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A Classification of Soybeans

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A Classification of Soybeans

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This classification of 134 varieties of the soybean is constructed mainly on the basis of their morphological features. The arrangement embraces most of the systematic forms of this plant now found in the United States, including (a) those being grown as field crops and (b) those whose broader usefulness is not yet recognized. It therefore deals with material that is practically complete at this time. But since forms differing from those now established will frequently appear through introduction from foreign sources, through accidental discovery, or through systematic plant breeding, the classification cannot long remain perfectly inclusive. A similar development is to be found among the varieties of any crop, though in a symmetrical classification additional subdivisions for new varieties are easily organized.

PURPOSES OF THE CLASSIFICATION

A classification of the forms of an economic plant may be useful (a) in discovering and exhibiting the existing range of structure in the varietal groups, (b) in attaching appropriate current names to the individual structural types, and (c) in systematically identifying these individuals. It is hoped this classification of the varieties of the soybean may serve each purpose effectively.

The Exhibit of Structural Features.—Because of the general relationship between structure and function in plants, local performance by varieties whose physical characteristics are definitely established may frequently be predicted. Thus if we know that a variety of the soybean is dwarfed in stature we can with almost complete certainty foretell its early maturity; or if the form is tall we are assured that it probably will ripen late. The grower who learns such correlations can more intelligently select a suitable variety for his conditions and purposes.

It is the plant geneticist, however, who may find especially constructive uses for a knowledge of systematic varieties. For his purposes a group of taxonomic units serves as a catalog of genetic material which may be employed in the synthesis of new forms. These units may be indivisible morphons or they may be arbitrarily delineated by the necessities of classification and hence divisible for certain limited purposes; in any case, they compose an exhibit of forms which the geneticist perhaps had not previously comprehended.

The Listing of Variety Names.—The multiplicity of misleading names among crop varieties is a special adversity of the agronomist. Recently some progress has been made in standardizing varietal nomen-

clature; official committees have been appointed to register the names and forms of varieties and to guard against duplication of names in experiment station practice. Obviously an essential step in this direction is the listing of names under specified morphological units, and we give here such a list for the varieties of the soybean. Physiological strains similar in structural features may in the discretion of authorities be distinguished with new names.

The Identification of Varieties.—Although taxonomy deals generally with the differentiation and arrangement of forms, it may incidentally and indirectly specify physiological qualities if their correlated morphological features are clearly and invariably shown. *Crop* taxonomy, while in a measure discharging these broad obligations, aims particularly at the identification of crop varieties and subordinates all other purposes to this end. The key for tracing the identity of forms is therefore the essential feature of the taxonomic method as used in agronomy. But since the key is based almost wholly on structural and visible characters, and does not deal specifically with the physiological variations, its efficiency in practical identification is sometimes questioned. Of what use is a key, it is asked, which fails to differentiate the physiological strains of a morphological unit? This is a critical question, but since it points to the restricted function of taxonomy in general, the query is not destructive. Actually the structural key is the most satisfactory general means yet devised for identifying such physiological strains. It at least serves to trace the identity of a given strain in a small taxonomic group wherein further specification may proceed by observation of physiological reactions. Moreover, it seems probable that in a large taxonomic series many of the morphons are also bions, and thus are practically incapable of further differentiation. The key, in these latter cases, is therefore a nearly perfect instrument for the identification of even the bion.

MATERIAL FOR CLASSIFICATION

In 1917 this Station collected all varieties of the soybean then available in the United States. They were obtained from the Office of Forage Crops of the United States Department of Agriculture, from state experiment stations, and from seedsmen. The first collection contained 867 specimens, which at that stage of the investigation represented an unknown number of varieties. Frequent additions to the list were made after 1918, so that by 1928, the last year of the project, a total of 1117 specimens had been grown and studied.

The samples were grown under ordinary field conditions each year, the spacing of the rows and of the plants in the row being regulated to permit the development commonly found in practical crops. In the earlier years the planting of a complete list of samples would be repeated

several times, a given series covering a plot whose theoretical degree of fertility was different from that of each of the other plots containing the remaining series. This gradation in fertility was produced by treatments with fertilizers and its purpose was to indicate whether variations in structural development would be caused by an ordinary change in the growth conditions of a given place. No fundamental variation from this cause, however, was found; consequently in the later years the samples were grown in only one series. With the gradual elimination of the numerous duplicates the annual job of growing the specimens in an arrangement that permitted a convenient comparison of forms became less difficult and the classification proceeded with greater facility and accuracy.

METHOD OF CLASSIFICATION

The essential steps in the present classification were (1) a thorough study of structures and visible characteristics among the specimens *en masse* and (2) a comparative analysis of the specimens to discover their individual differences as manifested by these features. Group divisions were ultimately determined on the basis of absolute differences; but in all minor descriptions and often in the differentiation of closely related morphons, relative variations were also employed. Finally all individuals, systematically arranged, were fully described and named and a key constructed for their identification.

NOMENCLATURE

Our usual practice in naming a variety was simply that of attaching to an individual the name which occurred most frequently among specimens conforming to its description. This, while arbitrary, seemed the only practical procedure for in most cases the original name carried by the variety could not be learned. Moreover, we do not suggest that the names here selected should be permanent; they are used only as a means of cataloging the identity of the classified morphons and they of course may be displaced by other names preferred by other authorities.

SELECTIONS FROM SPECIMENS

During the course of this study many morphological types, apparently unrecognized previously, were selected from the specimens received for classification. Such types being dissimilar to others are given a varietal status and are designated by the word *Selection* suffixed to the names of the groups in which they were found. Thus a distinct type selected from the specimen group *Hollybrook* is named *Hollybrook Selection* and added to the list of varieties. Nineteen of the varieties included in this classification were derived and named by these methods.

FACTORS IN CLASSIFICATION

Because this classification is based upon variations in the structures and habits of the mass of individuals, the plant features which are useful in identification are reviewed in the general order of their taxonomic value.

Testa Color.—The color of the seed coat is extremely important in agronomic classification because of its broad variation, its inherent permanency, its significance as a commercial factor, and the ease and accuracy with which it can be observed. Five distinct variations of color—yellow, green, brown, black, and bi-color—represent the primary divisions of the present classification (Plates I, II, III). Except in the occasional transition between yellow and the paler shades of green, there is no uncertainty in determining the membership of individuals in these five basic groups. Each group, especially, the green, the brown, and the bi-color, may be subdivided into the several shades of its general color; but these secondary distinctions are only of minor importance in the taxonomic scheme.

In some varieties the outer surface of the testa is wholly lacking in lustre but in others it is distinctly glossy, the latter condition probably arising from a waxy secretion of the testa itself. This difference in some instances is useful in identifying individuals within small groups.

Blossom Color.—The blossom of a given variety of soybeans is either white or purple. Group division on the basis of this permanent and conspicuous difference may be easily and accurately arranged. Indeed if these two distinct colors were being utilized in the strictest taxonomic order, they should be given precedence over the colors of the testa. The blossom color of the soybean is not affected by environment, and hence is stable, except as it develops a degree of heterogeneity from hybridization; whereas the testa color is subject to modification from weathering and mottling as well as from crossing. But the testa color has already an established usage in commercial identification, and its employment as the primary basis of classification is both expedient and constructive.

Pubescence.—One of the most striking features of the soybean plant is the short, coarse pubescence of the stem, branches, and pods. It occurs in two colors—white and tawny. The white pubescence in some varieties shows a sandy or gray tinge, but the tawny pubescence varies little from its color standard. Almost without exception among the commercial varieties there is no difficulty in deciding that the pubescence of an individual or group is either white or tawny, as the case may be.

Cotyledon.—The taxonomic distinction of the soybean cotyledon is in the color, which is either yellow or green. Yellow is the usual color, but a green cotyledon is found in many varieties of the green-seeded, the brown-seeded, and the black-seeded groups.

Colors of the testa, the blossom, the pubescence, and the cotyledon, co-ordinated in a dichotomous arrangement, are the principal bases of division in the present classification.

Seed Forms and Sizes.—For the purpose of this classification, form in the soybean seed is judged by the lateral outline. Three general forms —globose, ovoidal, ellipsoidal—each representing an important varietal distinction, are thus recognized (Fig. 1). Equally useful when found are the occasional truncate and subreniform outlines; but all relative conditions of the seed such as plump, flattened, and wrinkled, are employed only in minor divisions and descriptions. Naturally some degree of transition in form is to be found, but in a given variety a single form strongly predominates and, as measured by common observation, is in many instances apparently homogeneous.

Sizes of the seed range among different varieties from large to medium and small. Because of the impracticability of mechanical measurements in identification, the size of a seed must be regarded as simply a relative condition to be judged arbitrarily; therefore, a characteristic size is itself a reliable distinction only when comparisons with other sizes are available. Nevertheless size and form together constitute an important joint feature. Thus if the seeds are found unusually large and globose or notably small and ellipsoidal, a very particular point in identification is established.

Hilum.—Variations in color of the hilum range from black and brown to olive and gray. Brown is the most frequent color, the exact recognition of its many shades requiring practiced judgment and particular description. In many varieties of the soybean the hilum color is indistinct, matching in appearance the surrounding testa.

Color in the hilum is an especially useful distinction of yellow seeds and green seeds. Of brown seeds, however, the hilum is colored so like the testa that differentiation is impractical. Also in black seeds the colors of the hilum and testa are one, although in some varieties the median line of the hilum is relatively distinct and may be assigned a minor value in description.

Size of the hilum is distinctive in only a few varieties, in which cases it is a useful basis of separation.

Pod Formatin, Size and Color.—Two general modes of pod formation are recognized in the soybean: (a) a dense array of pods on the central stem, terminating there in a blunt apex, with a thin dispersal on the lateral branches; and (b) a sparse and comparatively even distribution of pods over all branches and stems, a diminishing frequency toward the tip of the central stem being notable (Fig. 4). By this difference the separation of small varietal groups may be effected.

