



PLANT IMMIGRANTS.

No. 169.

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GENERA REPRESENTED IN THIS NUMBER.

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Foreign Seed and Plant Introduction.

EXPLANATORY NOTE.

This multigraphed circular is largely made up from notes received from agricultural explorers, foreign correspondents, cooperators, and others, relative to the more important plants which have recently been received by the Office of Foreign Seed and Plant Introduction of the Department of Agriculture; in it are also contained accounts of the behavior in America of plants previously introduced. Descriptions appearing here are revised and published later in the Inventory of Seeds and Plants Imported.

Applications from experimenters for plants or seeds described in these pages may be made to this Office at any time. As they are received the requests are placed on file and when the material is ready for the use of experimenters it is sent to those who seem best situated and best prepared to care for it. The plants or seeds here described (except such as are distributed direct or are turned over to specialists in the Department who are working on investigational problems) are propagated at our Plant Introduction Field Stations, and when ready to be distributed are listed in our annual check lists, copies of which are sent to experimenters in the late fall. It is not necessary, however, to await the receipt of these lists should one desire to apply for plants which are described herein.

One of the main objects of the Office of Foreign Seed and Plant Introduction is to secure material for plant breeders and experimenters. Every effort will be made to fill specific requests for experimental quantities of new or rare foreign seeds or plants.

David Fairchild,
Agricultural Explorer in Charge

*Office of Foreign Seed and Plant Introduction,
Bureau of Plant Industry,
U. S. Department of Agriculture.*

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Asparagus acutifolius (Convallariaceae), 49458. From Hartsville, S. C. Seeds collected by Mr. J. B. Norton, agricultural explorer. "This is probably the hardiest evergreen species of the genus. Stock grown from S. P. I. No. 34620 has survived four winters at Hartsville, S. C., when the temperature has gone below 10° F. It makes a beautiful thick-set hedge of a very dark green color, suggesting a five-leaved juniper. As the plants grow older there is a tendency to produce vinelike shoots. The tuberlike storage roots and drought-resistant foliage make it valuable for regions of scanty rainfall. The shoots are edible, although much smaller than those of ordinary asparagus. The flavor, however is said by some to be superior to that of the common species." (Norton.)

Aulotandra sp. (Zinziberaceae), 49477. From Kafue, Northern Rhodesia. Collected by Dr. H. L. Shantz, agricultural explorer. "No. 320. A beautiful orchidlike plant which forms a spike about 6 inches high upon which one flower appears at a time. The flowers, about 2 to 3 inches across, have pale yellow centers, with the edges white to lavender or reddish lavender. They open in the morning and last most of the day. The swollen roots have a delicate flavor, and are aromatic." (Shantz.)

Bactris maraja (Phoenicaceae), 49476. **Palm.** From Bahia, Brazil. Seeds presented by Mr. H. M. Curran. "A palm said to grow in a swamp; has a spiny stem and produces clusters of edible, dark purple fruits resembling grapes in appearance and flavor. The fruits are very common. In the markets here in Ilheos, where these were obtained, they are called 'Manvel velho,' or swamp coconut." (Curran.)

Cassiope fastigiata (Ericaceae), 49623. From Darjiling, India. Seeds presented by Mr. G. H. Cave, curator, Lloyd Botanic Garden. A beautiful free-flowering alpine shrub about 9 inches high, one of the choicest from the northwest Himalayas. It is fairly abundant at elevations of 12,000 to 13,000 feet in shady situations and in moist, peaty, well-drained soil. The solitary, white, bell-shaped flowers have the corolla segments recurved, showing the pink center and the curious awned stamens like those of the arbutus. The tiny leaves, imbricated in 4 rows which give the stem a 4-sided appearance, have white, membranous, ciliated

margins. (Adapted from The Gardeners' Chronicle, 3d ser., vol. 47, p. 379.)

