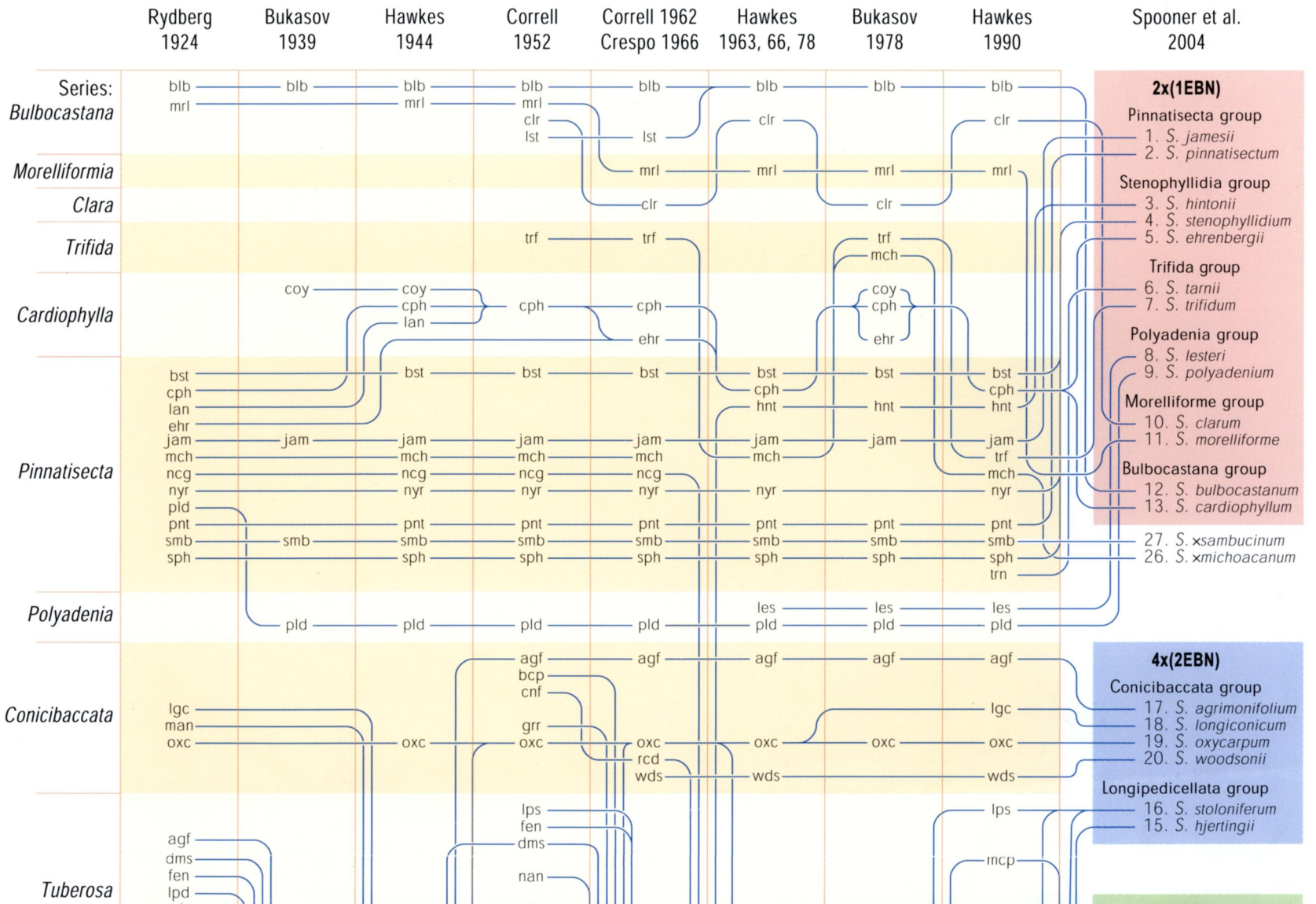
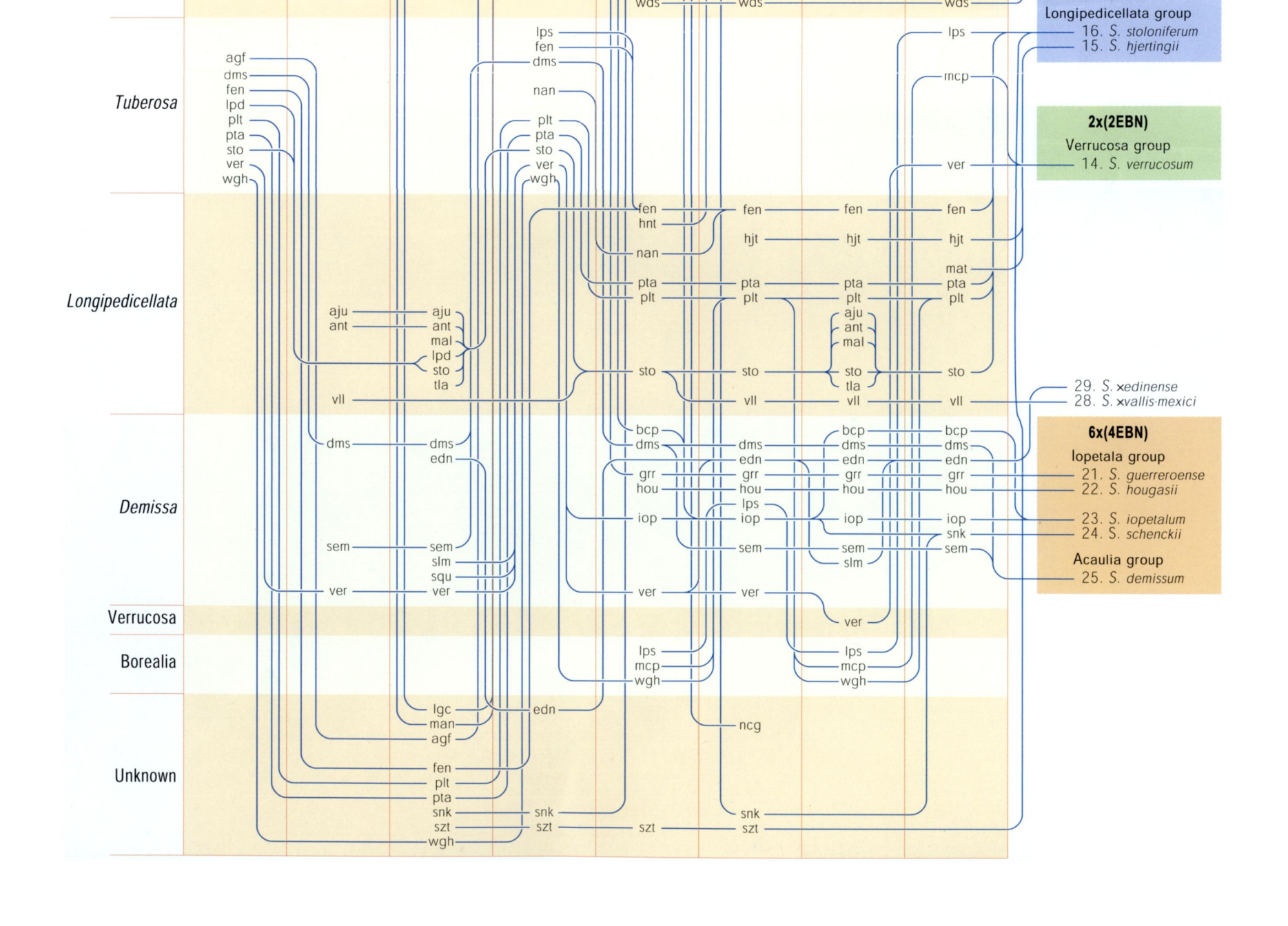
Plate 1. Chronological flow chart of hypotheses of species boundaries and series relationships of the North and Central American members of *Solanum* sect. *Petota* according to Rydberg (1924), Bukasov (1939, 1978), Hawkes (1944, 1963, 1966, 1978, 1990), Correll (1952, 1962), and Flores Crespo (1966) and our present treatment. We use informal species groups for reasons discussed in the text, and these are further grouped into ploidy and Endosperm Balance Number (EBN) crossability groups. The four nothospecies are not placed into informal groups. The following standardized abbreviations follow Simmonds (1963) and Spooner and Hijmans (2001), except for the abbreviations preceded by an asterisk, which were first used in Spooner and Sytsma (1992): agf *S. agrimonifolium*, aju *S. ajuscoense*, ant *S. antipoviczii*, bcp *S. brachycarpum*, blb *S. bulbocastanum*, *BRL series Borealia, bst *S. brachistotrichium*, BUL series *Bulbocastana*, CAR series *Cardiophylla*, *CLA series *Clara*, clr *S. clarum*, cnf *S. confusum*, CON series *Conicibaccata*, coy *S. coyoacanum*, cph *S. cardiophyllum*, DEM series *Demissa*, dms *S. demissum*, edn *S.* ×*edinense*, ehr *S. ehrenbergii*, fen *S. fendleri*, grr *S. guerreroense*, hjt *S. htertingii*, hnt *S. hintonii*, hou *S. hougasii*, iop *S. iopetalum*, jam *S. jamesii*, lan *S. lanciforme*, les *S. lesteri*, lgc *S. longiconicum*, LON series *Longipedicellata*, lpd *S. longipedicellatum*, lps *S. leptosepalum*, lst *S. longistylum*, mal *S. malinchense*, mat *S. matehuale*, mch *S.* ×*michoacanum*, mcp *S. macropilosum*, *man *S. manoteranthum*, MOR series *Morelliformia*, mrl *S. morelliforme*, nan *S. nannodes*, ncg *S. nicaraguense*, nyr *S. nayaritense*, oxc *S. oxycarpum*, PIN series *Pinnatisecta*, pld *S. polyadenium*, plt *S. polytrichon*, POL series *Polyadenia*, pnt *S. pinnatisectum*, pta *S. papita*, rcd *S. reconditum*, sem *S. semidemissum*, slm *S. salamanii*, smb *S.* ×*sambucinum*, snk *S. schenckii*, sph *S. stenophyllidium*, squ *S. squamulosum*, sto *S. stoloniferum*, szt *S. schizostigma*, tla *S. tlaxcalense*, *TRI series *Trifida*, trf *S. trifidum*, trn *S. tarnii*, TUB series *Tuberosa*, UNK Series unknown, ver *S. verrucosum*, vll *S.* ×*vallis-mexici*, *VRR series *Verrucosa*, wds *S. woodsonii*, wgh *S. wightianum*.

Species boundaries and affiliations of the North and Central American species of *Solanum* section *Petota*




Tuberosa
Longipedicellata
Demissa
Verrucosa
Borealia
Unknown
wds
lps
fen
dms
nan
plt
pta
sto
ver
wgh
agf
dms
fen
lpd
plt
pta
sto
ver
wgh
hnt
nan
mcp
mat
aju
ant
mal
lpd
sto
tla
vll
bcp
dms
edn
grr
hou
iop
sem
slm
squ
ver
lgc
man
agf
fen
plt
pta
snk
szt
wgh
ncg
Longipedicellata group
16. S. stoloniferum
15. S. hjertingii
2x(2EBN)
Verrucosa group
14. S. verrucosum
29. S. ×edinense
28. S. ×vallis-mexici
6x(4EBN)
Iopetala group
21. S. guerreroense
22. S. hougasii
23. S. iopetalum
24. S. schenckii
Acaulia group
25. S. demissum

WILD POTATOES (SOLANUM SECTION PETOTA; SOLANACEAE) OF NORTH AND CENTRAL AMERICA

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ABSTRACT. *Solanum* section *Petota* (Solanaceae), which includes the cultivated potato (*Solanum tuberosum*) and its wild relatives, contains about 200 wild species distributed from the southwestern U.S.A. (38°N) to central Argentina and adjacent Chile (41°S). Although most species occur in the Andes of South America, a secondary center of diversity exists between 16°N and 21°N in the central Mexican highlands; the populations include diploids (2n = 2x = 24; some mixed with triploids, 2n = 3x = 36), tetraploids (2n = 4x = 48), hexaploids (2n = 6x = 72), and triploid and pentaploid nothospecies. This treatment covers the wild potatoes of North and Central America (U.S.A. to the Panama/Colombia border). A summary of recent morphological and molecular studies of species limits and their interrelationships is presented. The field component of this study yielded herbarium specimens and germplasm samples from all countries harboring wild potatoes in North and Central America; germplasm collections of every species are now available. Twenty-five species and four nothospecies (and an unnamed additional nothospecies) from North and Central America are recognized and assigned to eleven informal species groups. Full descriptions and synonymies (including designations of lectotypes), illustrations, distribution maps, an extensive list of georeferenced localities, and a map of species richness are provided for all recognized taxa.

INTRODUCTION

Solanum section *Petota* Dumort., which includes the cultivated potato (*Solanum tuberosum* L.) and its wild relatives, contains about 200 wild species distributed from the

southwestern United States to central Argentina and adjacent Chile (Spooner & Hijmans 2001). The species occur from 38°N to 41°S, most in South America (peaking about 21°S); a secondary center of diversity is located around 20°N in the central Mexican highlands (Hijmans & Spooner 2001). Species from North and Central America include diploids (2n = 2x = 24), tetraploids (2n = 4x = 48), hexaploids (2n = 6x = 72), and triploid and pentaploid nothospecies. The most recent comprehensive treatment of the section by Hawkes (1990) recognized 224 wild and seven cultivated species. Spooner and Hijmans (2001) reviewed accepted species based on a literature survey, including new species described and names placed in synonymy since Hawkes's treatment (1990), and listed 203 tuber-bearing species. Huamán and Spooner (2002) reviewed seven names of cultivated potatoes with reference to the *International Code of Nomenclature of Cultivated Plants* (Trehane et al. 1995) and found they applied to one taxon, thus further reducing the number of species included in sect. *Petota* to 197.

Floristic treatments of the wild members of sect. *Petota* have been published for Argentina, Brazil, Paraguay, and Uruguay (Hawkes & Hjerting 1969), Bolivia (Hawkes & Hjerting 1989; Ochoa 1990), Peru (Ochoa 1999), and Chile (Contreras & Spooner 1999). The most recent treatments of sect. *Petota* for North and Central America were published by Correll (1952, updated in 1962) and Flores Crespo (1966; Mexico only). These treatments provided illustrations, specimen citations, and synonymies, but many names never had clear designations of types and no distribution maps were provided. In the intervening years more collections of herbarium specimens have become available, many focused on germplasm samples or on areas previously unexplored. Concepts of species limits and interrelationships have been revised with the aid of morphological and molecular studies (discussed in Relationships below). We have collected herbarium and germplasm samples in all countries harboring wild potatoes in North and Central America (United States, Mexico, Guatemala, Honduras, Costa Rica, and Panama), and germplasm collections are now stored for every species from these countries.

Hawkes (1990) recognized 33 species, 12 subspecies, and five nothospecies, in eight formal taxonomic series within North and Central America. We recognize 25 species and four nothospecies (and describe an unnamed additional nothospecies), and clearly indicate types or designate lectotypes. Because phylogenetic relationships are still unresolved we provisionally assign the 25 non-hybrid species to eleven informal species groups.

TAXONOMIC HISTORY

Of the North and Central American species included in sect. *Petota*, Dunal (1814) described the earliest recognized, *S. bulbocastanum*, and in his treatment for Candolle's *Prodromus* (1852) added *S. pinnatisectum* and *S. symphysicaulis* [=*S. bulbocastanum*], all from Mexico. Other early descriptions of taxa from North and Central America, some no longer accepted, include those by Torrey (1827, *S. jamesii*), Schlechtendal (1833, 1838, 1841, *S. stoloniferum*, *S. verrucosum*, and *S. oxycarpum*), Martens and Galeotti (1845, *S. stoloniferum* var. *pumilum* and *S. squamulosum*), Lindley (1848, *S. cardiophyllum* and *S. demissum*), Klotzsch (1849, *S. utile*), Gray (1856, 1878, *S. fendleri* and *S. tuberosum* var. *boreale*), and Greenman (1903, *S. polyadenium*).

Specialists of *Solanum* L. added many novelties, especially the prolific Bitter (1912–1913), who described 28 taxa, as well as Hawkes (1944, 1963, 1988, 1990; 17 taxa), Correll (1950, 1952, 1958, 1961a, b; 15 taxa), Rybin (1929; eight taxa), Rydberg (1924;

seven taxa), Bukasov (1930; six taxa), Lechnovich (1980; two taxa), Berthault (1911; two taxa), and Juzepczuk (1937; two taxa).

Early treatments of *Solanum* by Don (1838), Walpers (1844), Dunal (1852), Baker (1884), and Wittmack (1909) included the species discussed here, but the first modern comprehensive treatment of sect. *Petota* was provided by Hawkes (1956), who placed many of the earlier names in synonymy. Correll (1962) provided a similar account with regard to circumscription of species and series, but also included specimen citations and illustrations of the species. Additional comprehensive treatments including species from North and Central America are those of Hawkes (1963, 1978, 1990) and Bukasov (1978). In his most recent account Hawkes (1990) recognized 33 species, 12 subspecies, and five nothospecies from North and Central America, partitioned into eight formal taxonomic series (Plate 1). Rydberg (1924), Correll (1952), Flores Crespo (1966), Hawkes (1966), Rodríguez and Vargas (1994), and Spooner et al. (1998, 2001a) published regional treatments for part or all of North and Central America.

Bitter (1912) was the first taxonomist to adopt the rank of series for species included in sect. *Petota* when he published his ser. *Conicibaccata*; yet, in later publications he was inconsistent in assigning his new species to any series. Rydberg (1924) proposed the four groups *Bulbocastana*, *Oxycarpa*, *Pinnatisecta*, and *Tuberosa*, but provided no descriptions and made no indication of rank. Hawkes (1944) validated three of Rydberg's groups as ser. *Bulbocastana*, ser. *Pinnatisecta*, and ser. *Tuberosa*, but he included Rydberg's *Oxycarpa* in ser. *Conicibaccata*. Hawkes (1989) argued that despite Rydberg's (1924) lack of descriptions, the text in his dichotomous key to the groups served as valid diagnoses. Additional series were proposed by Correll (1950, ser. *Trifida*; 1952, ser. *Cardiophylla*, ser. *Polyadenia*; 1962, ser. *Clara*), Hawkes (1956, ser. *Morelliformia*), Bukasov (in Bukasov & Kameraz, 1959, ser. *Demissa*, ser. *Longipedicellata*). The names "ser. *Borealia*" (Correll 1962) and "ser. *Verrucosa*" (Bukasov 1978) were never validly published.

EXPLORATION FOR POTATO IN THE UNITED STATES, MEXICO, AND CENTRAL AMERICA AND NOTES ON THE RESULTANT COLLECTIONS

Herbarium and germplasm collections. The earliest specimens of wild potato we have seen in North and Central America are two specimens of *S. bulbocastanum* from Mexico: *Sessé & Mociño 1515* (F!) and *Sessé & Mociño 5362*, (F!), collected during the Sessé & Mociño expedition of 1787–1803. The next oldest specimen is the type of *S. pinnatisectum* (*A. Méndez, s.n.*, G-DC), from Guanajuato, Mexico, collected in 1829.

The first germplasm collecting expeditions in North and Central America were under the direction of Nicolay I. Vavilov, director of the All-Union Institute of Plant Industry (WIR) in Russia (Vavilov 1997). He dispatched Sergej M. Bukasov to Mexico and Central America in 1925, who collected only cultivated species. He also sent M. and M. Antipovich to central Mexico in the mid-1920's, who collected specimens of wild species that were used as types for 13 new wild potato taxa (Rybin 1929; Bukasov 1930; Juzepczuk 1937).

Donald Reddick, Paul Russell, and Max Souviron collected potato germplasm for the U.S. Department of Agriculture in Mexico in 1930 (Reddick 1933). In 1938, the team of Edward Balls, N. Balls, and W. Balfour Gourlay collected in central Mexico, and some of their herbarium and germplasm collections formed the basis for eleven new taxa described by John [Jack] G. Hawkes (1941, 1944). Hawkes later collected germplasm extensively in the U.S.A., Mexico and Central America variously with Jens Peter Hjerting and Richard

Lester in 1949, 1958, and 1965 (Hawkes 1959, 1966, 1997). Julian Steyermark made many collections in Guatemala from 1940–1942 (Gentry & Standley 1974). Donovan Correll collected widely in Mexico in 1947 and 1948 (Correll 1948a, b, 1952, 1962). Jerzy Rzedowsky has made extensive collections of wild potato in Mexico since 1952 and continues to do so to the present day. Keith Graham collected in Mexico in 1953, 1956, and1957 (Graham & Dione 1961), Raúl Flores Crespo from 1962 to 1967 (most collections reported in Flores Crespo, 1966), and Donald Ugent in 1962, 1963, and 1978 (most collections reported in Ugent 1967, 1968). T. Richard Tarn collected germplasm in Mexico in 1967 (Tarn 1969), and with Antonio Rivera-Peña, Jens Peter Hjerting, Roman Ross, and José Gómez led a series of extensive germplasm collecting expeditions to Mexico in 1982, 1983, and 1984. Carlos Ochoa collected herbarium specimens and germplasm samples in Mexico in 1980 (Ochoa & Schmiediche 1987). Aarón Rodriguez and colleagues collected germplasm and herbarium specimens of potatoes in Mexico in 1986 and continue to collect at present (Rodríguez & Vargas 1994; Rodríguez et al. 1995).

As a result of these field activities, the germplasm collections from North and Central America were substantial. The expeditions by Spooner and colleagues to Mexico in 1988 (Spooner et al. 1991a) and 1997 (Spooner et al. 2000), Guatemala in 1995 (Spooner et al. 1998), Costa Rica in 1997 (Spooner et al. 2001a), and Honduras and Panama in 2000, and those of of Bamberg and colleagues in the U.S.A. from 1992 to 2001 (Bamberg et al. 2003) greatly increased the number of specimens and the geographic coverage, as well as the number of species collected as germplasm. We now have access to germplasm of every species from North and Central America.

Citation of herbarium specimens and germplasm collections. Labels for collections by E. Balls, N. Balls, and W. Balfour Gourlay often bear two sets of collector identifiers, one at the top of the label under "collection number" and another at the bottom of the label under "collector." Often the "collection number" is attributed only to E. Balls, although the "collector" identifier includes all three collectors. To avoid ambiguity we cited the collectors as *Balls et al.* Hawkes (1944) generally cited the collections by the Balls team as syntypes for his new taxa. All were deposited at CPC (Commonwealth Potato Collection, Dundee, Scotland) and bear a label from this institute. The only herbarium material currently held at CPC are more recent specimens from living plants produced from seed of the germplasm collections that we do not cite here. The collections by the Balls team, formerly housed at CPC, are now widely distributed to A, B, BH, BM, BR, C, DS, E (10 specimens), F, G, GH, K (28 specimens), LL, MEXU, MICH, MPU, NY, P, UC (9 specimens), US (16 specimens), WAG, and WIS [largest sets noted in parentheses after herbarium abbreviation].

Ugent typed and photocopied his collection labels, which often had two or three nearby localities or minor habitat variants on the same label, and then marked the variant locality where the specimen was collected. He typically made many herbarium collections from a single locality and gave a separate collection number to each individual plant. These duplicates are widely distributed to BM (20 specimens), C, CM, ENCB, GAT, GH, IBUG, K, L, MEXU (40 specimens), MICH (23 specimens), MO (36 specimens), PH, PTIS, TEX, UC, US (41 specimens), VT, and WIS (67 specimens) [largest sets noted in parentheses after herbarium abbreviation]. Many of these specimens lack flowers and fruits. We grouped these duplicates as best we could, but had problems doing so efficiently because: 1) the collection numbers do not always appear to represent sequential numbers from the same place and time, 2) sometimes separate plants on different sheets have the

same collection number, in contrast to Ugent's usual practice, and 3) sometimes the same collection number is given to another specimen from a different locality.

T. Richard Tarn's collection numbers from 1967 sometimes overlap with his collection numbers from 1982 to 1984; however, his combination of collectors and collector number codes never overlap and create no problems of specimen citation overlap.

The NRSP-6 genebank assigned collector codes to expeditions that grouped all of the collectors as one, even when they often did not always collect together (Bamberg et al. 1996b). For example, NRSP-6 labeled all collections from T. Richard Tarn's 1982–1984 expeditions to Mexico as TRHRG (Tarn, Ross, Hjerting, Rivera-Peña, Gómez). Although convenient for the genebank, this system created problems in associating these germplasm collections with herbarium sheets. When possible, we listed the actual collectors if they numbered one or two.

Photographs. Donovan S. Correll took many photos that are widely distributed in herbaria. The negatives of these photos and others at F and US are conveniently numbered allowing for their efficient citation, and we identify them to their herbarium source and photo negative number. We also list other photos of types for which we do not know the source.

Types. Bitter (1912–1913) published 28 new names of wild potatoes from North and Central America. He cited many herbaria of deposition for duplicates and when possible we chose lectotypes from W, because many of his types are deposited there (Stafleu & Cowan 1976); otherwise, we chose the most complete specimens available from the cited herbaria. Hawkes (1944) published many new names, often based on collections of Balls et al., and generally cited syntypes. We preferentially chose as lectotypes duplicates from K and from the most complete collections.

We were not able to locate six types said to be deposited at WIR, despite searches there by Iris Peralta and Tamara Smelalova. Because these may still be found, we did not designate neotypes for the names affected.

MATERIALS AND METHODS

This treatment draws upon data from morphological, molecular, and field studies. The morphological studies used extensive germplasm collections grown in experimental field plots and greenhouses in Wisconsin to investigate: 1) the North and Central American diploid species of previously recognized series *Bulbocastana*, *Morelliformia*, *Pinnatisecta*, and *Polyadenia* (Lara Cabrera & Spooner, in press a); 2) the polyploid species of ser. *Longipedicellata* (Spooner et al. 2001b), 3) the polyploid species of ser. *Demissa* (Spooner et al. 1995), 4) corolla shapes to test whether these were useful as series characters (Spooner & van den Berg 2001). We changed the composition and names of these series to groups, as shown in Plate 1 and described in Relationships below. Our molecular studies involved: 1) chloroplast DNA (cpDNA) restriction site phylogenies of all species from North and Central America (Spooner & Sytsma 1992; Rodríguez & Spooner 1997); 2) Random Amplified Polymorphic DNA (RAPDs) for members of ser. *Conicibaccata* (Spooner et al. 2001c); 3) RAPDs, Amplified Fragment Length Polymorphisms (AFLPs), and cpDNA microsatellites for ser. *Longipedicellata* (van den Berg et al. 2002); 4) nuclear microsatellites for the North and Central American diploid species (Lara

Cabrera & Spooner, in press a) and AFLPs (Lara Cabrera & Spooner, in press b) for the Mexican diploid species. These studies used germplasm from the United States Potato Genebank at Sturgeon Bay Wisconsin (also called the National Support Research Program–6, NRSP–6; Bamberg et al. 1996b) and from our field collections. We use these results to complement insights gained from many prior studies on the genomic constitution, ploidy, morphology, and DNA systematics of this group as discussed in Relationships.

We visited many herbaria and annotated about 8500 specimens from 3486 collection numbers from 86 herbaria. After gaining insights from our fieldwork, herbarium work, morphological studies, and molecular studies, we studied living accessions of all the species one final time. This was done in August 2001 from representative accessions obtained and grown at Sturgeon Bay, Wisconsin. From this work we obtained photographs of some corollas and fruits needed for some species illustrations, but were unable to obtain illustrations of fruits for *S. guerreroense* and *S. oxycarpum*. Our descriptions, however, are from herbarium specimens collected in the wild, not from cultivated specimens from germplasm collections. The herbaria C, GAT, K, and PTIS have some herbarium specimens produced from germplasm collections; these records are listed in specimens citations without attempts to distinguish specimens collected in the wild from those prepared from cultivated plants.

The specimen database consisted of 3486 records, but only 1394 records (40%) had coordinate data that were available from the specimen labels. To allow for comprehensive mapping of species distributions, we assigned coordinates when possible, using the locality and altitude data. Coordinates were assigned to an additional 1927 records, bringing the total of records with coordinates to 3321 (95%).

To find coordinates we used maps, digital databases of place names (gazetteers) provided by the US Geological Survey for the United States (available at http://geonames.usgs.gov/) and by the US National Imagery and Mapping Agency for the other countries (available at http://164.214.2.59/gns/html/index.html), and digital maps of administrative units, roads, and altitude in ArcView-GIS software (ESRI, Redlands, CA, U.S.A.).

To correct for errors in coordinate data, both the original and the newly assigned coordinates were checked and sometimes modified following procedures described by Hijmans et al. (1999). First, we checked for gross errors, such as accessions located in the oceans. Then, we made overlays (spatial queries) of the collection sites and administrative boundary databases (first and second level subdivision for Guatemala, Mexico, and the United States, and first level for Costa Rica and Panama). We compared the names of the administrative units of each observation (specimen) in the wild potato distribution database with the name of the administrative unit in which it was mapped. In case of discrepancies between the two names, the coordinates were checked against the locality description and new coordinates were assigned where needed. In some cases the coordinates were correct, but the names of the administrative units were wrong. In addition, the altitude of all mapped localities was estimated using the GTOPO30 database (US Geological Survey, available at http://edcwww.cr.usgs.gov/landdaac/gtopo30/gtopo30.html), and gross outliers (>500 m) between reported and observed altitude were checked. The coordinates of the records that are listed in the specimen citations accompanying species treatments and in the Appendix are given in decimal degree notation (i.e., 12.50° is equivalent to 12°30′), rounded at two decimals. One-hundredth degree equals about 1 km.

Eighteen distribution maps were made with ArcView-GIS software, using the Lambert equal-area azimuthal projection. An elevation map (Plate 2) was made using the GTOPO30 database, and we overlaid the areas where wild potatoes occur on this map.

This delimitation was made by first drawing a circle with a radius of 25 km around each observation, and then dissolving the overlapping areas, i.e., only keeping the outer lines, using ArcInfo software (ESRI, Redlands, CA, U.S.A.).

A map of species richness was made using 50 by 50 km grid cells (Lambert equal-area azimuthal projection centered at 23.5°N, 100°W). For each cell the number of distinct species was counted, excluding the nothospecies, with the DIVA-GIS software (Hijmans et al. 2001).

Altitudes are generally obtained in the field with an altimeter that works on barometric pressure, and its natural variation can provide readings that vary 100 m or more each day. Where elevation was reported in feet we standardized it to meters, and this has resulted in some elevation data that appear more exact than they really are. The elevation summaries after each species treatment have questionable high and low extremes placed in parentheses.

MORPHOLOGY

Stolons and tubers. All members of sect. *Petota* produce tubers, generally arising from the end of the stolons (in contrast to a minority of species in South America, placed in ser. *Piurana* Hawkes, which have tubers arranged like beads on a string [moniliform arrangement, Salas et al. 2001]). The stolons can reach a meter or more in length, unlike in the cultivated species in which there has been selection for short stolons allowing for easy tuber harvest. There has never been a formal comparative taxonomic analysis of tuber morphology of the wild potatoes, and we do not provide one here. Our experience shows tubers of wild potato species from North and Central America generally to have tan or whitish skin, often with prominent lenticels, are round to oval in outline, sometimes curved, and sometimes with constrictions along their length. Typically they have whitish flesh, sometimes tinged with purple, and vary in size from 1 to 4 cm in length, rarely up to 10 cm, as we saw once in *S. oxycarpum*. *Solanum clarum* and *S. morelliforme* have consistently small round tubers, from 0.5 to 1 cm in diameter. Illustrations of some tubers of the wild species from North and Central America can be found in Correll (1952, 1962).

Stems. Stems are erect to decumbent, and when decumbent sometimes root at the nodes. All members of sect. *Petota* are herbaceous perennials that die back to the ground every year, but the stems may produce some secondary xylem at the base. Stems are terete to highly angled, sometimes with stem wings up to 5 mm wide. Stem colors range from light to dark green to reddish to deep purple, sometimes in mottled patterns. Stem wings and colors vary within populations, and we have found no taxonomic significance in these characters.

Danert (1970) and Child and Lester (1991) documented sympodial units and anthoclades (patterns of foliar lateral branches and associated inflorescences) in the Solanaceae. The inflorescences of wild potatoes, as of most Solanaceae, are terminal with a subtending axillary bud. The inflorescence assumes a lateral position by growth of this bud to a stem, and in sect. *Petota* three to many foliar nodes are produced followed by another inflorescence. *Solanum demissum* is characterized by inflorescences typically near the lower nodes, and all the other species with the inflorescence beginning near the middle of the stems or higher by additional inflorescences produced toward the proximal portion of the stems.

Leaves. Most species of sect. *Petota* have leaves that are once-pinnate with paired lateral leaflets and a terminal leaflet (imparipinnate) and 1–13 pairs of lateral leaflets (pinnae). Diminutive lobes are often intercalated with the lateral leaflets, and are here called interjected leaflets, but elsewhere called interstitial or intermediate leaflets. Leaves of some members of sect. *Petota* from South America are twice-pinnate with secondary lateral leaflets. Some species from North and Central America rarely have diminutive lobes on the apical or lateral leaflet petiolules. The lateral leaflets are sessile to petiolulate and usually opposite, but sometimes not exactly opposite. Sometimes the lateral leaflets are decurrent on the proximal (basiscopic) side of the leaf rachis. The most distal or second-most distal lateral leaflet pair is generally the largest, and the lateral pairs decrease in size towards the base to nearly the size of the interjected leaflets. If these small proximal structures are paired and have a form like the lateral leaflets we refer to them as lateral, not interjected, leaflets. Three species from North and Central America, *S. bulbocastanum*, *S. clarum*, and *S. morelliforme*, have simple leaves and therefore lack interjected leaflets.

Pseudostipules. The Solanaceae are considered to be exstipulate (Hunziker 2001). Most members of *Solanum* subg. *Potatoe* (sensu D'Arcy 1972) possess stipule-like structures that traditionally have been referred to as pseudostipules (Correll 1962; Hawkes 1990; Child & Lester 1991; Hunziker 2001). They are not attached to the stem or petiole as many other stipules, and Child and Lester (1991) use the term pseudostipule because the vasculature arises one node below their emergence. Metcalfe and Chalk (1979) point out that stipules take many forms and have various points of attachment, including axillary attachment, and have various types of vasculature including origins from one node below. They argue that it is unresolved whether stipules are fundamentally part of the leaf or separate from it. We use the term pseudostipule here. Most wild potatoes have pseudostipules that are paired, often clasping the stem, and lunate (e.g., Plate 9). Two species, *S. jamesii* and *S. pinnatisectum*, have pseudostipules that are shaped like diminutive pinnate leaves and do not clasp the stem. Sometimes the pseudostipules are only diminutive linear leaflets, and sometimes not present at all (Figs. 6, 8).

Vesture. Trichome types and density are useful taxonomically. Wild potatoes have a variety of uniseriate glandular and non-glandular trichomes (Fig. 1). The morphology and terminology of trichomes in *Solanum* have been reviewed by Seithe (1962), Gibson (1971), Roe (1971), and Seithe and Anderson (1982). Three types of glandular trichomes occur: 1) a short, storied trichome (ca. 10 μm long, Fig. 1A); 2) a short-stalked trichome with a four-celled head, a sticky substance is enclosed by the cell walls and is released by mechanical disruption (20–60 μm long, Fig. 1B); and 3) a long, multicellular, uniseriate trichome with an ovoid gland at the tip, which exudes a sticky exudate that is not membrane bound (650–950 μm long, Fig. 1C). Gibson (1971) described the latter two gland types in greater detail. His terms for them are widely used by potato researchers and are also used here; Fig. 3B a Type A gland, and Fig. 1C a Type B gland. These glandular trichomes repel or entrap insects, or otherwise inhibit their feeding or reproduction, and are effective natural defenses. Tingey et al. (1981) surveyed wild potatoes and showed Type A, Type B, or combinations of these on different species (he did not mention the storied trichome). The highly glandular species *S. lesteri* and *S. polyadenium* have only Type A glandular trichomes. Trichomes with a Type A morphology but without the terminal glandular exudate are very common on wild and cultivated potatoes and are not sticky to the touch.

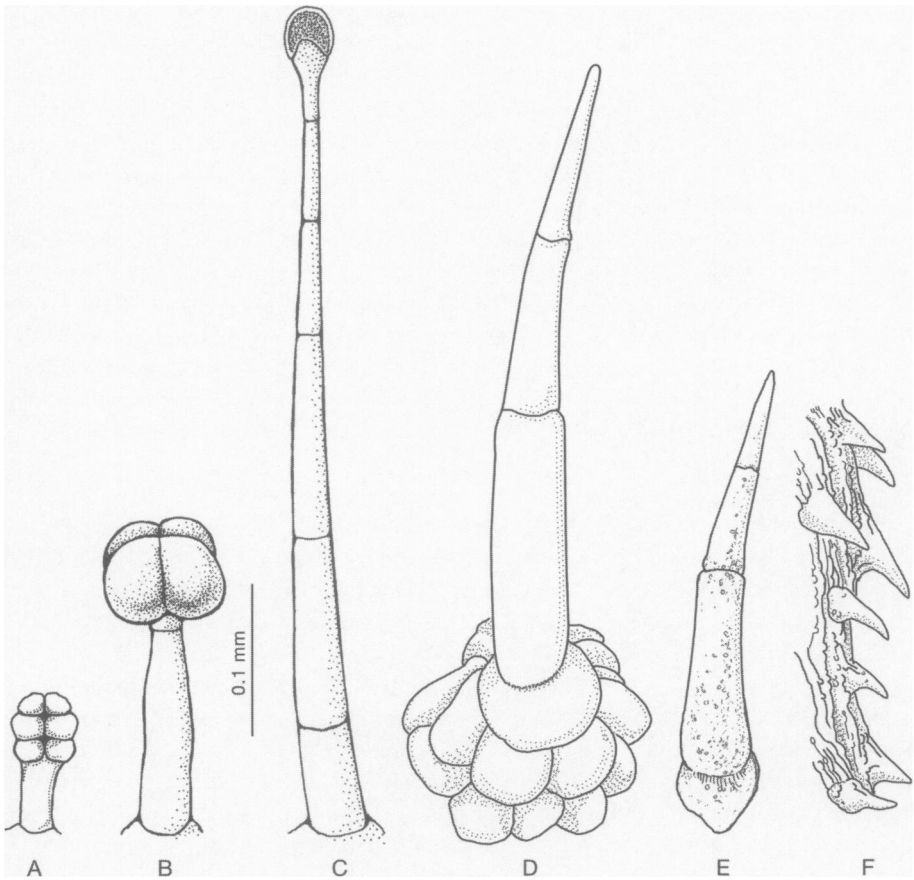


FIG. 1. Trichome types in *Solanum* sect. *Petota*. A. Storied gland. B. Type A glandular trichome. C. Type B glandular trichome. D. Multicellular uniseriate tapering trichome with a multicellular ring of cells at the base. E. Short, multicellular, uniseriate, tapering trichome without a multicellular base. F. Short, one-celled, tapering trichomes positioned on the leaf margin.

Non-glandular trichomes include uniseriate multicellular types of many lengths without the glandular tip, multicellular tapering trichomes with a multicellular ring of cells at the base (Fig. 1D), short multicellular uniseriate tapering trichomes (Fig. 1E), and short one-celled tapering trichomes (Fig. 1F). As in the cultivated potato *S. tuberosum*, leaf trichomes are often, but not uniformly, more abundant and sometimes longer on the abaxial leaf surface. The multicellular tapering trichomes are often common on the veins (McCauley & Evert 1988).

Glandular trichomes that confer insect resistance have been incorporated into the potato cultivar breeding pool by the use of the South American wild species *S. berthaultii* Hawkes (Plaisted et al. 1992), which has both Type A and Type B trichomes. Trichomes appear to be rather simply inherited (Mehlenbacher et al. 1984). Although Type A and B trichomes have been shown to be associated with undesirable yield and tuber traits, these agronomic difficulties can be overcome (Kalazich & Plaisted 1991). Thus, species from North and Central America with glandular trichomes and a variety of other mechanisms

for potent insect resistance continue to be of interest to breeders (Sikinyi et al. 1997; Pelletier & Tai 2001).

Inflorescences. The inflorescences in wild potatoes are ebracteate, monochasial or dichasially branched cymes (Danert 1970; Child & Lester 1991). Kardolus and Groendijk-Wilders (1998) studied the inflorescence architecture of members of ser. *Demissa* (from North and Central America), and ser. *Acaulia* Juzepczuk and ser. *Megistacroloba* Cárdenas & Hawkes (from South America). They described five variants of this basic inflorescence architecture, including a type not recognized previously, a monochasium with an "extra" flower at its base. None of these were species-specific and even varied on individual plants. *Solanum demissum* (from North and Central America) and *S. acaule* Bitter and *S. albicans* (Ochoa) Ochoa (from South America) often have the atypical "extra" flower. This morphological trait, combined with a rosette habit and high pedicel articulation, suggest a close relationship of *S. demissum* with other members of ser. *Acaulia* (see discussion under *S. demissum*).

Pedicels. Section *Petota* is distinguished from most other solanums by pedicel articulation above the base, and high pedicel articulation (in the distal 1/4 of the pedicel) generally distinguishes *S. demissum* from all other species in North and Central America. The position of articulation for other species is between the distal 1/4 and proximal 1/4, but varies greatly within and among species.

Calyx. The calyx is sympetalous and 5-merous. The lobes are acute to acuminate at the tip, and we use the term calyx acumen only to refer to the length of the acuminate tip, not the length of the entire free lobe. We measured the acumens at the point where the acuminate portion began to constrict to the apex, but sometimes there is no clear beginning of this constriction and these measurements therefore sometimes are imprecise. The very similar taxa *S. cardiophyllum*, *S. ehrenbergii*, and *S. stenophyllidium* are distinguished partly by acumen length: *S. cardiophyllum* minute (0.5 mm), and *S. ehrenbergii* and *S. stenophyllidium* longer (1.2–5 mm).

Corolla. Corolla shapes and colors are of high taxonomic importance in sect. *Petota.* Corollas vary in shape from deeply stellate (Plate 3A–C) to strongly rotate (Plate 3G, I–L), with intermediate shapes traditionally referred to as pentagonal (Plate 3D–F). These shapes are connected by intermediates, and it is sometimes difficult to use these terms to describe unambiguously some corolla shapes. Corollas of the most basal species (clades 1 and 2, see Relationships below) are deeply stellate and white, sometimes white tinged with blue to purple (Plate 3B, C), to cream white to yellow (Plate 3A), except *S. lesteri* and *S. polyadenium* for which corollas are white but pentagonal (Plate 3D). Members of clade 3 (all in South America) and clade 4 (species in North and Central America and in South America) are typically pentagonal to rotate (Plate 3E–L), predominantly blue to reddish purple to purple, sometimes white in the rays, between the rays, or at the tips of the rays, or occasionally pure white, as in some populations of *S. hougasii* and *S. stoloniferum.*

The edges of the corollas typically are flat in non-wilted corollas of all species except *S. verrucosum*, where the edges are curled adaxially (Plates 3E, 9). Unfortunately, this character is difficult to see in many herbarium specimens, because the corollas are absent, wilted, or not pressed flat.

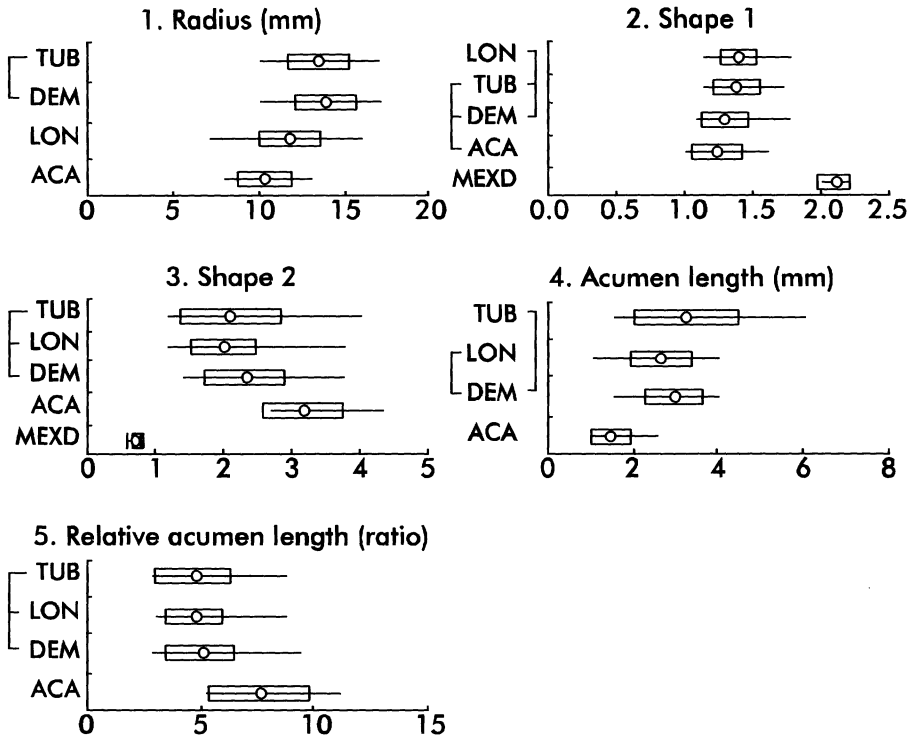


FIG. 2. Corolla measurements in *Solanum* sect. *Petota* from North and Central America. Means, ranges, and one standard deviation of the mean for corolla measurements for members of Hawkes's (1990) *Solanum* ser. *Acaulia* ACA (that we modified to include *S. demissum*; see text), ser. *Demissa* DEM, ser. *Longipedicellata* LON, ser. *Tuberosa* TUB (including *S. verrucosum*), and two diploid 2x(1EBN) species (*S. bulbocastanum*, *S. jamesii* MEXD) (from Spooner & van den Berg 2001). Shapes 1 and 2 are different measures of corolla dissection. The data show prior hypotheses advocating the usefulness of these characters for distinguishing among these series to be incorrect, except for members of the 2x(1EBN) species (Plate 1).

Hawkes (1990) used corolla shapes and associated corolla acumen lengths to distinguish all species of ser. *Demissa* (confined to North and Central America) from all species of ser. *Longipedicellata* (confined to North and Central America) and all species of ser. *Tuberosa* (*S. verrucosum* in Mexico and other species in South America). Based on recently published phylogenetic data (see Relationships and discussion under *S. demissum*, below) *S. demissum* is more closely related to members of ser. *Acaulia*, not ser. *Demissa*. Spooner and van den Berg (2001) measured corolla radius, two shape assessments of corollas, and absolute and relative length of the corolla acumens from germplasm accessions to test the taxonomic value of these characters. The corolla measurements failed to distinguish most of the species in any one series from species in the other series (Fig. 2). There are statistically significant differences of widely overlapping ranges for radius of corolla that distinguish Hawkes's (1990) ser. *Acaulia* from ser. *Longipedicellata* and from ser. *Demissa* + ser. *Tuberosa*; however, the wide overlap of size ranges precludes the utility of corolla size and shape as practical taxonomic characters to distinguish among the species Hawkes placed in these three series.

Anthers. The anthers of all wild potatoes dehisce by terminal pores, and apical poricidal dehiscence has served to distinguish potatoes from tomatoes [*Solanum* sect. *Lycopersicon* (Mill.) Wettst. subsect. *Lycopersicon*] in which anthers dehisce along their entire length by introrse slits. Close inspection of mature anthers of wild potatoes, however, shows many anthers to dehisce by an introrse slit partly down the anther, so this difference between potatoes and tomatoes is not absolute. Potatoes lack the terminal anther appendage of most wild tomatoes, but the wild tomato *Solanum pennellii* D. S. Correll also lacks this anther appendage. In a wider analysis, all species of *Solanum* initially dehisce by terminal anther pores, and some species have pores that enlarge into longitudinal slits. Anther length is useful in separating the similar taxa *S. cardiophyllum* (anthers 3–4 mm long) from *S. ehrenbergii* and *S. stenophyllidium* (anthers 4.5–6 mm long).

Fruits. Fruits of wild potatoes are bi-locular berries. Unpublished data from germplasm increases at NRSP-6 indicate that the self-compatible species (*S. demissum*, *S. hjertingii*, *S. stoloniferum*) generally produce about 50–150 seeds per fruit, and the self-incompatible species produce about 40–90 seeds per fruit, except for the small-fruited self-incompatible species *S. clarum* and *S. morelliforme*, which produce 5–15 seeds per fruit. As an interesting point of comparison, this differs markedly from some plants of the large-fruited cultivated potato species *S. tuberosum* that can produce up to 500 seeds per fruit.

Fruits vary from globose (Plate 4A–C, H–J) to ovoid (Plate 4K, L) to triangular in outline (Plate 4D) to conical (Plate 4E–G). They are round in cross section or slightly flattened parallel to the septum. Colors range from greenish white (Plate 4I) to light green (Plate 4C) to medium green (Plate 4G) to occasionally purple (not shown) to mottled or striped mixtures of these colors (Plate 4B, F, H, L), to green with white dots (Plate 4E, J, K).

Correll (1962) and Hawkes (1990) used verrucose fruits (with raised white dots) to distinguish *S. verrucosum* (Plate 4J) from other species of sect. *Petota*. Spooner et al. (1995), however, showed some accessions of *S. verrucosum* to have fruits with raised dots, others with non-raised white spots, and yet others to be smooth and evenly green throughout, and for other species to have flat or raised white dots, too. Consequently, possession of verrucose fruits is of little taxonomic value.

Seeds. Seeds of all members of sect. *Petota* are ovoid and ca. 2 mm long. They have a thick covering of "hair-like" lateral walls of the testal cells that make the seeds mucilaginous when wet. Removal of these hair-like lateral walls by enzyme digestion reveals a honeycomb pattern at their base. Seeds are remarkably similar in potatoes, tomatoes, and pepinos [*Solanum* sect. *Basarthrum* (Bitter) Bitter], and there are no known differences in the above characters that taxonomically distinguish species of wild potatoes (Lester 1991).

One species, *S. longiconicum*, is distinguished from all others in North and Central America by having a seed spot that is very evident on recently extracted fresh and dried seeds, caused by the purple embryo showing through the greenish white seed coat (Spooner et al. 2001c). This character is difficult to see on most herbarium specimens, because few specimens have mature fruits, seeds must be dissected from the fruits to see the character, and the seed "spots" fade on old specimens.

Nothing is known of longevity of seeds in nature, but potato seeds maintained in ex-situ genebanks may have impressive longevity when they are properly dried, hermetically

sealed, and stored at low temperature (Smejkal et al. 1988). Unpublished data from the US potato genebank show that even under presumably optimal conditions, germination can be quite variable within species. Dormancy and hormone-dependent genotypes have been reported (Bamberg et al. 1986; Bamberg 1999). At NRSP–6, seeds are prepared for storage by lowering their moisture content to 5% without heat (using a silica gel dehydrator) over a period of about four weeks. They are then sealed in metalized plastic pouches with high resistance to moisture transfer and stored at 0°C. Germination of >80% after >25 years in these conditions is not uncommon, and unpublished data for some species from North and Central America show germination of >90% for seeds stored up to 47 years.

BREEDING SYSTEMS

Ploidy. One hundred eighty-one species of sect. *Petota* have known ploidy levels, with 76% diploid, 3% exclusively triploid, 12% exclusively tetraploid, one species exclusively pentaploid, and 7% exclusively hexaploid. Three South American species have more than one even ploidy level (Hijmans et al. 2002). The base chromosome number (x) in *Solanum* is 12, and somatic chromosome levels of sect. *Petota* range from 2n = 2x = 24, 2n = 3x = 36, 2n = 4x = 48, 2n = 5x = 60, to 2n = 6x = 72.

All species of sect. *Petota* in North and Central America, except *S. woodsonii,* have been assessed for ploidy, and of the 25 species we recognize (exclusive of the nothospecies) 14 (56%) are diploid, six (24%) tetraploid, and five (20%) hexaploid. Three diploids (*S. bulbocastanum*, *S. cardiophyllum*, *S. jamesii*) have some triploid populations that are generally sterile (Hawkes 1956, 1978). The triploids are likely more common than presently documented, because most germplasm collecting expeditions collect seed rather than tubers, since germplasm collections from tubers are expected to contain less genetic diversity, contain more diseases, and are expensive to process through plant quarantine. Two of the nothospecies are diploid, one triploid, and one pentaploid.

Compatibility systems. Most diploid potatoes exhibit self-incompatibility. After self-pollination, pollen tube growth is inhibited by the interaction of the pollen and stylar tissue genotypes according to the classic S locus system (Hosaka & Hanneman 1998). Some diploid species from North and Central America are self-compatible, including *S. morrelliforme*, *S. polyadenium*, and *S. verrucosum* (Hawkes 1990). This is supported by crossing studies and evidence that intrapopulation variation is markedly less for *S. polyadenium* and *S. verrucosum* than for typical non-selfing diploids (Hosaka & Hanneman 1991; del Rio & Bamberg 2001).

Polyploid species are nearly all self-compatible (Hawkes 1990), and there are two classes of polyploids with respect to chromosome pairing. Tetraploid individuals of the cultivated species *S. tuberosum* are an example of a polysomic polyploid in which recombination among all four homologs is possible (Bradshaw & Mackay 1994). This type is exemplified in South American wild species by *S. sucrense* Hawkes. Such species do not exclusively self-fertilize in their natural habitats (Brown 1993) and maintain high levels of heterozygosity across generations (Hosaka & Hanneman 1991; Bamberg et al. 2000). Although inbreeding depression is strong if such species are forced to self-fertilize, inbreeding depression may be mitigated because, when selfing does occur, only the most heterozygous zygotes and seedlings are sufficiently fertile to be parents contributing to subsequent generations (Shonnard & Peloquin 1991).

In contrast, the polyploid species in North and Central America are disomic polyploids in which only bivalents are typically seen in meiosis, and traits segregate as if the parents are diploids (Everhardt & Rowe 1974). Observations of chromosome pairing in natural polyploids and artificial interspecific hybrids led to various genome designations in potato species, as described in the section Genomes below. Disomic polyploids are self compatible with much less intrapopulation variation than outcrossing diploids or polysomic polyploids (Hosaka & Hanneman 1991; del Rio & Bamberg 2001). Disomic polyploids maximize sexual reproduction by promoting high fertility, fecundity, and uniformly fit genotypes through "fixed heterozygosity" (Watanabe & Peloquin 1991). Furthermore, potatoes are capable of clonal reproduction from tubers. The relative proportions of reproduction from tubers or seed in nature is unknown.

Endosperm Balance Numbers. Endosperm Balance Number (EBN) relates to a strong isolating mechanism in sect. *Petota* and has been used to speculate on major evolutionary trends in the group. The EBN hypothesis was first proposed by Johnston et al. (1980) to explain success or failure of intra- and interspecific crosses, due to the functioning or breakdown of the endosperm after fertilization. The EBNs are hypothetical genetic factors, independent of ploidy. They are determined completely empirically relative to other EBNs, and the "number" is meaningful only relative to other numbers based on success with standard test EBN crosses. The EBN is published with the ploidy of the species (x = 12 throughout sect. *Petota*). In species of sect. *Petota*, these are 2x(1EBN), 2x(2EBN), 4x(2EBN), 4x(4EBN), and 6x(4EBN). Relatively straightforward methods of ploidy manipulation in *Solanum* facilitate geneflow between tuber-bearing relatives and cultivated potatoes, allowing for use of species with different ploidy and EBNs in breeding programs (Hougas & Peloquin 1958). Crosses between species with differing EBNs are almost always unsuccessful, and crosses between species with the same EBN are frequently successful, even if they differ in ploidy. The EBN is increased or decreased as a direct result of ploidy changes to introduce germplasm from normally EBN-incompatible species. That is, if the chromosomes of a 2x(1EBN) species are synthetically doubled to the tetraploid level, EBN also doubles, resulting in 4x(2EBN), and a corresponding EBN reduction occurs in the reverse ploidy reduction.

Seed abortion caused by crosses between EBN incompatible species forms a major biological isolating mechanism in potato, along with failure of the pollen grain to germinate on the style, or failure of the pollen tube to grow through the style (Fritz & Hanneman 1989; Hawkes & Jackson 1992). Watanabe and Peloquin (1989, 1991) documented the widespread occurrence of 2n pollen in wild and cultivated species that allows for changes in ploidy and EBN in natural populations. Ortiz and Ehlenfeldt (1992) stressed the role of EBN as an isolating mechanism driving speciation for sympatric progenitor-derivative species pairs. Hawkes and Jackson (1992) used EBN to support the phylogenetic hypothesis of sect. *Petota* advanced by Hawkes (1989, 1990) that divides potatoes into a primitive superseries *Stellata* J. G. Hawkes and an advanced superseries *Rotata* J. G. Hawkes. There is a strong association of EBN to the cpDNA clades of Spooner and Sytsma (1992) and Spooner and Castillo (1997). That is, all diploid species in outgroup sect. *Etuberosum* (Bukasov & Kameraz) A. Child, and clades 1 and 2 of sect. *Petota* are 2x(1EBN), and higher EBNs occur in clades 3 and 4. There is, however, a minority of 2x(1EBN) species from South America that falls in clade 4. Reproductive isolation by EBN also has justified maintenance of separate species status for species in ser. *Longipedicellata* (North and Central America) to phenetically very similar species in

South America, as *S. avilesii* Hawkes & Hjert. and *S. gourlayi* Hawkes (Spooner et al. 2001b).

Genomes. Genome differentiation is thought to be responsible for patterns of chromosome pairing within sect. *Petota* and close outgroup relatives in non-tuber-bearing sect. *Etuberosum* (Marks 1955; Hawkes 1958; Irikura 1976; Matsubayashi 1991). Homologous genomes have been classified into five groups, A, B, C, D, and E (Matsubayashi 1991). Variants of the A genome of the common autotetraploid potato are part of the genomes of all potato species, except for the non-tuber-bearing species of sect. *Etuberosum* that have the E genome (Matsubayashi 1991). The B genome is associated with the tetraploid species of the ser. *Longipedicellata* (AABB), the C genome with the tetraploid and hexaploid species of the ser. *Conicibaccata* (AACC, AAAACC), and the D genome with the hexaploid species of ser. *Demissa* (AAAADD) (Spooner et al. 1995). Cryptic structural differences with little influence on chromosome pairing have been described in North and Central America for series *Bulbocastana*, *Morelliformia*, *Pinnatisecta*, *Polyadenia*, and in other series from South America (Propach 1940; Magoon et al. 1958; Marks 1965, 1968; Matsubayashi & Misoo 1977; Matsubayashi 1991).

Hawkes (1990) used EBN and morphological data to postulate a phylogenetic and biogeographic hypothesis of genome evolution in wild potatoes. He partitioned his 19 tuber-bearing series into two superseries: *Stellata* (with stellate corollas) and *Rotata* (with rotate corollas). Within each superseries he informally designated the series as primitive to more advanced (Hawkes 1990) starting with a "primitive *Stellata*" type [all 2x(1EBN) species from North and Central America], progressing through "advanced *Stellata*" (species with stellate corollas in South America) to "primitive *Rotata*" (species with rotate-pentagonal to rotate corollas, all in South America) to "advanced *Rotata*" (series from North and Central America are ser. *Tuberosa* [*S. verrucosum*, diploid], ser. *Conicibaccata* [tetraploid], ser. *Longipedicellata* [tetraploid], and ser. *Demissa* [hexaploid]).

Hawkes (1990) postulated that the ancestral wild potato species had a B genome, white stellate corollas, and grew in the United States, Mexico, or Central America. Subsequent dispersal of one or more of these taxa to South America gradually led to the evolution of A genomes, rotate corollas, and species with 2EBN. This was then followed by a return migration of one or more of these diverged A genome species to Mexico and Central America, with hybridization and allopolyploidization with the native Mexican or Central American taxa to produce the tetraploid members of ser. *Longipedicellata* (AABB), and possibly ser. *Conicibaccata* (AACC), and ser. *Demissa* (AAAADD) through divergence of genomes (Fig. 3). Only ser. *Longipedicellata* was designated AABB, and the source of the C and D genome donors of ser. *Conicibaccata* and ser. *Demissa* is unknown. The sole AA species of Mexico, *S. verrucosum*, was postulated as an extant A genome contributor to members of ser. *Demissa*. Spooner et al. (1991b) gave partial support to this hypothesis by demonstrating the paraphyletic and basal nature of the B genome species group, and the monophyletic and derived nature of *S. verrucosum* and the Mexican polyploid species, and an A genome contribution to these allotetraploids.

In contrast to the genomic theory of chromosome pairing for polyploid species, Dvorak (1983) argued that suppression of heterogenomic pairing was governed by a mechanism similar to that in wheat, not by genome differences. He also argued that the lack of structural differentiation of diploid species genomes (Howard & Swaminathan 1953; von Wangenheim 1955; Marks 1968; Hermsen & Ramanna 1976) did not necessarily mean that homologous chromosomes are not differentiated. Rather, these could have

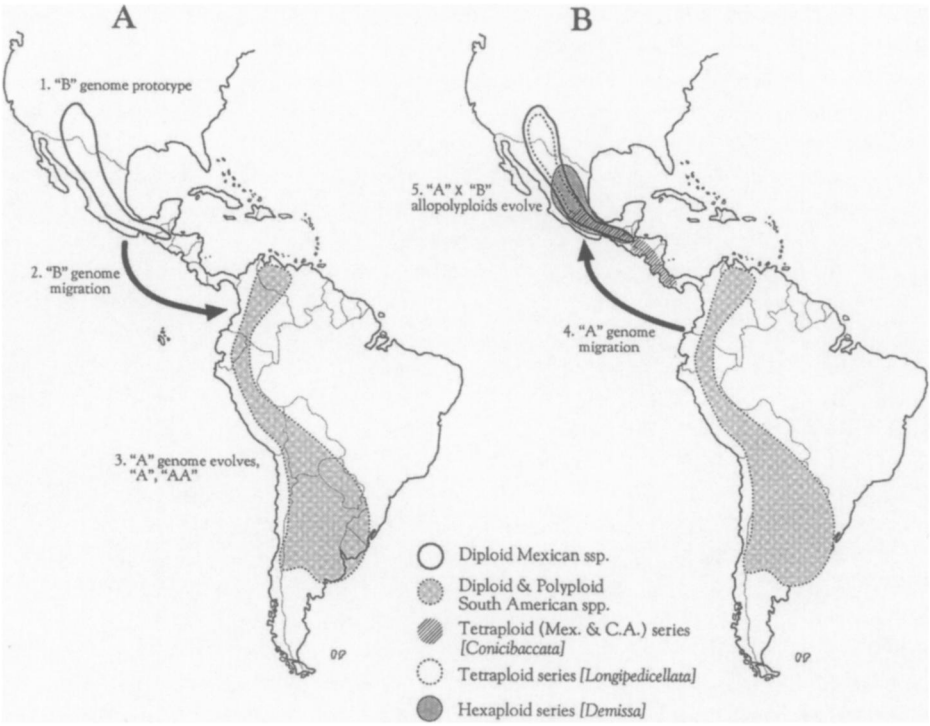


FIG. 3. Hawkes's (1990) phylogenetic and biogeographic hypothesis of genome evolution and migration in *Solanum* sect. *Petota* (as redrawn in Spooner et al. 1991b). A. The B genome of diploid species in North and Central America represents a prototype from which a migration to South America takes place, followed by evolution of the B genome to the A genome. B. A subsequent return migration to North and Central America of some diverged A genome species occurs, followed by hybridization and allopolyploidy between the A and B genomes to form ser. *Longipedicellata* (AABB), and possibly ser. *Conicibaccata* (AACC), and ser. *Demissa* (AAAADD) through divergence of genomes. Only ser. *Longipedicellata* was designated AABB, and the source of the C and D genome donors of ser. *Conicibaccata* and ser. *Demissa* is unknown.

experienced rapid evolution of noncoding sequences leading to reduced pairing (Dvorak 1981; Dvorak & McGuire 1981).

INTERSPECIFIC HYBRIDIZATION

Hawkes (1990) hypothesized that approximately 12% (26) of the 224 tuber-bearing solanums he recognized to have arisen by hybrid speciation (Spooner & van den Berg 1992a). In North and Central America these include the diploid putative hybrid species (nothospecies) *S.* ×*michoacanum* (*S. bulbocastanum* × *S. pinnatisectum*), *S.* ×*sambucinum* (*S. ehrenbergii* × *S. pinnatisectum*) and the triploid nothospecies *S.* ×*vallis-mexici* (*S. verrucosum* × *S. stoloniferum*), all allotetraploid species in ser. *Longipedicellata*; the pentaploid nothospecies *S.* ×*edinense* (*S. tuberosum* × *S. demissum*); and all allohexaploid species in ser. *Demissa*. These hypotheses of hybridization are based on intermediate morphology, inference from ploidy levels and distributional data, artificial reconstruction of the hybrids and comparison with putative natural hybrids, or assessment of reduction of fertility (Hawkes 1944, 1963, 1990; Marks 1958; Marks & Montelongo-Escobedo 1970;

Graham & Dionne 1961; Correll 1962; Ugent 1967; Hawkes & Lester 1968). An understanding of the nature and extent of hybridization and introgression helps explain patterns of variation that likely are partly responsible for the difficult taxonomy of the group.

Intermediate morphology, however, can be a misleading marker for hybridization, as shown by Rieseberg and Ellstrand (1993) from a general survey of angiosperm studies. Hypotheses of hybrid origins of species in potato were reinforced by the molecular studies of the pentaploid Mexican wild species *S.* ×*edinense* (Serquen & Hanneman, in press) and of the diploid South American species *S.* ×*rechei* Hawkes & Hjert. (Clausen & Spooner 1998). Hybrid origins were discounted by the molecular investigations of the South American diploid wild potato species *S. raphanifolium* Cárdenas & Hawkes (Spooner et al. 1991c) and *S. chacoense* Bitter (Miller & Spooner 1996). These results show that the many other hybrids from sect. *Petota* should be considered as tentative until subject of further study.

For our treatment we designate hybrid species (nothospecies) by prefix with a multiplication sign placed flush with the species epithet (×; Art. H.1.1; H.3A.1 of the *International Code of Botanical Nomenclature*, Greuter et al. 2000) only if they are of restricted distribution and are sympatric with their putative parents. We do not use the nothospecies designation for the putative allotetraploids and allohexaploids (see section Genomes, above). We do not include the nothospecies in our key because that would make it unworkable, but we mention them under their parents, and illustrate and describe them at the end of our treatment. We also do not include the nothospecies in our informal species groups, because their parents are members of more than one group.

RELATIONSHIPS

Outgroup relationships. Spooner et al. (1993) studied the outgroup relationships of potatoes with cpDNA restriction site data and morphology. They showed that the tuber-bearing species were monophyletic, but that the non-tuber-bearing species included by Hawkes (1990) in sect. *Petota* did not belong in this section. They also showed that the potato clade and the tomato clade were sister clades, a result firmly supported by other studies (Olmstead & Palmer 1992, 1997; Bohs & Olmstead 1997, 1999; Olmstead et al. 1999; Peralta & Spooner 2001). Section *Etuberosum* was sister to the tomato and potato clades.

Ingroup relationships, chloroplast DNA restriction site data. Hosaka et al. (1984) studied ingroup relationships of 37 accessions of sect. *Petota* using total cpDNA banding patterns from eight restriction endonucleases. Their data showed two main clades in sect. *Petota*: 1) the Mexican diploids, 2) all South American species and the Mexican polyploids. Spooner and Sytsma (1992; Fig. 4) and Spooner and Castillo (1997) examined members of sect. *Petota* by using cloned cpDNA probes, more (22) restriction endonucleases, and more (90) accessions of 86 species of 17 of the 19 tuber-bearing series of Hawkes (1990), and a representative of *Solanum* sect. *Etuberosum* as the outgroup. These studies defined four clades in sect. *Petota*: 1) the United States, Mexican, and Central American diploid species, exclusive of *S. bulbocastanum*, *S. cardiophyllum*, and *S. verrucosum*, 2) *S. bulbocastanum* and *S. cardiophyllum*, 3) all examined members of the South American ser. *Piurana* and some South American species assigned to other series,

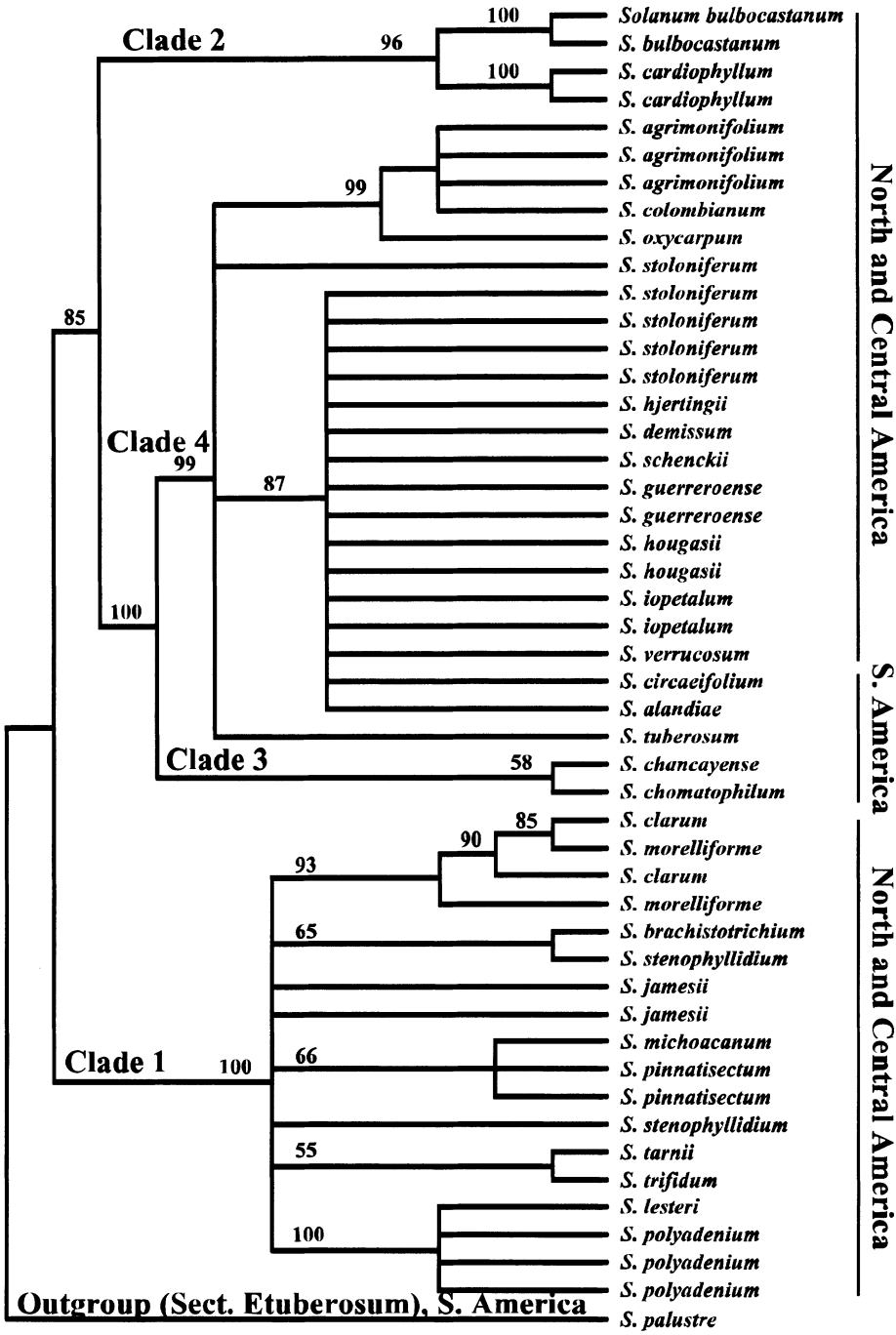


FIG. 4. Chloroplast DNA restriction site phylogeny of *Solanum* sect. *Petota*, primarily of species from North and Central America. The cladogram of Spooner and Sytsma (1992) is modified to show the four clades discovered by a later study of the primarily South American species (Spooner & Castillo 1997), and the terminal branches relabeled to reflect the species names recognized in this treatment. Numbers above branches represent bootstrap values above 50%.

4) all remaining South American species, the North and Central American polyploid species, and the diploid *S. verrucosum*.

Other cpDNA restriction site studies were in-depth extensions of the above three studies with greater intraspecific sampling of clades 2 and 4. Rodríguez and Spooner (1997) reexamined the clade 2 species *S. bulbocastanum* and *S. cardiophyllum* with cpDNA restriction site analysis of 48 accessions of all six subspecies of these two species. The results (Fig. 5) confirmed the prior cpDNA results except that *S. cardiophyllum* subsp. *ehrenbergii* fell in clade 1. These results suggested misclassification of this taxon or introgressive hybridization between members of these two clades. Castillo and Spooner (1997) examined phylogenetic relationships of ser. *Conicibaccata* using cpDNA restriction site variation and morphology, using 114 accessions of 23 of the 40 species. The results showed that the polyploids of ser. *Conicibaccata* (including all the species from North and Central America) formed a clade separate from the diploids of the series from northern Peru to Bolivia.

Ingroup relationships, other molecular markers. Because cpDNA is predominantly or entirely maternally inherited in *Solanum* (Hosaka et al. 1984; Corriveau & Coleman 1988) the interpretation of these maternal gene trees into species phylogenies awaits confirmation of data from nuclear markers (Wendel & Doyle 1998). Bonierbale et al. (1990) used a phenetic analysis of single- to low-copy nuclear restriction fragment polymorphisms (nRFLPs) to study the relationships of 12 wild and four cultivated members of *Solanum* sect. *Petota*, from seven series of Hawkes (1990), and *Solanum* sections *Etuberosum* and *Lycopersicon* as outgroups. The results grouped Mexican basal diploid species of clades 1 and 2 closest to sect. *Lycopersicon*, and intermixed members of two other series with members of ser. *Tuberosa*, concordant with the cpDNA studies. Bonierbale et al. (1990) also grouped *S. demissum* with *S. acaule*, rather than with other members of ser. *Demissa*.

Debener et al. (1990) used nRFLPs to study the interspecific relationships of 14 wild and three cultivated members of sect. *Petota*, including species from eight series of Hawkes (1990), with sect. *Etuberosum* as the outgroup. Like in Bonierbale et al. (1990) the results placed members of the North and Central American diploid series sister to sect. *Etuberosum*, placed *S. acaule* with *S. demissum*, and intermixed members of different series.

Kardolus et al. (1998) used AFLPs to examine interspecific relationships of 19 species of four series in *Solanum* sect. *Petota*, and three species of *Solanum* sect. *Lycopersicon* as outgroups. Their data also supported the North and Central American diploid species as basal in sect. *Petota*. Hawkes's (1990) series were poorly supported. As in the studies of Bonierbale et al. (1990) and Debener et al. (1990), AFLP data supported sister taxon relationships for *S. demissum* and *S. acaule*.

Mexican diploid species. Lara Cabrera and Spooner (in press a) examined morphological phenetic relationships of the Mexican diploid species. All of the species of Hawkes (1990) were supported except *S. brachistotrichium* and *S. stenophyllidium*, which were revealed to be conspecific. Four morphological species pairs were supported: 1) *Solanum trifidum* and *S. tarnii*, 2) *S. lesteri* and *S. polyadenium*, 3) *S. stenophyllidium* (including *S. brachistotrichium*) and *S. ehrenbergii*, and 4) *S. bulbocastanum* and *S. clarum*. Lara Cabrera and Spooner (in press b) studied these same accessions with AFLPs and found

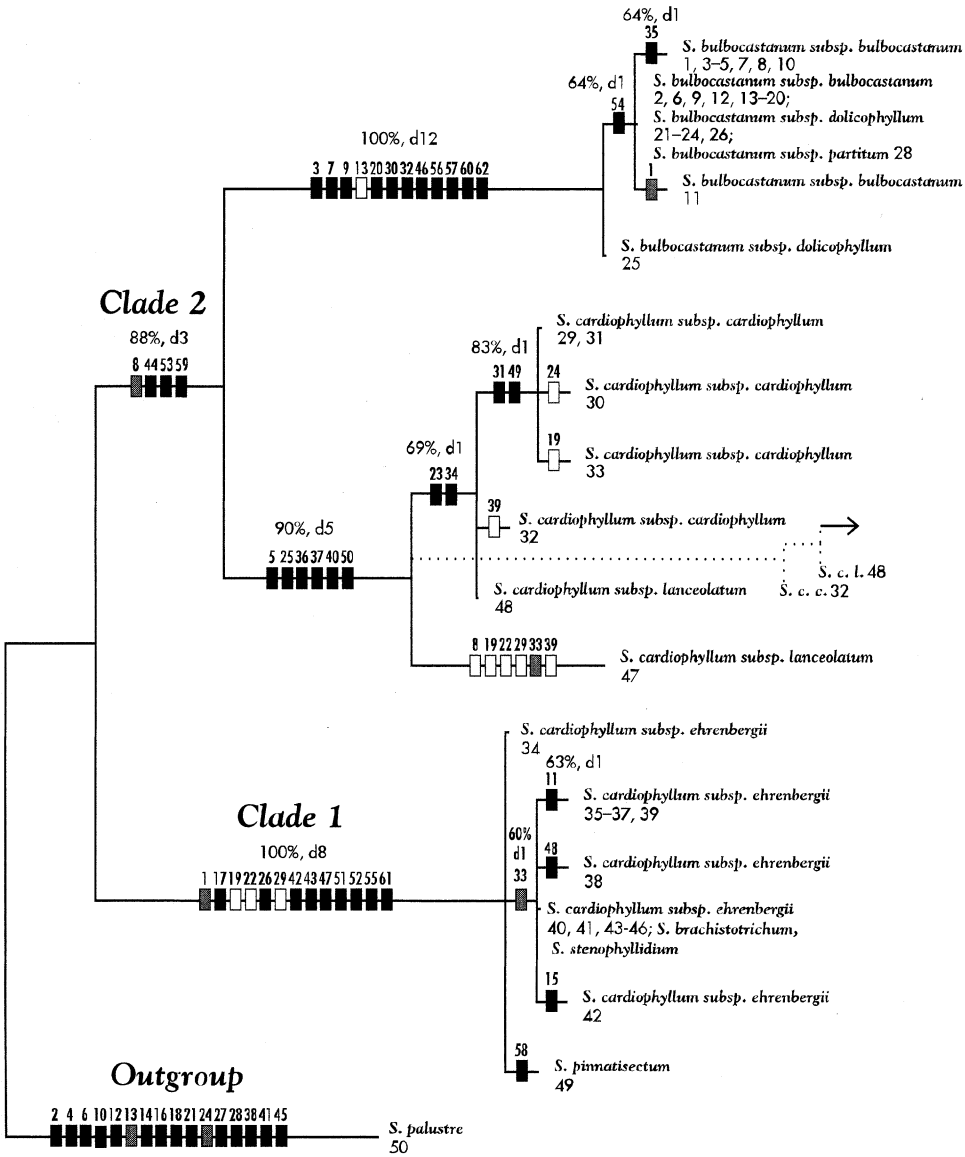


FIG. 5. One of two most-parsimonious 72-step Wagner trees (Rodríguez & Spooner 1997) of cpDNA restriction site data of the subspecies of *Solanum bulbocastanum* and *S. cardiophyllum*, as recognized by Hawkes (1990). Branches have overlaid bootstrap and decay values and enzyme site variants supporting each branch. Clade numbers correspond to Fig. 4. The difference in topology of the second most-parsimonious Wagner tree involves only two accessions of *S. cardiophyllum*, as indicated by the dashed lines. This study showed all accessions of *S. cardiophyllum* subsp. *ehrenbergii* to belong to clade 1, separate from the other subspecies of this species and all accessions of *S. bulbocastanum* that were on clade 2. The present treatment does not recognize subspecies in *S. bulbocastanum* and *S. cardiophyllum*, and recognizes *S. cardiophyllum* subsp. *ehrenbergii* as *S. ehrenbergii*.

similar groupings, except that *S. bulbocastanum* and *S. clarum* were not sister taxa, and *S. jamesii* and *S. pinnatisectum* were sister taxa.

Solanum ser. *Longipedicellata*. Spooner et al. (2001b) examined morphological phenetic relationships of six taxa of the Mexican tetraploid species of ser. *Longipedicellata*, and morphologically similar species in ser. *Demissa* (*S. demissum*) and ser. *Tuberosa* (*S. verrucosum* from Mexico and other species from South America). The results supported only three species in ser. *Longipedicellata:* 1) *S. fendleri* + *S. papita* + *S. stoloniferum*, 2) *S. polytrichon*, and 3) *S. hjertingii* + *S. matehualae*. Van den Berg et al. (2002) studied species boundaries in ser. *Longipedicellata* with AFLPs, RAPDs, and cpDNA microsatellites. They supported the union of all the ser. *Longipedicellata* species above, plus *S. polytrichon* and *S. stoloniferum*, to support only two species in the series, *S. hjertingii* and *S. stoloniferum*.

Solanum ser. *Conicibaccata*. Spooner et al. (2001c) examined all four species in *Solanum* ser. *Conicibaccata* from North and Central America with morphological and RAPD data. The RAPD results supported the genetic differences in *S. agrimonifolium*, *S. longiconicum*, and *S. oxycarpum* (germplasm of *S. woodsonii* was not then available). The morphological data supported all of these and also the distinctness of *S. woodsonii*. As with most species from North and Central America, however, support often was provided only by a series of overlapping character states, except for *S. longiconicum*, which clearly differed from all other species by a purple seed spot on the fresh green-white seeds (the fresh seeds of the other species are green-white throughout). This clearly diagnostic character is of limited utility for practical identification, because herbarium specimens rarely possess mature fruits, and the seed spot is not evident on mature dried seeds.

Solanum ser. *Demissa*. Spooner et al. (1995) examined morphological phenetic data to study the relationships of six taxa of the hexaploid species of ser. *Demissa*, the morphologically similar species *S. albicans* (ser. *Acaulia*), and *S. verrucosum* (ser. *Tuberosa*). The results questioned series affiliations and showed that *S. demissum* was closer to *S. albicans* than to any other species in ser. *Demissa*. The results highlighted the difficulty in distinguishing species within ser. *Demissa*. Especially similar were *S. guerreroense*, *S. hougasii*, and *S. iopetalum*, which are maintained as separate species mainly by a polythetic classification, that is, a classification that places together organisms that have the greatest number of shared features, and no single feature is either essential to group membership or is sufficient to make an organism a member of the group (Sokal & Sneath 1963; Stuessy 1990). Kardolus (1999) studied phenetic relationships of all taxa in ser. *Acaulia* and members of five other series. He also showed *S. demissum* to group with *S. albicans* of ser. *Acaulia*. Nakagawa and Hosaka (2002) studied the species relationships of *S. acaule* with nRFLPs and cpDNA restriction sites, and showed that *S. demissum* was tightly clustered with other accessions of members of ser. *Acaulia*.

SPECIES CONCEPT

Our goal is to apply a phylogenetic species concept and classification, but we have only partially met this goal for the following reasons. As outlined in Spooner and van den Berg (1992b), and discussed above in Morphology and Relationships, the identification of

species in wild potatoes remains extremely difficult. This is caused by great morphological similarity among species, phenotypic plasticity in different environments, sexual compatibility among many species, hybrid speciation, and introgressive hybridization. To date, many of our taxonomic decisions have relied on morphological species concepts, arising from phenetic analyses of large germplasm collections, using traditional morphological characters, and supplemented with molecular characters. These studies have helped to reduce the number of accepted names. Many species that remain, however, often are supported largely by a range of overlapping character states (polythetic support).

Polymorphism and phenotypic plasticity. The taxonomy of wild potatoes is notoriously difficult as discussed above. While some of the diploid wild species from North and Central America are distinctive (e.g., *S. bulbocastanum*, *S. clarum*, *S. morelliforme*, *S. pinnatisectum*), others are difficult to circumscribe. No one has stated this more clearly than Correll (1962: 364, 380–382), who had difficulty separating *S. verrucosum* (ser. *Tuberosa*), *S. demissum* (ser. *Demissa*), and *S. fendleri* and *S. stoloniferum* (ser. *Longipedicellata*).

> "In my opinion, the confusing of some plants of *S. verrucosum* with some plants of *S. demissum* is excusable. In fact, many plants collected in nature cannot be placed with certainty into either category . . . 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 I have leaned heavily on the shape of the corolla for separation of these plants . . . It must be noted, however, that variations are frequent and must be taken into consideration . . . All of these species, however, are exceedingly variable, especially in the size of the corolla, and the amount of pubescence present on the plant." (Note also the study by Spooner and van den Berg 2001, cited above in the section Morphology, which showed corollas not to be useful in separating these series).

The polymorphism described by Correll (1962) can have many causes. We frequently observed different phenotypes within populations grown in shade vs. sun, or dry vs. moist areas, suggesting phenotypic plasticity was involved. Correll (1962: plates vii, ix, x) documented three strikingly different morphologies of *S. demissum*: 1) collected in nature, 2) grown from tubers of this field collection in a greenhouse in Maryland, and 3) grown from tubers of this greenhouse-grown plant in a field in Wisconsin.

Whatever the cause of this polymorphism, Correll's (1962) statements of the difficulty in identification of these species are not exaggerated. Often, suites of overlapping character states must be used for identification, as we have found in our studies of ser. *Demissa* (Spooner et al. 1995), ser. *Longipedicellata* (Spooner et al. 2001b), and the Mexican diploid species (Lara Cabrera & Spooner, in press a). We had particular problems identifying herbarium specimens of *S. guerreroense*, *S. iopetalum*, *S. stoloniferum*, and *S. verrucosum* (sometimes *S. demissum*), especially incomplete specimens. We sometimes changed determinations when we encountered a more complete or better-preserved specimen from another herbarium, and a few of our herbarium annotations, therefore, will not always match our treatment. We also double-checked a few identifications with insights from new chromosome counts that did not match that expected for the species. We do not use chromosome counts to construct a one-character taxonomy, but rather know from prior morphological and molecular data that there is a correlation between species boundaries and ploidy level of these very similar species.

SPECIES GROUPS

As outlined above, the series classification of Hawkes (1990) and others has received only partial cladistic support in any molecular marker data set used to date. Currently, only the research using cpDNA data restriction sites has used representatives from most series (Spooner & Sytsma 1992; Castillo & Spooner 1997; Rodríguez & Spooner 1997; Spooner & Castillo 1997), and the results support only four clades within sect. *Petota*, with members of North and Central America in three of them (clades 1, 2, 4 of Fig. 4). Other nuclear molecular markers also fail to provide full support for the 21 series. We await comparison of the cpDNA results with a wider range of studies using nuclear markers before we commit to formal taxonomic interpretations. In addition, the polyploid species likely are polysomic polyploids (see Genomes, above), possibly of multiple and independent origins, precluding their easy phylogenetic placement.

Because of the unresolved phylogeny and lack of full understanding of genome contributors to the polyploids, we provisionally place our recognized species into the eleven informal species groups as illustrated in Plate 1. Similar non-formal group systems of classification have been widely applied to *Solanum* for similar reasons by Whalen (1984), Bohs (1994, in press), and Knapp (1991, 2000). Our informal groups conveniently comply with the ploidy and EBN categories (see Breeding Systems) useful for breeders, but our overriding classification philosophy is guided by phylogenetic relationships, not by breeding behavior (a biological species concept). Still, the polysomic polyploid Iopetala group and Longipedicellata group may have originated by hybridization from members of different clades, and we recognize them partly based on ploidy and EBN.

In consideration of the cpDNA cladistic results (Spooner & Sytsma 1992; Castillo & Spooner 1997; Rodríguez & Spooner 1977; Spooner & Castillo 1997), insights from recent morphological studies (Spooner et al. 1995; Spooner et al. 2001b, c; Lara Cabrera & Spooner, in press a), and molecular studies (Van den Berg et al. 2002), we surmise that our newly formulated groups Clara, Conicibaccata (the polyploid members in North and Central America), Pinnatisecta, Polyadenia, and Trifida may represent monophyletic terminal clades. The groups Acaulia, Iopetala, and Longipedicellata are likely composed of polysomic polyploids, and it is difficult to place the species in a phylogenetic classification. The Bulbocastana group is recognized solely on the basis of the cpDNA results (Figs. 4, 5), but may not be supported by nuclear data. The Stenophyllidia group may be paraphyletic and may not be maintained as currently circumscribed. The Verrucosa group contains only one species, *S. verrucosum*, and we avoid making statements of interrelationships at this time.

These groups have recognizable names that could be assigned to them if they were to be recognized as series, except for the new Iopetala group, Stenophyllidia group, and Verrucosa group. The new name "Iopetala group" is needed because we ally *S. demissum* to members of the Acaulia group (series *Acaulia* is the earlier name), not to others in series *Demissa* where it was placed by Hawkes (1990). The Stenophyllidia group comprises *S. ehrenbergii*, *S. hintonii*, *S. stenophyllidium*; these species were placed by Hawkes (1990) in ser. *Pinnatisecta*. We use the name Verrucosa group after Bukasov (1978), because ser. *Tuberosa* (where Hawkes, 1990, placed *S. verrucosum*) is clearly paraphyletic (Miller & Spooner 1999).

These groups are *not* intended to represent our formal attempt at a phylogenetic classification and are provisional names pending more data on interrelationships. They should not be confused with "cultivar-groups," which are formal taxonomic names for groups of

cultivars, as recognized by the *International Code of Nomenclature of Cultivated Plants* (Trehane et al. 1995; Huamán & Spooner 2002; Spooner et al. 2003).

PINNATISECTA GROUP: *S. jamesii*, *S. pinnatisectum*. These are the only two species in sect. *Petota* with pinnatifid pseudostipules. They are united by AFLP data (Lara Cabrera & Spooner, in press b).

STENOPHYLLIDIA GROUP: *S. ehrenbergii*, *S. hintonii*, *S. stenophyllidium*. This group is likely paraphyletic, and the name is used as a temporary label of convenience until we have more data on interspecific relationships in sect. *Petota*. We use this group to place species that do not form a clear monophyletic clade. Based on the cpDNA results (Fig. 4) this group would be monophyletic with the inclusion of the Morelliforme, Pinnatisecta, Polyadenia, and Trifida groups. Like those species, all members assessed for ploidy and EBN are 2x(1EBN).

TRIFIDA GROUP: *S. tarnii*, *S. trifidum*. Correll (1952) erected *Solanum* ser. *Trifida* to accommodate the sole species *S. trifidum*, and Correll (1962) and Flores Crespo (1966) followed him. Bukasov (1978) included this species and *S.* ×*michoacanum* in ser. *Tridifa*, but Hawkes (1990) included ser. *Trifida* in ser. *Pinnatisecta* (Plate 1; where he also included *S. tarnii*). *Solanum tarnii* and *S. trifidum* are united by cpDNA data (Spooner & Sytsma 1992), morphological data (Lara Cabrera & Spooner, in press a), and AFLP data (Lara Cabrera & Spooner, in press b). There is no single morphological character uniting the two species, however. They are easily distinguished from each other in the field, especially by the globose fruits of *S. tarnii* vs. the conical fruits of *S. trifidum*.

POLYADENIA GROUP: *S. lesteri*, *S. polyadenium*. *Solanum lesteri* and *S. polyadenium* clearly are sister taxa that are united by cpDNA data (Spooner & Sytsma 1992), morphological data (Lara Cabrera & Spooner, in press a) and AFLP data (Lara Cabrera & Spooner, in press b). As a group they are very easily distinguished in the field by their highly glandular leaves with Type A trichomes and their characteristic strong "mousy" odor; herbarium specimens have yellowish or yellow-brown foliage (green in other species).

MORELLIFORME GROUP: *S. clarum*, *S. morelliforme*. Hawkes (1956) erected *Solanum* ser. *Morelliformia* to accommodate the species *S. morelliforme*, and Correll (1962) described *Solanum* ser. *Clara* to accommodate the species *S. clarum*. Correll (1962) and Bukasov (1978) maintained this taxonomy, but Hawkes (1963, 1990) placed *S. clarum* and *S. bulbocastanum* into ser. *Bulbocastana* while maintaining a monotypic ser. *Morelliformia* (Plate 1).

Solanum clarum and *S. morelliforme* form a clade according to cpDNA data (Spooner & Sytsma 1992). They occur in very similar habitats; *S. morelliforme* is an epiphyte, and *S. clarum* rarely grows as an epiphyte but more commonly in the shade of trees in moss in epiphytic-like conditions. The species can be crossed with each other, but with great difficulty, and the hybrids exhibit chromosomal structural differences and sterility in the F_2 generation (Marks 1968). Marks (1969) demonstrated by pachytene analysis that the species share characteristic large telochromomeres (although on different chromosomes), unknown in the rest of sect. *Petota*. Nee (1999) was the first to ally both species in ser. *Morelliformia*, and we recognize them under the informal Morelliforme group.

BULBOCASTANA GROUP: *S. bulbocastanum*, *S. cardiophyllum*. These two species have never been allied in any taxonomic treatment before. We recognize this group based on cpDNA results, but this relationship must be tested with nuclear DNA data. The only morphological character uniting these two species is the cream to light yellow corollas not present on any other species from North and Central America.

VERRUCOSA GROUP: *S. verrucosum*. Hawkes (1990) placed fully half of the members of sect. *Petota*, including *S. verrucosum*, into ser. *Tuberosa*, but ser. *Tuberosa* is clearly paraphyletic (Miller & Spooner 1999). *Solanum verrucosum* falls into the highly unresolved cpDNA clade 4 containing members of many series (Fig. 4; Spooner & Sytsma 1992; Castillo & Spooner 1997). For simplicity and convenience, and to avoid the known paraphyly of ser. *Tuberosa*, we place *S. verrucosum* into its own group, following Bukasov (1978; Plate 1).

Solanum verrucosum is the only 2x(2EBN) species in North and Central America and possibly has served as a parent to the polyploids. It frequently is difficult to distinguish from members of the Acaulia, Iopetala, and Longipedicellata groups, especially as herbarium specimens, where the diagnostic inrolled corolla margins are often not evident owing to poor pressing or lack of flowers.

LONGIPEDICELLATA GROUP: *S. hjertingii*, *S. stoloniferum*. Included here are two polysomic polyploid 4x(2EBN) species; this ploidy/EBN is shared in North and Central America only with the four species of the Conicibaccata group. Our concept of *S. stoloniferum* includes the types of four species recognized by Hawkes (1990: *S. fendleri*, *S. papita*, *S. polytrichon*, *S. stoloniferum*). The separate morphotypes are distinctive, but are interconnected by morphological forms that make their recognition as species impossible to justify. Molecular data also fail to support these segregates of *S. stoloniferum*, as discussed below. As for members of the Iopetala group, there are no clear group-specific morphological characters defining this group. Species within the Longipedicellata group are similar to members of the Iopetala and Verrucosa groups; their parental origins are unknown, and they may have had multiple origins. We define the Longipedicellata group largely based on the 4x(2EBN) crossability.

CONICIBACCATA GROUP: *S. agrimonifolium*, *S. longiconicum*, *S. oxycarpum*, *S. woodsonii*. These four species are morphologically distinguished (sometimes with difficulty) as a group by conical fruits, and leaves with a somewhat parallel-sided morphology (mentioned in the descriptions as lateral leaflet pairs subequal or diminishing gradually towards the base) and narrowly ovate to elliptical leaflets. The species evaluated in North and Central America are all 4x(2EBN); *S. longiconicum* is not yet evaluated for EBN, and *S. woodsonii* is not yet evaluated for ploidy and EBN. Some related species traditionally placed in ser. *Conicibaccata* in South America are also 4x(2EBN), and others are 2x(2EBN) and 6x(4EBN). All species in North and Central America, like related species in South America, generally grow in moist organic soils in upland rain forests.

IOPETALA GROUP: *S. guerreroense*, *S. hougasii*, *S. iopetalum*, *S. schenckii*. Included here are four polysomic polyploid 6x(4EBN) species; this ploidy/EBN shared in North and Central America only with *S. demissum* of the Acaulia group. The members of the Iopetala group are very similar to each other and to one of their putative genome contributors, *S. verrucosum* (diploid, Verrucosa group). The members of the Iopetala group also

are morphologically similar to *S. stoloniferum*, 4x(2ENB), of the Longipedicellata group, but are separated from it by strong EBN-based crossability barriers. There are no clear morphological characters uniting members of this group, their parental origins are unknown, and, like other polyploids, they could have multiple origins. These factors make them difficult to classify in any phylogenetic scheme and frustratingly difficult to identify without well-preserved complete flowering and fruiting specimens. Like the Longipedicellata group, we define the Iopetala group largely based on the 6x(4EBN) crossability.

ACAULIA GROUP: *S. demissum*. The relationships of *S. demissum* to the two species traditionally placed in ser. *Acaulia* (*S. acaule*, tetraploid; and *S. albicans*, hexaploid) are indisputable. These relationships are supported by data from morphology, AFLPs, nRFLPs, and flavonoids, and discussed under Relationships above. All three of these species have a rosette to semi-rosette habit (but plants can be taller) and high pedicel articulation; however, in some populations of *S. acaule* and *S. albicans* the articulation is indistinct or even absent. They also grow in upland habitats, exhibit high frost tolerance (Vega & Bamberg 1995), and are self-compatible.

HABITATS AND DISTRIBUTION

Wild potatoes from North and Central America grow in a wide variety of habitats from deserts to rain forests, typically from 1200 to 3800 m (possibly as low as 800 m and as high as 4000 m) (Plates 5A, B). Some species (e.g., *S. stoloniferum*) grow in a wide range of habitats (such as sandy alluvial stream bottoms, edges of cultivated or fallow fields, along fencerows and railways, in grasslands, in fir, pine, juniper, or oak forests), whereas others (*S. clarum*, *S. morelliforme*, *S. agrimonifolium*) are more limited (*S. clarum* and *S. morelliforme* as epiphytes or in epiphytic-like conditions in moss; *S. agrimonifolium* in wet habitats in organic soils in areas of cloud forests). Almost all of these species, except *S. clarum* and *S. morelliforme*, are weedy, and a commonality to their habitats is disturbance, such as recently burned forests or recent landslides.

Potato collectors are always trying to keep one step ahead of grazing animals, and search for disturbed areas not yet subject to intensive grazing, or areas protected from grazing, such as very steep slopes, fence rows, rock piles, or at the base of agave or shrub and thorn thickets. Perhaps the most important factor for successful collecting expeditions is the amount of rainfall; during dry years it is very hard to find wild potatoes. Populations that are found in dry years often do not produce flowers or fruits and apparently persist vegetatively to the next year by new tubers produced each year. Even in good growing years for successful germplasm collections of fruits it is often necessary to revisit a site some weeks after non-fruiting populations are found. Wild potatoes can be very difficult to locate, and two or more days of intensive searches, in areas where potatoes are documented to occur, often pass without locating them.

Habitat information was present on 2300 of our 3486 records, and varied from very simple descriptions (e.g., pine forest) to extensive lists of associated species. It was difficult to make generalized summary statements from such extensive data, and we listed only those genera (alder, fir, oak, pine) or generalized habitats (grasslands, tropical deciduous forest, cloud forest) that were commonly mentioned, but omitted the less common habitats.

Wild potatoes are most commonly found in areas of middle to high elevations

throughout North and Central America (Plate 2). The largest gaps in the overall known distribution are in areas where there is not much land above 1500 m, e.g., in southern Mexico (southern Oaxaca) and in Central America (Belize, El Salvador, Nicaragua). In some highland areas of north-central Mexico no wild potatoes have been found (central Chihuahua and Durango, northern Zacatecas). These areas have low rainfall (Hijmans et al. 2002) but also are difficult to reach. In Arizona and New Mexico in the United States, most areas above 2000 m have populations of wild potatoes. The average estimated elevation over all observations is 2381 m, with 88% of the observations between 1700 and 3400 m. The mean estimated elevation for species is between 1283 m in *S. guerreroense* to 3197 m in *S.* ×*edinense*, and 2381 m on average over species.

On average, 129 observations were mapped per species (in this analysis the nothospecies are excluded) and ranged between one observation in *S. guerreroense* to 917 in *S. stoloniferum*. The median number of observations per species is 59, much lower than the average, as is typical for these types of data.

Species richness is low between 7°N and 11°N (Panama and Costa Rica) (Plate 6). There is a gap with no wild potatoes reported between 11°N and 14°N (Nicaragua, El Salvador, southern Honduras), likely because of the paucity of mid to high elevations (see above). Recent floristic studies of Nicaragua (D'Arcy 2001) have failed to find wild potatoes there. Species richness is high between 14°N and 31°N, from Guatemala to north-central Mexico, and particularly high between 16°N and 21°N (central Mexico), where 10 or more (up to 16) species occur by degree latitude; it is low in northern Mexico and the United States.

Species richness peaks in central Mexico where both rare and widespread species occur. All the species in northern Mexico and the United States are relatively common and have large range sizes. There are 359 cells on the map of species richness (Plate 6). A total of 193 of these cells have only one species and 83 cells have only two species (together 77% of all cells). At this scale of analysis there is a belt of areas with highest species richness from the Mexican states of Jalisco to Michoacán, México, Querétaro, Hidalgo, Distrito Federal, and Puebla, followed by a short interruption south to Oaxaca. Three cells have nine species (two cells in Michoacán and one in Puebla) and three cells have eight species (one in Jalisco on the border with Colima, one in Michoacán, and one in Querétaro).

Hijmans and Spooner (2001) and Hijmans et al. (2002) mapped species richness of the entire range of wild potatoes in the Americas. Those previous studies used data from genebanks, with additional data from herbaria and other sources, and had fewer observations (1193) than the 3321 mapped in our present study. Our results are not directly comparable to these previous studies, because the latter used 38 species including five nothospecies versus the 25 species (excluding nothospecies) used here. In addition, the previous studies used a different gridding method, with a circular neighborhood to assign observations to grid cells, which we did not use. Nevertheless, the previous studies showed similar patterns to the ones presented here; the results are comparable, because the differences are due mainly to the changed species circumscriptions determined in this treatment.

USES

Breeding value for biotic stresses. Wild potato genetic resources have proven value in breeding programs for disease resistances, environmental stresses, and other agronomic

traits of interest (Ross 1986; Hawkes 1990; Spooner et al. 1991a; Spooner & Bamberg 1994; Ruiz de Galerreta et al. 1998; Ochoa 1999; Jansky 2000). Species in North and Central America are particularly rich in such traits. For example, many of the wild species have high levels of resistance against *Phytophthora infestans* (Mont.) de Bary, which causes late blight, one of the most damaging fungal diseases of potato (Bamberg et al. 1994; Song et al. 2003). *Solanum stoloniferum* has long been recognized as a source of resistance to potato virus Y (Pavek & Corsini 2001). Nematode diseases are particularly difficult to combat without genetic resistance, such as that found in species like *S. bulbocastanum* and *S. hougasii* (Brown et al. 1991).

Breeding value for abiotic stresses. Species from North and Central America also contain high levels of resistance to abiotic stress. *Solanum demissum*, for example, ranks third in frost hardiness of all wild potato species (Vega & Bamberg 1995). In addition to protecting the crop from diseases, pests, and stresses, potato breeders also must maintain high quality standards. Brown et al. (1999) discovered resistance to non-enzymatic tuber browning in *S. hjertingii* and incorporated it into the cultivated gene pool through breeding. Evaluation data on these and other traits are available from the US Potato Genebank (Bamberg et al. 1994, 1996a), other national genebanks, and the International Potato Center (CIP).

Incorporation of wild species germplasm into cultivated potato. Ross (1986), Hanneman (1989), Plaisted and Hoopes (1989), Spooner and Bamberg (1994), Love (1999), and Pavek and Corsini (2001) reviewed the use of wild potato species germplasm for the development of improved potato cultivars. The exploitation of wild potato species through traditional means has been made possible by extensive research on the reproductive biology of the genus (see Breeding Systems, above). Hanneman (1999) provided a comprehensive review of the reproductive behavior of species of sect. *Petota* with respect to breeding and germplasm enhancement, and Hermsen (1994) summarized the challenges encountered when incorporating traits from wild potato species into cultivars. Ideally, wild species of the trait undergo selection at the genebank. This may be in the form of fine screening, in which individual plants within populations are tested and interbred to concentrate the trait within the wild species' background (Bamberg et al. 1996a; Douches et al. 2001), or enhancement to produce elite, progeny-tested breeding stocks adapted to cultivation.

Glycoalkaloids. Tubers and leaves of wild and cultivated potatoes contain steroidal glycoalkaloids that in high concentrations are thought to impart protection against pathogens and pests (Dale & Mackay 1994; Maga 1994). In high concentrations they can convey a bitter taste and in very high concentrations a burning sensation and various symptoms associated with food poisoning (Maga 1994). Concentrations differ in different species, but the relative concentrations in tubers and leaves are positively correlated. Approximately 95% of the total glycoalkaloids present in potatoes are accounted for by α-solanine and α-chaconine (Dale & Mackay 1994). Eleven glycoalkaloids have been documented in the leaves of sect. *Petota*. Six of these are known from the species from North and Central America: chaconine, demissine, solamargine, solanine, solasonine, and tomatine (Deahl et al. 1993, including data from an unpublished report referenced there and filed at NRSP-6). Glycoalkaloid concentrations are generally higher in the leaves than in the tubers, where on occasion they are toxic to humans

(Kúc 1975; Morris & Lee 1984). The widely accepted safety limit for levels in tubers is 0.2 mg/g fresh weight.

Wild species as food sources. Some of the species in North and Central America have been used directly for food. Tubers of *S. jamesii* and *S. stoloniferum* (the latter previously reported in the literature as *S. fendleri*) were used in the United States (Sturtevant 1919; Vestal 1940; Dunmire & Tierney 1995) and *S. cardiophyllum* was used in Mexico (Correll 1962). A collection of *S. stoloniferum* (*Bye & Mundy 6500*, ECON) has label data that indicates that the tubers are eaten by the Tarahumara Indians in Chihuahua, Mexico.

TAXONOMY

[NOTE: For very widely distributed species the listings of representative specimens examined are presented in the Appendix. Because flowering/fruiting times and elevations vary greatly in different parts of the range for most species, the date of collection and elevation, when available, are given for each collection, although phenology and distribution are summarized after each species description.]

Solanum L., Sp. pl. 1: 184. 1753.—TYPE: *Solanum nigrum* L.—See D'Arcy (1972, 1973) for generic synonymy.

The generic description below applies to *Solanum* including *Cyphomandra* Mart. ex Sendtn. (Bohs 1995), *Lycopersicon* Mill. (Spooner et al. 1993), *Normania* Lowe, and *Triguera* Cav. (Bohs & Olmstead 2001). Others (e.g., Hunziker 2001) maintain these taxa as distinct genera.

Herbs, shrubs, trees, or vines, with or without spines, glabrous or pubescent with unbranched or branched, often glandular hairs. Leaves alternate or paired and frequently unequal in size, simple to pinnately lobed or compound, petiolate or sessile, without stipules, but sometimes with "pseudostipules" (the vasculature arising one node below their emergence; see text). Inflorescences cymose, branched or unbranched. Flowers usually perfect, (4-) 5-merous, actinomorphic or zygomorphic; calyx campanulate, sometimes accrescent in fruit, corolla rotate, campanulate, stellate, or urceolate, white, green, yellow, pink, or purple; stamens equal or unequal, the filaments generally short and inserted at the corolla base, the anthers basifixed, equal or unequal, blunt or tapered toward apex, opening by terminal pores, sometimes expanding into longitudinal slits, or introrsely longitudinally dehiscent in sect. *Lycopersicon*; ovary 2-carpellate; ovules many; style articulated at base or above the base, usually slender; stigma capitate. Fruit a berry, usually fleshy but occasionally dry, usually many-seeded, the seeds often flattened; embryo curved, embedded in abundant endosperm. Chromosome number: n = 12, 23. (Modified from Bohs, 2001.)

Solanum section **Petota** Dumortier, Fl. belg. 38. 1827. *Solanum* subsection *Potatoe* G. Don, Gen. syst. 4: 420. 1838. *Solanum* section *Potatoe* (G. Don.) Walpers, Rep. bot. syst. 3: 38. 1844. *Solanum* subsection *Tuberarium* Dunal in DC., Prodr. 13(1): 28. 1852. *Solanum* section *Tuberarium* (Dunal) Bitter, Repert. Spec. Nov.

Regni Veg. 10: 531. 1912. *Solanum* subsection *Hyperbasarthrum* Bitter, Repert. Spec. Nov. Regni Veg. 11: 359. 1912.—LECTOTYPE, designated by D'Arcy, 1972: *Solanum tuberosum* L.

[The following description applies to *Solanum* sect. *Petota* only as represented by the species in North and Central America.]

Plants 0.1–2.5 m tall, herbaceous and tuber-bearing, tubers minute (5 mm in diameter) to 4–5 (–10) cm in diameter, oval to spindle-shaped; generally terrestrial (except epiphytic in *S. morelliforme* and growing in moss in epiphytic-like conditions in *S. clarum*), sometimes forming a rosette or semi-rosette in *S. demissum* or *S. guerreroense*, to more commonly erect or ascending, glabrous, puberulent, pilose, strigose, or pubescent, or densely invested with short-stalked glandular hairs (Type A glandular hairs in *S. lesteri* and *S. polyadenium*). Stems 2–13 mm in diameter at base of plant, green to purple to mottled or lined green and purple. Pseudostipules 2–23 mm long, simple, lunate and generally clasping the stem, or linear and pinnately compound and not clasping the stem (in *S. jamesii* and *S. pinnatisectum*). Leaves 2–52 cm long, 0.9–24 cm wide, simple to pinnately compound, petiolate, overall shape of blade lanceolate to ovate to elliptic to obovate; petioles 0.8–10 cm long; lateral leaflet pairs 0–8, opposite to sub-opposite, subequal or the size of the lateral leaflets diminishing abruptly towards the base of the leaf, the leaf widest at the first or second most-distal lateral pair, whereas the most proximal pair often reduced in size to that of the interjected leaflets; most distal lateral pair 1–14 cm long, 0.3–5 cm wide, linear, lanceolate, ovate, elliptic, obovate, apex obtuse to acute to acuminate, base cordate to rounded to cuneate, petiolulate with petiolules up to 10 mm, or sessile, sometimes decurrent on the basiscopic side; terminal leaflet 1.7–13 cm long, 0.3–7 cm wide, ovate to elliptical to obovate, apex obtuse to acute to acuminate, base cuneate to truncate to cordate; interjected leaflets 0–31, on the main rachis or rarely on the petiolules, ovate to elliptical to obovate, sessile to short-petiolate. Inflorescence a dichasially branched, ebracteate, monochasial or dichasial cyme, generally positioned in distal half of plant (commonly in proximal half of plant in *S. demissum*); peduncle 0.2–13 cm long. Flowers 3–38; pedicels 3–50 mm long, articulate between the proximal 1/4 and the distal 1/4 (except in the distal 1/4 in *S. demissum* and *S. ×edinense*); calyx 1.5–37 mm long, lobes acute to long-attenuate, acumens 0.5–6.5 mm long; corolla 1.2–4 cm in diameter, stellate to pentagonal to rotate, acumens 0–6 mm long, edges of corolla flat and not folded dorsally (or folded dorsally in *S. verrucosum*), white to white-cream to blue to purple; anthers 2–8 mm long, yellow, apically dehiscent, often maturing to a short introrse apical slit, laterally coherent to more rarely free; filaments 1–4 mm long; style 5–14 mm long, exceeding stamens by 0–7 mm, stigma globose to clavate, curved or straight. Fruits 0.5–5 cm long, globose to ovoid to conical, typically medium to deep green, or with a whitish bloom, colored equally throughout or with lighter flat or raised dots or reticulate patterns of lighter or darker colors of green or purple. Seeds from living specimens green-white throughout (except in *S. longiconicum,* which is distinguished by a purple dot formed by the purple embryo showing through the testa). Chromosome number (EBN combination): 2x(1EBN), 2x(2EBN), 4x(2EBN), 6x(4EBN), and hybrids with 3x and 5x (EBN unknown); some 2x(1EBN) species also have triploid populations with unknown EBN.

SYNOPTIC LIST OF CHARACTERS OF SOLANUM SECT. PETOTA FROM NORTH AND CENTRAL AMERICA

The following is a list of distinctive character states (or combinations of two states) found among some of the species of sect. *Petota* of North and Central America. Numbers correspond to the species number in the taxonomic treatment. In most cases, the diagnostic character states are listed, but the alternatives are not. This is not intended to be an exhaustive list of characters, but an aid in the identification of some distinctive species. The nothospecies and the taxonomically difficult species *S. stoloniferum*, *S. guerreroense*, *S. hougasii*, and *S. schenckii* are not included here.

Fruits short- to long-conical: 3, 7, 8, 17, 18, 19, 20, 21, 23
Leaves highly glandular and sticky to the touch, with a characteristic "mousy" odor in living condition, becoming yellowish or yellow-brown when dried (as in herbarium specimens): 8, 9
Leaves simple: 10, 11, 12
Corollas pure white, sometimes tinged with violet, stellate: 1, 2, 3, 4, 5, 6, 7, 10, 11
Corollas cream-white to light yellow, stellate: 12, 13
Stipules pinnatifid or absent: 1, 2
Pedicel articulation typically in distal 1/4 of pedicel: 25
Seeds in fresh condition with a purple spot: 18
Inflorescences often near base of plant: 25
Edges of corolla typically folded dorsally: 14
Styles typically exserted 2–8 mm beyond tip of anthers, noticeably curved: 15

KEY TO THE WILD SPECIES OF SOLANUM SECT. PETOTA OF NORTH AND CENTRAL AMERICA

1. Corollas stellate, or pentagonal to rotate-pentagonal if leaves are covered with dense glandular pubescence; corollas white to light yellow throughout, sometimes white with tones of violet on the abaxial side of the lobe tips [all 2x(1EBN) species].
   2. Corollas pentagonal to rotate-pentagonal; leaves covered with dense vesture of short-stalked glandular trichomes; plants with a strong spicy odor in living condition.
      3. Fruits globose to slightly triangular in face view, if triangular in face view less than 1.7 times as long as wide. 9. *S. polyadenium.*
      3. Fruits triangular in face view (Fig. 18C), mature fruits 1.7–2.2 times as long as wide. 8. *S. lesteri.*
   2. Corollas stellate; leaves pubescent, glabrescent, strigose, or with a very sparse covering of glandular trichomes; plants without noticeable odor in living condition.
      4. Leaves simple.
         5. Corollas white-cream to light yellow; mature fruits 1–1.3 cm long; plants robust, with stems 3–6 mm wide at base; growing mainly in soil. 12. *S. bulbocastanum.*
         5. Corollas white or white with tones of violet on the abaxial side of the lobe tips; mature fruits 0.5–0.8 cm long; plants slender, the stems 2–3 mm wide at base; plants epiphytic, or growing in epiphytic-like conditions in moss on the ground.
            6. Leaves ovate, the base cordate to truncate or attenuate. 10. *S. clarum.*
            6. Leaves elliptic to narrowly ovate, the base attenuate. 11. *S. morelliforme.*
      4. Leaves compound.
         7. Pseudostipules pinnatifid and not clasping the stem or rarely absent.
            8. Lateral leaflets 3–4 pairs, lanceolate to elliptic-lanceolate; calyx lobe acumens 1–2.5 mm long. 1. *S. jamesii.*
            8. Lateral leaflets 6–8 pairs, linear, lanceolate to elliptic-lanceolate; calyx lobe acumens 1.5–6.5 mm long. 2. *S. pinnatisectum.*

7. Pseudostipules lunate, usually clasping the stem.
   9. Fruits conical to triangular in face view.
      10. Lateral leaflet pairs 2–3, subsessile to short-petiolate, subequal in size. 3. *S. hintonii.*
      10. Lateral leaflet pairs (1–) 2–3, subsessile to decurrent, if more than 1 the proximal pair greatly reduced in size. 7. *S. trifidum.*
   9. Fruits globose to ovoid.
      11. Calyx 10–13 mm long, irregularly lobed, lobe acumens 2–6 mm long. 6. *S. tarnii.*
      11. Calyx 2.5–6 mm long, more or less evenly lobed, lobe acumens 0.5–2.5 mm long.
         12. Calyx lobe acumens minute to 0.5 mm long; corollas white-cream; anthers 3–4 mm long. 13. *S. cardiophyllum.*
         12. Calyx lobe acumens 1–2.5 mm long; corollas white or white with tones of violet on the abaxial side of the lobe tips; anthers 4.5–6 mm long.
            13. Leaflets linear to linear-lanceolate, base oblique. 4. *S. stenophyllidium.*
            13. Leaflets ovate-lanceolate to lanceolate, base rounded, cordate, oblique, or slightly truncate. 5. *S. ehrenbergii.*

1. Corollas pentagonal to rotate; vesture puberulent to strigose or pubescent, herbage never covered with dense glandular pubescence; corollas white to blue to purple [all 2x(2EBN), 4x(2EBN), or 6x(4EBN) species].
   14. Mature fruits short- to long-conical, often more than 2 times as long as broad; leaves typically with the first three or more most distal pairs of lateral leaflets narrowly ovate to elliptical, usually subequal in size, only gradually diminishing in size to the base of the leaf.
      15. Leaves with (3–) 6–7 (–8) lateral leaflets pairs; interjected leaflets 4–31; corollas blue to purple. 17. *S. agrimonifolium.*
      15. Leaves with (2–) 3–6 (–8) lateral leaflets pairs; interjected leaflets 0–6 (–8); corollas white, blue, or purple.
         16. Leaves shiny, glabrous or with scattered 1–2-celled short hairs; fresh seeds greenish white with a conspicuous purple spot caused by the purple embryo showing through the greenish white seed coat; corollas white to blue or purple. 18. *S. longiconicum.*
         16. Leaves dull, finely to coarsely pubescent; fresh seeds greenish throughout and without a spot; corollas typically bluish purple to purple, only rarely white.
            17. Larger leaves 15–25 cm long, with (3–) 4–6 (–8) pairs of lateral leaflets; Mexico. 19. *S. oxycarpum.*
            17. Larger leaves 25–40 cm long, with (2–) 3–5 pairs of lateral leaflets; Panama. 20. *S. woodsonii.*
   14. Mature fruits globose to short-conical, typically less than 2 times as long as broad; leaves with the first three or more most distal pairs of lateral leaflets ovate to broadly elliptical, diminishing greatly in size to the base of the leaf.
      18. Pedicel articulation typically in the distal 1/4 of pedicel; inflorescences often near base of plant or up to the middle, sometimes in distal 1/2 of plant. 25. *S. demissum.*
      18. Pedicel articulation typically in the middle of pedicel; inflorescences typically only in distal 1/4 of plant.
         19. Fruits ovoid to ellipsoid to short conical.
            20. Corollas typically light purple abaxially, dark purple adaxially; distal leaflets typically somewhat to strongly decurrent on petiolules. 24. *S. schenckii.*
            20. Corollas equally purple throughout or purple and splashed with purple color or with rays lighter purple or white; distal lateral leaflets typically petiolate.
               21. Interjected leaflets 0–10; plants ascending to erect, up to 0.75 m tall. 23. *S. iopetalum.*
               21. Interjected leaflets 8–19; plants semi-prostrate, only to 0.25 m tall. 21. *S. guerreroense.*
         19. Fruits globose.
            22. Styles typically exserted 2–8 mm beyond tip of anthers, noticeably curved; leaves essentially glabrous, shiny. 15. *S. hjertingii.*
            22. Styles typically exserted 1.5–4.5 mm beyond tip of anthers, typically straight; leaves pubescent.
               23. Edges of corollas typically inrolled dorsally; distal lateral leaflets diminishing in size towards the base of the leaf (Plates 3E, 9). 14. *S. verrucosum.*
               23. Edges of corollas flat; distal lateral leaflets subequal.

24. Leaves 7–15 cm wide; corollas typically pure white throughout, or white with purple interpetalar tissue. 22. *S. hougasii.*
24. Leaves 3.5–8 cm wide; corollas typically light purple above and darker purple below, or white tinged with purple at the tips, less commonly white throughout. 16. *S. stoloniferum.*

2x(1EBN) Species—Pinnatisecta Group

1. Solanum jamesii J. Torrey, Ann. Lyceum Nat. Hist. New York 2(5): 227. 1828.—Type: U.S.A. Without locality [collected during the Long Expedition to the Rocky Mountains], *E. P. James s.n.* (holotype: NY!; photo in Correll, 1952, p. 108).

Solanum jamesii var. *heterotrichium* Bitter, Repert. Spec. Nov. Regni Veg. 11: 444. 1912. *Solanum jamesii* subsp. *septentrionale* Bitter, Repert. Spec. Nov. Regni Veg. 12: 10. 1913.—Type: U.S.A. Colorado: Fort Collins, from the Herbarium of the State Agricultural College, Colorado, distributed by the Herbarium of the New York Botanical Garden, 3 Sep 1898, [*collector unknown*] *1742* (holotype: UPS! photo: G!; isotypes: C! CS! F! GH! LD! LY! MIN! NY[2]! P! PH! RM! UC! US-489307! VT!, photos of P isotype [Correll neg. 363]: BM! GH! K! LL! NY! P! UC! US!, other photos of P isotype: PTIS! WAG!).

Solanum jamesii var. *sinclairii* Bitter & Correvon, Repert. Spec. Nov. Regni Veg. 11: 444. 1912.—Type: Specimen prepared from plants cultivated at Valleyres, Vaud, Switzerland, from tubers of unknown provenance, ex hort. Barbey, 21 Aug 1888, *J. Vetter s.n.* (lectotype, here designated: Z!, photo [Correll neg. 473]: UC!).

Plants 0.2–0.5 m, herbaceous, terrestrial, erect. Stems 2–5 mm in diameter at base of plant. Pseudostipules to 10 mm long, pinnatifid like the leaves. Leaves 7–15 cm long, 4–9 cm wide, odd-pinnate, glabrescent and glandular adaxially and abaxially; petioles 1.5–3.5 cm long; lateral leaflet pairs 3–4, the second-most distal lateral leaflets larger than the most distal, then the size of the lateral leaflets diminishing gradually towards the base of the leaf; most distal lateral leaflets 3–5 cm long, 0.7–2 cm wide, lanceolate to elliptic-lanceolate, apex acute, base oblique, sessile, strongly decurrent on the rachis; terminal leaflet 4–6.5 cm long, 1–2.5 cm wide, lanceolate, apex acute to acuminate, base attenuate; interjected leaflets absent. Inflorescences generally in distal half of plant; peduncle 1–6 cm long. Flowers 4–10; pedicels 16 –30 mm long, articulate between the proximal 1/4 and the distal 1/4; calyx up to 6 mm long, lobes oblong, apiculate to caudate, acumens 1–2.5 mm long; corolla 2.8–3.5 cm in diameter, stellate, without acumens, edges of corolla flat, not folded dorsally, white; anthers 6 mm long, connate; style 12–14 mm long, exceeding stamens by 5–6 mm, straight. Fruits 1 cm long, globose, green throughout. Seeds from living specimens green-white throughout. Chromosome number: 2n = 24. EBN = 1. Fig. 6.

Phenology. Flowering and fruiting June through October.

Distribution (Fig. 7). U.S.A. (southern Utah and southern Colorado, New Mexico, Arizona, southwestern Texas) and Mexico (northern Sonora and northern Chihuahua, and disjunct populations in Querétaro and San Luis Potosí); among boulders on hillsides, sandy alluvial stream bottoms, in gravel along trails or roadways, rich organic soil of alluvial valleys, sandy fallow fields, grasslands, juniper-pinyon scrub deserts, oak thickets, coniferous and deciduous forests; 1370–2870 m.

See Appendix for a list of Specimens Examined (p. 145).

Solanum jamesii is very similar to *S. cardiophyllum*, *S. ehrenbergii,* and *S. stenophyllidium.* It is readily distinguished from them by its pinnatifid pseudostipules, a character

FIG. 6. *Solanum jamesii*. A. Habit. B. Flower, adaxial and side views. C. Fruit. D, E. Terminal leaflet and most distal lateral leaflets, adaxial (D) and abaxial (E) views. (Based on: A, B, D, E, *Bohrer 1494*, ARIZ; C, *Bamberg & Fernandez 83*, PTIS.)

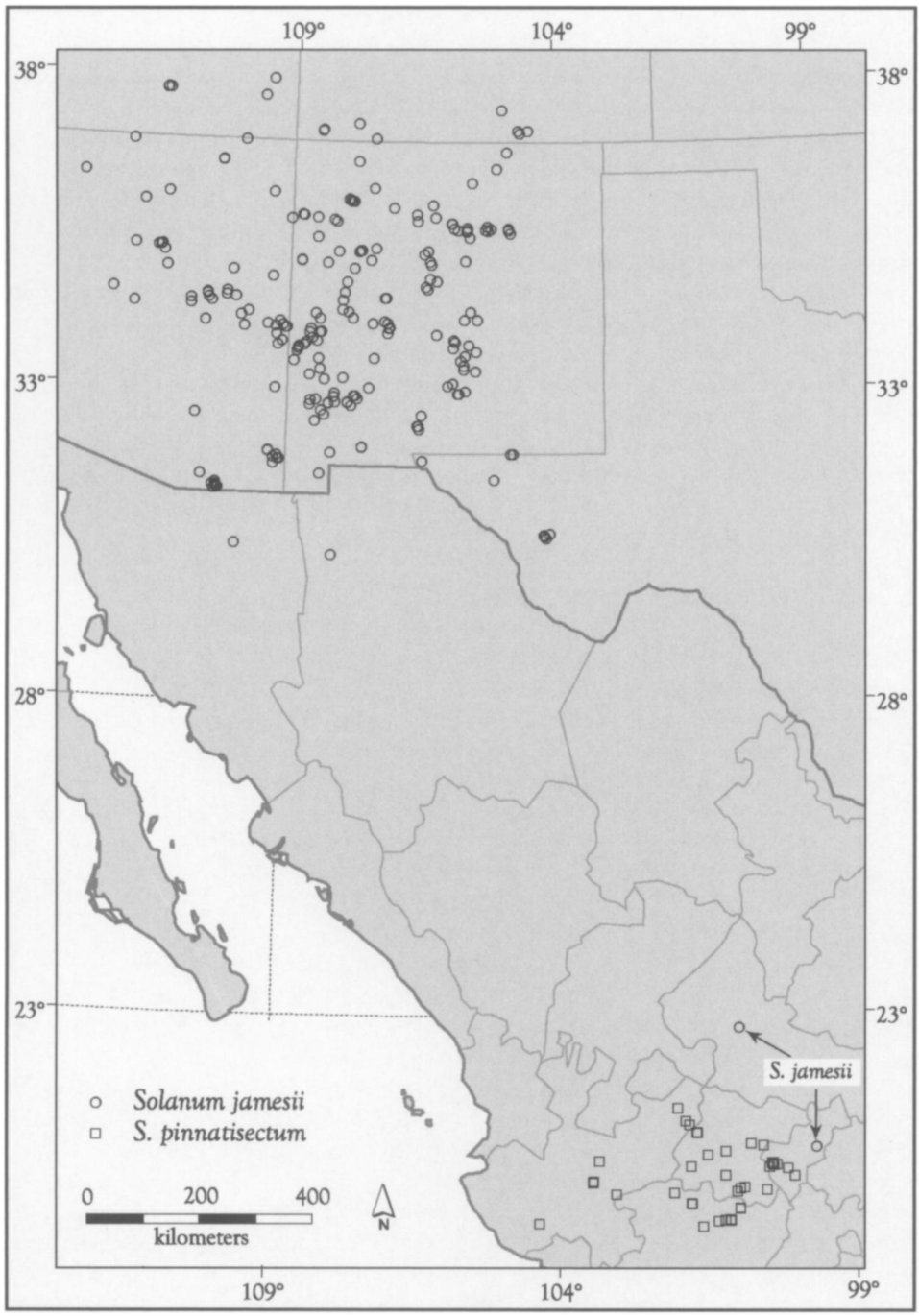


FIG. 7. Distribution *Solanum jamesii* and *S. pinnatisectum*. The two southern disjunct populations of *S. jamesii* are noted with arrows.

shared only with *S. pinnatisectum*, which has 6–8 pairs of lateral leaflets vs. 3–4 pairs for *S. jamesii*. All other wild potato species from North and Central America have lunate stipules.

Records of *S. jamesii* from natural habitats in Colorado are limited to the extreme southwestern and southeastern parts of the state. Several disjunct populations from northern Colorado in Boulder and Larimer counties and in Scottsbluff County, Nebraska, are near cultivated fields and greenhouses. Recent searches at these localities have been unsuccessful (Bamberg et al. 2003). These disjunct northern sites likely represent recent introductions to experimental stations, and we do not map them (Fig. 7) but list them in Specimens Examined (Appendix).

The type sheet of *S. jamesii* bears two flowering specimens, one larger than the other, which comprise the holotype, and the label "*Solanum jamesii*, Long's expedition, D. James" in Torrey's hand.

Bitter (1913) proposed *Solanum jamesii* subsp. *septentrionale* by combining *S. jamesii* var. *heterotrichium*, *S. jamesii* var. *sinclarii*, and *S. jamesii* var. *brachistotrichium* into a single subspecies. We consider the first and second of these names to be synonyms of *S. jamesii*, and the third to be a synonym of *S. stenophyllidium*. Bitter designated no type for this new name, but cited only the three varietal names. The types of these names, therefore, become syntypes from which a lectotype was chosen.

2. Solanum pinnatisectum Dunal, Prodr. 13(1): 40. 1852.—TYPE: MEXICO. Guanajuato: near León, W of Guanajuato, 1829, *Méndez s.n.* (holotype: G-DC!, photos [F neg. 6752]: F! GH! LL, MO, NY! US!, drawing: GH!).

Solanum pinnatisectum var. *pentazygum* Bitter, Repert. Spec. Nov. Regni Veg. 12: 49. 1913.—TYPE: MEXICO. Guanajuato: near León, W of Guanajuato, 1829, *Méndez s.n. p.p.* (holotype, the large flower in the packet ["in capsula"]: MPU!).

Solanum pinnatisectum var. *heptazygum* Bitter, Repert. Spec. Nov. Regni Veg. 12: 50. 1913.—TYPE: MEXICO. Michoacán: Morelia, Punguato, 4 Jul 1909, *G. Arsène 2895* (lectotype, here designated: MPU!, photo: G!, drawing: K!; isolectotypes: GH! MO! MPU! NY! P! US-1030967!; photo of US isolectotype [US neg. 1963]: MICH!, photo of MPU isolectotype: PTIS! WAG!).

Plants 0.4–0.7 m tall, herbaceous, terrestrial, erect. Stems 3–6 mm in diameter at base of plant. Pseudostipules to 10 mm long, pinnatifid like the leaves. Leaves 6–11.5 cm long, 4–6.5 cm wide, odd-pinnate, pilose adaxially and abaxially; petioles 1–4.2 cm long; lateral leaflet pairs 6–8, the second-most distal lateral leaflets larger than the most distal, then the size of the lateral leaflets diminishing gradually towards the base of the leaf; most distal lateral leaflets 1.5–3 cm long, 0.3–0.8 cm wide, linear, lanceolate to elliptic-lanceolate, apex acute, base rounded to oblique, sessile, decurrent on the rachis; terminal leaflet 1.7–3.2 cm long, 0.3–7 cm wide, linear-lanceolate to linear-oblong, apex obtuse, base rounded to oblique, decurrent on the rachis; interjected leaflets absent. Inflorescences generally in distal half of plant; peduncle 2.5–6 cm long. Flowers 3–12; pedicels 15–25 (–30) mm long, articulate between the proximal 1/4 and the distal 1/4; calyx 4–10 mm long, lobes oblong, apiculate to caudate, acumens 1.5–6.5 mm long; corolla 2.5–4 cm in diameter, stellate, without acumens, edges of corolla flat, not folded dorsally, white; anthers 6–8 mm long, connate; style up to 9 mm long, exceeding stamens by 3–4 mm, straight. Fruits to 2 cm long, globose or heart-shaped, with dark green stripes and white spots. Seeds from living specimens green-white throughout. Chromosome number: 2n = 24. EBN = 1. Fig. 8.

Phenology. Flowering and fruiting July through September.

FIG. 8. *Solanum pinnatisectum*. A. Habit. B. Flower, adaxial view. C. Part of inflorescence with side view of flower and young fruit. D. Detail of stem node with pinnatifid pseudostipule. E, F. Lateral leaflet, adaxial (E) and abaxial (F) views. (Based on: A, E, F, *Hawkes 1041*, K; B, D, *Hawkes 1435*, K; C, *Hawkes 1092*, K.)

Distribution (Fig. 7). Central Mexico (Guanajuato, Jalisco, Michoacán, Querétaro); frequently in cultivated or fallow fields, roadsides, tropical deciduous forests, mesquite-grasslands; 1500–2200 m.

