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B. T. GALLOWAY, *Chief of Bureau.*

THE FLORIDA VELVET BEAN AND RELATED PLANTS.

BY

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF PLANT INDUSTRY,
OFFICE OF THE CHIEF,
Washington, D. C., February 26, 1910.

SIR: I have the honor to transmit herewith and to recommend for publication as Bulletin No. 179 of the series of this Bureau the accompanying manuscript, entitled "The Florida Velvet Bean and Related Plants," prepared by Messrs. C. V. Piper, Agrostologist in Charge, and S. M. Tracy, Special Agent, Forage-Crop Investigations.

This paper points out an interesting example of the confusion that exists in the botany of the cultivated plants, which has in this particular case brought about the neglect of a number of valuable sorts related to the Florida velvet bean. Two of these species possess decided elements of superiority and will without doubt result in extending far to the northward the culture of this crop, as well as in greatly increasing its importance. This paper discusses nine of the species that have been studied, but is to be considered a preliminary rather than an exhaustive publication.

The authors desire to acknowledge the helpful suggestions and assistance rendered them by Mr. W. F. Wight, Botanist, of this Bureau.

Respectfully,

G. H. POWELL,
Acting Chief of Bureau.

Hon. JAMES WILSON,
Secretary of Agriculture.

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THE FLORIDA VELVET BEAN AND RELATED PLANTS.

INTRODUCTION.

For about fifty years the Florida velvet bean has been known in Florida, and in the last twenty years has become of increasing agricultural importance. Its early history has been told by Mrs. K. S. Bort in Bulletin No. 141, Part III, of the Bureau of Plant Industry.

The Florida velvet bean is principally grown on account of its extreme vigor and the large quantity of pods which it produces per acre. The plants are nearly always utilized by pasturing to stock, cattle being turned into the fields in November and finishing on the velvet bean in good condition for marketing.

The Florida velvet bean is a long-season crop, and even in Florida has to be planted early in the spring in order to mature its seed. On this account an earlier variety has long been a desideratum, especially if along with earliness can be secured a greater production of seed per acre. For various reasons the fact that there are other kinds of Stizolobium closely related to the Florida velvet bean has been overlooked by American agronomists, though at least three such species from India and Java were long ago described. Apparently none of these, however, were introduced for trial in Florida until 1907.

In September, 1906, there were received from Dr. J. W. Hart, Piracicaba, Brazil, seeds of a species of Stizolobium (S. P. I. No. 19181) which differed from the Florida velvet bean in having coal-black, shining seeds, and in February, 1907, another species, with white seeds, was received from Mr. W. S. Lyon, Manila, P. I., under the name of *Mucuna lyonii* Merrill. These two lots were grown in 1907 and since. After their receipt it seemed to be wise to endeavor to get together all of the other species of this genus in the hope of finding varieties that would prove earlier or otherwise more valuable than the Florida velvet bean. In the three years during which this effort has been made, with the assistance of the Office of Foreign Seed and Plant Introduction, twenty sorts distinct at least as to seed characters have been obtained. Not only have these varieties indicated that there are greater possibilities in this group of plants than had been supposed, but an exceed-

ingly interesting botanical problem has been disclosed, as there are clearly more species than had been recognized by botanists.

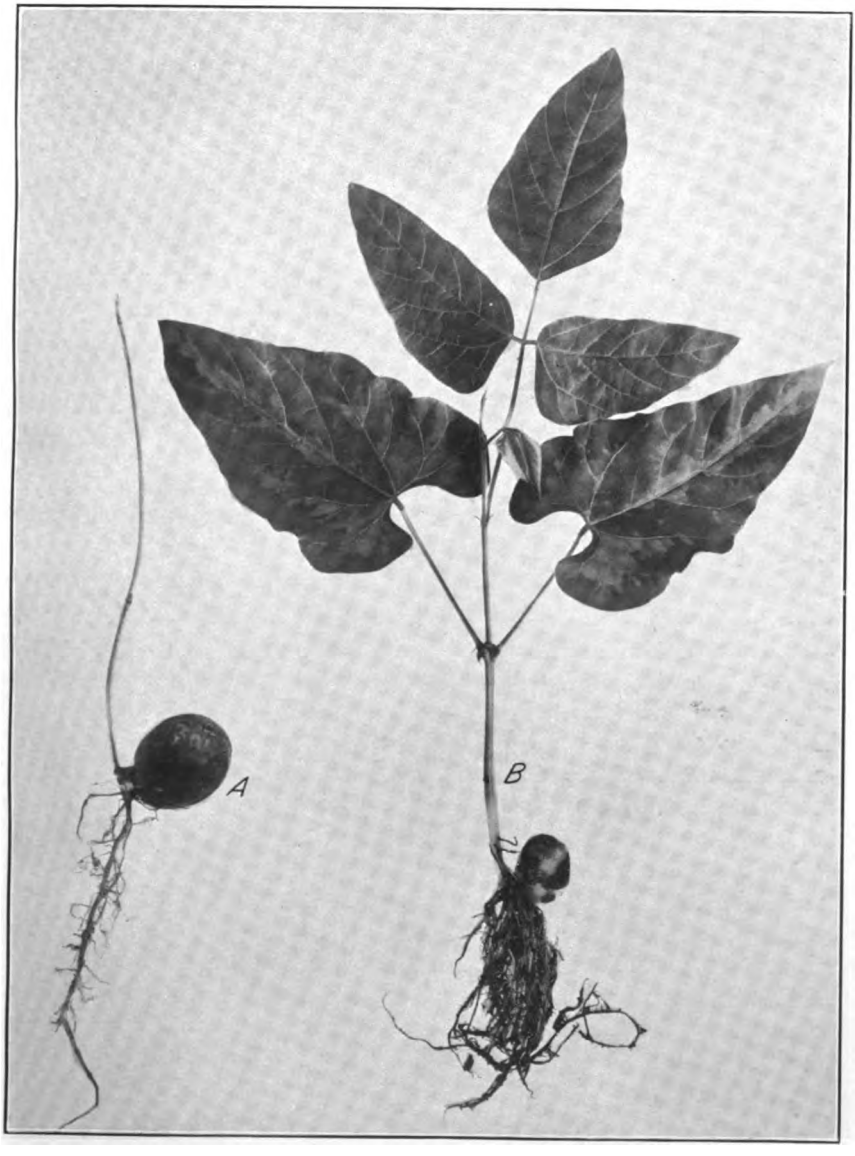
Until the publication of the paper previously mentioned,[a] the Florida velvet bean had been known in this country under the name of *Mucuna utilis*. Mrs. Bort showed clearly that it could not be the plant originally described under that name, nor could it be identified with any other described species. On this account she named and described the plant as a new species, *Stizolobium deeringianum*. She also emphasized the fact that the Florida velvet bean and allied plants constitute a distinct genus from Mucuna, pointing out that the genus Mucuna consists of perennial plants with woody stems and with a band-like hilum that extends two-thirds of the way around the seed, or more, while the genus Stizolobium[b] consists of plants essentially annual, with an oblong-crateriform hilum to the seed. She further stated that Mucuna in germination is hypogeous, while Stizolobium is epigeous. This last statement is incorrect, as both are hypogeous. There is a pronounced difference, however, in the germination. In Stizolobium the first leaves above the cotyledons are a pair of petioled leaves having solitary cordate leaflets, which immediately are followed by the typical alternate, trifoliate leaves of the plant. In Mucuna, on the contrary, the initial leaves are all alternate, very much reduced, and scale-like. These differences are well shown in Plate I, where the germination of *Mucuna keyensis* is contrasted with that of *Stizolobium hassjoo*.