Pod sizes may be arbitrarily described as large, medium and small (Fig. 2). Colors of the pods are transitional; also they are much affected by weather conditions at maturity. In pods which have ripened fully during bright weather, however, two fairly distinct color types—pale tan, or straw, and brownish-black—may be readily observed. Between these extremes the colors range from grayish-brown to dark brown, with little varietal distinction (Plate III; Figs. 1, 2, 3, 4).

Growth Periods.—The time from planting to the stage of maximum color development in most of the pods has seemed a satisfactory estimate of the growth period. It ranges from less than 100 days for some varieties to more than 150 days for others. In the length of time for the completion of individual growth varieties are grouped arbitrarily as: (1) extremely early, or maturing in 100 days or less; (2) early to medium early, or maturing in 101 days to 120 days; (3) medium late to late, or maturing in 121 days to 150 days; (4) extremely late, or maturing in more than 150 days. Such records of growth, besides their agronomic value, are useful for identification in cases of sharp contrasts between the ripening periods of a limited number of varieties.

Height and Form of the Plant.—Our descriptions of height are given as tall, medium, short, dwarfed (Fig. 3); and of form as slender, bushy, bunchy (Figs. 5, 6, 7). Height naturally is influenced to a marked degree by the conditions of growth, yet in the same environment a characteristic standard is an obvious varietal feature. Form is much more stable than height in resistance to growth stimuli, and the classification of form here suggested is easily applied to the members of a varietal group.

These features—height and form—jointly constitute an important item in the description of a variety.

Growth Habits.—In no other characteristic is the individuality of a soybean variety more obvious upon casual notice than in the vining tendency of the plant. General attitudes may be described somewhat arbitrarily as follows: (a) vining (Fig. 8); (b) mostly erect but showing a tendency to trail in the wavy attenuations of the tips (Fig. 5); (c) wholly erect and stiff, the tips ending abruptly (Fig. 9). There is no confusion between the two extreme attitudes, but in some cases doubt may arise as to the correct designation of individuals in the middle group. Practice in observation, however, will overcome this occasional difficulty.

In a few varieties the phenomenon of fully ripe pods on green stems and among green foliage has been noted year after year. This condition is in sharp contrast with the normal coincident maturation of vegetative and fruiting parts and certainly is to be regarded as a highly distinctive varietal characteristic.

As maturity approaches, the increasing weight of the pods tends to bear down the stems and branches or even to split the primary joints.

This results in the lodging of the plants, a condition extremely undesirable to the grower. Lodging occurs so extensively in some varieties that the whole crop appears sprawling or broken down (Fig. 10); in others it is limited to the breaking of a few primary joints; and in many it is rarely found unless the crop is growing on extremely fertile soil. Because of its varietal degrees, and its practical significance, lodging is of considerable value in description.

Leaves.—As an item of plant description, soybean leaves may be classified as large, medium and small. A marked differentiation of form or color among the leaves is seldom found, though in a few varieties the acuminate apex is noteworthy. Also there may be observed a type distinguished by an extremely roughened surface and somewhat stiff leathery texture in comparison with the moderately creased or wrinkled surface and soft papery texture of the prevailing type.

GROUP KEY

GROUP KEY (continued)

5. Bi-colored seeds
   - A. Blossoms purple
     - B. Pubescence white to gray or sandy.....Group XVII, p. 36
     - BB. Pubescence tawny.....Group XVIII, p. 36
   - AA. Blossoms white
     - B. Pubescence white to gray or sandy.....Group XIX, p. 38
     - BB. Pubescence tawny.....Group XX, p. 38

GROUP I.—SEEDS YELLOW, BLOSSOMS PURPLE, PUBESCENCE WHITE TO GRAY OR SANDY

A. Seeds globose to ovoidal in lateral outline
- B. Hilum conspicuously colored
  - C. Hilum remarkably small; testa glossy.....*S. *P. I. 37246* (p. 11)
  - CC. Hilum normal to large; testa not glossy
    - D. Seeds large
      - E. Hilum bright brown.....*Easycook* (p. 11)
      - EE. Hilum pale brown.....*Edward* (p. 11)
    - DD. Seeds medium in size
      - E. Plant short; maturing medium early.....*Pinpu* (p. 11)
      - EE. Plant tall; maturing late.....*Easycook Selection* (p. 11)
- BB. Hilum not conspicuously colored
  - C. Seeds remarkably large.....*Yokotenn* (p. 12)
  - CC. Seeds medium to large
    - D. Seeds mostly globose.....S. *P. I. 40371* (p. 12)
    - DD. Seeds mostly ovoidal
      - E. Pod formation on central stem prolific.....*Thurnoko* (p. 12)
      - EE. Pod formation on central stem sparse.....*Kentucky* (p. 12)

AA. Seeds ellipsoidal to ovoidal in lateral outline
- B. Pod formation on central stem prolific
  - C. Testa glossy; plant short or dwarfed
    - D. Hilum gray.....*Wea* (p. 12)
    - DD. Hilum dull brown.....*Mandarin* (p. 12)
  - CC. Testa not glossy; plant medium in height
    - D. Hilum dark brown, large.....*Haberlandt* (p. 12)
    - DD. Hilum light brown, small.....*Aksawa* (p. 13)
- BB. Pod formation on central stem sparse
  - C. Hilum conspicuously colored
    - D. Hilum surrounded by brown area in testa; plant tall.....*Toyonago* (p. 13)

*The letters S. P. I. are an old serial designation of the present Office of Foreign Plant Introduction of the United States Department of Agriculture. Varieties bearing these letters together with serial numbers of the Office are otherwise unnamed.

DD. Hilum not surrounded by brown area in testa; plant short to medium
E. Hilum black----------S. *P. I. 37062 Selection* (p. 13)
EE. Hilum brown
F. Testa glossy----------*Elton* (p. 13)
FF. Testa not glossy
G. Hilum dark clear brown--*Manchu Selection I* (p. 13)
GG. Hilum dull brown to gray or black----------S. *P. I. 37062* (p. 13)
CC. Hilum not conspicuously colored----------*Aksarben* (p. 13)

S. P. I. 37246.—Seeds medium in size, globose to ovoidal in lateral outline; testa glossy with a slight greenish tinge; hilum dark brown, remarkably small (Plate I, No. 1); pods medium in size (Fig. 2B), black (Plate III, No. 1); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems coarse, spreading (Fig. 6), the lower branches having a marked tendency to break down at maturity; leaves medium in size; plant medium in height (Fig. 3B), maturing late (140 to 145 days).

Easycook.—Seeds large, globose to ovoidal in lateral outline; testa not glossy; hilum bright brown, large (Plate I, No. 2); pods medium to large (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems coarse, spreading (Fig. 6); leaves medium in size; plant medium in height (Fig. 3B), maturing late (140 to 145 days).

Edward.—Seeds remarkably large, globose to ovoidal in lateral outline; testa scarcely glossy; hilum usually pale brown (Plate I, No. 3); pods large (Fig. 2C); pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems extremely coarse; leaves large; pubescence unusually dense and coarse; plant tall (Fig. 3A), maturing extremely late (160 to 170 days).

Pinpu.—Seeds medium in size, mostly globose in lateral outline, though many are ovoidal; testa scarcely glossy; hilum light brown (Plate I, No. 4); pods medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems fine, spreading (Fig. 6); leaves tapering; plant short (Fig. 3C), maturing medium early (105 to 115 days).

Easycook Selection.—Seeds medium in size, globose to ovoidal in lateral outline; testa pale, scarcely glossy; hilum bright brown (Plate I, No. 5); pods medium in size (Fig. 2B), straw-colored (Plate III, No. 4); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems extremely coarse; leaves large; pubescence unusually dense and coarse; plant tall (Fig. 3A), maturing late (140 to 145 days).

Yokotenn.—Seeds extremely large, mostly globose in lateral outline though some are ovoidal; testa not glossy; hilum colorless (Plate I, No. 6); pods large (Fig. 2C); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems coarse; leaves medium in size; plant short, bunchy (Fig. 7), maturing late (130 to 135 days).

S. P. I. 40371.—Seeds medium in size, mostly globose in lateral outline, few are ovoidal; testa glossy; hilum pale brown (Plate I, No. 7); pods medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems coarse; leaves medium in size; plant medium in height (Fig. 3B), maturing extremely late (155 to 160 days).

Thurnoko.—Seeds medium to large, mostly ovoidal in lateral outline, though some are globose; testa ivory yellow, scarcely glossy; hilum colorless (Plate I, No. 8); pods medium in size (Fig. 2B), straw-colored (Plate III, No. 4); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems and branches coarse, the latter spreading (Fig. 6) and tending to break down at maturity; plant medium in height (Fig. 3B), maturing late (140 to 150 days).

Kentucky.—Seeds medium in size, ovoidal in lateral outline, rarely globose; testa slightly glossy; hilum pale brown (Plate I, No. 9); pods medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems and leaves medium in size; plant tall (Fig. 3A), slender (Fig. 5), with few lateral branches, maturing late (145 to 150 days).

Wea.—Seeds medium in size, ellipsoidal to ovoidal in lateral outline; testa distinctly glossy; hilum olive gray, remarkably small (Plate I, No. 10); pods medium in size (Fig. 2B); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems coarse; leaves small and tapering; plant short, bunchy (Fig. 7), maturing extremely early (95 to 105 days).

Mandarin.—Seeds medium to large, ellipsoidal to ovoidal in lateral outline; testa glossy; hilum dull brown, short, medium in width (Plate I, No. 11); pods medium in size (Fig. 2B); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems coarse; leaves medium in size; plant dwarfed (Fig. 3D), bunchy (Fig. 7), maturing early (105 to 112 days).

Haberlandt.—Seeds medium to large, ellipsoidal to ovoidal in lateral outline; testa pale, not glossy; hilum dark brown, large (Plate I, No. 12); pods medium in size (Fig. 2B); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems and leaves medium in size, the latter leathery in texture; plant medium in height (Fig. 3B), maturing late (140 to 145 days).

Aksawa.—Seeds medium in size, ellipsoidal to ovoidal in lateral outline; testa not glossy; hilum pale clear brown (Plate I, No. 13); pods small (Fig. 2A), straw-colored (Plate III, Fig. 4); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems and leaves medium in size; plant medium in height (Fig. 3B), maturing extremely late (146 to 156 days).