Digitaria exilis (Poaceae), 49522. **Grass.** From Mano, Sierra Leone, West Africa. Seeds presented by Mr. D. W. Scotland, director of agriculture, Njala, Mano, Sierra Leone, through Prof. C. V. Piper. A cereal native to tropical Africa and cultivated in West Africa where it was first observed in 1798. It closely resembles *D. longiflora* which is probably the wild ancestral form. The grain has a very good flavor and it is believed that it might prove a valuable addition to the light farinaceous articles of food used by the delicate or convalescent. The plant is said not to require manuring and to thrive well in light soils and even in rocky situations. It is grown in Nigeria at an altitude of 4,000 feet. (Adapted from Kew Bulletin of Miscellaneous Information, No. 8, p. 383, 1915.)

Diospyros ebenaster (Diospyraceae), 49480. **Black sapote.** From Salina Cruz, Oaxaca, Mexico. Seeds presented by Mr. Wilbur Barker. "The black sapote, which is a native of India and is widely cultivated in the Tropics, is a compact and shapely ornamental tree with oblong-oval, glossy leaves about 4 inches long. The fruits, which greatly resemble those of the kaki, or Japanese persimmon, are light green when ripe and from 2 to 4 inches in diameter. The dark brown or almost black flesh is sweet, and when cut up or mashed with orange juice makes a first-rate dish." (Wilson Popenoe.)

For previous introduction see S. P. I. No. 44187.

Gladiolus psittacinus (Iridaceae), 49595. **Gladiolus.** From Bukama, Belgian Kongo. Collected by Dr. H. L. Shantz, agricultural explorer. "No. 418. A beautiful pure yellow gladiolus which grows in a very wet soil but also occurs on the upland. A fine large pure yellow flower as fine as our cultivated types, very pure but ranging to almost mottled with reddish spots in some individuals. The flower has unusually good form. An important introduction." (Shantz.)

Ligustrum delavayanum (Oleaceae), 49675. **Privet.** From Paris, France. Purchased from Vilmorin-Andrieux & Co. This hardy shrub was first discovered by Abbé Delavay in the mountains of Yunnan, China, where it becomes 2 or 3 meters high. In habit it is prostrate-spreading, except for a few perfectly upright branches which rise



A TROPICAL PERSIMMON.

(*Diospyros ebenaster* Retz. See S. P. I. No. 44187.)

The black sapote belongs to the same genus as the wild persimmon of the eastern United States and the kaki or Japanese persimmon. It comes from the Philippines, but is not grown in many parts of tropical America. It has fruited successfully in southern Florida. The specimens here shown are unusually fine ones, grown in the irrigated region near Tehuantepec, in southern Mexico. The fruit is green externally and contains dark-brown pulp, which makes a most delicious dessert when beaten with orange juice. (Photographed by Wilson Popenoe, at Tehuantepec, Oaxaca, Mexico, August 9, 1918; P17662FS.)



A SEEDLING WEST INDIAN AVOCADO IN CENTRAL FLORIDA.

(*Persea americana* Mill. See S. P. I. No. 46984.)

The presence of this West Indian avocado near Winter Haven, in the lake region of central Florida, shows that avocados, even of tender varieties, can be grown in this part of the State. In order to minimize the danger from frost injury, it is desirable to plant hardier varieties, such as those of the Guatemalan race and the hybrid Fuerte. The tree here shown has been cut back several times by frost. (Photographed by Wilson Popenoe, Winter Haven, Fla., March 22, 1919; P17645F'S.)

from the center of the shrub. The shining dark green foliage, which is remarkably persistent, reminds one of a myrtle and, with the white flowers and blue-black fruits, makes the plant a very attractive ornamental. (Adapted from Sargent, *Plantae Wilsonianae*, vol. 2, p. 601; and from *Revue Horticole*, vol. 73, p. 495.)