Of the 20 forms of Stizolobium obtained, 10 have been grown to maturity for one year or more in the field, and several others in the greenhouse. The field work has been conducted principally at Biloxi, Miss., and in cooperation with the Florida Agricultural Experiment Station at Gainesville, Fla. In addition, large quantities of seeds of the Lyon bean (S. P. I. No. 19979) and considerable quantities of the fleshy-pod bean (S. P. I. No. 21094) and of the Mauritius or Bengal bean (S. P. I. No. 21300) have been distributed for field testing.

The characters by which the different species of Stizolobium are distinguished are principally in the pods and seeds; otherwise the species are much alike both in habit and foliage. Slight differences occur in the leaves and flowers, which, however, are not conspicuous. It is probably due to the fact that most herbarium material does not contain mature pods that the distinctness of the species has not before

[a] Bulletin 141, pt. 3, Bureau of Plant Industry, 1909.

[b] The genus Stizolobium was first published by Patrick Browne (The Civil and Natural History of Jamaica, 1756, p. 290) and based upon the species now known as *Stizolobium pruriens*, the common cowitch. The seed characters by which Stizolobium is distinguished from Mucuna have been clearly pointed out by Prain (Journal of the Asiatic Society of Bengal, n. s., vol. 66, 1897, p. 404.)



SEEDLINGS OF MUCUNA KEYENSIS AND STIZOLOBIUM HASSJOO.

A, Seedling of Mucuna keyensis, S. P. I. No. 24427.
B, Seedling of Stizolobium hassjoo, S. P. I. No. 25254.
(Natural size.)

been recognized by botanists. There is also a considerable range as respects the life period of the species, some being much earlier than the Florida velvet bean and others much later.

The pod differences are displayed in differences of size, of shape, of ridges on the valves, and especially in the character of the pubescence. The latter character in the various forms is such that it seems impossible to refer them to a single species, as in no genus of legumes known to us do we find differences of this kind in agricultural varieties known to be such. Furthermore, these plants never seem to have been cultivated sufficiently to give rise to series of varieties such as are found in most cultivated legumes. A number of the species have been cultivated to a slight extent by the Hindus. Another species, *Stizolobium velutinum* (Hassk.) (*Mucuna velutina* Hassk.), seems to be more or less extensively cultivated in Java. In this species Hasskarl mentions six varieties differing in seed characters, but calls attention to no pod differences. The evidence at hand does not yet justify us in deciding whether all of these are really garden varieties or distinct species, but the latter conclusion best coincides with the facts thus far ascertained. Still another species, *Stizolobium hassjoo*, is said to be extensively cultivated in Yezo, the north island of Japan. This last is by far the earliest form yet obtained and will doubtless mature its seed as far north as Tennessee and North Carolina. From a single season's experience it seems to possess unusual merit and will probably come into extensive cultivation, especially for growing with corn.

Detailed notes setting forth the present knowledge of the different forms is given in connection with each species.

GENERAL CHARACTER OF THE GENUS STIZOLOBIUM.

All of the stizolobiums thus far grown are large, annual, much-branched, twining herbs, the stems twining in an opposite direction from the hands of a watch; leaves trifoliate, with large membranaceous leaflets shorter than the petiole; leaflets ovate, the lateral ones oblique, all mucronate, and attached by short, fleshy, very pubescent petiolules; stipules small and lanceolate; stipels bristle-like; flowers in pendent, usually long racemes, the flowers mostly in groups of three; mature pods black, pubescent, marked with one or more longitudinal ridges, or these rarely obscure or wanting.

From an economic standpoint, the species of Stizolobium may be divided into two groups, those which have abundant long stinging hairs on the pods and those which have few or no stinging hairs. The former also have stinging hairs on the calyx. In the former category are to be placed *Stizolobium pruriens* (L.) Medic. (*Dolichos pruriens* L.), the cowhage or cowitch, the type of the genus which is

native to the East Indies but which also occurs now in Jamaica and other West Indian Islands, probably as an introduction; *Stizolobium pruritum* (*Mucuna prurita* Hook. in Wight and Arnott, Prodromus Floræ Indiæ Peninsulæ Orientalis, 1834, vol. 1, p. 255); and *Stizolobium hirsutum* (W. and A.) Kuntze (*Mucuna hirsuta* Wight and Arnott, op. cit., p. 254), both of the latter native to India. Only one of these species with stinging hairs on the pods has matured in our trials, namely, S. P. I. No. 25263, *Stizolobium pruriens* (?). None of these species with stinging hairs can be utilized as forage crops, but they have been grown with the idea of ascertaining their relationship to the more valuable forms.

All of the stizolobiums possess something in the juice, especially in the green pods, which rapidly turns black on exposure to air. This substance blackens the hands and clothing of workmen cutting velvet beans for hay, which is occasionally done. It also causes the dried flowers and pods to become black, and does the same to the seeds of white-seeded varieties, especially if gathered too green or where they press upon each other.

Botanical descriptions and economic notes concerning nine species are presented in this publication.

ANALYTICAL KEY TO THE SPECIES.

Pods velvety with black pubescence.
- Seeds marbled, rarely white, thick, subglobose; pods 2.5 to 3 inches long, nearly as thick as broad..... *deeringianum.*
- Seeds black, oblong, somewhat flattened; pods flattened, 4 to 4½ inches long, *capitatum.*

Pods pubescent, but the pubescence not black or velvety.
- Pubescence dense, erect or nearly so, not appressed.
  - Seeds dull black with faint rusty markings; pubescence of pods tawny. *utile.*
  - Seeds ash colored; pubescence of pods whitish..... *cinereum.*
- Pubescence white, appressed.
  - Flowers white; leaf surface undulate; seeds ash colored..... *niveum.*
  - Flowers purple; leaf surface plane.
    - Pod valves with the principal ridge prominent, but secondary ridges rarely more than one.
      - Pubescence on pods rather coarse and long; leaflets 3 to 5 inches long, rather thick; seeds ash colored..... *hassjoo.*
      - Pubescence very fine; leaflets larger and thinner; seeds shining black..... *aterrimum.*
    - Pod valves with a well-developed principal ridge and two or more secondary ridges; pubescence soft.
      - Seeds flattened, white with black or gray spots; pods large, very fleshy when green, 5 to 7 inches long; valves with 3 to 5 secondary ridges; pubescence very sparse..... *pachylobium.*

STIZOLOBIUM DEERINGIANUM.

Stizolobium deeringianum Bort.[a] Florida velvet bean. (Pl. II, *B*.)

An annual, herbaceous, climbing vine, sometimes 20 meters in length when growing on supports, and even on the ground attaining a length of from 2 to 6 meters, bearing long, pendent racemes of purple flowers which produce dark, velvety pods 5 or 6 centimeters long. Stems rather slender, terete, sparsely pubescent with white, appressed hairs, especially on the ridges. Petioles equaling or exceeding the leaflets, pubescent like the stem, and continued for 2 to 4 centimeters beyond the lateral leaflets; stipules subulate, pubescent, about 1 centimeter long; stipels similar but smaller; petiolules about 5 millimeters long, stout, very pubescent. Leaflets rhomboid-ovate, the lateral ones oblique, membranaceous, acuminate-cuspidate, 5 to 15 centimeters long, about half as broad, sparsely pubescent above, especially on the veins, more densely pubescent beneath, the white hairs closely appressed. Inflorescence a raceme or thyrsus 15 to 30 centimeters long, pendent, bearing 5 to 30 flowers, usually about 12; rachis like the stem, but more pubescent; flowers borne singly or in twos or threes on short lateral branchlets. Bracts lanceolate-subulate, very pubescent, early fugacious. Calyx pubescent within and without with short, white, appressed hairs, 2 lipped, the upper lip broadly triangular, the lower lip 3 cleft, the lobes triangular-subulate, the middle one longest; stinging hairs absent. Corolla dark purple, 3 to 4 centimeters long; standard less than half the length of the keel, darker than the rest of the flower; wings slightly shorter than the keel, rather broad, oblanceolate-oblong, obtuse; keel straight to near the tip, where it curves sharply upward, the tip firm and acute; anthers of two sorts, alternately long and short, the latter on much broader filaments; ovary linear, pubescent; style filiform, pubescent nearly to the tip; stigma small. Pods when mature 5 to 6 centimeters long, turgid, densely covered with a soft, nearly black, velvety pubescence without stinging hairs; valves with 1 or 2 or sometimes 3 obscure longitudinal ridges. Seeds 3 to 5 in each pod, subglobose, marbled and speckled with brown or black, and sometimes both, on ash-gray ground color (though pure gray and, it is said, pure black occur rarely), 1 to 1.5 centimeters in diameter. Hilum white, oblong-crateriform, less than one-half the length of the seed.