Toyonago.—Seeds medium in size, mostly ellipsoidal or ovoidal in lateral outline, though some are subreniform; testa glossy; hilum bright clear brown and surrounded by a conspicuous brown area in testa (Plate I, No. 14); pods medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the wavy tip (Fig. 4A); stems fine; leaves small; plant tall (Fig. 3A), slender (Fig. 5), maturing late (135 to 145 days).

S. P. I. 37062 Selection. — Seeds medium to large, mostly ellipsoidal in lateral outline; testa ivory yellow, not glossy; hilum black, large (Plate I, No. 15); pods medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems coarse; leaves medium in size; plant medium in height (Fig. 3B), bushy (Fig. 6), maturing medium late (125 to 130 days).

Elton.—Seeds medium to large, mostly ellipsoidal in lateral outline; testa glossy; hilum clear brown (Plate I, No. 16); pods medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems fine; leaves small and tapering; plant short, bunchy (Fig. 7), maturing medium early (115 to 120 days).

Manchu Selection I.—Seeds medium to large, ellipsoidal to ovoidal in lateral outline; testa not glossy; hilum dark clear brown, large (Plate I, No. 17); pods medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems fine; leaves small and tapering; plant short, bunchy (Fig. 7), maturing medium early (115 to 120 days).

S. P. I. 37062. — Seeds mostly large, mostly ellipsoidal in lateral outline; testa ivory yellow, not glossy; hilum usually dull brown, but sometimes blending into gray or black (Plate I, No. 18); pods medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems and branches medium in size, the latter tending to break and settle to the ground as maturity approaches; leaves medium in size; plant maturing medium late (125 to 130 days).

Aksarben.—Seeds medium to large, ellipsoidal to ovoidal in lateral outline; testa glossy; hilum colorless; pods medium in size (Plate I, No. 19); pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems fine; leaves small and tapering; plant medium in height (Fig. 3B), bushy (Fig. 6), maturing medium late (125 to 135 days).

GROUP II.—SEEDS YELLOW, BLOSSOMS PURPLE, PUBESCENCE TAWNY

A. Seeds globose to ovoidal in lateral outline
  B. Hilum conspicuously colored; no brown spot at micropyle
    C. Plant dwarfed, maturing early ..... *Hollybrook Selection* (p. 14)
    CC. Plant medium to short, maturing medium late
      D. Seeds large
        E. Testa lemon yellow; hilum unusually large ..... *Nemo* (p. 14)
        EE. Testa straw yellow; hilum medium in size ..... *Mikado* (p. 14)
      DD. Seeds medium in size ..... *Midwest* (p. 14)
  BB Hilum not conspicuously colored; a brown spot shows at the micropyle ..... *Ito San* (p. 15)
AA. Seeds ellipsoidal to ovoidal in lateral outline
  B. Pod formation on central stem prolific
    C. Hilum brown; plant maturing extremely early ..... *Minsoy* (p. 15)
    CC. Hilum gray to black; plant maturing late ..... *Manchu Selection II* (p. 15)
  BB. Pod formation on central stem sparse
    C. Testa glossy ..... *Amherst* (p. 15)
    CC. Testa not glossy
      D. Hilum conspicuously colored
        E. Hilum black ..... *Manchu* (p. 15)
        EE. Hilum brown
          F. Hilum dark brown ..... *Habaro* (p. 15)
          FF. Hilum light brown ..... *A K* (p. 15)
      DD. Hilum not conspicuously colored ..... S. *P. I. 37241* (p. 16)

Hollybrook Selection.—Seeds large, globose to ovoidal in lateral outline; testa not glossy; hilum dark clear brown, large (Plate I, No. 20); pods medium in size (Fig. 2B); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems and leaves medium; plant dwarfed (Fig. 3D), bunchy (Fig. 7), maturing early (105 to 110 days).

Nemo.—Seeds mostly large, globose to ovoidal in lateral outline; testa lemon yellow, not glossy; hilum dark clear brown, large (Plate I, No. 21); pods medium in size (Fig. 2B); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems fine; leaves medium in size; plant medium in height (Fig. 3B), slender (Fig. 5), maturing late (135 to 145 days).

Mikado.—Seeds large, globose to ovoidal in lateral outline; testa not glossy; hilum pale dull brown (Plate I, No. 22); pods medium in size (Fig. 2B); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems coarse; leaves medium in size; plant short (Fig. 3D), bunchy (Fig. 7), maturing late (140 to 145 days).

Midwest.—Seeds medium in size, globose to ovoidal in lateral outline; testa not glossy; hilum pale clear brown (Plate I, No. 23); pods

medium to less in size (Fig. 2B); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems coarse; leaves medium in size; plant short, bunchy (Fig. 7), maturing late (140 to 145 days).

Ito San.—Seeds medium in size, globose to ovoidal in lateral outline; testa slightly glossy; hilum colorless, but a brown spot is usually found at the micropyle (Plate I, No. 24); pods medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems medium in size; leaves small and tapering; plant short (Fig. 3C), bushy (Fig. 6), maturing early (110 to 115 days).

Minsoy.—Seeds mostly medium in size, ellipsoidal to ovoidal in lateral outline; testa distinctly glossy; hilum clear brown in color, short and broad (Plate I, No. 25); pods medium in size (Fig. 2B), straw-colored (Plate III, No. 4); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems medium in size; leaves unusually small; plant dwarfed (Fig. 3D), bunchy (Fig. 7), maturing extremely early (85 to 95 days).

Manchu Selection II.—Seeds medium to large, mostly ellipsoidal in lateral outline, though many are ovoidal; testa glossy; hilum gray to black (Plate I, No. 26); pods medium in size (Fig. 2B); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems and leaves medium in size; plant dwarfed (Fig. 3D), extremely bunchy in appearance (Fig. 7), maturing late (130 to 140 days).

Amherst.—Seeds large, ellipsoidal to ovoidal in lateral outline; testa distinctly glossy; hilum colorless or nearly so, but large and conspicuous (Plate I, No. 27); pods medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems and leaves medium in size; plant medium in height (Fig. 3B), maturing late (130 to 140 days).

Manchu.—Seeds large, mostly ovoidal in lateral outline; testa not glossy; hilum black, large (Plate I, No. 28); pods medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems and leaves medium in size; plant medium in height (Fig. 3B), maturing medium late (120 to 125 days).

Habaro.—Seeds medium in size, ellipsoidal to ovoidal in lateral outline; testa ivory yellow, not glossy; hilum dull dark brown, large (Plate I, No. 29); pods straw-colored (Plate III, No. 4), medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems fine; leaves small and tapering; plant short (Fig. 3C), bushy (Fig. 6), maturing medium early (110 to 115 days).

A K.—Seeds medium to large, ellipsoidal to ovoidal in lateral outline; testa not glossy; hilum light brown, broad (Plate I, No. 30); pods

medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems fine; leaves small and tapering; plant short (Fig. 3C), maturing medium late (120 to 125 days).

S. P. I. 37241.—Seeds large, ellipsoidal to ovoidal in lateral outline; testa not glossy; hilum colorless (Plate I, No. 31); pods medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems and leaves medium in size; plant medium in height (Fig. 3B), bushy (Fig. 6), maturing medium late (120 to 125 days).

GROUP III.—SEEDS YELLOW, BLOSSOMS WHITE, PUBESCENCE WHITE TO GRAY OR SANDY

A. Seeds mostly globose in lateral outline
  B. Plant dwarfed ..... *Ohio 9001* (p. 16)
  BB. Plant not dwarfed
    C. Pod formation on central stem prolific
      D. Hilum large; plant maturing late ..... S *P. I. 37261* (p. 16)
      DD. Hilum small; plant maturing extremely late ... *Hollybrook* (p. 16)
    CC. Pod formation on central stem sparse
      D. Plant medium in height; stems and leaves fine ..... S. *P. I. 37261 Selection* (p. 16)
      DD. Plant tall; stems and leaves coarse ..... *Mammoth Yellow* (p. 16)

AA. Seeds ellipsoidal to ovoidal in lateral outline
  B. Testa distinctly glossy
    C. Hilum pale brown; plant medium in height ... *Kentucky Selection* (p. 16)
    CC. Hilum colorless; plant short ..... *Lexington* (p. 16)
  BB. Testa with little or no gloss
    C. Hilum brown
      D. Seeds small; plant semi-vining ..... *Chiquita* (p. 16)
      DD. Seeds medium to large; plant non-vining
        E. Hilum dark brown
          F. Median line of hilum distinctly white ..... S. *P. I. 44210* (p. 17)
          FF. Median line of hilum not distinctly white but frequently colored like the surrounding hilum area ..... *Sherwood* (p. 17)
        EE. Hilum pale brown ..... S. *P. I. 30745* (p. 17)
    CC. Hilum colorless ..... *Tokio Selection* (p. 17)

Ohio 9001.—Seeds large, mostly globose in lateral outline; testa not glossy; hilum pale brown or colorless (Plate I, No. 32); pods medium in size (Fig. 2B); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems coarse; leaves medium in size; plant dwarfed (Fig. 3D), bunchy (Fig. 7), maturing medium late (120 to 125 days).

S. P. I. 37261.—Seeds medium to large, mostly globose in lateral outline, though many are ovoidal; testa not glossy; hilum light brown, large (Plate I, No. 33); pods straw-colored (Plate III, No. 4); medium in size (Fig. 2B); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems coarse; leaves medium in size; plant medium in height (Fig. 3B), maturing late (140 to 145 days).

Hollybrook.—Seeds small to medium, almost uniformly globose in lateral outline; testa slightly glossy; hilum light brown, unusually short (Plate I, No. 34); pods straw-colored (Plate III, No. 4), small; pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems and leaves medium in size; plant slender (Fig. 5), maturing extremely late (150 to 160 days).

S. P. I. 37261 Selection.—Seeds large, mostly globose in lateral outline; testa with slightly greenish tinge, not glossy; hilum light brown, broad (Plate I, No. 35); pods medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems fine; leaves small; plant medium in height (Fig. 3B), slender (Fig. 5), maturing late (125 to 135 days).

