangularibus obtusis breviter pilosis. Corolla stellata, usque ad prope basim profunde lobata; petala reflexa, cum ungue brevi lato, ovato-lanceolata vel elliptico-lanceolata, obtusa, 8 ad 9 mm. longa. Antherae oblongae, circiter 4 mm. longae. Stylus 9 ad 10 mm. longus, filiformis, circiter staminibus duplo longior. Fructus ignoti.

Specimens examined:

MEXICO.—Morelos: El Parque, August 31, 1910, $C.\ R.\ Orcutt\ 3833$ [type collection] (CM).



Figure 60.—Solanum morelliforme (Purpus 7399). About \times %.

24. Solanum morelliforme Bitt. & Muench, Repert. Sp. Nov. 12: 154, pl. 2. 1913. Type locality: Mexico.—Chiapas: Gueytepec, in a knothole, "knollentragende Morelle," February 1912, German Muench s. n. (Figs. 60 and 61.)

Plant laxly ascending or pendent from its usually epiphytic habitat, simple or branched, 6 to 65 cm. tall, glabrous or essentially so, stoloniferous and tuber-bearing. Tubers small, orbicular or ellipsoid, 9 to 30 mm. long, 9 to 15 mm. in diameter. Stem slender, usually with the upper part conspicuously fractiflex (zigzag), fistulose (hollow). Leaves simple, ovate-lanceolate to narrowly

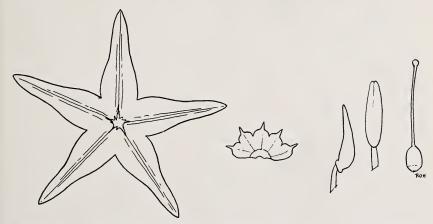


Figure 61.—Solanum morelliforme (Skutch 525): corolla, calyx, stamen (side view), stamen (dorsal view), pistil. All about \times 4.

lanceolate or rhombic-lanceolate, acute to long-acuminate or attenuate, cuneate to somewhat rounded at the oblique base, 2.5 to 14.0 cm. long (including the narrowly winged petiole) and 1 to 4 cm. wide; petioles up to 4 cm. long. Pseudostipular leaves (when present) narrowly lanceolate, acuminate, usually less than 1 cm. long. Inflorescences pseudoterminal or pseudoterminal and lateral, up to 15-flowered (sometimes more), laxly cymose; peduncles slender, up to 4.5 cm. long. Pedicels slender, 9 to 17 mm. long, articulate about the middle. Flowers white. Calyx 1.5 to 2.0 mm. long, with very short, acute toothlike lobes. Corolla stellate, about 7 mm. long, lobed to near the base; lobes reflexed, lanceolate, acuminate, ciliate, about 6 mm. long and 2.5 mm. wide. Anthers yellow, lanceolate in outline, rounded and somewhat auriculate at the base, tightly coherent to form a column about the style, 3 to 5 mm. long; filaments about 1 mm. long, often united to form a column. Style about as long as the stamens. Fruits orbicular, green or yellowish green, 5 to 7 mm. in diameter.

Range: Mountains of east-central Mexico to southern Guate-

mala, at about 2,000 m.

The occurrence of this species on rocks or as an epiphyte on

oaks and other trees is of interest. It is the only tuberous Solanum with this epiphytic tendency known to occur in our region.

The rounded, auriculate, noncordate base of the anthers is unusual in the section Tuberarium.



FIGURE 62.—Solanum trifidum (Correll 14751). Type specimen. About × 45.

Specimens examined:

MEXICO.—MÉXICO: Temascaltepec, Cumbre, epiphyte on oaks, November 4, 1934, Hinton 6813 (Gray, Mo, US). Puebla: Esperanza, "on hollow trees," August 1914, Purpus 7399 (Cal, CM, Gray, Mo, NY, US). Veracruz: Las Vigas to La Joya, Perote, 1,980 m., September 25, 1938, Balls B5556 (Cal, US); Orizaba, "Aserradero de Santa Cruz," July 1853, Müller 1552 (NY); Veracruz to Orizaba, 1857, Müller 1552 (Kew).

GUATEMALA.—DEPT. CHIMALTENANGO: Santa Elena, rooted in thick moss on horizontal trunk in forest, flowers white, July 18, 1933, Skutch 441 (Gray, US); plains about 2,200 m., near Tecpam, on oak tree, flowers white, August 3, 1933, Skutch 525 (Mich, US).

Series Trifida Correll, Texas Res. Found. Contrib. 1: 12. 1950.

Plants herbaceous, tuber-bearing, grayish green in color throughout. Leaves prominently 3-parted, on long somewhat winged petioles. Pedicels articulate about or slightly above the middle. Corolla deeply lobed to about or below the middle.

25. Solanum trifidum Correll, Texas Res. Found. Contrib. 1: 12, fig. 5. 1950. (Figs. 62 and 63.)

Plant herbaceous, erect, grayish green throughout, muchbranched, about 3.8 dm. tall, more or less shaggy pubescent with white hairs, tuber-bearing. Tubers ellipsoid and compressed, white, purplish-tinged, about 3 cm. long. Stem slender. Leaves prominently 3-parted, sometimes with a second pair of greatly reduced leaflets, on long somewhat winged petioles, up to 11 cm. long; petioles up to 3.5 cm. long. Leaflets elliptic to elliptic-lanceolate, narrowly obtuse to acute, decurrent on the petiole or rachis, up to 7 cm. long and 2.5 cm. wide; terminal leaflet much larger than the lateral leaflets. Pseudostipular leaves obliquely ovate-lanceolate, acute, falcate, up to 1.8 cm. long. Inflorescences pseudoterminal on leafy branches, few-flowered, cymosely paniculate; peduncles up to 3 cm. long, strongly pubescent. Pedicels about 1.5 cm. long, articulate at about or slightly above the middle. Flowers

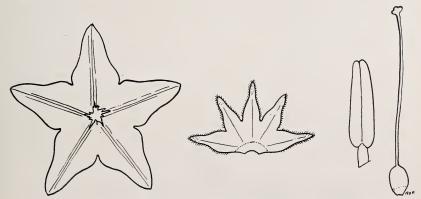


FIGURE 63.—Solanum trifidum (Correll 14751). Corolla and calyx, about \times 2; stamen and pistil, about \times 4.

creamy white, with the outer tip of the petals tinged lavender and greenish throughout (especially on the inner surface at the base). very fragrant. Calyx 5 to 7 mm. long, deeply lobed to below the middle: lobes lanceolate, acuminate, green with a deep purple stripe along the dorsal center. Corolla stellate, about 1 cm. long, deeply lobed to about or below the middle; lobes ovate-lanceolate to triangular-lanceolate, acute to acuminate. Anthers oblong-lanceolate in outline, 4 to 5 mm. long; filaments about 1 mm. long. Style 8 to 10 mm. long, greatly exceeding the anthers. Fruits unknown.

Specimens examined:

MEXICO .- MICHOACÁN: on the edge of a pine forest in mountains near Capacuaro, plants all dead but tubers taken, December 16, 1947, Correll 14339 (plant specimen grown at Sturgeon Bay, Wis., August 9 to 13, 1949, Correll 14751) [P. I. No. 161707A] [Type] (NA).

Series Cardiophylla Buk., Physis [Buenos Aires] 18: 43. 1939. nomen nudum.

Plants herbaceous, tuber-bearing. Leaves typically dark green, shining, glabrescent to pilose; leaflets usually 5 or 7. Pedicel articulate well above the base. Flowers stellate, cream- or buffcolored, sometimes purple-tinged. Fruits orbicular.

- Plant usually densely pilose with short pointed hairs and with glandular hairs (especially on the peduncle).
 27. S. cardiophyllum var. ehrenbergii.
- 1. Plant glabrous or with very few coarse hairs on the leaves and stem, never with glandular hairs.
 - 2. Leaflets typically ovate-lanceolate and acuminate, if ovate usual-
 - ly less than 3 cm. long28. S. cardiophyllum var. endoiodandrum.

 2. Leaflets typically broadly ovate and obtuse to acute, if narrowly ovate usually more than 3 cm. long26. S. cardiophyllum.
- Solanum cardiophyllum Lindl., Roy. Hort. Soc. Jour. 3: 70. 26. 1848. (Figs. 64, 65, and 66.)
 - Solanum cardiophyllum var. oligozygum Bitt., Repert. Sp. Nov. 11: 439. 1912.
 - S. cardiophyllum var. pliozygum Bitt., Repert. Sp. Nov. 11: 439. 1912.
 - S. coyoacanum Buk. ex Rybin, Bul. Appl. Bot. 20: 700. 1929.

Plant erect or forming a low rosette type of growth, sometimes ascending or sprawling, simple to much-branched, up to 60 cm. tall, essentially glabrous throughout, usually slightly pubescent when young but soon becoming glabrous, tuber-bearing. Tubers round or somewhat ellipsoid, whitish, rough-surfaced, up to 3 cm. or more long. Stem slender, sometimes slightly puberulent.

¹⁰ Planta herbacea, tuberifera. Folia saepissime atroviridia, nitentia, glabrescentia vel pilosa; foliola plerumque quinque vel septem. Pedicellus satis super basim articulatus. Flores stellati, eburnei vel lutei, aliquando pur-pureo-tincti. Frutus orbiculares.

Leaves odd-pinnate, up to 20 cm. long, glossy and dark green on the upper surface, the lower surface lighter and usually somewhat granulose, rarely with a few minute interstitial leaflets; petioles up to 7 cm. long, usually much shorter. Leaflets 5 or 7, rarely 3 or 9, broadly to narrowly ovate, rounded to acute or acuminate,



FIGURE 64.—Solanum cardiophyllum (Pringle 10832). About × 3.



Figure 65.—Solanum cardiophyllum. Drawing from Lindley (1848). About \times 1.

rounded to truncate or cordate at the base, on short winged petiolules up to 1 cm. long, glabrous or rarely sparsely puberulent, up to 7 cm. long and 6 cm. wide; terminal leaflet larger than the lateral leaflets. Pseudostipular leaves semiovate to broadly reniform, falcate, obtuse, up to 1.5 cm. long. Inflorescences pseudoterminal or pseudoterminal and lateral, on a short peduncle up to 3.5 cm. long, cymosely paniculate. Pedicels 8 to 15 mm. long, articulate at about the middle. Flowers creamy yellow. Calyx 2.5 to 3.5 mm. long, with broad obtuse shallow lobes. Corolla stellate, 8 to 13 mm. long, divided to below the middle into lanceolate subobtuse to acuminate lobes. Anthers lanceolate in outline, about 5 mm. long; filaments about 1 mm. long. Style up to 8 mm. long. Fruits orbicular, up to about 1 cm. in diameter.

Range: Highlands of west-central Mexico, from Puebla to Ja-

lisco and Sinaloa, usually above 2,000 m.

Lindley states that his plant (the type), grown in England from tubers sent by C. A. Uhde from Mexico, growing at 8,000 to 9,000 feet elevation, had an erect stiff stem about a foot in height, very dark-green heart-shaped leaflets, and small cream-colored flowers very much like those of S. nigrum L. The plant also was said to form very small round white tubers that were less watery than those of S. demissum and not susceptible to attack by disease. Lindley published an excellent description and drawing of his plant. The drawing is reproduced here (fig. 65). The writer has examined a photograph of the type.

It is of interest that, in nature, those plants having leaflets with a conspicuously cordate base are apparently rare and are seldom found. If, however, the tubers are grown under cultivation, especially under glass, broad leaves with a cordate base are nearly always produced and elongation of the internodes usually occurs. The plant illustrated in figure 64, although having larger leaves than is typical, is more or less representative of the plants of this

species found in nature.

Instead of arbitrarily separating and giving scientific names to plants having different numbers of leaflets that exhibit minor variations, the writer has considered it best to treat highly variable species, such as this one, in a broad sense. In following this course it is to be expected that some of the specimens cited here will vary considerably from the plants illustrated. Some plants tend to grade toward var. endoiodandrum, which represents a

rather distinctive extreme of S. cardiophyllum.

The monographer, Georg Bitter, who worked with less material than is at hand at present, segregated as var. *oligozygum* plants having fewer leaflets than in the typical form, and a plant having more leaflets, as var. *pliozygum*. With the rather large number of collections now available, this leaflet-number characteristic employed by Bitter is shown to be unreliable, as numerous intergradations exist. The plant described as var. *pliozygum* approaches var. *endoiodandrum* and is somewhat intermediate between that variety and the typical form.

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The plant described by Bukasov as S. coyoacanum is typical S. cardiophyllum. Bukasov published a number of illustrations of

S. coyoacanum, one of which is reproduced here (fig. 66).

It is of interest to note that E. K. Balls made the following observation regarding his collection (No. 4944) of this species, which was obtained in the Federal District, Mexico, at 2,135 m. elevation: "The leaves are without hairs, and the lower [altitude] ex-



FIGURE 66.—Solanum cardiophyllum. Drawing of inflorescence of S. coyoacanum, from Bukasov (1930). About \times 1.

ample almost universally rounded. Higher up the slopes the leafsegments appear pointed, with the same glossy surface."

Specimens examined:

MEXICO.—AGUASCALIENTES: near city of Aguascalientes, August 20, 1901, Rose and Hay 6225 (Gray, NY, US). DISTRITO FEDERAL: "Vallée de Mexico, Pedrigal," June 18, 1865, Bourgeau 346 (Gray, Kew); Cerro de Guadalupe, Valley of Mexico, 2,285 m., August 17, 1896, Pringle 6421 [type collection of S. cardiophyllum var. pliozygum] (Cal, CM, Gray, Iowa, Mo, NA, NY, PA, Vienna, US); Guadalupe, Valley of Mexico, August 5, 1901, Rose and Hay 5975 (Gray, US); Cerro de Guadalupe, Valley of Mexico, 2,285 m., August 14, 1909, Pringle 10832 (Ar, Gray, Mich, NA, US); Pedregal, June 30, 1938, 2,160 m., "not in flower. Leaves usually without hairs, glossy. Stems single, upright to 15 inches tall. There also appears a form with very short stems, and rosettes of leaves nearly on the ground. These two forms grow mixed together and the tubers have exactly the same appearance. Tubers round and rather brownish in colour with a rough surface. Growing in sandy soil among the old lava, and also on deep sandy banks on edges of cultivation. Mostly in shade of shrubs and trees," Balls 4926 (Cal, Cam, US); Sierra de Guadalupe, 2,135 m., July 4, 1938, "A single

flowering plant found, with cream-yellow flowers, ¾ inch diam. The leaves are without hairs, and in the lower example almost universally rounded. Higher up the slopes the leaf-segments appear pointed, with the same glossy surface. The stems grow up to 15 inches tall, but often the same plant seems to make a squat rosette little above the ground. The tubers are rough-surfaced, and seem to be considerably attacked by beetles or insects. Dark brown in colour the skin of the tubers is quite rough. Rough, stony ground, outside the range of cultivation," Balls 4944 (Cam, US); tubers taken from loose rocks on dry talus slope, Indios Verdes, at city limits of Mexico City, plants all dead, November 7, 1947, Correll 14242d [P. I. No. 161120 (in part)] (NA). GUANAJUATO: Jaral, frequent and in mountains, August 26, 1885, Schumann 976 (Paris). Hidalgo: Dublan, 2,050 m., July 8, 1904, Pringle 13138 (Ar, CM, Co, Gray, Mich, NA, US). Jalisco: wild potato under trees in large patches, La Palma, June 9, 1892, M. E. Jones 345 (US). México: Temascaltepec, Puerto Salitre, flowers white, 1,250 m., July 10, 1933, Hinton 4303 (US); in an old cornfield near General Gonzales Station, plant robust, erect, tubers small and white, flowers white, October 23, 1947, Correll 14206 (specimen from nature) [P. I. No. 160370] (NA). MICHOACÁN: cropped hillside near Morelia, 2,000 m., flowers cream, July 14, 1941, Schery 106 (Mich, Mo, US); 10 km. west of Morelia, in loose rocky soil, June 21, 1950, J. T. Baldwin, Jr. 14375 (NA). Morelos: lava beds, near Cuernavaca, June 26, 1896, Pringle 7368 (NA). PUEBLa: in the vicinity of San Luis Tultitlanapa (near Oaxaca), July 1908, Purpus 3365 (Cal (in part), CM, Gray (in part), Mo, NY, US). SINALOA: near Colomas, foothills of the Sierra Madre, July 16, 1897, Rose 2784 (US); no locality given, 1898, Edward Palmer 593 [cultivated in Kensington, Md.] (NA, US): STATE UNKNOWN: Plants from seeds sent to Boynton in 1835 by C. A. Uhde s. n. [apparently the type of S cardiophyllum var. oligozygum] (Vienna); no local

27. Solanum cardiophyllum var. ehrenbergii (Bitt.) Correll comb. nov. (Figs. 67 and 68.)

Solanum cardiophyllum subsp. ehrenbergii Bitt., Repert. Sp. Nov. 11: 442. 1912.

S. ehrenbergii (Bitt.) Rydb., Torrey Bot. Club Bul. 51: 169. 1924.

The type of *S. ehrenbergii* was destroyed along with other types of *Solanum* in the Berlin-Dahlem Museum during World War II. Apparently no photograph of this type is extant. A thorough study of the original description, however, and a comparison with it of the specimens cited here has convinced the writer that this plant is a distinct variety of *S. cardiophyllum*. Because of its apparent kinship with several species in the series *Pinnatisecta* it is probably a connecting link, as it were, between that series and the series *Cardiophylla*.

The following illustrates the points of difference between var.

ehrenbergii and the typical form:

Plant more or less glandular-pubescent throughout, the glands especially noticeable on the peduncle; calyx lobes longer than in typical *S. cardiophyllum*; corolla deeper colored, sometimes purple-tinged; anthers lanceolate, about 7 mm. long; style slender, about 1 cm. long, prominently exceeding the stamens, usually conspicuously curved at the apex.



FIGURE 67.—Solanum cardiophyllum var. ehrenbergii (Parry 10; J. N. Rose and J. S. Rose 11183). About \times $\frac{2}{5}$.

The leaflets are quite variable in size. They are, however, characteristically smaller and narrower than those of typical S. cardiophyllum, although some specimens have leaves as large as the largest found in the typical form. Some of the plants comprising a series collected by J. Gregg in 1848 have been placed here with some reservations. It is possible that with further study of these specimens and field work in the area whence they came (if this can be determined) another endemic species will be found.

Although some specimens approach very closely S. brachistotrichum, especially in habit, the coarser and more sparse pubescence and the apparent geographic isolation separate it from that spe-

cies.

It is of interest to note that C. L. Lundell states that the tubers

of the plant he obtained in Hidalgo were sweet.

Range: Endemic in mountains of north-central Mexico, from Hidalgo to Coahuila.

Specimens examined:

MEXICO.—Coahuila: tubers intercepted at Brownsville, Tex., No. 60391, February 17, 1946. Said by owner to have come from mountains around Monterrey, collected May 29, 1946, flowers white. [Specimens grown in quarantine, Glenn Dale, Md.] (NA). Guanajuato: in Guanajuato, Dugès s. n. (Gray). Hidalgo: Kilometer 183, Mexico City-Laredo highway, on mountainside, among rocks in scrub along trail, corolla lavender-tinged, tubers globose, sweet, July 5, 1943, C. L. Lundell and Amelia A. Lundell 12195 (Lun, NA). Querétaro: San Juan del Río, August 18, 1905, Pringle, s. n. (NA); near Querétaro, August 20 to 23, 1906, J. N. Rose and J. S. Rose 11183 (Gray, NY, US); stony hillside in stone fence row, San Juan del Río, 2,200 m., November 25, 1930, Reddick 442 (Co). San Luis Potosí: rocky hill near Guadalupe, January 15, 1878, 1,830 to 2,440 m., 22° N. Lat., Parry and Edward Palmer 633 (in part) (Gray, Iowa, Mo, NY, PA); no locality given, 1878, Parry 10 (Gray); Charcas, July and August 1934, Lundell 5531 (Mich). State Unknown: San Antonio [de las Alauzanar], purple, August 31, 1848, Gregg 386 (Gray, Mo); same locality, "wild potato," August 30, 1848, Gregg 420 (Kew, Mo, NY); probably same locality, 1848–49, Gregg 474 (Gray).

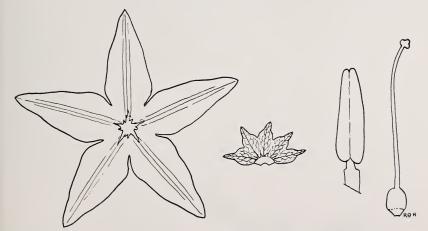


FIGURE 68.—Solanum cardiophyllum var. ehrenbergii (Pringle, August 18, 1905). Corolla and calyx, about × 2; stamen and pistil, about × 4.



Figure 69.—Solanum cardiophyllum var. endoiodandrum (Pringle 8599). Type collection. About \times %.

28. Solanum cardiophyllum var. endoiodandrum Bitt., Repert. Sp. Nov. 11: 442. 1912. (Figs. 69 and 70.)

Solanum lanceolatum Berthault, Ann. Sci. Agron., Ser. 3, 6: 201, pl 5. 1911. (Not S. lanceolatum Cav., 1794.)

S. cardiophyllum subsp. lanceolatum (Berth.) Bitt., Repert. Sp. Nov. 11: 440. 1912.

S. cardiophyllum subsp. lanceolatum var. endoiodandrum Bitt., Repert. Sp. Nov. 11: 442. 1912.

S. cardiophyllum subsp. lanceolatum var. amphixanthan-

drum Bitt., Repert. Sp. Nov. 11: 442. 1912. S. lanciforme Rydb., Torrey Bot. Club Bul. 51: 169. 1924.

At the time Bitter segregated, as subspecies lanceolatum, this plant from typical S. cardiophyllum, based on its typically lanceolate leaflets, he described as var. endoiodandrum and var. amphixanthandrum two plants in this subspecific category based on their differently colored anthers. Color variation in the anthers is frequently influenced by age and would not appear to be an acceptable basis for segregation of plants. The writer has combined these under all-inclusive var. endoiodandrum.

It is true that the anthers of some of the plants comprising this variety are strongly tinted with blue or purple. The most pronounced characteristic, however, that separates this variety from the typical form is its more narrow ovate to ovate-lanceolate leaflets with a subacute to acuminate apex, the base usually only rounded or subtruncate instead of being cordate. The leaves of the Puebla plants are also more or less pubescent, especially on the upper surface, with coarse hairs. This characteristic shows its relationship to var. *ehrenbergii*. Some of the plants in Oaxaca and Puebla are quite dwarf with very small leaflets.

Range: Endemic in east-central Mexico, where it is rare; at about 1.700 m.

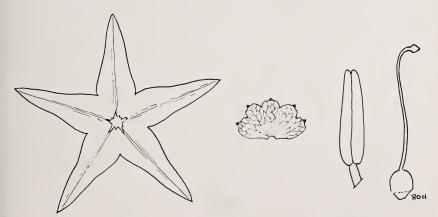


FIGURE 70.—Solanum cardiophyllum var. endoiodandrum (Rose and Painter 6627). Corolla and calyx, about × 3; stamen and pistil, about × 6.

Specimens examined:

MEXICO.—HIDALGO: near Tequixquiac, August 30, 1903, Rose and Painter 6627 (US). OAXACA: 1 mile west of Kilometer 568, Pan-American Highway, population of hundreds, in rich rocky soil. May 27, 1950, J. T. Baldwin, Jr. 14320 (NA). PUEBLA: Hacienda Noria, December 1909, Nicolás s. n. (Paris); calcareous hill near Tehuacan, 1,700 m., August 23, 1901, Pringle 8599 [type of S. cardiophyllum subsp. lanceolatum Bitt. and S. lanceolatum Berth.] (Cal, CM, Co, Mo, NY, PA, US, Vienna); El Riego, July 1905, Purpus 1282 (Cal. Mo); in the vicinity of San Luis Tultitlanapa (near Oaxaca), June 1908, Purpus 3364 (Cal, CM, Gray, NY).

Series Pinnatisecta Rydb., Torrey Bot. Club Bul. 51: 146, 167. 1924.

Herbs with fibrous roots and stolons, tuber-bearing. Leaves odd-pinnate, typically light green; leaflets usually 7 or more. Pedicels articulate some distance above the base. Corolla stellate. Fruits round.

Filaments united to base of anthers to form a distinct column;

Filaments free, not united; distribution north of Nicaragua.

 Pseudostipular leaves pinnately lobed.
 Plant usually erect and slender; leaflets characteristically linear-oblong to narrowly elliptic-lanceolate, less than 1 cm. wide; distribution primarily in the highlands of central Mexico. 35. S. pinnatisectum. Plant usually bushy and spreading; leaflets characteristically

narrowly elliptic to ovate-lanceolate, usually (at least some) 1 cm. or more wide; distribution United States and northern

Pseudostipular leaves entire, not pinnately lobed.

Plant (especially the inflorescence) glabrous or essentially so.

5. Plant straggly; distribution northern Mexico.

30. S. brachistotrichum var. ripicolum. 5. Plant erect; distribution central Mexico36. S. sambucinum.

Plant more or less pubescent or puberulent throughout, rarely subglabrous.

6. Corolla with long crisp hairs on the outer surface.

33. S. nayaritense. 6. Corolla without long crisp hairs, at most puberulent.

7. Peduncle coarsely pilose; calyx about 6 mm. long.

32. S. michoacanum. Peduncle subglabrous to finely puberulent; calyx less

than 5 mm. long. 8. Leaflets usually 5, characteristically linear to linear-

lanceolate; distribution Jalisco State, Mexico. 37. S. stenophyllidium. 8. Leaflets usually 7, characteristically elliptic-lanceolate;

distribution Chihuahua State, Mexico. 29. S. brachistotrichum.

29. Solanum brachistotrichum (Bitt.) Rydb., Torrey Bot. Club Bul. 51: 170. 1924. (Figs. 71 and 72.)

Solanum jamesii var. brachistotrichum Bitt., Repert. Sp. Nov. 11: 444. 1912.

Plant slender, erect or ascending, rarely trailing, 2.0 to 7.5 dm. tall, puberulent with stout sharp-pointed hairs, stoloniferous and



FIGURE 71.—Solanum brachistotrichum (Pringle 668). Type collection. About \times %.

tuber-bearing. Tubers ellipsoid, about 3 cm. long and 2 cm. in diameter. Stem slender, naked on the lower part, leafy above, simple or sometimes branched. Leaves odd-pinnate, 5 to 15 cm. long, occasionally with several small scattered interstitial leaflets; petioles up to 2.5 cm. long. Leaflets 5 to 9, usually 7; lateral leaflets ovate-lanceolate to elliptic-lanceolate or narrowly lanceolate, acute to acuminate, rarely obtuse, subtruncate to cuneate at the conspicuously oblique base, up to 4.5 cm. long and 1.5 cm. wide; terminal leaflet usually somewhat larger than the lateral leaflets, symmetrical; petiolules usually short, up to 5 mm. long. Pseudostipular leaves simple, obliquely semiovate, obtuse, somewhat falcate, up to

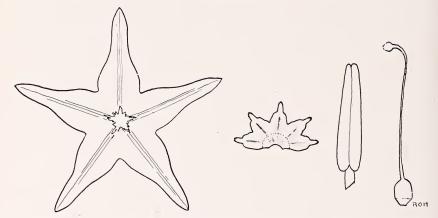


FIGURE 72.—Solanum brachistotrichum (White 2341). Corolla and calyx, about \times 2; stamen and pistil, about \times 4.

1.2 cm. long and 5 mm. wide. Inflorescences pseudoterminal on leafy branches, few-flowered (up to about 10), cymosely paniculate; peduncle up to 4 cm. long. Pedicels about 1 cm. or more long, articulate at about or somewhat above the middle. Flowers white, petals frequently tinged with lavender. Calyx 3 to 5 mm. long, usually sparsely puberulent, rarely glabrous, divided to about the middle into short triangular-ovate to ovate-lanceolate acute lobes. Corolla stellate, 8 to 13 mm. long, deeply lobed to below the middle; lobes elliptic-lanceolate, acute to subobtuse, ciliate. Anthers lanceolate in outline, 4 to 6 mm. long; filaments up to 1.5 mm. long. Style 6 to 8 mm. long, exceeding the stamens, reflexed at apex. Fruits orbicular, less than 1 cm. in diameter.

Range: Endemic in the mountains of Chihuahua, Mexico, at

about 2,000 m.

This plant is characterized by having its vegetative parts covered with a fine powdery puberulence. Based on the pseudostipular leaf character, it is more closely related to S. stenophyllidium than to S. jamesii. It is also rather closely related to S. cardiophyllum var. ehrenbergii. The leaflets of the latter plant, however, are usually but not always more or less cordate at the base and it is somewhat more heavily and coarsely pubescent. The

corollas are also differently shaped and the flowers of var. *ehrenbergii* are slightly larger.

Specimens examined:

MEXICO.—CHIHUAHUA: Cool shaded places, Santa Eulalia Mountains, August 14, 1885, Pringle 668 [type collection of S. jamesii var. brachistotrichum] (CM, Gray, NY, PA, US); Majalca (Pilares), 40 miles northwest of Chihuahua, flowers white, 2,050 m., August 11, 1939, White 2341 (Ar, Gray, Mich); Santa Eulalia Mountains, August 12, 1885, Wilkinson s. n. (Cal, Mich, US); Santa Clara Mountains, August 18, 1936, LeSueur s. n. (Cal, Gray, US), 256 (US); Majalca, August 20, 1935, LeSueur 64 (CM).

30. Solanum brachistotrichum var. ripicolum (Bitt.) Correll comb. nov.

Solanum jamesii subsp. septentrionale var. ripicolum Bitt.. Repert. Sp. Nov. 12: 151. 1913.

The semiovate, falcate, undivided pseudostipular leaves place this plant with *S. brachistotrichum* and not *S. jamesii*, which has pinnatisect pseudostipular leaves. This plant is apparently only a luxuriant, glabrescent variety of *S. brachistotrichum*. The plant is up to 8 dm. in height and has manifestly robust vegetative parts, with the lower stem about 4 mm. thick and internodes up to 6.5 cm. long. The leaves are up to 15.5 cm. long.

Specimens examined:

MEXICO.—CHIHUAHUA: Carretas, border of Chihuahua and Sonora, Municipio de Janos, flowers white, 1,500 m., August 26 to 28, 1939, White 2501 (Gray, NA). Sonora: Calabasa, riverbank, 1,750 m., October 9, 1890, Hartman 108 [type collection] (Gray).

31. Solanum jamesii Torr., N. Y. Ann. Lyc. 2: 227. 1828. (Figs. 73, 74, and 75.)

Solanum jamesii var. heterotrichium Bitt., Repert. Sp. Nov. 11: 444. 1912.

S. jamesii subsp. septentrionale Bitt., Repert. Sp. Nov. 12: 10. 1913.

? S. jamesii var. grandifrons Bitt., Repert. Sp. Nov. 12: 151. 1913. Type locality: Mexico, no special locality indicated, cultivated in Kew Gardens in 1874 under the name S. suaveolens (Kew Herbarium).

Plant usually short, erect or spreading and bushy, up to 5 dm. tall, usually less than 3 dm. tall, varying throughout from almost glabrous to conspicuously pilose and somewhat glandular, stoloniferous and tuber-bearing. Tubers small, orbicular to ellipsoid, creamy white or light brown in color, 0.5 to 2.0 cm. in diameter. Stem slender, much-branched or rarely simple. Leaves odd-pinnate, 6 to 15 cm. long, rarely with several small obsolescent interstitial leaflets; petioles up to 3 cm. long. Leaflets 7 to 11, rarely 5 or 13, narrowly elliptic to ovate or ovate-lanceolate, obtuse to shortly acuminate, tapering or slightly rounded at the base, up to 6 cm. long and up to 2 cm. wide, usually much smaller, the lower-



Figure 73.—Solanum jamesii (Toumey, August 30, 1894). About \times %.

most leaflets much reduced; petiolules naked or somewhat winged and up to 5 cm. long. Pseudostipular leaves similar to the regular leaves but greatly reduced. Inflorescences pseudoterminal on leafy branches, few-flowered, cymosely paniculate; peduncles up to 6 cm. long, usually about 2.5 cm. Pedicels 1 to 2 cm. long, prominently articulate at about or above the middle. Flowers white. Calyx 4 to 8 mm. long, irregularly lobed to about the middle; lobes triangular-ovate to lanceolate, acute to acuminate, frequently abruptly constricted at about the middle. Corolla stellate, deeply

lobed for one-third or more the distance to the base; lobes ovate-lanceolate to triangular-lanceolate, subobtuse to subacuminate, pubescent on the outer surface above the middle, 8 to 16 mm. long. Anthers lanceolate in outline, 4.5 to 7.0 mm. long; filaments 1.0 to 1.5 mm. long. Style 8 to 12 mm. long, much exceeding the stamens, somewhat thickened at the apex. Fruits orbicular, slightly less than 1 cm. in diameter.

Range: Rather frequent in Arizona and New Mexico; rare in Utah, Colorado, and Texas; and in Mexico (Sonora); 1,370 to

2,900 m.