ADDITIONAL SPECIMENS EXAMINED. **Mexico.** GUANAJUATO: potato fields in the vicinity of León, 21.11°N, 101.65°W, 1800 m, 26 Aug 1963, *Flores S-716* (K, LL, MEXU); Mpio. Valle de Santiago, Rancho El Brazo, near the town of Valle de Santiago, 20.41°N, 101.20°W, 17 May 1945, *Gilly 135* (F, MICH, MSC, NY, TEX); León, 2 km SE of the cement factory, 21.12°N, 101.67°W, 1800 m, 30 Aug 1949, *Hawkes & García 1093* (BR, IBUG, K, LL, MEXU, MPU, NY, PTIS, WAG); 4 km NE of León, Rancho de Zermeño in the direction of Alfaro, 21.12°N, 101.67°W, 1800 m, 29 Aug 1949, *Hawkes et al. 1092* (C, F, IBUG, K, LL, MEXU, PTIS); 4 mi from San Miguel Allende, Rancho de Canajo, 20.92°N, 100.75°W, 2000 m, 6 Sep 1958, *Hawkes et al. 1435* (C, IBUG, K, MEXU, PTIS, US); El Castillo, 2 mi from Silao on the road to Guanajuato, 20.75°N, 101.49°W, 1800 m, 8 Sep 1958, *Hawkes et al. 1455* (C, IBUG, K, MEXU, PTIS); at base of Cerro de la Márgara, near Puerto Nieto, 15 mi SE of San Miguel de Allende, 20.88°N, 100.53°W, 2195 m, 14 Aug 1956, *Johnson 2* (LL); 16.1 km W of Salvatierra on road to Yuriria, 20.21°N, 100.95°W, 1767 m, 22 Aug 1979, *Lane & Longstreth 2668* (TEX); Mpio. Jerácuaro, San Pedro, 20.17°N, 100.50°W, 2030 m, 11 Aug 1985, *Rubio 24* (IEB); 5 km NE of Salvatierra, on the road to Celaya, 20.23°N, 100.87°W, 1750 m, 9 Jun 1985, *Rzedowski 38757* (IEB, MEXU); 22 km SW of Cuerámaro, on the road to Barranca del Chilar, 20.56°N, 101.77°W, 2200 m, 5 Sep 1988, *Rzedowski 47174* (MEXU); Mpio. Santiago Maravatío, near Ojo de Agua, 20.16°N, 101.00°W, 1900 m, 16 Oct 1989, *Rzedowski 49123* (MEXU); San Miguel de Allende, 20.92°N, 100.75°W, 1981 m, 26 Jul 1950, *Spivey 171* (UC); just S of the city of León, Hwy 45, 21.12°N, 101.67°W, 1770 m, 14 Oct 1967, *Tarn 205A* (PTIS); road from San Miguel de Allende to Celaya, 9 km from San Miguel de Allende, 20.80°N, 101.18°W, 1900 m, 19 Oct 1983, *Tarn et al. 165* (PTIS).—JALISCO: 10 mi W of Zamora, 20.14°N, 103.04°W, 12 Aug 1947, *Barkley et al. 7661* (F, MEXU, TEX); 15 mi from León on the road to Aguascalientes, 21.50°N, 101.98°W, 1950 m, 8 Sep 1958, *Hawkes et al. 1456* (C, IBUG, K, MEXU, PTIS, US), *Hawkes et al. 1457* (C, IBUG, K, MEXU, PTIS); 29 mi from Guadalajara on the road to Mexico City, Hacienda de Huejotitán, 20.67°N, 103.33°W, 1600 m, 15 Sep 1958, *Hawkes et al. 1505* (C, IBUG, K, MEXU, PTIS, US); Mpio. Jocotepec, Potrero El Monte, Ejido Zapotitán de Hidalgo, 20.32°N, 103.44°W, 1500 m, 12 Aug 1992, *Machuca 6894* (IEB); Mpio. Jocotepec, Ejido Zapotitán, 20.34°N, 103.43°W, 1500 m, 10 Aug 1995, *Machuca 7443* (TEX); Mpio. Lagos de Moreno, Km 27 from Lagos de Moreno towards León, about junction to Las Cruces, 21.23°N, 101.78°W, 2000 m, 25 Aug 1993, *Rodríguez et al. 2572* (IBUG, PTIS, WIS); Mpio. Lagos de Moreno, La Aurora, road from Lagos de Moreno towards Aguascalientes, 21.28°N, 101.85°W, 2050 m, 25 Aug 1993, *Rodríguez et al. 2574* (IBUG, PTIS, WIS); Rt 15, 7 mi S of turnoff to Autlán, Guadalajara to Jiquilpan, near Km marking 635, 19.68°N, 104.35°W, 24 Jul 1955, *Weintraub & Roller 186* (MICH).—MICHOACÁN: Morelia, Rincón, 19.70°N, 101.12°W, 2000 m, 16 Aug 1910, *Arsène 6550*); vicinity of Morelia, 19.71°N, 101.13°W, 4 Jul 1909, *Arsène s.n.* (US); 10 km W of Morelia, 19.69°N, 101.13°W, 21 Jun 1950, *Baldwin 14374* (LL, NA, PTIS); Mpio. Panindícuaro, about 3 km from Estancia del Río, on the road to Zacapu, 19.98°N, 101.77°W, s.d., *Carranza 5578* (TEX); Km 16 from Morelia on road to Quiroga, 19.60°N, 101.58°W, 5 Aug 1965, *Correll et al. 31342* (GH, LL, S); Mpio. Zinapécuaro, Zinzimeo, 19.89°N, 100.95°W, 1900 m, 31 Jul 1991, *Escobedo 2025* (MEXU, IEB), *Rodríguez 2025* (MEXU); near Morelia, Km 329 on road to Guadalajara, on the right side of road next to a stone fence, 19.70°N, 101.12°W, 2000 m, 10 Sep 1962, *Flores S-665* (K, LL, MEXU); near Morelia, at Km 318 from México, 19.70°N, 101.12°W, 1860 m, 29 Jul 1949, *Hawkes et al. 1041* (A, BM, C, CPC, G, K, LL, S, WIS); 329 km from Mexico City on the road from Morelia to Pátzcuaro, 19.69°N, 101.33°W, 1950 m, 5 Aug 1965, *Hawkes et al. 2536* (K, P); Mpio. Morelia, about 300 m W of Santa María, 19.70°N, 101.22°W, 2050 m, 16 Jul 1986, *Huerta 574* (IEB); 4 km W of Panindícuaro, 1950 m, 29 Jul 1983, *Labat 328* (P); Mpio. Churintzio, Sanguijuela, 20.15°N, 102.06°W, 1850 m, 20 Jul 1986, *Labat 1621* (IEB, MEXU, P); Mpio. Panindícuaro, junction to Curimeo on road from Zacapú to Villachuato, 19.97°N, 101.77°W, 1750 m, 23 Jun 1990, *Pérez & García 1302* (MEXU); Pénjamo, 20 Sep 1898, *Pringle s.n.* (VT); near Morelia, 19.70°N, 101.12°W, 2000 m, 14 Jul 1941, *Schery 120* (MO); about 16 km WSW of Morelia, Km 329 on Hwy 15 (Morelia to Quiroga), Cerro del Aguila, N side of road, 19.69°N, 101.12°W, 2000 m, 11 Sep 1962, *Ugent et al. 1837–1838, 1840–1842, 1844, 1846, 1848–1851, 1855–1856* (BM, ENCB, MEXU, MICH, MO, US, WIS).—QUERÉTARO: Querétaro, 20.60°N, 100.38°W, 1910–1913, *Agniel 10580* (MO), 1900 m, 1910–1913, *Arsène 10380* (BM, F, GH, MO, NY, US), 1910, *Arsène 10467* (US), *Arsène 10580* (MO, US); road to La Venta, 20.38°N, 100.02°W, 1950 m, 23 Jun 1975, *Argüelles 89* (ENCB, MEXU); vicinity of Querétaro, 20.58°N, 100.38°W, 1900 m, 4 Jul 1976, *Argüelles 416* (MEXU), *Argüelles 418* (ENCB, MEXU); near Querétaro city, 20.60°N, 100.38°W, 1912, *Basile 131* (US), *Basile 132* (NY, US); Km 8, toll way from Celaya to Querétaro, on the right side of the road, 20.53°N, 100.45°W, 1850 m, 27 Aug 1963, *Flores S-718* (K,

MEXU); near Querétaro, hill slopes SE of town, 20.56°N, 100.37°W, 1800 m, 26 Aug 1949, *Hawkes et al. 1088* (K, LL, MEXU); 3 km SSE of Querétaro, by the small resevoir, 20.60°N, 100.38°W, 1900 m, 6 Sep 1958, *Hawkes et al. 1424* (IBUG, K, MEXU, PTIS), *Hawkes et al. 1426* (PTIS); Mpio. Pedro Escobedo, Ejido El Sauz, 13.5 km on the road from San Juan del Río to Querétaro, 20.50°N, 100.13°W, 1900 m, 10 Oct 1958, *Hawkes et al. 1665* (C, K, PTIS, US); 15 km SE of Querétaro, on the road from Irapuato to Querétaro, near Irapuato, 2 km before Castilla and 17 km SSE of Querétaro, 20.57°N, 100.32°W, 1940 m, 27 Sep 1980, *Ochoa 14179* (CIP, US); Mpio. Querétaro, road from Querétaro to Mexico City, just at the junction to El Rosario, E side of Conín Indian monument, 20.59°N, 100.39°W, 2000 m, 9 Aug 1993, *Rodríguez et al. 2495* (IBUG, MICH, PTIS, NY, WIS).

Solanum pinnatisectum, one of the most distinctive wild potato species in North and Central America, is easily distinguished by its 6–8 pairs of linear or lanceolate to elliptic-lanceolate lateral leaflets. It would be hard to confuse with any other species, except for its putative hybrid with *S. ehrenbergii*, *S.* ×*sambucinum* (Hawkes 1990). *Solanum* ×*sambucinum* has fewer lateral leaflets (4–5 vs. 6–8), lunate pseudostipules (vs. pinnatifid pseudostipules), and lanceolate leaflets (vs. linear-lanceolate leaflets).

Correll (1962) designated *S.* ×*michoacanum* as a nothospecies originating from a cross of *S. bulbocastanum* and *S. pinnatisectum*, which is somewhat morphologically intermediate between them but has many fewer lateral leaflets than *S. pinnatisectum* (see discussion of *S.* ×*michoacanum*, no. 26).

Stenophyllidia Group

3. Solanum hintonii D. S. Correll, Wrightia 2: 139, fig. 27. 1961.—Type: Mexico. México: Dist. Temascaltepec, Peñón, 1700 m, 10 Aug 1933, *G. B. Hinton 4416* (holotype: US-2089576!, photos [Correll neg. 46]: BM! GH! K! LL! NY! UC! US!; isotypes: K! MICH! NY! RSA!).

Plants 0.4–0.5 m tall, herbaceous, terrestrial, erect. Stems 3–4 mm in diameter at base of plant. Pseudostipules 9–15 mm long, lunate. Leaves 7–14.5 cm long, 4–11.5 cm wide, odd-pinnate, puberulent adaxially and abaxially; petioles 1.5–6.5 cm long; lateral leaflet pairs 2–3, the size of the lateral leaflets diminishing gradually towards the base of the leaf; most distal lateral leaflets 3.5–6.5 cm long, 1.3–1.8 cm wide, lanceolate to elliptic-lanceolate, apex acute, base oblique, subsessile to short-petiolate, decurrent on the rachis; terminal leaflet 3.5–10 cm long, 0.5–3 cm wide, lanceolate, elliptic to elliptic-lanceolate, apex acute to shortly acuminate, base attenuate; interjected leaflets absent. Inflorescences generally in distal half of plant; peduncle 1–9 cm long. Flowers 3–20; pedicels 8–15 mm long, articulate between the proximal 1/4 and the distal 1/4; calyx 6–7 mm long, lobes oblong or elliptic to ovate-elliptic, apiculate, acumens 2–4 mm; corolla 2 cm in diameter, stellate, without acumens, edges of corolla flat, not folded dorsally, white to white-cream; anthers 4–6 mm long, connate; style 10–11 mm long, exceeding stamens by 2–2.5 mm, straight. Fruits 2–2.2 cm long, conical, green. Seeds from living specimens green-white throughout. Chromosome number unknown. EBN unknown. Plate 4F, Fig. 9.

Phenology. Flowering and fruiting August through October.

Distribution (Fig. 10). Central Mexico (Colima, Guanajuato, México); along stream banks in areas with pine and oak forests, rocky hills in juniper woods; 1700–2800 m.

Additional Specimens Examined. **Mexico.** Colima: 19–20 km NW of Colima, 1 km E of Campo Cuatro, 19.35°N, 103.59°W, 1400 m, 14 Aug 1991, *Guzmán et al. 1359* (WIS).—Guanajuato: Mpio. Xichú, El Charco, 25 km N of Xichú, 21.40°N, 99.90°W, 2100 m, 12 Sep 1989, *Ventura & López 7282* (IEB, MEXU).—México: 6.5 km SW of Temascaltepec to Valle de Bravo Road, on road to San Pedro Tenayac, on S side of road,

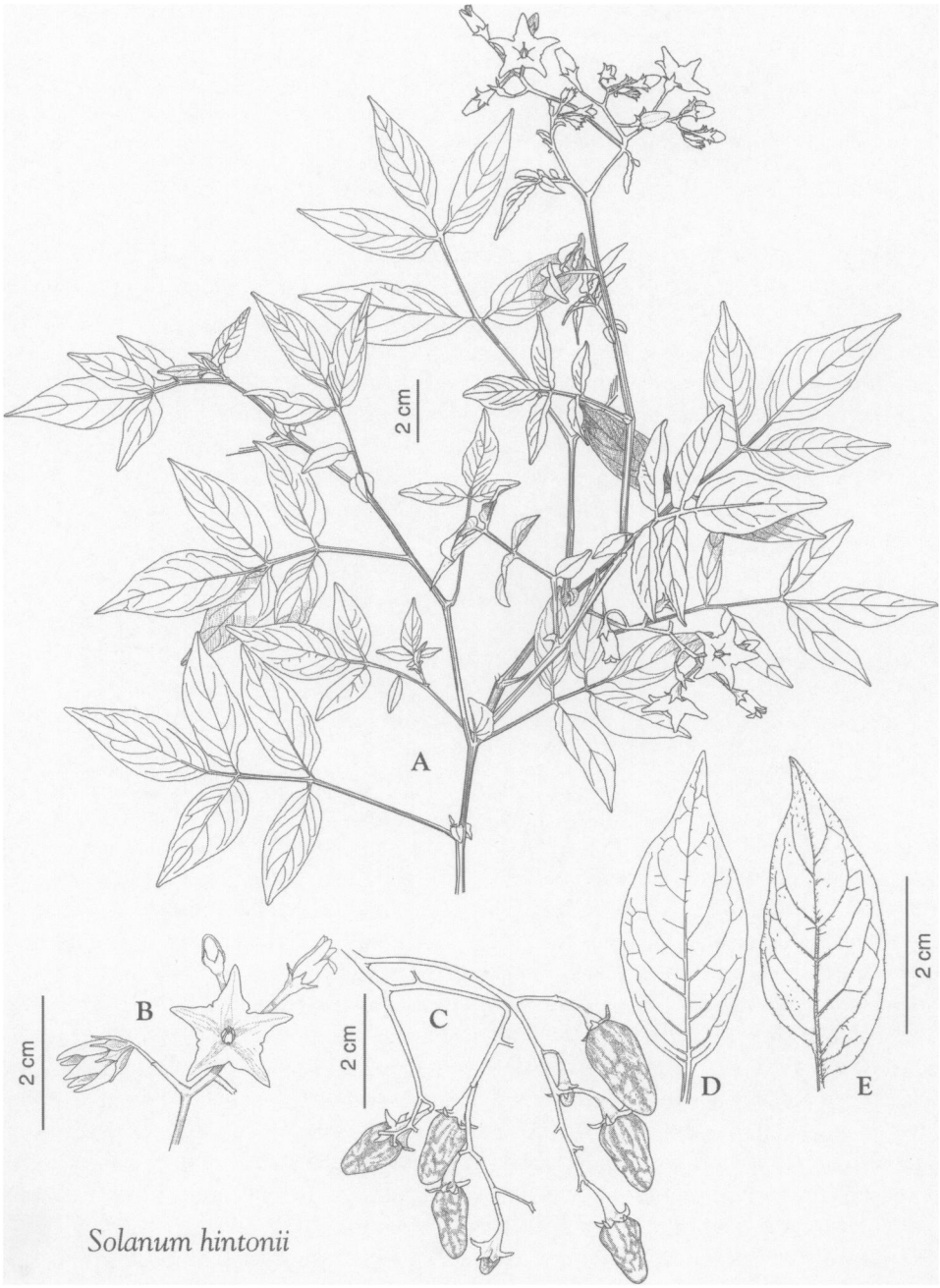


FIG. 9. *Solanum hintonii*. A. Habit. B. Part of inflorescence with buds and flowers. C. Part of infructescence with young and mature fruits. D, E. Lateral leaflet, adaxial (D) and abaxial (E) views. (Based on *Spooner et al. 4033*, PTIS.)

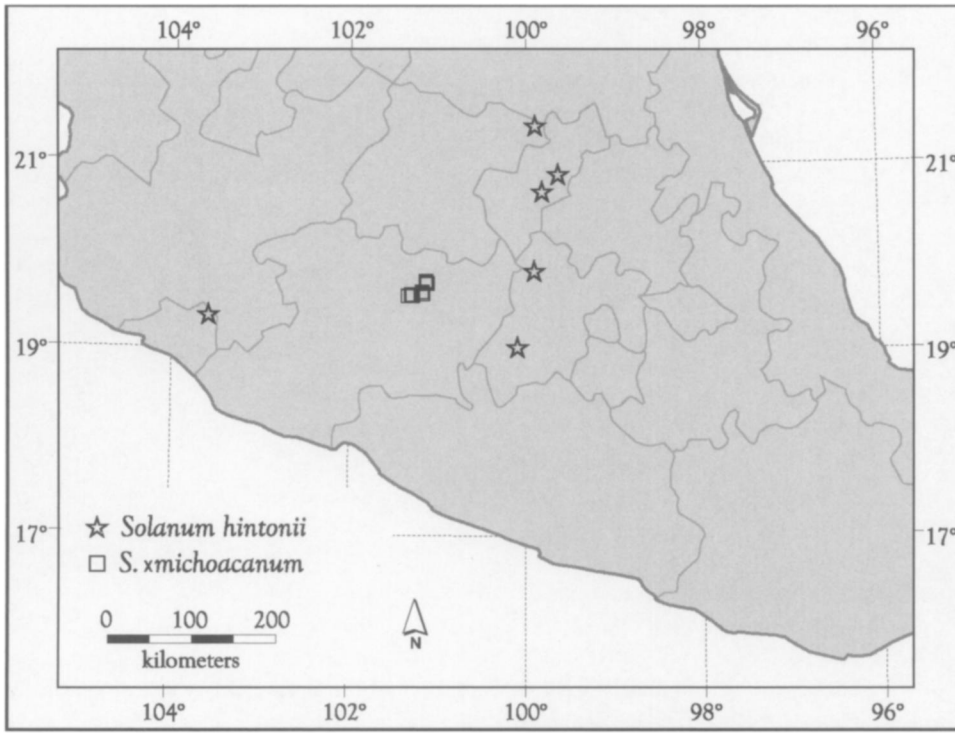


FIG. 10. Distribution of *Solanum hintonii* and *S.* ×*michoacanum*.

about 50 m downstream of bridge over road, 19.03°N, 100.10°W, 1860 m, 25 Aug 1988, *Spooner et al. 4033* (INIFAP, PTIS); 6.5 km SW of Temascaltepec to Valle de Bravo Road, on road to San Pedro Tenayac, on N side of road, about 100 m upstream of bridge over road, 19.03°N, 100.10°W, 1860 m, 25 Aug 1988, *Spooner et al. 4034* (INIFAP, PTIS, WIS).—QUERÉTARO: Mpio. Cadereyta, 5 km NW of El Doctor, 20.70°N, 99.82°W, 2800 m, 12 Oct 1987, *Rzedowski 45052* (IEB).

Solanum hintonii could be confused with *S. trifidum*, because both have white stellate corollas and conical fruits; however, the lateral leaflets of *S. hintonii* are clearly petiolate and subequal in size, whereas those of *S. trifidum* are subsessile and decurrent, with the proximal pair (when present) shorter than the distal pair.

4. Solanum stenophyllidium Bitter, Repert. Spec. Nov. Regni Veg. 12: 51. 1913.—TYPE: MEXICO. Jalisco: Río Blanco near Guadalajara, 17 Sep 1886, *E. Palmer 611* (holotype: G!; photos [Correll neg. 809]: BM! F! GH! K! LL! NY! US!, drawing: K!; isotypes: BM! GH! NY! U! US-42679, photo of BM isotype: U!, photos of GH isotype [Correll neg. 199]: BM! F! GH! K! LL! NY, US!, photos of U isotype [Correll neg. 136]: BM! F! GH! K! LL! NY! US!, photo of US isotype [US neg. 1964]: F! GH! MICH! NY! PTIS! US!).

Solanum jamesii subsp. *septentrionale* var. *ripicola* Bitter, Repert. Spec. Nov. Regni Veg. 12: 151. 1913. *Solanum brachistotrichium* var. *ripicola* (Bitter) Correll, Agric. Monogr. U.S.D.A. 11: 105. 1952 [as "*brachistotrichum*"].—TYPE: MEXICO. Sonora: river bank, Calabasas, 5800 ft, 9 Oct 1890, *C. V. Hartman 108*

(holotype: K!; isotype: GH!, photos [Correll neg. 201]: BM! F! GH! K! LL! NY! UC! US!).

Solanum jamesii var. *brachistotrichium* Bitter, Repert. Spec. Nov. Regni Veg. 11: 444. 1912. *Solanum brachistotrichium* [as "*brachistotrichum*' "] (Bitter) Rydberg, Bull. Torrey Bot. Club 51: 170. 1924.—TYPE: MEXICO. Chihuahua: Santa Eulalia Mountains, 14 Aug 1885, *C. G. Pringle 668* (lectotype, here designated: UPS!; isolectotypes: BM! F! G! GH! GOET! JE! K[2]! MICH! MO! NA! NY[2]! P[4]! PH[2]! US-67691! US-1418482! VT! WU[2]!, photos of F isolectotype: [F neg. 49337]: F! US!, photos of G isolectotype [Correll neg. 810]: BM! F! GH! K! LL! NY! UC! US!, photos of GH isolectotype [Correll neg. 476]: BM! F! GH! K! LL! NY! UC! US!, photos of P isolectotypes [Correll neg. 140]: BM! F! GH! K! LL! NY! UC! US!, also [Correll neg. 141]: BM! F! GH! K! LL! UC! US!], photo of WU isolectotype: GH!).

Solanum jamesii subsp. *nayaritense* Bitter, Repert. Spec. Nov. Regni Veg. 12: 8. 1913. *Solanum nayaritense* (Bitter) Rydberg, Bull. Torrey Bot. Club 51: 170. 1924.—TYPE: MEXICO. Jalisco: Sierra de Nayarit, W part, *L. Diguet s.n.* (holotype: P!).

Plants 0.25–0.8 m tall, herbaceous, terrestrial, erect. Stems 2–5 mm in diameter at base of plant. Pseudostipules 6–23 mm long, lunate. Leaves (4–) 7–25 cm long, 5–12.5 cm wide, odd-pinnate, subglabrous to densely puberulent adaxially and abaxially; petioles 1.5–5 cm long; lateral leaflet pairs (1–) 2 (–3), the size of the lateral leaflets diminishing abruptly towards the base of the leaf; most distal lateral leaflets 2–9 cm long, 0.4–1.7 cm wide, linear to linear-lanceolate, apex acute, base oblique, sessile, decurrent on the rachis; terminal leaflet 4–13 cm long, 0.6–1.8 cm wide, linear to linear-lanceolate, apex acute, base cuneate, decurrent on the rachis, occasionally forming a trilobed structure with the most distal lateral leaflets; interjected leaflets absent. Inflorescences generally in distal half of plant; peduncle 0.7–6 cm long. Flowers 4–17; pedicels 7–28 mm long, articulate between the proximal 1/4 and the distal 1/4; calyx 4–7 mm long, lobes oblong, acute to apiculate, acumens up to 1 mm; corolla 1.2–2.2 cm in diameter, stellate, without acumens, corolla edges flat, not folded dorsally, white with tones of violet on the abaxial side of the lobe tips; anthers 4–6.5 mm long, connate; style 10–11 mm long, exceeding stamens by 2 mm, straight. Fruits 0.8–1.1 cm long, globose, with dark green stripes. Seeds from living specimens green-white throughout. Chromosome number: 2n = 24. EBN = 1. Plates 3B, 4B; Fig. 11.

Phenology. Flowering and fruiting July through September.

Distribution (Fig. 12). Mexico (Aguascalientes, Chihuahua, Durango, México, Michoacán, Nayarit, Zacatecas); cultivated fields, tropical deciduous forests, oak forests, streamsides, savannas, mesquite grasslands, dry rocky hillsides, often in dry sandy rocky soils, or in richer organic soils, in areas of oak, pine, and *Acacia* forests; (1100–) 1380–2500 m.

See Appendix for a list of Specimens Examined (p. 152).

Solanum stenophyllidium is very similar to *S. ehrenbergii*, *S. cardiophyllum*, and *S. jamesii*. The lunate pseudostipules separate it from *S. jamesii*, which has pinnatifid pseudostipules. *Solanum stenophyllidium* is distinguished from *S. cardiophyllum* by its white corollas and longer calyx acumens (up to 1 mm); *S. cardiophyllum* has cream-colored corollas and minute calyx acumens less than 0.5 mm long. It differs from *S. ehrenbergii* by its leaflets, which are linear to linear-lanceolate and oblique at the base; in

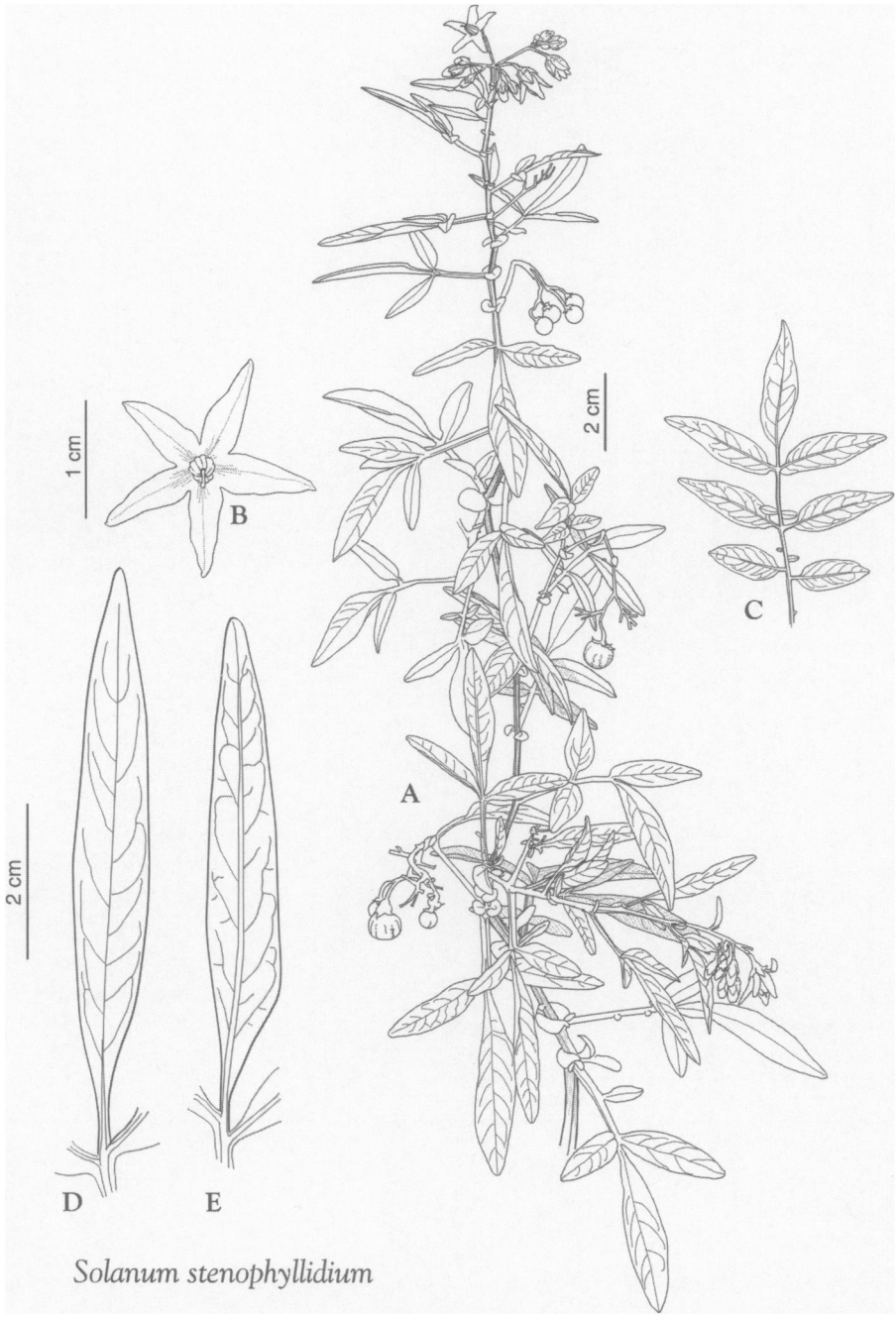


FIG. 11. *Solanum stenophyllidium*. A. Habit. B. Flower, adaxial view. C. Leaf, adaxial view. D, E. Lateral leaflet, adaxial (D) and abaxial (E) views. (Based on: A, *Rodríguez et al. 1398*, PTIS; B, *Hawkes 1234*, K; C–E, *Pringle 688*, W.)

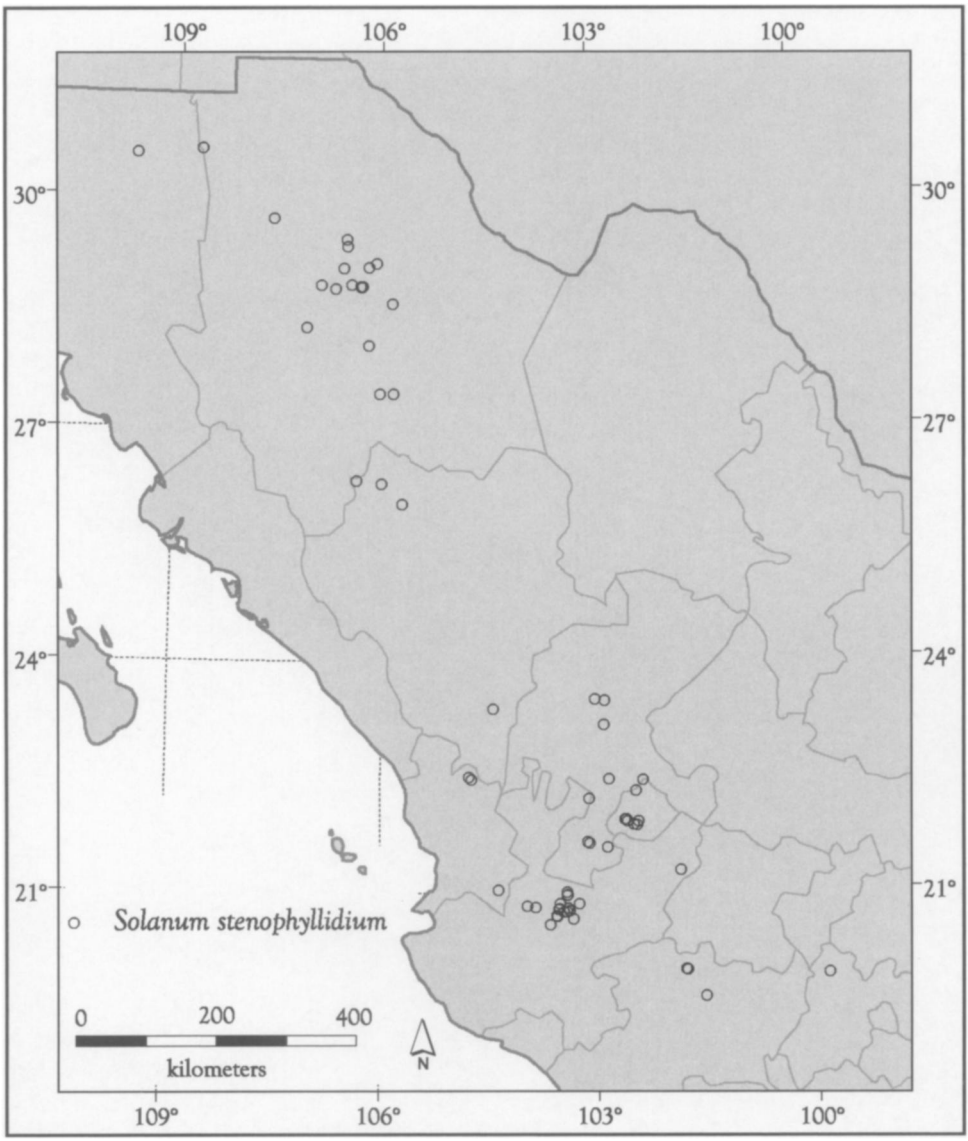


FIG. 12. Distribution of *Solanum stenophyllidium*.

S. ehrenbergii the leaflets are ovate-lanceolate to lanceolate with the base cordate, oblique, or slightly truncate.

Solanum stenophyllidium exhibits great variation in leaf size, leaflet shape, and indument length and density. Correll (1962) and Hawkes (1990) recognized *S. brachistotrichium*, *S. nayaritense*, and *S. stenophyllidium* as distinct species based on variation of these characters. Lara Cabrera and Spooner (in press a) could not separate *S. brachistotrichium* from *S. stenophyllidium* morphologically. They examined only one accession of the *S. stenophyllidium* variant; we also cannot distinguish three taxa among the

additional accessions we examined during this study. Living plants of all three variants cultivated under similar conditions at Sturgeon Bay, Wisconsin, U.S.A., show a continuous variation.

Our examination of living specimens of these accessions at Sturgeon Bay in 2001 showed all specimens collected in the Barranca of Guadalajara in Jalisco (Mexico), the type locality of *S. stenophyllidium* (*Spooner et al. 4091B*, *4104*), to have glabrescent and linear to linear-lanceolate leaves. In contrast, other living specimens from germplasm collected north of there (*Hawkes 1234*, *1471*; *Ochoa 14195*, *14206*; *Tarn et al. 13*, *208*, *213*, *214*, *215*, *223*) showed puberulent and lanceolate leaflets. *Tarn et al. 234A*, *270*, identified at NRSP-6 as *S. nayaritense*, had lanceolate and pilose leaflets. *Tarn et al. 207* had puberulent and linear-lanceolate leaflets. Some herbarium specimens collected in Jalisco (*Rodríguez et al. 2576*, IBUG, PTIS) are as densely pilose as those previously identified as *S. nayaritense*.

Hawkes (1990) noted that, in general, plants he called *S. stenophyllidium* are taller than those assigned to *S. brachistotrichium*, but this is not always true. Living specimens from germplasm from the type locality of *S. stenophyllidium* (*Spooner et al. 4104*) are as tall as *Hawkes 1471* from much farther north in Zacatecas, and *Spooner et al. 4091A* from the type locality is as short as collections previously identified as *S. brachistotrichium* (*Ochoa 14195*, *14206*; *Tarn et al. 13*, *208*, *213,* and *214*). For these reasons, we treat *S. stenophyllidium* as a morphologically variable species that includes the types of the names *S. brachistotrichium* and *S. nayaritense*.

Correll (1962: 280) was unable to locate the type of *S. jamesii* subsp. *nayaritense* and proposed the following "lectotype" (i.e., neotype): MEXICO. Nayarit: Tepic, Sierra Madre, near Santa Teresa, 9 Aug 1897, *J. N. Rose 2134* [Correll neg. 137: BM! GH! K! LL! NY! UC! US!]. We were more fortunate and located the holotype at P, thus setting aside Correll's neotypification.

When proposing the combination *Solanum brachistotrichium*, Rydberg (1924) spelled the epithet "*brachistotrichum.*" Hawkes (1990: 79) noted this orthographic change but incorrectly justified its maintenance based on established use by Correll (1952, 1962) and Hawkes (1956, 1963). We restore the correct spelling here.

5. Solanum ehrenbergii (Bitter) Rydberg, Bull. Torrey Bot. Club 51: 169. 1924. *Solanum cardiophyllum* subsp. *ehrenbergii* Bitter, Repert. Spec. Nov. Regni Veg. 11: 442. 1912. *Solanum cardiophyllum* var. *ehrenbergii* (Bitter) Correll, Agric. Monogr. U.S.D.A. 11: 97, fig. 67. 1952.—TYPE: MEXICO. Without locality, *Ehrenberg s.n.* (holotype: B, destroyed).—MEXICO. Querétaro: near Querétaro, 20–23 Aug 1906, *J. N. Rose & J. S. Rose 11183* (neotype, here designated: GH!; isoneotypes: NY! US-453965!, photo of US isoneotype: PTIS!).

Plants up to 0.8 m tall, herbaceous, terrestrial, rosette-forming to ascending. Stems 2–4 mm in diameter at base of plant. Pseudostipules 7–20 mm long, lunate. Leaves (3–) 5–15 (–30) cm long, 5–8 cm wide, odd-pinnate, pilose with simple and glandular hairs adaxially and abaxially; petioles 2.5–4.2 cm long; lateral leaflet pairs (1–) 2–3 (–4), the size of the lateral leaflets diminishing abruptly towards the base of the leaf; most distal lateral leaflets 1–10 cm long, 1–5 cm wide, ovate to ovate-lanceolate, apex acute or obtuse, base cordate, rounded, oblique or slightly truncate, sessile to petiolulate with petiolules up to 5 mm; terminal leaflet 3–12 cm long, 1.5–6 cm wide, ovate, ovate-elliptic to elliptic-lanceolate, apex acute to acuminate, base cordate, rounded, cuneate, or oblique;

interjected leaflets 0–2. Inflorescences generally in distal half of plant; peduncle 1–11.5 cm long. Flowers 3–20; pedicels 20–30 (–44) mm long, articulate between the proximal 1/4 and the distal 1/4; calyx 5–6 mm long, lobes elliptic, apiculate, acumens 1–2 mm long; corolla 2–2.5 cm in diameter, stellate, without acumens, edges of corolla flat, not folded dorsally, white with tones of violet on the abaxial side of the lobe tips; anthers 5–6 mm long, connate; style 10–13 mm long, exceeding stamens by 2.5–4 mm, straight. Fruits to 1 cm long, globose, light green throughout. Seeds from living specimens green-white throughout. Chromosome number: 2n = 24. EBN = 1. Fig. 13.

Phenology. Flowering and fruiting July through October.

Distribution (Fig. 14). Mexico (Aguascalientes, Distrito Federal, Guanajuato, Hidalgo, Jalisco, México, Michoacán, Nayarit, Puebla, Querétaro, San Luis Potosí, Zacatecas); in and about cultivated fields, xerophytic scrublands, tropical deciduous forests, mesquite grasslands, or in areas of oak and pine forests; (800–) 1450–2500 m.

ADDITIONAL SPECIMENS EXAMINED. **Mexico.** AGUASCALIENTES: Pan American Hwy, a little after the city of Aguascalientes at Km 571.5, 21.88°N, 102.29°W, 1960 m, 5 Sep 1963, *Flores S-725* (MEXU); 7 mi from Aguascalientes on the road to Loreto, 1 1/4 mi from the main Aguascalientes to Zacatecas Hwy, 21.88°N, 102.30°W, 1900 m, 9 Sep 1958, *Hawkes et al. 1458* (C, K, PTIS, US); about 8.5 mi from Aguascalientes on road to Loreto, 2 3/4 mi from main Aguascalientes to Zacatecas Hwy, 21.92°N, 102.28°W, 1950 m, 9 Sep 1958, *Hawkes et al. 1459* (C, K, US); near city of Aguascalientes, 21.89°N, 102.31°W, 20 Aug 1901, *Rose & Hay 6225* (GH, NY, US); Hwy 70, at Km 49 just before Calvillo, then N thru San Isidro and 12 km N of La Labor, beyond Temascal towards La Congoja, 22.05°N, 102.73°W, 2300 m, 26 Sep 1984, *Tarn et al. 223* (C, PTIS).—DISTRITO FEDERAL: Santiago Acahualtepec, near the women's prison, 19.36°N, 99.09°W, 2320 m, 18 Sep 1967, *Flores S-997* (MEXU).—GUANAJUATO: Mpio. Victoria, 13 km from Victoria on dirt road to Xichú, 21.38°N, 100.20°W, 2020 m, 18 Sep 1996, *Carranza & Pérez 5127* (IBUG, IEB, MEXU); roadside between Dolores Hidalgo and Atotonilco, 21.00°N, 100.50°W, 2073 m, Jul 1956, *Coon 26* (GH); Km 41, road from Guanajuato to Dolores Hidalgo, 21.15°N, 101.06°W, 2000 m, 14 Sep 1965, *Flores S-826* (ENCB, IBUG, LL, MEXU); 16 km S of León, 21.12°N, 101.67°W, 1850 m, 12 Oct 1957, *Graham 337* (LL, NY, US, W); Dolores Hidalgo, 24 mi from San Miguel Allende, between the railway station and the river bridge, on the left side of the road, 20.85°N, 101.40°W, 1850 m, 7 Sep 1958, *Hawkes et al. 1440* (C, K, PTIS, US); 6.5 mi from Dolores Hidalgo on the road to Guanajuato, 20.85°N, 101.40°W, 2000 m, 7 Sep 1958, *Hawkes et al. 1443* (C, K, PTIS, US); Mpio. Cortazar, Cerro Culiacán, 20.33°N, 100.97°W, 2330 m, 10 Jul 1987, *Mora 721* (IEB, LL); farm field "El Cortijo," 16 km NE of Dolores Hidalgo on San Luis de la Paz Hwy, 21.22°N, 100.80°W, 1906 m, 18 Aug 1996, *Ocampo 50* (MEXU); 11 km SW of town square of Dolores Hidalgo, about 50 m N of Rt 110, in town of Los Hernández, 21.17°N, 101.03°W, 2100 m, 26 Oct 1997, *Rivera-Peña et al. 993* (INIFAP, MEXU); Mpio. San Diego de La Unión, road from Querétaro City to San Luis Potosí, 21.47°N, 100.87°W, 2060 m, 23 Aug 1993, *Rodríguez et al. 2564* (F, IBUG, MO, NY, PTIS, WIS); 15 km W of Silvatierra, on road to Yuriria, 20.22°N, 100.96°W, 1880 m, 12 Jul 1985, *Rzedowski 38800* (CHAP, ENCB, IEB, MEXU); 32 km SW of Cuerámaro, on the road to Barranca del Chilar, 20.52°N, 101.82°W, 2200 m, 5 Sep 1988, *Rzedowski 47206* (IEB); León to Mexico road, Hwy 45, before Celaya at about Km 256 on N side of road, 20.65°N, 100.70°W, 1790 m, 14 Oct 1967, *Tarn & Gómez 210* (K); León to Mexico road, Hwy 45, before Celaya at about Km 256, S of road opposite 210, 20.67°N, 100.68°W, 1790 m, 14 Oct 1967, *Tarn & Gómez 212* (K).—HIDALGO: Km 70, toll road from Mexico to Querétaro, right side of the road, 2180 m, 3 Sep 1963, *Flores S-720* (MEXU); Km 183, Mexico City to Laredo Hwy, 6 Jul 1943, *Lundell & Lundell 12195* (LL, NA); road from Mexico to Querétaro, across from the monument commemorating the construction of the tollway, 2140 m, 27 Sep 1966, *Flores S-953* (ENCB, MEXU).—JALISCO: Km 201 from Guadalajara on the road to San Luis Potosí, 21.42°N, 102.65°W, 1850 m, s.d., *CPC 2302* (PTIS), 31 Aug 1949, *Hawkes & García 1095* (ECON, LL, MEXU, PTIS); Pan American Hwy, Km 472, turning to the right to Rancho El Tropezón, 2000 m, 4 Sep 1963, *Flores S-722* (MEXU); Matanzas, 238 km from Guadalajara towards San Luis Potosí, 21.62°N, 101.63°W, 2200 m, 31 Aug 1949, *Hawkes & García 1096* (PTIS); Hwy 45, 10 mi E of Encarnación de Díaz, road to Lagos de Moreno, 21.52°N, 102.23°W, 2000 m, 13 Sep 1958, *Hawkes et al. 1492* (C, K, PTIS, US); 10 mi N of Guadalajara, Río Blanco, 0.5 mi from the old cotton mill, 20.78°N, 103.33°W, 1600 m, 14 Sep 1958, *Hawkes et al. 1494* (C, K, PTIS, US); Mpio. Zapopan, Tesistán, farm field of La Toma, 20.78°N, 103.41°W, 1500 m, 11 Jul 1986, *Rodríguez Nieves 330c* (ANSM, CHAPA, ENCB, F, IBUG, IEB, MEXU, MICH, NY, WIS, XAL); on the side of

FIG. 13. *Solanum ehrenbergii*. A. Habit. B. Flower; pedicel with calyx. C, D. Lateral leaflet, adaxial (C) and abaxial (D) views. (Based on *Rodríguez 2497*, PTIS.)

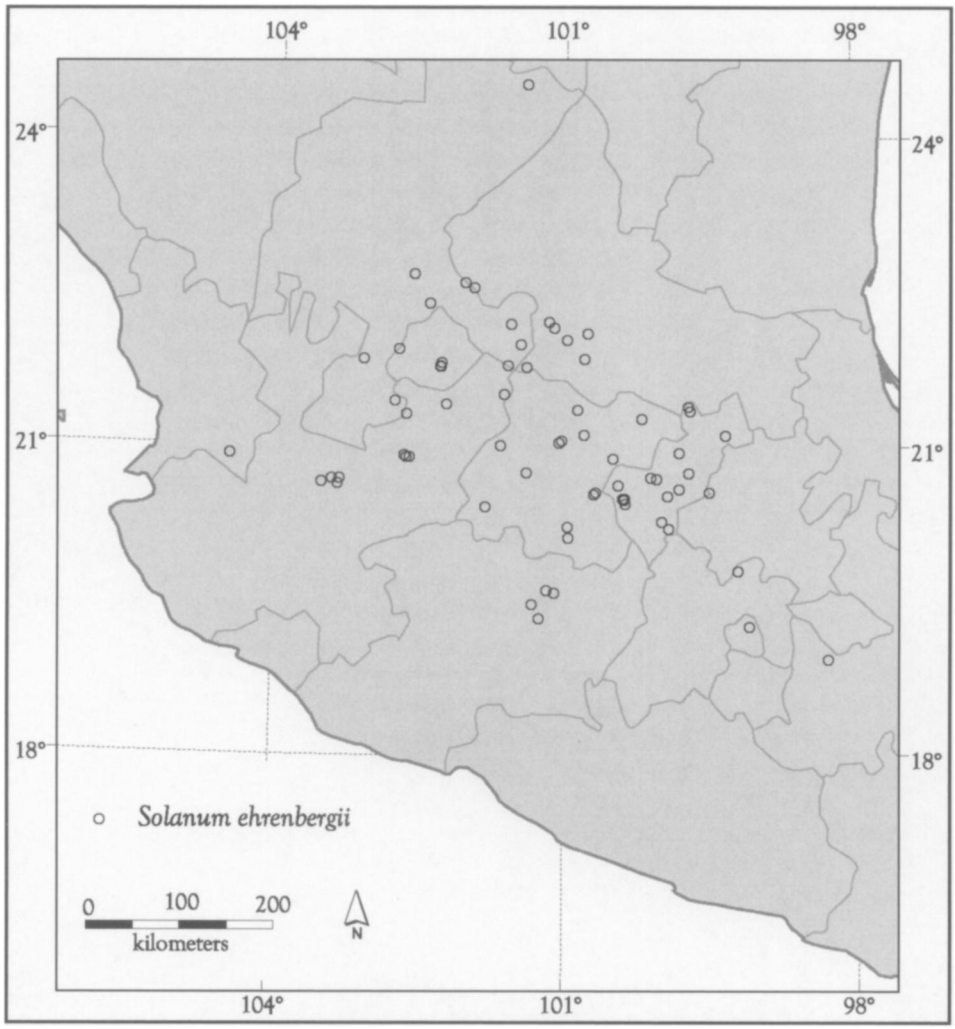


FIG. 14. Distribution of *Solanum ehrenbergii*.

greenhouse, College of Agriculture, Las Agujas, Nextipac, Zapopan, 20.75°N, 103.52°W, 1450 m, 25 Jul 1991, *Rodríguez & Vargas 2094* (F, IBUG, MICH, NY, WIS); Mpio. Valle de Guadalupe, La Nopalera, 21.02°N, 102.66°W, 1800 m, 19 Jul 1988, *Rodríguez et al. 1304* (ANSM, CHAPA, ENCB, IBUG, IEB, MEXU, MICH, NY, WIS, XAL); Mpio. Valle de Guadalupe, San Isidro, 4 km W of Valle de Guadalupe, 21.00°N, 102.65°W, 1850 m, 19 Jul 1988, *Rodríguez et al. 1313a* (ANSM, CHAPA, ENCB, IBUG, IEB, MEXU, MICH, NY, WIS, XAL); Mpio. Valle de Guadalupe, near the village and along the road, 21.00°N, 102.62°W, 1819 m, 26 Aug 1993, *Rodríguez et al. 2579* (IBUG, PTIS, WIS); Mpio. Zapopan, experimental fields around the College of Agriculture, University of Guadalajara, 20.73°N, 103.35°W, 1500 m, 30 Aug 1993, *Rodríguez et al. 2584* (IBUG, PTIS).—MÉXICO: 6 km N of Huehuetoca, along the road to Apaxco, 19.90°N, 99.20°W, 2350 m, 12 Sep 1977, *Rzedowski 35266a* (ENCB).—MICHOACÁN: N of Morelia, on mountain, in front of Uruétaro, 19.44°N, 101.26°W, 2100 m, 14 Sep 1962, *Flores S-671* (MEXU); along new Rt 120 at Km 21 SE of Morelia on way to Pátzcuaro, about 15 minute hike N of road along path on ridge, 19.58°N, 101.33°W, 1990 m, 1 Sep 1997, *Rivera-Peña et al. 902* (INIFAP, MEXU, PTIS, WAG); near Morelia, 19.72°N, 101.18°W, 2000 m, 14 Jul 1941, *Schery 106* (MICH, MO, US); about 16 km WSW of Morelia, Km 329 on Hwy 15 (México to

Quiroga), Cerro del Aguila, S side of road, 19.69°N, 101.10°W, 2000 m, 12 Sep 1962, *Ugent et al. 1896, 1897* (MEXU).—NAYARIT: El Ceboruco Volcano, near Jala, on road from Guadalajara to Tepic, 21.01°N, 104.47°W, 1500 m, 10 Sep 1965, *Flores S-823* (LL, MEXU).—PUEBLA: 0.5 km N of Acatepec, road to [Santa María] Tonantzintla, 19.03°N, 98.28°W, 2200 m, 9 Aug 1970, *Weber 631* (ENCB).—QUERÉTARO: Mpio. Arroyo Seco, W of El Sabinito, 21.45°N, 99.70°W, 1150 m, 15 Oct 1991, *Carranza 3643* (IEB); toll road from Mexico to Querétaro, 2 km after the Palmillas, at Km 162, 20.32°N, 99.92°W, 2180 m, 9 Sep 1965, *Flores S-820* (MEXU); near town of La Jaula, road from Querétaro to San Luis Potosí, 6 Oct 1972, *García et al. 186* (ARIZ, CHAPA); Querétaro, 31 Jul 1957, *Graham 289* (PTIS); San Juan del Río, SW of the town, 20.67°N, 99.50°W, 2050 m, 25 Aug 1949, *Hawkes & García 1086* (ECON, PTIS); Querétaro, near Querétaro, hill slopes SE of town, 20.56°N, 100.37°W, 1850 m, 26 Aug 1949, *Hawkes et al. 1089* (LL); road from San Juan del Río to Querétaro, 17 mi before Bernal, Cerro Galeras, E of the road, 20.63°N, 99.93°W, 2050 m, 5 Sep 1958, *Hawkes et al. 1421* (K, MEXU, PTIS); 3 km SSE of Querétaro, 20.60°N, 100.38°W, 1900 m, 6 Sep 1958, *Hawkes et al. 1427* (K, PTIS), *Hawkes et al. 1428* (C, K, PTIS, US); Santa Rosa, road from Querétaro to San Luis Potosí, 20.73°N, 100.45°W, 2050 m, 6 Sep 1958, *Hawkes et al. 1429* (K, PTIS); 18 km N of Querétaro, about 100 m E of Rt 57, 20.60°N, 100.40°W, 2100 m, 28 Aug 1995, *Hjerting et al. 95-7* (K); Mpio. Colón, 18 km from El Zamorano, road to Cerro El Zamorano, 20.81°N, 100.11°W, 2250 m, 14 Jul 1993, *Pérez & Carranza 2755* (IEB, MEXU); San Juan del Río, 20.38°N, 100.00°W, 18 Aug 1905, *Pringle s.n.* (NA); Mpio. Querétaro, road from Querétaro to Mexico City, just at the junction to El Rosario, E side of Conín Indian monument, 20.59°N, 100.39°W, 2000 m, 9 Sep 1993, *Rodríguez et al. 2496, 2497* (IBUG, PTIS, WIS); Mpio. Landa, 10 km SE of Agua Zarca on road to Pisaflores, 21.22°N, 99.33°W, 800 m, 16 Apr 1987, *Rzedowski 43278* (MEXU); Mpio. Cadereyta, 16 km ENE of Vizarrón, on the road to San Joaquín, 20.70°N, 99.82°W, 2200 m, 11 Oct 1988, *Rzedowski 47543* (IEB, MEXU); Mpio. Colón, 3 km SE of Trigos, on the road to Colón, 20.80°N, 100.05°W, 2500 m, 27 Aug 1989, *Rzedowski 48809* (IEB); Mpio. Cadereyta, 3 km S of Vizarrón, 20.85°N, 99.72°W, 2150 m, 1 Aug 1990, *Rzedowski 49689* (IEB, MEXU); 3 km W of Las Rosas, on the road to Tequisquiapan, 2000 m, 8 Sep 1990, *Rzedowski 50028* (IEB, MEXU); Mpio. Arroyo Seco, 4 km E of Arroyo Seco, road to Jalpan, 21.50°N, 99.72°W, 20 Oct 1982, *Tenorio & Romero 2263* (MEXU); Mpio. Peñamiller, 1.6 km NE of Cuesta Colorada, 21.05°N, 99.82°W, 2160 m, 10 Oct 1998, *Zamudio 10878* (MEXU).—SAN LUIS POTOSÍ: road from San Luis Potosí to Querétaro, Km 387.5, Rancho San Juan Capistrano, 1860 m, 6 Sep 1963, *Flores S-727* (LL, MEXU); near San Luis Potosí, 22.15°N, 100.98°W, 1920 m, 28 Sep 1966, *Flores S-954* (MEXU); San Luis Potosí, 31 Oct 1957, *Graham 371* (PTIS); hills S of San Luis Potosí, 322 km from Guadalajara, 22.15°N, 100.98°W, 2200 m, 31 Aug 1949, *Hawkes & García 1097* (ECON, PTIS); Mpio. Mexquitic de Carmona, La Tapona, about 14 km on the road to Cerro Prieto, 22.32°N, 101.17°W, 2075 m, 14 Sep 1982, *Luna s.n.* (CHAPA); Charcas, Jul–Aug 1934, *Lundell 5531* (MICH); chiefly in the region of San Luis Potosí, 22 degrees N, 1829–2438 m, 1878, *Parry & Palmer 633 p.p.* (GH, MO, NA, NY, PH, US); 28.1 km S of San Luis Potosí (jct Hwy 57 and 70), 3 km S of jct with hwy to Villa de Reyes, access road to Los Pilares, 200 yards E Hwy 57, 21.97°N, 100.80°W, 1829 m, 27 Aug 1977, *Reeves R6273* (ARIZ, LL); Villa de Arriaga, road from San Luis Potosí to Ojuelos, 21.88°N, 101.40°W, 2240 m, 24 Aug 1993, *Rodríguez et al. 2566* (IBUG, PTIS, WIS); Km 20 road form San Luis Potosí to Antiguo Morelos, 22.27°N, 101.12°W, 1900 m, 20 Jul 1955, *Rzedowski 6137* (ENCB); Km 30 on the road from San Luis Potosí to Río Verde, 22.22°N, 100.77°W, 2100 m, 20 Aug 1955, *Rzedowski 6236* (ENCB), *Rzedowski 6248* (ENCB, WIS); Hwy 49, at 67 km W of Zacatecas, then 1 km N along the track to Villa de Ramos, 22.65°N, 101.95°W, 2160 m, 25 Sep 1984, *Tarn et al. 211* (PTIS).—ZACATECAS: Mpio. Pinos, La Venta de San Agustín, 22.30°N, 101.57°W, 2170 m, 21 Sep 1974, *Banda et al. 73* (CHAPA); Pan American Hwy, a little before Zacatecas at Km 646.5, 22.78°N, 102.58°W, 2240 m, 5 Sep 1963, *Flores S-724* (LL, MEXU); 726.5 km from Mexico towards Zacatecas, 22.78°N, 102.58°W, 2100 m, 14 Sep 1949, *Hawkes & García 1102* (LL, PTIS), *Hawkes et al. 1100* (LL, PTIS); 4 mi S of Ojo Caliente, Km 695 on the Aguascalientes to Zacatecas Road, 50 mi from Aguascalientes, 22.50°N, 102.42°W, 2050 m, 9 Sep 1958, *Hawkes et al. 1462* (C, PTIS, US); Km 734.5 from Mexico City on the Aguascalientes to Zacatecas Road, 14 km from Zacatecas, E side of the road, 22.78°N, 102.58°W, 2200 m, 9 Sep 1958, *Hawkes et al. 1466* (C, K, PTIS, US); Mpio. Pánfilo Natera, Bajío de la Tesorero, Km 146 on road from San Luis Potosí to Zacatecas, 22.70°N, 102.05°W, 2060 m, 10 Aug 1982, *Luna s.n.* (CHAPA); Mpio. Pinos, La Estrella, about 20–25 km from Pinos to Ojuelos, on a dirt road, 22.10°N, 101.47°W, 2160 m, 23 Aug 1982, *Luna s.n.* (CHAPA); near Concepción del Oro, 24.63°N, 101.42°W, 22 Nov 1902, *Palmer 376* (NY, US); grown from tubers collected in Zacatecas, 1898, *Palmer 593* (NA, US); about 1 km N of Ojuelos, 21.90°N, 101.60°W, 2212 m, 24 Aug 1993, *Rodríguez et al. 2567* (IBUG, PTIS, WIS); near Plateado, 21.95°N, 103.10°W, 3 Sep 1897, *Rose 2784* (US); Hwy 70, 12 km NW of Jalpa, 0.5 km beyond Tlachichila towards Santa Gertrudis, 21.55°N, 102.77°W, 2260 m, 27 Sep 1984, *Tarn et al. 227A, 227B* (PTIS).

Solanum ehrenbergii is very similar to *S. stenophyllidium*. It is distinguished by its ovate-lanceolate to lanceolate leaflets with the base cordate, oblique, or slightly truncate; in *S. stenophyllidium* the leaflets are linear to linear-lanceolate with an oblique base.

Bitter (1912) provided a definitive description for *Solanum cardiophyllum* subsp. *ehrenbergii* based on a single specimen collected by Ehrenberg in Mexico and then housed at B; this holotype was destroyed. We agree with Correll (1962) that *Solanum ehrenbergii* is an accepted species. Correll (1962: 262) chose as "lectotype" *Rose & Rose 11183* but cited three herbaria (GH, NY, US). We follow Correll's suggestion and here designate *Rose & Rose 11183* at GH as the neotype.

Hawkes (1963) proposed *S.* ×*sambucinum* as a hybrid of *S. cardiophyllum* subsp. *ehrenbergii* (=*S. ehrenbergii*) and *S. pinnatisectum*. *Solanum* ×*sambucinum* has more lateral leaflets (4–5) than *S. ehrenbergii* (2–3, rarely 4).

TRIFIDA GROUP

6. Solanum tarnii Hawkes & Hjerting, Phytologia 65: 114. 1988.—TYPE: Specimens prepared from plants cultivated from seeds at Sturgeon Bay, Wisconsin, U.S.A., in 1988, *T. R. Tarn, R. W. Ross & J. Gómez 62* (holotype: K!; isotypes: BM! C! K!; we saw 15 additional isotypes at K that will be distributed to herbaria worldwide.). [Seed source: MEXICO. Hidalgo: Hwy 85 from Zimapán to Tamazunchale at Las Trancas, about 6 km E along track towards Nicolás Flores, 2420 m, 6 Sep 1983, *T. R. Tarn, R. W. Ross & J. Gómez 62*.]

Plants 0.6–1 m tall, herbaceous, terrestrial, erect. Stems 2.5–5 mm in diameter at base of plant. Pseudostipules 2–5 mm long, lunate. Leaves 8–15 cm long, 6–10 cm wide, odd-pinnate, pilose adaxially and abaxially; petioles 1–1.5 cm long; lateral leaflet pairs 3–5, the size of the lateral leaflets diminishing abruptly towards the base of the leaf; most distal lateral leaflets 3–5 cm long, 0.6–1.5 cm wide, lanceolate to elliptic-lanceolate, apex acute to apiculate, base cordate, rounded, cuneate or oblique, sessile to petiolate, with petiolules up to 3–8 mm; terminal leaflet 3–5 cm long, 0.6–1.5 cm wide, lanceolate to elliptic-lanceolate, apex acute to acuminate, base cuneate; interjected leaflets 4–10. Inflorescences generally in distal half of plant; peduncle 3–13 cm long. Flowers 5–15; pedicels 12–35 mm long, articulate between the proximal 1/4 and the distal 1/4; calyx 10–13 mm long, irregularly lobed, lobes oblong to lanceolate, apiculate to caudate, acumens 2–6 mm long; corolla 1.4–3 cm in diameter, stellate, without acumens, edges of corolla flat, not folded dorsally, white; anthers 5–9 mm long, connate; style 8–13 mm long, exceeding stamens by 2–3 mm, straight. Fruits 1.5–2 cm long, globose to ovoid with dark green stripes and white spots. Seeds from living specimens green-white throughout. Chromosome number: 2n = 24. EBN unknown. Fig. 15.

Phenology. Flowering and fruiting September through October.

Distribution (Fig. 16). Mexico (Hidalgo, Querétaro, and Veracruz); in and at margins of cultivated fields, pine and oak forests, among maguey, among scrub vegetation and rocks, roadsides; 2000–2600 m.

ADDITIONAL SPECIMENS EXAMINED. **Mexico.** HIDALGO: 6.3 km on gravel road towards Nicolás Flores, turning off Zimapán to Jacala road, 20.74°N, 99.37°W, 2600 m, 10 Dec 1995, *Hjerting et al. 95-99* (C, K); Rt 85 from Zimapán to Tamazunchale, turning off at Trancas and going 6 km towards Nicolás Flores, 20.69°N, 99.42°W, 2300 m, 17 Sep 1991, *Hjerting 7365* (PTIS); Hwy 85 from Zimapán to Jacala, Las Trancas, 7 km E towards Nicolás Flores, 20.82°N, 99.23°W, 2500 m, 10 Sep 1984, *Hjerting et al. 256* (K); turning off Hwy 85

FIG. 15. *Solanum tarnii*. A. Habit. B, C. Terminal leaflet, adaxial (B) and abaxial (C) views. (Based on *Tarn et al. 62*, PTIS.)

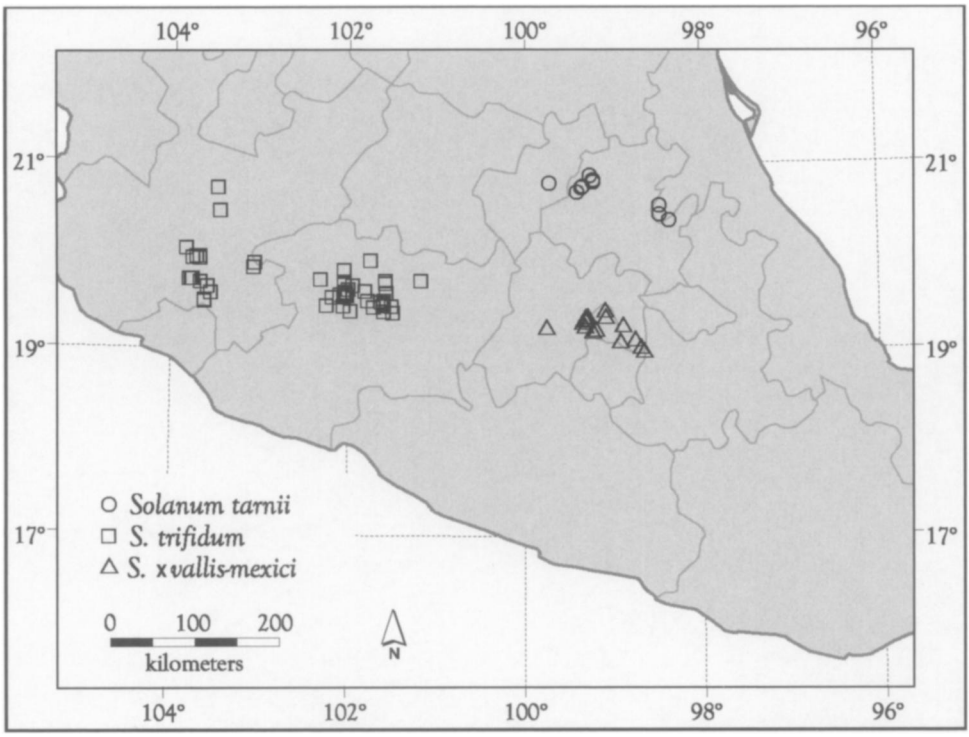


FIG. 16. Distribution *Solanum tarnii*, *S. trifidum*, and *S.* ×*vallis-mexici*.

(Zimapán/Jacala) at Las Trancas, 6.4 km along road towards Nicolás Flores, 20.80°N, 99.23°W, 2440 m, 10 Sep 1984, *Hjerting et al. 257* (C, F, K, MEXU, PTIS, WAG); Dist. Zimapán, Zimapán, head of Barranca de San Vicente, near Km 230 on hwy N of Zimapán, 20.75°N, 99.35°W, 2000 m, 25 Sep 1946, *Moore 2291* (BH); 28 km S of Huayacocotla, 8 km before Agua Blanca, 20.39°N, 98.37°W, 2360 m, 19 Oct 1983, *Tarn et al. 57A*, *57B* (PTIS), 4 Sep 1983, *Tarn et al. 57* (C, K, MEXU, PTIS); from Las Trancas, Hwy 85, Zimapán to Jacala, 20.87°N, 99.27°W, 2430 m, 8 Sep 1983, *Tarn et al. 78* (K, PTIS), 9 Sep 1983, *Tarn et al. 79* (K, PTIS).—QUERÉTARO: La Quebradora, on Hwy 120, 50 km from Jalpan towards San Juan del Río, just W of the fire observation point at the 2550 m peak, 20.78°N, 99.73°W, 2600 m, 10 Oct 1982, *Tarn et al. 36* (PTIS).—VERACRUZ: 20 km from Agua Blanca towards Huayacocotla, near Palo Bendito, 20.45°N, 98.48°W, 2230 m, 16 Sep 1991, *Hjerting 7361* (PTIS); about 14 km S of Huayacocotla, near Viborillos, on road to Tulancingo, 20.55°N, 98.48°W, 2410 m, 4 Sep 1983, *Tarn et al. 56* (K, PTIS).

Solanum tarnii is similar to many other white-flowered diploid species from North and Central America but is distinguished by its relatively long calyx (10–13 mm long) with long acumens (2–6 mm).

7. Solanum trifidum Correll, Contrib. Texas Res. Found., Bot. Stud. 1: 12, fig. 5. 1950.—TYPE: Specimens prepared from plants cultivated from tubers at Sturgeon Bay, Wisconsin, U.S.A., 9–13 Aug 1949, *D. S. Correll 14751* (holotype: NA!; isotypes: PTIS! TEX[2]!, photos of PTIS isotype [Correll neg. 115]: BM! GH! K! LL! NY! UC! US!, photos of TEX isotype [Correll neg. 114]: BM! K! LL! NY! UC! US!, photos of second TEX isotype [Correll neg. 356]: BM! GH! K! LL!

NY! US!). [Source of tubers: MEXICO. Michoacán: at edge of pine forest in mountains near Capácuaro, 16 Dec 1947, *Correll 14439b.*]

Plants 0.1–1 m tall, herbaceous, terrestrial, erect. Stems 1–4 mm in diameter at base of plant. Pseudostipules 4–10 mm long, lanceolate to lunate. Leaves 5–15 cm long, 2.6–9.5 cm wide, odd-pinnate, pubescent adaxially and abaxially; petioles 1–4.2 cm long; lateral leaflet pairs 1 (2–3), the size of the lateral leaflets diminishing abruptly towards the base of the leaf; most distal lateral leaflets 2–5.5 cm long, 0.5–1.3 cm wide, lanceolate to elliptic-lanceolate, apex acute to acuminate, base oblique, sessile, decurrent on the rachis; terminal leaflet 3.5–10 cm long, 0.5–3 cm wide, lanceolate, elliptic to elliptic-lanceolate, apex acute to shortly acuminate, base attenuate; interjected leaflets absent. Inflorescences generally in distal half of plant; peduncle 1–9 cm long. Flowers 3–9; pedicels (7–) 12–35 mm long, articulate between the proximal 1/4 and the distal 1/4; calyx (4–) 4–5 (–8) mm long, lobes oblong or elliptic to ovate-elliptic, apiculate, acumens 1.5–3 mm; corolla 1.4–3 cm in diameter, stellate, without acumens, edges of corolla flat, not folded dorsally, white to white-cream; anthers 4–6 mm long, connate; style 9–11 mm long, exceeding stamens by 3–4 mm, straight. Fruits 1.3–2.5 cm long, conical, light green throughout. Seeds from living specimens green-white throughout. Chromosome number: 2n = 24. EBN = 1. Plate 4E, Fig. 17.

Phenology. Flowering and fruiting July through October.

Distribution (Fig. 16). Mexico (Jalisco, Michoacán); cultivated or fallow fields, grazed fields, in areas of pine and oak forests, in sunny to shady areas; (1800–) 2000–2800 (–3050) m.

ADDITIONAL SPECIMENS EXAMINED. **Mexico.** JALISCO: foothills of Nevado de Colima, road from Ciudad Guzmán to the Nevado, 19.50°N, 103.63°W, 2300 m, 19 Aug 1967, *Flores S-977* (MEXU); N slope of Volcán de Colima, 19.51°N, 103.63°W, 2200 m, 5 Sep 1957, *Graham C-308* (CHAPA, K, LL, MEXU, MO, S); NE slope of Nevado de Colima, Los Alpes, 13 km from turn to Tolimán on the road from Ciudad Guzmán, 19.66°N, 103.60°W, 2300 m, 22 Sep 1958, *Hawkes et al. 1541* (IBUG, K, MEXU, PTIS); Sierra de Tapalpa, Cerro de Talcozagua, 2 km E of Tapalpa, Km 31, 19.73°N, 103.77°W, 2000 m, 9 May 1960, *Iltis et al. 775* (WIS); Mpio. San Gabriel, El Floripondio, Km 90, road from Ciudad Guzmán to El Grullo, 19.73°N, 103.81°W, 1800 m, 7 Aug 1994, *Puga & Suárez 16761* (MEXU); Mpio. Venustiano Carranza, El Floripondio, road from Ciudad Guzmán to El Grullo, 19.70°N, 103.68°W, 2400 m, 10 Aug 1991, *Rodríguez 2110* (CHAPA, IBUG, IEB, MEXU); Mpio. Zapopan, cultivated from roots of Tapalpa, 20.72°N, 103.49°W, 12 Jul 1988, *Rodríguez s.n.* (IBUG, MEXU); Mpio. Tapalpa, Ojo Zarco, 19.96°N, 103.69°W, 2000 m, 28 Sep 1988, *Rodríguez & de la Torre 1527* (ANSM, CHAPA, ENCB, IBUG, IEB, MEXU, WIS, XAL); Mpio. Mazamitla, near El Terrero on road from Mazamitla to Tamazula, 19.92°N, 103.06°W, 2100 m, 21 Jul 1988, *Rodríguez & Reynoso 1327* (ANSM, CHAPA, ENCB, F, IBUG, IEB, MEXU, MICH, MO, NY, PTIS, WIS, XAL); Mpio. Mazamitla, El Terrero, on road from Mazamitla to Tamazula de Gordiano, 19.87°N, 103.08°W, 2100 m, 21 Jul 1988, *Rodríguez & Reynoso s.n.* (IBUG); Mpio. Chiquilistlán, road from Tapala to Chiquilistlán, 1 km from the road junction, 19.96°N, 103.77°W, 2100 m, 17 Aug 1986, *Rodríguez & Suárez 539* (MEXU, IBUG); Mpio. Tapalpa, 2 km SE Juanacatlán on road to Tepec, 19.97°N, 103.72°W, 2400 m, 23 Aug 1986, *Rodríguez & Suárez 581* (ANSM, CHAPA, ENCB, IBUG, IEB, MEXU, MICH, NY, PTIS, WIS, XAL); Mpio. Venustiano Carranza, Rancho Sayulapa on road from Ciudad Guzmán to Venustiano Carranza, 19.73°N, 103.78°W, 2100 m, 22 Aug 1987, *Rodríguez & Suárez 942* (ANSM, CHAPA, ENCB, F, IBUG, IEB, LL, MEXU, MICH, MO, MU, NY, PTIS, TEX, UAMIZ, WIS, XAL); Mpio. Venustiana Carranza, between Sayulapa and El Isote, on road from Ciudad Guzmán to Venustiano Carranza, 19.73°N, 103.78°W, 2200 m, 23 Aug 1987, *Rodríguez & Suárez 943* (ANSM, CHAPA, ENCB, F, IBUG, IEB, LL, MEXU, MICH, MO, MU, NY, PTIS, TEX, WIS, XAL); Mpio. Tapalpa, road from Juanacatlán to Tepec, 19.98°N, 103.69°W, 2330 m, 26 Aug 1987, *Rodríguez & Suárez 954* (CHAPA, ENCB, IBUG, IEB, MEXU); Mpio. Chiquilistlán, slope of Cerro El Chichimeco, dirt road from Tapalpa to Chiquilistlán, 20.06°N, 103.84°W, 2100 m, 27 Aug 1987, *Rodríguez & Suárez 976* (ENCB, IBUG, IEB, MEXU); Mpio. Tlajomulco, Cerro Viejo, near the top, 20.47°N, 103.46°W, 2750 m, 15 Aug 1970, *Rzedowski 27539* (MICH); Mpio. Tuxpan,

FIG. 17. *Solanum trifidum*. A. Habit. B. Flower, adaxial view. C. Fruits. D. Leaf, adaxial view. E. Terminal leaflet, abaxial view. (Based on: A, D, E, *Correll 14751*, PTIS; B, *Rodríguez 943*, PTIS; C, *Spooner 4283*, PTIS.)

Km 9 on road to Colima Volcano, via El Fresnito, 19.59°N, 103.56°W, 2140 m, 7 Sep 1988, *Spooner et al. 4120* (INIFAP, MEXU).—MICHOACÁN: near Capácuaro, 19.55°N, 102.05°W, 2 Dec 1947, *Correll 14339* (LL); about 5.5 km from Pátzcuaro on road to Opopeo, 19.46°N, 101.61°W, 6 Aug 1965, *Correll et al. 31346* (GH, LL, S, UC); Km 48 on the Carapan to Uruapan Hwy, 19.63°N, 102.00°W, 30 Nov 1956, *Graham CSC 460* (PTIS); road from Pátzcuaro to Tacámbaro, about 7 km before Pátzcuaro, 19.46°N, 101.52°W, 2400 m, 16 Sep 1962, *Flores S-673* (ENCB, K, MEXU), 17 Sep 1962, *Flores & Ugent S-673* (ENCB, K, LL, MEXU); rd from Pátzcuaro to Tacámbaro, Km 30 on the left side of the road, 19.39°N, 101.50°W, 2720 m, 24 Aug 1963, *Flores S-713* (CHAPA, ENCB, K, LL, MEXU, TEX); 4 km before the village of Angaguán, near the Paricutín volcano, 19.46°N, 102.25°W, 25 Aug 1963, *Flores S-715* (CHAPA, K, LL, MEXU); Km 372 on road from Mexico to Guadalajara, about 15 km after Quiroga, 19.73°N, 101.59°W, 2250 m, 5 Aug 1965, *Flores S-814* (CAS, ENCB, MEXU, MO, NY); Km 51 road from Carapan to Uruapan, 1 km from the right side of the road, 19.60°N, 102.04°W, 21 Jul 1963, *Flores & Ugent S-707* (CAS, CHAPA, ENCB, K, LL, MEXU); Mpio. Paracho, near Quinceo, road to Cerro del Aguila, 19.73°N, 101.18°W, 2700 m, 24 Aug 1990, *García 3157* (IEB); between Quiroga and Pátzcuaro, Km 12–13, 19.60°N, 101.57°W, s.d., *Graham S-384* (K); Km 51, Carapan to Uruapan Hwy, 19.61°N, 102.04°W, 2320 m, 12 Jul 1956, *Graham & Galindo 243* (K, LL, NY, S, US); Sierra de los Tarascos, Carapan to Uruapan road, at 51 km from Carapan, E of road, 19.69°N, 102.05°W, 2400 m, 17 Sep 1958, *Hawkes et al. 1514* (C, K), 2 Sep 1958, *Hawkes et al. 1517* (K); Sierra de los Tarascos, 43 km from Carapan on the Uruapan road, Granja Villa Imelda, 19.72°N, 102.05°W, 2300 m, 18 Sep 1958, *Hawkes et al. 1522* (K); Sierra de los Tarascos, 2 km S of Carapan on road to Corupo, 19.84°N, 102.05°W, 2300 m, 18 Sep 1958, *Hawkes et al. 1525* (C, K); Km 372 from Mexico City on road from Quiroga to Carapan, 19.70°N, 101.59°W, 2250 m, 5 Aug 1965, *Hawkes et al. 2539* (A, G, K, S, WIS); 6 km from Pátzcuaro on road to Opopeo, 19.48°N, 101.60°W, 2300 m, 6 Aug 1965, *Hawkes et al. 2541* (F, K, MEXU); above Opopeo, 25 km from Pátzcuaro on road to Tacámbaro, 19.40°N, 101.60°W, 2650 m, 6 Aug 1965, *Hawkes et al. 2543* (K); Cerro Tapa, W of San Antonio, 19.74°N, 102.31°W, 2550 m, 9 Jul 1981, *Motte 339* (MEXU); San Gregorio, road from Pátzcuaro to Tacámbaro, 1 km from the lake in the camp of the experimental station for potatoes, in the non-cultivated part, 2700 m, 8 Aug 1962, *Niederhauser & Cubillos S-645* (CAS, CHAPA, ENCB, K, MEXU); Mpio. Paracho, 5 km SW of Paracho, 19.58°N, 102.10°W, 2200 m, 1 Aug 1987, *Pérez 133* (IEB, MEXU); 2 km N of Comembaro, on Rt 120 to Pátzcuaro, 19.52°N, 101.60°W, 2380 m, 22 Oct 1997, *Rivera-Peña et al. 985* (INIFAP); 8 km S of Pátzcuaro, 19.48°N, 101.60°W, 3 Jul 1982, *Siplivinsky et al. 4088* (CM); along dirt road, 1.7 km NE of Capácuaro, on S side of road, 19.57°N, 102.02°W, 2320 m, 1 Sep 1988, *Spooner et al. 4087B* (INIFAP); along microwave tower road off of dirt road beginning about 5 km NE of Capácuaro, 5.9 km from beginning of this microwave tower road, 19.58°N, 102.03°W, 2800 m, 1 Sep 1988, *Spooner et al. 4089B* (INIFAP, PTIS); 4.1 km NW of Rt 120 by Santa María Huiramangaro on road to San Francisco Pichátaro, 19.52°N, 101.78°W, 2330 m, 19 Oct 1988, *Spooner et al. 4280* (INIFAP, PTIS); on road from Rt 120 NW to Cherán, 2.5 km SE of Serina, 19.62°N, 101.82°W, 2650 m, 31 Aug 1988, *Spooner et al. 4283* (INIFAP, PTIS, WIS); 7.2 km E of church on E side of Cherán, on road to La Mojonica, on S side of road, 19.40°N, 101.98°W, 3050 m, 19 Oct 1988, *Spooner et al. 4284* (INIFAP, PTIS); Hwy 15 from Morelia to Guadalajara, at about Km 372, to W of road, 19.95°N, 101.75°W, 2270 m, 10 Oct 1967, *Tarn & Gómez 183, 185* (K); road from Hwy 37 to Angaguán at 14.3 km from hwy to right of road, 19.55°N, 102.18°W, 2330 m, 10 Oct 1967, *Tarn & Gómez 194* (BM, K), 11 Oct 1967, *Tarn & Gómez 195* (K); Uruapan to Carapan road, Hwy 37 at about 52 km to right of road, 19.68°N, 101.95°W, 2400 m, 11 Oct 1967, *Tarn & Gómez 196* (K); 5.1 km S of Pátzcuaro, on road to Opopeo, 19.49°N, 101.60°W, 2400 m, 16 Sep 1962, *Ugent & Flores 2119–2148* (BM, MICH, MO, US, WIS); 2.2 km W of Santa Clara del Cobre, 8 km SSW of Pátzcuaro, 19.45°N, 101.72°W, 2700 m, 17 Sep 1962, *Ugent & Flores 2187–2202* (MICH, US, WIS); 8 km N of Uruapan on the Uruapan to Carapan road, at Km 51, 19.46°N, 102.06°W, 2320 m, 21 Jul 1963, *Ugent et al. 5824–5839, 5843, 5845–5849, 5851–5855, 5859* (BM, ENCB, GH, MEXU, MICH, MO, UC, US, WIS); 3 km SW de Pátzcuaro, 19.50°N, 101.63°W, 2200 m, 15 Aug 1987, *Zamudio 5487* (ENCB, IEB).

Solanum trifidum and *S. hintonii* both have white stellate corollas and conical fruits, but *S. trifidum* has lateral leaflets subsessile and decurrent, with the proximal pair (when present) shorter than the distal pair, and *S. hintonii* has the lateral leaflets clearly petiolate and subequal in size.

Correll (1950) based *Solanum trifidum* on herbarium specimens, numbered *D. S. Correll 14751* and prepared during a five-day period, from plants grown from tubers at Sturgeon Bay, Wisconsin. All these gatherings are mixed together and bear the collection date 9–13 Aug 1949. The tubers of the original field-collected (wild) samples bear the

collection number *D. S. Correll 14339b*. Only the herbarium specimens labled *D. S. Correll 14751* are considered type material. Specimens of *Correll 14751* represent USDA Plant Introduction Number 161707, and germplasm of this collection is available for distribution from Sturgeon Bay.

POLYADENIA GROUP

8. Solanum lesteri Hawkes & Hjerting, Rec. Scott. Pl. Breed. Sta. 1963: 126, 171. 1963.—TYPE: Specimens prepared from plants cultivated in a greenhouse, *J. G. Hawkes, J. P. Hjerting & R. N. Lester 1714* (lectotype, here designated: K! [labeled "sheet 1," bearing a young fruit]; isolectotypes: K! ["sheet 2," bearing flowers; additional sheet, bearing large leaves, also flowers in a packet]). [Source of propagules: MEXICO. Oaxaca: Mpio. Miahuatlán, road from Oaxaca to Puerto Angel, 16 mi S of Miahuatlán, very damp bank above road in shade of bushes and trees, rich soil, 2300 m, 19 Oct 1958, *J. G. Hawkes, J. P. Hjerting & R. N. Lester 1714*.]

Plants 0.4–1.5 m tall, herbaceous, terrestrial, erect. Stems 4–7 mm in diameter at base of plant. Pseudostipules 3–10 mm long, lunate. Leaves 9–22 cm long, 6–14 cm wide, odd-pinnate, pubescent to pilose, densely covered with type A glands adaxially and abaxially, and with spreading hairs; petioles 1–5 cm long; lateral leaflet pairs 3–6, the size of the lateral leaflets not diminishing towards the base of the leaf, second pair of laterals often longer than first; most distal lateral leaflets 2.5–8 cm long, 1–2.6 cm wide, ovate to elliptical, apex acute to acuminate, base oblique, cuneate to cordate, typically sessile, rarely short-petiolulate or decurrent; terminal leaflet 4–10 cm long, 1.6–3.5 cm wide, ovate to elliptical, apex acute to acuminate, base cuneate; interjected leaflets 2–11. Inflorescences generally in distal half of plant; peduncle 5.5–9 cm long. Flowers 5–24; pedicels 14–50 mm long, articulation position extremely variable from the distal 1/3 of pedicels to somewhat below the middle; calyx 4–7 mm long, lobes acute to long-attenuate, acumens 2–3 mm long; corolla 1.8–3.4 cm in diameter, pentagonal to rotate, acumens 3 mm long, edges of corolla flat, not folded dorsally, white; anthers 4–6 mm long, connate; style 8–9 mm long, exceeding stamens by 2–4 mm, straight. Fruits 2.2–3 cm long, triangular in outline, widest near the base, 1.7–2.2 times as long as wide, green, sometimes with longitudinal dark purple stripes, sometimes with flat white spots. Seeds from living specimens green-white throughout. Chromosome number: 2n = 24. EBN unknown. Plate 4D, Fig. 18.

Phenology. Flowering and fruiting September through October.

Distribution (Fig. 19). Mexico (Oaxaca); in areas of alder, pine, and oak woods, in clearings along roadsides or in shade; 2100–2390 m.

ADDITIONAL SPECIMENS EXAMINED. **Mexico.** OAXACA: on Rt 125, 3.2 km S of jct with Rt 190, on W side of road, just S of town of San Juan Teposcolula, 17.55°N, 97.43°W, 2185 m, 5 Oct 1997, *Rivera-Peña et al. 957* (INIFAP, MEXU, PTIS, WAG); Mpio. Huautla, Dist. Nochixtlán, at El Boquerón, S of San Miguel Huautla, 17.74°N, 97.16°W, 2100–2200 m, 20 Sep 1991, *Salinas 6287* (NY); W side of Rt 125, 3.4 km S of Rt 190, just S of San Juan Teposcolula, 17.55°N, 97.43°W, 2250 m, 16 Sep 1988, *Spooner et al. 4155* (INIFAP, PTIS, WIS); E side of Rt 175, at Km 134.1, about 50 m off road, up a slope, S of Miahuatlán de Porfirio Díaz, 16.22°N, 96.53°W, 2390 m, 19 Sep 1988, *Spooner et al. 4177* (INIFAP, PTIS, WIS).

Solanum lesteri is easily distinguished in the field by its highly glandular leaves with a dense covering of Type A trichomes and the characteristic strong "mousy" odor, and as

FIG. 18. *Solanum lesteri*. A. Habit. B. Flower; opening bud. C. Part of infructescence with young and mature fruits. D, E. Lateral leaflet, adaxial (D) and abaxial (E) views. (Based on *Spooner et al. 4155*, PTIS.)

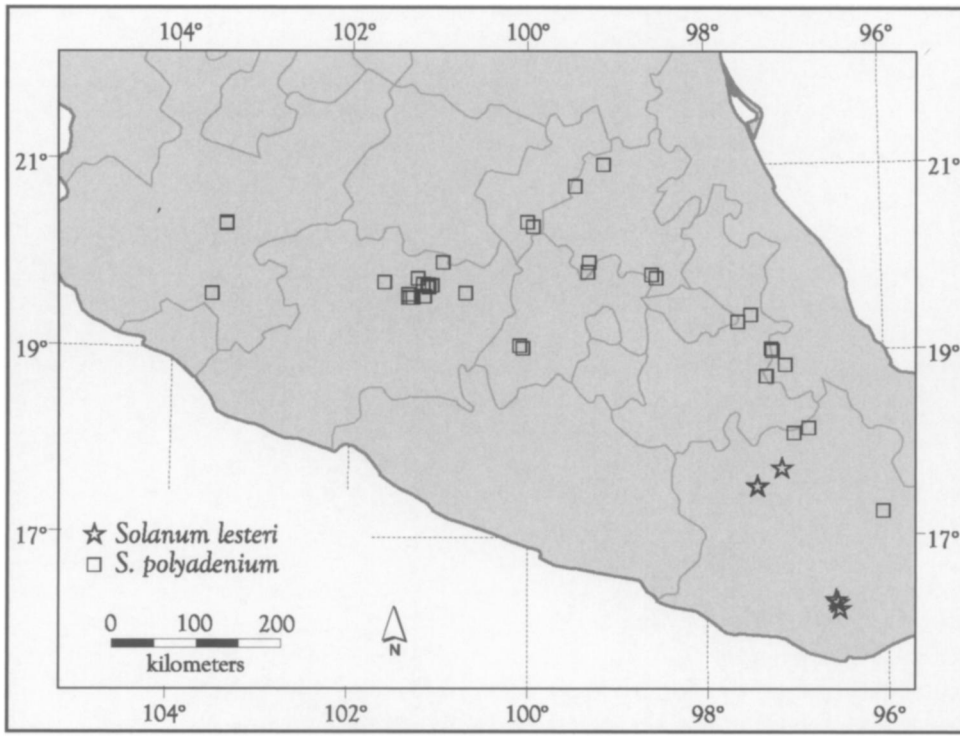


FIG. 19. Distribution of *Solanum lesteri* and *S. polyadenium*.

herbarium specimens by the yellowish or yellow-brown foliage. It could be confused only with *S. polyadenium*, but the two species are distinguished by fruit shape. *Solanum lesteri* has fruits triangular in face view (1.7–2.2 times as long as wide), and *S. polyadenium* has fruits globose or, if triangular, only up to 1.7 times as long as wide.

Hawkes (1963) designated a collection of *S. lesteri* at K as "type" and listed another possible isotype at JGH (his personal herbarium, later sent to K). It is unclear what specimen, if any, represents this possible JGH isotype. At K are three specimens from plants cultivated in a greenhouse; two are labeled as sheet 1 (our lectotype, bearing a young fruit) and sheet 2 (bearing flowers), and a third sheet is unlabeled (large leaves, flowers in a packet). A note showing through the isolectotype label of sheet 2 indicates the plants were cultivated in a greenhouse. Other specimens at K and other herbaria sometimes bear dates of cultivation that differ and could have been grown at a later time. It is unclear if these other specimens represent later gatherings; because of this ambiguity we consider as type material only the sheets chosen as the lectotype and isolectotype.

9. Solanum polyadenium Greenman, Proc. Amer. Acad. Arts 39: 89. 1903.—TYPE: MEXICO. Hidalgo: limestone cliffs, El Salto station, 15 Sep 1902, *C. G. Pringle 8692* (holotype: GH!, photos [Correll neg. 198]: BM! F! GH! LL! NY! UC! US!; isotypes: BM! C[2]! CM! CU! E[2]! F! G! GB! GOET! HBG! K! M! MICH! MIN! MO! NY! P! PH! S[2]! UC! US-460043! US-1175773! US-1324711! VT! W-11078! Z!, photos of GB isotype [Correll neg. 814]: BM! F!, photos of L

isotype: PTIS! WAG!, photo of MO isotype: PTIS!, photo of US-460043 isotype: K!).

Solanum polyadenium subsp. *orizabae* Bitter, Repert. Spec. Nov. Regni Veg. 12: 7. 1913.—TYPE: MEXICO. Veracruz: Orizaba, 8 Aug 1853, *F. Müller 1675* (holotype: P!, photos: LL! PTIS! WAG!; isotype: MPU!, photo: G!).

Plants 0.4–1.5 m tall, herbaceous, terrestrial, erect. Stems 4–7 mm in diameter at base of plant. Pseudostipules 2–12 mm long, lunate. Leaves 9–22 cm long, 6–15 cm wide, odd-pinnate, puberulent, pubescent to pilose, densely covered with type A glands adaxially and abaxially, and with spreading hairs; petioles 1–7 cm long; lateral leaflet pairs 3–6, the size of the lateral leaflets not diminishing towards the base of the leaf, second pair of laterals often longer than first; most distal lateral leaflets 3–9.8 cm long, 1.1–3.5 cm wide, ovate to elliptical, apex acute to acuminate, base oblique, cuneate to cordate, typically sessile, rarely short-petiolulate or decurrent; terminal leaflet 4.2–10.7 cm long, 1.1–4.1 cm wide, ovate to elliptical, apex acute to acuminate, base cuneate; interjected leaflets 2–21. Inflorescences generally in distal half of plant, often consisting of more than 2 (often 3–5) partial inflorescences; peduncle 3–8 cm long. Flowers 9–32; pedicels 4–22 mm long, articulation position extremely variable from the distal 1/3 of pedicels to somewhat below the middle; calyx 4–7 mm long, lobes acute to long-attenuate, acumens 2–3 mm long; corolla 1.8–2.4 cm in diameter, pentagonal to rotate, acumens 3–4 mm long, edges of corolla flat, not folded dorsally, white; anthers 4–6 mm long, connate; style 8–9 mm long, exceeding stamens by 2–4 mm, straight. Fruits 1.5–2 cm long, globose to slightly triangular in outline (if triangular then less than 1.7 times as long as wide), light green, sometimes with darker green stripes. Seeds from living specimens green-white throughout. Chromosome number: 2n = 24. EBN unknown. Plate 3D, Fig. 20.

Phenology. Flowering and fruiting August through October.

Distribution (Fig. 19). Widespread throughout central Mexico (Jalisco to Querétaro and Hidalgo) to southern Mexico (Oaxaca); deciduous tropical forests, fallow fields, in grassy areas among bushes, *Agave*, and *Opuntia,* and along fencerows, in areas of fir, oak, and pine forest; 1900–2900 m.

ADDITIONAL SPECIMENS EXAMINED. **Mexico.** HIDALGO: S of Tula, El Salto Station, hills above village on E side of valley, 19.95°N, 99.30°W, 2150 m, 7 Aug 1949, *Hawkes et al. 1053* (C, K, LL, S, WIS); Mpio. Zimapán, La Majada, 20–25 km NW of Zimapán, 20.77°N, 99.46°W, 2100 m, 13 Sep 1981, *Hernández 6522* (MEXU); near Zontecomate Station, 2896 m, 9 Aug 1904, *Pringle 13136* (BH, C, CAS, F, GH, K, LL, MEXU, MICH, MO, MSC, SMU, TEX, US, VT); hwy from Mexico City to Querétaro City, near the junction towards Tula, 19.85°N, 99.32°W, 2311 m, 22 Aug 1993, *Rodríguez et al. 2552* (F, IBUG, MICH, PTIS, NY, WIS); near El Salto, 19.95°N, 99.30°W, 16 Sep 1903, *Rose & Painter 7080* (US); Hwy 85, Zimapán to Tamzuchale, at Las Trancas, about 8 km E at Jaguey on the track to Nicolás Flores, 21.00°N, 99.13°W, 2400 m, 6 Sep 1983, *Tarn et al. 65* (PTIS); Mpio. Tlanalapa, Cerro San Isidro, 19.82°N, 98.60°W, 2650 m, 29 Oct 1975, *Ventura 503* (ARIZ, ASU, CHAPA, ENCB, IEB, MEXU, MO), 11 Jul 1976, *Ventura 1782* (ARIZ, ASU, CHAPA, ENCB, IEB, MEXU, MO, NY).—JALISCO: Cerro Buenavista, Temascaltepec, 19.03°N, 100.05°W, 2750 m, 23 Aug 1980, *Castilla & Tejero 750* (ENCB); Mpio. Jocotepec, track up to Cerro Viejo above Zapotitán de Hidalgo, 20.33°N, 103.41°W, 1900 m, 20 Aug 1986, *Rodríguez & Suárez 563* (ANSM, CHAPA, ENCB, F, IBUG, IEB, MEXU, MICH, MO, MU, NY, PTIS, TEX, WIS, XAL); Mpio. Jocotepec, Cerro Viejo, ascending from Las Trojes at the summit of La Chichilla, 20.35°N, 103.41°W, 2400 m, 9 Sep 1987, *Rodríguez et al. 1013* (ANSM, CHAPA, ENCB, F, IBUG, IEB, MEXU, MICH, MO, MU, NY, PTIS, TEX, WIS, XAL); new microwave tower road to top of Nevado de Colima, 16.5 km from beginning of this road which begins about 0.5 km SE of La Mesa and El Fresnito, near waterfall, 19.58°N, 103.57°W, 2725 m, 7 Sep 1988, *Spooner et al. 4122* (IBUG, INIFAP, PTIS).—MÉXICO: Mpio. Temascaltepec, Cerro Verde, 19.06°N, 100.09°W, 2450 m, 4 Jul 1981, *Castilla & Tejero 1345* (ENCB, IEB, MEXU).—MICHOACÁN: vicinity of Morelia, Punguato, 19.71°N, 101.13°W, 2200 m,

FIG. 20. *Solanum polyadenium*. A. Habit. B. Flower and opening bud. C. Infructescence with young and mature fruits. D, E. Lateral leaflet, adaxial (D) and abaxial (E) views. (Based on *Rodríguez et al. 1013*, PTIS.)

11 Aug 1910, *Arsène 5232* (F, GH, MO, MPU, P, US); near Matugeo, 19.73°N, 101.62°W, 23 Dec 1947, *Correll 14374* (ECON, GAT, MEXU, PTIS); Mount Punguato, 19.70°N, 101.12°W, 4 Aug 1965, *Correll et al. 31334* (GH, LL); Cerro Punguato, near Morelia, 19.70°N, 101.12°W, 9 Apr 1965, *EBS 2627* (PTIS), 9 Sep 1962, *Flores S-662* (K, LL, MEXU), 31 Oct 1953, *Graham 2* (IBUG, K, MEXU, PTIS); Km 22 on road from Morelia to Villa Madero, 19.59°N, 101.16°W, 4 Aug 1965, *Flores S-811* (ENCB, MEXU); Puerto de los Copales, Morelia, 19.62°N, 100.70°W, 1950 m, 8 Jul 1957, *Graham C-212* = *S-505* (CHAPA); Mount Punguato, outskirts of Morelia, 19.71°N, 101.12°W, Oct 1953, *Graham s.n.* (CHAPA); near Morelia, Cerro Punguato, top of the hill, 19.70°N, 101.08°W, 2250 m, 29 Jul 1949, *Hawkes et al. 1038* (A, B, BM, C, G, K, LL); near Morelia, Cerro Punguato, slope facing Morelia, 19.70°N, 101.12°W, 1900 m, 30 Jul 1949, *Hawkes et al. 1042* (G, K); near Morelia, Cerro Punguato, saddle between two peaks, 19.70°N, 101.12°W, 2250 m, 26 Sep 1958, *Hawkes et al. 1567* (C, IBUG, K, MEXU, PTIS, US), *Hawkes et al. 1568* (K, MEXU, PTIS), *Hawkes et al. 1569* (C, K, PTIS, US); near Morelia, Cerro Punguato, W facing slope, 19.70°N, 101.08°W, 2000 m, 4 Aug 1965, *Hawkes et al. 2526* (C, F, K, MEXU); near Morelia, 22 km along road to Villa Madero, 19.70°N, 101.12°W, 2000 m, 4 Aug 1965, *Hawkes et al. 2534* (K); Mpio. Morelia, Cañada Río Chiquito, 19.78°N, 101.24°W, 1959 m, 7 Aug 1988, *Medina 1329* (MEXU); between Morelia and Pátzcuaro, 1 km before turnoff to Tiripetío, 19.60°N, 101.35°W, 1950 m, Sep 1980, *Ochoa 14165* (CIP, PTIS, US, WIS); along new Rt 120 at Km 21 SE of Morelia on way to Pátzcuaro, about 100 m N of road, 19.57°N, 101.33°W, 1970 m, 1 Sep 1997, *Rivera-Peña et al. 901* (INIFAP, MEXU, PTIS, WAG); 5 km W of Iramuco, next to the road to Santa Ana Maya, 19.95°N, 100.96°W, 1950 m, 13 Sep 1987, *Rzedowski 44863* (MEXU); on S slope of Cerro Punguato, N of Rt 15, about 2 km E of E end of Morelia, about 100 m from television tower, 19.68°N, 101.12°W, 2150 m, 30 Aug 1988, *Spooner et al. 4067* (INIFAP, PTIS); on E side of Rt 120 S of Morelia, about 0.5 km N of El Reparo, 19.57°N, 101.30°W, 2080 m, 30 Aug 1988, *Spooner et al. 4076* (INIFAP, PTIS); along Rt 120 S of Morelia, 27.5 km (by roadside markers), S of Morelia, 19.57°N, 101.35°W, 2080 m, 31 Aug 1988, *Spooner et al. 4081* (INIFAP, PTIS, WIS); Morelia to Guadalajara road, Hwy 15, at Km 329.5, on N side of road, 19.70°N, 101.12°W, 2020 m, 9 Oct 1967, *Tarn 173A* (PTIS); Morelia to Guadalajara road, Hwy 15, at 333.5 km, on N side of road, 19.70°N, 101.12°W, 2090 m, 9 Oct 1967, *Tarn 174C* (PTIS); road from Morelia to Villa Madero, at about Km 23, between fields on E of road, 19.72°N, 101.18°W, 2040 m, 9 Oct 1967, *Tarn & Gómez 170* (BR, K, NY, WAG); Mount Punguato, Morelia, S slope, 19.70°N, 101.12°W, 2200 m, 9 Sep 1962, *Ugent et al. 1714–1723, 1725–1729, 1732, 1734, 1766* (BM, ENCB, IBUG, K, MEXU, MICH, MO, PTIS, US, WIS); Cerro del Aguila, about 16 km WSW of Morelia, Km 329 on Hwy 15 (Morelia to Quiroga, S side of road), 19.69°N, 101.12°W, 2000 m, 12 Sep 1962, *Ugent et al. 1912, 1913, 1919* (US).—OAXACA: Vigastepec, Km 19 on road from Teotitlán del Camino to Huautla, 18.15°N, 96.85°W, 2120 m, 7 Nov 1964, *Flores S-796* (ENCB, K, LL, TEX); Dist. Mixe, Mpio. Totontepec, Totontepec, 17.25°N, 96.03°W, 1900 m, 7 May 1990, *Rivera 1465* (K, MEXU, NY); growing along road in town of Vigastepec, a village on N side of road from Teotitlán to Santa María Teopoxco, 18.10°N, 97.01°W, 2120 m, 4 Oct 1997, *Rivera-Peña et al. 955* (INIFAP, MEXU, PTIS, WAG).—PUEBLA: Km 277.5 on the road from Puebla to Orizaba, near the limit of the border of Puebla and Veracruz, 18.99°N, 97.24°W, 2195 m, 28 Sep 1962, *Flores S-687* (ENCB, K, LL); top of pass of Acultzingo, 18.72°N, 97.32°W, 2300 m, 23 Sep 1957, *Graham 318* (LL, US); Rancho Las Rosadas, 1910, *Nicolas s.n.* (E); tollway from Mexico to Veracruz, at about Km 208.5, just past the toll, 19.30°N, 97.63°W, 2510 m, 23 Oct 1967, *Tarn & Gómez 221* (K, PTIS); 3.2 km SSW of Puerto del Aire, near state line between Chapulco and Acultzingo on Hwy 150 (Tehuacán to Orizaba), at Km 277.5, 19.38°N, 97.48°W, 2210 m, 28 Sep 1962, *Ugent & Flores 2505–2506, 2510, 2513–2518* (ENCB, MICH, MO, US), 29 Sep 1962, *Ugent et al. 2315* (MO).—QUERÉTARO: San Juan del Río and Palmillas, on road from Querétaro to Mexico, 20.38°N, 100.00°W, 2140 m, Sep 1980, *Ochoa 14187* (CIP, WIS, US); E side of Rt 57, SE of San Juan del Río, about 2 km N of Palmillas, 20.33°N, 99.93°W, 2150 m, 10 Sep 1988, *Spooner et al. 4147* (INIFAP, PTIS, WIS).—VERACRUZ: Las Cumbres de Acultingo, Puerto del Aire, 18.72°N, 97.32°W, 2320 m, 4 Oct 1963, *Flores S-728* (ENCB, K, LL, MEXU); Puente Colorado, a town situated at the turnoff that goes to the Cumbres of Acultzingo, towards Esperanza, about 2 km from this turnoff, 18.72°N, 97.32°W, 2250 m, 27 Sep 1964, *Flores S-789* (CAS, CHAPA, ENCB, K, LL, MEXU); near Puerto del Aire, on old Orizaba to Mexico road, Hwy 150, at the Veracruz-Puebla state border, 18.72°N, 97.32°W, 2340 m, 24 Oct 1967, *Tarn & Gómez 234* (K, PTIS).—State unknown: Souchil, 2134 m, Aug 1887, *Mohr s.n.* (US).

Solanum polyadenium is easily distinguished in the field by its highly glandular leaves with a dense covering of Type A trichomes and its characteristic strong "mousy" odor, and as herbarium specimens by the yellowish or yellow-brown foliage. It could be confused with *S. lesteri*. Hawkes (1990) distinguished *S. lesteri* from *S. polyadenium* by its "dense indumentum of long spreading multicellular hairs on all green parts, in addition

to the glandular ones," and conical fruits, in contrast to *S. polyadenium* with the "the whole plant covered with very frequent stalked glands" and "very sparse multicellular non-glandular hairs," and ovoid fruits. Our examination of living representatives of these two species in Sturgeon Bay, Wisconsin, in 2001 showed great variation in *S. lesteri*; *Hawkes et al. 1714* and *Spooner et al. 4177* had the dense non-glandular hairs, but *Spooner et al. 4155* had much less non-glandular pubescence more typical of *S. polyadenium*. In addition, some isotype specimens of *S. polyadenium* have a dense indumentum of non-glandular hairs. The only trait we can find to separate these species, therefore, is fruit shape.

This fruit shape difference is not so evident, however; the types of both *S. polyadenium* and *S. polyadenium* subsp. *orizabae* have short, triangular fruits, as do some other populations we cite here. Not all herbarium specimens of either species have mature fruits. *Solanum lesteri* appears as an extreme, long, triangular fruit variant of *S. polyadenium*. Their distribution pattern (*S. lesteri* at the southern end of the range of *S. polyadenium*) could argue for varietal or subspecies status for *S. lesteri*. Chloroplast DNA restriction site data (Spooner & Sytsma 1992) showed the two species to be united by 11 synapomorphies, but for the single population of *S. lesteri* to be distinguished from the three populations of *S. polyadenium* by three autapomorphies. We maintain them as separate because of the stark distinction of the fruit shapes in most specimens, but additional field and molecular studies may indicate that they intergrade more than is apparent here and suggest that recognition as one species is warranted.

MORELLIFORME GROUP

10. Solanum clarum Correll, Contrib. Texas Res. Found., Bot. Stud. 1: 10, fig. 4. 1950.—TYPE: GUATEMALA. Quezaltenango: Volcán Santa María, terrestrial, 11,800 ft, 27 Jul 1934, *A. F. Skutch 858* (holotype: GH!, photos [Correll neg. 901]: BM! F! GH! K! LL! NY! UC! US!, drawing: K!; isotypes: F! US-1643448!, photos of F isotype [F neg. 49352]: F! WIS!).

Plants 0.15–0.35 m tall, herbaceous, terrestrial, but growing in epiphytic-like conditions in moss, or more rarely epiphytic, erect. Stems 2–3 mm in diameter at base of plant. Pseudostipules 5–15 mm long, linear to narrowly ovate. Leaves 2–6 cm long, 1.5–4.2 cm wide, simple, ovate, apex acute to acuminate, base cordate to truncate or attenuate, finely pubescent adaxially and abaxially; petioles 1–3 cm long. Inflorescences generally in distal half of plant; peduncle 1.2–6 cm long. Flowers 4–15; pedicels 10–15 mm long, articulate between the proximal 1/4 and the distal 1/4; calyx 2.2–5 mm long, lobes acute to mucronate, acumens 1–1.5 mm long; corolla 1.5–2.3 cm in diameter, stellate, without acumens, edges of corolla flat, not folded dorsally, white with tones of violet; anthers 3–5.5 mm long, free; style 6–7.5 mm long, exceeding stamens by 2–3 mm, straight. Fruits 0.5–0.8 cm long, globose, yellow-green to green throughout. Seeds from living specimens green-white throughout. Chromosome number: 2n = 24. EBN unknown. Plate 3C, Fig. 21.

Phenology. Flowering and fruiting July through November.

Distribution (Fig. 22). Mexico (Chiapas) and Guatemala; typically growing in moss in upland pine and fir forests, frequently associated with *Acaena elongata* L., *Alchemilla pectinata* H. B. K., or *Pernettya ciliata* (Schltdl. & Cham.) Small; 2740–3800 m.

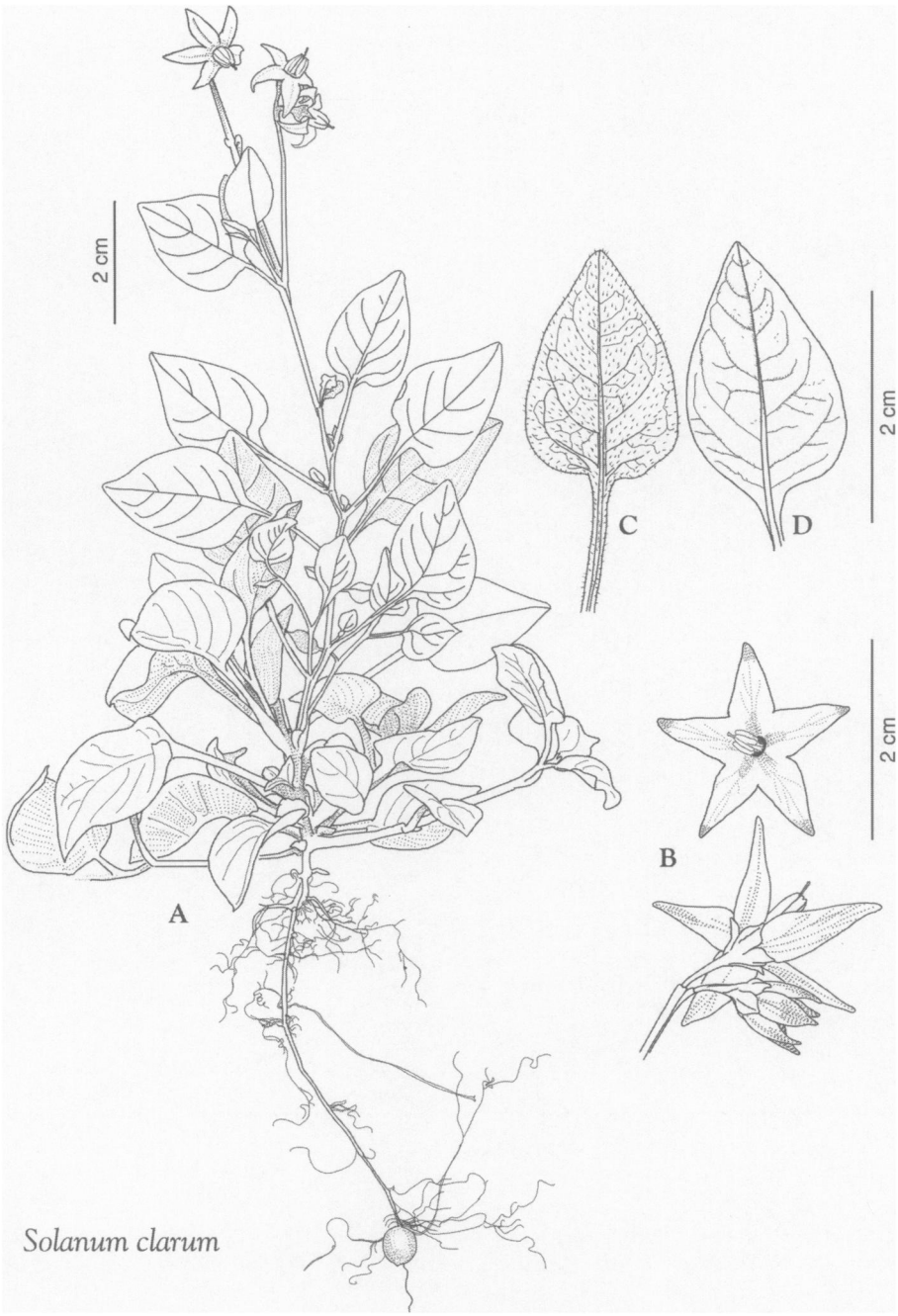


FIG. 21. *Solanum clarum*. A. Habit. B. Abaxial and adaxial views of flower. C, D. Lateral leaflet, adaxial (C) and abaxial (D) views. (Based on: A, C, D, *Spooner 4215*, PTIS; B, *Hawkes 1833*, photo of germplasm specimen grown at PTIS.)

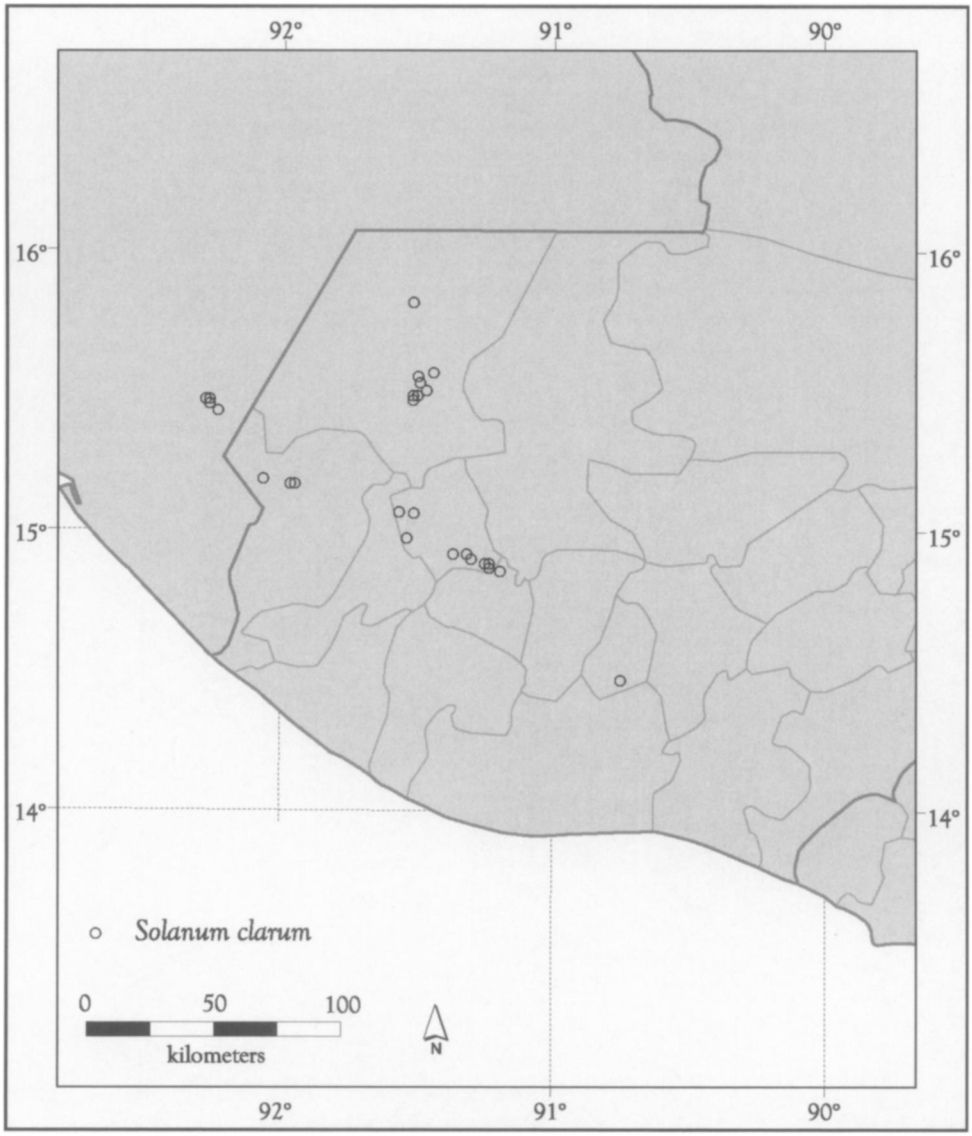


FIG. 22. Distribution of *Solanum clarum*.

ADDITIONAL SPECIMENS EXAMINED. **Mexico.** CHIAPAS: Mount Male, near El Porvenir, 15.43°N, 92.24°W, 3200 m, 7 Jul 1941, *Matuda 4618* (NY); 1.1 km N of town square of El Porvenir, on road to Siltepec, about 50 m W of road, 15.47°N, 92.28°W, 2850 m, 11 Oct 1997, *Rivera-Peña et al. 962* (INIFAP); on Mount Male, 2.2 km N of town center of El Porvenir on road N to Male, 15.47°N, 92.27°W, 2840 m, 25 Sep 1988, *Spooner et al. 4215* (INIFAP, PTIS, WIS); 1.1 km N of town square of El Porvenir on road to Siltepec, 15.47°N, 92.27°W, 2740 m, 25 Sep 1988, *Spooner et al. 4216* (IBUG, PTIS); 6.4 km S of town square of El Porvenir, on E side of road to Rt 190 S of Motozintla de Mendoza, 15.47°N, 92.27°W, 2740 m, 25 Sep 1988, *Spooner et al. 4217* (INIFAP, PTIS); 9.1 km S of town square of El Porvenir on road to Rt 190 S of Motozintla de Mendoza, about 50 km E of road, 15.45°N, 92.27°W, 2830 m, 25 Sep 1988, *Spooner et al. 4218* (INIFAP, PTIS).

Guatemala. HUEHUETENANGO: Sierra de los Cuchumatanes, between Tojiah and Chemal at Km 319.5, Ruta Nacional 9 N, 15.55°N, 91.50°W, 3380 m, 31 Jul 1960, *Beaman 3793* (GH, LL, MSC); Sierra de los

Cuchumatanes, slopes of Cerro Chemal, 28 mi from Huehuetenango, 15.55°N, 91.50°W, 3300 m, 30 Oct 1958, *Hawkes et al. 1776* (K), *Hawkes et al. 1777, 1778* (C, K); 31 km N of town square of Huehuetenango, Rt 9N, above Casario Chiabal, 3.5 km N of road junction to Todos Santos, about 1 km uphill, W of road, 15.48°N, 91.52°W, 3370 m, 16 Sep 1995, *Spooner et al. 7007* (AGUAT, PTIS, WAG); 4.3 km NW of road from Huehuetenango, to Santa Eulalia, road to Todos Santos Cuchumatán, 100 m N of road, 15.47°N, 91.52°W, 3280 m, 20 Oct 1995, *Spooner et al. 7059* (AGUAT, WAG); from Huehuetenango a point 4 km N of junction of road to Todos Santos, 15.48°N, 91.50°W, 3430 m, 23 Oct 1995, *Spooner et al. 7064* (AGUAT, PTIS, WAG); 31 km N of town square of Huehuetenango, Road 9N, 3.5 km N of road junction to Casario Chiabal, 2 km uphill, W of road, 15.48°N, 91.52°W, 3500 m, 24 Oct 1995, *Spooner et al. 7065* (AGUAT, PTIS), *Spooner et al. 7066* (AGUAT); 6 km E of Huehuetenango to Soloma Road (9N), road past Huito to Tuinimá, 1 km E of Huito, 15.50°N, 91.47°W, 3350 m, 25 Oct 1995, *Spooner et al. 7067* (AGUAT, PTIS, WAG); 24.3 km N of town square of Santa Eulalia, 5.5 km S of town square of San Mateo Ixtatán, Rt 9N, 15.82°N, 91.52°W, 3020 m, 26 Oct 1995, *Spooner et al. 7072* (AGUAT, PTIS, WAG); about 10.5 mi SW of San Juan Ixcoy, Rt 9N, Sierra de los Cuchumatanes, 15.57°N, 91.44°W, 18 Jul 1971, *Stevens 1262* (MSC); alpine areas in vicinity of Tunimá, Sierra de los Cuchumatanes, 3400–3500 m, 8 Jul 1942, *Steyermark 48385* (F); Cerro Chemal, summit of Sierra de los Cuchumatanes, 15.53°N, 91.49°W, 3700–3800 m, 8 Aug 1942, *Steyermark 50294* (F, NY, US).—SACATEPÉQUEZ: above Santa María de Jesús, N facing slope of Volcán de Agua, 14.47°N, 90.75°W, 2900 m, 8 Nov 1958, *Hawkes et al. 1909* (C, K, P, PTIS, US).—SAN MARCOS: 1.0 km NW of town square of Ixchiguán, road to Tacaná about 50 m N of road, 15.17°N, 91.95°W, 3380 m, 24 Sep 1995, *Spooner et al. 7027* (AGUAT, PTIS, WAG); 7.2 km NW of town square of Ixchiguán, 20 m S of road, 15.17°N, 91.97°W, 3360 m, 24 Sep 1995, *Spooner et al. 7028* (AGUAT, PTIS, WAG); 2.5 hours hike SW of town of Tacaná, towards village of San Rafael, at area of village of Chemealón, 15.18°N, 92.07°W, 3260 m, 25 Sep 1995, *Spooner et al. 7029* (AGUAT, PTIS, WAG).—SOLOLÁ: Km 152 between Quezaltenango and Los Encuentros, 14.86°N, 91.19°W, 3100 m, 8 Oct 1956, *Graham 118* (LL).—TOTONICAPÁN: near Cerro Quiché, Tecum Umán Ridge at Km 154, Ruta Nacional No. 1, 20 km E of Totonicapán, 14.92°N, 91.37°W, 3340 m, 14 Aug 1960, *Beaman 4176* (DUKE, GH, LL, MSC, UC, US); between Totonicapán and los Encuentros, 14.92°N, 91.37°W, 3000 m, 20 Oct 1956, *Graham 138* (K, PTIS); near the Quezaltenango border, 22 mi N of Quezaltenango, Cerro Calel, 14.97°N, 91.54°W, 3100 m, 2 Nov 1958, *Hawkes et al. 1813, 1827* (C, K, US), *Hawkes et al. 1824* (C, G, K, US), *Hawkes et al. 1839* (A, BM, C, K, US), *Hawkes et al. 1849* (B, K, US); 22 mi N of Quezaltenango, near the Guatemalan border, 15.06°N, 91.51°W, 3250 m, 2 Nov 1958, *Hawkes et al. 1833* (C, K, PTIS); Cerro El Quiché, 1 mi E of Totonicapán, road to Los Encuentros, just below the summit on NW side, 14.92°N, 91.37°W, 3400 m, 5 Nov 1958, *Hawkes et al. 1884* (C, K); 20 km from Totonicapán, road to Los Encuentros, Cerro Quiché, 14.92°N, 91.37°W, 3400 m, 5 Nov 1958, *Hawkes et al. 1894* (C, K, PTIS); road from Totonicapán to Los Encuentros, Km 143 from Guatemala City, 14.92°N, 91.37°W, 3200 m, 5 Nov 1958, *Hawkes et al. 1895* (C, K); 4.1 km E of town square of Calel, road to the Pan-American Hwy which begins at Puente Pologua, 15.07°N, 91.57°W, 3020 m, 20 Sep 1995, *Spooner et al. 7011* (AGUAT, PTIS, WAG); along old road N of Quezaltenango, going through Buenabaj to Calel, 1 km S of intersection of this road from Calel to Pan-American Hwy, about 4 km E of Calel, 15.07°N, 91.57°W, 3010 m, 20 Sep 1995, *Spooner et al. 7014* (AGUAT, PTIS); along old road from Los Encuentros to Totonicapán, 2 km W from border of Departments Sololá and Totonicapán, 14.87°N, 91.23°W, 3260 m, 12 Oct 1995, *Spooner et al. 7046* (AGUAT, PTIS, WAG); along old road from Los Encuentros to Totonicapán, 4 km W of border of Departments Sololá and Totonicapán, 14.88°N, 91.23°W, 3220 m, 12 Oct 1995, *Spooner et al. 7048* (AGUAT, PTIS, WAG); along old road from Los Encuentros to Totonicapán, 7.5 km W of border of Departments Sololá and Totonicapán, 14.88°N, 91.25°W, 3220 m, 12 Oct 1995, *Spooner et al. 7049* (AGUAT); 7.3 km E of town square of Totonicapán, 4.8 km from old road to Santa Cruz del Quiché, old road to los Encuentros, about 200 m uphill (S) of road, 14.92°N, 91.32°W, 3180 m, 17 Oct 1995, *Spooner et al. 7055* (AGUAT, PTIS, WAG); 12.4 km E of Totonicapán, 9.9 km E from deviation of road to Santa Cruz del Quiché, old road to Los Encuentros, 14.90°N, 91.30°W, 3150 m, 27 Oct 1995, *Spooner et al. 7075* (AGUAT, PTIS).

Solanum clarum is very distinctive with its simple leaves and relatively small stature (stems 2–3 mm wide at base, 0.15–0.35 m tall). *Solanum bulbocastanum* and *S. morelliforme* are the only other wild potato species from North and Central America with simple leaves. *Solanum morelliforme* is the most similar species, but differs from *S. clarum* by its lanceolate to ovate-lanceolate leaves (ovate in *S. clarum*). *Solanum bulbocastanum* is a much larger plant (stems 3–6 mm wide at base, plants up to 1 m tall) and has cream to yellow corollas (white or white tinged with purple in *S. clarum* and *S. morelliforme*).

Populations often contain hundreds of individuals in all stages of development, from emerging plants to plants with mature fruits, but fruiting plants can be scarce.

11. Solanum morelliforme Bitter & Muench, Repert. Spec. Nov. Regni Veg. 12: 154. 1913.—TYPE: MEXICO. Chiapas: Gueytepec, in a knothole, Feb 1912, *G. Muench s.n.* (lectotype, here designated: GOET-6863!; isolectotypes: GOET[2]!).

Plants 0.1–0.6 m tall, herbaceous, epiphytic, commonly on pine and oak trees, growing in leaf mould and moss or more rarely on ground at base of trees, erect. Stems 2–3 mm in diameter at base of plant. Pseudostipules 5–15 mm long, linear to narrowly ovate. Leaves 3–14 cm long, 1.5–4.4.9 cm wide, simple, elliptic to narrowly ovate, apex acute to acuminate, base attenuate, finely pubescent adaxially and abaxially; petioles 1–4 cm long. Inflorescences generally in distal half of plant; peduncle 0.7–2.2 cm long. Flowers 7–15; pedicels 10–15 mm long, articulate between the proximal 1/4 and the distal 1/4; calyx 1.5–2 mm long, lobes acute to mucronate, acumens up to 0.5 mm long; corolla 1.5–2 cm in diameter, stellate, without acumens, edges of corolla flat, not folded dorsally, white with tones of violet; anthers 4–5.5 mm long, free; style 6–8 mm long, about equaling stamens, straight. Fruits 0.5–0.8 cm long, globose, yellow-green to green throughout. Seeds from living specimens green-white throughout. Chromosome number: 2n = 24. EBN unknown. Plate 4C, Fig. 23.

Phenology. Flowering and fruiting July through October.

Distribution (Fig. 24). Widespread throughout central Mexico (southern Jalisco to Querétaro and Veracruz), to southeastern and south-central Guatemala and southern Honduras; epiphytic; 1870–3050 m.

ADDITIONAL SPECIMENS EXAMINED. **Mexico.** CHIAPAS: Mpio. San Cristóbal de las Casas, SW of Hwy 190 near Rancho Nuevo, about 9 mi SE of San Cristóbal de las Casas, 16.72°N, 92.61°W, 2743 m, 20 Aug 1966, *Breedlove 15091* (ENCB, F, MICH, US); Mpio. Teopisca, 10 km N of Teopisca along Hwy 190 near Rancho Belem, 16.57°N, 92.49°W, 2135 m, 21 Oct 1981, *Breedlove 53780* (MO); Km 1165 on Pan American Hwy, near San Cristóbal de las Casas, 16.75°N, 92.63°W, 2200 m, 6 Oct 1963, *Flores S-729* (K, LL, MEXU); 1 km before Mitzitán, on the road from San Cristóbal de las Casas to Comitán, 16.75°N, 92.63°W, 2500 m, 17 Jul 1985, *González et al. 157* (CHAPA); San Cristóbal de las Casas, Cerro Zontehuitz on the side ascending from San Cristóbal de las Casas through Santa Cruz de Ojo de Aguas, 3/4 hour from San Cristóbal by slow horse, 16.75°N, 92.63°W, 13 Jul 1949, *Hawkes et al. 1016* (F, K, LL, NY, MEXU, WIS); Mount San Nicolás near San Cristóbal de las Casas, 16.75°N, 92.64°W, 6 Jul 1956, *MacSwain s.n.* (DS); 2.1 km W of road to microwave tower Laguana Chamula on W side of Rt 190, 16.50°N, 92.32°W, 2400 m, 27 Sep 1988, *Spooner et al. 4219* (INIFAP, PTIS); 3.3 km N of Rt 190 on road to Ocosingo, N side of road, 16.75°N, 92.58°W, 2300 m, 27 Sep 1988, *Spooner et al. 4225* (INIFAP, PTIS); road from San Cristóbal de las Casas to Huitepec, about 3 km along road after turning from main road, Hwy 190, 16.80°N, 92.75°W, 2490 m, 22 Oct 1984, *Tarn et al. 279* (PTIS); Hwy 190 from San Cristóbal de las Casas to Comitán, turning off to microwave tower Laguna Chamula, 2.1 km along this road, 16.50°N, 92.32°W, 2400 m, 23 Oct 1984, *Tarn et al. 281* (PTIS).—GUERRERO: going up from Mazatlán 10 km (19 km S of Chilpancingo), about 1 km below microwave station, 17.55°N, 99.50°W, 2200 m, 6 Oct 1983, *Tarn et al. 147, 148* (PTIS).—HIDALGO: Mpio. Agua Blanca de Iturbide, El Tejocote, W of Agua Blanca de Iturbide, 2 km straight line from town center, 20.38°N, 98.37°W, s.d., *García and Guízar 90* (IEB).—JALISCO: Mpio. Minatitlán, 2 km W of Terrero, 19.43°N, 103.95°W, 2280 m, 26 Jul 1994, *Santana et al. 6797* (BRIT, ZEA).—MÉXICO: 44.5 km from the main Toluca to Morelia road, towards Valle de Bravo from Toluca, 19.15°N, 99.93°W, 2400 m, 2 Oct 1958, *Hawkes et al. 1613* (C, PTIS, US); Cumbre, Dist. Temascaltepec, 19.05°N, 100.05°W, 4 Nov 1934, *Hinton et al. 6813* (GH, K, MO, US); near Ixtapan de la Sal, 19.58°N, 98.93°W, 1900 m, 16 Aug 1953, *Matuda 29249* (MEXU); S side of road from Rt 130 (134) to Valle de Bravo, 2 km E of San Ramón, 19.17°N, 100.02°W, 2450 m, 24 Aug 1988, *Spooner et al. 4024B* (INIFAP, PTIS, WIS), 15 Oct 1988, *Spooner et al. 4254* (INIFAP, PTIS, WIS); about 18.5 km towards Valle de Bravo from Toluca to Temascaltepec Hwy 134 towards Rancho San Ramón, 19.15°N, 99.93°W, 2550 m, 26 Oct 1982, *Tarn et al. 48*

FIG. 23. *Solanum morelliforme*. A. Habit. B. Adaxial/side view of flower. C. Mature fruit. D, E. Lateral leaflet, adaxial (D) and abaxial (E) views. (Based on *Spooner 4219*, PTIS.)

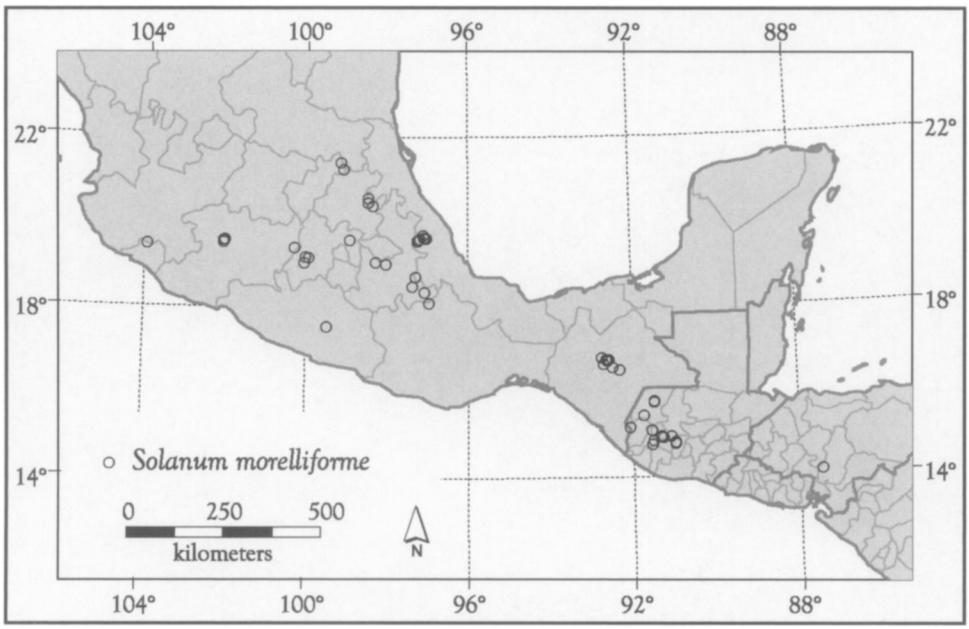


FIG. 24. Distribution of *Solanum morelliforme*.