Mammoth Yellow.—Seeds large, ovoidal to globose in lateral view; testa not glossy; hilum pale brown (Plate I, No. 36); pods large (Fig. 2C) straw-colored (Plate III, No. 4); pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems large, coarse; leaves large, coarse, roughened; plant remarkably tall (Fig. 3A), erect, maturing late (140 to 150 days).

Kentucky Selection.—Seeds mostly medium, ellipsoidal to ovoidal in lateral outline; testa distinctly glossy; hilum light brown (Plate I, No. 37); pods medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems and leaves medium in size; plant medium in height (Fig. 3B), slender (Fig. 5), maturing late (125 to 135 days).

Lexington.—Seeds mostly medium in size, mostly ovoidal in lateral outline, though many are ellipsoidal; testa distinctly glossy; hilum colorless (Plate I, No. 38); pods nearly black (Plate III, No. 1), medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems medium in size; leaves small and tapering; plant short (Fig. 3C), bushy (Fig. 6), maturing late (125 to 135 days).

Chiquita.—Seeds small, ellipsoidal to ovoidal in lateral outline; testa scarcely glossy; hilum clear brown, prominent (Plate I, No. 39); pods medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the wavy tip (Fig. 4A); stems remarkably fine; leaves medium in size; plant tall (Fig. 3A), slender (Fig. 5), semi-vining, showing marked tendency to lodge, maturing late (145 to 150 days).

S. P. I. 44210.—Seeds mostly medium in size, ellipsoidal to ovoidal in lateral outline; testa scarcely glossy; hilum clear dark brown, large with a distinctly white median line (Plate I, No. 40); pods mostly small (Fig. 2A); pod formation on central stem sparse, diminishing gradually toward the wavy tip (Fig. 4A); stems remarkably fine; plant medium in height (Fig. 3B), remarkably slender (Fig. 5), maturing late (130 to 135 days).

Sherwood.—Seeds medium to large, mostly ellipsoidal in lateral outline; testa not glossy; hilum dark clear brown (Plate I, No. 41); pods medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the wavy tip (Fig. 4A); stems fine; leaves small; plant medium in height (Fig. 3B), maturing late (130 to 135 days).

S. P. I. 30745.—Seeds medium to large, ellipsoidal to ovoidal in lateral outline; testa scarcely glossy; hilum pale brown (Plate I, No. 42); pods medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems medium in size; leaves small; plant medium in height (Fig. 3B), maturing medium late (120 to 125 days).

Tokio Selection.—Seeds medium to large, ellipsoidal to ovoidal in lateral outline; testa not glossy; hilum colorless (Plate I, No. 43); pods medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems fine; leaves small and tapering; plant short (Fig. 3C), maturing medium late (120 to 125 days).

GROUP IV.—SEEDS YELLOW, BLOSSOMS WHITE, PUBESCENCE TAWNY

A. Testa greenish-yellow; hilum black.....S. *P. I. 37053* (p. 18)
AA. Testa ivory or straw yellow; hilum brown or colorless
  B. Seeds globose to ovoidal in lateral outline.....S. *P. I. 40114* (p. 19)
  BB. Seeds ellipsoidal to ovoidal in lateral outline
    C. Pod formation on central stem prolific
      D. Seeds large; plant maturing medium late.....*Hongkong* (p. 19)
      DD. Seeds medium to small; plant maturing extremely late.....S. *P. I. 38455* (p. 19)
    CC. Pod formation on central stem sparse
      D. Testa glossy; hilum scarcely colored.....*Brooks* (p. 19)
      DD. Testa not glossy; hilum brown.....*Hoosier* (p. 19)

S. P. I. 37053.—Seeds mostly medium in size, though some are small, mostly ovoidal in lateral outline, though some are ellipsoidal; testa with greenish tinge, not glossy; hilum black, large, with indistinct median line (Plate I, No. 44); pods small (Fig. 2A); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems

coarse; leaves medium in size; plant medium in height (Fig. 3B), maturing late (140 to 145 days).

S. P. I. 40114.—Seeds medium to large, globose to ovoidal in lateral outline; testa not glossy; hilum colorless (Plate I, No. 45); pods medium in size (Fig. 2B); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems coarse; leaves large; plant tall (Fig. 3A), slender (Fig. 5), maturing late (140 to 150 days).

Hongkong.—Seed large, ellipsoidal to ovoidal in lateral outline; testa ivory-colored and slightly glossy; hilum pale dull brown to colorless, large (Plate I, No. 46); pods medium in size (Fig. 2B); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems coarse; leaves medium in size; plant short (Fig. 3C), maturing late (125 to 135 days).

S. P. I. 38455.—Seeds medium to small, mostly ellipsoidal in lateral outline, though a few are ovoidal; testa slightly glossy; hilum clear brown, large (Plate I, No. 47); pods mostly small (Fig. 2A); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems fine; leaves small; pubescence remarkably coarse and dense; plant medium in height (Fig. 3B), maturing late (140 to 145 days).

Brooks.—Seeds medium to large, ellipsoidal to ovoidal in lateral outline; testa glossy; hilum scarcely colored or sometimes pale dull brown (Plate I, No. 48); pods medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the wavy tip (Fig. 4A); stems fine, the lower branches showing a tendency to lodge; leaves small and tapering; plant medium in height (Fig. 3B), slender (Fig. 5), maturing late (125 to 135 days).

Hoosier.—Seeds medium to large, ellipsoidal to ovoidal in lateral outline; testa not glossy; hilum dull brown (Plate I, No. 49); pods medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems and leaves medium in size; plant medium in height (Fig. 3B), maturing medium early (115 to 120 days).

GROUP V.—SEEDS GREEN, BLOSSOMS PURPLE, PUBESCENCE WHITE TO GRAY OR SANDY

A. Cotyledon green; testa bright green
  B. Seeds ellipsoidal to ovoidal in lateral outline----------*Columbia* (p. 20)
  BB. Seeds globose to ovoidal in lateral outline----------S. *P. I. 37294* (p. 20)
AA. Cotyledon yellow; testa pale green or tinged with yellow
  B. Seeds ellipsoidal to ovoidal in lateral outline; hilum pale brown----------S. *P. I. 46689* (p. 20)
  BB. Seeds globose to ovoidal in lateral outline; hilum colorless----*Tokio* (p. 20)

Columbia.—Seeds mostly medium, though some are large, mostly ellipsoidal in lateral outline, though some are ovoidal; testa bright green, glossy; hilum dark brown (Plate II, No. 50); cotyledon green; pods black (Plate III, No. 1), medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the wavy tip (Fig. 4A); stems medium; leaves small; plant tall (Fig. 3A), slender (Fig. 5), maturing late (125 to 135 days).

S. P. I. 37294.—Seeds medium to large, globose to ovoidal in lateral outline; testa bright green, not glossy, frequently split on dry seed; hilum colorless or pale brown (Plate II, No. 51); cotyledon green; pods medium in size (Fig. 2B); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems coarse, leaves large, rough; plant medium in height (Fig. 3B), maturing extremely late (155 to 160 days).

S. P. I. 46689.—Seeds medium, mostly ovoidal in lateral outline; testa pale green, slightly glossy; hilum brown (Plate II, No. 52); cotyledon yellow; pods small; pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems and leaves medium in size, the latter appearing leathery in texture; plant medium in height (Fig. 3B), slender (Fig. 5), maturing late (135 to 145 days).

Tokio.—Seeds medium to large, globose to ovoidal in lateral outline; testa pale green, slightly glossy; hilum colorless (Plate II, No. 53); cotyledon yellow; pods medium in size (Fig. 2B); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems coarse; leaves medium in size; plant medium in height (Fig. 3B), spreading (Fig. 6), maturing extremely late (150 to 165 days).

GROUP VI.—SEEDS GREEN, BLOSSOMS PURPLE, PUBESCENCE TAWNY

A. Cotyledon green; testa bright green
  B. Seeds globose to ovoidal in lateral outline
    C. Hilum uniformly dark brown; plant medium in height---S. *P. I. 37298* (p. 21)
    CC. Hilum pale brown or colorless; plant short---S. *P. I. 37301* (p. 21)
  BB. Seeds ellipsoidal to ovoidal in lateral outline
    C. Hilum black---*Tashing* (p. 22)
    CC. Hilum brown or colorless
      D. Hilum uniformly dark brown---*Guelph* (p. 22)
      DD. Hilum pale brown or colorless---*Green* (p. 22)

AA. Cotyledon yellow; testa pale green or tinged with yellow
  B. Seeds globose to ovoidal in lateral outline---*Verea* (p. 22)
  BB. Seeds ellipsoidal to ovoidal or subreniform in lateral outline
    C. Hilum surrounded by a narrow brown band in the testa
      D. Plant tall; maturing medium late---S. *P. I. 19186* (p. 22)
      DD. Plant medium in height; maturing medium early---S. *P. I. 30746* (p. 22)
    CC. Hilum not surrounded by brown band
      D. Seeds flattened
        E. Seeds ellipsoidal to subreniform---*Hahto* (p. 23)
        EE. Seeds mostly ovoidal---*Hahto Selection* (p. 23)
      DD. Seeds not flattened
        E. Plant dwarfed
          F. Plant maturing early
            G. Seeds extremely large---*Early Green* (p. 23)
            GG. Seeds medium large---*Early Green Selection* (p. 23)
          FF. Plant maturing late---S. *P. I. 19981-1* (p. 23)
        EE. Plant not dwarfed
          F. Pod formation on central stem prolific---*Yosho* (p. 23)
          FF. Pod formation on central stem sparse
            G. Seeds plump, ellipsoidal to ovoidal in lateral outline---F. C. *1829* (p. 23)
            GG. Seeds mostly shriveled or dimpled, ellipsoidal to subreniform in lateral outline---*Okute* (p. 24)

S. P. I. 37298.—Seeds small to medium, globose to ovoidal in lateral outline; testa bright green with little or no gloss; hilum uniformly dark dull brown (Plate II, No. 54); cotyledon green; pods small (Fig. 2A); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems and leaves medium in size; plant medium in height (Fig. 3B), slender (Fig. 5), maturing late (145 to 150 days).