Mimusops huberi (Sapotaceae), 49709. From Para, Para, Brazil. Seeds presented by Mr. Paul Le Cointe, Goeldi Museum. "'Massaranduba' with large yellow fruits; from the vicinity of Para." (Le Cointe.) A large tree, found in the primeval forests of Para, Brazil; it has very thick rough bark and obovate leaves about 6 inches long. The one or two-seeded roundish fruits are pale yellow with occasional reddish violet markings. They are edible and are sold in the markets of Para. The timber is used for general construction work and for railroad ties. (Adapted from *Archivos do Jardim Botânico do Rio de Janeiro*, vol. 2, p. 14.)

Odina edulis (Anacardiaceae), 49597. From Kafue, Northern Rhodesia. Seeds collected by Dr. H. L. Shantz, agricultural explorer. "No. 33. A dark purple grapelike fruit with a delicate skin, somewhat musty in flavor but pleasant after the first taste. It is eaten by the natives and is supposed to be a cure for 'black water fever.' The fruits are produced before the leaves, the latter appearing at about the time the fruits are ripe. This plant is acaulescent or, at least, does not develop much above the surface of the soil and thus escapes the annual fires. It is abundant from Pretoria to Kafue." (Shantz.)

Piptanthus nepalensis (Fabaceae), 49645. From Darjiling, India. Seeds presented by Mr. G. H. Cave, curator, Lloyd Botanic Garden. A fairly hardy evergreen climber with beautiful foliage and flowers which are attractive throughout the summer. It thrives in poor soils, if the situation be warm, sunny, and sheltered. In common with most leguminous plants, *Piptanthus* makes simple vertical roots, 3 feet in length; it then develops stems 3 feet long the first season and reaches a height of 10 feet in the third year. It speedily covers the wall space allotted to it. In the first spring it will make lateral growths, each terminated by a yellow-flowered raceme that in shape closely resembles a bunch of grapes; the individual flowers bear a close resem-

blance to those of the English gorse (*Ulex europaeus*). The deep green, glabrous, trifoliolate leaves are large and similar in shape to those of well-grown broad beans (*Vicia faba*). (Adapted from The Gardeners' Chronicle, 3d ser., vol. 43, p. 178.)

Pittosporum crassifolium (Pittosporaceae), 49474. From San Francisco, Calif. Seeds presented by Mr. John McLaren, superintendent, Golden Gate Park. "An ever-green tree introduced from Australia. It is of easy culture, not particular as to soil, and is very effective as a lawn ornamental, either single or in groups; it also makes a good hedge plant. It is propagated by seeds." (John McLaren.)

Mr. McLaren has recommended this shrub as one which would probably endure the sea breeze and salt spray of the Florida coast.

Strychnos sp. (Loganiaceae), 49599. From Kafue, Northern Rhodesia. Seeds collected by Dr. H. L. Shantz, agricultural explorer. "No. 310. The small-fruited, sweet variety which is relished by the natives. It is lemon-orange in color, has a thick stony rind yellowish brown inside, and is rather juicy with a tart but very agreeable flavor. It is unlike any fruit I have eaten, is much easier to eat than an orange and, I should say, as agreeable to the taste. In eating, the seeds are rejected as are those of pomegranates. The fruits are borne in great abundance, and apparently are possessed of excellent keeping qualities. I think this is well worth trying out in cultivation." (Shantz).

Letters from Explorers in the Field.

Mr. Wilson Popenoe, agricultural explorer, writes from Guatemala, Guatemala, February, 27, 1920, the following report on the chayote in Guatemala:

"While it is true that the chayote (*Chayota edulis*) cannot be likened to the Irish potato in food value, yet it occupies a position in the dietary of the Guatemalan Indians somewhat analogous to that occupied by the potato in many northern countries. This analogy is evidenced by the abundance in which the chayote is seen on Guatemalan markets in the fall and winter months; no other vegetable is so conspicuous and no other is sold in such quantities.