(PTIS).—MICHOACÁN: vicinity of Capácuaro, 19.50°N, 102.05°W, 2150 m, 7 Aug 1965, *Correll et al. 31350* (ENCB, GH, LL, S); road from Uruapan to Carapan, a little after Capácuaro, 19.55°N, 102.05°W, 2150 m, 7 Aug 1965, *Flores S-816* (CHAPA, ENCB, MEXU); Sierra de los Tarascos, road from Uruapan to Carapan, just above Capácuaro, 100 m E of road, 19.55°N, 102.05°W, 2250 m, 17 Sep 1958, *Hawkes et al. 1507* (C, K, US); Sierra de los Tarascos, road from Uruapan to Carapan, just above Capácuaro, lane leading from main road to Arantepacua and Puricuaro, 19.55°N, 102.05°W, 2250 m, 17 Sep 1958, *Hawkes et al. 1510* (K, US); SE side of Cerro El Cacique, E of main road, S from Zitácuaro, 19.38°N, 100.30°W, 2350 m, 28 Aug 1988, *Spooner et al. 4051* (INIFAP, PTIS, WIS); along dirt road, 1.7 km NE of Capácuaro, on S side of road, 19.57°N, 102.02°W, 2320 m, 1 Sep 1988, *Spooner et al. 4088B* (INIFAP, PTIS, WIS); Capácuaro, on Carapan to Uruapan Road, Hwy 37, along track going E from Pueblo, 19.55°N, 102.05°W, 2270 m, 10 Oct 1967, *Tarn 190, 193* (PTIS).—OAXACA: Km 27.2 on road from Teotitlán to Huautla, at Puerto Soledad, 18.10°N, 96.98°W, 2370 m, 4 Oct 1997, *Rivera-Peña et al. 954* (INIFAP).—PUEBLA: Puerto Morelos (Puerto del Aire), on Cumbre Aculztingo, 18.72°N, 97.32°W, 2300 m, 7 Oct 1980, *Ochoa 14210* (CIP, WIS, US); Esperanza, 19.07°N, 98.30°W, Aug 1914, *Purpus 7399* (BM, F, GH, MO, NY, US); Tehuacán area, above Coxcatlán between Apala and the top of Cerro Chichiltepec, 18.49°N, 97.40°W, 2000 m, 17 Jul 1961, *Smith et al. 3841* (US); road from Tehuacán to Oaxaca, turning off at Coxcatlán, 20 km towards Zoquitlán, 18.35°N, 97.09°W, 2640 m, 23 Oct 1983, *Tarn et al. 176, 178* (PTIS); Valle de Piedras Encimadas National Park, 4 km above Camotepec turning off Hwy 119, Tulancingo to Zacatlán, 19.02°N, 98.03°W, 2500 m, 10 Oct 1984, *Tarn et al. 259* (PTIS).—QUERÉTARO: Mpio. Landa, Los Mixcahuales, 3 km NE of La Yesca, 21.22°N, 99.10°W, 1870 m, 7 Oct 1989, *González 1124* (IEB); Mpio. Landa, El Llano Chiquito, 21.38°N, 99.16°W, 1900 m, 12 Oct 1999, *Zamudio & Carranza 11176* (IEB, MEXU, TEX).—VERACRUZ: Las Vigas to La Joya, Perote, 19.55°N, 97.26°W, 1981 m, 26 Sep 1938, *Balls et al. 5556* (BM, K, US); Mpio. Xico, below Corral de Rajas, on way to Buenavista, 2500 m, 13 Oct 1987, *Cházaro & Hernández 5061* (IEB); along Hwy 140 through extensive lava flow called El Volcancillo, 26.5 km by road, NW of Jalapa, 1.7 km W of La Joya, 19.63°N, 97.10°W, 2150 m, 19 Jul 1978, *Cochrane et al. 8573* (F, TEX, WIS); SW of the rinconada by Cerro de la Tolva, Mpio. Las Minas, 19.69°N, 97.13°W, 2270 m, 11 Aug 1988, *Duran & Burgos 535* (MEXU); 1 km from Huayacocotla on road Huayacocotla to Viborillas, 20.55°N, 98.48°W, 2300 m, 14 Jul 1977, *Fay & Calzada 893* (ENCB, F, GH, LL, MSC, NY, TEX, US); 600 m away from Cumbres de Acultzingo and Puerto del Aire, 18.72°N, 97.32°W, 2600 m, 27 Sep 1962, *Flores S-682* (CHAP, CHAPA, K, LL, MEXU); La Joya, road from Mexico to Veracruz through Jalapa, about 100 m on the right side of the road, 19.62°N, 97.03°W, 2200 m, 29 Sep 1964, *Flores S-791* (CAS, CHAPA, F, K, LL, MEXU, MO, TEX); between Las Vigas and La

Joya, 19.63°N, 97.08°W, 2150 m, 12 Aug 1949, *Hawkes & Hernández 1063* (K, LL); upper outskirts of La Joya, disused enclosure in the pedregal, 19.62°N, 97.03°W, 2080 m, 12 Aug 1949, *Hawkes & Hernández 1065* (K, LL, MPU, P); near Perote, road from Las Vigas to Jalapa, upper edge of La Joya village, Malpaís de La Joya, walled enclosure on S side of road, Km 306.5 from Mexico, 19.57°N, 97.23°W, 2100 m, 7 Oct 1958, *Hawkes et al. 1644* (K, US); Km 305.5 from Mexico on the road from Las Vigas to Jalapa, Malpaís La Joya, 19.60°N, 97.20°W, 2150 m, 7 Oct 1958, *Hawkes et al. 1648* (K, PTIS); Palo Bendito, Huayacocotla, 20.45°N, 98.48°W, 1900 m, 21 Jul 1973, *Hernández 1931* (CHAPA, MEXU); Veracruz to Orizaba road, 1855, *Muller 1552* (K, NY); Mpio. Acajete, along Hwy 140, 1 km NW of La Joya, 19.62°N, 97.03°W, 2175 m, 6 Sep 1986, *Nee 32991* (K, MO, NY); Mpio. Rafael Ramírez, El Volcancillo, 2300 m, 8 Sep 1976, *Ortega 535* (F); on road from Perote to Jalapa just E of Toxtlacoaya, 3.6 km W of Las Vigas, 20 m off S side of road, 19.62°N, 97.06°W, 2300 m, 2 Oct 1997, *Rivera-Peña et al. 946* (INIFAP, MEXU, PTIS, WAG); on road from Perote to Jalapa, 2 km W of Las Vigas, then about 0.5 km S of road, 19.62°N, 97.05°W, 2270 m, 2 Oct 1997, *Rivera-Peña et al. 948* (INIFAP, MEXU, PTIS, WAG); Puerto del Aire, on old Orizaba to México road, Hwy 150, 18.71°N, 97.31°W, 2480 m, 24 Oct 1967, *Tarn & Gómez 227* (B, K, PTIS); Puerto del Aire, just W and high above Acultzingo, top of very steep pass on Hwy 150 (Tehuacán to Orizaba) near boundary between states of Veracruz and Puebla, Cumbres de Acultzingo, N side of road, 18.72°N, 97.32°W, 2409 m, 27 Sep 1962, *Ugent & Flores 2363, 2492* (BM, ENCB, L, MEXU, MICH, MO, US, WIS); Mpio. Las Vigas, Llano Grande, 19.63°N, 97.07°W, 2150 m, 4 Nov 1970, *Ventura 2246* (ENCB, F, IEB, MEXU).

Guatemala. CHIMALTENANGO: above Tecpán, 14.77°N, 91.00°W, 2400 m, 10 Oct 1956, *Graham 120* (LL, PTIS), 11 Oct 1956, *Graham 122* (LL), Oct 1965, *Graham S-743* (CHAPA, ENCB), 3 Aug 1933, *Skutch 525* (MICH, US); Santa Elena, 14.79°N, 91.00°W, 2400–2700 m, 18 Jul 1933, *Skutch 441* (F, GH, US).—HUEHUETENANGO: 11.8 km N of town square of Santa Eulalia, road to San Mateo Ixtatán, Road 9N, 50–250 m W of road, 15.77°N, 91.50°W, 3050 m, 17 Sep 1995, *Spooner et al. 7009* (AGUAT, PTIS, WAG); 9 km W of town square of Santa Eulalia, and 2 km S of junction of road to San Mateo Ixtatán and road to San Sebastián Coatán, walk 500 m up to near top of Cerro Chemalito, W-facing side, 15.73°N, 91.50°W, 2930 m, 26 Oct 1995, *Spooner et al. 7069* (AGUAT, PTIS, WAG); Cerro Pixpix, above San Ildefonso Ixtlahuacán, forested summit, 15.42°N, 91.77°W, 1600–2800 m, 15 Aug 1942, *Steyermark 50558* (F, NY, US).—QUEZALTENANGO: above Quezaltenango to S off road to Retalhuleu, 14.83°N, 91.52°W, 2500 m, 6 Oct 1956, *Graham 111* (LL, US); 5 km SW of Quezaltenango, lower slopes of Volcán Santa María, Bajo, 14.75°N, 91.55°W, 2550 m, 1 Nov 1958, *Hawkes et al. 1805* (K, PTIS, US), *Hawkes et al. 1809* (C, K, PTIS, US).—QUICHÉ: 5 mi S of Chichicastenango, Rt 15, 14.93°N, 91.12°W, 2300 m, 29 Oct 1958, *Hawkes et al. 1731* (K, PTIS, US).—SAN MARCOS: 4 hours hike SW of town of Tacaná, towards village of San Rafael, SW slope descending to San Rafael, 15.13°N, 92.10°W, 2900 m, 25 Sep 1995, *Spooner et al. 7030* (AGUAT, PTIS, WAG).—TOTONICAPÁN: 48 km on road from Quezaltenango to Huehuetenango, 14.90°N, 91.28°W, 3000 m, 31 Oct 1958, *Hawkes et al. 1802* (C, K); 6.5 km E of town square of Totonicapán, along road to Santa Cruz del Quiché, about 100 m E of junction of road to Santa María Chiquimula, about 100 m N of road, 14.93°N, 91.33°W, 2810 m, 15 Sep 1995, *Spooner et al. 7004* (AGUAT, BIGUA, F, PTIS, WAG); 7.3 km E of town square of Totonicapán, 1.9 km from deviation of road to Santa Cruz del Quiché, old road to Los Encuentros, 14.92°N, 91.33°W, 2960 m, 15 Sep 1995, *Spooner et al. 7005* (AGUAT, PTIS, WAG); along old road N of Quezaltenango, going through Buenebaj to Calel, 1 km S of intersection of this road and new road from Calel to Pan-American Hwy, about 4 km E of Calel, 15.07°N, 91.57°W, 3010 m, 20 Sep 1995, *Spooner et al. 7013* (AGUAT, PTIS, WAG). **Honduras.** MORAZÁN: at Lapaterique river bank thicket, 14.07°N, 87.47°W, 1600 m, 11 Aug 1961, *Molina & Molina 26100* (EAP, F, MO).

Solanum morelliforme is very distinctive with its simple leaves and relatively small stature (stems 2–3 mm wide at base, 0.1–0.5 m tall); see discussion under *S. clarum* (no. 10) for distinctions from the other simple-leaved species, *S. clarum* and *S. bulbocastanum*. It usually grows as an epiphyte, in contrast to its sister taxon *S. clarum*, which grows on the ground in epiphytic-like conditions in moss and only rarely as an epiphyte. *Solanum morelliforme* occurs on horizontal branches of mature trees, such as *Arbutus*, cypress, elm, juniper, pine, or oak trees, often in moss and organic litter. Occasionally it is found on the ground in the woods, on rotting wood of fallen trees, or in moss. We were unable to locate *S. morelliforme* at some previously documented localities that had been logged and reforested, and the range of this species may have been reduced by deforestation.

The southernmost record of *S. morelliforme*, *Molina & Molina 26100*, was collected in Honduras in 1961, the only record from that country. Antonio Molina (EAP) kindly led

us to the exact sites where he originally collected it in small valleys off the main road from Tegucigalpa to Lapaterique: Las Tablas (14°03.95′N, 87°22.73′W) and Quebrada Honda (14°03′56″N, 87°24′44″W), both at 1600 m. Unfortunately, we did not find any populations there or at other nearby sites.

Bitter (1913) listed *Muench s.n.* as type collection but not the herbarium of deposition. He indicated that the type material had fruits but no flowers, and also that he was cultivating the species from seeds taken from these specimens. GOET has four sheets with type locality data. Three of these are in fruit, and we chose one as the lectotype. The fourth specimen has flowers and clearly was cultivated later; thus, it is not considered type material.

BULBOCASTANA GROUP

12. Solanum bulbocastanum Dunal in Poiret, Encycl., suppl. 3: 749. 3 Sep 1814. *Solanum mexicanum* Sessé & Mociño, Pl. nov. hisp. 35. 1888, nom. superfl., non *Solanum mexicanum* Dunal, 1814.—TYPE: the original color plate (Sessé & Mociño expedition), *Torner Collection 0621*, Hunt Institute for Botanical Documentation, Pittsburgh (lectotype, here designated; isolectotype: the Node-Verán copy, drawing 31 cited by Dunal: MPU!, photos: PTIS! WAG!). [Locality of population from which the plate was drawn: MEXICO. Distrito Federal: Tepela near San Angel ["in Tepetlpae montibus prope Sancti Angeli oppidum," S of Mexico City, Distrito Federal, fide McVaugh, 2000.]

Solanum symphysicaulis Pavón ex Dunal in DC., Prodr. 13(1): 106. 1852.—TYPE: MEXICO. Without locality, *Sessé & Mociño s.n.* (holotype: G!; photo [F neg. 8590]: NY!; isotype: BM!). [The names *Sessé & Mociño* are not noted on these sheets, but the specimes likely were collected by them; see McVaugh, 1987, p. 168–169).

Solanum bulbocastanum var. *dolichophyllum* Bitter, Repert. Spec. Nov. Regni Veg. 11: 447. 1912. *Solanum bulbocastanum* subsp. *dolichophyllum* (Bitter) Hawkes, Rec. Scott. Pl. Breed. Sta. 1963: 95. 1963.—TYPE: MEXICO. Morelos: moist hillsides near Cuernavaca, 5000 ft, 23 Jul 1896, *C. G. Pringle 6397* (lectotype, here designated: W-4062!, photos: BM! G! GH!; isolectotypes: BM! CAS! E! F! G! GH! GOET! HBG! JE! K! M, MEXU! MIN! MO! MSC! NY! P! PH! S! UC! US-287851! US-1324467! VT! W! WU! Z!, photo of PH isolectotype: PTIS!, photos of W isolectotype: BM! G! GH!, photos of Z isolectotype [Correll neg. 95]: BM! F! GH! K! LL! UC! US-1324467!).

Solanum bulbocastanum var. *latifrons* Bitter, Repert. Spec. Nov. Regni Veg. 11: 447. 1912.—TYPE: MEXICO. Without locality, *Schmitz s.n.* (holotype: W-125669!, photo: GH!; isotypes: W[2]!).

Solanum bulbocastanum var. *glabrum* Correll, Agric. Monogr. U.S.D.A. 11: 79, figs. 53, 54. 1952.—TYPE: Specimen prepared from plants cultivated from seed at Sturgeon Bay, Wisconsin, U.S.A., fall 1949, *D. S. Correll 14226a* (holotype: NA!). [Seed source: MEXICO. Oaxaca: upper slopes of Cerro San Felipe, above Cerro San Felipe, in weedy thicket, 31 Oct 1947, *D. S. Correll 14226a.*]

Solanum bulbocastanum var. *partitum* Correll, Agric. Monogr. U.S.D.A. 11: 83, fig. 55. 1952. *Solanum bulbocastanum* subsp. *partitum* (Correll) Hawkes, Rec. Scott. Pl. Breed. Sta. 1963: 95. 1963.—TYPE: GUATEMALA. Baja Verapaz: Patal, thicket, 1600 m, Jul 1908, *H. von Türckheim 2316* (holotype: US-1324466!;

isotypes: C! G! GH! NY! US-1324467! Z[2]!, photos of G isotype [Correll neg. 442]: BM! F! G! GH! K! NY! UC! US!, additional photo: LL!, photo of GH isotype: [Correll neg. 443]: NY!, photos of NY isotype [Correll neg. 63]: BM! F! GH! K! LL! NY! UC! US!], photos of Z isotypes [Correll negs. 95 and 96]: BM! F! GH! K! LL! NY! UC! US!).

Solanum longistylum Correll, Agric. Monogr. U.S.D.A. 11: 87, figs. 58, 59. 1952.—TYPE: MEXICO. Morelos: El Parque, 31 Aug 1910, *C. R. Orcutt 3833* (holotype: F-282353!, photos [Correll neg. 62, F neg. 49435]: BM! F! GH! K! LL! NY! PTIS! US!).

Plants up to 1 m tall, herbaceous, terrestrial, erect. Stems 3–6 mm in diameter at base of plant. Pseudostipules 4–16 mm long, lunate. Leaves 2–17 cm long, 0.9–7.2 cm wide, simple, margins entire but often sinuate, broadly ovate, lanceolate to linear-lanceolate, apex acute or obtuse, base rounded, cuneate or decurrent, densely pubescent adaxially and abaxially; petioles 0.8–7 cm long. Inflorescences generally in distal half of plant; peduncle 0.3–4.5 cm long. Flowers 5–35; pedicels 3–17 mm long, articulate between the proximal 1/4 and the distal 1/4; calyx 3–8.5 mm long, lobes oblong, apiculate, acumens 1 mm long; corolla 1.3–2.1 cm in diameter, stellate, without acumens, edges of corolla flat, not folded dorsally, white-cream to light yellow; anthers 3–5.5 mm long, connate; style to 9 mm long, exceeding stamens by 1.5–3 mm, straight. Fruits 1–1.3 cm long, globose, light green throughout. Seeds from living specimens green-white throughout. Chromosome number: 2n = 24, 36. EBN = 1. Plates 3A, 4A, 7, 8; Fig. 25.

Phenology. Flowering and fruiting July through November.

Distribution (Fig. 26). Widespread from northwestern Mexico (Durango and Nayarit) south to Honduras; among grasses, cacti, tropical deciduous forests, scrub and oak forests, pine forests, often in shallow or dry rocky soil, steep rocky slopes, among piles of stones or along fencerows, railroad tracks, sometimes in cultivated fields; 1200–2300 m.

See Appendix for a list of Specimens Examined (p. 154).

Solanum bulbocastanum is one of the most distinctive wild potato species in North and Central America; it is easily recognized by its simple leaves and white-cream to light yellow corollas. It would be hard to confuse with another species, except possibly the simple-leaved species with white corollas, *S. clarum* and *S. morelliforme*; they are much smaller (stems 2–3 mm wide at base, generally under 0.5 m tall; vs. *S. bulbocastanum* with stems 3–6 mm wide at base, plants up to 1 m tall).

Correll (1962) designated *S.* ×*michoacanum* as a nothospecies originating from a cross of *S. bulbocastanum* and *S. pinnatisectum*. It is somewhat morphologically intermediate between them but has lateral leaflets, which are absent in *S. bulbocastanum* (see below).

Dunal (1814) based *S. bulbocastanum* on the watercolor prepared in the field during the Royal Expedition to New Spain (Plate 7) and a copy made by Node-Verán in Montpellier (Plate 8). As outlined by D'Arcy (1979), Dean (1997), Nee (1982), and McVaugh (2000) the Royal Expedition to New Spain occurred from 1787 to 1803, and covered Mexico and other areas in the Americas. The botanical specimens, manuscripts, and drawings from the expedition initially went to Spain, and Mociño later took them to France in 1812 because of political instability. In Montpellier Mociño met A. P. de Candolle and also M. F. Dunal, who was revising the genus *Solanum*. Candolle left Montpellier for Geneva in 1816 and with Mociño's permission took most of the watercolors and specimens with him, but seems to have left the *Solanum* plates with Dunal in Montpellier.

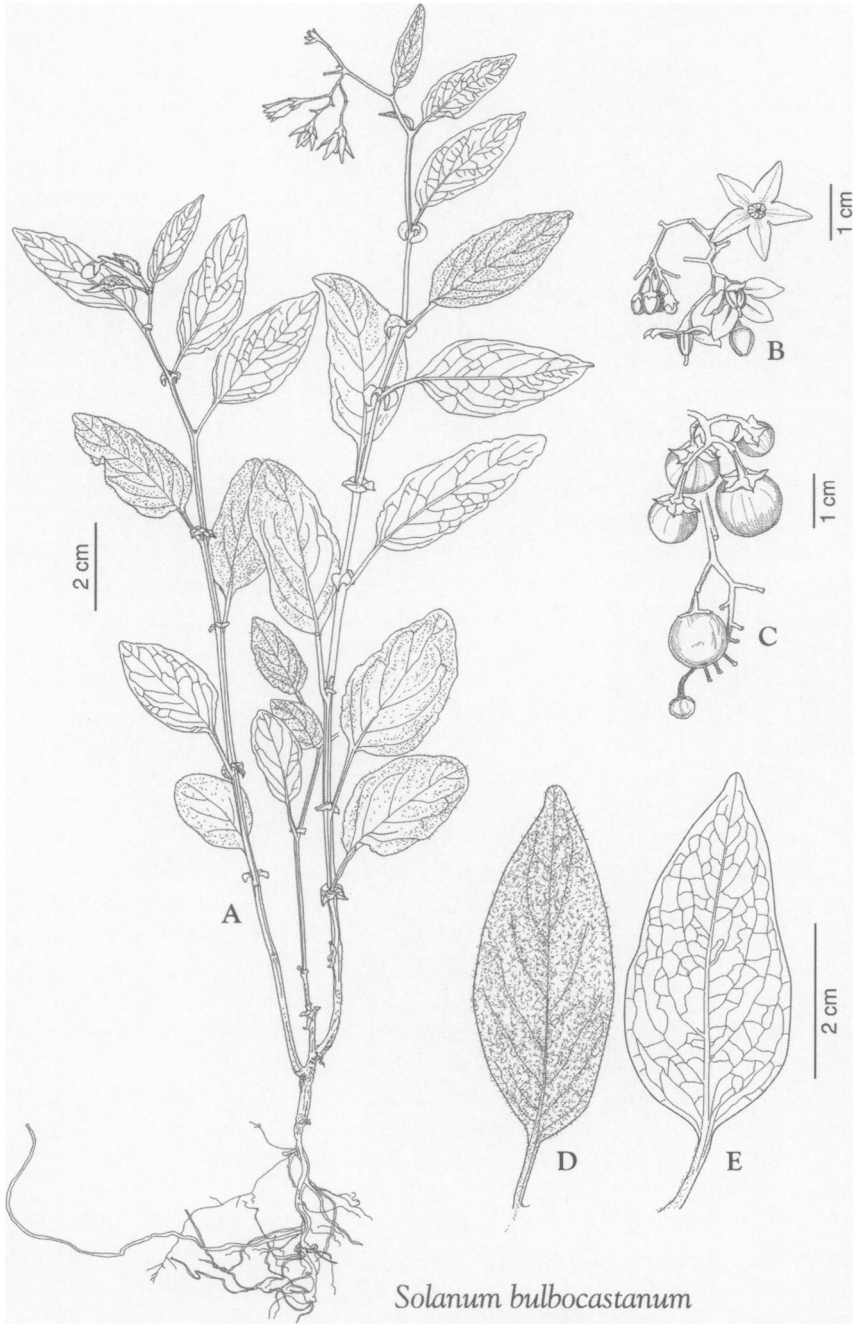


FIG. 25. *Solanum bulbocastanum*. A. Habit. B. Inflorescence branchlets with flowers and buds. C. Infructescence branchlets with young and mature fruits. D, E. Lateral leaflet, adaxial (D) and abaxial (E) views. (Based on: A, C–E, *Rodríguez 452*, PTIS; B, *Spooner 4174*, PTIS.)

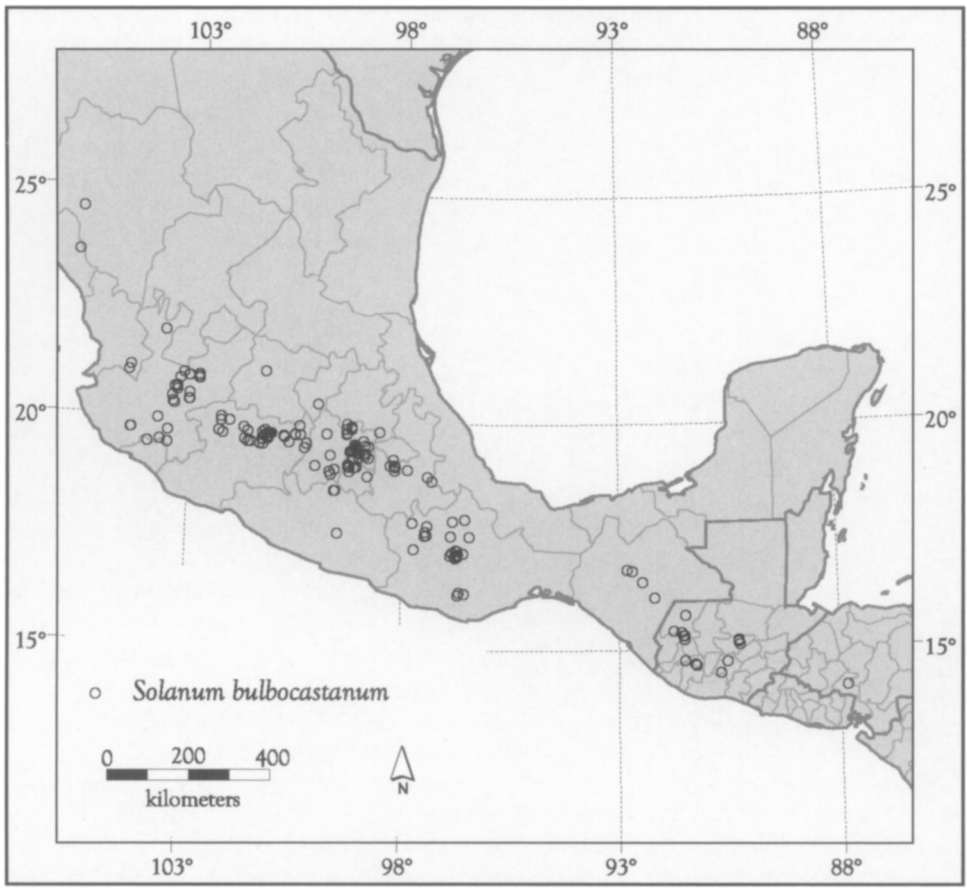


FIG. 26. Distribution of *Solanum bulbocastanum*.

Mociño eventually returned to Spain with the original drawings, which were considered lost until they were discovered in 1980 in Barcelona in a private library and purchased in 1981 by the Hunt Institute for Botanical Documentation in Pittsburgh. The association of one of the original watercolors from the expedition with the Node-Verán black-and-white copy drawing "Tab. 31" cited by Dunal is here made with the kind help of Dr. Robert Kiger at the Hunt Institute for Botanical Documentation.

The holotype of *Solanum symphysicaulis* bears no locality other than Mexico. A specimen at BM appears to be part of the same collection and has the same label, with a notation that it is from Pavón's herbarium; it is here considered an isotype.

Bitter cited a single collection from W as the type of *Solanum bulbocastanum* var. *latifrons*, but there are three specimens with the same label data. We consider W-125669 as the holotype, because it is the only specimen annotated by Bitter.

Correll (1952) based S. *bulbocastanum* var. *glabrum* on fruiting specimens of *D. S. Correll 14226*, collected in nature on 31 Oct 1947 (NA), and on cultivated plants (*D. S. Correll 14226a*) grown at Sturgeon Bay, Wisconsin, fall 1949, from seeds of this collection. The holotype is clearly labeled by Correll. Other herbarium specimens bearing this

collection number, grown from seeds, apparently were gathered later (e.g., PTIS, photos [Correll neg. 64]: GH! UC!); we do not consider these as type material.

We encountered four collections apparently part of the distributions of falsified collections attributed mostly to Brother G. Arsène (Standley 1927); all bear the distinctive black-bordered label. Three of these are purportedly from localities outside the range of *S. bulbocastanum*: *Frère Apollinaire s.n.*, Sep 1908 (E), and *Frère Idinoël s.n.*, Aug 1909 (G), from northern Colombia, and *G. L. Fischer s.n.*, Aug 1912 (G), from New Mexico, U.S.A. The fourth spurious collection is said to be from Mexico: "Punguato, vicinity of Morelia, 2100 m, 16 Jul 1909, *Arsène 2893*" (F, G, GH, MEXU, MO, MPU, P, US).

13. Solanum cardiophyllum Lindley, J. Hort. Soc. London 3: 70, 71. 1848, non *Solanum cardiophyllum* Dunal, 1852. *Solanum cardiophyllum* var. *oligozygum* Bitter, Repert. Spec. Nov. Regni Veg. 11: 439. 1912, nom. superfl.—TYPE: Specimen prepared from plants cultivated from tubers in England, *C. A. Uhde 5 p.p.* (holotype: CGE!, photos [Correll neg. 801]: BM! F! GH! K! LL! NY! UC! US!, also [F neg. 16]: F! GH!). [Source of tubers: unknown locality in MEXICO, 8000–9000 ft, *C. A. Uhde 5 p.p.*]

Solanum lanceolatum P. Berthault, Rech. bot. Solanum tub. 149, tab. 5. 1911, non *Solanum lanceolatum* Cavanilles, 1795. *Solanum cardiophyllum* subsp. *lanceolatum* (P. Berthault) Bitter, Repert. Spec. Nov. Regni Veg. 11: 440. 1912. *Solanum cardiophyllum* subsp. *lanceolatum* var. *amphixanthandrum* Bitter, Repert. Spec. Nov. Regni Veg. 11: 442. 1912, nom. superfl. *Solanum lanciforme* Rydberg, Bull. Torrey Bot. Club 51: 169. 1924.—TYPE: MEXICO. Puebla: calcareous hills near Tehuacán, 5600 ft, 23 Aug 1901, *C. G. Pringle 8599 p.p.* (lectotype, designated by Rodríguez and Vargas, 1994: W-7506! isolectotypes: BM! CM! E! F! G! GB! GOET[2]! HBG! K! L! LY! M! MEXU! MIN! MO! MSC! NY! P[2]! PH! UC! US-396389! US-1177853! US-1324483! W-7566! W-75061! Z[2]!, photo of F isolectotype: PTIS!, photos of L isolectotype: PTIS! WAG!, photos of Z isolectotypes [Correll neg. 97]: BM! F! GH! K! LL! NY! UC!).

Solanum cardiophyllum subsp. *lanceolatum* var. *endoiodandrum* Bitter, Repert. Spec. Nov. Regni Veg. 11: 442. 1912.—TYPE: MEXICO. Puebla: calcareous hill near Tehuacán, 5600 ft, 23 Aug 1901, *C. G. Pringle 8599 p.p.* (holotype: W-11077!).

Solanum cardiophyllum var. *pliozygum* Bitter, Repert. Spec. Nov. Regni Veg. 11: 439. 1912.—TYPE: MEXICO. Distrito Federal: Cerro de Guadalupe, Valley of Mexico, 2285 m, 17 Aug 1896, *C. G. Pringle 6421* (lectotype, here designated: W-4085!, photos: BM! GH! US!; isolectotypes: BM! C! E! F! GH! GOET! HBG! ISC! JE! K! MO! NA! NY! P[2]! PH! UC! US-287682! US-1324484! WRSU, WU! Z!).

Solanum coyoacanum Bukasov ex Rybin, Trudy Prikl. Bot. 20: 700. 1929.—TYPE: MEXICO. Distrito Federal: near Mexico City, Pedregal de Coyoacán. *M. Antipovich & M. Antipovich 32* (lectotype, here designated: WIR!, photo: PTIS!; isolectotype: WIR, photo: LL!).

Plants up to 0.8 m tall, herbaceous, terrestrial, rosette-forming to ascending. Stems 2–4 mm in diameter at base of plant. Pseudostipules 6–18 mm long, lunate. Leaves (3–) 5–15 (–30) cm long, 4.5–10.5 cm wide, odd-pinnate, glabrous and shiny above and glabrescent below; petioles 1.5–4 cm long; lateral leaflet pairs (1–) 2–3 (–4), the size of the lateral leaflets diminishing abruptly towards the base of the leaf; most distal lateral

leaflets 1–10 cm long and 1–5 cm wide, ovate to ovate-lanceolate, apex acute, obtuse to rounded, base cordate, oblique or slightly truncate, sessile; terminal leaflet 3–12 cm long, 1.5–6 cm wide, ovate to ovate-elliptic, apex acute or obtuse, base cordate, oblique or cuneate; interjected leaflets 0–2. Inflorescences generally in distal half of plant; peduncle 1–11.5 cm long. Flowers 4–24; pedicels 6–10 mm long, articulate between the proximal 1/4 and the distal 1/4; calyx 2.5–3 mm long, lobes oblong to triangular, mucronate, acumens minute to 0.5 mm long; corolla 1.3–1.5 cm in diameter, stellate, without acumens, edges of corolla flat, not folded dorsally, white-cream; anthers 3–4 mm long, connate; style 6–7 mm long, exceeding stamens by 2–2.5 mm, straight. Fruits 0.8–1 cm long, globose, light green throughout. Seeds from living specimens green-white throughout. Chromosome number: 2n = 24, 36. EBN = 1. Fig. 27.

Phenology. Flowering and fruiting July through October.

Distribution (Fig. 28). Rare in northern Mexico (Durango) but widespread from central Mexico (Jalisco, Aguascalientes, and Zacatecas) south to Oaxaca; in and about cultivated fields, in sandy or rocky ground or rich soil, streamsides, grassy fields, tropical deciduous forest, mesquite grasslands, oak or pine or alder forests, xerophytic scrublands; 1320–2800 m.

ADDITIONAL SPECIMENS EXAMINED. **Mexico.** AGUASCALIENTES: N of Aguascalientes, on track to San Lorenzo, about 5 km from Aguascalientes to Zacatecas Hwy, 21.94°N, 102.30°W, 1900 m, 14 Sep 1949, *Hawkes & García 1099* (LL); about 3 km N of village of Los Caños, located about 10 km by air SW of Aguascalientes on road from Aguascalientes to Villa Hidalgo, then driving about 3 km N on roads to fields, 21.79°N, 102.46°W, 1950 m, 7 Sep 1997, *Rivera-Peña et al. 912* (INIFAP, MEXU, PTIS, WAG).—CHIHUAHUA: Llano Grande, 28.07°N, 107.75°W, 3 Jun 1960, *Pennington 318* (LL).—DISTRITO FEDERAL: Pedregal, 19.37°N, 99.23°W, 2164 m, 30 Jun 1938, *Balls et al. 4926* (BM, K, US); Sierra de Guadalupe, Puerto de Santa Isabel, 19.58°N, 99.12°W, 2150 m, 2 Jul 1938, *Balls et al. 4941* (K); Sierra de Guadalupe, 19.58°N, 99.13°W, 2134 m, 4 Jul 1938, *Balls et al. 4944* (BM, C, E, K, NY, US); Valley of Mexico, 19.49°N, 99.09°W, 1865, *Bourgeau 346 p.p.* (GH, K, MPU); Valley of Mexico, Zacoalco Mountain Pass Guadalupe, 19.43°N, 99.10°W, 10 Jul 1865–1866, *Bourgeau 544 p.p.* (K, MPU, P); Pedregal de Coyoacán, S of Mexico City, 19.33°N, 99.16°W, 7 Jul 1949, *Hawkes et al. 1007* (LL); Valley of Mexico, hills NW of Tlanepantla, 19.42°N, 99.10°W, 10 Jun 1951, *Matuda 21131* (MEXU); Cerro de Guadalupe, Valley of Mexico, 19.46°N, 99.10°W, 2286 m, 14 Aug 1909, *Pringle 10832* (BM, ENCB, F, GH, LL, MICH, MSC, NA, US, WIS), 19 Aug 1901, *Pringle s.n.* (US), 5 Aug 1901, *Rose & Hay 5975* (BM, GH, NY), Aug 1901, *Rose & Painter 5975* (BM, NY, US); Guadalupe, 19.48°N, 99.10°W, 2280 m, 5 Sep 1906, *Ross 110* (M); Delegación Tláhuac, E slope of Cerro de Santa Catarina, near Santa Catarina, 19.31°N, 99.03°W, 2400 m, 13 Aug 1968, *Rzedowski 26046* (DS, ENCB); Delegación de Tláhuac, base of Sierra de Santa Catarina, N of Tlaltenco, 19.32°N, 99.03°W, 2300 m, 10 Aug 1981, *Rzedowski 37468* (ENCB, IEB, MEXU, MO).—GUERRERO: Botanical Garden, Autonomous University of Guerrero at Chilpancingo, 17.42°N, 99.90°W, 1330 m, 30 Jun 1978, *Blanco et al. 390* (ENCB); 8 km towards Huiziltepec from El Platanal on Hwy 95 from Chilpancingo to Mexico, 17.55°N, 99.50°W, 1480 m, 1 Oct 1982, *Tarn et al. 18* (PTIS); Mpio. Malinaltepec, Tejocote, 17.05°N, 98.67°W, 1900 m, 23 Jul 1991, *Wagenbreth 743* (MEXU).—HIDALGO: Mpio. San Agustín Tlaxiaxa, Barranca El Salto, SW of El Tajique, W of Sierra Chicavasco, Ejido El Tajique, 20.12°N, 98.88°W, 2040 m, 12 Aug 1990, *Díaz & Valverde 945* (IEB, MEXU); Rt 85 from Zimapán to Tamazunchale, turning off at Trancas and about 4.5 km towards Nicolás Flores, 20.70°N, 99.42°W, 2300 m, 17 Sep 1991, *Hjerting 7364* (PTIS); Mpio. Zimapán, on dry rocky slopes of Barranca de Tolimán somewhat above the mines, 8.1 mi from Zimapán on road to Loma del Toro Mine, 20.73°N, 99.45°W, 1524 m, 31 Oct 1949, *Moore 5452* (LL, MEXU, TEX); Dublán, 2073 m, 8 Jul 1904, *Pringle 13138* (C, F, GH, K, MICH, MO, MSC, NA, US); hwy from Mexico City to Querétaro City, near the junction towards Tula, 19.85°N, 99.32°W, 2311 m, 22 Aug 1993, *Rodríguez et al. 2557* (IBUG, PTIS); near Tequixquiac, 19.88°N, 98.64°W, 30 Aug 1903, *Rose & Painter 6627* (US).—JALISCO: Río Blanco, in cultivated fields by the school, 20.77°N, 103.38°W, 1500 m, 5 Jul 1986, *Rodríguez & Guzmán 317* (IBUG), 12 Jul 1986, *Rodríguez 317a* (IBUG); Mpio. Tala, La Primavera, Bosque Escuela, about 3 km NW of Cuxpala, about 10 km SSE of Tala, 20.70°N, 103.56°W, 1450 m, 30 Aug 1993, *Rodríguez 2585* (IBUG, PTIS); Mpio. Tala, La Primavera, Bosque Escuela, along Caliente Creek, 100 m downstream the springs, 20.70°N, 103.56°W, 1450 m, 20 Aug 1988, *Rodríguez & Reynoso 1463* (IBUG, WIS); Mpio. Tala, La Primavera, Bosque Escuela, path between El Rancho and the Presitas Creek, 20.70°N, 103.56°W, 1500 m, 1 Aug 1991, *Rodríguez*

FIG. 27. *Solanum cardiophyllum*. A. Habit. B. Flower; pedicel bearing calyx. C, D. Lateral leaflet, adaxial (C) and abaxial (D) views. (Based on *Balls et al. 4944*, K.)

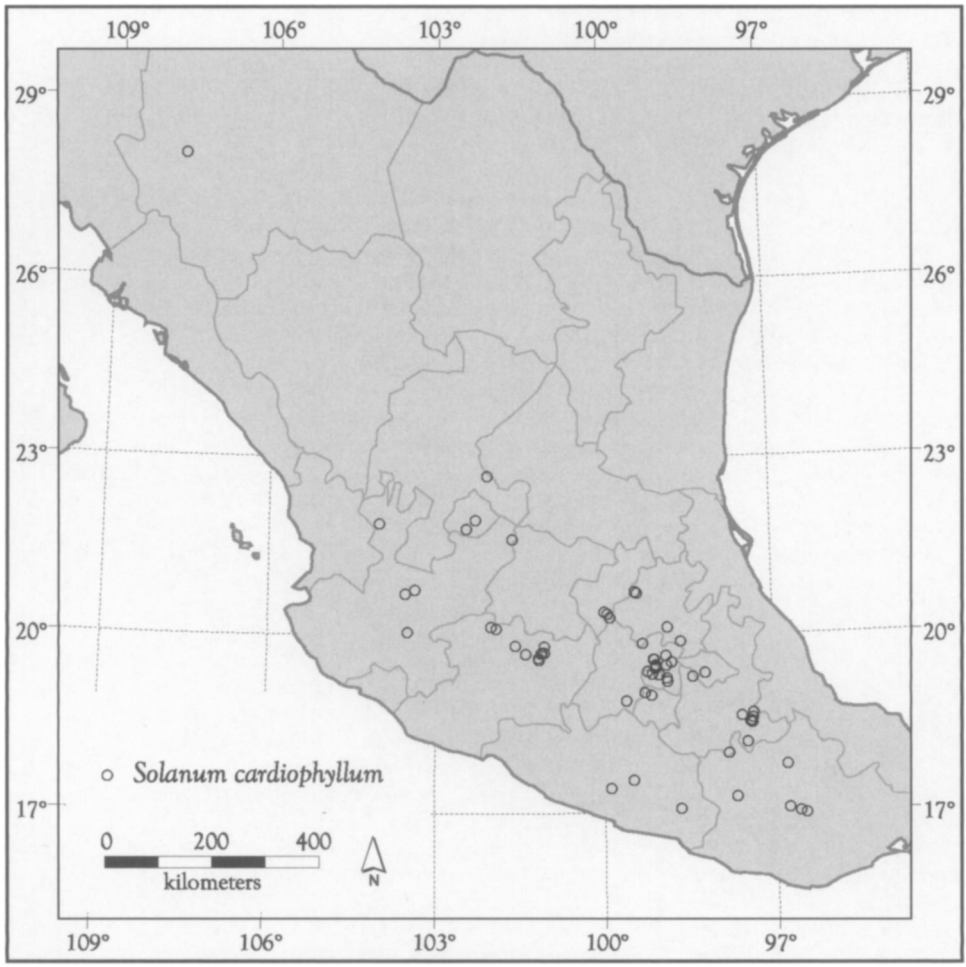


FIG. 28. Distribution of *Solanum cardiophyllum*.

& Vargas 2103 (IBUG); Mpio. Ojuelos, Matanzas, near the cemetery, 21.62°N, 101.63°W, 2192 m, 24 Aug 1993, *Rodríguez et al. 2570* (IBUG, MICH, NY, PTIS, WIS); Mpio. Bolaños, 1 km W of Tuxpan, 21.87°N, 104.02°W, 1100 m, Aug 1985, *Soltero s.n.* (IBUG); Mpio. Tala, La Primavera, Bosque Escuela, vicinity of the Caliente Creek, 20.70°N, 103.56°W, 1450 m, 5 Sep 1988, *Spooner et al. 4111* (IBUG, INIFAP); Mpio. Atoyac, Laguna de Sayula, summit of the Isla Grande, 20.05°N, 103.52°W, 1320 m, 2 Jun 1994, *Villegas 477* (IBUG, MEXU).—MÉXICO: near General González Station, 19.53°N, 98.82°W, 23 Oct 1947, *Correll 14206* (LL); 2 km E of Temamatla, 19.20°N, 98.88°W, 2350 m, 20 Aug 1972, *Elias 186* (ENCB); area about the School of Agriculture, Chapingo, 19.48°N, 98.90°W, 2240 m, 18 Sep 1967, *Flores S-1000* (CHAP, ENCB, IBUG, MEXU); 2 km after Chalco, on road to Cuautla, 19.26°N, 98.90°W, 2200 m, 30 Aug 1967, *Flores et al. S-981* (CHAPA, ENCB, MEXU); near Texcoco, Chapingo, La Serona, Escuela Nacional de Agricultura, Valley of Mexico, 19.48°N, 98.90°W, 2200 m, 8 Jul 1949, *Hawkes et al. 1010* (LL); road from Tenancingo to Ixtapan de la Sal, just past Villa Guerrero, 18.88°N, 99.62°W, 1800 m, 1 Oct 1958, *Hawkes et al. 1598* (C); hills above Santa Fe, 11 Aug 1909, *Pringle 10831 p.p.* (GH, MSC, SMU); vicinity of San Luis Tultitlanapa, near Oaxaca, Jul 1908, *Purpus 3365 p.p.* (BM, C, E, F, MO, NY, US); Mpio. Acolman, S slopes of Cerro Chiconautla, 19.64°N, 98.92°W, 2400 m, 18 Jul 1973, *Rzedowski 30931* (ENCB).—MICHOACÁN: 10 km W of Morelia, 19.68°N, 101.40°W, 21 Jun 1950, *Baldwin 14375* (LL, NA); about 21 km S of Morelia on road to Villa Madero, 19.61°N, 101.18°W, 4 Aug 1965, *Correll et al. 31336* (GH, LL); Mpio. Coeneo, Rancho Quenzio, 19.82°N, 101.58°W, 2050 m, 24 Jul 1986, *Díaz*

& López 2480 (MEXU, IEB), 25 Jul 1986, *Díaz & Nery s.n.* (IEB); near Morelia, Km 329 on road to Guadalajara, on the left side of the road and 200 m away from it, 19.70°N, 101.08°W, 2000 m, 12 Sep 1962, *Flores S-666* (LL, MEXU); Km 22 of Morelia to Villa Madero Road, 1 km after where were collected *S. bulbocastanum* and *S. michoacanum*, 19.59°N, 101.16°W, 4 Aug 1965, *Flores S-810* (MEXU); Km 310 on Hwy 15 W of Morelia, 19.70°N, 101.12°W, 1900 m, 10 Jul 1957, *Graham 227* (LL); Dist. Temascaltepec, Puerto Salitre, 1250 m, 10 Jul 1933, *Hinton 4303* (K, NY, US); Zináparo, 20.13°N, 102.02°W, s.d., *Labat 995* (P); Mpio. Penjamillo, 2 km NW of Penjamillo, 20.11°N, 101.92°W, 1850 m, 25 Jul 1990, *Pérez & García 1476* (IEB, MEXU), 26 Jul 1990, *Rodríguez 1476* (MEXU); 10 km W of Morelia, near Cerro de Aguila, at Km 329 on Hwy 15, 19.69°N, 101.13°W, 2000 m, *Ugent 2002* (K); Uruétaro, 7.4 km NE of Tarímbaro, on Morelia to Zinapécuaro Road, 19.80°N, 101.08°W, 2100 m, 14 Sep 1962, *Ugent & Flores 2017–2036* (BM, ENCB, GAT, GH, MEXU, MICH, MO, US, WIS); Cerro del Aguila, about 16 km WSW of Morelia, Km 329 on Hwy 15 (Morelia to Quiroga), S side of rd, 19.69°N, 101.12°W, 2000 m, 12 Sep 1962, *Ugent et al. 1894–1911* (MICH, MO, US).—MORELOS: near Cuernavaca, 19.02°N, 99.28°W, 26 Jun 1896, *Pringle 7368* (MEXU, NA); Texcal, on road from Cuernavaca to Tepoztlán, 18.97°N, 99.18°W, 1750 m, 20 Aug 1993, *Rodríguez et al. 2551* (F, IBUG, MICH, MO, NY, PTIS, WIS).—OAXACA: Km 568, CR-American Hwy, and 1 mi W, 27 May 1950, *Baldwin 14320* (LL, NA); Pan American road, Km 568, beyond Oaxaca, 1 mi W of a junction, 17.05°N, 96.78°W, 1850 m, 30 Sep 1962, *Flores & Ugent S-689* (K, LL, MEXU); along Rt 190, 3 mi E of Tlacolula, 17.78°N, 96.80°W, 14 Aug 1961, *Powell & Edmondson 698* (TEX); Rt 125, 98.5 km SW of Rt 190 (by posted km signs), S of Santa María Asunción Tlaxiaco, 17.25°N, 97.70°W, 2400 m, 17 Sep 1988, *Spooner et al. 4163* (INIFAP, PTIS); turning E off Pan American Hwy 190 S of Oaxaca at Km 568, about 1.8 km along track, 1680 m, 27 Oct 1967, *Tarn & Gómez 251* (K); archeological site of Yagul, 4.6 km SE of Tlacolula, 16.95°N, 96.48°W, 1 Aug 1983, *Torres & Hernández 3386* (MEXU); 15 km SE of Oaxaca (1.6 km SW of km 568 CR American Hwy), 16.99°N, 96.59°W, 1740 m, 1 Oct 1962, *Ugent et al. 2559–2566, 2568–2572, 2575–2578, 2584–2585, 2587–2604* (BM, ENCB, GAT, GH, MEXU, MICH, MO, US, WIS).—PUEBLA: 51 km from Tehuacán on road to Huajuapán de León, 18.49°N, 97.40°W, 1950 m, 25 Sep 1957, *Graham 324* (LL, US); near Tehuacán, by road from Puebla to Orizaba, 18.49°N, 97.40°W, 1800 m, 24 Jul 1949, *Hawkes et al. 1032* (K, LL); near Tehuacán, 2 mi on road to Veracruz from the Puebla to Tehuacán road, 18.49°N, 97.40°W, 1750 m, 6 Oct 1958, *Hawkes et al. 1638* (C, K); near Tehuacán, 4 mi on road to Veracruz from the Puebla to Tehuacán road, 18.49°N, 97.40°W, 1800 m, 6 Oct 1958, *Hawkes et al. 1640* (C, US); Hacienda Noria, 1600 m, 14 Oct 1909, *Nicolas s.n.* (E, P); El Riejo, Jul 1905, *Purpus 1282* (MO); vicinity of San Luis Tultitlanapa, near Oaxaca, Jun 1908, *Purpus 3364* (F, GH, NY); Mpio. San Miguel Ixitlán, San Antonio del Río, on the Huajuapan de León to Tehuacán road, 17.99°N, 97.82°W, 1930 m, 15 Aug 1993, *Rodríguez et al. 2529* (IBUG, PTIS, WIS); Mpio. Caltepec, Santiago Acatepec, on the side of the road from Huajuapan de León to Tehuacán, 18.17°N, 97.48°W, 2050 m, 15 Aug 1993, *Rodríguez et al. 2533* (IBUG, PTIS, WIS); road from Tehuacán to Orizaba, just at the junction to Miahuatlán, 18.52°N, 97.42°W, 1870 m, 16 Aug 1993, *Rodríguez et al. 2534* (F, IBUG, MICH, NY, PTIS, WIS); Km 19 from Tehuacán on the road to Orizaba, just at the intersection to Ciudad Serdán, 18.58°N, 97.38°W, 2110 m, 16 Aug 1993, *Rodríguez et al. 2538* (IBUG, K, PTIS); Cañada de Rojas, road from Tehuacán to Orizaba, 18.67°N, 97.37°W, 2150 m, 16 Aug 1993, *Rodríguez et al. 2541* (IBUG, K, PTIS, WIS); road from Tehuacán to Orizaba, junction to San Vicente, 18.53°N, 97.40°W, 1820 m, 17 Aug 1993, *Rodríguez et al. 2544* (IBUG, PTIS, WIS); left side of the Tehuacán to Huajuapan de León road on the Puebla side of border, Hwy 125, almost at Puebla-Oaxaca state border, 18.62°N, 97.58°W, 2060 m, 25 Oct 1967, *Tarn 241D* (PTIS); new toll road from Mexico to Veracruz, just before Km 150, about 150 m to the right of road, 19.28°N, 98.43°W, 2220 m, 23 Oct 1967, *Tarn & Gómez 218* (K).—QUERÉTARO: San Juan del Río, hill SW of the town, 20.38°N, 100.00°W, 2050 m, 25 Aug 1949, *Hawkes et al. 1087* (LL); San Juan del Río, rocky hill just NW of town on W-facing slope of Cerro Casas Grandes, 20.38°N, 100.00°W, 2000 m, 4 Sep 1958, *Hawkes et al. 1402* (C); hwy from Mexico City to Querétaro City, just on the Querétaro-México state border, 20.28°N, 99.90°W, 2174 m, 22 Aug 1993, *Rodríguez et al. 2560* (IBUG, PTIS); E side of Rt 57, SE of San Juan del Río, about 2 km N of Palmillas, 20.34°N, 99.94°W, 2150 m, 10 Sep 1988, *Spooner et al. 4148* (INIFAP, WIS).—SINALOA: foothills of the Sierra Madre near Colomas, 16 Jul 1897, *Rose 1707* (GH, US).—TLAXCALA: Tizatlán, near Tlaxcala, walls by lane, 19.33°N, 98.22°W, 2150 m, 11 Aug 1949, *Hawkes et al. 1059* (K).—ZACATECAS: Rt 49 from Zacatecas to San Luis Potosí, at Km 139, on N side of road, 22.68°N, 102.10°W, 2060 m, 8 Sep 1997, *Rivera-Peña et al. 914* (INIFAP, MEXU).

Solanum cardiophyllum is very similar to *S. ehrenbergii*, *S. jamesii*, and *S. stenophyllidium*. It is distinguished from all of them by its white-cream corollas (pure white or pure white tinged with violet in the other species), its minute calyx lobe acumens only to 0.5 mm long (vs. 1–2.5 mm long), and its small anthers 3–4 mm long (vs. 4.5–6 mm long).

Bitter (1912) recognized *Solanum cardiophyllum* subsp. *lanceolatum* var. *amphixanthandrum* and var. *endoiodandrum* when he proposed the combination *S. cardiophyllum* subsp. *lanceolatum*. He considered var. *amphixanthandrum* to be the "typical" variety and var. *endoiodandrum* to differ by its purple (not typical yellow) anthers. Berthault's description mentioned yellow anthers, so we consider var. *amphixanthandrum* to apply to the nominate variety. Both names were described from different sheets of *Pringle 8599*, and Bitter's annotations clarify his choice of sheets. The holotype of var. *endoiodandrum* has yellow anthers only slightly tinged with purple.

We consider the locality of the following collection of *S. cardiophyllum* mislabeled: MEXICO. Chiapas: Cerro Zontehuitz, almost at the top by the microwave station, 2800 m, 8 Jul 1966, *Flores S-952* (CHAPA, K, MEXU). The collection number *Flores S-952* applies to another collection of *S. stoloniferum* from Michoacán. No collections of *S. cardiophyllum* have been recorded from Chiapas.

2x(2EBN) SPECIES—VERRUCOSA GROUP

14. Solanum verrucosum Schlechtendal, Index sem. hort. halensis: 10. 1839.—TYPE: "Ad vias in muris, per sylvas pr. Mineral Real del Monte frequ. vel cult in Hort. Bot. Hal?," *C. A. Ehrenberg s.n.* (lectotype, here designated: HAL!; epitype, here designated: the plate, t. 2, fig. 1 in Schlechtendal, 1841; reproduced here as Plate 9).

Solanum squamulosum Martens & Galeotti, Bull. Acad. Roy. Sci. Bruxelles 12(1): 140. 1845.—TYPE: MEXICO. Hidalgo: in alpine forests of Real del Monte, 8000 ft, Sep 1840, *H. G. Galeotti 1221* (holotype: BR!, photos [Correll neg. 671]: BH! BM! F! GH! K! LL! UC!; isotype: W!, photos [F neg. 33111]: F! MO!).

Solanum macropilosum Correll, Wrightia 2: 189. 1961.—TYPE: MEXICO. Nuevo León: Cerro del Viejo, Mpio. Zaragoza, 15 mi W of Dulces Nombres, on limestone boulders in open pine woods, 3330 m, 18 Aug 1948, *F. G. Meyer & D. J. Rogers 2968* (holotype: G!, photos [Correll neg. 446]: BM! F! GH! K! LL! NY! UC! US!; isotypes: BR! E! MO!, photo of BR isotype: NY!, photos of E isotype [Correll neg. 187]: A! BM! F! GH! K! LL! NY! UC! US!, photos of MO isotype [Correll neg. 188]: BM! F! GH! K! LL! NY! UC! US!).

Plants 0.2–0.5 m tall, herbaceous, terrestrial, erect to ascending. Stems 3–6 mm in diameter at base of plant. Pseudostipules 3–7 mm long, lunate. Leaves 9.5–21 cm long, 6–15 cm wide, odd-pinnate, puberulent to pubescent adaxially and abaxially; petioles 1.5–6 cm long; lateral leaflet pairs 1–4, the size of the lateral leaflets typically diminishing abruptly towards the base of the leaf; most distal lateral leaflets 2.2–4 cm long, 1.6–2.4 cm wide, ovate to narrowly to broadly elliptical, apex acute to acuminate, base oblique, cuneate, sessile or with petiolules up to 2.8 mm long, sometimes the most distal laterals decurrent; terminal leaflet 3–8.5 cm long, 1.5–4.5 cm wide, ovate to elliptical, apex acute to acuminate, base cuneate; interjected leaflets typically absent or scarce, up to 7. Inflorescences generally in distal half of plant; peduncle 3–9 cm long. Flowers 4–11; pedicels 10–29 mm long, articulate between the proximal 1/4 and the distal 1/4; calyx 4–8 mm long, lobes acute to long-attenuate, acumens 1–3 mm long; corolla 2–2.8 cm in diameter, rotate to rotate-pentagonal, acumens 1–3 mm long, edges of corolla inrolled dorsally, bluish purple above, dark violet below; anthers 3.5–6.5 mm long, connate; style 5–10 mm long, exceeding stamens by 3–5 mm, straight. Fruits 1–1.3 cm long, globose, medium green, often

with smooth to raised white dots. Seeds from living specimens green-white throughout. Chromosome number: 2n = 24. EBN = 2. Plates 3E, 4J, 9.

Phenology. Flowering and fruiting June through November.

Distribution (Fig. 29). Widely distributed throughout Mexico from the northeast (Coahuila, Nuevo León, San Luis Potosí) to central Mexico and south to Oaxaca; often in cloud forests, in rich soil in alder, fir, pine, and oak forests, among bushes, at roadsides, clearings in woods, among grasses; (1870–) 2100–3500 (–4000) m.

See Appendix for a list of Specimens Examined (p. 158).

Solanum verrucosum is very similar to some populations of *S. stoloniferum* and *S. demissum*, as described under Polymorphism and Phenotypic Plasticity (above). It is best distinguished by the corollas with the edges inrolled dorsally (Plates 3E, 9), but this is difficult to see on poorly prepared specimens.

Hawkes (1990) recognized *S.* ×*vallis-mexici* as a triploid nothospecies, formed by hybridization between *S. stoloniferum* and *S. verrucosum*. We have difficulty distinguishing *S.* ×*vallis-mexici* from *S. stoloniferum* in the herbarium, and poorly preserved specimens of *S. verrucosum* could also be confused with either of the above. We maintain this nothospecies based on some populations documented to be triploid and specimens with a generalized aspect similar to the lectotype here chosen.

Schlechtendal (1839) published the name *S. verrucosum* in *Index seminum in horto academico halensi in 1839 collectorum*, reprinted in *Linnaea* 14 (Litt.): 126–140. 1840 [or 1841]. We have not been able to locate the original publication. These seed catalogues are extremely rare. The 1839 catalog was not found by Mabberley (1983; who searched for it at BM, CGE, K, OXF) nor Stafleu and Cowan (1985). We have not been able to locate it at other logical places of deposition, such as B, C, or HAL. We must rely on the description given in the *Linnaea* reprint, but it does not provide us the original page of publication.

Schlechtendal described *S. verrucosum* in detail in 1841. The original publication (as assessed by the *Linnaea* reprint) bears only a short description and cites no collection number, but in the *Hortus halensis* Schlechtendal provides a detailed description and color illustration (reprinted as Plate 9 here), based on specimens collected by Ehrenberg (no collection number given) in Mineral del Monte, on roads, in forests, walls, etc., flowering July to October (no year mentioned). Hawkes (1957) reasoned that the lack of a clear description invalidated the first publication, but this is incorrect because the first publication satisfied the requirements of the Code (see also Mabberley, 1983).

Hawkes (1957) showed that duplicates of *Ehrenberg 80* and *Ehrenberg 1132*, both from Mineral del Monte, from various herbaria are *S. stoloniferum* or *S. verrucosum*, or mixed sheets of both species. He therefore avoided these and chose three "co-lectotypes" for *S. verrucosum*. One is a specimen from HAL annotated as *S. verrucosum* by Schlechtendal that now lacks flowers and fruits. This specimen has a typed label of "Mexico: ad vias in muris, per sylvas pr. Mineral Real del Monte frequ. vel cult in Hort. Bot. Hal." A separate label in Schlechtendal's hand reads "*Solanum verrucosum* D. F. L. von Schlechtendal, Linn XIX. p. 273." The second is a sheet at M bearing three specimens, all labeled "Hort bot. Monacensis, 1846", and the third the illustration in the *Hortus halensis* of 1841.

Such co-lectotypification is not admissible according to the Code, and a single lectotype must be designated. We reject the three specimens at M and the illustration, because they are dated after the original publication in 1839. The specimen at HAL is labeled to suggest that it is original material, and we choose it as lectotype, even though it lacks flowers or fruits useful for fixing the name. The highly diagnostic illustration in the *Hortus*

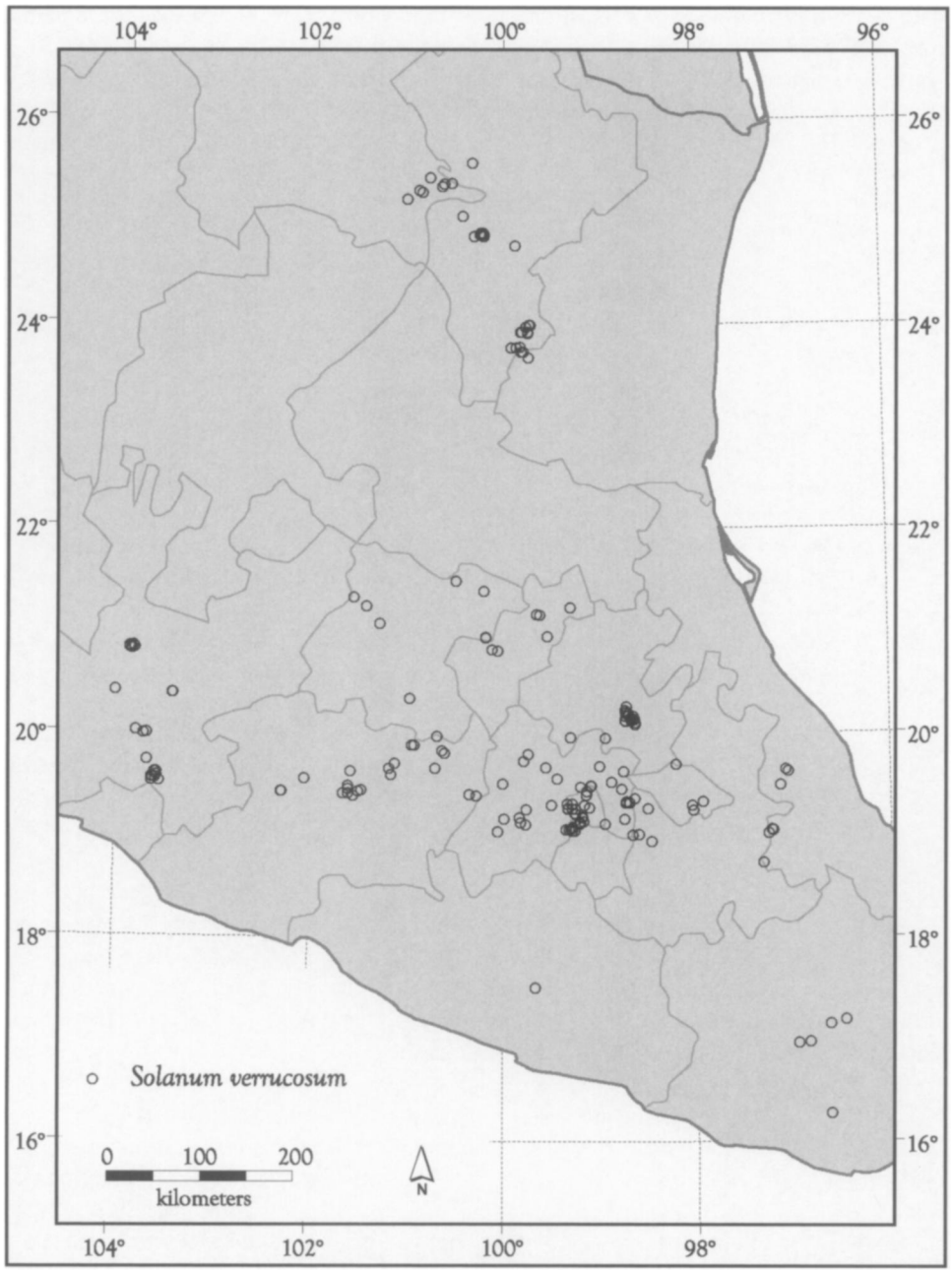


FIG. 29. Distribution of *Solanum verrucosum*.

halensis (1841) demonstrates the author's intention for this species and thus is a suitable epitype (for a definition of "epitype," see the Code, Article 9.7, Greuter et al. 2000: 13).

4x(2EBN) Species—Longipedicellata Group

15. Solanum hjertingii Hawkes, A revision of the tuber-bearing solanums, 2d ed., 123, 171. 1963.—Type: Mexico. Coahuila: near Saltillo, Lirios, fields S of village on lower border of mountain forests, growing as weed of cultivation, 2300 m, 23 Aug 1958, *J. G. Hawkes, J. P. Hjerting & R. N. Lester 1356* (lectotype, here designated: K, the lowermost of three specimens on a sheet labeled "sheet 1"!; isolectotypes: C! K! US-3314897!).

Solanum fendleri var. *physaloides* Correll, Agric. Monogr. U.S.D.A. 11: 157, figs. 105, 106. 1952. *Solanum hjertingii* var. *physaloides* (Correll) Hawkes, The potato: evolution, biodiversity and genetic resources, 188. 1990.—Type: Mexico. Tamaulipas: on mountain side with sparse vegetation of *Agave* and low herbs, 4 km W of Miquihuana, 2700 m, 7 Aug 1941, *L. R. Stanford, K. L. Retherford & R. D. Northcraft 743* (holotype: DS!, photos [Correll neg. 748]: BM! F! GH! K! LL! NY! UC! US!; isotypes: ARIZ! GH! MO! NY!, photos of GH isotype [Correll neg. 747]: BM! F! GH! K! LL! NY! UC! US!, photo of MO isotype: K!, photo of NY isotype: US!).

Solanum matehualae Hjerting & T. R. Tarn, Phytologia 65: 116. 1988.—Type: Specimens prepared from plants cultivated from seeds at Sturgeon Bay, Wisconsin, U.S.A., *J. P. Hjerting, R. W. Ross & J. Gómez 155* (holotype: K!; isotypes: A! B! BM! BR, C! F! G! K! MEXU! MPU! NY! P! S! WAG! WIS!, photos of MPU isotype: PTIS! WAG!). [Seed source: Mexico. San Luis Potosí: Sierra de Catorce, road turning off 10 km W of Cedral (N of Matehuala), track to Real de Catorce, 2 km above tunnel, 2740 m, 13 Oct 1983, *J. P. Hjerting, R. W. Ross & J. Gómez 155*.]

Plants 0.2–0.4 m tall, herbaceous, terrestrial, erect to ascending. Stems 3–6 mm in diameter at base of plant. Pseudostipules 4–14 mm long, lunate. Leaves 10.5–21 cm long, 5–12 cm wide, odd-pinnate, glabrous or glabrescent and with scattered hairs, especially on veins, adaxially and abaxially; petioles 1.5–3 cm long; lateral leaflet pairs 2–4, the size of the lateral leaflets gradually diminishing towards the base of the leaf; most distal lateral leaflets 2–4 cm long, 0.9–2.3 cm wide, ovate to narrowly or broadly elliptical, apex acute to acuminate, base oblique, cuneate to cordate, petiolules 2–7 mm long; terminal leaflet 2.5–4 cm long, 1–2.5 cm wide, narrowly to broadly elliptical to obovate, apex acute to acuminate, base cuneate to cordate; interjected leaflets 2–19. Inflorescences generally in distal half of plant; peduncle 2.5–12 cm long. Flowers 6–18; pedicels 16–28 mm long, articulate between the proximal 1/4 and the distal 1/4; calyx 10–27 mm long, lobes acute to long-attenuate, acumens 1–4 mm long; corolla 2.7–3.6 cm in diameter, pentagonal to rotate, acumens 1.5–4 mm, edges of corolla flat, not folded dorsally, light violet adaxially, darker violet abaxially; anthers 2.5–7.5 mm long, connate; style 10–11 mm long, exceeding stamens by 2–8 mm, curved. Fruits 0.8–1.2 cm long, globose to slightly ovoid, greenish white to medium green with white spots or medium green throughout. Seeds from living specimens green-white throughout. Chromosome number: 2n = 48. EBN = 2. Plate 3H, Fig. 30.

Phenology. Flowering and fruiting July through October.

Distribution (Fig. 31). Mexico (Coahuila, Nuevo León, San Luis Potosí, Tamaulipas);

FIG. 30. *Solanum hjertingii*. A. Habit. B. Two flowers, adaxial and side views. C, D. Lateral leaflet, adaxial (C) and abaxial (D) views. (Based on *Hawkes et al. 1114*, K.)

in and at borders of cultivated fields, in pine, oak, and juniper forests, bushy hillsides, grasslands, fencerows; (1230–) 1650–3210 m.

ADDITIONAL SPECIMENS EXAMINED. **Mexico.** COAHUILA: near Saltillo, Rancho Chupadero, on the road to Los Lirios, 25.55°N, 101.03°W, 2000 m, 30 Sep 1966, *Flores S-957* (MEXU); 6 km from Saltillo, near the Agriculture School, 25.41°N, 101.00°W, 1650 m, 30 Sep 1966, *Flores S-958* (K, MEXU, NY, WAG); near

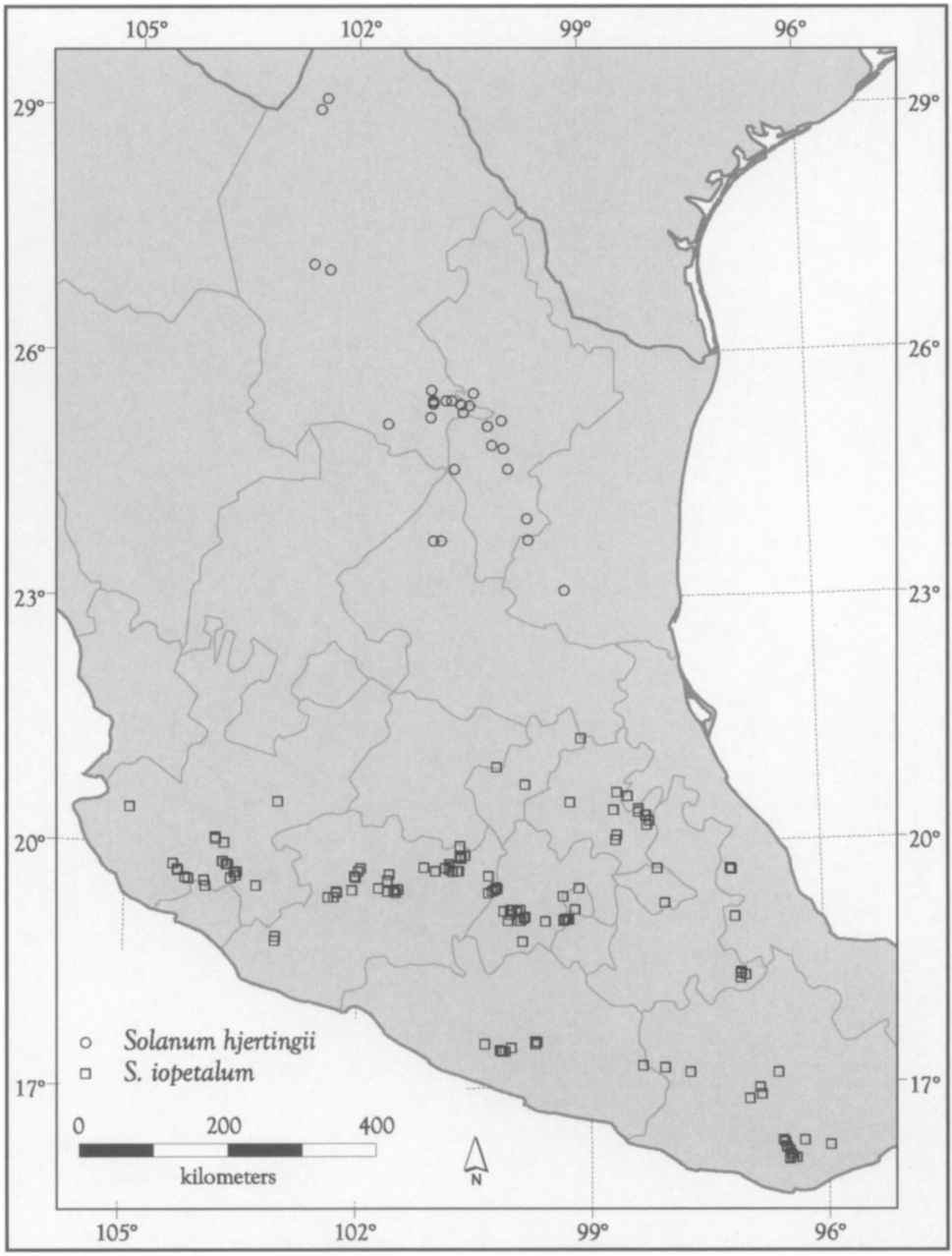


FIG. 31. Distribution of *Solanum hjertingii* and *S. iopetalum*.

Saltillo, School of Agriculture, Valley of Saltillo, 8 km from Saltillo, 25.38°N, 101.00°W, 1650 m, 11 Oct 1949, *Hawkes et al. 1112* (C, K, LL); Mpio. Artiaga, near Saltillo, Cañón de Los Lirios, Chupadero, Sierra Madre Oriental, 25.41°N, 101.00°W, 2000 m, 12 Oct 1949, *Hawkes et al. 1113* (C, IBUG, K, LL, MEXU, PTIS); Mpio. Artiaga, near Saltillo, Cañón de Los Lirios, Chupadero, Sierra Madre Oriental, 25.38°N, 101.00°W, 2250 m, 12 Oct 1949, *Hawkes et al. 1114* (C, IBUG, K, MEXU, PTIS); Saltillo, School of

Agriculture, about 5 mi S of Saltillo, 25.38°N, 101.00°W, 1760 m, 23 Aug 1958, *Hawkes et al. 1353* (C, IBUG, K, MEXU), *Hawkes et al. 1358* (K, PTIS); Saltillo, E of Saltillo, Cañón de Los Lirios, 4 mi W of the Lirios village, 25.42°N, 101.00°W, 2200 m, 23 Aug 1958, *Hawkes et al. 1355* (C, IBUG, K, MEXU, PTIS); Saltillo, 19 mi from Saltillo, Rt 57, entering at Puerto de Flores on the track to Rancho Las Vacas, 25.42°N, 101.00°W, 2100 m, 23 Aug 1958, *Hawkes et al. 1357* (C, IBUG, K, MEXU, PTIS, US); about 35 km by air W of Cuatro Ciénegas in Canyon de la Hacienda on limestone, Sierra de la Madera along trail SE of roads end, 27.09°N, 102.61°W, 2408 m, 5 Aug 1973, *Henrickson & Wendt 11914* (LL); Mpio. Arteaga, S of Coahuilón, 25.42°N, 100.75°W, 3210 m, 30 Jun 1985, *Hinton et al. 18894* (TEX); 7 mi S of Arteaga, 25.42°N, 100.83°W, 16 Aug 1948, *Kenoyer & Crum 2823* (A); Saltillo and vicinity, 25.42°N, 101.00°W, Jun 1898, *Palmer 305* (F, G, GH, K, MO, NA, NY, UC, US); Sierra Madre, 40 mi S of Saltillo, 25.21°N, 101.03°W, Jul to Aug 1880, *Palmer 938* (F, G, GH, K, NA, P, PH, US, WU); Mpio. Ocampo, Maderas del Carmen Mountains, 28.98°N, 102.53°W, 6 Aug 1974, *Riskind et al. 1743* (LL); E of Saltillo in Cañón de Los Lirios, 9 km S of Los Lirios on road to Cola de Caballo, 25.35°N, 100.51°W, 2250 m, 22 Sep 1997, *Rivera-Peña et al. 927* (INIFAP, MEXU); near Saltillo, Los Lirios village, 50 km from Saltillo on the road to Allende, 25.37°N, 100.63°W, 2340 m, 14 Oct 1983, *Tarn et al. 159* (C, IBUG, K, MEXU, PTIS); Los Lirios, 50 km from Saltillo on the road to Allende, 700 m S of the village go up the slope towards the woods, 25.37°N, 100.63°W, 2340 m, 14 Oct 1983, *Tarn et al. 160* (IBUG, MEXU, PTIS); 5 km E of San Antonio de las Alazanas, village of Efigenia, 25.27°N, 100.60°W, 2350 m, 15 Oct 1983, *Tarn et al. 163* (IBUG, MEXU, PTIS); Rancho of Mr. Arzuaga at Las Playas in Sierra Tapón de Toro, NW of Santa Anita, SW of Saltillo, 25.13°N, 101.60°W, 2300 m, 26 Sep 1984, *Tarn et al. 239* (K, PTIS); on N, igneous slopes of Picacho del Centinela, Del Carmen Mountains, 29.12°N, 102.45°W, 1829 m, 24 Aug 1953, *Warnock 11596* (SRSC, TEX); Cañón de la Barrica, S facing slope, at base of massive S cliffs of Picacho El Pajarito, 27.03°N, 102.39°W, 2200 m, 28 Aug 1975, *Wendt & Lott 1354* (LL).—NUEVO LEÓN: near mount of N facing canyon, about 2 mi SW of Pablillo, 21 Jul 1958, *Correll & Johnston 19958* (K, LL, S, UC, US); San Antonio de Alanzanar, 25.17°N, 100.09°W, 1848–1849, *Gregg 420* (GH, K, MO, NY); W side, La Joya de Abajo, just below Las Canoas, 25.51°N, 100.47°W, 2450 m, 25 Aug 1958, *Hawkes et al. 1373* (B, C, K); Cerro Potosí, bottom of creek, below Las Canoas, edge of La Joya de Abajo, 24.87°N, 100.22°W, 2500 m, 25 Aug 1958, *Hawkes et al. 1378* (BR, C, IBUG, K, MEXU, MPU, PTIS); Mpio. Galeana, Cerro Potosí, W side, La Joya de Abajo, 24.87°N, 100.22°W, 2400 m, 25 Aug 1958, *Hawkes et al. 1379* (C, K, US); Cerro El Viejo, Zaragoza, 23.97°N, 99.77°W, 1930 m, 23 Sep 1923, *Hinton 23504* (TEX); Mpio. Rayones, Galeana to Rayones, 25.10°N, 100.29°W, 1230 m, 17 Oct 1990, *Hinton et al. 20786* (GH, TEX); El Pañuelo, 24.57°N, 100.72°W, 1725 m, 24 Jul 1991, *Hinton et al. 21114* (TEX); Galeana, 24.83°N, 100.07°W, 1750 m, 14 Sep 1996, *Hinton et al. 25851* (TEX); about 1.5 km S of Pablillo, located on road S of Galeana, near road and in canyon N of road, 24.57°N, 100.01°W, 2120 m, 24 Sep 1997, *Rivera-Peña et al. 933* (INIFAP, MEXU, PTIS, WAG).—SAN LUIS POTOSÍ: Sierra de Catorce, Real de Catorce, 2 km above tunnel, 23.70°N, 100.90°W, 2600 m, 19 Oct 1991, *Hjerting 7387* (PTIS).—TAMAULIPAS: Mpio. Gómez Farías, Sierra de Guatemala, between Julio and Las Canoas, 23.08°N, 99.28°W, 1433–1737 m, 24 Jun 1971, *Sullivan 578* (ENCB, TEX).

Solanum hjertingii is most similar to *S. stoloniferum* but is distinguished by its curved styles, generally long-exserted (2–8 mm) beyond the tip of the anther tube, and glabrous to glabrescent leaves. *Solanum stoloniferum* has straight styles exserted 2–4.5 mm beyond the tip of the anther tube and strigose, puberulent, or pubescent leaves.

Hawkes (1963) designated a specimen at K of *Hawkes et al. 1356* as the "type" of *S. hjertingii*. There are two sheets at K labeled "sheet 1" and "sheet 2," both marked as isotypes on labels typed by Hawkes. Sheet 1 has three separate specimens, and the lowestmost is chosen as lectotype.

Hjerting and Tarn (in Hawkes et al. 1988) described *S. matehualae* and suggested it was most similar to *S. hjertingii*. Spooner et al. (2001b) showed these two taxa to cluster in an analysis of morphological data, and van den Berg et al. (2002) showed such clustering in analyses of RAPD and AFLP data. The only morphological character we find to distinguish the two elements is a slight difference in corolla color, with *S. matehualae* darker purple than *S. hjertingii*.

16. Solanum stoloniferum Schlechtendal, Linnaea 8: 255. 1833.—TYPE: Specimens prepared from plants cultivated at the Berlin Botanic Garden, *W. Schiede & F. Deppe 192 p.p.* (lectotype, designated by Hawkes, 1957: UPS!; isolectotypes: GH! GOET! HAL! W!, photos of W isolectotype [F neg. 33113]: F! G! GH! LL! MICH! MO! US!). [Source of propagules: MEXICO. Veracruz: Mount Orizaba, Lake Huatulaca, Sep 1828–1830, *C. J. W. Schiede & F. Deppe 192 p.p.*]

Solanum fendleri A. Gray, Amer. J. Sci. Arts, ser. 2, 22: 285. 1856, non *Solanum fendleri* Van Heurck & Müller Argoviensis, 1884. *Solanum tuberosum* var. *boreale* A. Gray, Syn. fl. N. Amer. 2(1): 227. 1878. *Solanum boreale* (A. Gray) Bitter, Repert. Spec. Nov. Regni Veg 11: 459. 1912.—TYPE: U.S.A. New Mexico: mountains at the copper mines, near summit, at base of rocky ledges, 1851–1852, *C. Wright 1589* (lectotype, designated by Correll, 1952: GH, right-most of three plants on sheet!, photos [Correll neg. 745]: BM! F! GH! K! LL! NY! UC! US!]; isolectotypes: BM! CGE! GH! K[2]! MO! P! PH! TCD! US-66272!, photo of K isotypes: US!).

Solanum schizostigma Bitter, Repert. Spec. Nov. Regni Veg. 11: 449. 1912.—TYPE: MEXICO. Unknown locality, *Aschenborn 306* (holotype: B, destroyed).

Solanum longipedicellatum Bitter, Repert. Spec. Nov. Regni Veg. 11: 457. 1912.—TYPE: MEXICO. Distrito Federal: Valley of Mexico, 2225 m, 10 Sep 1901, *C. G. Pringle 8602* (lectotype, here designated: Z!; isolectotypes: ARIZ! BM! C! CU! E! F! G! GH! GOET! HBG! K! L! M! MICH! MO! NA! NY! P! PH! RSA! UC! US-396767! US-1133282! W11076!, photos of G isolectotype [Correll neg. 683]: F! GH! K! LL! NY! UC!, photos of L isolectotype: PTIS! WAG!, photos of PH isolectotype [Correll neg. 684]: F! GH! K! LL! NY! UC!, photo of US-1133282 isolectotype: PTIS!).

Solanum longipedicellatum var. *pseudoprophyllum* Bitter, Repert. Spec. Nov. Regni Veg. 11: 458. 1912.—TYPE: MEXICO. Distrito Federal: Valley of Mexico, 2225 m, 10 Sep 1901, *C. G. Pringle 8571* (lectotype, here designated: Z!; isolectotypes: B! C! E! F! G! GB, GH! GOET! HBG! K! LD! M! MICH! MSC! NA! NY! P! PH! RSA! UC! US-1133281! US-1324630! W!, photos of GB isolectotype [Correll neg. 541]: F! GH! K! LL! NY! UC!, photos of NA isolectotype [Correll neg. 687]: F! GH! K! NY! UC!).

Solanum papita Rydberg, Bull. Torrey Bot. Club 51: 148. 1924.—TYPE: MEXICO. Durango: Otinapa, 25 Jul–5 Aug 1906, *E. Palmer 392* (holotype: US-571417!, photos PTIS!, also [Correll neg. 160]: BM! F! K! LL! UC! US!; isotypes: CM! F! GH! K! MO! NA! NY! UC!, photo of NA isotype [Correll neg. 920]: BM!, photo of NY isotype: US!). [A specimen with this collection number at K is from plants grown from a tuber of the original collection and is not type material.]

Solanum wightianum Rydberg, Bull. Torrey Bot. Club 51: 149. 1924.—TYPE: Specimens prepared from plants cultivated from tubers at Cambridge, Massachusetts, U.S.A., *F. L. Lozano s.n.* (holotype: GH!, photos [Correll neg. 667]: BM! F! GH! K! PTIS! UC! US!]; isotypes: US-2216240!, photos [Correll neg. 668]: BM! F! K! UC! US!). [Source of tubers: MEXICO. Guanajuato: under cliffs near Acámbaro, Oct 1904, *F. L. Lozano s.n.*; the collectors initials are given as "F. S." in the protologue.]

Solanum polytrichon Rydberg, Bull. Torrey Bot. Club 51: 150. 1924, non *Solanum polytrichum* Moricand, 1837.—TYPE: MEXICO. San Luis Potosí: chiefly in region of San Luis Potosí, 1830–2440 m, 1878, *C. C. Parry & E. Palmer 632*

(holotype: US-42677!, photos: K! LL! PTIS!; isotypes: BM! E! F[3]! G! GH! ISC! K! MO[2], NA! PH!).

Solanum ajuscoense Bukasov ex Rybin, Trudy Prikl. Bot. 20: 699. 1929.—TYPE: MEXICO. Distrito Federal: near Mexico City, close to Ajusco, Xitle, 3100–3200 m, *M. Antipovich & M. Antipovich 1209* (lectotype, here designated: WIR, photos: K! LL!; isolectotype: K!).

Solanum antipovichii Bukasov ex Rybin, Trudy Prikl. Bot. 20: 700. 1929.—TYPE: MEXICO. Distrito Federal: Tlaxpehualco, 2600–2700 m, 26 Aug 1926, *M. Antipovich & M. Antipovich s.n.* (lectotype: here designated, right-most of two fruiting plants on a single sheet: WIR!, photos: K! LL! PTIS!).

Solanum neoantipoviczii ["*neo-antipoviczii*"] Bukasov, Trudy Prikl. Bot. Suppl. 47: 217. 1930. *Solanum antipovichii* ["*antipoviczii*"] var. *neoantipoviczii* (Bukasov) Hawkes, Bull. Imp. Bur. Pl. Breed. Genet., Cambridge 35. 1944.—TYPE: MEXICO. Valle de México, Malinale, *M. Antipovich 13* (holotype: WIR?, not located).

Solanum candelarianum Bukasov, Trudy Prikl. Bot. Suppl. 47: 218. 1930, non *Solanum candelarianum* Cárdenas, 1956.—TYPE: Specimens prepared from plants cultivated from tubers, *M. Antipovich s.n.* (lectotype, here designated: WIR!, photo: PTIS!; isolectotype: WIR, photos: K! LL!). [Source of tubers: MEXICO. Valley of Mexico, at Candelaria, *M. Antipovich s.n.*]

Solanum longipedicellatum var. *longimucronatum* Hawkes, Bull. Imp. Bur. Pl. Breed. Genet., Cambridge 32, 117, fig. 12. 1944.—TYPE: MEXICO. México: Popocatépetl, Amecameca to Paraje Provincial, in woods, open ground, wasteland, and arable land, 8800 ft, 25 Jul 1938, *N. Balls, E. K. Balls & W. B. Gourlay 5097* (lectotype, here designated: K!; isolectotypes: E! K! MICH! UC! US-1794427!).

Solanum malinchense Hawkes, Bull. Imp. Bur. Pl. Breed. Genet., Cambridge 32, 117, fig. 13. 1944.—TYPE: MEXICO. Tlaxcala: La Malinche, Tetlanochán (San Francisco), Extranjerotla, growing on banks between cultivation and among corn, in very sandy soil, 8500 ft, 21 Jun 1938, *N. Balls, E. K. Balls & W. B. Gourlay 4864* (lectotype, here designated: K!, photo: PTIS!; isolectotypes: E! K[2]! UC! US-1794331!, photo of US isolectotype: PTIS!).

Solanum tlaxcalense Hawkes, Bull. Imp. Bur. Pl. Breed. Genet., Cambridge 33, 117, figs. 16, 17. 1944.—TYPE: MEXICO. Tlaxcala: Tizatlán, old walls, stony soil, old Tlaxcala Palace, 7300 ft, 19 Jul 1938, *N. Balls, E. K. Balls & W. B. Gourlay 4843* (lectotype, here designated: K!, photo: PTIS!; isolectotypes: BM! K! UC! US-1794321!).

Solanum leptosepalum Correll, Agric. Monogr. U.S.D.A. 11: 158, figs. 107, 108. 1952.—TYPE: MEXICO. Coahuila: SE of Monclova, Sierra de la Gloria, 4 Aug 1939, *E. G. Marsh 1962* (holotype: F-1219212!, photos [F neg. 49433]: F! G! US!, also [Correll neg. 45]: BM! GH! K! LL! NY! UC! US!]; isotypes: GH! SMU!, photos of GH isotype [Correll neg. 79]: BM! F! GH! K! LL! NY! UC! US!).

Solanum nannodes Correll, Agric. Monogr. U.S.D.A. 11: 161, figs. 109, 110. 1952.—TYPE: MEXICO. Sonora: Cerro Saguarivo, E of San Bernardo, Pacific slope, thin soil over rocks, 1500–1700 m, 7–8 Aug 1935, *F. W. Pennell 19645* (holotype: US-2086416!, photos [Correll neg. 50]: BM! GH! K! LL! NY! US!).

Solanum fendleri var. *texense* Correll, Wrightia 2: 187. 1961.—TYPE: U.S.A. Texas: Jeff Davis Co., infrequent along stream, Little Aguja Canyon near Calf Slide,

Buffalo Trail Scout Ranch, Davis Mountains, 1650 m, 8 Aug 1948, *B. H. Warnock & B. L. Turner, 8058* (holotype: LL!, photos [Correll neg. 746]: BM! F! GH! K! LL! NY, UC! US!; isotype: SRSC!).

Solanum fendleri subsp. *arizonicum* Hawkes, Rec. Scott. Pl. Breed. Sta. 1963: 123, 171. 1963.—TYPE: U.S.A. Arizona: Cochise Co., Chiricahua Mountains, Barfoot Park, rolling and andesitic, rich soil, recently pine-clad area, open westward, 8000–8200 ft, 29 Jul 1907, *J. C. Blumer 1566* (holotype: K!; isotypes: ARIZ! DS! E! F! GH! K! L! MO! NY! U! US-561776! US-563355! W-9202! Z!, photos of L isotype: PTIS! WAG!).

Solanum orbiculatibaccatum Lechnovich, Nauchno-Tekhn. Byull. Vsesoyuzn. Ordena Lenina Ordena Druzhby Narodov Nauchno-Issl. Inst. Rasteniev. N. I. Vavilova 105: 10. 1980.—TYPE: Specimen prepared from plants cultivated from tubers at the WIR station Pavlovskiensi, Russia, type collection *k–17012 (402365)* (holotype: WIR, not located). [Source of tubers: MEXICO. Guanajuato: via La Piedad, by a river in a dry valley, Sep 1977, *A. F. Merezhnko 73.*]

Solanum stoloniferum subsp. *moreliae* Hawkes, The potato: evolution, biodiversity and genetic resources, 191. 1990.—TYPE: MEXICO. Michoacán: near Morelia, 21 km on road to Villa Madero, 2000 m, in grass by a stream or ditch crossing the road, 4 Aug 1965, *J. G. Hawkes 2530* (holotype: K!; isotypes: K! MEXU! WIS!).

Plants 0.2–0.7 m tall, herbaceous, terrestrial, erect to ascending. Stems 2–6 mm in diameter at base of plant. Pseudostipules 5–16 mm long, lunate. Leaves 7.5–22 cm long, 3.5–8 cm wide, odd-pinnate, strigose, puberulent or pubescent adaxially and abaxially; petioles 1.5–4 cm long; lateral leaflet pairs 1–4, the size of the lateral leaflets usually diminishing gradually or sometimes diminishing abruptly towards the base of the leaf; most distal lateral leaflets 2.5–3.2 cm long, 1–2.2 cm wide, elliptical to obovate, apex acute to acuminate, base oblique, cuneate to cordate, petiolules 1.5–6 mm long or sometimes the most distal laterals highly decurrent; terminal leaflet 2.8–6 cm long, 2–3.5 cm wide, elliptical to obovate, apex acute to acuminate, base cuneate; interjected leaflets 0–15. Inflorescences generally in distal half of plant; peduncle 3.4–10 cm long. Flowers 3–26; pedicels 11–37 mm long, articulate between the proximal 1/4 and the distal 1/4; calyx 9–37 mm long, lobes acute to long-attenuate, acumens 1–3 mm long; corolla 1.8–3.3 cm in diameter, pentagonal to rotate, acumens 1.5–4 mm, edges of corolla flat, not folded dorsally, typically light purple adaxially and darker purple abaxially, or white tinged with purple at the tips, less commonly white throughout; anthers 3.5–6.5 mm long, connate; style 5–10 mm long, exceeding stamens by 0–4.5 mm, straight. Fruits 0.9–1.7 cm long, globose to slightly ovoid, almost pure white to deep green, sometimes light green with darker green stripes and white spots. Seeds from living specimens green-white throughout. Chromosome number: 2n = 48. EBN = 2. Plates 3F, G, 4H, I; Figs. 32, 33, 34.

Phenology. Flowering and fruiting July through September in the north (U.S.A.) and July through November further south in southern Mexico.

Distribution (Fig. 35). Southwestern U.S.A. (Arizona, New Mexico, SW Texas) to Oaxaca, Mexico; among boulders on steep hillsides, sandy alluvial stream bottoms, in gravel along trails or roadways, in thick leaf mulch under trees, at edges of cultivated or fallow fields, along fencerows and railways, in organic moist soil to dry sandy soils, in grasslands, juniper-pinion scrub, desert tropical deciduous forests, and fir, pine, juniper, and oak forests; (1040–) 1440–3400 (–3700) m.

See Appendix for a list of Specimens Examined (p. 163).

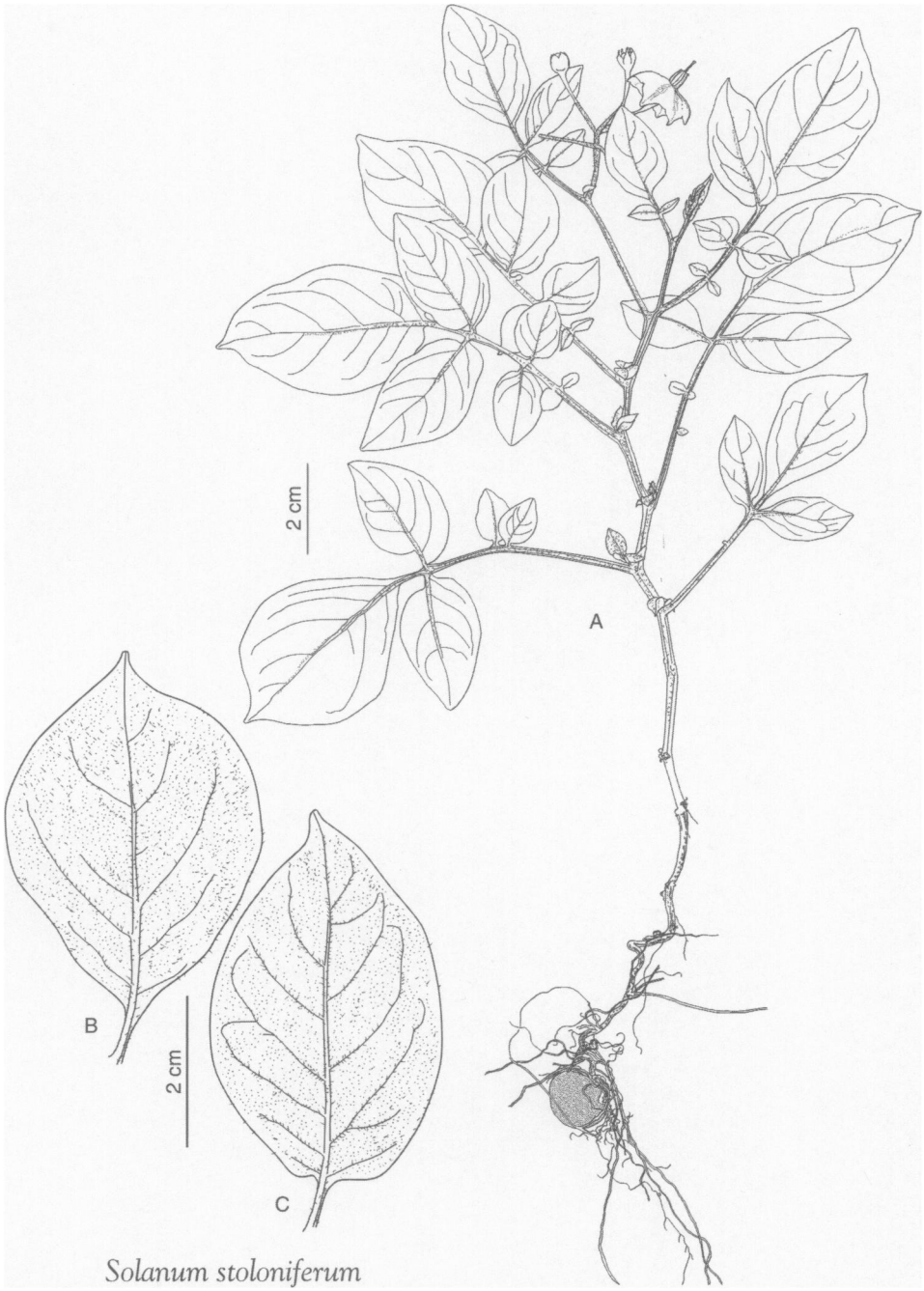


FIG. 32. *Solanum stoloniferum*. A. Habit. B, C. Lateral leaflet, adaxial (B) and abaxial (C) views. (Based on *Wright 1589*, BM, isolectotype of *Solanum fendleri*.)

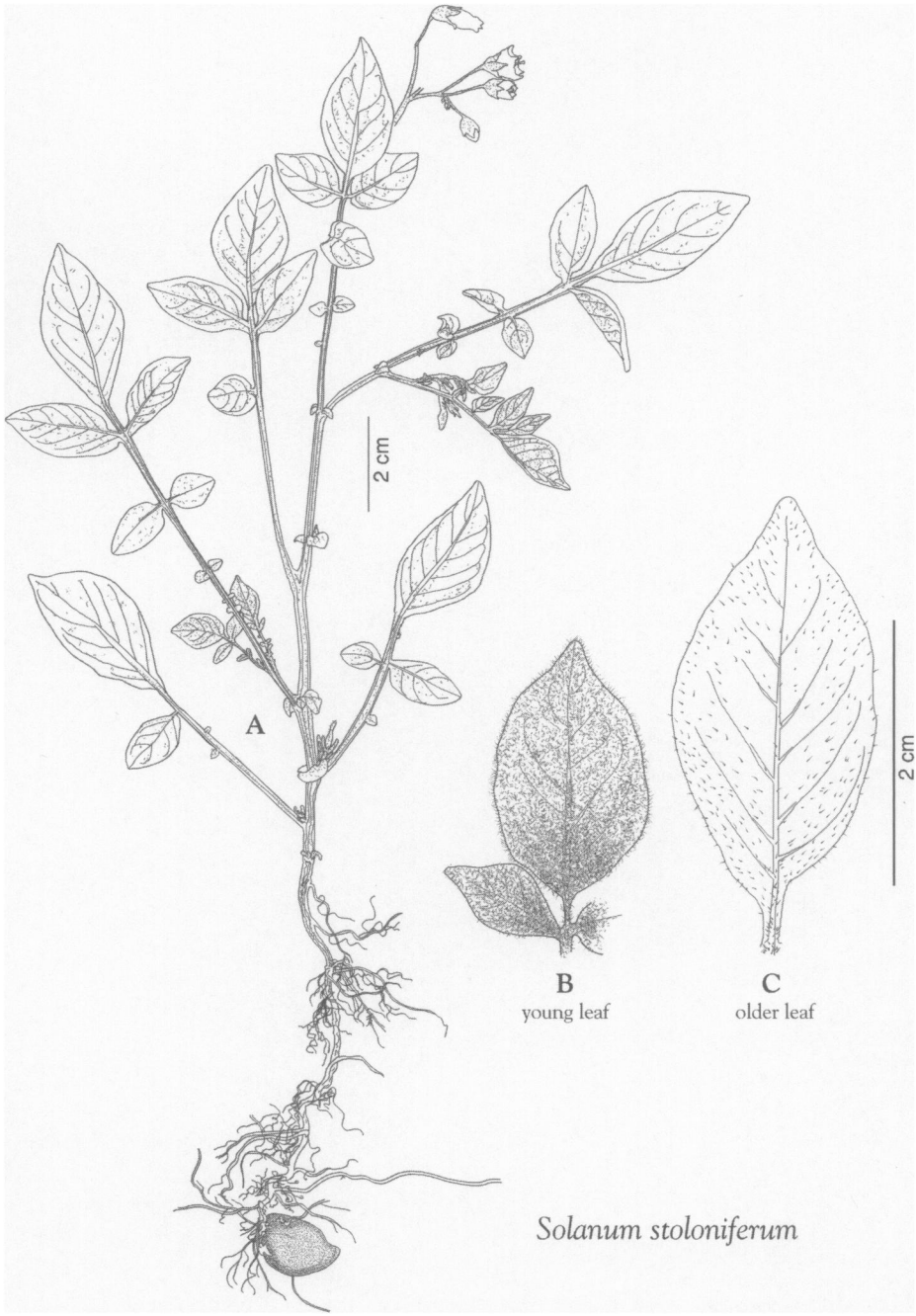


FIG. 33. *Solanum stoloniferum*. A. Habit. B. Young terminal and most distal lateral leaflets, adaxial view. C. Older terminal leaflet, abaxial view. (Based on *Parry and Palmer 632*, BM, isotype of *Solanum polytrichon*.)

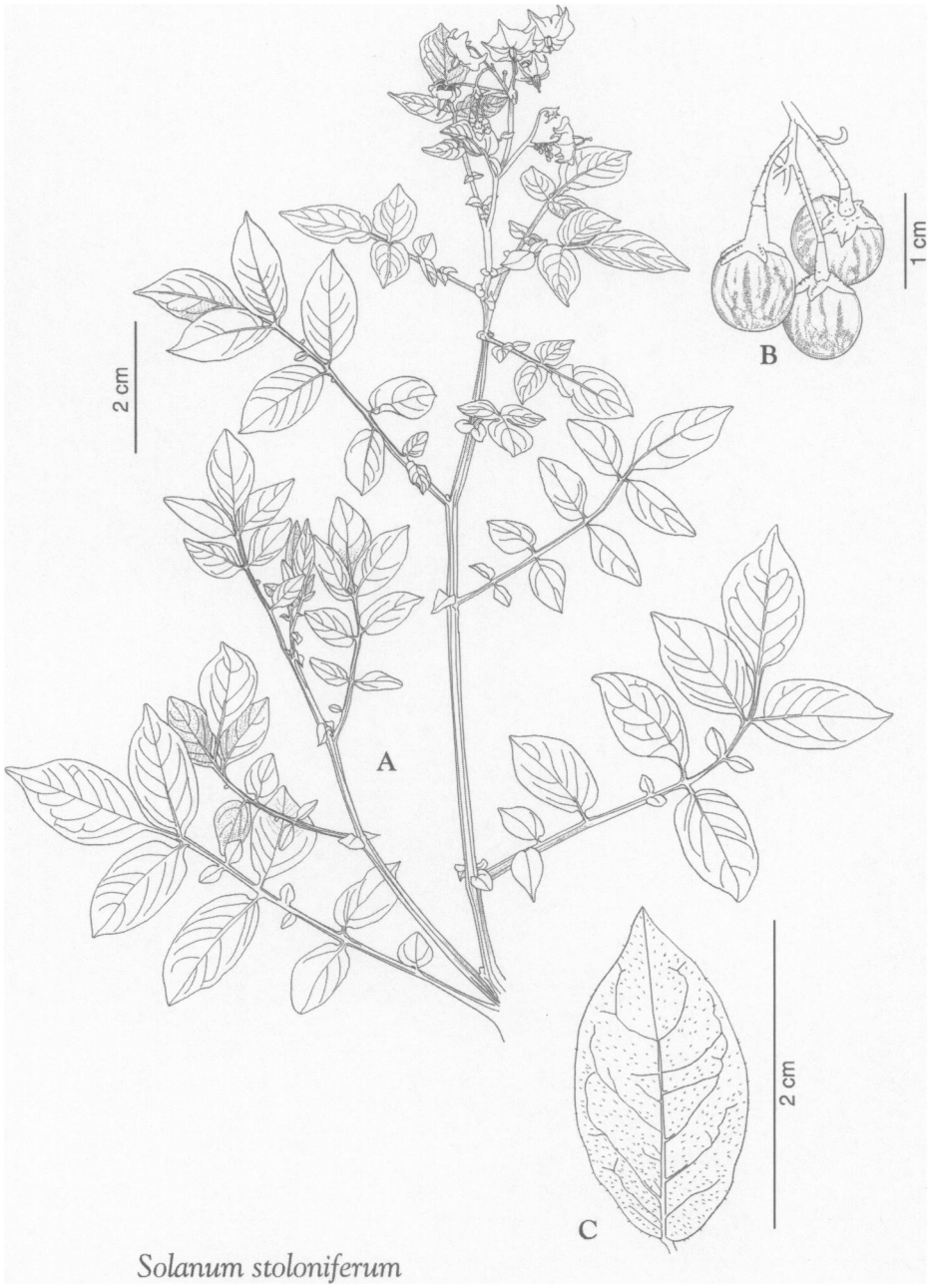


FIG. 34. *Solanum stoloniferum*. A. Habit. B. Portion of infructescence with mature fruits. C. Terminal leaflet, adaxial view. (Based on *Spooner et al. 4163*, PTIS.)

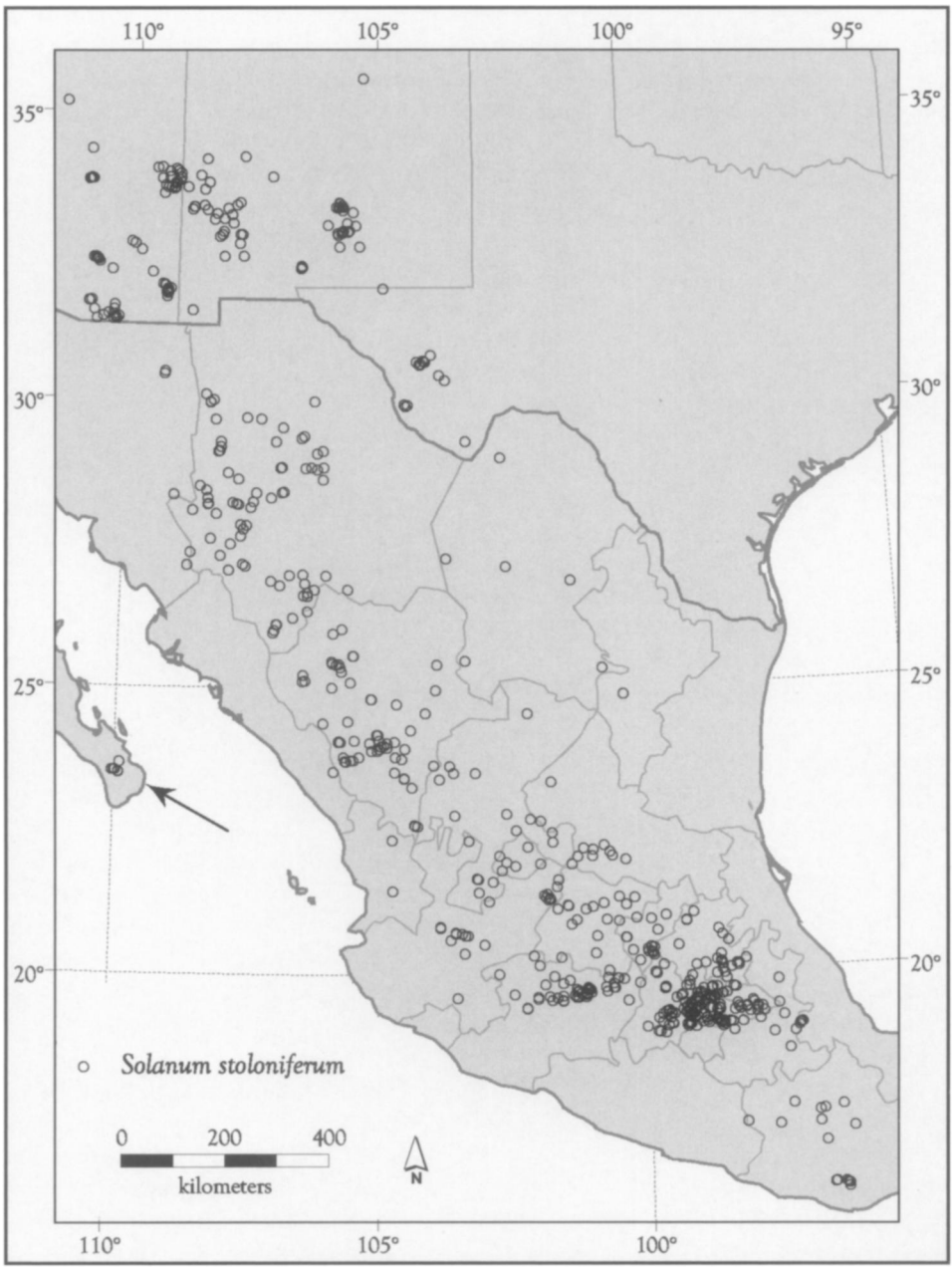


FIG. 35. Distribution of *Solanum stoloniferum*. The arrow points to populations in the Laguna Mountains in southern Baja California Sur.

Solanum stoloniferum is one of the most common, widespread, and polymorphic species of wild potatoes in North and Central America. It is very similar to some populations of *S. demissum*, *S. hjertingii*, and *S. verrucosum*. *Solanum stoloniferum* has pedicel articulation below the distal 1/4 of the pedicel, flat corolla margins, and straight styles exserted only 0–4.5 mm beyond the tip of the anthers. *Solanum demissum* has pedicel articulation in the distal 1/4 of the pedicel, *S. hjertingii* has curved styles exserted 2–8 mm beyond the tip of the anthers, and *S. verrucosum* has corollas with the edges inrolled dorsally.

Hawkes (1990) placed six species in ser. *Longipedicellata*: *S. fendleri*, *S. hjertingii*, *S. matehualae*, *S. papita*, *S. polytrichon*, and *S. stoloniferum*. The specimens Hawkes labeled with these names are all tetraploid (2n = 4x = 48) and grow in the southeastern U.S.A. (Hawkes's *S. fendleri*) and Mexico. Morphological data (Spooner et al. 2001b) supported at best only three species in series *Longipedicellata*: 1) *S. polytrichon*, 2) *S. hjertingii* (including *S. matehualae*), and 3) *S. stoloniferum* (including *S. fendleri* and *S. papita*). *Solanum polytrichon* was supported as a species only by a canonical variate analysis, but not by a principal components analysis that intermixed *S. polytrichon* with many other species, and thus was the least supported species.

Van den Berg et al. (2002) showed *S. polytrichon* to be completely intermixed with *S. stoloniferum* (including *S. fendleri* and *S. papita*) in an analysis of AFLP data. Our reexamination of living accessions previously identified as *S. polytrichon* at Sturgeon Bay, Wisconsin, in 2001 showed that the putative diagnostic characters of spreading pubescence, enlarged terminal leaflets, and white corollas vary tremendously. For example, *Graham 250*, *256*, *315*, *358*; *Hawkes 1468*; *Ochoa 14178* had a clear expression of dense spreading pubescence, enlarged terminal leaflets, and white corollas. Other accessions, however, are impossible to distinguish clearly and consistently as *S. polytrichon* and were supported as species in the canonical variate analysis only by widely overlapping character states. For example, *Tarn et al. 235*, *Rodríguez 2558*, *2571*, and *Spooner et al. 4109* have only few spreading hairs, and *Tarn et al. 212* and *Spooner et al. 4118* have purple corollas. Accessions identified as *S. papita* (*Correll 20075* and *Tarn et al. 114*) have white corollas and spreading hairs. There is such an intergradation of these supposedly "species-specific" characters as to make *S. polytrichon* impossible to recognize as a distinct taxon; the putative smaller corollas distinguishing *S. papita* are not significantly different from those of the other members of this group.

There is a tendency for *S. stoloniferum* to be of shorter stature with fewer interjected leaflets in the northern part of its range when compared to the populations in the southern part; these northern populations have been recognized as *S. fendleri*. Yet, there are so many exceptions (e.g., *Blumer 1566*, type of *S. fendleri* subsp. *arizonicum*, is taller; *Blumer 1579* and *Lemmon 2845* from Arizona have up to four sets of interjected leaflets) that height alone fails to distinguish this formerly recognized species.

Solanum stoloniferum can easily be confused with some landraces of *S. tuberosum*. *Solanum tuberosum* often has wider leaflets and longer peduncles than *S. stoloniferum*, and some landraces have pink corollas (never pink in *S. stoloniferum*). *Solanum tuberosum* is so variable, however, (including cultivars with narrower leaflets, shorter peduncles, and white or blue or purple corollas; e.g., *Mexia 2658* at E, RSA) that the two taxa may be impossible to distinguish consistently and reliably on herbarium sheets.

Hawkes (1990) recognized *S.* ×*vallis-mexici* as a triploid nothospecies, formed by hybridization between *S. stoloniferum* and *S. verrucosum*. We have difficulty

distinguishing herbarium specimens of *S.* ×*vallis-mexici* from *S. stoloniferum*, and poorly preserved specimens of *S. verrucosum* could also be confused with either of them. We maintain *S.* ×*vallis-mexici* as a nothospecies based on some populations documented to be triploid and specimens with a generalized aspect similar to the type of *S. stoloniferum.*

We illustrate some of this variability in Fig. 32 (the type of *S. fendleri*, a short plant with few lateral leaflets and an enlarged terminal leaf), Fig. 33 (the type of *S. polytrichon*, a densely pubescent plant with few lateral leaflets and enlarged terminal leaflet), and Fig. 34 (a common morphotype of *S. stoloniferum*, a taller plant with more and subequal-sized lateral and terminal leaflets). Like us, Correll (1962) was confounded by tremendous variation in *S. stoloniferum*, but he accepted taxa we include here under *S. stoloniferum* and suggested even the need to segregate species from *S. stoloniferum.* Our circumscription of *S. stoloniferum* runs counter to Correll's view (1962: 374): "It is quite probable that when lengthy detailed field studies are made a different, more strict, interpretation of this species will result in the segregation of several rather well defined entities."

Schlechtendal first published *S. stoloniferum* in *Linnaea* 8: 255 [May or June] 1833, and he and Bouché reported on this species in detail a few months later (Verh. Vereins Beförd. Gartenbaues Königl. Preuss. Staaten. 9: 319, tab. 2 [September] 1833). Hawkes (1957) reasoned that the lack of a clear description and confusion concerning location of the type invalidated the first publication, but this is incorrect because the first publication satisfied the requirements of the Code. Hawkes (1957) chose as lectotype of *S. stoloniferum* a cultivated specimen from the Berlin Botanic Gardens, grown from tubers collected in the wild, now deposited at UPS. Hawkes's lectotypification must be followed, but his opinion that the name was not validly published in *Linnaea* is rejected.

Hawkes (1944) designated *Balls et al. 4864* as the type of *S. malinchense* and *Balls et al. 5097* as the type of *S. longipedicellatum* var. *longimucronatum*, but more than one specimen of these numbers exists, necessitating our choosing a lectotype. Also, K has two sheets each labeled with same numbers as these type collections, but the specimens are taken from plants cultivated later and thus are not type material.

Bitter (1912) based *S. schizostigma* on *A. Aschenborn 306*, from an unknown locality in Mexico. The holotype was destroyed and no duplicates have been located. The basal parts of the plant are unknown. The pseudostipules and medial pedicel articulation clearly identify it as a member of sect. *Petota.* Despite an excellent description, Correll (1952, 1962) and Hawkes (1990) could not assign this name to any accepted species, although Hawkes suggested it may apply to *S. cardiophyllum* or *S. hintonii.* The anthers, 5–5.5 mm long, preclude *S. cardiophyllum*, and the subrotate corollas preclude any 2x(1EBN) diploid species. The white subrotate corollas, styles 8–9 mm long, and ovoid fruits ally the type of *S. schizostigma* with S. *stoloniferum.*

We have not been able to locate the types of *S. orbiculatibaccatum* and *S. coriaceifoliolatum* despite searches at WIR. Correll (1952, 1962) and Hawkes (1990) ally both of them with the "collective species" *S. stoloniferum.* The description of *S. orbiculatibaccatum* falls entirely within the range of morphology of *S. stoloniferum.* The description of *S. coriaceifoliolatum* is ambiguous, and therefore we list this name among Doubtful and Excluded Names.

CONICIBACCATA GROUP

17. Solanum agrimonifolium Rydberg, Bull. Torrey Bot. Club 51: 154. 1924.—TYPE: MEXICO. Chiapas: Cerro del Boquerón, Sep 1913, *C. A. Purpus 6977* (holotype: US-567248!, photos: K! PTIS!; isotypes: BM! F! GH! MO! NY[2]!, photo of F isotype: PTIS!, photos of GH isotype [Correll neg. 434]: BM! F! K! NY, PTIS! US-567248!, photo of MO isotype: PTIS!, photos of NY isotypes: LL! PTIS!).

Plants 0.5–2 m tall, herbaceous, terrestrial, erect to ascending. Stems 2–13 mm in diameter at base of plant. Pseudostipules 2–10 mm long, lunate. Leaves 14–48 cm long, 10–24 cm wide, odd-pinnate, finely pubescent adaxially and abaxially; petioles 1–5 cm long; lateral leaflet pairs (3–) 6–7 (–8), subequal or the size of the lateral leaflets diminishing gradually towards the base of the leaf; most distal lateral leaflets 4.5–10.1 cm long, 1.8–2.7 cm wide, narrowly ovate to elliptical, apex acuminate, base oblique, rounded to cuneate, sessile to subsessile with petiolules up to 2 mm long; terminal leaflet 6.2–12.5 cm long, 1.8–3.9 cm wide, ovate to elliptical, apex acute to acuminate, base attenuate; interjected leaflets 4–31. Inflorescences generally in distal half of plant; peduncle 2.8–9.5 cm long. Flowers 8–38; pedicels 15–30 mm long, articulate between the proximal 1/4 and the distal 1/4; calyx 4.5–12.5 mm long, lobes acute to long-attenuate, acumens 1–4 mm long; corolla 2–3 cm in diameter, rotate, acumens 0–6 mm, edges of corolla flat, not folded dorsally, blue to purple adaxially and abaxially; anthers 4–5.5 mm long, connate; style 5–8 mm long, exceeding stamens by 2–3 mm, straight. Fruits 2–5 cm long, conical, obtuse to acute at tip, medium to deep green throughout. Seeds from living specimens green-white throughout. Chromosome number: 2n = 48. EBN = 2. Plates 3I, 4G; Fig. 36.

Phenology. Flowering and/or fruiting collections have been made in every month but April and May.

Distribution (Fig. 37). Southern Mexico (Chiapas), southeast through Guatemala and central Honduras; in wet habitats, organic soils, often in openings of cloud forests, recently logged or otherwise recently disturbed areas in valleys, streamsides, upland marshes, or roadside ditches; 1800–3400 (–3800) m.

ADDITIONAL SPECIMENS EXAMINED. **Mexico.** CHIAPAS: Mpio. Chamula, steep slopes on SE side of Zontehuitz near summit, 16.73°N, 92.67°W, 2865 m, 30 Jul 1964, *Breedlove 6696* (DS, LL, MEXU, US); Mpio. San Cristóbal de las Casas, steep heavily wooded NE slope of Zontehuitz near summit, 16.74°N, 92.68°W, 2835 m, 20 Jul 1965, *Breedlove 11137* (DS, F, LL, MICH, NY); Mpio. San Cristóbal de las Casas, steep NE slope of Zontehuitz near summit, 16.75°N, 92.63°W, 20 Sep 1965, *Breedlove 12343* (DS, F, LL, MEXU, MICH); Mpio. Motozintla de Mendoza, steep canyon, SW side of Cerro Mozotal, 11 km NW of jct of road to Motozintla along road to El Porvenir and Siltepec, 15.35°N, 92.28°W, 2100 m, 17 Jun 1972, *Breedlove 25761* (DS); Mpio. Motozintla de Mendoza, high ridge near Niquivil at jct with a small side ridge to Cerro Boquerón, 15.26°N, 92.22°W, 2600 m, 16 Dec 1976, *Breedlove 42787* (DS); Barrio Emiliano Zapata, high mountains between Huixtla and Motozintla, 15.20°N, 92.30°W, 2180 m, 8 Jul 1966, *Flores S-948* (K, MEXU); San Cristóbal de las Casas, Cerro Zontehuitz, on path to Los Angeles, at the highest point, 16.75°N, 92.63°W, 2900 m, 13 Jul 1949, *Hawkes et al. 1019* (B, K, LL, P); Fraylesca, near Siltepec, 15.65°N, 92.28°W, 2000 m, 11 Mar 1945, *Matuda 5246* (F, LL, MEXU, NA); Amatenango del Valle, 16.52°N, 92.45°W, 1835 m, 14 Jun 1945, *Matuda 30161* (MEXU); Cerro Huitepec, W of San Cristóbal, Mpio. Zinacantán, 16.74°N, 92.69°W, 18 Jul 1985, *Méndez 8353* (MO); Montaña Alcoliades, rt from Motozintla to Porvenir, near Colonia de Las Savias, 15.45°N, 92.28°W, 2930 m, 13 Sep 1980, *Ochoa 14147* (CIP, US); Cerro Zontehuitz, 9.7 km up microwave tower road, turning off the San Cristóbal de las Casas to Tenejapa road, 16.81°N, 92.58°W, 2800 m, 11 Oct 1997, *Rivera-Peña et al. 959* (INIFAP, MEXU, PTIS, WAG); 50 m walk downhill from the uppermost antenna cluster on Cerro Zontehuitz, by the lower of the two shrines, 16.82°N, 92.58°W, 2950 m, 11 Oct 1997, *Rivera-Peña et al. 960* (INIFAP, MEXU, PTIS, WAG); 17.4 km N of Rt 190 just S of Motozintla on road to El Porvenir, about 50 m W of road,

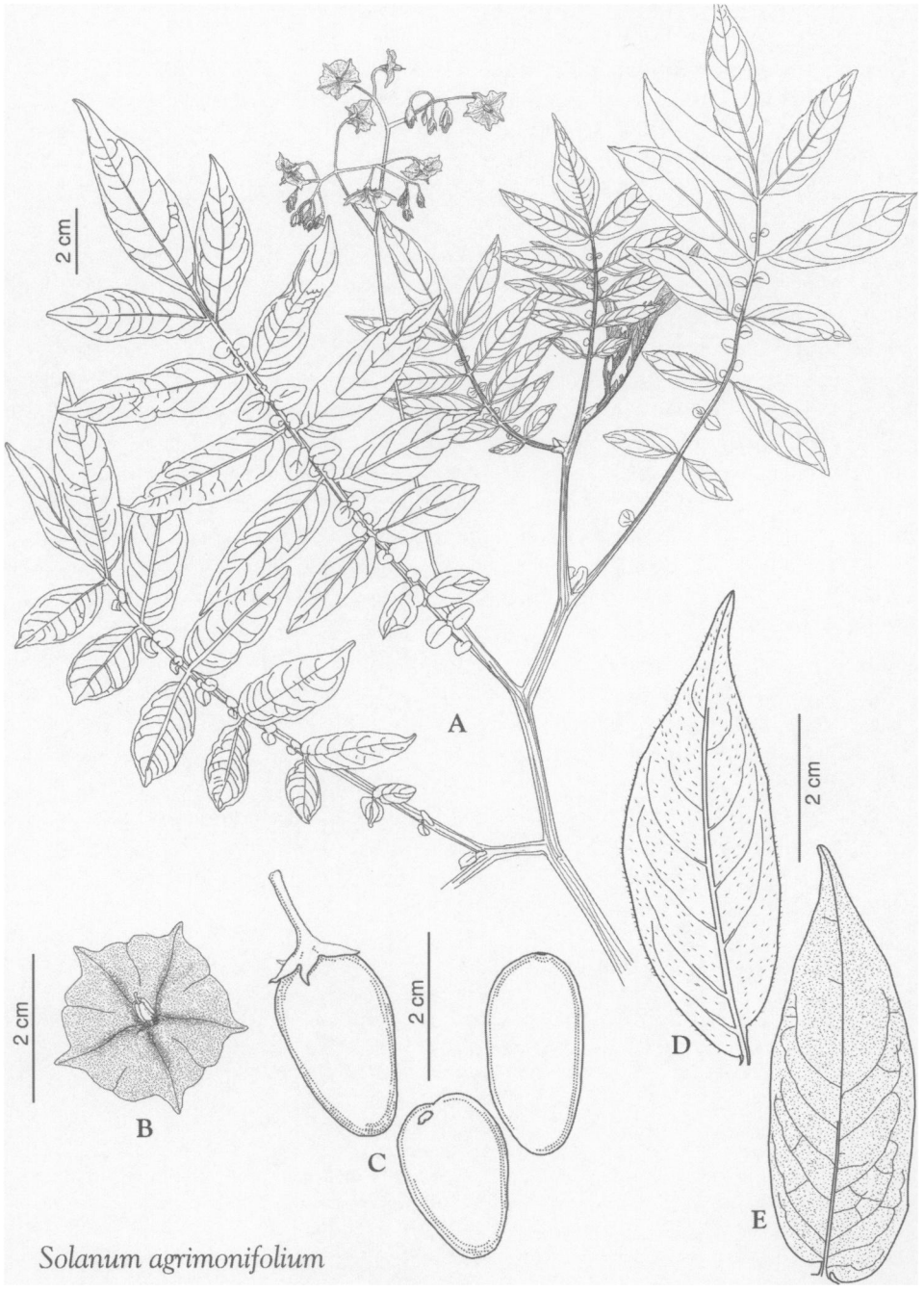


FIG. 36. *Solanum agrimonifolium*. A. Habit. B. Flower. C. Mature fruits. D, E. Lateral leaflet, adaxial (D) and abaxial (E) views. (Based on: A, C–E, *Spooner 4208,* PTIS; B, *Spooner 4206*, PTIS.)

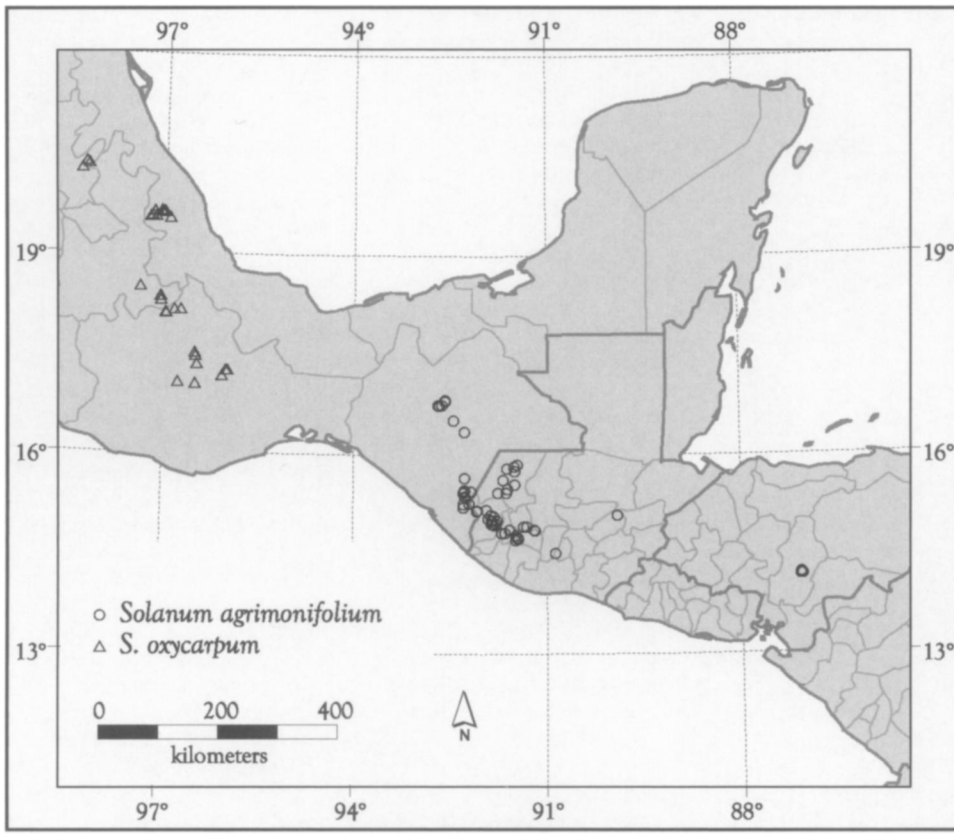


FIG. 37. Distribution of *Solanum agrimonifolium* and *S. oxycarpum*.

15.45°N, 92.19°W, 2410 m, 12 Oct 1997, *Rivera-Peña et al. 961* (INIFAP, MEXU, PTIS, WAG); 1.2 km N of town square of El Porvenir, on road to Siltepec, about 100 m W of road, 15.47°N, 92.28°W, 2850 m, 12 Oct 1997, *Rivera-Peña et al. 963* (INIFAP); Cerro Boquerón, 15.25°N, 92.30°W, Sep 1913, *Rydberg s.n.* (F, GH, MO, NY, US); 6.9 km N of Rt 190 beginning S of Motozintla de Mendoza on road to Siltepec, in woods on W side of road, in Ejido Benito Juárez, 15.37°N, 92.28°W, 2005 m, 24 Sep 1988, *Spooner et al. 4208* (IBUG, INIFAP, PTIS); Cerro del Boquerón at Barrio Pizarrín, in woods, on W side of road, 17.4 km N of Rt 190 of Motozintla de Mendoza on road to Siltepec, 15.42°N, 92.30°W, 2330 m, 24 Sep 1988, *Spooner et al. 4211* (INIFAP, PTIS, WIS); 12.1 km along road to microwave tower of Zontehuitz, from San Cristóbal de las Casas to Tenejapa road, 0.1 km downhill from microwave tower, along roadside, 16.33°N, 92.28°W, 2790 m, 29 Sep 1988, *Spooner et al. 4227* (IBUG, INIFAP, PTIS, WIS); road from San Cristóbal de las Casas to Cerro Zontehuitz, 9.7 km along road to microwave tower, turning off the road to Tenejapa, 16.82°N, 92.58°W, 2750 m, 20 Oct 1984, *Tarn et al. 277* (PTIS); road from San Cristóbal de las Casas to Cerro Zontehuitz, 9.8 km along road to microwave tower, turning off road to Tenejapa, 16.82°N, 92.58°W, 2760 m, 20 Oct 1984, *Tarn et al. 278* (K, PTIS); road from San Cristóbal de las Casas to Cerro Zontehuitz, about 10 km along road to microwave tower, turning off the road to Tenejapa, 16.80°N, 92.58°W, 2760 m, 22 Oct 1984, *Tarn et al. 280* (PTIS).—State unknown: Trujillo, s.d., *López 7846* (TEX).