S. P. I. 37301.—Seeds small to medium, globose to ovoidal in lateral outline; testa bright green with little or no gloss; hilum pale brown or colorless (Plate II, No. 55); cotyledon green; pods small

(Fig. 2A); pod formation on central stem remarkably prolific, terminating abruptly at the tip (Fig. 4B); stems fine; leaves medium in size and leathery in texture; plant short (Fig. 3C), maturing late (140 to 150 days).

Tashing.—Seeds medium to large, ellipsoidal to ovoidal in lateral outline; testa bright green, glossy; hilum black, large (Plate II, No. 56); cotyledon green; pods medium or smaller (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems medium in size; leaves small and tapering; plant medium in height (Fig. 3B), maturing medium early (115 to 120 days).

Guelph.—Seeds medium to large, ellipsoidal to ovoidal in lateral outline; testa bright green, slightly glossy; hilum uniformly dark brown, large (Plate II, No. 57); cotyledon green; pods medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems and leaves medium in size; plant medium in height (Fig. 3B), slender (Fig. 5), maturing medium late (125 to 130 days).

Green.—Seeds medium to large, ellipsoidal to ovoidal in lateral outline; testa bright green, slightly glossy; hilum dull brown or colorless (Plate II, No. 58); cotyledon green; pods mostly small (Fig. 2A), though some range toward medium; pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems coarse; leaves large and rough; plant short (Fig. 3C), bushy (Fig. 6), maturing late (145 to 160 days).

Verea.—Seeds small to medium, globose to ovoidal in lateral outline; testa pale green with little or no gloss; hilum dull brown (Plate II, No. 59); cotyledon yellow; pods medium in size (Fig. 2B); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems and leaves medium in size; plant dwarfed (Fig. 3D), bunchy (Fig. 7), maturing extremely early (95 to 105 days).

S. P. I. 19186.—Seeds medium to large, mostly ellipsoidal in lateral outline; testa often tinged with yellow, not glossy; hilum dark brown, large, banded by a brown area in the testa (Plate II, No. 60); cotyledon yellow; pods medium in size (Fig. 2B); pod formation sparse, diminishing gradually toward the tip (Fig. 4A); stems coarse; leaves medium in size; plant tall (Fig. 3A), slender (Fig. 5), maturing medium late (125 to 135 days).

S. P. I. 30746.—Seeds mostly large, though some are medium, mostly ellipsoidal in lateral outline; testa often with yellow tinge, not glossy; hilum dark brown, banded by a brown area in the testa (Plate II, No. 61); cotyledon yellow; pods medium to small (Fig 2B); pod formation on central stem sparse, diminishing gradually toward the wavy tip (Fig. 4A); stems fine; leaves small and tapering; plant medium in height (Fig. 3B), maturing medium early (115 to 120 days).

Hahto.—Seeds extremely large and distinctly flattened, mostly ellipsoidal in lateral outline; testa pale green with little or no gloss; hilum black, large (Plate II, No. 62); cotyledon yellow; pods unusually large; pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems coarse; leaves large and rough; plant medium in height (Fig. 3B), spreading (Fig. 6), maturing extremely late (150 to 155 days).

Hahto Selection.—Seeds large, flattened, mostly ovoidal in lateral outline, though some are ellipsoidal; testa pale green with little or no gloss; hilum black, large (Plate II, No. 63); cotyledon yellow; pods unusually large (Fig. 2C); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems coarse; leaves medium in size; plant medium in height (Fig. 3B), spreading (Fig. 6), maturing late (145 to 150 days).

Early Green.—Seeds extremely large, ellipsoidal to ovoidal in lateral outline; testa pale green, often split on the ripened seed, not glossy; hilum black to gray or dull brown (Plate II, No. 64); cotyledon yellow; pods unusually variable in size, ranging from medium to large (Fig. 2B); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems coarse; leaves medium in size; plant dwarfed (Fig. 3D), bunchy (Fig. 7), maturing early (105 to 115 days).

Early Green Selection.—Seeds large, mostly ovoidal in lateral outline; testa pale green, usually wrinkled, not glossy; hilum dark dull brown (Plate II, No. 65); cotyledon yellow; pods medium in size (Fig. 2B); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems coarse; leaves large; plant dwarfed (Fig. 3D), bunchy (Fig. 7), maturing medium early (110 to 120 days).

S. P. I. 199881-1.—Seeds medium large to extremely large, ellipsoidal to ovoidal in lateral outline; testa pale green, not glossy; hilum usually black, though sometimes gray or dull brown (Plate II, No. 66); cotyledon yellow; pods medium to large (Fig. 2B); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems coarse; leaves large; plant dwarfed (Fig. 3D), bunchy (Fig. 7), maturing late (130 to 140 days.)

Yosho.—Seeds medium, mostly ovoidal in lateral outline; testa pale green, slightly glossy; hilum dark brown (Plate II, No. 67); cotyledon yellow; pods medium in size (Fig. 2B); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems coarse; leaves large; plant medium in height (Fig. 3B), spreading (Fig. 6), maturing late (140 to 145 days).

F. C. *1829.*—Seeds large, ellipsoidal to ovoidal in lateral outline; testa pale green, not glossy; hilum dark brown, large (Plate II, No. 68);

cotyledon yellow; pods medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the wavy tip (Fig. 4A); stems coarse; leaves medium in size; plant tall (Fig. 3A), slender (Fig. 5), maturing late (140 to 150 days).

Okute.—Seeds large, mostly ellipsoidal in lateral outline, usually shriveled or dimpled; testa usually pale green, though tinged with yellow on many seeds, not glossy; hilum dull brown to colorless (Plate II, No. 69); cotyledon yellow; pods medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems medium in size; leaves small; plant medium in height (Fig. 3B), maturing medium early to medium late (120 to 125 days).

GROUP VII.—SEEDS GREEN, BLOSSOMS WHITE, PUBESCENCE WHITE TO GRAY OR SANDY.

A. Cotyledon green; testa bright green ..... S. *P. I. 44510* (p. 24)
AA. Cotyledon yellow; testa pale green or tinged with yellow
  B. Seeds globose to ovoidal in lateral outline
    C. Hilum brown; seeds mostly globose ..... *Hope Selection* (p. 24)
    CC. Hilum colorless; seeds about equally globose and ovoidal ..... *Hope* (p. 24)
  BB. Seeds ellipsoidal to ovoidal in lateral outline
    C. Hilum brown ..... *Yosho Selection* (p. 25)
    CC. Hilum colorless ..... *Morse* (p. 25)

S. P. I. 44510.—Seeds mostly medium in size, ellipsoidal to ovoidal in lateral outline; testa bright green with little or no gloss; hilum light brown (Plate II, No. 70); cotyledon green; pods medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems and leaves medium in size; plant medium in height (Fig. 3B), maturing late (145 to 150 days).

Hope Selection.—Seeds mostly medium in size, though a few are large, globose to ovoidal in lateral outline; testa pale green, not glossy; hilum brown (Plate II, No. 71); cotyledon yellow; pods medium in size (Fig. 2B); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems coarse; leaves large; plant medium in height (Fig. 3B), maturing extremely late (150 to 155 days).

Hope.—Seeds medium in size, mostly ovoidal in lateral outline, though a few are globose; testa pale green with little or no gloss; hilum colorless (Plate II, No. 72); cotyledon yellow; pods large (Fig. 2C); pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems coarse; leaves large; pubescence remarkably coarse and dense; plant tall (Fig. 3A), slender (Fig. 5), maturing extremely late (155 to 160 days).

Yosho Selection.—Seeds large, ellipsoidal to ovoidal in lateral outline; testa pale green, not glossy; hilum pale brown (Plate II, No. 73); cotyledon yellow; pods medium in size (Fig. 2B); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); ripe pods shatter excessively; stems and leaves medium in size; plant medium in height (Fig. 3B), slender (Fig. 5), maturing seed medium late (120 to 125 days) while the stems and leaves are still green.

Morse.—Seeds medium in size, ellipsoidal to ovoidal in lateral outline; testa pale green, glossy; hilum colorless (Plate II, No. 74); cotyledon yellow; pods medium in size (Fig. 2B); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems coarse; leaves large and rough; plant medium in height (Fig. 3B), spreading, maturing late (130 to 140 days).

GROUP VIII.—SEEDS GREEN, BLOSSOMS WHITE, PUBESCENCE TAWNY

A. Cotyledon green; testa bright green
  B. Seeds globose to ovoidal in lateral outline; plant maturing late—S. *P. I. 44212* (p. 25)
  BB. Seeds ellipsoidal to ovoidal in lateral outline; plant maturing early—S. *P. I. 30594* (p. 25)

AA. Cotyledon yellow; testa pale green or tinged with yellow
  B. Seeds globose to ovoidal in lateral outline—*Illinois 178* (p. 26)
  BB. Seeds ellipsoidal to ovoidal in lateral outline
    C. Pod formation on main stem prolific
      D. Plant maturing early—*Shingto* (p. 26)
      DD. Plant maturing ate—*Shingto Selection* (p. 26)
    CC. Pod formation on main stem sparse—*Sonoma* (p. 26)

S. P. I. 44212.—Seeds medium large, mostly ovoidal in lateral outline, though many are globose; testa bright green, not glossy; hilum black (Plate II, No. 75); cotyledon green; pods medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems and leaves medium in size; plant medium in height (Fig. 3B), slender (Fig. 5), maturing late (130 to 140 days).

S. P. I. 30594.—Seeds medium to large, ellipsoidal to ovoidal in lateral outline; testa bright green, slightly glossy; hilum black or dark brown (Plate II, No. 76); cotyledon green; pods mostly small (Fig. 2A), a few ranging towards medium size; pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems fine; leaves small; plant medium in height (Fig. 3B), spreading (Fig. 6), maturing medium early (110 to 120 days).