The type collection of S. jamesii in the New York Botanical Garden Herbarium consists of two plants. One is 13 cm. tall and

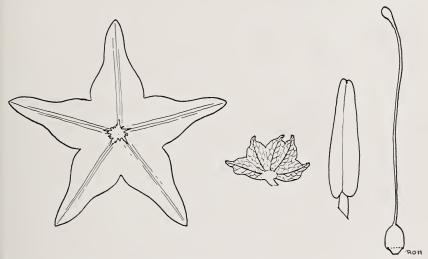


FIGURE 74.—Solanum jamesii (Toumey, August 30, 1894). Corolla and calyx, about \times 2; stamen and pistil, about \times 4.

rather strongly pilose throughout; the other plant is about 12 cm. tall and, except for the peduncle, is merely puberulent to almost

glabrous. Both plants are somewhat glandular.

After examining the type and a large series of specimens, it is the writer's conclusion that, instead of attempting to segregate named forms and varieties from this species, it should be considered as being highly variable. Although it is here treated systematically as a single variable species, there is little doubt that numerous dissimilar genetical factors are involved that give rise to much segregation of a minor nature.

The plants comprising this species vary from almost glabrous to conspicuously pilose with long and short hairs intermixed. The pilose plants were segregated by Bitter as var. *heterotrichium*. Some plants, especially the peduncle, are densely pilose and are provided with short-stalked glands. The calyx is extremely variable in the shape and length of the lobes and in the density of pi-



FIGURE 75.—Solanum jamesii (Dr. James s. n.). Type collection. About \times %.

losity. Although the plants are usually short and bushy, some

plants occur that are rather slender and straggly.

The Mexican plants are more robust and straggly, and the flowers are larger than in most collections of this species. The calyx lobes are also much longer than those shown in figure 74. There is, however, no basic difference between the plants.

It has not been possible to place definitely var. *grandifrons*. A specimen in the Kew Herbarium of a Mexican plant cultivated in October 1874 was not identified by Bitter. However, a note on the sheet in Bitter's handwriting states that the plant is definitely not *S. suaveolens*, a species to which he referred in his description of var. *grandifrons*. The Kew specimen, although smaller than Bitter's description, might well be the basis for *S. jamesii* var. *grandifrons*, conceivably described by Bitter more or less as an afterthought. If this were the case, *S. jamesii* var. *grandifrons* would have to be placed in *S. oxycarpum*.

In 1885 Lemmon wrote an account of the native potatoes found in Arizona. He stated that both *S. jamesii* and *S. fendleri* are found on the slopes of the Huachuca Mountains in Cochise County. He and his wife also found them invading at lower altitudes the few gardens of the region, a rather common occurrence wherever tuberous solanums are found. He also made the following interesting observation, which, as far as the writer knows, has never been thoroughly checked. It should be checked, as *S. pinnatisectum* has been discovered in the Hauchuca Mountains during the course of this work, leading one to suspect that additional tuberous solanums might well be found in this somewhat noted relict area.

"Perhaps a third species may be yet derived from plants found near the summit of the highest peak of the Huachuca, at an altitude of 9,000 feet. This potato [S. jamesii]... has its leaflets simple or at most in threes, while its stolons sometimes originate from the aerial portion of the stem, running out over [the] ground a long distance, then turning downward with sharp, needle-like points that penetrate the earth and finally bear tubers at their extremities. However, plants raised from seeds of this kind, last year, presented multiparted leaves, subterranean runners, and it behaved in other respects like the purple potato [S. fendleri]..."

Lemmon, who hoped to produce new and better varieties for cultivation, proposed to use *S. jamesii* and *S. fendleri* as parent stock. He distributed tubers throughout the United States and abroad and required a careful report of cultivation, methods, success, or failure from the recipients. Some of these reports sent to Lemmon are rather interesting. One enthusiastic man in Oakland, Calif., reported that 7 plants produced 565 tubers, the largest being 9 cm. long. However, Asa Gray, the noted American botanist, wrote Lemmon: "Your Arizona potatoes will not amount to anything as potatoes!" To date, it appears that Gray was right.

It is of further interest that Lemmon blames the Navaho Indians for the small size of the tubers of the Arizona wild potatoes. He wrote: "The Navahoe squaw never plants a potato or sows a seed, much less cultivates them with the hoe, or frees them from the encroachment of weeds. She simply digs them. Armed with a basket and a sharpened stick, or lately with a railroad spike, she seeks the nearest potato patch, selects the largest plants, squats on the ground beside them and digs up all the ground about them. This process brings a few of the tubers to the surface, from which

she picks the biggest for her basket. The small potatoes, and those that have run off and hidden under stones or roots, are the ones that are left from year to year and age to age to perpetuate the species, so that small potatoes on long stems are legitimate

products of squaw treatment."

With reference to the tubers being eaten, Lemmon's report included comments of various individuals, one stating that New Mexican natives who tried to eat tubers of S. jamesii found them to be a violent purgative and unhealthful. Yet, as late as 1942, Kearney and Peebles in their "Flowering Plants and Ferns of Arizona" wrote the following regarding this species and S. fendleri: "The plants sometimes are found growing wild in gardens of the Indians, who used them as food. The tubers are cooked by the Hopi with saline clay, and are said to have been used by them also in making yeast." Also, in 1925, George M. McLellan stated that the Navaho Indians use the tubers of this species.

Specimens examined:

UTAH.—San Juan County: Allen Canyon, southwest of Abajo Mountains, 1,800 to 2,000 m., July 30 and 31, 1911, Rydberg and Garrett 9308 (NY, US).

COLORADO.—HUERFANO COUNTY: La Veta, July 14, 1896, Shear 3575 (NY). LA PLATA COUNTY: Florida Mesa, September 4, 1936, Christ 3714 (NA). LARIMER COUNTY: Fort Collins, plum orchard, September 21, 1893, ex Herb. State Agr. College, Colo. 1742 [type collection of S. jamesii var. heterotrichium] (Cal, Col, CM, Gray, NY, PA, US); Fort Collins, 1,525 m., August 9, 1892, Crandall s. n. (NY), same locality, September 21, 1893, Crandall s. n. (Mo); same locality, September 3, 1898, Crandall s. n. (Cal); border of cultivated field, Fort Collins, 1,525 m., August 9, 1892, Crandall 369 (US); Fort Collins, college grounds, July 3, 1891, Cowen 527 (Col), same locality, July 14, 1893, Cowen 343 (Iowa), 1744 (Col); Fort Collins, August 1916, Rolfs s. n. (Iowa); Fort Collins, Cache La Poudre River, 1,525 to 1,670 m., August 16, 1901, Rolfs s. n. (Iowa). Las Animas County: Trinidad, June 8, 1887, Tracy and Evans 30 (NY); Trinidad, gardens, August 4, 1881, Popenoe s. n. (PA).

ARIZONA.—APACHE COUNTY: "Long H" Ranch to St. John's, August 6 to 15, 1903, Griffiths 5183 (US). Cochise County: Chiricahua Mountains, September 1881, Lemmon s. n. (Cal.); Chiricahua Mountains, Blumer U. 126 (Ar), U. 176a (Ar, US); Chiricahua Mountains, Paradise, shady alluvium, 1,600 m., September 24, 1907, Blumer 2182 (CM. Gray); rich sandy bottoms, lower Bonita Canyon, Chiricahua National Monument, August 12, 1939, Clark 8530 (Ar); Mormon Lake, July 18, 1892, Touney 5106 (Ar); shore of Davenport Lake, near the town of Williams, August 1884, J. G. Lemmon and wife s. n. (Cal); "an indigenous potato invading the gardens of certain ranches of the Huachuca Mountains. . . Tubers and flowers white," July to October 1882, Lemmon 2846 (Cal, Gray); Crater, May to October 1901, Purpus 8194 (Cal, US); (?) Johnson's Canyon, August 31, 1909, Rusby s. n. (NY); Tanner's Cañon, Huachuca Mountains. August 3, 1893, Holzner 1578 (US); near Fort Huachuca, August 1894, Wilcox 329 (US). Coconino County: mesa west of Buckskin Mountains, 1830 m., September 21. 1894, Jones 6063 (US); eastern foot of Elden Mesa, 1,900 m., July 29, 1901, Leiberg 5776 (US). GREENLEE COUNTY: Blue River, Clifton, September 1 and 8, 1902, Davidson 702 (Cal, Dud, NY). Navajo County: Holbrook, August 10, 1896, Zuck s. n. (Mo, NY, US); Water Lily Cañon, 35 miles northwest of Lakeside Ranger Station, in rich soil among rocks along Showlow Creek, 2,000 m., August 11, 1945, Pultz 1799 (Ar); Taylor, June to July 1897, Hough 84 (US); Skeleton Mesa Canyon, 1 1/4 miles from "End., decomposed ss.," August 16, 1937, Wetherill 919/3181 (NY). Yavapai County:

Prescott, August 30, 1894, Tourney s. n. (Cal, Gray, NY); Hassayampa Creek, Fort Whipple, June 6, 1865, Coues and E. Palmer 270 (Mo); moist creek banks, flowers white, Fort Whipple, August 6, 1865, Coues and E. Palmer 115 (Mo); Fort Whipple, 1869, E. Palmer s. n. (US). COUNTY UNKNOWN: "plants of the Hopis" (Tümna) (Hough, p. 143), Millspaugh 194 (CM); Moqui Valley, August 1891, Owens, s. n. (Gray); Frijoles Canyon, one quarter mile below headquarters, south slope, gravelly soil, 1,830 m., August 26, 1939, Thomas T-110 (Ar); no locality given, 1869, E. Palmer s. n. (PA), 1853, E. Palmer s. n. (Gray); no locality given, 1873, Dr. Loew 158-a (CM, Gray); Niggerhead Mountains, near Monument 82, August 15, 1893, Mearns 1895 (Dud, US), same locality, August 17, 1893, Mearns 1933 (Dud, US); Little Colorado River, August 1896, Fernow s. n. (US); "Arizona," 1869, E. Palmer s. n. (US).

ARIZONA or NEW MEXICO.—County unknown: on Beale's Wagon Road Survey, J. H. Redfield 11515 (Mo); Valley of Vanduan, September 13, 1859, collected by Dr. Newberry in Capt. Macomb's Expedition (NY, US).

NEW MEXICO.—CATRON COUNTY: Mogollon Mountains, alluvial flats along Rio Puercus, July 1880, and sandy bottoms of canyons, August 1881, Rusby 312 (CM, Co, Mich, Mo, NY); Reserve, July 9, 1906, Wooton s. n. (US); near Luna, Datil Forest, 2,140 to 2,200 m., July 17-20, 1924, Eggleston 20317 (US); hills north of Navajo Lodge, Datil, Datil Forest, 2,300 to 2,400 m., July 24 to 25, 1924, Eggleston 20344 (US). COLFAX COUNTY: open hillside, m., July 24 to 25, 1924, Eggleston 20344 (US). COLFAX COUNTY: open hillside, vicinity of Ute Park, 2,200 to 2,900 m., August 27, 1916, Standley 13867 (NY); under pinyon trees, vicinity of Ute Park, 2,200 to 2,900 m., September 7, 1916, Standley 14459 (NY, US). Dona Ana County: Organ Mountains, August 29, 1894, Wooton s. n. (US). Grant County: Fort Bayard, August 1895, Mulford 702 (Iowa, Mo); in the Gila River bottom near Cliff, 1,370 m., June 15, 1903, Metcalfe 148 (Mo, NY); Fort Bayard watershed, forest nursery, October 1, 1905, Blumer 105 (Gray, NY, US); Mangas Springs, July 3, 1880, Greene s. n. (CM. NY, PA); same locality, 18 miles northwest of Silver City, July 1901, Metcalfe s. n. (Mo, US); August 1901 (Ar); Silver City, 1880, Greene s. n. (PA): Big Burros ranger station, Gila Forest, 1.900 m. City, July 1901, Metcalfe s. n. (Mo, US); August 1901 (Ar); Silver City, 1880, Greene s. n. (PA); Big Burros ranger station, Gila Forest, 1,900 m., September 11, 1920, Eggleston 17249 (Gray, PA); mountain ravines. Copper Mines, August 1851, Thurber 1107 (CM, Gray, NY); along Nimber's River, near Swartz, August 15, 1915, Pilsbry s. n. (PA); East Canyon and GOS Ranch, August 27 to September 12, 1911, Holzinger s. n. (US). LINCOLN COUNTY: White Mountains, 1,900 m., July 26, 1897, Wooton 209 (Cal, Dud, Gray, Mo, NY, US); vicinity of Gilmores Ranch, on Eagle Creek, July 14, 1895, Wooton s. n. (NY), July 29, 1901, Wooton s. n. (US); north of El Capitan Mountains, in sand, 2,135 to 2,280 m., August 30, 1900, F. S. Earle and Esther S. Earle s. n. (NY); White Mountains, 2,250 m., August 25, 1907, Wooton and Standley 3394 (Dud, US); Bonito, July 1925, Thackery s. n. (Co); Pueblo Bonito Ruin (Crownpoint P. O.), from a court in the ruins, 1,830 m., said to have 4 ft. of snow in winter, plants in moist depressions, tubers small but used by Navajos; there were 18 tubers from about half a plant, October 15, 1925, McLellan s. n. (Cal); wooded slope about half a plant, October 15, 1925, McLellan s. n. (Cal); wooded slope above Ruidoso Creek, June 10, 1932, Wilken 2364 (PA). Luna County: Deming, August 1895, Mulford 1013a (Mo). McKinley County: Zuni Deming, August 1895, Mulford 1013a (Mo). McKinley County: Zuni Mountain, August 27, 1851, ex Torrey Herb. (NY). Otero County: Alamo National Forest, Cloudcroft (cultivated specimen), Clark s. n. (NY, NA); along Tularosa Creek, August 20, 1899, Wooton s. n. (US). Sandoval County: Sandia Mountains, Capelin Cañon, dry rocky hillsides, 2,440 m., June 2, 1914, Ellis 68 (US). San Miguel County: mountains near Las Vegas, July 1881, Vasey s. n. (US); near Pecos, 2,030 m., August 15, 1908, Standley 4944 (Gray, Mo, NY, US); Las Vegas, Cañon S., August 18, 1926, Arsène 18378 (Dud); Las Vegas, in garden, July 16, 1927, Arsène 18693 (Mich); Canada de Los Alamos, 2,300 m., August 25, 1929, Curtin 68 (CM). Santa Fe County: Santa Fe, M. J. Nagle (cultivated plant, September 6, 1911, Tidestrom 3925) (NA); Santa Fe, August 3, 1916, Bertaud 202 (NY); south of Santa Fe, August 23, 1904, Wooton 2688 (US). Sierra County: Frisco, August 10, 1900, Wooton s. n. (US); Animas Creek, in cultivated field, 1,525 m., July 13, 1904, Metcalfe 1146 (CM, Gray, NY, US). Socorro County: Black Canyon, Diamond Bar Range, Gila Forest, 1,800 m., August



Figure 76.—Solanum michoacanum (Arsène 2896). Type collection. About \times $\frac{2}{5}$.

8, 1920, Eggleston 16993 (Gray); Water Canyon, Magdalena Mountains, July 10, 1910, C. Judson Herrick and Ruth Herrick 35 (CM); canyon and foothills of Ben Rentfrow's cattle ranch, 1,800 to 2,100 m., September 12, 1923, Eggleston 19391a (US), 19379 (US); Mogollon Mountains, middle fork of Gila, August 4, 1900, Wooton s. n. (US); Magdalena Mountains, 1,980 m., August 28, 1909, Goldman 1661 (US); Mogollon Mountains, sandy cañons, August 1881, Rusby 2 (US). TAOS COUNTY: Ojo Caliente, August 25, 1893, Smith s. n. (PA). VALENCIA COUNTY: mountains west of Grant's Station, August 2, 1892, Wooton 452 (US); Ojo Caliente, July 28, 1904, Wooton 2691 (US). COUNTY UNKNOWN: Crains Ranch, July 14, 1900, Wooton, s. n. (US); Santa Clara Cañon, 2,440 m., August 23, 1906, Bailey 1003 (US); Chaco Canyon National Monument, May 1937, Hastings s. n. (Ar); without locality, 1851–52, Wright 1588 (CM, Gray, Mo); Memphis, August 6, 1852, Fendler s. n. (Mo); Lorenzo's Spring, September 8, 1895, Mulford 1195 (Iowa, Mo, NY); Fort Defiance, Friese (PA); Redstone, August 13, 1895, Mulford 855 (Mo); no locality given, 1879, Brandegee s. n. (Cal, CM); Cold Spring, September 4, 1895, Mulford 1173 (Mo), 1173a (NY); creek valley, "about fields and water . .;" shady places in woods, June and July 1847, Fendler 669 (Cal, CM, Gray, Mo, PA).

TEXAS.—Jeff Davis County: Northwest Canyon, Mount Livermore, August 10, 1935, *Hinckley 309* (CM); H O Canyon, mostly under *Quercus grisea* trees, infrequent, about 1,900 m., August 10, 1935, *Hinckley s. n.* (Gray); Davis Mountains, Madera Canyon near Livermore, August 6, 1939, *Hinckley s. n.* (Ar). County unknown: "... raised from Texan tubers distributed by the Agricultural Department & planted by Mr. Wm. Bowers of the Botany Club. Received Sept. 1869." (NY); "Long's 1st Expedition," *Dr. James* [type of *S. Jamesii*] (NY).

MEXICO.—Sonora: riverbanks, San Pedro, September 10 to 20, 1890, Hartman 871 (Gray, Mo, NY, US); between San Pedro and Fronteras, September 20 to 24, 1890, Hartman 956 (Gray, Mo, NY, US).

32. Solanum michoacanum (Bitt.) Rydb., Torrey Bot. Club Bul. 51: 171. 1924. (Figs. 76 and 77.)

Solanum jamesii subsp. nayaritense var. michoacanum Bitt., Repert. Sp. Nov. 12: 9. 1913.

Plant erect or ascending, somewhat pilose throughout, the upper part (especially the peduncle) provided with short-stalked glands that are scattered among the long hairs, stoloniferous and tuberbearing. Tubers orbicular, about 2 cm. in diameter. Stem slen-

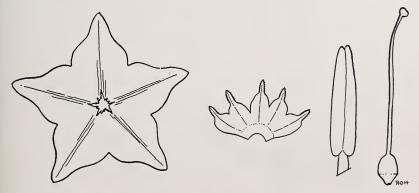


FIGURE 77.—Solanum michoacanum (Arsène 2896). Corolla and calyx, about × 2; stamen and pistil, about × 4.

der, simple or branched. Leaves odd-pinnate, up to 10 cm. long, apparently without interstitial leaflets; petioles 1 to 2 cm. long. Leaflets 5 or 7, sessile to shortly petiolulate; lateral leaflets elliptic to lanceolate, obtuse to shortly acuminate, somewhat decurrent on the rachis at the somewhat oblique cuneate base, up to 5 cm. long and 1.5 cm. wide; terminal leaflet somewhat larger than the lat-



Figure 78.—Solanum nayaritense (Rose 2134). About \times %.

eral leaflets, symmetrical. Pseudostipular leaves simple, ovate to ovate-lanceolate, obtuse, somewhat falcate, up to 1 cm. long. Inflorescence pseudoterminal on leafy branches, 8-flowered (sometimes more), cymosely paniculate; peduncles up to 6 cm. long, prominently pilose and somewhat glandular. Pedicels about 1 cm. long, noticeably smaller than the supporting peduncle branch, articulate at about the middle, the articulation prominent, glabrous or with very few hairs. Flowers probably white (no color notes seen). Calyx about 6 mm. long, subglabrous to sparsely pubescent with spreading incurved hairs, divided to about the middle into ovate-lanceolate lobes that are abruptly constricted and acuminate. Corolla stellate, 1.1 to 1.4 cm. long, divided to about the middle into broadly triangular-ovate obtuse-apiculate lobes. Anthers oblong in outline, 6 to 7 mm. long; filaments broad, 1.0 to 1.5 mm. long. Style slender, about 1 cm. long, exceeding the Fruits unknown.

Range: Apparently endemic in Michoacán, Mexico; at 2,100 m. This species is closely allied to *S. nayaritense*. It is, however, less densely pubescent and the corolla lacks the long hairs found on the corolla of that species.

Specimens examined:

MEXICO.—Michoacán: Punguata, vicinity of Morelia, 2,100 m., July 16, 1909, Arsène 2896 [type collection] (Mo, NY).

33. Solanum nayaritense (Bitt.) Rydb., Torrey Bot. Club Bul. 51: 170. 1924. (Figs. 78 and 79.)

Solanum jamesii subsp. nayaritense Bitt., Repert. Sp. Nov. 12: 8. 1913.

Plant erect or essentially so, up to 4.7 dm. tall, pilose throughout, tuber-bearing. Tubers ovoid, about 2 cm. long. Stem slender, simple. Leaves odd-pinnate, up to 10.5 cm. long, pilose on both surfaces, rarely with obsolescent interstitial leaflets; petioles about 1 cm. long. Leaflets 7 to 9; lateral leaflets elliptic-lanceolate to lanceolate, obtuse to acute, decurrent on the rachis at the somewhat oblique cuneate base, up to 3.7 cm. long and 1.4 cm. wide; terminal leaflet symmetrical, slightly larger than the lateral leaflets. Pseudostipular leaves simple, semiovate, obtuse, about 7 mm. long. Inflorescences pseudoterminal, few-flowered (about 6), cymosely paniculate; peduncles up to 3 cm. long, with stipitate glands that are scattered among the long hairs. Pedicels 1 to 2 cm. long, articulate at about the middle. Flowers probably white (no color notes seen). Calyx 5 to 6 mm. long, pubescent, deeply lobed to about the middle; lobes ovate-lanceolate to lanceolate, acute to acuminate. Corolla stellate, with long crisp hairs on the outer surface, about 1.4 cm. long, deeply lobed to near the base; lobes ovate-lanceolate, acuminate, up to 1 cm. long and 5 mm. wide. Anthers linear-lanceolate in outline, 6.5 to 8.0 mm. long; filaments about 1 mm. long, glabrous. Style filiform, about 1 cm. long, slightly exceeding the stamens. Fruits unknown,

Range: Apparently endemic in Nayarit, Mexico.

The undivided pseudostipular leaves place this species with the S. sambucinum and S. brachistotrichum group, not the S. jamesii group. The long crisp hairs on the outer surface of the corolla distinguish it from related species. The rather dense pubescence covering the entire plant, however, shows its close relationship with S. brachistotrichum, and the blunt apex of the leaves and glandular peduncle show its relationship with S. michoacanum.

Although the writer borrowed material from the Paris Museum, the type of *S. jamesii* subsp. *nayaritense* that was obtained by L.

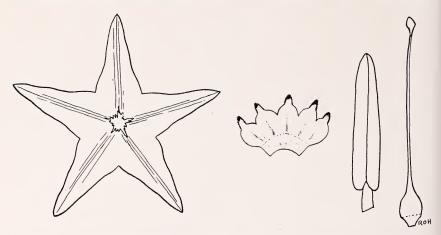


FIGURE 79.—Solanum nayaritense (Rose 2134). Corolla and calyx, about \times 2; stamen and pistil, about \times 4.

Diguet in the western part of Sierra Nayarit was not included. It apparently was inadvertently overlooked when the specimens were extracted from the herbarium. A study of the original description and a comparison of the specimen cited below with the description and with photographs of the type, however, convince the writer that this collection is representative of this species.

Specimens examined:

MEXICO.—NAYARIT: Tepic, collected in the Sierra Madre, near Santa Teresa, August 9, 1897, Rose 2134 (US).

34. Solanum nicaraguense Rydb., Torrey Bot. Club Bul. 51: 171. 1924. (Figs. 80 and 81.)

Plant of a low rosette type, rarely slender and erect, up to 2.5 dm. tall, with stolons and tubers. Stem short, slender, sparingly pilose or glabrate. Leaves odd-pinnate, 7 to 16 cm. long, sometimes with several minute interstitial leaflets. Leaflets 3 to 7, elliptic to ovate-elliptic, rounded to obtuse, sessile and decurrent on the rachis at the somewhat oblique cuneate base, glabrous to



FIGURE 80.—Solanum nicaraguense (Flint 8). Type collection. About × 3.

sparingly pilose above, more pubescent beneath; terminal leaflet 3 to 8 cm. long and up to 4 cm. wide; lateral leaflets gradually smaller, the lowermost pair usually minute. Pseudostipular leaves small, semiovate, obtuse, up to 4 mm. long. Inflorescences pseudoterminal or pseudoterminal and lateral from the stem, up to 10-flowered, cymosely paniculate; peduncles 2 to 7 cm. long. Pedicels 1.0 to 1.5 cm. long, the articulation prominent and usually about the middle, pilose to subglabrous. Flowers probably white (no color notes seen). Calyx 3 to 5 mm. long, divided above the middle into triangular to ovate acute lobes. Corolla stellate, 8 to 12 mm. long, deeply lobed to below the middle; lobes deltoid-lanceolate to deltoid-ovate, acuminate, puberulent especially at the margins. Anthers elliptic-lanceolate in outline, 5

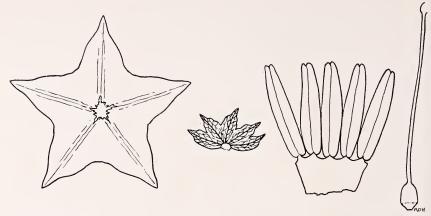


FIGURE 81.—Solanum nicaraguense (Flint 8). Corolla and calyx, about \times 2; stamens and pistil, about \times 4.

to 6 mm. long; filaments about 2 mm. long, united to the apex or to well above the middle. Style about 1 cm. long, greatly exceeding the stamens. Fruits unknown.

Range: Apparently endemic in Nicaragua.

In this species the filaments are united to the apex or to well above the middle to form a crown on which the anthers are sessile or essentially so, whereas in *S. jamesii*, to which it is closely allied, the filaments are free and not fused.

Specimens examined:

NICARAGUA.—No locality given, 1868, $Dr.\ C.\ Flint\ \delta$ [type collection] (US).

35. Solanum pinnatisectum Dun. in DC., Prodromus 13 (1): 40. 1852. (Figs. 82, 83, and 84.)

Solanum pinnatisectum var. heptazygum Bitt., Repert. Sp. Nov. 12: 50. 1913.

S. pinnatisectum var. pentazygum Bitt., Repert. Sp. Nov. 12: 49. 1913, nomen nudum.

Plant herbaceous, erect or decumbent, 2.5 to 6.0 dm. tall, glabrous or very sparsely pilose, tuber-bearing. Tubers small, orbicular to ellipsoid, about 1.5 cm. in diameter. Stem simple or branched. Leaves odd-pinnate, 5 to 12 cm. long, without interstitial leaflets. Leaflets 7 to 17, linear-oblong to linear-lanceolate or narrowly elliptic-lanceolate, tapering to the obtuse apex, narrowed to the sessile base, decurrent on the rachis, 1.4 to 3.2 cm. long and 4 to 8 mm. wide, the lowermost pairs somewhat reduced. Pseudostipular leaves similar to the regular leaves but much smaller. Inflorescences pseudoterminal or pseudoterminal and lateral, few-flowered, cymosely paniculate or sometimes racemose; peduncles up to 6 cm. long. Pedicels slender, up to 2 cm. long, rarely longer, articulate at or above the middle. Flowers white. Calyx



Figure 82.—Solanum pinnatisectum (Arsène 10380). About \times %.

4 to 10 mm. long, glabrous to sparsely pilose, deeply and unequally lobed to about or below the middle; lobes narrowly triangular-lanceolate to ovate-lanceolate, acuminate or tapering to an obtuse apex. Corolla stellate, up to 1.5 cm. long, lobed to near the middle; lobes ovate-lanceolate, obtuse to acute, ciliate above. Anthers

narrowly oblong-lanceolate in outline, 6 to 8 mm. long; filaments about 1 mm. long, stout. Style 9 to 11 mm. long, slightly longer than the stamens, thickened and somewhat reflexed at the apex. Fruits unknown.

Range: Rare in the mountains of Michoacán and Querétaro, Mexico, and Cochise County, Ariz., where it is apparently iso-

lated; usually above 1,900 m.

The writer has seen a photograph (fig. 84) of the type in the Delessert Herbarium. The material cited here is characteristic of this species. The pseudostipular leaves, which are miniatures of the regular leaves, show its close affinity with *S. jamesii*.

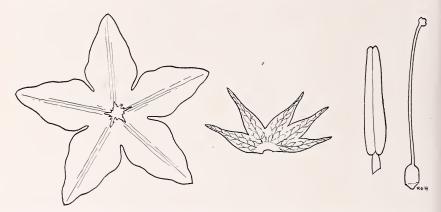


FIGURE 83.—Solanum pinnatisectum (Arsène, July 4, 1909). Corolla and calyx, about \times 2; stamen and pistil, about \times 4.

The lone station in the Huachuca Mountains of Arizona is of interest not only because it adds a species new to the United States but because of its apparent isolation from the heretofore known area of distribution for this species. The nearest Mexican locality known is in Querétaro State. The plants from Arizona are typical. Several other collections, especially those from Mangas Springs, N. Mex., approach this species. They have, however, been considered here as *S. jamesii*, with leaves somewhat narrower than usual.

Specimens examined:

ARIZONA.—Cochise County: open flats, at base of mountains, Bear Creek, Huachuca Mountains, July 30, 1909, Goodding 277 (Ar.)

MEXICO.—MICHOACÁN: Punguato, vicinity of Morelia, 2,160 m., July 16, 1909, Arsène 2895 [type collection of S. pinnatisectum var. heptazygum] (Gray, Mo, NY, Paris, US); marshy ground near Morelia, flowers white, 2,000 m., July 14, 1941, Schery 120 (Mo); vicinity of Morelia, July 4, 1909, Arsène s. n. (US); Rincón, vicinity of Morelia, 1,900 m., August 14, 1910, Arsène 6550 (US); 10 km. west of Morelia, in loose rocky soil, June 21, 1950, J. T. Baldwin, Jr., 14374 (NA). QUERÉTARO: 1910–13, Br. Agniel 10467 (US), 10580 (CM, Mo); 1,900 m., 1910–13, Agniel 10380 (or possibly 10580) (CM, Gray, Mo, NY, US); Cercania de Querétaro, 1912, Basile 131, 132 (US).



Figure 84—Solanum pinnatisectum. Type collection from Leon, west of Guanajuato, Mexico, 1829, Mendez s. n. About \times $\frac{2}{3}$.



FIGURE 85.—Solanum sambucinum (Rose et al. 9586). Type collection. About

36. Solanum sambucinum Rydb., Torrey Bot. Club Bul. 51: 169. 1924. (Figs. 85 and 86.)

Plant herbaceous, more than 3 dm. tall, essentially glabrous throughout or with very few scattered several-celled hairs, doubtless tuber-bearing (no tubers seen). Stem somewhat angular. Leaves odd-pinnate, up to 1.5 dm. long, without interstitial leaflets; petioles up to 1.5 cm. long. Leaflets 9 to 11, ovate-lanceolate to elliptic-lanceolate or lanceolate, acuminate, somewhat rounded to narrowly cuneate at the base, subsessile to shortly petiolulate, glabrous above, paler and somewhat pruinose beneath, 2 to 6 cm. long and up to 1.8 cm, wide. Pseudostipular leaves entire, ovatelanceolate to lanceolate, obtuse to acuminate, oblique, up to 1.2 cm. long and 4 mm. wide. Inflorescences pseudoterminal on leafy branches, few-flowered, cymosely paniculate; peduncles up to 5 cm. long. Pedicels 1 cm. or more long, articulate at about the middle. Flowers probably white (no color notes with specimen). Calyx 5 to 7 mm. long, glabrous except for the puberulence on the short triangular acute lobes, unequally and shortly lobed above the mid-Corolla stellate, 1 cm. or more long, lobed to about the middle; lobes ovate-lanceolate, tapering to an obtuse to subacute apex, the apical portion of the lobes puberulent. Anthers oblong in outline, 5 to 6 mm. long; filaments about 2 mm. long. Style stout, 6 to 7 mm. long, slightly exceeding the stamens. Fruits unknown.

Range: Apparently endemic in Querétaro, Mexico.

This species forms a close alliance with S. michoacanum and S. nayaritense. The glabrous calyx, however, distinguishes it from those species. The entire plant is also essentially glabrous.

Solanum sambucinum is apparently a very rare species. Although the time was probably unseasonal, in November 1947 the writer scoured the hills for signs of this species in the vicinity of San Juan del Río. Querétaro, without success.

Specimens examined:

MEXICO.—QUERÉTARO: stony hillsides near San Juan del Río, August 18, 1905, J. N. Rose, J. H. Painter, and J. S. Rose 9586 [type collection] (US).

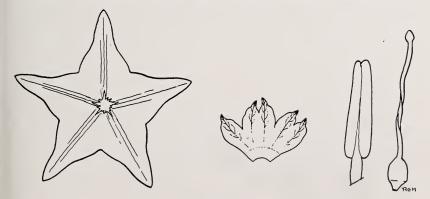


FIGURE 86.—Solanum sambucinum (Rose et al. 9586). Corolla and calyx, about \times 2; stamen and pistil, about \times 4.