Guatemala. CHIMALTENANGO: N facing slope of Volcán Acatenango, a 1-hour walk above Soledad, 14.52°N, 90.88°W, 2880 m, 13 Oct 1995, *Spooner et al. 7050* (AGUAT, BIGUA, PTIS, WAG), *Spooner et al. 7051* (AGUAT, WAG).—EL PROGRESO: Sierra de las Minas, 3.5 km WNW of Finca Piedad, about 11 km W of El Cimento, 15.09°N, 89.92°W, 2400 m, 12 Dec 1989, *Förthner s.n.* (M).—HUEHUETENANGO: Cuchumatanes Mountains, road from Huehuetenango to Concepción, 3 km from Concepción, 15.62°N, 91.68°W, 2695 m, 5 Sep 1976, *Baeke 153* (GH, MO, NY); Mpio. San Mateo Ixtatán, cloud forest at a place called Kurus Lemún, 4 mi E

of San Mateo Ixtatán, along road to Barillas, 15.85°N, 91.47°W, 2591 m, 7 Aug 1965, *Breedlove 11621* (DS); Chemal, 15.55°N, 91.50°W, 2900 m, 23 Oct 1956, *Graham 145* (K, LL, PTIS, S); Sierra de los Cuchumatanes, 2 km walk N of San Juan Atitán, footpath to Todos Santos, 15.48°N, 91.62°W, 2730 m, 23 Oct 1995, *Spooner et al. 7061* (AGUAT, PTIS, WAG); 3 km walk N of San Juan Atitán, logging path diverting from main path to Todos Santos at a point 2 km N of San Juan Atitán, 15.48°N, 91.62°W, 2830 m, 23 Oct 1995, *Spooner et al. 7062* (AGUAT, PTIS, WAG); 3.5 km walk N of San Juan Atitán, logging path diverting from main path from Todos Santos at a point 2 km N of San Juan Atitán, 15.48°N, 91.62°W, 2880 m, 23 Oct 1995, *Spooner et al. 7063* (AGUAT, PTIS, WAG); 24.3 km N of town square of Santa Eulalia, 5.5 km S of town square of San Mateo Ixtatán, Rt 9N, 15.82°N, 91.52°W, 3020 m, 26 Oct 1995, *Spooner et al. 7073* (AGUAT, PTIS, WAG), *Spooner et al. 7074* (AGUAT); between Xoxlac and Nucapuxlac, Sierra de los Cuchumatanes, 15.83°N, 91.67°W, 1650–2500 m, 18 Jul 1942, *Steyermark 48961* (F); top of Sierra Chemalito, Sierra de los Cuchumatanes, 3 1/2 mi W of Santa Eulalia, 15.75°N, 91.51°W, 3100–3150 m, 2 Aug 1942, *Steyermark 49938* (F); Cerro Pixpix, above San Ildefonso Ixtahuacán, forested summit, 15.42°N, 91.77°W, 1600–2800 m, 15 Aug 1942, *Steyermark 50555* (EAP, F); trail between Todos Santos and San Juan Atitán, Sierra de los Cuchumatanes, 15.43°N, 91.63°W, 2600–2700 m, 7 Sep 1942, *Steyermark 51942* (F).—QUEZALTENANGO: between San Martín Chile Verde and Mujuliá, lower slope of Volcán Lacandón, 14.82°N, 91.70°W, 1900 m, 19 Aug 1956, *Graham 136* (K, LL); road from San Martín Chile Verde to Colomba, above Majuliá, 17.5 km from San Mateo, 14.87°N, 91.58°W, 2100 m, 4 Nov 1958, *Hawkes et al. 1868* (C, K, US); Zunil, 14.78°N, 91.48°W, 3100–3200 m, 27 Dec 1976, *Schwabe s.n.* (B); Volcán Zunil, 14.73°N, 91.45°W, 3100–3200 m, 28 Dec 1976, *Schwabe s.n.* (MEXU); Mpio. Zunil, 2-hour walk E of Fuente de Aguas Termales Georginas, located 8 km SE of Pan-American Hwy from town of Zunil, W-facing slope of Volcán Zunil, 14.75°N, 91.46°W, 2900 m, 22 Sep 1995, *Spooner et al. 7019* (AGUAT, PTIS, WAG); Fuentes Georginas, W slope of Volcán de Zunil, 14.74°N, 91.46°W, 2850 m, 4 Mar 1939, *Standley 67499* (F); above Mujuliá between San Martín Chile Verde and Colomba, 14.82°N, 91.65°W, 1800 m, 1 Feb 1941, *Standley 85459* (F, US); Volcán Santo Tomás, 14.72°N, 91.48°W, 2500–3700 m, 22 Jan 1940, *Steyermark 34822* (F).—SAN MARCOS: San Luis, 4.4 mi W of Ixchiguán, road to Tacaná, 15.15°N, 92.09°W, 3400 m, 13 Aug 1959, *Beaman 3252* (DUKE, ENCB, GH, LL, MSC, US); Volcán Tacaná, entering Mexico from Unión de Juárez, near border with Mexico, 15.14°N, 92.10°W, 10 Jul 1966, *Flores S-950* (MEXU); village of San Andres Chapil, 8 km on Rt 12 from San Marcos to Tejutla at Km 255 from Guatemala, below the cliffs, 15.00°N, 91.78°W, 2750 m, 3 Nov 1958, *Hawkes et al. 1851* (B, C, K, MPU, P, PTIS, US); 12 km from San Marcos, road to Tejutla, entering forest from left by small bridge, 14.97°N, 91.80°W, 3000 m, 3 Nov 1958, *Hawkes et al. 1853* (B, C, K); 13 km from San Marcos, road to San Rafael de la Cuesta, 14.97°N, 91.80°W, 2400 m, 3 Nov 1958, *Hawkes et al. 1854* (C, K, US); 12.4 km W of town square of San Marcos, road to San Rafael Pie de la Cuesta, N side of road in valley, 14.95°N, 91.85°W, 2340 m, 23 Sep 1995, *Spooner et al. 7021* (AGUAT, PTIS, WAG); 1.0 km NW of town square of Ixchiguán, road to Tacaná, about 50 m N of road, 15.17°N, 91.95°W, 3380 m, 24 Sep 1995, *Spooner et al. 7026* (AGUAT, PTIS, WAG); N slope of Volcán Tajumulco, W-facing valley, a 10-minute hike S into woods from a point 2.5 km W of road from San Marcos to Tacaná to town of Tajumulco, 15.08°N, 91.88°W, 2780 m, 26 Sep 1995, *Spooner et al. 7034* (AGUAT, PTIS, WAG); Barranco Eminencia, above San Rafael Pie de la Cuesta, 14.96°N, 91.86°W, 2100–2400 m, 14 Mar 1939, *Standley 68461* (F); 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, 15.00°N, 91.86°W, 2500–2700 m, 6 Feb 1941, *Standley 86448* (F); along road between San Sebastián at Km 21 and Km 8, 8 to 18 mi NW of San Marcos, moist thickets near waterfall, 15.07°N, 91.83°W, 2700–3800 m, 15 Feb 1940, *Steyermark 35728* (F); between La Vega Ridge and Río Vega and along NE slopes of Volcán Tacaná, to 3 mi from Guatemala-Mexican boundary, in vicinity of San Rafael, 15.15°N, 92.08°W, 2500–3000 m, 20 Feb 1940, *Steyermark 36178* (F); between Finca Piamonte and top of Montaña Piamonte along Joya Pacayal, 15.01°N, 91.87°W, 2500–3000 m, 7 Feb 1942, *Steyermark 43672* (F, UC); wet mountain forest near Aldea Fraternidad, between San Rafael Pie de La Cuesta and Palo Gordo, W-facing slope of the Sierra Madre Mountains, 14.93°N, 91.82°W, 1800–2400 m, 10–18 Dec 1963, *Williams et al. 25582* (EAP, F, NY), *25754* (EAP, F, NY, US), *26292* (EAP, F); upper slopes of Tajumulco Volcano, Sierra Madre Mountains, about 10 km W of San Marcos, 15.03°N, 91.91°W, 2400–2700 m, 3 Jan 1965, *Williams et al. 27192* (EAP, F, NY).—SOLOLÁ: between Quezaltenango and Los Encuentros, by mountain stream, 14.86°N, 91.19°W, 3050 m, 8 Aug 1956, *Graham 116* (K, LL, W); 7.0 km W of the intersection of the road from Nahuala to Guatemala City, and the old road W to Totonicapán, about 20 m N of road, 14.87°N, 91.20°W, 3000 m, 28 Sep 1995, *Spooner et al. 7036* (AGUAT, PTIS, WAG).—TOTONICAPÁN: Mujuliá, 1900 m, 17 Oct 1956, *Graham 136* (PTIS); Cerro El Chiché, 1 [10] mi E of Totonicapán, road to Los Encuentros, 14.92°N, 91.37°W, 3300 m, 5 Nov 1958, *Hawkes et al. 1889* (C, K, US); Cerro el Quiché, 1 [10] mi E of Totonicapán, road to los Encuentros, Km 163.5 from Guatemala City, by a stream on the lower side of the road, 14.92°N, 91.37°W, 3300 m, 5 Nov 1958, *Hawkes et al. 1891* (K, PTIS, US); Cerro el Quiché, 1 mi E of

Totonicapán, road to los Encuentros, Km 163.5 from Guatemala City, by a small stream, upper side of the road, 14.92°N, 91.37°W, 3300 m, 5 Nov 1958, *Hawkes et al. 1892* (BR, C, K, US, WAG); 10.2 km E of town square of Totonicapán, 4.8 km from deviation of road to Santa Cruz del Quiché, old road to Los Encuentros, 14.92°N, 91.32°W, 3150 m, 15 Sep 1995, *Spooner et al. 7006* (AGUAT, PTIS, WAG). **Honduras.** MORAZÁN: Montaña La Tigra, 22 mi from Tegucigalpa on road to San Juancito, 14.17°N, 87.11°W, 2000 m, 24 Nov 1958, *Hawkes et al. 2035* (B, C); Montaña La Tigra, between Tegucigalpa and San Juancito, SW of San Juancito, 14.17°N, 87.11°W, 2200 m, 29 Nov 1958, *Hawkes et al. 2137* (C); Bosque de Peña Blanca en Montaña La Tigra, San Juancito NW of Rosario, 14.18°N, 87.09°W, 1800 m, 7 Dec 1957, *Molina 8590* (EAP); Montaña La Tigra SW of San Juancito, 14.17°N, 87.11°W, 2000 m, 24 Nov 1958, *Molina 8677* (EAP, F); El Prado de Fátima en Montaña La Tigra, 14.18°N, 87.09°W, 2000 m, 29 Nov 1958, *Molina 8757* (EAP); above Rancho Quemado on Montaña La Tigra, 14.17°N, 87.07°W, 10 Dec 1968, *Molina 8770* (EAP, F); mountains above San Juancito, 14.21°N, 87.09°W, 2000 m, 6 Nov 1947, *Williams & Molina 13377* (EAP).

Solanum agrimonifolium, like all four species in the Conicibaccata group, is distinguished by conical fruits, leaves with a somewhat parallel-sided morphology (i.e., lateral leaflet pairs subequal or diminishing gradually towards the base) and narrowly ovate to elliptical leaflets. Like most species from North and Central America, it is distinguished from species that are most similar (*S. longiconicum*, *S. oxycarpum*, and *S. woodsonii*) only by a series of overlapping character states. *Solanum agrimonifolium* differs from these three species by its highly dissected leaves, with generally 6–7 lateral leaflets and 4–31 interjected leaflets; the leaves of the other species generally have 3–6 lateral leaflets and 0–6 interjected leaflets.

The southernmost records of S. *agrimonifolium* were collected in Honduras, from Montaña La Tigre, all clustered within a few km of each other. We were not able to find any populations there during our searches in 2000; perhaps this species is no longer found in Honduras.

18. Solanum longiconicum Bitter, Repert. Spec. Nov. Regni Veg. 10: 534. 1912.—TYPE: COSTA RICA. Cartago: "defrichements du roble, massif de l'Irazú," 2000 m, 10 Jul 1891, *A. Tonduz 4235* (lectotype, designated by Spooner et al., 2001c: K!, photos: G! Z!; isolectotypes: BR, CR! G[3]! US-1324498! Z!, photo of G isolectotype: K!, photos of Z isolectotype [Correll neg. 892]: B! F! GH! K! LL! NY! UC! US! WAG!).

Solanum manoteranthum Bitter, Repert. Spec. Nov. Regni Veg. 11: 383. 1912.—TYPE: COSTA RICA. San José: Volcán Barba, *A. Roesl s.n.* (holotype: M!, photos [Correll neg. 316]: BM! F! GH! K! LL! NY! PTIS! UC! US!).

Plants 0.2–2 m tall, herbaceous, terrestrial, erect to ascending. Stems 2–13 mm in diameter at base of plant. Pseudostipules 2–10 mm long, lunate. Leaves 9–33 cm long, 5–20 cm wide, odd-pinnate, glabrous or with only scattered 2–3-celled short hairs adaxially and abaxially; petioles 1–5 cm long; lateral leaflet pairs (2–) 3–5 (–6), subequal or the size of the lateral leaflets diminishing gradually towards the base of the leaf; most distal lateral leaflets 3.6–9.0 cm long, 1.2–3.3 cm wide, narrowly ovate to elliptical, apex acuminate, base oblique, rounded to cuneate, sessile or with petiolules up to 10 mm long; terminal leaflet 4.5–10.0 cm long, 1.2–2.5 cm wide, ovate to elliptical, apex acute to acuminate, base attenuate; interjected leaflets commonly 0 to rarely 6. Inflorescences generally in distal half of plant; peduncle 3.8–11 cm long. Flowers 8–16; pedicels 15–30 mm long, articulate between the proximal 1/4 and the distal 1/4; calyx 4–10 mm long, lobes acute to short-attenuate, acumens 1–4 mm long; corolla 2–3 cm in diameter, rotate, acumens 0–2 mm long, edges of corolla flat, not folded dorsally, white to dark blue to purple or white

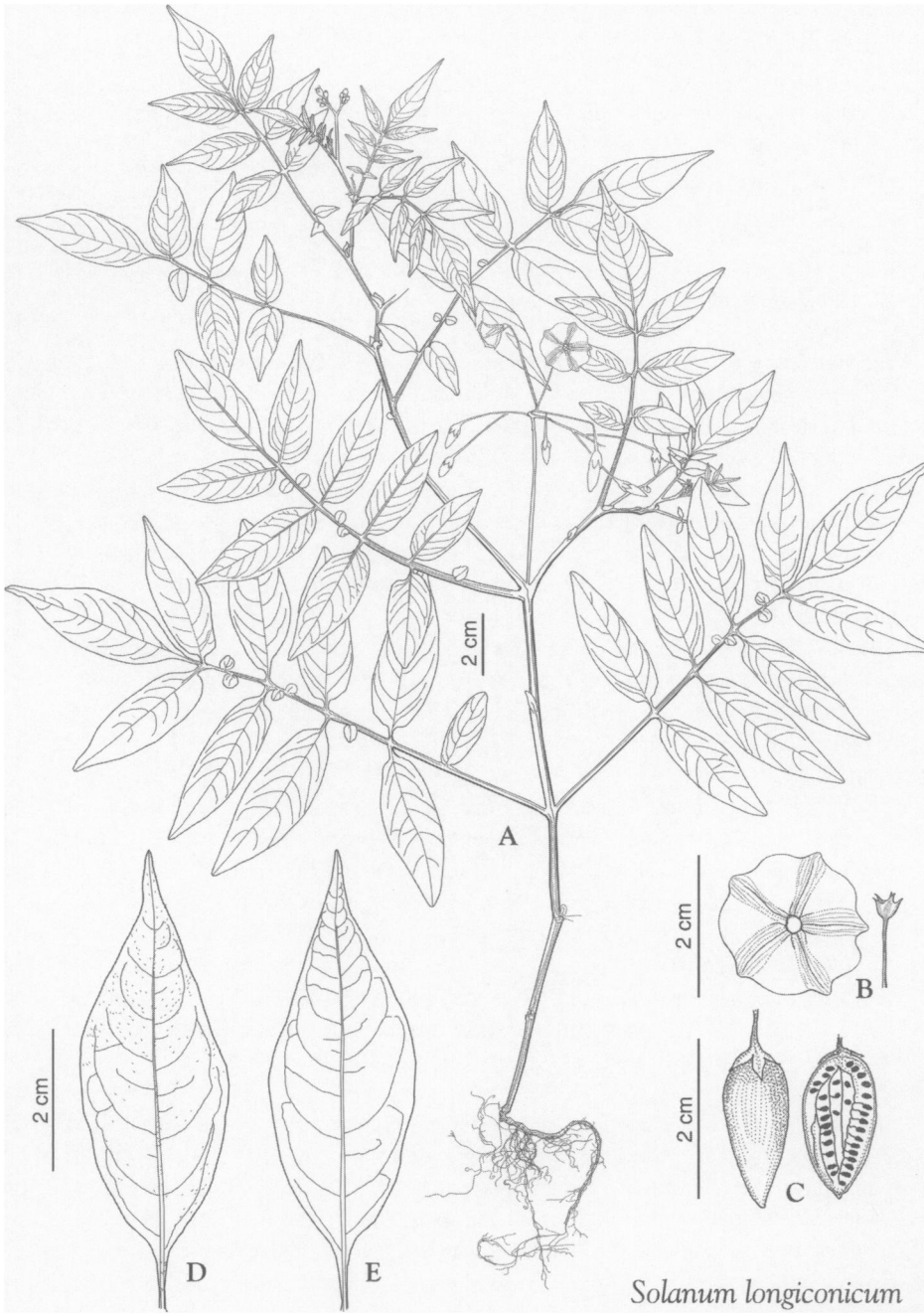


FIG. 38. *Solanum longiconicum*. A. Habit. B. Flower and pedicel with calyx. C. Mature fruits; fruit at right in longitudinal section, showing seeds. D, E. Lateral leaflet, adaxial (D) and abaxial (E) views. (Based on *Spooner et al. 7109*, PTIS.)

with purple stripes or mottling above and below; anthers 4–5.5 mm long, connate; style 5–8 mm long, exceeding stamens by 2–3 mm, straight. Fruits 1.1–3.9 cm long, conical, obtuse to acute at tip, medium to deep green throughout. Seeds from living specimens green-white with a purple spot. Chromosome number: 2n = 48. EBN unknown. Fig. 38.

Phenology. Flowering and fruiting throughout the year.

Distribution (Fig. 39). Central Costa Rica to western Panama; in wet habitats, organic soils, openings of cloud forests and near sunny openings in primary forest, often among oaks or pines, marshy grasslands, also in disturbed habitats, such as landslides, streamsides, road cuts, moist garbage heaps, recently plowed soil in forest clearings, recently burned forests, roadside ditches, forest edges, or on rotting tree stumps; (1050–) 1400–3300 m.

See Appendix for a list of Specimens Examined (p. 182).

Solanum longiconicum, like all four species in the Conicibaccata group, is distinguished by conical fruits, leaves with a somewhat parallel-sided morphology, and narrowly ovate to elliptical leaflets. It differs from the other members of the group by its shiny, glabrous to subglabrous leaves, and seeds with a purple spot, caused by the purple embryo showing through the greenish seed coat.

19. Solanum oxycarpum Schiede ex Schlechtendal, Hort. hal. 1: 5, tab 3. 1841.—TYPE: MEXICO. Veracruz: in rocky places at Malpaís de La Joya, Jun 1829, *C. J. W. Schiede s.n.* (lectotype designated by Hawkes, 1957: HAL, right-hand specimen!, photos: MPU! K! PTIS!; isolectotype: L!, photos: PTIS! WAG!).

Solanum confusum Correll, Agric. Monogr. U.S.D.A. 11: 63, figs. 41, 42. 1952, non *Solanum confusum* C. V. Morton, 1944. *Solanum nelsonii* Correll, Madroño 14: 236. 1958, non *Solanum nelsonii* Dunal, 1852. *Solanum reconditum* Correll, Wrightia 2: 175. 1961.—TYPE: MEXICO. Oaxaca: 18 mi SW of Ciudad Oaxaca, 2280–2890 m, 10–20 Sep 1894, *E. W. Nelson 1319 p.p.* (holotype: GH!, photos [Correll neg. 68]: BM! F! GH! LL! PTIS! UC! US!).

Plants 0.5–2 m tall, herbaceous, terrestrial, erect to ascending. Stems 2–13 mm in diameter at base of plant. Pseudostipules 2–10 mm long, lunate. Leaves 14–35 cm long, 10–19 cm wide, odd-pinnate, finely pubescent adaxially and abaxially; petioles 1–5 cm long; lateral leaflet pairs (3–) 5–7 (–8), subequal or the size of the lateral leaflets diminishing gradually towards the base of the leaf; most distal lateral leaflets 2.8–7.5 cm long, 1.0–2.0 cm wide, narrowly ovate to elliptical, apex acuminate, base oblique, rounded to cuneate, sessile to subsessile with petiolules up to 2 mm long; terminal leaflet 4.2–7.5 cm long, 1.0–2.2 cm wide, ovate to elliptical, apex acute to acuminate, base attenuate; interjected leaflets 4–31. Inflorescences generally in distal half of plant; peduncle 2–10.5 cm long. Flowers 8–38; pedicels 15–30 mm long, articulate between the proximal 1/4 and the distal 1/4; calyx 4.5–10 mm long, lobes acute to long-attenuate, acumens 1–4 mm; corolla 2–3 cm in diameter, rotate, acumens 0–5 mm long, edges of corolla flat, not folded dorsally, blue to purple; anthers 4–5.5 mm long, connate; style 5–8 mm long, exceeding stamens by 2–3 mm, straight. Fruits 2–5 cm long, conical, obtuse to acute at tip, medium to deep green throughout. Seeds from living specimens green-white throughout. Chromosome number: 2n = 48. EBN = 2. Fig. 40.

Phenology. Flowering and fruiting July through November.

Distribution (Fig. 37). Mexico (Hidalgo, Oaxaca, Puebla, Veracruz); wet habitats, often in openings of cloud forests, often in pine and oak forests, in organic soils, among

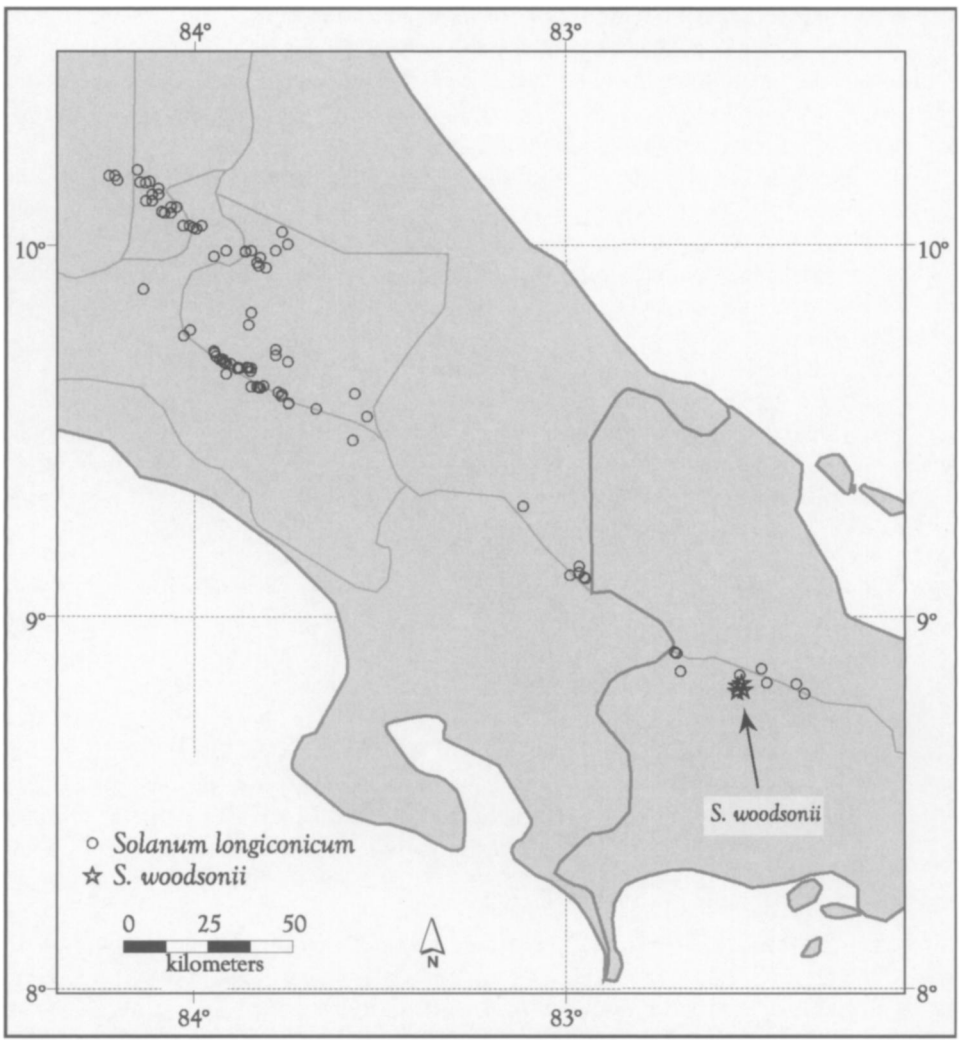


FIG. 39. Distribution of *Solanum longiconicum* and *S. woodsonii*; the arrow points to the populations of *S. woodsonii* from Volcán de Chiriquí (=Volcán Barú).

shrubs and in pine-oak-alder forests, frequently in pockets of volcanic rocks, often growing among ferns and mosses; (1520–) 1870–2870 m.

ADDITIONAL SPECIMENS EXAMINED. **Mexico.** HIDALGO: Mpio. Tenango de Doria, 11 km W of Tenango de Doria, 20.35°N, 98.31°W, 2100 m, 7 Jul 1979, *Hernández 3427* (MEXU); Mpio. Metepec, 20 km E of Metepec, 20.25°N, 98.37°W, 2130 m, 10 Aug 1980, *Hernández & Hernández 4772* (CAS, ENCB, MEXU, MO); on Metepec to Tenango de Doria Road, 16 km NE of intersection of this road with road entering Metepec, on S side of road from 50 and then 250 m up slope off road, 20.32°N, 98.26°W, 2280 m, 1 Oct 1997, *Rivera-Peña et al. 944* (INIFAP, MEXU, PTIS, WAG).—OAXACA: mountains NE of Ixtlán de Juárez on road to Tuxtepec, 17.34°N, 96.48°W, 20 Jul 1968, *Anderson & Anderson 4850* (ENCB, MICH); in mountains of Oaxaca, 17.05°N, 96.78°W, 1859, *Cuming s.n.* (G, P); Km 25 on road from Teotitlán del Camino to Huautla, on the right side of the road, 18.15°N, 96.75°W, 2060 m, 7 Nov 1964, *Flores S-797* (K, LL); Yotao, 1840, *Galeotti 1225P* (W); Sierra Madre del Oriente, 29 km E of Teotitlán, 17.03°N, 96.50°W, 2300 m, 24 Sep 1957,

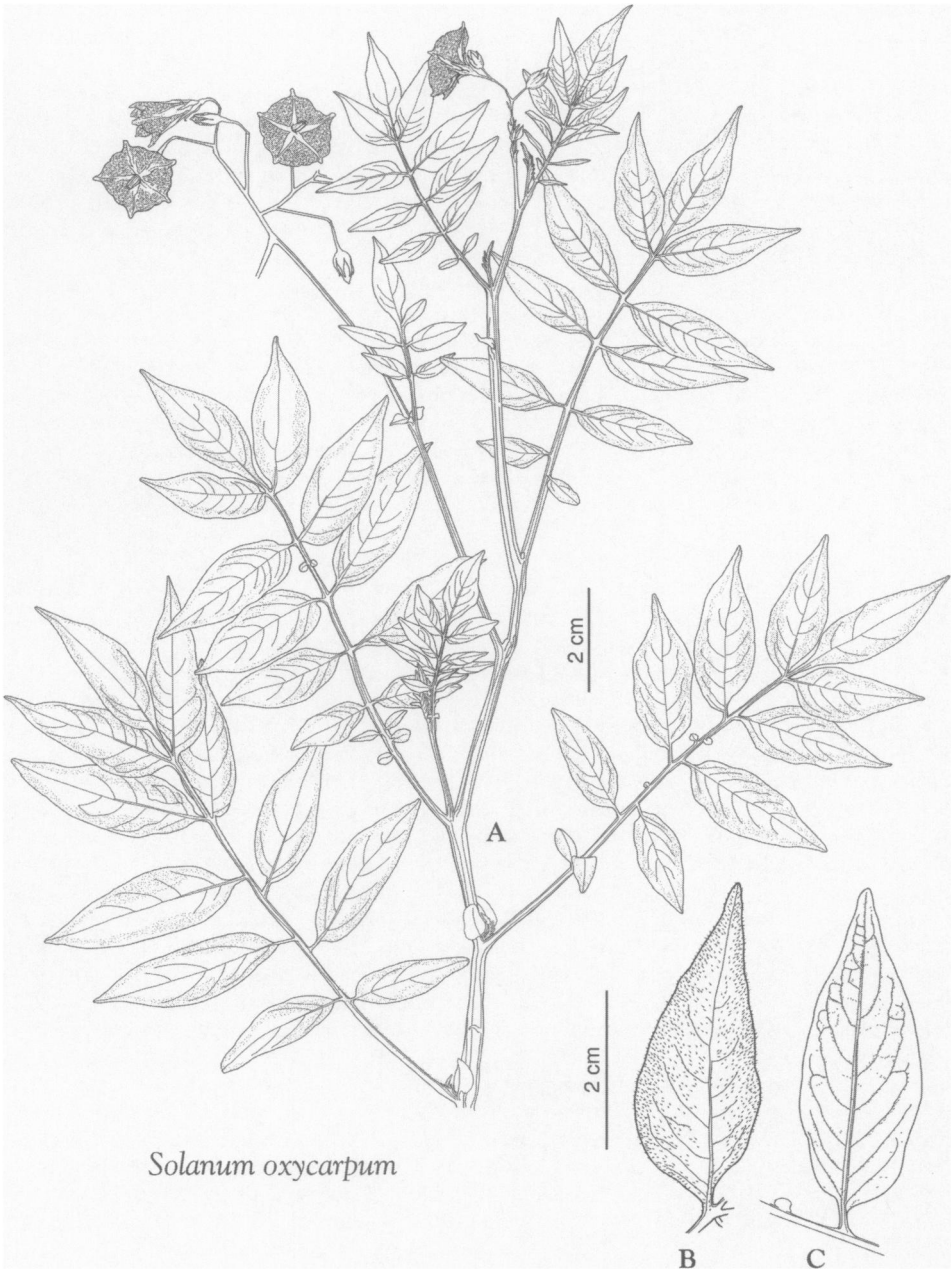


FIG. 40. *Solanum oxycarpum*. A. Habit. B, C. Lateral leaflet, adaxial (B) and abaxial (C) views. (Based on *Rivera Peña et al. 951*, PTIS.)

Graham 323 (LL); Cerro Blanco, W of Cerro Zempoaltepec, road from Yacochi to Mixitlán, 120 km SE of Oaxaca, 17.17°N, 96.08°W, 2550 m, Sep 1980, *Ochoa 14139* (CIP); Mpio. Totontepec, Dist. Mixe, 17.25°N, 96.00°W, 1900 m, 6 Oct 1986, *Reyes 484* (K, MEXU, NY); Dist. Mixe, Mpio. Totontepec, 17.25°N, 96.00°W, 1900 m, 2 Nov 1989, *Reyes 1245* (NY); Mpio. Totontepec, Dist. Mixe, Totontepec, 17.25°N, 96.03°W, 1900 m, 2 Nov 1989, *Rivera 1245* (MEXU); Km 25 on the road from Teotitlán to Huautla, about 20 m S of road above stream, 18.11°N, 96.99°W, 2240 m, 4 Oct 1997, *Rivera-Peña et al. 952* (INIFAP, MEXU, PTIS, WAG); Km 27.2 on road from Teotitlán to Huautla, at Puerto Soledad, 18.10°N, 96.98°W, 2370 m, 4 Oct 1997, *Rivera-Peña et al. 953* (INIFAP, MEXU); 21.8 km N of Ixtlán de Juárez on Rt 175 to Tuxtepec, 17.47°N, 96.50°W, 2870 m, 22 Sep 1988, *Spooner et al. 4200* (INIFAP, PTIS), 16 Oct 1984, *Tarn et al. 272* (PTIS); 27 km N of N end of Ixtlán de Juárez on Rt 175 to Tuxtepec, 17.52°N, 96.52°W, 2850 m, 22 Sep 1988, *Spooner et al. 4202* (INIFAP); 8.5 mi E Rt 135 on road to Huautla, 18.15°N, 96.85°W, 18 Oct 1981, *Warnock 2506* (TEX).—PUEBLA: from Tehuacán to Oaxaca road, turn NE on road to Zoquitlán, 22 km up road, by divergence of road to Coyomeapa, 18.30°N, 97.07°W, 2640 m, 4 Oct 1997, *Rivera-Peña et al. 951* (INIFAP, MEXU, PTIS, WAG); Tehuacán area, above Teotitlán del Camino on the road to Huautla, 18.49°N, 97.40°W, 2000–2250 m, 3 Aug 1961, *Smith et al. 4163* (F, US); road from Tehuacán to Oaxaca, turning off at Coxcatlán, 21 km towards Zoquitlán, La Griega, where road divides to Zoquitlán and Coyomeapa, 18.35°N, 97.07°W, 2660 m, 23 Oct 1983, *Tarn et al. 180* (F, PTIS, S); road from Tehuacán to Oaxaca turning off at Coxcatlán towards Zoquitlán, 22 km along this road, 1 km past La Griega towards Coyomeapa, 18.35°N, 97.08°W, 2640 m, 23 Oct 1983, *Tarn et al. 182* (K, PTIS).—VERACRUZ: Perote, La Joya, 19.55°N, 97.26°W, 1950 m, 2 Sep 1938, *Balls & Gourlay 5513* (BM, K); La Joya, road from Jalapa to Perote, Rafael Ramírez, 19.62°N, 97.03°W, 2100 m, 28 Aug 1972, *Dorantes et al. 1618* (CAS, CHAPA, ENCB, F, LL, MEXU, TAES); La Joya, road from Mexico to Veracruz through Jalapa, about 100 m on the right side of the road, 19.62°N, 97.03°W, 29 Sep 1964, *Flores S-792* (K, LL, MEXU); Pedregal de la Joya, 19.62°N, 97.05°W, 2000 m, 27 Sep 1953, *Graham 1* (PTIS); about 1–2 km E of Las Vigas on Mex Hwy 140, near open cavern, 19.63°N, 97.08°W, 10 Oct 1970, *Graham 1168* (MICH); upper outskirts of La Joya, 19.62°N, 97.03°W, 2080 m, 12 Aug 1949, *Hawkes et al. 1064* (B, K, LL, MEXU, MPU, P, WAG); near Perote, Km 306.5 from México, road from Las Vigas to Jalapa, upper edge of La Joya village, Malpaís de la Joya, 19.57°N, 97.23°W, 2100 m, 5 Oct 1958, *Hawkes et al. 1634* (PTIS); near Perote, road from Las Vigas to Jalapa, upper edge of La Joya village, Malpaís La Joya, 19.57°N, 97.23°W, 2100 m, 7 Oct 1958, *Hawkes et al. 1643* (C, K); near Perote, road from Las Vigas to Jalapa, upper edge of the La Joya village, Malpaís de La Joya, 19.57°N, 97.23°W, 2100 m, 7 Oct 1958, *Hawkes et al. 1645* (C, K, MPU, PTIS, US); Km 305.5 from Mexico on the road from Las Vigas to Jalapa, Malpaís La Joya, 19.62°N, 97.19°W, 2150 m, 7 Oct 1958, *Hawkes et al. 1649* (C, K, P, PTIS); Mpio. Acajete, along Hwy 140, 1 km NW of La Joya, 19.62°N, 97.03°W, 2175 m, 6 Sep 1986, *Nee 32990* (NY); old lava field about 4 mi W of Jalapa, 19.53°N, 96.95°W, 1524 m, 27 Aug 1970, *Norris & Taranto 16840* (CAS, MEXU, MO); La Joya, rt from Jalapa to Puebla, near Perote, 19.62°N, 97.03°W, 2150 m, 9 Oct 1980, *Ochoa 14213* (CIP, PTIS, US, WIS); collected at La Joya (Perote to Jalapa Road) about 100 m S of road by the restaurants on the road, 19.61°N, 97.03°W, 2188 m, 2 Oct 1997, *Rivera-Peña et al. 949* (INIFAP, MEXU, PTIS, WAG); Malpaís de La Joya between Perote and Jalapa, about 32 km from Perote, Km 176 on Rt 140, 19.62°N, 97.03°W, 2200 m, 31 Oct 1984, *Tarn et al. 286, 287* (PTIS); turning off Rt 140 between Perote and Las Vigas, go S from Sierra de Agua (N slope of Cerro Cofre de Perote), 14 km above Pescados, Rajas, 19.55°N, 97.17°W, 2840 m, 1 Nov 1984, *Tarn et al. 288* (PTIS); Mpio. Las Vigas, Llano Grande, 19.62°N, 97.08°W, 2115 m, 15 Jul 1971, *Ventura 3868* (ENCB, IEB, MEXU); Mpio. Acajete, La Joya, 19.62°N, 97.03°W, 2050 m, 12 Jul 1980, *Ventura 17479* (ENCB, IEB); Mpio. Las Vigas, Piedra Blanca, 19.63°N, 97.08°W, 2250 m, 13 Jul 1982, *Ventura 19639* (ENCB, IEB, MEXU); Mpio. Las Vigas, 200 m E of road from Jalapa to Vigas at Toxtlacoaya, 19.62°N, 97.06°W, 2200 m, 30 Aug 1989, *Zamora 1009* (IEB, MEXU).

Solanum oxycarpum, like all four species in the Conicibaccata group, is distinguished by conical fruits, leaves with a somewhat parallel-sided morphology, and narrowly ovate to elliptical leaflets. It is most similar to *S. agrimonifolium* and *S. woodsonii* (see discussion under *S. woodsonii*, no. 20).

The holotype of *S. confusum* is *Nelson 1319* (GH), but a duplicate at US is *S. verrucosum*.

Hawkes (1990) placed *S. reconditum* in synonymy under *S. schenckii*, but *S. reconditum* is clearly a synonym of *S. oxycarpum*.

20. Solanum woodsonii Correll, Wrightia 2: 137, fig. 26. 1961.—TYPE: PANAMA. Chiriquí: Volcán de Chiriquí (=Volcán Barú), Potrero Muleto to summit, 3500–4000 m, 13–15 Jul 1940, *R. E. Woodson Jr. & R. W. Schery 399* (holotype: GH!, photos [Correll neg. 67]: LL! US!; isotypes: MO-1204867!, MO-without accession number! US-1808036!, photos of MO-1204867 isotype [Correll neg. 99]: BM! F! LL! MO! NY, UC! US!, photos of MO isotype without accession no. [Correll neg. 67]: BM! F! LL! MO! UC! US!], photo of US isotype: PTIS!).

Plants 0.3–2.5 m tall, herbaceous, terrestrial, erect to ascending. Stems 2–13 mm in diameter at base of plant. Pseudostipules 2–10 mm long, lunate. Leaves 13–52 cm long, 6–22 cm wide, odd-pinnate, finely to coarsely pubescent adaxially and abaxially; petioles 3–10 cm long; lateral leaflet pairs (2–) 3–5, subequal or the size of the lateral leaflets diminishing gradually towards the base of the leaf; most distal lateral leaflets 3.7–10.0 cm long, 1.5–3.2 cm wide, narrowly ovate to elliptical, apex acuminate, base oblique, rounded to cuneate, sessile to subsessile with petiolules up to 2 mm long; terminal leaflet 3.4–12.2 cm long, 1.5–4.3 cm wide, ovate to elliptical, apex acute to acuminate, base attenuate; interjected leaflets 0–2. Inflorescences generally in distal half of plant; peduncle 4–9.5 cm long. Flowers 7–16; pedicels 15–30 mm long, articulate between the proximal 1/4 and the distal 1/4; calyx 4.5 mm long, lobes acute to long-attenuate, acumens 1–1.5 mm long; corolla 2.8–3.6 cm in diameter, rotate, acumens absent or minute, edges of corolla flat, not folded dorsally, light purple adaxially and abaxially; anthers 4–5.5 mm long, connate; style 6 mm long, exceeding stamens by 2–3 mm, straight. Fruits 1.5–2.6 cm long, conical, obtuse to acute at tip, medium to deep green throughout. Seeds from living specimens green-white throughout. Chromosome number and EBN unknown. Fig. 41.

Phenology. Collected in July and September, but, like other members of this group, probably flowering and fruiting throughout the year.

Distribution (Fig. 39). Panama (E-facing slope of Volcán de Barú, i.e., Volcán de Chiriquí); clearings in dense rainforests with *Chusquea*, in rich organic soil; 3000–3500 m.

ADDITIONAL SPECIMENS EXAMINED. **Panama.** CHIRIQUÍ: Boquete Dist., Volcán de Chiriquí, Potrero Muleto, 8.80°N, 82.53°W, 3170 m, s.d., *Davidson 1017* (LL, F); Dist. and Corregimiento Boquete, E slope of Volcán Barú (Volcán de Chiriquí), near the dirt road to the summit of the volcano from Bajo Boquete, along the way to El Salto, above Potrero Muleto, 8.82°N, 82.53°W, 3015 m, 6 Sep 2000, *Spooner et al. 7405* (CIP, PMA, PTIS); Distrito Bugaba, Corregimiento Cerro Punta, on N facing slope of Volcán Barú (Volcán de Chiriquí), ascending sendero (footpath) de los Quetzales, a trail departing from the park guard station of Alto Respingo, reached by driving on a dirt road about 5 km E of town of Cerro Punta, 08.81°N, 82.54°W, 3045 m, 9 Sep 2000, *Spooner et al. 7413* (CIP, PMA, PTIS).

Solanum woodsonii, like all four species in the Conicibaccata group, is distinguished by conical fruits, leaves with a somewhat parallel-sided morphology (i.e., lateral leaflet pairs subequal or diminishing gradually towards the base), and narrowly ovate to elliptical leaflets. It is most similar to *S. agrimonifolium* and *S. oxycarpum*. *Solanum woodsonii* is distinguished from *S. agrimonifolium* by its fewer numbers of lateral and interjected leaflets (3–5 lateral, 0–2 interjected in *S. woodsonii* vs. 6–7 lateral, 4–31 interjected in *S. agrimonifolium*), and from *S. oxycarpum* by its larger leaves (25–40 cm long in *S. woodsonii* vs. 15–25 cm long in *S. oxycarpum*).

Correll (1961a) described *S. woodsonii* as having a small dorsal lobe at the base of the anther and stated that this anther lobe "may be diagnostic." We could not find this lobe on the holotype or isotype specimens nor in living material in the field in Panama.

FIG. 41. *Solanum woodsonii*. A. Habit. B. Part of inflorescence with flower and buds. C. Mature fruits. D, E. Lateral leaflet, adaxial (D) and abaxial (E) views. (Based on *Spooner 7413*, PTIS.)

Correll (1962) cited a single Venezuelan collection of this species (Venezuela: Andes of Trujillo and Mérida, 1225–4300 m, *J. Linden 473 p.p.*, FI, G, K) and listed other duplicates at OXF, P, US as the type gathering of *S. dolichocarpum* Bitter, a name he placed with *S. colombianum* Bitter (Correll 1962). Hawkes (1990) also indicated that *S. woodsonii* is found in Venezuela, but did not cite an actual specimen. Hawkes (1997, database accompanying his publication) cited no specimen of *S. woodsonii* for Venezuela, but rather identified different duplicates of *J. Linden 473* as *S. colombianum* and *S. otites* Dunal. We collected herbarium specimens of the Conicibaccata group at 16 localities throughout Venezuela (Spooner et al. 1995), and searched the Andean localities of Trujillo and Mérida, and points in between. These cities are more than 100 km apart by air and therefore precluded definitive searches for the locality of *Linden 473*. We identify all of our Venezuelan specimens as *S. colombianum*. Our examination of *Linden 473* at G, OXF, P, and US show it to be *S. colombianum*. In agreement with Ochoa (1979) we do not think that *S. woodsonii* occurs in Venezuela.

6x(4EBN)—Iopetala Group

21. Solanum guerreroense Correll, Agric. Monogr. U.S.D.A. 11: 65, figs. 43, 44. 1952.—Type: Specimen prepared from plants cultivated from tubers and harvested 9–11 Aug 1949 at Sturgeon Bay, Wisconsin, U.S.A., *D. S. Correll 14410a* (holotype: NA!, photos [Correll neg. 30]: BM! F! K! LL! NY! UC! US!; isotypes: MEXU! PTIS!, photos: [Correll neg. 66]: BM! F! K! LL! US!). [Source of tubers: Mexico. Guerrero: in pine-oak forest on summit of mountain above Chilpancingo, to the north, 27 Dec 1947, an unvouchered collection referred to as *Correll 14410*.]

Plants up to 0.25 m, herbaceous, terrestrial, ascending. Stems 4 mm in diameter at base of plant. Pseudostipules 6–8 mm long, lunate. Leaves 14–22 cm long, 11–13 cm wide, odd-pinnate, pubescent, strigose to puberulent adaxially and abaxially; petioles 1–3 cm long; lateral leaflet pairs 4–5, the first two pairs often equal or only gradually diminishing in size towards the base of the leaf; most distal lateral leaflets 5–7 cm long, 2–4 cm wide, ovate to broadly elliptical, apex acute to acuminate, base oblique, cuneate to cordate, sessile; terminal leaflet 5–7.5 cm long, 3.5–4.2 cm wide, broadly elliptical, apex acute to acuminate, base cuneate to truncate; interjected leaflets 8–19. Inflorescences generally in distal half of plant; peduncle up to 3.4 cm long. Flowers 8–14; pedicels 11–23 mm long, articulate between the proximal 1/4 and the distal 1/4; calyx up to 4 mm long, lobes attenuate, acumens 1–2 mm long; corolla up to 2.6 cm in diameter, rotate, acumens up to 2 mm long, edges of corolla flat, not folded dorsally, light violet adaxially, darker abaxially; anthers up to 6 mm long, connate; style up to 9 mm long, not exceeding stamens, straight. Fruits up to 3 cm long, conical, medium to deep green throughout. Seeds from living specimens green-white throughout. Chromosome number: 2n = 72. EBN = 4. Fig. 42.

Solanum guerreroense is known only from the type, a specimen grown from tubers collected in Guerrero, Mexico (Fig. 43). Other herbarium specimens bearing this collection number at K and LL were collected at a later date and are therefore not considered type material. Searches for *S. guerreroense* in 1988 (Spooner et al. 1991a) and 1997 (Spooner et al. 2000) at the locality in Guerrero from which Correll obtained the tubers were unsuccessful. The type was collected in mature fruit in December; *S. guerreroense* may flower and fruit from July to December, like other members of the Iopetala group.

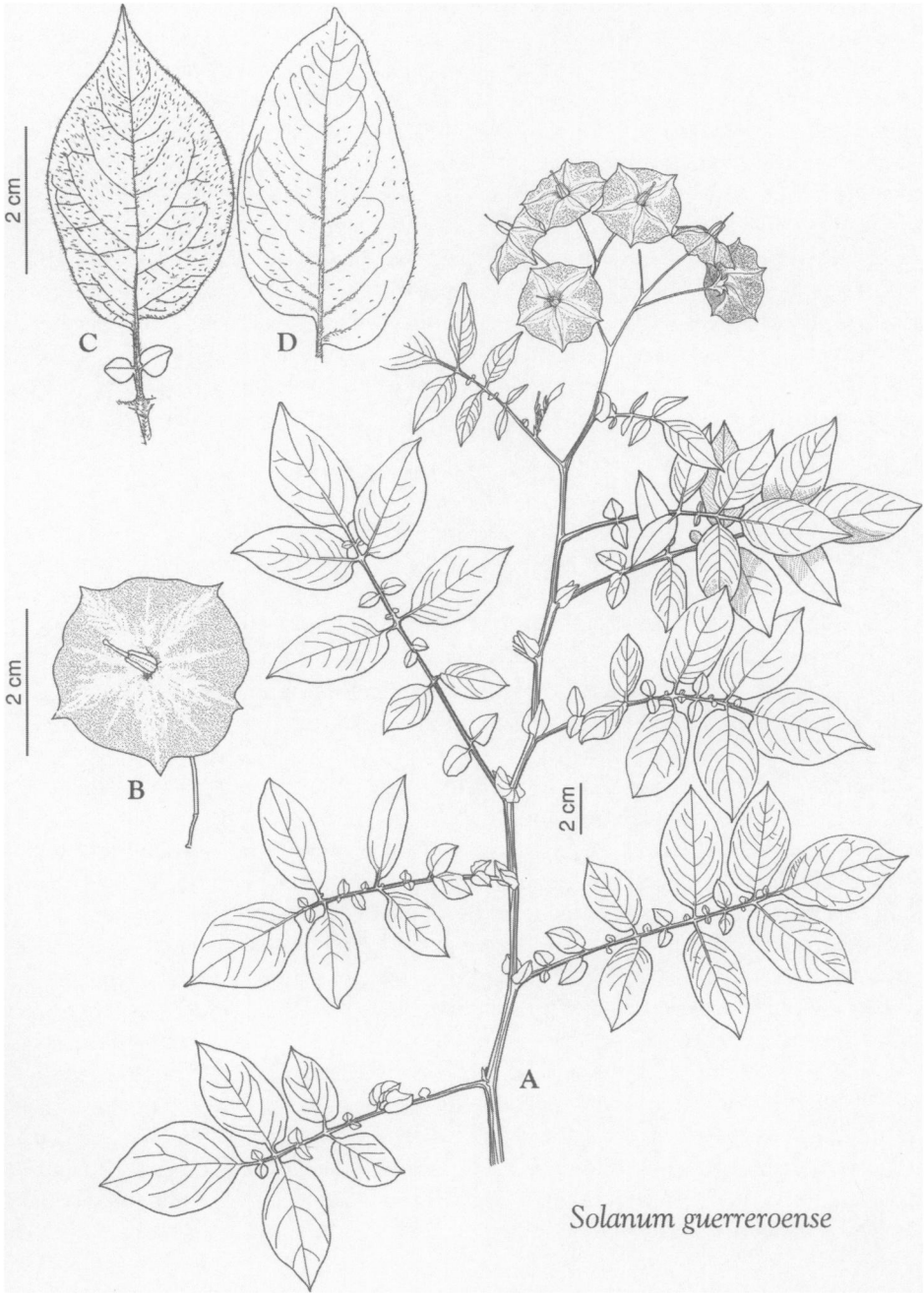


FIG. 42. *Solanum guerreroense*. A. Habit. B. Flower. C, D. Lateral leaflet, adaxial (C) and abaxial (D) views. (Based on *Correll 14410a*, K, isotype.)

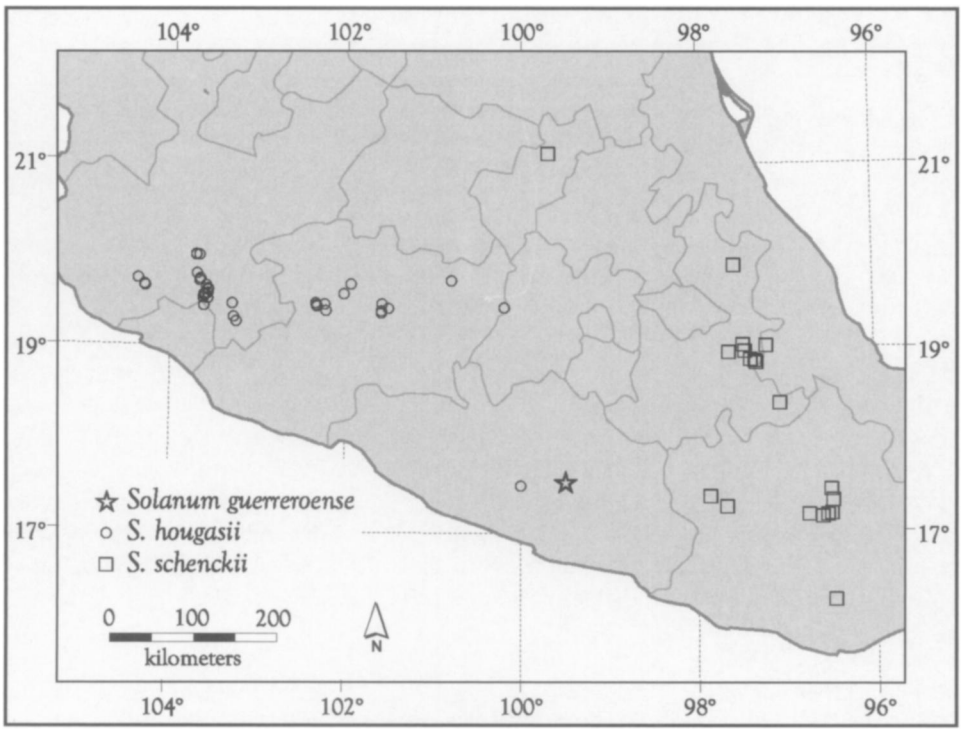


FIG. 43. Distribution of *Solanum guerreroense*, *S. hougasii*, and *S. schenckii*.

We struggled with the proper treatment of *S. guerreroense*. Correll (1952) described it as low-growing plants (similar to some populations of *S. demissum*) with white corollas (like *S. hougasii*), and with conical fruits (like *S. iopetalum*). He cited two gatherings of this species, *Correll 14410* (the source of the tubers in Guerrero from which the type was grown), and *Hinton 11929* from Michoacán. Correll (1952) determined another collection, *Correll 14342*, as *S. verrucosum* var. *spectabilis* (=*S. hougasii*) that was later identified in the genebank as *S. guerreroense*. The morphological study of Spooner et al. (1995) showed material identified in genebanks as *S. guerreroense*, *S. hougasii*, and *S. iopetalum* (including *S. brachycarpum*) to be very difficult to separate into three taxa, but *Correll 14342* clustered with other populations of *S. hougasii*, as we circumscribe it here.

Solanum guerreroense is very similar to both *S. iopetalum* (with fewer interjected and lateral leaflets) and *S. hougasii* (with globose fruits). We identify Correll's (1952) paratype *Hinton 11929* as *S. hougasii*. *Solanum guerreroense* maybe a highly rare and endemic species very similar to and possibly conspecific with *S. iopetalum*. Lack of sufficient comparative material leads us to maintain it as a separate species at this time.

22. Solanum hougasii Correll, Madroño 14: 236. 1958. *Solanum verrucosum* var. *spectabilis* Correll, Agric. Monogr. U.S.D.A. 11: 228, figs. 164, 165, 166. 1952. *Solanum spectabile* (Correll) Hawkes, Ann. Mag. Nat. Hist. Ser. 12, 7: 701. 1954, non *Solanum spectabile* Steudel, 1841.—TYPE: Specimens prepared from cultivated plants, *D. S. Correll 14253* (holotype: NA-14253!, photos [Correll neg. 864]: F! GH! K! LL! NY! US!; isotypes: IBUG! MEXU!). [Source of

propagules: MEXICO. Michoacán: about base of large trees on edge of balsam cloud forest, about 7 miles above Opopeo, 13 Nov 1947, *D. S. Correll 14253*.]

Plants up to 0.75 m, herbaceous, terrestrial, erect to ascending. Stems 3–5 mm in diameter at base of plant. Pseudostipules 3–8 mm long, lunate. Leaves 10–24 cm long, 7–15 cm wide, odd-pinnate, strigose, puberulent or pubescent adaxially and abaxially; petioles 2–6 cm long; lateral leaflet pairs 3–4, the first two pairs often equal or only gradually diminishing in size towards the base of the leaf; most distal lateral leaflets 3.8–7 cm long, 2–4 cm wide, medium to broadly elliptical, apex acute to acuminate, base oblique, cuneate, sessile, or with petiolules up to 10 mm long, rarely decurrent; terminal leaflet 4–8 cm long, 1.5–2.9 cm wide, broadly elliptical, apex acute to acuminate, base cuneate; interjected leaflets 4–18. Inflorescences generally in distal half of plant; peduncle 2–9.3 cm long. Flowers 9–19; pedicels 11–23 mm long, articulate between the proximal 1/4 and the distal 1/4; calyx 5–7 mm long, lobes attenuate, acumens 1–2 mm long; corolla 2.4–2.8 cm in diameter, rotate, acumens up to 2 cm long, edges of corolla flat, not folded dorsally, white throughout, or white with purple interpetalar tissue; anthers 4.5–5.5 mm long, connate; style 8–10 mm long, exceeding the stamens by 2.5–4 mm, straight. Fruits 1.2–2 cm long, globose, medium green with white spots. Seeds from living specimens green-white throughout. Chromosome number: 2n = 72. EBN = 4. Plates 3J, K, 4K; Fig. 44.

Phenology. Flowering and fruiting August through December.

Distribution (Fig. 43). Mexico (Colima, Guerrero, Jalisco, Michoacán); at edges of cultivated fields, roadsides, grasslands, in areas of alder, fir, and pine and oak forests; 1600–3135 m.

ADDITIONAL SPECIMENS EXAMINED. **Mexico.** COLIMA: lower slopes of Nevado de Colima, 19.44°N, 103.63°W, 2600 m, Sep 1980, *Ochoa 14176* (CIP, US, WIS).—GUERRERO: Mpio. Tlacotepec, 20 km NE Puerto del Gallo, on road to Filo del Caballo, 17.46°N, 100.10°W, 2900 m, 15 Jun 1982, *Martínez 851* (MEXU).—JALISCO: Mpio. Tonila, Colima volcano, roadside from El Fresnito to El Refugio de las Joyas, 19.51°N, 103.58°W, 2950 m, 31 Jul 1989, *Cházaro et al. 6012* (MEXU); Nevado de Colima, intersection of El Fresnito to the refuge of Las Joyas, 19.56°N, 103.62°W, 2950 m, 31 Jul 1989, *Cházaro et al. 6014* (NY); El Isote, upper slopes of Nevado de Colima, 19.50°N, 103.63°W, 18 Dec 1947, *Correll 14340, 14340a, 14340b* (C, GAT, IBUG, K, LL, MEXU, PTIS); Sayulapa, slopes of Nevado de Colima, 19.65°N, 103.60°W, 18 Dec 1947, *Correll 14342, 14342a, 14342b* (C, K, PTIS, US); lower slopes of Nevado de Colima, road from Ciudad Guzmán to the Nevado, 19.62°N, 103.58°W, 2600 m, 19 Aug 1967, *Flores S-978* (MEXU); NE side of Volcán Colima, 19.52°N, 103.63°W, 3048 m, 22 Jul 1905, *Goldsmith 72* (DS, F, GH, MO, NY, UC, US); Nevado de Colima (Nevado de Zapotlán), a few mi S of Ciudad Guzmán, 19.55°N, 103.63°W, 3080 m, 2 Jul 1956, *Gregory & Eiten 284* (GH, MEXU, MICH, MO, P, SMU); NE slopes of the Nevado de Colima, below Canoa de Leoncito, 19.56°N, 103.62°W, 2900–3100 m, 10 Sep 1952, *McVaugh 12844* (G, K, LL, MEXU, MICH, SMU, US); Mpio. Venustiano Carranza, 3 km before the canyon, road from Sayula to Venustiano Carranza, 19.78°N, 103.71°W, 23 Jul 1991, *Reynoso 549* (MEXU, IBUG); Mpio. Tapalpa, 1 km N of Juanacatlán, along the dirt road to Atemajac de Brizuela, 19.98°N, 103.72°W, 2400 m, 23 Aug 1986, *Rodríguez 571* (ANSM, CHAPA, ENCB, F, IBUG, IEB, MEXU, MICH, NY, WIS, XAL); Mpio. Venustiano Carranza, El Isote, on road from Ciudad Guzmán to El Grullo, 19.71°N, 103.68°W, 2300 m, 8 Sep 1988, *Rodríguez 1522* (ENCB, IBUG, IEB, MEXU); Mpio. Tecalitlán, San Isidro, along dirt road from Tecalitlán to Jilotlán de Dolores, 19.47°N, 103.30°W, 1900 m, 16 Aug 1986, *Rodríguez & Suárez 526* (ANSM, CHAPA, ENCB, F, IBUG, IEB, MEXU, MICH, NY, WIS, XAL); Mpio. Tapalpa, 1 km SE of Juanacatlán, on road to Tepec, 19.98°N, 103.72°W, 2400 m, 23 Aug 1986, *Rodríguez & Suárez 572* (ENCB, IBUG, IEB, MEXU); Mpio. Venustiano Carranza, on road Ciudad Guzmán to V. Carranza, El Isote, N side of the Nevado de Colima, 19.72°N, 103.67°W, 2400 m, 23 Aug 1987, *Rodríguez & Suárez 949* (ANSM, CHAPA, ENCB, F, IBUG, IEB, MEXU, MICH, NY, PTIS, WIS, XAL); Mpio. Tapalpa, road from Juanacatlán to Tepec, 19.98°N, 103.69°W, 2330 m, 26 Aug 1987, *Rodríguez & Suárez 951* (ANSM, CHAPA, ENCB, IBUG, IEB, MEXU, WIS, XAL); Mpio.

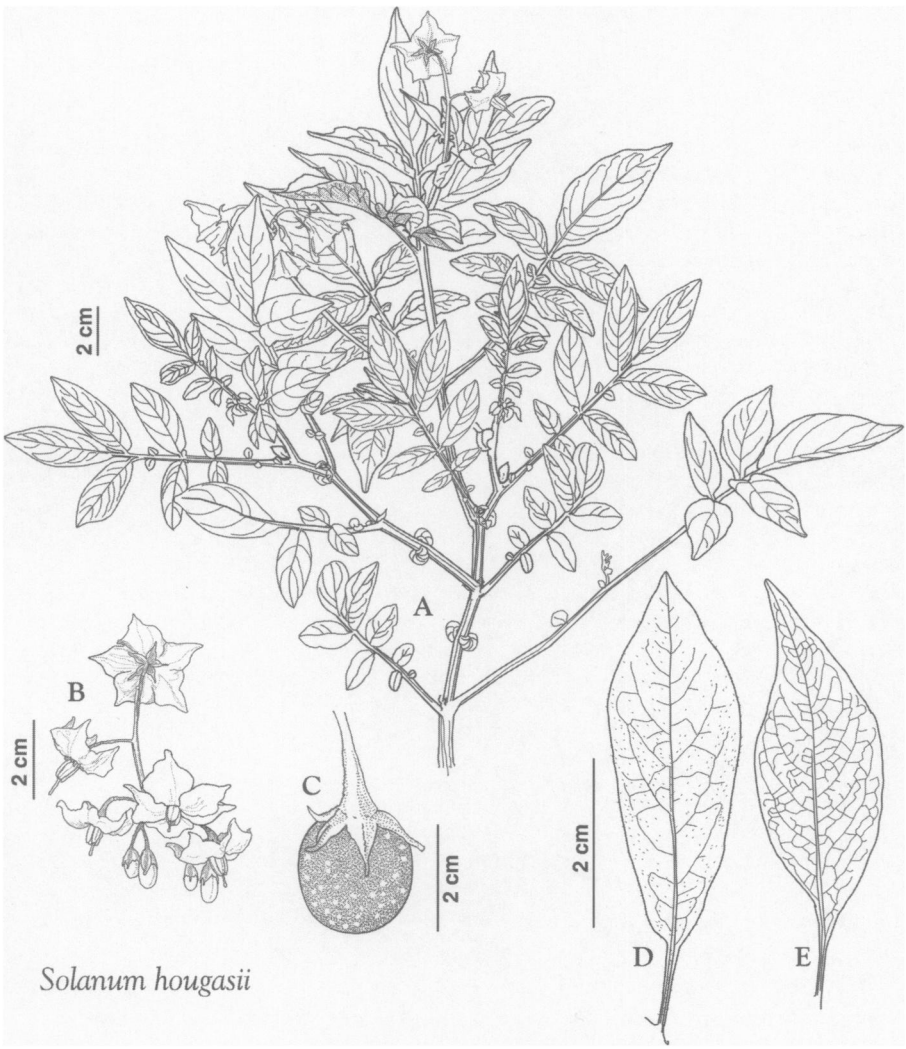


FIG. 44. *Solanum hougasii*. A. Habit. B. Portion of inflorescence with flowers and buds. C. Mature fruit. D, E. Lateral leaflet, adaxial (D) and abaxial (E) views. (Based on: A, B, D, E, *Spooner 4129*, PTIS; C, *Spooner et al. 4285*, PTIS.)

Tapalpa, along the road to Atemajac de Brizuela, 2 km N of Juanacatlán, 19.98°N, 103.72°W, 2520 m, 9 Oct 1988, *Rodríguez & Suárez 1581* (ANSM, CHAPA, ENCB, F, IBUG, IEB, MEXU, MICH, NY, WIS, XAL); at San Isidro, on road from Llanitos to Cruz de Garibay, S of Ciudad Guzmán, 7.4 km N of Alotitlán, on W side of road by streamside, 19.32°N, 103.28°W, 1870 m, 6 Sep 1988, *Spooner et al. 4116* (IBUG, INIFAP, MEXU, PTIS, WIS), on road from Llanitos to Cruz de Garibay, S of Ciudad Guzmán, 1 km S of Alotitlán, 0.5 km N of church on E side of road, about 100 m W of road, 19.27°N, 103.25°W, 1910 m, 6 Sep 1988, *Spooner et al. 4117* (IBUG, INIFAP, PTIS, WIS); new microwave tower road to top of Nevado de Colima, 24 km from beginning of this road, which begins about 0.5 km SE of La Mesa and El Fresnito, 19.57°N, 103.58°W, 3135 m, 7 Sep 1988, *Spooner et al. 4124* (IBUG, INIFAP, MEXU, PTIS, WIS); on microwave tower road 8.8 km S of Alista to La Mesa and El Fresnito Road, road begins just E of Sayulapa, next to microwave tower Víboras, 19.60°N, 103.58°W, 2920 m, 8 Sep 1988, *Spooner et al. 4129* (IBUG, INIFAP, MEXU, PTIS, WIS); on microwave tower road which begins just E of Sayulapa on Alista to La Mesa and El

Fresnito Road, 3.3 km from top of microwave tower of Víboras, 19.62°N, 103.58°W, 2700 m, 8 Sep 1988, *Spooner et al. 4132* (IBUG, IEB, INIFAP, MEXU, PTIS, WIS); Mpio. Autlán, Las Playas, Las Joyas, 19.72°N, 104.39°W, 1800 m, 1 Aug 1985, *Vázquez 3464* (MEXU); mountains E of Manantlán about 15 mi SSE of Autlán by way of Chante, 19.65°N, 104.31°W, 2195 m, 22 Jul 1949, *Wilbur & Wilbur 1784* (MICH), 23 Jul 1949, *Wilbur & Wilbur 1797* (MICH).—MICHOACÁN: Las Peras, Km 272 to Morelia, 19.73°N, 100.80°W, 2510 m, 13 Sep 1962, *Flores S-670* (MEXU); Paricutín, 19.47°N, 102.25°W, 30 Sep 1957, *Graham 368* (PTIS); near Paricutín, 19.47°N, 102.25°W, 1600 m, 2 Jan 1956, *Graham S-368* (K, PTIS), *Graham S-740B* (K), Sep 1957, *Graham & Galindo 15* (LL); 7 mi beyond Opopeo, Km 51 on the Quiroga to Tacámbaro Road, 19.40°N, 101.60°W, 2950 m, 20 Sep 1958, *Hawkes et al. 1531* (C, K, PTIS, US); Dist. Zitácuaro, Zitácuaro-Cacique Mountain, 2700 m, 6 Jun 1938, *Hinton et al. 11929* (K, US); 1 km below El Arco, road from Villa Victoria to Zitácuaro, 19.45°N, 100.20°W, 3075 m, 10 Oct 1980, *Ochoa 14159* (CIP, US, WIS); Ojo de Agua track up to Camdémbaro, 2500 m, 24 Sep 1982, *Ochoa 14168* (US, WIS); between Paso de Nieve and Ojo de Agua, 19.48°N, 102.35°W, 2100 m, Sep 1982, *Ochoa 14169* (CIP, US, WIS); on S side of Cerro Burro, on road to microwave tower, 4 km N of Opopeo to Tacámbaro de Codallos Road, 19.43°N, 101.52°W, 2950 m, 18 Oct 1988, *Palmer 4274* (PTIS), *Spooner et al. 4273* (INIFAP, PTIS, WIS); Mpio. Cherán, Santa Cruz Tanaco, SE slope of Cerro Grande, 19.68°N, 101.95°W, 2850 m, 14 Aug 1987, *Pérez 183* (MEXU); NW-facing slope of Volcán Tancítaro, 11 km SE of Peribán on road to Paso la Nieve, then a 50 m walk uphill SE of road, 19.46°N, 102.34°W, 2550 m, 23 Oct 1997, *Rivera-Peña et al. 987* (INIFAP, MEXU); NW-facing slope of Cerro Tancítaro, 11 km SE of Peribán on road to Paso la Nieve, then a 1.5 km walk SE uphill, 19.45°N, 102.33°W, 2600 m, 23 Oct 1997, *Rivera-Peña et al. 988* (PTIS); NW-facing slope of Cerro Tancítato, 11 km SE of Peribán on road to Paso la Nieve, then a 2 km walk SE up hill, 19.45°N, 102.33°W, 2650 m, 23 Oct 1997, *Rivera-Peña et al. 989* (INIFAP, MEXU, PTIS, WAG); along microwave tower road off of dirt road beginning about 5 km NE of Capácuaro, about 6.5 km from beginning of this microwave tower road, 19.58°N, 102.03°W, 3000 m, 1 Sept 1988, *Spooner et al. 4090B* (INIFAP, PTIS); N side of Opopeo to Tucambaro de Codallos road, 4.8 km W of junction of this road to Opopeo, 19.38°N, 101.60°W, 2550 m, 18 Oct 1988, *Spooner et al. 4277* (INIFAP, PTIS); 12.6 km W of town square of Nuevo San Juan Parangaricutiro, on road to Tancítaro, 19.40°N, 102.23°W, 2350 m, 20 Oct 1988, *Spooner et al. 4285* (INIFAP, PTIS, WIS); roadside, 8.2 km from dirt road NE of Capácuaro, on road to microwave tower, 19.58°N, 102.03°W, 3050 m, 20 Oct 1988, *Spooner et al. 4286* (INIFAP, PTIS).

As discussed under *S. guerreroense*, *S. hougasii* is especially similar to *S. guerreroense* and *S. iopetalum*, but differs in the shape of the fruit; *S. hougasii* has globose fruits, and *S. guerreroense* and *S. iopetalum* have ovoid to conical fruits. Because some herbarium specimens of all three species lack well-preserved flowers and fruits, we may have misidentified some of them.

Some specimens superficially appear to be type material but were collected at a later date. Those at LL and PTIS are cultivated specimens, but were prepared in 1953 and are labeled *Correll 14253a* or *14253b*. A specimen at C bears a collection number *Correll 14253* but was collected 1987.

23. Solanum iopetalum (Bitter) J. G. Hawkes, Bull. Imp. Bur. Pl. Breed. Genet., Cambridge 30. 1944. *Solanum verrucosum* var. *iopetalum* Bitter, Repert. Spec. Nov. Regni Veg. 11: 455. 1912.—TYPE: MEXICO. Hidalgo: wet woods near Trinidad Iron Works, 5700 ft, 16 Jun 1904, *C. G. Pringle 8954* (lectotype, here designated: W-4750!; isolectotypes: C! CAS! CM! CU! E[3]! F! G! GH! GOET[2]! K! LY! M! MO! MSC! NY! P! PH! RSA! S[2]! UC! US-461431! US-1177852! VT, Z!, photo of F isolectotype: US!, photos of GH isolectotype [Correll neg. 104]: BM! F! GH! K! L! LL! NY! UC! US!, photo of NY isolectotype: US!, photos of P isolectotypes: [Correll neg. 428]: F! GH! LL! NY! UC! US!, photo of PH isolectotype: PTIS!, photo of US-1177852 isolectotype: US!, photos of Z isolectotype [Correll neg. 312]: F! GH! K! NY! UC! US!).

Solanum demissum f. *longibaccatum* Bukasov ex Rybin, Trudy Prikl. Bot. 20: 699. 1929.—TYPE: Cultivated plants, *M. Antipovich 1208a* (lectotype, here designated: WIR!, a sheet with two portions of a plant, a leaf, and two flowers, photos: LL! PTIS!; isolectotype: WIR!, a sheet with nine inflorescences/flowers, photos: LL! PTIS!). [Source of propagules: MEXICO. Distrito Federal: mountain range, Tlaxpehualco, *M. Antipovich 1208a.*]

Solanum demissum f. *recurvoacuminatum* Bukasov ex Rybin, Trudy Prikl. Bot. 20: 698. 1929.—TYPE: MEXICO. Distrito Federal: near México, Tlaxpehualco, 2600–2700 m, *M. Antipovich & M. Antipovich 1207* (holotype: WIR!, photos: K! LL! PTIS!).

Solanum demissum f. *stenantherum* Lechnovich ex Bukasov, Trudy Prikl. Bot. Suppl. 47: 223. 1930.—TYPE: MEXICO. Distrito Federal: Valley of Mexico, Monte Allegre, *M. Antipovich 6* (lectotype, here designated: WIR!, photos: K! LL! PTIS!).

Solanum oxycarpum var. *brachycarpum* Correll, Contrib. Texas Res. Found., Bot. Stud. 1: 8, fig. 3. 1950. *Solanum brachycarpum* (Correll) Correll, Agric. Mon. U.S.D.A. 11: 59. 1952.—TYPE: MEXICO. Michoacán: District Coalcomán, S Torricillas, pine forest, 2350 m, 25 Jul 1939, *G. B. Hinton et al. 13995* (holotype: NY!, photo: US!; isotypes: F! GH! LL! MO! NY! PH! RSA! US-1841454! W-10062!, photos of GH isotype [Correll neg. 60]: BM! F! GH! K! LL! NY! UC! US!, photos of LL isotype [Correll neg.: 433]: BM! F! GH! K! LL! NY! UC! US!).

Plants 0.3–0.75 m tall, herbaceous, terrestrial, erect to ascending. Stems 3–5 mm in diameter at base of plant. Pseudostipules 5–15 mm long, lunate. Leaves 9–35 cm long, 6–27 cm wide, odd-pinnate, strigose, puberulent or pubescent adaxially and abaxially; petioles 2–10 cm long; lateral leaflet pairs 2–4, the first two pairs often equal or only gradually diminishing in size towards the base of the leaf; most distal lateral leaflets 4–14 cm long, 1.8–5 cm wide, ovate to more commonly broadly elliptical, apex acute to acuminate, base oblique, sessile or with petiolules up to 6 mm long, rarely decurrent; terminal leaflet 6–13 cm long, 2–4 cm wide, elliptical, apex acute to acuminate, base cuneate; interjected leaflets 0–10. Inflorescences generally in distal half of plant; peduncle 1–9.8 cm long. Flowers 3–17; pedicels 13–25 mm long, articulate between the proximal 1/4 and the distal 1/4; calyx 5–8 mm long, lobes acute to long-attenuate, acumens minute to 3.5 mm long; corolla 1.9–4 cm in diameter pentagonal to rotate, acumens 2–3 mm long, edges of corolla flat, not folded dorsally, white or very light violet to dark violet usually darker abaxially than adaxially; anthers 5–6 mm long, connate; style 8–10 mm long, exceeding stamens by 3–5 mm, straight. Fruits 1–2 cm long, ellipsoid to conical, light to medium green, often with smooth to raised white dots. Seeds from living specimens green-white throughout. Chromosome number: 2n = 72. EBN = 4. Fig. 45.

Phenology. Flowering and fruiting July through November.

Distribution (Fig. 31). Widely distributed from central Mexico (Jalisco to Querétaro) south to Oaxaca; in rich organic soil, along roadsides, among bushes, edges of cultivated fields, in areas of alder, pine, oak, and fir forests; 1700–3350 m.

See Appendix for a list of Specimens Examined (p. 185).

Solanum iopetalum is most similar to *S. guerreroense* and *S. hougasii* (see discussion under *S. guerreroense*, no. 21). It has fewer interjected leaflets (0–10) than *S. guerreroense* (8–19), and ellipsoid to conical fruits (globose in *S. hougasii*).

FIG. 45. *Solanum iopetalum*. A. Habit. B. Portion of infructescence with mature fruits. C, D. Lateral leaflet, adaxial (C) and abaxial (D) views. (Based on *Spooner 4166*, PTIS.)

24. Solanum schenckii Bitter, Repert. Spec. Nov. Regni Veg. 11: 448. 1912.—TYPE: MEXICO. "Veracruz" [Puebla]: Boca del Monte near Esperanza, 2 Sep 1908, *Schenck 126* (holotype: B, destroyed).—Specimens prepared from cultivated plants, *J. P. Hjerting & J. Gómez 290* (neotype, designated by Hawkes, 1990: 196: K!; isoneotypes: BM! C[3]! G! GH! K[2]! PTIS! WIS!). [Source of propagules: MEXICO. Puebla: Esperanza, going 9 km SE, about 2–3 km past Boca del Monte station on rd to Cumbre de Aguila (microwave station), *J. P. Hjerting & J. Gómez 290.*]

Solanum demissum var. *megalocalyx* Hawkes, Bull. Imp. Bur. Pl. Breed. Genet., Cambridge: 27, 116. 1944.—TYPE: MEXICO. Veracruz: Orizaba, Loma Grande, growing among low scrub and bushes in hedgerow, deep loamy soil with rich humus, only found in one limited spot, 9700 ft, 27 Apr 1938, *N. Balls, E. K. Balls & W. B. Gourlay 4370* (lectotype, here designated: K!; isolectotypes: K[2]!).

Plants up to 0.45 m tall, herbaceous, terrestrial, decumbent to erect. Stems 3–5 mm in diameter at base of plant. Pseudostipules 5–11 mm long, lunate. Leaves 9–21 cm long, 5–9 cm wide, odd-pinnate, strigose, puberulent or pubescent adaxially and abaxially; petioles 1–4 cm long; lateral leaflet pairs 2–4, frequently the size of the lateral leaflets rapidly diminishing towards the base of the leaf; most distal lateral leaflets 3.5–6 cm long, 1.8–2.6 cm wide, ovate to elliptical to obovate, apex acute to acuminate, base oblique, cuneate, typically sessile and highly decurrent, rarely petiolulate, with petiolules up to 1.5 mm long; terminal leaflet 3.7–8.4 cm long, 1.6–5.5 cm wide elliptical to obovate, apex acute, base cuneate; generally without interjected leaflets, rarely 1 or 2. Inflorescences generally in distal half of plant; peduncle 1–4.5 cm long. Flowers 4–7; pedicels 13–30 mm long, articulate between the proximal 1/4 and the distal 1/4; calyx 5–12 mm long, lobes often noticeably wide, acumens 0–5 mm long; corolla 2–3.3 cm in diameter, pentagonal to rotate, acumens 1–3 mm long, edges of corolla flat, not folded dorsally, typically light violet or violet-blue adaxially and darker purple-violet abaxially, with a narrow light margin along the edges of the abaxial side, sometimes a pattern on the abaxial side with the petals darker than the interpetalar tissue; anthers 4–6 mm long, connate; style 8–11 mm long, exceeding stamens by 2–4 mm, straight. Fruits 1.8–2.5 cm long, ovoid, medium to deep green, dotted or mottled with lighter green. Seeds from living specimens green-white throughout. Chromosome number: 2n = 72. EBN = 4. Plate 4L, Fig. 46.

Phenology. Flowering and fruiting August through October.

Distribution (Fig. 43). Mexico (Querétaro south to Puebla and Oaxaca); rich soil of oak and pine forests, fencerows, among bushes; (1780–) 2420–2900 (–3700) m.

ADDITIONAL SPECIMENS EXAMINED. **Mexico.** OAXACA: Cerro San Felipe, 17.17°N, 96.75°W, 15 Aug 1897, *Conzatti & González 415* (BH, GH, MEXU); Sierra de Juárez, 14 mi on the Oaxaca to Ixtlán road past the divergence from the Oaxaca to Tehuantepec Hwy, 17.33°N, 96.48°W, 2700 m, 21 Oct 1958, *Hawkes et al. 1724* (A, B, BM, C, G, K, PTIS, S, US, WIS); summit of Estepe (Ixtepec), 1842, *Liebmann 1463* (C); Mpio. Miahuatlán, 35 km ESE of Miahuatlán, 5 km NE of Santo Domingo Ozolotepec, Cerro Quiexobra, 16.25°N, 96.47°W, 3500–3700 m, 5 Oct no year, *McDonald 3016* (TEX, NY); Tlaxiaco to Yucumino, going from Guerrero to Santiago Nuyó, Dist. Tlaxiaco, 17.27°N, 97.68°W, 2750 m, 6 Sep 1980, *Ochoa 14137* (CIP, IBUG, K, MEXU, P, US, WIS); road from La Cumbre to Yuyila, near Yaviles, NE of Oaxaca, 17.18°N, 96.50°W, 2770 m, 8 Sep 1980, *Ochoa 14140* (B, CIP, IBUG, K, MEXU, US, WIS); Mpio. San Juan Mixtepec, Río Azucena, 14 km NW San Juan Mixtepec, 17.38°N, 97.87°W, 1780 m, 9 Jul 1988, *Reyes 315* (MEXU); 3.5 km E of La Cumbre on road to Yuvila, and 3.3 km W of Yuvila, 17.17°N, 96.54°W, 2720 m, 13 Oct 1997, *Rivera-Peña et al. 964* (INIFAP, MEXU, PTIS, WAG); clearing in shrubs around microwave tower, 1.9 km SE of Rt 175 N of Oaxaca City, on road to Yuvila, about 16 km NNE of outer Oaxaca City, 17.15°N, 96.60°W, 2690 m, 22 Sep 1988, *Spooner et*

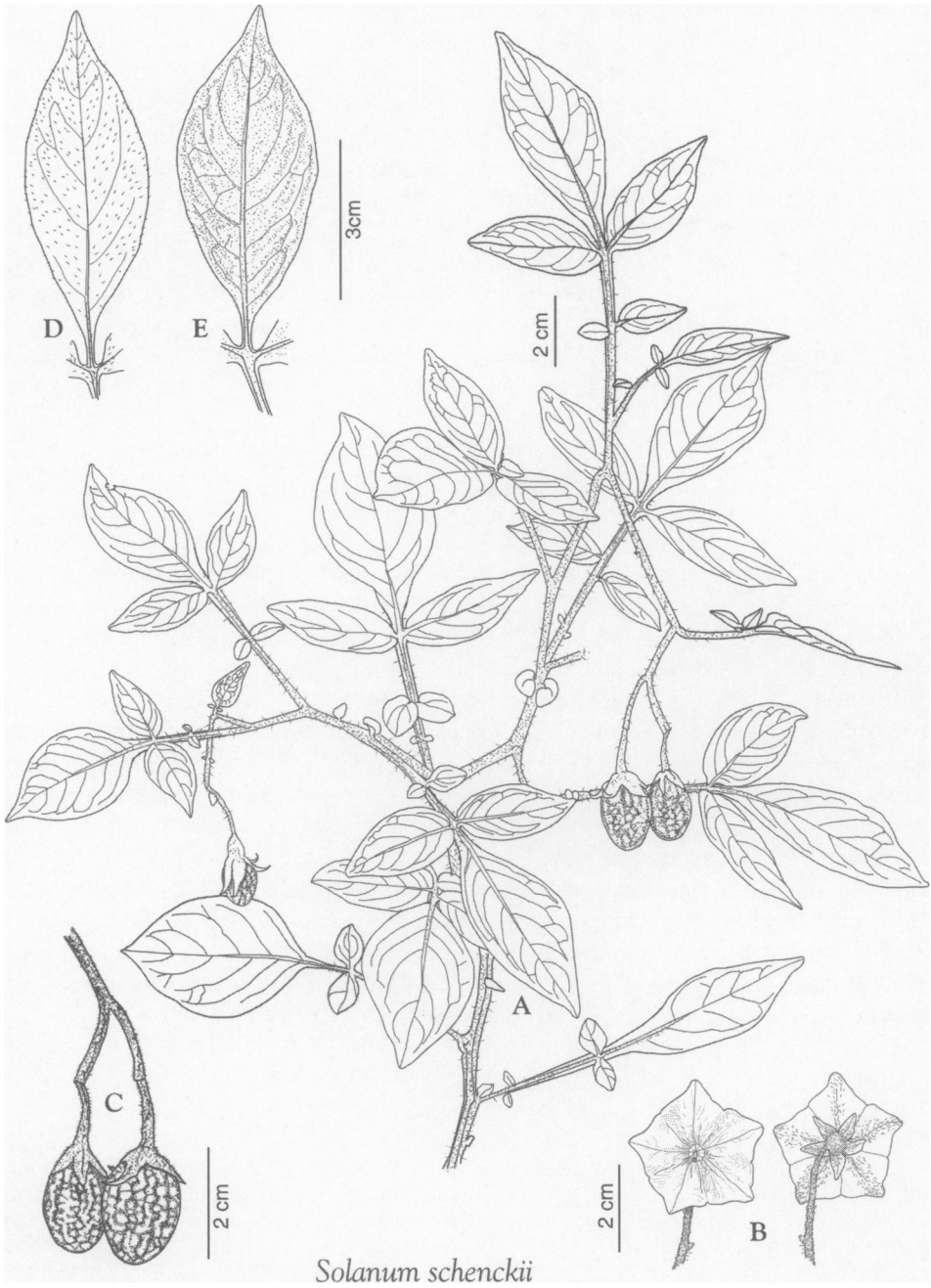


FIG. 46. *Solanum schenckii*. A. Habit. B. Flowers. C. Portion of infructescence with mature fruits. D, E. Terminal leaflet, adaxial (D) and abaxial (E) views. (Based on *Spooner 4194*, PTIS.)

al. 4194 (INIFAP, PTIS); E side of Rt 175, 17.9 km N of N entrance to Ixtlán de Juárez, about 0.5 km S of posted Km 137 sign, 17.45°N, 96.50°W, 2720 m, 22 Sep 1988, *Spooner et al. 4199* (PTIS).—PUEBLA: Sierra de Zacapoaxtla, 19.88°N, 97.58°W, *Diguet s.n.* (P); 2 km from Esperanza, 18.87°N, 97.40°W, 2420 m, 28 Sep 1964, *Flores S-790* (CHAPA, ENCB, F, IBUG, K, MEXU, MO, NY), 29 Sep 1964, *Flores S-790-II (this grown in Mexico from earlier collection)* (K, ENCB); Mount Orizaba, from Esperanza, near Atzitzintla, Los Positos, 18.96°N, 97.46°W, 2650 m, 16 Aug 1949, *Hawkes et al. 1069* (F, K, LL, NY, WIS); Mount Orizaba, from Esperanza, between Atzizintla and Tesmalaquilla, 19.03°N, 97.48°W, 2900 m, 17 Aug 1949, *Hawkes et al. 1072* (K, LL, MPU); SE of Esperanza, near Puebla, 18.87°N, 97.40°W, 2520 m, 7 Oct 1980, *Ochoa 14208* (PTIS, US, US, WIS); Boca del Monte near Esperanza, 2 Sep 1908, *Schenck 126* (GOET); toll road from Orizaba to Puebla, at Km 228 (by posted km signs), by bridge crossing, about 5 km E of Esperanza railroad station, 18.85°N, 97.35°W, 2600 m, 30 Sep 1988, *Spooner et al. 4231* (INIFAP, PTIS, WIS); Tehuacán to Oaxaca road, turning at Coxcatlán towards Zoquitlán, 21 km along this road, La Griega, to where the road divides to Zoquitlán and Coyomeapa, 18.39°N, 97.07°W, 2660 m, 23 Oct 1983, *Tarn et al. 179* (C, K, NY, PTIS); road from Orizaba to Puebla, Km 107.8 from Puebla, about 40 km from Orizaba, 18.95°N, 97.65°W, 2600 m, 24 Oct 1983, *Tarn et al. 185* (K, PTIS); about Km 228 on road from Mexico City to Orizaba, 5–6 km after La Esperanza Railway Station, 18.85°N, 97.35°W, 2470 m, 25 Oct 1984, *Tarn et al. 283* (C, K, PTIS, S).—QUERÉTARO: from Hwy 120, Jalpan to San Juan del Río, beyond Madroño, 21.10°N, 99.70°W, 2900 m, 15 Sep 1983, *Tarn et al. 104* (C, IBUG, K, MEXU, PTIS), *Tarn et al. 105* (K, MEXU); Hwy 120, Jalpan to San Juan del Río, just beyond Madroño, about 4 km NW along the track to the microwave tower, 21.10°N, 99.70°W, 2850 m, 15 Sep 1983, *Tarn et al. 107* (K, PTIS).

Solanum schenckii is partly distinguished by its decurrent leaflets, but this decurrence is sometimes only slight, as shown in Fig. 46, and other species occasionally produce decurrent leaflets as well (e.g., *S. jamesii*, Fig. 6). It also characteristically has calyx lobes wider than other species from North and Central America. Most specimens are much easier to identify in living condition, where they more clearly show the sharp contrast to the light violet coloration of the corolla abaxially and very dark violet adaxially. Despite these minor and sometimes inconstant diagnostic characters, the species was well separated from other members of the group in the morphological phenetic study of Spooner et al. (1995).

Bitter (1912) cited *Schenck 126* (B) as the holotype for *S. schenckii*. The type was destroyed, but a drawing of a single leaf of the type, at GOET! (Correll neg. 601: BM! F! GH! K! NY! UC!) shows the lateral leaflet decurrency of this species. Correll (1952) and Hawkes (1963) listed *S. schenckii* as an excluded and dubious name, respectively. Correll (1962) included *S. schenckii* in *S. oxycarpum*. Flores Crespo (1968) rediscovered the species very near the type locality. Hawkes (1990) designated specimens cultivated from propagules obtained near the type locality (*J. P. Hjerting & J. Gómez 290*) as the neotype collection. The date of gathering this material is unknown.

ACAULIA GROUP

25. Solanum demissum Lindley, J. Hort. Soc. London 3: 70, fig. pg. 69. 1848.—TYPE: MEXICO. Locality unknown, 8000–9000 ft, 1846–47, *C. A. Uhde 5 p.p.* (holotype: CGE!, photos [Schubert neg.]: G! GH!, [Field Museum neg. 17]: F!, [Correll neg. 576]: BM! F! GH! K! LL! NY! UC! US!).

Solanum stoloniferum var. *pumilum* M. Martens & Galeotti, Bull. Acad. Roy. Sci. Bruxelles 12: 138. 1845.—TYPE: MEXICO. Puebla or Veracruz: Pico de Orizaba, 10,000–12,000 ft, *H. Galeotti 1175 p.p.* (lectotype: BR-0838969!).

Solanum utile Klotzsch, Allg. Gartenzeitung 17: 315. 1849.—TYPE: Specimens prepared from plants cultivated from seeds distributed by Friedrich Otto, *Klotzsch s.n.* (holotype: not located).—"In hort. Klotzsch ex cultum," Aug 1852, *Klotzsch*

s.n. (neotype: here designated: UPS!). [Seed source for original type collection, fide Klotzsch, 1849: MEXICO. Río Frío, in the mountains between Puebla and México, 10,000 ft.]

Solanum demissum f. *xitlense* Bukasov ex Rybin, Trudy Prikl. Bot. 20: 699. 1929.—TYPE: MEXICO. Distrito Federal: near Mexico [City], Sierra de Ajusco, Volcán Xitle, 3100–3200 m, *M. Antipovich & M. Antipovich s.n.* (holotype: WIR!, photos: K! PTIS!).

Solanum demissum f. *tlaxpehualcoense* Bukasov ex Rybin, Trudy Prikl. Bot. 20: 698. 1929.—TYPE: MEXICO. Distrito Federal: mountain range of Tlaxpehualco, *M. Antipovich & M. Antipovich s.n.* (holotype: WIR, not located).

Solanum demissum f. *adpressoacuminatum* Bukasov ex Rybin, Trudy Prikl. Bot. 20: 698. 1929.—TYPE: Specimen prepared from plants cultivated from seed supplied by the horticultural firm of Vilmorin from an undetermined location in Mexico, without collector or number (lectotype, here designated: WIR!, photos: LL! PTIS!).

Solanum demissum f. *atrocyaneum* Lechnovich, Trudy Prikl. Bot. Suppl. 47: 224. 1930.—TYPE: MEXICO. Monte Allegre, *M. Antipovich s.n.* (holotype: WIR, not located).

Solanum demissum f. *microcalyx* Lechnovich ex Bukasov, Trudy Prikl. Bot. Suppl. 47: 225. 1930.—TYPE: MEXICO. Santa Rosa, *M. Antipovich 30a* (holotype: WIR, not located).

Solanum semidemissum Juzepczuk, Izv. Akad. Nauk SSSR, Ser. Biol. 2: 314. 1937.—TYPE: MEXICO. Distrito Federal: Valle de México, La Venta, 3250 m, *M. Antipovich 28* (lectotype, here designated: WIR!, photo: PTIS!; isolectotype: WIR[2], photos of WIR isolectotypes: K! LL!).

Solanum demissum var. *mastoidostigma* Hawkes, Bull. Imp. Bur. Pl. Breed. Genet., Cambridge 26, 115. 1944.—TYPE: MEXICO. México: Mount Popocatépetl, Paraje, steep slopes of volcanic dust, 3400 m, 16 Apr 1938. *N. Balls, E. K. Balls & W. B. Gourlay 4246* (lectotype, here designated: K!; isolectotypes: BH! BM! C! E! K[3]! LL! UC[2]! US-1794063!, photos of BM isolectotype [Correll neg. 753]: BM! F! GH! K! LL! NY! UC! US!).

Solanum demissum var. *orientale* Hawkes, Bull. Imp. Bur. Pl. Breed. Genet., Cambridge 25, 115, fig. 6. 1944.—TYPE: MEXICO. Puebla: Tesmalaquilla, Sierra Negra, Mount Orizaba, growing in dry-dust soil, open slopes of long uncultivated land that has at some time been used as fields, 5 May 1938, *N. Balls, E. K. Balls & W. B. Gourlay 4441* (lectotype, here designated: K!; isolectotypes: BM! E! K[4]! UC! US-1794144!).

Solanum demissum var. *demissum* f. *calycotrichum* Hawkes, Bull. Imp. Bur. Pl. Breed. Genet., Cambridge 25, 115. 1944.—TYPE: MEXICO. Tlaxcala: Mount Malinche, in deep shade of young and rather dense pine woods, in rotting pine needles, 2050 m, 22 Jun 1938, *N. Balls, E. K. Balls & W. B. Gourlay 4893* (lectotype, here designated: K!; isolectotypes: K[3]! US-1794341!).

Solanum demissum var. *demissum* f. *perotanum* Hawkes, Bull. Imp. Bur. Pl. Breed. Genet., Cambridge 26, 115. 1944.—TYPE: MEXICO. Veracruz: Cofre de Perote, 11,000 ft, 11 Sep 1938, *N. Balls, E. K. Balls & W. B. Gourlay 5431* (lectotype, here designated: UC-684443!, upper right-hand specimen of two specimens on sheet, photos: [Correll neg. 408]: BM! GH! K! LL! UC!).

Solanum demissum var. *demissum* f. *tolucense* Hawkes, Bull. Imp. Bur. Pl. Breed. Genet., Cambridge 25, 115. 1944.—TYPE: MEXICO. México: below Ojos de Agua, Nevado de Toluca, 11,000 ft, 11 Jul 1938, *N. Balls, E. K. Balls & W. B. Gourlay 4971/2* (lectotype, here designated: K!, photos [Correll neg. 751]: BM! GH! K!; isolectotypes: BM! CPC, E! K[4]!, photos of BM isolectotype [Correll neg. 407]: BM! F!, photos of CPC isolectotype [Correll neg. 749]: BM! F! K! LL! UC!).

Solanum demissum var. *demissum* f. *longifilamentosum* Hawkes, Bull. Imp. Bur. Pl. Breed. Genet., Cambridge 26, 116. 1944.—TYPE: MEXICO. Distrito Federal: Las Cruces, camino de Toluca, cultivated fields and open places, 3050 m, 13 Aug 1938, *N. Balls, E. K. Balls & W. B. Gourlay 5241* (lectotype, here designated: K!; isolectotypes: BM! BR! CPC, K! UC! US! WIS!, photos of CPC isolectotype [Correll neg. 409]: BM! F! K! LL!).

Solanum alpicum Standley & Steyermark, Field Mus. Nat. Hist., Bot. Ser. 23: 232. 1947.—TYPE: GUATEMALA. Huehuetenango: Cerro Chémal, summit of Sierra de los Cuchumatanes, 3700–3800 m, 8 Aug 1942, *J. A. Steyermark 50303* (holotype: F-1148536!, photos [F neg. 49340]: G! US!).

Plants up to 0.6 m tall, herbaceous, terrestrial, varying from a basal rosette to erect. Stems 3–6 mm in diameter at base of plant. Pseudostipules 1–5 mm long, lunate. Leaves 3.5–20 cm long, 1.5–10 cm wide, odd-pinnate, finely to coarsely pubescent adaxially and abaxially; petioles 1–5 cm long; lateral leaflet pairs 2–4, the size of the lateral leaflets gradually diminishing towards the base of the leaf; most distal lateral leaflets 2–4 cm long, 1.2–2.5 cm wide, ovate to elliptical, base rounded to cuneate, apex obtuse to acute, sessile, generally decurrent, sometimes subsessile with petiolules up to 2 mm long; terminal leaflet 3–6 cm long, 2–4 cm wide, ovate to elliptical, apex acute to obtuse, base rounded to cuneate; interjected leaflets 0–10. Inflorescences generally in proximal half of plant; peduncle 0.2–1.9 cm long. Flowers 5–10; pedicels 3–15 mm long, articulate in distal 1/4; calyx 4.5–8 mm long, lobes acute, minute, acumens up to 1 mm long; corolla 1.5–2.6 cm in diameter, rotate, acumens 1–2 mm long, edges of corolla flat, not folded dorsally, violet to violet-purple adaxially, uniform abaxially or lighter purple in the rays and interpetalar tissue; anthers 2–4.5 mm long, connate; style 5–6 mm long, equaling or exceeding stamens up to 2 mm, straight. Fruits 1–2.5 cm long, globose to ovoid, light to medium green, sometimes with smooth white dots. Seeds from living specimens green-white throughout. Chromosome number: 2n = 72. EBN = 4. Fig. 47.

Phenology. Flowering and fruiting August through October.

Distribution (Fig. 48). Widely distributed from northern Mexico (Chihuahua and Sonora) to Guatemala; generally at higher elevations in fir, pine, oak, alder, or juniper forests, often in very rich organic soil in clearings or edges of dense forests but sometimes in deep shade, among shrubs and forest undergrowth, roadside thickets, grasslands; (1900–) 2100–3700 m.

See Appendix for a list of Specimens Examined (p. 188).

Solanum demissum is generally easily distinguished by its high-placed pedicel articulation (in the distal 1/4 of the pedicel) and inflorescences in the proximal 1/2 of the plant, but it can be confused with poorly pressed specimens of *S. verrucosum* (distinguished by its inrolled corolla margins) and *S. stoloniferum* (see Polymorphism and Phenotypic Plasticity, above). It frequently, but not consistently, has a semi-rosette habit seen otherwise among the wild potatoes in North and Central America only in *S. guerreroense*.

We consider *S. demissum* to be more closely related to other members of ser. *Acaulia*

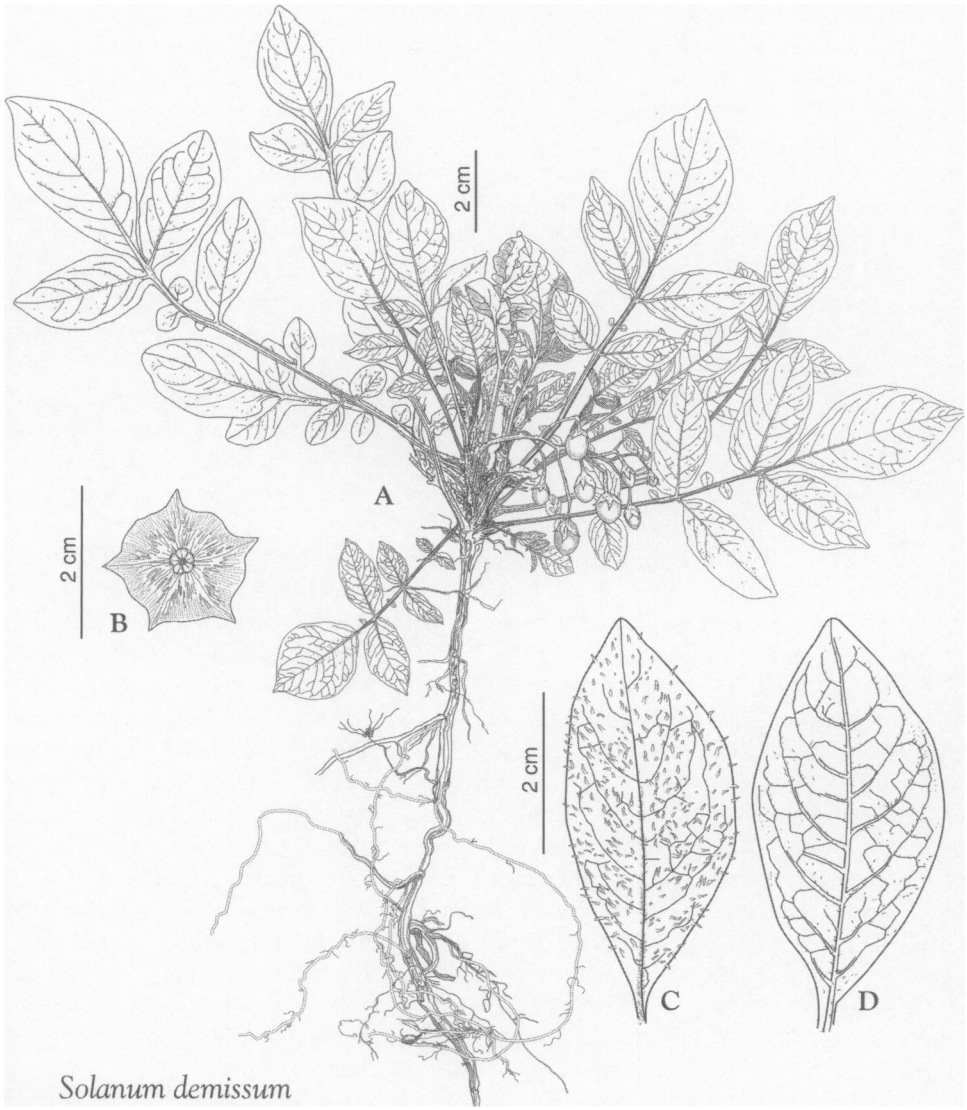


FIG. 47. *Solanum demissum.* A. Habit. B. Flower. C, D. Lateral leaflet, adaxial (C) and abaxial (D) views. (Based on *Balls et al. 4246*, K, lectotype of *S. demissum* var. *mastoidostigma*.)

(*S. acaule* and *S. albicans*) than to other members of Hawkes's (1990) ser. *Demissa*. As stated above under Relationships, we base this conclusion on data from morphological phenetics (Spooner et al. 1995; Kardolus 1999), inflorescence architecture (Kardolus & Groendijk-Wilders 1998), single- to low-copy nuclear restriction fragment length polymorphisms (nRFLPs; Debener et al. 1990; Nakagawa & Hosaka 2002), steroidal glycoalkaloids (Petersen et al. 1993), and AFLPs (Kardolus et al. 1998).

The collection *Galeotti 1175* is a mixed gathering. Only one sheet of two at BR is *S. demissum*, which we choose as the lectotype of *S. stoloniferum* var. *pumilum*. The other sheet is *S. verrucosum*; a third specimen, at G, is *S. tuberosum*.

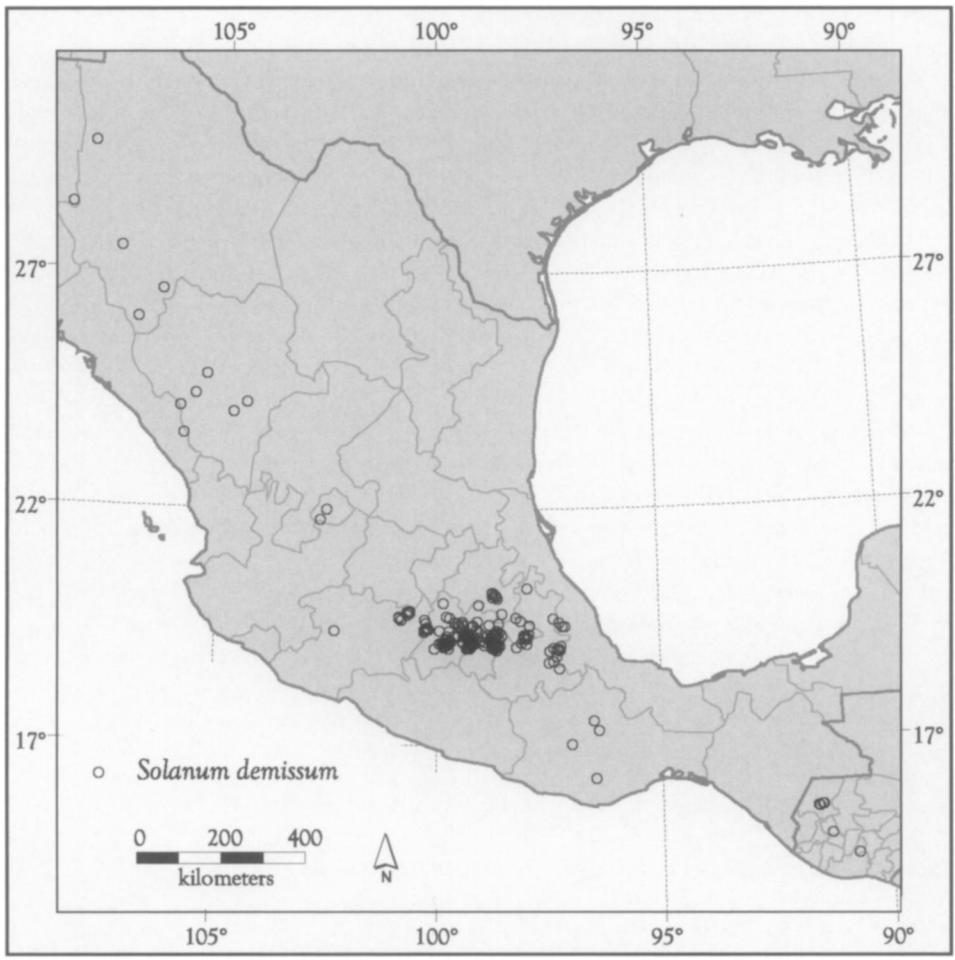


FIG. 48. Distribution of *Solanum demissum*.

Klotzsch (1849) based *Solanum utile* on plants he grew from seeds received in May of 1849 from Friedrich Otto, Director of the Berlin Botanic Garden. The seeds originally were distributed to the "Gesellschaft der Gartenfreunde Berlins" by the "Landes-Oekonomie-Collegium" for the purpose of cultivation and experimentation. The Klotzsch specimens at Berlin were destroyed; our neotype dates from 1852 and was part of Klotzsch's herbarium. Two other specimens at UPS from Klotzsch's herbarium are dated 1855. The neotype bears Bitter's annotation "*Solanum demissum* var. *klotzschii*," a name never published; see Doubtful and Excluded Names.

Rybin (1929) indicated *S. demissum* f. *xitlense* has conical fruits, but the type specimen lacks mature fruits. The high-placed pedicel articulation and enlarged terminal leaflets clearly show the type to belong to *S. demissum*.

Solanum semidemissum Juz. ex Bukasov was first mentioned in 1930 [Trudy Prikl. Bot. 47: 60 (Russian text), 480 (English translation)] but without description. Juzepczuk (1937) validated the name and cited *M. Antipovich 25* and *M. Antopovich 28*. WIR lent us

three sheets of *Antipovich 25*, and one sheet of a flowering specimen of *M. Antipovich 28*, which we designate as lectotype, because it was the most complete specimen.

Juzepczuk (1937) and Hawkes (1990) recognized *S. semidemissum* as a pentaploid nothospecies, formed by hybridization between *S. demissum* and *S. verrucosum* and distributed in the state of México and the Distrito Federal. Pentaploid populations (2n = 5x = 60) similar to these species have been determined as *S. semidemissum* (Rybin 1933; Juzepczuk 1937; Hawkes 1944), supporting a hybrid origin, but we cannot find any characters to give us even a hint of traits with which to distinguish these hybrids. *Solanum semidemissum* possibly is a hybrid taxon, which bears further investigation with field study. We list here the herbarium collections annotated by Hawkes as *S. semidemissum* to aid others to pursue this inquiry, but cite them in our treatment as *S. demissum*: *Antipovich 25*; *Balls et al. 5046*; *Flores S-696*; *Hawkes et al. 1597*; *Hawkes et al. 1675*, *2501*, *2502*, *2503*; *Lyonnet 2147*; *Martínez s.n.*; *Tarn 78*; *Tarn & Flores 72*, *79*; *Ugent et al. 1188*.

Hawkes (1944) listed syntypes for the following three names for which we designate lectotypes. For *S. demissum* var. *mastoidostigma* he cited *Balls et al. 4242*, *Balls et al. 4246* (our lectotype), and *Balls et al. 5009*; we did not locate material of *Balls et al. 4242*. He based *S. demissum* var. *orientale* on *Balls et al. 4441* (our lectotype), *Balls et al. 4621a*, and *Balls et al. 5305*; we did not locate material of *Balls et al. 5305*. For *S. demissum* var. *demissum* f. *tolucense* he listed *Balls et al. 4971* and *Balls et al. 4971/2* (our lectotype), both from the same locality but the second collection from 11,000 ft and dated three days later.

Solanum ×*edinense* is of clear hybrid origin between *S. demissum* and the cultivated species *S. tuberosum*. It can be distinguished from *S. demissum* by its generally wider leaves and taller stature, and from *S. tuberosum* by its high-placed pedicel articulation. It differs from both its parents by its pentaploidy (see discussion under S. ×*edinense*, no. 29).

NOTHOSPECIES

26. Solanum ×michoacanum (Bitter) Rydberg, Bull. Torrey Bot. Club 51: 171. 1924. *Solanum jamesii* subsp. *nayaritense* var. ×*michoacanum* Bitter, Repert. Spec. Nov. Regni Veg. 12: 9. 1913.—TYPE: MEXICO. Michoacán: Punguato, vicinity of Morelia, 2100 m, 16 Jul 1909, *G. Arsène 2896* (holotype: MPU, photos: G! K!, drawing: K!; isotypes: BM! GH! ILL, MO! NY! P! US-1030968, photo of ILL isotype: K!, photo of NY isotype: K!, photos of P isotype: PTIS! WAG!, photo of US isotype: PTIS!).

Plants 0.3–0.4 m tall, herbaceous, terrestrial, erect. Stems 3–5 mm in diameter at base of plant. Pseudostipules 8–13 mm long, lunate or lanceolate. Leaves 7–11.5 cm long, 4.5–8 cm wide, odd-pinnate, puberulent adaxially and abaxially; petioles 1–2.7 cm long; lateral leaflet pairs 2–3, the size of the lateral leaflets gradually diminishing towards the base of the leaf; most distal lateral leaflets 3.5–6.5 cm long, 1–2.5 cm wide, elliptic to elliptic-lanceolate, apex obtuse, acute to acuminate, base oblique, sessile; terminal leaflet 4–7.5 cm long, 1–2 cm wide, lanceolate, apex acute, base attenuate; interjected leaflets absent. Inflorescences generally in distal half of plant; peduncle 1–3.2 cm long. Flowers 2–10; pedicels 10–20 mm long, articulate between the proximal 1/4 and the distal 1/4; calyx 5.5–7 mm long, lobes elliptic, apiculate, acumens 1–3 mm long; corolla 1.5–2.5 cm in diameter, stellate, without acumens, edges of corolla flat, not folded dorsally, white to white-cream; anthers 5–6 mm long, connate; style 9–12 mm long, exceeding stamens by 3 mm, straight. Fruits about 1 cm long, globose, green throughout. Seeds generally not present. Chromosome number: 2n = 24. EBN unknown. Fig. 49.

FIG. 49. *Solanum* ×*michoacanum*. A. Habit. B. Inflorescence branchlet with flowers. C, D. Terminal leaflet and bases of most distal lateral leaflets, adaxial (C) and abaxial (D) views. (Based on *Spooner 4077*, PTIS.)

Phenology. Flowering and fruiting July through September.

Distribution (Fig. 10). Mexico (Michoacán); tropical deciduous forest, among grasses, shrubs, and cacti of old lava fields, in areas where *S. bulbocastanum* and *S. pinnatisectum* grow; 1900–2100 m.

ADDITIONAL SPECIMENS EXAMINED. **Mexico.** MICHOACÁN: vicinity of Morelia, Punguato, 19.71°N, 101.13°W, 2100 m, 17 Jul 1909, *Arsène 7896* (GH); about 21 km S of Morelia on road to Villa Madero, 19.61°N, 101.18°W, 4 Aug 1965, *Correll 31335* (GH, LL, NA, S, UC); Km 21 on road from Morelia to Villa Madero, right side of road, on margin of creek, 19.59°N, 101.16°W, 20 Jul 1963, *Flores & Ugent S-702* (MEXU); 21–22 km S of Morelia on road to Villa Madero, 19.70°N, 101.12°W, 2000 m, 9 Jul 1957, *Graham 220* (K, LL, S, US), *Graham 222* (K, LL, PTIS, US), 4 Aug 1965, *Hawkes et al. 2531* (B, K, MEXU, WIS), *Hawkes et al. 2532* (BR, K, MPU, P), 19 Jul 1963, *Ugent et al. 5745–5748, 5750–5767, 5769, 5771* (BM, ENCB, GAT, GH, MEXU, MO, UC, US, WIS); Km 325, just W of Morelia, 19.73°N, 101.13°W, 1900 m, 10 Jul 1957, *Graham C-229* (LL, MEXU); along new Rt 120 at Km 21.5 SE of Morelia on way to Pátzcuaro, about 200 m N of road, 19.57°N, 101.33°W, 1990 m, 1 Sep 1997, *Rivera-Peña et al. 903* (INIFAP, MEXU, PTIS, WAG); at Km 21 marker along Rt 120 S of Morelia, on W side of Rt 120, 19.58°N, 101.30°W, 2080 m, 31 Aug 1988, *Spooner et al. 4077* (INIFAP, PTIS); on E side of Rt 120, at Km 21 marker along Rt 120 S of Morelia, 19.58°N, 101.30°W, 2080 m, 31 Aug 1988, *Spooner et al. 4079* (INIFAP, PTIS).

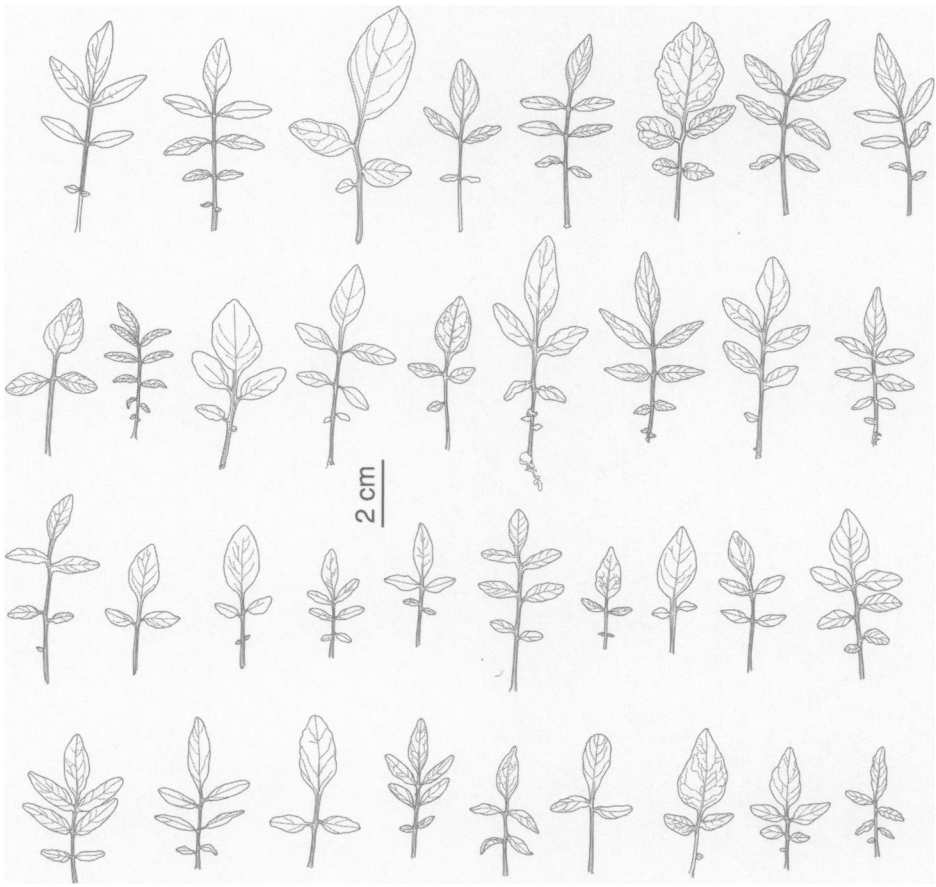
Correll (1962) designated *S.* ×*michoacanum* as a valid nothospecies originating from a cross of *S. bulbocastanum* and *S. pinnatisectum*, as supported by the morphology of artificial hybrids raised by Graham and Dionne (1961). *Solanum* ×*michoacanum* occurs within the range of both of these species (Figs. 7, 26) and is morphologically intermediate between them. It is similar to *S. trifidum* but differs in its taller stature and globose fruits. Our herbarium specimens collected in 1988 (Spooner et al. 1991a) suggested the nothospecies is sterile, because the fruits were devoid of seeds.

The holotype was at MPU, but we were not able to find it there; we did see photos of the holotype at G and K. Because the holotype may yet be located, we did not designate a lectotype. The photo of the holotype and the isotypes serve well to fix the name.

27. Solanum ×sambucinum Rydberg, Bull. Torrey Bot. Club 51: 169. 1924.—TYPE: MEXICO. Querétaro: stony hillsides near San Juan del Río, 18 Aug 1905, *J. N. Rose, J. H. Painter & J. S. Rose 9586* (holotype: US-453076!, photos [Correll neg. 139]: BM! F! GH! K! LL! NY! UC! US!; drawing: K!).

Plants 0.3–0.8 m tall, herbaceous, terrestrial, erect. Stems 4–6 mm in diameter at base of plant. Pseudostipules 8–10 mm long, lunate. Leaves 10–16 cm long, 4–12 cm wide, odd-pinnate, puberulent or glabrous adaxially and abaxially; petioles 1–3.5 cm long; lateral leaflet pairs 4–5, the second-most distal lateral leaflets larger than the most distal, then the size of the lateral leaflets diminishing gradually towards the base of the leaf; most distal lateral leaflets 3–5.5 cm long, 1–2 cm wide, lanceolate to elliptic-lanceolate, apex acute, base oblique, sessile, decurrent on the rachis; terminal leaflet 4–7 cm long, 1–2 cm wide, lanceolate to elliptic-lanceolate, apex acute to acuminate, base cuneate; interjected leaflets absent. Inflorescences generally in distal half of plant; peduncle 2–4.5 cm long. Flowers 12–17; pedicels 15–25 mm long, articulate between the proximal 1/4 and the distal 1/4; calyx up to 5 mm long, lobes oblong or elliptic, mucronate, acumens 0.5–1 mm long; corolla 2.5 cm in diameter, stellate, without acumens, edges of corolla flat, not folded dorsally, white; anthers 5–5.5 mm long, connate; style 10–11 mm long, exceeding stamens by 2–3 mm, straight. Fruits 0.8 cm long, globose, green throughout. Seeds from living specimens green-white throughout. Chromosome number: 2n = 24. EBN unknown. Figs. 50, 51.

FIG. 50. *Solanum* ×*sambucinum*. A. Habit. B, C. Lateral leaflet, adaxial (B) and abaxial (C) views. (Based on *Rodríguez et al. 2563*, PTIS.)



Solanum ×sambucinum

FIG. 51. *Solanum ×sambucinum*; leaves from separate individudals grown by Hawkes from seeds of *Hawkes et al. 1442*. All specimens are mounted on a single herbarium sheet deposited at K, with a note indicating that these leaves, all from F_1 offspring, demonstrate segregation approaching the two putative parents, *S. ehrenbergii* (leaves with few lateral leaflets) and *S. pinnatisectum* (leaves with many lateral leaflets); see text.

Phenology. Flowering and fruiting August through October.

Distribution (Fig. 54). Mexico (Guanajuato and Querétaro); in and at margins of cultivated fields, tropical deciduous forests, fencerows, rock piles, among thorny bushes, mesquite grasslands; 1720–2200 m.

ADDITIONAL SPECIMENS EXAMINED. **Mexico.** GUANAJUATO: rd from Mexico to Ciudad Juárez, Km 338 a little bit ahead of Irapuato, 20.68°N, 101.35°W, 1721 m, 27 Aug 1963, *Flores S-717* (K, LL, MEXU); Los Hernández, Km 9 road from Dolores Hidalgo to Guanajuato, 21.16°N, 101.01°W, 2080 m, 14 Sep 1965, *Flores S-827* (K, LL, MEXU); 12 km from Dolores Hidalgo on Guanajuato Road, Hernández, 20.85°N, 101.40°W, 2000 m, 16 Sep 1949, *Hawkes & García 1105* (K, LL, PTIS); 9 km from Dolores Hidalgo on road to Guanajuato, 21.60°N, 100.95°W, 2000 m, 16 Sep 1949, *Hawkes et al. 1106* (K); San Miguel Allende, 2 1/2 mi on road to Dolores Hidalgo, 20.92°N, 100.75°W, 1800 m, 7 Sep 1958, *Hawkes et al. 1438* (C, K, US, WIS); road between San Miguel Allende and Dolores Hidalgo, 13 mi from San Miguel Allende, Rancho de Galvanes,

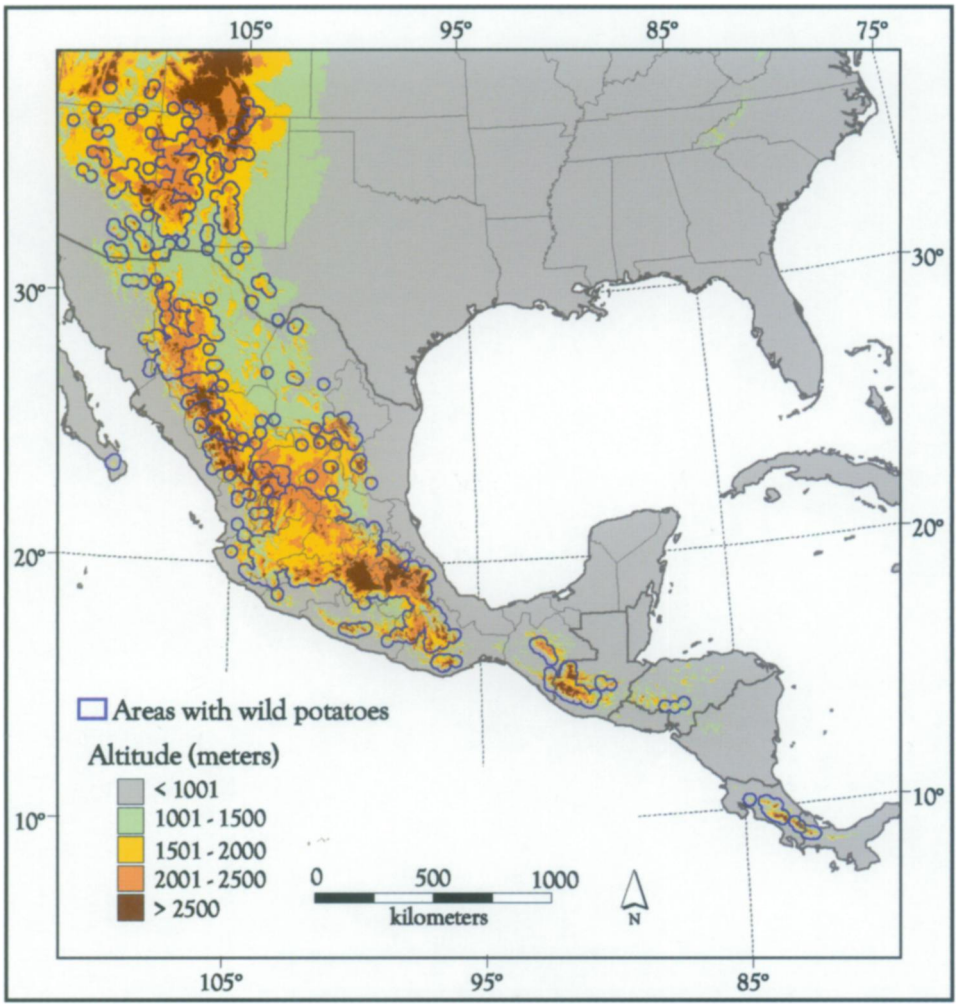


Plate 2. General area of distribution and altitudes of *Solanum* sect. *Petota* in North and Central America.

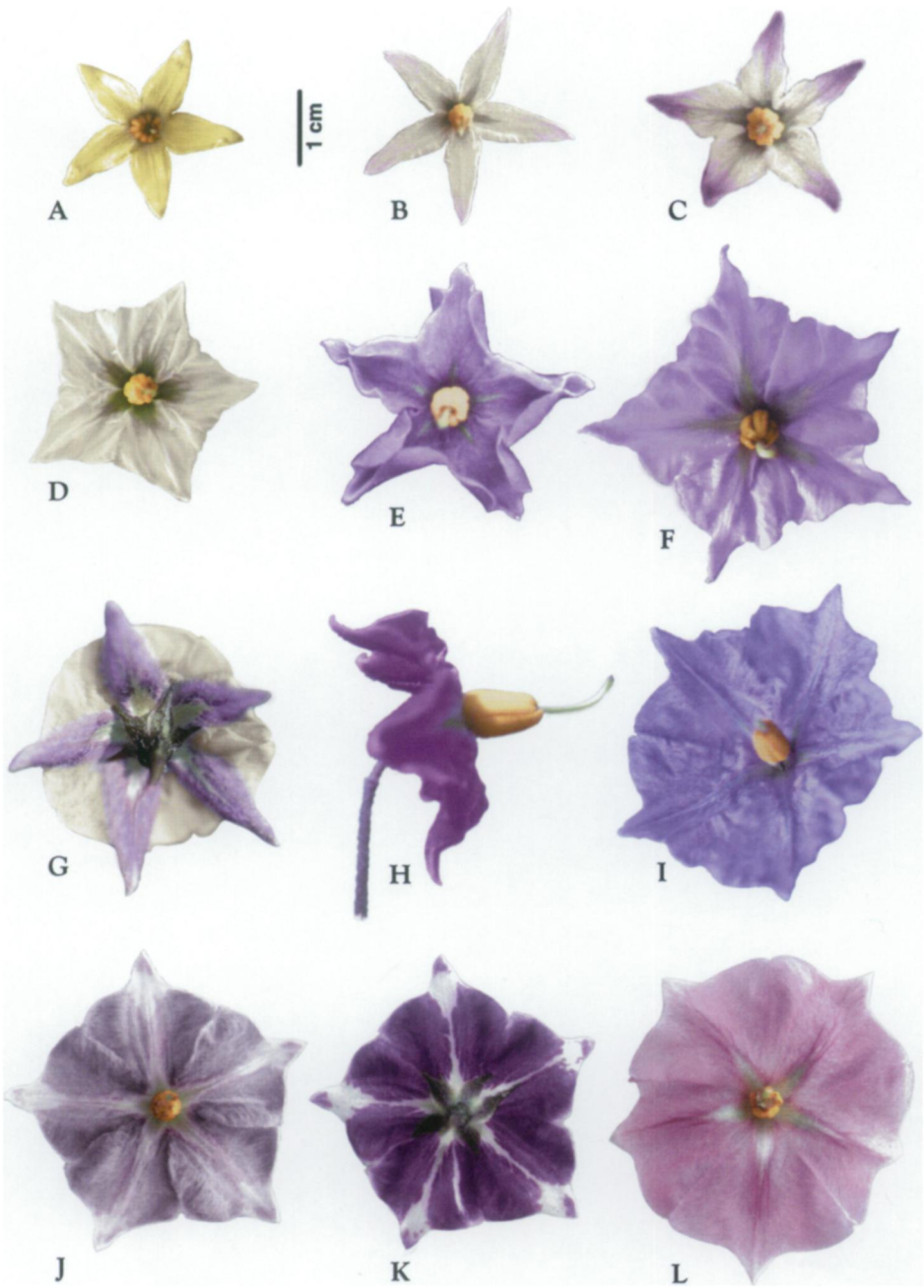


Plate 3. Corollas of *Solanum* sect. *Petota* from Mexico and Central America. A. *Solanum bulbocastanum*, *Spooner et al. 4174*. B. *S. stenophyllidium*, *Hawkes 1234*. C. *S. clarum*, *Hawkes 1833*. D. *S. polyadenium*, *Tarn 174C*. E. *S. verrucosum*, *Spooner et al. 931*. F. *S. stoloniferum*, *Spooner et al. 4191*. G. *S. stoloniferum*, *Spooner et al. 4074*. H. *S. hjertingii*, *Hjerting 7387* (side view showing long, exserted, curved style). I. *S. agrimonifolium*, *Spooner et al. 4208*. J. *S. hougasii*, *Spooner et al. 4117*. K. *S. hougasii*, *Spooner et al. 4117*. L. *S.* ×*edinense*, *Spooner et al. 4004*. A, E, G, wild plants; B, C, I, K, L, grown in greenhouse; D, F, H, grown in field at Sturgeon Bay, Wisconsin. Photos by David Spooner.

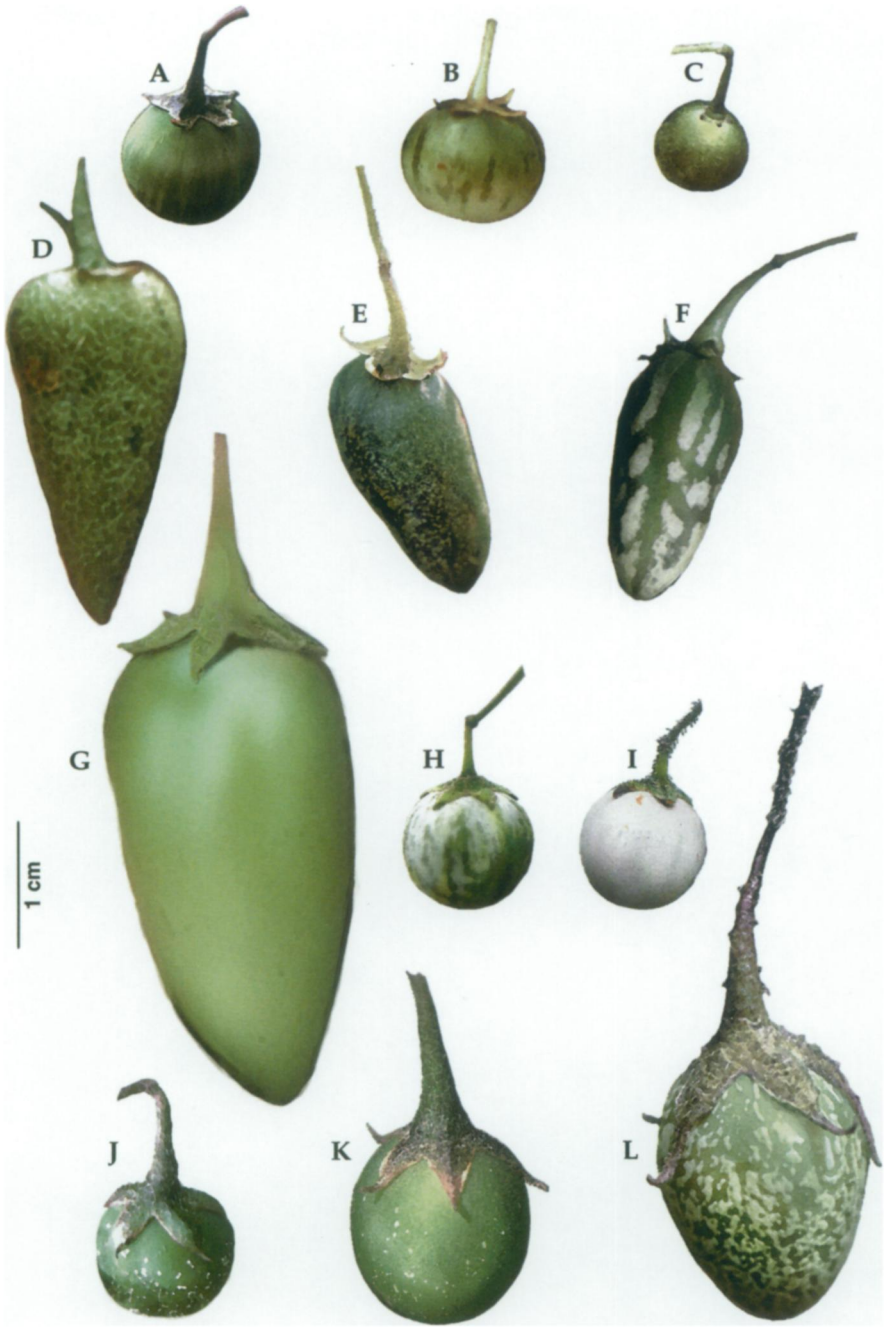


Plate 4. Fruits of *Solanum* sect. *Petota* from North and Central America. A. *Solanum bulbocastanum*, *Spooner et al.* 4174. B. *S. stenophyllidium*, *Spooner et al. 4091a*. C. *S. morelliforme*, *Spooner et al. 4051*. D. *S. lesteri*, *Spooner et al. 4177*. E. *S. trifidum*, *Spooner et al. 4283*. F. *S. hintonii*, *Spooner et al. 4033*. G. *S. agrimonifolium*, *Spooner et al. 4211* (grown in field). H. *S. stoloniferum*, *Spooner et al. 4118* (grown in field). I. *S. stoloniferum*, *Rodríguez 2571* (grown in field). J. *S. verrucosum*, *Spooner et al. 4123*. K. *S. hougasii*, *Spooner et al. 4285*. L. *S. schenckii*, *Spooner et al. 4194*. A, B, C, D, E, F, J, K, L, wild plants; G, H, I, grown from seed from the germplasm collection in field at Sturgeon Bay, Wisconsin. Photos by David Spooner.