Illinois 178.—Seeds medium to large, globose to ovoidal in lateral outline; testa pale green, glossy; hilum colorless (Plate II, No. 77); cotyledon yellow; pods medium in size (Fig. 2B); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems coarse; leaves large and rough; plant short (Fig. 3C), bushy (Fig. 6), maturing late (130 to 140 days).

Shingto.—Seed medium to large, mostly ellipsoidal in lateral outline; testa pale green, often with yellow tinge, slightly glossy; hilum pale dull brown (Plate II, No. 78); cotyledon yellow; pods black (Plate III, No. 1); medium in size (Fig. 2B); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems medium in size; leaves small and tapering; plant medium in height (Fig. 3B), bushy (Fig. 6), maturing medium early (110 to 120 days).

Shingto Selection.—Seeds mostly medium, though some are large, ellipsoidal to ovoidal in lateral outline; testa pale green, not glossy; hilum dark brown (Plate II, No. 79); cotyledon yellow; pods medium in size (Fig. 2B); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems coarse; leaves large; plant short (Fig. 3C), bushy, (Fig. 6), maturing medium late (125 to 130 days).

Sonoma.—Seeds mostly large, ellipsoidal to ovoidal in lateral outline; testa pale green, often tinged with yellow, not glossy; hilum dark brown (Plate II, No. 80); cotyledon yellow; pods medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems coarse, the lower branches lodging at maturity; leaves medium in size; plant medium in height (Fig. 3B), bushy (Fig. 6), maturing late (135 to 145 days).

GROUP IX.—SEEDS BROWN, BLOSSOMS PURPLE, PUBESCENCE WHITE TO GRAY OR SANDY.

A. Seeds mostly globose to ovoidal in lateral outline; median line of hilum distinct
  B. Pod formation on central stem prolific
    C. Seeds large, mostly ovoidal----------*Buster Brown* (p. 26)
    CC. Seeds extremely small, mostly globose---------S. *P. I. 1492* (p. 27)
  BB. Pod formation on central stem sparse----*Buster Brown Selection* (p. 27)
AA. Seeds mostly ellipsoidal in lateral outline; median line of hilum usually indistinct----------*Chestnut* (p. 27)

Buster Brown.—Seeds mostly large, mostly ovoidal in lateral outline; testa pale brown, not glossy; hilum colored like the testa, but having a distinct median line (Plate II, No. 81); pods medium in size (Fig. 2B); pod formation on central stem prolific, terminating abruptly

at the tip (Fig. 4B); stems coarse; leaves large; plant medium in height (Fig. 3B), spreading (Fig. 6), maturing late (145 to 150 days).

S. P. I. 1492.—Seeds extremely small, uniformly globose in outline; testa ranging in color from pale brown to dark brown, not glossy; hilum colored like the testa but having a strong white median line (Plate II, No. 82); pods straw-colored (Plate III, No. 4), very small (Fig. 2A); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems and leaves medium in size; plant medium in height (Fig. 3B), bushy (Fig. 6), maturing late (140 to 150 days).

Buster Brown Selection.—Seeds medium in size, mostly ovoidal in lateral outline; testa colored a medium shade of brown, not glossy; hilum colored like the testa, but having a white median line (Plate II, No. 83); pods straw-colored (Plate III, No. 4), very small (Fig. 2A); pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems and leaves medium in size; plant medium in height (Fig. 3B), bushy (Fig. 6), maturing late (145 to 150 days).

Chestnut.—Seeds medium to large, ellipsoidal in lateral outline; testa bright brown, glossy; hilum colored like the testa (Plate II, No. 84); pods black (Plate III, No. 1), medium in size (Fig. 2B); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems fine; leaves small and tapering; plant medium in height (Fig. 3B), maturing medium early (115 to 120 days).

GROUP X.—SEEDS BROWN, BLOSSOMS PURPLE, PUBESCENCE TAWNY

A. Cotyledon green ..... *Ohio 9035 Selection* (p. 28)
AA. Cotyledon yellow
  B. Plant vining; seeds extremely small
    C. Plant maturing extremely early; testa glossy ..... S. *P. I. 20409* (p. 28)
    CC. Plant maturing extremely late; testa not glossy ..... *Barchet* (p. 28)
  BB. Plant not vining; seeds medium to large
    C. Seeds globose to ovoidal in lateral outline ..... S. *P. I. 37396* (p. 28)
    CC. Seeds ellipsoidal to ovoidal in lateral outline
      D. Pod formation on central stem prolific
        E. Plant dwarfed ..... *Ohio 9035* (p. 28)
        EE. Plant not dwarfed
          F. Testa olive brown ..... *Hamilton* (p. 28)
          FF. Testa with no olive tinge
            G. Plant maturing early; testa mostly dark brown ..... *Early Brown* (p. 29)
            GG. Plant maturing extremely late; testa pale brown ..... *Mammoth Brown* (p. 29)
      DD. Pod formation on central stem sparse
        E. Plant maturing early ..... *Ogemaw* (p. 29)

EE. Plant maturing late
F. Seeds narrowly ellipsoidal; testa mottled dark brown and olive brown ..... *Virginia* (p. 29)
FF. Seeds broadly ellipsoidal; testa all dark brown ..... *Biloxi* (p. 29)

Ohio 9035 Selection.—Seeds large, globose to ovoidal in lateral outline; testa dark brown, glossy; hilum colored like the testa with the median line distinct (Plate II, No. 85); cotyledon green; pods medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems coarse; leaves medium in size, rough; plant tall (Fig. 3A), slender (Fig. 5), maturing late (140 to 150 days).

S. P. I. 20409.—Seeds small, flattened, ellipsoidal to ovoidal in lateral outline; testa olive brown, slightly glossy; hilum colored like the testa (Plate II, No. 86); cotyledon yellow; pods small (Fig. 2A), very slender; pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems remarkably fine; leaves small; plant dwarfed and vining, maturing extremely early (90 to 100 days).

Barchet.—Seeds small, flattened, ellipsoidal in lateral outline; testa dull, rusty to reddish brown, not glossy; hilum indistinct but colored like the testa (Plate II, No. 87); cotyledon yellow; pods small (Fig. 2A), flattened and slender; pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems remarkably fine; leaves small; plant medium in height (Fig. 3B), vining (Fig. 8), maturing extremely late (165 to 175 days.).

S. P. I. 37396.—Seeds large, globose in lateral outline; testa medium brown with a slight olive tinge, glossy; hilum colored like the testa with a strong white median line (Plate II, No. 88); cotyledon yellow; pods medium in size to somewhat larger (Fig. 2B); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems coarse; leaves large; plant medium in height (Fig. 3B), maturing extremely late (150 to 155 days).

Ohio 9035.—Seeds large, ellipsoidal to ovoidal in lateral outline; testa light brown to dark brown, glossy; hilum colored like the testa with median line faint or invisible (Plate II, No. 89); cotyledon yellow; pods medium in size (Fig. 2B); pod formation on central stem prolific, terminating abruptly toward the tip (Fig. 4B); stems coarse; leaves medium in size, leathery; plant dwarfed (Fig. 3D), bunchy (Fig. 7), maturing late (140 to 150 days).

Hamilton.—Seeds medium, ellipsoidal to ovoidal in lateral outline; testa clear olive brown; hilum colored like the testa with a pale brown

median line (Plate II, No. 90); cotyledon yellow; pods medium in size (Fig. 2B); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems and leaves medium in size; plant medium in height (Fig. 3B), slender (Fig. 5), maturing medium late (125 to 135 days).

Early Brown.—Seeds medium to extremely large, ellipsoidal to ovoidal in lateral outline; testa light brown to dark brown, glossy; hilum colored like the testa, median line faint to indistinct (Plate II, No. 91); cotyledon yellow; pods medium in size (Fig. 2B); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems coarse; leaves medium in size; plant medium in height (Fig. 3B), bushy (Fig. 6), maturing medium early (115 to 120 days).

Mammoth Brown.—Seeds large, ellipsoidal to ovoidal in lateral outline; testa pale brown, often with yellowish tinge, not glossy; hilum large, darker than the testa, with a distinct median line which is usually white (Plate II, No. 92); cotyledon yellow; pods medium to larger (Fig. 2B); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems coarse; leaves medium in size; plant medium in size (Fig. 3B), maturing extremely late (160 to 165 days).

Ogemaw.—Seeds medium to large, broadly ellipsoidal to ovoidal in lateral outline; testa yellowish brown to dark brown, slightly glossy; hilum colored like the testa with median line usually indistinct (Plate II, Fig. 93); cotyledon yellow; pods straw-colored (Plate III, No. 4), medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems and leaves medium in size; plant short (Figure 3C), bushy (Fig. 6), maturing early (105 to 110 days).

Virginia.—Seeds medium in size, somewhat flattened, ellipsoidal in lateral outline, often truncate; testa mottled, olive brown to reddish brown, slightly glossy; hilum colored like the testa with a median line which is brown and not strongly marked (Plate II, No. 94); cotyledon yellow; pods medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the wavy tip (Fig. 4A); stems fine; leaves small; plant medium in height (Fig. 3B), slender (Fig. 5), maturing late (130 to 140 days).

Biloxi.—Seeds large, slightly flattened, broadly ellipsoidal to ovoidal in lateral outline; testa chocolate brown, glossy; hilum pale brown with strong median line (Plate II, No. 95); cotyledon yellow; pods large (Fig. 2C); pod formation on cental stem sparse, diminishing gradually toward the tip (Fig. 4A); stems coarse, erect; leaves coarse; plant tall (Fig. 3A), bushy (Fig. 6), maturing extremely late (160 to 170 days).

GROUP XI.—SEEDS BROWN, BLOSSOMS WHITE, PUBESCENCE WHITE TO GRAY OR SANDY

A. Seeds mostly ovoidal in lateral outline, though some are globose; testa clear light brown ..... *Auburn* (p. 30)
AA. Seeds ellipsoidal to ovoidal in lateral outline; testa pale dull brown ..... *Trenton* (p. 30)

Auburn.—Seeds medium in size, mostly ovoidal in lateral outline, though some are globose; testa clear light brown with little or no gloss, frequently split on the ripening seed; hilum colored like the testa, with a strong white median line (Plate II, No. 96); pods straw-colored (Plate III, No. 4), medium in size (Fig. 2B); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems coarse; leaves medium in size; plant medium in height (Fig. 3B), slender (Fig. 5), maturing extremely late (155 to 165 days).