37. Solanum stenophyllidium Bitt., Repert. Sp. Nov. 12: 51. 1913. (Figs. 87 and 88.)

Plant erect, up to 4.4 dm. tall, sparsely puberulent with sharp hairs to essentially glabrous throughout, stoloniferous and tuberbearing. Tubers ellipsoid, about 2.5 cm. long and 1.5 cm. in diameter. Stem slender, simple, usually with the lower third naked.



Figure 87.—Solanum stenophyllidium (Palmer 611). Type collection. About $\times \frac{9}{5}$.

Leaves odd-pinnate, 5 to 13 cm. long, without interstitial leaflets; petioles 1 to 2 cm. long. Leaflets 5, rarely 7, linear to linear-lanceolate, obtuse to acute, sessile at the tapering base, decurrent on the rachis, up to 8.5 cm. long and 8 mm. wide, the lowermost pair much reduced. Pseudostipular leaves simple, semiovate to obliquely lanceolate, obtuse, falcate, up to 1.2 cm. long and 4 mm. wide. Inflorescences pseudoterminal, up to 15-flowered, cymosely paniculate; peduncles up to 5 cm. long. Pedicels up to 2 cm. long, articulate above the middle, essentially glabrous. Flowers probably yellowish white (no color notes seen). Calyx 3.5 to 4.5 mm.

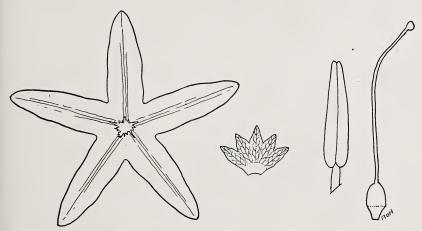


Figure 88.—Solanum stenophyllidium (Palmer 611). Corolla and calyx, about \times 2; stamen and pistil, about \times 4.

long, glabrous, divided to about the middle into triangular-ovate to triangular-lanceolate acute lobes. Corolla stellate, 1.0 to 1.3 cm. long, lobed to below the middle; lobes triangular-lanceolate, acute to obtuse, puberulent at the margins. Anthers lanceolate in outline, about 6.5 mm. long; filaments about 1 mm. long. Style 7 to 8 mm. long, slightly exceeding the stamens. Fruits orbicular, less than 1 cm. in diameter.

Range: Apparently endemic in the vicinity of Río Blanco, Jalis-

co, Mexico.

In habit and type of puberulence this species closely resembles some specimens of *S. brachistotrichum*, to which it is apparently most closely allied. The undivided pseudostipular leaves also place it nearest to *S. brachistotrichum* rather than to *S. pinnatisectum*, with which it has usually been associated.

Specimens examined:

MEXICO.—JALISCO: Río Blanco, September 1886, Edward Palmer 611 [type collection] (Gray, US); Río Blanco, July 11, 1893, C. G. Pringle s. n. (Iowa).



Figure 89.—Solanum polyadenium (Pringle 8692). Type collection. About \times %.

Series Polyadenia Buk., 11 Physis [Buenos Aires] 18: 43. 1939, nomen nudum.

Herbs with fibrous roots and stolons, tuber-bearing, densely glandular-pubescent throughout, malodorous when fresh. Leaves odd-pinnate. Pedicels articulate at about the middle. Corolla rotate-stellate. Fruits ovoid, cordate at the base.

38. Solanum polyadenium Greenm., Amer. Acad. Arts and Sci. Proc. 39: 89. 1903. (Figs. 89, 90, 91, and 92.)

Solanum polyadenium subsp. orizabae Bitt., Repert. Sp. Nov. 12: 7. 1913.

Plant erect or erect-spreading, up to 10 dm. or more tall, covered throughout with dark stipitate glands and spreading white hairs, malodorous. Tubers cylindrical or ellipsoidal, often much elongated, typically curved and sometimes coiled, white or sometimes with a reddish-purple tinge, up to 4 dm. or more long. Stem somewhat angular, simple or branched. Leaves odd-pinnate, up to 20 cm. long, usually with numerous interstitial leaflets; petioles short, usually less than 2 cm. long. Leaflets 7 to 11; lateral leaflets elliptic-lanceolate to ovate-lanceolate or sometimes elliptic, sub-

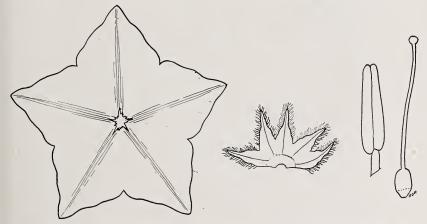


FIGURE 90.—Solanum polyadenium (Pringle 8692). Corolla and calyx, about \times 2; stamen and pistil, about \times 4.

obtuse to acuminate, rounded to cuneate at the usually very oblique base, shortly petiolulate, up to 6.5 cm. long and 3 cm. wide; terminal leaflet only slightly larger than the lateral leaflets; petiolule up to 3 mm. long. Interstitial leaflets irregular, ovate to

¹³ Herbae cum ridicibus fibrosis, stoloniferae, tuberiferae, omnino dense glanduloso-pubescentes, in vivo fetidae. Folia imparipinnata. Pedicelli circiter in medio articulati. Corolla rotato-stellata. Fructus ovoideus, basi cordatus.



Figure 91.—Solanum polyadenium (Correll 14374a). Plant grown at Glenn Dale, Md. About \times $\frac{1}{12}$.



FIGURE 92.—Solanum polyadenium (Correll 14374). Tubers collected near Matujeo, Michoacán, Mexico. About \times 1.

ovate-elliptic, obtuse, sessile or with a short petiolule up to 1 mm. long. Pseudostipular leaves semiovate, falcate, up to 1.5 cm. long. Inflorescences pseudoterminal on leafy branches or lateral, 2- to several-branched, cymosely paniculate; peduncles conspicuously forked once above, up to 8 cm. long, usually much shorter. Pedicels up to 3 cm. or more long, articulate above the middle. Flowers as many as 20 or more, white or cream white, sometimes violettinged at the base. Calyx 6 to 7 mm. long, divided to below the middle into ovate-lanceolate acuminate lobes, usually somewhat constricted at about the middle. Corolla rotate-stellate, up to 3.5 cm. in diameter, with lobes broadly ovate and acute to subobtuse. Anthers broadly lanceolate in outline, 5 to 6 mm. long; filaments less than 1 mm. long, broad and short. Style about 9 mm. long, exceeding the stamens; stigma globose. Fruits ovoid, light green striped with broad bands of darker green, up to 2 cm. long and 1.5 cm. in diameter.

Range: Apparently endemic in the high mountains of central

Mexico, from Veracruz to Jalisco, above 2,000 m.

This species is one of the most distinctive found in Mexico. As Sutton (1908) pointed out, the plant, especially when fresh, emits a strong unpleasant odor somewhat resembling feverfew (*Chrysanthemum parthenium*). It probably produces the largest tubers of any indigenous species found in our region; these are sometimes 4 dm. or more in length and often tightly coiled or wrapped about stones or other extraneous matter.

Solanum polyadenium is potentially of great value in a breeding program because it is exceedingly disease-resistant and repellent or poisonous to insects. F. J. Stevenson, who is especially interested in this species, has been investigating the possibility of using it in breeding investigations. Its crossability with other species, including the commonly cultivated potato, has apparently

never been ascertained.

The plant described as subsp. *orizabae* is not essentially different from typical material. The leaflets, however, are somewhat broader than usual.

Specimens examined:

MEXICO.—HIDALGO: limestone hills, El Salto station, heavy scented, tubers white, September 15, 1902, Pringle 8692 [type collection of S. polyadenium] (Cal, CM, Co, Gray, Mo, NY, PA, US, Vienna); El Salto, September 16, 1903, Rose and Painter 7080 (NY, US); rocky hills near Zontecomate station, 2,897 m., August 9, 1904, Pringle 13136 (Ar, CM, Co, Gray, Mich, US). JALISCO: Volcán de Nevada, from flats in snowfields near treeline, plants all dead, fruits green with faint speckles and deeper green stripes, shining and smooth, tubers white and typically spindle-shape, December 21, 1947, Correll 14371e [P. I. No. 161709 (in part)] (NA). MICHOACÁN: Punguato, vicinity of Morelia, 2,200 m., August 11, 1910, Arsène 5232 (CM, Gray, Mo, US); near Matujeo, among rocks in old lava flow, plants all dead, tubers white or with a reddish purple tinge, fruits green with prominent deep-green stripes, December 23, 1947, Correll 14374a, 14374c [P. I. Nos. 161710 (in part), 161728] (NA). PUEBLA: Rancho de las Posádos, April 1900, Nicolás s. n. (Paris). VERACRUZ: Orizaba, August 1853, Müller 1675 [type of S. polyadenium subsp. orizabae] (Paris). STATE UNKNOWN: Souchil, open meadows in the mountains, flowers white, 2,135 m., August 1857, Mohr s. n. (US).

Series Tuberosa Rydb., Torrey Bot. Club Bul. 51: 146, 147. 1924.

Demissa Buk., Physis [Buenos Aires] 18: 43. 1939, nomen nudum.

Longipedicellata Buk., Physis [Buenos Aires] 18: 43. 1939, nomen nudum.

Herbaceous plants, always producing stolons and tubers, often coarse and tall but rosette forms are frequent. Leaves commonly with many more or less prominent interstitial leaflets. Corolla rotate or rotate-stellate. Tubers often large and white to purplish.

As noted in the Introduction, during the fall and winter of 1947– 48 the writer collected tubers and fruits of Solanum throughout south-central Mexico. In most cases it was not possible to obtain botanical specimens of these collections. Subsequently herbarium material was prepared from specimens grown from these fruits and tubers. In studying these herbarium specimens, especially in the series Tuberosa, the writer has found some unique plants that he is convinced represent either species new to science or strikingly distinct varieties of already known species. Since, however, the writer is opposed to describing new species based solely upon material cultivated in long-day regions, these specimens are here cited under the species to which they appear to be most closely related, but they are generally set apart from the regular citations with some comments regarding them. In this way they will be called to the attention of future collectors who might visit these stations in proper season and obtain specimens from nature.

New species proposed by previous workers that were based solely upon cultivated specimens have created exceedingly difficult problems. The writer does not wish to contribute unnecessarily to the already existing confusion in the nomenclature of tuberous solanums by proposing additional species based on plants grown

under abnormal conditions.

The writer's observations have convinced him that, for the most part, it is futile to describe as "new" plants of *Solanum* in the series *Tuberosa* when they are grown under cultivation in regions other than where they are indigenous. The variations in plants produced from either tubers or true seeds under cultivation are frequently startlingly different from the parent material found in nature. Indeed, in some instances, it seems impossible to obtain in cultivated material the identical habit of the plant found in nature. The variations in habit are even greater for those plants grown under glass than for those grown outdoors in proper season. The illustrations shown in various parts of this work graphically demonstrate the above observations.

The writer would like to emphasize again that the first step in clarifying the enormous complexity of the section Tuberarium, especially in the series *Tuberosa*, is to go back to nature to determine the entities already composing this section. This should be done before any additional species are proposed, especially any

based solely on cultivated material and with no knowledge of the

parent material as found in nature.

When this series was first examined, the writer could well sympathize with the nineteenth century botanists, viz Lindley, Gray, Baker, Sutton, who earnestly thought that nearly all tuber-bearing solanums were either directly referable to S. tuberosum or were only minor variants of that heterogeneous cultigen. As the entities comprising the first ten series had proved to be not too difficult, it was with much exasperation that the present series was found to be extremely difficult, taxonomically. The writer must confess that even after due consideration and long periods of mulling over the exceedingly large collection assembled he is far from satisfied with the present treatment of the series Tuber-A prodigious amount of thorough field work over a period of years is needed to give one the necessary experience to cope with this difficult group of plants. The writer, therefore, considers the treatment of the series Tuberosa to be only a tentative revision. There is vast room for clarification. Since it is largely in the series Tuberosa that potato breeders and geneticists have found the material with which to carry on their work in conjunction with the commonly cultivated potato, a vigorous investigation of all the species comprising this series would doubtless prove to be exceedingly worth while.

In our region, this series includes three basic, highly variable groups of plants (exclusive of *S. tuberosum*), two of which are concentrated in the high mountains of south-central Mexico, the *S. demissum-S. verrucosum* and *S. stoloniferum* complexes, and the *S. fendleri* complex of northern Mexico and western United States. It is of interest that practically all other species in this series center about the above species and, in most instances, show pronounced evident relationship to them. In the writer's opinion, our commonly cultivated potato could well have developed from a consociation of characters in the above plants. *Solanum stoloniferum* itself is very closely related to the cultivated potato, espe-

cially the plant segregated as S. andigenum.

There is no doubt that *S. demissum* and *S. verrucosum* hybridize freely. Indeed, in some localities, the hybrid population would seem to be much greater than that of the combined parent population. This age-long interbreeding has well-nigh obliterated specific characteristics of the two species in question to the extent that one is almost inclined to consider them as one polygenetic entity. The writer, however, has maintained the two specific categories and has made no futile effort to segregate putative hybrid plants. Instead, those plants that exhibit characteristics tending more strongly toward *S. demissum* or *S. verrucosum* have been included under that particular species.

There is also little doubt that a number of well-defined variants might be segregated in some of the species, as in *S. demissum*; but, in the writer's opinion this should be undertaken only after more first-hand knowledge has been obtained, especially in the field where the plants occur naturally. To name haphazardly individ-

ual variants, especially in material cultivated under abnormal con-

ditions, does not help the problem.

In the treatment of most of the entities comprising this series, the presence or absence of interstitial leaflets did not prove to be a critical or diagnostic characteristic. For instance, in some of the type collections, such as that of S. verrucosum var. iopetalum, some of the plants have leaves essentially devoid of interstitial leaflets while others have leaves that have prominent interstitial leaflets. This demonstrates the impracticability of the classification of the section Tuberarium proposed by Dunal in 1852, wherein all species having odd-pinnate leaves with interstitial leaflets were placed in one group (Potatoe) and those species having simple or odd-pinnate leaves without interstitial leaflets were placed in another group (Pterophyllum).

The plants comprising the S. stoloniferum complex usually have green, nearly spherical, fruits with vertical purplish bands or streaks. The fruit of S. demissum is typically ovoid and deep green without any distinctive markings or sometimes with faint white specks, while that of S. verrucosum is orbicular or ovoid

with numerous conspicuous small white warts.

It is of interest to note that under cultivation the tubers frequently produce one type of plant while the seeds, through segregation, often produce two or more different types of plants. In most cases, however, seed-produced plants show affinity with the

parent stock.

It would appear from the field notes of E. K. Balls, who had the opportunity to collect during the spring, summer, and fall in Mexico, that in many instances plants from the same colony in spring and fall differed considerably in habit and behavior. For instance, Balls' collection (No. 4246) of S. demissum, segregated as var. mastoidostigma Hawkes, contains notes that point out seasonal differences of the plants collected under this number.

1. Corolla rotate-stellate.

- 2. Interpetalar tissue usually rounded or slightly raised; corolla 2 cm. or more in diameter, the lobes slender and reflexed.
- Interpetalar tissue depressed and usually with a distinct sinus. not noticeably rounded or raised.

Corolla lobes triangular, the sinus shallow.

- Plant coarsely pubescent with long crisp white hairs (especially on the stem near the base); peduncle glandular-pubescent; corolla usually more than 1.5 cm. in diameter.
- able sinus.
 - Style 7 mm. or more long; leaflets usually 7.
 - Plant usually much less than 5 dm. tall; fruit not
 - 41. S. fendleri var. physaloides,

Corolla rotate.

7. Leaflets sessile or essentially so; plants often forming a rosette or with a stem ______39. S. demissum. Leaflets (at least some) with a distinct petiolule; plants never

forming a rosette.

8. Terminal leaflet conspicuously larger than the lateral leaflets.

leaflets.

10. Leaflets (at least some) usually provided with secondary leaflets on their petiolules; fruit orbicular, green; flowers white to purplish, usually with some tinge of pink.

47. S. tuberosum. 10. Leaflets without secondary leaflets; fruits ovoid to ellipsoid, rarely suborbicular or conical, green and typically with numerous small white warts.

......48. S. verrucosum.

11. Fruits usually ovoid ellipsoid, sometimes conical.

11. Fruits ovoid-ellipsoid to ellipsoid, sometimes conical. 12. Fruits conical; plant tall and lax.

49. S. verrucosum var. iopetalum. Fruits ovoid-ellipsoid to ellipsoid, not conical; plant low and bushy 50. S. verrucosum var. spectabilis.

39.Solanum demissum Lindl., Roy. Hort. Soc. Jour. 3: 69, 70. 1848. (Figs. 1, 2, 3, 4, 5, 93, 94, 95, 96, 97, 98, 99, 100, 101, 149, and 150.)

Solanum utile Klotzsch, Allg. Gärt. Ztg. 17: 315. 1849. Type locality: Originally cultivated from tubers from Río Frío, in the mountains between Puebla and México, Mexico.

S. demissum var. klotzschii Bitt., Repert. Sp. Nov. 11: 454.

1912: 12: 454. 1913.

S. semidemissum Juz. ex Buk., Bul. Appl. Bot., Genet., and Plant Breeding [Leningrad], Suppl. 47: 60, 480. 1930, nomen nudum; Acad. Sci. U. R. S. S., Bul., ser. Biol., No. 2: 314. 1937. Type locality: Mexico, San Miguel, Valley of Mexico, 1929, Antipovicz (tubers No. 28).

S. alpicum Standley & Steyermark, Field Mus. Pub. Bot. 23:

232.1947.

Plant varying from a rosette to a much-branched spreading or ascending habit, commonly grayish green, rarely up to 6 dm. tall, densely pubescent to essentially glabrous. Tubers usually small, variously shaped, flattened, white or purple-tinged, the flesh crisp and whitish. Leaves odd-pinnate, rarely up to 25 cm. long, usually less than 15 cm. long, with or without interstitial leaflets. Leaflets 5 to 9, usually 7, sessile or essentially so, ovate to ovate-elliptic, obtuse to acute or sometimes shortly acuminate, rounded to cuneate at the slightly oblique base; lateral leaflets up to 8 cm. long and 4 cm. wide; terminal leaflet usually larger than the lateral leaflets. Inflorescences lateral or pseudoterminal, laxly cymosely paniculate; peduncles usually short and less than 3 cm. long. Pedicels 1 to 2 cm. long, articulate at about or well above the middle. Flowers bright violet to purplish, sometimes lighter on the



FIGURE 93.—Solanum demissum. Drawing taken from Lindley, 1848. About \times 1.

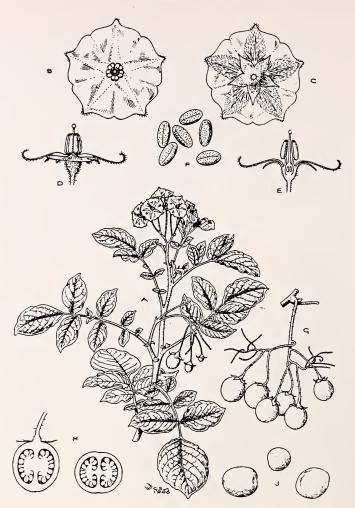


Figure 94.—Solanum demissum. Drawing taken from Sutton, 1909. A, Inflorescence and upper leaves, about \times ½; B, flower, showing anthers, about \times 1½; C, flower, showing calyx, about \times 1½; D, flower, side view, about \times 1½; E, flower, in cross section, about \times 1½; F, pollen, about \times 200; G. cyme with fruits, about \times ½; H, fruit, vertical and horizontal sections, about \times ½; J, tubers, about \times ¾.

inner surface. Calyx 4 to 8 mm. long, divided to about the middle into triangular-lanceolate acute lobes. Corolla rotate, with a 10-lobed aspect, rarely more than 3 cm. in diameter, nearly circular in outline; the lobes often reflexed so as to hide the calyx. Anthers oblong or lanceolate in outline, 4 to 5 mm. long; filaments about 1 mm. long. Style slender to somewhat stout, up to 9 mm. long, exceeding the stamens. Fruits ovoid to suborbicular, uniformly deep green or grass green, sometimes with small white specks, 1.0 to 2.5 cm. long.

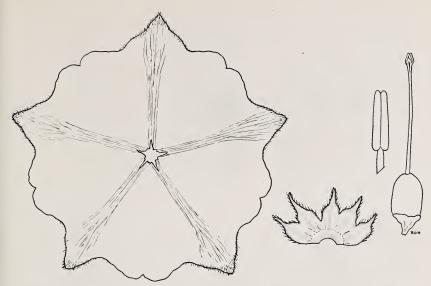


FIGURE 95.—Solanum demissum (Russell and Souviron 146). An exceptionally large-flowered form. Corolla and calyx, about \times 2; stamen and pistil, about \times 4.



FIGURE 96.—Solanum demissum (Correll 14412). Fruiting plants and bags of tubers collected near Las Cruces, Distrito Federal, Mexico. The fruits are about 2.5 cm. in diameter,

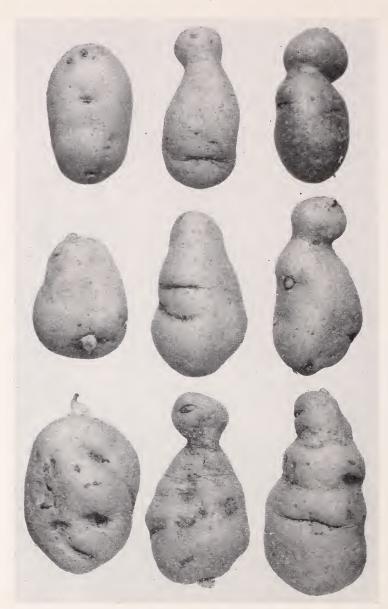


FIGURE 97.—Solanum demissum (Correll 14412). Tubers collected near Las Cruces, Distrito Federal, Mexico. The tubers are larger than usual. About \times 1.

Range: Pine-balsam zone of high mountains from south-central Mexico to Guatemala, usually above 2,400 m.

Solanum demissum was founded on plants that were cultivated in England from tubers sent to Lindley from Mexico by C. A.



FIGURE 98.—Solanum demissum (Correll 14432). Tubers collected in thicket of open pine forest at Selva Obscura, Puebla, Mexico; about the average size found in nature. About \times 1.

Uhde. A reproduction of a photograph of the type is included here (see fig. 5). Later, Klotzsch described as *S. utile* plants that were also grown from tubers collected in Mexico. Although the type has not been seen by the writer, Bitter, who apparently saw the type, reduced it to a variety of *S. demissum*, and he identified the specimen illustrated here (see fig. 4) as belonging to the var. klotzschii. The writer would go a step further and reduce it to synonymy under *S. demissum*.

At the time he described this species, along with *S. cardiophyllum*, Lindley made the interesting comment: "The first of these [tubers of *S. demissum*] was marked 'Native Mexican Potatoes,



FIGURE 99.—Solanum demissum (Correll 14212). Upper two plants collected on Mount Popocatepetl, México. Lower left-hand plant grown from tubers at Sturgeon Bay, Wis. \times %.

growing at 8000 to 9000 feet elevation.' This proved a particularly dwarf sort. It was planted May 2, and was in flower in the end of June. Its flowers are produced close to the ground, and fruit soon succeeds them; branches then push up, and blossom at

the height of 12 to 15 inches."

This species is usually found at high elevations where it is characteristically a rosette type of plant. At lower elevations it often assumes an upright or bushy habit like the plant which Lindley grew from tubers in England. In October 1947 the writer collected nonflowering mature plants (fig. 99) of the rosette type in a coniferous forest on the slopes of Mount Popocatepetl, México State, at about 3,350 m.

Specimens (fig. 99) were grown in August 1949 at Sturgeon Bay, Wis., from tubers of the Mexican collection, where they flowered profusely and developed an ascending nonrosette habit. This variation produced in plants of this species when grown under different environments is discussed in detail in the introduction. It has, of course, been impossible to examine types of species proposed by Russian workers, if such exist. However, as noted earlier, most of these proposed species have been illustrated in one way or another, which makes it possible to place them, at least tentatively. The writer considers S. semidemissum (fig. 100) to be synonymous with S. demissum. Also, the Guatemalan plant described as S. alpicum (fig. 101) by Standley and Steyermark belongs here. They wrote the following regarding S. alpicum:

"The region where the species grows is an alpine one, where below-freezing temperatures are common during the winter months of the North, and probably throughout the year. The plant is, of course, a relative of *Solanum tuberosum*, and it is curious to note that in the Chémal region the only agriculture is

potato growing. This, however, is a coincidence."

A number of geneticists and potato breeders have considered this species to be of enormous potential value for the creation of blight- and frost-resistant strains in our cultivated potato. Also, recent investigations have revealed a poisonous property in the leaves of this species that is efficacious in controlling the Colorado potato beetle. If this poisonous property could be transmitted to the leaves of cultivated strains, without injurious effects on tubers, it would be of great value. R. W. Hougas, Sturgeon Bay, Wis., reported that many of the writer's Mexican collections of this species were unaffected by several consecutive nights of temperature ranging as low as 26° F., while all strains of cultivated potatoes were killed outright. There are, of course, several unfavorable factors in S. demissum. It rarely forms tubers under long-day conditions and these are small and at the end of long stolons. Although some strains of S. demissum produce appetizing tubers, the majority apparently produce unpleasant-tasting ones.

An explanation should be made regarding some of the writer's collections of seeds and tubers of this species in the cases where it is noted that the collections represented potatoes supposed to be



FIGURE 100.—Solanum demissum. Photograph of published plate of S. semidemissum, taken from Bukasov, 1933. About \times %.



Figure 101.—Solanum demissum (Steyermark 50303). Type of S. alpicum. About \times %.

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cultivated by the natives. In most instances when the seeds and tubers were grown, not only plants of S. tuberosum were produced but also those of S. demissum. This does not mean that S. demissum, as such, was cultivated. This species merely occurred as a weed in the potato field, and its tubers and fruits were accidentally included in these collections.

In some collections the plants grown in the field at Sturgeon Bay developed leaflets with rather pronounced short petiolules and resembled the plant described as S. salamanii (see fig. 160).

Because of segregation, plants grown from seeds may be extremely variable in such characteristics as pubescence and habit. For example, in the writer's No. 14243, from Hidalgo, Mexico, some plants grown from seeds at Sturgeon Bay, Wis., varied from densely long pubescent to nearly glabrous and from a low, bushy

habit to an ascending, rather slender habit.

It is noteworthy that the corolla is commonly violet purple on the back and light lavender or grayish lavender on the face. Also, it may be of interest to note that in many of the species, especially S. demissum, the fully ripened fruits have the odor of mango, papaya, and, in some, wild strawberry. Because of this odor characteristic, it often happened that when the writer entered a forest where wild potatoes grew abundantly he would discover their presence even though the plants were all dead and not readily Smell thus frequently proved to be as useful as sight in potato collecting.

A large number of varieties and forms, based on insignificant and inconstant characteristics, have been proposed by the Buka-These variations are probably of sov school and by Hawkes. genetical value, but in the writer's opinion, from a systematic standpoint, they are of no practical value. Since this species is highly important to geneticists and potato breeders, these proposed varieties and forms are cited below and their place of publication given so that those interested may readily refer to them.

The Bukasov school described the following Mexican varieties and forms:

Solanum demissum f. atrocyaneum Lechnovicz ex Buk., Bul. Appl. Bot., Genet., and Plant Breeding [Leningrad], Suppl. 47: 224. 1930. S. demissum f. microcalyx Lechnovicz ex Buk., Bul. Appl. Bot., Genet., and Plant Breeding [Leningrad], Suppl. 47: 225. 1930.

S. demissum f. stenantherum Lechnovicz ex Buk., Bul. Appl. Bot., Genet.,

and Plant Breeding [Leningrad], Suppl. 47: 223. 1930. S. demissum f. xitlense Buk. ex Rybin, Bul. Appl. Bot., Genet., and Plant

Breeding [Leningrad], 2nd ser., 20: 699. 1929; Suppl. 47: 221, fig. 117.

S. demissum f. adpressoacuminatum Buk. ex Rybin, Bul. Appl. Bot., Genet., and Plant Breeding [Leningrad], 2nd ser., 20: 698. 1929; Suppl. 47: 222, fig. 118. 1930.

S. demissum f. recurvoacuminatum Buk. ex Rybin, Bul. Appl. Bot., Genet., and Plant Breeding [Leningrad], 2nd ser., 20: 698. 1929; Suppl. 47:

S. demissum f. tlaxpehualcoense Buk. ex Rybin, Bul. Appl. Bot., Genet., and Plant Breeding [Leningrad], 2nd ser., 20: 698. 1929; Suppl. 47: 222. 1930.

S. demissum var. longibaccatum Buk. ex Rybin, Bul. Appl. Bot., Genet., and Plant Breeding [Leningrad], 2nd ser., 20: 699. 1929; Suppl. 47: 219. 1930.

In 1944, Hawkes described three varieties and four forms of S. demissum from Mexico. As noted above, the Bukasov school proposed eight forms and varieties in this species, and it is of interest that Hawkes was of the opinion that some of his proposed variants might be the same as those proposed by Bukasov and his colleagues. The writer considers all of these varieties and forms to represent only minor inconstant differences in individual plants. If minor differences in this species are to be given names there is still need for a great many more. Hawkes published a key to his varieties and forms, which is included below with page references where they are described in his 1944 publication.

Stigma long, not wider than style apex.

Calyx with dense long pubescence. S. demissum f. calycotrichum Hawkes (pp. 25 and 115).

Calyx with sparse short pubescence.

S. demissum f. tolucense Hawkes (pp. 25 and 115). Stigma large, conical, thicker than the style apex.

Habit persistently rosette like, corolla small.

S. demissum var. orientale Hawkes (pp. 25 and 115).

Habit bushy, stems sometimes quite long.

S. demissum var. mastoidostigma Hawkes (pp. 26 and 115). Stigma short, capitate.

Calyx of medium size, style short.

Filaments short.

S. demissum f. perotanum Hawkes (pp. 26 and 115).

Filaments long.

S. demissum f. longifilamentosum Hawkes (pp. 26 and 116).

Calyx large, style long.

S. demissum var. megalocalyx Hawkes (pp. 27 and 116).

Specimens examined:

MEXICO.—DISTRITO FEDERAL: La Cima, 3,050 m., August 1904, Kuntze MEXICO.—DISTRITO FEDERAL: La Cima, 3,050 m., August 1904, Kuntze 23774 (in part) (NY); "Fajalpa," 1,830 m., August 1904, Kuntze 23774 (in part) (NY); El Desierto; very rich loam under humus, under large balsam trees above convent, plant tall, tubers oval, irregular, pale purple, 3,050 m., October 13, 1930, Reddick 541 (66) (Co); outside the wall, convent, El Desierto, 3,000 m., October 13, 1930, Reddick 539 (63) (Co); in rich loam and humus, under pine, 3 km. above El Convento, El Desierto, tubers oblong, large, white, November 5, 1930, Reddick 575 (264) (Co); in the church, El Convento, El Desierto, 3,000 m., October 13, 1930, Reddick 536 (60) (Co); same place and date, 602 (57) (Co); same place and date, Reddick 535 (Co); in dense shade and rich humus, outside walls of convent, El Desierto, plants tall, berries smooth, green with faint white specks, cordate with vertical suture, tubers pale purple, oblong, 3,000 m., October 13, 1930, Reddick 538 (Co); rich soil under humus, 2 km. above convent, ber 13, 1930, Reddick 538 (Co); rich soil under humus, 2 km. above convent, El Desierto, fruit green, smooth with faint white specks, elliptic to obconic, with a vertical suture, tubers white, smooth, oval, about 3,150 m., October 13, 1930, Reddick 542 (67) (Co); in dense shade, very rich humus outside walls of convent, El Desierto, plant tall, fruit smooth, green with white specks, cordate with lateral suture, tuber white, only one found, 3,000 m., October 13, 1930, Reddick 537 (61) (Co); under pine tree, 2 or 3 km. above El Convento, El Desierto, November 5, 1930, Reddick 574 (263) (Co); same place and date, Reddick 573 (262) (Co); same place and date, fruits very abundant, green, smooth, with vertical depression, tubers white, oval to oblong, abundant, *Reddick 576 (265)* (Co); road above convent, El Desierto, plants low, flowers very large, purple, no fruits, tubers white, oval, 3,050 m., October

13, 1930, Reddick 540 (65) (Co); roadside, El Desierto, October 6, 1930, Red-13, 1930, Redatck 540 (65) (Co); roadside, El Desiello, Octobel 6, 1930, Russell and dick 519 (Co); La Portrera, tuberous, 2,890 m., September 6, 1930, Russell and Souviron 148 (US); El Mirador, slope of hill, flowers purple, fruit green, 2,700 m., September 1, 1930, Russell and Souviron 95 (US); Desert of the Lions, damp shaded woodland, August 20, 1940, Langman 2743 (NA, PA); growing wild in mountains, near Mexico City, January 1924, Reich s. n. (NA); El Desierto, near buildings at convent, tubers, September 5, 1930, Russell and Souviron 146 (PA, US); Desierto de los Leones, July 9, 1938, Kussett and Souviron 140 (FA, US); Desierto de los Leones, July 9, 1958, Kenoyer A293 (Ar, CM); El Desierto, coniferous woods, flowers deep purple, tubers, 2,700 m., August 25, 1930, Russell and Souviron 49 (PA, US); El Desierto, shaded coniferous forest, fruit green, tubers small, one to a plant, 3,050 m., December 26, 1930, Erlanson and Souviron 6 (US); Ajusco, edge of field along road, flowers purplish, tubers, September 13, 1930, Russell and Souviron 180 (US); Las Cruces, Camino de Toluca, cultivated fields and open places, flowers purple, to 2 cm. in diameter, leaves narrow-lobed, and open places, howers purple, to 2 cm. In diameter, leaves harrow-loved, pointed, harshly hairy, dark green, making flattish rosette, rather loose, tubers all used up, 3,050 m., August 13, 1938, Balls 5241 [type citation of S. demissum f. longifilamentosum] (Cam, US); El Guarda, in newly cleared land to be used for corn, plants all dead, November 19, 1947, Correll 14274a and 14274b [P. I. Nos. 161087, 161365] (NA); same locality and date, on the edge of a cornfield, plants all dead, Correll 14275a [P. I. No. 161088] (NA); El Desierto, balsam-pine forest opening in rich black soil, plants large and robust, fruits ovoid, 2 cm. long, deep green, October 22, 1947, Correll 14199 and 14199a [P. I. No. 160220] (NA); La Venta, thicket along ditch, plants large and robust, tubers smooth and white, October 22, 1947, Correll 14200 and 14200a [P. I. No. 160202] (NA); Cruz Blanca, open pasture, plants stunted and cropped by cattle, fruits ovoid, 1.5 cm. long, tubers small, less than 1 cm. in diameter, October 22, 1947, Correll 14201 and 14201a [P. I. No. 160203] (NA); Cruz Blanca, edge of cultivated cornfield, plants small, tubers small, October 22, 1947, Correll 14203 and 14203a [P. I. No. 161149] (NA); on open embarkment on the edge of balsam forest. Quatro Dinamo (NA); on open embankment on the edge of balsam forest, Quatro Dinamo, plants mostly dead and past their prime, October 26, 1947, Correll 14222 and 14222a [P. I. No. 161153] (NA); above Quatro Dinamo, in rich soil at base of Abies religiosa, plant luxuriant, tubers well-formed and numerous, October 26, 1947, Correll 14223 through 14223c [P. I. Nos. 160376, 161154] (NA), same locality and date, among shrubs in open forest of Abies religiosa, plants mostly dead, tubers many, Correll 14224 through 14224b [P. I. Nos. 161155, 160377] (NA); slope of Ajusco Mountain, among shrubs of open forest, many fruits are produced but no good tubers found, October 25, 1947, Correll 14215 through 14215b [P. I. Nos. 160210, 160227] (NA); same locality and date, plants low and spreading with very few tubers, Correll 14219 and 14219a [P. I. No. 160214] (NA), same locality and date, in cornfield, plants large, fruits prolific, tubers large and red (Cult.?), Correll 14220 and 14220b [P. I. No. 160230] (NA); along road below Quatro Dinamo, in thicket on edge of mountain forest, October 26, 1947, Correll 14221 through 14221b [P. I. edge of mountain forest, October 20, 1941, Correll 14221 through 14210 [1.1.]