Plate 5A. Habitats of *Solanum* sect. *Petota* in the U.S.A. and Mexico. A. Desert scrub. U.S.A. New Mexico. San Juan Co.: Crownpoint, 1940 m, *Solanum jamesii* (*Scofield s.n*). B. Oak forest. New Mexico. Grant Co.: Iron Creek Campground W of Kingston, 2200 m, *S. stoloniferum*, (*Bamberg et al. 26*), *S. jamesii* (*Bamberg et al. 27*). C, D. Oak forest. Mexico. Baja California Sur: Laguna Mountains, 1600 m, *S. stoloniferum* (*Spooner et al. 4237*). E. Oak-juniper forest. Mexico. Chihuahua: along Los Mochis to Chihuahua railway line, 1550 m, *S. stoloniferum* (*Spooner et al. 4241*). F. Tropical deciduous forest. Mexico. Michoacán: S of Morelia, 2080 m, *S.* ×*michoacanum* (*Spooner et al. 4077*), *S. bulbocastanum* (*Spooner et al. 4078*), *S. polyadenium* (*Spooner et al. 4078*). G. Barranca of Guadalajara. Mexico. Jalisco: 1400 m, oak forest in the barranca, *S. stenophyllidium* (*Rodríguez & Suárez 1398*, *Spooner et al. 4104*). H. Volcán de Toluca. Mexico. México: pine and fir forests, 3075–3340 m, many collections of *S. demissum*, *S.* ×*edinense*, *S. stoloniferum*. Photos by David Spooner, except A, B by John Bamberg.

Plate 5B. Habitats of *Solanum* sect. *Petota* in Mexico and Central America. I. Fir forest. Mexico. México: Nevado de Toluca, 3080 m, *S. demissum* (*Spooner et al. 4008*). J. Edge of cornfield. Mexico. México: just NE of Calimaya, Peter Hjerting collecting *S. stoloniferum* (*Spooner et al. 4005*). K. Recently logged pine-fir forest. Mexico. Michoacán: just E of Macho de Agua, *S. iopetalum* (*Spooner et al. 4049*). L. Tropical hardwoods, tree ferns, moss-covered ground. Mexico. Chiapas: just N of El Porvenir, 2840 m, *S. clarum* (*Spooner et al. 4215*). M. Virgin cloud forest, with *Chusquea* in sunny openings. Panama. Chiriquí: Volcán de Chiriquí, 3045 m, Alberto Salas collecting *S. woodsonii* (*Spooner et al. 7413*). N. Horizontal branch of large pine tree. Guatemala. Totonicapán: 6.6 km E of Totonicapán, van den Berg (on Spooner's shoulders) and Victor Martínez collecting *S. morelliforme* (*Spooner et al. 7004*). Photos by David Spooner, except N by Joerg Altekruse.

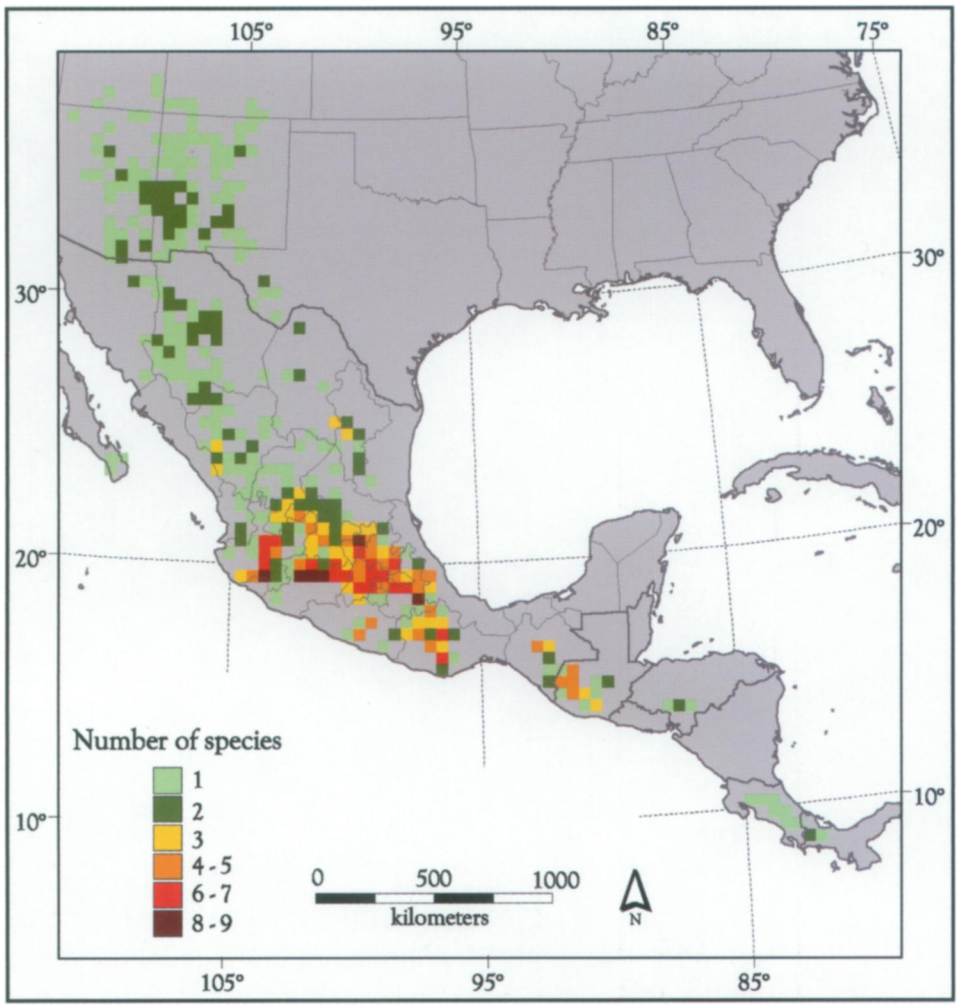


Plate 6. Species richness of *Solanum* sect. *Petota* in the U.S.A., Mexico, and Central America. Grid cells are 50 by 50 km.

Plate 7. Lectotype of *Solanum bulbocastanum* Dunal and *Solanum mexicanum* Sessé & Moc. (see text). Photograph of the original color plate, *Torner Collection 0621*. Reproduced by courtesy of Torner Collection of Sessé and Mociño Biological Illustrations, Hunt Institute for Botanical Documentation, Carnegie Mellon University, Pittsburgh.

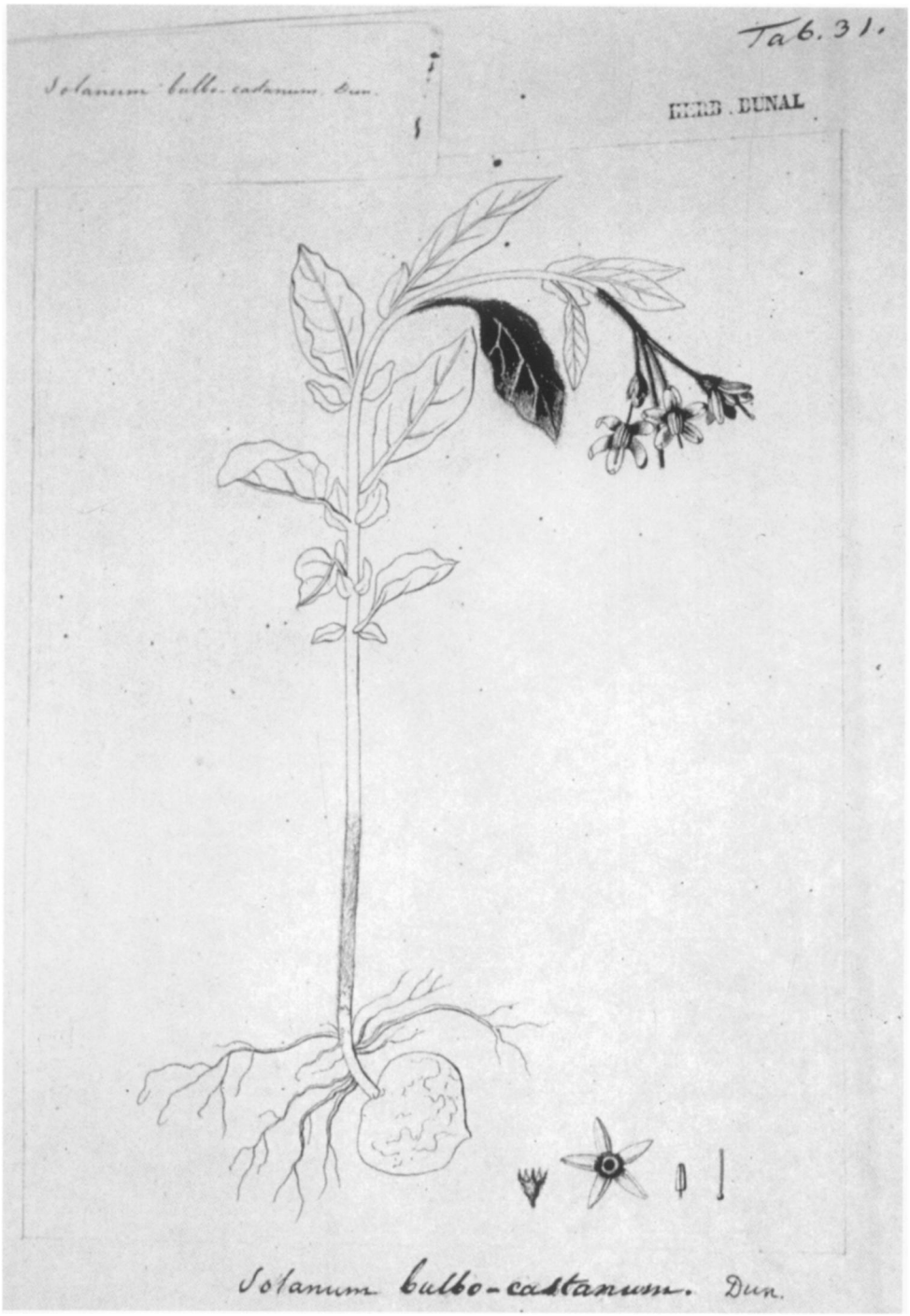


Plate 8. Isolectotype of *Solanum bulbocastanum* Dunal. Copy of the of the original watercolor from the Sessé and Mociño expedition (see Plate 8) drawn by Node-Veran; this is Dunal's t. 31 (see text). Reproduced by courtesy of the Herbier, Institut de Botanique, Montpellier.

Plate 9. *Solanum verrucosum* Schiede ex Schltdl. Photograph of t.2, *Hortus halensis*,1841. Reproduced by courtesy of the Royal Botanic Gardens, Kew.

20.92°N, 100.75°W, 1800 m, 7 Sep 1958, *Hawkes et al. 1439* (C, K, US); 6.5 mi from Dolores Hidalgo on the road to Guanajuato, 21.62°N, 100.95°W, 2000 m, 7 Sep 1958, *Hawkes et al. 1442* (C, K, US); Cerro Capulín, a large gentle hill just E of México 43, about 8 km NNE of Uriangato on road to Salamanca, 20.18°N, 101.10°W, 1900–2100 m, 17 Sep 1977, *Iltis & Doebley 143* (WIS); at base of Cerro de la Márgara, near Puerto Nieto, 15 mi SSE of San Miguel de Allende, 20.92°N, 100.75°W, 2195 m, 14 Aug 1956, *Johnson 1* (LL); San Miguel Allende, 20.92°N, 100.75°W, 11 Aug 1947, *Kenoyer 1987* (GH); 11 km SW of town square of Dolores Hidalgo, about 150 m S of Rt 110, in town of Los Hernández, 21.17°N, 101.03°W, 2100 m, 26 Oct 1997, *Rivera-Peña et al. 992* (INIFAP, MEXU); Mpio. San Diego de La Unión, road from Querétaro City to San Luis Potosí, 21.47°N, 100.87°W, 2060 m, 23 Aug 1993, *Rodríguez et al. 2565* (MICH, PTIS); León to México road, Hwy 45 at about km 338 near Irapuato, 20.63°N, 101.34°W, 1740 m, 14 Oct 1967, *Tarn & Gómez 209* (K, P); Mpio. La Victoria, Mesas del Tigre, 21.28°N, 100.31°W, 1900 m, 15 Aug 1990, *Ventura & López 8561* (IEB, MEXU).—QUERÉTARO: 2 km on road to Los Cues, 1950 m, 7 Feb 1985, *Argüelles 2322* (MEXU); road at junction of the Querétaro to Huimilpan and Mexico-Huimilpan roads, 20.58°N, 100.40°W, 1800 m, 21 Jul 1986, *Argüelles 2568* (IEB, MEXU); 20 km along the road to Bernal, 21.10°N, 100.10°W, 2100 m, 19 Aug 1990, *Argüelles 3240* (IEB, MEXU); Cerro La Venta, about 3 km from San Juan del Río, base of hill near Presa Pinta, 20.66°N, 99.50°W, 1950 m, 10 Oct 1958, *Hawkes et al. 1667, 1668* (C, K); foothills of El Buey Mountain, near the Querétaro to San Luis Potosí and Mexico City to San Luis Potosí roads junction, 20.80°N, 100.43°W, 2050 m, 23 Aug 1993, *Rodríguez et al. 2563* (F, IBUG, MICH, MO, NY, PTIS).

Hawkes (1963) proposed *S.* ×*sambucinum* as a hybrid of *S. cardiophyllum* subsp. *ehrenbergii* (=*S. ehrenbergii*) and *S. pinnatisectum*; he considered overlap of parental ranges, intermediate morphology, and morphological segregation of F_1 offspring to the parental types when grown from seed (Fig. 51). Hawkes and Lester (1968) quantified leaf shape and immunological differences between these three taxa to further support their hypothesis. *Solanum* ×*sambucinum* has fewer lateral leaflets (4–5) than *S. pinnatisectum* (6–8); *S.* ×*sambucinum* has lunate pseudostipules but *S. pinnatisectum* has pinnatifid pseudostipules, and *S.* ×*sambucinum* has lanceolate leaflets but *S. pinnatisectum* has linear-lanceolate leaflets.

28. Solanum ×**vallis-mexici** Juzepczuk, Izv. Akad. Nauk SSSR, Ser. Biol. 2: 315. 1937.—TYPE: Specimen prepared from plants cultivated from tubers, *M. Antipovich 12* (holotype WIR!, photo: PTIS!). [Source of tubers: MEXICO. Valley of Mexico, Malinale, 2940 m, 1929, *M. Antipovich 12*.]

Plants 0.25–0.4 m tall, herbaceous, terrestrial, erect to ascending. Stems 2–4 mm in diameter at base of plant. Pseudostipules 1–7 mm long, lunate. Leaves 4.0–15.5 cm long, 2.3–9.0 cm wide, odd-pinnate, puberulent to strigose adaxially and abaxially; petioles 0.6–3 cm long; lateral leaflet pairs 2–4, the size of the lateral leaflets diminishing gradually or abruptly towards the base of the leaf; most distal lateral leaflets 1.1–4.5 cm long, 0.6–2.3 cm wide, elliptical to ovate, apex acute to acuminate, base oblique to cuneate, sessile or petiolules up to 3 mm long or sometimes the most distal lateral leaflets slightly decurrent; terminal leaflet 1.2–7.0 cm long, 0.5–2.1 cm wide, elliptical to obovate, apex acute to acuminate, base cuneate; interjected leaflets 0–4. Inflorescences generally in distal half of plant; peduncle 3.2–6.0 cm long. Flowers 4–10; pedicels 0.7–3.5 mm long, articulate between the proximal 1/4 and the distal 1/4; calyx 3.5–7 mm long, lobes acute to attenuate, acumens 1.5–3 mm long; corolla 1.1–1.4 cm in diameter, pentagonal, acumens 2.5–3 mm long, edges of corolla flat, not folded dorsally, dark purple above and below; anthers 4–5 mm long, connate; style 7–8 mm long, exceeding stamens by 1–2 mm, straight. Mature fruits not seen (fruits probably globose, like the ovary). Chromosome number: 2n = 36 (possibly also 2n = 60; see below). EBN unknown. Fig. 52.

Phenology. Flowering and fruiting July through October.

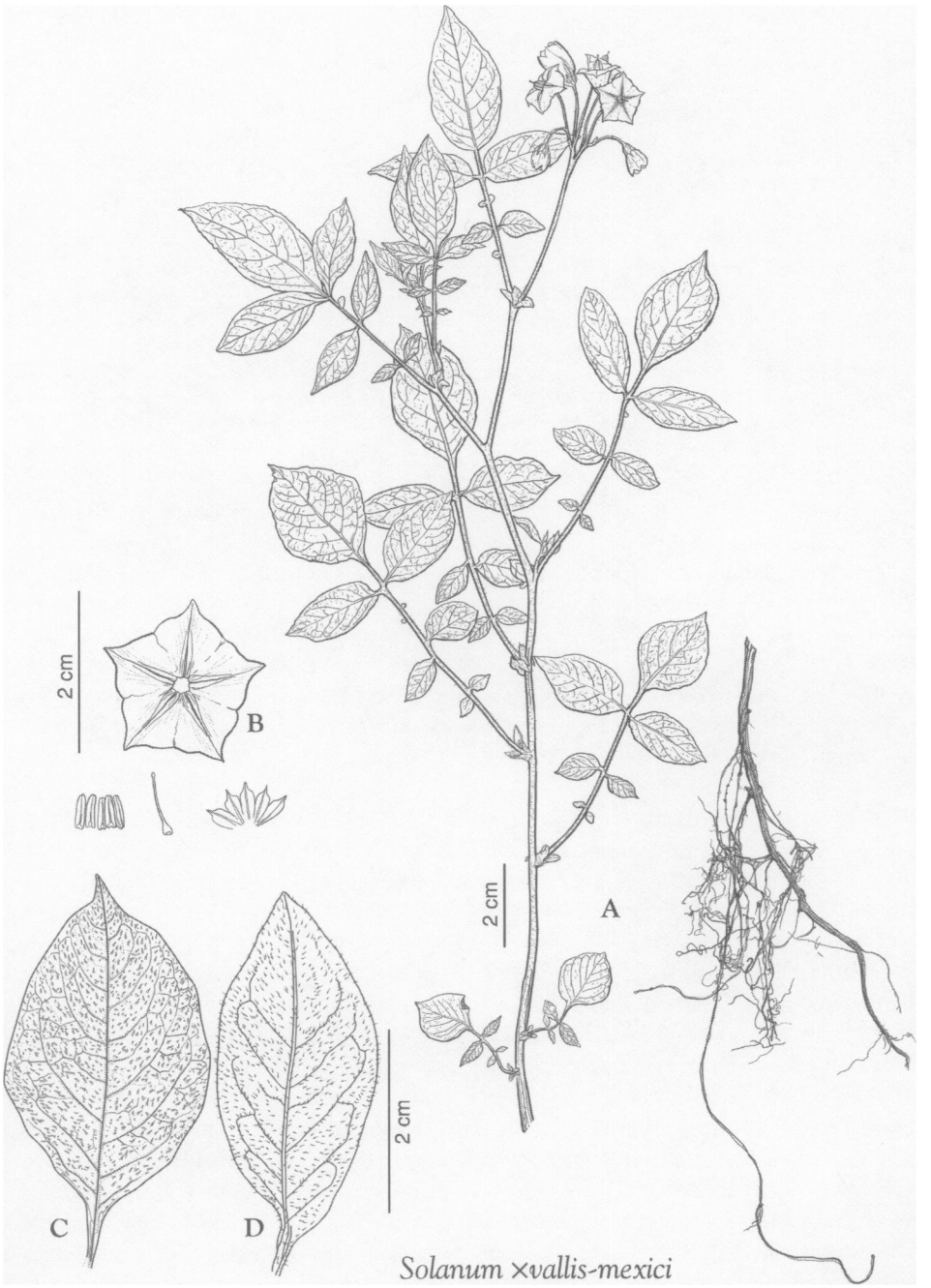


FIG. 52. *Solanum* ×*vallis-mexici*. A. Habit. B. Flower and, below, anthers (spread out), pistil, and calyx (spread out). C, D. Lateral leaflet, adaxial (C) and abaxial (D) views. (Based on *Hawkes 1034*, K.)

Distribution (Fig. 16). Mexico (Distrito Federal and México); among grasses and bushes or in abandoned fields in areas of pine or oak forests; 2280–3000 m.

ADDITIONAL SPECIMENS EXAMINED. **Mexico.** DISTRITO FEDERAL: La Venta, 19.33°N, 99.32°W, 2469 m, 13 Jul 1935, *Fisher s.n.* (NY); La Venta, at junction of Toluca and Desierto de Los Leones Hwy, 19.33°N, 99.32°W, 2800 m, 20 Jul 1949, *Hawkes et al. 1023* (C, K, LL, MEXU, WIS); Desierto de los Leones, 19.25°N, 99.33°W, 2850 m, 20 Jul 1949, *Hawkes et al. 1025* (C, K, S); near village of Ajusco, by side of track, 19.22°N, 99.20°W, 2900 m, 20 Jul 1949, *Hawkes et al. 1027* (K); on road from Mexico City to Toluca, just before arriving at La Venta, 19.32°N, 99.32°W, 2780 m, 27 Jul 1949, *Hawkes et al. 1034* (K, LL); 23.5 km from Mexico City on road to Toluca, just below La Venta, 19.33°N, 99.32°W, 2760 m, 12 Oct 1958, *Hawkes et al. 1672* (K, WIS); 24 km from Mexico City on road to Toluca, La Venta, woods on N side of road, 19.35°N, 99.32°W, 2800 m, 12 Oct 1958, *Hawkes et al. 1673* (BM, C, K, MEXU); road from Desierto de Los Leones to San Angel, 23 km from Mexico City, 19.30°N, 99.36°W, 2950 m, 12 Oct 1968, *Hawkes et al. 1677* (B, C, K); Delegación de Tlalpan, 4 km E of Mount Ajusco, 19.20°N, 99.24°W, 2750 m, 23 Jul 1967, *Rzedowski 24109* (ENCB); Delegación de Cuajimalpa, 2 km N of La Cabrera, 19.36°N, 99.30°W, 2500 m, 4 Aug 1971, *Rzedowski 28359* (ENCB); S of road from Los Reyes to Ixtalala, about opposite the women's prison, near track, 19.36°N, 99.09°W, 2320 m, 18 Sep 1967, *Tarn 103, 103B* (K).—MÉXICO: Amecameca, 19.12°N, 98.77°W, 2469 m, 26 Jul 1924, *Fisher 256* (US); La Venta, 19.33°N, 99.32°W, 2469 m, 12 Jul 1935, *Fisher 35527* (F, NY); Toluca Valley, road from Toluca to Nevado de Toluca, near San Juan de las Huertas, 19.25°N, 99.76°W, 2800 m, 2 Aug 1965, *Hawkes et al. 2512* (B, K, MEXU, MPU, P, WIS); Popocatépetl, 18.99°N, 98.66°W, 2743 m, 22 Aug 1901, *Rose & Hay 6259* (US); Km 67 on road from Amecameca to Tlamacas, on foothills of Popocatépetl, 19.03°N, 98.70°W, 3000 m, 9 Aug 1962, *Rzedowski 15738* (ENCB); along road from Chalco to Amecameca, Hwy 115, about 6 km beyond Chalco, 19.27°N, 98.90°W, 2280 m, 27 Aug 1967, *Tarn et al. 16* (K); road from Oaxtepec to Xochimilco, 6.1 km N of the Morelos-México state border, 19.09°N, 98.93°W, 2930 m, 4 Oct 1984, *Tarn et al. 252A* (K, MEXU).

Hawkes (1990) recognized *S.* ×*vallis-mexici* as a triploid nothospecies, formed by hybridization between *S. stoloniferum* and *S. verrucosum*; all three occur in the state of México and the Distrito Federal. He distinguished *S.* ×*vallis-mexici* from *S. stoloniferum* by its terminal leaflet, larger than the laterals, and purple corolla (white to medium purple in *S. stoloniferum*); however, the terminal leaflet is frequently larger than the laterals in *S. stoloniferum* (Figs. 32, 33). Furthermore, Hawkes (1990) partly separated his *S. stoloniferum* subsp. *moreliae* from subsp. *stoloniferum* by its dark purple corollas, showing the variable nature of corolla color in *S. stoloniferum*. Our concept of *S. stoloniferum* encompasses populations with a wide range of terminal leaflet shapes and sizes, and corolla colors; most herbarium collections lack data on ploidy level. We have difficulty distinguishing *S.* ×*vallis-mexici* from *S. stoloniferum* in the herbarium. We maintain this nothospecies, because some populations have been documented to be triploid (Rybin 1933; Juzepczuk 1937; Tétry 1941; Marks 1956), and we assign them to this nothospecies partly based on voucher specimens that resemble the type in generalized aspect (Fig. 52).

Marks (1958) crossed *S. stoloniferum* and *S. verrucosum* to produce hybrids similar to naturally occurring specimens of *S.* ×*vallis-mexici*. The ranges of *S. stoloniferum* and *S. verrucosum* overlap extensively (Figs. 29, 35). There may be other triploid hybrids between them that we did not recognize and list here as *S. stoloniferum*, or even possibly as *S. verrucosum*. Of further interest is the report of a natural pentaploid population of *S.* ×*vallis-mexici*, from the state of México, of putative origin from *S. stoloniferum* and an unreduced gamete of *S. verrucosum* (Marks & Montelongo-Escobedo 1970).

Juzepczuk (1937) designated *M. Antipovich 12* as "type" for *S.* ×*vallis-mexici*, and also listed *M. Antipovich 14*. There are two herbarium specimens at K, both bearing the label M. *Antipovich 12 and 14*, yet both of these sheets each bear a single plant. It is unclear how to interpret this ambiguity of two collector numbers on a single herbarium sheet with only one specimen, and we cannot determine which of these is an isotype.

29. Solanum ×edinense P. Berthault, Rech. bot. Solanum tub. 142, fig. 41, 42, tab. 8. 1911.—TYPE: MEXICO. Tlaxcala: below Pilares, Mount Malinche (from Huamantla), 8500 ft, 17 Oct 1938, *N. Balls, E. K. Balls & W. B. Gourlay 5658* (neotype, here designated: K!).

Solanum salamanii Hawkes, Bull. Imp. Bur. Pl. Breed. Genet., Cambridge 28, 116. 1944. *Solanum ×edinense* subsp. *salamanii* (Hawkes) Hawkes, Rec. Scott. Pl. Breed. Sta. 1963: 95. 1963.—TYPE: MEXICO. México: Paraje Mungia [Munguía], Nevado de Toluca, edges of potato fields and among crops, 3550 m, 12 Jul 1938, *N. Balls, E. K. Balls & W. B. Gourlay 5010* (holotype: K!; isotypes: BM[2]! CHAPA! E! K[5]! NY! US-1794391!).

Plants 1–2 m tall, herbaceous, terrestrial, erect to ascending. Stems 3–6 mm in diameter at base of plant. Pseudostipules 5–10 mm long, lunate. Leaves 10–21 cm long, 6–12 cm wide, odd-pinnate, puberulent to pubescent adaxially and abaxially; petioles 1–3 cm long; lateral leaflet pairs 3–5, the size of the lateral leaflets usually diminishing gradually towards the base of the leaf; most distal lateral leaflets 3.5–7 cm long, 2–3.5 cm wide, ovate to broadly elliptical to obovate, apex acute to acuminate, base oblique, cuneate to truncate, sometimes with interjected leaflets on the petiolules; terminal leaflet 4.5–8.5 cm long, 2–3.5 cm wide, broadly elliptical to obovate, apex acute to acuminate, base cuneate, frequently with interjected leaflets on the petiolule; interjected leaflets 5–15. Inflorescences generally in distal half of plant; peduncle 4–10 cm long. Flowers 8–12; pedicels 20–35 mm long, articulate in the distal 1/4; calyx 5–8 mm long, lobes acute to long-attenuate, acumens 2–3 mm long; corolla 2.8–3.2 cm in diameter, rotate, acumens 3–4 mm long, edges of corolla flat, not folded dorsally, light to dark violet blue above and below; anthers 6–8 mm long, connate; style 8–9 mm long, exceeding stamens by 1–3 mm, straight. Fruits 1.0–2.0 cm long, globose, medium green throughout. Seeds generally not present. Chromosome number: 2n = 60. EBN unknown. Plate 3L, Fig. 53.

Phenology. Flowering and fruiting August through October.

Distribution (Fig. 54). Central Mexico (Distrito Federal, Guanajuato, Hidalgo, México, Michoacán, Puebla, Tlaxcala, Veracruz); a weed in and at the edges of cultivated potato fields, in areas where *S. demissum* grows, also along roadsides and fencerows, and among bushes; 2050–3560 m.

ADDITIONAL SPECIMENS EXAMINED. **Mexico.** DISTRITO FEDERAL: near village of Ajusco, by side of track, 19.22°N, 99.20°W, 2900 m, 20 Jul 1949, *Hawkes et al. 1026* (K); Ajusco, between the railway station and the village, 19.23°N, 99.20°W, 2750 m, 21 Aug 1949, *Hawkes et al. 1076* (BR, K, LL, MPU).—GUANAJUATO: around San Agustín, Mpio. Victoria, 21.30°N, 100.18°W, 2400 m, 11 Aug 1991, *Rzedowski 50856* (IEB, MEXU).—HIDALGO: Real del Monte, side of road to Pachuca by where Actopan road branches, 20.13°N, 98.67°W, 2750 m, 6 Aug 1949, *Hawkes et al. 1051* (K).—MÉXICO: Km 4 on the road to Nevado de Toluca, 19.14°N, 99.79°W, 3330 m, 16 Jul 1963, *Flores S-695* (K, LL, MEXU); Agua Bendita, between Km 36–37, on the road from Toluca to Valle de Bravo, 18.78°N, 99.86°W, 2900 m, 1 Aug 1965, *Flores S-798* (MEXU), *Hawkes et al. 2505* (K), *Ugent et al. 6019* (MEXU, MO, US, WIS); road between Santiago Tilapa and San Miguel Tilapa, 19.19°N, 99.42°W, 26 Jul 1964, *González 1162a* (ENCB, MICH); Mount Toluca, Loma Alta, 19.17°N, 99.81°W, 3200 m, 23 Aug 1949, *Hawkes et al. 1081* (K, LL, P); road from Toluca to crater on Nevado de Toluca, 19.14°N, 99.79°W, 3300 m, 2 Aug 1965, *Hawkes et al. 2509* (B, BM, K, MEXU, S), *Hawkes et al. 2510* (K); Nevado de Toluca, 19.10°N, 99.77°W, 4 Aug 1962, *Huerta s.n.* (ENCB); on Rt 10 at Loma Alta, 1.2 km S of La Puerta, Rt 134, on E side of road, in Parque Nacional Nevado de Toluca, on W-facing lower slopes of volcano, 19.17°N, 99.80°W, 3330 m, 20 Oct 1997, *Rivera-Peña et al. 969* (INIFAP, PTIS), *Rivera-Peña et al. 970* (INIFAP, MEXU, PTIS, WAG); at El Capulín, a small settlement 21.3 km S of La Puerta, Rt 134, in Parque Nacional Nevado de Toluca, on W-facing lower slopes of volcano, 19.08°N, 99.85°W, 3100 m, 20 Oct 1997, *Rivera-Peña et al. 974* (INIFAP, MEXU, PTIS, WAG); S side of Rt 134, 6.8 km SW of La Puerta, at Km 25.7 km SW of Toluca, by

FIG. 53. *Solanum* ×*edinense*. A. Habit. B. Flower. C, D. Lateral leaflet, adaxial (C) and abaxial (D) views. (Based on *Spooner et al. 4004*, PTIS.)

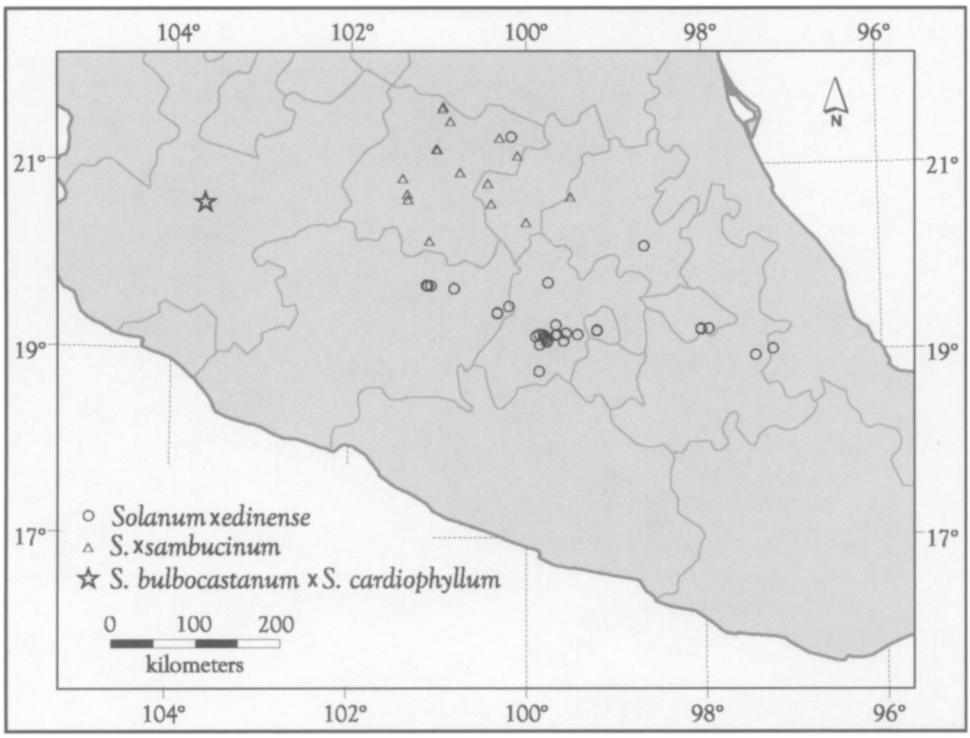


FIG. 54. Distribution of *Solanum* ×*edinense*, *S.* ×*sambucinum*, and of an unnamed hybrid of *S. bulbocastanum* × *S. cardiophyllum*.

posted road markers, 19.18°N, 99.86°W, 3100 m, 20 Oct 1997, *Rivera-Peña et al. 980* (INIFAP, MEXU, PTIS, WAG); growing 50 m downslope and 300 m N of Rt 134, 35.7 km SW of Toluca, by posted road signs, shortly SW of entrance to Mesón Viejo, 19.17°N, 99.89°W, 2700 m, 20 Oct 1997, *Rivera-Peña et al. 983* (INIFAP, MEXU, PTIS); 2.4 km SW of Zacango (zoo at SW end), on paved and then dirt road ascending base of Nevado de Toluca, E-facing slope of volcano, 19.19°N, 99.66°W, 2840 m, 27 Oct 1997, *Rivera-Peña et al. 994* (PTIS); 3.5 km SW of Zacango (zoo at SW end), on paved and then dirt road ascending Nevado de Toluca, E-facing slope of volcano, 19.18°N, 99.67°W, 2800 m, 27 Oct 1997, *Rivera-Peña et al. 995* (INIFAP, MEXU, PTIS, WAG); on road from Toluca to Nevado de Toluca, 19.14°N, 99.79°W, 2900 m, 4 Aug 1962, *Rzedowski 15814* (ENCB, US, WIS); near Toluca, about 1 mi N of Chapultepec on road to CIMMYT station, 19.20°N, 99.55°W, 2600 m, 21 Aug 1988, *Spooner et al. 4004* (INIFAP); along roadside, E of Tenango de Arista, about 2 km along road to Santa María Jalapa, 19.12°N, 99.58°W, 2540 m, 21 Aug 1988, *Spooner et al. 4007* (INIFAP, PTIS); along road to Nevado de Toluca S of Rt 130, just S of Loma Alta, near Km 5, 19.17°N, 99.80°W, 3080 m, 22 Aug 1988, *Spooner et al. 4009* (INIFAP, PTIS, WIS); at top of microwave tower road, N of Rt 15, just E of Michoacán border, along roadside and edge of cornfields, 19.48°N, 100.20°W, 3000 m, 27 Aug 1988, *Spooner et al. 4044* (INIFAP, PTIS, WIS); at Rancho La Piedra, at top of microwave tower road, N of Rt 15, just E of México-Michoacán state border, along roadside and edge of cornfields, 19.48°N, 100.20°W, 3000 m, 27 Aug 1988, *Spooner et al. 4046A* (INIFAP, PTIS); road from Hwy 130 to Nevado de Toluca, at about 8 km at junction above Raíces, 19.10°N, 99.77°W, 3550 m, 3 Sep 1967, *Tarn 38* (K, MEXU), 9 Dec 1967, *Tarn 90* (K), 10 Oct 1967, *Tarn 138* (K, NY); Cerro Jocotitlán between Toluca and San Juan del Río road up to microwave station, 2 km above village of Jocotitlán, 19.74°N, 99.76°W, 2800 m, 27 Oct 1983, *Tarn et al. 189* (PTIS); N slopes of Volcán de Toluca, farm of Rafael Alvarez and Fidel García, 19.12°N, 99.76°W, 3340 m, 15 Aug 1962, *Ugent et al. 1129–1130*, *1133*, *1136–1152*, *1154–1162* (WIS), 16 Jul 1963, *Ugent et al. 5683* (WIS), 7 Sep 1962, *Ugent et al. 1498*, *1501–1520* (MEXU, US, WIS), 23 Sep 1962, *Ugent et al. 2279–2281* (MO); Nevado de Toluca, 19.14°N, 99.79°W, 2800 m, 19 Aug 1962, *Vázquez 35* (ENCB).—MICHOACÁN: slope of Mount Punguato, 19.71°N, 101.13°W, 4 Aug 1965, *Correll et al. 31331* (GH); Mount Punguato, near Morelia, 19.70°N, 101.12°W, 2080 m,

4 Aug 1965, *Flores S-808* (MEXU); above Macho de Agua, road to Morelia from Mexico City at 147.5 km, 19.41°N, 100.33°W, 2600 m, 3 Aug 1965, *Hawkes et al. 2515* (A, C, G, K, MEXU, WIS); near Morelia, Cerro Punguato, E of the town, 19.70°N, 101.08°W, 2050 m, 4 Aug 1965, *Hawkes et al. 2524* (MEXU, K); Macho de Agua, Km 147 on Hwy 15, between Toluca and Zitácuaro, about 8 km W of boundary between México and Michoacán, 19.42°N, 100.33°W, 2600 m, 3 Aug 1965, *Ugent et al. 6068, 6069* (US, WIS); W slope, Mount Punguato, near Morelia, 19.68°N, 100.82°W, 2130 m, 4 Aug 1965, *Ugent et al. 6104* (WIS).—PUEBLA: Mount Orizaba, from Esperanza, Atzitzintla, La Joya, 18.95°N, 97.42°W, 2600 m, 16 Aug 1949, *Hawkes et al. 1068* (K, LL, MEXU, WAG, WIS).—TLAXCALA: Mount Malinche, from Huamantla, La Herita, 19.24°N, 97.94°W, 2987 m, 16 Oct 1938, *Balls et al. 5657* (K); Volcán Malinche, NW slopes, approached from Huamantla, 19.24°N, 98.03°W, 2900 m, 3 Sep 1962, *Ugent et al. 1361, 1372–1374* (BM, MEXU, MO, US, WIS), *Ugent et al. 1364–1365, 1368* (GH, US).—VERACRUZ: Lomagrande, Mount Orizaba, 19.01°N, 97.22°W, 2652 m, 27 Aug 1938, *Balls et al. 5366* (BM, C, CPC, E, MEXU, US).

Solanum ×*edinense* is of clear hybrid origin between *S. demissum* and the cultivated species *S. tuberosum* (Hawkes 1944, 1963; Ugent 1967; Serquen & Hanneman, in press). *Solanum* ×*edinense* is very similar in appearance to *S. demissum*, and like that species has a high-placed pedicel articulation. *Solanum* ×*edinense* can have wider leaves than *S. demissum* (6–12 cm wide vs. 1.5–10 cm wide) and is generally taller than *S. demissum* (1–2 m tall vs. up to 0.6 m tall); yet, frankly it is impossible for us to determine with confidence all herbarium specimens as one or the other taxon. *Solanum* ×*edinense* is easier to identify in the field. The populations we sampled in Mexico are taller than *S. demissum*, and all formed fruits but with few to no seeds, suggesting *S.* ×*edinense* is sterile. Like other populations previously reported (Rybin 1929, 1933; Hawkes 1944; Hruby 1957) our gatherings were pentaploid (2n = 5x = 60).

Hawkes (1990) recognized two subspecies of *S.* ×*edinense*: subsp. ×*edinense* of putative hybrid origin between *S. demissum* and *S. tuberosum* subsp. *tuberosum*, and subsp. *salamanii*, a putative hybrid between *S. demissum* and *S. tuberosum* subsp. *andigenum* (Juz. & Bukasov) Hawkes. He distinguished the two subspecies by plant height and corolla color, but in practice he identified all populations collected in gardens in Europe as subsp. ×*edinense* and those collected in Mexico as subsp. *salamanii*. We observed a range of corolla colors and sizes in Mexico and cannot distinguish subspecies.

UNNAMED HYBRID

30. Solanum bulbocastanum Dunal × **S. cardiophyllum** Lindley

Plants 0.6–0.8 m tall, herbaceous, terrestrial, erect. Stems 4–5 mm in diameter at base of plant. Pseudostipules 6–12 mm long, lunate. Leaves 8–16 cm long, 3–8 cm wide, simple or odd-pinnate, pubescent to glabrescent above and below; simple leaves ovate to ovate-lanceolate, apex acute to shortly acuminate, base cordate, rounded, cuneate or oblique; petioles 2.5–5.2 cm long; compound leaves 8–17.5 cm long, 4–5.5 cm wide, with one pair of lateral leaflets; petioles 2.5–5 cm long; lateral leaflets 2–6 cm long and 1–2 cm wide, ovate to ovate-lanceolate, apex acute, base oblique, sessile or decurrent; terminal leaflet 6.5–13 cm long, 2.5–7 cm wide, ovate to ovate-lanceolate, apex acute to shortly acuminate, base rounded, cordate, decurrent or oblique; interjected leaflets absent. Inflorescences generally in distal half of plant; peduncle up to 2 cm long. Flowers 11–14; pedicels 6–7 mm long, articulate between the proximal 1/4 and the distal 1/4; calyx 3–4 mm long, lobes triangular, acute, acumens 1–1.5 mm; corolla up to 1.6 cm in diameter, stellate, without acumens, edges of corolla flat, not folded dorsally, white-cream; anthers

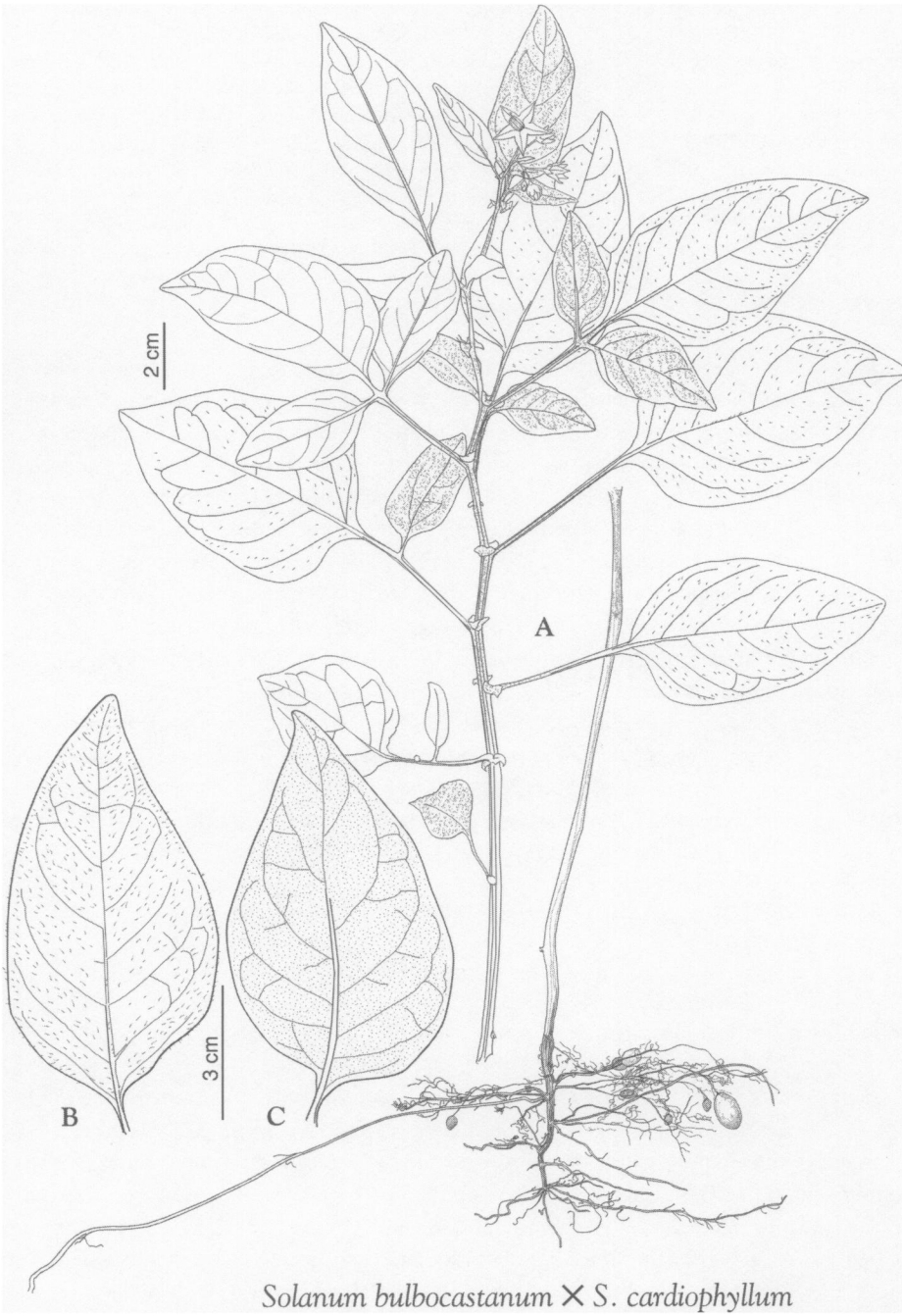


FIG. 55. *Solanum bulbocastanum* × *S. cardiophyllum*. A. Habit. B, C. Lateral leaflet, adaxial (B) and abaxial (C) views. (Based on *Rodríguez & Vargas 2104*, IBUG.)

up to 4 mm long, connate; style 6–8 mm long, exceeding stamens by 2.5–3 mm, straight. Fruits unknown. Chromosome number and EBN unknown. Fig. 55.

Only one population is known: MEXICO. Jalisco: Mpio. Tala, road between the ranch and arroyo Presitas, University of Guadalajara School forest "La Primavera," 1450 m, 1 Aug 1991, *A. Rodríguez & O. Vargas 2104* (IBUG) (Fig. 54).

We list this hybrid here as an example of yet another possible hybrid combination. It grows with its parents and is morphologically intermediate between them.

DOUBTFUL AND EXCLUDED NAMES

Solanum antipochacoense A. Koopmans, Genetica 25: 265. 1951, nomen nudum. [This name was used for an artificial hybrid of *S. stoloniferum* (as *S. antipoviczii*) × *S. chacoense* that spontaneously doubled its ploidy to 2n = 6x = 72.]

Solanum antipophureja A. Koopmans, Genetica 25: 269. 1951, nomen nudum. [This name was used for an artificial hybrid of *S. stoloniferum* (as *S. antipoviczii*) × the diploid South American cultivated species *S. phureja* Juzepczuk & Bukasov that was colchicine-doubled to 2n = 6x = 72.]

Solanum artificiale Toxopeus, Genetica 24: 95. 1947, nomen nudum. [This name was used for an artificial hybrid of *S. stoloniferum* (as *S. antipoviczii*) × the diploid South American wild species *S. chacoense* Bitter that was colchicine-doubled to 2n = 6x = 72.]

Solanum coriaceifoliolatum Lechnovich, Nauchno-Tekhn. Byull. Vsesoyuzn. Ordena Lenina Ordena Druzhby Narodov Nauchno-Issl. Inst. Rasteniev. N. I. Vavilova 105: 11. 1980.—TYPE: Specimen prepared from plants cultivated from tubers at the WIR station Pavlovskiensi, Russia, *type collection k–17011 (402364)* (holotype: WIR, not located). [Source of tubers: MEXICO. Guanajuato: via Acámbaro–Maravatío, dry rocky pasture, 15 Sep 1977, *A. F. Merezhnko 72*.]—The description of *S. coriaceifoliolatum* indicates white pentagonal corollas, as in some populations of *S. stoloniferum*, but coriaceous leaves and small anthers (4 mm long), only slightly longer than in most populations of *S. cardiophyllum*. The author also says the species is similar to *S. cardiophyllum*. The name could apply to either *S. stoloniferum* or *S. cardiophyllum* (or indeed an undescribed species). We list *S. coriaceifoliolatum* here until we have the opportunity to study the type specimen.

Solanum demissorosum A. Koopmans, Genetica 25: 285. 1951, nomen nudum. [This name was used for an artificial hybrid of *S. demissum* × the tetraploid cultivated species *S. tuberosum* that was colchicine-doubled to 2n = 10x = 120.]

Solanum demissum var. *klotzschii* Bitter, Repert. Spec. Nov. Regni Veg. 11: 454. 1912, pro syn. [Bitter hesitated to recognize *S. demissum* and *S. utile* Klotzsch as conspecific, and indicated that in the event that *S. utile* were to be included in *S. demissum* as a variety, then the misleading epithet *utile* should be set aside in favor of "*klotzschii*."]

Solanum gandarae Bukasov.—Hawkes (1990: 214) refers to this name as a "nomen nudum . . . variously mentioned in Russian plant breeding literature as *S. antipoviczii*

var. *gandarae* or as *S. gandarae*," and indicated it applies to *S. stoloniferum*. He listed no citations for these names, and we have not encountered them in the literature.

S. hjertingii Fibras & Ross, Z. Pflanzenzücht. 45: 282. 1961, nomen nudum.

Solanum jamesii var. *grandifrons* Bitter, Repert. Spec. Nov. Regni Veg. 12: 151. 1913.—TYPE: Specimen prepared from plants cultivated at the Royal Botanical Gardens, Kew, Jul 1874, without collector or number (holotype: K!). [Source of progagules: "MEXICO," locality unknown] = *S. chacoense* var. *muelleri* (Bitter) J. G. Hawkes & Hjerting.—Bitter (1913) cited a single specimen grown at Kew in 1874 under the name *S. suaveolens*, supposedly obtained from Mexico. Superficially the type is similar vegetatively to *S. oxycarpum*. Correll (1962: 273) questionably placed this name with *S. jamesii* but also suggested (p. 274) that it may apply to *S. oxycarpum*. The type has a white stellate corolla, and in agreement with Hawkes and Hjerting (1969, p. 183, 220), we include it in the South American *S. chacoense* var. *muelleri*.

Solanum jamesii var. *pentazygum* Hawkes, The potato: evolution, biodiversity and genetic resources, Belhaven Press, London, 81. 1990, nomen nudum.

Solanum martinezii Bukasov, Trudy Prikl. Bot. Suppl. 58: Plate 1. 1933, nomen nudum.

Solanum mexicanum Dunal in Poiret, Encycl., suppl. 3: 770. 1814, non *Solanum mexicanum* Sessé & Mociño, 1888. = *Solanum laurifolium* Miller, fide McVaugh (2000).

Solanum mexicanum Willdenow ex J. J. Roemer & J. A. Schultes, Syst. veg. 4: 663, 1819, pro syn.

Solanum mexicanum Hill, a typographical error in *Index kewensis* for *S. mexianum* Hill, Veg. syst. 9: 39, pl. 39, fig. 1. 1765.

Solanum nicaraguense Rydberg, Bull. Torrey Bot. Club 51: 171. 1924.—TYPE: NICARAGUA. Locality unknown, 1868, *C. Flint 8* (holotype: US-42676!, photos [Correll neg. 138]: BM! GH! K! LL! NY! PTIS! UC! US!]; probable isotypes: MIN-229765! US-67868!, photos of US isotype [Correll neg. 361]: BM! F! GH! K! LL! NY! UC! US!). We list here "probable isotypes," because the specimens have no collection number; the locality ["Nicaragua"] is the same and the specimens appear to belong to the type gathering.—*Solanum nicaraguense* is the only record of a wild potato from Nicaragua. The only information we found on the collector Flint (Anonymous 1889) is a one-paragraph biography that provides no itineraries. As pointed out by Hawkes (1990), the type appears to be a misidentified specimen of *S. commersonii* Dunal, which grows in southern South America. The Flint collection could represent an established disjunct population of *S. commersonii*, a waif, a mislabeled collection, or possibly even a new species. Collectors should be alerted to search in Nicaragua.

Solanum reddickii Bukasov in N. I. Vavilov, Theoretical Bases of Plant Breeding, 3: 51. 1937, nomen nudum.

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LITERATURE CITED

Anonymous 1889. Scientific news. Amer. Nat. 23: 748–752.

Baker, J. G. 1884. A review of the tuber-bearing species of *Solanum*. J. Linn. Soc., Bot. 20: 489–507, pl. 44–46.

Bamberg, J. B. 1999. Dependence on exogenous gibberellin for seed germination in *Solanum acaule* Bitter and other *Solanum* (potato) species. Amer. J. Potato Res. 76: 351–355.

Bamberg, J. B., R. E. Hanneman, Jr., and L. E. Towill. 1986. Use of activated charcoal to enhance the germination of botanical seeds of potato. Amer. Potato J. 63: 181–189.

Bamberg, J. B., C. Longtine, and E. B. Radcliffe. 1996a. Fine screening *Solanum* (potato) germplasm accessions for resistance to Colorado potato beetle. Amer. Potato J. 73: 211–223.

Bamberg, J. B., M. W. Martin, and J. J. Schartner. 1994. *Elite selections of tuber-bearing Solanum species germplasm*. Madison, Wisconsin: University of Wisconsin Press.

Bamberg, J. B., M. W. Martin, J. J. Schartner, and D. M. Spooner. 1996b. *Inventory of tuber-bearing Solanum species: catalog of potato germplasm*. Madison, Wisconsin: Potato Introduction Station, Sturgeon Bay.

Bamberg, J. B., C. Singsit, A. H. del Rio, and E. B. Radcliffe. 2000. RAPD analysis of genetic diversity in *Solanum* populations to predict need for fine screening. Amer. J. Potato Res. 77: 275–278.

Bamberg, J. B., A. del Rio, Z. Huamán, S. Vega, M. Martin, A. Salas, J. Pavek, S. Kiru, C. Fernandez, and D. M. Spooner. 2003. A decade of collecting and research on wild potatoes of the Southwest U.S.A. Amer. J. Potato Res. 80: 159–172.

Berthault, P. 1911. Recherches botaniques sur les variétés cultivées du *Solanum tuberosum* et les espèces sauvages de *Solanum* tubérifères voisins. Thèses présentées à la Faculté des Sciences de Paris pour obtenir le grade de docteur ès sciences naturelles. Nancy: Imprimerie Berger-Levrault.

Bitter, G. 1912–1913. Solana nova vel minus cognita, V, VI, IX, X, XI. Repert. Spec. Nov. Regni Veg. 11: 349–394, 431–473, 12: 1–10, 49–90, 136–162.

Bohs, L. 1994. *Cyphomandra* (Solanaceae). Fl. Neotrop. Monogr. 63: 1–175.

———. 1995. Transfer of *Cyphomandra* (*Solanaceae*) and its species to *Solanum*. Taxon 44: 583–587.

———. 2001. Revision of *Solanum* section *Cyphomandropsis* (Solanaceae). Syst. Bot. Monogr. 61: 1–85.

———. In press. Major clades in *Solanum* based on *ndh*F sequence analyses. Monogr. Syst. Bot., Missouri Bot. Gard.

Bohs, L., and R. G. Olmstead. 1997. Phylogenetic relationships in *Solanum* (Solanaceae) based on *ndh*F sequences. Syst. Bot. 22: 5–17.

———. 1999. *Solanum* phylogeny inferred from chloroplast DNA sequence phylogeny. In *Solanaceae IV: advances in biology and utilization*, ed. M. Nee, D. E. Symon, R. N. Lester, and J. P. Jessop, 97–110. Kew: Royal Botanic Gardens.

———. 2001. A reassessment of *Normania* and *Triguera* (Solanaceae). Pl. Syst. Evol. 228: 33–48.

Bonierbale, M., W. Ganal, and S. D. Tanksley. 1990. Applications of restriction fragment length polymorphisms and genetic mapping in potato breeding and genetics. In *The molecular and cellular biology of the potato*, ed. M. E. Vayda and W. D. Park, 13–24. Wallingford, UK: CAB International.

Bradshaw, J. E., and G. R. Mackay. 1994. Breeding strategies for clonally propagated potatoes. In *Potato genetics*, ed. J. E. Bradshaw and G. R. Mackay, 467–498. Wallingford, UK: CAB International.

Brown, C. R. 1993. Outcrossing rate in cultivated autotetraploid potato. Amer. Potato J. 70: 725–734.

Brown, C. R., H. Mojtahedi, and G. S. Santo. 1991. Resistance to Columbia root-knot nematode in *Solanum* ssp. and in hybrids of *S. hougasii* with tetraploid cultivated potato. Amer. Potato J. 68: 445–452.

Brown, C. R., M. McNabay, and B. B. Dean. 1999. Genetic characterization of reduced melanin formation in tuber tissue of *Solanum hjertingii* and hybrids with cultivated diploids. Amer. J. Potato Res. 76: 37–43.

Bukasov, S. M. 1930. The cultivated plants of Mexico, Guatemala and Colombia. Trudy Prikl. Bot. Suppl. 47: 191–226, 513–525. [In Russian, with English summary; a Spanish translation by Jorge León was published in 1981 by Centro Agronomico Tropical de Investigacion y Enseñanza (CATIE), Turrialba, Costa Rica.]

———. 1939. The origin of potato species. Physis (Buenos Aires) 18: 41–46.

———. 1978. Systematics of the potato. Trudy Prikl. Bot. 62: 3–35. [In Russian; English translation in *Systematics, breeding, and seed production of potatoes*, ed. V. S. Kothetar, translator, A. K. Dhote, 1–42. New Delhi: Amerind Publ. Co.]

Bukasov, S. M., and Y. Kameraz. 1959. *Bases of potato breeding*. Moscow-Leningrad: Gosudar. Izdatel. Sel'sko Liter. [In Russian]

Castillo-T., R., and D. M. Spooner. 1997. Phylogenetic relationships of wild potatoes, *Solanum* series *Conicibaccata* (sect. *Petota*). Syst. Bot. 22: 45–83.

Child, A., and R. N. Lester. 1991. Life form and branching within the Solanaceae. In *Solanaceae III: taxonomy, chemistry, evolution*, ed. J. G. Hawkes, R. N. Lester, M. Nee, and N. Estrada, 151–159. Kew: Royal Botanic Gardens, Kew; London: Linnaean Society of London.

Clausen, A. M., and D. M. Spooner. 1998. Molecular support for the hybrid origin of the wild potato species *Solanum* ×*rechei*. Crop Sci. 38: 858–865.

Contreras-M., A., and D. M. Spooner. 1999. Revision of *Solanum* section *Etuberosum* (subgenus *Potatoe*). In *Solanaceae IV: advances in biology and utilization*, ed. M. Nee, D. E. Symon, R. N. Lester, and J. P. Jessop, 227–245. Kew: Royal Botanic Gardens.

Correll, D. S. 1948a. Collecting wild potatoes in Mexico. U.S.D.A. Circ. 797: 1–40.

———. 1948b. Wild potato collecting in Mexico. Field & Lab. 16: 94–112.

———. 1950. New middle American solanums, section *Tuberarium*. Contr. Texas Res. Found., Bot. Stud. 1: 4–14.

———. 1952. Section *Tuberarium* of the genus *Solanum* of North America and Central America. Agric. Monogr. U.S.D.A. 11: 1–243.

———. 1958. A new species and some nomenclatural changes in *Solanum*, section *Tuberarium*. Madroño 14: 232–236.

———. 1961a. Four new solanums in section *Tuberarium*. Wrightia 2: 133–141.

———. 1961b. New species and some nomenclatural changes in section *Tuberarium* of *Solanum*. Wrightia 2: 169–197.

———. 1962. The potato and its wild relatives. Contr. Texas Res. Found., Bot. Stud. 4: 1–606.

Corriveau, J. L., and A. W. Coleman. 1988. Rapid screening method to detect potential biparental inheritance of plastid DNA and results for over 200 angiosperm species. Amer. J. Bot. 75: 1443–1458.

Dale, M. F. B., and G. R. Mackay. 1994. Inheritance of table and procession quality. In *Potato genetics*, ed. J. E. Bradshaw and G. R. Mackey, 285–319. Wallingford, UK: CAB International.

Danert, S. 1970. Infragenerische Taxa der Gattung *Solanum* L. Kulturpflanze 18: 253–297.

D'Arcy, W. 1972. Solanaceae studies II: typification of subdivisions of *Solanum*. Ann. Missouri Bot. Gard. 59: 262–278.

———. 1973. Solanaceae. In "Flora of Panama," ed. R. E. Woodson and R. W. Schery. Ann. Missouri Bot. Gard. 60: 573–780.

———. 1979. The classification of the Solanaceae. In *The biology and taxonomy of the Solanaceae*, ed. J. G. Hawkes, R. N. Lester, and A. D. Skelding, 3–47. London: Academic Press.

———. 2001. Solanaceae. In *Flora de Nicaragua*, ed. W. D. Stevens, C. Ulloa Ulloa, A. Pool, and O. Martha Montiel. Monogr. Syst. Bot., Missouri Bot. Gard. 85(3): 2376–2426.

Deahl, K. L., S. L. Sinden, and R. J. Young. 1993. Evaluation of wild tuber-bearing *Solanum* accessions for foliar glycoalkaloid level and composition. Amer. Potato J. 70: 61–69.

Dean, E. A. 1997. Lectotypification and synonymy of the names of *Solanum mozinianum* Dunal and *Solanum uniflorum* Sessé & Mociño. Brittonia 49: 192–196.

Debener, T., F. Salamini, and C. Gebhardt. 1990. Phylogeny of wild and cultivated *Solanum* species based on nuclear restriction fragment length polymorphisms (RFLPs). Theor. Appl. Genet. 79: 360–368.

del Rio, A. H., and J. B. Bamberg. 2001. Genetic heterogeneity among breeding systems of potato species and its ramifications in germplasm conservation. Amer. J. Potato Res. 78: 452.

Don, G. 1838. *General history of the dichlamydeous plants*, vol. 6. London: J. G. and F. Rivington et al.

Douches, D. S., J. B. Bamberg, W. Kirk, K. Jastrzebski, B. A. Niemira, J. Coombs, D. A. Bisognin, and K. J. Felcher. 2001. Evaluation of wild *Solanum* species for resistance to the US-8 genotype of *Phytophthora infestans* utilizing a fine-screening technique. Amer. J. Potato Res. 78: 159–165.

Dunal, M. F. 1814 ["1813"]. *Morelle, Solanum*. In *Encyclopédie méthodique, botanique*, Suppl. 3, ed. J. L. M. Poiret, 738–780. Paris: H. Agasse.

———. 1852. *Solanum*. In *Prodromus systematis naturalis regni vegetabilis*, ed. A. de Candolle, 13: 27–387. Paris: Treuttel et Würtz.

Dunmire, W. W., and G. D. Tierney. 1995. *Wild plants of the Pueblo Province*. Santa Fe: Museum of New Mexico Press.

Dvorak, J. 1981. Evidence for genetic suppression of heterogenetic chromosome pairing in polyploid species of *Solanum*, section *Petota*. Canad. J. Genet. Cytol. 25: 530–539.

———. 1983. Evidence for genetic suppression of heterogenetic pairing in polyploid species of *Solanum*, sect. *Petota*. Canad. J. Genet. Cytol. 25: 530–539.

Dvorak, J., and P. E. McGuire. 1981. Nomenclatural chromosome differentiation among wheat cultivars, with special reference to differentiation of chromosomes in related species. Genetics 97: 391–414.

Everhardt, E. R., and P. R. Rowe. 1974. Disomic inheritance of anthocyanins and flavonol glycosides in the tetraploid tuber-bearing species *Solanum stoloniferum*. Amer. Potato J. 51: 287–294.

Ewan, J. 1942. Botanical miscellany-IV, a biographical guide to the Brandegee collections. Amer. Midl. Nat. 27: 772–789.

Flores Crespo, R. 1966. *Estudio preliminar del género Solanum, sección Tuberarium subsección Hyperbasarthrum en México*. Thesis, México, D. F.: Univ. Nac. Autonoma de México.

———. 1968. *Solanum schenckii* Bitt., su confirmación como verdadera especie. Agric. Técn. Mexico 2: 374–375.

Fritz, N. K., and R. E. Hanneman, Jr. 1989. Interspecific incompatibility due to stylar barriers in tuber-bearing and closely related non-tuber-bearing solanums. Sexual Pl. Reprod. 2: 184–192.

Gentry, J. L., and P. C. Standley. 1974. Solanaceae. In "Flora of Guatemala X," Fieldiana, Bot. 24(1–2): 1–151.

Gibson, R. W. 1971. Glandular hairs providing resistance to aphids in certain wild potato species. Ann. Appl. Biol. 68: 113–119.

Graham, K. M., and L. A. Dionne. 1961. Crossability relationships of certain diploid Mexican *Solanum* species. Canad. J. Genet. Cytol. 3: 121–127.

Gray, A. 1856. Wild potatoes in New Mexico and Western Texas. Amer. J. Sci. Arts, Ser. 2, 22: 284–285.

———. 1878. *Synoptical flora of North America*, vol. 2, part 1. New York: Ivison, Blakeman, Taylor, and Co.

Greenman, J. M. 1903. New and otherwise noteworthy angiosperms from Mexico and Central America. Proc. Amer. Acad. Arts 39: 69–120.

Greuter, W., J. McNeill, F. R. Barrie, H. M. Burdett, V. Demoulin, T. S. Filgueiras, D. H. Nicolson, P. C. Silva, J. E. Skog, P. Trehane, N. J. Turland, and D. L. Hawksworth. 2000. International Code of Botanical Nomenclature (St. Louis Code). Regnum Veg. 138: 1–474.

Hanneman, R. E., Jr. 1989. The potato germplasm resource. Amer. Potato J. 66: 655–667.

———. 1999. The reproductive biology of the potato and its implication for breeding. Potato Res. 42: 283–312.

Hawkes, J. G. 1941. *Potato collecting expeditions in Mexico and South America*, 1–30. Cambridge: School of Agriculture.

———. 1944. *Potato collecting expeditions in Mexico and South America. II. Systematic classification of the collections*, 1–142. Aberystwyth: Imperial Bureau of Plant Breeding and Genetics.

———. 1956. A revision of the tuber-bearing solanums. Annual Rep. Scott. Pl. Breed. Sta. 1956: 37–109.

———. 1957. On the lectotypes of *Solanum stoloniferum* Schlechtendal et Bouché, *S. oxycarpum* Schiede and *S. verrucosum* Schlechtendal. Wiss. Z. Martin-Luther-Univ. Halle-Wittenberg 6(5): 849–854.

———. 1958. Kartoffel. I. Taxonomy, cytology and crossability. In *Handbuch der Pflanzenzüchtung*, ed. 2, ed. H. Kappert and W. Rudorf, 3: 1–43. Berlin: Paul Parey.

———. 1959. The Birmingham University plant collecting expedition to Mexico and Central America. Univ. Birmingham Gaz. 11: 60–63.

———. 1963. A revision of the tuber-bearing solanums. II. Rec. Scott. Pl. Breed. Sta. 1963: 76–181.

———. 1966. Modern taxonomic work on the *Solanum* species of Mexico and adjacent countries. Amer. Potato J. 43: 81–103.

———. 1978. Biosystematics of the potato. In *The potato crop, the scientific basis for improvement*, ed. P. M. Harris, 15–69. London: Chapman and Hall Ltd.

———. 1988. Two new tuber-bearing *Solanum* species from Mexico: *S. tarnii* and *S. matehualae*. Phytologia 65: 114–118.

———. 1989. Nomenclatural and taxonomic notes on the infrageneric taxa of the tuber-bearing solanums (Solanaceae). Taxon 38: 489–492.

———. 1990. *The potato: evolution, biodiversity and genetic resources*. Oxford: Belhaven Press.

———. 1997. A database for wild and cultivated potatoes. Euphytica 93: 155–161.

Hawkes, J. G., and J. P. Hjerting. 1969. *The potatoes of Argentina, Brazil, Paraguay and Uruguay: a biosystematic study*. Oxford, UK: Oxford Univ. Press.

———. 1989. *The potatoes of Bolivia: their breeding value and evolutionary relationships*. Oxford, UK: Oxford Univ. Press.

Hawkes, J. G., and M. T. Jackson. 1992. Taxonomic and evolutionary implications of the Endosperm Balance Number hypothesis in potatoes. Theor. Appl. Genet. 84: 180–185.

Hawkes, J. G., and R. N. Lester. 1968. Immunological studies on the tuber-bearing solanums III. Variability within *S. bulbocastanum* and its hybrids with species in series *Pinnatisecta*. Ann. Bot. (Oxford) 32: 165–186.

Hermsen, J. G. T. 1994. Introgression of genes from wild species, including molecular and cellular approaches. In *Potato genetics*, ed. J. E. Bradshaw and G. R. Mackay, 515–538. Wallingford, UK: CAB International.

Hermsen, J. G. T., and M. S. Ramanna. 1976. Barriers to hybridization of *Solanum bulbocastanum* Dun. and *S. verrucosum* D. F. L. von Schlechtendal and structural hybridity in their F_1 plants. Euphytica 25: 1–10.

Hijmans, R. J., and D. M. Spooner. 2001. Geographic distribution of wild potato species. Amer. J. Bot. 88: 2101–2112.

Hijmans, R. J., L. Guarino, M. Cruz, and E. Rojas. 2001. Computer tools for spatial analysis of plant genetic resources data: 1. DIVA-GIS. Pl. Genet. Res. Newsletter 127: 15–19.

Hijmans, R. J., M. Schreuder, J. de la Cruz, and L. Guarino. 1999. Using GIS to check co-ordinates of germplasm accessions. Genet. Res. Crop Evol. 46: 291–296.

Hijmans, R. J., D. M. Spooner, A. R. Salas, L. Guarino, and J. de la Cruz. 2002. *Atlas of wild potatoes*. Systematic and Ecogeographic Studies on Crop Genepools, No. 10. Rome: International Plant Genetic Resources Institute.

Holmgren, P. K., N. H. Holmgren, and L. C. Barnett. 1990. *Index herbariorum*. Part. I: The herbaria of the world, 8th ed. Regnum Veg. 120: 1–693.

Hosaka K., and R. E. Hanneman, Jr. 1991. Seed protein variation within accessions of wild and cultivated potato species and inbred *Solanum chacoense*. Potato Res. 34: 419–428.

———. 1998. Genetics of self-compatibility in a self-incompatible wild diploid potato species *Solanum chacoense*. 1. Detection of an S locus inhibitor (Sli) gene. Euphytica 99: 191–197.

Hosaka K., Y. Ogihara, M. Matsubayashi, and K. Tsunewaki. 1984. Phylogenetic relationship between the tuberous *Solanum* species as revealed by restriction endonuclease analysis of chloroplast DNA. Jap. J. Genet. 59: 349–369.

Hougas, R. W. and S. J. Peloquin. 1958. The potential of potato haploids in breeding and genetic research. Amer. Potato J. 35: 701–707.

Howard, H. W., and M. S. Swaminathan. 1953. The cytology of haploid plants of *Solanum demissum*. Genetica 26: 381–389.

Hruby, K. 1957. Polyploidie a její Vyznam v prirode. Vesmír 36(1): 11–15.

Huamán, Z., and D. M. Spooner. 2002. Reclassification of landrace populations of cultivated potatoes (*Solanum* sect. *Petota*). Amer. J. Bot. 89: 947–965.

Hunziker, A. T. 2001. *Genera solanacearum, the genera of Solanaceae illustrated, arranged according to a new system*. Ruggell, Germany: A. R. G. Gantner Verlag.

Irikura, Y. 1976. Cytogenetic studies on the haploid plants of tuber-bearing *Solanum* species. II. Cytogenetic investigations on haploid plants and interspecific hybrids by utilizing haploidy. Res. Bull. Hokkaido Natl. Agric. Res. Sta. 115: 1–80. [In Japanese, with English summary]

Jansky, S. H. 2000. Breeding for disease resistance in potato. Plant Breed. Rev. 19: 69–155.

Johnston, S. A., T. P. M. den Nijs, S. J. Peloquin, and R. E. Hanneman, Jr. 1980. The significance of genic balance to endosperm development in interspecific crosses. Theor. Appl. Genet. 57: 5–9.

Juzepczuk, S. W. 1937. New species of the genus *Solanum* L. in the group *Tuberarium* Dun. Izv. Akad. Nauk S.S.S.R. Ser. Biol. 2: 295–331.

Kalazich, J. C., and R. L. Plaisted. 1991. Association between trichome characters and agronomic traits in *Solanum tuberosum* (L.) × *S. berthaultii* (Hawkes) hybrids. Amer. Potato J. 68: 833–847.

Kardolus, J. P. 1999. Morphological variation within series *Acaulia* Juz. (*Solanum* sect. *Petota*). In *Solanaceae IV: advances in biology and utilization*, ed. M. Nee, D. E. Symon, R. N. Lester, and J. P. Jessop, 257–274. Kew: Royal Botanic Gardens.

Kardolus, J. P., and N. Groendijk-Wilders. 1998. The inflorescence architecture of *Solanum acaule* and related taxa of *Solanum* section *Petota* (Solanaceae). Acta Bot. Neerl. 47: 195–207.

Kardolus, J. P., H. J. van Eck, and R. G. van den Berg. 1998. The potential of AFLPs in biosystematics: a first application in *Solanum* taxonomy (*Solanaceae*). Pl. Syst. Evol. 210: 87–103.

Klotzsch, J. F. 1849. *Solanum utile*. Allg. Gartenzeitung 17: 314–316.

Knapp, S. 1991. A revision of the *Solanum sessile* species group (section *Geminata* pro parte: Solanaceae). Bot. J. Linn. Soc. 105: 179–210.

———. 2000. A revision of *Solanum thelopodium* species group (section *Anthoresis* sensu Seithe, pro parte): Solanaceae. Bull. Nat. Hist. Mus. London (Bot.) 30: 13–30.

Kúc, J. 1975. Teratogenic constituents of potatoes. Recent Advances Phytochem. 9: 139–150.

Lara Cabrera, S. I., and D. M. Spooner. In press a. Taxonomy of Mexican diploid wild potatoes (*Solanum* sect. *Petota*): morphological and microsatellite data. Monogr. Syst. Bot., Missouri Bot. Gard.

Lara-Cabrera, S. I., and D. M. Spooner. In press b. Taxonomy of North and Central American diploid wild potato (*Solanum* sect. *Petota*) species: AFLP data. Pl. Syst. Evol.

Lechnovich, V. S. 1980. New wild potato species from Mexico and Peru Nauchno-Tekhn. Byull. Vsesoyuzn. Ordena Lenina Ordena Druzhby Narodov Nauchno-Issl. Inst. Rasteniev. N. I. Vavilova 105: 10–13. [In Russian, with English summary]

Lester, R. N. 1991. Evolutionary relationships of tomato, potato, pepino, and wild species of *Lycopersicon* and *Solanum*. In *Solanaceae III: taxonomy, chemistry, evolution*, ed. J. G. Hawkes, R. N. Lester, M. Nee, and N. Estrada, 283–301. Kew: Royal Botanic Gardens, and London: Linnean Society of London.

Lindley, J. 1848. Notes on the wild potato. J. Hort. Soc. London 3: 65–72.

Love, S. L. 1999. Founding clones, major contributing ancestors, and exotic progenitors of prominent North American potato cultivars. Amer. J. Potato Res. 76: 263–272.

Mabberley, D. J. 1983. Dr. Smith's *Anemia*, or, the prevention of later homonyms. Taxon 32: 79–87.

Maga, J. A. 1994. Potato flavor. Food Reviews Internat. 10: 1–48.

Magoon, M. L., D. C. Cooper, and R. W. Hougas. 1958. Cytogenetic studies of some diploid solanums section *Tuberarium*. Amer. J. Bot. 45: 207–221.

Marks, G. E. 1955. Cytogenetic studies in tuberous *Solanum* species. I. Genomic differentiation in the Group *Demissa*. J. Genet. 53: 262–269.

———. 1956. The cytology of *Solanum vallis-mexicae*. Annual Rep. John Hort Innes. Inst. 47: 20.

———. 1958. Cytogenetic studies in tuberous *Solanum* species. II. A synthesis of *Solanum* ×*vallis-mexici* Juz. New Phytol. 57: 300–310.

———. 1965. Cytogenetic studies in tuberous *Solanum* species. III. Species relationships in some South and Central American species. New Phytol. 64: 293–306.

———. 1968. Structural hybridity in a tuberous *Solanum* hybrid. Canad. J. Genet. Cytol. 10: 18–23.

———. 1969. The pachytene chromosomes of *S. clarum*. Caryologia 22: 161–167.

Marks, G. E., and H. Montelongo-Escobedo. 1970. A new pentaploid Mexican wild potato and its progeny. Evolution 24: 745–749.

Martens, M., and H. Galeotti. 1845. Enumeration synoptica plantarum phanerogamicarum ab Henrico Galeotti in regionibus mexicanus collectarum. Bull. Acad. Roy. Sci. Bruxelles 12(1): 129–149.

Matsubayashi, M. 1991. Phylogenetic relationships in the potato and its related species. In *Chromosome engineering in plants: genetics, breeding, evolution*, part B, ed. T. Tsuchija and P. K. Gupta, 93–118. Amsterdam: Elsevier.

Matsubayashi, M., and S. Misoo. 1977. Species differentiation in *Solanum*, sect. *Tuberarium*. IX. Genomic relationships between three Mexican diploid species. Jap. J. Breed. 27: 241–250.

McCauley, M. M., and R. F. Evert. 1988. Morphology and vasculature of the leaf of potato (*Solanum tuberosum*). Amer. J. Bot. 75: 377–390.

McVaugh, R. 1987. Botanical results of the Sessé and Mociño expedition (1787–1803): III, impact of this and other expeditions on contemporary botany in Europe. Contr. Univ. Michigan Herb. 16: 155–171.

———. 2000. *Botanical results of the Sessé & Mociño expedition (1787–1803). VII. A guide to relevant scientific names of plants*. Pittsburgh: Carnegie Mellon University, Hunt Institute for Botanical Documentation.

Mehlenbacher, S. A., R. L. Plaisted, and W. M. Tingey. 1984. Heritability of trichome density and droplet size in interspecific potato hybrids and relationship to aphid resistance. Crop Sci. 24: 320–322.

Metcalfe, C. R., and L. Chalk. 1979. *Anatomy of the dicotyledons, ed. 2, vol. 1: systematic anatomy of leaf and stem, with a brief history of the subject*. Oxford: Clarendon Press.

Miller, J. T., and D. M. Spooner. 1996. Introgression of *Solanum chacoense* (*Solanum* sect. *Petota*): upland populations reexamined. Syst. Bot. 21: 461–475.

———. 1999. Collapse of species boundaries in the *Solanum brevicaule* complex: molecular data. Plant Syst. Evol. 214: 103–130.

Morris, S. C., and T. H. Lee. 1984. The toxicity and teratogenicity of Solanaceae glycoalkaloids, particularly those of the potato (*Solanum tuberosum*): a review. Food Techno. Austral. 36: 118–124.

Nakagawa, M., and K. Hosaka. 2002. Species relationships between a wild tetraploid potato species, *Solanum acaule* Bitter, and its related species as revealed by RFLPs of chloroplast and nuclear DNA. Amer. J. Potato Res. 79: 85–98.

Nee, M. 1982. The new species of *Solanum* published by Dunal in the Encyclopédie Méthodique, Botanique, Suppl. 3. Taxon 31: 320–322.

———. 1999. Synopsis of *Solanum* in the New World. In *Solanaceae IV: Advances in biology and utilization*, ed. M. Nee, D. E. Symon, R. N. Lester, and J. P. Jessop, 285–333. Kew: Royal Botanic Gardens.

Ochoa, C. 1979. Nueva papa silvestre Venezolana de la serie *Conicibaccata*. Biota 11: 331–333.

———. 1990. *The potatoes of South America: Bolivia*. Cambridge: Cambridge University Press.

———. 1999. Las papas de sudamerica: Peru (Parte I). Lima: International Potato Center.

Ochoa, C, and P. Schmiediche. 1987. Status of the collection at CIP: wild species. In *Strategies for the conservation of potato genetic resources IV*, 19–26. Lima: International Potato Center.

Olmstead, R. G., and J. D. Palmer. 1992. A chloroplast DNA phylogeny of the Solanaceae: subfamilial relationships and character evolution. Ann. Missouri Bot. Gard. 79: 346–360.

———. 1997. Implications for the phylogeny, classification, and biogeography of *Solanum* from cpDNA restriction site variation. Syst. Bot. 22: 19–29.

Olmstead, R. G., J. A. Sweere, R. E. Spangler, L. Bohs, and J. D. Palmer. 1999. Phylogeny and provisional classification of the Solanaceae based on chloroplast DNA. In *Solanaceae IV: advances in biology and utilization*, 111–137, ed. M. Nee, D. E. Symon, R. N. Lester, and J. P. Jessop. Kew, UK: Royal Botanic Gardens.

Ortiz, R., and M. Ehlenfeldt. 1992. The importance of Endosperm Balance Number in potato breeding and the evolution of tuber-bearing *Solanum* species. Euphytica 60: 105–113.

Pavek, J. J., and D. L. Corsini. 2001. Utilization of potato genetic resources in variety development. Amer. J. Potato Res. 78: 433–441.

Pelletier, Y., and G. C. C. Tai. 2001. Genotypic variability and mode of action of Colorado potato beetle (Coleoptera: Chrysomelidae) resistance in seven *Solanum* species. J. Econ. Entomol. 94: 572–578.

Peralta, I. E., and D. M. Spooner. 2001. Granule-bound starch synthase (GBSSI) gene phylogeny of wild tomatoes (*Solanum* L. section *Lycopersicon* [Mill.] Wettst. subsection *Lycopersicon*). Amer. J. Bot. 88: 1888–1902.

Petersen, H. W., P. A. Mølgaard, U. Nyman, and C. E. Olsen. 1993. Chemotaxonomy of the tuber-bearing *Solanum* species, subsection *Potatoe* (Solanaceae). Biochem. Syst. & Ecol. 21: 629–644.

Plaisted, R. L., and R. W. Hoopes. 1989. The past record and future prospects for the use of exotic potato germplasm. Amer. Potato J. 66: 603–627.

Plaisted, R. L., W. M. Tingey, and J. C. Steffens. 1992. The germplasm release of NYL 235-4, a clone with resistance to the Colorado potato beetle. Amer. Potato J. 69: 843–846.

Propach, H. 1940. Cytogenetische Untersuchungen in der Gattung *Solanum*, sect. *Tuberarium*. V. Diploide Artbastarde. Z. Indukt. Abstammungs-Vererbungsl. 78: 115–128.

Reddick, D. 1933. Biological specialization in *Phytophthora infestans*. Amer. Potato J. 11: 129–134.

Rieseberg, L. H., and N. C. Ellstrand. 1993. What can molecular and morphological markers tell us about plant hybridization? Crit. Rev. Pl. Sci. 12: 213–241.

Rodríguez-C., A., and D. M. Spooner. 1997. Chloroplast DNA analysis of *Solanum bulbocastanum* and *S. cardiophyllum*, and evidence for the distinctiveness of *S. cardiophyllum* subsp. *ehrenbergii* (sect. *Petota*). Syst. Bot. 22: 31–43.

Rodríguez-C., A., and O. Vargas-P. 1994. Las especies de papa silvestre (*Solanum* L. sección *Petota* Dumortier) en Jalisco. Bol. Instit. Bot., Univ. Guadalajara, Mexico 2: 1–68.

———. 2001. Nuevos registros de *Solanum* L. (Solanaceae) para El Bajío y regions adyacentes. Acta Bot. Mex. 56: 1–8.

Rodríguez-C., A., O. Vargas-P., E. Villegas, and D. M. Spooner. 1995. Wild potato (*Solanum* sect. *Petota*) germplasm collecting expedition to Mexico in 1993, with special reference to *Solanum bulbocastanum* Dunal and *S. cardiophyllum* Lindley. Potato Res. 38: 47–52.

Roe, K. E. 1971. Terminology of hairs in the genus *Solanum*. Taxon 20: 501–508.

Ross, H. 1986. Potato breeding—Problems and perspectives. Adv. Plant Breed. Suppl. 13. Berlin: Paul Parey.

Ruiz de Galerreta, J. I., A. Carrasco, A. Salazar, I. Barrena, E. Iturritxa, R. Marquinez, F. J. Legorburu, and E. Ritter. 1998. Wild *Solanum* species as resistance sources against different pathogens of potato. Potato Res. 41: 57–68.

Rybin, V. A. 1929. Karyological investigations on some wild growing and indigenous cultivated potatoes of America. Trudy Prikl. Bot. 20: 655–720. [In Russian, with English summary]

———. 1933. Results of cytological studies on the South American cultivated and wild potatoes and their importance for breeding. Trudy Prikl. Bot. Ser. 2, 2: 3–100.

Rydberg, P. A. 1924. The section *Tuberarium* of the genus *Solanum* in Mexico and Central America. Bull. Torrey Bot. Club 51: 145–154, 167–176.

Salas, A. R., D. M. Spooner, Z. Huamán, R. V. Torres-Maita, R. Hoekstra, K. Schüler, and R. J. Hijmans. 2001. Taxonomy and new collections of wild potato species in central and southern Peru in 1999. Amer. J. Potato Res. 78: 197–207.

Schlechtendal, D. F. L. 1833. Plantis Mexicanis A. G. Schiede M. Dre collectis nuntium adfert. Linnaea 8: 245–256.

———. 1839. *Index seminum in horto academico halensi in 1839 collectorum*. Halle, Germany.

———. 1841. *Hortus halensis*, vol. 1. Halle, Germany.

Seithe, A. 1962. Die Haararten der Gattung *Solanum* L. und ihre taxonomische Verwertung. Bot. Jahrb. Syst. 81: 261–335, t. 25–28.

Seithe, A., and G. J. Anderson. 1982. Hair morphology and relationships of species in *Solanum* sect. *Basarthrum*. Pl. Syst. Evol. 139: 229–256.

Serquen, F. C., and R. E. Hanneman, Jr. In press. An analysis of the hybrid nature of *Solanum* ×*edinense* Berth. using molecular, cytological and crossability studies. Potato Res.

Shonnard, G. C., and S. J. Peloquin. 1991. Performance of true potato seed families. 1. Effect of level of inbreeding. Potato Res. 34: 397–407.

Sikinyi, E., D. J. Hannapel, P. M. Imerman, and H. M. Stahr. 1997. Novel mechanism for resistance to Colorado potato beetle (Coleoptera: Chrysomelidae) in wild *Solanum* species. J. Econ. Entomol. 90: 689–696.

Simmonds, N. W. 1963. Abbreviations of potato names. Eur. Potato J. 6: 186–190.

Smejkal, J. E., J. B. Bamberg, and R. E. Hanneman, Jr. 1988. Effect of refrigeration and hermetic sealing on long-term preservation of *Solanum* seed germinability. Amer. Potato J. 65: 501.

Sokal, R. R., and R. R. Sneath. 1963. *Principles of numerical taxonomy*. San Francisco: Freeman.

Song, J., J. M. Bradeen, S. K. Naess, J. A. Raasch, S. M. Wielgus, G. T. Haberlach, J. Liu, H. Kuang, S. Austin-Phillips, C. R. Buell, J. P. Helgeson, and J. Jiang. 2003. Gene RB cloned from *Solanum bulbocastanum* confers broad spectrum resistance to potato late blight. Proc. Natl. Acad. Sci. U.S.A. 100: 9128–9133.

Spooner, D. M., and J. B. Bamberg. 1994. Potato genetic resources: sources of resistance and systematics. Amer. Potato J. 71: 325–337.

Spooner, D. M., and R. Castillo-T. 1997. Reexamination of series relationships of South American wild potatoes (Solanaceae: *Solanum* sect. *Petota*): evidence from chloroplast DNA restriction site variation. Amer. J. Bot. 84: 671–685.

Spooner, D. M., and R. J. Hijmans. 2001. Potato systematics and germplasm collecting, 1989–2000. Amer. J. Potato Res. 78: 237–268, 395.

Spooner, D. M., and K. J. Sytsma. 1992. Reexamination of series relationships of Mexican and Central American wild potatoes (*Solanum* sect. *Petota*): evidence from chloroplast DNA restriction site variation. Syst. Bot. 17: 432–448.

Spooner, D. M., and R. G. van den Berg. 1992a. Species limits and hypotheses of hybridization of *Solanum berthaultii* Hawkes and *S. tarijense* Hawkes: morphological data. Taxon 41: 685–700.

———. 1992b. An analysis of recent taxonomic concepts in wild potatoes (*Solanum* sect. *Petota*). Genet. Res. Crop Evol. 39: 23–37.

———. 2001. Quantitative assessment of corolla shape variation in Mexican *Solanum* section *Petota*. In *Solanaceae V: advances in taxonomy and utilization*, eds. R. G. van den Berg, G. Barendse, G. W. van der Weerden, and C. Mariani, 61–71. Nijmegen, The Netherlands: Nijmegen University Press.

Spooner, D. M., G. J. Anderson, and R. K. Jansen. 1993. Chloroplast DNA evidence for the interrelationships of tomatoes, potatoes, and pepinos (Solanaceae). Amer. J. Bot. 80: 676–688.

Spooner, D. M., R. Hoekstra, and B. Vilchez. 2001a. *Solanum* sect. *Petota* in Costa Rica: taxonomy and genetic resources. Amer. J. Potato Res. 78: 91–98.

Spooner, D. M., K. J. Sytsma, and E. Conti. 1991b. Chloroplast DNA evidence for genome differentiation in wild potatoes (*Solanum* sect. *Petota*: Solanaceae). Amer. J. Bot. 78: 1354–1366.

Spooner, D. M., K. J. Sytsma, and J. F. Smith. 1991c. A molecular re-examination of diploid hybrid speciation of *Solanum raphanifolium*. Evolution 45: 757–764.

Spooner, D. M., R. G. van den Berg, and J. B. Bamberg. 1995. Examination of species boundaries of *Solanum* series *Demissa* and potentially related species in series *Acaulia* and series *Tuberosa* (sect. *Petota*). Syst. Bot. 20: 295–314.

Spooner, D. M., R. G. van den Berg, and J. T. Miller. 2001b. Species and series boundaries of *Solanum* series *Longipedicellata* (Solanaceae) and phenetically similar species in ser. *Demissa* and ser. *Tuberosa*: implications for a practical taxonomy of sect. *Petota*. Amer. J. Bot. 88: 113–130.

Spooner, D. M., J. B. Bamberg, J. P. Hjerting, and J. Gómez. 1991a. Mexico, 1988 potato germplasm collecting expedition and utility of the Mexican potato species. Amer. Potato J. 68: 29–43.

Spooner, D. M., W. L. A. Hetterscheid, R. G. van den Berg, and W. Brandenburg. 2003. Plant nomenclature and taxonomy: an horticultural and agronomic perspective. Hort. Rev. 28: 1–60.

Spooner, D. M., A. Rivera-Peña, R. G. van den Berg, and K. Schüler. 2000. Potato germplasm collecting expedition to Mexico in 1997: taxonomy and new germplasm resources. Amer. J. Potato Res. 77: 261–270.

Spooner, D. M., R. Hoekstra, R. G. van den Berg, and V. Martínez. 1998. *Solanum* sect. *Petota* in Guatemala: taxonomy and genetic resources. Amer. J. Potato Res. 75: 3–17.

Spooner, D. M., R. G. van den Berg, A. Rivera-Peña, P. Velguth, A. del Rio, and A. Salas. 2001c. Taxonomy of Mexican and Central American members of *Solanum* Series *Conicibaccata* (sect. *Petota*) Syst. Bot. 26: 743–756.

Standley, P. C. 1927. A counterfeit collection of Mexican plants falsely attributed to Brother G. Arsène. Science 65: 130–133.

Stafleu, F. A., and R. S. Cowan. 1976. Taxonomic Literature, ed. 2, vol. 1: A–G. Regnum Veg. 94: 1–1136.

———. 1985. Taxonomic Literature, ed. 2, vol. 5: Sal–Ste. Regnum Veg. 112: 1–1066.

Stuessy, T. F. 1990. *Plant taxonomy: the systematic evaluation of comparative data.* New York: Columbia University Press.

Sturtevant, E. L. 1919. *Sturtevant's edible plants of the world.* Reprint (1972), ed. U. P. Herrick. New York: Dover Publications.

Tarn, T. R. 1969. New collections of potato species from Mexico. Amer. Potato J. 46: 357–358.

Tétry, A. 1941. Le pamir et la naissance d'especes nouvelles. Rev. Sci. 79: 190.

Tingey, W. M., S. A. Mehlenbacher, and J. E. Laubengayer. 1981. Occurrence of glandular trichomes in wild *Solanum* species. Amer. Potato J. 58: 81–83.

Torrey, J. 1827. Some account of a collection of plants made during a journey to and from the Rocky Mountains in the summer of 1820, by Edward James, M. D., Assistant Surgeon, U.S. Army. Ann. Lyceum Nat. Hist. New York 2: 161–254.

Trehane, P., C. D. Brickell, B. R. Baum, W. L. A. Hetterscheid, A. C. Leslie, J. McNeill, S. A. Spongberg, and F. Vrugtman. 1995. International Code of nomenclature for cultivated plants. Regnum Veg. 133: 1–175.

Ugent, D. 1967. Morphological variation in *Solanum* ×*edinense*, a hybrid of the common potato. Evolution 21: 696–712.

———. 1968. The potato in Mexico: geography and primitive culture. Econ. Bot. 22: 108–123.

van den Berg, R. G., G. Bryan, A. del Rio, and D. M. Spooner. 2002. Reduction of species in the wild potato *Solanum* section *Petota* series *Longipedicellata*: AFLP, RAPD, and chloroplast SSR data. Theor. Appl. Genet. 105: 1109–1114.

Vavilov, N. I. 1997. *Five continents*, transl. D. Löve, ed. S. Reznik and P. Stapleton. Rome: International Plant Genetic Resources Institute.

Vega, S. E., and J. B. Bamberg. 1995. Screening the US potato collection for frost hardiness. Amer. Potato J. 72: 13–21.

Vestal, P. A. 1940. Notes on a collection of plants from the Hopi Indian Region of Arizona made by J. G. Owens in 1891. Bot. Mus. Leafl. 8: 153–168.

von Wangenheim, K. H. F. 1955. Das Pachytan und der weitere Ablauf der Meiose in diploiden *Solanum*-arten und -Bastarden. Chromosome 8: 671–690.

Walpers, W. G. 1844. *Repertorium botanices systematicae*, vol. 3. Leipzig: F. Hofmeister.

Watanabe, K., and S. J. Peloquin. 1989. Occurrence of 2n pollen and *ps* gene frequencies in cultivated groups and their related wild species in tuber-bearing solanums. Theor. Appl. Genet. 78: 329–336.

———. 1991. The occurrence and frequency of 2n pollen in 2x, 4x, and 6x wild, tuber-bearing *Solanum* species from Mexico, and Central and South America. Theor. Appl. Genet. 82: 621–626.

Wendel, J. F., and J. J. Doyle. 1998. Phylogenetic incongruence: window into genome history and molecular evolution. In *Molecular systematics of plants II: DNA sequencing*, ed. D. E. Soltis, P. S. Soltis, and J. J. Doyle, 265–296. Boston: Kluwer Academic Publishers.

Whalen, M. D. 1984. Conspectus of species groups in *Solanum* subgenus *Leptostemonum*. Gentes Herb. 12: 179–282.

Wittmack, L. 1909. Die Stammpflanze unserer Kartoffel. Landw. Jahrb. 38 (Suppl. 5): 551–605.

APPENDIX

CITATIONS OF SPECIMENS FOR WIDELY DISTRIBUTED TAXA OF SOLANUM SECT. PETOTA

[1. *S. jamesii*, 4. *S. stenophyllidium*, 12. *S. bulbocastanum*, 14. *S. verrucosum*, 16. *S. stoloniferum*, 18. *S. longiconicum*, 23. *S. iopetalum*, 25. *S. demissum*]

1. Solanum jamesii (p. 33).

Note: The records listed below for Boulder County and Larimer County were most likely recent introductions to breeding stations and no longer exist; we do not map them in Fig. 7.

U.S.A. ARIZONA. Apache Co.: near Eagar, about 0.2 mi S of the triangle intersection of Rts 180 and 160, one mi down the abandoned section of Picnic Creek road, 34.10°N, 109.24°W, 2220 m, 28 Sep 1995, *Bamberg*

28 (PTIS); near Nelson Reservoir, at 2 mi S of reservoir, take Rt 216 1 mi E, 34.03°N, 109.17°W, 2530 m, 28 Sep 1995, *Bamberg 30* (PTIS); near Nelson Reservoir, at 2 mi S of Reservoir, take Rt 216 E for 5 mi to mi marker zero at Davis Creek, 34.00°N, 109.13°W, 2530 m, 28 Sep 1995, *Bamberg 31* (PTIS); Canyon de Chelly National Monument, about 2/3 mi E of Antelope Ruins, near intersection of del Muerto and Black Rock Canyons, 36.15°N, 109.44°W, 1770 m, 18 Sep 1998, *Bamberg et al. 73* (PTIS); White Mountains near Black River, Caldwell Ranch, 33.89°N, 109.30°W, 2377 m, 17 Aug 1961, *Barr 61-240* (RM); White Mountains, about 5 mi SW of Eagar, S of Colorado Bridge, Big Lake Road, 34.02°N, 109.31°W, 2134 m, 17 Sep 1963, *Barr & Wiedhopf 63-472* (ARIZ); opposite Springerville Dump [Eagar vicinity], 34.10°N, 109.24°W, 1 Sep 1965, *Crosswhite 2967* (MO, US, WIS); "Long H" Ranch to St. John's, 34.80°N, 109.40°W, 1814 m, 6–15 Aug 1903, *Griffiths 5183* (US); Canyon de Chelly National Monument, small side canyon off Canyon del Muerto in which Antelope trail is located, 36.15°N, 109.44°W, 1743 m, 30 Aug 1971, *Halse 724* (ARIZ, MIN); 7 mi N of Greer on Arizona Rt 373, 34.05°N, 109.46°W, 2530 m, 21 Aug 1971, *Pinkava et al. 590* (ASU); Fort Defiance, 35.74°N, 109.07°W, *Porter s.n.* (PH); 4 mi SE of Eagar, 34.03°N, 109.17°W, 2362 m, 4 Sep 1912, *Ripley & Barneby 5053* (CAS); Sitgreaves Forest, Sponseller Lake, E of Shadow Creek, 34.24°N, 109.84°W, 2103 m, 2 Sep 1916, *Roberts 190* (RM); first canyon E of US Public Health Building, 2057 m, 9 Sep 1961, *Rock & Bohrer 669d* (UC); near Nelson Reservoir, 2 mi S on Rt 666, then E 1 mi on road 275, on lower side of road under trees, 34.03°N, 109.17°W, 2370 m, 13 Aug 1992, *Salas et al. 24* (PTIS); Nelson Reservoir vicinity, 2 mi S of the reservoir, take road 275 to its end (mi marker zero), or 5 mi from Rt 666, found only on creek bank on N side of road, 34.00°N, 109.13°W, 2530 m, 13 Aug 1992, *Salas et al. 26* (PTIS); Eagar vicinity, about 0.2 mi S of triangle intersection of 180 and 160 just S of Eagar, take Picnic Creek Road to the E about 1 mi to the base of high ridge, 34.10°N, 109.24°W, 2220 m, 13 Aug 1992, *Salas et al. 27* (PTIS); 11.8 mi N of Nutrioso along Hwy 180, about 2 mi S of Eagar, at jct of Apache County Road 130, top of bluff, 34.10°N, 109.24°W, 19 Aug 1978, *Ugent & Rhude 16-78* (PTIS, WIS); 2 mi SE of Nelson Resevoir along County Road 116, broad valley near base of Escudilla Mountain, 34.00°N, 109.10°W, 19 Aug 1978, *Ugent & Ruhde 17-78* (CM, PH, WIS). Cochise Co.: in Chiricahua N. M. just N of Faraway Ranch parking lot, in floodplain of dry creek, 32.01°N, 109.37°W, 1780 m, 27 Sep 1995, *Bamberg 24* (PTIS); Chiricahua Mountains, East Turkey Creek above Paradise, 31.94°N, 109.21°W, 1737 m, 10 Aug 1962, *Barr 62-480* (ARIZ); Chiricahua Mountains, Paradise, 31.94°N, 109.21°W, 1615 m, 24 Sep 1907, *Blumer 2182* (F, GH, US); Chiricahua Mountains, 31.81°N, 109.28°W, s.d., *Bruner U.126* (ARIZ); Chiricahua National Monument, lower Bonita Canyon, 32.01°N, 109.38°W, 12 Aug 1939, *Clark 8530* (ARIZ); Bear Creek, Huachuca Mountains, open flats at base of mountains, 31.38°N, 110.36°W, 30 Jul 1909, *Goodding 277* (ARIZ); Chiricahua Mountains, East Turkey Creek, 1/2 mi N of Paradise, 31.94°N, 109.21°W, 1650 m, 5 Aug 1958, *Hawkes et al. 1197* (K); Chiricahua Mountains, near Portal, grounds of Southwestern Research Station, path by entrance gates and in flower beds, 31.88°N, 109.20°W, 1650 m, 5 Aug 1958, *Hawkes et al. 1201* (C, K); Chiricahua Mountains, Bonita Canyon, just below Faraway Ranch, at edge of national monument, 32.01°N, 109.37°W, 1600 m, 6 Aug 1958, *Hawkes et al. 1207* (K, PTIS); Huachuca Mountains, Montezuma Canyon, 1 mi below entrance to Coronado National Memorial, 31.43°N, 110.33°W, 1600 m, 7 Aug 1958, *Hawkes et al. 1212* (C, K); Tanner's Canyon, Huachuca Mountains, 31.41°N, 110.32°W, 3 Aug 1893, *Holzinger 1578* (US); Huachuca Mountains, Miller Peak, T23S, R19E, 31.39°N, 110.29°W, 2868 m, 20 Aug 1973, *Lehto 1897* (BH); Stewart Camp Grounds in Chiricahua Mountains, 31.89°N, 109.17°W, 1494 m, 27 Aug 1964, *Lehto 3965* (ASU), 30 Aug 1964, *Lehto 4015* (ASU); Chiricahua Mountains, Stewart Camp Grounds, 31.89°N, 109.17°W, 1494 m, 26 Aug 1965, *Lehto 5420* (ASU); Huachuca Mountains, near Fort Huachuca, 31.44°N, 110.35°W, Sep 1882, *Lemmon 2846* (GH, P, UC); Huachuca Mountains, 31.43°N, 110.33°W, Sep 1881, *Lemmon s.n.* (UC); Coronado National Forest, [near Sierra Vista, Huachuca Mountains] Sunnyside Canyon, NW 1/4 S15, T23S, R19E, 31.44°N, 110.40°W, 1783 m, 11–15 Aug 1990, *McLaughlin & Bowers 5922* (ARIZ); Huachuca Mountains, NW of Coronado National Memorial, about 3.8 mi past the summit take gravel road to Wakefield Mine, about 1/8 mi up path, follow the barbed wire fence W to where it intersects with the wash, 31.38°N, 110.36°W, 1690 m, 8 Aug 1992, *Salas et al. 2* (PTIS); Chiricahua National Monument, about 85 paces N of the Faraway Ranch parking area between the footpath and the wash, 32.01°N, 109.37°W, 1780 m, 9 Aug 1992, *Salas et al. 34* (PTIS); Rustler Park, Chiricahua Mountains, 31.90°N, 109.28°W, 31 Aug 1975, *Van Devender & O'Rourke s.n.* (ARIZ); near Fort Huachuca, 31.47°N, 110.35°W, Aug 1894, *Wilcox 329* (US); Huachuca Mountains, Fort Huachuca Military Instillation, Garden Canyon in upper canyon near bottom, 31.47°N, 110.35°W, 1631 m, 11 Aug 1980, *Yatskievych 80-456, 80-468* (ARIZ). Coconino Co.: Mormon Lake S of Flagstaff, E side of lake among tumbled rocks on W facing slope, 34.94°N, 111.44°W, 2169 m, 6 Oct 1995, *Bamberg 40* (PTIS); Grand Canyon National Park, S rim, across road from Buggeln Picnic Area down wooded slope to "Buggeln Tank," near a spring on a raised berm, 35.98°N, 111.94°W, 2150 m, 23 Aug 1999, *Bamberg et al. 79* (PTIS); E on 40 from Williams, to N shore of (intermittently dry), Davenport Lake, 35.27°N, 112.07°W, 2120 m, 24 Aug 1999, *Bamberg et al. 80* (PTIS); Mogollon Rim, 34.41°N, 110.95°W, 2134 m, 26 Sep 1936, *Collom 708* (ASU); Mor-

mon Lake, Long Valley Hwy, 34.94°N, 111.44°W, 16 Aug 1946, *Deaver 1695* (ASU), *Kearney 1695* (ASC); Little Colorado River, 36.11°N, 111.48°W, Aug 1896, *Fernow s.n.* (US); Flagstaff, 35.26°N, 111.56°W, 2073 m, Aug 1937, *Gentry 3106* (MICH, RSA); Mormon Lake 7.5 Quad, 34.94°N, 111.44°W, 2188 m, 20 Aug 1994, *Hammond 10494* (ARIZ, ASU, TEX); Walnut Canyon National Monument, bottom of Walnut Canyon below Ancient Trail, 35.17°N, 111.51°W, 1920 m, 18 Jul 1949, *Hastings 48* (US); Wood Canyon Lake, 34.33°N, 110.95°W, 21 Aug 1966, *Hesselberg s.n.* (ARIZ); Buckskin Mountains, 36.93°N, 112.22°W, 2134 m, 21 Sep 1894, *Jones 6603* (RSA); Mesa W of Buckskin Mountains [probably NW Coconino Co., N of Grand Canyon], 36.93°N, 112.22°W, 1829 m, 21 Sep 1894, *Jones 6063m* (US); E foot of Elden Mesa, 35.25°N, 111.58°W, 1900 m, 29 Jul 1901, *Leiberg 5776* (US); shore of Davemport Lake, near the town of Williams, 35.27°N, 112.07°W, Aug 1884, *Lemmon & Lemmon s.n.* (UC); Elden Mountain, SW slope near base just above Paradise Spring, T21N R7E S2, 35.25°N, 111.63°W, 2256 m, 15 Sep 1985, *Morefield 3184* (RSA); Moqin [Moqui?] Valley [probably Flagstaff vicinity], Aug 1891, *Owens s.n.* (GH); Crater [Crater Mountain 20 mi E of Prescott], 34.34°N, 112.03°W, May-Oct 1901, *Purpus 8194* (MO, UC, US); Mormon Lake, 34.94°N, 111.44°W, 2169 m, 18 Jul 1892, *Toumey 5106* (ARIZ). Greenlee Co.: Rt 666 [191] S of Alpine, 13 mi to Beaverhead, then 3.5 mi W, about 2 mi S of Sprucedale along the banks of Beaver Creek, 33.72°N, 109.26°W, 2360 m, 28 Sep 1995, *Bamberg 33* (PTIS); White Mountains, 3–4 mi W of Beaverhead on road to Sprucedale Ranch, 33.72°N, 109.26°W, 17 Aug 1966, *Caldwell 66264* (ARIZ); Clifton, Blue River, 33.02°N, 109.29°W, 8 Sep 1902, *Davidson 702* (DS, NY, RSA, UC); White Mountains, 15 mi N of Hannigan Meadow, 33.78°N, 109.19°W, 2621 m, 12 Aug 1935, *Kearney & Peebles 12449* (ARIZ). Mojave Co.: Mount Trumbull, jct of Temple Trail and Nixon Springs Road, T35N, R8W, 36.39°N, 113.15°W, 1981 m, 2 Sep 1977, *Thorne 233* (UT). Navajo Co.: Overgaard, on N side of the road around parking lot of the restaurant and grocery store, 34.39°N, 110.55°W, 2010 m, 10 Oct 1993, *Bamberg 4* (PTIS); W of Heber at mi 320.7 on Rt 260, at a hilltop pulloff, 34.44°N, 110.62°W, 2030 m, 10 Oct 1996, *Bamberg 5* (PTIS); near Kayenta, near Navajo National Monument and Betatakin Ruins, off 160 on trail from Anasazi Inn (at Tsegi) to private land in Tsegi Canyon, in narrow SW/NE canyon along N face of shear sandstone cliff, 36.65°N, 110.46°W, 1950 m, 18 Sep 1998, *Bamberg et al. 74* (PTIS); 8 1/2 mi S of Keyenta [Kayenta], 1 mi NW of road to Tuba City, 36.65°N, 110.45°W, 1829 m, 14 Sep 1949, *Blos 47* (CAS, UC); 10 mi NW of Cibeque, immediately N of Grasshopper Ruin, 34.07°N, 110.65°W, 1829 m, 28 Aug 1971, *Bohrer 1494* (ARIZ); 10 mi NW of Cibeque, 34.07°N, 110.65°W, 1798 m, 18 Jul 1974, *Bohrer 1901* (ARIZ); Betatakin Area, W of Navajo National Monument, 36.65°N, 110.45°W, 2134 m, 28 Aug 1946, *Brewer NB46-2* (UC, US); Water Lily Canyon, 35 mi NE of Kayenta, 36.99°N, 110.02°W, Jul–Aug 1934, *Burton 105* (NA); Taylor, 34.47°N, 110.09°W, Jun–Jul 1897, *Hough 84* (US); 12 mi W of Snowflake, 34.49°N, 110.27°W, 1981 m, 8 Sep 1963, *Lehto 3469* (ASU, ENCB, NA); 1 mi NW of Lakeside Ranger Station, along Showlow Creek, 34.17°N, 109.98°W, 2012 m, 11 Aug 1945, *Pultz 1799* (ARIZ); Fort Apache Indian Reservation, along N fork of White River between Indian Pine and Whitewater, about 6 mi S of Indian Pine [Rt 73], 34.01°N, 109.90°W, 1920 m, 2 Sep 1963, *Schmidt 219* (ARIZ); NW of Apache Reservation, 34.55°N, 110.26°W, 17 Aug 1967, *Scott s.n.* (ASU); Apache-Sitgreaves National Forest T13N R16E S22 [6 mi NW of Heber], 34.50°N, 110.64°W, 2012 m, 6 Aug 1990, *Tharalson 17* (ASU); Apache-Sitgreaves Forest, about 5 mi NW of Heber, T13N R16E S15, 34.52°N, 110.64°W, 2012 m, 11 Sep 1990, *Tharalson s.n.* (ASU); Skeleton Mesa Canyon, 1 1/4 mi from end, Decompound SS [probably Tsegi Canyon], 36.65°N, 110.45°W, 16 Aug 1937, *Wetherill s.n.* (NY); Hopi Reservation, large corn field near Second Mesa, 17 Aug 1937, *Whiting 854/2773* (ARIZ); Holbrook, 34.91°N, 110.16°W, 1548 m, 10 Aug 1896, *Zuck s.n.* (MO, NY, US). Santa Cruz Co.: Coronado National Forest, Papago Springs Cave, 6 mi S of Sonoita, Canelo Hills, T21S R17E S16, 31.61°N, 110.62°W, 1608 m, Aug 1981, *Van Devender s.n.* (ARIZ). Yavampi Co.: Prescott, 34.55°N, 112.45°W, 1615 m, 30 Aug 1894, *Toumey s.n.* (GH, NY, UC); Fort Whipple, 34.55°N, 112.45°W, 1615 m, 6 Aug 1865, *Coues & Palmer 115* (MO); Fort Whipple, Hassayampa Creek presently Vet. Hospital, Prescott, 34.55°N, 112.45°W, 1615 m, 6 Jun 1865, *Coues & Palmer 270* (MO), 1869, *Palmer s.n.* (PH, US). County unknown: Johnson's Canyon, 31 Aug 1909, *Rusby s.n.* (NY).—COLORADO: Archuleta Co.: south slope of Mount Allison, 1500 ft E of "Haystack," 100 ft from Road CR 973, in orchard, 37.04°N, 107.46°W, 19 Aug 1996, *Holm 1* (PTIS). Boulder Co.: University of Colorado campus, Boulder, beside the greenhouse, 40.02°N, 105.25°W, 1676 m, 6 Jul 1956, *Bonde s.n.* (COLO). Huerfano Co.: [La Veta coordinates for town], 37.51°N, 105.01°W, 2140 m, 14 Jul 1896, *Shear 3575* (NY). La Plata Co.: Florida Mesa [E of Durango], 37.27°N, 107.81°W, 2316 m, 4 Sep 1936, *Christ 3714* (NA). Larimer Co.: Fort Collins, 40.59°N, 105.07°W, 1524 m, 9 Aug 1892, *Crandall 369* (NY, US), *Crandall s.n.* (NY), 21 Sep 1893, *Crandall s.n.* (MO, RM), *Herb State Agricultural College, Colorado s.n.* (RM), Aug 1916, *Rolfe s.n.* (TEX); vicinity of Fort Collins, 40.59°N, 105.07°W, 1524 m, 3 Sep 1898, *Crandall s.n.* (LY, MSC, UC). Las Animas Co.: near Trinidad, W of Trinidad on Rt 12 about 10 mi then N on Burro Canyon Road 1.3 mi, under pinon W of road at base of slope, 37.14°N, 104.66°W, 1980 m, 14 Aug 1998, *Bamberg 62* (PTIS); 10 mi W of Trinidad on Rt 12, then 1.3 mi N on Burro Canyon Road, just before first bridge over the river, 37.14°N, 104.66°W, 1980 m, 20 Sep

1996, *Bamberg et al. 52* (PTIS); near Trinidad, about 3.5 mi N on Burro Canyon Road from Rt 12, just before the cattle crossing, 37.17°N, 104.68°W, 2030 m, 20 Sep 1996, *Bamberg et al. 53* (PTIS); Trinidad, 37.17°N, 104.50°W, Jun 1891, *Eastwood s.n.* (COLO), 1859 m, 8 Jun 1887, *Tracy & Evans 30* (NY); Trinidad, Gardens, 37.17°N, 104.50°W, 1859 m, 4 Aug, *Popenoe s.n.* (PH). Montezuma Co.: near Cortez, in Mesa Verde National Monument at junction of Spruce and Navajo Canyons, 37.17°N, 108.50°W, 1930 m, 30 Sep 1994, *Bamberg 13* (PTIS), 20 Aug 1999, *Bamberg et al. 75* (PTIS), 16 Sep 1963, *Erdman 412* (COLO); Mesa Verde National Park, Navajo Canyon, just below junction with Spruce Canyon, 37.15°N, 108.51°W, 28 Jul 1958, *Hawkes et al. 1143* (C, K, US); lower Spruce Canyon near jct with Navajo Canyon, 37.15°N, 108.51°W, 17 Sep 1947, *Weber 3627* (CAS, RSA, TEX).—NEBRASKA: Scottsbluff Co.: SE edge Scottsbluff, collected in cultivated field, but a wild plant, 41.83°N, 103.70°W, 29 Jul 1944, *Wallis 14* (NA).—NEW MEXICO: Bernalillo Co.: Manzano Mountains, 6 mi S of Tijeras, 35.02°N, 106.35°W, 1981 m, 1 Sep 1956, *Barneby 12832* (CAS); Chamisoso Canyon in Manzanita Mountains, S of Sandia Ranger Station, T10N, R6E, S26, 35.07°N, 106.38°W, 1951 m, 15 Sep 1977, *Jafoya s.n.* (UNM); Sandia Mountains [NE of Albuquerque], 35.18°N, 106.49°W, 1910, *Watson 10* (RM). Catron Co.: on Rt 180, 1.6 mi S of junction with Rt 12, beside road, 33.67°N, 108.87°W, 1900 m, 9 Oct 1993, *Bamberg 3* (PTIS); near Reserve, about 4 mi NE on Rt 12 just before 49 on E side of roadway, 33.76°N, 108.71°W, 1870 m, 28 Sep 1995, *Bamberg 34* (PTIS); NE of Reserve on Rt 12 to 33 mi marker, on W side of road, 33.92°N, 108.47°W, 2150 m, 28 Sep 1995, *Bamberg 35* (PTIS); N of town of Apache Creek, on Rt 32 at exactly 0.8 mi N of the 6 mi marker, in floodplain of Apache Creek on W side of road, 33.92°N, 108.65°W, 2050 m, 28 Sep 1995, *Bamberg 36* (PTIS); Quemado vicinity, on Rt 32 from Apache Creek to Quemado at mi 32 on E side of road at a driveway, 34.22°N, 108.54°W, 2220 m, 28 Sep 1995, *Bamberg 38* (PTIS); near Pie Town, on dirt road 41 which goes due S from 117 to Pie Town, at 21 mi N of 60, on SW corner of 41 and a dirt road running W, 34.56°N, 108.01°W, 2230 m, 18 Aug 1998, *Bamberg 69* (PTIS); W of Navajo Lodge, Datil, Datil Forest, 34.14°N, 107.84°W, 2300–2400 m, 24–25 Jul 1924, *Eggleston 20344* (NY, US); Datil Mountains, T1S, R10W, S6, 34.25°N, 107.92°W, 2560 m, 20 Jul 1976, *Fletcher 787* (UNM); Datil Mountains, T2N, R11W, S6, 34.43°N, 108.04°W, 2134 m, 10 Aug 1976, *Fletcher 908* (UNM); Datil Mountains, T1N R12W S34, 34.28°N, 108.05°W, 2316 m, 29 Aug 1963, *Goodrow & Fletcher 1127* (UNM); Gila National Forest, Apache Forest, Squirrel Springs, S17 T6S R16W, 33.78°N, 108.51°W, 2316 m, 7 Aug 1925, *Hendricks 65* (RM); Datil Forest, Jewett Ranger Station, 33.98°N, 108.63°W, 2225 m, 8 Aug 1915, *Hill & Talbot 153* (RM); 3.1 mi N of Cottonwood Campground, Rt 180, 33.66°N, 108.87°W, 1875 m, 14 Aug 1974, *Pinkava et al. P12486* (ARIZ, NY, US); Cottonwood Campground, Rt 180, San Francisco Mountains, 33.62°N, 108.89°W, 14 Aug 1974, *Pinkava et al. P12529* (ASU); Reserve vicinity, at about 6 mi NE of Aragon on Hwy 12 [at 33 mi marker from Hwy 180], 33.92°N, 108.47°W, 2150 m, 13 Aug 1992, *Salas et al. 21* (PTIS); Reserve vicinity, 7 mi W of Reserve [NE corner of intersection of Rts 180 and 12], 33.69°N, 108.86°W, 1950 m, 13 Aug 1992, *Salas et al. 22* (PTIS); Quemado vicinity, Quemado Lake Campground (6 mi E from Hwy 32 on road 103), 34.14°N, 108.47°W, 2360 m, 14 Aug 1992, *Salas et al. 28* (PTIS); Quemado vicinity, between 31 and 32 mi markers S of Quemado on Hwy 32, 34.22°N, 108.54°W, 2220 m, 14 Aug 1992, *Salas et al. 29* (PTIS); Apache (Datil) Forest, Hood Ranger Station Pasture, 33.83°N, 108.61°W, 1829 m, 4 Sep 1921, *Simmons 2* (RM); vicinity of Bat Cave, SE [SW] edge Plains of San Agustin, 14 mi SW of Horse Springs, 33.94°N, 108.43°W, 18 Aug 1948, *Smith 205* (GH); mid S19 and 30 T1S R16W, Largo Canyon, 33.33°N, 108.44°W, 2347 m, 19 Jul 1972, *Tierney s.n.* (UNM); 6.1 mi NE of Aragon, about 1 mi SW of the continental divide, and about 25.8 mi SW of the village of Reserve, 33.92°N, 108.47°W, 11 Aug 1978, *Ugent & Rhude Oct-78* (WIS); along Hwy 32 between Quemado and Apache Creek (9.6 mi S of junction of Hwy 60), lower slopes of Econdito Mountain, 34.22°N, 108.54°W, 20 Aug 1978, *Ugent & Ruhde 19-78* (CM, WIS); Frisco Hot Springs 9 mi E of Luna, 33.50°N, 108.48°W, 10 Aug 1900, *Wooton s.n.* (US); middle fork of the Gila, Mogollon Mountains [vicinity Gila Cliff Dwellings National Monument], 33.46°N, 108.95°W, 4 Aug 1900, *Wooton s.n.* (US); Reserve, 33.72°N, 108.75°W, 9 Jul 1906, *Wooton s.n.* (US). Cibola Co.: near Grants, on Hwy 547 to Mount Taylor, between the 7 and 8 mi markers, SE side of the road, 35.21°N, 107.74°W, 2225 m, 28 Sep 1994, *Bamberg 10* (PTIS); near Grants, on Hwy 547 to Mount Taylor, just past the 10 mi marker at a side road, 35.23°N, 107.72°W, 2230 m, 28 Sep 1994, *Bamberg 11* (PTIS); near Grants on Hwy 547 to Mount Taylor, just before mi 11, Coal Mine Campground, at far E edge, 35.24°N, 107.70°W, 2290 m, 28 Sep 1994, *Bamberg 12* (PTIS), 17 Aug 1998, *Bamberg 67* (PTIS); near Grants, about 31 mi S of Rt 40 on Rt 117, in El Malpais region at 27.6 mi marker, on E side of road, 34.73°N, 107.97°W, 2200 m, 28 Sep 1995, *Bamberg 39* (PTIS); near Grants, from Grants N on 547 toward Mount Taylor, just past 10 mi marker near intersection with road 19A, 35.23°N, 107.72°W, 2225 m, 17 Aug 1998, *Bamberg 66* (PTIS); near Grants, on 40 E from Grants 7 mi then S on 117 past El Malpais National Monument Visitor Center to gravel road to Sandstone Bluffs Overlook, at 1.2 mi up this road (0.3 mi from overlook) at curve, 34.95°N, 107.83°W, 2120 m, 18 Aug 1998, *Bamberg 68* (PTIS); near Grants, El Morro National Monument, near campsite, 35.04°N, 108.34°W, 2190 m, 23 Aug 1999, *Bamberg et al. 78* (PTIS); N base of El Morro, 35.04°N, 108.34°W, 6 Aug 1954, *Castet-*

ter 5548 (UNM); top of Chivato Mesa near rim of Seboyeta, 35.27°N, 107.42°W, 2408 m, 25 Sep 1977, *Marley 930* (UNM); El Morro National Monument, 35.04°N, 108.34°W, 2195 m, 9 Sep 1979, *McCallum 637* (UNM); Zuni Mountains, junction FS 3178.1 and 3180, T11N, R12W, S6, 35.22°N, 108.14°W, 2365 m, 17 Aug 1968, *Riffle 780* (UNM); mountains W of Grant's Station, 35.09°N, 107.51°W, 2 Aug 1892, *Wooton 452* (US); Ojo Caliente 13 mi SW of Zuni Pueblo, 35.07°N, 108.85°W, 28 Jul 1904, *Wooton 2691* (US). Colfax Co.: near Raton, about 35 mi W of Raton on 555 to Pittsburgh and Midland's York Canyon coal mine, between mi marker 1 and 2 on mine road SE along river, 36.83°N, 104.91°W, 2200 m, 16 Sep 1998, *Bamberg et al. 72* (PTIS); vicinity of Ute Park, 36.56°N, 105.11°W, 2200–2900 m, 27 Aug 1916, *Standley 13867* (E, NY), 7 Sep 1916, *Standley 14459* (NY, US); Middle York Canyon [35 mi W Raton on 555], W ridge, 36.83°N, 104.91°W, 28 Jul 1981, *Wolfe 725* (UNM). Dona Ana Co.: near Las Cruces, N on Rt 70 past Organ to San Agustin Pass Overlook, E side of footpath to overlook, 32.42°N, 106.57°W, 1739 m, 17 Aug 1996, *Bamberg 44* (PTIS); Jornada Range Reserve, 32.42°N, 106.60°W, 4 Sep 1927, *Campbell & Canfield 622* (RM); San Andres Mountains, Black Brushy peak [Big Brushy Peak], 32.60°N, 106.52°W, 2256 m, 16 Aug 1950, *Fleetwood s.n.* (UNM); Organ Mountains, 32.38°N, 106.56°W, 29 Aug 1894, *Wooton s.n.* (US). Grant Co.: near Silver City, on Rt 90 from Lordsburg to Silver City at 17 mi marker, on W side of the road, 32.49°N, 108.51°W, 1860 m, 27 Sep 1995, *Bamberg 25* (PTIS); near Sierra County border just W of Kingston on Rt 152 at Iron Creek Campground, within 75 paces both directions from the camp entrance gate along the creek, 32.91°N, 107.80°W, 2200 m, 27 Sep 1995, *Bamberg 27* (PTIS); Fort Bayard Cemetery, just SE of the main gate on the E side of the cemetery, 32.80°N, 108.15°W, 1880 m, 10 Sep 2001, *Bamberg et al. 85* (PTIS); Fort Beyard [Bayard] Watershed, 32.80°N, 108.15°W, 1 Oct 1905, *Blumer 105* (GH, NY, US); E of Santa Rita, 16 Aug 1942, *Clark 10492* (UNM); Black Canyon, Diamond Bar Range [Ranch], Gila Forest, 33.19°N, 108.01°W, 1800 m, 8 Aug 1920, *Eggleston 16993* (GH, RSA); Big Burros Ranger Station, Gila Forest, 32.67°N, 108.40°W, 1900 m, 11 Sep 1920, *Eggleston 17249* (GH, PH, RSA); Gila Valley, 32.76°N, 108.62°W, Jul 1890, *Greene s.n.* (RSA); Mangos [Mangas] Springs, 32.84°N, 108.51°W, 1451 m, 3 Jul 1880, *Greene s.n.* (F, K, NY, P, PH, WU); near Silver City, 32.77°N, 108.27°W, 30 Jul 1880, *Greene s.n.* (NA); Pinos Altos Mountains, 32.89°N, 108.17°W, 27 Jul 1890, *Greene s.n.* (NA); Silver City, 32.77°N, 108.27°W, 25 Aug 1883, *Greene s.n.* (PH); S end of Big Burro Mountains, by road from Silver City to Lordsburg, Rt 180 (90) at 17 mi from Lordsburg, 32.49°N, 108.51°W, 1800 m, 3 Aug 1958, *Hawkes et al. 1176* (K); in the vicinity of Silver City, Fort Bayard, Santa Rita, Fierro, the Mimbres Valley and E Canyon tributary, 32.78°N, 108.27°W, 12 Sep–27 Aug 1911, *Holzinger s.n.* (MIN, US); State Hwy 180 [90], 15.6 mi NE of Lordsburg, at Hidalgo County-Grant County Boundary, 32.49°N, 108.51°W, 1800 m, 10 Sep 1963, *Lester et al. 1* (K); State Hwy 180 [90], 16.3 mi NE of Lordsburg, 32.49°N, 108.51°W, 1800 m, 10 Sep 1963, *Lester et al. 2* (TEX), *Lester et al. 3* (K); State Hwy 180 [90], 17.0 mi NE of Lordsburg, 32.49°N, 108.51°W, 10 Sep 1963, *Lester et al. 5* (K, TEX); Gila River bottom near cliff, 32.83°N, 108.61°W, 1372 m, 15 Jun 1903, *Metcalfe 148* (MO, NY, RM); Mangas Springs, 32.84°N, 108.51°W, Aug 1901, *Metcalfe s.n.* (RM, RSA, US); Mangas Springs, 18 mi NW of Silver City, 32.84°N, 108.51°W, 1433 m, Jul 1901, *Metcalfe s.n.* (MO, UNM, US); Redstone [Meadow Creek area about 15 mi N of Silver City], 32.95°N, 108.17°W, 13 Aug 1895, *Mulford 853* (MO); farm field "El Cortijo," 16 km NE of Dolores Hidalgo on San Luis de la Paz Hwy, 32.80°N, 108.15°W, Aug 1895, *Mulford 702* (K, MO); Cold Spring [near Mimbres Hot Springs], 32.75°N, 107.84°W, 4 Sep 1895, *Mulford 1173* (MO, NY); Lorenzo's Spring, 32.81°N, 107.92°W, 8 Sep 1895, *Mulford 1195* (K, MO, NY); Indian ruins near New Mexico University Summer Camp, 32.59°N, 108.34°W, 13 Aug 1932, *Nelson & Nelson 229* (S); along Niber's [Mimbres?] River near Swartz Post Office, 32.80°N, 107.92°W, 15 Aug 1915, *Pilsbry s.n.* (PH); Mogollon Mountains, 33.16°N, 108.35°W, Aug 1881, *Rusby 312* (F, MICH, MIN, MO, P, PH, S); Silver City vicinity, Gila National Forest on Rt 90 from Lordsburg to Silver City, about 50 ft S of the 17 mi marker on E side of the road, 32.49°N, 108.51°W, 1860 m, 12 Aug 1992, *Salas et al. 17* (PTIS); Gila National Forest, 27 mi SW of Silver City along Hwy 90, 32.49°N, 108.51°W, 10 Aug 1978, *Ugent & Ruhde 7-78* (C, TEX, WIS); Gila Forest, Big Burrows [Burro] Ranger Station pasture, 32.67°N, 108.40°W, 1935 m, 13 Oct 1920, *Warner 163*, *BB3* (RM); Black Range, Iron Creek Campground, forested canyon near bottom of stream, 32.91°N, 107.80°W, 2195 m, 23 Aug 1980, *Worthington 6443* (ARIZ). Hidalgo Co.: S of Hachita, 31.65°N, 108.40°W, 12 Aug 1950, *Clark 15491* (UNM). Lincoln Co.: N of Capitan, White Oaks S quad, T17S R12E NE 1/4 of NW 1/4 of S1 [should be T7S], 33.73°N, 105.64°W, 2097 m, 25 Jun 1985, *Adams 46* (ARIZ), 5 Sep 1987, *Adams & Adams 82* (ARIZ); near Corona, about 2 mi NW of Rt 54 on road to Gallinas Peak, 34.14°N, 105.72°W, 2100 m, 25 Sep 1995, *Bamberg 16* (PTIS); El Capitan Mountains, 33.63°N, 105.49°W, 2134–2286 m, 30 Aug 1900, *Earle & Earle s.n.* (NY); 0.6 mi S of Nogal, 33.55°N, 105.70°W, 2080 m, 17 Aug 1949, *Gordon & Dunn 734* (UNM); S fork of Eagle Creek, 5 mi W of Alto, in White Mountains, 33.39°N, 105.73°W, 2280 m, 22 Jul 1969, *Hutchins 2320* (RSA, UNM); White Mountains, 33.31°N, 105.50°W, 2073 m, 22 Aug 1970, *Hutchins 3277* (UNM); Lake Bonita road, 3 mi E of dam, 33.48°N, 105.79°W, 2134 m, 5 Sep 1971, *Hutchins 3677* (UNM), 1920 m, 26 Jul 1897, *Wooton 209* (BM, E, GH, MIN, MO, NY, P, RM, RSA, UC, US, VT, WU),