Trenton.—Seeds medium to large, ellipsoidal to ovoidal in lateral outline; testa pale dull brown, not glossy, often split on the ripening seed; hilum colored like the testa with a strong white median line (Plate II, No. 97); pods medium in size (Fig. 2B); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems and leaves medium in size; plant dwarfed (Fig. 3D), bunchy (Fig. 7), maturing late (125 to 135 days),

GROUP XII.—SEEDS BROWN, BLOSSOMS WHITE, PUBESCENCE TAWNY

A. Testa olive brown
  B. Seeds globose to ovoidal in lateral outline ..... *Eda* (p. 30)
  BB. Seeds ellipsoidal to ovoidal in lateral outline ..... *Merko* (p. 31)
AA. Testa chocolate brown
  B. Seeds remarkably small, uniformly globose in lateral outline ..... *S. P. I. 1492 Selection* (p. 31)
  BB. Seeds medium to large, globose to ovoidal in lateral outline ..... *Ito San Cross* (p. 31)

Eda.—Seeds mostly large, globose to ovoidal in lateral outline; testa olive brown, ranging nearly to green, glossy; hilum colored like the testa with median line pale brown but indistinct (Plate II, No. 98); pods medium in size (Fig. 2B); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems medium in size; leaves small; plant dwarfed (Fig. 3D), bunchy (Fig. 7), maturing early to medium early (115 to 120 days).

Merko.—Seeds medium in size, ellipsoidal in lateral outline; testa olive brown, slightly glossy; hilum colored like the testa with median line pale brown and distinct (Plate III, No. 99); pods medium in size to smaller (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the wavy tip (Fig. 4A); stems remarkably fine and having a pronounced tendency to lodge; leaves small; plant medium in height (Fig. 3B), maturing medium late (125 to 130 days).

S. P. I. 1492 Selection.—Seeds small, globose in lateral outline; testa clear chocolate brown, not glossy; hilum colored like the testa but having white median line (Plate III, No. 100); pods straw-colored (Plate III, No. 4), very small (Fig. 2A); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems fine; leaves medium in size; plant short, bunchy (Fig. 7), maturing late (135 to 145 days).

Ito San Cross.—Seeds medium to large, globose to ovoidal in lateral outline; testa usually chocolate brown, but darker on many seeds, not glossy; hilum colored like the testa, but the median line is pale brown and usually distinct (Plate III, Fig. 101); pods medium to smaller (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems fine; leaves small; plant medium in height (Fig. 3B), remarkably slender (Fig. 5), maturing late (130 to 135 days).

GROUP XIII.—SEEDS BLACK, BLOSSOMS PURPLE, PUBESCENCE WHITE TO GRAY OR SANDY.

A. Testa rusty, or gray-black ..... *Riceland* (p. 31)
AA. Testa clear black
  B. Seeds remarkably small ..... *Chernie* (p. 31)
  BB. Seeds medium large
    C. Seeds plump, mostly ovoidal in lateral outline ..... *Watson Black* (p. 32)
    CC. Seeds somewhat flattened, mostly ellipsoidal in lateral outline ..... *Early Black* (p. 32)

Riceland.—Seeds medium in size, ellipsoidal in lateral outline, flattened; testa dull rusty black; hilum indistinct (Plate III, No. 102); pods medium in size (Fig. 2B), slender; pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems fine; leaves small; plant medium in height (Figure 3B), maturing late (130 to 135 days).

Chernie.—Seeds small, flattened, ellipsoidal in lateral outline; testa slightly glossy; hilum lighter than the testa (Plate III, No. 103); pods

straw-colored (Plate III, No. 4), medium in size (Fig. 2B), unusually slender; pod formation on central stem sparse, diminishing gradually toward the wavy tip (Fig. 4A); stems medium in size and showing a tendency to lodge at maturity; leaves small; pubescence remarkably coarse and dense; plant tall (Fig. 3A), slender (Fig. 5), maturing late (140 to 150 days).

Watson Black.—Seeds medium to large, mostly ovoidal in lateral outline, though many are ellipsoidal; testa glossy; hilum lighter than the testa and having a distinct median line, ranging in color from pale brown to white (Plate III, No. 104); pods medium in size or smaller (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems fine; leaves small; plant medium in height (Fig. 3B), remarkably slender (Fig. 5), maturing late (130 to 135 days).

Early Black.—Seeds large, ellipsoidal in lateral outline; testa glossy; hilum lighter than the testa with a brown median line (Plate III, No. 105); pods black (Plate III, No. 1), small (Fig. 2A), slender; pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems fine; leaves small; plant medium in height (Fig. 3B), maturing medium late (120 to 130 days).

GROUP XIV.—SEEDS BLACK, BLOSSOMS PURPLE, PUBESCENCE TAWNY.

A. Seeds flattened
  B. Seeds small
    C. Seeds remarkably small, mostly ellipsoidal in lateral outline---*Black Champion* (p. 33)
    CC. Seeds small to nearly medium, mostly ovoidal in lateral outline---*Ebony* (p. 33)
  BB. Seeds medium or large
    C. Seeds mostly ovoidal in lateral outline---*Arlington* (p. 33)
    CC. Seeds mostly ellipsoidal in lateral outline
      D. Testa usually distinctly glossy; seeds medium in size---*Wisconsin Black* (p. 33)
      DD. Testa not distinctly glossy; seeds large---*Jet* (p. 33)

AA. Seeds not flattened
  B. Seeds globose to ovoidal in lateral outline
    C. Testa glossy
      D. Plant maturing medium early; seeds large---*Wing Jet* (p. 33)
      DD. Plant maturing medium late; seeds medium in size---*Hybrid 5-L-3* (p. 33)
    CC. Testa not glossy---*Buckshot* (p. 34)
  BB. Seeds ellipsoidal to ovoidal in lateral outline
    C. Testa glossy; seeds mostly ellipsoidal---*Royal* (p. 34)
    CC. Testa not glossy; seeds mostly ovoidal---*Tarheel Black* (p. 34)

Black Champion.—Seeds small, flattened, ellipsoidal in lateral outline; testa with little or no gloss; hilum lighter than the testa with indistinct median line (Plate III, No. 106); pods medium in size (Fig. 2B), slender; pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems and leaves medium in size, the lower branches showing a tendency to break down at maturity; plant tall (Fig. 3A), slender (Fig. 5), maturing late (140 to 150 days).

Ebony.—Seeds medium to small, globose to ovoidal in lateral outline; testa with little or no gloss; hilum lighter than the testa (Plate III, No 107); pods small (Fig. 2A); pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems fine; leaves small;plant medium in height (Fig. 3B), slender (Fig. 5), maturing extremely late (150 to 160 days).

Arlington.—Seeds large, flattened, mostly ovoidal in lateral outline, though some are ellipsoidal; testa with little or no gloss, often dimpled; hilum lighter than the testa with median line brown and usually indistinct (Plate III, No. 108); pods medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the wavy tip (Fig. 4A); stems and leaves medium in size; plant medium in height (Fig. 3B), spreading (Fig. 6), maturing medium late (120 to 125 days).

Wisconsin Black.—Seeds medium to large, flattened, mostly ellipsoidal in lateral outline; testa glossy; hilum lighter than the testa with the median line brown and usually indistinct (Plate III, No. 109); pods medium in size (Fig. 2B), slender; pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems fine; leaves small and tapering; plant short (Fig. 3C), spreading (Fig. 6), maturing medium late (120 to 125 days).

Jet.—Seeds large, flattened, ellipsoidal in lateral outline; testa slightly glossy; hilum lighter than the testa with an indistinct median line (Plate III, No. 110); pods medium in size (Fig. 2B), slender; pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems unusually fine; leaves remarkably small and tapering; plant short (Fig. 3C), spreading (Fig. 6), maturing medium early (110 to 115 days).

Wing Jet.—Seeds medium to large, globose to ovoidal in lateral outline; testa glossy, often dimpled; hilum lighter than the testa (Plate III, No. 111); pods straw-colored (Plate III, No. 4), medium in size (Fig. 2B); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems coarse; leaves medium in size; plant dwarfed (Fig. 3D), bunchy (Fig. 7), maturing medium early (110 to 115 days).

Hybrid 5-L-3.—Seeds medium in size, globose to ovoidal in lateral outline; testa glossy; hilum lighter than the testa (Plate III, No. 112); pods straw-colored (Plate III, No. 4), medium in size (Fig. 2B); pod for-

mation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems fine; leaves medium in size; plant dwarfed (Fig. 3D), bunchy (Fig. 7), maturing late (125 to 135 days).

Buckshot.—Seeds large, mostly globose in lateral outline; testa dull, not glossy; hilum lighter than the testa with median line usually distinct (Plate III, No. 113); pods medium in size (Fig. 2B); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems and leaves medium in size; plant dwarfed (Fig. 3D), bunchy (Fig. 7), maturing medium late (120 to 125 days).

Royal.—Seeds medium to large, ellipsoidal to ovoidal in lateral outline; testa glossy; hilum lighter than the testa (Plate III, No. 114); pods mostly small (Fig. 2A); pod formation on central stem sparse, diminishing gradually toward the wavy tip (Fig. 4A); stems medium in size; leaves small; plant medium in height (Fig. 3B), slender (Fig. 5), maturing late (140 to 145 days).

Tarheel Black.—Seeds medium to large, ellipsoidal to ovoidal in lateral outline; testa not glossy; hilum lighter than the testa, large, with distinct white median line (Plate III, No. 115); pods medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the wavy tip (Fig. 4A); stems medium in size, the lower branches showing a tendency to break down at maturity; leaves small; plant tall (Fig. 3A), maturing late (140 to 150 days).