No. 160216] (NA); near Las Cruces, in and about cultivated fields, plants all dead, mostly very small, December 11, 1947, Correll 14319a through 14319c [P. I. Nos. 161693, 161701] (NA); near Las Cruces, in balsam-pine forest, plants all dead, fruits ovoid and green, tubers small and white, December 28, 1947, Correll 14412a through 14412c [P. I. Nos. 161732, 161747] (NA); same locality and date, in and about old wheat-oat fields, plants all dead, tubers white or purple-tinged, Correll 14413a through 14413c [P. I. No. 161719] (NA); Desierto Víégo, Vallée de Mexico, September 7, 1865–66, Bourgeau 870 (Kew, Paris); slope of Ajusco Mountain, edge of wheatfield, plants large, October 25, 1947, Correll 14217a [P. I. No. 160212] (NA). DURANGO: no locality, P. Ibana Garcia 461 (US). HIDALGO: wild potatoes, Mineral [Real] del Monte, September 1832, Ehrenberg s. n. (in part) (Cal); in rocky, disturbed soil on the edge of a balsam-oak forest, plant large and robust, Real del Monte, November 7, 1947, Correll 14243 through 14243d [P. I. Nos. 161121, 161168] (NA), same locality and date, plant prostrate, leaves spreading on ground, Correll 14244 through 14244b [P. I. Nos. 161122, 161169] (NA). México: Mount Popocatepetl, Paraje, Provincial, steep slopes of volcanic dust, called "papa cimarrona," 3,400 m., April 16, 1938, Balls and Gourlay 4246 (Cam); Volcanoes Road above Amecameca, slopes of Mount Popocatepetl, in rich deep humus of pine-balsam forest, plants prostrate and with leaves forming a rosette spreading on the ground, October 24, 1947, Correll 14212 and 14212a [P. I. No. 160208] (NA); very rich soil, open field, just east of Río Frío, fruit smooth, green, oval, tubers white, 2,745 m., October 8, 1930, Reddick 528 (44) (Co); rich loose soil, open pasture, bank of ditch just above Río Frío, fruits green, obconical, tubers white, oblong, 2,745 m., October 8, 1930, Reddick 524 (38) (Co), same locality and date. fruit smooth, obconic, a few obscure white flecks, Reddick 594 (43) (Co); rich sandy loam in open field just east of Río Frío, 2,745 m., October 8, 1930, Reddick 527 (42) (Co); rich sandy loam, base of large balsam, open woods, east of Río Frío, 2,745 m., October 8, 1930, Reddick 527 (42) (Co); rich sandy loam, base of large balsam, open woods, east of Río Frío, plant 1.5 to 2.0 dm. tall, fruits smooth, green, obconic, with whitish flecks, at base of large balsam tree, about 2,745 m., October 8, 1930, Reddick 523 (31) (Co); dry bank of ditch in open good sandy loam, fruit smooth, green, oval, tubers smooth, white, about 2,745 m., October 8, 1930, Reddick 523 (31) (Co); lava rubble, under pine tree, Joco, on way up to Pico de Xitle, fruit uniform color, green, with slight vertical depression, tubers small, white, 2,650 m., October 17, 1930, Reddick 59 (108) (Co); Cerro de San Miguel, under balsam tree, tubers white, November 5, 1930, Reddick 571 (258) (Co); same locality and date, fruit green, smooth, with vertical depression, tubers white or pinkish, Reddick 572 (261) (Co); La Venta, 2,470 m., July 12, 1935, Fisher 35480 (CM, Mo, NY); along road, Monte Río Frío, 45 km. east-southeast of Mexico City, 3,050 m., July 1941, Rollins 11 (NA); lower slopes of Volcán Popocatepetl, at edge of wet forest, tubers bitter, C. L. Lundell and Amelia A. Lundell 15013 (Lun); Mount Popocatepetl, 3,050 m., with tubers, August 5–6 [no year given], Hitchcock s. n. (US); Amecameca, blue, wi cameca, slopes of Mount Popocatepetl, in rich deep humus of pine-balsam forest, plants prostrate and with leaves forming a rosette spreading on the relatively small, fruit green, abundant, tubers on some, 3,050 m., April (or August) 27, 1930, Russell and Souviron 69 (PA, US); Telapon, mountains, relatively small, fruit green, abundant, tubers on some, 3,050 m., April (or August) 27, 1930, Russell and Souviron 69 (PA, US); Telapón, mountains, July 1930, Lyonnet 712 (Mo, NY, US); Mount Popocatepetl, 3,600 m., August 7-8, 1901, Rose and Hay 6024 (US); Mount Popocatepetl, 3,300 m., August 22, 1901, Rose and Hay 6240 (US); below Paraje Provincial, Mount Popocatepetl, leaves broad-lobed, soft, hairy, loose spreading habit to 12 inches tall, in deep shade among shrubs and undergrowth in forest of Abies religiosa, 2,950 m., July 31, 1938, Balls 5154 (US); Ojos de Agua, Nevada de Toluca, flowers midpurple, up to 2 cm. in diameter, rarely opening flat, on stems up to 5.5 cm. long, leaves grayish, hairy, segments pointed, making rosettes lying flat on ground as a rule, this plant is general throughout the forest regions all along this side of the Nevada de Toluca, it appears to have a range from about 2,745 m. up to nearly 3,965 m., but in the lower altitudes the growth is apt to be more luxuriant and there may be some differences in the plants, usually in somewhat shaded places throughout the pine woods and more especially thick and hearty along the edges of potato fields which is the main crop in this country, 3,660 m., July 8, 1938, Balls 4971 [type citation of S. demissum f. tolucense] (Cam, US); (first collection April 4, 1938) Mount Popocatepetl, Paraje Provincial, the growth appears first in ground fairly recently disturbed so that the very variable depth of the tubers is probably unnatural, in the woods around there were no signs of the potato at this time, steep slopes of volcanic dust without rock or stones, flowers pale purple, first rosette of slightly hairy leaves flattened on ground surface, (second collection August 1, 1938) bushy tufted habit in shaded places or among shrubs, growing to 3 dm. tall and branching from ground surface, the plant is now all along the roadsides, in great abundance and very lush growth, in the forest and open places the growth is more flattened and rather like the origin uriant in this region, flowers purple with transparent veins and deep yellow anthers, up to 2.5 cm. in diameter, leaves grayish with short white hairs,

tufted habit, rather flattened to ground though not making a rosette, only a single tuber to each plant, called "papa cimarrona," 3,550 m., July 12, 1938, Balls 5009 [type citation of S. demissum var. mastoidostigma] (Cam, US); Molino de Flores, around trees on open slope, plants large, October 23, 1947, Correll 14209c [P. I. No. 161151 (in part)] (NA); Río Frío, on floor of balsam-pine forest, November 5, 1947, Correll 14239 through 14239b [P. I. Nos. 161117, 161166] (NA); same locality and date, rich rocky soil, plants mostly dead, Correll 14236 through 14236b [P. I. No. 161114] (NA); same locality and date, edge of a balsam-pine forest, fruits large and ovoid, compressed and speckled with white, Correll 14238 through 14238b [P. I. No. 161116 (NA); in an old field, Col. Manuel Ávila Camacho, November 5, 1947, Correll 14240 through 14240c [P. I. Nos. 161118, 161167] (NA); La Puerta, upper slopes of Nevada de Toluca, in thicket along road, plants large and straggly, badly wilted, probably an escape from cultivation, November 15, 1947, Correll 14264a and 14264b [P. I. No. 161139] (NA); same locality and date, opening in balsam forest, plants all dead, fruiting prolifically, Correll 14265a and 14265b [P. I. Nos. 161140, 161179] (NA); near Villa Hermosa, upper slopes of Nevada de Toluca, in open pine-forest clearings in dense thick humus, plants low and prostrate, mostly dead and badly wilted, tubers small and white, November 15, 1947, Correll 14266a [P. I. No. 161180] (NA); same locality and date, in openings on pine-forest slope, large colonies grow in this region, plants all dead, fruits very prolific, slope, large colonies grow in this region, plants all dead, fruits very prolific, with the odor of strawberries, November 15, 1947, Correll 14267a and 14267b [P. I. Nos. 161142, 161181] (NA); same locality and date, in open pine-forest clearings, plants all dead, apparently escaped from cultivation and well established, Correll 14268a [P. I. No. 161182 (in part)] (NA); Río Frío, in a fallow field, November 5, 1947, Correll 14237 through 14237b [P. I. Nos. 161115, 161164] (NA); Lake Zempoala, on cliff in pine-balsam forest in seepage soil, plants large, robust, flowers deep blue, November 22, 1947, Correll 14280 through 14280b [P. I. No. 161090] (NA); Río Ondito, in an old cornfield in almost pure sand, plants large, robust, badly wilted, tubers deep rich purplish red, December 11, 1947, Correll 14321a and 14321b [P. I. No. 1617021 (NA): Lakes of Zempoala, damp shaded banks, flowers purple. No. 161702] (NA); Lakes of Zempoala, damp shaded banks, flowers purple, August 11, 1940, Langman 2665 (NA, PA); Lake Zempoala, in shrub on the edge of a balsam-pine forest, plants short and sturdy, tubers well-formed and white, November 21, 1947, Correll 14279 through 14279b and 14279e [P. I. No. 161286 (in part)] (NA). MICHOACÁN: near San José de las Cumbres, in rank vegetation on edge of a balsam-pine forest, plants all dead, fruits prolific, tubers few and very small, November 14, 1947, Correll 14259a [P. I. No. 161175] (NA), same locality and date, Correll 14260a and 14260b [P. I. Nos. 161135, 161176] (NA); Macho de Agua, among maguey plants on edge of field, plants all dead, tubers purple, December 11, 1947, Correll 14322a and 14322b [P. I. No. 161703] (NA); mountains near Capacuaro, December 16, 1947, Correll 14751A (14339) [P. I. No. 161707B] (NA); San José de las Cumbres, edge of Juniper-balsam-pine forest in rich soil, plants all dead, December 12, 1947, Correll 14328b [P. I. No. 161725] (NA); same locality, in pine-balsam forest, plants all dead, fruits pale green, December 24, 1947, Correll 14378a, 14378c, 14378d [P. I. Nos. 161714 (in part), 161729] (NA); vicinity of Pino Gordo, upper slopes of mountain, plants all dead, tubers variously shaped, December 24, 1947, Correll 14379a, 14379b, 14379d [P. I. No. 161715 (in part)] (NA). MORELOS: above Tres Cumbres, in and on the edge of cornfields in mountains, plants dead or badly wilted, November 23, 1947, Correll 14283a and 14283b [P. I. Nos. 161287, 161366] (NA); above Tres Cumbres, in and about old cornfields, plants all dead, December 28, 1947, Correll 14411b [P. I. No. 161731] (NA). OAXACA: Cerro San Felipe, 3,000 m., August 15, 1897, Conzatti and Gonzales 415 (Co, Gray). PUEBLA: Cerro Pinar, 35 km. northeast of Puebla, October 2, 1930, Russell and Souviron 237 (US); Tesmalaquilla, Sierra Negra, Mount Orizaba, growing in dust-dry soil, open slopes of long uncultivated land that has at some time been used as fields, flowers very pale purple to almost white, on stems las Cumbres, edge of Juniper-balsam-pine forest in rich soil, plants all dead, time been used as fields, flowers very pale purple to almost white. on stems so short as to seem sessile in center of rosette of leaves which lie flat on the ground surface, tubers fairly regular and usually more than 3 cm. long, 3,300 m., May 5, 1938, Balls 4441 [type citation of S. demissum var. orientale] (Cam, US); above Tesmalaquilla, on upper slopes of Pico de

Orizaba, cultivated, plants all dead, red and white potatoes grown here, November 27, 1947, Correll 14286a [P. I. No. 161367] (NA); below Tesmalaquilla, growing in shade of hedgerows and along banks by trackside, in the hedges the growth reached a height of 3.0 to 4.5 dm. tall, rich loam with sandy base, between cultivation, flowers deep red purple with light color, often almost white on reverse, rather flattened spreading habit, seed not yet ripe, called "papa cimarrona," 2,800 m., August 23, 1938, Balls 5337 [type citation of S. demissum f. longifilamentosum] (US); slope of Mount [type citation of S. demissum f. longiplamentosum] (US); slope of Mount Popocatepetl, at base of ledge in rocky soil, tubers pink-tinged, pear-shaped, and compressed, November 4, 1947, Correll 14234a [P. I. No. 161161 (in part)] (NA); near Esperanza, in an old field, plants all dead, November 28, 1947, Correll 14285a [P. I. No. 161349 (in part)] (NA); Selva Obscura, in thickets in open pine forest, plants all dead, tubers small, white or with purplish tinge, January 6, 1948, Correll 14432a through 14432c [P. I. Nos. 161682, 161769] (NA). TLAXCALA: Mount Malinche, in deep shade of young and rather dense pine woods, in rotting pine needles, flowers pale mauve with deeper markings and bright-yellow anthers, 2.0 to 2.5 cm. in diameter, on stems about 5 cm. tall leaves making flat rosettes tubers diameter, on stems about 5 cm. tall, leaves making flat rosettes, tubers slightly dark colored though not red, called "papa cimarrona," 3,050 m., June 22, 1938, Balls 4893 [type citation of S. demissum f. calycotrichum] (Cam, US); Mount Malinche (from Huamantla), Portalillo, in soft sandy loam with rich humus, shade of Abies religiosa, fruits heart-shaped, pendent, flowers purple, 2 cm. in diameter, bushy, spreading plants, tubers flattened to 6 cm. long, called "papa cimarrona," 3,500 m., October 15, 1938, Balls 5648 [type citation of S. demissum f. calycotrichum] (Cam, US); cultivated at San Cristobal, plants all dead, tubers white with pink eyes, November 18, 1947, Correll 14273b [P. I. No. 161284 (in part)] (NA); Mount Malinche, in narrow barranca well up into the mountain slopes, this seemed to be a very limited area, growing in deep rich vegetable humus, among rotting leaves and branches of Pinus and Abies, in dense moist shade, flowers pale mauve, to 2.5 cm. in diameter, with darker markings and orange-yellow anthers, leaves making a flattened rosette on surface of ground, bright green and harshly hairy, 2,745 m., June 21, 1938, *Balls 4875* (US); on Mount Cuyuguen above San Agustin Tlaxco, on edge of pine-balsam forest, plants all dead, fruits rather large, tubers well-formed and white or purplish, January 7, 1948, Correll 14435a and 14435b [P. I. Nos. 161684, 161686] (NA). VERACRUZ: above Los Pescados, Cofre de Perote, growing in woods of Pinus and Abies religiosa, open patches not far from trackside, rosettes of leaves flattened to surligiosa, open patches not far from trackside, rosettes of leaves flattened to surlace of ground, single tubers to each plant, rarely 2.5 cm. in diameter, not yet
flowering, called "papa cimarrona," 3,500 m., May 25, 1938, Balls 4621 [type
citation of S. demissum f. perotanum] (Cam, US); east of Acultzingo,
upper slope of Cerro Santa Catarina, in pine forest, plants all dead, about
two tubers to each plant, some tubers large and flat and elongate with scaly
skin, November 30, 1947, Correll 14288a and 14288b [P. I. No. 161351] (NA).
STATE UNKNOWN: Mount Orizaba, July 25–26, 1901, Rose and Hay 5701
(US); Vallée de Mexico, Desierto Viéjo, September 7, 1865–66, Bourgeau 870
(Gray); in mountains, Picacho, September, Hartweg 292 (Kew); Guadalupe,
Schaffner 57 (in part) (Vienna); "Mexico," Schmitz 572 (Vienna); "Mexteo," ex Berlin-Dahlem Herbarium (Kew); slopes of Mount Orizaba, September 1828, Ehrenberg s. n. (Cal). tember 1828, Ehrenberg s. n. (Cal).

GUATEMALA.—Dept. Huehuetenango: vicinity of Chémal, summit of Sierra de los Cuchumatanes, rocky limestone outcrops around entrance to cave, in shade, corolla purple with white stripe in center of each lobe, anthers golden-colored, 3,700 to 3,750 m., August 8, 1942, Steyermark 50247 (CM, US); Cerro Chémal, summit of Sierra de los Cuchumatanes, acaulescent, corolla lavender purple with white in center, anthers golden, 3,700 to 3,800 m., August 8, 1942, Steyermark 50303 [type of S. alpicum] (CM); alpine areas in vicinity of Tunimá, Sierra de los Cuchumatanes, acaulescent, corolla dull purple, stamens golden color, 3,400 to 3,500 m., July 7, 1942, Steyermark 48369 (CM); near Chémal, Sierra de los Cuchumatanes, September 15, 1941, Johnston 1969 (CM). Dept. Sacatepéquez: slopes of Volcán de Agua, above Santa María de Jesús, damp forest, in trail, called "papa," 2,250 to 3,000 m., February 11, 1939, Standley 65276 (CM).

Probable natural hybrids involving S. demissum:

MEXICO.—DISTRITO FEDERAL: Cruz Blanca, in cornfield, plants large and robust, fruits small and mottled, tubers large, October 22, 1947, Correll 14204 through 14204b [P. I. No. 160205] (probably a natural hybrid of S. demissum × S. stoloniferum) (NA). México: Lake Zempoala, in shrub on the edge of a balsam-pine forest, plants short and sturdy, tubers wellformed and white, November 21, 1947, Correll 14279c [P. I. No. 161286 (in part)] (probably a natural hybrid of S demissum × S. stoloniferum) (NA). Morelos: Tres Marias, recent fill, roadside, plant 6 to 8 dm. tall, fruits very few, nearly white, some showing spots of green especially at base, tubers white, kidney-shaped, 3,050 m., October 28, 1930, Reddick 562 (probably a natural hybrid of S. demissum × S. stoloniferum) (Co). Puebla: above Tesmalaquilla, upper slopes of Pico de Orizaba, in corn and potato fields on upper slopes, plants all dead, (according to natives the tubers have an astringent taste when cooked, they are not eaten, all the natives told the writer that they considered this to be a natural hybrid of the cultivated plant S. tuberosum and a native species), November 29, 1947, Correll 14287a and 14287b [P. I. No. 161399] (probably a natural hybrid of S. demissum × S. tuberosum) (NA).

40. Solanum fendleri A. Gray, Amer. Jour. Arts and Sci., Ser. 2, 22: 285. 1856. (Figs. 102, 103, and 104.)

Solanum tuberosum var. boreale Gray, Syn. Fl. 2 (1): 227. 1878.

S. boreale (Gray) Bitt., Repert. Sp. Nov. 11: 459. 1912.

Plant slender to somewhat bushy, erect or ascending, 1 to 5 dm. tall, more or less pilose throughout, stoloniferous and tuber-bear-Stem simple or much-branched. Tubers small, rounded to ellipsoid, white to purplish, up to about 3 cm. long. Leaves oddpinnate, up to 25 cm. long, usually about 12 cm. long, with or without small interstitial leaflets; petioles up to 4 cm. or more long. Leaflets 5 to 9, usually 7, ovate to oblong-elliptic or rarely obovate. obtuse to acute, cuneate to truncate at the slightly oblique base, petiolulate or sometimes subsessile, the lowermost pair much reduced; lateral leaflets up to 8.0 cm. long and 3.5 cm. wide; terminal leaflet commonly larger than the lateral leaflets; petiolules up to 7 mm. long. Pseudostipular leaves semiovate, falcate, up to 1.5 cm. long. Inflorescences lateral or pseudoterminal, or both, several-flowered, racemose or paniculate, usually densely pilose and sometimes sparsely glandular; peduncle short, usually less than 4 cm. long. Pedicels up to 3 cm. long, articulate well above the middle or sometimes just below the calyx. Flowers blue or purplish to white and purple-tinged. Calyx 4 to 7 mm. long, divided to the middle or above into ovate-lanceolate to triangular-lanceolate acute to acuminate lobes. Corolla rotate-stellate, rarely more than 3 cm. in diameter; lobes sometimes reflexed, broadly triangular-ovate, subobtuse to acute. Anthers oblong-lanceolate, 3.5 to 6.0 mm. long; filaments 1 mm. long or less. Style slender, 7 to 10 mm. long, exceeding the stamens by at least 1.5 mm. Fruits orbicular, about 1 cm. in diameter.

Range: In open coniferous forests in high mountains of Colorado, Arizona, New Mexico, Texas and north-central Mexico, rarely

below 2,000 m.



Figure 102.—Solanum fendleri. Two small plants on left: Rothrock 435 from Arizona. Large plant on right: Wright 1589 (lectotype) from New Mexico. All about × %.

The type of *S. fendleri* appears never to have been clearly defined. In the original description of this species Asa Gray wrote, in part, as follows: "We have received from Dr. A. J. Myer, U. S. A. . . . a detailed communication on the discovery in western Texas of what he takes to be the common potato (*Solanum tuberosum*, L.) in a wild state, accompanied with specimens of the tubers and of the whole plant neatly dried and prepared. Dr. Myer first detected the plant on and near the Rio Limpio [present-day Jeff Davis County], and afterwards ascertained that it was pretty widely diffused throughout all that region and into New Mexico."

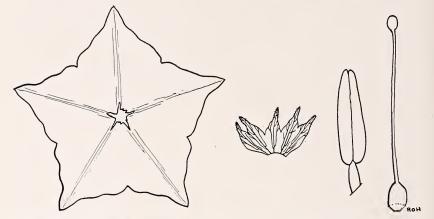


Figure 103.—Solanum fendleri (Wright 1589). Corolla and calyx, about \times 2; stamen and pistil, about \times 4.

Dr. Gray proceeded to point out the differences between this plant and the earlier described S. jamesii Torr., and named the plant S. fendleri in honor of August Fendler. Gray wrote as follows: "These wild potatoes have been known for some time. Passing by Dr. James, who gathered the one which bears his name, 36 years ago, but without knowing it was tuberiferous, we may attribute their proper discovery to that most excellent botanical explorer, Mr. Fendler, whose collection made nine years ago in the northern part of New Mexico, comprised both species, with their tubers. [Grav doubtless referred to Fendler's collection No. 669 of S. jamesii, made in 1847.] They were also gathered by Mr. Wright, in 1849, and are contained in his invaluable collection made between Eastern Texas and El Paso by the military road then opened through that region; and again in 1851 and 1852, they were gathered in various parts of New Mexico by Mr. Wright, Dr. Bigelow, and the other naturalists attached to the Mexican Boundary Commission, who recognized their near relationship to the common potato."

In the Gray Herbarium are several sheets of *S. fendleri* annotated in Gray's hand. The only collection by Dr. Myer is labeled as from New Mexico, not Texas. A collection by Charles Wright



Figure 104.—Solanum fendleri (Mearns 1635). Large-flowered form from Sonora, Mexico, and Arizona. About \times %.

(No. 1589) from "mountains at the Copper Mines, near summit, at base of rocky ledges," New Mexico, has the following interesting inscription in Gray's hand: "I suppose I took this to be of Fendler's collection, and called it *S. Fendleri* in Sill. Journal [Amer. Jour. Arts and Sci., edited by Sillman]." The label also

bears the name Solanum tuberosum var. boreale in Gray's hand. In his Synoptical Flora of North America 1, pt. 2: 227 (1886), Gray renamed his S. fendleri as S. tuberosum var. boreale Gray. Under his treatment of S. jamesii in the same work he wrote, "Seems on the whole distinct; but Fendler's No. 669 belongs here, at least in part." All of Fendler's collection No. 669 that the writer has seen is referable to S. jamesii.

On the basis of the above findings, and, in view of the lack of a definite designation of type for *Solanum fendleri*, the writer herewith designates Charles Wright's collection No. 1589 (Gray Herbarium) as the lectotype of this species. It is of interest that, in 1884, Baker also was of the opinion that Wright's collection

(No. 1589) typified this species.

Vegetatively, many plants of *S. fendleri*, *S. demissum*, *S. verrucosum*, and *S. stoloniferum* found in nature approach one another very closely, and because of this the writer has leaned heavily on the shape of the corolla for separation of plants. The corolla described here for each of the above is the basic shape for the particular species. It must be noted, however, that variations are frequent and must be taken into consideration. The broad triangular-ovate corolla lobes distinguish *S. fendleri* from the other species listed above. All of these species, however, are exceedingly variable, especially in the size of the corolla and the amount of pubescence.

Although the type has petiolulate leaflets, many of the specimens here included in *S. fendleri* have some leaflets that are sessile or essentially so. At least some of the leaflets on any plant are more or less petiolulate, which aids in separating it, vegetatively, from *S. demissum*. The leaflets are also typically obtuse to acute; those of *S. verrucosum* are usually more or less abruptly acuminate. The leaflets are fewer, usually five or seven, and broader than those in most material of *S. stoloniferum*. The flowers are more the size of typical *S. demissum*, being smaller than those of most *S. verrucosum*. There is little doubt that these several plants are confluent species and are at most only extremes of what eventually might prove to be one widespread, diverse species.

The flowers of all the specimens from Texas and of some from New Mexico match the type very closely, but the Arizona and Mexican material is on the whole extremely variable. Plants from Arizona and northern Mexico usually have a style exceeding the stamens only 2 mm. or less, while those from New Mexico and Texas usually have a style exceeding the stamens by at least 3 mm. As no other distinctive differences were found in these plants,

their segregation has not been attempted.

Two collections by Blumer (Nos. 1566 and 1579) from Barfoot Park, Chiricahua Mountains, Ariz., are extremely variable and perplexing. The writer has seen six sheets for each of these collections. Some of the plants approach S. demissum and S. verrucosum very closely in habit. In some the leaflets are essentially sessile, while in others they are conspicuously petiolulate. Some plants are short and bushy, while others are slender and erect.

The flower, however, places these plants in *S. fendleri*. It is quite possible that a thorough investigation of the wild potatoes in the Chiricahua and Huachuca Mountains of Arizona might lead to the discovery of additional species. It is the writer's belief that it would be necessary to study fresh specimens in the field to arrive at a satisfactory conclusion regarding species in these two mountain ranges.

Specimens examined:

COLORADO.—County unknown: "S. Colorado," 1888, Prof. Cassidy s. n. (CM).

ARIZONA.—Cochise County: between Fort Huachuca and San Pedro River, July 27, 1893, *Mearns 1534* (US); "An indigenous potato on the highest peaks of the Huachuca Mountains," tubers white, 2,745 m., September 21, 1882, Lemmon 2845/2 (Cal.); "A northern variety of the original Peruvian potato," Tanner's Mill and near Fort Huachuca, Huachuca Mountains, tubers purplish, July-October 1882, Lemmon 2845 (Cal, CM, Gray, US); Huachuca Mountains, July 4, 1884, Pringle s. n. (NA); near Fort Huachuca, 1891, Wilcox s. n. (US); Huachuca Mountains, August 22, 1893, Holzner 1969 (US); Chiricahua Mountains, September 15, 1896, Toumey s. n. (Gray); Barfoot Park, Chiricahua Mountains, rolling andesitic pine land, recently lumbered, 2,500 m., September 27, 1906, Blumer 1432 (Ar, CM, Dud, Gray, Mo); Barfoot Park, north slope, Chiricahua Mountains, 2,500 m., September 27, 1906, Blumer 1432a (Iowa, Mo); Barfoot Park, Chiricahua Mountains, rolling andesitic recently pine-clad area, open westward, 2,500 m., August 10, 1907, Blumer 1579 (Ar, CM, Dud, Gray, Iowa, Mo, US), July 29, 1907, 1566 (Ar, CM, Dud, Gray, Iowa, Mo, US); open flats, good soil, high altitudes Can Peak, Huachuca Mountains, July 22, 1909, Goodding 264 (Ar, Gray); Huachuca Mountains, Ramsey Canyon, August 14, 1914, Thornber 7239 (Ar); bottoms and mountainsides, Pickett Park and canyon, Chiricahua National Monument 1929, Heath II Arizona (822) (Ar); Chiricahua Mountains Plan Monument, 1939, Herb. U. Arizona 8683 (Ar); Chiricahua Mountains, Blumer 195 (Ar); Chiricahua Mountains, Barfoot Park, Blumer TR3 (Ar). GILA COUNTY: Sierra Ancha, August 26, 1928, Harrison and Kearney 5675 GILA COUNTY: Sierra Ancha, August 26, 1928, Harrison and Kearney 56/5 (US); along canyon in pine forest, Workman Creek area, about one mile below falls, Sierra Ancha Mountains, 1,670 m., August 27, 1946, Gould 3735 (Ar). GRAHAM COUNTY: Mount Graham, 2,800 m., August 1874, Rothrock 436 (CM, Gray). PIMA COUNTY: Santa Rita Mountains, Madera Canyon, August 1902, Mr. and Mrs. J. J. Thornber (Ar); North slope of Santa Rita Mountains, September 13 to 21 1904, Griffiths 7265 (Mo); Santa Catalina Mountains, Webber's Ranch, August 6, 1908, Livingston and Thornber 5992 (Ar); Santa Catalina Mountains Marshall Gulch August 23, 1908, Shreve 8, M. Santa Catalina Mountains, Marshall Gulch, August 23, 1908, Shreve s, n. (CM); on trail east of camp, near Hunternan's, July 29, 1911, J. G. Brown 103 (Ar); Santa Catalina Mountains, August 22, 1931, Harrison and Kearney 8057 (CM). SANTA CRUZ COUNTY: Walnut Canyon, September 11-12, 1910, Pilsbry s. n. (PA); Santa Rita Mountains, September 20 to October 4, 1902, Griffiths and Thornber 102 (US); Patagonia Mountains, August 18, 1928, Peebles et al. 5598 (US); Santa Rita Mountains, August 23, 1936, Arnold and Darrow s. n. (Gray); along trail from White House Canyon to Mount Wrightson, Santa Rita Mountains, 2,440 m., August 12, 1945, Parker et al. 5844 (Ar).

NEW MEXICO.—Dona Ana County: chiefly in the Valley of the Rio Grande, below Dona Ana, Parry et al. s. n. (US); Organ Mountains, Van Pattens, August 26, 1894, Wooton s. n. (US); Organ Mountains, August 29, 1892, Wooton s. n. (US); Organ Mountains, Filmore Canyon, September 48, 1976, Wooton s. n. (US); Organ Mountains, 2,440 m., September 23, 1906, Wooton and Standley s. n. (US). Grant County: mountains at the Copper Mines, near summit, at base of rocky ledges, 1851–52, C. Wright 1589 (lectotype collection of S. fendleri] (Gray, Mo, PA, US); Pinos Altos Mountains, September 15, 1880, Greene s. n. (NY, PA); Pinos Altos Mountains, August 13, 1895, Mulford 885 (Mo); Hanover Mountains, August 27 to September 12, 1911, Holzinger s. n. (US); moist conifer woods along Black Creek in Black Mountains, 1,830 m., August 28, 1924, Archer 349 (Mich).