Wooton s.n. (NY, P); T6S, R10 E, S9, 33.81°N, 105.91°W, 1646 m, 6 Aug 1964, *Iwen & Iwen 124* (WIS); Harkey Ranch, E side of Kipouka, T7S, R10E, S20, 33.68°N, 105.92°W, 1603 m, 6 Aug 1964, *Iwen & Iwen 127* (BM, WIS); T6S, R10 E, S27, 33.78°N, 105.88°W, 1646 m, 19 Aug 1965, *Iwen & Iwen 249* (WIS); wooded slope above Ruidoso Creek, 33.34°N, 105.72°W, 2188 m, 11 Jun 1932, *Wilkens 2364* (PH); Lincoln Forest, Gallinas Division, 34.14°N, 105.47°W, 1981 m, Nov 1920, *Woods 1W* (RM); 2438 m, 8 Oct 1921, *Woods W-32* (RM); vicinity of Gilmores Ranch, on Eagle Creek, 33.39°N, 105.73°W, 29 Jul 1901, *Wooton s.n.* (US), 14 Jul 1895, *Wooton s.n.* (NY); mesa W of the White Mountains, 33.31°N, 105.50°W, 2256 m, 25 Aug 1907, *Wooton & Standley 3394* (DS, MIN, US, WIS). Luna Co.: Deming, 32.09°N, 107.63°W, Aug 1895, *Mulford 1013a* (MO); Cedar Mountains, north side of Cedar Mountain, 8.5 air mi NE of Hachita, T27S, R13W, S9, 31.99°N, 108.21°W, 19 Aug 1996, *Worthington 25779* (PTIS); Florida Mountains, about 0.5 mi NW from top of Baldy Peak at spring, NW 1/4 S36 T25S R8W [15 mi SE Deming], 32.09°N, 107.63°W, 1676 m, 25 Aug 1990, *Worthington 18625.5* (RM). McKinley Co.: about 5 mi S of Fort Wingate on Rt 400, in fork of dirt road about 1/10 mi E, 35.44°N, 108.55°W, 2265 m, 12 Sep 2001, *Bamberg et al. 88* (PTIS); Zuni, 35.08°N, 108.85°W, 1920 m, 18 Sep 1913, *Cook s.n.* (NA); mouth of Chuskai [Chuska] Wash Navajo Experimental Station, 35.81°N, 108.85°W, 2012 m, 22 Aug 1936, *Gardner s.n.* (UNM); Mexican Springs, 35.79°N, 108.83°W, 16 Aug 1940, *Leopold s.n.* (WIS); T17N, R13W S8 [about 6 mi NW of Crownpoint], 35.73°N, 108.24°W, 2103 m, 3 Oct 1976, *Manthey 1470* (UNM); T17N, R13W S27 [about 3 mi NW of Crownpoint], 35.70°N, 108.20°W, 2088 m, Jul 1976, *Marley 123* (UNM); mesa W of Wild Berry Canyon, 35.76°N, 108.55°W, 2012 m, 18 Aug 1976, *Wagner 2398* (UNM); Cibola National Forest, open meadow alongside NM-400, 2 mi S of Fort Wingate village, 5 mi S of I-40, 35.44°N, 108.55°W, 2316 m, 13 Aug 1981, *Ward & Spellenberg 81-498* (NY, RSA); about 3.5 mi SE of Gallup, about 2 mi S of Rehoboth, T15N, R17W, S20, 35.44°N, 108.55°W, 2073 m, 28 Jul 1977, *Welsh et al. 15759* (NY). Otero Co.: along Rt 24 [224] in Sacramento Mountains, 2 mi NNE from Cloudcroft, 32.98°N, 105.70°W, 2743 m, 9 Aug 1965, *Bennett 8632* (F); Sacramento Mountains, Fresnal Canyon, about 6 mi NE of Alamogodro, 32.95°N, 105.85°W, 1676 m, 18 Aug 1971, *Bohrer 1406* (ARIZ), 19 Aug 1971, *Bohrer 1424* (ARIZ); road from Alamorgordo, to Cloudcroft, at 7 mi from Cloudcroft, 32.95°N, 105.82°W, 2150 m, 30 Jul 1958, *Hawkes et al. 1152* (K); Hwy 70, 6 mi E of Tularosa, 33.12°N, 105.93°W, 1603 m, 5 Sep 1971, *Hutchins 3711* (UNM); along Tularosa Creek, 33.08°N, 106.02°W, 20 Aug 1899, *Wooton s.n.* (US). Rio Arriba Co.: about 1.8 mi N of Counselor, NM on 379 N of Rt 44/550, corner of Rio Arriba County, Haynes Canyon, at wash where road bends from 345° to 300°, 36.23°N, 107.46°W, 2085 m, 13 Sep 2001, *Bamberg et al. 89* (PTIS). San Juan Co.: Navajo Reservation, near Crownpoint, Chaco Culture National Historical Park, 36.03°N, 107.87°W, 1940 m, 22 Aug 1999, *Bamberg et al. 76* (PTIS); Chaco Canyon, 36.06°N, 107.96°W, 27 Aug 1940, *Castetter 5557* (SMU, UNM), 15 Aug 1945, *Clark 12881* (UNM); Hango Pari, [Hungo Pavi] Chaco Canyon, 36.05°N, 107.93°W, 2134 m, 24 Aug 1940, *Castetter 5559* (UNM); Chaco Canyon National Monument, 36.06°N, 107.96°W, May 1937, *Hastings s.n.* (ARIZ); about 8 mi S of Largo Bridge, 1/4 mi W of Largo Canyon, near well locations along access road, 36.66°N, 107.79°W, 1758 m, 22 Aug 1998, *Heil 12497* (UNM); Chaco Canyon, Pueblo Bonito, 36.06°N, 107.96°W, 15 Jul 1925, *Scofield s.n.* (NA, RSA), *Scofield s.n.* (LL); NE of Crownpoint, Chaco Culture National Historical Park, 25–50 m W of W wall of "Wijiji" greathouse, 36.03°N, 107.87°W, 1890 m, 19 Aug 1996, *Whitefield 1* (PTIS); NE of Crownpoint, Chaco Culture National Historical Park, employee housing area, 36.03°N, 107.91°W, 1900 m, 19 Aug 1996, *Whitefield 2* (PTIS); NE of Crownpoint, Chaco Culture National Historical Park, inside central Kiva at "Hungo Pavi" greathouse, 36.05°N, 107.93°W, 1884 m, 19 Aug 1996, *Whitefield 3* (PTIS); NE of Crownpoint, Chaco Culture National Historical Park, 0.5 mi SSW of Pueblo del Arroyo greathouse, floor of S Gap Canyon near mouth of Chaco Canyon, 36.05°N, 107.97°W, 1860 m, 19 Aug 1996, *Whitefield 4* (PTIS). San Miguel Co.: vicinity of Las Vegas, 35.60°N, 105.21°W, 2000 m, 29 Jul 1926, *Arsène 18213* (P, S); vicinity of Las Vegas, canyon south, 35.60°N, 105.21°W, 1850 m, 18 Aug 1926, *Arsène 18378* (DS, P, UPS); Las Vegas, Agua Zarca, 35.57°N, 105.27°W, 2042 m, 16 Jul 1927, *Arsène 18693* (LD, MICH, P), 11 Aug 1927, *Arsène 19289* (P, RSA); near jct of Rts 40 and 285, about 6 mi N of Clines Corners at roadside picnic place on Rt 285 (between 254 and 255 mi markers), about 50 paces N of parking lot only under one juniper, 35.09°N, 105.71°W, 2150 m, 21 Aug 1996, *Bamberg 50* (PTIS); near Santa Fe at Pecos, about 1 mi N of Pecos on 63 at Lisboa Springs Fish Hatchery, in ditch on N side of hatchery entrance and across Rt 63, 35.61°N, 105.68°W, 2160 m, 21 Aug 1996, *Bamberg 51* (PTIS); N of Pecos, 3 mi at Lisboa Springs Fish Hatchery, at entrance to hatchery and along driveway, 35.55°N, 105.69°W, 2100 m, 13 Aug 1998, *Bamberg 59* (PTIS); about 2 mi S of Pecos on 63 at Pecos National Historical Park, in parking area and directly N, 35.55°N, 105.69°W, 2100 m, 13 Aug 1998, *Bamberg 60* (PTIS); near Las Vegas, on Rt 283 W of 25 just past the 6 mi marker, N side of roadside pulloff near crest of hill, 35.58°N, 105.32°W, 2170 m, 14 Aug 1998, *Bamberg 61* (PTIS); near Rowe, on frontage road running along S side of 25 to exactly 4 mi E of Rowe, 35.45°N, 105.63°W, 2070 m, 16 Aug 1998, *Bamberg 65* (PTIS); about 19 mi E of Las Vegas, NM on Rt 104 then 2/10 mi S on SSR 97 toward Joe Harris Ranch, E side of road near an iron gate, 35.60°N, 104.88°W, 1965 m, 13 Sep

2001, *Bamberg et al. 91* (PTIS); head of Juniper Canyon, 2.8 mi S of Rt 104, 18 mi E of Las Vegas, Crystal Pasture, N fenceline, 35.57°N, 104.87°W, 1920 m, s.d., *Hill & Levandoski 12140* (VT); M. E. O'Connor Trust Ranch, Conchas River bottoms, Conchas Canyon at Cuevas Canyon below Crystal Pasture, 8.5 mi due W of Trujillo, 35.52°N, 104.84°W, 1768 m, 22 Aug 1982, *Hill & Levandoski 12176* (NY, TAES, VT); Rt 25, 4 mi SE of Rowe, 35.45°N, 105.63°W, 2552 m, 11 Sep 1963, *Lester et al. 7* (K, TEX); near Pecos, 35.58°N, 105.68°W, 2042 m, 15 Aug 1908, *Standley 4944* (GH, MO, NY, RM, US); Las Vegas, 35.60°N, 105.21°W, 1951 m, Jul 1881, *Vasey s.n.* (BM, K, NA, US). Sandoval Co.: Santa Clara Canyon [near Espanola], 35.98°N, 106.34°W, 2438 m, 23 Aug 1906, *Bailey 1003* (US); between Torreon and Cuba on Rt 197, at 0.7 mi W of powerline, just over 11 mi W of Cuba, 35.93°N, 107.10°W, 2130 m, 23 Sep 1996, *Bamberg et al. 55* (PTIS), 22 Aug 1999, *Bamberg et al. 77* (PTIS); Jemez Camp, Battleship Rock, Jemez Mountains, 35.83°N, 106.64°W, 2134 m, 22 Aug 1930, *Castetter 5558* (UNM); Sandia Mountains, Capelin Canyon, 35.23°N, 106.41°W, 2438 m, 2 Jun 1914, *Ellis 68* (US); Frijoles Canyon, vicinity Tuyoni Ruins, 35.78°N, 106.28°W, 1829 m, 10 Jul 1988, *Jacobs & Jacobs 4284* (UNM); LA 135 on mesa W of Paliza Campground 12 mi NE of Jemez Pueblo, up to Vallecitos, Jemez Mountains, Río Grande drainage, 35.71°N, 106.63°W, 2103 m, 3 Sep 1972, *Kempers 30, 164* (RSA); Bandelier National Monument, Frijoles Canyon, 1/4 mi below headquarters, S slope, 35.78°N, 106.28°W, 1829 m, 26 Aug 1939, *Thomas T-110* (ARIZ); Los Frijoles, 35.78°N, 106.28°W, 5 Sep 1929, *Whitehouse s.n.* (TEX); Bandelier National Monument, mesa top 200 ft SW of Frijoles Canyon, overlooking headquarters, Frijolito Ruins, 35.78°N, 106.28°W, 1999 m, 12 Aug 1957, *Yarnell 91* (UNM); Bandelier National Monument, mesa top 200 ft SW of Frijoles Canyon, 35.78°N, 106.28°W, 1999 m, 12 Aug 1957, *Yarnell s.n.* (UNM). San Miguel Co.: El Pueblo National Forest near Montezuma, NW of Santa Fe, 35.64°N, 105.28°W, 20 Sep 1974, *Schooley s.n.* (*COLO 280242*). Santa Fe Co.: Sante Fe, near 144 Cedar Street, 35.69°N, 105.96°W, 2100 m, 16 Aug 1998, *Bamberg 63* (PTIS), 13 Sep 2001, *Bamberg et al. 90* (PTIS); Cañada de los Alamos, on Old Santa Fe Trail Road toward Cañada de los Alamos CR 67 S to Stoney Episcopal Camp and Conference Center, 35.57°N, 105.86°W, 2240 m, 16 Aug 1998, *Bamberg 64* (PTIS); Santa Fe, 35.68°N, 105.95°W, 3 Aug 1916, *Bertaud 202* (NY), 1879, *Brandegee 12109* (MO); Santa Fe, Rt 25, 3 mi SE of Santa Fe Road, 35.60°N, 105.91°W, 11 Sep 1963, *Lester et al. 6* (TEX); S of Santa Fe, 35.68°N, 105.95°W, 23 Aug 1904, *Wooton 2688* (US). Sierra Co.: near Truth or Consequences, Emory Pass Lookout W of Hillsboro on Rt 152 W from Rt 25, within 100 ft of the parking lot, 32.91°N, 107.76°W, 2490 m, 17 Aug 1996, *Bamberg 42* (PTIS); Gila Forest, bottom of Tierra Blanca Canyon, 32.86°N, 107.73°W, 2073 m, 18 Aug 1916, *Chapline 610* (RM); W of Ben Rentfrow's Cattle Ranch, 1800–2100 m, 12 Sep 1923, *Eggleston 19379* (US); canyon and foothills of Ben Rentfrow's Cattle Ranch, 1800–2100 m, 12 Sep 1923, *Eggleston 19391a* (US); Animas Creek [ca 14 mi W of top of Caballo Lake], 33.04°N, 107.52°W, 1524 m, 13 Jul 1904, *Metcalfe 1146* (BM, CAS, E, F, GH, MIN, NY, RSA, UC, UNM, US). Socorro Co.: near Magdalena, on 60, 12.2 mi W of Magdalena at roadside picnic area, N side of road, 34.08°N, 107.45°W, 2180 m, 18 Aug 1998, *Bamberg 70* (PTIS), 25 Aug 1999, *Bamberg et al. 81* (PTIS), 9 Sep 2001, *Bamberg et al. 82* (PTIS), 14 Aug 1992, *Salas et al. 31* (PTIS); Cook's Cabin, Hop Canyon, Magdalena Mountains, 34.08°N, 107.17°W, 24 Aug 1903, *Diehl 484* (RSA); Magdalena Mountains, 34.11°N, 107.23°W, 1981 m, 28 Aug 1909, *Goldman 1661* (US); S end of San Mateo Mountains, S23, T9S, R6W, 33.50°N, 107.42°W, 2103 m, 28 Aug 1963, *Goodrow 923* (UNM); Chupadera Mesa, valley at transect station #21 [far SE corner of county], 33.90°N, 106.25°W, 1981 m, 16 Aug 1949, *Gordon & Dunn 667* (UNM); Water Canyon, Magdalena Mountains, 34.00°N, 107.14°W, 10 Jul 1910, *Herrick & Herrick 35* (F); vicinity of Water Canyon, Magdalena Mountains, 33.99°N, 107.15°W, 2530 m, 27 Jul 1973, *Hutchins 4539* (UNM); Sawmill Canyon, Magdalena Mountains, 33.92°N, 107.17°W, 2057 m, 2 Sep 1973, *Hutchins 4843* (UNM), 29 Sep 1974, *Hutchins 5340* (UNM); W of Ladron at end of county road in S15, 34.48°N, 107.21°W, 1768 m, 21 Sep 1975, *Manthey 585* (UNM); Landron, pass W end of county maintained road, S16, 34.48°N, 107.23°W, 1768 m, 21 Sep 1975, *Manthey 586* (UNM); 12.2 mi W of Magdalena along Hwy 60 (0.6 mi W of jct of this road with Hwy 52), across from roadside park, 34.08°N, 107.45°W, 20 Aug 1978, *Ugent & Rhude 20-78* (PH, WIS). Taos Co.: 1 mi up Río Chiquito Creek on road 437, Carson NF, T24N R13E S11, 36.33°N, 105.58°W, 2366 m, 2 Aug 1996, *Atwood 21194* (NY, UNM). Torrance Co.: near Albuquerque, just E of Tajique, 0.7 mi W of intersection of Rts 55 and 337, 34.76°N, 106.24°W, 1980 m, 25 Sep 1995, *Bamberg 14* (PTIS); near Corona, where Rt 42 passes through Cibola National Forest, about 1.0 mi NW of Corona at the roadside pulloff on the S side of the road, 34.27°N, 105.61°W, 2100 m, 25 Sep 1995, *Bamberg 15* (PTIS); near Tajique, from Tajique town 7 mi up gravel road to 4th of July Campground, at gate to campground and around parking area along stream, 34.79°N, 106.38°W, 2300 m, 18 Aug 1998, *Bamberg 71* (PTIS); Manzano Mountains, Red Canyon, Red Canyon Camp, 34.62°N, 106.42°W, 2377 m, 5 Aug 1962, *Bedker 432* (UNM); [Manzano Mountains] 3 mi E of East View School House, 16 mi NW of Mountainair, 34.66°N, 106.45°W, 2103 m, 31 Aug 1946, *Parker & McClintock 6533* (ARIZ, CAS, RSA, UC, US). County unknown: 23.67°N, 109.90°W, 1879, *Brandegee s.n.* (F, UC); Cañada de los Blancos, 2316 m, 25 Aug 1929, *Curtin 68* (F); Jun–Jul 1847, *Fendler 669* (CGE, F, GH, K, MO, OXF, TCD); Copper Mines, Aug 1851, *Thurber 1107* (GH,

NY, UC); Socom (or Jocono or Socono spelling unclear), Jul 1881, *Vasey s.n.* (K, P); Crains Ranch, 14 Jul 1900, *Wooton s.n.* (US); 1851–1852, *Wright 1588* (F, GH, K, MO, TCD).—TEXAS: Culberson Co.: Guadalupe National Park, around campsites and picnic area along creek just S of ranger station, 31.99°N, 104.83°W, 1900 m, 20 Aug 1996, *Bamberg 49* (PTIS); Guadalupe Mountains, SW portion of Dark Canyon [Dog Canyon?], 31.99°N, 104.83°W, 1 Sep 1965, *Powell & Sikes 1374* (ARIZ, TEX); between Ploughman Tank and Cox Tank, N Guadalupe Mountains near W Dog Canyon, 31.99°N, 104.83°W, 5 Sep 1954, *Warnock 12031* (LL, SRSC); near ranger station, W Dog Canyon area, 31.99°N, 104.83°W, 1829 m, 11–15 Aug 1981, *Warnock 21664* (SRSC); McKittrick Canyon, Guadalupe Mountains near NM border, 31.98°N, 104.78°W, 29 Aug 1916, *Young s.n.* (SRSC, TEX). El Paso Co.: near El Paso, on Transmountain Road (Loop 375), E of Rt 10 (about 6 mi S of NM border), over top of pass to the roadside pulloff where hiking path leads up N facing canyon, about half way up the canyon along path, 31.87°N, 106.49°W, 1800 m, 17 Aug 1996, *Bamberg 45* (PTIS); Franklin Mountains, 0.4 air mi NW top S Franklin Mountain, 31.87°N, 106.49°W, 1798 m, 16 Sep 1978, *Worthington 3485* (MSC, TEX), 22 Sep 1978, *Worthington 3576* (COLO). Hudspeth Co.: Black Mountain of the Cornudas Range, 31.57°N, 105.15°W, 1646 m, 8 Sep 1961, *Correll & Johnston 24322* (F, LL, MO, NY, SMU, UC). Jeff Davis Co.: near Fort Davis, on Rt 118 at Madera Canyon (L. E. Wood picnic area), near Canyon (S) edge of and across Rt 118 in ditch, 30.71°N, 104.11°W, 1780 m, 19 Aug 1996, *Bamberg 47* (PTIS), 9 Sep 2001, *Bamberg et al. 83* (PTIS); H. O. Canyon near Livermore, Davis Mountains, 30.67°N, 104.20°W, 1900 m, 5 Aug 1935, *Hinckley 309* (F, GH, NY, SRSC, TEX); Davis Mountains, canyon near Livermore, 30.64°N, 104.18°W, 6 Aug 1939, *Hinckley s.n.* (ARIZ); NW upper slope of Sawtooth, 30.69°N, 104.23°W, 2274 m, 11 Jul 1948, *Turner s.n.* (SRSC); in Madera Canyon, Davis Mountains, 30.71°N, 104.11°W, 1554 m, 26 Jul 1952, *Warnock 10895* (LL, SRSC).—UTAH: Garfield Co.: Escalante, in NE corner of Hwy 12 and road to Petrified Forest State Park, 37.78°N, 111.64°W, 1780 m, 14 Sep 1997, *Bamberg et al. 56* (PTIS); Escalante, just to the S of 100 ft cliffs, 37.78°N, 111.62°W, 1780 m, 14 Sep 1997, *Bamberg et al. 57* (PTIS); 1 mi NE of Escalante, 37.78°N, 111.58°W, 1707 m, 15 Jul 1959, *Cottam 12571* (UT), 15 Jul 1950, *Hall 22A* (UC, UT). San Juan Co.: near Blanding, about 9 mi SW of Blanding on Rt 95, then 5 mi N on S Cottonwood Rd, then 4.9 mi up Allen Canyon, 37.71°N, 109.66°W, 1780 m, 22 Sep 1996, *Bamberg et al. 54* (PTIS); Newspaper Rock State Park, about 12 mi by air NW of Monticello, UT, above Rt 211 about 500 ft E of petroglyphs and just NE of cattle guard, near big upward-pointed rock, 37.98°N, 109.52°W, 1920 m, 17 Sep 1997, *Bamberg et al. 58* (PTIS); Allen Canyon, SW of Abajo Mountains, 37.71°N, 109.66°W, 1800–2000 m, 30–31 Jul 1911, *Rydberg & Garrett 9308* (NY, US, UT).—State unknown: Niggerhead Mountains near Monument no. 82, 15 Aug 1893, *Mearns 1895* (DS, US), 17 Aug 1893, *Mearns 1933* (DS, US).

Mexico. CHIHUAHUA: Sierra La Buena on E slopes of Sierra Madre Occidental, 4.3 mi up Piedras Verdes River where river is diverted into canal before entering Max Spillsbury's Ranch, 30.34°N, 108.14°W, 12 Aug 1999, *Spencer 1418* (TEX).—QUERÉTARO: Mpio. Cedereyta, Cerro El Espolón, near Rancho Pinalito, 20.84°N, 99.64°W, *Pérez & Zamudio s.n.* (IEB).—SAN LUIS POTOSÍ: in the Ratón Mountains, Aug 1867, *Bell 47* (BM); Wartenberg, near Tanoyuca, Huasteca, 1858, *Ehrenberg 175* (GH); San Felipe, 22.78°N, 100.90°W, 29 Jul 1890, *Pringle s.n.* (VT).—SONORA: San Pedro, 30.51°N, 109.94°W, Sep 10–20 1890, *Hartman 871* (DS, GH, MO, NY, UC, US); between San Pedro and Fronteras, 20–24 Sep 1890, *Hartman 956* (DS, GH, MO, NY, UC, US).

4. Solanum stenophyllidium (p. 41).

Mexico. AGUASCALIENTES: 24 km W of Aguascalientes on road to Calvillo, 21.88°N, 102.48°W, 2150 m, 14 Oct 1957, *Graham 345* (LL, MEXU, W); road to Calvillo, 19–20 mi W of Aguasalientes near Km 31, summits of hills, 21.87°N, 102.44°W, 2200 m, 24 Aug 1960, *McVaugh 18257* (DUKE, ENCB, G, K, LL, NY, TEX, US, VT); road to Calvillo, E of Aguascalientes near Km 40, 21.92°N, 102.42°W, 1850 m, 25 Aug 1960, *McVaugh 18315* (VT); at Km 21 on new Calvillo to Aguascalientes road, 21.92°N, 102.57°W, 2100 m, 7 Sep 1997, *Rivera-Peña et al. 910* (INIFAP); from Rincón de Romos on Hwy 45, 30 km along the track towards El Chiquihuitillo, Rancho Tierra Colorada, 22.32°N, 102.45°W, 2420 m, 25 Sep 1984, *Tarn et al. 207* (BR, C, K, MEXU, PTIS), *Tarn et al. 208* (PTIS); Hwy 70, about 33 km from Aguascalientes, 8.2 km along the track past Milpillas de Arriba towards potrero Los López, 21.95°N, 102.58°W, 2320 m, 26 Sep 1984, *Tarn et al. 213, 215* (PTIS); from Aguascalientes to Calvillo Hwy 70, about 33 km from Aguascalientes, 8.2 km along track past Milpillas de Arriba towards potrero Los López, 21.95°N, 102.58°W, 2320 m, 26 Sep 1984, *Tarn et al. 214* (PTIS); Hwy 70, about 33 km from Aguascalientes, 10.2 km along the track past Milpillas de Arriba towards potrero Los López, 21.95°N, 102.60°W, 2460 m, 26 Sep 1984, *Tarn et al. 219* (PTIS).—CHIHUAHUA: E of Majalca, 28.82°N, 106.30°W, 29 Jul 1958, *Correll & Johnston 20303* (IBUG, LL, PTIS); 31 km after Chihuahua, W of the road, towards the cumbres of Majalca, 28.80°N, 106.69°W, 1780 m, 2 Oct 1966, *Flores S-960* (MEXU); 92 km after Chihuahua, W of road to Santa Clara, Canyon of Santa Clara, 29.35°N, 106.51°W, 2100 m, 15 Aug 1967, *Flores S-968* (MEXU); road from Chihuahua to Majalca, just past La Manga, 30 mi from Chihuahua, 27.45°N,

106.04°W, 1750 m, 13 Aug 1958, *Hawkes et al. 1228* (C); Majalca, 40 mi NW of Chihuahua, near the village, 29.13°N, 106.08°W, 2150 m, 14 Aug 1958, *Hawkes et al. 1234* (C, IBUG, PTIS, US); Majalca, 40 mi NW of Chihuahua, 28.83°N, 106.32°W, 2150 m, 14 Aug 1958, *Hawkes et al. 1258* (C, US); road from Chihuahua to Majalca, 4 mi from Majalca, 28.85°N, 106.45°W, 1950 m, 15 Aug 1958, *Hawkes et al. 1273* (C, US); road from Parral to Vergel, 11 mi from Vergel, Saddle, 28.30°N, 107.10°W, 2500 m, 18 Aug 1958, *Hawkes et al. 1313* (C, US); Santa Clara Mountains, 29.44°N, 106.52°W, 18 Aug 1936, *Le Sueur s.n.* (BRIT, CAS, GH, K, MEXU, MICH, SMU, TEX, UC, US); WSW of Buenaventura about 12 air mi, Rancho de la Tinaja, 29.71°N, 107.59°W, 2000–2100 m, 30 Aug 1989, *Mayfield et al. 201* (TEX); up to Majalca by the canyon, 28.83°N, 106.28°W, 1775 m, 30 Sep 1980, *Ochoa 14193*, *14194* (CIP, US); Cañón de Majalca, 29.13°N, 106.08°W, 1875 m, Sep 1980, *Ochoa 14195* (CIP, PTIS, US, WIS); Km 20–21, Chihuahua to Ciudad Juárez road, 29.08°N, 106.20°W, 3 Oct 1980, *Ochoa 14206* (CIP, IBUG, PTIS, US, WIS); Santa Clara Mountains, at Km 29.5 on dirt road from Rt 45 N of Chihuahua W to Namiquipa, 29.07°N, 106.57°W, 2170 m, 13 Sep 1997, *Rivera-Peña et al. 923* (INIFAP, MEXU, PTIS, WAG); 13 km along the dirt road to Santa Clara from Km 92 on Hwy 45 from Chihuahua to Delicias, 28.08°N, 106.20°W, 1640 m, 21 Sep 1982, *Tarn et al. 3* (PTIS); La Aurora at Km 41, along road to San Juanito from the La Junta to Yepachic Hwy, 27.45°N, 105.83°W, 2100 m, 22 Sep 1982, *Tarn et al. 13* (PTIS); Majalca (Pilares) 40 mi NW of Chihuahua, 28.85°N, 106.90°W, 2073 m, 11 Aug 1939, *White 2341* (ARIZ, GH, MICH); Mpio. Janos, Carretas, border of Chihuahua and Sonora, 30.61°N, 108.68°W, 1463 m, 26–28 Aug 1939, *White 2501* (GH, MEXU, MICH, NA); Santa Eulalia Mountains, 28.62°N, 105.85°W, 12 Aug 1885, *Wilkinson s.n.* (MICH, MU, UC, US).—DURANGO: 24 km SE of Troncón, along the road to Temoaya, 23.38°N, 104.42°W, 2350 m, 25 Sep 1983, *Fernández 1208* (CHAPA, ENCB, IEB, MEXU); near Chihuahua border, 40 mi from Parral to Verel, 26.02°N, 105.70°W, 2300 m, 16 Aug 1958, *Hawkes et al. 1284* (C, US); near the Chihuahua border, 45 mi from Parral between Ojito and Río Balleza, after passing the highest point of the road in that region, 26.28°N, 106.00°W, 2250 m, 16 Aug 1958, *Hawkes et al. 1287* (C, PTIS); near Chihuahua border, road between Río Balleza and Arroyo Chihuite, 28 mi from Vergel, 26.33°N, 106.36°W, 1800 m, 18 Aug 1958, *Hawkes et al. 1317* (C, US).—JALISCO: Mpio. Santa María de los Angeles, Huacasco, on road to Laguna de las Rosas, 22.22°N, 103.10°W, 2100 m, 19 Aug 1986, *Guzmán s.n.* (IBUG, MEXU, PTIS); Guadalajara, 20.66°N, 103.33°W, 11 Jul 1893, *Pringle s.n.* (MEXU, VT); Río Blanco, 20.77°N, 103.38°W, 1893, *Pringle s.n.* (GOET); along road N of Guadalajara past side road to San Francisco Tesistán to San Cristóbal de la Barranca, at Km 20.5, about 1.5 km S of overlook, about 150 m W of road, 20.96°N, 103.42°W, 1450 m, 4 Sep 1997, *Rivera-Peña et al. 904* (INIFAP); 6 km S of the railroad tracks S of Tequila, on way to microwave towers of Volcán Tequila, 200 to 300 m E of road, 20.83°N, 103.97°W, 1690 m, 5 Sep 1997, *Rivera-Peña et al. 905* (INIFAP, MEXU, PTIS, WAG); Mpio. Zapopan, 3 km N of Santa Lucía, road from Santa Lucía to La Coronilla, 20.86°N, 103.52°W, 1940 m, 1 Aug 1993, *Rodríguez & Alvarez 2582* (PTIS); Mpio. Zapopan, 1.5 km E of Río Blanco, 20.75°N, 103.47°W, 1500 m, 6 Jul 1986, *Rodríguez & Guzmán 318* (ENCB, IBUG, IEB, MEXU); Mpio. Tala, La Primavera, along the Arroyo Caliente, 20.69°N, 103.56°W, 1500 m, 20 Aug 1988, *Rodríguez & Reynoso 1445* (IBUG), *Rodríguez & Reynoso 1462* (ANSM, CHAPA, ENCB, IBUG, IEB, MEXU, WIS, XAL); Mpio. San Cristóbal de la Barranca, 300 m before El Mirador, on road from Guadalajara to San Cristóbal de la Barranca, 20.97°N, 103.41°W, 1400 m, 10 Aug 1988, *Rodríguez & Suárez 1398* (ANSM, CAS, CHAPA, ENCB, F, IBUG, IEB, LL, MEXU, MICH, MO, MU, NY, PTIS, SIN, TEX, UAMIZ, WIS, XAL, ZEA); Mpio. Zapopan, Mesa Colorada, 20.79°N, 103.53°W, 1500 m, 19 Aug 1988, *Rodríguez & Suárez 1425* (IBUG), *Rodríguez & Suárez 1443* (ANSM, CHAPA, ENCB, F, IBUG, IEB, MEXU, MICH, NY, PTIS, WIS, XAL); Mpio. Ixtlahuacán del Río, Km 44 on the road from Guadalajara to Ixtlahuacán, 1 km N of El Salvial, 20.86°N, 103.25°W, 1380 m, 19 Aug 1988, *Rodríguez & Suárez 1461* (CHAPA, ENCB, IBUG, IEB, MEXU); Mpio. Tala, School Forest, track between El Rancho and the Presitas Creek, 20.70°N, 103.56°W, 1450 m, 1 Aug 1991, *Rodríguez & Vargas 2102* (CHAPA, IBUG, IEB, MEXU); Mpio. Lagos de Moreno, La Aurora, road from Lagos de Moreno towards Aguascalientes, 21.28°N, 101.85°W, 2050 m, 25 Aug 1993, *Rodríguez et al. 2576* (IBUG, PTIS, WIS); W side of microwave tower road on Volcán Tequila, 5.5 km N of railroad tracks at base of Volcán Tequila just S of town of Tequila, 20.82°N, 103.85°W, 1600 m, 3 Sep 1988, *Spooner et al. 4091A* (INIFAP, MEXU, PTIS, WIS); road from N side of Guadalajara, past side road to San Francisco Tesistán to San Cristóbal de la Barranca, on W side of road, Km 20.5 (by posted km signs), N of Guadalajara, about 0.5 km S of El Mirador, 21.00°N, 103.42°W, 1400 m, 4 Sep 1988, *Spooner et al. 4104* (PTIS); Río Blanco, a small village just N of Guadalajara, 20.80°N, 103.40°W, 1500 m, 4 Sep 1988, *Spooner et al. 4108* (INIFAP, PTIS); Bosque Escuela de Universidad de Guadalajara, about 3 km from Cuxpala, about 10 km SSE of Tala, about 2 km N of Observatory Building, 20.58°N, 103.65°W, 1440 m, 5 Sep 1988, *Spooner et al. 4113* (INIFAP, MEXU, PTIS); Mpio. Zapopan, E of the town of Río Blanco, 20.75°N, 103.42°W, 1520 m, 24 Jul 1978, *Villarreal & Carvajal 10601* (ENCB).—MÉXICO: 5 km S of Acambay, 19.91°N, 99.84°W, 2550 m, 21 Jul 1957, *Graham 253* (LL, NY, US).—MICHOACÁN: S of the village of Tzintzuntzán, 19.65°N, 101.53°W, 2000 m, Sep 1956, *Graham & Galindo 1* (LL); Mpio.

Panindícuaro, hwy from Mexico to Guadalajara, between La Piedad and Zacapu, 5 km before the bridge of La Medina, Km 319–320, 19.99°N, 101.78°W, s.d., *Rodríguez et al. 2661* (CHAPA, CIIDIR, ENCB, IBUG, IEB, MEXU, PTIS, WIS, XAL), *Rodríguez et al. 2907* (CHAPA, ENCB, IBUG, IEB, MEXU, PTIS, WIS).—NAYARIT: Ojo de Agua, near Ixtlán del Río, 21.03°N, 104.37°W, 1100 m, 23 Sep 1926, *Mexia 742* (MIN); near Santa Anita, about 1.5 km NE of Santa Teresa, 22.50°N, 104.77°W, 2180 m, 19 Oct 1984, *Tarn et al. 270A*, *270B* (C, G, K, PTIS).—ZACATECAS: La Encantada, 23.48°N, 102.87°W, 11 Aug 1948, *Dressler 170* (MO); ruins of Chicomostoc (La Quemada archaeological site), Km 42, Jalpa to Zacatecas Hwy, 22.47°N, 102.82°W, 2100 m, 15 Oct 1957, *Graham 351* (LL); 20 mi from Fresnillo on the road to Durango, Valuarte, at the base of a small hill, 0.5 km W of the main road, near the reservoir, 23.17°N, 102.88°W, 2150 m, 10 Sep 1958, *Hawkes et al. 1471* (PTIS); along Rt 45 at crossing with Tropic of Cancer monument, 40 km NW of Fresnillo, 23.50°N, 103.00°W, 2000 m, 16 Sep 1978, *Iltis & Lasseigne 276* (WIS); Hwy 70, 12 km NW of Jalpa, 18 km along the track SE towards Tlachichila, 21.58°N, 102.85°W, 2460 m, 27 Sep 1984, *Tarn et al. 225* (K, PTIS); Hwy 54, 10 km SW of Jalpa, 20.2 km along the track towards Tlaltenango, 21.63°N, 103.10°W, 2160 m, 28 Sep 1984, *Tarn et al. 228* (K, PTIS); Hwy 54, 10 km SW of Jalpa, 26.3 km along the track towards Tlaltenango, 21.65°N, 103.13°W, 2400 m, 28 Sep 1984, *Tarn et al. 234A* (K, PTIS), *Tarn et al. 234B* (PTIS); 9.7 mi NW of Cuauhtémoc, 22.45°N, 102.35°W, 2164 m, 9 Aug 1969, *Taylor & Taylor 5962* (BRIT, MO, NY).

12. Solanum bulbocastanum (p. 70).

Mexico. CHIAPAS: Mpio. Zinacantán, along Hwy 190 at Paraje Granadila, 16.75°N, 92.70°W, 1372 m, 1 Jul 1965, *Breedlove 10597* (DS, F, US); 1864–1870, *Ghiesbreght 895* (GH); Mpio. Ixtapa, along trail from Zinacantán Center to Ixtapa below Paraje Vo'bits at Burrero, 16.78°N, 92.81°W, 1219 m, 17 Jun 1966, *Laughlin 1088* (DS); on NE side of Rt 190 near Atenango del Valle, 1.8 km SE of junction of this road and road to Las Rosas, 16.50°N, 92.47°W, 1800 m, 27 Sep 1988, *Spooner et al. 4222* (INIFAP, PTIS, WIS); 9.4 km S of Rt 190 from near Teopisca, to Las Rosas, 16.17°N, 92.20°W, 1720 m, 27 Sep 1988, *Spooner et al. 4224* (IBUG, INIFAP, PTIS, WIS).—COLIMA: 9–10 km ENE of Minatitlán, Km 7 and 8 from El Saúz al Terreno, road from El Saúz to al Terreno, 19.43°N, 103.97°W, 1600 m, 26 Jul 1991, *Santana et al. 5218* (WIS).—DISTRITO FEDERAL: Valley of Mexico, near Zapan, 19.43°N, 99.10°W, 18 Jun 1865, *Bourgeau 345* (FI, G, GH, K, P); Mexico Valley, Zapan, 19.42°N, 99.10°W, 18 Jun 1865–1866, *Bourgeau 349* (K, L, MPU); about 23 mi S of Mexico City, 19.38°N, 99.14°W, 6 Nov 1947, *Correll 14241* (NA); Cerro de Guadalupe, W slope extending N to Cerro Guerrero, 19.48°N, 99.10°W, 2250 m, 3 Jul 1949, *Hawkes et al. 1001* (F, K, LL); Pedregal de San Angel, University campus, 19.35°N, 99.20°W, 1 Oct 1958, *Hawkes et al. 1581* (IBUG, IEB, MEXU, PTIS, WIS), *Hawkes et al. 1582*, *1583* (IBUG, MEXU, PTIS); Cuilcuilco, Pedregal, 19.18°N, 99.19°W, 2200 m, 1 Oct 1958, *Hawkes et al. 1594* (PTIS); El Tepeyac National Park, 7 km N of Mexico City, 19.51°N, 99.14°W, 2350 m, 4 Oct 1958, *Hawkes et al. 1617* (C, K, MEXU); Pedregal de San Angel, 19.37°N, 99.23°W, Jul 1929, *Lyonnet 515* (BM, ENCB, F, GH, MEXU, MICH, MO, NY, US), 10 Jan 1913, *Reiche s.n.* (MEXU); Pyramid of Cuicuilco, Tlalpan, 19.18°N, 99.17°W, 2256 m, 15 Aug 1935, *MacDaniels 39* (BH, F); Cerro Guadalupe, SE of the Federal District, road from Mexico to Cerro Vicente Guerrero, 19.46°N, 99.09°W, 18 Sep 1980, *Ochoa 14150* (CIP, US); El Pedregal, S of Mexico City, E of Azteca stadium and E of El Ajusco Volcano, 19.40°N, 99.08°W, 2210 m, 18 Sep 1980, *Ochoa 14152* (CIP, US); Tizapán, 19.43°N, 99.10°W, 2286 m, 24 Aug 1900, *Pringle 9136* (BH, F, GH, K, LY, MO, NA, RM, US, VT, Z); Valley of Mexico, 19.49°N, 99.09°W, 2286 m, 19 Aug 1901, *Pringle 9340* (CAS, GH, MICH, NY, S, US, VT); hills, Valley of Mexico, 19.48°N, 99.09°W, 25 Jul 1904, *Pringle s.n.* (C, MEXU, S); Valley of Mexico, San Angel, 19.35°N, 99.20°W, 17 Jul 1901, *Rose & Hay 5513* (US); hillside of Cerro de la Estrella, 19.33°N, 99.08°W, 2300 m, 9 Sep 1930, *Russell & Souviron 159* (US); Pedregal de San Angel, near Cerro de Zacatepec, 19.37°N, 99.23°W, 8 Jun 1952, *Rzedowski 1093* (ENCB); Pedregal de San Angel, near by the University campus, 19.37°N, 99.23°W, 2300 m, 26 Jul 1970, *Rzedowski 27378* (ENCB); Pedregal, 19.37°N, 99.23°W, s.d., *Salazar s.n.* (US); Delegación Coyoacán, Pedregal de San Angel, S of Mexico City, 19.37°N, 99.18°W, 13 Aug 1944, *Sharp & Gilly 135* (MICH, MSC); Teutli, Delegación de Milpa Alta, 19.22°N, 99.03°W, 2500 m, 24 Jul 1976, *Ventura 1875* (ENCB, IEB, MEXU, MO, NY); Pedregal, between Peña Pobre and Cerro Zacatepec, 19.37°N, 99.23°W, 2300 m, 4 Sep 1949, *Williams et al. 14866* (EAP).—DURANGO: Mpio. Tayoltita, El Pino, 20 km from the junction to Sapioris, on the road from Coyotes to San Miguel de Cruces, 24.52°N, 105.82°W, 1860 m, 8 Jul 1984, *Ramamoorthy & Romero 6332* (MEXU).—GUANAJUATO: about 15 mi from Guanajuato on road to Dolores Hidalgo, 21.09°N, 101.25°W, 16 Aug 1957, *Solbrig & Ornduff 4523* (GH).—GUERRERO: Taxco, 18.50°N, 99.57°W, 15 Jul 1937, *Abbott 257* (ENCB, GH), 20 Jul 1938, *Kenoyer A303* (F); Landa, 5 km SW of Taxco, on road to Ixcateopan, 18.50°N, 99.60°W, 1790 m, 7 Jul 1982, *Soto 4005* (MEXU, MO); 8 km towards Huitziltepec from El Platanal on Hwy 95 from Chilpancingo to Mexico City, 17.55°N, 99.50°W, 1500 m, 6 Oct 1983, *Tarn et al. 149* (PTIS).—HIDALGO: toll road from Mexico to Querétaro, across from the monument Presidente Adolfo Ruiz Cortínez, 2220 m, 20 Sep 1967, *Flores S-1001* (MEXU); S of Tula, El Salto

Station, hills above village on E side of valley, 19.95°N, 99.30°W, 2180 m, 7 Aug 1949, *Hawkes et al. 1052* (K); hwy from Mexico City to Querétaro City, near the junction towards Tula, 19.85°N, 99.32°W, 2311 m, 22 Aug 1993, *Rodríguez et al. 2555* (IBUG, PTIS); Mpio. Tepeapulco, Cerro del Tecolote, 19.78°N, 98.55°W, 2500 m, 19 Aug 1975, *Ventura 130* (ENCB, GH, IEB, MO).—JALISCO: Mpio. Guadalajara, Barranca de la Experiencia, 2 km W of the Architecture School, 20.66°N, 103.33°W, 1300 m, 4 Aug 1991, *Flores 3087* (IBUG); Mpio. Balaños, 15 km NE of Balaños, road from Villa Guerrero to San Martín, 21.91°N, 103.66°W, 1600 m, 15 Jun 1990, *Flores et al. 1834* (MO, TEX); Mpio. Tonila, 3 km N of El Fresnal along the road Tonila El Fresnal, 19.43°N, 103.52°W, 1880 m, 21 Aug 1988, *Fuentes 544* (CHAPA, MICH, NY); S of Guadalajara, 20.67°N, 103.38°W, 7 Aug 1957, *Graham 277* (LL, PTIS); Cuidad Guzmán, 19.70°N, 103.52°W, 31 Aug 1957, *Graham 300B* (IBUG, K, PTIS), 1 Sep 1957, *Graham 313* (K, PTIS); Mpio. Tlajomulco, about 3 km S de San Lucas Evangelista, on pathway Los Copales towards Potrerillos, 20.47°N, 103.43°W, 1600 m, Sep 1991, *Martínez & Nieves 101* (MEXU); near Guadalajara, 20.60°N, 103.33°W, 29 Sep 1891, *Pringle 5177* (GH, VT); near Guadalajara, 20.68°N, 103.33°W, 13 Sep 1893, *Pringle s.n.* (GH); Mpio. Poncitlán, 500 m S of the Casablanca village, along the Tigre Creek, 20.40°N, 103.03°W, 1800 m, 26 Jul 1986, *Rodríguez 426* (IBUG); Mpio. Cuquío, Rancho Villa Quieta, road from Cuquío to Yahualica, 20.91°N, 103.05°W, 1920 m, 29 Aug 1993, *Rodríguez & Alvarez 2581* (F, IBUG, MICH, NY, PTIS); Mpio. Tepatitlán de Morelos, Km 22 on road from Tepatitlán to Yahualica, 20.87°N, 102.79°W, 2100 m, 3 Aug 1986, *Rodríguez & Suárez 452* (IBUG); Mpio. Tepatitlán de Morelos, Km 30 on road from Tepatitlán to Yahualica, 20.95°N, 102.80°W, 1900 m, 3 Aug 1986, *Rodríguez & Suárez 454* (IBUG); Mpio. Tepatitlán de Morelos, Km 20 on road from Tepatitlán to Yahualica, 20.91°N, 102.80°W, 2100 m, 3 Aug 1986, *Rodríguez & Suárez 455* (IBUG); Mpio. Jocotepec, uphill path to Cerro Viejo, above Zapotitán de Hidalgo, Primer Toma de Agua, 20.33°N, 103.41°W, 1900 m, 20 Aug 1986, *Rodríguez & Suárez 562* (IBUG); Mpio. Autlán, road between Puerto Los Mazos and the microwave station, 19.72°N, 104.38°W, 1500 m, 9 Jul 1987, *Rodríguez & Suárez 903* (IBUG); Mpio. Tapalpa, Km 13 on road from Tapalpa to Venustiano Carranza, 19.95°N, 103.77°W, 1800 m, 26 Jul 1987, *Rodríguez & Suárez 920* (IBUG); Mpio. Autlán, 3 km along the Ahuacapán to Corralitos Road, 19.72°N, 104.38°W, 1500 m, 27 Jul 1987, *Rodríguez & Suárez 930* (ANSM, CHAPA, ENCB, F, IBUG, IEB, MEXU, MICH, NY, PTIS, WIS, XAL); Mpio. Autlán, road between Puerto Los Mazos and the microwave station, 19.73°N, 104.39°W, 1400 m, 27 Jul 1987, *Rodríguez & Suárez 933* (IBUG); Mpio. Ixtlahuacán del Río, Km 44 on the road from Guadalajara to Ixtlahuacán, 1 km N of El Salvial, 20.86°N, 103.25°W, 1380 m, 19 Aug 1988, *Rodríguez & Suárez 1460* (IBUG); Mpio. Jocotepec, uphill path above Las Trojes, 20.30°N, 103.39°W, 1800 m, 9 Sep 1987, *Rodríguez et al. 990* (IBUG); Mpio. Cuquío, Villa Quieta 11 km along the road from Cuquío to Yahualica, 20.92°N, 103.03°W, 1700 m, 5 Aug 1988, *Rodríguez et al. 1366* (ANSM, CHAPA, ENCB, F, IBUG, IEB, MEXU, MICH, MO, NY, WIS, XAL); Mpio. Zapotitlán, La Joya, Rancho El Jabali, 22 km NNW of the city of Colima, 19.48°N, 103.70°W, 1300 m, 24 Aug 1988, *Sanders et al. 8252* (NY, RSA); on microwave tower road to Cerro Grande, SE of Santa Fe, 20.53°N, 103.03°W, 1800 m, 9 Sep 1988, *Spooner et al. 4136* (INIFAP); S of Guadalajara to Lagos de Moreno Road, Hwy 80, 28 km from Guadalajara, 20.67°N, 103.38°W, 2250 m, 13 Oct 1967, *Tarn & Gómez 200* (K); Jalpa to Guadalajara Hwy 54, 16 km N of Ixtlahuacán del Río, 20.98°N, 103.17°W, 1990 m, 29 Sep 1984, *Tarn et al. 237* (IBUG, PTIS); Mpio. Poncitlán, 1 km S of the Casablanca village, along the Tigre Creek, 20.40°N, 103.03°W, 1480 m, 8 Aug 1976, *Villarreal 9224* (IBUG).—MÉXICO: 8 km after Chalco, road to Cuautla, 19.26°N, 98.90°W, 2280 m, 30 Aug 1967, *Flores S-982* (MEXU); road from Amecameca to Chalco, Tlalmanalco, 19.22°N, 98.80°W, 2400 m, 1 Oct 1958, *Hawkes et al. 1585* (IBUG, K, PTIS), *Hawkes et al. 1586* (IBUG, PTIS); Cerro de Cocotitlán, 19.72°N, 99.78°W, 1 Oct 1958, *Hawkes et al. 1595* (IBUG, MEXU, PTIS); near Texcoco, Chapingo, Casas Antiguas, 19.48°N, 98.90°W, 2200 m, 1 Oct 1958, *Hawkes et al. 1596* (PTIS); Temascaltepec, 19.03°N, 100.05°W, 1800 m, 25 Jul 1933, *Hinton 4246* (BM, CAS, G, K, US, WIS); near Ixtapan de la Sal, 19.58°N, 98.93°W, 1800 m, 16 Aug 1953, *Matuda 28807* (MEXU); near Tenancingo, 18.97°N, 99.60°W, 2200 m, 23 Aug 1953, *Matuda 28983* (MEXU); Ixtapan de la Sal, Hwy 55, 18.83°N, 99.68°W, 1650 m, 28 Jul 1964, *Mick & Roe 347* (WIS); from Mexico, D.F., to Temascaltepec via Toluca, 19.26°N, 99.70°W, Oct 1980, *Ochoa 14215* (CIP, US); Mpio. Tepotzotlán, Sierra de Alcaparrosa, 19.75°N, 99.29°W, 2600 m, Jul 1974, *Paray 3475* (ENCB); Tenancingo, 18.97°N, 99.60°W, 2530 m, 13 Nov 1930, *Reddick 585* (BH); Mpio. Texcoco, Tetzcuitzingo Mountain right next to San Nicolás Tlamaca, 19.47°N, 98.81°W, 2400 m, 19 Aug 1993, *Rodríguez et al. 2546* (F, IBUG, MICH, NY, PTIS); E slope of Cerro del Pino, near Ayotla, 19.31°N, 98.92°W, 2600 m, 13 Jul 1967, *Rzedowski 24008* (ENCB); 4 km N of Huehuetoca, near Rancho Nuevo, Cerro Ahumada, 19.88°N, 99.20°W, 2350 m, 11 Aug 1971, *Rzedowski 28391* (ENCB); Cerro de la Cruz, 5 km NW of Tepotzotlán, 19.73°N, 99.32°W, 2400 m, 23 Jul 1974, *Rzedowski 31964* (ENCB); Mpio. Huehuetoca, W slope of Cerro Sincoque, 19.85°N, 99.20°W, 2500 m, 3 Aug 1976, *Rzedowski 34315* (ENCB, MEXU, MO); 6 km N of Huehuetoca, along the road to Apaxco, 19.90°N, 99.20°W, 2350 m, 23 Jul 1977, *Rzedowski 35226* (ENCB); Mpio. Ixtapaluca, Cerro del Pino, 19.31°N, 98.88°W, 2550 m, 31 Aug 1979, *Rzedowski 36343* (ENCB); E of Coatepec Harinas, between San Francisco and Porfirio

Díaz, 18.92°N, 99.72°W, 2450 m, 3 Oct 1984, *Tarn et al. 244* (B, K, IBUG, PTIS).—MICHOACÁN: Morelia, 19.70°N, 101.12°W, Apr 1909, *Arsène 28* (F); vicinity of Morelia, Punguato, 19.71°N, 101.13°W, 2100 m, 26 Jun 1909, *Arsène 3472* (MO, US), 11 Aug 1910, *Arsène 6927* (MO, MPU, P, US), 18 Aug 1910, *Arsène 6949* (GH, MO, MPU, US), 9 Sep 1962, *Flores S-661* (K, LL, MEXU), 23 Aug 1963, *Flores S-709* (LL, MEXU), 4 Aug 1965, *Flores et al. S-809* (MEXU); near Morelia, 19.70°N, 101.12°W, 28 Apr 1913, *Arsène s.n.* (P); near Río Bello, 9–13 Dec 1947, *Correll 14334, 14334b* (LL); at junction of road to Maravatío, Mexico to Morelia Hwy, 19.64°N, 100.76°W, 3 Aug 1965, *Correll et al. 31324* (LL); Mount Punguato, 19.70°N, 101.12°W, 4 Aug 1965, *Correll et al. 31329* (LL); about 21 km S of Morelia on road to Villa Madero, 19.61°N, 101.18°W, 4 Aug 1965, *Correll et al. 31337* (LL); Mpio. Morelia, near Rancho Los Pastores, 19.70°N, 101.12°W, 2100 m, 28 Jul 1986, *Díaz 2343* (IEB); Mpio. Acuitzio del Canje, Las Peñas, 19.49°N, 101.36°W, 2100 m, 2 Jul 1986, *Díaz 2368* (IEB); Mpio. Acuitzio del Canje, Cerro de Guadalupe, E of Acuitzio del Canje, 19.48°N, 101.28°W, 2180 m, 24 Jul 1986, *Díaz 2455* (IEB, MEXU); Mpio. Erongarícuaro, Oponguia, 19.57°N, 101.70°W, 2100 m, 5 Jul 1990, *Díaz 6203* (ENCB, IEB, MEXU); Mpio. Pátzcuaro, Cerro Colorado, 19.51°N, 101.62°W, 2100 m, 1 Aug 1986, *Escobedo 1089* (IEB); Km 22 on road from Morelia to Villa Madero, on right side of road, 19.59°N, 101.16°W, 18 Jul 1963, *Flores S-701* (MEXU); Km 21 on road from Morelia to Villa Madero, 19.59°N, 101.16°W, 19 Jul 1963, *Flores S-704* (MEXU); Km 208 on Morelia road, where begins the turnoff towards Maravatío, 19.90°N, 100.43°W, 1950 m, 3 Aug 1965, *Flores et al. S-805* (MEXU); 21 km S of Morelia on road to Villa Madero, 19.70°N, 101.12°W, 2000 m, 9 Jul 1957, *Graham 221* (IBUG, LL); Cerro Punguato, near Morelia, 19.70°N, 101.11°W, 1920–2250 m, 27 Jul 1949, *Hawkes et al. 1037* (K, LL, NY); near Morelia, Cerro Punguato, 19.70°N, 101.12°W, 2100–2300 m, 26 Sep 1958, *Hawkes et al. 1565* (C, IBUG, K, MEXU); near Zacapu, at Km 400 from Mexico City on the road to Guadalajara, 19.83°N, 101.72°W, 1 Oct 1958, *Hawkes et al. 1584* (IBUG, MEXU, PTIS); road from Mexico City to Morelia, at Km 208, at junction with road to Maravatío, 19.68°N, 100.53°W, 1950 m, 3 Aug 1965, *Hawkes et al. 2516* (BR, K, MEXU, MPU); near Morelia, Cerro Punguato, E of the town, 19.70°N, 101.08°W, 2000 m, 4 Aug 1965, *Hawkes et al. 2522* (K); Mpio. Morelia, about 3.5 km SW of Cerro Quinceo, 19.74°N, 101.30°W, 1970 m, 2 Jul 1985, *Huerta 11* (IEB); Hwy 15, 3 km ESE of Comaja, 16 km ESE of Zacapu, 19.75°N, 101.63°W, 2300 m, 26 Jul 1960, *Iltis et al. 444* (WIS); barranca W of Arroyuelos, 1800 m, 19 Jul 1986, *Labat 1599* (ENCB, MEXU, P); Mpio. Morelia, Río Chiquito, 19.79°N, 101.23°W, 1950 m, 30 Jul 1988, *Medina 1269* (IEB); Cerro Lapa, W of San Antonio, 19.75°N, 102.32°W, 2550 m, 7 Aug 1981, *Motte 326a* (MEXU); Las Palmitas, 5 km along road from Tuxpan to Morelia, 19.53°N, 100.66°W, 1925 m, Sep 1980, *Ochoa 14162* (CIP, IBUG, K, PTIS, WIS); village near the junction Maravatío and the Toluca to Morelia Road, 19.68°N, 100.53°W, 1920 m, 22 Sep 1980, *Ochoa 14163* (IBUG, PTIS, US); Mpio. Tlazazalca, 2 km W of La Yerbabuena, 19.97°N, 102.07°W, 1850 m, 7 Jul 1990, *Pérez & García 1399* (IEB); Cerro La Alberca, near Villa Jiménez, 19.70°N, 102.22°W, 2100 m, 2 Aug 1986, *Rzedowski 40205* (IEB); Mpio. Morelia, 3 km S of San Miguel del Monte, 19.64°N, 101.15°W, 2300 m, 25 Jul 1988, *Rzedowski 47015* (IEB); 10 km S of Morelia, along the road to Atécuaro, 19.65°N, 101.15°W, 2300 m, 17 Aug 1990, *Rzedowski 49930* (IEB); Mpio. Morelia, near the railroad station of La Huerta, 19.66°N, 101.23°W, 1900 m, 22 Jul 1992, *Rzedowski 51542* (IBUG, IEB, MEXU); near Zamora, 20.03°N, 102.27°W, 17 Jul 1941, *Schery 181* (MO); along road from Zitácuaro to San Andrés to Cerro El Cacique, 1.8 km past San Andrés town square, 19.42°N, 100.30°W, 2250 m, 28 Aug 1988, *Spooner et al. 4054* (INIFAP, PTIS, WIS); in field on NW corner of Rt 15 and road to Maravatío, 19.70°N, 100.52°W, 2080 m, 29 Aug 1988, *Spooner et al. 4057* (INIFAP, PTIS, WIS); at Km 21 along Rt 120 S of Morelia, on W side of Rt 120, 19.58°N, 101.30°W, 2080 m, 31 Aug 1988, *Spooner et al. 4078* (PTIS); Mexico to Morelia road, Hwy 15, at junction with road to Maravatío, 19.52°N, 100.25°W, 2060 m, 6 Oct 1967, *Tarn & Gómez 153* (BR, IBUG, K, MEXU, MPU, P, PTIS); road from Morelia to Villa Madero, 19.72°N, 101.18°W, 2020 m, 8 Oct 1967, *Tarn & Gómez 166* (K, WAG); 6.4 km NE of Pátzcuaro on the road to Zurumútaro, 19.53°N, 101.57°W, 2070 m, 16 Sep 1962, *Ugent & Flores 2073–2082* (BM, ENCB, MEXU, MICH, MO, US, WIS); S slope, Mount Punguato, Morelia, 19.66°N, 100.78°W, 2185 m, 9 Sep 1962, *Ugent et al. 1656, 1670, 1678–1689, 1690–1692* (GAT, GH, MICH, MO, UC, US, WIS); W slope of Mount Punguato, Morelia, small relatively undisturbed field between corn fields, 19.71°N, 101.13°W, 2150 m, 10 Sep 1962, *Ugent et al. 1803–1807* (MEXU); SSW of Morelia on the road to Villa Madero (just NE of Tiripetío, at Km 21–22), 19.57°N, 101.28°W, 2000 m, 19 Jul 1963, *Ugent et al. 5736, 5738, 5740, 5772–5776* (BM, MEXU, MICH, MO, US, WIS); 1.2 km NE of Jacona on Hwy 15, 19.96°N, 102.26°W, 2000 m, 20 Jul 1963, *Ugent et al. 5810–5813* (MICH, MO, WIS, US); 26 mi W of México and Michoacán boundary and 18 mi E of Ciudad Hidalgo, 19.68°N, 100.40°W, 1951 m, 27–30 Jul 1975, *Watkins et al. 692* (MO, ENCB).—MORELOS: after El Parque, along the railroad tracks, Km 95.5 on road from Mexico to Cuernavaca, 19.06°N, 99.29°W, 7 Oct 1964, *Flores S-794* (K, LL, MEXU); Km 64–65 from Mexico City on road to Cuernavaca, 19.02°N, 99.29°W, 2100 m, 21 Jul 1949, *Hawkes et al. 1028* (K, LL, P), 5 Oct 1958, *Hawkes et al. 1637* (C, K, MEXU); region of El Parque, railway from Mexico City to Cuernavaca, 95 km from Mexico City, 19.01°N, 99.10°W, 2250 m, 5 Oct 1958, *Hawkes et al. 1627*,

1628 (C, K, MEXU); Km 90 on the railway from Mexico City to Cuernavaca, 0.5 km above the El Parque, 19.02°N, 99.10°W, 2300 m, 5 Oct 1958, *Hawkes et al. 1632* (C, K, MEXU, PTIS); 20 km NE of Cuautla, 18.80°N, 98.83°W, 1981 m, 27 Jul 1950, *Humphreys 3* (MEXU); El Parque, 19.01°N, 99.10°W, 24 Aug 1940, *Langman 2781* (NA), *Miranda 530* (MEXU); Mpio. Cuernavaca, at Cuernavaca, 18.92°N, 99.25°W, 1372 m, 10 Jul 1941, *Leavenworth & Leavenworth 910* (F); La Pera, hwy from Mexico City to Cuernavaca, 19.00°N, 99.15°W, 2225 m, 20 Aug 1993, *Rodríguez et al. 2548* (IBUG, PTIS); barranca, above Salto de San Antón, 1600 m, 7 Aug 1970, *Vázquez 2558* (MEXU).—NAYARIT: El Ceboruco volcano, near Jala, on road from Guadalajara to Tepic, 21.10°N, 104.45°W, 10 Sep 1965, *Flores S-822* (K, LL, MEXU); Arroyo de la Fundición, 5 mi SE of Ahuacatlán on road to Barranca del Oro, 20.99°N, 104.48°W, 1300 m, 25 Aug 1957, *McVaugh 16328* (G, LL, MEXU, MICH, US).—OAXACA: Hacienda de Aguilera, 17.20°N, 96.75°W, 1550 m, 15 Aug 1931, *Conzatti 77* (US); Pan American road, before Oaxaca City, Km 535, turnoff to San Felipe, 17.05°N, 96.78°W, 1695 m, 3 Oct 1962, *Flores S-690* (MEXU); Cerro San Felipe, 17.15°N, 96.83°W, 1780 m, 6 Jul 1966, *Flores S-945* (A, K, MEXU); near Oaxaca, Cerro de San Felipe, above village of San Felipe de Aguas, 17.20°N, 96.72°W, 1850–2250 m, 16 Jul 1949, *Hawkes et al. 1020* (K, LL, NY); near Oaxaca, Cerro San Felipe, 17.88°N, 96.55°W, 1 Oct 1958, *Hawkes et al. 1590* (IBUG, PTIS); ruins of Monte Albán, 17.03°N, 96.77°W, 1950 m, 1 Oct 1958, *Hawkes et al. 1591*, *1592* (IBUG, PTIS); road from Oaxaca to Valle Nacional, 17.50°N, 96.45°W, 1950 m, 1 Oct 1958, *Hawkes et al. 1593* (IBUG, MEXU, PTIS); Sierra de las Mixtecas, road from Puebla to Oaxaca at 500 km from Mexico City, 17.61°N, 97.47°W, 2050 m, 20 Oct 1958, *Hawkes et al. 1717* (K); Sierra de las Mixtecas, near Siete Cabrillas, 475 km from Mexico City on the road to Oaxaca, 17.50°N, 96.87°W, 20 Oct 1958, *Hawkes et al. 1718* (K), *1719* (C, K, MEXU, PTIS); vicinity of Monte Albán archeological site, 17.03°N, 96.77°W, 2550 m, 9 Sep 1980, *Ochoa 14142* (CIP, IBUG, MEXU, PTIS, US); Cerro San Felipe, W of Oaxaca, 17.16°N, 96.84°W, 1500 m, 9 Sep 1980, *Ochoa 14144* (US); Tlaxiaco, San Pedro Molinos, Km 64 on the Tlaxiaco to Putla road, 17.22°N, 97.72°W, 2000 m, 3 Aug 1994, *Panero & Calzada 4448* (TEX); Almoloyas, 7 Jul 1897, *Pringle s.n.* (MEXU); Rt 125, 6.5 km S of jct or Rt 190, about 3.5 km S of town of San Juan Teposcolula, 17.53°N, 97.45°W, 2250 m, 5 Oct 1997, *Rivera-Peña et al. 956* (INIFAP, MEXU, PTIS); Mpio. San Felipe del Agua, foothills of San Felipe Mountains, 500 m N of the town, 17.12°N, 96.71°W, 1830 m, 12 Aug 1993, *Rodríguez et al. 2509* (F, IBUG, MICH, NY, PTIS), *Rodríguez et al. 2510* (IBUG, PTIS); Mpio. San Felipe del Agua, dirt road uphill to Cerro de San Felipe, 17.09°N, 96.87°W, 1670 m, 12 Aug 1993, *Rodríguez et al. 2518* (IBUG, PTIS, WIS); Monte Albán archeaological site, 17.03°N, 96.76°W, 1856 m, 13 Aug 1993, *Rodríguez et al. 2522* (IBUG, PTIS); road from Oaxaca to Monte Albán, just at the intersection with the road to San Juanito, 17.03°N, 96.76°W, 1820 m, 13 Aug 1993, *Rodríguez et al. 2523* (IBUG, MICH, NY, PTIS); E side of Rt 175, 14.2 km S of S end of Miahuatlán de Porfirio Díaz, 16.25°N, 96.57°W, 1990 m, 19 Sep 1988, *Spooner et al. 4174* (INIFAP, PTIS, WIS); 9 km SW of town square of Santa Catarina Cuixtla, SW of Miahuatlán de Porfirio Díaz, at Km 16.5, 16.27°N, 96.68°W, 2090 m, 20 Sep 1988, *Spooner et al. 4185* (INIFAP, PTIS, WIS); 3.7 km S of Miahuatlán de Porfidio Díaz to San Pedro Coatlán Road, on road to San Miguel Coatlán, 16.22°N, 96.72°W, 2080 m, 20 Sep 1988, *Spooner et al. 4188* (INIFAP); Huajuapan de León to Oaxaca road, beyond Huahuapan at Km 366, 17.80°N, 97.77°W, 1970 m, 25 Oct 1967, *Tarn & Gómez 243* (K); San Miguel Tixa, on road from Tlaxiaco to Pan American Hwy 190, 17.52°N, 97.48°W, 2210 m, 26 Oct 1967, *Tarn & Gómez 250* (K, MEXU); front of entrance to San Felipe Arboretum, E of Oaxaca, 1800 m, 28 Oct 1967, *Tarn & Gómez 254* (K); Oaxaca to Guelatao road, at El Estudiante, Km 12, 17.13°N, 96.60°W, 2070 m, 28 Oct 1967, *Tarn & Gómez 258* (K); ruins of Monte Albán near Oaxaca City, 17.03°N, 96.77°W, 2000 m, 22 Oct 1983, *Tarn et al. 173* (PTIS); upper slopes of Cerro San Felipe, above and W of Tejalapan (San Felipe), about 13 km NW of Oaxaca (air distance), 17.15°N, 96.83°W, 3 Oct 1962, *Ugent et al. 2667–2675*, *2677–2679*, *2681*, *2683–2685*, *2687–2693* (BM, GAT, GH, MEXU, MICH, MO, US, WIS); San Felipe, N of Oaxaca, 17.83°N, 96.83°W, 11 Mar 1962, *Ugent 3057* (IBUG, MEXU, PTIS); upper slopes of El Cerro San Felipe del Agua, 7–10 km N of Oaxaca de Juárez, 17.05°N, 96.72°W, 24 Jul 1944, *Vera 3219* (MICH).—PUEBLA: cemetery of Piedad, 19.06°N, 98.20°W, 2175 m, 16 Jul 1907, *Arsène 1980* (MPU, P, US); vicinity of Puebla, sur L'Atayac, Mayorazgo, 19.06°N, 98.20°W, 2120 m, 20 May 1907, *Arsène 10132* (US); vicinity of Puebla, Barranca de L'Alseseca, Hacienda Batán, near Totimehuacán, 18.96°N, 98.18°W, 2120 m, 8 Aug 1907, *Arsène s.n.* (US); vicinity of Puebla, Cerro Tepoxuchil, 19.02°N, 98.17°W, 2330 m, 11 Jul 1907, *Arsène s.n.* (US); vicinity of Puebla, Mayorazgo S of Matoyas, 19.06°N, 98.20°W, 2120 m, 10 Sep 1907, *Arsène s.n.* (MO, US); Cholula, Teocali, 19.07°N, 98.30°W, 2100 m, 23 Jul 1949, *Hawkes et al. 1029* (C, F, G, K, LL, MEXU, S, WIS), 14 Jul 1910, *Nicolás s.n.* (E, P); Tepeaca, road from Puebla to Orizaba, 18.97°N, 97.90°W, 2200 m, 24 Jul 1949, *Hawkes et al. 1030* (K); Cholula pyramids, 19.07°N, 98.30°W, 2150 m, 1 Oct 1958, *Hawkes et al. 1587* (IBUG, K, PTIS); Km 155 from Mexico on the road from Mexico to Oaxaca, 18.82°N, 97.43°W, 1 Oct 1958, *Hawkes et al. 1588* (K, PTIS); Rancho Rosadas, near Puebla, 19.05°N, 98.20°W, 3 Jul 1909, *Nicolás 248* (LY, P), *Nicolás 433* (K), 8 Mar 1909, *Nicolás 733* (K); Cholula, 19.07°N, 98.30°W, 14 Jul *1910*, *Nicolás 5266* (P); border of the Atoyac near Puebla, 3 Jul 1909, *Nicolás s.n.* (P);

border of Alseseca, 1909, *Nicolás s.n.* (E); Hacienda San Cristo, 3 Jul 1909, *Nicolás s.n.* (P).—QUERÉTARO: San Juan del Río, rocky hill NW of town on NW facing slope, 20.38°N, 100.00°W, 2300 m, 5 Sep 1958, *Hawkes et al. 1413* (K).—SAN LUIS POTOSÍ: Rt 15, Guadalajara to Mexico, at Km 478.5, near Jacona, 20 Jul 1963, *Flores S-706* (MEXU).—SINALOA: Mpio. Concordia, Potrerillos, 23.56°N, 105.84°W, 1440 m, 9 Aug 1986, *Vega 1982* (MEXU).—TLAXCALA: Km 8 on the road from Tlaxcala to Puebla, 19.18°N, 98.22°W, 1 Oct 1958, *Hawkes et al. 1589* (IBUG, PTIS).—VERACRUZ: old Orizaba to Mexico road, Hwy 150, E of Acultzingo, 18.72°N, 97.32°W, 1880 m, 24 Oct 1967, *Tarn & Gómez 224* (K, NY).—State unknown: Nefrantla, 2400 m, 1 Sep 1932, *Saint Pierre 2558* (P).

Guatemala. BAJA VERAPAZ: road from Salamá to Cobán, Patal, summit of road, 16 mi from Salamá, 15.10°N, 90.27°W, 1700 m, 11 Nov 1958, *Hawkes et al. 1922* (K); road from Salamá to Cobán, Patal, 15 mi from Salamá, 15.10°N, 90.27°W, 1650 m, 11 Nov 1958, *Hawkes et al. 1938* (K); road from Salamá to Cobán, Patal, 11 mi from Salamá, 15.10°N, 90.27°W, 1350 m, 11 Nov 1958, *Hawkes et al. 1943* (K); 8.8 km N from town square of Salamá, old road to Cobán, 15.15°N, 90.30°W, 1430 m, 5 Oct 1995, *Spooner et al. 7040* (AGUAT, PTIS, WAG); 11.5 km N from town square of Salamá, old road to Cobán, 50 m W of private road past power line, 15.17°N, 90.30°W, 1640 m, 5 Oct 1995, *Spooner et al. 7042* (AGUAT); 18.8 km N from town square of Salamá, old road to Cobán, 15.22°N, 90.30°W, 1420 m, 5 Oct 1995, *Spooner et al. 7043* (AGUAT, PTIS, WAG).—GUATEMALA: Chilloni (note: no Chilloni located in references, but a Chillani in U.S. gazetteer of Guatemala at 14.43S, –90.33'W where we mapped this record), 14.72°N, 90.55°W, 1500 m, 21 Jun 1921, *Rojás 83* (US).—HUEHUETENANGO: between Huehuetenango and San Sebastián, junction of Huehuetenango and Pan American Hwys, 15.38°N, 91.58°W, 1850 m, 31 Oct 1958, *Hawkes et al. 1789* (B, C, K, US); road from Huehuetenango to Quezaltenango, 5 km S of Malacatancito, in damp gully above the road, 15.22°N, 91.52°W, 1800 m, 31 Oct 1958, *Hawkes et al. 1796* (C, K, PTIS); between Km 100 and 107, vicinity of Campo Bolas, way to overlook, Sierra de los Cuchumatanes, 15.39°N, 91.44°W, 2000 m, 12 Sep 1971, *Molina & Molina 26381* (F); vicinity of Campo de Bolas, way to El Mirador, Sierra Cuchumatanes, 15.38°N, 91.44°W, 2000 m, 13 Sep 1971, *Molina & Molina 26402* (F); between Puento Negro and Los Alisos, way to Aguacatán, 15.35°N, 91.38°W, 1600 m, 17 Sep 1971, *Molina & Molina 26547* (F); along 9N, at junction of entrance to Huehuetenango, 50–200 m W of road, 15.77°N, 91.50°W, 2000 m, 18 Sep 1995, *Spooner et al. 7010* (AGUAT, BIGUA, PTIS, WAG); 3.1 km NW of the road entrance to Huehuetenango, Rt CA1, 200 m uphill (SW) of road, 15.32°N, 91.52°W, 1900 m, 18 Oct 1995, *Spooner et al. 7056* (AGUAT, PTIS, WAG); 7.3 km NW of entrance to Huehuetenango, Rt CA 1, 400 m uphill (SW) of road, 15.32°N, 91.55°W, 2000 m, 19 Oct 1995, *Spooner et al. 7057* (AGUAT, BIGUA, PTIS, WAG); along road between Huehuetenango and San Sebastián H, 15.38°N, 91.58°W, 2000 m, 12 Aug 1942, *Steyermark 50404* (F); dry slopes between San Ildefonso Ixtahuacán and Cuilco, 15.42°N, 91.77°W, 1350–1600 m, 16 Aug 1942, *Steyermark 50687* (F).—QUEZALTENANGO: 8 km S of Quetzaltenango on Hwy 9S, near hydroelectric plant 1/2 mi N of Zunil, 14.75°N, 91.52°W, 2075 m, 31 Jul 1965, *Roe et al. 685* (MICH, MO, US, WIS).—SACATEPÉQUEZ: road between Palín and Antigua, about 1/2 km by road S of Santa María de Jesús, 14.48°N, 90.70°W, 1900 m, 8 Jul 1976, *Breckon & Breckon 2082* (F).—SOLOLÁ: slopes of Volcán San Pedro, 14.65°N, 91.27°W, 2150 m, 21 Sep 1971, *Molina & Molina 26659* (F); trail between village of San Pedro, via San Juan, San Cristóbal Buena Vista, and NW slopes of Volcán Santa Clara, 14.67°N, 91.28°W, 1800–2300 m, 8 Jun 1942, *Steyermark 47308* (F). **Honduras.** LA PAZ: La Paz, near Guajiquiro, 14.13°N, 87.84°W, 1900–2000 m, 23 May 1993, *Liesner 26501* (MO).

14. Solanum verrucosum (p. 79).

Mexico. COAHUILA: near Saltillo, Cañón de Los Lirios, 37 mi from Saltillo, N facing slope, 25.36°N, 100.63°W, 2600 m, 22 Aug 1958, *Hawkes et al. 1345* (K), 3300 m, 22 Aug 1958, *Hawkes et al. 1350* (C, K); Sierra Madre Oriental, road W from San Antonio, La Carolena sawmill, 2750 m, 24 Aug 1958, *Hawkes et al. 1368* (C, K, US); Arteaga, Sierra Zapaliname, 25.42°N, 100.78°W, 2865 m, 27 Jun 1990, *Hinton 20434* (GH, TEX); Lerios, a mountain section 15 leagues E of Saltillo, 25.21°N, 101.03°W, 10–13 Jul 1880, *Palmer 937* (F, G, GH, P, US); road to Sierra Hermosa, 6.3 km along road turning off from Hwy 57 at Km 29 from Saltillo, 25.30°N, 100.90°W, 2200 m, 13 Oct 1983, *Tarn et al. 158* (PTIS, WIS); road from Saltillo towards E, between Jamé and Ciénega de la Purísima, at the highest part of the road, 25.28°N, 100.87°W, 2720 m, 14 Oct 1983, *Tarn et al. 161* (K, PTIS); Las Vigas, Cañón de la Carbonera, Sierra de Arteaga, 25.33°N, 100.65°W, 2100–2600 m, 15 Sep 1988, *Villarreal et al. 4562* (TEX).—DISTRITO FEDERAL: at the SE side of Distrito Federal, 19.42°N, 99.14°W, 12 Jul 1947, *Barkley et al. 2212* (F, TEX); slopes of Mount Ajusco, 19.20°N, 99.25°W, 25 Oct 1947, *Correll 14217* (C, GAT, IBUG, NA, PTIS), s.d., *Correll 14217B* (GAT, PTIS, TEX); Desierto de Los Leones National Park, 19.25°N, 99.33°W, 17 Jul 1963, *Flores S-699* (K, MEXU); Cañada de Contreras, 19.17°N, 99.18°W, Aug 1952, *Gallegos 369, 402* (MEXU); Cerro Ajusco, along path from village, lower slopes, 19.21°N, 99.26°W, 3000 m, 21 Aug 1949, *Hawkes et al. 1080* (BM, C, G, K, LL, S, WIS); Cerro Gordo or Cerro Cuatillo Grande,

high hill of layered volcanic ash, 1/4 km S of La Cima railroad station, just N and W of old Hwy 95, 19.11°N, 99.20°W, 3050–3150 m, 12 Jul 1960, *Iltis et al. 150* (MICH, US, WIS); lava fields 2 km SSW of La Cima railroad station on either side of old Hwy 95, on top of Sierra de Ajusco, about 1 km N of Morelos border, 19.10°N, 99.21°W, 3050–3100 m, 12–14 Jul 1960, *Iltis et al. 168* (MICH, MO, US, WIS); 8 km E of Desierto de Los Leones, 19.25°N, 99.25°W, 13 Jul 1939, *Langman 2068* (MEXU, PH); just W of km 30 on Cuernavaca road, 19.13°N, 99.17°W, 7 Aug 1940, *Langman 2603* (NA, PH); Eslava, 2700–2900 m, Jul 1936, *Lyonnet 3021* (US); El Desierto de los Leones, 19.25°N, 99.33°W, 2743 m, 18 Aug 1935, *MacDaniels 98* (F, GH), 19 May 1940, *Miranda 293* (MEXU), 17 Jun 1963, *Rojano 74* (ENCB), *Ugent & Flores 5713, 5715–5724* (BM, MEXU, MICH, MO, US, WIS); Valle de México, 19.48°N, 99.09°W, Aug 1943, *Martínez s.n.* (US); 20 mi S of Mexico City, 19.38°N, 99.14°W, 1 Sep 1946, *Ortenburger et al. 16M734* (F); in mountains 20 mi S of Mexico City, 19.16°N, 99.18°W, 1 Sep 1946, *Ortenburger et al. 16M822* (F, MICH, TEX); Cañada de Contreras, 19.30°N, 99.28°W, Jun 1982, *Paray 216* (ENCB); El Desierto, 19.25°N, 99.33°W, 2438 m, 6 Oct 1930, *Reddick 518* (BH); El Desierto Convent, 19.25°N, 99.33°W, 2652 m, 13 Oct 1930, *Reddick 530, 532* (BH), 2940 m, 13 Oct 1930, *Reddick 601* (BH); near summit of Cerro de San Miguel above El Desierto, 19.30°N, 99.34°W, 5 Nov 1930, *Reddick 577 p.p.* (BH); El Desierto, 19.25°N, 99.33°W, 25 Aug 1930, *Russell & Souviron 50, 51* (US); SW of Contreras, 19.30°N, 99.28°W, 17 Sep 1930, *Russell & Souviron 199* (US); Sierra del Ajusco, vicinity of La Cima station, 19.28°N, 99.16°W, 3000 m, 14 Aug 1960, *Rzedowski 12578* (ENCB); vicinity of La Cima station, Sierra del Ajusco, 19.25°N, 99.28°W, 3000 m, 7 Aug 1964, *Rzedowski 18470* (DS, MICH, US), 22 Aug 1965, *Rzedowski 20457* (DS, ENCB, US); Sagón Guadalupe, 19.48°N, 99.10°W, 1847, *Schaffner 57* (GOET, P, W); Delegación Xochimilco, Cerro de Esquehuil, 19.26°N, 99.11°W, 2900 m, 30 Jun 1976, *Ventura 1706* (ARIZ, ASU, ENCB, F, IEB, MEXU, MO); Delegación de Contreras, Rancho Pachita, 19.30°N, 99.28°W, 2750 m, 25 Jun 1977, *Ventura 2857* (ENCB, GH, IEB, MEXU, MO, US); on old Road 95, 42 km S of Mexico City, 19.12°N, 99.21°W, 28 Jun 1966, *Windler & Snider 1029* (MO).—GUANAJUATO: Mpio. Acámbaro, high part of Cerro El Moro, Sierra de los Ajustinos, 19.96°N, 100.68°W, 3100 m, 21 Jul 1987, *Díaz 3959* (IEB, MICH); Mpio. San Luis de la Paz, 2 km from Mesas de Jesús, along the road to Vergel, 21.48°N, 100.49°W, 2300 m, 21 Jul 1992, *Díaz & García 7081* (IEB); Mpio. San Felipe, 25 km NNE of León, 21.32°N, 101.56°W, 2460 m, 8 Aug 1987, *Galván & Galván 2808* (IEB); Mpio. San Felipe, near El Fuerte, road from León to San Felipe, 21.23°N, 101.42°W, 2610 m, 12 Sep 1991, *Galván & Galván 3616* (IEB); 14 km from San Luis de La Paz, near Victoria (French towards la Prensita), 21.38°N, 100.20°W, 2180 m, 29 Sep 1994, *Labat 2520* (IEB, MEXU); Mpio. Cortazar, high part of Cerro Culiacán, 20.33°N, 100.97°W, 2750 m, 3 Oct 1986, *Rzedowski 40684* (MEXU); Mpio. Guanajuato, 9 km WNW of La Valenciana, along road to El Cubilete, 21.06°N, 101.28°W, 2300 m, 12 Aug 1990, *Rzedowski 49772* (IEB, MEXU).—GUERRERO: 1 km from Omiltemi, at sawmill about 40 km from Chilpancingo, 17.50°N, 99.67°W, 2220 m, 9 Sep 1962, *Flores S-819* (F, K, MEXU).—HIDALGO: Cerro de las Ventanas, 6 km N of Pachuca, 20.16°N, 98.73°W, 2900 m, 28 Aug 1966, *Armenta s.n.* (DS, ENCB, MEXU), 26 Jun 1976, *Hidalgo s.n.* (ENCB), 1 Oct 1969, *Rzedowski 26802* (ENCB); Sierra de Pachuca, summit of ridge about 2 km S of Real del Monte, 20.11°N, 98.67°W, 2980 m, 7 Jul 1959, *Beaman 2746* (GH, LL, MSC, TEX, UC, US); Real del Monte, 20.13°N, 98.67°W, 8 Nov 1947, *Correll 14245* (NA), *Hawkes et al. 1046* (BR, F, K, LL, MEXU, MPU, NY, P, US), *Hawkes et al. 1047* (B, K), 3 Jun 1899, *Rose & Hough 4487* (US); Mpio. Mineral del Chico, Cerro de las Ventanas, 20.22°N, 98.73°W, 2950 m, 4 Aug 1963, *Cruz 903* (ENCB), *Galván s.n.* (ENCB, WIS), *González 245* (ENCB, MEXU, MICH); 3 km NW of Tolcayuca, 19.94°N, 98.94°W, 2550 m, 9 Oct 1978, *Equihua 272-A* (IEB); Real del Monte, 20.13°N, 98.67°W, 2750 m, 5 Aug 1949, Real del Monte, above town on the W side, 20.13°N, 98.67°W, 2850 m, 6 Aug 1949, *Hawkes et al. 1050* (A, K, LL, MEXU); Pachuca, Real del Monte, in the woods above the town, 20.12°N, 98.73°W, 2700 m, 9 Oct 1958, *Hawkes et al. 1658* (A, BM, C, K, PTIS); Mpio. Mineral del Chico, 3 km S of El Chico, 20.22°N, 98.73°W, 2800 m, 12 Jun 1988, *Hernández 132* (IEB); El Sotal, 19.95°N, 99.30°W, 2850 m, 21 Jun 1988, *Hernández 142* (IEB); El Chico, 20.25°N, 98.72°W, 29 Jul 1938, *Lyonnet 2218* (US); Tezoantla, 20.13°N, 98.65°W, Aug 1946, *Martínez 15040* (MO); Omitlán, 20.16°N, 98.65°W, Aug 1946, *Martínez 15050* (MO); Mpio. Real del Monte, 1.5 km WSW of Real del Monte, 20.13°N, 98.65°W, 2800 m, 22 Jun 1975, *Medina 428* (MEXU); Mpio. Real del Monte, 1 km SSE of Real del Monte, 20.13°N, 98.64°W, 2900 m, 28 Jul 1975, *Medina 530* (ENCB, MEXU, MO); Mpio. Mineral del Chico, Las Ventanas, 20.22°N, 98.73°W, 3000 m, 5 Oct 1975, *Medina 864* (MEXU); Mpio. Real del Monte, Tezoantla on roadside, 20.13°N, 98.67°W, 2800 m, 20 Jun 1976, *Medina 1420* (IEB); Mpio. Epazoyucan, 2 km SE of Tezoantla, 20.10°N, 98.63°W, 2900 m, 16 Sep 1976, *Medina 1597* (CAS, ENCB, IEB, MEXU, RSA); Dist. Pachuca, above Pueblo Nuevo and below El Chico National Park on road from Real del Monte to El Chico, 20.18°N, 98.70°W, 3000 m, 25 Jul 1948, *Moore & Wood 4110* (A, BH, LL); El Chico National Park N of Pachuca, 5 km W along the road diverging into the park, on both sides of road, by sign La Cabañas de Lobo, 20.17°N, 98.69°W, 2830 m, 1 Oct 1997, *Rivera-Peña et al. 939* (INIFAP, MEXU, PTIS, WAG); Sierra de Pachuca, 20.11°N, 98.73°W, 21–22 Jul 1901, *Rose & Hay 5579* (NY, US), 24 Sep 1906, *Rose & Rose 11490*

(US), 20–24 Jul 1905, *Rose et al. 8878* (GH, NY, P, US); between Pachuca and Real del Monte, 20.13°N, 98.67°W, 31 Aug 1903, *Rose & Painter 6698* (US); 6 km W of Real del Monte, 20.14°N, 98.68°W, 2800 m, 4 Aug 1963, *Rzedowski 17048* (ENCB, MICH, MSC, US); Mpio. Epazoyucan, near Peñas Largas, 20.08°N, 98.63°W, 2900 m, 3 Aug 1975, *Rzedowski 33437* (ENCB); National Park 11 km along the road to El Chico from Rt 105 from Pachuca to Tampico, 20.20°N, 98.72°W, 2960 m, 5 Oct 1982, *Tarn et al. 23* (K, PTIS, WIS).—JALISCO: on road to Nevado de Colima, 18.7 mi NW of intersection of road to Nevado and road between Atenquique and Tonila, 19.51°N, 103.56°W, 2890 m, 12 Aug 1972, *Denton 2057* (MICH); Mpio. Tequila, Cerro Tequila, 20.80°N, 103.85°W, 2750 m, 13 Jul 1971, *González 222* (MICH); Nevado de Colima, Llanito de las Tepozas, NE slope of the mountain, 19.55°N, 103.63°W, 3100 m, 23 Sep 1958, *Hawkes et al. 1542* (IBUG, K, MEXU, PTIS, US); Nevado de Colima, NE side, near Rancho Juan Martínez, 19.55°N, 103.63°W, 3250 m, 23 Sep 1958, *Hawkes et al. 1546* (B, IBUG, K, MEXU, P, PTIS); Nevado de Colima, W side, Tranquitas, 19.55°N, 103.63°W, 3200 m, 23 Sep 1958, *Hawkes et al. 1548* (IBUG, K, MEXU, PTIS); Mpio. Tlajomulco, "La Bola del Viejo" to "La Cañada," 20.37°N, 103.43°W, 2850 m, 12 Aug 1989, *Machuca 6294* (IBUG, MEXU); Mpio. San Martín Hidalgo, Sierra de Quilla, on road from Lagunillas to Cerro del Huehuentón, 20.39°N, 104.02°W, 2400 m, 4 Aug 1991, *Machuca 6685* (WIS); near Ciudad Guzmán, track up to Volcán Colima, 19.52°N, 103.63°W, 2650 m, 25 Sep 1980, *Ochoa 14170* (US), *Ochoa 14171*, *14172* (CIP, US); Mpio. Tonila, Las Joyas, Nevado de Colima, 19.55°N, 103.62°W, 3400 m, 2 Aug 1987, *Ramírez 691* (IBUG, MEXU), *Rodríguez 681* (IBUG); about 10–12 km up dirt road ascending Volcán de Colima, diverging from road near Atenquique, 19.60°N, 103.60°W, 2910 m, 24 Oct 1997, *Rivera-Peña et al. 990* (INIFAP, MEXU, PTIS, WAG); Mpio. Tequila, Km 17.5 on the road to the microwave station of Cerro de Tequila, 20.82°N, 103.86°W, 6 Jul 1986, *Rodríguez 327a* (MEXU, IBUG); Mpio. Tequila, Km 17.5 on the road to the microwave station of Cerro de Tequila, 20.82°N, 103.88°W, 2580 m, 13 Jul 1986, *Rodríguez 623a* (ANSM, CHAPA, ENCB, IBUG, IEB, MEXU, XAL); Mpio. Tequila, Km 19 on the road to the microwave station of Cerro de Tequila, 20.83°N, 103.84°W, 2700 m, 13 Jul 1986, *Rodríguez 623b* (CHAPA, IBUG, MEXU); Mpio. Tequila, Km 20 on road from Tequila to microwave station road, 20.81°N, 103.83°W, 2650 m, 14 Sep 1986, *Rodríguez s.n.* (ANSM, CHAPA, ENCB, IBUG, IEB, MEXU, XAL); Mpio. Tapalpa, 1 km N of Juanacatlán, along the dirt road to Atemajac de Brizuela, 19.98°N, 103.72°W, 2400 m, 23 Aug 1986, *Rodríguez & Suárez 570* (ANSM, CAS, CHAPA, F, IBUG, IEB, LL, MEXU, MICH, MO, MU, NY, PTIS, SIN, TEX, UAMIZ, WIS, XAL); Mpio. Tapalpa, 1 km SE of Juanacatlán, on road to Tepec, 19.98°N, 103.72°W, 2400 m, 23 Aug 1986, *Rodríguez & Suárez 574* (CHAPA, ENCB, IBUG, IEB, MEXU, PTIS); Mpio. Tapalpa, Km 5 on the dirt road from Tapalpa to Chiquilistlán, at Piedras Bolas, 20.00°N, 103.80°W, 2100 m, 24 Aug 1986, *Rodríguez & Suárez 586* (CHAPA, ENCB, IBUG, IEB, MEXU); Mpio. Venustiano Carranza, dirt road from El Floripondio to microwave station Las Víboras, 19.72°N, 103.68°W, 2400 m, 22 Aug 1987, *Rodríguez & Suárez 912* (CHAPA, ENCB, IBUG, IEB, MEXU); Mpio. Tapalpa, road from Juanacatlán to Tepec, 19.98°N, 103.69°W, 2330 m, 26 Aug 1987, *Rodríguez & Suárez 952* (CHAPA, ENCB, IBUG, IEB, MEXU); Mpio. Tequila, Km 20 on road from Tequila to microwave station road, 20.81°N, 103.88°W, 2650 m, 15 Sep 1986, *Rodríguez et al. s.n.* (ANSM, CHAPA, ENCB, IBUG, IEB, MEXU, XAL); Mpio. Tlajomulco, Cerro Viejo, near the crest, 20.37°N, 103.43°W, 2950 m, 15 Aug 1970, *Rzedowski 27546* (ENCB, MICH); along Volcán Tequila microwave tower road S of town of Tequila, on the top of the highermost of the two microwave tower roads on the top of Volcán Tequila, under oaks about edge of microwave tower, 20.80°N, 103.85°W, 2700 m, 3 Sep 1988, *Spooner et al. 4102* (INIFAP, PTIS); new microwave tower road to top of Nevado de Colima, 23 km from beginning of this road which begins about 0.5 km SE of La Mesa and El Fresnito, 19.57°N, 103.58°W, 3020 m, 7 Sep 1988, *Spooner et al. 4123* (IBUG, INIFAP, MEXU, PTIS, WIS); new microwave tower road to top of Nevado de Colima, 24 km from beginning of this road which begins about 0.5 km SE of La Mesa and El Fresnito, 19.57°N, 103.58°W, 3475 m, 7 Sep 1988, *Spooner et al. 4125* (IBUG, INIFAP, MEXU, PTIS, WIS); new microwave tower road to top of Nevado de Colima which begins about 0.5 km SE of La Mesa and El Fresnito, 1.5 km W of Estación de Vigilancia de Sedue, 19.57°N, 103.58°W, 3410 m, 7 Sep 1988, *Spooner et al. 4127* (IBUG, INIFAP, MEXU, PTIS, WIS); on microwave tower road, 8.8 km S of Alista to La Mesa and El Fresnito Road, road begins just E of Sayulapa, next to microwave tower, 19.60°N, 103.58°W, 2920 m, 8 Sep 1988, *Spooner et al. 4130* (IBUG, INIFAP, MEXU, PTIS, WIS).—MÉXICO: N of Los Volcanes Nevados, road from Mexico to Puebla, 19.50°N, 100.00°W, 2800 m, 26 Jul 1964, *Castro 28* (US); Cerro Telapón, Llano Grande, 19.66°N, 99.56°W, 3000 m, s.d., *Castro s.n.* (ENCB); Desierto des Leones, a park near Mexico City, 19.25°N, 99.33°W, 2896 m, 27 Jun 1941, *Chute M-52* (MEXU); San Juan de las Huertas, road to Nevado de Toluca, 19.25°N, 99.76°W, 2700 m, 2 Aug 1965, *Flores S-801* (K, MEXU, WAG); Popocatépetl Park, 18.99°N, 98.66°W, 2700 m, 27 Sep 1953, *Graham et al. S-270* (K); Texcoco, 19.52°N, 98.88°W, 30 Jun 1861, *Hahn 168* (LL); Mpio. Ixtapaluca, Experimental Station of Zoquiapan, 8 km S of Río Frío, 19.31°N, 98.69°W, 3120 m, 14 Jun 1975, *Koch 75173* (CHAPA), 20 May 1978, *Vega 126* (CHAPA); Lakes of Zempoala, 19.05°N, 99.32°W, 11 Aug 1940, *Langman 2665* (NA, PH); Mpio. Lerma, M. Hidalgo and Costilla (La Mar-

quesa National Park), 19.28°N, 99.50°W, 3000 m, 24 Jul 1967, *León 71* (ENCB); 15 km NE of Temascaltepec on road to Toluca, 19.15°N, 99.98°W, 2800 m, 11 Jul 1969, *Marcks & Marcks 1136* (WIS); Lagunas de Zempoala National Park, 19.05°N, 99.32°W, 2750 m, 30 Jul 1983, *Martínez & Espejo 8* (MEXU); Cerro de Azompan, Tequexquináhuac, 19.03°N, 100.05°W, 2860 m, 1 Aug 1954, *Matuda 31190* (ENCB); Mount Toluca, 19.10°N, 99.77°W, s.d., *Mohr s.n.* (US); El Vigía, 45.5 km from Mexico City on Puebla road, 19.31°N, 98.72°W, 3719 m, 15 Oct 1930, *Reddick 549* (BH); El Corazón, 45 km from Mexico City on Puebla Road, 19.30°N, 98.73°W, 3658 m, 15 Oct 1930, *Reddick 551* (BH); above El Desierto, near summit of San Miguel, 19.47°N, 99.20°W, 5 Nov 1930, *Reddick 578* (BH); on the road from Toluca to Atlacomulco, 4.2 km W of jct of Rt 11, 19.78°N, 99.74°W, 2870 m, 30 Sep 1997, *Rivera-Peña et al. 937* (INIFAP, MEXU); NW slopes of Nevado de Toluca, 10 km (by rd) W of junction of rds to Sultepec and Temascaltepec on Hwy 130 to Temascaltepec or 27 km (by rd) SW of Toluca, 19.17°N, 99.83°W, 3200 m, 16 Jul 1965, *Roe et al. 284* (MICH, MO, US, WIS); El Mirador, 19.32°N, 98.72°W, 2600 m, 19 Sep to 22 Aug 1930, *Russell & Souviron 97,98* (US); Amecameca to Tlamacas Road, NW slopes of Popocatépetl, at Km 75, 19.15°N, 98.74°W, 3200 m, 15 Jul 1965, *Rzedowski 20190* (ENCB); 22 km NE of Texcoco, on road to Calpulalpan, 19.62°N, 98.75°W, 2900 m, 17 Aug 1971, *Rzedowski 28519* (ENCB); 5 km NW Santa Ana Jilotzingo, along the road to Jiquipilco, 19.55°N, 99.44°W, 3100 m, 7 Aug 1977, *Rzedowski 35120* (ENCB, IEB, MEXU, MO); Mpio. Texcoco, 2 km SE of San Pablo Ixayoc, 19.45°N, 98.77°W, 2600 m, 21 Jun 1981, *Rzedowski 37318* (ENCB, IEB, MEXU, MO); Valley of Mexico, 19.67°N, 99.00°W, 1875, *Schaffner 562* (GOET); Toluca to Temascaltepec road, Hwy 130, at 14 km, 19.17°N, 99.83°W, 3020 m, 13 Sep 1967, *Tarn 91F* (PTIS, WIS); Cerro Jocotitlán, road up to the microwave station, 6 km above the village of Jocotitlán, 19.72°N, 99.78°W, 3060 m, 27 Oct 1983, *Tarn et al. 193* (PTIS); Cerro Jocotitlán, road up to the microwave station, 8 km above the village of Jocotitlán, 19.72°N, 99.78°W, 3200 m, 27 Oct 1983, *Tarn et al. 197* (PTIS); Hwy 130 from Toluca to Temascaltepec, along Rt 3 from La Puerta towards Sultepec at 14 km, just W of the road, 19.12°N, 99.82°W, 3440 m, 21 Sep 1984, *Tarn et al. 199* (PTIS); along Hwy 142 from Oaxtepec to Xochimilco, 6.1 km N of Morelos-México state boundary, 3 km W towards CICITEC and 1 km along track, 19.10°N, 98.95°W, 2930 m, 4 Oct 1984, *Tarn et al. 251* (K, PTIS); Parque Nacional Lagunas de Zempoala, Monte del Zacatal, 12.7 km SW of Huitzilac, 19.05°N, 99.32°W, 3050 m, 6 Sep 1962, *Ugent & Flores 1441–1455, 1461–1463* (BM, MEXU, MICH, MO, US, WIS); 3 km E Santa Marta, along the road to Lagunas de Zempoala, 19.05°N, 99.35°W, 2800 m, 14 Aug 1966, *Vargas s.n.* (ENCB); Mpio. Texcoco, Tequexquinahuac, 19.52°N, 98.88°W, 2600 m, 11 Sep 1983, *Ventura 1383* (MEXU, IBUG).—MICHOACÁN: Morelia, Cerro Azul, 19.70°N, 101.12°W, 2300 m, 19 Dec 1912, *Arsène s.n.* (G); Mpio. Zinapécuaro, near the well Az-4, Los Azufres, 19.82°N, 100.63°W, 2750 m, 4 Aug 1994, *Carranza 4824* (IEB, MEXU); about 7 mi above Opopeo, 19.40°N, 101.60°W, 13 Nov 1947, *Correll 14252* (GAT, NA, PTIS), 6 Aug 1965, *Correll et al. 31348* (GH, LL, S); Puerto Garnica, 19.65°N, 100.70°W, 15 Nov 1947, *Correll 14262* (NA); about 12 km on road to Tacámbaro from jct of Rt 120 on Pátzcuaro to Ario de Rosales Road, at Km 10+, on road to Estación Microondas Cerro Burrol, the hill to the left of the microwave tower at very top of slope, 19.42°N, 101.50°W, 2926 m, 24 Jul 1977, *Davis 778* (MO); Pátzcuaro to Opopeo Road, 19.45°N, 101.60°W, 2700 m, 9 Jun 1965, *EBS 2632* (PTIS); Mpio. Opopeo, Ejido de Casas Blancas, 19.40°N, 101.60°W, 2400 m, 12 Jul 1986, *Escobedo 1038* (IEB, K, MICH); road from Pátzcuaro to Tacámbaro, Km 25, on right side of road, 1 km from road, 19.38°N, 101.55°W, 2700 m, 6 Aug 1965, *Flores S-815* (MEXU); Cerro Tancítaro, 27 km W of Uruapan (by air), about 2 km N of San Nicolás, 19.42°N, 102.28°W, 3500 m, 26 Jul 1996, *García 4093* (IEB); Sierra de los Tarascos, road from Uruapan to Carapan just above Capácuaro, 300 m from road, 19.55°N, 102.05°W, 2250 m, 17 Sep 1958, *Hawkes et al. 1512* (BR, C, K, US); Sierra de los Tarascos, Capácuaro, E side of village, 19.55°N, 102.05°W, 2250 m, 17 Sep 1958, *Hawkes et al. 1513* (C, K); 7 mi beyond Opopeo, Km 51 on Quiroga to Tacámbaro Road, 19.40°N, 101.60°W, 2950 m, 20 Sep 1958, *Hawkes et al. 1527* (C, K, PTIS), *Hawkes et al. 1528* (K, PTIS), *Hawkes et al. 1532* (K, MPU, PTIS); above Opopeo, 25 km from Pátzcuaro on road to Tacámbaro, 19.40°N, 101.60°W, 2700 m, 6 Aug 1965, *Hawkes et al. 2542* (G, K, MEXU, S); Mpio. Zitácuaro, zone 12, W side of Cerro Caciche, 19.39°N, 100.35°W, 2700 m, 5 Aug 1978, *Ibarra 194* (F, MEXU); Mpio. Morelia, N of Jesús del Monte, 19.65°N, 101.18°W, 2100 m, 13 Jul 1988, *Medina 1237* (IEB, MEXU); Mpio. Santa Clara del Cobre, Cerro La Tapada, 19.40°N, 101.65°W, 2750 m, 23 Aug 1989, *Pérez 634* (IEB, MEXU); Sierra de San Andrés, Hacienda Agua Fría, 19.80°N, 100.60°W, 3000 m, 1 Sep 1906, *Ross 414* (M); Opopeo, on road to Tacámbaro, 19.40°N, 101.60°W, 2700 m, 9 Jun 1965, *Rowe 10* (PTIS); Cerro Tancítaro, 27 km W of Uruapan by air, about 2–3 km W of Tepetate, 19.42°N, 102.29°W, 3500 m, 25 Jul 1996, *Ruiz et al. 4093* (MICH); Colonia Lázaro Cárdenas, near Tzintzuntzan, 19.62°N, 101.58°W, 2100 m, 7 Mar 1985, *Rzedowski 38893* (IEB); Mpio. Morelia, 4 km S of Jesús del Monte, 19.59°N, 101.16°W, 2100 m, 20 Jul 1986, *Rzedowski 39983* (ENCB, IEB, MEXU, MO); Mpio. Queréndaro, area about San José Lagunillas, 19.87°N, 100.92°W, 2750 m, 24 Aug 1986, *Rzedowski 40458* (ENCB, IEB, MEXU, MO); near the archaeological site of Tzintzuntzan, 19.62°N, 101.58°W, 2100 m, 24 Aug 1986, *Rzedowski 40511* (IEB); Mpio. Queréndaro, road between San José Lagunas

and Milpillas, 19.87°N, 100.94°W, 2800 m, 28 Jun 1987, *Santos 2106* (IEB, MEXU); near top of Cerro Burro road of right-hand fork of road at radio station, about 100 m downhill of tower on road, 19.43°N, 101.46°W, 3240 m, 18 Oct 1988, *Spooner et al. 4275* (INIFAP, PTIS); at Canal 8 station television tower near top of Cerro Burro, on left hand fork of road near top of Cerro Burro, 19.43°N, 101.46°W, 3240 m, 18 Oct 1988, *Spooner et al. 4276* (PTIS); México-Michoacán state border on Toluca to Morelia Road, Hwy 15, hillside N of road, 19.38°N, 100.28°W, 3120 m, 6 Oct 1967, *Tarn & Gómez 151* (B, K, P).—MORELOS: Lagunas de Zempoala National Park, 19.07°N, 99.28°W, 2991 m, 27 Jul 1949, *Cole 3* (MEXU), *Traylor 6* (MEXU), 25 Jul 1949, *Mitchell 16* (MEXU), 26 Jul 1949, *Smith 7* (MEXU); Km 52.5 on toll road from Mexico to Cuernavaca, 19.07°N, 99.28°W, 2400 m, 6 Oct 1964, *Flores S-793* (MEXU); Lagunas de Zempoala, 19.05°N, 99.30°W, 3000 m, 21 Jul 1966, *Iniguez s.n.* (ENCB); mountainside, near lake number 3, Lagunas de Zempoala National Park, 19.07°N, 99.28°W, 2808 m, 26 Jul 1949, *McAdams 36* (MEXU); NW of Huitzilac at 15 km marker on road to Zemapoala, 19.03°N, 99.28°W, 2800 m, 5 Jul 1982, *McGruer 33* (WIS); Mpio. Huitzilac, Cerro Tezoyoc, 19.04°N, 99.26°W, 3000 m, 3 Aug 1982, *Monrroy s.n.* (CHAPA); El Vigía, 46 km from Mexico City on road to Puebla, 19.31°N, 98.70°W, 3719 m, 15 Oct 1930, *Reddick 606* (BH); road to Lagunas de Zempoala National Park, 9.25 km W of Tres Cumbres (Mex 95), 19.07°N, 99.28°W, 2800 m, 25 Jul 1975, *Steingraeber 91* (MEXU, WIS); Lagunas de Zempoala National Park, 19.07°N, 99.28°W, 2743 m, 26 Jul 1949, *Teer 16* (MEXU); Parque Nacional Lagunas de Zempoala, 19.05°N, 99.30°W, 26 Jul 1949, *Wyatt 49* (MICH).—NUEVO LEÓN: Cerro Potosí, E side of mountain, above Ejido 18 de Marzo, 24.87°N, 100.22°W, 3200 m, 13 Sep 1960, *Beaman 4476* (LL, MSC, US); top of Cerro Potosí near microwave tower, 24.85°N, 100.32°W, 10 Aug 1972, *Dun et al. 20204* (MO), 2 Aug 1975, *Lewis 131* (LL, TEX), 2743 m, 7 Jul 1963, *McGregor et al. 251* (LL, US); Mpio. Galeana, on side of road to Cerro Potosí, 24.87°N, 100.23°W, 3500–3600 m, 4 Aug 1988, *García 80* (IEB), 27 Jul 1995, *Garza & Estrada 4266* (BRIT), 20 Jul 1969, *Hinton et al. 17198* (K, TEX), 29 Aug 1986, *McDonald 2183* (TEX); Cerro El Potosí, 24.86°N, 100.25°W, 26 Jul 1985, *Ginzbarg et al. 233* (TEX); Mpio. Galeana, Cerro Potosí, W side above Las Canoas Mesa de los Indios, 24.87°N, 100.22°W, 2700 m, 25 Aug 1958, *Hawkes et al. 1374* (C, K, NY, US), *Hawkes et al. 1375* (C, IBUG, K, MEXU, US); Cerro Potosí, bottom of creek, below Las Canoas, edge of La Joya de Abajo, 24.85°N, 100.22°W, 2550 m, 25 Aug 1958, *Hawkes et al. 1377* (K); Zaragoza, 23.97°N, 99.77°W, 2155 m, 4 Aug 1993, *Hinton et al. 23314* (TEX); Cerro El Viejo, Zaragoza, 23.97°N, 99.77°W, 1870 m, 4 Aug 1993, *Hinton et al. 23326* (MICH, NY, TEX); Cerro Potosí, road up to microwave station, about 20 km along road, 24.87°N, 100.26°W, 3200 m, 22 Oct 1991, *Hjerting 7393, 7394, 7395* (PTIS); Cerro Potosí, 2.2 km (1.4 mi below microwave tower on Cerro Potosí road), 24.85°N, 100.22°W, 3000 m, 13 Aug 1981, *Lowry & Warnock 3187* (MO, TEX); Cerro del Potosí, subalpine zone, 24.86°N, 100.24°W, 3500 m, 21 Jun 1985, *McDonald 1664* (TEX); summit of Cerro Potosí, 24.85°N, 100.22°W, 3500–3600 m, 26 Jul 1985, *McDonald 1794* (MO, TEX); Mpio. Galeana, the canyon below Las Canoas on Cerro Potosí, 24.88°N, 100.25°W, 20 Jul 1935, *Muller 2215* (F, GH, MICH, MO, NY, P, TEX); about 37 km ENE of Doctor Arroyo, S trending trail to summit of Cerro Peña Nevada beginning near road junction at vicinity of Puerto Pinos, 23.77°N, 99.92°W, 2700–2900 m, 5 Aug 1983, *Nesom 4801* (TEX); Mpio. Zaragoza, Cañada La Tinaja, between Rancho La Encantada and Cerro La Peña, 23.92°N, 99.82°W, 2500–2600 m, 3 Jul 1988, *Patterson 5752* (TEX); 16 km SW of Zaragoza on dirt road called Camino La Encantada, 23.92°N, 99.81°W, 2550 m, 23 Sep 1997, *Rivera-Peña et al. 929* (INIFAP, MEXU, PTIS, WAG); slopes of Cerro El Viejo, along logging path up hill, about 5.5 km (by air) ENE of town square of Zaragoza, 23.98°N, 99.73°W, 2750 m, 24 Sep 1997, *Rivera-Peña et al. 931* (INIFAP, MEXU, PTIS, WAG); slopes of Cerro El Viejo, along logging path up hill, about 6 km (by air) ENE of town square of Zaragoza, 23.98°N, 99.72°W, 2850 m, 24 Sep 1997, *Rivera-Peña et al. 932* (INIFAP, MEXU, PTIS); Cerro Potosí, NW of Galeana, on road to microwave tower, by the first of the two sets of towers, 24.88°N, 100.22°W, 3220 m, 25 Sep 1997, *Rivera-Peña et al. 934* (INIFAP, MEXU, PTIS, WAG); on S Madre Avenue, Colonia del Valle, Monterrey, 25.57°N, 100.33°W, Sep 1960, *Smith M391* (TEX); from Doctor Arroyo to Galeana road, about 35 km NE along track to Zaragoza, just beyond Puerto el Pino, 23.91°N, 99.75°W, 2600 m, 9 Sep 1983, *Tarn & Gómez 93* (PTIS); from Doctor Arroyo to Galeana road, 39 km NE along the track to Zaragoza, 23.91°N, 99.75°W, 2620 m, 12 Sep 1983, *Tarn et al. 94* (C, K, PTIS); from Doctor Arroyo to Galeana road, about 60 km NE, beyond La Encantada, on track to Zaragoza, 23.97°N, 99.77°W, 2160 m, 12 Sep 1983, *Tarn et al. 96* (K, PTIS); Sierra El Solado, summit of Cerro Peña Nevada, Puerto Dios, junction Joya de San Diego del Camino, San Antonio Peña Nevada, and Zaragoza, 24.76°N, 99.88°W, 3100 m, 25 Aug 1989, *Villarreal et al. 4978* (MEXU); about 1 mi WSW of San Pablo, 15 mi E of San Rafael on Hwy 57, 25.05°N, 100.43°W, 2438 m, 22–23 Jul 1977, *Wells & Nesom 162* (LL, TEX); area of Cerro Peña Nevada, about 12 km NE of San Antonio Peña Nevada, 30 km E of Doctor Arroyo, N and NE slopes of mt known locally as Picacho Onofre, and ridges and valleys about 5 km to the NE of this peak, 23.77°N, 99.87°W, 27–30 Jul 1977, *Wells & Nesom 427* (LL, TEX).—OAXACA: Yavesía, May 1844, *Galeotti 1225K* (W); Cañada de Molinos, Valley of Oaxaca, ENE of Oaxaca, 17.14°N, 96.66°W, Jul 1845, *Jurgensen 482* (G, OXF, TCD); 18 mi SW of the City of Oaxaca, 16.96°N,

96.86°W, 2286–2896 m, 10–20 Sep 1894, *Nelson 1319 p.p.* (US); 5 km, straight line, W of Yuvila, near Oaxaca, 17.18°N, 96.50°W, 2750 m, 8 Sep 1980, *Ochoa 14141* (US); La Plazuela, road from Oaxaca to Las Peras, 16.95°N, 96.98°W, 2760 m, 10 Sep 1980, *Ochoa 14143* (CIP, US, WIS); El Manzanal, between Portillo de San Andrés and Portillo de Santa Ana, on road Miahuatlán to Pochutla, 16.26°N, 96.66°W, 2650 m, 10 Sep 1980, *Ochoa 14146* (CIP, IBUG, K, MEXU, US).—PUEBLA: San Andrés Aneyacatitla F. de Ixtacíhuatl, 3000 m, 16 Jun 1968, *Boege 779* (MEXU); Metepec, road to Popocatépetl, 18.93°N, 98.47°W, 2835 m, 30 Aug 1962, *Flores S-651* (K, MEXU); Mexico City to Puebla Hwy, 19.25°N, 98.50°W, 31 Aug 1957, *Graham 327* (PTIS); SE slopes of Popocatépetl, approached from the village of Metepec, 19.00°N, 98.60°W, 2838 m, 31 Aug 1962, *Ugent et al. 1289, 1322, 1325, 1327, 1329, 1330, 1333* (BM, K, MEXU, MO, PTIS, US, WIS); 1.5 km E of Río Frío, along the road to Puebla, 19.35°N, 98.64°W, 2950 m, 5 Jul 1970, *Weber 471* (ENCB).—QUERÉTARO: Mpio. Pinal de Amoles, 2 km N of El Madrono, Cerro La Calentura, 21.14°N, 99.62°W, 2870 m, 14 Sep 1989, *Carranza 2082* (IEB); Mpio. San Joaquín, N of Las Ranas archaeological site, 20.94°N, 99.54°W, 2300–2400 m, 26 Sep 1991, *Carranza 3557* (IEB, MEXU, TEX); near summit of Cerro Zamorano, 20.81°N, 100.11°W, 2950 m, 3 Aug 1972, *Denton 1956* (ENCB, MICH); Mpio. Landa, 2 km SE El Rincón de San José, 21.22°N, 99.30°W, 10 Sep 1990, *Rubio 1933* (IEB, MEXU); Mpio. Colón, summit of Cerro Zamorano, 20.93°N, 100.18°W, 3200 m, 1 Sep 1987, *Rzedowski 44426* (CAS, MICH, TEX); Mpio. Colón, SW slope of Cerro Zamorano, 20.80°N, 100.05°W, 2800 m, 27 Aug 1989, *Rzedowski 48776* (MEXU); Cerro El Zamorano, going up from Carboneras on road from Colón towards W, about 25 km from Carboneras, near tower of TV station, 20.93°N, 100.18°W, 3200 m, 7 Nov 1984, *Tarn et al. 300* (PTIS); Mpio. Pinal de Amoles, La Cañada, 21.15°N, 99.65°W, 2570 m, 26 Jul 1987, *Zamudio 5360* (IEB, MEXU, MICH).—SAN LUIS POTOSÍ: region of San Luis Potosí, 1878, *Parry & Palmer 633 p.p.* (US); Sierra Gorda, 1879, *Schaffner 407* (A, GOET, NY).—TAMAULIPAS: summit of Peña Nevada, 23.72°N, 99.81°W, 5 Jul 1961, *Gillett 1245* (MSC); Tamaulipas and Nuevo León state border, ridge and E side of Peña Nevada, 23.77°N, 99.82°W, 3500–3600 m, 5 Jul 1985, *McDonald 1635* (TEX); Mpio. Miquihuana, Sierra de Peña Nevada, ridge and S and SW slope, 23.66°N, 99.74°W, 3600 m, 22 Aug 1986, *McDonald 2077* (TEX); E and S slopes of Peña Nevada, 23.72°N, 99.79°W, 19 Jul 1949, *Stanford et al. 2584* (DS, G, US).—TLAXCALA: above San Diego de Pinar, Malinche, 19.28°N, 98.05°W, 2896 m, 12 Oct 1938, *Balls & Gourlay 5628* (BM, C, DS, E, F, K, MEXU, NY, UC, US, WAG); Malinche Mountain, San Diego de Pinar, 19.23°N, 98.03°W, s.d., *CPC 54.3* (PTIS, TEX); Cerro Clacauapanco, N of Mount Malinche, 19.28°N, 98.05°W, 2774 m, 21 Aug 1944, *Hernández 406* (LL); Volcán Malinche, NW slopes approached from Huamantla, 19.32°N, 97.93°W, 3340 m, 3 Sep 1962, *Ugent et al. 1384–1386, 1394, 1400–1401, 1411–13* (GH, UC), *Ugent et al. 1397–1399, 1402, 1411–15, 1419, 1420, 1423* (BM, ENCB, GAT, GH, MEXU, WIS); Peñón del Rosario, 24 km E of APAM, on Tlaxcala-Puebla border, lower western slopes, 19.68°N, 98.22°W, 2750–3000 m, 12 Jul 1966, *West Q-20* (WIS).—VERACRUZ: Cofre de Perote, below Las Vigas, 19.48°N, 97.13°W, 2100 m, 7 Jun 1938, *Balls & Gourlay 4760* (K); Barranca de San Miguel Tlaquistiapa, Pico de Orizaba, 19.04°N, 97.21°W, 2500 m, 2 Jul 1985, *Charazo & Leach 3444* (WIS); Mpio. Calcahualco, N slopes of Pico de Orizaba, 5 km SW of Jacal, along zigzag part of (impassable dirt road ascending the NW slope of canyon of Río Jamapa, part of the Coscomatepec to Escola to Jacal Road), 19.05°N, 97.23°W, 3450–3700 m, 6 Jul 1982, *Nee & Diggs 24818* (F, NY); on road from Perote to Jalapa, just E of Toxtlacoaya, 3.6 km W of Las Vigas, 19.62°N, 97.06°W, 2300 m, 2 Oct 1997, *Rivera-Peña et al. 947* (INIFAP); Mount Orizaba, 19.01°N, 97.26°W, 3048 m, 1891, *Seaton s.n.* (GH); N of Puerto del Aire, old Orizaba to México Road, Hwy 150, 2460 m, 24 Oct 1967, *Tarn & Gómez 225* (BR, K, MEXU, MPU, NY); Puerto del Aire, on old Orizaba to México Road, Hwy 150, just before the village, 2380 m, 24 Oct 1967, *Tarn & Gómez 231* (F, K, WAG); Puerto del Aire, just W and high above Acultzingo, top of very steep pass on Hwy 150 (Tehuacán to Orizaba) near boundary between states of Veracruz and Puebla, Cumbres de Acultzingo, S side of road, 18.72°N, 97.32°W, 2409 m, 27 Sep 1962, *Ugent & Flores 2375–2377, 2380, 2383–2386, 2389, 2393–2399, 2400–2405, 2407–2415, 2467–2470, 2482–2486, 2489-2491* (ENCB, GAT, GH, MEXU, MICH, MO, UC, US, WIS); Mpio. Las Vegas, Casa Blanca, 19.63°N, 97.08°W, 2350 m, 30 Jul 1974, *Ventura 10426* (ENCB, IEB, MEXU).—State unknown: Cocustepec, 2682 m, s.d., *Drake s.n.* (P); Los Ocotes, 3048 m, 1841–1843, *Liebmann 1453* (C).