The leaflets of this species are abruptly mucronate from a usually obtuse apex.

This is the well-known species which has been so long cultivated in Florida. Its importance in late years has grown rapidly, and it is now much more cultivated than ever before. The principal objection to it is the long season required for maturing, which has in a large measure militated against its cultivation farther north. It will, however, make a very large growth of vines as far north as Virginia and Kentucky, but rarely matures its seed north of Florida. It is not well adapted as a hay plant on account of its extreme vininess, and where it does not produce pods is of only limited usefulness. Like all of the stizolobiums it is absolutely immune to the wilt which affects so many other legumes and also to root-knot caused by nematodes. In all of the time this plant has been under cultivation in Florida the only variant produced is one having white or nearly

[a] Bulletin 141, pt. 3, Bureau of Plant Industry, 1909, p. 31.

white seeds, apparently being identical in all other respects with the ordinary form having mottled seeds.

The original source of this species has never yet been determined, though in all probability it comes from southern Asia or some island of the Malay Archipelago. It has been widely distributed throughout the world by the United States Department of Agriculture. Seed which is undoubtedly the progeny of such distributions has been obtained from Saigon, Cochin China (S. P. I. No. 25261), and also from Poona, India (S. P. I. No. 25715). On account of the wide distribution which has been made of the seed of this species, it will be rather difficult to ascertain its exact place of nativity, which can probably be determined only by finding the plant growing under conditions where it is undoubtedly wild.

STIZOLOBIUM CAPITATUM.

Stizolobium capitatum (Roxburgh) Kuntze. (Pl. II, *A*.)

Carpopogon capitatum Roxburgh, Flora Indica, 1832, vol. 3, p. 284.

Mucuna capitata Wight and Arnott, Prodromus Floræ Peninsulæ Indiæ Orientalis, 1834, p. 255.

Roxburgh's original description is as follows:

Annual, twining. Heads axillary, subsessile. Legumes armed with soft velvet-like down.

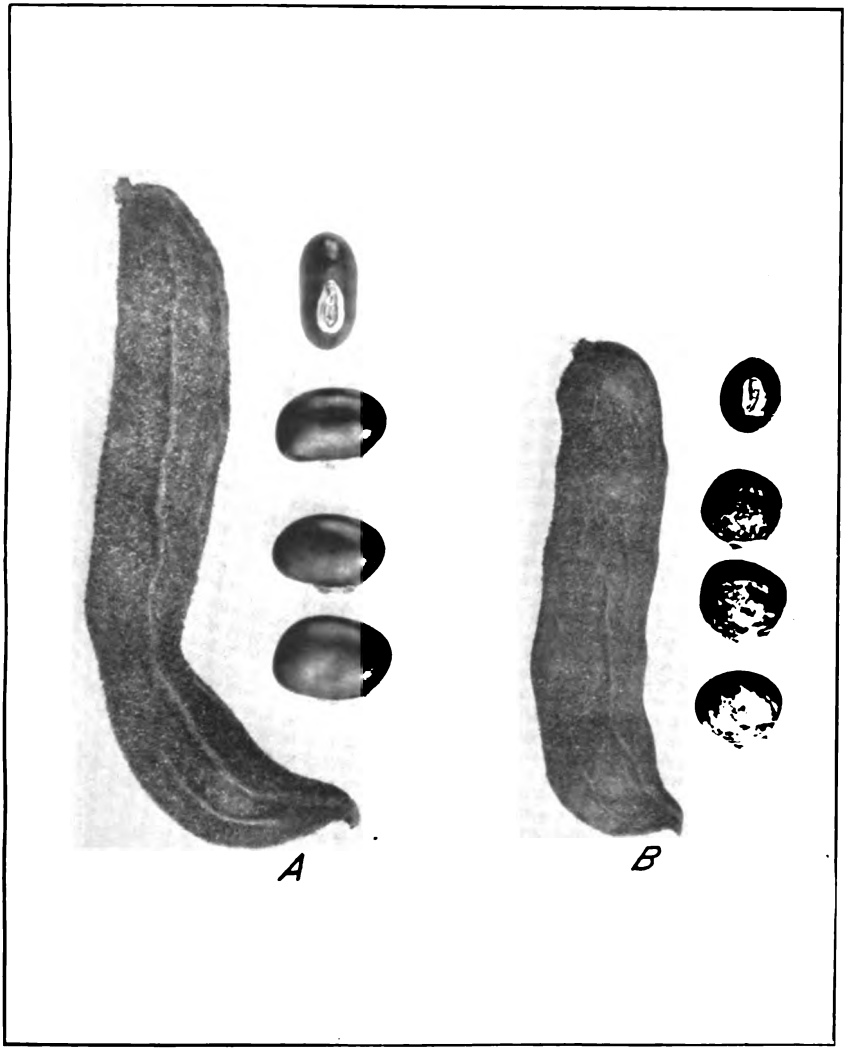
Teling. Soorootoo.

This I have only found in a cultivated state, and that during the cold season, in the gardens of the natives. It is an annual.

Stem herbaceous, twining, branchy, running to an extent of 10 to 12 feet, if supported; young shoots slightly downy. Leaves ternate. Leaflets equal in size, the exterior ones ovate, about 3 inches long and 2 broad, the lateral ones obliquely cordate; all are entire and obtuse, above smooth, a little downy underneath. Stipules of the petioles axillary, short, many flowered. Bracts, flowers, stamens, and pistil as in *C. pruriens*. Legumes cylindric, depending, a little curved, about as thick as the forefinger or thumb, and about 6 inches long, covered with soft, velvet-like down; when ripe wrinkled longitudinally. Seeds five or six, of the size of a small garden bean, smooth, shining, black.

The young pods like those of *Dolichos lignosus* and *lablab* are used by the natives in their curries, after rubbing off the down that covers them.

Pods 9 to 10 cm. long, about 1½ cm. wide, strongly falcate, much compressed, mostly four seeded; valves with a strong central ridge extending from near the base to the tip, a secondary ridge usually present extending for the upper third; pubescence identical with that of *Stizolobium deeringianum*, dense, soft, nearly black, the larger hairs tipped with white; seeds oblong, glossy, black, with or without faint brownish markings, 8 by 15 mm., the white hilum 5 mm. long.



MATURE PODS AND SEEDS OF STIZOLOBIUM CAPITATUM AND STIZOLOBIUM DEERINGIANUM.

A, Pod and seeds of Stizolobium capitatum (seeds, black), S. P. I. No. 22464-A.
B, Pod and seeds of Stizolobium deeringianum, S. P. I. No. 22339.

(Natural size.)