HIDALGO COUNTY: Animas Mountains, Indian Cañon, 1,830 m., August 7, 1908, Goldman 1395 (US). LINCOLN COUNTY: White Mountain, 2,650 m., July 6, 1895, Wooton s. n. (Dud, US). OTERO COUNTY: James Cañon, Sacramento Mountains, August 3, 1899, Wooton s. n. (Ar, Cal, Dud, Mich, US); along Tularosa Creek, August 18, 1899, Wooton s. n. (US); Ruidoso Creek, in or near the Lincoln National Forest, 1903, Plummer s. n. (US); Cloudcroft, Lincoln Forest, 2,700 m., July 1-8, 1918. Eggleston 14524 (Gray, NA, US); Cloudcroft, 2,600 m., August 18, 1919, Eggleston 15595 (CM); Cloud-



FIGURE 105.—Solanum fendleri var. physaloides (L. R. Stanford, K. L. Retherford, and R. D. Northcraft 743). Type collection. About × %.

croft, 2,745 m., August 18, 1939, Hershey s. n. (Iowa). SAN MIGUEL COUNTY: Hot Springs Cañon, above Las Vegas, September 12, 1881, Engelmann s. n. (Mo). Socorro County: bottoms of cañons, along streams, August 1881, Rusby 313 (CM, Co, Mich); Mogollon Mountains, Eagle Peak, August 2, 1900, Wooton s. n. (US); Mogollon Mountains, west fork Gila River, 2,280 m., August 28, 1903, Metcalfe 838 (Cal, Mo, US); White Creek Ranger Station, Gila Forest, 2,540 m., August 1, 1920, Eggleston 16876 (CM, US). County UNKNOWN: no locality given, Dr. Myer 1-8 (Gray); Alamo National Forest, Haynes Canyon, in forest meadow, August 10, 1911, Barlow s. n. (CM); Puerto de Paysano, Bigelow s. n. (NY).

TEXAS.—Brewster County: in protection of oaks in rich soil, Paradise Valley, about 5 miles west of Alpine, September 22, 1935, Sperry T89 (US). Culberson County: Guadalupe Mountains, August 23, 1901, Bailey 456 (US). Jeff Davis County: north slope, Mount Livermore, August 5, 1935, Hinckley 293 (CM); Mount Livermore, moist thick humus of north slope in pine-oak forest, 2,300 m., August 5, 1935, and August 16, 1936 (from Limpia Canyon), Hinckley s. n. (Ar, Gray). Presidio County: Chinati Mountains, 1889, Nealley 586 (341) (US).

MEXICO.—BAJA CALIFORNIA: San Francisquito Mountains, 1890, Brandegee 411 (Cal); El Taste, September 13, 1893, Brandegee s. n. (Cal). CHIHUAHUA: La Bufa, September 3, 1887, Pringle s. n. (NA); near Colonia Garcia, Sierra Madre, June 21—July 29, 1899, Nelson 6166 (Gray, US); near Colonia Garcia, Sierra Madre, 2,280 m., July 27, 1899, Townsend and Barber 172 (Cal, CM, Gray, Mo, NY, US); Majalca, August 20, 1935, LeSueur Mex-148 (CM, Gray); Mojarachic, July 29, 1938, Knobloch 5232 (CM); Majalca (Pilares) 40 miles northwest of Chihuahua, flowers purple, 2,050 m., August 11, 1939, White 2380 (Ar, Gray, Mich). Nuevo León: common in the moist wooded arroyo, the Cañon below Las Canoas on Cerro Potosi, Municipio de Galeana, flowers purple, July 20, 1935, Mueller 2215 (CM, Gray, Mich). Sonora: region of Río de Bavispe, Puerto de los Aserraderos, Rancho de Cruz Díaz, pine land burned over, June 1939, flowers purple, August 13, 1940, White 3284 (Gray); region of Río de Bavispe, Cañon Internacional, flowers purple, August 23, 1940, White 2498 (Mich); San José Mountains, flowers purple, a white-flowering potato grows on mountains farther east—quite a different species [doubtless S. jamesii], August 3, 1893, Mearns 1599 (US), same locality, August 5, 1893, Mearns 1635 (Dud, US), same locality, this potato grows all over the higher peaks of the Huachuca and San José Mountains, "I saw it on their highest summits," August 10, 1893, Mearns 1752 (Dud, US). Zacatecas: limestone ledges below Aranzazu, Sierra Madre Oriental, corolla violet, mulberry purple, anthers waxy, light cadmium, 2,500 to 2,600 m., July 19, 1934, Pennell 17440 (US).

41. Solanum fendleri var. physaloides Correll var. nov. 12 (Figs. 105 and 106.)

This is a robust, glabrescent variant of *S. fendleri* that also may be geographically isolated from the typical form, the nearest stations for which are in Chihuahua, Mexico, and the Chisos Mountains of Texas. All the plants comprising the five sheets which represent the type collection are larger than any plants of *S. fendleri* known to the writer. They are essentially glabrous and have five, rarely three, leaflets. The flowers are pale blue, marked with yellow along the center of the petals and, except for being somewhat larger, are similar in shape to those of *S. fendleri*. The characteristic from which the name of this variety is derived would be remarkable in this genus if it proved to be constant; that is, the investment of the fruit by the calyx (fig. 106) as in

¹² Herba robusta, glabrescens. Foliola quinque, vel raro tria. Flores pallide caerulei. Fructus globosi, calyce aliquando cincti.

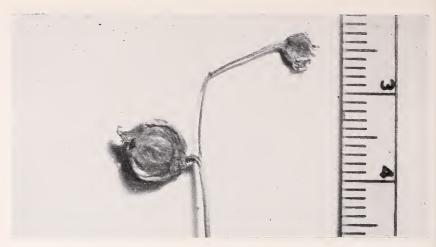


Figure 106.—Solanum fendleri var. physaloides (L.R. Stanford et al. 743), showing the investment of the fruit by the calyx. About × 2.

the genus *Physalis*. It is unfortunate that only one immature fruit was found produced on an aborted pedicel, a fact that might place this variety in a freak category. The young fruit is only 8 mm. in diameter, but it is completely invested in the bladderlike calyx whose five tips are pinched together over the apex of the orbicular fruit.

Range: Apparently isolated in Tamaulipas, Mexico.

It is hoped that some collections with mature fruits will be forthcoming from this station in Tamaulipas in the near future so that the calyx characteristic can be verified.

Specimens examined:

MEXICO.—TAMAULIPAS: on mountainside with sparse vegetation of *Agave* and low herbs, 4 km. west of Miquihuana, flowers blue and yellow, 2,700 m., lat. 23° 42′ N., long. 99° 45′ W., August 7, 1941, *L. R. Stanford*, *K. L. Retherford*, and *R. D. Northcraft 743* [type in Dudley Herbarium, Stanford U., No. 289342; isotypes: Ar, Gray, Mo, NY].

42. Solanum leptosepalum Correll sp. nov. 13 (Figs. 107 and 108.)

Plant slender, lax, 3 dm. or more tall (only upper part seen), essentially glabrous or sparsely pilose throughout, probably tuberbearing. Leaves odd-pinnate, up to 18 cm. long; interstitial leaf-

¹³ Herba 3 dm. vel plus alta, gracilis laxaque, tuberifera probabiliter, plusminusve glabra vel omnino, parce pilosa. Folia imparipinnata; laminae inter foliola minutae. Foliola quinque cum pari infimo multo redacto, late ovata vel elliptico-ovata, obtusa vel acuminata, petiolulata. Inflorescentia pseudoterminalis, cymoso-paniculata, pauciflora. Pedicelli super medium articulati. Flores purpureocaerulei. Calyx 6–8 mm. longus, in lobos ovatolanceolatos longe acuminatos circiter usque ad in medio vel infra medium divisus. Corolla rotata, circiter 2.5 cm. in diametro, lobi circiter 3 mm. longi, cum textu inter petala conspicue elevato. Antherae lineari-oblongae. Stylus infra medium dense granuloso-puberulentus, circiter 1 cm. longus. Fructus globosus, circiter 1.5 cm. in diametro.



FIGURE 107.—Solanum leptosepalum (Marsh 1962). Type collection. About \times %.



Figure 108.—Solanum leptosepalum (Marsh 1962). Corolla and Calyx, about \times 2; stamen and pistil, about \times 4.

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lets minute, oblong to spatulate; petioles up to 5 cm. long. Leaflets 5, very irregular, broadly ovate to elliptic-ovate, obtuse to abruptly acuminate, broadly rounded to subcordate at the oblique base, the lowermost pair much reduced, petiolulate; lateral leaflets up



FIGURE 109.—Solanum nannodes (Pennell 19645). Type collection. About $\times \frac{9}{5}$.

to 7 cm. long and 3.5 cm. wide; terminal leaflet much larger than the lateral leaflets. Pseudostipular leaves auriculiform, about 1 cm. long. Inflorescence pseudoterminal, few-flowered, cymosely paniculate; peduncles 3.5 cm. long. Pedicels about 1.2 cm. long, articulate above the middle. Flowers purplish lavender. Calyx 6 to 8 mm. long, divided to about or below the middle into ovatelanceolate long-acuminate lobes. Corolla rotate, about 2.5 cm. in diameter, with lobes about 3 mm. long, the interpetalar tissue prominently raised. Anthers linear-oblong, 5 to 6 mm. long; filaments about 1 mm. long. Style 1 cm. long, densely granulose-puberulent below the middle. Fruits orbicular, about 1.5 cm. in diameter.

Range: Coahuila, Mexico.

The long attenuate sepals, rotate corolla, and granulose-puberulent style are a combination of characteristics which distinguish this species from others in this series.

Specimen examined:

MEXICO.—COAHUILA: Monclova, Gloria Mountains, August 4, 1939, Ernest G. Marsh 1962 [type collection in Chicago Natural History Museum, No. 1219212].

43. Solanum nannodes Correll sp. nov. 14 (Figs. 109 and 110.)

Plant small, erect or erect-ascending, 8 to 15 cm. tall, more or less sparsely pilose throughout (except the calyx and pedicel above the articulation), stoloniferous and probably tuber-bearing (none seen). Stem very slender. Leaves odd-pinnate, 3 to 5 cm. long including the petiole, which is 5 to 15 mm. long, without interstitial leaflets. Leaflets usually 5 (immature leaves simple or with 3 leaflets), orbicular-ovate to ovate-elliptic, obtuse to acute, subsessile or shortly petiolulate, up to 2.5 cm. long and 1.7 cm. wide, the lower pair much reduced; terminal leaflet much larger than the lateral leaflets. Pseudostipular leaves minute, auriculiform. Inflorescence pseudoterminal, few-flowered (up to 4), racemose; peduncles slender, up to 3 cm. long, provided with a leaf just below the first flower. Pedicels slender, up to 1.3 cm. long, conspicuously articulate at about the middle, glabrous above the articulation. Flowers violet. Calyx 3 to 4 mm. long, glabrous, divided to about the middle into ovate-lanceolate acute lobes. Corolla rotate-stellate, 1.5 to 2.0 cm. in diameter, the sinus between the lobes obscured by pleating of the interpetalar membrane;

¹⁴ Herba parva, 8-15 cm. alta, erecta vel erecto-adscendens, stolonifera et tuberifera ut videtur, omnino plusminusve parce pilosa. Folia imparipinnata, sine laminis inter foliola. Foliola quinque cum pari infimo multo redacto, subsessilia vel breviter petiolulata, orbiculari-ovata vel ovato-elliptica, obtusa vel acuta, usque ad 2.5 cm. longa, cum foliola terminali quam foliolis lateralibus multo majore. Inflorescentia pseudoterminalis, racemosa, pauciflora. Pedicelli graciles, circiter in medio prominenter articulati, super articulationem glabri. Flores violacei. Calyx 3-4 mm. longus, glaber, in lobos ovato-lanceolatos, acutos usque ad prope medium divisus. Corolla rotato-stellata, usque ad 2 cm. in diametro cum lobis late ovatis et acutis. Antherae 3.5-4 mm. longae, oblongae. Stylus 5 mm. longus. Fructus non visus.



Figure 110.—Solanum nannodes (Pennell 19645). Corolla and calyx, about \times 2; stamen and pistil, about \times 4.

lobes broadly ovate, somewhat abruptly contracted into the triangular acute apex. Anthers 3.5 to 4.0 mm. long, oblong in outline; filaments less than 1 mm. long. Style 5 mm. long. Fruit not seen.

Range: Sonora, Mexico.

As the specific name implies, this is a very small plant—the smallest known from our region. This species is related most closely to *S. fendleri*, but the small, somewhat differently shaped corolla as well as the general smallness distinguish it from that species.

Specimen examined:

MEXICO.—Sonora: Cerro Saguarivo, east of San Bernardo, Pacific slope, thin soil over rocks, corolla violet, 1,500 to 1,700 m., August 7-8, 1935, F. W. Pennell 19645 [type in U. S. National Herbarium].

44. Solanum papita Rydb., Torrey Bot. Club Bul. 51: 148. 1924. (Figs. 111 and 112.)

Plant usually small and erect, sometimes bushy and spreading, rarely more than 2.5 dm. tall, more or less pilose throughout, stoloniferous and tuber-bearing. Leaves odd-pinnate, up to 15 cm. long; interstitial leaflets usually present, small; petioles up to 4 cm. long. Leaflets 7 or 9, rarely 5, ovate to ovate-elliptic, obtuse to acute or shortly acuminate, rounded to broadly cuneate or subcordate at the oblique base, petiolulate; lateral leaflets up to 4 cm. long and 2 cm. wide, the lowermost pair or pairs much reduced; terminal leaflet sometimes larger than the lateral leaflets. Pseudostipular leaves lunate, up to 1.2 cm. long. Inflorescence pseudoterminal or lateral, few-flowered, racemose or cymosely paniculate; peduncle up to 6 cm. long. Pedicels 1.0 to 1.5 cm. long, articulate well above the middle, often glabrous above the articulation. Flowers bluish violet or purplish. Calyx 4 to 6 mm. long, more or less pilose with coarse hairs, divided to about the middle into broadly triangular to ovate-lanceolate obtuse to acute lobes. Corolla rotate-stellate, about 1.2 cm. in diameter; lobes broadly



Figure 111.—Solanum papita (Palmer 392). Type collection. About \times %.

triangular, subacute, rather prominent. Anthers oblong, 3 to 4 mm. long; filaments less than 1 mm. long. Style about 7.5 mm. long, exceeding the stamens by about 2 mm. Fruits orbicular, about 1 cm. in diameter.

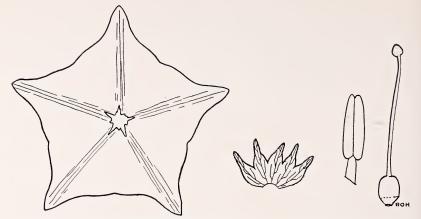


FIGURE 112.—Solanum papita (Palmer 392). Corolla and calyx, about \times 2; stamen and pistil, about \times 4.

Range: Durango and San Luis Potosí, Mexico.

Both vegetatively and florally this plant is intermediate between S. fendleri and S. stoloniferum. Its most distinctive feature is its small corolla with rather broadly triangular lobes. At most, it is an extremely weak species. It has been maintained here, however, more as a matter of convenience to provide a category for those plants that do not readily fall into either S. fendleri or S. stoloniferum. It is quite possible that further study will reveal that S. papita is a hybrid of the above-mentioned species.

Specimens examined:

MEXICO.—DURANGO: Otinapa, July 25-August 5, 1906, E. Palmer 392 [type collection of S. papita] (CM, Mo, NY, US). SAN LUIS POTOSÍ: San Luis Potosí, wild, 1878, Parry 9 (Gray); chiefly in the region of San Luis Potosí, called by the natives, "peyrilla del monte," 1,830 to 2,440 m., 1878, Parry and Palmer 632 (in part) (CM, Gray, Iowa), same locality and date (also rocky hill near Guadalupe), Parry and Palmer 633 (in part) (Mo); in mountains about San Luis Potosí, called "peyrilla del monte" by natives, 1876, Schaffner 693 (Gray, Kew, NY, PA).

45. Solanum polytrichon Rydb., Torrey Bot. Club Bul. 51: 150. 1924. (Figs. 113, 114, 115, and 116.)

Plant erect or bushy and spreading, up to about 4.5 dm. tall, usually much less, provided with long leaves on the lower half of stem, more or less glandular-pubescent throughout with long white crisp hairs (especially on the stem near the base), stoloniferous and tuber-bearing. Leaves odd-pinnate, up to 17 cm. long, usually with 5 or more interstitial leaflets. Leaflets 5 to 9, ovate to ovate-elliptic, occasionally suborbicular or oblanceolate, obtuse to acute, rounded at the oblique base, shortly petiolulate, sometimes with the upper pair sessile or decurrent on the rachis; lateral leaflets up to 5.5 cm. long and 2.5 cm. wide; terminal leaflet usually slightly longer than the lateral leaflets. Interstitial leaflets sessile, ovate, obtuse, up to 7 mm. long. Pseudostipular leaves lunate, up to 1.5



Figure 113—Solanum polytrichon (Parry and Palmer 632). Type collection. About \times %.

cm. long. Inflorescence pseudoterminal or lateral, few- to many-flowered (as many as 15), cymosely paniculate; peduncles (and pedicels) up to 8 cm. long, densely glandular-pubescent. Pedicels up to 2 cm. long, articulate above the middle or just below the calyx. Flowers white or purple-tinged or blue. Calyx about 5 mm. long, lobed to about the middle; lobes ovate-elliptic to ovate-lance-olate, obtuse to acute of sometimes acuminate. Corolla rotate-stellate, 1.5 to 2.0 cm. in diameter; lobes broadly triangular,

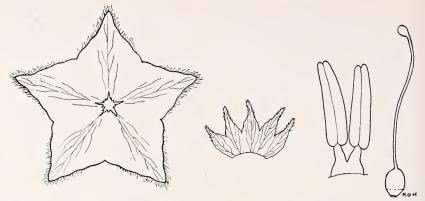


FIGURE 114—Solanum polytrichon (Pringle 3499). Corolla and calyx, about × 2; stamen and pistil, about × 4.

pubescent. Anthers oblong-lanceolate, 4 to 5 mm. long; filaments about 1 mm. long, sometimes united below the middle. Style slender, 6 to 10 mm. long, exceeding the stamens. Fruits orbicular, about 1 cm. in diameter.

Range: North-central Mexico, on high plains and mountains. Vegetatively, the plants comprising this species resemble those of *S. stoloniferum*, *S. fendleri*, and, in some instances, *S. demissum*. They are, however, typically coarsely pubescent, especially the lower part of the stem and the inflorescence (the latter is also usually conspicuously glandular), and the corolla has the shape of *S. fendleri*. There is little doubt that this species, along with the ones noted above, comprise a complex group of closely interrelated plants which freely hybridize.

Palmer's collection (No. 484) from Tejamén, Durango, is here cited as a putative hybrid of *S. polytrichon* and *S. stoloniferum*. This collection consists of four sheets. Vegetatively, the plants approach most closely those of *S. polytrichon*. Some of the flowers, however, have corollas (fig. 116) similar to those of *S. stoloniferum*.

niferum.

Specimens examined:

MEXICO.—CHIHUAHUA: in shade of cliffs, rocky hills near Chihuahua, August 29, 1885, Pringle 667 (CM, Gray, NA, NY, PA, US). COAHUILA: Sierra Mojada, Cañon de San Salvador, flowers white, single tuber to 2.5 cm. in diameter, sparse in moist canyon, September 14, 1939, Müller 3308 (Cal, NA). San Luis Potosí: chiefly in the region of San Luis Potosí, 1,830 to 2,440 m., 1878, Parry and Palmer 632 (US [type sheet No. 42677 of S. polytrichon]), 632 (in part) (Gray, Iowa, Kew, Mo, PA), same locality and date (also rocky hills near Guadalupe), Parry and Palmer 633 (in part) (Gray, Iowa, Mo, PA); in mountains about San Luis Potosí, flowers white or sometimes blue, August 1876, Schaffner 694 (Gray). ZACATECAS: a common weed in cultivated fields, plains about La Honda, August 19, 1890, Pringle 3499 (Gray, NA).

Probable natural hybrid involving S. polytrichon:

MEXICO.—DURANGO: Tejamén, August 21-27, 1906, E. Palmer 484 (probably a natural hybrid of S. polytrichon \times S. stoloniferum) (CM, Gray, NY, US).



Figure 115.—Solanum polytrichon (Pringle 3499). An erect form. About × %.

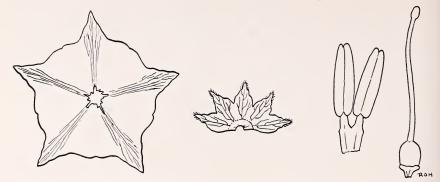


FIGURE 116.—Putative hybrid of S. polytrichon \times S. stoloniferum (Palmer 484). Corolla and calyx, about \times 2; stamen and pistil, about \times 4.

46. Solanum stoloniferum Schlecht., Linnaea 8: 255. 1833; Schlecht. & Bouché, Verhandlung des Vereins zur Beförderung des Gartenbaues in den Königlich Preussischen Staaten. 9: 319, pl. 2. 1833. (Figs 117, 118, 119, 120, 121 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, and 139.)

Solanum longipedicellatum Bitt., Repert., Sp. Nov. 11: 457. 1912.

S. longipedicellatum var. pseudoprophyllum Bitt., Repert. Sp. Nov. 11: 548. 1912.

S. ajuscoense Buk. ex Rybin, Bul. Appl. Bot., Genet., and Plant Breeding [Leningrad], 2nd ser., 20: 699. 1929. Type locality: Mexico, Distrito Federal: near village of Ajusco, Volcán Xitle, 3,100 to 3,200 m., M. and M. Antipovich.

S. antipovichi Buk. ex Rybin, Bul. Appl. Bot., Genet., and Plant Breeding [Leningrad], 2nd ser., 20: 700. 1929. Type locality: Mexico, Distrito Federal: stony ridge, Tlaxpehualco [Tlaxipehualco?], August 26, 1926, M. and M. Antipovich.

S. vallis-mexici Juz. ex Buk., Bul. Appl. Bot., Genet., and Plant Breeding [Leningrad], Suppl. 47: 60, 480. 1930 (as Vallis Mexici), nomen nudum; Bul. Acad. Sci. U. R. S. Sar Biol 2: 315, 1937

S., ser. Biol., 2: 315. 1937.

S. neoantipovichi Buk., Bul. Appl. Bot., Genet., and Plant Breeding [Leningrad], Suppl. 47: 217, fig. 111. 1930 (as S. neo-Antipoviczii). Type locality: Mexico.

S. candelarianum Buk., Bul. Appl. Bot., Genet., and Plant

S. candelarianum Buk., Bul. Appl. Bot., Genet., and Plant Breeding [Leningrad], Suppl. 47: 60, 218. 1930. Type locality: Mexico.

S. ajuscoense var. candelarianum Hawkes, Potato Coll. Exped. Mexico and S. Amer. 2: 33. 1944, nomen nudum.

S. antipovichi var. neoantipovichi (Buk.) Hawkes, Potato Coll. Exped. Mexico and S. Amer. 2: 35. 1944.

S. longipedicellatum var. longimucronatum Hawkes. Potato Coll. Exped. Mexico and S. Amer. 2: 32, 117, fig. 12. 1944.

S. malinchense Hawkes, Potato Coll. Exped. Mexico and S. Amer. 2: 32, 117, figs. 13-15. 1944.

S. tlaxcalense Hawkes, Potato Coll. Exped. Mexico and S. Amer. 2: 33, 117, figs. 16, 17. 1944.

Plant erect or bushy, up to 8 dm. or more tall, more or less pilose throughout, also usually somewhat glandular, stoloniferous and tuber-bearing. Stem erect or decumbent, simple or much-branched. Tubers usually of good size and well-shaped, purple or white with a purple tinge, up to 4 cm. in diameter. Leaves odd-pinnate, up to 27 cm. long, varying from densely pilose and cinerascent to glabrous and deep shiny green, with or without interstitial leaflets (these frequently numerous); petioles up to 4.5 cm. long. Leaflets 7 to 11, usually at least some prominently petiolulate; lateral leaflets ovate, ovate-elliptic to elliptic or ovate-lanceolate, cuneate to rounded or cordate at the oblique base, obtuse to shortly acuminate, up to 6 cm. long and 3 cm. wide; terminal leaflet sometimes slightly larger, obovate to broadly elliptic and sometimes rhomboid. Pseudostipular leaves lunate, up to about 1.5 cm. long. Inflorescences pseudoterminal or lateral, commonly exceeding the leaves, many-flowered, usually cymosely paniculate; peduncles bifurcate, up to 7 cm. long, usually densely pilose and often with small, short, stipitate glands. Pedicels 1.5 to 3.5 cm. long, usually articulate far above the middle, usually densely pilose below the articulation and subglabrous to glabrous above the articulation. Flowers typically white but pale blue, purple, or purple-tinged flowers not uncommon. Calyx 5 to 9 mm. long, divided to about the middle into triangular-ovate to lanceolate acute to acuminate lobes, which are sometimes constricted at about the middle. Corolla rotate-stellate, usually 2 to 2.5 cm. in diameter; lobes typically reflexed, subglabrous to pilose on the outer surface, prominent (up to 6 mm. long). Anthers oblong-lanceolate in outline, 5 to 6 mm. long; filaments up to 2 mm. long. Style 8 to 10 mm. long, exceeding the stamens, sometimes puberulent below the middle. Fruits orbicular, green, commonly striped or mottled with dark green or deep purple.

Range: Frequent in the high mountains of central Mexico, less frequent northward to Coahuila and southward to Oaxaca; usually

above 2,000 m., sometimes over 3,000 m.

In 1833 (Linnaea 8: 255), Schlechtendahl described as S. stoloniferum a Mexican collection of Schiede and Deppe (No. 192), which he and A. De Candolle had previously placed in Solanum tuberosum (Linnaea 5: 111. 1830.) when they first reported the Mexican collections of Schiede and Deppe. This plant was collected in September and was said to occur wild at the foot of Mount Orizaba, on the mountain itself, and near Lake Huetulaca. When he described S. stoloniferum, Schlechtendahl stated that the plant would be illustrated and described in Verhandlung des

Gartenbau-Vereins fur Preussen, Bd. 9, which was subsequently published the same year, 1833. The plant illustrated there was grown in the Berlin-Dahlem Garden from tubers that were collected by Schiede and Deppe on June 29 at Malpays de la Joya,

Veracruz, Mexico.

The writer has examined the type of *S. stoloniferum* (fig. 117) (*Schiede* and *Deppe 192*) and finds that, superficially, it has little in common with the plant illustrated and described as *S. stoloniferum* (fig. 118) by Schlechtendahl and Bouché, as noted above. The type is a dwarf plant, about 10 cm. tall, with two pairs of petiolulate lateral leaflets and occasionally with an additional minute pair near the base of the leaf. There are no conspicuous interstitial leaflets, and the peduncle is abbreviated. The plant illustrated as *S. stoloniferum* (fig. 118) by Schlechtendahl, probably based on plants similar to those represented by herbarium specimens (which the writer has seen) in the Vienna Museum Herbarium (fig. 119) and elsewhere (fig. 120), is large, with three distinct pairs of petiolulate leaflets (sometimes with secondary leaflets on the petiolule) and numerous interstitial leaflets and a long-pedunculate inflorescence.

Although there is a tremendous difference in the actual type specimen collected in nature and the plant cultivated from tubers and used by Schlechtendahl to illustrate and more or less typify this species, the writer's investigations have borne out that this difference in the wild and cultivated plants noted above is to be expected (see figs. 136, 137, 138). The English worker, Hawkes, experienced this difficulty when he described *S. malinchense* and *S. tlaxcalense* (see figs. 131, 132, 133, 134). Although the type specimen of *S. stoloniferum* and the plant used by Schlechtendahl to illustrate this species are strikingly different, especially in size, the writer finds that the corolla and petiolulate leaflets of the type are basically similar to those of the cultivated plant illustrated by Schlechtendahl, and he has adopted these two phases, as it were,

as the basis for his concept of this species.

Bitter proposed the var. pseudoprophyllum (fig. 121), based on the inflorescence possessing false bracts, as the name implies, at the time he described S. longipedicellatum (figs. 122, 123). This characteristic does not hold, as some of the plants comprising the type collection of S. longipedicellatum also have these so-called false bracts. The series of specimens of the type collection of var. pseudoprophyllum, however, are mostly densely pilose, especially the leaves and peduncle, and the dried plant has a gray-ish-green color in contrast to the deep green of most of the type series of S. longipedicellatum. Here again, however, these characters do not hold, as several sheets (CM, Mo, NY, US) of the type collection of S. longipedicellatum are conspicuously pilose and, in two sheets, are grayish green in color. It would seem to be best to point out only these variations and not attempt their taxonomic segregation. One plant (Mo), in particular, of the type collection of S. longipedicellatum is identical to the plant illustrated as S. stoloniferum (fig. 118).



Figure 117.—Solanum stoloniferum (Schiede and Deppe 192). Type collection. About \times 1.



FIGURE 118.—Solanum stoloniferum. Plant about \times ½; seedlings (fig. 2), about \times ½; flower (fig. 4), about \times ½; stamen (fig. 3), enlarged; fig. a, a young plant (seedling) of Solanum tuberosum, \times ½; fig. b, stamen of S. tuberosum, enlarged; fig. c, flower of S. tuberosum, \times ½; fig. d, fruit of S. tuberosum, \times ½. From Schlechtendahl.



FIGURE 119.—Solanum stoloniferum (Scheide and Deppe s. n.). Plant cultivated, in Herb, Lambert. About \times %.



FIGURE 120.—Solanum stoloniferum. Plant cultivated, in Herb. Basil, September 1837. About \times $^2\%$.



Figure 121.—Solanum stoloniferum (Pringle 8571). Type collection of S. longipedicellatum var. pseudoprophyllum. About \times %. 956658-52-12



Figure 122.—Solanum stoloniferum (Pringle 8602). Type collection of S. longipedicellatum. About \times %.

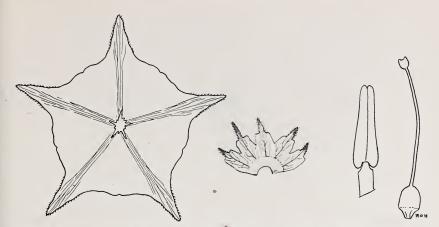


FIGURE 123.—Solanum stoloniferum (Pringle 8602). Corolla and calyx, about × 2; stamen and pistil, about × 4.

In 1929, Bukasov described a plant from Distrito Federal, Mexico, as *S. antipovichi* (figs. 124, 125). It is interesting that Juzepczuk, one of Bukasov's coworkers, stated in 1937 that "This species is closely related (if not identical) to *S. longipedicellatum*." Later, in 1939, Bukasov considered that his *S. antipovichi* was a collective species which not only included *S. antipovichi*, in a strict sense, but also his *S. ajuscoense* (figs. 126, 127).

In 1937, after having stated that S. antipovichi was probably identical to S. longipedicellatum, Juzepczuk commented regarding S. ajuscoense, "Likewise closely related to S. longipedicellatum

Bitt."

Judging from the descriptions and illustrations of both *S. anti-*povichi and *S. ajuscoense* and a comparison of these with *S. sto-*loniferum (*S. longipedicellatum*), the writer is inclined to go even further than Juzepczuk and consider them to be inseparable from

that species.

A critical study of the illustrations and incidental description of *S. neoantipovichi* (figs. 128, 129) has convinced the writer that it, too, is probably synonymous with *S. stoloniferum*. Some reservations should be made, however, in regard to *S. neoantipovichi*, as some of the plants placed here by Bukasov might have been referred.

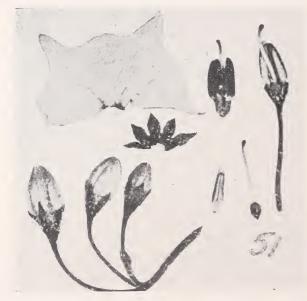
erable to S. verrucosum (see fig. 152).

The writer has seen a specimen of *S. vallis-mexici* (fig. 130) that was grown at Leningrad, U. S. S. R., from tubers of type material collected by Antipovich (Nos. 12 and 14). It is referable to this species. It is the writer's opinion that when it is possible to check the identity of *S. candelarianum* it will be found to be referable to this species, to which it is here tentatively referred.

In describing S. malinchense (fig. 131), Hawkes stated: "Quite closely related to S. longipedicellatum Bitt. from which it differs in the shorter leaves, more numerous interjected leaflets, smaller



Figure 124.—Solanum stoloniferum. Illustration of plant of S. antipovichi. From Bukasov.