"The cultivation of the plant is not limited to any particular zone in Guatemala, but is more extensive

in regions between 4,000 and 7,000 feet in elevation. The city of Guatemala, the largest market in the country, draws its main supply from the village of Santa Maria de Jesus, which lies at an elevation of approximately 6,700 feet on the slopes of the Volcan de Agua, near Antigua. The fruit is common in the markets of towns upon the coast as well as in those of the highlands. but production seems to be much greater in the latter region. While it is evident that the plant is fairly adaptable in its climatic requirements, it appears at the same time that best results are obtained in a somewhat cool atmosphere.

"Taking, for example, Santa Maria de Jesus as representative of the zone in which the chayote flourishes most luxuriantly, we may observe that the soil is a loose volcanic loam; that the annual rainfall is between 25 and 40 inches (though this is not significant, since the vines are irrigated artificially), and that the temperatures are never high (rarely exceeding 80° F. and not often falling to the freezing point). Judging from the character of the vegetation in Santa Maria, it is permissible to assume that minimum temperatures of 28° to 30° F. may sometimes be experienced.

"Amatitlan, another region in which chayotes are successfully grown, has a much warmer climate than Santa Maria, with minimum temperatures probably never below 40° F., and maxima as high as 90° F. The soil of this region is slightly more compact than that of Santa Maria, yet of the same volcanic origin. It is a loose black loam, of excellent fertility and good mechanical texture.

"The Coban region, which also produces good chayotes, is quite different in character, the soil being a clay loam, underlaid with clay, and the rainfall being much heavier than in central and southern Guatemala,-- commonly it is about 80 inches, distributed throughout ten months of the year while in central Guatemala there is a dry season of at least six months' duration.

"Judging from the behavior of the chayote in Guatemala, one is perhaps justified in asserting that a relatively cool climate (by tropical standards) suits it best, and that it requires an abundance of water, for in regions such as Santa Maria, where rainfall is insufficient, the plants are irrigated sometimes as frequently as once a day.

Planting and Culture.

"The Guatemalan Indians plant the chayote in early spring or even in winter (January and February in Santa Maria, March at Coban) and harvest a crop the following October to December. The vines are not perennial, but die down every winter, usually about the month of January. It is evident that this takes place whether they are subjected to frost or not; though it is equally evident that different plants show different times of maturity and death of the tops. At Santa Maria, in the month of February, most of the chayote arbors were covered with dead leaves, and new green sprouts were just pushing up from the roots; at the same time, however, there were a few vines which were in growth and were bearing fruits. Whether or not this difference is due to variation of the time of sowing cannot be ascertained at present.

"In this connection, there is a custom at Santa Maria which is worthy of passing notice. Upon the advent of winter, and the consequent possibility of frost which might kill the chayote vines, the Indians place upon the top of the arbor a dish which has been dipped in lime, the theory being that the lime will give off heat and protect the vines from cold.

"Little preparation is made for planting. A hole 8 or 10 inches deep is prepared to receive the chayote which should already have commenced to sprout, and the fruit is then laid upon its side in the hole and covered with 4 or 5 inches of soil. In heavy soil it must not be planted so deeply, but in the friable volcanic loam of Santa Maria the young sprout seems able to make its way to the surface through 7 or 8 inches of soil without difficulty.

"After planting, it is usually necessary to protect the seed from hogs; hence a circular barrier about 18 inches in diameter is made of small sticks, set into the ground 7 or 8 inches, and placed so close to one another that a hand cannot be slipped between them. This barrier is usually 4 or 5 feet high. When the first shoot makes its appearance, several small twigs are stuck into the ground close beside it, for it to climb upon. When it reaches the tops of these twigs and the height of the circular barrier it is ready to spread out upon the 'tapezca' or arbor.