Seed (S. P. I. No. 25120–A) representing this species was obtained from Maj. A. T. Gage, superintendent of the Royal Botanical Garden, Calcutta, British India. This seed was mixed with S. P. I. No. 25120, *Stizolobium utile*, from the same place. At Gainesville, Fla., this same species was mixed with S. P. I. No. 22464, *Stizolobium utile*, obtained through Mr. A. C. Hartless, superintendent of the Government Botanic Garden, Seharanpur, British India, under the name of *Mucuna capitata*. As the seeds of these two species are much alike, the mixture was in each case probably accidental.

This species is the only one having pod pubescence of the type found on the Florida velvet bean, but the pods and seeds are very different. At Biloxi, Miss., and Gainesville, Fla., it matures its pods in about the same length of time as the Florida velvet bean, and probably is of about the same agronomic value.

Later botanical writers have made various comments on Roxburgh's species. Wight and Arnott (Prodromus Floræ Peninsulæ Indiæ Orientalis, 1834, p. 255) quote the herbarium name of Roxburgh, *Dolichos soorootoo*, from an unpublished drawing in the herbarium at Calcutta and also identify the plant questionably with Rumphius's *Cacara nigra*, Plate 138, published in the Herbarium Amboinense. The flowers as indicated on Rumphius's plate are very different from those of any Stizolobium, while the pods resemble closely those of *Pachyrhizus angulatus*. The drawing of the seed, however, indicates a typical Stizolobium. We are unable satisfactorily to identify this plate. Wight and Arnott also state that they have examined specimens collected by Klein, obtained from the Missionaries' Garden. Baker, in Hooker (Flora of British India, vol. 2, p. 187), also refers *Mucuna velutina* Hassk. to this species, a reference which we consider erroneous. A similar reference is also made by Miquel (Flora van Nederlandsch Indië, vol. 1, p. 212). Miquel also refers with doubt to this species the plant described by Rumphius in Herbarium Amboinense as *Cacara nigra*. In this he apparently follows Wight and Arnott.

There could seem to be little doubt regarding the identity of this species as based on Roxburgh's ample description and from the further fact that this plant has been received from Calcutta, the type locality. It does not seem likely that Roxburgh's original plant is *Stizolobium utile*, as the pubescence on the pods of that could scarcely be called velvety. The species is perfectly distinct in its pod characters, in which respect it can only be associated with the Florida velvet bean, which has pods of very different shape and seeds of different shape and color.

STIZOLOBIUM UTILE.

Stizolobium utile (Wall.) n. comb. (Pl. III, *B*).

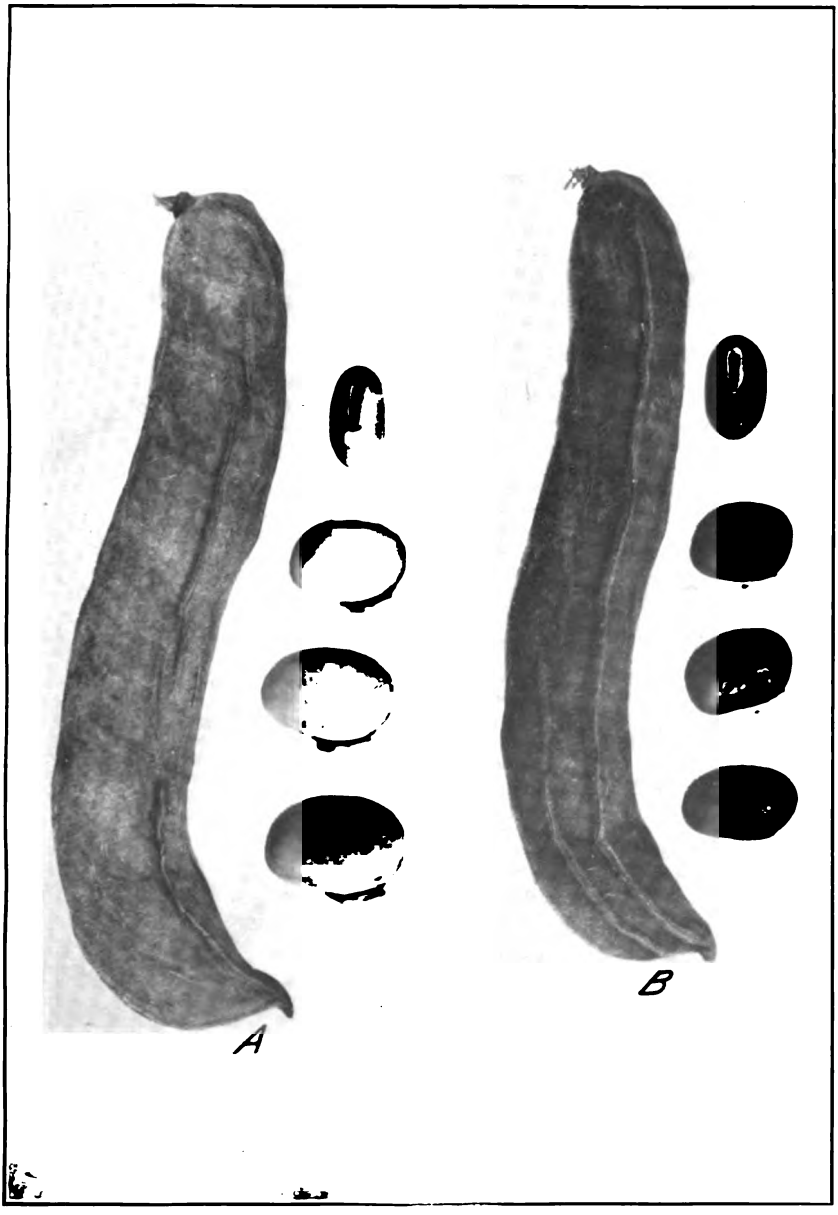
Mucuna utilis Wall. (Wight, Icones Plantorum Indiæ Orientalis, 1840, vol. 2, p. 280).

Wight publishes an excellent plate of this plant, which has been reproduced in Bulletin No. 141 of the Bureau of Plant Industry, page 28. The only description given by Wight is as follows:

Mucuna utilis (Wall. MSS.). The principal difference of this species, if indeed a species, and *M. prurita* consists in the hairs of its legumes being appressed and almost silky, not erect, rigid, and stinging. In all other respects they sufficiently agree. The flowers in both are purple. The greater size of this is probably attributable to cultivation, in which state only it is known.

Voigt (Hortus Suburbanus Calcuttensis, 1845, p. 235) identifies the plant with "the variety extensively cultivated in the Mauritius and Van Diemen's Land as a table vegetable and also as a fodder for cattle." This plant is the variety with black, shiny seeds commonly known as Mauritius bean. Voigt also gives the name "Pois noir de Bourbon." Cordemoy (Flore de l'Ile de la Reunion, 1895, p. 393) accepts this identification. This author states that the plant on the island of Reunion is known under the name of "Pois mascate." He also gives a detailed description of the plant, which he states was imported into Reunion to serve for breeding purposes, but is now naturalized. We should be inclined to accept this identification if it were not for two facts. First, Wallich's figure indicates more pubescence on the pod than occurs in the Mauritius bean and the pubescence is not closely appressed; secondly, we have obtained from Maj. A. T. Gage, superintendent of the Botanic Garden at Calcutta, seeds of two species of Stizolobium now being grown in the garden at Calcutta. One of these is *Stizolobium capitatum*, already described; the other is the species which we feel confident is the same plant that Wallich has figured. It is very different from the Mauritius bean in that the pod is densely covered with tawny pubescence which is not appressed. The following is a detailed description:

Stems stout, growing 30 to 50 feet long, striate and furrowed, pubescent with fine retrorse hairs; leaflets plane, ovate, 5 to 8 inches long, mostly obtuse, mucronate, puberulent on both sides with fine appressed hairs; racemes 9 to 15 inches long; calyx saccate, pubescent without and within, with fine white appressed hairs, the upper lobe triangular, blunt or notched, the lower lobe one-half longer than the lateral lobes; corolla dark purple, 1½ inches long, the wings broad; ovary densely pubescent with white and purple hairs; pods flattened, 3½ to 4½ inches long, densely pubescent with short erect or ascending tawny hairs with a few purple ones interspersed; lateral ridge strong, more or less broken, extending nearly the length of the valves; seeds oblong, rather thick, 12 to 14 mm. long, dull black, faintly marked with brown flecks, the veins invisible.