 $\begin{tabular}{ll} Figure 125. — Solanum stoloniferum. Illustration of flowers of S. antipovichi. \\ From Bukasov. \\ \end{tabular}$



FIGURE 126.—Solanum stoloniferum. Illustration of a plant of S. ajuscoense. From Bukasov.



Figure 127.—Solanum stoloniferum. Illustration of inflorescence of S. ajuscoense. From Bukasov.



FIGURE 128.—Solanum stoloniferum. Illustration of plant of S. neoantipovichi. From Bukasov,

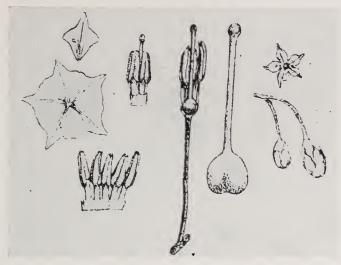


Figure 129.—Solanum stoloniferum. Floral analysis of S. neoantipovichi. From Bukasov.

primary leaflets, shorter pedicels, central pedicel articulation, larger corolla which is of a bluish-purple color and longer filaments Although S. malinchense does not differ in very many characters from S. longipedicellatum, the differences are as well marked as those between the other species in this series created by Bukasov. One is therefore justified in giving it specific rank, at any rate until we have the opportunity of studying more material from the original locality of S. longipedicellatum."

The writer cannot, of course, agree with the above philosophy in dealing with the taxonomy of this group, especially since he considers the systematic work of the Bukasov school to be wellnigh inexcusable. It is true that the pedicel of the type collections of S. longipedicellatum is articulate well above the middle, but this does not hold when S. stoloniferum is considered in a broad sense. The articulation is always about or above the middle. In this species this characteristic is no more variable than in the majority of species comprising this series.

Hawkes stated that S. malinchense has shorter leaves and more numerous interjected (interstitial) leaflets than S. longipedicellatum. A glance at the illustrations of these two will show that this is not the case. The cultivated plants (fig. 131) which Hawkes used to illustrate S. malinchense have leaves that are almost identical to those of some of the type collections of S. longi-

pedicellatum.

The leaves of the plants of S. malinchense collected in the field in Mexico (fig. 132) are almost identical in outline to those of the cultivated plants of S. tlaxcalense. They have, however, very few minute interstitial leaflets, and in some leaves these are entirely lacking.



Figure 130.—Solanum stoloniferum (Antipovich 12 and 14). Type collection of S. vallis-mexici. About \times %.



Figure 131.—Solanum stoloniferum (Balls and Gourlay 4864). Type collection of S. malinchense (cultivated plant). About \times %.



FIGURE 132.—Solanum stoloniferum (Balls and Gourlay 4864). Type collection of S. malinchense (plant from nature in Mexico). About \times $\frac{2}{6}$.

In describing S. tlaxcalense (fig. 133) Hawkes stated: "(Description made from plants growing at Cambridge. Those collected in Mexico from apparently a dry habitat were much smaller and differed in several vegetative features) S. tlaxcalense is closely related to S. longipedicellatum Bitt. from which it differs in the smaller habit, the greater degree of pubescence over the whole plant and the smaller number of interjected leaflets (these are completely absent in the original Mexican herbarium speci-

As stated in the Introduction, in order to identify a species, such as in the above case, it would be necessary to bring propagating material from Mexico, grow it in an abnormal environment, such as under the long-day conditions found in Cambridge, and then identify the species as founded on the cultivated mate-

als. This, as all will agree, would be absurd. It is unfortunate that the Mexican collections (fig. 134) were all sterile, for it would have been more to the point to base S. tlaxcalense on material from its native region and denote differences

in the cultivated plant (shown in fig. 133).

At first glance one would be inclined to accept S. tlaxcalense as valid. With more critical study, however, and a comparison of the collections with the mass of collections of S. stoloniferum available, it becomes apparent that S. tlaxcalense represents only one of the various forms of this species. In fact, in comparing material of S. tlaxcalense with one of the writer's collections (No. 14208) of S. stoloniferum from Molino de Flores, México State, it was found that among plants of this collection grown at Sturgeon Bay, Wis., (derived from seeds collected in Mexico) were some specimens which matched type material of both S. longipedicellatum and S. tlaxcalense (fig. 135). These plants were, however, less pubescent than those described for S. tlaxcalense. This pubescent characteristic, nevertheless, seems to be of little value in this species.

An observation similar to the one made on S. demissum, discussed in the Introduction, was made on one of the writer's Mexican collections of S. stoloniferum. On November 8, 1947, the writer collected a mature flowering and fruiting plant (fig. 136) of this species in gravelly soil about 8 miles east of Pachuca, Hidalgo, Mexico. The fruits were light green with dark-green stripes, characteristic of this species. Plants were subsequently obtained from tubers grown at Glenn Dale, Md., in April 1948 (fig. 137) and Sturgeon Bay, Wis., in August 1949 (fig. 138).

The plants obtained under these three conditions differed considerably from each other, but not so markedly as did the plants of S. demissum. The plants collected in Mexico had no obvious interstitial leaflets and are a good match for plants collected in Mexico and labeled S. malinchense by Hawkes. Although the plants obtained under cultivation at Glenn Dale had fewer interstitial leaflets, they approach very closely the plant illustrated as S. stoloniferum (fig. 118) by Schlechtendahl and the plants of S. malinchense (fig. 131) grown in the field at Cambridge, England, whose



Figure 133.—Solanum stoloniferum (Balls and Gourlay 4843). Type collection of S. tlaxcalense (cultivated plant). About \times %.



FIGURE 134.—Solanum stoloniferum (Balls and Gourlay 4843). Type collection of S. tlaxcalense (plant from nature in Mexico). About \times %.



FIGURE 135.—Solanum stoloniferum (Correll 14208b). The large plant resembles the type of S. longipedicellatum; the small plant (upper part) resembles the type of S. tlaxcalense. About \times ½.



Figure 136.—Solanum stoloniferum (Correll 14246). Plant from nature in Mexico. About \times %.

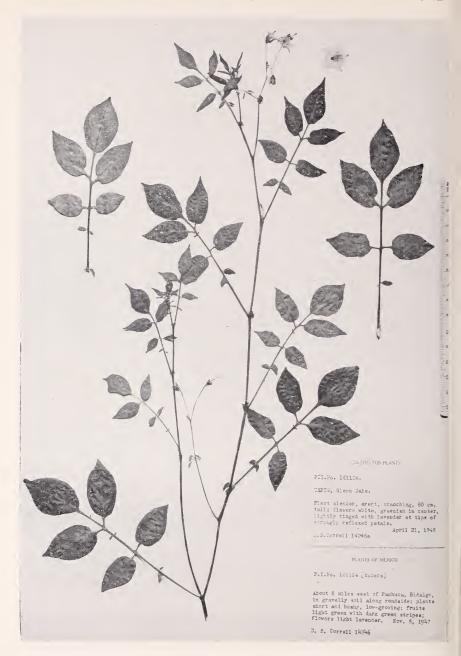


FIGURE 137.—Solanum stoloniferum (Correll 14246a). Plants grown from tubers in greenhouse at United States Plant Introduction Garden. Glenn Dale Md. About \times %.



FIGURE 138.—Solanum stoloniferum (Correll 14246b). Plant grown from tubers in field at Potato Introduction Station, Sturgeon Bay, Wis. About × %.

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leaves were used by Hawkes, in 1944, to illustrate *S. malinchense*. Plants grown at Sturgeon Bay resemble closely the plants used by Bukasov to illustrate *S. ajuscoense* (fig. 126) and *S. antipovichi*

(fig. 124).

A most confusing element exists in S. stoloniferum: that is, not only small plants of this species are to be found in nature but also large plants that correspond to those produced under Temperate Zone cultivation from tubers of small plants obtained in Mexico. The large plants, either in nature or under cultivation, usually occur, however, at lower elevations and are doubtless an ecologic response to their habitats. The type of S. longipedicellatum (fig. 122) and that of the plant described as var. pseudoprophyllum (fig. 121) were both collected under short-day conditions below 2,200 m. in the field in Mexico, and there have been other collections from that country which match almost perfectly the type collections of these plants. On the other hand, other collections from the field in Mexico, such as the one obtained by the writer (fig. 136) and the plant described as S. malinchense (fig. 132), differ considerably from these original types of S. longipedicellatum in that they are smaller plants with few, if any, interstitial leaflets, but when these are grown under cultivation in a long-day region plants are produced (figs. 131, 138) that approach very closely type material of S. longipedicellatum. This apparently was the situation in regard to the type of S. stoloniferum, itself (figs. 117, 118).

From the above one would conclude that, although day-length greatly affects the habit and activity of the plants, there are doubtless other factors occurring in nature, such as differences in elevation, exposure, temperature, soils, water, which also give

rise to vegetative variations.

As may be deduced from the above, *S. stoloniferum* is here treated as a collective species, similarly to *S. tuberosum*. The basic characteristics are the typically small petiolulate leaflets and usually reflexed rotate-stellate corolla with five prominent lobules. Though typically white, the corolla may vary in color to dark purple and be variously marked. The plant is commonly erect and slender, but bushy spreading forms are not infrequent. The orbicular fruit (fig. 139) is usually green and mottled or striped with deep purple or dark greenish purple, and the tubers, though variable in shape, are usually purplish red or white tinged with purple.

As shown by the series of illustrations, various forms have been described as distinct species by some students of the genus. The writer, however, has considered these to be members of a gradual intergradation of forms of a highly variable complex species. It is quite probable that when detailed field studies are made a different, more strict, interpretation of this species will result in the segregation of several rather well defined entities. On the basis of the heterogeneous material now available for study, including a large number of cultivated forms, it seems best, as noted



Figure 139—Fruits of Solanum. Top to bottom: S. stoloniferum (Correll 14208); S. stoloniferum (Correll 14211); S. verrucosum (Correll 14217); S. stoloniferum (Correll 14231); S. stoloniferum (Correll 14247). All about × 1.

above, to consider *S. stoloniferum* at least tentatively as a collective species.

Specimens examined:

MEXICO.—Coahuila: Saltillo, September 1898, E. Palmer 305 (CM, Gray, Mo, NY, US); cañon and elevated portion of Sierra Madre, 40 miles south of Saltillo, flowers light purple with white center, called "Peyrilla del monte," July-August 1880, E. Palmer 938 (in part) (Gray, PA, US).

DISTRITO FEDERAL: Tlalpam, fields, escape (?), August 22, 1930, Russell and Souviron 39 (US); Valley of Mexico, Schmitz 160 (Vienna); Pedrigal, Valley of Mexico, June 18, 1865–66, Bourgeau 346 (Kew, Paris); Zapam, Valley of Mexico, July 1865–66, Bourgeau 346 (CM, US); Valley of Mexico, 2,225 m., September 10, 1901, Pringle 8602 [type collection of S. longipedicellatum] (Ar, Cal, CM, Co, Gray, Mich, Mo, NY, PA, US, Vienna); same locality, August 17, 1901, Pringle 8571 [type collection of S. longipedicellatum var. pseudoprophyllum] (Cal, CM, Co, Gray, NA, NY, PA, US, Vienna); Tlalpam, flowers lavender, August 22, 1930, Russell and Souviron 35 (US); just west of km. 30, Cuernavaca road, sunny bank, flowers lavender, August 7, 1940, Langman 2603 (PA); San Angel, flowers white. August 20, 1923 DISTRITO FEDERAL: Tlalpam, fields, escape (?), August 22, 1930, Russell just west of km. 30, Cuernavaca road, sunny bank, flowers lavender, August 7, 1940, Langman 2603 (PA); San Angel, flowers white, August 20, 1923, Smyth 90 (US); Tlalpam, rocky hills, flowers lavender purple, August 22, 1930, Russell and Souviron 43 (US); El Mirador, slope of hill, tuberous, leaflets acute, 2,700 m., September 1, 1930, Russell and Souviron 24 (US); El Corazon, slope of hill, tuberous, flowers very pale lavender, fruit green, September 1, 1930, Russell and Souviron 100 (US); Santa Fé, Valley of Mexico, 2,590 m., August 11, 1909, Pringle 10831 (Gray, Mich, NA, US); San Esteban Tacuba, September 1909, Ruiz 17 (CM, US); El Marcaron, near El Mirador, flowers almost white, 2,550 m., September 1, 1930, Russell and Souviron 109 (US); vicinity of Rancho del Rosario, 10 miles north of Mexico City, near Atzcapotzolco, 2,200 to 2,280 m., July 1-15, 1937, Hann 210 (Mo): City, near Atzcapotzolco, 2,200 to 2,280 m., July 1-15, 1937, Happ 210 (Mo); El Cantil, rocky open slopes among shrubs, plants luxuriant, producing numerous well-formed tubers, October 25, 1947, Correll 14214 through 14214e [P. I. Nos. 160374, 161152] (NA); near Zoquiac, in mountains, plants all dead, tubers white and well formed, December 10, 1947, Correll 14318a and 14318b [P. I. No. 161700] (NA). GUANAJUATO: wild, Ceuvas, near Guanajuato, Dugès 417a (US). HIDALGO: very abundant along wood roads and on walls, Mineral [Real] del Monte, flowers light blue, July-October, Ehrenberg 80 (in part) (Cal); about 8 miles east of Pachuca, in gravelly soil along roadside, plants short and bushy, low-growing, fruit light green with dark-green stripes, flowers light lavender, November 8, 1947, Correll 14246 through 14246b [P. I. No. 161124] (NA); east of Tulancingo, in thicket on bank of small stream, fruits green or light green, November 8, 1947, Correll 14247 through 14247c [P. I. Nos. 161125, 161171] (NA); Acaxochitlan, in thickets on the edge of cornfields, plants all dead, November 8, 1947, Correll 14248 through 14248d [P. I. Nos. 161126, 161172] (NA); San Mateo, growing among maguey plants on edge of burro trail, plants large but all dead, tubers smooth and plants on edge of burro trail, plants large but all dead, tubers smooth and well formed, usually white with pink-purplish blush, (natives sometimes eat this potato but not too palatable), December 31, 1947, Correll 14416a [P. I. No. 161685] (NA); near Real del Monte, June 2, 1899, Rose and Hough 4487 (US). México: Toluca, "porphyrgebirge von San Miguel," 2,550 m., Heller 302, 304, 320, (Vienna); 5 km. south of Toluca, rich loam, fruit green, globular, smooth, tubers white, some with a tinge of purple, of irregular shape, 2,650 m., November 12, 1930, Reddick 332 (Co); El Polvorin, 43 km. on Puebla road, fruit green, tubers white, 3,660 m., October 15, 1930, Reddick 553 (91) (Co); El Vigia, 46 km. from Mexico City on road to Puebla, rich deep loam in shade of bushes, herb 1 m. tall, fruit white when half-grown, tubers white, scarce, 3,800 m., October 15, 1930, Reddick 543 (72) (Co); same locality and date, rich loam, plants 6 dm. tall, flowers 543 (72) (Co); same locality and date, rich loam, plants 6 dm. tall, flowers purple, tubers scarce, white, Reddick 544 (73) (Co); same locality and date, plant 1 m. tall, flowers purple, fruit white, tubers white, Reddick 547 (78) (Co); same locality and date, rich loam in brush, plant 1 m. tall, fruit immature, white when young, tubers abundant, white, oval, Reddick 546 (76) (Co); same locality and date, rich loam, Reddick 545 (74) (Co); El Mirador, rich soil, roadside, 45 km. from Mexico City on road to Puebla, fruits white and purple, October 15, 1930, Reddick 550 (86) (Co); lava rubble, Joco railroad station, about halfway up to Pico de Xitle, fruit green, smooth, no markings, tubers small, white, oval, 2,650 m., October 17, 1930, Reddick 557 (106) (Co); same place and date, Reddick 558 (107) (Co); same place and date, lava rubble under pine trees, Reddick 556 (105) (Co); Pico de Xitle, volcanic crater rim, fruit smooth, green, no markings, tubers purplish, 2,745 m., October 17, 1930, Reddick 560 (Co); rich loam in pine woods, top of a little peak 3 km. southeast of Amecameca, plant 10 to 15 dm. tall, tubers white, scarce, 2,440 m., November 10, 1930, Reddick 580 (Co), same

locality and date, fruit green with vertical purplish bands or streaks, nearly spherical, tubers white, oval, $Reddick\ 310\ (Co)$; rich loam, roadside, open field, El Marcaron, 43 km. from Mexico City on Puebla road, tubers white, 3,660 m., October 15, 1930, $Reddick\ 552\ (90)\ (Co)$; La Venta, 2,475 m., July 12, 1935, $Fisher\ s.\ n.\ (NY)$; Amecameca, 2,475 m., July 26, 1924, $Fisher\ 256\ (CM,\ Mo,\ US)$; Molino, August 24, 1936, $MacDaniels\ 557\ (CM)$; Mount Popocatepetl, Amecameca to Paraje Provincial, flowers white with very slight topological property and provincial strengths of pueble meaning and property and the product of the property of the property of the property of the product of the property slight touches of pale mauve, usually single-stemmed, upright habit, to 4.5 dm. tall, leaves grayish, tubers clear, pale yellow, oval, generally pointed, in woods these seem larger, in open ground and wasteland the tubers largely rotted away or very small, in cultivated fields the plants developed a broad spreading bushy habit to 6 dm. diameter, at this altitude it grows through both woodland and arable land, 2,650 m., July 25, 1938, Balls 5097 [type collection of S. longipedicellatum var. longimucronatum] (Cam, US); roadside, 5 miles west of the Desert of the Lion (D. F.), July 13, 1939, Langman 2068 (PA); barranca above Santa Fe, August 28, 1900, Pringle 9142 (Mo); "La Carbonera," Puebla highway, sunny roadside, August 4, 1940, Langman 2558 (NA, PA); Molino de Flores, on banks along the Tescocuasco River, plants robust, fruits light green with deep-green stripes, tubers of River, plants robust, fruits light green with deep-green stripes, tubers of good size and abundant, October 23, 1947, Correll 14207 through 14207c [P. I. Nos. 160371, 161150] (NA); same locality and date, around trees on open slope, plants large, October 23, 1947, Correll 14209 through 14209b and 14209d [P. I. Nos. 160372, 161151 (in part)] (NA); Molino de Flores, rocky bluffs along the Tescocuasco River, plants small, fruits striped with deep green, orbicular, tubers rather numerous, October 23, 1947, Correll 14208 through 14208c [P. I. Nos. 160206, 160224] (NA); Volcanes road above Amecameca, slope of Mount Popocatepetl, in balsam-pine forest in deep rich humus tubers uniformly about 2.5 cm. long October 24, 1947, Correll 14211 through 14208c [P. 1. Nos. 160205, 160224] (NA); Voicanes road above Amecameca, slope of Mount Popocatepetl, in balsam-pine forest in deep rich humus, tubers uniformly about 2.5 cm. long, October 24, 1947, Correll 14211 through 14211c [P. I. Nos. 160207, 160225] (NA); near Amecameca, on the edge of a deep barranca, October 24, 1947, Correll 14213 through 14213b [P. I. No. 160226] (NA); near San Juan de las Huertas, lower slopes of Volcán de Toluca, in thicket along road, plants large and scraggly, fruits orbicular, green with purple mottlings, November 15, 1947, Correll 14263 through 14263b [P. I. Nos. 161138, 161178] (NA); General Gonzáles Station, on edge of cornfield, plants low and bushy, called "papa cimarrona," November 18, 1947, Correll 14270 and 14270a [P. I. No. 161364] (NA); Lake Zempoala, in shrubs on the edge of balsam-pine forest, plants short and sturdy, tubers well-formed and white, November 21, 1947, Correll 14270d [P. I. No. 161286 (in part)] (NA); Pico de Xitle, under pine tree as usual, on lava, fruit smooth, green, no markings, slight vertical depression, tubers small, 2,745 m., October 17, 1930, Reddick 555 (102) (Co); above Col. Manuel Ávila Camacho, in pine forests in mountains, plants all dead, December 4, 1947, Correll 14304b and 14304d [P. I. No. 161353 (in part)] (NA); barranca above Santa Fé, August 28, 1900, Pringle 9142 (CM, Mich, NA, US); Vallée de Mexico, 2,940 m., 1929, M. Antipovich 12 and 14 [type collection of S. vallis-mexici] (plant grown at Leningrad) (Cam). MICHOA-CÁN: in open, 1 mile south of Tancitaro, common purple-flowered herb, 1,950 m., July 27, 1940, Leavenworth 379 (CM); pedregal lava flow, 2 miles south of Tancitaro, 1,980 m., August 14, 1940, Leavenworth 548 (CM, Gray, NY); Las Peras, in brush about a pine tree in a new clearing, plants luxuriant and low, not in fruit, November 14, 1947, Correll 14256 through 14256h [P. I. No. 161132] (NA): San José de las Cumbres edge plants luxuriant and low, not in fruit, November 14, 1947, Correll 14256 through 14256b [P. I. No. 161132] (NA); San José de las Cumbres, edge of juniper-balsam-pine forest in rich soil, plants all dead, December 12, 1947, Correll 14328a [P. I. No. 161738] (NA); Mount Punguato, vicinity of Morelia, 2,200 m., August 11, 1910, Arsène 6543 (Paris, US); above Macho de Agua, in pine-balsam forest in mountains, plants all dead, December 24, 1947, Correll 14381a and 14381b [P. I. No. 161770] (NA). Morelos: 59 km. from Mexico City on road to Chernavaca, flavous white fruit groce, roufertly from Mexico City on road to Cuernavaca, flowers white, fruit green, perfectly smooth, no spots nor streaks, tubers white, oval, with prominent lenticels, 2,745 m., October 7, 1930, Reddick 520 (11) (Co); rich loam under pine tree, highway west of Tres Marias, plant 2 to 4 dm. tall, tubers white, oval, 3,050 m., October 29, 1930, Reddick 564 (208) (Co). same place and date, plant very short, 1 to 2 dm. tall, tubers white, oval, Reddick 565 (209) (Co); Tres Marias, rich soil in dense shade under Alnus, plant 6 to 7 dm.

tall, fruit smooth, green, tubers white, oval, 3,050 m., October 29, 1930, Reddick 563 (207) (Co); near Tres Cumbres, in weedy soil under pine trees, plants luxuriant, November 19, 1947, Correll 14278 through 14278b [P. I. No. 161089] (NA). OAXACA: Cienegilla, 2,280 m., June 21, 1895, L. C. Smith 402 (Gray). PUEBLA: in the vicinity of San Luis Tultitlanapa, July 1908, Purpus 3365 (in part) (Cal, Gray); moist slope, Puente del Emperador, La Venta, flowers pale blue (gray), almost white, 2,500 m., August 25, 1944, Sharp 44539 (NA); said to be grown by natives on upper slopes of La Malinche, November 3, 1947, Correll 14230a and 14230b [P. I. No. 161108] (NA); same locality and date, among Agave (maguey) plants on the edge of a field, Correll 14232 and 14232b [P. I. No. 161159] (NA); slope of La Malinche, in and on the edge of thickets along a dry stream slope of La Malinche, in and on the edge of thickets along a dry stream bed, plants 10.5 dm. tall, fruits round, green, about 1.5 cm. in diameter, tubers small, white, November 3, 1947, Correll 14231 through 14231b [P. I. No. 161109] (NA); slope of Mount Popocatepetl, in gravelly sandy soil in stream bed in an old field, plants producing numerous stolons, tubers white, November 4, 1947, Correll 14233 through 14233b [P. I. Nos. 161111, 161160] (NA); same locality and date, at base of ledge in rocky soil, tubers pink-tinged, pear-shaped, and compressed, Correll 14234b [P. I. No. 161161 (in part)] (NA); near Esperanza, in an old field, plants all dead, November 28, 1947, Correll 14285b and 14285c [P. I. No. 161349 (in part)] (NA). QUERÉTARO: between Hacienda Ciemo and San Juan del Río, near Cadereyta, August 26, 1905, J. N. Rose, Painter, and J. S. Rose 9841 (US). SAN LUIS POTOSÍ: chiefly in the region of San Luis Potosí, 1,830 to 2,440 m., SAN LUIS POTOSI: chieny in the region of San Luis Potosi, 1,000 to 2,440 m, 1878, Parry and Palmer 633 (in part) (CM, Gray, Kew, PA, US); Guadalupe, Schaffner 57 (in part) (Paris); Alvarez, September 5–10, 1902, E. Palmer 83 1/2 (US). TLAXCALA: Tizatlan, old walls, sandy soil, old Tlaxcala Palaca, upright stems, called "papa cimarrona," 2,250 m., June 19, 1938, Balls and Gourlay 4843 [type collection of S. tlaxcalense] (Cam, Kew, US); Mount Maliache, Tatlangchan (San Francisco). Estrapiacatla, flower manye, with dark linche, Tetlanochan (San Francisco), Estranjerotla, flower mauve, with dark markings on reverse of corolla, stems slender, upright, to 3 dm. tall, usually a single stem to each plant, unbranched to inflorescence, leaves gray and slightly hairy, growing on banks between cultivation and among corn in very sandy soil, tubers often very deep and rarely more than 4 cm. in diameter, pale yellow in color, all the wild potatoes of this region are called "papa cimarrona," the natives do not seem to distinguish between species if there are more than one here, "one man told me these potatoes were poison but he was not corroborated by his companions," 2,592 m., June 21, 1938, Balls and Gourlay 4864 [type collection of S. malinchense] (Cam, Kew, US); near and Gouring 4004 [type conection of S. matinchense] (Cam, Kew, US); near San Cristobal, growing among maguey plants on the edge of a field, plants small and fragile, fruits mottled with purple, November 18, 1947, Correll 14271 through 14271c [P. I. Nos. 161281, 161282] (NA), same locality and date, in weeds and under pine trees on edge of a deep barranca, plants all dead, tubers purplish, many badly riddled with larvae, Correll 14272a and 14272b [P. I. No. 161283] (NA). Veracruz: region of Orizaba, Borrego, July 11, 1865-66, Bourgeau s. n. (Kew). State unknown: "Plantae Novae, Hispaniae" 1787, 1795, 1804, Sassé Macion Cratille and Maldonade Novae Hispaniae," 1787, 1795, 1804, Sessé, Mociño, Castillo, and Maldonado 241 (1523) (CM); Mount Orizaba, Deppe and Schiede s. n. (Vienna); Mount Popocatepetl 2,745 m., August 22, 1901, Rose and Hay 6259 (US); Mount Popocatepetl 2,745 m., August 22, 1901, Rose and Hay 6259 (US); near Lake Huetulaca [probably Veracruz], September 1828, Ehrenberg s. n. (Cal); Texcotzingo, July 1, 1938, Kenoyer A294 (CM); near banks of Atotonilio, flowers white, tubers few, small, October 1893, Ehrenberg 1132 (Cal, Kew); "Mexico," cultivated by Vilmorin in France, September 22, 1854 (Kew); "Mexico," 1838, Vischer s. n. (NY); Mr. Bates s. n. (Kew); Kagel 40 (Vienna); Schmitz s. n. (Gray); Mount Orizaba and Lake Huetulaca [probably Veracruz], Schiede and Deppe 192 [type collection of S. stoloniferum] (Vienna); "Mexico," rare, wild potato in mountains, called "papa silvestre," 1894, Dugès 417a (Gray).

The following collections are here cited as possible hybrids of *S. stoloniferum* with *S. verrucosum* or *S. demissum*. It is of interest that one collection (*Russell* and *Souviron* 173) resembles

somewhat the plant illustrated by Bukasov as representing his *S.* neoantipovichi (fig. 128):

MEXICO.—DISTRITO FEDERAL: Cerro Xitle, no flowers or tubers, fruit green, 3,000 m., September 13, 1930, Russell and Souviron 173 (US); Tlalpam, flowers purplish, August 22, 1930, Russell and Souviron 42 (US); Pedrigal, Valley of Mexico, August 29, 1896, Pringle 7369 (NA); lava field, Tizapam, Valley of Mexico, August 24, 1900, Pringle s. n. (NA). HIDALGO: between Somoriel and Las Lajas, August 5, 1905, J. N. Rose et al. 9182 (US). Michoacán: Mount Punguato, Morelia, 2,100 m., June 20, 1912, Arsène s. n. (US); same locality, July 16, 1909, Arsène 2893 (CM, Gray, Mo, US); Cuincho, vicinity of Morelia, 1,900 m., July 1, 1909, Arsène 7304 (US); 10 km. west of Morelia, in loose rocky soil, June 21, 1950, Baldwin 14373 (NA). Morelos: rich loam under pine trees in woods, 1 km. west of Tres Marias, plants 3 to 4 dm. tall, tubers white, oval, 3,050 m., October 29, 1930 Reddick 566 (211) (pobable natural hybrid of S. stoloniferum × S. demissum) (Co). State Unknown: "Mexico," Schmitz 160 (probable natural hybrid of S. stoloniferum with S. polytrichon) (Vienna).

47. Solanum tuberosum L., Sp. Pl., 185. 1753.

(Figs. 6, 140, 141, 142, 143, 144, 145, 146, 147, 148, and 151.)

Solanum andigenum Juz. & Buk., U. S. S. R. Cong. Genet. Proc. 3: 609. 1929. Type locality: Peru, Bolivia, Colombia.

S. andigenum var. mexicanum Buk., Bul. Appl. Bot., Genet., and Plant Breeding [Leningrad], Suppl. 47: 202, 516. 1930. Type locality: Mexico and Guatemala.

S. andigenum var. mexicanum f. tolucanum Buk., Bul. Appl. Bot., Genet., and Plant Breeding [Leningrad], Suppl. 47: 202, 516. 1930. Type locality: Mexico.

S. andigenum var. mexicanum f. chalcoense Buk., Bul. Appl. Bot., Genet., and Plant Breeding [Leningrad], Suppl. 47: 204, 517. 1930. Type locality: Mexico.

S. andigenum var. mexicanum f. guatemalense Buk., Bul. Appl. Bot., Genet., and Plant Breeding [Leningrad], Suppl. 47: 205, 518. 1930. Type locality: Guatemala.

This, the commonly cultivated potato, is among the four most important food plants grown throughout the world today. A classical treatise on its history and social significance was published by Salaman in 1949. The reader is referred to that excellent work for complete information regarding this important complex cultigen.

Even to attempt to formulate a comprehensive description of the cultigen Solanum tuberosum (S. andigenum) would be a colossal undertaking, since it includes multitudinous forms. These preclude the possibility of typifying it. The series of illustrations included shows the variability of this cultigen and demonstrates the broad latitude of the plant. Two of the illustrations (figs. 140, 141) used here are adapted from charts prepared by Bukasov and Juzepczuk to illustrate new species of cultivated potatoes. The two figures represent extremes within the broad limits of S. tuberosum. Juzepczuk and Bukasov, in 1929, considered that S. tu-



FIGURE 140.—Solanum tuberosum. Top, details of flower, about \times 1½; lower left, leaf, upper surface, about \times ½; lower right, habit of plant, about \times ½. Adapted from chart by Bukasov.

berosum was derived from indigenous wild species in the Chiloé region of southern Chile and that S. andigenum was derived from indigenous wild species in the Andes of South America. They concluded that only S. andigenum var. mexicanum and its several forms were cultivated in Mexico and Central America. Despite the fact that seed potatoes (tubers) of the cultigen S. tuberosum are imported into Mexico from the United States and elsewhere and grown in the zone where native species occur, the Russians stated positively that no S. tuberosum was observed under cultivation in that country. It is to be expected that when seed pota-



Figure 141.—Solanum tuberosum (S. andigenum, fide Bukasov). Top, details of flower, about \times 1½; lower left, leaf, lower surface, about \times ½; lower right, habit of plant, about \times $\frac{1}{10}$. Adapted from chart by Bukasov.

toes are transported from a long-day region and grown under short-day conditions most, if not all, of them will assume a different habit. This could account for the above observation by the

Russian explorers.

Miller and McGoldrick, who experimented with several forms of the cultivated potatoes in 1941, found that "with field and controlled experiments, plants under short days showed less vegetative growth, matured earlier, and the potatoes were generally smoother. The opposite effects were obtained under long-day conditions; the plants were very vegetative, matured later, tubers had deeper eyes, and were more irregular in shape, although the total

yields were higher."

Hawkes, in 1944, was of the opinion that S. tuberosum and S. andigenum had a single origin and were not so distinct as was at first suspected. The writer is in agreement with Hawkes when he states that these two entities are separated by the sum of many small characteristics rather than by one or two well-defined ones. He continues: "For instance, the stems of S. andigenum are in general longer, thinner, more numerous, with smaller leaves and leaflets, giving the plant a more 'open' appearance; the flowers are produced more abundantly, generally give fertile seed and are often highly colored. S. tuberosum, on the other hand is typically shorter, with thicker stems, more 'closed' habit, larger wider leaflets, thicker pedicels below the calyx, generally fewer flowers and is much less fertile." Hawkes also points out that the two differed in their photoperiodic reactions, S. andigenum yielding better under the short 12-hour day of the tropics and S. tuberosum producing the best crops in the long summer days of temperate latitudes.