"For convenience in gathering the fruit, chayote arbors are usually arranged in the following manner: Uprights, 4 to 6 feet in height, are set in the ground

about 8 feet apart. On top of these is arranged a lattice-work of light canes placed horizontally. The distance between the canes is quite variable, but is rarely more than a foot. The vines extend horizontally over this framework, and the fruits hang down through it, where they are easily seen and easily gathered. The size of the arbor is quite variable; for a single 'hill' of chayotes it may sometimes be as much as 25 feet in diameter, and often several hills are planted under a common arbor 30 to 40 feet square.

"No tillage is given the soil around the base of the plant, but water is applied frequently in the regions where rainfall is not abundant. At Santa Maria it is said to be the custom to pour a bucket of water upon each hill every day.

"The hill once started will last several years, if not dug for the tubers. These are ready for using at the end of the second season.

"The fruits commence to mature in September. They are most abundant in November and December, but there are still quite a few in the markets as late as the first of March. The Indians do not like to pick chayotes until they are fully mature, as they contend that the fruits have much more flavor at this time than when eaten half-grown or immature. Maturity is indicated by the appearance of the cotyledons in the slit at the apex of the fruit. The young sprout also makes its appearance while the fruit is still on the vine. The Indians of Santa Maria break off the plumule with the finger nail before taking the fruit to market in Guatemala City or Antigua, so that it cannot be used for planting. They fear that chayotes will be grown in other places and they will no longer have a market for their product.

"The mature fruit, when picked, will keep for two or three weeks in good condition. If laid away for a longer time, it gradually shrivels and sends out sprouts. By destroying the plumule, so that the fruit can not sprout, and burying it in the ground, the Indians claim to keep chayotes in good condition for two months.

"The picking season extends over several months, and a large amount of fruit is produced by most varieties. Undoubtedly the different varieties vary in productiveness, yet all of those which are commonly grown in the highlands seem to be satisfactorily productive.

"After the plant has dried up and the fruit has all been harvested, the 'ichintal', or tuber, may be dug if the second season of growth has been completed. Since the tubers bring a relatively high price in the

market, quite often the entire hill is dug and the tuber sold. The size of the tubers varies greatly; as commonly seen in the markets they are 1 or 2 inches in diameter, and 10 to 18 inches long; but the largest of them are 4 to 5 inches in diameter and up to $2\frac{1}{2}$ feet long. In answer to my question, 'Which is best, the fruit or the tuber?', most natives have replied that they preferred the tuber. But since the latter is available in relatively small quantity, it does not play so important a rôle, by any means, in the dietary of the Indians as the fruit itself. It is customary to eat the tuber boiled, as a part of the favorite dish 'cocido' (boiled meat and vegetables of several kinds, served together); or fried in batter, often with a thin tomato sauce which is added after cooking. The tuber, when well cooked, is fairly mealy in texture, but not so well flavored as a good potato, and to my own taste is not preferable to a good mealy chayote.

Varieties.

"A good mealy chayote' brings up the question of varieties, which I am convinced is one of the most important in connection with chayote culture, and one to which we have not as yet devoted sufficient attention in the United States.

"Unquestionably there are important differences in the flavor and quality of the different varieties cultivated in Guatemala, differences almost sufficiently marked to condemn the chayote as a poor vegetable or to characterize it as an excellent thing, according as one samples a really good sort or one of the poorer ones.

"For some time I thought that green-fruited varieties were better flavored than the white ones, but I have now come to believe that there are good and inferior varieties of both colors, just as there are good avocados of purple color and good ones that are green. Perhaps it is true, as various natives have asserted to me, that the dark green chayotes are usually the best. I am inclined to think it is. But the very best variety which has yet come under my observation is the 'guisquil de papa,' (potato chayote) of certain gardens in Antigua. This is a broadly obovoid fruit about 4 inches in length, plump, perfectly smooth on the surface (though with brownish cracks when fully ripe), and of an ivory-white color, almost opaque in character. This variety has an unusually mealy character and is much better in flavor than most others. It is,

in my opinion, the one which should be disseminated most widely in the United States if a trial shows that it will succeed there.