MATURE PODS AND SEEDS OF STIZOLOBIUM CINEREUM AND STIZOLOBIUM UTILE.

A, Pod and seeds of Stizolobium cinereum, S. P. I. No. 22463.
B, Pod and seeds of Stizolobium utile (seeds, dull black), S. P. I. No. 22464.
(Natural size.)

This is S. P. I. No. 25120, obtained from Maj. A. T. Gage, superintendent of the Botanic Garden at Calcutta, British India. Identical with it is S. P. I. No. 22464, from Mr. A. C. Hartless, superintendent of the Government Botanic Garden, Seharanpur, British India.

This species has been grown for two seasons at Biloxi, Miss., and Gainesville, Fla. It matures with the Florida velvet bean and is about as productive. The pubescence on the pods, however, is rather harsh, rubs off easily, and is irritating to the skin. On this account it will doubtless not be found desirable for cultivation.

STIZOLOBIUM CINEREUM.

Stizolobium cinereum n. sp. Ashy-pod bean. (Pl. III, *A*.)

Stems stout, growing 30 to 50 feet long, furrowed, covered with a fine, harsh pubescence, the hairs not retrorse; leaflets plane, broadly ovate, mostly obtuse, mucronate, 5 to 8 inches long, pubescent on both sides with appressed white hairs, especially beneath; racemes 9 to 15 inches long; calyx saccate, silky with white appressed hairs without, less so within; corolla dark purple, 1¼ inches long; pods flattened, 4 to 4½ inches long, densely pubescent with short erect or ascending white hairs; median ridge prominent, complete, the secondary irregular, varying from continuous to broken or sometimes wanting; seeds oblong, ash colored, the ends often black, veiny, about 15 mm. long.

This species has been grown for two seasons at Biloxi, Miss., and Gainesville, Fla. It matures with the Florida velvet bean, but is no more prolific and the hairs are irritating.

This is S. P. I. No. 22463, from Mr. A. C. Hartless, superintendent of the Government Botanic Garden, Seharanpur, British India.

STIZOLOBIUM NIVEUM.

Stizolobium niveum (Roxburgh) Kuntze. Lyon bean. (Pl. IV, *A*.)

Carpopogon niveum Roxburgh (Flora Indica, 1832, vol. 3, p. 285).

Mucuna nivea Wight and Arnott (Prodromus Floræ Indiæ Peninsulæ Orientalis, 1834, p. 255).

Mucuna lyoni Merrill (Philippine Journal of Science, Supplement 1, 1906, p. 197).

Roxburgh's original description is as follows:

Annual, twining. Racemes pendulous. Legumes from six to eight seeded, while young downy; when old destitute of down and wrinkled.

Bengal-Khamach.

Like *Carpopogon capitatum*, I have only found this in a cultivated state, and even then very uncommon, having seen it but in one or two gardens near Calcutta; however, if it is not indigenous in Bengal, it must have been long known to the natives, not only on account of their having a vernacular name for it, but because it is eaten by them, as a Hindoo requires a long and intimate acquaintance with any article before he makes it a part of his diet. Potatoes they must have known fifty years or more before they began to admit them at their tables.

Be that as it may, the plant is cultivated during the cold season, when it blossoms and produces fruit in great abundance.

Root ramous, generally annual, though in some soils it lasts longer. Stem twining to an extent of some fathoms, very ramous and thick, but of a spongy, succulent nature, young shoots a little villous. Leaves ternate. Leaflets entire, the pair nearly semicordate, the terminal one rhomboidal; all have short acute points and are nearly equal in size, of a soft delicate texture and slightly villous on both sides; from 4 to 10 inches long. Petioles round, slightly villous, from 6 to 12 inches long. Stipules lanceolate. Racemes axillary, solitary, pendulous, often as long or even longer than the leaves, bearing numerous, three-fold, pendulous, very large white flowers. Bracts fourfold, a common one to each tubercle of the racemes, on which the three flowers are inserted, and one to each of the proper pedicels, all are caducous, nearly lanceolate, and villous. Calyx four parted. The upper division broad and emarginate; the lower one narrowest and more lengthened than the lateral pair. Corol papilionaceous. Banner cordate, incumbent on the wings and keel, and about half their length. Wings oblong, with a remarkable callous gland near the base of each. Keel one petalled, linear, length of the wings, with a sharp, rigid, incurved point. Nectary a crenulate gland round the insertion of the germ. Filaments one and nine, alternately clavate and filiform, with long linear, subsagittate anthers on the slender filaments, and short-ovate ones on the clavate ones. Germ hairy. Style slender and villous. Stigma small. Legume linear, about 6 inches long, curved a little like an italic *S* when ripe, black, destitute of down, and longitudinally wrinkled. Seeds generally from six to eight, oval, smooth, ash colored, and separated by thin partitions.

By removing the exterior velvet-like skin of the large, fleshy, tender legumes, they are when dressed, like French beans (*Phaseolus vulgaris*), a most excellent vegetable for our tables, and the full-grown beans are scarcely inferior to the large garden beans of Europe.

We identify as this species S. P. I. No. 24936, obtained through Mr. C. Drieberg, of the Ceylon Agricultural Society, Colombo, Ceylon, which at Biloxi, Miss., and Gainesville, Fla., proved indistinguishable from *Mucuna lyonii* (S. P. I. No. 19979) obtained from the Philippines. The original specimens of *Mucuna lyonii* came from Pampanga Province, Luzon, there called "Sabual." This is the only species obtained by us with ash-colored seeds that has white flowers. Wight and Arnott,[a] in discussing *Mucuna capitata*, comment as follows:

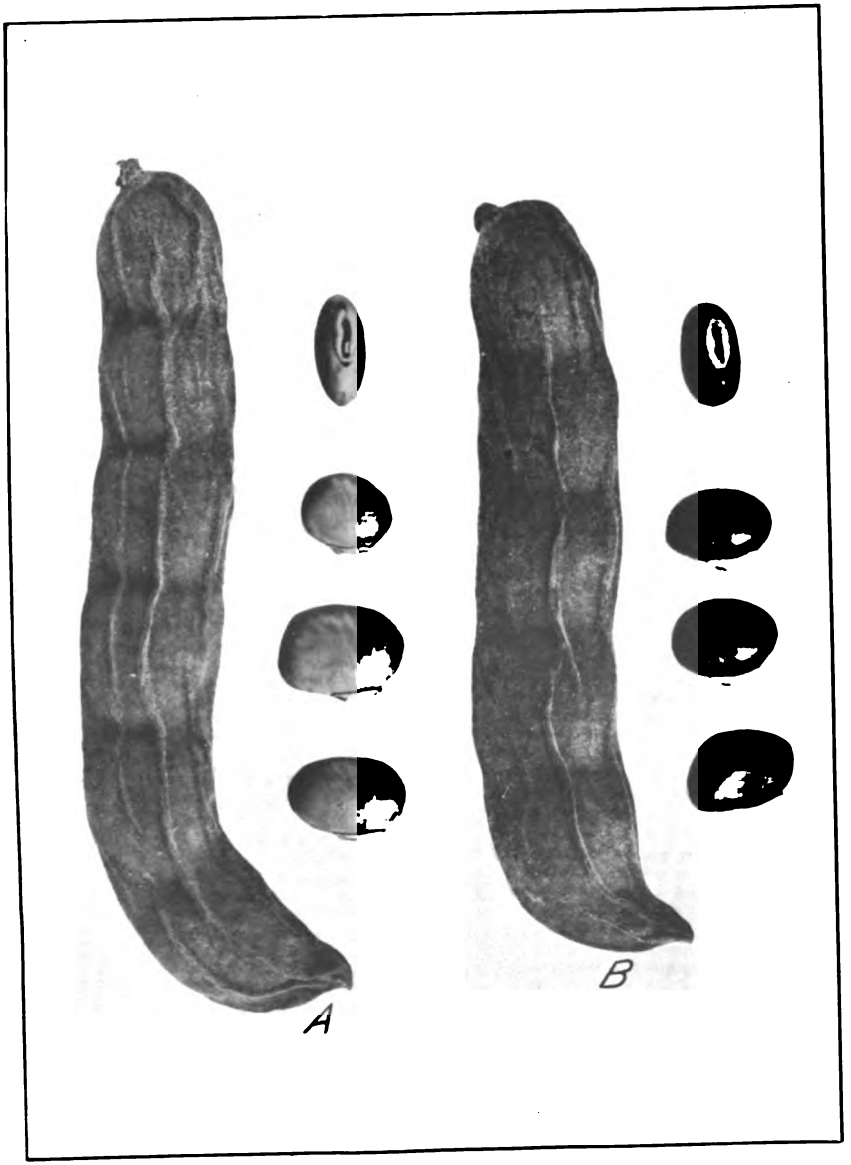
M. niveum, D. C. (*Carpopogon niveum*, Roxb. in East India Company, mus. tab. 1601) is a species very closely allied, but differs by the long drooping racemes and the legumes when ripe, entirely free from pubescence; it likewise is only known as a cultivated plant.

Watt's Dictionary of the Economic Products of India, 1891, vol. 5, p. 285, comments as follows:

Met with in Burma and Bengal, perhaps only a cultivated variety of *Mucuna pruriens*.

Cultivated during the cold season for the sake of its abundant and useful fruit. The large, fleshy, tender legumes have long been known and valued as a vegetable by the Hindus, and, according to Roxburgh, are, when dressed, like French beans, a most excellent vegetable for European tables.

[a] Op. cit., p. 255.



MATURE PODS AND SEEDS OF STIZOLOBIUM NIVEUM AND STIZOLOBIUM ATERRIMUM.

A, Pod and seeds of Stizolobium niveum, S. P. I. No. 19979.
B, Pod and seeds of Stizolobium aterrimum (seeds, shining black), S. P. I. No. 21300.
(Natural size.)

Watt also states that the vernacular names in use in Bengal are "Khamach" and "Alkushi." Firminger (Manual of Gardening for India, p. 133) says: "To me the beans seem to partake rather of the agreeable flavor of the Lima bean, and afford a very nice dish during the latter end of the rain season." Baker in Hooker (Flora of British India, vol. 2, p. 188) quotes *Mucuna nigra* Ham. (in Wall. Cat. 5617) as a synonym, but neither description nor citation accompanies the publication of that name.

The Lyon bean has now been cultivated in Florida and other Southern States for three years. It requires about the same length of time to mature as the Florida velvet bean, or is perhaps slightly earlier. It is, however, much more prolific in seed production and is therefore likely to come into prominent use. Besides its greater productivity it has the advantage over the Florida velvet bean of being wholly devoid of stinging hairs. The leaf surface, unlike any other species known to us, is decidedly undulate, so that the plant can readily be recognized even before it blooms. The vine is fully as ornamental as the Florida velvet bean and should become a popular arbor plant, especially if the seeds are as edible as indicated by Roxburgh and others.

Prof. P. H. Rolfs, of the Florida Agricultural Experiment Station, and five other persons tested the edibility of the seeds prepared as baked beans. While they were found to be very palatable, they caused both purging and vomiting. Three of the persons who ate about half as much of the dish as they would of ordinary baked beans were thus affected. The other three who ate of them very sparingly suffered no ill effects.

The pods and seeds of this species are well represented in Plate IV, *A*. The flower clusters are longer than in any other species.

STIZOLOBIUM HASSJOO.

Stizolobium hassjoo n. sp. Yokohama bean. (Pl. V, *B*.)

Vines slender, 6 to 20 feet long, sparsely pubescent with retrorse white hairs; leaflets ovate, acutish, abruptly mucronate, rather thick and firm in texture, plane, 4 to 5 inches long, sparsely pubescent on each face with white appressed hairs; racemes 4 to 6 inches long; flowers dark purple; calyx saccate, the lower lobe one-half longer than the lateral ones, densely appressed-pubescent without and within; corolla 1½ inches long; pods 4 to 4½ inches long, 5 to 6 seeded, covered with rather long white appressed pubescence; median ridge prominent, the secondaries faint or wanting; seeds ash colored, often blackish at the ends, oblong, flattened, 15 to 18 mm. long, the veins of the testa very obscure.

This is S. P. I. No. 25254, obtained from the Yokohama Nursery Company, Yokohama, Japan, who state that this plant is widely grown in Hokkaido or Yezo, the north island of Japan. In the "Useful Plants of Japan," 1895, page 9, where it is erroneously iden-

tified with *Mucuna capitata* Wight and Arnott, the following information is given:

Jap. *Osharaku-mame, Hassho-mame;* an annual leguminous climber cultivated in common dry land. The young soft grains are eaten boiled and have a taste of *Vicia faba* L., but this bean contains a poisonous ingredient in a slight quantity; so it is advisable to eat moderately.

Stizolobium hassjoo is by far the earliest species known to us. Planted at Biloxi, Miss., April 19, 1909, it was perfectly mature and dry on September 20; at Gainesville, Fla., it was fully mature by September 27, having been planted on May 1; at Monetta, S. C., it was planted June 15 and the pods were mature enough to ripen when the vines were killed by frost on October 25; at the Arlington Experimental Farm, near Washington, D. C., it was in full bloom on October 12, having been planted on June 21. The individual plant will cover a plat 3 to 4 feet square, which will indicate the proper distance to plant.

This species was also grown at Manhattan, Kans., in 1890 under the name *Mucuna capitata*, by Prof. C. C. Georgeson. From seed planted May 19 the plant began to bloom August 7 and matured a few pods before frost.[a]

This plant is mentioned by Siebold (Verhandelingen van het Bataviaasch Genootschap, 1830, vol. 12, p. 55) under the name *Dolichos hassjoo*, and the Japanese name "Hassjoomame" is cited, but no description given. We have thought it best, however, to use the same specific name.

STIZOLOBIUM ATERRIMUM.