16. Solanum stoloniferum (p. 86).

U.S.A. ARIZONA. Apache Co.: near Nelson Reservoir, at 2 mi S of reservoir, take Rt 216 E one mile, on S side of road, 34.03°N, 109.17°W, 2530 m, 28 Sep 1995, *Bamberg 29* (PTIS); about 1.2 mi N of Greenlee County line on W side of road across from roadside pulloff, 33.79°N, 109.16°W, 2540 m, 28 Sep 1995, *Bamberg 32* (PTIS); Boggy Creek at Maverick Road, 33.89°N, 109.30°W, 2438 m, 17 Aug 1961, *Barr 61-238* (ARIZ); White Mountains, near Muzzy Place, Beaver Creek, 33.98°N, 109.30°W, 3 Sep 1966, *Barr 66-123* (ARIZ); AZ 373 at Hall Creek (tributary of Little Colorado River) about 4 mi N of Greer and about 1 mi S of 260, 34.06°N, 109.46°W, 2470 m, 19 Aug 1996, *Hamm 11067* (PTIS); along Rt 275, N of Alpine [=Stone Creek Road],

33.87°N, 109.06°W, 2438 m, 11–15 Aug 1998, *Hammond 11434* (MO); sides of Milk Canyon, Escudilla Mountain, 8 mi E of Nutrioso, 33.96°N, 109.07°W, 2591 m, 25 Aug 1951, *Parker & McClintock 7571* (ARIZ, DS, RSA, UC); Horse Creek, cattle guard to logging road, 33.74°N, 109.38°W, 26 Jul 1962, *Rickert 142* (ARIZ); Luna Lake, 3 mi W of the Arizona-New Mexico state line, along Hwy 260/Hwy 180, 4 mi E of the town of Alpine, E shore of lake and along the San Francisco River below dam, R31E, T5N, S16, 33.83°N, 109.09°W, 2404 m, 29 Aug 1988, *Ricketson & Raechal 4281* (MO, RSA, TEX); Alpine vicinity, Hwy 666 [191], 1.2 mi NE of Greenlee County line, at the pulloff, on W side of road under very large pines, especially in rotting fallen logs, 33.79°N, 109.16°W, 2540 m, 13 Aug 1992, *Salas et al. 23* (PTIS); near Nelson Reservoir, 2 mi S on Rt 666 then E 1 mi on Rt 275, on lower side of road under trees, 34.03°N, 109.17°W, 2370 m, 13 Aug 1992, *Salas et al. 25* (PTIS); White Mountains, Big Cienega (Big Meadows), 34.04°N, 109.56°W, 2743–2804 m, 6 Aug 1960, *Schmidt 158* (ARIZ), *Smith 158* (ARIZ); on road to Maverick 3.1 mi N of Indian reservation boundary, 4.8 mi S of W Fork of Black River, N part of T5N, R27E, 33.85°N, 109.46°W, 2673 m, 30 Aug 1980, *Spellenberg & Soreng 5840* (NY); Hwy 666 [191], 1 2/10 mi NE of Greenlee County line, 33.79°N, 109.16°W, 11 Aug 1978, *Ugent & Ruhde 12-78* (IBUG, MEXU, WIS); 5.9 mi SE of Nelson Reservoir along County Road 116, upper slopes of Escuidila Mountain near Davis Creek, 34.00°N, 109.13°W, 2560 m, 19 Aug 1978, *Ugent & Ruhde 18-78* (CM, ENCB, IBUG, MEXU, PH, TEX, WIS). Cochise Co.: Santa Rita Mountains, 31.49°N, 110.46°W, 23 Aug 1936, *Arnold & Darrow s.n.* (GH), 4 Oct to 20 Sep 1902, *Griffiths & Thornber 102* (NY, US), 1829 m, 24 Aug 1903, *Jones s.n.* (RSA), Aug 1902, *Thornber & Thornber s.n.* (ARIZ); Chiricahua National Monument, on Natural Bridge/Picket Park Trail, about 2 mi down trail, or about 300 m after entering the ponderosa pine bottom, 32.03°N, 109.36°W, 1730 m, 27 Sep 1994, *Bamberg 7* (PTIS); near Chiricahua National Monument at Rustler Park, mountain slope just W of campground, 31.90°N, 109.28°W, 2580 m, 27 Sep 1995, *Bamberg 22* (PTIS); near Chiricahua N. M. at Barfoot Park, SE of the camp buildings in a pasture and around the wellhouse, 31.91°N, 109.28°W, 2480 m, 27 Sep 1995, *Bamberg 23* (PTIS); Dos Cabezas Mountains, N-facing slope below heads, 32.22°N, 109.59°W, 2286 m, 20 Aug 1976, *Bingham 2473* (ASU); Chiricahua Mountains, Barfoot Park, 31.91°N, 109.28°W, 2438–2515 m, 10 Aug 1907, *Blumer 1579* (ARIZ, DS, E, F, GH, K, L, MO, NY, US, W, Z), 27 Sep 1906, *Blumer 1432 and 1432a* (DS, E, F, GH, K, L, MO, US, W, Z), 4 Aug 1958, *Hawkes et al. 1177* (C, IBUG, K, MEXU, US); Chiricahua Mountains, Barefoot, 31.81°N, 109.28°W, s.d., *Blumer s.n.* (ARIZ); about 1/2 mi S of Rustler Park Trail to Flys Peak, Chiricahua Mountains, 31.87°N, 109.26°W, 2652 m, 21 Aug 1981, *Buchanan & Hodgson H1572* (MEXU, NY); Chiricahua Mountains, Rustler Park, 31.90°N, 109.28°W, 2500–2700 m, 11 Aug 1966, *Cazier 216* (ASU), 14 Aug 1970, *Clarke s.n.* (WIS), 4 Aug 1958, *Hawkes et al. 1180* (K), 13 Jul 1966, *Hernbrode 147* (ARIZ), 26 Aug 1965, *Lehto 5386* (ASU, BM, MSC, NA), 7 Sep 1975, *Lehto 18890* (ASU), 28 Aug 1966 *Tate 556* (ASU), 11 Aug 1960, *Thorne 12674* (MSC, RSA); Onion Saddle in Chirichua Mountains, 31.94°N, 109.26°W, 2316 m, 29 Aug 1966, *Cazier 681* (ASU); Chiricihua Mountains, T18S R30E, along trail about 3/4 mi S of Rustler Park toward Flys Peak, 31.89°N, 109.28°W, 2743 m, 6 Sep 1980, *Engard et al. H1079* (ASU, H); Huachuca Mountains, 31.63°N, 110.34°W, 1524–2438 m, 5 Sep 1936, *Epling & Stewart s.n.* (UC), 22 Aug 1893, *Holzner 1969* (US); Chiricahua Mountains, Centella Point, 31.88°N, 109.27°W, 7 Sep 1991, *Fishbein et al. 498* (ARIZ); Carr Peak, Huachuca Mountains, 31.41°N, 110.30°W, 2789 m, 22 Jul 1909, *Goodding 264* (ARIZ, E, G, GH, NY); Huachuca Mountains, Ramsey Canyon, 31.43°N, 110.32°W, 1750 m, 22 Aug 1910, *Goodding 746* (ARIZ, NY), 7 Aug 1958, *Hawkes et al. 1209* (C, IBUG, K, MEXU), *Hawkes et al. 1210* (C, K), 7 Aug 1966, *Hesselberg s.n.* (ARIZ), 4 Aug 1914, *Thornber 7239* (ARIZ); N slope of Santa Rita Mountains, 31.49°N, 110.46°W, 13–21 Sep 1904, *Griffiths 7265* (MO); Chiricahua National Monument, Picket Park, 32.03°N, 109.36°W, 1750 m, 6 Aug 1958, *Hawkes et al. 1204* (C, K); Huachuca Mountains, SW side, by entrance to Wakefield Mine, at base of mountains, 31.38°N, 110.36°W, 1700 m, 7 Aug 1958, *Hawkes et al. 1216* (C, K, US), *Hawkes et al. 1217* (K); Chiricahua National Monument, Totem Canyon, 32.00°N, 109.31°W, 2012 m, 6 Aug 1975, *Jandrey & Reeves R4241* (ASU); Chiricahua Mountains, 31.81°N, 109.28°W, 2743–2896 m, 15 Jul 1927, *Kusche s.n.* (CAS), 15 Sep 1896, *Toumey s.n.* (GH); Chiricahua Mountains, Chiricahua Wilderness Area, Greenhouse Trail, *S*-facing slope, 31.86°N, 109.27°W, 2548 m, 29 Jul 1975, *Leithliter 179* (ASU); Chiricahua Mountains, Chiricahua Wilderness Area, Saulsbury Trail, 31.87°N, 109.30°W, 2594 m, 17 Aug 1976, *Leithliter 515* (ASU); Chiricahua Wilderness Area, Chiricahua Mountains, Greenhouse Trail, 31.86°N, 109.27°W, 2286 m, 18 Aug 1976, *Leithliter 578* (ARIZ); East Turkey Creek, [Paradise], Chiricahua Mountains, 31.94°N, 109.21°W, 2134 m, 14 Aug 1960, *McCormick et al. 416* (ARIZ), 17 Aug 1967, *Walker W670817* (WIS); Coronado National Forest, trail to Miller Peak, saddle SE of Bathtub Spring, SE 1/4 S28, T20E [must be S27 of R20E, T23S on trail between Carr and Miller Peaks], 31.40°N, 110.31°W, 2591 m, 26 Aug 1990, *McLaughlin & Bowers 6080* (ARIZ); between Fort Huachuca and San Pedro River [near Ramsey Canyon], 31.43°N, 110.32°W, 27 Jul 1893, *Mearns 1534* (US); Ramsey Canyon, Huachuca Mountains, W slope above and adjacent to grassy area with stone plaque, 31.43°N, 110.32°W, 1722 m, 21 Aug 1988, *Pilversack & Onder 141* (ASU); Huachuca Mountains, 31.43°N, 110.25°W, 4 Jul 1884, *Pringle s.n.* (NA); Cochise County,

Huachuca Mountains, side Canyon of Huachuca Canyon, 31.47°N, 110.35°W, 1951–2134 m, 3 Aug 1974, *Reeves R898* (ARIZ); Chiricahua Mountains, slopes above Rustler Park, 31.90°N, 109.28°W, 2652–2743 m, 8–9 Aug 1974, *Reeves 937* (ASU); Chiricahua National Monument, summit of Sugarloaf Mountain, 32.01°N, 109.33°W, 2227 m, 10 Aug 1974, *Reeves R998* (ASU); about 1 mi SW of Sierra Vista Estates in Ramsey Canyon (private property), about 0.2 mi from the visitor center in the stream bottoms, 31.43°N, 110.32°W, 1940 m, 8 Aug 1992, *Salas et al. 3* (PTIS); Coronado National Forest, on roadside near Pinery Campground on road from NW park entrance to Barfoot Park, 31.93°N, 109.27°W, 2150 m, 9 Aug 1992, *Salas et al. 4* (PTIS); Coronado National Forest, about 15 mi from the NW park entrance in Barfoot Park, about 30 m SW of Boyscout Camp Victoria buildings, 31.91°N, 109.28°W, 2480 m, 9 Aug 1992, *Salas et al. 5* (PTIS); Rustler Park, about 15.5 mi from NW entrance of Coronado National Forest, within the circle drive loop of the campground, and especially just to the S at the base of the mountain, 31.90°N, 109.28°W, 2580 m, 9 Aug 1992, *Salas et al. 6* (PTIS); Chiricahua National Monument, on Natural Bridge/Picket Park Trail, about 2 mi down trail, or about 300 m after entering the ponderosa pine bottom, 32.03°N, 109.36°W, 1780 m, 5 Aug 1992, *Salas et al. 33* (PTIS); in canyon bottom along trail about 1/2 mi up from the box, T23S R20E SW1/4 of NW1/4 of S16, Ramsey Canyon, Huachuca Mountains, 31.43°N, 110.32°W, 1951 m, 9 Aug 1980, *Toolin & Yatskievych 991* (ARIZ); Coronado National Forest, Chiricahua Mountains, Rustler Park (15.3 mi from NW park entrance on road to Portal), vicinity of picnic area, 31.90°N, 109.28°W, 13 Aug 1978, *Ugent & Ruhde 13-78 (*IBUG, MEXU, WIS); Coronado National Forest, Chiricahua Mountains, Barfoot Park (15 mi from NW entrance on road to Portal), 31.91°N, 109.28°W, 13 Aug 1978, *Ugent & Ruhde 14-78 (*IBUG, MEXU, WIS); Miller Peak, Huachuca Mountains, T23S, R19E, 31.39°N, 110.29°W, 1868 m, 20 Aug 1973, *Wentworth 1887* (BH); Fort Huachuca, 31.56°N, 110.36°W, Sep 1892, *Wilcox s.n.* (NY), 1891, *Wilcox s.n.* (US). Coconino Co.: Woods Canyon, below dam, Sitgreaves Recreation Area, Sitgreaves National Forest, 34.33°N, 110.95°W, 21 Aug 1963, *Mason & Mason 2291* (ARIZ, VT, W); Walnut Canyon, 35.17°N, 111.51°W, 11–12 Sep 1910, *Pilsbry s.n.* (PH). Gila Co.: along canyon, Workman Creek area, about 1 mi below falls, Sierra Ancha Mountains, 33.83°N, 110.94°W, 1676 m, 27 Aug 1946, *Gould 3735* (ARIZ); Sierra Ancha, 33.82°N, 110.89°W, 26–28 Aug 1928, *Harrison & Kearney 5675* (ARIZ, US); Sierra Ancha Wilderness Area in Tonto National Forest, Reynold's Creek below Knoll's Hole Spring, along Trail 150, T6N R14E, 33.84°N, 110.92°W, 2134 m, 29 Aug 1992, *Imdorf & Rebman 970* (ASU); Tonto Forest, Parker Creek Dam, 33.80°N, 110.96°W, 1707 m, 28 Sep 1938, *Johnson J-28* (ASU, RM); Peterson Ranch, S33, T6N, R14E, 33.82°N, 110.92°W, 2256 m, 24 Aug 1961, *Pase 1286* (ARIZ). Graham Co.: near Safford, on Mount Graham at Rigg's Lake, 32.71°N, 109.96°W, 2670 m, 26 Sep 1994, *Bamberg 9* (PTIS); Pinaleno Mountains, near Alber Alder Spring, T9S R24E, 32.61°N, 109.84°W, 2134 m, 18–20 Aug 1982, *Buhrow 173* (ARIZ); Pinaleno Mountains, Tripp Canyon Road near Turkey Spring, 32.74°N, 110.04°W, 2316 m, 19 Aug 1982, *Buhrow 174* (ARIZ); Pinaleno Mountains, Riggs Flat Campground of Coronado National Forest, *S*-facing slope with granite boulders, 500 yards S of Riggs Lake, 32.71°N, 109.96°W, 2621 m, 25 Aug 1989, *Demlong 119* (ASU); Mount Graham [near Safford], 32.71°N, 109.96°W, Aug 1874, *Rothrock 436* (GH, F). Greenlee Co.: White Mountains, near Muzzy Place, Beaver Creek, 3 Sep 1966, *Barr & Wiedhopf 66-126* (ARIZ); 3–4 mi W of Beaverhead on road to Sprucedale Ranch, White Mountains, 33.71°N, 109.26°W, 2377 m, 17 Aug 1966, *Caldwell 66263* (ARIZ); Hwy 666 [191], about 15 mi S of Alpine [Beaverhead], 33.69°N, 109.21°W, 2591 m, 11 Jul 1963, *Deaver 6475* (CAS); White Mountains, 15 mi N of Hannagan Meadow, 33.78°N, 109.19°W, 2621 m, 12 Aug 1935, *Kearney & Peebles 12450* (ARIZ); White Mountains, 2 mi S of Sprucedale, 33.71°N, 109.33°W, 2438 m, 30 Aug 1951, *Parker & McClintock 7652* (ARIZ); 1.9 mi E of Buffalohead Jct [Beaverhead Jct?] Rt 567 to Blue, AZ, 33.71°N, 109.18°W, 2377 m, 14 Aug 1974, *Pinkava et al. P12397* (ASU, NY, US); US 666 [191], road to Gobbler Peak [Point] and Reno Lookout Tower, 33.61°N, 109.40°W, 2743 m, 7 Sep 1968, *Pinkava et al. 13739B* (ASU). Pima Co.: near Tucson, Coronado National Forest, Santa Catalina Hwy on road to Mount Lemmon, at the visitor center past mi 19, in the wash by the horse corral, 32.41°N, 110.72°W, 2410 m, 6 Oct 1993, *Bamberg 1* (PTIS); near Tucson, Coronado National Forest, Santa Catalina Hwy on road to Mount Lemmon, at 2.8 mi before the Mount Lemmon Café, on edge of big gorge, 32.41°N, 110.73°W, 2500 m, 25 Sep 1994, *Bamberg 6* (PTIS); Santa Catalina Mountains, summit of Mount Bigelow, 32.42°N, 110.71°W, 2438 m, 23 Aug 1939, *Benson 9702* (MU, RSA); Rincon Mountains, Spud Rock Cabin, 2344 m, 13 Aug 1983, *Bowers R1253* (ARIZ); Rincon Mountains, along the trail from Manning Camp to the Devil's Bathtub, 2225 m, 13 Aug 1983, *Bowers & McLaughlin R1261* (ARIZ); trail E of camp near Huiteran's[?], 29 Jul 1911, *Brown s.n.* (ARIZ); trailhead of Oracle Ridge Trail, Santa Catalina Mountins, 32.45°N, 110.76°W, 2408 m, 26 Aug 1979, *Buhrow 146* (ARIZ); Santa Catalina Mountains, Santa Catalina Trail E of Soldier Camp, 32.43°N, 110.74°W, 2438 m, 29 Aug 1932, *Graham 1745* (DS); Santa Catalina Mountains, 32.25°N, 110.42°W, 22 Aug 1931, *Harrison & Kearney 8057* (F); near Summerhaven, Mount Lemmon, 32.44°N, 110.76°W, 2390 m, 23 Aug 1931, *Harrison et al. 8075* (ARIZ, CAS); Santa Catalina Mountains, Webber's Ranch, 32.41°N, 110.72°W, 6 Aug 1906, *Livingston & Thornber 5992* (ARIZ, DUKE, SMU, TAES); Rincon or

Santa Catalina Mountains, 32.25°N, 110.42°W, 4 Jul 1942, *MacDougal s.n.* (US); Santa Catalina Mountains, about 0.2 mi N of junction of "Control Road" and Mount Lemmon Hwy, 32.44°N, 110.76°W, 2408 m, 5 Sep 1996, *McLaughlin 7006* (ARIZ); Santa Catalina Mountains, Oracle side, S Fork below Samaniego Ridge, upper canyon wash, 32.45°N, 110.81°W, 2012 m, 13 Aug 1963, *Niering & Whittaker s.n.* (ARIZ); Coronado National Forest, about 0.6 mi past the 24 mi marker, just past the emergency station turnoff, just off the road on both sides, 32.42°N, 110.74°W, 2390 m, 7 Aug 1992, *Salas et al. 1* (PTIS); Santa Catalina Mountains, Marshall Gulch, 32.43°N, 110.76°W, 2271 m, 23 Aug 1908, *Shreve s.n.* (F); Bear Wallow Campgrounds, Mount Lemmon, Santa Catalina Mountains, 32.45°N, 110.77°W, 2438 m, 28 Aug 1938, *Smith 14173* (ARIZ); Santa Catalina Mountains, Coronado National Forest, 1 mi NW of Soldiers Camp (or 24 mi from Tanque Verde entrance to park), growing on a rocky ledge, 32.42°N, 110.74°W, 15 Aug 1978, *Ugent & Ruhde 15-78* (WIS); Santa Catalina Mountains, Bear Canyon Picnic Area, forest in stream canyon, streamside, 32.38°N, 110.69°W, 1774 m, 4 Aug 1989, *Van Devender & Van Devender 89-250* (ARIZ). Santa Cruz Co.: S of Tucson, near Mount Wrightson, from Madera Canyon take Old Baldy Trail about 2 mi to Josephine Saddle, 31.69°N, 110.86°W, 2150 m, 25 Sep 1994, *Bamberg 8* (PTIS); Patagonia Mountains, about 13.4 mi E of Rt 82 on Dusquene Rd, about 100 ft W of Majalca Drive at Washington Camp, 31.38°N, 110.69°W, 1630 m, 11 Sep 2001, *Bamberg et al. 87* (PTIS); Patagonia Mountains, 31.38°N, 110.69°W, 1630 m, 18 Aug 1928, *Kearney & Peebles 5598* (ARIZ); along trail from White House Canyon to Mount Wrightson, Santa Rita Mountains, 31.70°N, 110.85°W, 2438 m, 12 Aug 1945, *Parker et al. 5844* (ARIZ); Patagonia Mountains, 31.54°N, 110.75°W, 18 Aug 1928, *Peebles et al. 5598* (ARIZ, US); Madera Canyon, Santa Rita Mountains, 31.44°N, 110.56°W, 1981 m, 21 Aug, *Reeves R1027* (ASU); Gardner Canyon, Santa Rita Mountains, above stream and near the end of the road, 31.71°N, 110.81°W, 1829 m, 7 Aug 1982, *Van Devender & Kiber s.n.* (ARIZ).—COLORADO: S Colorado, 1888, *Cassidy s.n.* (F).—NEW MEXICO: Catron Co.: about 3.1 mi E of the 9 mi marker at the town of Mogollon (just past where stream crosses the road), on the upper side roadcut, 33.38°N, 108.76°W, 2210 m, 9 Oct 1995, *Bamberg 2* (PTIS); N of town of Apache Creek on Rt 32 at 0.8 mi N of the 6 mi marker, in floodplain of Apache Creek on W side of the road, 33.92°N, 108.65°W, 2050 m, 28 Sep 1995, *Bamberg 37* (PTIS); White Creek Ranger Station, Gila Forest, 33.26°N, 108.31°W, 2540 m, 1 Aug 1920, *Eggleston 16876* (F, US); Datil Mountains, T1N, R9W, S34, 34.26°N, 107.74°W, 2560 m, 16 Aug 1976, *Fletcher 1087* (UNM); Mogollon Mountains, Willow Creek, 1/2 mi above Willow Creek Lodge, 33.41°N, 108.58°W, 2400 m, 3 Aug 1958, *Hawkes et al. 1172* (K), 3 Aug 1958, *Hawkes et al. 1173* (K, US); Mogollon Mountains, 15 mi on Willow Creek on road to Glenwood, 33.41°N, 108.58°W, 2200 m, 3 Aug 1958, *Hawkes et al. 1174* (IBUG, K, MEXU); Cibola (Datil) Forest, Baldwin Station Pasture, 33.72°N, 108.91°W, 2286 m, 30 Aug 1921, *Hiler 14* (RM); Gila National Forest near Wall Lake, 33.35°N, 108.08°W, 1981 m, 31 Aug 1980, *Hutchins 9156* (UNM); Willow Creek, Mogollon Mountains, 33.41°N, 108.58°W, 24 Jul 1960, *Jones 483* (UNM); Little Whitewater Canyon, T1S, R19W, S29, 33.32°N, 108.82°W, 2134 m, 15 Aug 1981, *Knight 1728* (UNM); Mogollon Mountains, on or near the W fork of the Gila River, 33.32°N, 108.51°W, 2286 m, 28 Aug 1903, *Metcalfe 838* (BM, E, G, K, MO, NY, P, UC, US); about 1.6 mi E of Mogollon, along the road in the gravel shoulder, 33.38°N, 108.77°W, 2140 m, 12 Aug 1992, *Salas et al. 18* (PTIS); Mogollon vicinity, about 15.5 mi E of Mogollon, about 0.5 mi E of the dead end road to Willow Creek Ranch, on S side of the road, 33.41°N, 108.58°W, 2430 m, 12 Aug 1992, *Salas et al. 19* (PTIS); Reserve vicinity, at 12 mi NE of Reserve on Hwy 12 to town of Apache Creek, take Cox Canyon road about 15 mi to John Kerr Lookout Tower peak, along roadside about 0.5 mi up primitive trail, 33.80°N, 108.48°W, 2650 m, 13 Aug 1992, *Salas et al. 20* (PTIS); Quemado vicinity, between 31 and 32 mi markers S of Quemado on Hwy 32, 34.22°N, 108.54°W, 2220 m, 14 Aug 1992, *Salas et al. 30* (PTIS); 1.6 mi E of Mogollon on road to Willow Creek, 33.41°N, 108.58°W, 10 Aug 1978, *Ugent & Ruhde 8-78* (IBUG, MEXU, WIS); 1/2 mi E of Willow Creek Lodge (or 18.2 mi E of Mogollon), 33.38°N, 108.77°W, 10 Aug 1978, *Ugent & Ruhde 9-78* (WIS); vicinity of the John Kerr Peak Lookout Tower, reached by driving 12 mi NE of Reserve on Hwy 12 to the intersection of Cox Canyon Road, or Hwy 47, then turning to the SE for 15.3 mi, 33.80°N, 108.48°W, 11 Aug 1978, *Ugent & Ruhde 11-78* (PTIS, WIS); Mogollon Mountains, Eagle Peak, 33.68°N, 108.57°W, 2957 m, 2 Aug 1900, *Wooton s.n.* (US). Dona Ana Co.: Santa Rita del Cobra, chiefly in the Valley of the Río Grande, below Dona Ana, 32.34°N, 106.53°W, s.d., *Bigelow 22* (NY); Dona Ana County, Canyon above Dripping Springs, 32.33°N, 106.57°W, 2316 m, 28 Jul 1952, *Dunn 8423* (UNM); on Rt 70 from Las Cruces to Alamagordo, near town of Organ in Organ Mountains, Aquirre Campground, trail at S end of campground, along the bank of the wash, about 150 m up from the second metal trail marker, 32.37°N, 106.56°W, 1850 m, 10 Aug 1992, *Salas et al. 7* (PTIS); Organ Mountains, Fillmore Canyon, 32.34°N, 106.57°W, 4 Sep 1897, *Wooton s.n.* (US); Organ Mountains, Van Pattens, 32.34°N, 106.53°W, 29 Aug 1894, *Wooton s.n.* (US); Organ Mountains, 32.34°N, 106.53°W, 2438 m, 23 Sep 1906, *Wooton & Standley s.n.* (US). Grant Co.: Black Creek, Black Mountains, 33.17°N, 108.16°W, 1829 m, 28 Aug 1924, *Archer 349* (MICH); nearly at Sierra County border W of Kingston, on Rt 152 at Iron Creek Campground, within 75 paces in both directions from the entrance gate along the creek banks,

32.91°N, 107.80°W, 2200 m, 27 Sep 1995, *Bamberg 26* (PTIS); near Truth or Consequences, W of junction of Rts 25 and 152 to Iron Creek Campground, near the banks of the creek right at both sides of the entrance, 32.91°N, 107.80°W, 2200 m, 17 Aug 1996, *Bamberg 41* (PTIS); N from Silver City on 15 to just before mi number 15, here a gravel road runs 3 mi E to Meadow Creek, 32.95°N, 108.17°W, 2210 m, 10 Sep 2001, *Bamberg et al. 86* (PTIS); Emory Pass, Black Range, 32.91°N, 107.76°W, 2499 m, 13 Aug 1942, *Clark 10342* (UNM); Black Range, E of Santa Rita Mountains, 14 Aug 1942, *Clark 10373* (UNM); Pinos Altos Mountains, 32.86°N, 108.24°W, 15 Sep 1880, *Greene 12494* (MO, PH); Pinos Altos Mountains, 32.51°N, 108.14°W, 15 Sep 1880, *Greene s.n.* (NY, P); Pinos Altos Mountains [mountains N of Silver City], 13 Aug 1895, *Mulford 885* (MO); Black Range, Iron Canyon [assumed Iron Creek Campground vicinity], 32.91°N, 107.80°W, 3 Sep 1961, *Osborn 924* (UNM); Mimbres Hot Springs, 32.75°N, 107.83°W, 1963, *Phelps 87* (TEX); Mogollon Mountains, 33.16°N, 108.35°W, Aug 1881, *Rusby 313* (BH, F, GH, MICH, NY, P); Black Range of Gila National Forest, road to McKnight Mountain, T15S, R11W, SW 1/4 S11, 33.09°N, 107.96°W, 2591 m, 3 Sep 1974, *Schultz & Schultz 1423* (GH, NY). Hidalgo Co.: Animas Mountains (Indian Canyon), 31.57°N, 108.75°W, 1829 m, 7 Aug 1908, *Goldman 1395* (US). Lincoln Co.: near Ruidoso, Montjeau Lookout Peak, 33.43°N, 105.73°W, 2920 m, 26 Sep 1995, *Bamberg 17* (PTIS); near Ruidoso, W from Rt 48 on Rt 532 to Apache Ski Area, between 9 and 10 mi marker at Windy Point Vista Lookout platform, 33.39°N, 105.78°W, 3036 m, 26 Sep 1995, *Bamberg 18* (PTIS); Lincoln National Forest, Tanbark Canyon above Bonito Lake, 33.48°N, 105.79°W, 2420 m, 20 Aug 1968, *Correll & Correll 36140* (ENCB, GH, LL, S, UC); Bonita Lake in White Mountains, 33.48°N, 105.79°W, 2256 m, 21 Aug 1968, *Hutchins 1529* (UNM); White Mountains, 33.31°N, 105.50°W, 2673 m, 23 Jul 1969, *Hutchins 2347* (UNM), 6 Jul 1895, *Wooton s.n.* (DS, US); S fork of Eagle Creek, 5 mi W of Alto, in White Mountains, 33.39°N, 105.73°W, 2280 m, 18 Aug 1969, *Hutchins 2444* (RSA, UNM), 8 Jul 1972, *Hutchins 3849* (UNM); Three Rivers Canyon, White Mountain, 33.40°N, 105.85°W, 2286 m, 9 Aug 1970, *Hutchins 3247* (UNM); in or near the Lincoln National Forest, Ruidoso Creek, 33.34°N, 105.72°W, 2188 m, s.d., *Plummer s.n.* (US); Ruidoso vicinity, at about 19 mi N of Ruidoso take road W to Bonito Lake, Circle Lake (about 4.3 mi from dam), taking turnoff to Crow Lode Mine, about 100 m before jeep trail, on S side of road in meadow, 33.48°N, 105.79°W, 2420 m, 11 Aug 1992, *Salas et al. 16* (PTIS); near Ruidoso, Montjeau Lookout Peak, 33.43°N, 105.73°W, 2920 m, 5 Aug 1992, *Salas et al. 32* (PTIS); White Mountains, Monjeau Lookout Road, 1.6 mi W of jct with Hwy 37 (road jct is located 8.8 mi N of Ruidoso), 33.40°N, 105.71°W, 8 Aug 1978, *Ugent & Ruhde 4-78 (*IBUG, MEXU, WIS); White Mountains, Monjeau Lookout Road, 5.2 mi W of jct with Hwy 37 (road jct is located 8.8 mi N of Ruidoso), 33.39°N, 105.75°W, 2743 m, 8 Aug 1978, *Ugent & Ruhde 5-78 (*IBUG, MEXU, PH, WIS); White Mountains, Tan Bark Canyon, 7/10 mi above the old "Crow Load Mine," the latter located 19.8 mi N of Ruidoso on Hwy 37, or 4.3 mi W of Bonito Lake Dam, 33.48°N, 105.79°W, 8 Aug 1978, *Ugent & Ruhde 6-78 (*WIS); Ruidoso, 33.34°N, 105.72°W, 2188 m, 28 Aug 1929, *Watkins s.n.* (TEX); James Canyon, Sacramento Mountains [E of Cloudcroft on Rt 82], 33.46°N, 105.77°W, 3 Aug 1899, *Wooton s.n.* (RSA, US); White Mountains, Oak Grove Campground, S36 T10S R12E [R11E, about 5 mi W of Alto on 532], 33.40°N, 105.75°W, 2438 m, 16 Aug 1980, *Worthington 6373* (ARIZ). Luna Co.: summit of Cooke's Peak, T20S R9W SW1/4 of SW 1/4 S25 [near Deming], 32.53°N, 107.74°W, 2560 m, 20 Sep 1986, *Columbus 642* (UC); base of high granitic cliffs just below (NE of) summit of Cooke's Peak, T20S R9W SW1/4 S25, 32.53°N, 107.74°W, 2499 m, 6 Sep 1987, *Columbus 1738* (UC). Otero Co.: Sierra Blanca, at N border of Mescalero Indian Reservation, 10 mi NW of Ruidoso, highest peak of White Mountains, 33.37°N, 105.81°W, 2700–3400 m, 24 Jul 1964, *Baad 953* (MICH); near Cloudcroft, at 19 mi marker on Rt 244 N of Cloudcroft, W roadside along a large pasture, 33.11°N, 105.63°W, 2343 m, 26 Sep 1995, *Bamberg 19* (PTIS); Cloudcroft, just across the road from the school among rocks protected from mowing, 32.96°N, 105.74°W, 2640 m, 26 Sep 1995, *Bamberg 20* (PTIS); Cloudcroft, grassy corner lot on S side of main street, 32.96°N, 105.74°W, 2650 m, 26 Sep 1995, *Bamberg 21* (PTIS); Haynes Canyon, Alamo Lincoln National Forest, 32.95°N, 105.82°W, 10 Aug 1911, *Barlow s.n.* (F); Lincoln Forest, bottom of Kerr [Karr] Canyon, S 22, T16S R11E [R12 E], 32.90°N, 105.81°W, 2316 m, 30 Aug 1921, *Burrall & Smith S-31* (RM); Cloudcroft and Ruidoso area, Cox Canyon, Sacramento Mountains, 32.95°N, 105.74°W, 3 Jul 1949, *Castetter & Dittmer 5538* (UNM); 1 mi S [SE] of Cloudcroft, 32.95°N, 105.72°W, 2743 m, 8 Jul 1916, *Chapline 587* (RM), 22 Aug 1956, *Waterfall 12954* (GH, MICH, RSA, SMU, TEX, UC, US); Cloudcroft, 32.96°N, 105.74°W, 19 Aug 1968, *Correll & Correll 36134* (GH, LL, NA, UC), 18 Aug 1919, *Eggleston 15595* (F); Cloudcroft, Lincoln Forest, 32.96°N, 105.74°W, 2700 m, 1–8 Jul 1918, *Eggleston 14524* (GH, NA, NY, US); 17.2 mi SW of Mayhill, 32.70°N, 105.78°W, 2743 m, 13 Aug 1949, *Gordon & Norris 606* (UNM); Lincoln National Forest, lane about 1/4 mi from Cloudcroft to the south, 32.94°N, 105.74°W, 2600 m, 31 Jul 1958, *Hawkes et al. 1156* (K); Lincoln National Forest, about 1 mi SE of Cloudcroft [Sleepy Grass Camp Area], 32.95°N, 105.72°W, 2700 m, 31 Jul 1958, *Hawkes et al. 1157* (C, IBUG, K, MEXU, US); Lincoln National Forest, Cloudcroft, in the main square, 32.96°N, 105.74°W, 2600 m, 31 Jul 1958, *Hawkes et al. 1158* (C, IBUG, K, MEXU, US); Lincoln National Forest, 3 mi N of Cloudcroft on road to Mescalero, 32.98°N,

105.72°W, 2850 m, 31 Jul 1958, *Hawkes et al. 1159* (C, K, US); Mescalero Indian Reservation, 16 mi from Cloudcroft, 33.11°N, 105.63°W, 2200 m, 31 Jul 1958, *Hawkes et al. 1160* (IBUG, K, MEXU); Turkey Pen Canyon, 15S 13E, S30, 32.98°N, 105.70°W, 17 Aug 1938, *Humphreys 75* (ARIZ, UNM); Cloudcroft, E edge of town, across the street from the school, on a rocky unmowed pile near a children's play area, 32.96°N, 105.74°W, 2640 m, 10 Aug 1992, *Salas et al. 8* (PTIS); Cloudcroft, on the S side of the main business district in a grassy area beside the propane gas company lot, 32.96°N, 105.74°W, 2650 m, 10 Aug 1992, *Salas et al. 9* (PTIS); Lincoln National Forest about 1/4 mi from Cloudcroft, on Apache Canyon Road on way to Sleepy Grass Campground, 32.94°N, 105.74°W, 2700 m, 10 Aug 1992, *Salas et al. 10* (PTIS); Lincoln National Forest near Cloudcroft, in Sleepy Grass Campground on Apache Canyon Road, 32.95°N, 105.72°W, 2640 m, 10 Aug 1992, *Salas et al. 11* (PTIS); Cloudcroft vicinity, at 8 mi N of Cloudcroft on Hwy 82, take the gravel road to Sixteen Springs Canyon to the cemetery (about 6.2 miles), 32.99°N, 105.58°W, 2320 m, 10 Aug 1992, *Salas et al. 12* (PTIS); Cloudcroft vicinity, at 8 mi N of Cloudcroft on Hwy 82, take the road to Sixteen Springs Canyon, near James Ridge Lookout Tower near campsite on N side of the road, 32.97°N, 105.61°W, 2610 m, 11 Aug 1992, *Salas et al. 13* (PTIS); Cloudcroft vicinity, at 8 mi N of Cloudcroft on Hwy 82 take the gravel road to Sixteen Springs Canyon, about 1.1 mi just below the parking pulloff at the curve, 32.96°N, 105.62°W, 2460 m, 11 Aug 1992, *Salas et al. 14* (PTIS); Cloudcroft vicinity, about 3.2 mi N of Cloudcroft on road to Mescalero, 32.98°N, 105.72°W, 2720 m, 11 Aug 1992, *Salas et al. 15* (PTIS); Sacramento Mountains, on N side of Cuervo Canyon, 32.70°N, 105.38°W, 2225 m, 10 Aug 1990, *Sivinski 1557* (UNM); Cloudcroft, E ridge of town across from school and ballfield, 32.96°N, 105.74°W, 7 Aug 1978, *Ugent & Ruhde 1-78* (WIS); 1 2/10 mi N of Hwy 82 on road towards Sixteen Springs Canyon (junction is located 8 mi E of Cloudcroft), 32.96°N, 105.62°W, 7 Aug 1978, *Ugent & Ruhde 2-78* (IBUG, MEXU, WIS); Sixteen Springs Canyon (6.2 mi N of Hwy 82 and 8 mi E of Cloudcroft), along wire fence of rural cemetery, 32.99°N, 105.58°W, 7 Aug 1978, *Ugent & Ruhde 3-78* (IBUG, MEXU, WIS); Sacramento Mountains, Apache Canyon, 5 mi S of Cloudcroft, Sleepy Grass Campground, 32.95°N, 105.72°W, 2682 m, 18 Jul 1981, *Ward & Soreng 81-411* (NY); along Tularosa Creek, 33.08°N, 106.02°W, 18 Aug 1899, *Wooton s.n.* (US); Sacramento Mountains, Cloudcroft, 32.96°N, 105.74°W, 9 Aug 1899, *Wooton s.n.* (CGE); Sacramento Mountains, James Canyon, 33.07°N, 105.45°W, 3 Aug 1899, *Wooton s.n.* (DS, MICH, UC, US). San Miguel Co.: Hot Spring Canyon above Las Vegas, 35.65°N, 105.30°W, 2250 m, 12 Sep 1881, *Engelmann s.n.* (MO); Montezuma [=Hot Springs, mountains on S side of village], 35.65°N, 105.30°W, 2250 m, 11 Sep 1963, *Lester et al. 8* (K). Sierra Co.: near Truth or Consequences, Emory Pass Lookout W of Hillsboro on Rt 152 W of Rt 25, at 330 compass within 50 ft of parking lot, 32.91°N, 107.76°W, 2490 m, 17 Aug 1996, *Bamberg 43* (PTIS); Sawmill Peak Area, Black Range, 33.46°N, 107.82°W, 2256 m, 12 Aug 1982, *Hutchins 10286* (UNM); Scales Creek, Black Range, 33.42°N, 107.90°W, 2362 m, 13 Aug 1982, *Hutchins 10398* (UNM); E Diamond Canyon, Black Range at T12S, R11W, S16, *S*-facing hill, 33.25°N, 107.99°W, 2134 m, 12 Aug 1982, *Knight 2217* (UNM). Socorro Co.: Sawmill Canyon, Magdalena Mountains, 33.92°N, 107.17°W, 2057 m, 2 Sep 1973, *Hutchins 4833* (UNM).—TEXAS: Brewster Co.: Paradise Canyon, about 5 mi W of Alpine, 30.65°N, 104.15°W, 22 Sep 1935, *Sperry T89* (TAES, TEX, US); Paradise Canyon W of Alpine, 30.36°N, 103.67°W, 2316 m, 18 Jul 1932, *Steiger 81-411* (NY); Big Bend National Park, Green Gulch, 29.29°N, 103.28°W, 1463 m, 30 Aug 1965, *Warnock 23476* (SRSC, TEX). Culberson Co.: Guadalupe Mountains, 23 Aug 1901, *Bailey 456* (US); Culberson County, Guadalupe Mountains National Park, N side of Bush Mountain, 31.97°N, 104.90°W, 1 Aug 1974, *Burgess 2255* (TEX). Jeff Davis Co.: near Fort Davis, on Rt 118 between McDonald Observatory an Madera Canyon (L. E. Wood Picnic area), 2.4 mi S of Madera Canyon where creek crosses the road (flood gauge), just off SW side of road, 30.70°N, 104.08°W, 1780 m, 19 Aug 1996, *Bamberg 46* (PTIS); near Fort Davis, on Rt 118 at Madera Canyon (L. E. Wood picnic area), along canyon edge of park near the fenceline, 30.71°N, 104.11°W, 1780 m, 19 Aug 1996, *Bamberg 48* (PTIS); near Fort Davis, on Rt 118 at Madera Canyon (L. E. Wood picnic area), near Canyon (S) edge of and across Rt 118 in ditch, 30.71°N, 104.11°W, 1780 m, 9 Sep 2001, *Bamberg et al. 84* (PTIS); near summit of Mount Livermore, 30.64°N, 104.18°W, 2591 m, 20 Sep 1966, *Correll 33763* (GH, LL), 14 Aug 1914, *Young s.n.* (TEX); on upper slopes on summit of Sawtooth Mountain, Davis Mountains, 30.69°N, 104.23°W, 2316 m, 11 Sep 1967, *Correll 34968* (LL, UC); Tiffit Canyon, Davis Mountains, SE of Mitre Peak, 30.46°N, 103.78°W, 1524 m, 9 Oct 1927, *Cory 48514* (NA); Davis Mountains, Mount Livermore, 30.64°N, 104.18°W, 2300 m, 5 Aug 1935, *Hinckley 293* (ARIZ, F, GH, NY, SMU, SRSC, TEX); Davis Mountains Preserve, Tobe Spring and Canyon above spring within 0.2 mi upstream to talus slopes below Tobe Gap, 30.65°N, 104.18°W, 2042 m, 28 Jul 1999, *Karges & Bryan s.n.* (SRSC); N slope of Mount Livermore in extreme upper Madera Canyon, very near the peak, 30.64°N, 104.18°W, 2438 m, 30 Sep 1991, *Lockwood 289* (SRSC); upper Madera Canyon, 21 1/4 mi NW of Fort Davis, 30.64°N, 104.18°W, 12 Aug 1934, *Parks & Cory 9507* (TAES); Davis Mountains, Mount Livermore, NE slopes in and near Madera Canyon, and on the peak, 30.64°N, 104.18°W, 1 Sep 1984, *Powell & Powell 4888* (SRSC); near Mount Livermore Peak, ridges SE of the peak, 30.63°N, 104.17°W, 2460 m, 17 Sep 1977, *Powell et al.*

3195 (SRSC); upper canyons and slopes in vicinity of Tobe's Gap, N of Mount Livermore, 30.64°N, 104.18°W, 2195 m, 23 Aug 1986, *Powell et al. 5276* (SRSC); Davis Mountains, upper canyons and slopes of Tobe's Gap, N of Mount Livermore, 30.64°N, 104.18°W, 2195 m, 23 Aug 1986, *Powell et al. 5287* (SRSC); above upper spring in Madera Canyon on Mount Livermore, Davis Mountains, 30.64°N, 104.18°W, 11 Sep 1947, *Warnock 7451* (SRSC, TEX); Elbow Canyon, scenic loop, Davis Mountains, 30.69°N, 104.08°W, 1676 m, 14 Sep 1959, *Warnock 17366* (SRSC, TEX); upper Madera Canyon of Mount Livermore, Davis Mountains, 30.64°N, 104.18°W, 2286 m, 23 Aug 1968, *Warnock 23021* (SRSC); rock talus near top of Mount Livermore, Davis Mountains, 30.64°N, 104.18°W, 2438 m, 23 Aug 1968, *Warnock 23090* (SRSC, TEX); upper Madera Canyon, Davis Mountains, 30.64°N, 104.18°W, 1981 m, 10 Aug 1968, *Warnock 23310* (SRSC); Mount Livermore, 30.64°N, 104.18°W, 2134 m, 12 Sep 1947, *Warnock & Hinckley 4138* (NY, SRSC); base of N-facing cupola of rocky slope [probably near Mount Livermore], 20 Sep 1986, *Whitefield 1* (SRSC); around Davis Mountains, 30.64°N, 104.18°W, 9 Sep 1918, *Young s.n.* (RSA, SRSC, TEX); Mount Livermore, 30.64°N, 104.18°W, 21 Aug 1914, *Young s.n.* (TEX). Predisio Co.: at summit of Chinati Peak, Chinati Mountains, 29.95°N, 104.48°W, 2325 m, 21 Jul 1945, *McVaugh 7454* (NA, SMU); Chemates Mountains [probably Chinati Mountains], 29.95°N, 104.48°W, 2325 m, 1889, *Nealley 586* (US); about 3 mi S of Russell Menzies ranch house [Chinati Mountains?], 29.90°N, 104.45°W, 1768 m, 9 Nov 1946, *Warnock & Hinckley 3704* (NY); in upper Tigna Canyon, N side of Chinati Mountains, old Woods Ranch 18 [8] mi NW of Shafter, 29.94°N, 104.43°W, 1676 m, 10 Nov 1946, *Warnock & Hinckley 46924* (NY, SRSC, TEX). County unknown: Tippit Canyon, 9 Oct 1927, *Parks & Cory s.n.* (TAES).

Mexico. AGUASCALIENTES: Mpio. Palo Alto, Mesa de Preñadas, 21.92°N, 101.97°W, 2400 m, 25 Sep 1980, *Gutiérrez 123* (CHAPA); Cerro San Juan, near Km 21 on hwy between Rincón de Romos and Loreto, 22.21°N, 102.21°W, 13 Aug 1976, *Hartman & Funk 4066* (LL); Mount Picacho, 21.87°N, 102.43°W, 1 Sep 1901, *Hartweg 292* (K); Sierra del Laurel, near the Jalisco-Aguascalientes border, about 10 mi SE of Calvillo, 3 hours by horse from Rancho de los Adobes, 21.80°N, 102.68°W, 2500–2700 m, 26–28 Aug 1960, *McVaugh 18400* (ENCB, G, LL, MICH, NY, US), *McVaugh 18426* (ENCB, LL, MICH, US); about 20 km E of Rincón de Romos, road to Asientos, between Cerro Altamira and Cerro San Juan, 21.80°N, 102.68°W, 2200–2450 m, 26–28 Aug 1960, *McVaugh 23765* (MICH); Hwy 70, about 33 km from Aguascalientes, 10.2 km along the track past Milpillas de Arriba towards potrero Los López, 21.95°N, 102.60°W, 2460 m, 26 Sep 1984, *Tarn et al. 217, 218* (K, PTIS); Hwy 70, at Km 49 just before Calvillo, then N thru San Isidro and 12 km N of La Labor, beyond Temascal towards La Congoja, 22.05°N, 102.73°W, 2300 m, 26 Sep 1984, *Tarn et al. 222* (PTIS).—BAJA CALIFORNIA SUR: San Francisquito Mountains, 25.03°N, 110.90°W, 1890, *Brandegee 411* (UC) [fide Ewan, 1942]; El Taste, 23.70°N, 109.82°W, 13 Sep 1893, *Brandegee s.n.* (RSA, UC); La Laguna, at Laguna Mountains, 27.63°N, 113.46°W, 22 Sep 1930, *Jones 27312* (DS, RSA); La Laguna Valley, Sierra de La Laguna, 23.50°N, 109.93°W, 1820 m, 6 Nov 1990, *León 4804* (IEB); Sierra La Laguna, on a footpath to La Laguna marsh on top of Sierra, ENE of Todos Santos, 23.53°N, 110.05°W, 1180 m, 8 Oct 1988, *Spooner et al. 4234, 4239* (INIFAP, PTIS, WIS), *Spooner et al. 4237* (PTIS).—CHIHUAHUA: Mpio. Guachochic, along stone fence following road to the W of Guachochic, 26.85°N, 107.08°W, 2500 m, 12 Jul 1972, *Bye 2326* (ECON, MEXU); Mpio. Bocoyna, S of San Ignacio Arareco, S of Creel airstrip, 27.83°N, 107.58°W, 2195 m, 20 Jul 1972, *Bye 2391* (GH); between Creel and San Ignacio, 27.75°N, 107.63°W, 2233 m, 23 Jul 1972, *Bye 2425* (MEXU); Mpio. Guachochic, Cusárare, between road vado of Arroyo Cusárare and falls, 27.05°N, 107.90°W, 2103 m, 27 Jul 1972, *Bye 2622* (ECON); Mpio. Batopilas, E of La Bufa, S side of Barranca de Batopilas, at base of eroded slope along arroyo bank, 27.14°N, 107.64°W, 1036 m, 3 Aug 1973, *Bye 4510* (ECON); Mpio. Bocoyna, E of Gonogochi, E of Creel, flat N of valley, 27.84°N, 107.68°W, 2286 m, 7 Sep 1973, *Bye 4943* (ECON); Mpio. Bocoyna, SW of Creel along Río Oteros along upper river bank, 27.83°N, 107.58°W, 14 Aug 1977, *Bye 8011* (RM, VT); Mpio. Guerrero, S of Mesa Colorada, S side of Arroyo Ancho, 28.19°N, 107.74°W, 2100 m, 28 Aug 1978, *Bye 8880* (MEXU, MICH); Mpio. Guazapares and Chínipas, between Wasachi and cross on ridge W of Rokoloibo, 27.59°N, 108.27°W, 1829–2103 m, 23 Jul 1974, *Bye & Mundy 6500* (ECON); Mpio. Bocoyna, Ejido de San Ignacio Arareco, 27.63°N, 107.69°W, 3070 m, 9 Sep 9187, *Bye et al. 15693* (MEXU); in large mountain mass W of Rt 45, about 15 mi S of Encinillas, 29.38°N, 106.45°W, 23 Oct 1959, *Correll 23287* (LL); Sierra de Santa Bárbara, about 4 mi SW of Villa Matamoros, 26.71°N, 105.60°W, 1920 m, 5 Oct 1959, *Correll & Gentry 22818* (LL); 46 mi W of Parral, on road to El Vergel, 26.95°N, 106.02°W, 1676 m, 6 Oct 1959, *Correll & Gentry 22867* (LL); near San Juan, Sierra Chinatú, 26.22°N, 106.65°W, 2713 m, 8 Oct 1959, *Correll & Gentry 22919* (LL); 20 km N Ciudad de Chihuahua, on base of a canyon, next to the Temple of San Cristóbal, 28.80°N, 106.20°W, 1600 m, 2 Oct 1966, *Flores S-959* (K, MEXU); NE of Ciudad Cuauhtémoc, beyond Santo Tomás, on road to Madera, 28.41°N, 106.85°W, 2000 m, 12 Aug 1967, *Flores S-966* (MEXU); 92 km after Chihuahua, on road to Santa Clara, Canyon of Santa Clara, 29.35°N, 106.51°W, 1900 m, 14 Aug 1967, *Flores S-967* (ENCB, MEXU, TEX); between Guadalupe and Calvo and Tecolote, 26.82°N, 106.42°W, 19 Oct 1959, *Gentry 18006* (PTIS); Mpio.

Guadalupe and Calvo, Sierra Mohinora, 26.10°N, 106.96°W, 2286 m, 13 Oct 1959, *Gentry et al. 17995* (ARIZ, LL, US); Majalca, 40 mi NW of Chihuahua, near the village, 29.13°N, 106.08°W, 2100 m, 14 Aug 1958, *Hawkes et al. 1230* (C, K, PTIS, US), *Hawkes et al. 1259* (IBUG, K, MEXU, PTIS), 20 Aug 1935, *Le Sueur 148* (F, GH, SMU, TEX), 11 Aug 1939, *White 2380* (GH, MICH); road from Chihuahua to Majalca, 3.5 mi before Majalca, 28.85°N, 106.90°W, 1900 m, 15 Aug 1958, *Hawkes et al. 1272* (C, K, US, WIS); Mpio. Balleza, Vergel, near the Durango border and near the fire tower, 26.61°N, 106.44°W, 2900 m, 17 Aug 1958, *Hawkes et al. 1293* (BR, C, K, PTIS, US); Mpio. Balleza, road from Vergel to Pueblo Nuevo, 26.96°N, 106.45°W, 2600 m, 17 Aug 1958, *Hawkes et al. 1298* (C, K, S, US, WAG); Mpio. Balleza, Vergel, on the edge of the village when entering from Parral, 26.59°N, 106.36°W, 2750 m, 18 Aug 1958, *Hawkes et al. 1301* (C, F, K, PTIS, US); 11 mi from Vergel on road from Parral, 26.65°N, 106.37°W, 2500 m, 18 Aug 1958, *Hawkes et al. 1314* (IBUG, K, MEXU, PTIS, US); road from Parral to Vergel, 11 mi from Vergel, Saddle, 28.30°N, 107.10°W, 2500 m, 18 Aug 1958, *Hawkes et al. 1315* (K); road from Vergel to Parral, Arroyo Chihuito, 26.70°N, 106.23°W, 2100 m, 18 Aug 1958, *Hawkes et al. 1319* (C, K, US), *Hawkes et al. 1320* (K); Mpio. Guachochic, Caborachi, 20 km E Guachochic, 26.78°N, 106.91°W, 2000 m, 9 Aug 1982, *Hernández 8566* (MEXU), 10 Aug 1982, *Hernández 8600* (MEXU); S of Guadalupe and Calvo, slope of Sierra de Mohinora, 26.00°N, 107.00°W, 2800–3000 m, 8 Oct 1988, *Hjerting 7260*, *7263*, *7264*, *7265* (PTIS); Río Mayo Region, 4 km ESE of Memelichic, 28.02°N, 108.17°W, 2500 m, 17 Aug 1989, *Jenkins et al. 89-111* (ARIZ); Río Mayo Region, Cordón Capeina, 5 km W of Huajmar air strip, 28.19°N, 108.33°W, 2500 m, 18 Aug 1989, *Jenkins et al. 89-233* (ARIZ); Soldier Canyon, Sierra Madre Mountains, 28.63°N, 107.75°W, 2012 m, 16 Sep 1903, *Jones s.n.* (RSA); SW of Nuevo Casas Grandes in Sierra Madre Occidental, about 1 mi S of Colonia García along road to Colonia Llano Largo, 29.96°N, 108.33°W, 2134 m, 4 Sep 1979, *Keil et al. 13408* (ASU, TEX); Mojarachic, 29 Jul 1938, *Knobloch 5232* (F, MSC); Nabogamé, 28.50°N, 108.50°W, 1800 m, 21 Jul 1988, *Laferrière 1525* (ARIZ, MO); Mpio. Temosachi, Nabogame, 28.50°N, 108.50°W, 1800 m, 16 Aug 1988, *Laferrière 1676* (MO, TEX); Río Mayo Region, Gamusero settlement and adjacent Río La Haciendita of La Bataria, 28.30°N, 108.35°W, 1700 m, 29 Aug 1986, *Martin et al. s.n.* (ARIZ); Upper Río Mayo, 2 km SE of Ocampo, 28.18°N, 108.35°W, 2100 m, 25 Jul 1990, *Martin et al. s.n.* (ARIZ); WSW of Buenaventura about 12 air mi, Rancho de la Tinaja, 29.71°N, 107.59°W, 2000–2100 m, 30 Aug 1989, *Mayfield et al. 194* (TEX); Río Gavilán, 7 mi SW of Pacheco, 30.10°N, 108.43°W, 1800 m, 7 Aug 1948, *McCabe 71* (WIS); Mpio. Guadalupe and Calvo, Cerro de Mohinara, S of Guadalupe and Calvo, 26.10°N, 106.97°W, 3100–3300 m, s.d., *McDonald 2420* (TEX), 27 Aug 1987, *McDonald & Martínez 2398* (NY, TEX); Sierra Madre, near Colonia García, 29.98°N, 108.33°W, 29 Jul to 21 Jun 1899, *Nelson 6166* (GH, K, US), 2286 m, 27 Jul 1899, *Townsend & Barber 172* (BM, E, ENCB, F, G, GH, K, MEXU, MO, NY, P, RSA, TEX, UC, US, VT, WU, Z); Mpio. Madera, Los Leones, rt from Matachic to Madera, 29.20°N, 108.10°W, 2250 m, 1 Oct 1980, *Ochoa 14196* (IBUG, K, MEXU, PTIS, US); between Nuevo Madera and Las Veras, Mpio. Madera, 29.28°N, 108.11°W, 2300 m, Oct 1982, *Ochoa 14198* (CIP); El Mirador, on rt from Temosichic to Bajumas, 30.00°N, 106.26°W, 2350 m, Sep 1980, *Ochoa 14201* (CIP, IBUG, MEXU, PTIS); El Mirador, 30.00°N, 106.26°W, 2150 m, Sep 1980, *Ochoa 14202* (MEXU, IBUG, PTIS); Km 63-64 along the road from La Junta to Temochec, 28.40°N, 107.38°W, 2150 m, 2 Oct 1982, *Ochoa 14203* (CIP, PTIS, US, WIS); road from Temochec to Basaseachic, 2 km above El Vallecito, 28.22°N, 107.85°W, 2075 m, Oct 1982, *Ochoa 14204* (CIP, US, WIS); rt from Tomochic to Basasiachic, 2 km above El Vallecito, 28.20°N, 107.78°W, 2075 m, Sep 1980, *Ochoa 14205* (CIP, IBUG, K, MEXU, PTIS, US, WIS); Km 20–21, road from Chihuahua to Ciudad Juárez, 29.08°N, 106.20°W, 1550 m, 3 Oct 1980, *Ochoa 14207* (US); La Ciénega, 28.08°N, 108.65°W, 1524–1828 m, 20 Jul 1965, *Pennington 72* (TEX); Yepachic, 28.43°N, 108.38°W, 19 Sep 1971, *Pennington 93* (MEXU); near Chihuahua, 28.63°N, 106.08°W, 29 Aug 1885, *Pringle 667* (BM, CHAPA, F, G, GH, JE, K, NA, NY, P, PH, US, WIS); La Bufa, 27.11°N, 107.58°W, 3 Sep 1887, *Pringle s.n.* (NA); 23 km along road to Santa Clara from Km 92 on Hwy 45 from Chihuahua to Delicias, 29.28°N, 107.02°W, 1800 m, 21 Sep 1982, *Rivera-Peña & Ross 5* (A, G, K, PTIS); 17 km from Cuauhtémoc towards La Junta, 28.40°N, 106.88°W, 2090 m, 21 Sep 1982, *Rivera-Peña & Ross 6* (BM, K); along the road from La Junta to Tomochic, on the E side of the Papigochic River, 29.68°N, 107.32°W, 2090 m, 21 Sep 1982, *Rivera-Peña & Ross 7* (B, K, P, PTIS); about 15 km along the road from Madera to Sirupa, 29.12°N, 108.15°W, 2100 m, 23 Sep 1982, *Rivera-Peña & Ross 15* (G, K, PTIS); Mpio. Belleza, Ejido de Guazarachic, 26.95°N, 106.72°W, 2250 m, 9 Aug 1974, *Robert 3204* (ENCB); Sierra La Brena on the Sierra Madre Occidental, 2 mi W of Junction of Pacheco/Willy, along a wash bottom and among rock faces, 30.02°N, 108.26°W, s.d., *Spencer 1445* (TEX); railroad km 171.5, about 3 km SW of Bauchivo railroad station, Los Mochis to Chihuahua Railroad, about 250 m SE of railroad line across stream, 27.30°N, 108.08°W, 1550 m, 11 Oct 1988, *Spooner et al. 4241* (PTIS); in creek on SE side of railroad line at San Rafael, on N side of town, 27.50°N, 107.88°W, 2150 m, 12 Oct 1988, *Spooner et al. 4245* (INIFAP, PTIS); Cañón de la Madera, SE flank of Sierra Rica, N of Rancho de la Madera, 29.53°N, 106.88°W, 25 Sep 1942, *Stewart 2528* (GH); near hwy, 20 km N of Chihuahua City, 28.84°N, 106.06°W, 10 Oct 1941, *Stewart & Johnston 2118* (GH); Cerro Mo-

hinora, about 10 mi SW of Guadalupe and Calvo, SE base, 25.96°N, 107.03°W, 2300–2400 m, 13 Aug 1960, *Straw & Forman 2045* (MICH, RSA); 15 km towards San Juanito from the La Junta to Yepachic Hwy, 28.73°N, 107.95°W, 2070 m, 22 Sep 1982, *Tarn et al. 8* (K, MEXU, PTIS, S); 27 km along the road to San Juanito from the La Junta to Yepachic Hwy, 28.23°N, 107.45°W, 2060 m, 22 Sep 1982, *Tarn et al. 9* (G, IBUG, K, MEXU, PTIS); 30 km along the road to San Juanito from the La Junta to Yepachic Hwy, 28.23°N, 107.45°W, 2040 m, 22 Sep 1982, *Tarn et al. 10* (A, IBUG, K, MEXU, PTIS); near Cebolla, 36 km along the road from the La Junta to Yepachic Hwy, 28.14°N, 107.50°W, 2060 m, 22 Sep 1982, *Tarn et al. 11* (BM, K, PTIS); about 5 km W of Madera on the road to Sirupa, 29.13°N, 108.13°W, 2050 m, 23 Sep 1982, *Tarn et al. 16* (IBUG, K, MEXU, PTIS); Mpio. Madera, 3 km SE of El Maderal, 29.67°N, 108.23°W, 2050 m, 28 Sep 1982, *Tenorio & Romero 1802* (MEXU).—COAHUILA: 14 km W of San Antonio de las Alazanas, 25.30°N, 100.70°W, 2500 m, 11 Aug 1970, *Alaniz & Medina GA-451* (TEX); Mpio. Sierra Mojada, Sierra Mojada, Canyon of San Salvador, 27.25°N, 103.68°W, 15 Sep 1939, *Muller 3308* (GH, NA, UC); Sierra de La Madera, from a dirt road going W about 2.5 km S of Ocampo, 28 km along this road to base of Cañón de la Charretera, then hiking uphill a few km, 27.10°N, 102.51°W, 2370 m, 19 Sep 1997, *Rivera-Peña et al. 925* (INIFAP); near top of Sierra de La Gloria, from about 15 km E of Monclova on road to Candela, then S on road to farm of Doctor Cárdenas (by swimming pool complex), up private dirt road to nearing top of sierra, then hike to top, 26.85°N, 101.27°W, 2070 m, 21 Sep 1997, *Rivera-Peña et al. 926* (INIFAP, MEXU, PTIS); road on S side of Santiago Xalitzintla, 20.50°N, 98.53°W, 2580–2650 m, 12 Aug 1987, *Tlapa & Ubierna 106* (MEXU); Sierra Maderas del Carmen, near Campo Tres, on ridge between camp and "Hell's Kitchen" to the N, 29.00°N, 102.60°W, 2600 m, 6 Aug 1974, *Wendt & Adamcewicz 518F* (LL, MEXU, TEX).—DISTRITO FEDERAL: Ajusco, Volcano Xitle, 19.21°N, 99.26°W, 3100 m, s.d., *Antipovich 1209* (K); Ticomán, 19.52°N, 99.13°W, 14 Aug 1955, *Bopp 231* (MEXU); Valley of Mexico, 19.35°N, 99.12°W, 1865–1866, *Bourgeau 346 p.p.* (C, F, K, LL, P, US); Zacoalco Mountain, near Guadalupe, 19.50°N, 99.12°W, 1865, *Bourgeau 544 p.p.* (LL, P); El Cantil, 19.21°N, 99.27°W, 26 Oct 1947, *Correll 14214* (NA, PTIS); Pico de Xitle, 19.21°N, 99.25°W, s.d., *CPC 1333.2* (PTIS); rd to Mount Ajusco, a little after the village of the same name, 19.20°N, 99.24°W, 2900 m, 21 Sep 1964, *Flores S-782* (CAS, ENCB, MEXU, MO, NY); Km 24.3 on Mexico to Toluca road, 19.28°N, 99.33°W, 2860 m, 9 Oct 1964, *Flores S-795* (MEXU); after Santa Rosa, road to Desierto de los Leones, 19.25°N, 99.32°W, 2990 m, 25 Aug 1967, *Flores S-979* (MEXU); Santiago Acahualtepec, near the women's prison, 19.36°N, 99.09°W, 2320 m, 18 Sep 1967, *Flores S-998* (ENCB, MEXU); Sierra de Guadalupe, N of Cuautepec, 19.58°N, 99.13°W, 31 Jul 1950, *Gold s.n.* (MEXU); vicinity of Rancho del Rosario, 10 mi N of Mexico City near Atzcapotzalco, 19.48°N, 99.16°W, 2225–2286 m, Jun–Jul 1939, *Happ 210* (MO); Cerro de Guadalupe, W slope extending N to Cerro Guerrero, 19.48°N, 99.10°W, 2250 m, 7 Jul 1949, *Hawkes et al. 1002* (K, S); S edge of Mexico City, Pedregal in region of Tizapán N road to Tlalpan, 19.28°N, 99.17°W, 2200 m, 7 Jul 1949, *Hawkes et al. 1005* (K); Pedregal de Coyoacán, S of Mexico City, 19.33°N, 99.16°W, 8 Jul 1949, *Hawkes et al. 1008* (G, K, LL); near Mexico City, above Santa Fe, road to Toluca S branch at Km 10–11, 19.38°N, 99.25°W, 27 Jul 1949, *Hawkes et al. 1033* (BR, K, LL); Ajusco, on path from the village to Cerro Ajusco, 19.22°N, 99.20°W, 2950 m, 21 Aug 1949, *Hawkes et al. 1078* (A, G, K, LL, S); above Contreras, Cuatro Dínamos, between the first and second hydroelectric plants, 19.30°N, 99.28°W, 2600 m, 25 Sep 1949, *Hawkes et al. 1107* (K, PTIS); Ajusco, 19.23°N, 99.20°W, 2950 m, 21 Aug 1949, *Hawkes et al. 1579* (PTIS); Texcotzingo, 10 Jul 1938, *Kenoyer A294* (F); Pedregal de San Angel, 19.37°N, 99.23°W, Sep 1939, *Lyonnet 1009* (MEXU, US); Cuajimalpa, 19.36°N, 99.30°W, Sep 1946, *Martínez 15092* (MO); Cerro Vicente Guerrero, SE of the Federal District, 19.17°N, 99.18°W, 2275 m, 18 Sep 1980, *Ochoa 14149* (CIP, US, WIS); Pedregal de San Angel, 19.43°N, 99.14°W, 3100 m, 3 Jul 1980, *Panti 159* (MEXU); Valley of Mexico, 19.48°N, 99.09°W, 2225 m, 10 Sep 1901, *Pringle 4602* (ARIZ, BM, CU, F, G, GH, MICH, NY, PH, UC, US, W); Pedregal, Federal District, 19.37°N, 99.23°W, 29 Aug 1896, *Pringle 7369* (E, MO, NA, WIS); Tizapán, Valley of Mexico, 19.43°N, 99.10°W, 24 Aug 1900, *Pringle s.n.* (NA); 343 km S of Morelia, below the road at Experimental Farm of El Olivar, 19.30°N, 99.25°W, 9 Jun 1965, *Rowe 9* (PTIS); San Esteban Zacuba, 19.16°N, 98.96°W, Sep 1909, *Ruiz 17* (F, US); El Corazón, 19.08°N, 99.03°W, 19 Sep to 22 Aug 1930, *Russell & Souviron 100* (US); Cerro Xitle, 19.27°N, 99.22°W, 3000 m, 19 Sep to 22 Aug 1930, *Russell & Souviron 173* (US); Tlalpan, 19.28°N, 99.17°W, 22 Aug 1930, *Russell & Souviron 35,39,42,43* (US); Delegación Coyoacán, Pedregal de San Angel, S of Mexico City, 19.33°N, 99.16°W, 13 Aug 1944, *Sharp & Gilly 140* (F, MICH, MSC); San Angel, 19.37°N, 99.23°W, 20 Aug 1923, *Smyth 90* (US); S of road from Los Reyes to Ixtapalapa, opposite to track above Santiago Acahualtepec, 19.36°N, 99.09°W, 2320 m, 18 Sep 1967, *Tarn 102* (K); S of road from Los Reyes to Ixtapalpa, through Santiago Acahualtepec, past Quarry, 19.36°N, 99.09°W, 2320 m, 21 Sep 1967, *Tarn 116* (K), 23 Sep 1967, *Tarn et al. 119* (BR, IBUG, K, MEXU, PTIS); Delegación of Tlalpan, Topilejo, 19.20°N, 99.14°W, 2700 m, 8 Jun 1976, *Ventura 1542* (ENCB, GH, IEB, MEXU, MO); Delegación de Tlalpan, Cerro del Ajusco, 19.28°N, 99.16°W, 2900 m, 18 Jun 1977, *Ventura 2845* (ASU, ENCB, IEB, MEXU, MO, NY); Colonia Roma, 19.13°N, 98.96°W, 11 Sep 1925, *Yoshida 599* (ENCB).—DURANGO: La Mesita de Los Pinos, 25.22°N,

106.43°W, 10 Sep 1989, *Benítez P903* (CHAP); 11 km from Tepehuanes towards Guanaceví, 25.35°N, 105.73°W, 2015 m, 31 Aug 1989, *Bravo 110* (CHAP, MEXU); 17 km from Tepehuanes towards Guanaceví, 25.35°N, 105.73°W, 2 Sep 1989, *Bravo 137* (CHAP); Mpio. Santiago Papasquiaro, outskirts of Los Altares, 25.00°N, 105.90°W, 2430 m, 29 Jul 1990, *Bravo 1003* (IEB); Mpio. Las Cebollitas, private land Las Cebollitas, 25.10°N, 106.45°W, 2460 m, 1 Aug 1990, *Bravo 1062* (IEB); Mpio. Canelas, 0.5 km from the Campamento Cuevecillas of the UAF Topia, 25.12°N, 106.40°W, 2650 m, 4 Aug 1990, *Bravo 1145* (IEB, MEXU); Km 26 from Tepehuanes, towards Guanaceví, 25.35°N, 105.73°W, 2000 m, 31 Aug 1989, *Bravo & Ramos 128* (CHAP, MEXU); Mpio. Santiago Papasquiaro, 3.5 km W of La Soledad, 11 km NW of Santiago Papasquiaro, 25.08°N, 105.53°W, 1900–2100 m, 23 Aug 1983, *Corral & Worthington 11279* (BH, MO); 6 mi W of Durango, on Rt 40, 24.03°N, 104.83°W, 24 Jul 1958, *Correll & Johnston 20049* (LL, US); 10 mi W of Durango, Rt 40, 23.89°N, 104.98°W, 24 Jul 1958, *Correll & Johnston 20063* (US); N slope of canyon of the Río Chico, 18 mi W of Durango, Rt 40, 23.33°N, 105.11°W, 24 Jul 1958, *Correll & Johnston 20075* (K, LL, MO, NY, PTIS, UC); Mimbres Canyon, 26 mi W of Durango, Rt 40, 23.94°N, 104.99°W, 24 Jul 1958, *Correll & Johnston 20135* (LL, S, US); Rt 40, W of Durango, near Navajas, 23.90°N, 105.13°W, 1540 m, 8 Jul 1966, *Flores S-952* (ENCB, MEXU); Rt 40, 7.5 km W of Durango, 24.05°N, 104.70°W, 2000 m, 5 Oct 1966, *Flores S-961* (K, MEXU, ENCB); Rt 40, W of Durango, near Pueblo Navajas, 23.90°N, 105.13°W, 2540 m, 6 Oct 1966, *Flores S-962* (K, ENCB); Rt 40, W of Durango, next to poblado Metates, 23.96°N, 104.83°W, 2280 m, 16 Aug 1967, *Flores S-970* (MEXU); Rt 40, 60 km W of Durango, 24.08°N, 104.98°W, 2250 m, 17 Aug 1967, *Flores S-971* (CHAPA, ENCB, MEXU); Rt 40, 60 km W of Durango, on the left side of the road, 24.08°N, 104.98°W, 2590 m, 17 Aug 1967, *Flores S-972* (CHAPA, ENCB, MEXU); Rt 40, 148 km W of Durango on road to Mazatlán, 24.06°N, 105.72°W, 2600 m, 17 Aug 1967, *Flores S-973* (CHAPA, ENCB, MEXU); Rt 40, Buenos Aires, 152 km W of Durango, on right side of road, 25.40°N, 103.87°W, 2670 m, 17 Aug 1967, *Flores S-974* (CHAPA, ENCB, MEXU); Buenos Aires, 152 km W of Durango, on left side of road, 23.72°N, 105.64°W, 2670 m, 16 Aug 1967, *Flores 975* (CHAP, CHAPA, MEXU); Rt 40, El Espinazo del Diablo, 169 km W of Durango, 24.06°N, 105.76°W, 2380 m, 17 Aug 1967, *Flores S-976* (ENCB); Mpio. El Mezquital, 30 km S of El Troncón, on road to Temoaya, 23.26°N, 104.36°W, 2350 m, 24 Sep 1982, *González & Fernández 2226* (CHAPA, IEB, MEXU, MICH, NY); Km 972, Hwy 40, Durango–El Salto, 23.90°N, 105.02°W, 30 Sep 1957, *Graham 358* (K, PTIS); near Las Adjuntas, 23.73°N, 105.52°W, Jul–Nov 1957, *Graham 362* (K); near the Chihuahua border, 45 mi from Parral between Ojito and Río Balleza, after passing highest point, 26.33°N, 106.36°W, 2200 m, 16 Aug 1958, *Hawkes 1288* (C, K, US, WAG); near the Chihuahua border, 25 km SW of Parral, road to Puerto de Sandía on the old railway, 25.95°N, 105.86°W, 2050 m, 16 Aug 1958, *Hawkes et al. 1280* (K); near Chihuahua border, 40 mi from Parral to Vergel, 26.02°N, 105.70°W, 2300 m, 16 Aug 1958, *Hawkes et al. 1283* (C, K, US); near Chihuahua border, road between Río Balleza and Arroyo Chihuite, 28 mi from Vergel, 26.33°N, 106.36°W, 1800 m, 18 Aug 1958, *Hawkes et al. 1318* (K); El Soldado, turn N, off of the Durango to Mazatlán hwy, 24.18°N, 105.03°W, 2400 m, 11 Sep 1958, *Hawkes et al. 1475* (IBUG, MEXU, PTIS); 3 mi towards Otinapa, turning N at El Soldado from the Durango to Mazatlán hwy, 24.18°N, 105.03°W, 2400 m, 11 Sep 1958, *Hawkes et al. 1476* (K, PTIS); near Hacienda Otinapa, Rancho Alamito, high valley of Río Chico, 24.95°N, 103.90°W, 2300 m, 11 Sep 1958, *Hawkes et al. 1482* (C, K, P, PTIS, US); NW of Durango, 1 mi from Otinapa along the road to Durango, 24.18°N, 105.03°W, 2200 m, 11 Sep 1958, *Hawkes et al. 1486* (IBUG, K, MEXU, MPU, PTIS); Mpio. Tepehuanes, 18 km NW Tepehuanes, 25.40°N, 105.80°W, 1700 m, 20 Jul 1982, *Hernández 8008* (MEXU); Mpio. Tepehuanes, 30–40 km W Tepehuanes, toward Topia, 25.46°N, 105.90°W, 2000 m, 23 Jul 1882, *Hernández 8197* (MEXU); Mpio. Tepehuanes, 30 km NW de Tepehuanes, 25.43°N, 105.88°W, 2000 m, 25 Jul 1982, *Hernández 8238* (MEXU, NY); Mpio. Súchil, Magueicitos, La Michilía Biosphere Reserve, 23.64°N, 103.95°W, 25 Aug 1975, *Maury et al. 160* (IEB); N slopes of Cerro Huehueto, S of Huachicheles, about 75 mi W of Durango City, 24.08°N, 105.75°W, 2900–3150 m, 2 Jul 1950, *Maysilles 7269* (MICH); Hacienda Coyotes, 63 mi WSW of the city of Durango, 23.73°N, 105.48°W, 2400–2500 m, 26 Jul 1950, *Maysilles 7432* (ASU, CAS, CHAPA, LL, MICH); N slopes of Cerro Huehuento S of Huachicheles, about 75 mi W of Durango City, 24.09°N, 105.45°W, 2900–3150 m, 23 Jul 1955, *Maysilles 7995* (MICH); Tejamén, 24.80°N, 105.13°W, 21–27 Aug 1906, *Palmer 484* (F, GH, K, NY, US); Sierra Azul, 80 km S of Durango on road to La China just N of Mezquital, then driving up the sierra to the W on a dirt road towards San Miguel Temoaya, 24 km on this dirt road, 23.42°N, 104.51°W, 2410 m, 10 Sep 1997, *Rivera-Peña et al. 917* (INIFAP); Sierra Azul, 80 km S of Durango on road to La China just N of El Mezquital, then driving up the sierra on a road W up a dirt road on way to San Miguel Temoaya, 25 km up this road, 23.41°N, 104.51°W, 2420 m, 10 Sep 1997, *Rivera-Peña et al. 918* (INIFAP, MEXU, PTIS, WAG); on dirt road N of Rt 40 W of Durango on way to Mazatlán, diverging N at Coyotes to San Miguel de Cruces, 92 km up this dirt road, 24.42°N, 105.59°W, 2580 m, 11 Sep 1997, *Rivera-Peña et al. 919* (INIFAP, MEXU, PTIS, WAG); Km 87 along Rt 45 N of Durango to Hidalgo del Parral, 24.71°N, 104.64°W, 1900 m, 12 Sep 1997, *Rivera-Peña et al. 921* (INIFAP, MEXU, PTIS, WAG); Km 12, road from Te-

pehuanes to Guanaceví, 25.42°N, 105.75°W, 2140 m, 19 Aug 1974, *Robert 3652* (ENCB); along track from Huejuquilla to Santa Lucía de la Sierra, 30 km W of turn to San Juan Capistrano, 22.58°N, 104.26°W, 2610 m, 22 Sep 1983, *Tarn et al. 110* (PTIS); along the track from Huejuquilla to Santa Lucía de la Sierra, 8 km S of Las Canoas, 22.60°N, 104.31°W, 2640 m, 22 Sep 1983, *Tarn et al. 112* (IBUG, K, MEXU, P, PTIS); along the track from Huejuquilla to Santa Lucía de la Sierra, 2 km E of Las Canoas, 22.59°N, 104.31°W, 2750 m, 22 Sep 1983, *Tarn et al. 113* (K, PTIS); S of Durango, 36 km along track from La Ferrería to Aserradero La Flor, 24.25°N, 104.38°W, 2420 m, 24 Sep 1983, *Tarn et al. 122B* (PTIS); 3 km beyond La Flor on the track to Las Bayas, 24.55°N, 104.10°W, 2700 m, 24 Sep 1983, *Tarn et al. 125* (K, PTIS); 8 km beyond La Flor on the track to Las Bayas, 24.55°N, 104.10°W, 2810 m, 24 Sep 1983, *Tarn et al. 127* (IBUG, K, MEXU, PTIS); S of Durango, 68 km along the track from La Ferrería to La Flor, 24.25°N, 104.38°W, 2680 m, 24 Sep 1983, *Tarn et al. 128* (K, PTIS); 25 km W of El Salto on Hwy 40 at Las Rusias microwave tower, 23.78°N, 105.67°W, 2730 m, 25 Sep 1983, *Tarn et al. 130* (C, IBUG, K, MEXU, PTIS), *Tarn et al. 132* (A, IBUG, K, MEXU, PTIS, WAG); Hwy 40, 51 km W of Durango, 0.5 km along the track to Barballones, 24.03°N, 105.17°W, 2630 m, 25 Sep 1983, *Tarn et al. 133* (IBUG, MEXU, PTIS); 45 km W of El Salto on Hwy 40 just before La Ciudad, 24.38°N, 106.05°W, 2530 m, 25 Sep 1967, *Tarn et al. 134* (G, IBUG, K, MEXU, PTIS); 7 km S of El Salto on the track to La Peña, 23.78°N, 105.37°W, 2620 m, 25 Sep 1983, *Tarn et al. 135* (IBUG, K, MEXU, PTIS); 12 km S of El Salto on the track to La Peña, 23.78°N, 105.37°W, 2710 m, 25 Sep 1983, *Tarn et al. 136* (IBUG, K, MEXU, PTIS, WIS); 16 km S of El Salto on the track to La Peña, 23.78°N, 104.67°W, 2790 m, 25 Sep 1983, *Tarn et al. 137* (IBUG, K, MEXU, PTIS); 18 km S of El Salto on the track to La Peña, 23.78°N, 104.67°W, 2810 m, 25 Sep 1983, *Tarn et al. 138* (IBUG, K, MEXU, PTIS, S); 17 km S of El Salto on the track to La Peña, 23.78°N, 104.67°W, 2790 m, 25 Sep 1983, *Tarn et al. 139* (B, IBUG, K, MEXU, PTIS); just before Km 103 on Hwy 39 between Santa Teresa and Santiago Papasquiaro, 24.80°N, 105.13°W, 2150 m, 26 Sep 1983, *Tarn et al. 140* (K, PTIS); Mpio. El Salto, 52 km, from the intersection of road to San Miguel de Cruces and the road from Durango to Mazatlán, 25.55°N, 105.47°W, 2200 m, 9 Jul 1982, *Tenorio & Romero 893* (MEXU); Mpio. Tepehuanes, SE of Tepehuanes, 25.28°N, 105.70°W, 23 Jul 1982, *Tenorio & Romero 1242* (NY); 17 mi W of El Salto, 23.71°N, 105.62°W, 12 Aug 1956, *Waterfall 12696* (GH, MICH, UC, US); 19 mi SE of Durango, 23.75°N, 104.56°W, 10 Aug 1957, *Waterfall & Wallis 13493* (SMU); 5.5 mi E of El Salto, about 55 mi SW of Durango, 25.55°N, 105.49°W, 12 Aug 1957, *Waterfall & Wallis 13625* (TEX); 35 mi S of Durango, 23.75°N, 104.56°W, 13 Aug 1957, *Waterfall & Wallis 13738* (SMU); about 77 road km S of Durango by Hwy to La Flor, 4 km N of La Flor by road to city of Durango at mountain meadow area called Bajío de Los Ejes, 23.53°N, 104.70°W, 2743 m, 18 Aug 1982, *Worthington 8827* (TEX).—GUANAJUATO: Mpio. Victoria, 2 km NE Joya Fría, 21.29°N, 100.23°W, 2300 m, 29 Sep 1998, *Carranza 5660* (IEB, MEXU, TEX); Sauvage, Cuevas de Guanajuato, 20.92°N, 101.31°W, s.d., *Dugès 417A* (GH, US); Km 12 on road from Guanajuato to Dolores Hidalgo, 21.11°N, 101.14°W, 2580 m, 14 Sep 1965, *Flores S-825* (ENCB, F, MEXU, MO, NY); Dolores Hidalgo to Guanajuato Road, 20.85°N, 101.40°W, 30 Sep 1957, *Graham 334* (PTIS); 16 km N of León, 21.12°N, 101.67°W, 30 Sep 1957, *Graham 341* (PTIS); 18 mi from Dolores Hidalgo on the road to Guanajuato, 20.85°N, 101.40°W, 2250 m, 7 Sep 1958, *Hawkes et al. 1452* (K, PTIS); 23 mi from Dolores Hidalgo on road to Guanajuato, 21.15°N, 101.01°W, 2250 m, 7 Sep 1958, *Hawkes et al. 1453* (K); slope of Cerro de la Márgara, above Puerto Nieto, 15 mi SE of San Miguel de Allende, 20.89°N, 100.53°W, 2438 m, 14 Aug 1956, *Johnson 3, 4* (LL); San Miguel Allende, after the Cañada del Obroje, 20.92°N, 100.75°W, 1900 m, 19 Jul 1980, *Kishler 899* (MEXU); Mpio. Cortazar, Cerro Culiacán, 20.33°N, 100.97°W, 2400 m, 8 Jul 1987, *Mora 734* (IEB); farm field "El Cortijo," 16 km NE of Dolores Hidalgo on San Luis de la Paz hwy, 21.21°N, 100.80°W, 1906 m, 3 Sep 1996, *Ocampo 74* (MEXU); near Irapuato, 15 km SE of Querétaro on the rt from Irapuato to Querétaro, 20.63°N, 100.93°W, 1940 m, Sep 1980, *Ochoa 14178* (CIP, K, PTIS, WIS, US); rt from Irapuato to Querétaro, 20.63°N, 100.93°W, 1840 m, Sep 1980, *Ochoa 14181* (BR, CIP, K, MEXU, MPU, NY, PTIS); Mpio. Acámbaro, 7 km N of San Luis de los Agustinos, 20.03°N, 100.73°W, 2500–2600 m, 17 Jul 1986, *Rubio 295* (IEB); 29 km NE of León, along the road to San Felipe, 21.18°N, 101.46°W, 2400 m, 13 Aug 1990, *Rzedowski 49853* (IEB), *Rzedowski 49855* (IEB, MEXU); Mpio. León, 10 km SW Nuevo Valle de Moreno, 21.17°N, 101.45°W, 2500 m, 28 Aug 1995, *Vargas 52390* (IEB); Mpio. Doctor Mora, Cerro La Cantera, 7 km NW of Doctor Mora, 21.17°N, 100.38°W, 2000 m, 8 Aug 1989, *Ventura & López 7030* (IEB, MEXU); Mpio. San Luis de la Paz, La Misión de Abajo, road toward Victoria, 21.30°N, 100.51°W, 1950 m, 5 Aug 1991, *Ventura & López 9401* (IEB, MEXU).—HIDALGO: about 8 mi E of Pachuca, 20.12°N, 98.67°W, 8 Nov 1947, *Correll 14246* (GAT, NA, PTIS); E of Tulancingo, 20.08°N, 98.33°W, tubers cultivated at Glenn Dale, Maryland, 8 Nov 1947, *Correll 14247* (GAT, LL, NA, PTIS); Acaxochitlán, 20.17°N, 98.20°W, 11 Aug 1947, *Correll 14248* (BM, GAT, K, PTIS); Real del Monte, 20.13°N, 98.67°W, s.d., *Coulter 1242* (GH, K, TCD); La Barranca, al N del poblado Emiliano Zapata, vertiente S de la Sierra de Chicavasco, 20.11°N, 98.95°W, 2180 m, 19 Aug 1988, *Díaz 2* (ENCB. MEXU); Mpio. Ajacuba, "Las Peñitas Blancas," rock formations NE of the Emiliano Zapata cemetery, S slope of Sierra Chicavasco, San Nicolás Tecomatlán, 20.09°N, 99.11°W, 2260 m, 23 Aug 1988,

Díaz & Valverde 89 (MEXU); Mineral del Monte, 20.12°N, 98.66°W, 9 Sep 1832, *Ehrenberg 1132 p.p.* (UC); Atotonilco, N of Real del Monte, above baths, on path from town to baths, 20.26°N, 98.66°W, 1950 m, 5 Aug 1949, *Hawkes et al. 1048* (C, F, K, LL, MEXU, NY, WAG, WIS, S); near Tulancingo, about 2 km S of Honey Station, 20.08°N, 98.37°W, 2100 m, 8 Oct 1958, *Hawkes et al. 1652* (B, K, PTIS); Mpio. Tlanalapa, Buena Vista, 5 km S of Santo Tomás, 23 km N of Tepeapulco, 19.84°N, 98.57°W, 2500 m, 5 Sep 1980, *Hernández 4921* (ENCB, MEXU, MO); slopes of Cerro Chulco, 3–5 km S of Apán, along Calpulalpan to Apán Road, N of Colonia Los Veladores, 19.68°N, 98.41°W, 2000 m, 29 Aug 1995, *Hjerting et al. 95-10* (K); about 7 km NE of Tulancingo, just below the first pass along Rt 130 to the gulf coast, 20.05°N, 98.34°W, 2320 m, 10 Nov 1995, *Hjerting et al. 95-87* (C, K); Mpio. Real del Monte, 2 km WSW of Real del Monte, 20.13°N, 98.65°W, 2800 m, 23 Jun 1975, *Medina 433* (ENCB); Mpio. Real del Monte, Rufina, 1 km SE of Real del Monte, 20.12°N, 98.65°W, 2750 m, 20 Jun 1976, *Medina 1422a* (ENCB); Mpio. Pachua, 5 km N of Pachuca, 20.16°N, 98.73°W, 2650 m, 15 Aug 1976, *Medina 1537* (ENCB); Mpio. Epazoyucan, Peñas Largas, 20.08°N, 98.63°W, 2850 m, 7 Aug 1983, *Medina & Barrios 2444* (CHAP); between Somorriel and Las Lajas, 20.03°N, 98.48°W, 5 Aug 1905, *Rose et al. 9182* (US); Mpio. Zempoala, Cerro Tecajete, near Santa María Tecajete, 19.93°N, 98.60°W, 2650 m, 19 Jul 1963, *Rzedowski 16922* (ENCB); Sierra de los Pitos, near San Pedro Tlaquilpan, 19.92°N, 98.73°W, 2700 m, 9 Aug 1963, *Rzedowski 17087* (ENCB, MEXU, MICH); Cerro Ventoso, between Pachuca and Real del Monte, 20.13°N, 98.67°W, 2500 m, 29 Aug 1965, *Rzedowski 20558* (ENCB), *Rzedowski 20584* (US); Cerro Ventoso, 6 km NE of Pachuca, on the road to Real del Monte, 20.12°N, 98.67°W, 2700 m, 12 Aug 1971, *Rzedowski 25458* (ENCB); Cerro Grande, 2 km S of Epazoyucan, 20.00°N, 98.63°W, 2500 m, 1 Aug 1971, *Rzedowski 28306, 28319* (ENCB); 5 km W of Pachuca, 20.12°N, 98.65°W, 2400 m, 18 Aug 1972, *Rzedowski 29170* (ENCB); Cerro Alto, 2 km S of Epazoyucan, 20.00°N, 98.63°W, 6 Sep 1973, *Rzedowski 31121* (ENCB); Hwy 45, from Huichapan to Ixmiquilpan, 62 km W of the intersection with Hwy 57, 20.43°N, 99.43°W, 2380 m, 4 Oct 1982, *Tarn et al. 21* (K, MPU, PTIS, WIS); Piedra Blanca, Km 90, Hwy 105 between Metzquititlán and Zacualtipán, 20.60°N, 98.62°W, 2000 m, 6 Oct 1982, *Tarn et al. 33* (PTIS); Los Alumbres, Km 101, Hwy 105, between Zacualtipán and Molango, 20.70°N, 98.68°W, 2180 m, 6 Oct 1982, *Tarn et al. 34* (IBUG, MEXU, PTIS); Hwy 85, Zimapán to Tamazuchale, at Las Trancas, about 4 km E along the track towards Nicolás Flores, 21.00°N, 99.13°W, 2300 m, 6 Sep 1983, *Tarn et al. 61* (PTIS); Hwy 85, Zimapán to Tamazuchale, at Las Trancas, about 6 km E along the track towards Nicolás Flores, 21.00°N, 99.13°W, 2420 m, 6 Sep 1983, *Tarn et al. 63* (PTIS); Hwy 85, Zimapán to Tamazuchale, near Km 143 between Maguey Verde and Pelillos, 21.00°N, 99.13°W, 2200 m, 7 Sep 1983, *Tarn et al. 68* (PTIS); Hwy 85, Zimapán to Tamazuchale, N of Barranca los Mármoles, about 3 km E along the track to La Encarnación, 21.00°N, 99.13°W, 2460 m, 7 Sep 1983, *Tarn et al. 71, 74, 75* (PTIS); from Maguey Verde on Hwy 85, Zimapán to Jacala, along the track to the W, 20.86°N, 99.27°W, 2110 m, 1983, *Tarn et al. 77* (PTIS); from Las Trancas on Hwy 85, Zimapán to Jacala, about 7 km E towards Nicolás Flores, then 2 km NE on the track to Puerto de Piedra, 20.87°N, 99.27°W, 2520 m, 8 Sep 1983, *Tarn et al. 80* (PTIS); Mpio. Apán, 1 km E of Chimalpa to Tlalayote and Rt 116 from Calpulalpan to Apán, base of Cerro Trompetillo, 19.70°N, 98.44°W, 2550 m, 16 Aug 1983, *Williams 100* (CHAPA).—JALISCO: Mpio. Lagos de Moreno, at Km 31 on road from Lagos de Moreno to León, 21.35°N, 101.91°W, 15 Jul 1991, *Arreola 1270b* (IEB, MEXU); Guadalajara, 20.67°N, 103.33°W, 31 Jul 1957, *Graham 278* (IBUG, MEXU, PTIS); about 40 km S of Guadalajara, 20.67°N, 103.38°W, 1600 m, 7 Aug 1957, *Graham 280* (LL); 28 km W of Guadalajara, 20.67°N, 103.38°W, 1550 m, 9 Aug 1957, *Graham 282* (LL); 32 km NE of Lagos de Moreno, 21.51°N, 101.66°W, 2100 m, 13 Oct 1957, *Graham 343* (LL); Mpio. Jocotepec, Cerro Viejo, 20.35°N, 103.39°W, 2900 m, 18 Sep 1995, *Machuca 7454* (TEX); Paso de la Troje, near Km 36, SW of Ojuelos on road to Aguascalientes, 21.26°N, 102.93°W, 2100–2300 m, 9–12 Aug 1958, *McVaugh 16805* (ENCB, G, LL, MICH, NY, US, VT); Sierra del Laurel, near the Jalisco-Aguascalientes border, about 10 mi SE of Calvillo, 3 hours by horse from Rancho de los Adobes, 21.31°N, 101.88°W, 2500–2700 m, 26–28 Aug 1960, *McVaugh 18359* (ENCB, LL, MICH); Mpio. Huejúcar, on escarpment below village of San Rafael, 14 km (12 km by air W of Huejúcar on road to Monte Escobedo), 22.32°N, 103.30°W, 2150–2200 m, 24 Jul 1982, *Nee & Diggs 25294* (F, NY); Mpio. Zapopan, Km 22 on road from Guadalajara to Tequila, S slope of Cerro del Tepopote, 20.70°N, 103.44°W, 1500 m, 27 Jul 1986, *Rodríguez 451* (ANSM, CHAPA, F, IBUG, IEB, MEXU, MICH, MO, MU, NY, PTIS, TEX, UAMIZ, WIS, XAL); Mpio. Tala, school woods, La Primavera, along the Los Letreros Creek, 20.70°N, 103.56°W, 1500 m, 17 Jul 1988, *Rodríguez 1278* (ANSM, CHAPA, ENCB, IBUG, IEB, MEXU, PTIS, XAL), 20 Aug 1988, *Rodríguez & Reynoso 1448* (IBUG); Mpio. Tala, La Primavera, woods of the school, along Arroyo Caliente, 20.70°N, 103.56°W, 1500 m, 13 Aug 1988, *Rodríguez & Reynoso 1432a* (CHAPA, ENCB, IBUG, IEB, MEXU); Mpio. Tala, La Primavera, Bosque Escuela, margin of Arroyo Caliente, 100 m before its origin, 20.70°N, 103.56°W, 1450 m, 20 Aug 1988, *Rodríguez & Reynoso 1466* (ANSM, CHAPA, ENCB, IBUG, IEB, MEXU, WIS, XAL); Mpio. Tala, School Forest, track between El Rancho and the Presitas Creek, 20.70°N, 103.56°W, 1450 m, 1 Aug 1991, *Rodríguez & Vargas 2097* (CAS, CHAPA, IBUG, IEB, TEX, WIS); Mpio. Lagos de Moreno, 3 km E of Jaramillo

de Abajo, 21.30°N, 101.80°W, 2000 m, 27 Aug 1986, *Rodríguez et al. 616* (ANSM, CHAPA, ENCB, F, IBUG, IEB, MEXU, MICH, NY, PTIS, WIS, XAL); Mpio. Ojuelos, Matanzas, near by the cemetery, 21.62°N, 101.63°W, 2192 m, 24 Aug 1993, *Rodríguez et al. 2569* (IBUG, PTIS); Mpio. Lagos de Moreno, La Ermita, on road from Lagos de Moreno to León, 21.38°N, 101.85°W, 2174 m, 24 Aug 1993, *Rodríguez et al. 2571* (IBUG, PTIS); Mpio. Lagos de Moreno, Km 25 from Lagos de Moreno towards León, 21.27°N, 101.82°W, 2100 m, 25 Aug 1993, *Rodríguez et al. 2573* (IBUG, PTIS); N side of Rt 15 W of Guadalajara, about 3 km W of La Venta, 20.72°N, 103.57°W, 1670 m, 2 Sep 1988, *Spooner et al. 4086A* (IBUG, INIFAP, MEXU, PTIS); along Volcán Tequila microwave tower road S of city of Tequila, 8.6 km from railroad tracks at base of Volcán Tequila, 20.82°N, 103.85°W, 2000 m, 3 Sep 1988, *Spooner et al. 4093* (INIFAP, PTIS); along Volcán Tequila microwave tower road, S of town of Tequila, 17.3 km S of railroad tracks at base of Volcán Tequila, 20.80°N, 103.83°W, 2600 m, 3 Sep 1988, *Spooner et al. 4100* (IBUG, INIFAP, MEXU, PTIS, WIS); along Volcán Tequila microwave tower road, S of town of Tequila, 18.5 km S of railroad tracks at base of Volcán Tequila, 20.80°N, 103.83°W, 2700 m, 3 Sep 1988, *Spooner et al. 4101* (INIFAP, PTIS, WIS); Bosque Escuela de Universidad de Guadalajara, about 3 km NW of Cuxpala, about 10 km SSE of Tala, about 2 km N of observatory building, 20.58°N, 103.65°W, 1440 m, 5 Sep 1988, *Spooner et al. 4109* (IBUG, INIFAP, MEXU, PTIS); new microwave tower road to top of Nevado de Colima, at edge of cornfield, 6 km from beginning of this road which begins about 0.5 km SE of La Mesa and El Fresnito, 19.58°N, 103.53°W, 1775 m, 7 Sep 1988, *Spooner et al. 4118* (IBUG, INIFAP, MEXU, PTIS); Mpio. Zapotlanejo, on microwave tower road to Cerro Grande, SE Santa Fé, 1.1 km downhill of top of town, 20.50°N, 103.03°W, 2220 m, 9 Sep 1988, *Spooner et al. 4137* (F, IBUG, INIFAP, MEXU, NY, WIS); 2.4 km NE of Rt 45, on dirt road between Lagos de Moreno and Leon, dirt road begins 15.6 km NW of Jalisco-Guanajuato State border, 21.28°N, 101.78°W, 2000 m, 10 Sep 1988, *Spooner et al. 4144* (INIFAP, PTIS), *Spooner et al. 4145* (CHAPA, IEB, INIFAP, MEXU, NY, PTIS, WIS).—MÉXICO: near El Pueblito, between Los Olvera and Santa Bárbara, 1950 m, 23 Jul 1984, *Argüelles 2137* (MEXU); Mpio. Texcoco, Cerro Tetzcutzingo, 7 km E of Texcoco, 19.52°N, 98.87°W, 2550 m, 7 Oct 1983, *Barrie 458b* (TEX), 28 Aug 1979, *Pulido 109* (CHAPA), *Pulido 110* (ENCB); near Texcoco, Mexico City, 19.51°N, 98.89°W, 1865, *Bourgeau s.n.* (K); Cerro Gordo, San Martín de las Pirámides, 19.70°N, 98.83°W, 2900 m, 9 Sep 1980, *Castilla & Tejero 654* (MEXU); Cerro Gordo, Otumba, 19.70°N, 98.75°W, 2800 m, 7 Jun 1981, *Castilla & Tejero 1299* (ENCB); along the Tescocuasco River, Molino de Flores, 19.53°N, 98.82°W, 23 Oct 1947, *Correll 14207* (GAT, LL, NA, PTIS), *Correll 14208* (CIP, GAT, NA, PTIS); along the Volcanes Road above Amecameca, slope of Mount Popocatépetl, 19.10°N, 98.70°W, 24 Oct 1947, *Correll 14211* (GAT, NA, PTIS); about pyramids of Teotihuacán, 19.68°N, 98.85°W, 31 Jul 1965, *Correll 31309* (LL); Molino de Flores, 19.53°N, 98.82°W, 24 Oct 1947, *Correll 14209a* (IBUG, NA, PTIS); near Amecameca, 19.12°N, 98.77°W, 25 Oct 1947, *Correll 14213* (C, G, K, NA, PTIS, S), s.d., *CPC 28.2, 28.4* (PTIS); lower slopes of Nevado de Toluca, near San Juan de las Huertas, 19.10°N, 99.77°W, 15 Nov 1947, *Correll 14263* (GAT, NA, PTIS); General González Station, 19.03°N, 100.05°W, 18 Nov 1947, *Correll 14270* (GAT, NA, PTIS); summit of Hwt 15, 18 mi from Chapultepec and La Reforma jct Chapultepec Park, 19.42°N, 99.23°W, 16 Aug 1962, *Dunn et al. 20360* (MO); SW of Rancho la Biznaga, NW of Santiago Tlazala, 19.57°N, 99.40°W, 20 Jul 1981, *Equihua 840* (IEB); SE of Rancho la Biznaga, NW of Santiago Tlazala, 19.55°N, 99.42°W, 22 Aug 1981, *Equihua 894* (IEB); Mpio. Otumba, junction of Atumba and Cuautlacingo rds, 19.70°N, 98.75°W, 10 Aug 1977, *Espinosa 228* (MEXU); Amecameca, 19.13°N, 98.77°W, 2469 m, 26 Jul 1924, *Fisher s.n.* (RM), *Fisher s.n.* (ARIZ, F, MO, P, US), 14 Jul 1960, *Peñalosa 722* (CAS); San Juan de las Huertas, road to Nevado de Toluca, 19.25°N, 99.76°W, 2700 m, 2 Aug 1965, *Flores S-802* (CHAPA, ENCB, MEXU), 9 Feb 1965, *Flores S-803* (CHAP, K); 7 km after Amecameca, road to Popocatépetl, 19.12°N, 98.75°W, 2620 m, 30 Aug 1967, *Flores S-983* (CHAP, ENCB); Metepec, road to Popocatépetl, 19.25°N, 99.60°W, 2580 m, 30 Aug 1962, *Flores & Ugent S-652* (ENCB); Mpio. Texcoco, Santa Inés, Km 50 on road from Texcoco to Calpulalpan, 19.51°N, 98.83°W, 2260 m, 23 Sep 1983, *García s.n.* (CAS, CHAPA, TEX); Salazar, Sierra of Las Cruces, 19.32°N, 99.38°W, 3353 m, 13 Aug 1896, *Harshberger 61* (BH); near Texcoco, Chapingo, La Serona, Escuela Nacional de Agricultura, Valley of Mexico, 19.48°N, 98.90°W, 2200 m, 8 Jul 1949, *Hawkes et al. 1011* (C, K, LL, MEXU, WAG, WIS); NW of Mexico City, Teotihuacán, on ancient pyramid site, 19.68°N, 98.87°W, 2250 m, 15 Aug 1949, *Hawkes et al. 1067* (C, K, LL, S, WIS); Zinacatepec, 8 km SW of Toluca, 19.28°N, 99.70°W, 2700 m, 23 Aug 1949, *Hawkes et al. 1084* (B, BM, K, LL, P, PTIS), *Hawkes et al. 1085* (F, K, LL, MEXU, NY, WAG); Valley of Mexico, Chapingo Experimental Station, La Serona, 19.48°N, 98.90°W, 2200 m, 30 Sep 1949, *Hawkes et al. 1109* (PTIS); 81.5 km from Mexico City, above Amecameca, Volcanes road to Cortés Pass, 19.12°N, 98.77°W, 2970 m, 30 Oct 1949, *Hawkes et al. 1119* (PTIS); pyramids of Teotihuacán, 19.67°N, 98.85°W, 2250 m, 31 Aug 1958, *Hawkes et al. 1388* (C, K, NY, PTIS, US); Mexico City to San Juan del Río at Km 167, Hwy 57, near Calpulalpan, San Martín, 20.10°N, 99.72°W, 3100 m, 4 Sep 1958, *Hawkes et al. 1392* (C, IBUG, K, MEXU, PTIS, US, WIS); road from Amecameca to Popocatépetl, 19.06°N, 98.68°W, 2750 m, 26 Jul 1965, *Hawkes et al. 2500* (K); Toluca Valley, road Toluca to Nevado de

Toluca, near San Juan de las Huertas, 19.25°N, 99.76°W, 2800 m, 2 Aug 1965, *Hawkes et al. 2511* (K, S), *Hawkes et al. 2513* (K); Rancho San Luis Aculco, Tenango del Aire, 19.17°N, 98.85°W, 2300 m, 14 Sep 1980, *Hinton 18002* (ENCB, IEB, TEX); La Carbonera to Puebla Hwy, 4 Aug 1940, *Langman 2558* (NA, PH); Cerro Sacromonte, near Amecameca, 19.12°N, 98.77°W, 2500 m, 6 Aug 1967, *López 32* (ENCB), *Rzedowski 24200* (DS, ENCB, MICH); Molino, 19.53°N, 98.82°W, Aug 1924, *MacDaniels 557* (F); Llano Grande, Valle de México, 19.66°N, 99.00°W, 2700 m, 9 Jul 1950, *Matuda 19081* (US); San Gerónimo, Villa del Carbón, 19.72°N, 99.70°W, 2800 m, 30 Aug 1953, *Matuda 29225* (MEXU); El Mirador 2 mi SW of San Andrés, 19.32°N, 98.72°W, 12 Jul 1947, *Miranda et al. 2192* (TEX); 3 km SE of Coacalco, 19.58°N, 99.09°W, 2300 m, 24 Aug 1969, *Ortíz 67* (ENCB, WIS); above Santa Fe, 19.40°N, 99.26°W, 28 Aug 1900, *Pringle 9142* (B, F, GH, MICH, MO, NA, US); hills above Santa Fe, 11 Aug 1909, *Pringle 10831 p.p.* (ARIZ, ASU, ENCB, GH, LL, MICH, MIN, MSC, NA, SMU, TEX, UC, US, VT, WIS); Mpio. Texcoco, Cerro Tetzcotzingo, 8 km E of Texcoco, 19.52°N, 98.88°W, 2270–2600 m, 7 Sep 1979, *Pulido 163* (ENCB); vicinity of San Luis Tultitlanapa, near Oaxaca, Jul 1908, *Purpus 3365 p.p.* (GH); El Vigía, 46 km from Mexico City on road to Puebla, 19.30°N, 98.71°W, 3750 m, 15 Sep 1930, *Reddick 547* (WIS); INIFAP Experimental Station potato field, outskirts of Metepec, 19.25°N, 99.59°W, 2610 m, 30 Sep 1997, *Rivera-Peña et al. 936* (INIFAP, MEXU, PTIS, WAG); Mpio. Texcoco, Tetzcuitzingo Mountain right next to San Nicolás Tlamaca, 19.48°N, 98.81°W, 2400 m, 19 Aug 1993, *Rodríguez et al. 2547* (IBUG, PTIS); Mpio. Amecameca, road to Tlamacas, 19.07°N, 98.71°W, 14 Aug 1983, *Romero s.n.* (CHAPA); El Marcarón, near El Mirador, 19.32°N, 98.71°W, 2520 m, 19 Sep to 22 Aug 1930, *Russell & Souviron 109* (US); El Mirador, W of Río Frío, 19.32°N, 98.72°W, 2700 m, 19 Sep to 22 Aug 1930, *Russell & Souviron 94* (US); Pedregal de San Angel, W part, 19.32°N, 99.27°W, 2 Jul 1952, *Rzedowski 1275* (ENCB); 6 km N of Huehuetoca, along the road to Apaxco, 19.90°N, 99.20°W, 2350 m, 12 Sep 1977, *Rzedowski 2350* (ENCB); near Ayotla, E slope of Cerro del Pino, 19.32°N, 98.91°W, 2600 m, 14 Jul 1967, *Rzedowski 24008a* (ENCB); Mpio. Naucalpan, 2 km SE of San Francisco Chimalpa, 19.43°N, 99.35°W, 2600 m, 3 Sep 1967, *Rzedowski 24323* (ENCB); Mpio. Ecatepec, Rancho El Copal, near San Juan Ixhuatepec, 19.60°N, 99.05°W, 2350 m, 10 Aug 1970, *Rzedowski 27438* (ENCB); Sierra de Alcaparrosa, 5 km NW of Tepozotlán, 19.73°N, 99.26°W, 2600 m, 29 Aug 1971, *Rzedowski 28250, 28252, 28279* (ENCB); Mpio. Chalco, 7 km E of Cuautlalpan, 19.28°N, 98.76°W, 2750 m, 15 Aug 1972, *Rzedowski 29144* (ENCB); Cerro de la Cruz, 5 km NW of Tepotzotlán, 19.73°N, 99.32°W, 2400 m, 23 Jul 1974, *Rzedowski 31969* (ENCB); Cerro del Tigre, NW of Atizapán, 19.52°N, 99.50°W, 2500 m, 4 Aug 1974, *Rzedowski 32010* (ENCB, IEB, MEXU); Mpio. Coyotepec, W part of the Sierra de Alcaparrosa, 19.80°N, 99.25°W, 2500 m, 8 Sep 1980, *Rzedowski 37001* (ENCB); 8 km SE of Tepetlaoxtoc, 19.55°N, 98.78°W, 2600 m, 3 Aug 1981, *Rzedowski 37449* (ARIZ, IEB, MEXU, MO, ENCB); Valley of Mexico, 19.67°N, 99.00°W, s.d., *Schmitz 160* (W), *Schmitz s.n.* (GH); Mpio. Zoquiapan, Km 42 along the old road from Mexico to Puebla, 19.32°N, 98.85°W, 2650 m, 6 Sep 1970, *Segura 109* (DS, ENCB); near Toluca, about 1 km NW of CIMMYT station in San Gaspar, Codagem to CIMMYT Road, 19.25°N, 99.55°W, 2600 m, 21 Aug 1988, *Spooner et al. 4003* (INIFAP, PTIS); just NE of Calimaya, about 2 km W of Rt 55, S of Toluca, 19.17°N, 99.62°W, 2600 m, 21 Aug 1988, *Spooner et al. 4005* (INIFAP, PTIS); San Luis Huexotla, 4 km SE of Texcoco, 19.48°N, 98.87°W, 2250 m, 13 Sep 1988, *Spooner et al. 4150, 4151* (INIFAP, PTIS); Toluca to Temascaltepec Road, Hwy 130, at 14 km, 19.17°N, 99.83°W, 2980 m, 6 Sep 1967, *Tarn 53B* (PTIS), *Tarn 56* (K, MEXU, PTIS), 13 Sep 1967, *Tarn 91E* (PTIS); Hwy 130, from Toluca to Temascaltepec, about 5.4 km, 19.17°N, 99.83°W, 2730 m, 2 Sep 1967, *Tarn 19B* (PTIS), 10 Feb 1967, *Tarn 21* (B, BM, K), *Tarn 22, 25* (PTIS), *Tarn 24* (A, B, BM, K, PTIS), 3 Sep 1967, *Tarn 30* (C, K, MEXU, WAG, WIS), *Tarn 32, 40, 42, 44* (K), *Tarn 36* (F, K), 2 Sep 1967, *Tarn et al. 19* (G, K); about 5 km W of farm belonging to Institute of Agriculture at Chapingo, 19.48°N, 98.90°W, 2230 m, 3 Sep 1967, *Tarn 50* (K, NY); Toluca to Temascaltepec Road, Hwy 130, near San Juan de Las Huertas, 19.30°N, 99.65°W, 2850 m, 4 Oct 1967, *Tarn 142* (K, MPU); Toluca to Temascaltepec Road, Hwy 130, near San Juan de Las Huertas, 19.29°N, 99.67°W, 2850 m, 10 Oct 1967, *Tarn 147* (BR, K, P); Barrio de la Luz, above the village of Santiago Yeché, 19.68°N, 99.72°W, 2600 m, 13 Aug 1967, *Tarn & Chávez 6* (BR, IBUG, K, MEXU, PTIS); Barrio de la Luz, above the village of Santiago Yeché, 19.71°N, 99.72°W, 2600 m, 13 Aug 1967, *Tarn & Chávez 7* (IBUG, K, MEXU); Lagunas de Zempoala National Park, 19.05°N, 99.32°W, 2500 m, 9 Sep 1967, *Tarn & Flores 76* (K); at Km 124, Toluca to Morelia Hwy 15, above and to the S of the road, 19.29°N, 99.67°W, 2540 m, 9 Sep 1967, *Tarn & Gómez 148* (K); along Hwy 55, between Tenango and Tenancingo, 2 km S of Tenango, 19.07°N, 99.59°W, 2650 m, 14 Oct 1982, *Tarn et al. 40* (IBUG, K, MEXU, PTIS); along Hwy 55, between Tenango and Tenancingo, 2 km S of Tenango, 19.07°N, 99.58°W, 2650 m, 14 Oct 1982, *Tarn et al. 41* (PTIS); 12 km from Hwy 55 on road thru San Pedro Tlanisco, about 2 km SW of Tlanisco, 19.03°N, 99.67°W, 2700 m, 14 Oct 1982, *Tarn et al. 42* (K, PTIS); along Hwy 55, Toluca to San Juan del Río, 7 km N of Acambay, on slopes surrounding a shooting range site to the E of the road, 19.95°N, 99.85°W, 2750 m, 20 Sep 1983, *Tarn et al. 108* (PTIS); Toluca to Sultepec Road, at about 32 km take turn to Coatepec, at 2.7 km turn E following tracks, 7.7 km towards El Picacho, S of Agua Bendita, 18.95°N, 99.85°W, 2670 m, 3 Oct

1984, *Tarn et al. 240, 241* (PTIS); Toluca to Sultepec Road, take turn at about 32 km to Coatepec, at 2.7 km turn E following track 10.5 km to El Picacho, 18.93°N, 99.82°W, 2630 m, 3 Oct 1984, *Tarn et al. 243* (PTIS); E of Coatepec Harinas, between San Francisco and Porfirio Díaz, 18.92°N, 99.72°W, 2460 m, 3 Oct 1984, *Tarn et al. 245* (PTIS); along Hwy 142 from Oaxtepec to Xochimilco, 2.5 km N of Morelos-México state boundary, 19.07°N, 98.92°W, 2680 m, 4 Oct 1984, *Tarn et al. 247, 248* (PTIS); along Hwy 142 from Oaxtepec to Xochimilco, 6.1 km N of Morelos-México state boundary, 3 km W towards CICITEC and 1 km along track, 19.10°N, 98.95°W, 2930 m, 4 Oct 1984, *Tarn et al. 250* (MEXU, PTIS, WIS), *Tarn et al. 250B* (PTIS), *Tarn et al. 254* (PTIS, WIS); Rt 55 from Querétaro to Toluca, 2.2 km NW of Acambay, near Dongú, 19.97°N, 99.87°W, 2650 m, 8 Nov 1984, *Tarn et al. 301* (PTIS); N-facing slopes just S of Pan-American Hwy at pass of Monte Río Frío (5 km WNW of Río Frío) at Llano Grande, 19.37°N, 98.72°W, 3100–3200 m, 24 Sep 1962, *Ugent 2298* (WIS); Mpio. Otumba, Ejidos de Otumba, 19.70°N, 98.75°W, 2450 m, 4 Aug 1975, *Ventura 74* (ARIZ, ASU, ENCB, IEB, MEXU, MO, NY); Mpio. Texcoco, Molino de Flores, 19.53°N, 98.81°W, 2300 m, 30 Jul 1983, *Ventura 1161* (IEB, MEXU); 7 mi below (W) of Paso de Cortés, 19.08°N, 98.63°W, 2957 m, 16 Jun 1962, *Webster et al. 11376* (K, LL, MEXU, WIS); Mpio. Ixtapaluca, 5 km E of Coatepec, Barranca Tepila, 1.5 km from the Popotla Mine, near Xaltomatla Canyon, 19.32°N, 98.88°W, 3 Sep 1983, *Williams 140* (CHAPA, IEB); Mpio. Texcoco, Santa María Tecuanulco, 19.52°N, 98.87°W, 2700 m, 10 Aug 1984, *Williams 573* (CHAPA); Mpio. Texcoco, San Nicolás Tlamiacas, Cerro Tetzcutzingo, 19.52°N, 98.87°W, 18 Sep 1984, *Williams et al. 580* (CHAPA), *Williams et al. 582* (CHAPA, IEB, NY); Mpio. Texcoco, San Nicolás Tramiacas, Cerro Tetzcutzingo, 19.52°N, 98.88°W, 19 Sep 1984, *Williams et al. 583* (CHAPA).—MICHOACÁN: vicinity of Morelia, Punguato, 19.71°N, 101.13°W, 2200 m, 11 Aug 1910, *Arsène 6643* (MPU, P, US); Cuincho, vicinity of Morelia, 19.70°N, 101.12°W, 1900 m, 1 Jul 1909, *Arsène 7304* (MPU, US); Morelia, 19.70°N, 101.12°W, 2100 m, 20 Jun 1912, *Arsène s.n.* (US); near Morelia, Punguato, 19.70°N, 101.12°W, 2000–2400 m, 16 Sep 1909, *Arsène s.n.* (E, MPU), 11 Jun 1912, *Arsène s.n.* (M, US), 9 Mar 1965, *EBS 2626* (PTIS); *EBS 2630* (PTIS), 26 Sep 1958, *Hawkes et al. 1554* (K, PTIS), 9 May 1965, *Rowe 7* (PTIS); 10 km W of Morelia, 19.65°N, 101.08°W, 21 Jun 1950, *Baldwin 14373* (LL, NA); 6 km from Maravatío on roadside to Morelia, 19.87°N, 100.46°W, 2120 m, 24 Jul 1998, *Carranza & Pérez 5561* (IEB, MEXU); near Las Peras, 19.73°N, 100.80°W, 15 Nov 1947, *Correll 14256* (NA); above Macho de Agua, 19.55°N, 102.05°W, 24 Dec 1947, *Correll 14381* (LL); slope of Mount Punguato, 19.71°N, 101.13°W, 4 Aug 1965, *Correll et al. 31330* (GH, LL); about 21 km S of Morelia on road to Villa Madero, 19.61°N, 101.16°W, 4 Aug 1965, *Correll et al. 31338* (LL); Mpio. Pátzcuaro, Joya Las Nieves, 19.52°N, 101.60°W, 2300 m, 3 Jun 1986, *Díaz 2302* (CHAP, ENCB, IEB, MEXU); Mpio. Morelia, near Rancho Los Pastores, 19.70°N, 101.12°W, 2100 m, 28 Jun 1986, *Díaz 2345* (CHAPA, IEB); Mpio. Morelia, Jacuaro, 19.72°N, 100.63°W, 2050 m, 17 Jul 1992, *Escobedo 2342* (IEB); Mpio. Erongarícuaro, Pedregal (rock field of Tocuaro), 19.57°N, 101.70°W, 2150 m, 7 Aug 1992, *Escobedo 2409* (IEB); Km 325 on right side of road from Mexico City to Guadalajara, a little after Morelia, 19.73°N, 101.13°W, 20 Jul 1963, *Flores S-705* (MEXU); Mount Punguato, near Morelia, 19.70°N, 101.12°W, 2150 m, 23 Aug 1963, *Flores S-711* (ENCB, K, LL, MEXU); Mount Punguato, near Morelia, 19.70°N, 101.12°W, 1950 m, 3 Aug 1965, *Flores S-807* (CHAPA, ENCB, F, MEXU, NY); El Olivar Experimental Station, Km 343 on road from Mexico to Guadalajara, after Morelia, 19.58°N, 101.35°W, 2220 m, 5 Aug 1965, *Flores S-813* (F, LL, MEXU, MO, NY, TEX); Km 21 on road from Morelia to Villa Madero, 19.57°N, 101.16°W, 19 Jul 1963, *Flores & Ugent S-703* (CAS, ENCB, LL, MEXU); Sierra de los Tarascos, 43 km from Carapan on the Uruapan Road, Granja Villa Imelda, 19.58°N, 102.05°W, 2300 m, 1 Sep 1957, *Graham 300* (BR, K, MEXU, MPU, PTIS), 18 Sep 1958, *Hawkes et al. 1521* (K, PTIS); Hwy 110, Guadalupe to Jiquilpan, 19.98°N, 102.77°W, 1 Sep 1957, *Graham 315* (K, PTIS); Pátzcuaro, 16 km from the village to Quiroga, 19.52°N, 101.60°W, 1900 m, 1952, *Graham 385* (ENCB, K, PTIS); 20 km E of Mount Punguato, Morelia, 19.69°N, 101.13°W, 8 Jan 1957, *Graham CSC 234* (K); Cerro Punguato, near Morelia, 19.70°N, 101.11°W, 1960 m, 29 Jul 1949, *Hawkes et al. 1039* (K, LL, MEXU); Cero Punguato, by México to Morelia Hwy at Km 308, 19.70°N, 101.11°W, 1960 m, 29 Jul 1949, *Hawkes et al. 1040* (C, K, LL, MPU); Sierra de los Tarascos, 42 km from Carapan on the Uruapan Road, near Paracho, 19.58°N, 102.05°W, 2300 m, 18 Sep 1958, *Hawkes et al. 1520* (K, MEXU, PTIS); near Morelia at base of Cerro Punguato, in scree below roadside, 19.70°N, 101.11°W, 1950 m, 3 Aug 1965, *Hawkes et al. 2521* (B, BR, K, MPU, P, WAG, WIS); near Morelia, Cerro Punguato, E of the town, 19.70°N, 101.08°W, 2050 m, 4 Aug 1965, *Hawkes et al. 2523* (K); 325 km from Mexico City on the road from Morelia to Pátzcuaro, 19.70°N, 101.34°W, 1950 m, 5 Aug 1965, *Hawkes et al. 2535* (C, K, WIS); El Olivar, at 343 km from Mexico City on road from Morelia to Pátzcuaro, 19.60°N, 101.38°W, 2300 m, 5 Aug 1965, *Hawkes et al. 2538* (A, B, BM, C, G, K, MEXU, MPU, P, S); road from Quiroga to Pátzcuaro, 12 km from Quiroga, 19.59°N, 101.59°W, 2100 m, 5 Aug 1965, *Hawkes et al. 2540* (K); about 5 km W of San Antonio Puerco, about 10 km W of Zacapu on road to Charapan, Km 414, 19.80°N, 101.92°W, 2400 m, 11 Aug 1960, *Iltis et al. 882* (US, WIS); Mpio. Zinapécuaro, La Cañada, 1 km E of El Rincón de Jeráhuaro, 19.88°N, 100.57°W, 2580 m, 15 Aug 1989, *Jasso 1376* (CHAP, IEB, MEXU); Mpio. Zinapécuaro, El Llanito, 500 m W of Jeráhuaro, 19.90°N,

100.76°W, 2470 m, 18 Sep 1989, *Jasso 1409* (IEB); Mpio. Zinapécuaro, El Cerrito, 1.5 km E of Jeráhuaro, 19.88°N, 100.57°W, 2540 m, 19 Aug 1989, *Jasso 1455* (CHAP, IEB); 1 km N of Jeráhuaro, road to Buenavista, margin of creek, 19.88°N, 100.58°W, 2450 m, 9 Sep 1989, *Jasso 1548* (IEB); 4 km W of Panindícuaro, 1950 m, 29 Jul 1983, *Labat 335* (P); Mpio. Coeneo, Comanja, 19.82°N, 101.58°W, 2000 m, 18 Aug 1983, *Labat 424* (P); Mpio. La Piedad, Cerro Grande, 20.30°N, 102.12°W, 2500 m, 27 Aug 1986, *Labat 1872* (IEB, MEXU, P); Mpio. Tancítaro, 1 mi S of Tancítaro, 19.39°N, 102.25°W, 1890 m, 27 Jul 1940, *Leavenworth 379* (F); Mpio. Tancítaro, 2 mi S of Tancítaro, 19.38°N, 102.25°W, 1981 m, 14 Aug 1940, *Leavenworth 548* (F, GH, MICH, NY); Mpio. Morelia, Río Bello, 19.70°N, 101.12°W, 2200 m, 31 Jul 1988, *Medina 1297* (MEXU); E exit from Samatacuaro, 2400 m, 2 Jul 1981, *Motte 328* (MEXU); Santa Clara del Cobre, 19.63°N, 102.48°W, 2200 m, 16 Jul 1988, *Pérez 110* (IEB, MEXU, MO); Mpio. José Sixto Verduzco, Cerro Tres Mezquites, 20.27°N, 101.62°W, 1900 m, 21 Jun 1990, *Pérez & García 1268* (IEB, MEXU); Mpio. Zináparo, Cerro Zináparo, 20.13°N, 102.02°W, 2300 m, 7 Aug 1990, *Pérez & García 1552* (IEB); Mpio. Coeneo, La Constitución, 19.82°N, 101.58°W, 1980 m, 3 Sep 1988, *Ramos 162* (IEB); Mpio. Morelia, vicinity of Cointzio dam, 19.63°N, 101.25°W, 2000 m, 30 Jun 1990, *Rodríguez 49502* (MICH, TEX), *Rzedowski 49502* (CHAPA, MEXU, TEX); E of Morelia, 19.70°N, 101.12°W, 9 Mar 1965, *Rowe 6* (C, PTIS); area about Tlalpujahua, along roadside, 19.80°N, 100.17°W, 2600 m, 16 Aug 1987, *Rzedowski 44714* (IEB, MEXU); Mpio. Morelia, 4 km S of San Miguel del Monte, 19.62°N, 101.15°W, 2300 m, 25 Jul 1988, *Rzedowski 46997* (IEB, MEXU); 4 km S of Atécuaro, along the road to Morelia, 19.63°N, 101.14°W, 2300 m, 30 Jul 1991, *Rzedowski 50736* (IEB); 4 km S of Atécuaro, along the road to Morelia, 19.63°N, 101.15°W, 2300 m, 30 Jul 1991, *Rzedowski 50742* (IEB, MEXU); Mpio. Huaniqueo, center of a small rock field, 1.1 km SW of Tendeparacua, 19.87°N, 101.46°W, 2100 m, 25 Jul 1993, *Silva 921* (IEB); Mpio. Huaniqueo, in central of a small rock field, 1.3 km SW of Tendeparacua, 19.87°N, 101.46°W, 2150 m, 25 Jul 1993, *Silva 928* (IEB); on road from Rt 15 to San Pedro Jacuaro, 6 km NW of Rt 15, 19.72°N, 100.65°W, 2270 m, 29 Aug 1988, *Spooner et al. 4058* (INIFAP, PTIS, WIS); 20 km N of road from Rt 15 just W of Ciudad Hidalgo, N past San Pedro Jacuaro to Ucareo to Queréndaro rd, by Los Tejaminules, 19.80°N, 100.65°W, 2700 m, 29 Aug 1988, *Spooner et al. 4061* (INIFAP, WIS), *Spooner et al. 4063* (INIFAP); on S slope of Cerro Punguato, 2 km E of E end of Morelia, NE Rt 15, 19.68°N, 101.12°W, 2080 m, 30 Aug 1988, *Spooner et al. 4066* (INIFAP, PTIS, WIS); about 3 km W of W edge of Morelia, on N side of Rt 15, about 0.5 km E of road diverting S to Cointzio, 19.68°N, 101.28°W, 2000 m, 30 Aug 1988, *Spooner et al. 4069* (INIFAP, PTIS); on W side of Rt 120 S of Morelia, just S of El Reparo, 19.57°N, 101.32°W, 2080 m, 30 Aug 1988, *Spooner et al. 4074* (INIFAP, PTIS); along Rt 120 S of Morelia, 27.5 km (by roadside markers), S of Morelia, 19.57°N, 101.35°W, 2080 m, 31 Aug 1988, *Spooner et al. 4080* (INIFAP, PTIS); on road NW of Rt 120, 1 km NW of San Francisco Pichátaro, 19.58°N, 101.83°W, 2450 m, 31 Aug 1988, *Spooner et al. 4084* (INIFAP, WIS); 4.1 km NW of Rt 120 by Santa María Huiramangaro on road to San Francisco Pichátaro, 19.52°N, 101.78°W, 2330 m, 19 Oct 1988, *Spooner et al. 4278* (INIFAP, PTIS); Toluca to Morelia road, Hwy 15, at 124 km, 19.50°N, 100.38°W, 2540 m, 6 Oct 1967, *Tarn 148F* (PTIS); Hwy 15, Morelia to Guadalajara, at 387 km, on left of road, 19.70°N, 101.12°W, 2080 m, 10 Oct 1967, *Tarn 187* (PTIS); Cerro Punguato, Morelia, to left of track leading up the Cerro from Hwy 15, 19.70°N, 101.12°W, 2120 m, 8 Oct 1967, *Tarn & Gómez 158* (K); Cerro Punguato, Morelia, along the path leading up, W side of cerro to summit, 19.70°N, 101.11°W, 2210 m, 8 Oct 1967, *Tarn & Gómez 161* (F, K, WAG); Hwy 15, Morelia to Guadalajara, at about 378 km, on left (S) of road, 19.94°N, 101.75°W, 2080 m, 10 Oct 1967, *Tarn & Gómez 186* (IBUG, K, MEXU); 21 km S of Morelia on the road to Villa Madero, 19.70°N, 101.12°W, s.d., *Ugent 5778–5784* (K); Las Peras, 38 km E of Morelia (ca 33 km air distance), Km 272 on Hwy 15 (Ciudad Hidalgo to Morelia), 19.73°N, 100.80°W, 2515 m, 14 Sep 1962, *Ugent et al. 1994* (MEXU); near Morelia, S slope of Mount Punguato, 19.70°N, 101.12°W, 2120 m, 4 Aug 1965, *Ugent et al. 6100* (ENCB, MEXU, MO, US, WIS); S slope of Mount Punguato, near Morelia, 19.66°N, 100.78°W, 2120 m, 4 Aug 1965, *Ugent et al. 6101* (WIS); 15 km WSW of Morelia, Km 325 on Hwy 15 (Morelia to Quiroga), 19.66°N, 101.33°W, 19 Jul 1963, *Ugent et al. 5803, 5804, 5806* (US, VT, WIS); Finca La Playa, Pátzcuaro, 19.51°N, 101.60°W, 2100 m, 1 Aug 1986, *Zamudio 4202* (IEB, MEXU); Mpio. La Piedad, Cerro Grande de La Piedad, 20.30°N, 102.12°W, 2400 m, 30 Aug 1994, *Zamudio et al. 9382* (IEB).—MORELOS: road to Lagunas de Zempoala, about 4 km after Huitzilac, 19.04°N, 99.27°W, 2720 m, 9 Sep 1967, *Flores S-990* (CHAPA); 59 km from Mexico City on road to Cuernavaca, 19.02°N, 99.30°W, 2700 m, 11 Jul 1930, *Reddick 520* (WIS); Tres Marías, 19.05°N, 99.24°W, 3048 m, 29 Oct 1930, *Reddick 563* (BH); La Pera, hwy from Mexico City to Cuernavaca, 19.01°N, 99.16°W, 2225 m, 20 Aug 1993, *Rodríguez et al. 2550* (PTIS); Lagunas de Zempoala National Park, 19.07°N, 99.28°W, 2972 m, 28 Jul 1949, *Teer 30* (MEXU); Lagunas de Zempoala National Park, on mountain side by the lake, 19.07°N, 99.28°W, 3021 m, 27 Jul 1949, *Traylor 14* (MEXU).—NAYARIT: Cerro Sanganguey Road from Guadalajara to Tepic, Km 886.5 near Tepic, ascending from El Refugio village, 21.45°N, 104.73°W, 1600 m, 12 Sep 1965, *Flores S-824* (K, LL, MEXU); Mpio. Nayar, 12 km N of Linda Vista, road to Santa Teresa, 22.33°N, 104.75°W, 2250 m, 3 Aug 1990, *Flores et al. 2208* (MEXU).—

NUEVO LEÓN: Cerro Potosí Mountain, along road up mountain, Km 14.5, 24.85°N, 100.32°W, 2926 m, 23 Aug 1965, *Mertz 296* (MEXU, MU); Cerro Potosí, N of Galeana, 24.85°N, 100.32°W, Sep 1970, *Norris 17595* (MEXU).—OAXACA: Sierra de Miahuatlán, near San José del Pacífico, 16.17°N, 96.50°W, 2300 m, 18–20 Aug 1972, *Breedlove 26749* (CAS); Distrito Santiago Juxtlahuaca, Municipio de San Martín Peras, 1 km de la desviación al poblado de la Escopeta, carretera Coicoyán de Las Flores, 17.32°N, 98.27°W, 2655 m, 31 Aug 1995, *Calzada & Clevinger 20141* (MEXU); Sierra de las Mixtecas, near Siete Cabrillas, 475 km from Mexico City on the road to Oaxaca, 17.50°N, 96.87°W, 20 Oct 1958, *Hawkes et al. 1720* (K, PTIS); Mpio. Comaltepec, Dist. Ixtlán, S [of?] Comaltepec, 17.56°N, 96.52°W, 2000 m, s.d., *López & Martin 842* (NY); Mpio. Santiago Laxopa, Dist. Ixtlán, S Laxopa, 17.18°N, 96.35°W, 2000 m, 6 Sep 1987, *Maldonado 177* (NY); Misteco, Dist. Tlaxiaco, 17.27°N, 97.68°W, 2750 m, 6 Sep 1980, *Ochoa 14135* (CIP, US, WIS); Cerro Pacatillo, between Portillo de San Andrés, on the rt to Miahuatlán and San Pedro, 16.20°N, 96.73°W, 2375 m, 10 Sep 1980, *Ochoa 14145* (CIP, PTIS, US, WIS); 6 km W from Rts 190 and 131 rds junction, Oaxaca to Huajuapan de León road, between La Carbonera and Santiago Tenango, 17.28°N, 96.95°W, 1940 m, 14 Aug 1993, *Rodríguez et al. 2527* (IBUG, PTIS, WIS); Cieneguilla, 17.48°N, 96.95°W, 2286 m, 21 Jun 1895, *Smith 402* (GH); by microwave tower, near junction of Rts 125 and 190, 17.62°N, 97.42°W, 2670 m, 16 Sep 1988, *Spooner et al. 4154* (INIFAP, PTIS); W side of Rt 175, S of Miahuatlán de Porfirio Díaz, 5 km N of San Miguel Suchixtepec, at Km 149 sign, 16.12°N, 96.48°W, 2620 m, 18 Sep 1988, *Spooner et al. 4171* (INIFAP, PTIS); 3 km S of Miahuatlán de Porfirio Díaz to San Pedro Coatlán Road, on road to San Miguel Coatlán, 16.22°N, 96.72°W, 2110 m, 20 Sep 1988, *Spooner et al. 4187* (INIFAP, PTIS), Km 22.5 (by posted km marker), W of main road in Zaachila on dirt road toward Santa Inés del Monte, 16.95°N, 96.85°W, 2600 m, 21 Sep 1988, *Spooner et al. 4191* (INIFAP, PTIS); Hwy 175 to Puerto Angel, 22.6 km S of Miahuatlán, 16.20°N, 96.53°W, 2380 m, 18 Oct 1984, *Tarn et al. 273* (MEXU, PTIS), *Tarn et al. 274* (C, K, PTIS); road from Oaxaca to Puerto Angel, Hwy 175, 2 km from S. José Pacífico towards La Fábrica, 16.17°N, 96.48°W, 2610 m, 18 Oct 1984, *Tarn et al. 276* (PTIS); El Porvenir, road from Pochutla to Oaxaca, 16.18°N, 96.51°W, 15 Jun 1985, *Torres & García 6834* (MEXU, MO).—PUEBLA: Aljojuca, 18.97°N, 97.27°W, 2 Sep 1966, *Boege 223* (MEXU); Mount Malinche, 19.06°N, 98.64°W, 3 Nov 1947, *Correll 14231* (GAT, K, NA, PTIS); slope of Mount Popocatépetl, 19.03°N, 98.63°W, 4 Nov 1947, *Correll 14233* (GAT, NA, PTIS); Metepec, near San Baltazar on road up to Popocatépetl, 18.93°N, 98.47°W, 2520 m, 30 Aug 1962, *Flores & Ugent S-650* (LL); Oriental, 19.37°N, 97.62°W, s.d., *Graham 403* (PTIS); road from Puebla to Orizaba, between Hipólito and Tlacatepec, 18.88°N, 97.73°W, 2100 m, 24 Jul 1949, *Hawkes et al. 1031* (A, BM, K); El Carmen, on the Puebla-Tlaxcala border, near Laguna del Carmen, 18.58°N, 97.45°W, 2340 m, 24 Jul 1974, *Hernández et al. R-88* (CHAPA, US); 8 km from El Carmen on road to Amozoc, 18.58°N, 97.45°W, 2340 m, 28 Jul 1974, *Hernández et al. R-164* (CHAPA); Rt 129 from Puebla to Tezuitlán, turning off Zaragoza NNW towards Jilotepec, 19.78°N, 97.62°W, 2400 m, 30 Oct 1984, *Hjerting & Gómez 284* (C, K); Mpio. San Martín Texmelucan, Totolqueme Experemiental Fields, 3 km N of San Martín, 19.28°N, 98.43°W, 2450 m, 19 Sep 1979, *Mancera 14* (CHAPA, ENCB, F, NY); 3 km E of center of San Nicolás Buenos Aires, 19.17°N, 97.53°W, 2350 m, 7 Sep 1986, *Nee & Soule 33037* (MEXU, NY); Cholula, near Puebla, 19.07°N, 98.30°W, 14 Jul 1909, *Nicolas s.n.* (P); bridge the Emperador, La Venta, 2530 m, 25 Aug 1944, *Sharp 44539* (NA); tollway from Mexico to Veracruz, at about Km 208.5, just past the toll, 18.88°N, 97.34°W, 2510 m, 23 Oct 1967, *Tarn & Gómez 220* (K, MEXU, P); road from Puebla and Cholula to Amecameca, between Volcán Iztaccíhuatl and Volcán Popocatépetl, about 3.3 km from Cholula, 19.08°N, 98.53°W, 3040 m, 2 Nov 1984, *Tarn et al. 293* (IBUG, MEXU, PTIS); Mpio. San Nicolás de las Ranchos, road from Tepetzingo, on N side of Santiago Xalitzintla, 19.07°N, 98.48°W, 2620 m, 9 Oct 1987, *Tlapa & Ubierna 774* (IEB); Volcán Popocatépetl, 19.00°N, 98.66°W, 2835 m, 31 Aug 1962, *Ugent 1288* (K, PTIS); SE slopes of Popocatépetl, approached from the village of Metepec, 19.00°N, 98.66°W, 2520–2580 m, 31 Aug 1962, *Ugent et al. 1295-1298, 1300–1307, 1326, 1340* (MEXU, US, WIS).—QUERÉTARO: Km 203 on road to Mexico, 1950 m, 17 Jun 1975, *Argüelles 83* (ENCB); Km 11 on road to Huimilpan, 20.37°N, 100.28°W, 2297 m, 27 Jul 1984, *Argüelles 2149* (MEXU); Km 165 on the road from Querétaro to Mexico, just after San Juan del Río, 20.38°N, 100.00°W, 2100 m, 27 Aug 1963, *Flores S-719* (CHAPA); toll road from Mexico to Querétaro, 2 km after the Palmillas, at Km 162, 20.32°N, 99.92°W, 1180 m, 9 Sep 1965, *Flores S-821* (ENCB, K, LL); San Juan del Río, 20.33°N, 100.00°W, 2 Jun 1957, *Graham 250* (K, PTIS); San Juan del Río, 20.33°N, 100.00°W, 30 Sep 1957, *Graham CSC 368* (K, PTIS); San Juan del Río, ESE of town, near the México Hwy, 20.33°N, 100.00°W, 2000 m, 26 Aug 1949, *Hawkes et al. 1090* (A, C, K, LL, MEXU, PTIS); Cerro Casas Grandes, San Juan del Río, NW of town, 20.33°N, 100.00°W, 2000 m, 4 Sep 1958, *Hawkes et al. 1403* (G, K, PTIS); Cerro La Venta, about 3 km from San Juan del Río, base of hill near Presa Pinta, 20.38°N, 100.00°W, 1950 m, 11 Oct 1958, *Hawkes et al. 1669* (C, K, NY, PTIS, WAG); Cadereyta, 20.70°N, 99.82°W, 22 Jul 1952, *Kelley 698* (UC); San Juan del Río, Cerro de La Venta, 20.38°N, 100.00°W, 2140 m, 10 Aug 1962, *Ochoa 2440* (CIP, WIS, US); about 15 km SE of Querétaro, near Castillo on road from Querétaro to Irapuato, 20.60°N, 100.40°W, 1940 m, 27 Sep 1980, *Ochoa 14180, 14180a, 14185,*

14186 (CIP, US, WIS); rt from San Juan del Río to Palmillas, 20.41°N, 99.89°W, 2040 m, Sep 1980, *Ochoa 14184* (CIP, K, MEXU, P, PTIS); between San Juan del Río and Palmillas, 20.38°N, 100.00°W, 2410 m, Sep 1980, *Ochoa 14189* (CIP), *Ochoa 14190* (CIP, WIS, US); Mpio. Querétaro, road from Querétaro to Mexico City, just at the junction to El Rosario, E side of Monín Indian Monument, 20.59°N, 100.39°W, 2000 m, 9 Sep 1993, *Rodríguez et al. 2493* (IBUG, PTIS); hwy from Mexico City to Querétaro City, just on the Querétaro-México border, 20.28°N, 99.90°W, 2174 m, 22 Aug 1993, *Rodríguez et al. 2558* (IBUG, PTIS, WIS); between Hacienda Ciervo and San Juan del Río, 20.38°N, 100.00°W, 26 Aug 1905, *Rose et al. 9841* (US); 7 km SE of Amealco, along the road in the direction of San Juan del Río, 20.18°N, 100.15°W, 2500 m, 9 Jul 1989, *Rzedowski 48553* (IEB, MEXU), 10 Jul 1989, *Rzedowski 48565* (IEB); Mpio. Tolimán, about El Derramadero, 20.92°N, 99.93°W, 2550 m, 10 Sep 1990, *Rzedowski 50071* (IEB, MEXU); E side of Rt 57, SE of San Juan del Río, about 2 km N of Palmillas, 20.33°N, 99.93°W, 2150 m, 10 Sep 1988, *Spooner et al. 4146* (INIFAP, PTIS, WIS), *Spooner et al. 4149* (INIFAP, PTIS); León to Mexico road, Hwy 45, between San Juan del Río and Palmillas, but nearer Palmillas than 213, 20.32°N, 99.92°W, 2170 m, 14 Oct 1967, *Tarn & Gómez 214* (F, K, PTIS); Mexico to Querétaro Hwy 57 near Km 154, between Puerta de Palmillas and San Juan del Río, 20.32°N, 99.92°W, 2130 m, 9 Sep 1983, *Tarn et al. 86* (PTIS); Hwy 120, Cadereyta to Jalpan, about 14 km E along the road to San Joaquín, 20.97°N, 99.65°W, 2400 m, 9 Sep 1983, *Tarn et al. 87* (PTIS); Hwy 120, Cadereyta to Jalpan, 19 km E towards San Joaquín, then about 1 km along the track to El Doctor, 20.97°N, 99.65°W, 2430 m, 9 Sep 1983, *Tarn et al. 89* (PTIS); from Hwy 120, Cadereyta to Jalpan, about 19 km E towards San Joaquín, then about 2.5 km along track to El Doctor, 20.70°N, 99.82°W, 2540 m, 9 Sep 1983, *Tarn et al. 90* (PTIS); from Hwy 120, Cadereyta to Jalpan, about 19 km E towards San Joaquín, then about 5 km along track to El Doctor, 20.97°N, 99.65°W, 2560 m, 9 Sep 1983, *Tarn et al. 91* (PTIS); Hwy 57, Km 154 from Mexico City, between Palmillas and San Juan del Río, near Palma de Romero, 20.43°N, 99.94°W, 2200 m, 7 Nov 1984, *Tarn et al. 297* (PTIS), *Tarn et al. 298* (PTIS); Cerro El Zamorano, going up from Carboneras on road from Colón towards the W, 21.6 km from turning at Carboneras, 20.93°N, 100.20°W, 2820 m, 7 Nov 1984, *Tarn et al. 299* (PTIS).—SAN LUIS POTOSÍ: Mpio. Villa de Arriaga, Cerro La Bolsa, W of Cerrito Dolores, 21.90°N, 101.38°W, 2475 m, 29 Sep 1974, *Banda et al. 131* (CHAPA, MO); road from San Luis Potosí to Río Verde, town of Santo Domingo, 23.33°N, 101.73°W, 1950 m, 29 Sep 1966, *Flores S-955* (CHAPA, ENCB, K, MEXU); Puerto Huerta, road from San Luis Potosí to Río Verde, 2400 m, 28 Sep 1966, *Flores S-956* (A, K); Canoas, Km 320 from Guadalajara on road to San Luis Potosí, 21.96°N, 100.36°W, 2300 m, 1 Sep 1949, *Hawkes & García 1098* (B, C, ENCB, K, LL, MPU, P); 10–11 km E of Zaragoza along gravel road to Salitrera, 22.09°N, 100.66°W, 2030 m, 20 Sep 1995, *Hjerting et al. 95-158* (C, K); Alvarez, 22.03°N, 100.62°W, Sep 1902, *Palmer 83 1/2* (US); San Luis, 22.15°N, 100.98°W, 1878, *Parry 9* (GH); region of San Luis Potosí, 22.15°N, 100.98°W, 1800 m, 1878, *Parry & Palmer 633 p.p.* (NY); Mpio. Villa de Arriaga, Rancho El Palmar, farm field of Tortugas, 22.02°N, 101.28°W, 2150 m, 31 Jul 1983, *Rivas & González 81* (CHAPA, TAES); Sierra de San Miguelito, canyon above Terreno, SW of San Luis Potosí, 22.03°N, 101.00°W, 2150 m, 9 Sep 1954, *Rzedowski 4335* (ENCB); Km 30 on the road from San Luis Potosí to Río Verde, 22.22°N, 100.77°W, 2050 m, 20 Aug 1955, *Rzedowski 6249* (ENCB); San Luis Potosí, 22.15°N, 100.98°W, 1876, *Schaffner 693* (GH, K, NY, PH), Jun 1893, *Schaffner 694* (GH), 1875, *Schaffner s.n.* (M); Hwy 49, at 67 km W of Zacatecas, then 1 km N along the track to Villa de Ramos, 22.65°N, 101.95°W, 2160 m, 25 Sep 1984, *Tarn et al. 212* (K, PTIS); 1877, *Urbina s.n.* (MEXU); Mpio. San Luis Potosí, Sierra de San Miguelito, NE of San Luis Potosí, 22.17°N, 101.15°W, 2210 m, 21 Sep 1996, *Villarreal 8416* (TEX).—SINALOA: Mpio. Concordia, 7 km SW of El Palmito on Rt 40, 23.54°N, 105.84°W, 2000 m, 3 Aug 1980, *Breedlove & Almeda 44879* (CAS, ENCB); Km 23 towards Manzanillo from Morelia, 2 Sep 1957, *Graham 304* (C, K, PTIS).—SONORA: San José Mountains, 3 Aug 1893, *Mearns 1599* (US); San José Mountains, 5 Aug 1893, *Mearns 1635* (DS, US); San José Mountains, 10 Aug 1893, *Mearns 1752* (DS, NY, S, US); El Divisadero (El Bordo), 1 km SE of El Llano on road to Bermúdez, Mesa El Campanero, 28.35°N, 109.02°W, 1800 m, 16 Aug 1998, *Reina et al. 98-976* (ARIZ); Rancho Santa Bárbara, 27.12°N, 108.72°W, 1200 m, 18 Jul 1900, *Smith & Rascon s.n.* (ARIZ); region of the Río de Bavispe NE Sonora, Puerto de los Aserraderos, Rancho de Cruz Díaz, 30.51°N, 109.26°W, 13 Aug 1940, *White 3284* (GH, MICH); region of Río Bavispe, International Canyon, 30.46°N, 109.27°W, 23 Aug 1940, *White 3498* (MICH).—TLAXCALA: San Rafael Tepatlaxco, 19.12°N, 97.98°W, 26 Jul 1978, *Aguilar 29* (MEXU); Santa María de las Cuevas, Atzayanca, 19.58°N, 98.58°W, 2430 m, 15 Sep 1995, *Cantero & Bonilla 605* (CHAP, MEXU); near the city of Tlaxcala, Malinche Mountain, 19.32°N, 98.23°W, 2830 m, s.d., *CCC 72* (PTIS); near the city of Tlaxcala, Malinche Mountain, ascent from Santa Ana, 19.32°N, 98.23°W, 2620 m, s.d., *CCC 605B* (IBUG, MEXU, PTIS); near San Cristóbal, 19.56°N, 98.65°W, 18 Nov 1947, *Correll 14271* (LL), *Correll 14272* (PTIS); Tetlanocán, Extranjerotla, Mount Malinche, 19.33°N, 98.02°W, 2500 m, s.d., *CPC 12.1* (PTIS); 1 km on road from Huamantla to Puebla, in the village of Ignacio Zaragoza, 19.32°N, 97.93°W, 5 Sep 1965, *Flores S-817* (CAS, ENCB, MEXU, MO, NY); Pilares, at base of Mount La Malinche, 4 km from Huamantla, 19.32°N, 97.93°W, 5 Sep 1965, *Gómez S-818* (ENCB, MEXU); between Apizaco and San

Pablo, Puente de Atlquianhuac, 19.40°N, 98.08°W, 2250 m, 11 Aug 1949, *Hawkes & Hernández 1056* (K, LL, MPU, P), *Hawkes & Hernández 1057* (B, BR, F, K, LL, MEXU, MPU, NY, P); Mount Malinche, ascent from Santa Ana, Extranjerotla, 19.24°N, 98.03°W, 2620 m, 12 Aug 1949, *Hawkes & Hernández 1062* (A, B, BM, BR, K, LL, MPU, P); Tizatlán, near Tlaxcala, 19.33°N, 98.22°W, 2150 m, 11 Aug 1949, *Hawkes et al. 1058* (C, K); Mount Malinche, San Francisco Tetlanocán towards Extranjerotla, 19.25°N, 98.15°W, 2500 m, 12 Aug 1949, *Hawkes et al. 1060* (K); road from Teacalco to Torre Forestal, 350 m before microwave station, N slope of the Malinche volcano, 19.30°N, 98.03°W, 2830 m, 11 Oct 1984, *Tarn et al. 262* (PTIS); road from Texcoco to Tlaxcala, 5 km after the state border, 19.57°N, 98.66°W, Aug 1974, *Tena 1* (CHAP); San Miguel Tepalca, along a dry canal of La Hacienda dam, 2540 m, 26 Jul 1983, *Williams 81* (CHAPA, NY); Mpio. Calpulapan, wheat fields near the pass, on the side of the road 136 from Texcoco to Calpulalpan, Km 28, 19.58°N, 98.58°W, 2880 m, 11 Aug 1983, *Williams 84* (CHAPA, IEB); Mpio. Ixtaciuxtla, La Caridad Cuaxonacayo, along the road to Hueyotlipan, at the top of La Loma, 19.40°N, 98.39°W, 2640 m, 12 Aug 1983, *Williams 95* (CHAPA, NY, RSA, TEX); Mpio. Tetla, Santiago Tetla, 19.43°N, 98.10°W, 2480 m, 18 Aug 1983, *Williams 111* (CHAPA); Mpio. Ixtenco, 3 km W of San Juan Ixtenco along the road to La Malinche, 19.25°N, 97.90°W, 2650 m, 18 Aug 1983, *Williams 117* (CHAPA, NY); Mpio. Tetla, 10 km N of Santiago Tetla on the road to Xicoténcatl industrial city, 19.43°N, 98.10°W, 2540 m, 23 Aug 1983, *Williams 119* (CHAPA, ENCB), *Williams 120* (CHAPA, IEB), *Williams 121* (CHAPA); Mpio. Tequixquitla, 2 km W of Tequixquitla, on Rt 136 to Huamantla, 19.30°N, 98.33°W, 2400 m, 24 Aug 1983, *Williams 130* (CHAPA, K, NA, NY, TEX); Mpio. Ixtacuixtla, 7 km S Hueyotlipan, road from San Felipe Ixtacuixtla, community farmfields of San Juan Nepapualco, 19.33°N, 98.37°W, 2580 m, 25 Sep 1983, *Williams 288* (CHAPA).—VERACRUZ: Loma Grande, Mount Orizaba, 19.01°N, 97.22°W, 2652 m, 2 Aug 1938, *Balls & Gourlay 5548* (K); Borrego, region of Orizaba, 11 Aug 1865–1866, *Bourgeau 346 p.p.* (G, K, P); hills above Santiago, high part of sierra, 20 Jul 1971, *Nevling & Gomez-Pompa 1872* (MEXU); slope of Pico de Orizaba, on the state border with Puebla, 19.00°N, 97.25°W, 3400 m, 27 Jul 1971, *Nevling & Gomez-Pompa 2079* (F, GH).—ZACATECAS: Mpio. Juchipila, W of Pueblo Viejo, Cerro de Piñones, E slope, Ojo de Agua "Los Fresnos," 21.42°N, 103.12°W, 2010 m, 7 Aug 1998, *Ballesa & Adame 8736* (MEXU); Mpio. Loreto, San Miguel between Pedregoso and Lobena, 22.28°N, 101.72°W, 2200 m, 7 Sep 1973, *Banda s.n.* (CHAPA, ENCB); Mpio. San Pedro Piedra Gorda, Cerro Prieto, 2450 m, Sep 1988, *Castillo & Trujillo ZA-55* (CHAPA); Mpio. San Pedro Piedra Gorda, Cerro Prieto, 22.45°N, 101.73°W, Oct 1980, *Castillo & Trujillo ZA-64* (CHAPA); along the Zacatecas to Fresnillo Road, 2496 m, 8 Oct 1972, *García et al. 272* (CHAPA); Hwy 45, Fresnillo to Sombrerete, 23.40°N, 103.85°W, 30 Sep 1957, *Graham 356* (C, K, PTIS, WIS); 726.5 km from Mexico towards Zacatecas, 22.78°N, 102.58°W, 2100 m, 14 Sep 1949, *Hawkes & García 1101* (BR, K, LL, MEXU, PTIS, WIS); Morelos, Km 765 on Zacatecas to Durango Road, 22.78°N, 102.58°W, 2200 m, 15 Sep 1949, *Hawkes & García 1103* (F, K, LL, MEXU, NY, PTIS), *Hawkes & García 1104* (G, K, LL, PTIS, S); 50 mi from Aguascalientes to Zacatecas, 4 mi S of Ojocaliente, Km 695, 22.50°N, 102.42°W, 2050 m, 9 Sep 1958, *Hawkes et al. 1461* (C, K, MEXU, NY, US); Km 726 from Mexico City on the Aguascalientes to Zacatecas Road, 22.78°N, 102.58°W, 2200 m, 9 Sep 1958, *Hawkes et al. 1465* (K, PTIS); 8 mi from Zacatecas on the road to Durango, 22.78°N, 102.58°W, 2350 m, 9 Sep 1958, *Hawkes et al. 1467* (C, K, PTIS, US, WIS), *Hawkes et al. 1468* (C, G, K, PTIS, US), 10 Sep 1958, *Hawkes et al. 1469* (PTIS); 82 mi from Fresnillo on the road from Zacatecas, El Alamo, 7 mi from the Durango border, 23.50°N, 103.17°W, 2350 m, 10 Sep 1958, *Hawkes et al. 1473* (C, K, PTIS, US, WIS); 4.2 mi from the Durango border, along the road from Durango to Zacatecas, 23.50°N, 103.58°W, 2250 m, 12 Sep 1958, *Hawkes et al. 1488* (C, IBUG, K, MEXU, PTIS, US); 15 mi by air NE of Estación Camacho, NW and just below summit of Pico de Teyra, 24.53°N, 102.16°W, 2652 m, 23 Sep 1973, *Henrickson 13489* (F, LL); plains about La Honda, 19 Aug 1890, *Pringle 3499* (GH, NA); on Rt 49 from Zacatecas to San Luis Potosí, at Km 143.5, on N side of road, 22.69°N, 102.15°W, 2110 m, 8 Sep 1997, *Rivera-Peña et al. 915* (INIFAP, MEXU, PTIS, WAG); 26 km W of Valparaíso on road to Huejuquilla, 22.77°N, 103.57°W, 2310 m, 23 Sep 1983, *Tarn et al. 114* (IBUG, K, MEXU, PTIS); Sierra of Sombrerete, from San Martín, near Hwy 45, 5 km along the track to the microwave tower, 23.63°N, 103.65°W, 2760 m, 23 Sep 1983, *Tarn et al. 117* (B, IBUG, K, MEXU, MPU, PTIS), 23 Sep 1967, *Tarn et al. 118* (BR, F, IBUG, K, MEXU, NY, PTIS); Hwy 45, 18 km NW of Sombrerete towards Vicente Guerrero, at junction with side-track to El Alamo, 23.63°N, 103.65°W, 2380 m, 23 Sep 1983, *Tarn et al. 120* (C, IBUG, K, MEXU, PTIS); 7 km W of Zacatecas and 1.5 km N of the intersection of Hwy 54 to Villanueva and Hwy 45/49 to Fresnillo, 22.78°N, 102.58°W, 2320 m, 27 Sep 1983, *Tarn et al. 144* (PTIS); Hwy 70, 12 km NW of Jalpa, 14 km along the track SE towards Tlachichila, 21.60°N, 102.85°W, 2220 m, 27 Sep 1984, *Tarn et al. 224* (PTIS); Hwy 54, 10 km SW of Jalpa, 26.3 km along the track towards Tlaltenango, 21.65°N, 103.13°W, 2400 m, 28 Sep 1984, *Tarn et al. 231, 232, 235* (PTIS), *Tarn et al. 233* (K, PTIS); Hwy 54, 10 km SW of Jalpa, 28.2 km along the track towards Tlaltenango, 21.67°N, 103.15°W, 2520 m, 28 Sep 1984, *Tarn et al. 236* (PTIS).—State unkown: chiefly in the valley of the Río Grande, below Doñana, s.d., *Parry et al. 1008* (NY, US); Mexico, 1847, *Uhde 7* (CGE).