"The chayotes of Guatemala are variable in character, and there are no well-fixed and widely established varieties. Forms such as the 'guisquil de papa,' above referred to, are of very limited distribution. There is, of course, the well-known 'guisquil de Santa Maria,' but after examining it carefully I do not consider it to be a variety, but rather a race or group of closely related varieties. The 'guisquil de Santa Maria' is nearly round in form, 2 to 5 inches in diameter, dark green in color, and smooth to prickly on the surface. It is considered to be of good quality and is the commonest sort in the market of Guatemala City. It may be observed in this connection that it is generally considered by Guatemalans that the spiny sorts are of better quality than the smooth ones; but I am convinced that while this may in general be true, there are occasional smooth varieties which are as good as any of the spiny ones, and for the sake of greater convenience in handling and preparing for the table we will do well to avoid the spiny forms and search out the few good smooth ones for our use.

"Chayotes of pyriform shape, such as most of those which have been grown in the United States, are not so common in Guatemala as the round ones. Large-fruited varieties are also somewhat uncommon, though fruits a pound in weight may occasionally be found in the market.

"There is a group of chayotes, which is of particular interest as being as yet unknown in the United States (outside of a few experimental plantings) and as possessing good quality coupled with attractive appearance. These are the 'peruleros,' which name I take to imply small-fruited smooth forms, of both green and white color. Most of the peruleros are about the size of hens' eggs, and when young and tender they are excellent. The larger fruited peruleros include some splendid forms, of about eight ounces weight, which would seem to be especially worthy of propagation. The 'guisquil de papa' of Antigua, mentioned above, would seem almost to come within the class of large-fruited peruleros.

"For attractiveness, the white-fruited varieties are undoubtedly the best. Some of these are watery in character as are also most of the pale green varieties; but the white forms which have an opaque appearance and the deep green varieties are apt to be of fairly good

quality. It must be stated, however, that a really good chayote, - that is, one which is not watery and which has a mealy consistency and good flavor, - is relatively rare.

"The preparation of the chayote for the table, as commonly practiced in Guatemala, is not calculated to bring out the flavor of the fruit nor to make it attractive to the European palate. The Indians commonly consume the fruit without other preparation than boiling. Salt may be added as seasoning (the Guatemalan Indians consume immense quantities of common salt), but other seasoning is rarely added. The fruit is boiled, and then it is peeled with the fingers and eaten. Sometimes it is thrown into a meat stew, after being cut in small pieces. In any event, the Indians serve it in the most primitive manner imaginable, and indeed it may be said that the refinements of chayote preparation are rarely practiced by any one in Guatemala. Among higher class Guatemalans, however, there are a few modes of serving which increase the palatability of the chayote and indeed make it a good dish. The best of these methods is probably the following, which I take from a well-known Antiguan housewife:

Guisquiles Rellenos.

"The chayotes are cut in half and boiled. The flesh is then removed from the skins carefully, and mixed with eggs, bread crumbs, butter, raisins, almonds, cinnamon, sugar, and wine; after being thoroughly mixed, the stuffing is replaced in the skins and bread crumbs are sprinkled over the top; a little salt is added and they are placed in the oven for a short time. This dish, when well prepared, is exceedingly rich and delicious, yet it does not partake strongly of the character of the chayote.'

"Below are given two recipes furnished by Mrs. W. C. Townsend, of Antigua:

Guisquil de papa.

"Boil the chayotes thoroughly, then peel them. Season with butter, salt, and pepper, and serve. This method of serving is applicable to other varieties as well.'

Guisquil de papa, au gratin.

"Boil the chayotes thoroughly, then peel them. Heat a skillet very hot, and put in it some butter and a little salt and pepper. Put in the chayotes and let them brown a bit, then add some bread crumbs and stir for a few minutes. Remove from the fire and serve.'"

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BUREAU OF PLANT INDUSTRY
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