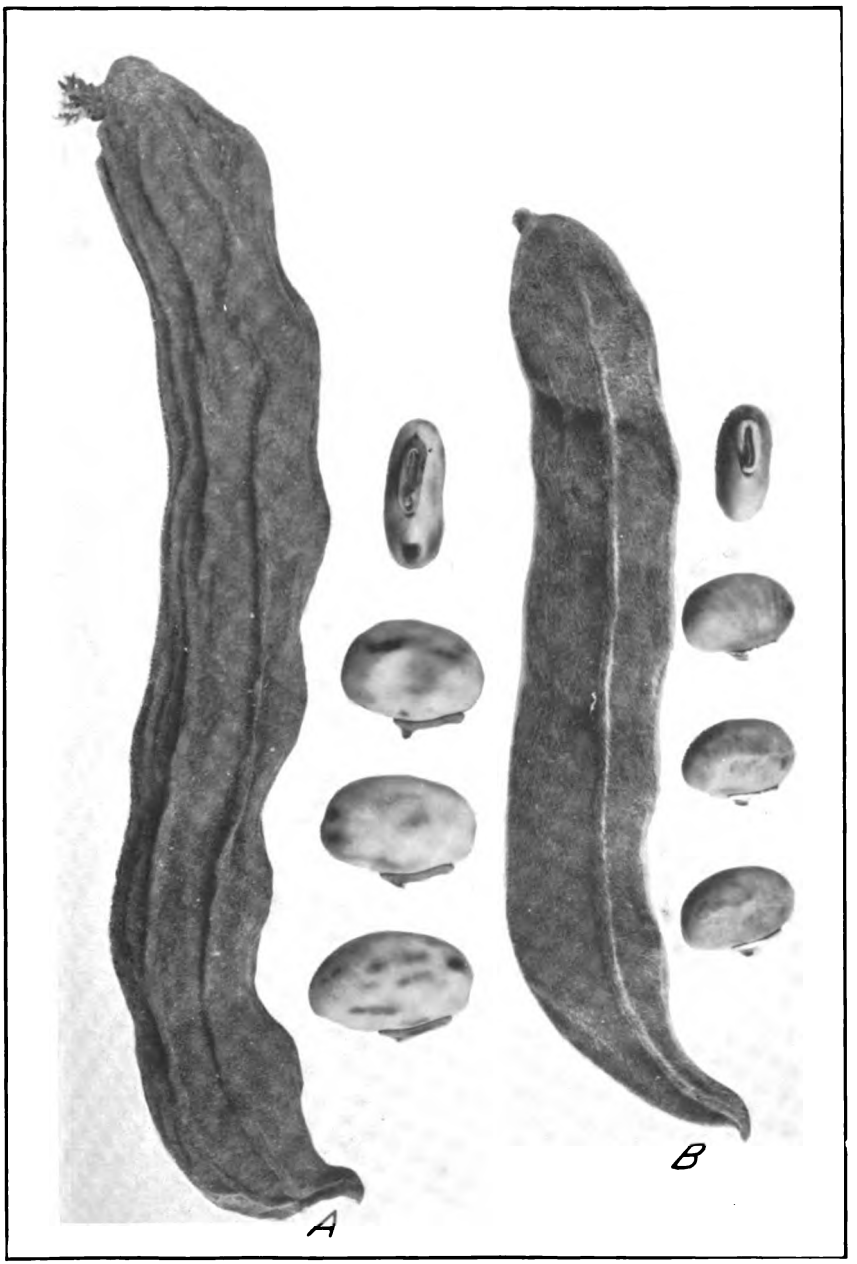
Stizolobium aterrimum n. sp. Mauritius or Bengal bean. (Pl. IV, *B*, and Pl. VII.)

Vine very strong and vigorous, the stem striate but scarcely furrowed, covered with a soft, sparse pubescence; leaflets very large, plane, mostly acute, strongly mucronate, sparsely appressed-pubescent on each side; racemes pendent, 18 to 30 inches long, many flowered; flowers purple; calyx not saccate, densely appressed-pubescent without and within; pods falcate, about 4 inches long, black when mature, sparsely covered with a short, white, appressed pubescence; median ridge on valves prominent but sometimes broken; secondary ridge faint or wanting; seeds four or five, oblong, black, very shiny, 10 to 12 mm. long, the prominent hilum white.

This species is apparently much more widely cultivated than any other and has been obtained from the following sources:

S. P. I. Nos. 19181 and 21300, from Piracicaba, Brazil.
S. P. I. No. 22031, from Sydney, New South Wales, under the name "Black Mauritius bean."
S. P. I. No. 22032, from Kamerunga, Queensland, Australia, under the name "Black Mauritius bean."

[a] See Kansas Agricultural Experiment Station, Bulletin 19, December, 1890, p. 199.



MATURE PODS AND SEEDS OF STIZOLOBIUM PACHYLOBIUM AND STIZOLOBIUM HASSJOO.

A, Pod and seeds of Stizolobium pachylobium, S. P. I. No. 21094.
B, Pod and seeds of Stizolobium hassjoo, S. P. I. No. 25254.
(Natural size.)

S. P. I. No. 25262, from Saigon, Cochin China.
S. P. I. No. 24922, from Saigon, Cochin China.
S. P. I. No. 25870, from Barbados, under the name "Bengal bean."
S. P. I. No. 25755, from Mauritius.
S. P. I. No. 21951, from Buitenzorg, Java.
S. P. I. No. 21953, from Buitenzorg, Java.
S. P. I. No. 24935, from Colombo, Ceylon.

This species is also grown in Hawaii under the name of Mauritius bean, and has been obtained from Brazil under the name of Horse-Eye bean.

Both at Biloxi, Miss., and at Gainesville, Fla., this species grows to a much larger size than the Florida velvet bean, but is much later, so that the pods barely mature. On account of its extreme lateness it is not at all likely that it will be of value under American conditions. In Barbados Mr. John R. Bovell, the Superintendent of Agriculture, writes that it is grown to only a small extent for green manuring. He has never known it to be used for fodder or as human food.

In Mauritius, according to Director P. Boname, of the agricultural station at Reduit, the Florida velvet bean has proved to be much less luxuriant and valuable.

As already stated, this plant was identified by Voigt as the *Mucuna utilis* of Wallich. For the reasons given in the discussion under *Stizolobium utile*, we regard this identification as erroneous. There is still slight room for doubt in connection with this matter, which, however, can only be cleared up by comparison with the original type.

STIZOLOBIUM PACHYLOBIUM.

Stizolobium pachylobium n. sp. Fleshy-pod bean. (Pl. V, *A*, and Pl. VI.)

Vines stout, 40 to 60 feet long; stems sparsely pubescent with soft white hairs; leaflets 3 to 7 inches long, mostly acute, cuspidate, sparsely appressed-puberulent on both sides, especially on the veins beneath; racemes 1 to 2 feet long, the peduncle often bearing a small leaf; flowers dark purple, 1½ inches long; calyx appressed-puberulent without and within, the lower lobe little exceeding the laterals; pods large, 5 to 7 inches long, very fleshy when green, sparsely puberulent with weak white hairs, black and slightly falcate when mature, somewhat compressed, the valves mostly having two complete longitudinal ridges and several secondary ones; seeds much flattened, 18 to 22 mm. long, white with scattered black or gray spots.

The original seed of this, S. P. I. No. 21094, was presented to the Department by Mr. J. C. Vaughan, of Chicago.

It was sent to him by Mr. A. L. Kennan, from Talgarh, Midnapur, India, who writes: "The spotted bean is very productive, but is cultivated to a very limited extent by the Santals, one of the aboriginal tribes of India. They cook the green pods and also the ripened seeds, but do not like either very well."

This has larger seeds than any other species, and the pods also are the largest and least pubescent. It requires, unfortunately, a longer season than the Florida velvet bean by at least a month. Some of the clusters of pods of this bean measure 3 feet in length and bear over 50 pods.

The edibility of the pods and seeds has been tested by Mr. S. H. Gaitskill, of McIntosh, Fla., who writes:

> We have been giving the fleshy-pod velvet bean a trial. I could not get the negroes to try it until I had eaten it and had Mr. Dedman try it; then the negroes tried it. I do not consider it a fine-flavored bean, but has no bad taste; in fact, is quite palatable, and there were no bad effects at all. I would call it an edible bean.
>
> We found the bean better than the pod, and it might be that it would be more palatable to let them get fairly ripe and use them as shelled beans.

An important characteristic in which this species differs from the others is that the pods do not dehisce at maturity, but the pods can be broken in pieces without the valves separating. This character will very likely be valuable in crossing with the Lyon bean and others which dehisce rather too easily and thus shatter seed.

STIZOLOBIUM VELUTINUM.

Stizolobium velutinum (Hassk.) n. comb.