Despite the fact that Juzepczuk and Bukasov concluded that only variants of their *S. andigenum* were cultivated in Middle America, the writer has seen specimens (figs. 142, 143, 144) from this region that not only match rather well the two Bukasov illustrations here included but also fall into what appear to be intermediate forms (figs. 145, 146) of these two. Figures 145 and 146 demonstrate the vegetative change that occurred (not so pronounced as in *S. demissum* and others) when *S. tuberosum* was grown under cultivation at Sturgeon Bay, Wis., from tubers collected in Mexico. The plants collected in Mexico (fig. 145), though not in flower, appeared to be rather mature. As will be seen in figure 146, the leaves of the plant grown in Wisconsin are more dissected and more interstitial leaflets were produced.

A superficial point for separating plants of the cultigen *S. tu-berosum* from all other tuber-bearing species found in our region is that in most instances at least some leaflets will have small secondary leaflets on their petiolules or subsidiary leaflets in or close to the axil formed by the petiolule and rachis. Also, flowers of most of the cultivated plants usually have some shade of pink, although their color may vary from delicate creamy white through all shades of pink, rose purple, lavender, and blue. Many have ex-

ceedingly attractive flowers.



FIGURE 142.—Solanum tuberosum (Mexia 2658). Plant from Puebla, Mexico, of the S. andigenum type. About \times %.



FIGURE 143.—Solanum tuberosum (Russell and Souviron 70). Characteristic S. tuberosum plants from Distrito Federal, Mexico. About \times %.



FIGURE 144.—Solanum tuberosum (Calderón 852). Characteristic S. tuberosum plants from El Salvador. About \times %.



FIGURE 145.—Solanum tuberosum (Correll 14255). Plants collected in Michoacán, Mexico. About \times %.



FIGURE 146.—Solanum tuberosum (Correll 14255a). Plant grown under cultivation at Sturgeon Bay, Wis., from tubers collected in Mexico. About \times %.

At the time the writer was on Mount Orizaba, above the village of Tesmalaquilla, Puebla, in November 1947, the natives were harvesting a good crop of potatoes. They provided him with fruits and tubers of both red and white varieties, which they were growing. The tubers were later grown at Sturgeon Bay, Wis., and produced two types of plants, a white-flowered one (fig. 147) not unlike average plants of S. tuberosum, the other (fig. 148) pinkflowered and resembling the form described as S. andigenum (fig. 141). To add to the confusion, tubers produced from seeds of fruits given to the writer were also grown at Sturgeon Bay and these tubers produced purple-flowered plants (fig. 149), which are referable to S. demissum. At the time the natives gave the writer samples of the tubers they cultivated, they gave him round purplish tubers of good size, which they were discarding. According to them these tubers have an astringent taste when cooked and are, therefore, not edible. They also told the writer that they considered them to be the product of a natural hybrid of their cultivated potato with a wild species. When the tubers were grown at Sturgeon Bay, they produced purple-flowered plants (fig. 150) that might well represent a hybrid of S. tuberosum and S. demissum, under which species it has been cited as a putative hybrid.

The writer has seen collections of *S. tuberosum* from various parts of the United States and Canada. These represent either cultivated material or nonpersistent waifs (fig. 151) that were found in ballast about coastal towns or in dumps. Since it is extremely doubtful that such plants will become naturalized in these localities, possibly with a few exceptions in the southern part of the United States, the specimens are not cited here.

Specimens examined:

MEXICO.—Coahuila: cañon and elevated portion of Sierra Madre, 40 miles south of Saltillo, July—August 1880, E. Palmer 938 (in part) (Iowa, PA, US). Distrito Federal: cultivated near Las Cruces, plants all dead, December 11, 1947, Correll 14320a and 14320b [P. I. Nos. 161724, 161737] (NA); near El Guarda, in an old field, plants all dead, tubers white, plant cultivated several years ago but now naturalized, November 19, 1947, Correll 14276a and 14277b [P. I. No. 161401] (NA), same locality and date, Correll 14276a and 14276b [P. I. No. 161285] (NA); in thickets along the edge of an oatfield, upper slopes of Ajusco Mountain, plants large, tubers various and crisp, with the flavor of peanut, said to have been cultivated many years ago by natives, now growing wild, October 25, 1947, Correll 14216 [P. I. No. 160211] (NA); same locality and date, in cornfield, plants large, fruits prolific, tubers large and red, Correll 14220a [P. I. No. 160215] (NA). GUANAJUATO: low mountains, 1904, Dugès 10 (Gray). Hidaloc: Mineral [Real] del Monte, wild potato, September 1832, Ehrenberg s. n. (Cal); cultivated at El Susto, plants all dead, some wild strains may be mixed with these, December 30, 1947, Correll 14414a [P. I. 161695] (NA); El Susto, in an old cornfield, only one plant found dead with a solitary tuber, December 30, 1947, Correll 14415a [P. I. No. 161696] (NA); San Mateo, cultivated, plants robust, December 31, 1947, Correll 14417a [P. I. No. 161677] (NA); same locality and date, cultivated, plants robust, tubers white, smooth and very well formed, Correll 14418a [P. I. No. 161698] (NA). Jalisco: El Isote, upper slopes of Volcán de Nevada, cultivated by natives several years before but now well established, plants all dead, tubers white with reddish-purple eyes, December 18, 1947, Correll 14341a [P. I. No. 161708] (NA). México: Río Frío, cultivated in mountains by natives, plants all



FIGURE 147.—Solanum tuberosum (Correll 14286b). Plants grown from Mexican tubers in field at Potato Introduction Station, Sturgeon Bay, Wis, About \times %.

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FIGURE 148.—Solanum tuberosum (Correll 14286c). Plants grown from Mexican tubers in field at Potato Introduction Station, Sturgeon Bay, Wis. About \times %.



FIGURE 149.—Solanum demissum (Correll 14286a). Plants grown from tubers (produced from Mexican seeds) in field at Potato Introduction Station, Sturgeon Bay, Wis. About \times %.



FIGURE 150.—Putative hybrid of S. tuberosum \times S. demissum (Correll 14287b). Plants grown from Mexican tubers in field at Potato Introduction Station, Sturgeon Bay, Wis. About \times %.



FIGURE 151.—Solanum tuberosum (E. F. Williams). Escape, Sunday Cove, Lake Umbagag, Maine, August 1, 1903. Characteristic plant of cultivated potato occurring as nonpersistent waif. About \times %.

HONDURAS.—Dept. Morazán: Zamorano, 800 m., October 5, 1943, J. Valerio R. 1103 (CM); same locality, February 1945, J. Valerio R. 2294 (CM).

EL SALVADOR.—Dept. San Salvador. San Salvador, cultivated, called "papa," or "patata," July 1922, Calderón 852 (US).

COSTA RICA.—Prov. San José: near Finca La Cima, above Los Lotes, north of El Copey, brushy slope, erect herb, 3 to 6 dm. tall, flowers purple, a common escape, called "papa," 2,100 to 2,400 m., December 21 and 22, 1925, Standley 42554 (US). Prov. Cartago: in potrero, southern slope of Volcán

de Turrialba, near the Finca del Volcán de Turrialba, naturalized, 2,000 to 2,400 m., February 22, 1924, Standley 34931 (US). PROV. UNKNOWN: cultivated, 2,135 m., June 24, 1874, Kuntze 2296 (NY).

48. Solanum verrucosum Schlecht., Ind. Sem. Hort. Hal. 1839: 10. 1839; Hort. Hal. 1 (3): pl. 2. 1841. Type locality: Mexico, Hidalgo. Type a cultivated plant grown from seeds sent by Ehrenberg from Mineral del Monte [Real del Monte]. (Figs. 139, 152, 153, 154, 155, 156, 157, 158, 159, 160, and 161.)

Solanum squamulosum Mart. & Gal., Bul. Acad. Brus. 12 (1): 140. 1845. Type locality: Mexico, Hidalgo: In alpine forests of Real del Monte, Sept., H. Galeotti 1221.

S. salamanii Hawkes, Potato Coll. Exped. Mexico and S.

Amer. 2: 116. 1944.

Plant usually erect and slender, sometimes stout and bushy, never rosettelike, up to 6 dm. or more tall, pilose to glabrescent throughout, stoloniferous and tuber-bearing. Stem often prominently angled. Tubers oval, compressed, white or purple-tinged, about 3 cm. long, sometimes much longer. Leaves odd-pinnate, up to 25 cm. or more long, usually much smaller, with or without small interstitial leaflets. Leaflets 5 to 11, elliptic or ovate-elliptic to ovate-lanceolate or elliptic-lanceolate, acute to acuminate, petiolulate; lateral leaflets up to 10 cm. long and 4.5 cm. wide, usually much smaller; terminal leaflet usually somewhat larger than the lateral leaflets. Pseudostipular leaves semiovate, falcate, up to 2.5 cm. long. Inflorescences lateral or lateral and pseudoterminal, few-flowered, showy, cymosely paniculate; peduncles up to 8 cm. long. Pedicels 1.5 to 2.5 cm. long, articulate at about or above the middle. Flowers deep purple to light purple or lavender purple. Calyx 5 to 9 mm. long, divided to about the middle into ovatelanceolate to lanceolate-acute to acuminate lobes. Corolla rotate, often with a 10- (or more-) lobed aspect, up to 3.5 cm. in diameter, usually about 2.5 cm. in diameter; lobes triangular and acute. Anthers oblong-lanceolate, 4 to 5 mm. long; filaments 1 to 3 mm. long. Style slender, 7 to 11 mm. long, glabrous to somewhat puberulent, usually much exceeding the stamens. Fruits ovoid to suborbicular, usually green with numerous small white warts, up to 2 cm. long.

Range: Frequent in the high mountains of central Mexico, rare northward to Coahuila and southward to Oaxaca: usually above

2,500 m., sometimes up to 3,800 m.

This species was originally proposed by Schlechtendahl in 1839, when he stated that it was collected in Mexico and was allied to Solanum stoloniferum (this statement was doubtless based on the plant of S. stoloniferum in fig. 118) from which it differed in its verrucose fruits. No direct reference was made by Schlechtendahl to Ehrenberg's Mexican specimens. Schlechtendahl stated that S. verrucosum would be illustrated later with another species (S. oxycarpum) having acute fruits. These illustrations were pub-



FIGURE 152.—Solanum verrucosum. 1, Upper part of flowering stem, about \times ½; 2, stolon with simple leaves, about \times ½; 3, mature fruits, about \times ½; 4, seeds, about \times ½; 5, seeds, visible under a lens. From Schlechtendahl.

lished 2 years later, at which time Schlechtendahl stated that the seeds of *S. verrucosum* were collected by Ehrenberg at Mineral [Real] del Monte, Hidalgo, Mexico. Although Schlechtendahl stated in his description that the leaves had small interstitial leaflets, none are shown in the illustration reproduced here (fig. 152). The presence or absence of interstitial leaflets does not, however, appear to be of much consequence in this species.

Of interest is the statement by Lindley, in 1848, that Schlechten-

dahl's S. verrucosum (figures in Hortus Halensis) was raised in the Halle Botanical Institute garden from tubers sent from Mineral [Real] del Monte, Hidalgo, Mexico, by Charles Ehrenberg, upon whose authority it was stated to be common by pathways in

woods, among ruins of walls, and elsewhere.

The writer has seen several sheets of Ehrenberg's collections of *S. verrucosum* from Real del Monte, apparently identified by Schlechtendahl, in which the plants are exceedingly diverse in habit and the leaves may or may not possess interstitial leaflets. An Ehrenberg collection (No. 1132), labeled *S. stoloniferum*, in the United States National Herbarium closely resembles Schlech-

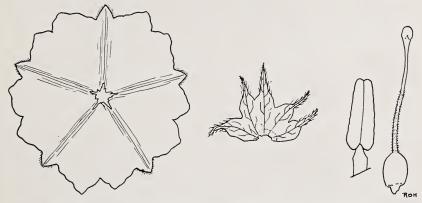


FIGURE 153.—Solanum verrucosum (Ehrenberg 1132). Corolla and calyx, about \times 2; stamen and pistil, about \times 4.

tendahl's illustration (fig. 152) of S. verrucosum. It may be that this particular collection is part of the S. verrucosum type, a flow-

er of which is here illustrated (fig. 153).

A sheet of Ehrenberg's collection in the University of California Herbarium (labeled S. verrucosum, supposedly in Schlechtendahl's hand) contains five plants, two of which are S. demissum and three of which can be placed in S. tuberosum. Ehrenberg's collections attributed to S. verrucosum thus apparently consisted of several species. The writer has, however, accepted the illustration and rather complete and clear description published by Schlechtendahl in 1841 as the basis for his concept of S. verrucosum.

The corolla of *S. verrucosum* has traditionally been considered to be similar to that of *S. demissum* (fig. 95). This is usually true in regard to the outline of the corolla. It is of interest, however, that the interpetalar tissue, though rounded when the corolla is flattened out, is frequently deeply cleft with the margins infolded as shown in the uppermost flower in figure 152.

The writer's collections from slopes of Mount Ajusco, Distrito Federal (Nos. 14217, 14217b, 14217c) (fig. 154) and from pine forests above Col. Manual Ávila Camacho, México State (Nos. 14304a, 14304c), are without doubt comparable to the plant il-



FIGURE 154.—Solanum verrucosum (Correll 14217b). Plants grown from tubers (produced from Mexican seed) in field at Potato Introduction Station, Sturgeon Bay, Wis. About × %.

lustrated as *S. verrucosum* by Schlechtendahl. Hans Ross of the Max-Planck Institut, Germany, agrees with the writer in this conclusion. Allowance has been made for great variation in this species. Even if *S. verrucosum* is considered in a strict sense, the above collections would be among the very few which the writer has seen that could be placed in this species. This is especially true in regard to the flowers (fig. 155).

In the writer's opinion the confusing of plants of *S. verrucosum* with those of *S. demissum* is excusable. It would appear that they are, at best, only extreme conditions of the same species, which can be separated only arbitrarily. In fact, many plants collected

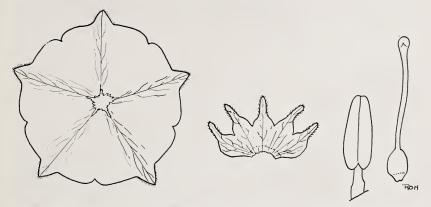


FIGURE 155.—Solanum verrucosum (Correll 14252b). Corolla and calyx, about \times 2; stamen and pistil, about \times 4.

in nature cannot be placed with certainty into either category, while specimens of cultivated plants of both *S. verrucosum* and *S. demissum* are exceedingly variable. Characteristics used here to separate "typical" material of so-called *S. verrucosum* from material found cited under *S. demissum* are: plants typically erect, less branched, and usually taller; at least some leaflets always distinctly petiolulate and usually more acute or acuminate; inflorescences characteristically near the summit of the plant and mostly standing above the leaves or subequal to them, showy; flowers usually larger.

The plant described as *S. squamulosum*, also from Real del Monte, Hidalgo, Mexico, has been considered by most students of *Solanum* to be referable to *S. verrucosum*. Although the type specimen (fig. 156) was poorly prepared and thus difficult to study, the writer is also of the opinion that this plant, although somewhat more pubescent than usual, should be referred to *S.*

verrucosum.

According to Alphonse de Candolle (Revue Horticole), a plant considered to be this species was cultivated for many years by peasants in the neighborhood of Geneva, Switzerland. This cultivation was finally abandoned, however, because of the smallness



Figure 156.—Solanum verrucosum (Galeotti 1221). Type specimen of S. squamulosum. About \times 1½,

of the tubers and because they did not, as had been hoped, resist the disease *Phytophthora infestans*. The tubers produced were smaller and later in development than ordinary *S. tuberosum*, of excellent flavor, with yellowish flesh, the flowers large and deep-

colored, and the fruit globose with raised white dots.

The same observations were made concerning one of the writer's Mexican collections of this species as were made concerning S. demissum, discussed in the Introduction, and concerning S. stoloniferum. On November 7, 1947, the writer collected a mature plant (fig. 157) of this species in the vicinity of Real del Monte, Hidalgo, the type locality of S. verrucosum. Plants were subsequently obtained from tubers grown at Glenn Dale, Md., in April 1948 (fig. 158) and Sturgeon Bay, Wis., in August 1949 (fig. 159).

Similarly to *S. demissum*, plants obtained under these three conditions differed markedly from each other. The plant collected in Mexico is similar to the plant used by Schlechtendahl to illustrate (fig. 152) this species. The leaflets, however, are somewhat broader than in that plant. The plants obtained under cultivation at Glenn Dale resemble some of the Ehrenberg specimens examined that were also cultivated from living material brought from Mexico. The plants obtained from Sturgeon Bay resemble closely the plant described as *S. salamanii* (fig. 160), and because of this apparent affinity *S. salamanii* is included here. It is highly probable that *S. salamanii* represents a hybrid of *S. verrucosum* and *S. tuberosum*.

An examination and comparison of the various illustrations included here should provide sufficient evidence that the interpretation of tuberous solanums from our region should be on a broad rather than a narrow basis.

Specimens examined:

MEXICO.—COAHUILA: Lerios, 40 miles south of Saltillo, a mountain section supposed to be 3,050 m., flowers dark purple, July 10-13, 1880, E. Palmer 937 (CM, Gray, US). DISTRITO FEDERAL: Valley of Mexico, 1876, Schaffner (Paris); rock and dirt pile in convent garden, El Desierto, fruit smooth, green with white specks, 2,950 m., October 13, 1930, Reddick 601 (55) (Co); same locality and date, rich loam, fruit solid green or spotted with small white specks, Reddick 530 (51) (Co); same locality and date, tubers white, oval, with rough surface, Reddick 532 (56) (Co); near convent, El Desierto, fruits green, smooth, oval to obconic, tubers white, oval, irregular, purplish (in January), 2,950 m., October 13, 1930, Reddick 533 (Co); very rich soil with 10 to 20 cm. of humus, under large balsam tree, thin woods, 2,440 m., October 6, 1930, Reddick 518 (9) (Co); El Desierto, evergreen woods, flowers purple, tuberous, with green fruits, 2,700 m., August 25, 1930, Russell and Souviron 51 (US); near Contreras, flowers bright blue and large, 2,700 m., August 29, 1944, Goodman 3463 (CM); El Mirador, flowers lavender purple, large, in terminal clusters, tubers present, September 1, 1930, Russell and Souviron 97 (US); El Desierto, 2,700 m., flowers purple, tuberous, August 25, 1930, Russell and Souviron 50 (US); El Mirador, slope of hill, flowers deep purple, tuberous, 2,700 m., September 1, 1930, Russell and Souviron 98 (US); south of Contreras, damp bank along road, flowers purple, tubers, September 17, 1930, Russell and Souviron 199 (US); El Desierto de los Leones, on well-drained slope, 2,745 m., August 18, 1935, MacDaniels 98 (CM); Desierto de los Leones, deep rich soil, inclined to be clayey, on edge of forests of Pinus and Abies, along the roadside, the species does not seem to go into the dense parts of the forests



Figure 157.—Solanum verrucosum (Correll 14245). Plant collected at Real del Monte, Hidalgo. About \times %.



FIGURE 158.—Solanum verrucosum (Correll 14245a). Plant grown from Mexican tubers in greenhouse, United States Plant Introduction Garden, Glenn Dale, Md. About \times %.



FIGURE 159.— $Solanum\ verrucosum\ (Correll\ 14245b)$. Plant grown from Mexican tubers in field at Potato Introduction Station, Sturgeon Bay, Wis. About $\times\ \%$.



Figure 160.—Solanum verrucosum (Balls and Gourlay 5010). Type collection of S. salamanii. About \times %.

but to keep along the more cleared areas where there is plenty of shade, flowers deep purple, about 2.5 cm. in diameter, in loose heads to 7.5 cm. across, stems usually upright, often single, to 3.5 dm. tall, leaves glossy green and only slightly hairy, 2,745 m., July 23, 1938, Balls and Gourlay 5087 (Cam, US); slope of Ajusco Mountain, edge of wheatfield, plants large, fruits white-spotted, October 25, 1947, Correll 14217, 14217b, 14217c [P. I. No. 160228] (NA). HIDALGO: Real del Monte. Ehrenberg 1132 (in part) (Paris); Sierra de Pachuca, July 21 and 22, 1901, Rose and Hay 5579 (US); between Pachuca and Real del Monte, August 31, 1903, Rose and Painter 6698 (US); Sierra de Pachuca, September 24, 1906, J. N. Rose and J. S. Rose 11490 (US); Honey station, June 21, 1908, Pringle 15607 (Gray, Mich, US); Sierra de Pachuca, July 20 and 24, 1905, Rose and Painter 8878 (Gray, NY, US); rich soil, woods above Trinidad mine, Real del Monte, 2,745 m., November 3, 1930, Reddick 569 (219) (Co); same locality and date, rich loam under pine tree, Reddick 569 (221) (Co); Real del Monte, in thicket along roadside, plants robust, with small tubers. November 7, 1947, Correll 14245 through 14245b [P. I. No. 161123] (NA). México: Volcán Toluca, Cocustepec, 2,650 m., called "papa cimaron," Heller 333 (Paris, Vienna); El Carazon, 45 km. from Mexico City on Puebla road, plant 1 m. tall, fruits green with very numerous small white wayts tubers white abundant 3,660 m. Otto very numerous small white warts, tubers white, abundant. 3,660 m., October 15. 1930, Reddick 551 (87) (Co); dry soil, roadside, El Vigia, 46 km. from Mexico City on road to Puebla, plant 2 to 3 dm. tall, fruit green with abundant small white warts, 3,750 m., October 15, 1930, Reddick 606 (79) (Co); same locality and date, rich loam shaded by bushes, plant 1 m. tall, fruit green with very numerous small white warts on surface, tubers white, Reddick 548 (80) (Co); same locality and date, fruit green with very numerous white warts, tubers white, Reddick 549 (82) (Co); pine woods, near summit of Cerro de San Miguel (above El Desierto, Distrito Federal), tubers russet, November 5, 1930, Reddick 578 (Co); same locality and date, very rich loam under pine tree, tubers white, Reddick 577 (Co); same locality and date, Reddick 577a (Co); "In montos Toluca." 2,130 to 3,050 m., Mohr s. n. (US); La Venta, 2,500 m., July 12, 1935, Fisher 35527 (CM); Nevada de Toluca, Paraje Mungia, flowers deep red purple, 3 cm. in diameter, in loose spreading heads to 10 cm. across, upright bushy habit to 4.5 dm. tall, often with several branches breaking away from main root just above ground surface, the plant has a flat lush appearance, very near to that of the cultivated plants, it grows in immense profusion all along the edges of potato fields, and among the crops where it is ruthlessly hoed out, nevertheless the natives say it is eaten. "The tubers are often 6 cm. in diameter, rather round-oval and with a reddish skin, quite unlike any other wild species we have seen, the plant is never found in the woods, but only along the edges of cultivation, this might suggest the plant to be a revert from some earlier cultivated species, we were told that the tubers a revert from some earlier cultivated species, we were told that the tubers are eaten but the general hoeing out from among the crops and along the edges of the fields would suggest that the plant was not considered very favorably," the native name "papa morda" (without the "cimarrona" which seems to attach to most wild species in this country), 3,550 m., July 12, 1938, Balls 5010 [type collection of S. salamanii] (Cam, US); above Col. Manuel Avila Camacho, in pine forests in mountains, plants all dead, December 4, 1947, Correll 14304a and 14304c [P. I. No. 161353 (in part)] (NA). MICHOACÁN: Tancitaro, Mount Tancitaro, herb, flowers purple, common in rich soil among rocks either in partial shade or in open field, 2,400 m., July 25, 1941, Leavenworth and Hoogstraal 1212 (CM); pine woodland north of Uruapan, flowers purple, July 16, 1941, Schery 156 (Mo); north of San Lorenzo, in pine forest and around pine stumps in newly cleared cornfield in mountains, plants all dead or badly wilted, two species are apparcornfield in mountains, plants all dead or badly wilted, two species are apparently in this collection, December 15, 1947, Correll 14337a and 14337b [P. I. No. 161705] (NA); vicinity of San José de la Cumbre, in pine-balsam forest, plants all dead, fruits pale green, December 24, 1947, Correll 14378b and 14378e [P. I. No. 161714 (in part)] (NA); vicinity of Las Peras, edge of forest, plants all dead, tubers purplish, December 24, 1947, Correll 14377a and 14377b [P. I. No. 161713] (NA); above Macho de Agua, in pine-balsam forest in mountains, plants all dead, December 24, 1947, Correll 14381a and 14381c [P. I. No. 161717] (NA); on edge of balsam cloud forest, about 7 miles

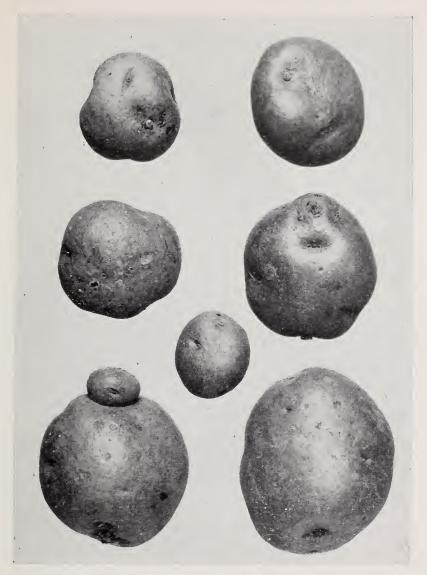


Figure 161.—Solanum verrucosum (Correll 14411). Tubers collected on the edge of cornfields on mountain slopes above Tres Cumbres, Morelos. About \times 1.

above Opopeo, plants tall and straggly, fruits round and rough, white-speckled, tubers well formed and of good size, November 13, 1947, Correll 14252 through 14252b [P. I. Nos. 161128, 161173] (NA). Morelos: above Tres Cumbres, in and about old cornfields, plants all dead, two species here—one with small white tubers, the other with large red-purple tubers, December 28, 1947, Correll 14411a and 14411c [P. I. No. 161718] (NA) (fig. 161). Oaxaca: Cordillera, November-April 1840, Galeotti 1190 (US); 18 miles southwest of the city of Oaxaca, 2,280 to 2,900 m., September 10-20, 1894, Nelson

1319 (in part) (US). Puebla: Honey, pine woods, 2,135 m., October 22, 1908, Barnes and Land 519 (CM, US). San Luis Potosí: chiefly in region of San Luis Potosí, 1,830–2,440 m., 1878, Parry and Palmer 632 (in part) (Mo). Tlaxcala: Mount Malinche, San Diego de Pinar, 2,890 m., October 12, 1938, Balls and Gourlay 5628 [cultivated specimen] (Cam); Huamantla, La Herita, called "papa azul," 3,950 m., October 16, 1938, Balls and Gourlay 5657 [cultivated specimen] (Cam); Mount Malinche, from Huamantla, below Los Pilars, called "papa blanca," 2,590 m., October 17, 1938, Balls and Gourlay 5658 [cultivated specimen] (Cam). Verracruz: Lomagrande, Mount Orizaba, growing along the edges of barley fields, in rich sandy volcanic loam, flowers deep purple with orange anthers, up to 2.5 cm. in diameter, loose tufted habit to 3 dm. tall, tubers small, reddish, called "papa cimarrona," 2,600 m., August 27, 1938, Balls and Gourlay 5366 (Cam, US). State unknown: Mount Orizaba, 3,050 m., August 8, 1891, Seaton B. (Gray); "Mexico," no locality, August 1853, Müller (NY); "Mexico," Ehrenberg 1132 (US); "Mexico," Dr. Coulter 1242 (Gray); "Mexico," 1856, Heller 89 (Vienna); "Mexico," bearing small tubers, 1868, Hahn s. n. (Mo).

Probable natural hybrids involving S. verrucosum:

MEXICO.—Hidalgo: San Mateo, growing among maguey plants on edge of burro trail, plants all dead, tubers smooth and well-formed, usually white with a pink-purplish blush, [natives sometimes eat this potato but not too palatable], December 31, 1947, Correll 14416a and 14416c [P. I. No. 161697] (probably a natural hybrid of S. verrucosum × S. stoloniferum) (NA). TLAXCALA: above San Diego de Pinar, Mount Malinche, 2,900 m., in pine forests, shade among rank herbage and in deep rich humus, flowers mauve, purple, 2 cm. in diameter, loose bushy plants up to 4.5 dm. tall, broad, spreading, fruits oval, speckled with white, up to 4 cm. long, October 12, 1938, Balls 5628 (probable natural hybrid of S. verrucosum × S. tuberosum) (Dud, US).

49. Solanum verrucosum var. iopetalum Bitt., Repert. Sp. Nov. 11: 455. 1912. (Figs. 162 and 163.)

Solanum iopetalum (Bitt.) Hawkes, Potato Coll. Exped. Mexico and S. Amer. 2: 30. 1944.

The writer has maintained this plant in a varietal category, as it represents an extreme condition found in this species. It is larger in all its parts than typical *S. verrucosum*. The corolla lobes are also more pronounced, but this may be only the result of its increase in size.

Fruits found on the 10 sheets of the type collection examined, though immature, have a definite conical shape; in some the apex is decidedly acute. The writer has not observed this fruit characteristic in typical S. verrucosum. This conical characteristic of the fruit is a disturbing factor, as it approaches that of some species now referred to the series Conicibaccata. In fact, var. iopetalum, which apparently grows at low elevations, shows definite relationship with S. brachycarpum (series Conicibaccata), whose center of distribution is in the high mountains of Michoacán. Hence, var. iopetalum is here placed in the series Tuberosa with some reservations. With further study and availability of material with mature fruits, it may be found that it should be given specific rank as Hawkes indicates and placed in the series Conicibaccata.

Pringle's collection (No. 15607) from Honey Station, Hidalgo,



Figure 162.—Solanum verrucosum var. iopetalum (Pringle 8954). Type collection. About \times %.

though referred to typical S. verrucosum, is somewhat intermediate between the typical form and its var. iopetalum.

Specimens examined:

MEXICO.—HIDALGO: Mineral [Real] del Monte, very abundant along wood roads and on walls, flowers light blue, July-October, *Ehrenberg 80* (in part) (Cal); wet woods near Trinidad Iron Works, 1,750 m., June 16, 1904, *Pringle 8954* [type collection of *S. verrucosum* var. *iopetalum*] (Cal, CM, Co, Gray, Mo, NY, PA, US, Vienna). VERACRUZ: Orizaba, 1855, *Fred Müller 1673* (Kew, NY).

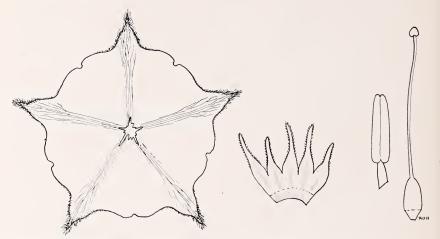


FIGURE 163.—Solanum verrucosum var. iopetalum (Pringle 8954). Corolla and calyx, about \times 2; stamen and pistil, about \times 4.

50. Solanum verrucosum var. spectabilis Correll var. nov. 15 (Figs. 164, 165, and 166.)

This is a rather coarse, typically squat bushy plant with large showy flowers. The flowers are usually white with light-lavender or bluish mottlings, especially near the base of the corolla. The flowers may, however, be purplish. The fruit is more ellipsoid-

ovoid or ellipsoid than in the typical form.

Variety *spectabilis* is apparently confined to the high mountains of western Mexico, where it occurs up to at least 4,000 meters. At the type locality, Opopeo, Michoacán, plants of typical *S. verrucosum* grew nearby but were almost passé, which would indicate that var. *spectabilis* matures later than the typical form. It was bitterly cold at the time of the writer's visit in middle November, and from the appearance of the general herbaceous vegetation frost had apparently occurred before his arrival. This would imply that var. *spectabilis* is frost-resistant.

¹⁵ Herba crassa, satis humilis et fruticosa. Flores magni, spectabiles, vulgo albi cum maculis pallide violaceis vel subcaeruleis, prope corollae basim praesertim, raro purpureis. Fructus ellipsoidei vel ellipsoideo-ovoidei.



Figure 164.—Solanum verrucosum var. spectabilis (Correll 14253). Type collection. About \times %. (The two flowers in lower right-hand corner were taken from Correll 14340a.)

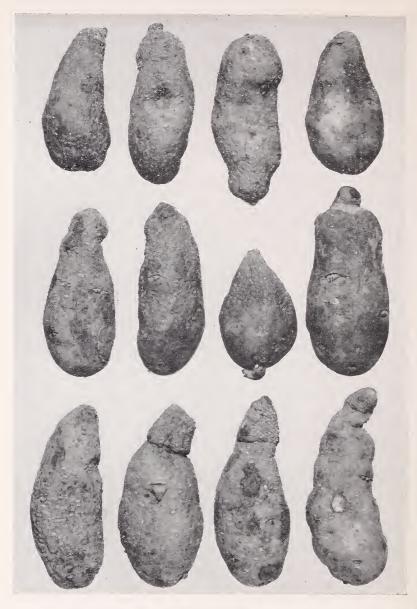


FIGURE 165.—Solanum verrucosum var. spectabilis (Correll 14371). Tubers collected in flats in snow fields near timber line on Volcán de Nevada, Jalisco. About \times 1.