18. Solanum longiconicum (p. 99).

Costa Rica. ALAJUELA: between Socorro and San Ramón, path to San Antonio, 26 Aug 1926, *Brenes s.n.* (CR); Volcán Poás, 10.18°N, 84.22°W, 2678 m, 30 Jan 1922, *Greenman & Greenman 5374* (GH, MO); Isla Bonita [located on the road N of Vara Blanca], 10.20°N, 84.16°W, 1050 m, s.d., *Hope s.n.* (K, PTIS); Volcán Poás, on SE shoulder of volcano, 10.18°N, 84.22°W, 2135 m, 26 Mar 1947, *Horn 1* (A, LL, NA, UC); road between large meadow of Volcán Poás and Poasito, 10.17°N, 84.21°W, 20 Aug 1961, *Jiménez 174* (F); Volcán Poás, 8.5 km from Poasito, 400 m before large meadow in the National Park, 10.18°N, 84.23°W, 2560 m, 9 Dec 1996, *Spooner et al. 7122* (CR, INB, PTIS, WAG); Volcán Poás, clearing of the Achiote, 10.18°N, 84.22°W, 2200 m, Nov 1896, *Tonduz 10801* (US); Volcán Poás National Park at main entrance, 400 m S of main road, 10.18°N, 84.22°W, 2500 m, 2 May 1993, *Valerio 657* (CR); Volcán Poás, near upper end of Hwy 120, 10.18°N, 84.22°W, 2500 m, 15 Jan 1967, *Weston et al. 4111* (UC).—ALAJUELA/GUANACASTE/PUNTARENAS BORDERS: Cerro Amigos, E side, 10.31°N, 84.79°W, 1750–1800 m, 26 Jan 1977, *Dryer 1150* (F, MO); high ridge N of television relay tower above Monteverde and bordering Monteverde Cloud Forest Nature Reserve, 10.32°N, 84.78°W, 1750–1800 m, 27 Feb 1977, *Gentry 3819* (CHAPA, CR, DUKE, F, MO, NY); Monte Verde Biological Reserve, between La Torre and Río Negro, at the continental divide, 10.31°N, 84.78°W, 1600–1700 m, 22 Jan 1988, *Haber & Bello 8029* (CR); Monteverde Cloud Forest Preserve, top of Cerro Amigos, around television tower (channel 13), 10.31°N, 84.79°W, 1830 m, 30 Nov 1996, *Spooner et al. 7109* (CR, INB, PTIS, WAG).—CARTAGO: S of Tapantí along the new road on the E slope above the Río Grande de Orosí, 09.70°N, 83.78°W, 1400–1600 m, 10–24 Jun 1968, *Burger & Stolze 5723* (CR, F, MO, NY); Volcán Irazú, 09.96°N, 83.83°W, 1948, *Casseres 1* (CR); on the road from Cartago to Volcán Irazú, 09.94°N, 83.83°W, 23 Aug 1940, *Chrysler 5552* (F); SE slope of Cerro de la Muerte, Talamanca Cordillera, along Interamerican Hwy, 09.57°N, 83.75°W, 2700 m, 24 May 1976, *Croat 35386* (MO); Tapantí Hydroelectric Reserve along the Río Grande de Orosí, 4.5 km beyond small bridge that crosses the river inside preserve, along road to diversion dam, 09.78°N, 83.86°W, 1500–1700 m, 23 Jun 1976, *Croat 36150* (MO); Tapantí Reserve about 1 km S of junction of Quebrada Salo and Río Grande de Orosí, along trail leading eastward into mountains from road, 09.72°N, 83.78°W, 1500–1800 m, 29 Sep 1987, *Croat & Grayum 68265* (NY); Cerro Buena Vista (Cerro de la Muerte), Pan American Hwy, Cordillera de Talamanca, 09.57°N, 83.75°W, 21 Apr 1947, *Fosberg 27307* (WIS); Cantón de El Guarco, Río Macho, Cuenca del Savegre, Estación Ojo de Agua, sendero el Mascarilla, 09.62°N, 83.82°W, 2950–3000 m, 12 Jan 1996, *Gamboa 945* (BM); about 15 km S of Tapantí along the new road on E slope above Río Grande de Orosí near the concrete bridge, 09.70°N, 83.78°W, 1500 m, 13–14 Apr 1973, *Gentry & Burger 2935* (F, MO); 10 km SE of Empalme along Interamerican Hwy, 09.68°N, 83.92°W, 2000 m, 9 Feb 1971, *Gillis & Plowman 10037* (F, MSC); Tres de Junio Biological Reserve, 09.67°N, 83.85°W, 22 Aug 1975, *Gómez Laurito et al. GL-1200* (USJ); road to crater of Volcán Turrialba, 10.03°N, 83.77°W, 18 Jun 1976, *Gómez Laurito GL-1680* (USJ); in forest along creek emptying into Río Grande de Orosí from the E, about 1 km upstream from confluence of Quebrada Salta, Tapantí, 09.72°N, 83.78°W, 1500–1700 m, 12 Jul 1984, *Grayum & Sleeper 3461* (NY); Interamerican Hwy, 35 km S of Cartago, 09.71°N, 83.95°W, 2520 m, 7 Nov 1949, *Hawkes & Mesén 1126* (K); Pan American Hwy, 50 km from Cartago, 09.70°N, 83.95°W, 2700 m, 7 Nov 1949, *Hawkes et al. 1127* (B, K, P); Interamerican Hwy, 52 km S of Cartago, 09.70°N, 83.95°W, 2850 m, 7 Nov 1949, *Hawkes et al. 1128* (B, BM, BR, C, K, MEXU, MPU, NY, P, WIS); Interamerican Hwy, 65 km S of Cartago, 09.69°N, 83.93°W, 2970 m, 7 Nov 1949, *Hawkes et al. 1129* (K); Interamerican Hwy, 60 km S of Cartago, 09.68°N, 83.92°W, 2850 m, 7 Nov 1949, *Hawkes et al. 1130* (A, B, BM, C, G, IBUG, K, MEXU, NY, P, PTIS, WIS); Irazú, 09.98°N, 83.85°W, 2500 m, 7 Sep 1953, *Heiser 3486* (US); 9 km from Millsville to Cartago, 09.60°N, 83.77°W, 3000 m, 22 Jul 1949, *Holm & Iltis 517* (A, G, MO); Dos Amigos, Pan American Hwy, 09.62°N, 83.83°W, 3000 m, Sep 1943, *Jiménez 5* (CR, US); La Trinidad, SE of Empalme, 09.67°N, 83.88°W, 2500 m, s.d., *Jiménez 2197* (F); Pan American Hwy, S of Empalme, 09.71°N, 83.95°W, 2300 m, 28 Feb 1984, *Khan et al. 1336* (BM, MICH); road up Volcán Irazú, near bridge over Río Birrís, 09.98°N, 83.85°W, 2900 m, 24 Feb 1965, *Lent 387* (F, MO); Interamerican Hwy, Cerro de la Muerte, 09.57°N, 83.75°W, 2526–3150 m, Jun 1944, *Mesén 496, 497, 498, 499, 500* (K); Interamerican Hwy, Cerro de la Muerte, between Empalme and Cañón, 09.57°N, 83.75°W, 2526–3150 m, Jun 1944, *Mesén 503* (K); Section 4, 3000 m, Jun 1944, *Mesén 504* (K); CR American Hwy, Km 11, section 4, between Madreselva and Cañón, 09.69°N, 83.92°W, 2510 m, Jun 1944, *Mesén 505* (K); Interamerican Hwy, Km 21, section 4, near Río Humo [Río Humo is N of Tres de Junio], 09.67°N, 83.86°W, 2790–2860 m, Jun 1944, *Mesén 506, 508, 511* (K); Interamerican Hwy, S4, Km 34 + 900, 09.60°N, 83.78°W, 3150 m, 16 Jan 1948, *Mesén 515* (K); Interamerican Hwy, Km 22 + 900, 09.66°N, 83.85°W, 2860–2880 m, 16 Jan 1948, *Mesén 516, 521* (K); Interamerican Hwy, Km 21, between Madreselva and Cañón, 09.69°N, 83.93°W, 2570 m, 16 Jan 1948, *Mesén 517* (K); Interamerican Hwy, section 4, Río Humo, Km 22 + 400, 09.67°N, 83.86°W, 2860 m, 16 Jan 1948, *Mesén 519* (K); Interamerican Hwy, S4, Río Humo, 09.67°N, 83.86°W, 2860 m, 16 Jan 1948, *Mesén 520* (K); Cordillera de Talamanca, Cerro de la Muerte, Interamerican Hwy between Km 60 and 77, La Trinidad, 09.57°N,

83.75°W, 3140 m, 27 Feb 1966, *Molina et al. 17888* (F); 28 km S of Empalme, 09.64°N, 83.84°W, 12 Jan 1975, *Ocampo & Otorola 960* (CR); Volcán Irazú, Hacienda Chicua, 09.98°N, 83.85°W, 3000 m, 29 Apr 1948, *Orozco 525* (K); between milk factory and base of Volcán Turrialba, 10.03°N, 83.77°W, 3000 m, 1 Nov 1948, *Oviedo 522, 523, 524* (K); Volcán Irazú, slopes, 09.98°N, 83.85°W, 2745 m, 28 Jun 1920, *Popenoe 1015* (NA, NY, US); 09.3 km S of Empalme at Km 66 of the Interamerican Hwy, 09.68°N, 83.92°W, 2500 m, 28 Nov 1996, *Spooner et al. 7101* (CR, INB, PTIS, WAG); 13.5 km S of Empalme at the Interamerican Hwy, 09.68°N, 83.90°W, 2770 m, 28 Nov 1996, *Spooner et al. 7103* (INB, PTIS, WAG); 20.3 km S of Empalme along Interamerican Hwy, 09.67°N, 83.89°W, 3020 m, 28 Nov 1996, *Spooner et al. 7104* (CR, INB, PTIS, WAG); Tapantí Nacional Park, 09.2 km from entrance of park, from concrete bridge until the end of the road at electricity station, 09.68°N, 83.75°W, 1740 m, 11 Dec 1996, *Spooner et al. 7129* (CR, INB, PTIS, WAG); Volcán Turrialba, 9.5 km on road towards volcano, 10.00°N, 83.75°W, 2910 m, 12 Dec 1996, *Spooner et al. 7133* (CR, INB, PTIS, WAG); Volcán Irazú, 2.9 km N of Potrera Cerrado, at Km 25, under bridge over Río Birrís, 09.95°N, 83.83°W, 2900 m, 13 Dec 1996, *Spooner et al. 7136* (INB, PTIS, WAG); Volcán Turrialba, S slope, near the Finca del Volcán Turrialba, 10.03°N, 83.77°W, 2000–2400 m, 23 Feb 1924, *Standley 34993* (US); Volcán Irazú, S slope, Río Birrís, 09.94°N, 83.81°W, 24 Feb 1924, *Standley 35400* (US); N of Irazú, 09.98°N, 83.85°W, 3050 m, 28 Mar 1928, *Stork 1281* (F); along the ICR road along the Río Grande de Osori, in the forested watershed reserve area, between the bridge at the junction of Río Dos Amigos and the end of the road where the dam is, between Km 10 and 17 from the bridge at Tapantí, 09.82°N, 83.85°W, 1400–1500 m, 10 Aug 1981, *Taylor 1250* (DUKE); Cartago, 1400 m, Sep 1908, *Wercklé 17296* (GH); San Cristóbal, 09.77°N, 84.01°W, s.d., *Wercklé s.n.* (US).—CARTAGO/SAN JOSÉ BORDER: near division, Cerro de la Muerte, 09.57°N, 83.75°W, 3000 m, 7 Oct 1978, *Antonio 667* (CR, F); 22 km SE of Empalme, along Interamerican Hwy, 09.67°N, 83.86°W, 2500–2600 m, 10 Aug 1971, *Burger 7961* (F); Interamerican Hwy, 22 km SE of Empalme, 09.67°N, 83.86°W, 10 Aug 1971, *Burger 7969* (DUKE, F, MO, S); Interamerican Hwy near Trinidad and Km 72, about 20 km SE of Empalme, 09.67°N, 83.88°W, 2600–2800 m, 6 Feb 1982, *Burger & Barringer 11479* (F, CR); 22 km SE of Empalme, along Interamerican Hwy, 09.67°N, 83.86°W, 2500–2600 m, 28 Nov 1969, *Burger & Liesner 6466* (CR, F, MO); 20 km SE from Empalme along Interamerican Hwy, Km 72, La Trinidad, 09.67°N, 83.88°W, 2600 m, 25 May to 19 Jun 1968, *Burger & Stolze 5262* (F); Interamerican Hwy, Km 37, section 4, Cerro de la Muerte, 09.57°N, 83.75°W, 3150 m, Jun 1944, *Mesén 509* (K); along Pan American Hwy in mountains S of Cartago, near Km 67 and 68, S of store Flor del Sur at Macho Gaff de Dota about 0.5–1 km, 2600 m, 25 Jul 1981, *Taylor 531* (DUKE); Cordillera de Talamanca, near and below Cerro de la Muerte, 09.57°N, 83.75°W, 3200 m, 27 Jan 1965, *Williams et al. 28304* (F).—HEREDIA: Volcán Barba, E slopes, between Río Nuevo (upper Río Patria), 10.10°N, 84.05°W, 2000 m, 26 Oct 1975, *Burger & Baker 9486* (F); Volcán Barva, SW slopes, above Sacramento, 10.12°N, 84.12°W, 2200–2300 m, 4 Feb 1982, *Burger & Barringer 11432* (F); Volcán Barba, E slope, Río Uvertas (upper Río Patria near the continental divide), 10.10°N, 84.07°W, 2000 m, 22–24 Nov 1969, *Burger & Liesner 6419* (DUKE, F, MO); along the Río Vara Blanca (Pacific drainage), Cerros Zurqui, 10.05°N, 84.02°W, 1600–1800 m, 8 Feb 1977, *Gentry s.n.* (CR); Río Uvertas (upper Río Patria) on the E slope of Volcán Barba at the Caribbean side of the Continental divide, 10.10°N, 84.07°W, 1900 m, 1–3 Apr 1973, *Gentry & Burger 2869* (F, MO); around lake of Volcán Barva, 10.13°N, 84.10°W, 2900 m, 26 Jan 1979, *Gómez Laurito GL-4387* (USJ); Cantón de Barva, Parque Nacional Braulio Carrilo, Estación Barva, 10.13°N, 84.12°W, 2600 m, 12 May 1995, *González 736* (BM); headwaters of Río Santo Domingo, about 3 km NE of San Rafael de Vera Blanca, N slope of Volcán Barva, 10.17°N, 84.12°W, 2060 m, 11 Apr 1986, *Grayum 7240* (MO); slopes and ridges above Laguna del Barva and summit of Volcán Barva, 10.13°N, 84.10°W, 2480–2900 m, 1986, *Grayum & Quesada 7425* (MO); between Los Cartagos and Vara Blanca, 10.17°N, 84.15°W, 1830 m, 22 Jun 1963, *Jiménez 762* (CR, F, NY, US); Finca la Selva, San Rafael de Vara Blanca slopes N of Volcán Barba, 10.16°N, 84.13°W, 1700 m, 23 Jun 1963, *Jiménez 801* (CR, F, NY); forest at base of Cerro Zurqui, 10.05°N, 84.03°W, 1650 m, 9 Jul 1973, *Lent 3569* (CR, F); between Poás and Barba volcanoes, Vara Blanca, 10.17°N, 84.15°W, 1600–1700 m, 22 Jul 1923, *Maxon & Harvey 8274* (BM, US); Alto de Roble, 10.08°N, 84.08°W, 2000 m, May 1888, *Pittier 18* (G), *Pittier 34* (G), *Pittier 215* (BR); Volcán Barba, edge of path, 10.13°N, 84.10°W, 2900 m, 18 Feb 1962, *Rodríguez 839* (CR); central Cordillera, N slope, between Poás and Barba volcanoes, Vara Blanca de Sarapiquí, 10.17°N, 84.15°W, 1920 m, Feb 1938, *Skutch 3580* (F, GH, K, MO, NY, S, US); Volcán Barva, 500 m after entrance of park, 100 m NW towards viewpoint, 10.12°N, 84.13°W, 2570 m, 29 Nov 1996, *Spooner et al. 7105* (CR, INB, PTIS, WAG); Volcán Barva, above Laguna Barva on the path to Laguna Copey, 10.13°N, 84.12°W, 2780 m, 29 Nov 1996, *Spooner et al. 7107* (INB, PTIS, WAG); Volcán Barva, along path above Laguna Copey, 10.15°N, 84.10°W, 2780 m, 29 Nov 1996, *Spooner et al. 7108* (INB, PTIS, WAG); Braulio Carillo National Park, sector Cerro Chompipe, 6.3 km N of San Rafael, 10.08°N, 84.07°W, 2200 m, 10 Dec 1996, *Spooner et al. 7123* (CR, INB, PTIS, WAG); Cerro de Las Lajas, N of San Isidro, 10.04°N, 84.00°W, 2000–2400 m, 7 Mar 1926, *Standley & Valerio 51583* (F, US); NE of San Isidro, Yerba Buena, 10.05°N, 84.01°W, 2000 m, 22–28 Feb 1926, *Standley*

& Valerio 49948, 49973, 49982 (all US); Rancho Flores [on Volcán Barva], 10.13°N, 84.10°W, 2043 m, 23 Feb 1890, *Tonduz 2181* (BR); Cerro Gallito [the village of Gallito is at about 2100 m, on the lower *S*-facing slopes of Volcán Barva], 10.13°N, 84.10°W, 2000 m, 3 Feb 1935, *Valerio 1048* (F); Braulio Carillo National Park, Estación Barva, 10.12°N, 84.12°W, 2500 m, 1 Jul 1990, *Varela 83* (INB); Cerro Chompipe, San Rafael, 10.09°N, 84.09°W, 2100 m, 17 Dec 1993, *Vargas et al. 1617a* (CR).—LIMÓN: Cantón de Coto Brus, Parque Internacional La Amistad, Cordillera de Talamanca, Estación Altamira, by Jardín Natural la Amistad, margin of Río Terbi, 09.12°N, 82.97°W, 2450 m, 18 Apr 1995, *Angulo 235* (BM); Cordillera de Talamanca, Atlantic slope, Valle de Silencio, area just N of Cerro Hoffman, 4.5 airline km W of the Costa Rican-Panamanian border, 09.10°N, 82.95°W, 2350–2450 m, 8 Sep 1984, *Davidse et al. 28637* (MO), 9 Sep 1984, *Davidse et al. 28690* (CR); Cordillera de la Talamanca, Parque Internacional de la Amistad, N of Cerro Hoffman, along trail which begins at park station Altamira, 09.10°N, 82.95°W, 2320 m, 5 Dec 1996, *Spooner et al. 7116* (INB, PTIS, WAG); upper Río Lari, Cordillera de Talamanca, alluvial plain, 09.30°N, 83.12°W, 2000 m, 3 Apr 1967, *Weston 4649* (UC).—PUNTARENAS: Cantón de Pérez Zeledón, Parque Internacional La Amistad, Cordillera de Talamanca, Sendero Herradura to Urán, next to the quebrada, 09.11°N, 82.99°W, 2600–2800 m, 7 Apr 1995, *Aguilar & Gamboa 3950* (BM); Monteverde, San Luis Valley on Pacific slope, 10.31°N, 84.81°W, 1200 m, 15 Nov 1985, *Bello 3400* (MO); about 2 km SE of Monteverde in the Pacific watershed, on ridge along trail, 10.30°N, 84.80°W, 1500 m, 18–21 Mar 1973, *Gentry & Burger 2712* (CR, F, MO, NY); Monteverde Biological Reserve, path to Chomogo, 10.31°N, 84.79°W, 10 Mar 1976, *Gómez Laurito et al. GL-1388* (USJ).—SAN JOSÉ: Cantón de Pérez Zeledón, Cuenca Térraba–Sierpe, Fila Cementerio de la Maquina, 09.47°N, 83.58°W, 1700 m, 2 May 1997, *Aguilar 5048* (INB); Cantón de Pérez Zeledón, Parque Nacional Chirripó, Cuenca Térraba–Sierpe, Sendero El Paso Los Indios, 09.53°N, 83.54°W, 3000–3200 m, 1 May 1977, *Gamboa 1282* (INB); Cordillera de Talamanca, Pacific slope near Chirripó massif, 09.60°N, 83.57°W, 2700–3000 m, 6 Apr 1969, *Davidse & Pohl 1638* (MO); Potreros of Rancho Redondo, 09.97°N, 83.95°W, 2220–2600 m, 9 Nov 1929, *Dodge & Thomas 4926* (F, GH, MICH, MO); Cantón de Pérez Zeledón, Cuenca Térraba–Sierpe, Estación Cuericí, Sendero a la Piedra, 5 km E of Villa Mills, 09.56°N, 83.68°W, 2700 m, 9 Oct 1996, *Gamboa 763* (INB); high above Río Hondura, 10.05°N, 83.98°W, 1400 m, 11 Mar 1973, *Lent 3227* (F); Interamerican Hwy, Km 29, section 4, Jaboncillos [note: Jaboncillos is a small village just W of Escazú, just W of San José], 09.88°N, 84.14°W, 2900 m, Jun 1944, *Mesén 501* (K); Angostura, 3080 m, Jul 1944, *Mesén 502* (K); Interamerican Hwy, Km 29, section 4, Jaboncillos Km 29 + 700, section 4, 09.61°N, 83.83°W, 2950 m, 16 Jan 1948, *Mesén 513* (K); Cantón de Aserrí, Cerros de Escazú Protected Area, Cerros Escazú, La Carputerá, El Cedral, Alto Hierbabuena, high oak woods to the NE, 10.15°N, 84.10°W, 2150 m, 6 Nov 1993, *Morales 1964* (CR, MO, INB); Valley of Archángeles, massif of the Irazú, 09.98°N, 83.87°W, 25 May 1888, *Pittier 260, 261* (BR); edge of Province of San José, InterAmerican Hwy between Empalme and Cerro de la Muerte, Cordillera de Talamanca, 09.59°N, 83.77°W, 2355 m, 7 Nov 1961, *Rossbach 3198* (GH); Las Nubes, 09.98°N, 83.92°W, 1500–1900 m, 20–22 Mar 1924, *Standley 38614, 38666, 38756, 38818* (US); Cerro de Las Vueltas, 09.62°N, 83.85°W, 2700–3000 m, 29-Dec to 1-Jan 1925/6, *Standley & Valerio 43591, 43661, 43759, 43913, 49931* (GH, US); Irazú on road to El Roble, 09.98°N, 83.86°W, 3050 m, 16 May 1928, *Stork 1999* (F); San Cristóbal road, 09.75°N, 84.03°W, 2440 m, 27 May 1928, *Stork 2213* (F); new road from La Estrella to Copey, 09.65°N, 83.92°W, 2450 m, 15 Feb 1935, *Valerio 1050* (F).—Province unknown: Monté Sin fé, 7 Feb 1967, *Gómez 27* (CR); Cerro del Fugles, 25 Dec 1931, *Kupper 173* (M); Ferralos [or Feualos], 24 Jan 1913, *León 1115* (CR); clearing at the mouth of Zhorquin, Talamanca, Atlantic slope, Mar 1894, *Tonduz 8503* (P). **Panama.** CHIRIQUÍ: Boquete Dist., Bajo Chorro, 08.80°N, 82.53°W, 1829 m, 19 Feb 1939, *Davidson 314* (F); at boundary with Prov. Bocas del Toro, along continental divide to about 1 km E of Cerro Pate Macho, 08.82°N, 82.46°W, 2100–2200 m, 8 Feb 1986, *Grayum 6439* (MO); S of Paso Respingo trail to high ridge N of Volcán summit, 08.84°N, 82.53°W, 3048–3292 m, 5 Apr 1979, *Hammel et al. 6717* (MO); Bocas del Toro border, trail along continental divide NE of Boquete, above Palo Alto, down slope on Bocas side of trail, 08.79°N, 82.36°W, 2164 m, 23 May 1979, *Hammel et al. 7362* (MO); summit and ridge N of Cerro Pando, 08.90°N, 82.70°W, 2400–2500 m, 16 Oct 1981, *Knapp 1609* (MO); Cerro Pando, on the continental divide between the Panama-Costa Rican border, about 16 km NW of El Hato del Volcán, 08.85°N, 82.69°W, 2000–2482 m, Jul 1975, *Mori & Bolten 7322* (NY); Dist. and Corregimiento of Boquete, E base of Cerro Pate de Macho, about 100 m S of continental divide at border with Province of Bocas del Toro, 08.82°N, 82.38°W, 2000 m, 8 Sep 2000, *Spooner et al. 7411* (CIP, PMA, PTIS); Distrito Renacimiento, Corregimiento Río Sereno, growing along a path at summit of continental divide separating Panama and Costa Rica, about path leading to the stone division marker at the summit of Cerro Pando, 08.90°N, 82.71°W, 2445 m, 12 Sep 2000, *Spooner et al. 7414* (CIP, PMA, PTIS).—CHIRIQUÍ/BOCAS DEL TORO BORDER: Cerro Horqueta, along foot path from the N base of Volcán Barú (Volcán de Chiriquí) NW out of Bajo Boquete, walking N to Laguna Escondida, at a local place name (no houses) called Culebras, on both sides of continental divide, 08.86°N, 82.48°W, 1970 m, 8 Sep 2000, *Spooner et al. 7412* (CIP, PMA, PTIS).

23. Solanum iopetalum (p. 112).

Mexico. DISTRITO FEDERAL: Rt 95 from Mexico to Cuernavaca, between Km 42–43, about 1 km N of La Cima, 19.16°N, 99.19°W, 8 Aug 1989, *Norrbom 89M4 p.p.* (US).—GUANAJUATO: Mpio. Acámbaro, La Mojonera vértice 66, El Moro, 19.96°N, 100.66°W, 3100 m, 22 Jul 1987, *Rubio 674* (IEB).—GUERRERO: Mpio. Metlatonoc, at Xatu Yahta, W of Coicoyán, fields of Atzompa, 17.25°N, 98.33°W, 2600 m, 20 Aug 1989, *Avila 739* (MEXU); Dist. Galeana, Teotepec, 17.45°N, 100.16°W, 2750 m, 16 Jul 1939, *Hinton et al. 14438* (ARIZ, F, GH, LL, MO, NA, NY, PH, RSA, TEX, US); Mpio. Tlacotepec, Filo de Caballo, 15 km NE Puerto del Gallo, on road to Atoyac, 17.45°N, 100.11°W, 3050 m, 24 Nov 1983, *Martínez & Barrie 5628* (MEXU); Mpio. Chilpancingo, 5 km W from El Ocotito, road to Jaleaca, 24 Nov 1983, *Martínez & Soto 5748* (MEXU); 4 km NE Puerto del Gallo, road to Filo de Caballo, 17.53°N, 100.36°W, 3000 m, 7 Sep 1983, *Martínez & Villaseñor 4258* (MEXU), *Martínez & Villaseñor 4263* (BM, MEXU); Mpio. Alvarez, 1 km SW of Puerto del Gallo, on road to Atoyac, 17.46°N, 100.06°W, 2500 m, 20 Oct 1983, *Martínez et al. 5017* (NY); road W of Chilpancingo de las Bravos, 1 km W of Omiltemi, 15 m off N side of road, 17.55°N, 99.69°W, 2200 m, 18 Oct 1997, *Rivera-Peña et al. 965* (INIFAP, MEXU, PTIS, WAG); road W of Chilpancingo de los Bravos, 3 km W of Omiltemi, 15 m on S side of road, 17.55°N, 99.70°W, 2370 m, 18 Oct 1997, *Rivera-Peña et al. 966* (PTIS); road W of Chilcancingo de los Bravos, 4.3 km W of Omiltemi, 17.55°N, 99.71°W, 2530 m, 18 Oct 1997, *Rivera-Peña et al. 967* (INIFAP, MEXU, PTIS, WAG); Mpio. Tlacotepec, Cerro Teotepec, 17.45°N, 100.16°W, 3200 m, 10 Aug 1964, *Rzedowski 18548* (ENCB); 6 km NW of Omiltemi, road from Chilpancingo to Omiltemi to Las Joyas, 17.53°N, 99.71°W, 2530 m, 12 Nov 1982, *Tenorio et al. 2660* (MEXU).—HIDALGO: Mpio. Agua Blanca de Iturbide, W of Agua Blanca de Iturbide, 2 km from the downtown of the village, 20.36°N, 98.35°W, 26 Jul 1997, *García & Guízar 77* (MEXU); San Mateo, 20 km NE of Tulancingo, 20.20°N, 98.25°W, 16 Sep 1956, *Graham 93* (IBUG, MEXU, PTIS); about 8 km N of Agua Blanca on road from Tulancingo to Huayacocotla, 20.40°N, 98.35°W, 2350 m, 16 Sep 1991, *Hjerting 7359* (PTIS); Mpio. Epazoyucan, 1 km SW of El Guajolote, 20.01°N, 98.65°W, 2700 m, 17 Jun 1984, *Medina & Barrios 2574* (F, MICH, NY); on Metepec to Tenango de Doria Road, 20 km NE of intersection of road entering Metepec, on N side of road, 20.32°N, 98.25°W, 2290 m, 1 Oct 1997, *Rivera-Peña et al. 941* (INIFAP, MEXU, PTIS, WAG); on Metepec to Tenango de Doria Road, 17 km NE of intersection of this road with road entering Metepec, on S side of road, 20.32°N, 98.26°W, 2230 m, 1 Oct 1997, *Rivera-Peña et al. 942* (INIFAP, MEXU, PTIS, WAG); on Metepec to Tenango de Doria Road, 16 km NE of intersection of this road with road entering Metepec, on S side of road on slope, 20.32°N, 98.26°W, 2270 m, 1 Oct 1997, *Rivera-Peña et al. 943* (INIFAP, MEXU, WAG); Mpio. Epazoyucan, area about Peñas Largas, 20.08°N, 98.63°W, 2900 m, 25 Aug 1984, *Rzedowski 38488* (IEB); Piedra Blanca, Km 90, Hwy 105 between Metzquititlán and Zacualtipán, 20.60°N, 98.62°W, 2000 m, 6 Oct 1982, *Tarn et al. 32* (BR, K, PTIS, WIS); from Hwy 105, Pachuca to Zacualtipán, 5.5 km along the track towards Huayacocotla, 20.38°N, 98.67°W, 1950 m, 4 Sep 1983, *Tarn et al. 53* (K, PTIS); N of Ixmiquilpan, 18 km N of Nequetejé, between El Defay and Agua Florida, 20.48°N, 99.23°W, 2630 m, 5 Sep 1983, *Tarn et al. 58* (K, NY, PTIS).—JALISCO: Hill San Pedro, Mpio. Talpa de Allende, 20.41°N, 104.94°W, 2000 m, 12 Aug 1994, *Cházaro et al. 7402* (CHAPA); Mpio. Autlán, from El Silacayote Creek to Piedra Bola Creek, 19.72°N, 104.38°W, 4 Aug 1986, *Cuevas 1501* (IBUG, ZEA); Mpio. Ciudad Guzmán, Nevado de Colima, Km 14 on the dirt road from El Fresnito to the antennas of channel 13, 19.62°N, 103.58°W, 2660 m, 13 Sep 1986, *Guzmán s.n.* (IBUG, IEB); 10–11 km SW of Tolima, 17–18 km NNE of Minatitlán, 3 km SSE of La Laguna, 19.52°N, 103.97°W, 2000–2100 m, 4 Sep 1990, *Guzmán & Cuevas 1106* (WIS); Nevado de Colima, W side, Tranquitas, 19.55°N, 103.63°W, 3200 m, 23 Sep 1958, *Hawkes et al. 1547* (IBUG, K, NY, PTIS, US, WIS); 1.5 km N of Terrero on road to La Laguna, about 27 km NW of Colima, top of Cerro Grande, on a massive limestone plateau, 19.46°N, 103.95°W, 2300 m, 18 Dec 1988, *Iltis et al. 30147* (WIS); Mpio. Huejotitán, at local place called Jaral, 2.5 km S of Huejotitán, 1950 m, 2 Aug 1986, *Machuca 3054* (NY); Sierra de Manantlán, 15 mi SE of Autlán, about 2 mi from Aserradero San Miguel Uno, W and S of the divide toward Manzanillo, 19.64°N, 104.30°W, 2250–2400 m, 4–5 Nov 1952, *McVaugh 13888* (MICH); Nevado de Colima, 19.55°N, 103.63°W, 2600 m, 12 Sep 1986, *Ornelas 523* (IBUG); Mpio. Cuautitlán, 800 m NE of Mr. Valencia Zalapa's house, Las Joyas, 19.54°N, 104.17°W, 1700 m, 16 Jun 1983, *Pérez de la Rosa 374* (IBUG); Mpio. Ciudad Guzmán, Km 14 on dirt road from El Fresnito to microwave station, 19.63°N, 103.55°W, 2660 m, 13 Sep 1986, *Ramírez et al. 538* (IBUG); Mpio. Chiquilistlán, El Jabalí Creek on Tapalpa to Chiquilistlán road, 20.03°N, 103.83°W, 2100 m, 27 Aug 1987, *Rodríguez s.n.* (IBUG); Mpio. Tecalitán, Plan del Ego, Sierra del Halo, 19.47°N, 103.30°W, 1940 m, 2 Aug 1985, *Rodríguez & Pérez de la Rosa 161* (ENCB, IBUG, MEXU); Mpio. Tecalitlán, Sierra del Halo, dirt road to Jilotlán de Dolores, wood camp of Plan del Ego, 19.47°N, 103.30°W, 1800 m, 19 Jul 1986, *Rodríguez & Suárez 414* (ENCB, IBUG, IEB, MEXU); Mpio. Tecalitlán, dirt road from Tecalitlán to Jilotlán de Dolores, Alotitlán, wood camp Plan del Ego, 19.47°N, 103.30°W, 1940 m, 16 Aug 1986, *Rodríguez & Suárez 506* (ANSM, CHAPA, ENCB, F, IBUG, IEB, MEXU, MICH, MO, MU, NY, TEX, WIS, XAL); Mpio. Chiquilistlán, road from Tapala to Chiquilistlán, 1 km from the road junction, 20.05°N,

103.83°W, 2100 m, 17 Aug 1986, *Rodríguez & Suárez 540* (CHAPA, ENCB, IBUG, IEB, MEXU, PTIS, XAL); Mpio. Venustiano Carranza, Nevado de Colima, N slope of El Floripondio on road to microwave station, 19.76°N, 103.73°W, 2400 m, 24 Aug 1986, *Rodríguez & Suárez 592* (IBUG); Mpio. Venustiano Carranza, dirt road to El Floripondio to microwave station Las Víboras, 19.72°N, 103.67°W, 2400 m, 22 Aug 1987, *Rodríguez & Suárez 937* (CHAPA, ENCB, IBUG, IEB, MEXU, XAL); new microwave tower road to top of Nevado de Colima, 16 km from beginning of this road, which begins about 0.5 km SE of La Mesa and El Fresnito, 19.58°N, 103.57°W, 2710 m, 7 Sep 1988, *Spooner et al. 4121* (IBUG, IEB, INIFAP, MEXU, PTIS, WIS); Mpio. Venustiano Carranza, dirt road between Puerto El Floripondio and microwave station Las Víboras, 19.75°N, 103.74°W, 2400 m, 8 Sep 1988, *Spooner et al. 4128* (INIFAP, IBUG, WIS), *Spooner et al. 4133* (IBUG, INIFAP, MEXU); Mpio. Venustiano Carranza, dirt road between Puerto El Floripondio and microwave station Las Víboras, 19.72°N, 103.68°W, 2600 m, 8 Sep 1988, *Spooner et al. 4131* (IBUG, IEB, INIFAP, MEXU); Mpio. Tapalpa, 2 km N of Juanacatlán, 19.98°N, 103.72°W, 2520 m, 8 Sep 1988, *Spooner et al. 4135* (IEB, INIFAP); on microwave tower road to Cerro Grande, SE of Santa Fe, 0.7 km downhill of top of tower, 20.50°N, 103.03°W, 2230 m, 9 Sep 1988, *Spooner et al. 4140* (INIFAP, PTIS); 35 km SE of Autlán, between San Miguel and Rincón de Manantlán, 19.56°N, 104.21°W, 2400 m, 4 Sep 1981, *Vázquez & Nieves 472* (IBUG); mountains E of Manantlán about 15 mi SSE of Autlán by way of Chante, 19.65°N, 104.31°W, 2012 m, 26 Jul 1949, *Wilbur & Wilbur 1860* (MICH).—MÉXICO: 1 1/2 hours walking from Herradura de Avándaro to Temascaltepec, 19.15°N, 100.11°W, 2300 m, 1 Aug 1965, *Flores et al. S-800* (MEXU); Tenancingo, 19.02°N, 99.57°W, s.d., *Graham S-454* (K, PTIS); Agua Bendita, Toluca to Valle de Bravo Road at 38 km from main Toluca to Morelia road, 18.78°N, 99.86°W, 2750 m, 2 Oct 1958, *Hawkes et al. 1607* (C, K, PTIS); Dist. Temascaltepec, Las Cruces, 19.14°N, 99.93°W, 3350 m, 15 Jul 1932, *Hinton 1047* (BM, G, GH, K, MEXU); 13 km along Tres Marías to Lagunas de Zempoala National Park Road, just W of the Morelos state border, 19.05°N, 99.32°W, 2900 m, 9 Sep 1995, *Hjerting et al. 95-83* (K); Alvarado, Temascaltepec, 19.04°N, 100.05°W, 1900 m, 2 Aug 1953, *Matuda 28848* (MEXU); road from Toluca to Temascaltepec, Km 55, 19.12°N, 100.02°W, 2125 m, Oct 1980, *Ochoa 14221* (CIP, WIS, US); from El Capulín, a small settlement 21.3 km S of La Puerta, Rt 134, drive 2 km E and then S on track into forest, in Parque Nacional Nevado de Toluca, on W-facing lower slopes of volcano, 19.07°N, 99.84°W, 3100 m, 20 Oct 1997, *Rivera-Peña et al. 976* (INIFAP, MEXU, PTIS, WAG); on N side of Rt 134, 35.7 km SW of Toluca, by posted road signs, shortly SW of entrance to Mesón Viejo, 19.17°N, 99.89°W, 2750 m, 20 Oct 1997, *Rivera-Peña et al. 982* (INIFAP, MEXU, PTIS, WAG); W slopes of Nevado de Toluca, 35 km SW of Toluca on Hwy 130, 19.08°N, 99.83°W, 3000 m, 29 Aug 1965, *Roe et al. 1474* (MICH, MO, US, WIS); on S side of road from Rt 130 (134) to Valle de Bravo, 3 km W of Rt 130, 19.17°N, 99.93°W, 3350 m, 24 Aug 1988, *Spooner et al. 4021* (INIFAP, PTIS, WIS); about 0.25 km S of road from Rt 130 (134) to Valle de Bravo, 8 km E of Rt 130, 19.17°N, 100.00°W, 2900 m, 24 Aug 1988, *Spooner et al. 4024A* (INIFAP, PTIS, WIS), 15 Oct 1988, *Spooner et al. 4250* (INIFAP, PTIS, WIS); S side of Rt 15, by Parada El Puerto, about 1 mi S of Rt 15, about 1 mi E of México-Michoacán state border, 19.43°N, 100.18°W, 2900 m, 27 Aug 1988, *Spooner et al. 4046B* (INIFAP, PTIS); about 200 m N of road from Rt 130 (134) to Valle de Bravo, 2 km E of San Ramón, 19.17°N, 100.02°W, 2450 m, 15 Oct 1988, *Spooner et al. 4255* (INIFAP, PTIS, WIS); about 6.5 km towards San Pedro Tenayac from junction with Temascaltepec-Valle de Bravo road, 19.03°N, 100.05°W, 1860 m, 15 Oct 1982, *Tarn et al. 44* (PTIS); road between Santa Marta and Huitzilac, near Lagunas de Zempoala National Park, approximately 13 km from Tres Marías, 19.03°N, 99.33°W, 2900 m, 19 Oct 1983, *Tarn et al. 166* (K, PTIS); from Toluca to Temascaltepec, Hwy 130, along Rt 3 at about 30 km, immediately before Paredones, 19.03°N, 99.88°W, 2880 m, 21 Sep 1984, *Tarn et al. 206* (F, IBUG, K, PTIS); from Toluca to Temascaltepec, Hwy 130 along Rt 3 at about Km 30, immediately before Paredones, about 0.5 km NE of Paredones, 19.03°N, 99.88°W, 2900 m, 6 Nov 1984, *Tarn et al. 295* (IBUG, K, PTIS); road from Toluca to Sultepec, about 5 km from Paredones towards Tequisquiapan, 19.03°N, 99.92°W, 2730 m, 6 Nov 1984, *Tarn et al. 296* (PTIS).—MICHOACÁN: Puerto Garnica, 19.65°N, 100.70°W, 3 Aug 1965, *Correll et al. 31321* (LL); Mpio. Villa Madero, El Tzintzun, 19.61°N, 101.58°W, 2850 m, 30 Aug 1988, *Díaz 5028* (IEB); road from Mexico to Morelia, Km 267, on the right side of the road, 19.64°N, 100.76°W, 2690 m, 9 Sep 1962, *Flores S-660* (MEXU); rd from Pátzcuaro to Tacámbaro, Km 30 on the left side of the road, 19.39°N, 101.50°W, 2720 m, 24 Aug 1963, *Flores S-714* (MEXU, WIS); Puerto Garnica, on road to Morelia, 19.65°N, 100.68°W, 2800 m, 3 Aug 1965, *Flores et al. S-806* (MEXU); Cerro Tancítaro, 27 km W of Uruapan (by air), El Arroyo, 1 km W of El Tepetate, 19.40°N, 102.27°W, 2850 m, 29 Aug 1996, *García 4152* (IEB); Mpio. Nahuatzen, Cerro El Pilón, 19.64°N, 101.99°W, 3000 m, 15 Aug 1990, *García & Pérez 3006* (IEB); near Zitácuaro, hills above Mexico to Morelia Hwy at Km 147 from Mexico, 19.40°N, 100.25°W, 2920–3000 m, 31 Jul 1949, *Hawkes et al. 1043* (A, B, BM, BR, C, F, G, IBUG, K, LL, MEXU, MPU, P, S, WAG, WIS); Km 266 from Mexico on the road from Morelia, San José de las Cumbres, 19.68°N, 100.85°W, 2700 m, 26 Sep 1958, *Hawkes et al. 1577* (C, F, K, IBUG, MEXU, PTIS); Puerto Garnica, road from Mexico City to Morelia at 258.4 km, 19.65°N, 100.68°W, 2850 m, 3 Aug 1965, *Hawkes et al. 2520*

(K); Dist. Zitácuaro, Zitácuaro, Cerro Pelón, 19.40°N, 100.25°W, 17 Jun 1938, *Hinton 11969* (BM, DS, F, GH, K, MEXU, MICH, NY, RSA, UC, US); Dist. Coalcomán, Barroloso, Cerro de las Conchas highest point, 18.85°N, 103.05°W, 2900 m, 10 Aug 1939, *Hinton et al. 15096* (ARIZ, F, GH, LL, MO, NA, NY, PH, TEX, US); Km 213 on the Toluca to Morelia Road, Barranca El Salto, about 27 km E of junction of Rts 15 and 43, 19.66°N, 100.80°W, 2050 m, 1995, *Hjerting et al. 95-152* (K, MEXU); Mpio. Zinapécuaro, San Andrés dam, 500 m NW of Jeráhuaro, 19.84°N, 100.60°W, 2470 m, 30 Aug 1989, *Jasso 1497* (IEB, MEXU); Mpio. Tancítaro, S slope mount Tancítaro, 19.33°N, 102.37°W, 2743 m, 25 Jul 1940, *Leavenworth 360* (F); Mpio. Tancítaro, Mount Tancítaro, 19.33°N, 102.37°W, 2377 m, 25 Jul 1941, *Leavenworth & Hoogstraal 1212* (F); Mount Tancítaro, 19.38°N, 102.26°W, 2286 m, 5 Jul 1941, *Leavenworth & Hoogstraal 4021* (F, GH, LL, MICH, MO, NY); Aruamo, 5 km S of Tancítaro, 19.33°N, 102.30°W, 1900 m, 12 Sep 1958, *Limón 426a* (B, K, MPU); Opopeo, road from Pátzcuaro to Tacámbaro, 19.40°N, 101.60°W, 2425 m, 23 Sep 1980, *Ochoa 14166* (CIP, US, WIS); Mpio. Santa Clara del Cobre, Cerro San Miguel, Zirahuén, 19.44°N, 101.71°W, 2800 m, 28 Oct 1988, *Pérez 349* (IEB, MEXU); 5 km up road to Cerro Burro, from junction with Rt 120 S of Pátzcuaro, 19.43°N, 101.46°W, 3130 m, 22 Oct 1997, *Rivera-Peña et al. 986* (INIFAP, MEXU, PTIS, WAG); N of Uruapan, 19.42°N, 102.07°W, 16 Jul 1941, *Schery 156* (MO); on slope on N side of Rt 15, 7 mi E of Macho de Agua, E of Zitácuaro, 0.3 km W of México-Michoacán State border, 19.45°N, 100.20°W, 2820 m, 27 Aug 1988, *Spooner et al. 4040* (INIFAP, PTIS), *Spooner et al. 4042* (WIS), 15 Oct 1988, *Spooner et al. 4260* (PTIS); about 2 km S of Rt 15 on gravel road beginning just E of Macho de Agua, 19.42°N, 100.22°W, 2850 m, 27 Aug 1988, *Spooner et al. 4049* (INIFAP, PTIS); SE side of Cerro El Cacique, about 6.5 km E of main road S from Zitácuaro, 19.38°N, 100.30°W, 2300 m, 28 Aug 1988, *Spooner et al. 4050* (INIFAP, PTIS, WIS); SE side of Cerro El Cacique, E of main road, S from Zitácuaro, 19.38°N, 100.30°W, 2350 m, 28 Aug 1988, *Spooner et al. 4052* (INIFAP, PTIS); 20 km N of road from Rt 15 just W of Ciudad Hidalgo, N past San Pedro Jacuaro to Ucareo to Queréndaro Road, by Los Tejamaniles, 19.80°N, 100.65°W, 2700 m, 29 Aug 1988, *Spooner et al. 4060* (INIFAP, PTIS, WIS); 21 km N of Rt 15, at junction of road N of Rt 15 just W of Ciudad Hidalgo, past San Pedro Jacuaro and road to steam wells at Los Azufres, 19.82°N, 100.65°W, 2750 m, 29 Aug 1988, *Spooner et al. 4064* (INIFAP, PTIS); 1 km N of Laguna Larga, on road N of Rt 15 diverting just E of Ciudad Hidalgo, past San Pedro Jacuaro, 17 km S of Ucareo to Queréndaro road, 19.83°N, 100.67°W, 2750 m, 29 Aug 1988, *Spooner et al. 4065* (INIFAP, PTIS, WIS); along dirt road, 1.7 km NE of Capácuaro, on S side of road, 19.57°N, 102.02°W, 2320 m, 1 Sep 1988, *Spooner et al. 4086B* (PTIS); along microwave tower road off of dirt road beginning about 5 km NE of Capácuaro, about 5.5 km from beginning of this microwave tower road, 19.58°N, 102.03°W, 2800 m, 3 Sept 1988, *Spooner et al. 4091B* (INIFAP, PTIS); just N of steam power station on W side of road from Rt 15, W of Ciudad Hidalgo to Ucareo to Queréndaro road, 4 km N of Laguana Larga, 19.82°N, 100.67°W, 2880 m, 17 Oct 1988, *Spooner et al. 4265* (INIFAP, PTIS); near top of Cerro Burro road of right-hand fork of road at radio station tower, 19.43°N, 101.46°W, 3250 m, 18 Oct 1988, *Spooner et al. 4274* (INIFAP, PTIS); S side of Mex-15, 5.5 km E of San José de La Cumbre, near Puerto Garnica, 19.70°N, 100.80°W, 2500 m, 20 Jul 1975, *Steingraeber 40* (MEXU, WIS); Pátzcuaro to Tacámbaro Road beyond San Gregorio and lake at about 55 km on left of road, 19.53°N, 101.60°W, 2780 m, 10 Oct 1967, *Tarn & Gómez 180* (K); Mpio. Ocampo, road to Salto, E of Ocampo, 19.58°N, 100.30°W, 2 Oct 1989, *Torres 13248* (IEB, MEXU); Las Peras, 38 km E of Morelia (ca. 33 km air distance), Km 272 on Hwy 15 from Ciudad Hidalgo to Morelia, 19.73°N, 100.80°W, 2515 m, 13 Sep 1962, *Ugent & Flores 1958–1962, 1966-1968, 1978–1985, 1991–1993, 1995-2001, 2005–2007* (BM, GAT, GH, MICH, MO, UC, US, WIS); about 6 km NNW of Tacámbaro on the road to Pátzcuaro, at Km 59, 19.41°N, 101.52°W, 2520 m, 17 Sep 1962, *Ugent & Flores 2235–2238, 2240* (MO, US, WIS); 46 km E of Morelia (32 air km) Hwy 15, at Km 267, Sierra Madre Occidental, 19.65°N, 100.98°W, 8 Sep 1962, *Ugent et al. 1564–1569, 1573–1578, 1581-1587, 1595, 1598-1599, 1600–1601, 1606, 1621–1624, 1625–1629* (BM, GAT, GH, MEXU, MO, UC, US, WIS); Mpio. Cherán, SE slope of Cerro Grande, Santa Cruz Tanaco, 19.68°N, 101.95°W, 2850 m, 14 Aug 1987, *Zamudio 5433* (IEB, MEXU); Mpio. Morelia, high part of Cerro del Aguila, 19.70°N, 101.13°W, 3100 m, 19 Aug 1988, *Zamudio 6675* (IEB, MEXU).—MORELOS: road to Lagunas to Zempoala, about 5 km from Huitzilac, along roadside, 19.04°N, 99.27°W, 2780 m, 9 Sep 1967, *Flores S-991* (MEXU); between Huitzilac and Zempoala, Km 9–10, hollow on right side of road, 19.04°N, 99.27°W, 22 Sep 1991, *Norrbom 91M14* (US); Km 9, road to Zempoala, Barranca Oclatzingo, 19.05°N, 99.30°W, 2 Aug 1969, *Vázquez 2252* (MEXU).—OAXACA: Peña Prieta, 15 km to the north of Oaxaca City and 3 km to the NW from El Estudiante town, 17.14°N, 96.61°W, 2700 m, 23 Aug 1997, *Acevedo 89* (MEXU); Mpio. Santiago Juxtlahuaca, slopes and summit of cerro microwave tower El Manzanal, 17.23°N, 98.05°W, 2395 m, 12 Sep 1996, *Calzada 21353* (MEXU); 26 km S Miahuatlán, 16.17°N, 96.50°W, 2380 m, 6 Jul 1966, *Flores S-946* (C, G, K, MEXU, S, WIS); Cordillera, 1840, *Galeotti 1190* (US); Dist. Miahuatlán, 4 km N of Campamento Río Molino, between San José del Pacífico and Sochixtepec, 16.30°N, 96.30°W, 2600 m, 13 Jun 1985, *García & Torres 1627* (F, MEXU, MO); Mpio. Zimatlán, El Campanario, 16.87°N, 96.83°W, 2540 m, 18 Sep 1998, *Guízar et al. 4240* (MEXU); Mpio. Miahuatlán, road

from Oaxaca to Puerto Angel, 23 mi S of Miahuatlán, 16.28°N, 96.55°W, 2400 m, 19 Oct 1958, *Hawkes et al. 1710* (C, G, K, IBUG, MEXU, PTIS, S, WIS); Mpio. Miahuatlán, road from Oaxaca to Puerto Angel, 16 km S of Miahuatlán, 16.31°N, 96.58°W, 2300 m, 19 Oct 1958, *Hawkes et al. 1713* (K); about 20 km S of Santa María Ecatepec and just above the village of Santo Tomás Teipan, 16.23°N, 95.97°W, 2400 m, 3 Sep 1995, *Hjerting et al. 95-49* (C, K); Mpio. Zimatlán, El Frijolón Canyon, 8 km NW From La Cofradía, San Pedro el Alto community, 16.82°N, 96.98°W, 2790 m, 8 Oct 1998, *Miranda & Hernández 228* (MEXU); Dist. Tlaxiaco, near Yucumino de Guerrero, rd from Tlaxiaco to Yucumino, 17.17°N, 97.73°W, 2750 m, 6 Sep 1980, *Ochoa 14138* (CIP, IBUG, K, PTIS, US, WIS); on Rt 175 (Oaxaca to Puerto Angel Road), 4.0 km N of N end, by church of Suchiltepec, by Km 143, 16.12°N, 96.48°W, 2750 m, 6 Oct 1997, *Rivera-Peña et al. 958* (INIFAP, MEXU, PTIS, WAG); 1 km N of El Pacífico or 34 km S of Miahuatlán on Hwy 75 at Km 132, high mountains of Sierra Madre del Sur, 16.08°N, 96.50°W, 2500 m, 26 Jul 1965, *Roe et al. 633* (WIS); W side of Rt 175, S of Miahuatlán de Porfirio Díaz, 10 km S of S end of San Miguel Suchixtepec, 16.07°N, 96.50°W, 2250 m, 18 Sep 1988, *Spooner et al. 4166* (INIFAP, PTIS, WIS); E side of Rt 175, S of Miahuatlán de Porfirio Díaz, 2.8 km S of S end of San Miguel Suchixtepec, 16.08°N, 96.45°W, 2260 m, 18 Sep 1988, *Spooner et al. 4167* (INIFAP, PTIS, WIS); E side of Rt 175, S of Miahuatlán de Porfirio Díaz, about 20 km N of San Miguel Suchixtepec, at Km 134.1 (by posted signs), 16.22°N, 96.53°W, 2390 m, 18 Sep 1988, *Spooner et al. 4172* (INIFAP, PTIS); Km 22.5 (by posted km marker), W of main road in Zaachila on dirt road toward Santa Inés del Monte, 16.95°N, 96.85°W, 2600 m, 21 Sep 1988, *Spooner et al. 4192* (INIFAP, PTIS, WIS); El Manzanal, Km 144 from Oaxaca towards Puerto Angel, Rt 175, 16.23°N, 96.54°W, 2780 m, 21 Oct 1983, *Tarn et al. 170* (C, K, IBUG, PTIS); road from Oaxaca to Puerto Angel, Hwy 175 at El Manzanal, Km 144, 16.13°N, 96.50°W, 2710 m, 18 Oct 1984, *Tarn et al. 275* (IBUG, MEXU, PTIS); Pochutla, along Río Molino about 4 mi S of Suchixtepec, 16.08°N, 96.42°W, 2347 m, 14 Jul 1972, *Webster et al. 17352* (DUKE, GH, MEXU, MO, MSC, TEX).—PUEBLA: Honey, 20.25°N, 98.22°W, 2134 m, 22 Oct 1908, *Barnes & Land 519* (F, K, US); road from Tehuacán to Oaxaca, 24 km along Coxcatlán to Zoquitlán road, 3 km past La Griega, 18.38°N, 97.06°W, 2640 m, 23 Oct 1983, *Gómez et al. 183* (K); Honey, Trinidad Iron Works, 20.25°N, 98.22°W, 2000 m, 4 Aug 1949, *Hawkes et al. 1044* (K, LL, MPU, WIS); 2–3 km from Honey, on the path N to Tehuatlán, escarpment edge, 20.25°N, 98.22°W, 1950 m, 8 Oct 1958, *Hawkes et al. 1654* (A, C, G, IBUG, K, MEXU, PTIS, WIS), *Hawkes et al. 1655* (A, BM, C, G, K, P, PTIS); Honey Station, 20.25°N, 98.22°W, 21 Jun 1908, *Pringle 15607* (ARIZ, CAS, F, GH, GOET, MICH, MO, MSC, S, SMU, US, VT); from Tehuacán to Oaxaca road, turn NE on road to Zoquitlán, 22 km along road, by divergence of road to Coyomeapa, 18.30°N, 97.07°W, 2640 m, 4 Oct 1997, *Rivera-Peña et al. 950* (INIFAP, MEXU, WAG); road from Tehuacán to Oaxaca turning off at Coxcatlán towards Zoquitlán, 22 km along this road, 1 km past La Griega towards Coyomeapa, 18.33°N, 97.00°W, 2640 m, 23 Oct 1983, *Tarn et al. 181* (C, K, IBUG, PTIS); road from Tehuacán to Oaxaca, turning off at Coxcatlán, 24 km towards Zoquitlán, about 3 km past La Griega towards Coyomeapa, 18.35°N, 97.07°W, 2640 m, 23 Oct 1983, *Tarn et al. 183* (K, PTIS).—QUERÉTARO: Mpio. Colón, summit of Cerro Zamorano, 20.93°N, 100.18°W, 3250 m, 2 Nov 1987, *Rzedowski 44370* (CHAP, IBUG, MEXU); Mpio. Cadereyta, near El Doctor, 20.70°N, 99.82°W, 2600 m, 12 Oct 1988, *Rzedowski 45101* (MEXU); Mpio. Landa, 2 km W of Neblinas, on roadside to Agua Zarca, 21.27°N, 99.08°W, 1 Jan 1989, *Rzedowski 48175* (IEB, MEXU).—TLAXCALA: La Malintzin volcano, by the CREA dormitories, 19.23°N, 98.03°W, 3000 m, 13 Jul 1990, *Blacio & Buendia 115* (K, MEXU); Mpio. Tlaxco Cerro del Peñón de Tlaxco, N of Rosario, 19.66°N, 98.12°W, 2800 m, 16 Aug 1991, *Cházaro & Costa 6690* (MICH, MO).—VERACRUZ: 5 km past Cruz Blanca towards Minas de Somelaliuacan, 19.63°N, 97.17°W, 2250 m, 22 Aug 1985, *Cházaro & Acosta 3677* (WIS); E of Acultzingo, upper slope of Cerro Santa Catarina, tubers cultivated at USPIG, Glenn Dale, Md, 30 Nov 1947, *Correll 14288a* (LL); Veracruz to Orizaba Road, 1857, *Müller 1673* (K, NY); Mpio. Villa Aldama, 5 km by road N of Hwy 140 at Cruz Blanca on road to Las Minas, 14 km, 19.65°N, 97.18°W, 2300 m, 24 Aug 1986, *Nee 32884* (K, NY, MEXU, TEX); lower slopes of Cerro Las Peñas, 2 km E of Cutlachapa, Mpio. Tetelzingo, Coscomaltepec, 19.05°N, 97.13°W, 2400 m, Oct 1980, *Ochoa 14212* (CIP, WIS, US); about 2.4 km S of Huayacocotla on the road to Tulancingo, 20.55°N, 98.48°W, 2300 m, 4 Sep 1983, *Tarn et al. 55* (IBUG, K, PTIS).

25. Solanum demissum (p. 117).

Mexico. AGUASCALIENTES: Playa Cebolletas, Monte Grande de Sierra Fría, 21.99°N, 102.50°W, 2850 m, 4 Sep 1993, *García 3209* (IEB); on W slopes of Sierra El Laurel, about 10 km by air SE of Calvillo, by the end of the road by a dam, passing Rancho de Los Adobes, 21.78°N, 102.65°W, 2400 m, 6 Sep 1997, *Rivera-Peña et al. 909* (INIFAP). CHIHUAHUA: Mpio. Madera, Arroyo de las Garrochas, Ejido El Largo, 29.68°N, 108.25°W, 2600 m, 28 Aug 1990, *Bravo 1320* (MEXU); Mpio. Guachochic South of Cusárare in CLT, 27.49°N, 107.48°W, 2200 m, 5 Jun 1984, *Bye et al. 12878* (MEXU); Mpio. Balleza, near Vergel, by the side of a small lake, not far from the fire tower, 26.61°N, 106.44°W, 2850 m, 17 Aug 1958, *Hawkes et al. 1295* (C, IBUG, K, MEXU, PTIS, US), *Hawkes et al. 1296* (C, K, PTIS, S); S of Guadalupe and Calvo, slope of Sierra de Mohinora, 26.00°N,

107.00°W, 3050 m, 8 Oct 1988, *Hjerting 7259* (PTIS).—DISTRITO FEDERAL: San Miguel, La Venta, 19.22°N, 99.20°W, 3200 m, 2 Jan 1929, *Antipovicz 25* (K); Desierto de los Leones, 19.25°N, 99.33°W, 2743 m, 23 Jul 1938, *Balls et al. 5087* (BM, E, K, MEXU, P, US, WIS), 10 Jul 1938, *Kenoyer A293* (F), 20 Aug 1940, *Langman 2743* (MEXU, NA, PH), Jul 1938, *Lyonnet 2147* (ENCB, MEXU, US), 23 Sep 1938, *Lyonnet 2585* (CAS, IBUG, IEB, MEXU, US); 25 mi SE of Mexico City, 19.39°N, 99.06°W, 2743 m, 2 Aug 1947, *Barkley et al. 2435* (F, MEXU, TEX); near La Cima station, Sierra del Ajusco, 19.28°N, 99.25°W, 3000 m, 25 Aug 1966, *Bolaños s.n.* (ENCB), *Bolaños s.n.* (ENCB); Desierto Viejo, Valley of Mexico, 19.43°N, 99.10°W, 1865–1866, *Bourgeau 870* (G, GH, K, LL, MPU, P, US); El Desierto, 19.25°N, 99.31°W, 22 Oct 1947, *Correll 14199* (IBUG, NA, PTIS); La Venta, 19.33°N, 99.32°W, 2450 m, 22 Oct 1947, *Correll 14200* (CGE, GAT, IBUG, LL, MEXU, NA, PTIS, WIS), 12 Jul 1935, *Standley 35480* (NY); Cruz Blanca, 19.50°N, 99.19°W, 22 Oct 1947, *Correll 14201, 14203* (IBUG, NA, PTIS), 23 Oct 1947, *Correll 14204* (NA); slopes of Mount Ajusco, 19.20°N, 99.25°W, 25 Oct 1947, *Correll 14215* (IBUG, PTIS); upper slopes of Mount Ajusco, 19.20°N, 99.26°W, 25 Oct 1947, *Correll 14219* (C, IBUG, MEXU, NA, PTIS), *Correll 14220* (C, IBUG, LL, MEXU, NA, PTIS); below Cuatro Dínamos, 19.28°N, 99.30°W, 27 Oct 1947, *Correll 14221* (NA); Cuatro Dínamos, 19.27°N, 99.30°W, 26 Oct 1947, *Correll 14222* (GAT, IBUG, MEXU, NA, PTIS); above Cuatro Dínamos, 19.24°N, 99.30°W, 26 Oct 1947, *Correll 14223* (GAT, IBUG, MEXU, NA, PTIS), *Correll 14224* (GAT, IBUG, NA, PTIS), *Correll 14225* (LL); near El Guarda, 19.15°N, 99.18°W, 19 Nov 1947, *Correll 14274* (IBUG, LL, PTIS); Las Cruces, 19.25°N, 99.17°W, 11 Dec 1947, *Correll 14319* (GAT, IBUG, PTIS), 28 Dec 1947, *Correll 14412* (GAT, IBUG, PTIS, WIS); near Las Cruces, 19.25°N, 99.17°W, 28 Dec 1947, *Correll 14413* (IBUG, PTIS); El Desierto, the convent, 19.25°N, 99.30°W, s.d., *EBS 48B/8* (IBUG, PTIS); Parres, Valley of Mexico, 19.13°N, 99.17°W, 20 Jun 1979, *Espinosa 616* (ENCB, MEXU, MO); rd to Mount Ajusco, near Monte Alegre, 19.20°N, 99.24°W, 3100 m, 23 Sep 1964, *Flores S-784* (MEXU), *Flores S-785* (K, MEXU); Delegación Contreras, Tercer Dínamo, 19.30°N, 99.28°W, 3100 m, 28 Aug 1965, *García s.n.* (ENCB), *Vázquez s.n.* (ENCB); near Contreras, Distrito Federal, 19.30°N, 99.28°W, 29 Aug 1944, *Goodman 3463* (F); Cañada de Contreras, 19.29°N, 99.28°W, 2400 m, 1 Sep 1962, *Gutiérrez 55* (ENCB); Desierto de Los Leones, the convent, 19.25°N, 99.33°W, 2900 m, 20 Jul 1949, *Hawkes et al. 1024* (K, LL, S); La Venta, road from Mexico to Toluca, 19.33°N, 99.32°W, 2800 m, 27 Jul 1949, *Hawkes et al. 1035* (G, K, LL); Ajusco, between the railway station and the village, 19.23°N, 99.20°W, 2825 m, 21 Aug 1949, *Hawkes et al. 1077* (IBUG, K, LL, MEXU, PTIS, S); Ajusco, on path from the village to Cerro Ajusco, 19.23°N, 99.20°W, 2950 m, 21 Aug 1949, *Hawkes et al. 1079* (IBUG, K, LL, MEXU, NY, PTIS); above Contreras, Cuatro Dínamos, between the first and second hydroelectric plants, 19.30°N, 99.28°W, 2625 m, 25 Sep 1949, *Hawkes et al. 1108* (K (flowers only), PTIS); above Mexico City, Desierto de los Leones, road to San Miguel, near water station, 19.25°N, 99.33°W, 3050 m, 12 Oct 1958, *Hawkes et al. 1675* (K, MEXU); Desierto de los Leones, by road at S entrance, 19.25°N, 99.33°W, 2950 m, 12 Oct 1958, *Hawkes et al. 1676* (C, K, MEXU, P); Cañada de Contreras, near Llanos de Copilco, 19.31°N, 99.30°W, 3000 m, 8 Aug 1965, *Hernández s.n.* (ENCB, US), 9 Sep 1965, *Sánchez 35651* (ENCB); La Cima station, Sierra del Ajusco, 19.25°N, 99.28°W, 3000 m, 22 Aug 1965, *Hernández s.n.* (DS, ENCB, US); lava fields 2 km SSW of La Cima railroad station on either side of old Hwy 95, on top of Sierra de Ajusco, about 1 km N of Morelos border, 19.10°N, 99.21°W, 3050–3100 m, 14 Aug 1960, *Iltis et al. 961* (WIS); La Cima, 19.25°N, 99.28°W, 3048 m, Aug 1904, *Kuntze 23774* (NY); Llano Alegre, Sierra del Ajusco, 22 km NW of Mexico City, 19.34°N, 99.38°W, 3300 m, 1 Aug 1987, *Lorence 3499* (BM, MEXU); Sierra de Ajusco, SE slope, 19.28°N, 99.16°W, 3000 m, 15 Aug 1986, *Lorence 5070* (MEXU, NY, US); Las Cruces, 19.32°N, 99.35°W, Aug 1945, *Martínez s.n.* (ENCB, NY), Sep 1945, *Martínez s.n.* (MICH, US, WIS); road from La Venta or Cruz Blanca, Desierto de los Leones, Cuajimalpa, 19.33°N, 99.32°W, 2800 m, 4 Aug 1968, *Mille 81* (CAS, ENCB); Rt 95 from Mexico to Cuernavaca, between Km 42–43, about 1 km N of La Cima, 19.13°N, 99.21°W, 8 Aug 1989, *Norrbom 89M4 p.p.* (US); El Desierto, 19.33°N, 99.33°W, 3000 m, 26 Dec 1930, *Erlanson & Souviron 6* (US), s.d., *Reddick 178, 692, 696* (PTIS), 6 Oct 1930, *Reddick 519* (BH, WIS), 13 Oct 1930, *Reddick 533* (BH, IBUG, PTIS), 25 Aug 1930, *Russell & Souviron 49* (US); El Desierto, the convent, within the church, 19.25°N, 99.33°W, 2987 m, 13 Oct 1930, *Reddick 535, 538, 602* (BH), 25 Aug 1930, *Russell & Souviron 49146* (K, US); El Desierto, road above the convent, 19.25°N, 99.33°W, 3048 m, 13 Oct 1930, *Reddick 540* (BH); El Desierto, 2 to 3 km above the convent, 19.25°N, 99.33°W, 5 Nov 1930, *Reddick 542, 573, 574, 575, 576* (BH); 2.5 km S of Parres, 19.14°N, 99.18°W, 5 Aug 1978, *Rico & Trejo 174* (MEXU); W-facing slope of Volcán Ajusco, about 5 km S of El Ajusco, on W side of road, 19.19°N, 99.21°W, 3270 m, 27 Oct 1997, *Rivera-Peña et al. 997* (INIFAP, MEXU, PTIS, WAG); Desierto de los Leones, 19.25°N, 99.33°W, 2700 m, 13 Sep 1962, *Rojano 35* (ENCB); El Desierto, Monastery, 19.25°N, 99.33°W, 25 Aug 1930, *Russell & Souviron 146* (PH, US); La Portera, 2896 m, 22 Aug to 19 Sep 1930, *Russell & Souviron 148* (US); Ajusco, 19.23°N, 99.20°W, 22 Aug to 19 Sep 1930, *Russell & Souviron 180* (US); S of Xitle, Pedregal de San Angel, 19.27°N, 99.22°W, 27 Jun 1952, *Rzedowski 1238* (ENCB); Sierra del Ajusco, vicinity of La Cima station, 19.28°N, 99.16°W, 3000 m, 14 Aug 1960, *Rzedowski 12580* (ENCB, MICH); Delegación de Tlalpan, vicinity of

La Cima station, 19.28°N, 99.25°W, 3000 m, 19 Jul 1981, *Rzedowski 37423* (ARIZ, ASU, IBUG, ENCB, MEXU); Delegación Tlalpan, Volcán Pelado, W side, 19.19°N, 99.21°W, 3310 m, 9 Aug 1987, *Sandoval 301* (MEXU); Delegación Cuajimalpa, Desierto de los Leones, 19.25°N, 99.33°W, 2926 m, 9 Jul 1944, *Sharp & Gilly 23* (F, MICH, MSC); Tlaltepec, Delegación de Milpa Alta, 19.19°N, 99.02°W, 2900 m, 7 Jul 1976, *Ventura 1759* (ENCB, IEB, MEXU, MO, NY); Los Dínamos, Delegación de Contreras, 19.30°N, 99.28°W, 3000 m, 14 Aug 1979, *Ventura 3489* (ARIZ, ASU, ENCB, IEB, MEXU, NY); 55 km SE of Mexico City, 19.35°N, 99.30°W, 3200 m, 1 Jul to 7 Jul 1942, *Weaver 749* (NA); between Mexico City and Cuernavaca, 19.19°N, 99.17°W, 10 Aug 1949, *White 233* (US).—DURANGO: Durango, 24.03°N, 104.68°W, s.d., *Hawkes et al. 1134* (IBUG, PTIS); on dirt road W of Durango on way to Mazatlán, diverging N at Coyotes at San Miguel de Cruces, 92 km up this dirt road, 24.42°N, 105.59°W, 2580 m, 11 Sep 1997, *Rivera-Peña et al. 920* (INIFAP, MEXU, PTIS); S of Durango, 72 km along the track from La Ferrería, just before La Flor, 24.25°N, 104.38°W, 2800 m, 24 Sep 1983, *Tarn et al. 123* (IBUG, PTIS); Mpio. Santiago Papasquiaro, 35 km from the junction of road to Topia and the road Santiago Papasquiaro to Tepehuanes, 24.83°N, 105.33°W, 18 Jul 1982, *Tenorio & Romero 1064* (NY); Mpio. Tayoltita, Jacales, 44 km SW of San Miguel de Cruces on road to Tayoltita, 24.15°N, 105.92°W, 2100 m, 6 Jul 1984, *Tenorio et al. 6221* (MEXU).—HIDALGO: Cerro de las Ventanas, El Chico National Park, 20.18°N, 98.75°W, 2950 m, 19 Jul 1970, *Alva 6* (ENCB, LL, WIS); Mpio. Mineral del Monte, 3 km SW of Ciénaga Larga, 20.13°N, 98.67°W, 2900 m, 22 Jul 1989, *Barquín & Zamora 779* (BH, IEB); Mpio. Mineral del Chico, Cerro de las Ventanas, 20.22°N, 98.73°W, 3000 m, 9 Apr 1963, *Chávez s.n.* (ENCB), 4 Aug 1963, *Lachica s.n.* (ENCB); Real del Monte, 20.13°N, 98.67°W, 12 Jul 1947, *Correll 14234* (PTIS), 7 Nov 1947, *Correll 14243* (IBUG, MEXU, NA, PTIS, WIS), 8 Nov 1947, *Correll 14244* (GAT, IBUG, MEXU, NA, PTIS); Mineral del Monte, 20.12°N, 98.66°W, 9 Sep 1832, *Ehrenberg 1132 p.p.* (UC); Real del Monte, coppice above town near road to Pachuca, 20.13°N, 98.67°W, 2750 m, 5 Aug 1949, *Hawkes et al. 1045* (B, BM, BR, C, G, K, LL, MEXU, NY, P, PTIS, MPU, S, WAG, WIS); Real del Monte, field on rt, road to Pachuca by where Actopan road branches off, 20.13°N, 98.67°W, 2750 m, 6 Aug 1949, *Hawkes et al. 1049* (B, K, LL, MPU, P); Pachuca, Real del Monte, in the woods above the town, 20.12°N, 98.73°W, 2700 m, 9 Oct 1958, *Hawkes et al. 1657* (BM, IBUG, K, MEXU, PTIS); Mpio. Mineral del Chico, Parque Nacional El Chico, at the forest station, 20.22°N, 98.73°W, 2900 m, 2 Jul 1988, *Hernández 218* (CAS, CHAPA, ENCB, IEB); Mpio. Mineral del Chico, 4 km N of Pachuca, 20.22°N, 98.75°W, 2750 m, 15 Sep 1975, *Medina 747* (ENCB, IEB, MEXU, MO, RSA); Real de Monte, in rt from Mexico to Pachuca, near Cerro Portezuelo, from Mexico to Pachuca, 10 km before Zimapán, 20.13°N, 98.67°W, 2800 m, 19 Sep 1980, *Ochoa 14154* (CIP, IBUG, PTIS, US, WIS); Real de Monte, in rt from Mexico to Pachuca, 20.13°N, 98.67°W, 2700 m, 31 Aug 1980, *Ochoa 14155* (IBUG, MEXU, PTIS); Real de Monte, in rt from Mexico to Pachuca, 10 km before Zimapán, 20.13°N, 98.67°W, 2800 m, 31 Aug 1980, *Ochoa 14156* (CIP, IBUG, PTIS, US, WIS); El Chico National Park N of Pachuca, 5 km W along road diverging into the park, on S side of road, by sign La Cabañas de Lobo, 20.17°N, 98.69°W, 2830 m, 1 Oct 1997, *Rivera-Peña et al. 940* (PTIS); Mpio. Epazoyucan, near Peñas Largas, 20.08°N, 98.63°W, 2800 m, 23 Jul 1979, *Rzedowski 36226* (ENCB); Cerro Santa Ana 10 km NE of Apan (NE-SE slopes), 19.77°N, 98.53°W, 2950–3025 m, 19 Jun 1966, *West 34* (WIS).—MÉXICO: Mpio. Jilotzingo, 3 km NW of San Luis Ayucán, 19.51°N, 99.39°W, 2800 m, 30 Oct 1978, *Alvarado 78–62* (ENCB); foothills of Cerro Telapón, 19.18°N, 98.69°W, 3100 m, 26 Jul 1964, *Arrington s.n.* (ENCB); Paraje Mungía, Nevado de Toluca, 19.10°N, 99.77°W, 3536 m, 12 Jul 1938, *Balls & Gourlay 5009* (B, BM, E, K, MEXU, MPU, P, UC, US); Ojos de Agua, Nevado de Toluca, 19.10°N, 99.77°W, 3658 m, 8 Jul 1938, *Balls et al. 4971* (BM, CPC, E, K, US); Nevado de Toluca, El Rincón, 19.14°N, 99.79°W, 3353 m, 13 Jul 1938, *Balls et al. 5046* (B, K); below Paraje Provincial, Mount Popocatépetl, 19.05°N, 98.67°W, 2957 m, 31 Jul 1938, *Balls et al. 5154* (A, BH, E, K, MICH, US); near Km 72 on Amecameca to Popocatépetl road, 19.05°N, 98.75°W, 3000 m, 2 Aug 1958, *Beaman 2089* (GH, LL, MEXU, MSC, RM, UC, WIS); Popocatépetl, N side at Km 86.5, 19.05°N, 98.63°W, 3835 m, 17 Sep 1958, *Beaman 2630* (MSC); Telapón, 19.60°N, 99.58°W, 3300 m, 5 Jul 1967, *Boege 572* (DUKE, MEXU); Mpio. Coacalco, 19.60°N, 99.09°W, 2320 m, 21 May 1994, *Bye & Linares 19061* (MEXU); Mpio. Chalco, Llano Grande, 19.32°N, 98.85°W, 3150 m, 12 Sep 1966, *Cabrera s.n.* (ENCB); Molino de Flores, 19.53°N, 98.82°W, 23 Oct 1947, *Correll 14209B* (MEXU, PTIS, WIS); along Volcanes road above Amecameca, slope of Mount Popocatépetl, 19.10°N, 98.70°W, 25 Oct 1947, *Correll 14212* (IBUG, NA, PTIS); Río Frío, 19.32°N, 98.66°W, 5 Nov 1947, *Correll 14236* (C, GAT, IBUG, MEXU, NA, PTIS), *Correll 14237* (GAT, IBUG, MEXU, PTIS); above Río Frío, 19.32°N, 98.66°W, 5 Nov 1947, *Correll 14238*, *14239* (GAT, IBUG, MEXU, NA, PTIS), 8 Oct 1930, *Reddick 524* (BH); Colonia Manuel Avila Camacho, 19.55°N, 98.75°W, 5 Nov 1947, *Correll 14240* (GAT, IBUG, MEXU, NA, PTIS); San Juan de las Huertas, upper slopes of Nevado de Toluca, 19.10°N, 99.77°W, 15 Nov 1947, *Correll 14265* (GAT, IBUG, MEXU, PTIS, WIS); near Villa Hermosa, upper slope of Nevado de Toluca, 19.10°N, 99.77°W, 15 Nov 1947, *Correll 14266* (GAT, IBUG, LL, MEXU, PTIS, WIS); Villa Hermosa, upper slopes of Nevado de Toluca, 19.13°N, 99.73°W, 15 Nov 1947, *Correll 14267* (GAT, PTIS, WIS); Lake Zempoala, 19.05°N, 99.32°W, 21 Nov 1947, *Correll*

14279 (LL, NA); about Lake Zempoala, 19.06°N, 99.32°W, 23 Nov 1947, *Correll 14280* (NA); resting area of Mungía, Nevado de Toluca, 19.13°N, 99.78°W, s.d., *CPC 21.5* (IBUG, PTIS); slopes of Popocatépetl and Iztaccíhuatl, just before Paso de Cortés, 19.08°N, 98.63°W, 3350 m, 6 Jul 1972, *Denton 1748* (ENCB, MICH); Mpio. Atlautla, 19.02°N, 98.69°W, 3780 m, 27 Aug 1987, *Escamilla 201* (MEXU); 1 km N of Llano Grande along road S of Telapón, 19.57°N, 99.54°W, 3200 m, 26 Jul 1964, *Espinosa 549* (ENCB); Mpio. Ixtapaluca, 12 km S of Llano Grande, 19.31°N, 98.73°W, 3200 m, 17 Jul 1983, *Fernández 1655 A* (ENCB, IBUG, IEB); La Venta, 19.33°N, 99.32°W, 2469 m, 12 Jul 1935, *Fisher 35480* (F, MO, NY); Km 4 on the road to Nevado de Toluca, 19.14°N, 99.79°W, 3330 m, 16 Jul 1963, *Flores S-696* (K, MEXU), *Flores S-697* (LL); Río Frío, on the toll way from Mexico to Puebla, on the right side of road and 300 m away from it, 19.32°N, 98.66°W, 2900 m, 27 Sep 1964, *Flores S-786* (K, LL, MEXU); Río Frío, on the toll way from Mexico to Puebla, on the right side of road and 275 m away from it, 19.32°N, 98.66°W, 2900 m, 27 Sep 1964, *Flores S-787* (K, MEXU); road to Popocatépetl, ascending for Amecameca, 19.06°N, 98.68°W, 2720 m, 30 Aug 1967, *Flores S-984* (MEXU), 30 Aug 1967, *Flores S-986* (MEXU); road to the Nevado, about 4 km, on the left side to the road, 19.14°N, 99.79°W, 3330 m, Sep 1962, *Flores & Ugent S-656* (MEXU); Tlamacas, 19.07°N, 98.63°W, 9 Jul 1962, *Galicia s.n.* (ENCB), 8 Jul 1962, *Salgado 80* (ENCB); Mpio. Tlalmanalco, San Rafael Cañón, 19.22°N, 98.80°W, 2650 m, 30 Jun 1968, *García 40* (ENCB); Mpio. Tescaltitlán, about El Capulín village, 19.96°N, 99.06°W, 3000 m, 6 Jul 1968, *García 232* (DS, ENCB, MICH); Mpio. Amecameca, along road up Popocatépetl volcano, 19.12°N, 98.77°W, 2438–2743 m, 4 Jul 1943, *Gilly & Dodds 6* (MICH, MSC, NY); road between Santiago Tilapa and San Miguel Tilapa, 19.19°N, 99.42°W, 26 Jul 1964, *González 1162* (ENCB, WIS); Mpio. Tlalmanalco, 3 km E San Rafael, 19.22°N, 98.80°W, 2800 m, 10 Aug 1969, *Guijosa 11* (CAS, ENCB, MICH); hwy from Mexico City to Puebla, Llano Grande of México, slopes of Mount Ixtaccihuatl, 19.19°N, 98.69°W, 3196 m, 17 Jul 1949, *Hawkes et al. 1022* (C, K, LL); Las Cruces, road from Mexico to Toluca, by small ornamental fish pond, 19.31°N, 99.58°W, 3050 m, 27 Jul 1949, *Hawkes et al. 1036* (A, K, LL); Río Frío, hwy from Puebla to Mexico, 19.35°N, 98.67°W, 2850 m, 13 Aug 1949, *Hawkes et al. 1066* (K, LL, WIS); Mount Toluca, Loma Alta, 19.17°N, 99.81°W, 3200 m, 23 Aug 1949, *Hawkes et al. 1082* (BR, K, LL, MEXU, MPU), *Hawkes et al. 1083* (F, K, LL, WAG); 81.5 km from Mexico City, above Amecameca, Volcanes Road to Cortés Pass, 19.12°N, 98.77°W, 3460 m, 30 Oct 1949, *Hawkes et al. 1117* (K (flowers only), PTIS); 75 km from Mexico City, above Amecameca, Volcanes road to Cortés Pass, 19.12°N, 98.77°W, 3030 m, 30 Oct 1949, *Hawkes et al. 1118* (K (flowers only), PTIS); road from Tenango to Tenancingo, Zintepec, hillside track to W of town, 19.17°N, 98.91°W, 2700 m, 1 Oct 1958, *Hawkes et al. 1597* (C, K, US); 32.5 km from the main Toluca to Morelia road, towards Valle de Bravo, 19.15°N, 99.93°W, 2900 m, 2 Oct 1958, *Hawkes et al. 1601* (C, G, IBUG, K, MEXU, PTIS); Agua Bendita, Toluca to Valle de Bravo road at 38 km from main Toluca to Morelia road, 19.15°N, 99.93°W, 2750 m, 2 Oct 1958, *Hawkes et al. 1608* (IBUG, K, MEXU, PTIS); road from Amecameca to Popocatépetl, 19.06°N, 98.68°W, 3000 m, 26 Jul 1965, *Hawkes et al. 2501* (C, G, K, MEXU, S), *Hawkes et al. 2502* (F, K), *Hawkes et al. 2503* (K, NY, WIS); Mpio. Zoquiapan, Llano Grande, 19.32°N, 98.85°W, 3000 m, 6 Sep 1970, *Hernández 77* (DS, ENCB, LL, MICH, WIS); Mesón Viejo, Dist. Temascaltepec, 19.17°N, 99.88°W, 2830 m, 11 May 1932, *Hinton 612* (K, G, NY, US); Mount Popocatépetl, 19.04°N, 98.72°W, 3048 m, 5–6 Aug 1910, *Hitchcock s.n.* (LL, US); road to Tlamacas, foothills of Popocatépeptl, 19.07°N, 98.63°W, 2800 m, 8 Jul 1962, *Huerta 136* (ENCB); about 20 km NE of Zitacuaro, 19.58°N, 100.23°W, 3400–3600 m, 19 Jul 1960, *Iltis et al. 300* (WIS); Mpio. Ixtapaluca, Experimental Station of Zoquiapan, 8 km S of Río Frío, on track 4 and 4 km S of junction with track 3, 19.31°N, 98.69°W, 3300 m, s.d., *Koch 75220* (MEXU, MO), 20 Jun 1975, *Koch & Magaña 75200* (ENCB, MEXU, MO); Mpio. Ixtapaluca, Experimental Station of Zoquiapan, 8 km S de Río Frío, 19.31°N, 98.69°W, 3360 m, 27 Jun 1975, *Koch 75229* (ARIZ, CHAPA, ENCB, IBUG, MEXU, WIS), 13 Jul 1978, *Vega 297* (CHAPA); Mpio. Ixtapaluca, Experimental Station of Zoquiapan, 8 km S of Río Frío, Llano de Aculco, next to a building, 19.31°N, 98.69°W, 3250 m, 5 Jul 1975, *Koch 75267* (CHAPA, IBUG); Mpio. Ixtapaluca, Experimental Station of Zoquiapan, 8 km S of Río Frío, on track 4 and 6–7 km S of junction with track 3, 19.31°N, 98.69°W, 3410 m, 27 Jun 1975, *Koch & Magaña 75221* (NY); SW slopes of Volcán Ixtaccíhuatl, 3 km W of road junction at Paso de Cortés on N side of Hwy 451, just W of entrance to Parque Ixtapopo, 19.05°N, 98.67°W, 3500 m, 16 Jul 1978, *Kolterman & Raveret 24* (WIS); Amecameca, 19.12°N, 98.77°W, 2621 m, Aug 1904, *Kuntze 23671* (NY); 11 mi E of Amecameca, W slope, in rt up to Popocatépetl, 19.12°N, 98.70°W, 3338 m, 1 Aug 1975, *LeDoux et al. 2041* (ENCB); lower slopes of Volcán Popocatepétl, 19.04°N, 98.70°W, 12 Aug 1943, *Lundell & Lundell 15013* (LL); Telapón Mountain, 19.60°N, 99.58°W, Jul 1930, *Lyonnet 712* (BM, MEXU, NY, US); Mpio. Río Frío, Zoquiapan, farm fields of Loma San Diego, 19.34°N, 98.66°W, 3350 m, 27 Sep 1979, *Mancera 16* (ARIZ, ENCB, K, MEXU, WIS); Las Cruces, 19.32°N, 99.38°W, Jul 1945, *Martínez s.n.* (US); Llano Grande, 19.25°N, 98.67°W, 2700 m, 9 Jul 1950, *Matuda 19210* (MEXU, US), 8 Jul 1951, *Matuda 21312* (MEXU); Llano Grande, Río Frío, 19.25°N, 98.67°W, 2900 m, 12 Jul 1953, *Matuda 28724* (MEXU); Alvarado, Temascaltepec, 19.04°N, 100.05°W, 1900 m, 2 Aug 1953, *Matuda 28849* (MEXU); Cerro de la Bufa, 2900–3450 m, 8 Aug 1954, *Matuda*

31163 (ENCB, MEXU); Llanos de Salazar, 19.30°N, 99.38°W, 9 Sep 1957, *Medellín & Rzedowski 53* (ENCB); vicinity of Vosencheve, on rt from Zitácuaro to Villa Victoria, 19.41°N, 99.94°W, 2575 m, 31 Aug 1980, *Ochoa 14158* (CIP, IBUG, PTIS, US); between Toluca and San Juan de Las Huertas, 19.13°N, 99.73°W, 3000 m, Sep 1980, *Ochoa 14217* (IBUG, PTIS); near San Juan de Las Huertas, 19.23°N, 99.78°W, 2980 m, Sep 1980, *Ochoa 14218* (CIP); near La Puerta, slopes of Volcán Toluca, 19.14°N, 99.79°W, 3075 m, 10 Oct 1980, *Ochoa 14219* (US); Nevado de Toluca, 19.14°N, 99.79°W, 3353 m, 8 Jul 1971, *Oliver & Verhoek-Williams 553* (BH, MO); Lerma, 19.29°N, 99.52°W, Oct 1951, *Ramírez s.n.* (MEXU); E of Río Frío, 62 km from Mexico City to Puebla, 19.35°N, 98.67°W, 2743 m, 8 Oct 1930, *Reddick 523* (BH, HBG); Río Frío, 1 km above the village, about 62 km from Mexico City to Puebla, 19.35°N, 98.67°W, 2743 m, 8 Oct 1930, *Reddick 525* (BH, HBG); near summit of San Miguel, above El Desierto, 19.60°N, 99.58°W, 5 Nov 1930, *Reddick 577 p.p.*(BH); just back of Río Frío, 19.35°N, 98.67°W, 2743 m, 8 Oct 1930, *Reddick 594* (BH); on Rt 10, 4.8 km S of La Puerta, Rt 134, on W side of road, in Parque Nacional Nevado de Toluca, on W-facing lower slopes of volcano, 19.15°N, 99.81°W, 3450 m, 20 Oct 1997, *Rivera-Peña et al. 971* (INIFAP, MEXU, PTIS, WAG); 1.1 km W of Rt 10 along dirt path, at a point 13.7 km S of La Puerta, Rt 134, in Parque Nacional Nevado de Toluca, on W-facing lower slopes of volcano, 19.11°N, 99.85°W, 3370 m, 20 Oct 1997, *Rivera-Peña et al. 972* (INIFAP, MEXU, PTIS, WAG), *Rivera-Peña et al. 973* (INIFAP, MEXU, PTIS, WAG); at El Capulín, a small settlement 21.3 km S of La Puerta, Rt 134, in Parque Nacional Nevado de Toluca, on W-facing lower slopes of volcano, 19.08°N, 99.84°W, 3100 m, 20 Oct 1997, *Rivera-Peña et al. 975* (INIFAP, MEXU, PTIS, WAG); from El Capulín, a small settlement 21.3 km S of La Puerta, on Rt 134, drive 2 km E and then S along track into woods, in Parque Nacional Nevado de Toluca, on W-facing lower slopes of volcano, 19.07°N, 99.84°W, 3100 m, 20 Oct 1997, *Rivera-Peña et al. 977* (INIFAP, MEXU, PTIS, WAG); growing about 500 m SW of Mesón Viejo, about 35 km SW of Toluca, by posted road signs, 19.15°N, 99.88°W, 2750 m, 20 Oct 1997, *Rivera-Peña et al. 984* (INIFAP); 3.5 km SW of Zacango (zoo at SW end), on paved and then dirt road ascending Nevado de Colima, on E-facing slope of volcano, 19.18°N, 99.67°W, 2800 m, 27 Oct 1997, *Rivera-Peña et al. 996* (PTIS); W-facing slope of Volcán Ajusco, Km 5 from Tlaxiaco to Ajusco, 19.16°N, 99.40°W, 3200 m, 27 Oct 1997, *Rivera-Peña et al. 998* (INIFAP, MEXU, PTIS, WAG); NW slopes of Nevado de Toluca, 19.17°N, 99.75°W, 3500 m, 16 Jul 1965, *Roe et al. 309* (WIS); Monte Río Frío, 45 km ESE of Mexico City, 19.35°N, 98.67°W, 3048 m, Jul 1941, *Rollins 11* (NA); Popocatépetl, 18.99°N, 98.66°W, 3597 m, 8 Aug 1901, *Rose & Hay 6024* (US), 22 Aug 1901, *Rose & Hay 6240* (US); Mexico City to Morelia road, on the border of México and Michoacán states, 19.40°N, 99.73°W, 2800 m, 9 Mar 1965, *Rowe 1* (IBUG, K, MEXU, PTIS); Río Frío, 19.32°N, 98.67°W, 27 Aug 1930, *Russell & Souviron 69, 88* (PH, US); El Mirador, along main hwy, 19.32°N, 98.72°W, 2652 m, 22 Aug to 19 Sep 1930, *Russell & Souviron 95* (US); Km 67 on road from Amecameca to Tlamacas Road, on foothills of Popocatépetl, 19.03°N, 98.70°W, 3000 m, 8 Jul 1962, *Rzedowski 15735* (ENCB, MEXU); Nevado de Toluca, 19.10°N, 99.77°W, 3600 m, 5 Sep 1962, *Rzedowski 15773* (ENCB); Mpio. Chalco, 1 km N of Llano Grande, foothills of Cerro Telapón, 19.29°N, 98.78°W, 3200 m, 26 Jul 1964, *Rzedowski 18462* (ENCB, US, WIS), 27 Jul 1964, *Rzedowski 18642* (US); N slope of Nevado de Toluca, along a creek, 19.10°N, 99.77°W, 3650 m, 6 Aug 1966, *Rzedowski 22872* (DS, MICH, MSC); Mpio. Iturbide, about Iturbide dam, 19.61°N, 99.42°W, 3300 m, 19 Jul 1967, *Rzedowski 25959* (ENCB); about Iturbide dam, 6 km WNW of Santiago Tlazala, 19.57°N, 99.44°W, 3350 m, 7 Aug 1977, *Rzedowski 35112, 35116* (ENCB); Mpio. Amecameca, Paso de Cortés, between Popocatépetl and Ixtaccíhuatl, 19.09°N, 98.68°W, 3650 m, 31 Aug 1979, *Rzedowski 36331* (ENCB); Mpio. Ixtapaluca, Cerro Papayo, 6 km S of Llano Grande, 19.33°N, 98.73°W, 3450 m, 5 Aug 1980, *Rzedowski 36747* (ENCB, IEB, MEXU, MO), *Rzedowski 36753* (ENCB, F, GH, IEB, MEXU); Mpio. Ixtapaluca, Llano Pinahua, 10 km S of Llano Grande, 19.31°N, 98.69°W, 3250 m, 12 Aug 1980, *Rzedowski 36793* (ENCB); 100 km S of junction of Rt 130 and road to Nevado de Toluca, near La Puerta, 19.22°N, 99.78°W, 3080 m, 22 Aug 1988, *Spooner et al. 4008* (INIFAP, PTIS, WIS); along roadside, near junction of road S of Rt 130 and spur road that goes directly to the top of Nevado de Toluca, 19.15°N, 99.80°W, 3465 m, 22 Aug 1988, *Spooner et al. 4010* (INIFAP, PTIS), *Spooner et al. 4018, 4019* (INIFAP, PTIS, WIS); along road to top of Nevado de Toluca, 3 km from turnoff with Rt 3 S of Rt 120, near the toll, 19.13°N, 99.78°W, 3630 m, 23 Aug 1988, *Spooner et al. 4011* (INIFAP, PTIS, WIS); on road to top of Nevado de Toluca, E of Rt 3, S of Rt 120, 19.13°N, 99.78°W, 3800 m, 23 Aug 1988, *Spooner et al. 4017* (INIFAP, PTIS); at Rancho La Piedra, at top of microwave tower road, N of Rt 15, just E of México-Michoacán State border, 19.48°N, 100.20°W, 3000 m, 27 Aug 1988, *Spooner et al. 4045* (INIFAP, PTIS, WIS); region of Barrio de la Luz above the village of Santiago Yeché, 19.68°N, 99.72°W, 2600 m, 13 Aug 1967, *Tarn 7A, 11* (IBUG, PTIS), *Tarn & Chávez 8* (IBUG, K, MEXU, P, PTIS); along the road from Chalco to Amecameca, Hwy 115, about 2 km beyond Chalco, 19.27°N, 98.90°W, 2240 m, 27 Aug 1967, *Tarn 14B* (IBUG, PTIS); along the road from Chalco to Amecameca, Hwy 115, about 6 km beyond Chalco, 19.27°N, 98.90°W, 2250 m, 27 Aug 1967, *Tarn 15D* (IBUG, PTIS); road from Chalco to Amecameca, Hwy 115, 7–8 km before Amecameca, 19.22°N, 98.80°W, 2500 m, 27 Aug 1967, *Tarn 17* (MEXU, IBUG, PTIS); road from Hwy 130 to Nevado de

Toluca at about 8 km, at the junction above Raíces, 19.13°N, 99.73°W, 3550 m, 8 Sep 1967, *Tarn 63* (IBUG, MEXU, PTIS), 3 Oct 1967, *Tarn 134A* (IBUG, PTIS), *Tarn 136* (IBUG, MEXU, PTIS), *Tarn 137* (IBUG, K, MEXU, PTIS); Lagunas de Zempoala, 19.05°N, 99.32°W, 2500 m, 10 Sep 1967, *Tarn 78* (K); road from Hwy 130 to Nevado de Toluca, near the junction above Raíces, 19.13°N, 99.73°W, 3560 m, 10 Dec 1967, *Tarn 89* (PTIS); road from Hwy 130 to Nevado de Toluca at about 8 km, at the junction above Raíces, 19.10°N, 99.77°W, 3550 m, 3 Oct 1967, *Tarn 135* (K); Toluca to Temascaltepec road, Hwy 130, near San Juan de las Huertas, 19.17°N, 99.83°W, 2850 m, 4 Oct 1967, *Tarn 142C* (IBUG, PTIS); Lagunas de Zempoala National Park, 19.05°N, 99.32°W, 2500 m, 9 Sep 1967, *Tarn & Flores 79* (BR, K, MPU, PTIS); road from Hwy to Nevado de Toluca at about 8 km, near to the junction above the Raíces, 19.10°N, 99.77°W, 3560 m, 12 Sep 1983, *Tarn et al. 88* (MEXU, IBUG); 26 km from Toluca, 7.5 km from La Puerta, near turn off to Nevado de Toluca, 19.22°N, 99.81°W, 3370 m, 8 Oct 1983, *Tarn et al. 150* (IBUG, K, PTIS); road between Santa Marta and Huitzilac, near Lagunas de Zempoala National Park, approximately 13 km from Tres Marías, 19.03°N, 99.33°W, 2900 m, 19 Oct 1983, *Tarn et al. 167* (IBUG, PTIS); Cerro Jocotitlán between Toluca and San Juan del Río, road up to the microwave station, 4 km N above the village of Jocotitlán, 19.72°N, 99.78°W, 2960 m, 27 Oct 1983, *Tarn et al. 192* (PTIS); Cerro Jocotitlán, road up to the microwave station, 6 km N above the village of Jocotitlán, 19.72°N, 99.78°W, 3060 m, 27 Oct 1967, *Tarn et al. 194* (IBUG, PTIS); Cerro Jocotitlán, road up to the microwave station, 11 km N above the village of Jocotitlán, 19.72°N, 99.78°W, 3450 m, 27 Oct 1983, *Tarn et al. 196* (IBUG, MEXU, PTIS); from Toluca to Temascaltepec, Hwy 130, along Rt 3 from La Puerta towards Sultepec at 14 km, just W of the road, 19.12°N, 99.82°W, 3440 m, 21 Sep 1984, *Tarn et al. 198* (IBUG, PTIS), *Tarn et al. 202* (IBUG, MEXU, PTIS); from Toluca to Temascaltepec, Hwy 130, along Rt 3 from La Puerta towards Sultepec at 18 km, and about 1 km E along the track, 20.00°N, 99.85°W, 3340 m, 21 Sep 1984, *Tarn et al. 203* (PTIS); from Toluca to Temascaltepec, Hwy 130, along Rt 3 from La Puerta towards Sultepec at 18 km and about 1 km E along the track, 19.10°N, 99.85°W, 3340 m, 21 Sep 1984, *Tarn et al. 204A*, *204C* (IBUG, MEXU, PTIS); road from Puebla and Cholula to Amecameca, just past highest point (Paso de Cortés), Km 22 near the state border with Puebla, 19.08°N, 98.67°W, 3640 m, 2 Nov 1984, *Tarn et al. 294* (IBUG, MEXU, PTIS); road from Ixtlahuaca to Mexico City, 35.7 km along road, slope of Cerro Cañada Honda, 19.53°N, 99.50°W, 3570 m, 8 Nov 1984, *Tarn et al. 302* (IBUG, MEXU, PTIS); 44 km along the road from Ixtlahuaca to Mexico City, slope of Cerro Cañada Honda, 19.52°N, 99.48°W, 3370 m, 8 Nov 1984, *Tarn et al. 304* (IBUG, MEXU, PTIS); Raíces, Nevado de Toluca, 19.13°N, 99.73°W, 3352 m, 10 Jul 1962, *Ugent 1514* (IBUG, MEXU, PTIS), 23 Sep 1962, *Ugent 2448* (IBUG, MEXU, PTIS); Hacienda Santa Rosa, just N of Santa Elena, 9.6 km E of Toluca on the Mexico City to Toluca road, 19.29°N, 99.60°W, 2643 m, 14 Oct 1962, *Ugent 2770* (WIS), *Ugent & Ugent 2769*, *2771–2772* (MICH, MO, US), 22 Aug 1962, *Ugent & Ugent 1267* (WIS); N slopes of Nevado de Toluca, farm of Rafael Alvarez and Fidel García, 19.14°N, 99.78°W, 3340 m, 15 Aug 1962, *Ugent et al. 1188* (WIS), 11 Aug 1962, *Ugent et al. 1063-1068*, *1072–1086*, *1094–1103*, *1106–1108*, *1164*, *1167–1186* (WIS), 7 Sep 1962, *Ugent et al. 1493–1494* (BM, WIS), 10 Jul 1962, *Ugent et al. 1506*, *1511* (MO), 7 Sep 1962, *Ugent et al. 1515–1525* (MEXU, MO), 23 Sep 1962, *Ugent et al. 2277–2278* (US), 16 Jul 1963, *Ugent et al. 5685–5686* (WIS); N slopes of Nevado de Toluca, in the farm village of Raíces, 19.14°N, 99.79°W, 3460 m, 7 Sep 1962, *Ugent et al. 1532–1533*, *1536–1537*, *1544–1546*, *1548–1549*, *1552–1553* (BM, ENCB, GH, MEXU, MO, US, WIS), 23 Sep 1962, *Ugent et al. 2686*, *2689-2691* (MICH, WIS); N slopes of Volcán de Toluca, 19.14°N, 99.78°W, 3230 m, 23 Sep 1962, *Ugent et al. 2267–2288* (MICH, WIS), *Ugent et al. 2286–2288* (US), 16 Jul 1963, *Ugent & Ugent 5695-5697*, *5706–5709* (MEXU, WIS), *Ugent et al. 5710–12* (MO); 37.5 km SW of Mexico City on Hwy 15 (Mexico City to Toluca), about 3.5 km W of La Marquesa, 19.30°N, 99.40°W, 17 Jul 1963, *Ugent et al. 5726–5628*, *5733–5734* (MICH, US, WIS); Km 139.3 on Hwy 15, between Toluca and Zitácuaro, 19.43°N, 100.23°W, 2880 m, 3 Aug 1965, *Ugent et al. 6064* (WIS); Km 56, road from Amecameca to Tlamacas, 19.12°N, 98.77°W, 3000 m, 9 Jul 1962, *Vázquez 33* (ENCB); Mpio. Ixtapaluca, Experimental Station of Zoquiapan, 8 km S of Río Frío, between Llano Chepalpan and Llano Aculco, 19.31°N, 98.69°W, 3260 m, 30 Jun 1978, *Vega 217* (CHAPA); Mpio. Ixtapaluca, Experimental Station of Zoquiapan, 8 km S of Río Frío, on the hillsides of Aculco Valley, 200 m SE, on pathway 4, 19.31°N, 98.69°W, 3250 m, 3 Jul 1978, *Vega 239* (CAS, F); Mpio. Ixtapaluca, Río Frío, 19.34°N, 98.67°W, 3000 m, 5 Oct 1982, *Ventura 143* (ENCB, IEB, MEXU), 25 Jul 1983, *Ventura 1011* (ASU, ENCB, IBUG, MEXU); 55 km SE of Mexico City, 19.10°N, 98.93°W, 3150 m, 7 Jul 1942, *Weaver 707* (NA, TAES); 3 mi W of Lagunas Zempoala, 19.04°N, 99.33°W, 2987 m, 7 Aug 1976, *Webster & Armbruster 20646* (GH).—MICHOACÁN: near Morelia, Punguato, 19.66°N, 100.78°W, 16 Jul 1909, *Arsène s.n.* (LY); Summit of Cerro San Andrés, about 12 km (straight line distance N of Ciudad Hidalgo), 19.80°N, 100.60°W, 3589 m, 6 Sep 1960, *Beaman 4291* (GH, LL, MSC, UC, US), *Beaman 4359* (GH, K, LL, MSC, UC, US); San José de las Cumbres, 19.68°N, 100.85°W, 14 Nov 1947, *Correll 14259* (GAT, IBUG, MEXU, PTIS, WIS), *Correll 14260* (GAT, PTIS, WIS), 12 Dec 1947, *Correll 14328* (GAT, IBUG, PTIS), 24 Dec 1947, *Correll 14378* (GAT, IBUG, PTIS); Pino Gordo, 19.65°N, 100.80°W, 24 Dec 1947, *Correll 14379* (IBUG, PTIS); Slope of Mount

Punguato, 19.66°N, 100.78°W, 4 Aug 1965, *Correll et al. 31328* (LL); Cerro Tancítaro, open peak on E slope of mountain, 19.41°N, 102.30°W, 3100 m, 13 Aug 1961, *De Jong & Longpre 1060* (MSC); Los Azufres, 19.75°N, 100.66°W, 18 Jul 1957, *Díaz 4* (ENCB); Mpio. Zinapécuaro, Llano de la Bolsa, base of Cerro San Andrés, Los Azufres, 19.84°N, 100.60°W, 3100 m, 9 Jul 1967, *Díaz 3908* (ENCB, IEB); Puerto Lengua de Vaca, 200 m after the México-Michoacán State border on road to Morelia, 19.42°N, 100.28°W, 2840 m, 3 Aug 1965, *Flores S-804* (MEXU); Puerto Lengua de Vaca, road to Morelia from Mexico City at 139.5 km, 19.43°N, 100.18°W, 2800 m, 3 Aug 1965, *Hawkes et al. 2514* (A, K); Mpio. Zinapécuaro, Llano Los Ajolotes, Los Azufres, 19.82°N, 100.63°W, 2740 m, 8 Jul 1989, *Jasso 1259* (IEB), *Rodríguez 1259* (MEXU); Mpio. Angangueo, Llano de las Papas, Ejido Cerro Prieto, 19.65°N, 100.27°W, 2975 m, 24 Oct 1986, *Mejía s.n.* (IEB); Sierra de San Andrés, 19.80°N, 100.60°W, 2200 m, 1 Sep 1906, *Ross 395, 414A* (M); Village of Macho de Agua, 19.45°N, 100.20°W, 2600 m, 9 Mar 1965, *Rowe 2* (IBUG, K, MEXU, PTIS); Mpio. Queréndaro, 4 km E of La Cumbre, along the road to Mil Cumbres, 19.72°N, 100.85°W, 2800 m, 24 Aug 1986, *Rzedowski 40447* (IEB); on slope on N side of Rt 15, 7 mi E of Macho de Agua, E of Zitácuaro, 0.3 km W of México-Michoacán State border, 19.45°N, 100.20°W, 2820 m, 27 Aug 1988, *Spooner et al. 4041* (INIFAP, PTIS, WIS), 15 Oct 1988, *Spooner et al. 4261* (INIFAP, PTIS); at edge of garden by gravel road, 1 km S of Rt 15 from just E of Macho de Agua, 19.43°N, 100.22°W, 2730 m, 27 Aug 1988, *Spooner et al. 4048* (INIFAP, PTIS, WIS); 20 km N of road from Rt 15 just W of Ciudad Hidalgo, N past San Pedro Jacuaro to Ucareo to Queréndaro road, by Los Tejamaniles, 19.80°N, 100.65°W, 2700 m, 29 Aug 1988, *Spooner et al. 4062* (INIFAP, PTIS, WIS); just N of steam power station on W side of road from Rt 15, W of Ciudad Hidalgo to Ucareo to Queréndaro road, 4 km N of Laguna Larga, 19.82°N, 100.67°W, 2280 m, 17 Oct 1988, *Spooner et al. 4266* (INIFAP, PTIS); México-Michoacán state border on Toluca to Morelia road, Hwy 15, 19.38°N, 100.28°W, 3120 m, 9 Sep 1967, *Tarn & Gómez 150* (K); Mpio. Zinapécuaro, high part of Cerro San Andrés, 19.84°N, 100.60°W, 3400 m, 29 Aug 1987, *Zamudio 5569* (IEB); Mpio. Zinapécuaro, Llano Grande dam, Los Azufres, 19.82°N, 100.63°W, 3000 m, 30 Aug 1987, *Zamudio 5610* (IEB, MEXU).—MORELOS: mountains above Tres Cumbres, 19.05°N, 99.25°W, 23 Nov 1947, *Correll 14283* (IBUG, MEXU, PTIS); above Tres Cumbres, 19.05°N, 99.25°W, 28 Dec 1947, *Correll 14411* (GAT, IBUG, PTIS); Tres Cumbres, above the road from Mexico City to Cuernavaca, 19.05°N, 99.25°W, 11 Jul 1976, *Delgado 249* (CHAPA, MEXU); Mpio. Huitzilac, Rancho San Lorenzo, Km 53.5 on road from Mexico to Acapulco (95, SW of Tres Marías), 19.04°N, 99.26°W, 2660 m, 7 Sep 1989, *Díaz 1034, 1062* (K, MEXU); 20 mi S of Mexico City along Hwy 95, 19.09°N, 99.22°W, 2743 m, 1 Aug 1956, *Fearing & Thompson 125* (TEX, US); Lagunas de Zempoala, Rt México to Cuernavaca, 19.05°N, 99.30°W, 2700 m, 29 Oct 1963, *Flores S-736* (MEXU); road to Lagunas de Zempoala, about 4 km after Huitzilac, 19.04°N, 99.27°W, 2720 m, 9 Sep 1967, *Flores S-988* (MEXU); Mpio. Huitzilac, Tres Marías, 19.03°N, 99.27°W, 2900 m, 1 Sep 1966, *Pedraza 25* (ENCB); Lagunas de Zempoala National Park, 19.07°N, 99.28°W, 2991 m, 27 Jul 1949, *Quiram 20* (MEXU); 1 km W of Tres Marías, 53 km from Mexico City, 19.05°N, 99.24°W, 3048 m, 29 Oct 1930, *Reddick 566* (BH); 9.25 km W of Tres Cumbres (Mex 95), on road to Lagunas de Zempoala, 19.04°N, 99.30°W, 2800 m, 25 Jul 1975, *Steingraeber 93* (LL); road from Tres Marías to Lagunas de Zempoala National Park, about 4 km beyond Huitzilac, 19.03°N, 99.27°W, 2720 m, 9 Sep 1967, *Tarn 64* (IBUG, K, MEXU, PTIS); road from Tres Marías to Lagunas de Zempoala National Park, about 5 km beyond Huitzilac, 19.05°N, 99.24°W, 2780 m, 9 Sep 1967, *Tarn & Flores 70* (K), *Tarn & Flores 71* (B, K), *Tarn & Flores 72* (F, K, NY).—OAXACA: Dist. Ixtlán, 5 km along the dirt road from La Cumbre to Corral de Piedra, 17.27°N, 96.40°W, 2950 m, 31 Jul 1985, *García et al. 1742* (K, MEXU); Mpio. Miahuatlán, 35 km ESE of Miahuatlán, 5 km NE of Santo Domingo Ozolotepec, Cerro Quiexobra, 16.25°N, 96.47°W, 3500–3700 m, 3 Oct 1990, *McDonald 2987* (NY, TEX); 21.8 km N of Ixtlán de Juárez on Rt 175 to Tuxtepec, 17.47°N, 96.50°W, 2720 m, 22 Sep 1988, *Spooner et al. 4201* (INIFAP, PTIS), 16 Oct 1984, *Tarn et al. 271* (IBUG, MEXU, PTIS).—PUEBLA: below Tesmalaquilla, 18.58°N, 97.25°W, 2835 m, 23 Aug 1938, *Balls et al. 5337* (BM, CPC, E, K, US, K, UC); N of Paso de Cortés, 19.09°N, 98.63°W, 3700 m, 21 Jul 1959, *Beaman 2894* (MSC); Los Humeros before Mastaloyan, 19.65°N, 97.38°W, 2650 m, 25 Aug 1984, *Castillo et al. 3279* (UC); above Tesmalaquilla, on the upper slopes of Pico de Orizaba, 19.02°N, 97.27°W, 27 Nov 1947, *Correll 14286* (GAT, LL, PTIS, WIS); upper slopes of Pico de Orizaba, Volcán Citlaltepetl, above Texmalaquilla, a village 10 (by road beyond) NE of Atzitzintla, about 17 km by road NE of paved Hwy 144, 18.97°N, 97.25°W, 3000 m, 5 Jul 1978, Dist. Morelos, Selva Obscura, 18.72°N, 97.48°W, Jan 6 1948, *Correll 14432* (GAT, IBUG, MEXU, PTIS); *Diggs & Corcoran 2062* (ENCB, WIS); near Tesmalaquilla, a village on the foothills of Pico de Orizaba, 18.99°N, 97.24°W, 3020 m, 16 Sep 1962, *Flores S-677* (K, MEXU); Mount Orizaba, from Esperanza, Atzizintla, Los Positos, 18.96°N, 97.46°W, 2650 m, 16 Aug 1949, *Hawkes et al. 1070* (F, K, LL, WAG); Mount Orizaba, from Esperanza, above Tesmalaquilla, 19.03°N, 97.37°W, 3100 m, 17 Aug 1949, *Hawkes et al. 1073* (K); Mpio. Cañada de Morelos, Dist. Sená, SE of Esperanza, towards Santa Cruz de Soledad, 18.74°N, 97.38°W, 2550 m, May 1980, *Ochoa 14101* (CIP, US, WIS); E of Río Frío, 62 km from Mexico City to Puebla, 19.35°N, 98.64°W, 2743 m, 8 Oct 1930, *Reddick 521, 527* (BH), *Reddick 528* (BH, WIS); 62

km from Mexico City on road to Puebla, 19.37°N, 98.59°W, 2743 m, 8 Oct 1930, *Reddick 522* (BH); Cerro Pinar, 35 km NE of Puebla, 19.05°N, 98.20°W, 3 Oct 1930, *Russell & Souviron 237* (US); Mount Orizaba, 19.06°N, 97.22°W, 25–26 Jul 1901, *Rose & Hay 5701* (US); Mount Orizaba, 19.02°N, 97.27°W, 1901, *Schiede 192 p.p.* (GOET); Km 57.4 from Mexico City on road to Puebla, Rt 190, 19.29°N, 98.54°W, 3200 m, 24 Oct 1983, *Tarn et al. 186* (IBUG, PTIS); Mpio. San Nicolás de los Ranchos, road to Paso de Cortés, E side of Santiago, 19.08°N, 98.59°W, 3200 m, 15 Sep 1987, *Tlapa & Ubierna 457* (IEB, MEXU); Texcayehualco, CFE, San Juan Tetla, 19.20°N, 98.60°W, 3650 m, 8 Aug 1982, *Toledo s.n.* (MEXU); Mpio. Xicotepec de Juárez, Km 2 along road from Mazacoatlán to La Cumbre, 20.30°N, 97.97°W, 14 Feb 1976, *Turra 2621* (MEXU); SW slopes of Volcán Citlaltepetl, Pico de Orizaba, below Temalaquilla, 19.00°N, 97.30°W, 3200 m, 26 Sep 1962, *Ugent & Flores 2301, 2305–2306, 2314* (GAT, GH, MEXU, MO, US), *Ugent et al. 2300, 2303–2305, 2307–2314* (ENCB, MO, WIS); San Agustín tower, San Juan Tetla, 3600 m, 5 Jul 1977, *Vega 28* (ENCB).—SINALOA: 3 km NE of El Palmito, 23.57°N, 105.83°W, 1950 m, 12 Aug 1974, *Breedlove 36432* (CAS, MO).—SONORA: Maicoba, 28.37°N, 108.70°W, Jul 1968, *Pennington 182* (TEX).—TLAXCALA: San Rafael Tepatlaxco, 19.12°N, 97.98°W, 25 Jul 1978, *Aguilar 38* (MEXU); Mount Malinche, 19.28°N, 98.05°W, 2743 m, 21 Jun 1938, *Balls et al. 4875* (A, BM, E, G, K, UC, US); Portalillo, Mount Malinche, 19.23°N, 97.98°W, 3505 m, 15 Oct 1938, *Balls et al. 5648* (BM, E, K, UC, US, WAG); Mount Malinche, from Huamantla, above Los Pilares, 19.27°N, 97.96°W, 3048 m, 15 Oct 1938, *Balls et al. 5652* (CPC, F, K, UC, US); Mpio. Calpulalpan, 19.57°N, 98.60°W, 21 Sep 1985, *Carillo s.n.* (MEXU); Mountain Cuyuaguen, above San Agustín Tlaxco, 19.62°N, 98.12°W, 7 Jan 1948, *Correll 14435* (IBUG, PTIS, WIS); Malinche Mountain, 19.23°N, 98.03°W, s.d., *CPC 14.2* (PTIS), *CPC 14.3* (PTIS), 3300 m, 10 Mar 1962, *Ugent 1359* (PTIS); Mount Malinche, near Huamantla, 19.32°N, 97.93°W, 3340 m, 3 Sep 1962, *Flores S-654* (MEXU); Mount Malinche, E side of mountain above Huamantla by Natividad, 19.24°N, 98.03°W, 3285 m, 11 Aug 1949, *Hawkes et al. 1054* (BR, K, LL, MEXU, NY); slope of Cerro Conejo, about 40 km from Apizaco towards Villarreal, 19.50°N, 97.92°W, 3020 m, 11 Nov 1984, *Hjerting et al. 266* (C, K); road from Teacalco to Torre Forestal, 350 m before microwave station, N slope of the Malinche volcano, 19.30°N, 98.03°W, 2830 m, 11 Oct 1984, *Tarn et al. 261* (PTIS); La Malinche volcano, N slope, 4.7 km above Campamento de Montaña, which is on the road from Teacalco to Torre Forestal, 19.27°N, 98.02°W, 3400 m, 11 Oct 1984, *Tarn et al. 264* (PTIS); N slope of La Malinche volcano, 2.3 km above Campamento de Montaña, which is on the road from Teacalco to Torre Forestal, 19.28°N, 98.03°W, 3180 m, 11 Oct 1984, *Tarn et al. 265* (PTIS); slope of Cerro Conejo, 34 km from Apizaco towards Villarreal, 19.48°N, 97.92°W, 2930 m, 11 Oct 1984, *Tarn et al. 268* (IBUG, MEXU, PTIS); Mpio. San Miguel Canoa Xaxalpa, 7 km NE San Miguel Canoa, 19.15°N, 98.09°W, 16 Sep 1988, *Tenorio 15162* (MEXU); Volcán Malinche, NW slopes, approached from Huamantla, 19.24°N, 98.03°W, 3340 m, 3 Sep 1962, *Ugent et al. 1395-96, 1408–10, 1418* (MO, US); Peñón del Rosario, 24 km E of Apán, on Tlaxcala-Puebla border, lower W slopes, 19.68°N, 98.22°W, 2750–3000 m, 12 Jul 1966, *West Q-10* (ENCB, WIS).—VERACRUZ: Cofre de Perote, above Los Pescados, 19.48°N, 97.13°W, 3505 m, 25 May 1938, *Balls et al. 4621* (BM, K, UC, US, WIS), s.d., *CPC 7.3* (IBUG, PTIS); Cofre de Perote, los Pescados, 19.48°N, 97.13°W, 3048 m, 25 May1938, *Balls et al. 4621a* (BM, K [3]); Mpio. Perote, N slopes of Cofre de Perote, 2.5 km below village of Conejos and 11 km (by road SE of town of Perote along road to television towers on summit of Cofre de Perote, 19.48°N, 97.18°W, 3000 m, 8 Jul 1980, *Hansen & Nee 7692* (F, MO, NY); Pico de Orizaba, 19.02°N, 97.27°W, 3600 m, 1838, *Linden 246* (FI, G, GH, K, P); Perote, grounds of Perote Experimental Station, 19.57°N, 97.25°W, 2400 m, 1 Nov 1984, *Tarn et al. 289* (IBUG, K, MEXU, PTIS).

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