Mucuna velutina Hassk. (Beiblätter, p. 77, to Flora, 25th year, 1842, vol. 2.)

The original description is as follows:

Mucuna velutina. Nom. sund. ***Kwas boddas.***

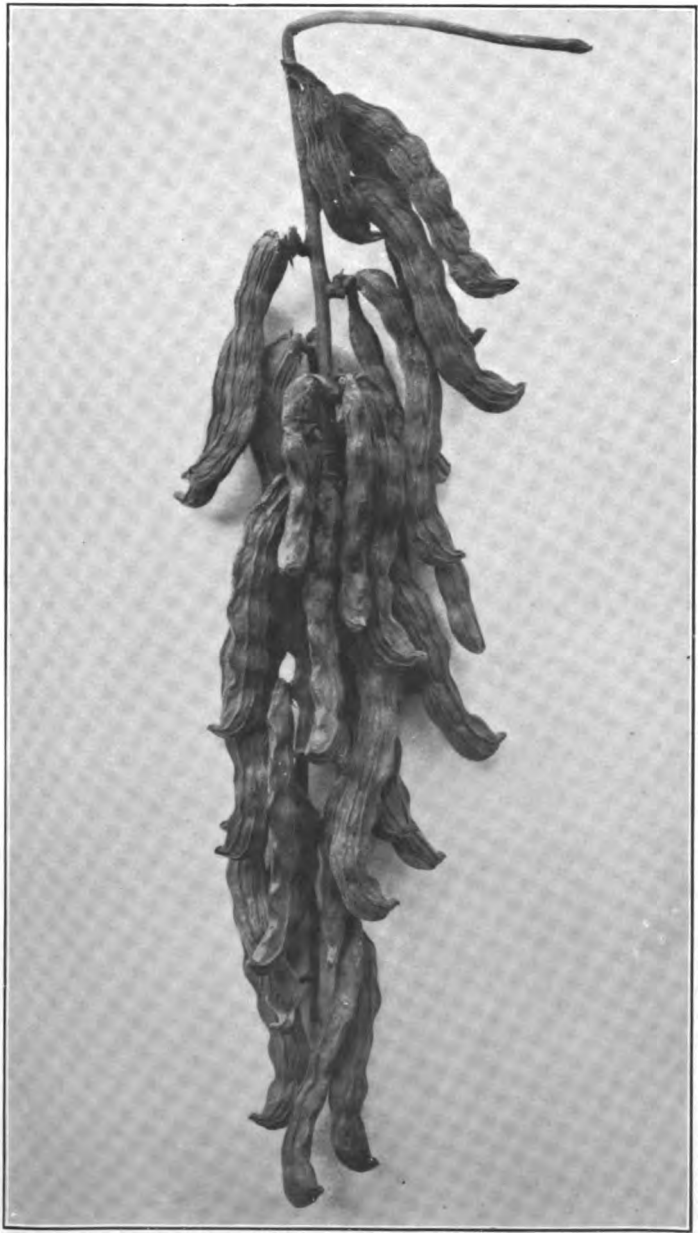
Legumina lamellis transversis fere distituta:—Racemis abreviatis 6—4, 5 poll. long. 0, 5 pll. crassis densissime velutinis subtereti-oblongis apice curvatis 6-loculatis, seminibus compressis;—foliolis (lateralibus oblique–) ovatis mucronulatis utrinque pilis adpressis minutissimus sparsis (in junioribus & calyce sericeis); corolla alba. Caulis volubilis, petioli pedales, stipellæ subulatæ,—Spec. intermedia M. mitem inter & mollem DC. Prdr. II. 405.

Hasskarl later published a modified description (Catalogus Plantarum in Horto Botanico Bogoriensi, 1844, p. 277), as follows:

Mucuna velutina. Kwas.

Floribus racemosis, bracteis subnullis, leguminibus densissime velutinis subtereti-oblongis, apice curvatis vix 6- (sub 1-) loculatis, foliolis ovatis mucronulatis utrinque pilis minutissimis adpressis sparsis.—Variat seminbus nunc maculatis majoribus minoribusve (Kw. boeriek gedeh & leutiek) nunc immaculatis albis rugosis s. lævibus (Kw. boddas mengrœt & lietjien) aut viridiusculis aut nigris (Kw. heedjoh s. hiedung).

Through the kindness of Dr. M. Treub, director of the Buitenzorg Botanical Garden, we have obtained seeds of all the sorts now grown there. These include the following S. P. I. Nos.: 21951 and 21953, with black shiny seeds; 21952, with ash-colored seeds; 24657, marbled ash and brown; 24424, reddish to pinkish gray, more or less marbled with black or brown; 21955, greenish yellow or brownish, clouded



CLUSTER OF RIPE PODS OF FLESHY-POD BEAN (STIZOLOBIUM PACHYLOBIUM) GROWN AT MCINTOSH, FLA.

(Two-sevenths natural size.)

CLUSTERS OF GREEN PODS OF MAURITIUS BEAN (STIZOLOBIUM ATERRIMUM), S. P. I. NO. 24922, GROWN AT GAINESVILLE, FLA.

(One-third natural size.)

over with black, perhaps the same as 24424, but with discolored seeds. There was also found in some asparagus bean seed from Buitenzorg a variety with greenish-yellow seeds, No. 0840.

Doctor Treub writes, under date of April 26, 1909:

> The three varieties described by Hasskarl, (1) "Kwas boeriek," (2) "Kwas hiedung," (3) "Kwas boddas," are now grown in our botanical garden under the following names: (1) *Mucuna velutina* Hassk. var., (2) *Mucuna capitata* var. *nigra*, (3) *Mucuna capitata* var. *alba*. The subvariety described by Hasskarl with rough seeds ("Kwas boddas mengroet") seems to be no more present.

It will be noticed, however, that there were received from Buitenzorg more kinds than Doctor Treub mentions. Of these S. P. I. Nos. 21955 and 0840 failed to germinate; Nos. 21951 and 21953, with black, shiny seeds, proved to be identical with the Mauritius bean; No. 21952, with ash-colored seeds, is a very late sort with purple flowers, but the pods did not mature; Nos. 24424 and 24657, both with marbled seeds, also did not mature at Biloxi, Miss., or Gainesville, Fla., but have been grown to maturity in the greenhouse.

Since Hasskarl in his first description referred only to "Kwas boddas," that is clearly the type of the species. It will be noted that in the first description Hasskarl states that this has white flowers. According to his second description, Kwas boddas has white seeds, rough in one form and smooth in the other, but the color of the flowers is not mentioned.

In a comparatively recent publication from the Buitenzorg Garden, Burck (Annales du Jardin Botanique de Buitenzorg, 1893, vol. 11, p. 187) considers *velutina* identical with *utilis* and reduces both it and *capitata* to varieties of *Mucuna pruriens*. According to him, var. *utilis* (*velutina*) has the seeds white, fuscous, or fuscous-maculate. He does not specify the color of the seed of var. *capitata*.

None of the kinds that we have secured from Buitenzorg and grown fulfills these conditions of white flowers and white seeds, as all that grew had purple flowers and only one had seeds that can be called white. There remains S. P. I. No. 0840, with greenish-yellow seeds. This seems to be identical with S. P. I. No. 25756, received from Mauritius, and that does have white flowers. This, however, would seem to fit best with Hasskarl's "Kwas heedjoh," the seeds of which are described as greenish, "viridiusculis."

We are therefore at a loss to determine the identity of the real *Mucuna velutina*, which seemingly is not contained among those grown by us, unless it may indeed be identical with *Stizolobium niveum*, the only species we as yet know with white flowers and white seeds.

As before stated, the species with black, shiny seeds proves to be the same as the Mauritius bean. The two kinds with mottled seeds are probably distinct species.

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