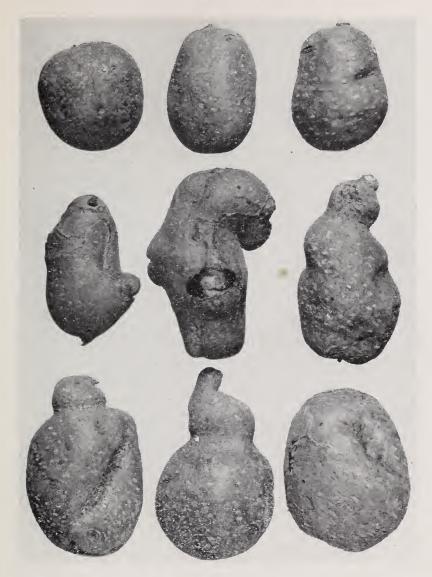


FIGURE 166.—Solanum verrucosum var. spectabilis (Correll 14342). Tubers collected in flats on edge of field in thicket, Sayulapa, slopes of Volcán de Nevada, Jalisco. About \times 1.

Specimens examined:

MEXICO.—Colima: Cuchilla, northeast side Volcán Colima, 3,050 m., July 22, 1905, Goldsmith 72 (Gray, Mo, NY, US). Jalisco: Sayulapa, slopes of Volcán de Nevada, on edge of field in thicket, plants large but dead, tubers white or tinged with purple, December 18, 1947, Correll 14342a through 14342c [P. I. Nos. 161727, 161741] (NA); Volcán de Nevada, from flats in snow fields near tree line, plants all dead, fruits green with faint speckles snow fields near tree line, plants all dead, fruits green with faint speckles and deeper green stripes, shining and smooth, tubers white and typically spindle-shaped, December 21, 1947, Correll 14371a and 14371b [P. I. No. 161709 (in part)] (NA); El Isote, on edge of balsam-pine forest, upper slopes of Volcán de Nevada, plants large but all dead, December 18, 1947, Correll 14340a through 14340c [P. I. Nos. 161726, 161740] (NA). MICHOACÁN: about base of large trees on edge of balsam cloud forest, about 7 miles above Opopeo, plants short and bushy, fruits ellipsoid, green and slightly whitish, flowers white lavender, leaves heavy and thick, November 13, 1947, Correll 14253 [type in U. S. National Aboretum Herbarium] 14253a and 14253b [P. I. Nos. 161129, 161174] (NA); Puerto Carnica, on edge of balsampine forest in rocky soil, plants low and bushy, November 14, 1947, Correll 14262 through 14262b [P. I. No. 161137] (NA); near Matujeo, among rocks in old lava flow, plants all dead, tubers white or with reddish-purple tinge, December 23, 1947, Correll 14374b [P. I. No. 161710 (in part)] (NA).

51. Solanum wightianum Rydb., Torrey Bot. Club Bul. 51: 149. (Figs. 167 and 168.) 1924.

Plant 4 dm. or more tall, more or less pilose throughout with flat, white, somewhat kinked hairs, with subterranean stolons and tubers. Stem angular and striate. Leaves on the seedlings or young shoots simple, broadly ovate, 2 to 3 cm. long, the petioles up to 1.5 cm. long; leaves of the mature plant odd-pinnate, 1.0 to 1.5 dm. long. Leaflets 3 or 5, broadly ovate to ovate-elliptic, rounded to acute, broadly rounded to subtruncate at the base, distinctly petioled, 4.0 to 6.0 cm. long and up to 4.5 cm. wide, the upper pair of leaflets up to 4 cm. long and 2 cm. wide, the lowermost pair up to 1.5 cm. long; terminal leaflet conspicuously larger than the lateral leaflets. Pseudostipular leaves falcate, auriculiform, about 8 mm, long. Inflorescences about 5-flowered, racemose; peduncles up to 4.5 cm. long, terminal on the branches. Flowers white. Pedicels 2 to 3 cm. long, articulate above the middle. Calvx about 5 mm. long, divided to about the middle into triangular-ovate acute to acuminate lobes. Corolla rotate, up to 2 cm. in diameter, puberulent on the outer surface. Anthers oblong, 4 mm. long; filaments stout, about 1 mm. long. Style rather stout, 7 to 8 mm. long, exceeding the stamens. Fruits not seen.

Range: Apparently endemic in Guanajuato, Mexico. The conspicuously large terminal leaflet is distinctive and readily serves to separate this species from its nearest allies. Since S. wightianum is represented only by cultivated material, the plant in its native environment probably differs somewhat from the type collection. This point should be kept in mind in identifying material from Guanajuato and vicinity.

Specimens examined:

MEXICO.—GUANAJUATO: grown from tubers found under cliffs near Acambaro, October 1904, F. L. Lozano s. n. [type collection] (Gray, NA).



FIGURE 167.—Solanum wightianum (Lozano s. n.). Type specimen. About × %.

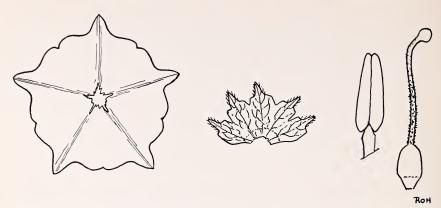


FIGURE 168.—Solanum wightianum (Lozano s. n.). Corolla and calyx, about × 2; stamen and pistil, about × 4.

EXCLUDED SPECIES

It has not been possible to place accurately *Solanum schenkii* and *S. schizostigma*. The type specimens in the Berlin-Dahlem Museum were destroyed during World War II, and the writer has not been able to locate photographs of these, if such were taken. Although the original descriptions were complete, there are no characteristics that place either definitely into any one category. It appears from the descriptions that *S. schenkii* belongs in the

It appears from the descriptions that *S. schenkii* belongs in the series *Tuberosa* and may possibly be related to *S. stoloniferum*, if not a form of that species. *Solanum schizostigma* may also be referable to series *Tuberosa*. A free translation of the original description of each is given below.

Solanum schenkii Bitt., Repert. Sp. Nov. 11: 448. 1912. Type locality: Mexico.—Boca del Monte near Esperanza, Veracruz, H. Schenk 126.

Lower part of plant not seen. Stem suberect, branching, pilose, 40 cm. tall; internodes 4.0 to 5.5 cm. long. Leaves 13.5 cm. long (petioles 3 to 5 cm. long), odd-pinnate, 2- or 3-paired, with decurrent bases, without interstitial leaflets. Leaflets lanceolate, the lower ones elliptic, obtuse (if ultimate segments are present on leaflets they are small), gradually larger toward apex, lower ones subpetiolulate, upper pair sessile, strongly decurrent on rachis, attenuate on both sides, obtuse; terminal leaflet largest, narrowed toward apex, often almost acuminate, the apex obtuse, green on both sides, rather long hairs above, shorter hairs on lower sur-Pseudostipular leaves oblique, 5 to 9 mm. long, 3 to 5 mm. face. Inflorescence at first terminal, at maturity crowded on a branch from the axil of the uppermost leaf [the uppermost leaf apparently develops with age], few- (3-) flowered; peduncle 3 cm. long, slender. Pedicels 17 to 18 mm. long, jointed above middle. with multicellular acute hairs incurved (also on peduncle), some pustulate, with small stipitate gland above the articulation. Calyx campanulate, in flowering state 6 to 7 mm. in diameter across the lobes; lobes equal, joined by a pellucid membrane, free part almost 3 mm. long, very acute, with short incurved hairs. Corolla white, rotate, 19 to 20 mm. in diameter; lobes joined by membranes, almost 3.5 mm. long, lanceolate and acute, with long dense hairs on margins, cucullate at apex, membrane pilose on margins but glabrous in very center. Anther elliptic-lanceolate, 4 mm. long, 1.5 mm. wide, cordate at base; filaments 1.3 mm. long, glabrous. Style 9 mm. long, glabrous; stigma club-shaped, less than 1 mm. long and wide.

Solanum schizostigma Bitt., Repert. Sp. Nov. 11: 449. 1912. Type locality: Mexico, no definite locality, Aschenborn 306.

Plant slender, only upper part seen; stem 1.0 to 1.5 mm. thick, almost glabrous; internodes 2 to 3 cm. long. Leaves about 17 to 18 cm. long, 2- or 3-jugate, with no interstitial leaflets or only an elliptic one (5 mm. long, 4 mm. wide) between the upper pair of leaflets; petiole 2.5 to 3.0 cm. long, narrowly winged like the rachis, almost glabrous. Leaflets green on both sides, glabrous above (with occasional hairs on veins), sparsely pubescent below on midvein and lateral veins, with prominent punctae in dried state; larger leaflets broadly lanceolate or oblong-lanceolate; lateral leaflets oblique at base, lower ones shortly petiolulate or subsessile, upper on "basoscopo" side decurrent on the narrowly winged rachis; terminal leaflet on both sides gradually attenuate, up to 7.5 cm. long, 3 to 4 cm. wide, gradually acute at apex, somewhat rounded attenuate at the base into a winged petiolule about Pseudostipular leaves oblique, about 1 cm. long, 5 to 6 mm. wide. Inflorescence about 7- or 8-flowered, oncebranched; peduncle slender, glabrous, 2 to 5 cm. long, joined with the uppermost leaf-bearing internode or with the two uppermost Pedicels loosely disposed, 12 to 15 mm. long, slender, articulate at middle, up to 3 cm. long in the fruiting stage, glabrous. Calvx campanulate, rather large, 7 to 8 mm, in diameter between the lobes; lobes lanceolate, rather long-acuminate, about 4 mm. long, 1.5 mm. wide, pellucid membrane joins base and somewhat marginate, furnished with short unicellular acute hairs on upper margins, inside with short stipitate glands. Corolla white, subrotate, 2 cm. in diameter; lobes joined with long interpetalar membranes, rather broad, 5 to 7 mm. long, 4 to 6 mm. wide, acute, margin with dense multicellular acute hairs (some simple or subbranched). Anther ellipsoid-lanceolate, about 5.0 to 5.5 mm. long, 1.2 to 1.5 mm. wide, cordate at base; filaments glabrous, 2 to 3 mm. long. Style surpassing the stamens, 8 to 9 mm. long, glabrous, straight; stigma eventually plainly bifid. Fruiting calyx enlarged; immature fruits globose.

In 1818, Humboldt, Bonpland, and Kunth proposed as variety parvifolium a Mexican plant of the commonly cultivated plant S. muricatum. Rydberg, in 1924, was of the opinion that this plant

was possibly the same as *S. morelliforme*. It is here excluded because of insufficient data to place it accurately.

Solanum muricatum [var.] parvifolium H.B.K., Nov. Gen. et Sp. 3: 21. 1818. Type locality: near Mexico City, 2,135 m., Humboldt.

BIBLIOGRAPHY

Baker, J. G.

1884. A REVIEW OF THE TUBER-BEARING SPECIES OF SOLANUM. Linn. Soc. London, Jour. Bot. 20: 489-507, illus.

BERTHAULT, P.

1911. RÉCHERCHES BOTANIQUES SUR LES VARIETÉS CULTIVÉES DU SO-LANUM TUBEROSUM ET LES ESPÈCES SAUVAGES DE SOLANUM TUBÉRIFÈRES VOISINS. Ann. Agron. [Paris], ser. 3, 6 (2): 1-59, 87-143, 173-216, 248-291, illus.

BITTER, G.

1912–14. SOLANA NOVA VEL MINUS COGNITA. Repert. Spec. Novarum Regni Veg. 10: 529–565; 11: 1–18, 202–237, 241–260, 349–394, 431–473, 481–491, 561–566; 12: 1–10, 49–90, 136–162, 433–467, 542–555, illus.; 13: 88–103, 169–173.

Bukasov, S. M.

- 1930. THE CULTIVATED PLANTS OF MEXICO, GUATEMALA AND COLOMBIA.
 Trudy Prikl. Bot., Genet., i Selek. (Bul. Appl. Bot., Genet., and Plant Breeding), Sup. 47: 191–226, 513–523, illus. [In Russian, English summary.]
- 1933. THE POTATOES OF SOUTH AMERICA AND THEIR BREEDING POSSI-BILITIES. Lenin Acad. Agr. Sci., U. S. S. R. Inst. Plant Indus. (Sup. 58 to Bul. Appl. Bot., Genet., and Plant Breeding), 192 pp., illus. Leningrad. [In Russian, English summary.]
- 1938. INTERSPECIFIC HYBRIDIZATION IN THE POTATO. Acad. des Sci. U. R. S. S. Bul. 711-732. In Russian, English summary, pp. 723-732.]
- 1939. THE ORIGIN OF POTATO SPECIES. Physis [Buenos Aires] 18: 41-46, illus.

CORRELL, D. S.

- 1948. COLLECTING WILD POTATOES IN MEXICO. U. S. Dept. Agr. Cir. 797, 40 pp., illus.
- 1948. WILD POTATO COLLECTING IN MEXICO. Field and Lab. 16: 94–112, illus.
- 1950. NEW MIDDLE AMERICAN SOLANUMS, SECTION TUBERARIUM. Tex. Res. Found. Contrib. 1: 4-14, illus.

DUNAL (in De Candolle).

1852. PRODROMUS [SOLANACEAE] v. 13: 27-387. Paris.

HAWKES, J. G.

- 1941. POTATO COLLECTING EXPEDITIONS IN MEXICO AND SOUTH AMERICA.

 Imp. Bur. Plant Breeding and Genet., 30 pp., illus. Cambridge.
- 1944. POTATO COLLECTING EXPEDITIONS IN MEXICO AND SOUTH AMERICA.
 II. SYSTEMATIC CLASSIFICATION OF THE COLLECTIONS. Imp.
 Bur. Plant Breeding and Genet., 142 pp., illus. Cambridge.

JUZEPCZUK, S. W.

1937. NEW SPECIES OF THE GENUS SOLANUM I. IN THE GROUP TUBER-ARIUM DUN. Akad. Nauk S. S. S. R. Izv. (Acad. des Sci. U. R. S. S. Bul.) 2: 295-331. (In Russian, English summary.) JUZEPCZUK, S. W. and BUKASOV, S. M.

1929. A CONTRIBUTION TO THE QUESTION OF THE ORIGIN OF THE POTATO.
U. S. S. R. Cong. Plant and Animal Breeding Proc. and
Genet. 3: 593-611. [In Russian, English summary, pp. 600-611.1

LEMMON, J. G.

1885. INDIGENOUS POTATOES OF NORTH AMERICA. Amer. Hort. Soc. Trans. 3: 141-150.

LINDLEY, J.

1848. NOTES ON THE WILD POTATO. Roy. Hort. Soc. Jour. 3: 65-72, illus.

MACMILLAN, H. G.

1942. THE AID OF EXPLORATION IN POTATO IMPROVEMENT. Amer. Potato Jour. 19: 255-266.

MILLER, J. C., and McGoldrick, F.

1941. EFFECT OF DAY LENGTH UPON THE VEGETATIVE GROWTH, MATURI-TY, AND TUBER CHARACTERS OF THE IRISH POTATO. Amer. Potato Jour. 18: 261-265.

[MITCHELL, W. S.]

1886. THE ORIGIN OF THE POTATO. Gard. Chron. 25: 487, 552, 553, 584.

RYDBERG, P. A.

1924. THE SECTION TUBERARIUM OF THE GENUS SOLANUM IN MEXICO AND CENTRAL AMERICA. Torrey Bot. Club Bul. 51: 145-154, 167 - 176.

SABINE, J.

1824. ON THE NATIVE COUNTRY OF THE WILD POTATOE WITH AN ACCOUNT OF ITS CULTURE IN THE GARDEN OF THE HORTICULTURAL SO-CIETY. . . . Hort. Soc. London, Trans. 5: 249-259, illus.

SAFFORD, W. E.

1925. THE POTATO OF ROMANCE AND OF REALITY. Jour. Hered. 16: 113-126, 175-184, 217-230, illus.

SALAMAN, R. N.

1937. THE POTATO IN ITS EARLY HOME AND ITS INTRODUCTION INTO EUROPE. Roy. Hort. Soc. Jour. 62: 61-77, 112-123, 153-162, 253-266. illus.

1949. THE HISTORY AND SOCIAL INFLUENCE OF THE POTATO. 685 pp., illus. Cambridge.

SUTTON, A. W.

1898. THE POTATO. Roy. Agr. Soc., Jour., Ser. 3, 9: 581-653, illus.

1909. NOTES ON SOME WILD FORMS AND SPECIES OF TUBER-BEARING SOLANUMS. Linn. Soc. London, Jour. Bot. 38: 446-453, illus.

TORREY, J. 1828. SOME ACCOUNT OF A COLLECTION OF PLANTS MADE DURING JOUR-NEY TO AND FROM THE ROCKY MOUNTAINS IN THE SUMMER OF 1820 . . . Ann. Lyceum Nat. Hist. N. Y. 2: 161-254.

VAVILOV, N. I.

1928. GEOGRAPHISCHE GENZENTREN UNSERER KULTURPFLANZEN [Geographical centers of our cultivated plants]. Internatl. Cong. (Fifth) Genet. Proc. (1927): 342-369, illus. [Ztschr. f. Induktive Abstam. u. Vererbungslehre. Sup. 1.]

1931. MEXICO AND CENTRAL AMERICA AS THE PRINCIPAL CENTER OF ORIGIN OF CULTIVATED PLANTS OF THE NEW WORLD. Trudy Prikl. Bot., Genet., i Selek. (Bul. Appl. Bot., Genet., and Plant Breeding) 26: 135-199, illus. [În Russian, English summary, pp. 179-199.]

VIIRILÄ, P.

1949. ON THE EFFECT OF DAY LENGTH ON THE BIOLOGY OF SOLANUM DEMISSUM LINDL. (PÄIVÄN PITUUDEN VAIKUTUKSISTA MEKSI-KOLAISEN LUONNONVARAISEN PERUNAN, SOLANUM DEMISSUM LINDL., BIOLOGIAAN) . . . Arch. Soc. Zool. Bot. Fenn. 'Vanamo' 4: 60-72, illus.

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Walpers, G. G. 1844-45. Ordo clii. solanaceae bartl. Repert. Bot. System v. 3: 5-126.

Wight, W. 1916. Origin, introduction and primitive culture of the potato. Potato Assoc. Amer. Proc. 3: 35-49.

WITTMACK, L. 1909. DIE STAMPFLANZE UNSERER KARTOFFEL. Landw. Jahrb. 38 (Sup. 5): 551-605.

1914. EINEGE NEUE SOLANUM-ARTEN AUS DER TUBERARIUM-GRUPPE. Bot. Jahrb. 50 (Sup.): 539-555, illus.

INDEXES

PLANT INTRODUCTION NUMBERS

The United States Department of Agriculture Plant Introduction numbers refer to the living material introduced for propagation; in the case of the following, tubers and seeds. The P. I. numbers given here were first mimeographed April 1, 1948, and distributed as Special Inventory No. 1 by the Division of Plant Exploration and Introduction. The identity of these numbers, which are also cited in the text, are given below. They are included here for the convenience of workers, and may be best used in conjunction with the Special Inventory No. 1. It must be borne in mind, however, that the determinations are based solely upon collections made by the writer. It is quite possible that the various research workers who are dealing with the living material will discover additional variants, or even additional species, in the materials that have not been available to the writer.

In all cases where tubers and fruits were obtained in the same Mexican field collection they received separate P. I. numbers, but the writer's same field number was used for both tubers and seeds. The writer's field number is given in parentheses after the P. I. number. Where the letters, as "a," "b," "c," follow the plant name, they denote the suffix which accompanies the writer's Mexican field-collection number that originally represented, in most cases, only tubers and fruits. These suffixes are used on the herbarium label to separate entities in mixed collections and those herbarium speci-

mens that were made at various times from cultivated plants.

```
Solanum demissum.
160201
         (14199)
                                        160225
                                                 (14211)
                                                           S. stoloniferum (a,
160202
         (14200)
                   S. demissum
S. demissum
                                  (a).
                                          b, c).
                                        160226
160203
         (14201)
                                  (a).
                                                  (14213)
                                                            S. stoloniferum (a,
                                          b) [S. schenkii, fide Hans Ross].
160204
         (14202)
                   Discarded.
                                        160227
160205
         (14204)
                   ? S. demissum X
                                                  (14215)
                                                           S. demissum (a, b).
  S. stoloniferum (a, b).
                                        160228
                                                  (14217)
                                                            S. verrucosum (b,
160206
         (14208)
                   S. stoloniferum (a,
                                          c).
                                        160229
  b, c).
                                                 (14219)
                                                           No specimen made;
                                          same as P. I. No. 160214.
160207
         (14211)
                   S. stoloniferum (a,
  b, c).
                                        160230
                                                 (14220)
                                                           S. demissum (a, b).
160208
                                        160369
                                                  (14205)
                                                            Tubers failed to
         (14212)
                   S. demissum (a).
160209
         (14213)
                   No specimen made;
                                          grow; discarded.
  same as P. I. No. 160226.
                                        160370
                                                 (14206)
                                                           S. cardiophyllum.
                                        160371
                   S. demissum (a, b).
                                                 (14207)
                                                           S. stoloniferum (a,
160210
         (14215)
160211
         (14216)
                   S. tuberosum.
                                          b, c).
160212
         (14217)
                   S. demissum (a).
                                         160372
                                                  (14209)
                                                            S. stoloniferum (a,
                                          b, d).
160213
         (14218)
                   Discarded.
         (14219)
160214
                   S. demissum (a).
                                        160373
                                                  (14210)
                                                            Discarded.
         (14220)
                                        160374
                                                  (14214)
                                                            S. stoloniferum (a,
160215
                   S. tuberosum (a).
160216
         (14221)
                      demissum (a,
                                           b, c, d, e).
                                                  (14222)
                                        160375
  b).
                                                            No specimen made: *
160217
         (14225)
                   Unidentifiable.
                                           same as P. I. No. 161153.
                                         160376
                                                  (14223)
                                                            S. demissum (a, b,
160220
                   S. demissum (a).
         (14199)
160221
                   No specimen made;
                                          c).
         (14200)
  same as P. I. No. 160202.
                                         160377
                                                  (14224)
                                                            S. demissum (a, b).
  0222 (14201) No specim
same as P. I. No. 160203.
                                                            S. demissum (a, b).
                                         161087
                                                  (14274)
160222
                   No specimen made;
                                                  (14275)
                                                            S. demissum (a).
                                         161088
         (14204)
                                         161089
                                                  (14278)
                                                            S. stoloniferum (a,
160223
                  No specimen seen
  [? S. demissum, fide Hans Ross,
                                           b).
                                         161090
                                                  (14280)
                                                            S. demissum (a, b).
  Max-Planck Institut].
                                         161106
                                                  (14227)
                                                            Discarded.
160224
         (14208)
                   S. stoloniferum
                                         161107
                                                  (14229)
                                                            S. tuberosum.
  (a, b, c).
```

```
161108
         (14230)
                   S. stoloniferum (a, 161151
                                                 (14209)
                                                           S. demissum (c);
  b).
                                          S. stoloniferum (a, b, d).
161109
         (14231)
                   S. stoloniferum (a.
                                        161152
                                                 (14214)
                                                           S. stoloniferum (a.
  b).
                                          b, c, d, e).
161110
         (14232)
                                        161153
                                                 (14222)
                   S. tuberosum (a).
                                                           S. demissum (a).
161111
         (14233)
                   S. stoloniferum (a,
                                                 (14223)
                                        161154
                                                           S. demissum (a. b.
  b).
                                          c).
161112
         (14234)
                   Tubers did not pro-
                                        161155
                                                 (14224)
                                                           S. demissum (a, b).
  duce plants; see P. I. No. 161161.
                                                 (14226)
                                        161156
                                                           S. bulbocastanum
         (14235)
                   S. tuberosum (a,
161113
                                          var. glabrum (a).
  b).
                                        161157
                                                          No specimen seen
                                                 (14227)
161114
         (14236)
                   S. demissum (a, b).
                                          [S. andigenum (S. tuberosum), fide
         (14237)
                   S. demissum (a, b).
161115
                                          Hans Ross].
                                                 (14231)
161116
         (14238)
                   S. demissum (a, b).
                                        161158
                                                           No specimen made:
                                          same as P. I. No. 161109.
161117
         (14239)
                   S. demissum (a, b).
161118
         (14240)
                   S. demissum (a, b,
                                        161159
                                                 (14232)
                                                          S. stoloniferum
  c).
                                          (b).
161119
                                        161160
         (14241)
                   S.
                       bulbocastanum
                                                 (14233)
                                                           S. stoloniferum (a,
  (b).
                                          b).
161120
         (14242)
                   S.
                                                           S. demissum (a);
                       bulbocastanum
                                        161161
                                                 (14234)
  (c); S. cardiophyllum (d).
                                          S. stoloniferum (b).
161121
         (14243)
                   S. demissum (a, b,
                                        161162
                                                 (14235)
                                                           S. tuberosum (a,
  c, d).
                                          b).
161122
                   S. demissum (a, b).
         (14244)
                                         161163
                                                 (14236)
                                                           No specimen made;
161123
         (14245)
                   S. verrucosum (a,
                                          same as P. I. No. 161114.
  b).
                                        161164
                                                 (14237)
                                                           S. demissum (a, b).
161124
         (14246)
                   S. stoloniferum (a,
                                        161165
                                                 (14238)
                                                           No specimen made;
  b).
                                          same as P. I. No. 161116.
161125
         (14247)
                   S. stoloniferum (a,
                                        161166
                                                 (14239)
                                                           S. demissum (a, b).
  b, c).
                                                           S. demissum (a, b,
                                        161167
                                                 (14240)
161126
         (14248)
                   S. stoloniferum (a.
                                          c).
  b, c, d).
                                        161168
                                                 (14243)
                                                           S. demissum (a, b,
161127
         (14249)
                   S. tuberosum (a).
                                          c, d).
161128
         (14252)
                                        161169
                                                 (14244)
                                                           S.
                                                                            (a,
                   S. verrucosum (a.
                                                                demissum
  b).
                                          b).
161129
                                        161170
         (14253)
                   S. verrucosum var.
                                                 (14246)
                                                           No specimen made;
                                          same as P. I. No. 161124.
  spectabilis (a, b).
161130
         (14254)
                   S.
                       bulbocastanum
                                        161171
                                                 (14247)
                                                           S. stoloniferum (a.
  (b).
                                          b. c).
161131
         (14255)
                   S. tuberosum (a).
                                        161172
                                                 (14248)
                                                           S. stoloniferum (a,
161132
         (14256)
                   S. stoloniferum (a.
                                          b, c, d).
  b).
                                        161\dot{1}7\dot{3}
                                                 (14252)
                                                           S. verrucosum (a,
161133
         (14221)
                   Seeds did not ger-
                                          b).
  minate; see P. I. No. 160216.
                                        161174
                                                           S. verrucosum var.
                                                 (14253)
161134
        (14259)
                  No specimen made;
                                          spectabilis (a, b).
  same as P. I. No. 161175.
                                                 (14259)
                                        161175
                                                           S. demissum (a).
161135
         (14260)
                   S. demissum (a, b).
                                        161176
                                                 (14260)
                                                           S. demissum (a, b).
                                          31177 (14262) Seed did not germinate; see P. I. No. 161137.
161136
         (14261)
                   Discarded.
                                        161177
161137
         (14262)
                   S. verrucosum var.
                                                           S. stoloniferum (a,
  spectabilis (a, b).
                                        161178
                                                 (14263)
161138
         (14263)
                   S. stoloniferum (a,
                                          b).
                                        161179
  b).
                                                 (14265)
                                                           S. demissum (a, b).
161139
         (14264)
                   S.
                                                 (14266)
                                                           S. demissum (a).
                       demissum
                                   (a,
                                        161180
  b).
                                        161181
                                                 (14267)
                                                           S. demissum (a, b).
                                                 (14268)
                                                           S. demissum (a);
161140
         (14265)
                   S. demissum (a, b).
                                        161182
161141
         (14266)
                   No specimen made;
                                          S. tuberosum (b, c).
                                                           S. stoloniferum (a,
  same as P. I. No. 161180.
                                        161281
                                                 (14271)
161142
         (14267)
                   S. demissum (a, b).
                                          b. c).
                                        161282
161143
         (14268)
                   S. tuberosum (b.
                                                 (14271)
                                                           S. stoloniferum (a.
                                          b, c).
  c).
                                        161283
161149
         (14203)
                   S. demissum (a).
                                                 (14272)
                                                           S. stoloniferum (a,
         (14207)
                   S. stoloniferum (a,
161150
                                          b).
  b. c).
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```
S. demissum (b); 161704
161284
         (14273)
  S. tuberosum (c).
161285
         (14276)
                  S.
                      tuberosum (a,
  b).
161286
         (14279)
                  S. stoloniferum
        S. demissum (a, b, e); ? S.
  (d):
  demissum × S. stoloniferum (c).
161287
        (14283)
                  S. demissum (a, b).
161347
         (14270)
                  No specimen made;
  same as P. I. No. 161364.
         (14284)
161348
                  S. tuberosum
                                  (a,
  b).
161349
         (14285)
                  S. stoloniferum (b,
  c); S. demissum (a).
161350
         (14286)
                  S. tuberosum
                                   (b,
  c).
161351
         (14288)
                  S. demissum (a, b).
161352
         (14303)
                  S. tuberosum (a).
                  S. stoloniferum (b,
161353
         (14304)
  d); S. verrucosum (a, c).
161364
        (14270)
                  S. stoloniferum
  (a).
161365
         (14274)
                  S. demissum (a, b).
161366
        (14283)
                  S. demissum (a, b).
         (14286)
161367
                  S. demissum (a).
161368
         (14296)
                  S. suaveolens.
         (14287)
                   ? S. demissum \times S.
161399
  tuberosum (a,
                  b).
161401
         (14277)
                   S. tuberosum
                                   (a,
  b).
161677
         (14417)
                  S. tuberosum (a).
161678
         (14421)
                      tuberosum
                                   (a,
  b).
161679
         (14422)
                   S.
                      tuberosum
                                   (a,
  b).
         (14423)
                  S. tuberosum (a).
161680
161681
         (14424)
                  No specimen made;
        as P. I. No. 161774.
  same
         (14432)
161682
                  S. demissum (a, b,
  c).
161683
         (14434)
                   S. tuberosum
                                   (a,
  b).
161684
         (14435)
                  S. demissum (a, b).
                   S. stoloniferum
161685
         (14416)
  (a).
161686
                   S.
         (14435)
                       demissum
                                   (a,
  b).
161693
         (14319)
                  S. demissum (a, b,
  c).
161694
         (14337)
                  No specimen made;
  see P. I. No. 161705.
161695
         (14414)
                  S. tuberosum (a).
161696
         (14415)
                  S. tuberosum (a).
                   ? S. verrucosum X
161697
         (14416)
  S. stoloniferum (a, c).
         (14418)
161698
                  S. tuberosum (a).
                  S. tuberosum (a).
161699
         (14425)
161700
         (14318)
                  S. stoloniferum (a,
  b).
161701
         (14319)
                  S. demissum (a, b,
  c).
161702
         (14321)
                   S. demissum (a, b).
161703
         (14322)
                  S. demissum (a, b).
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(14334)S. bulbocastanum (b). 161705 (14337)S. verrucosum (a, b). 161706 S. tuberosum (a). (14338)161707A (14339)S. brachycarpum (a); S. trifidum. 161707B (14339) S. demissum. 161708 (14341)S. tuberosum (a). 161709 (14371)S. polyadenium (c); S. verrucosum var. spectabilis (a, b). 161710 (14374)S. polyadenium (a, c); S. verrucosum var. spectabilis (b). 161711 (14375)S. bulbocastanum (b). 161712 (14376)S. bulbocastanum (b). 161713 (14377)S. verrucosum (a, b). 161714 S. demissum (a, c, (14378)d); S. verrucosum (b, e). 161715 (14379)S. bulbocastanum (c); S. demissum (a, b, d). 161716 (14380)S. tuberosum (b); S. brachycarpum (a). S. verrucosum (a, 161717(14381)c). 161718 (14411)S. verrucosum (a, c). 161719 (14413)S. demissum (a, b, c). 161724 (14320)S. tuberosum (a, b). 161725 (14328)S. demissum (b). 161726 spectabilis (a, b, c).

spectabilis (14342) S. verrucosum var. (14340)S. verrucosum var. 161727spectabilis (a, b, c). (14374)161728 S. polyadenium (a, c). 161729 (14378)S. demissum (a, c, d). 161730 (14410)S. guerreroense (a). 161731(14411)S. demissum (b). 161732 (14412)S. demissum (a, b, c). S. 161737 (14320)tuberosum (a. b). S. stoloniferum 161738 (14328)(a). 161739 (14335)S. tuberosum (c); S. bulbocastanum (a, b). S. verrucosum var. 161740 (14340)spectabilis (a, b, c). (14342)S. verrucosum var. 161741 spectabilis (a, b, c). 161742 (14343)Discarded. 161743 (14344)Discarded. 161744 (14345)Discarded.

161745	(14408)	S. brack	nycarpum	161771	(14421)	S.	tuberosum	(a,
(a). 161746	(14410)	Tubers	failed to	b). 161772	(14422)	S.	tuberosum	(a,
		see P. I. N						
161747	(14412)	S. demiss	um (a, b,	161773	(14423)	No	specimen tal	ken;
c).				same	as P. I.	No. 1	161680.	,
161769	(14432)	S. demiss	um (a, b	161774	(14424)	S.	tuberosum (a).
c).							,	
161770	(14381)	S. stoloni	ferum (a.					
b).			- '	1				

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