GROUP XV.—SEEDS BLACK, BLOSSOMS WHITE, PUBESCENCE WHITE TO GRAY OR SANDY

Cloud.—Seeds large, mostly ellipsoidal in lateral outline; testa not glossy; hilum lighter than the testa, with median line usually brown (Plate III, No. 116); pods medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the wavy tip (Fig. 4A); stems coarse; leaves medium in size; plant medium in height (Fig. 3B), slender (Fig. 5), maturing medium late (115 to 120 days) while the stems and leaves are still green.

GROUP XVI.—SEEDS BLACK, BLOSSOMS WHITE, PUBESCENCE TAWNY

A. Cotyledon green
  B. Seeds small, globose to ovoidal in lateral outline---------- *Kingston* (p. 35)
  BB. Seeds remarkably large, ellipsoidal to ovoidal in lateral outline---------- *Fairchild* (p. 35)
AA. Cotyledon yellow
  B. Seeds flattened, mostly ellipsoidal in lateral outline
    C. Testa rusty, or gray-black---------- *Sooty* (p. 35)
    CC. Testa clear, glossy black
      D. Seeds unusually large; pod formation on central stem sparse---------- *Nuttall* (p. 35)
      DD. Seeds medium in size; pod formation on central stem prolific---------- *Peking* (p. 36)
  BB. Seeds not flattened, mostly ovoidal in lateral outline---------- *Wilson* (p. 36)

Kingston.—Seeds small, mostly ovoidal in lateral outline, though some are globose; testa distinctly glossy; hilum lighter than the testa (Plate III, No. 117); cotyledon green; pods black (Plate III, No. 1), small (Fig. 2A); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems medium in size; leaves medium in size, rough, leathery; plant short (Fig. 3C), bushy (Fig. 6), maturing medium late (125 to 130 days).

Fairchild.—Seeds remarkably large, ellipsoidal to ovoidal in lateral outline; testa slightly glossy; hilum lighter than the testa (Plate III, No. 118); cotyledon green; pods medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the wavy tip (Fig. 4A); stems and leaves medium in size; plant medium in height (Fig. 3B), slender (Fig. 5), maturing medium late (120 to 130 days) while the stems and leaves are still green.

Sooty.—Seeds medium to large, flattened, mostly ellipsoidal in lateral outline; testa dull rusty grayish black; hilum indistinct (Plate III, No. 119); cotyledon yellow; pods black (Plate III, No. 1), small (Fig. 2A), slender; pod formation on central stem sparse, diminishing gradually toward the wavy tip (Fig. 4A); stems and leaves medium in size; plant medium in height (Fig. 3B), bushy (Fig. 6), maturing late (130 to 140 days).

Nuttall.—Seeds large, slightly flattened, mostly ellipsoidal in lateral outline; testa distinctly glossy; hilum lighter than the testa, with median line usually brown (Plate III, No. 120); cotyledon yellow; pods medium

in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the wavy tip (Fig. 4A); stems and leaves medium in size; plant medium in height (Fig. 3B), slender (Fig. 5), maturing late (130 to 140 days).

Peking.—Seeds medium to small, flattened, mostly ellipsoidal in lateral outline; testa glossy; hilum lighter than the testa (Plate III, No. 121); cotyledon yellow; pods straw-colored (Plate III, No. 4), slender, medium in size (Fig. 2B); pod formation on central stem dense, terminating abruptly at the tip (Fig. 4B); stems and leaves medium in size; plant medium in height (Fig. 3B), bushy (Fig. 6), maturing late (125 to 135 days).

Wilson.—Seeds medium in size, ellipsoidal to ovoidal in lateral outline; testa with little or no gloss; hilum lighter than the testa with median line usually brown (Plate III, No. 122); cotyledon yellow; pods mostly small (Fig. 2A); pod formation on central stem sparse, diminishing gradually toward the wavy tip (Fig. 4A); stems medium in size; leaves medium in size, rough; plant medium in height (Fig. 3B), slender (Fig. 5), maturing medium late (120 to 130 days).

GROUP XVII.—SEEDS BI-COLORED, BLOSSOMS PURPLE, PUBESCENCE WHITE TO GRAY OR SANDY

Manchuria.—Seeds medium to large, ellipsoidal to ovoidal in lateral outline; testa pattern a dark brown saddle on a light brown or yellow base; testa not glossy and usually split on the ripened seed; hilum indistinct except for the pale brown median line (Plate III, No. 123); pods medium in size or slightly larger (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems coarse, leaves medium in size, rough; plant short (Fig. 3C), bushy (Fig. 6), maturing early (105 to 110 days).

GROUP XVIII.—SEEDS BI-COLORED, BLOSSOMS PURPLE, PUBESCENCE TAWNY

A. Testa colored in a pattern
  B. Color pattern is concentric bands of black on a brown base---- *Meyer* (p. 37)
  BB. Color pattern is a saddle of black on a lighter base
    C. Black saddle on yellow base---------- *Taha* (p. 37)
    CC. Black saddle on brown base---------- *Black Eyebrow* (p. 37)

AA. Testa not colored in a pattern, being black with minute, irregular specks of yellow or brown
  B. Seeds flattened, ellipsoidal in lateral outline
    C. Seeds small---------- *Laredo Selection* (p. 37)
    CC. Seeds remarkably large---------- S. *P. I. 47131* (p. 37)
  BB. Seeds not flattened, mostly ovoidal in lateral outline------- *Otootan* (p. 37)

Meyer.—Seeds medium to large, ellipsoidal to ovoidal in lateral outline; testa pattern is usually black concentrics on a brown base; testa glossy; hilum brown, usually with a distinct light brown median line (Plate III, No. 124); pods medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the wavy tip (Fig. 4A); stems medium, showing a tendency to lodge at maturity; leaves medium in size; plant medium in height (Fig. 3B), maturing medium late (120 to 125 days).

Taha.—Seeds large, mostly ellipsoidal in lateral outline; testa pattern a black saddle on a yellow base; testa not glossy; hilum black except the distinct white median line (Plate III, No. 125); pods medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the wavy tip (Fig. 4A); stems coarse; leaves medium in size; plant tall (Fig. 3A), spreading (Fig. 6), maturing late (145 to 150 days).

Black Eyebrow.—Seeds large, ellipsoidal to ovoidal in lateral outline; testa pattern a black saddle on a yellow-brown base; testa slightly glossy; hilum black with indistinct median line (Plate III, No. 126); pods medium in size to somewhat smaller (Fig. 2B); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems medium in size; leaves small; plant medium in height (Fig. 3B), bushy (Fig. 6), maturing medium early (115 to 120 days).

Laredo Selection.—Seeds small, flat, mostly ellipsoidal in lateral outline; testa pattern composed of minute brown or yellow specks on a black ground; testa not glossy; hilum lighter than the testa, with indistinct median line (Plate III, No. 127); pods medium in size (Fig. 2B), remarkably slender; pod formation on central stem sparse, diminishing gradually toward the wavy tip (Fig. 4A); stems medium in size and showing a tendency to lodge at maturity; leaves medium in size; pubescence unusually coarse and dense; plant medium in height (Fig. 3B), bushy (Fig. 6), maturing extremely late (150 to 160 days).

S. P. I. 47131.—Seeds extremely large, ellipsoidal in lateral outline; testa pattern usually composed of brown specks on a black ground, though on some seeds the testa is mottled in the same colors; testa slightly glossy; hilum brownish with an indistinct median line (Plate III, No. 128); pods medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems medium in size and showing a tendency to lodge at maturity; leaves small and tapering; plant medium in height (Fig. 3B), bushy (Fig. 6), maturing medium early (115 to 120 days) while the stems and leaves are still green.

Otootan.—Seeds medium to small, mostly ovoidal in lateral outline; testa pattern composed of minute brown specks on a black ground;

testa slightly glossy; hilum lighter than the testa (Plate III, No. 129); pods mostly small (Fig. 2A), slender; pod formation on central stem sparse, diminishing gradually toward the wavy tip (Fig. 4A); stems and leaves medium in size; plant medium in height (Fig. 3B), bushy (Fig. 6), maturing extremely late (150 to 160 days).

GROUP XIX. SEEDS BI-COLORED, BLOSSOMS WHITE, PUBESCENCE WHITE TO GRAY OR SANDY

No specimens combining these characteristics were found among the varieties studied in this classification.

GROUP XX.—SEEDS BI-COLORED, BLOSSOMS WHITE, PUBESCENCE TAWNY

A. Testa colored in a pattern
  B. Color pattern is a saddle of black on a yellow base.. *Taha Selection* (p. 38)
  BB. Color pattern is a saddle of black on a green or brown base
    C. Black saddle on a green base..... *Black Eyebrow Selection I* (p. 38)
    CC. Black saddle on a brown base.... *Black Eyebrow Selection II* (p. 38)
AA. Testa not colored in a pattern, being black speckled or blended with yellow or brown
  B. Seeds small, conspicuously flattened; testa speckled with yellow or brown..... *Laredo* (p. 39)
  BB. Seeds mostly large, scarcely flattened; testa black blended with yellow or brown..... S. *P. I. 44508* (p. 39)

Taha Selection.—Seeds large, ellipsoidal to ovoidal in lateral outline; seed pattern a black saddle on a yellow base; testa not glossy; hilum black like the saddle with an indistinct median line (Plate III, No. 130); pods medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems coarse and showing a tendency to lodge; leaves medium in size; plant medium in height, (Fig. 3B), bushy (Fig. 6), maturing late (140 to 145 days).

Black Eyebrow Selection I.—Seeds large, ellipsoidal to ovoidal in lateral outline; testa pattern a black saddle on a green base; testa slightly glossy; hilum black like the saddle, with the median line usually distinct (Plate III, No. 131); pods medium in size (Fig. 2B); pod formation on central stem prolific, terminating abruptly at the tip (Fig. 4B); stems medium in size; leaves small, tapering, rough; plant short (Fig. 3C), bushy (Fig. 6), maturing medium early (115 to 120 days) while the stems and leaves are still green.

Black Eyebrow Selection II.—Seeds large, ellipsoidal to ovoidal in lateral outline; testa pattern a black saddle on a brown base; testa glossy; hilum black like the saddle, with median line usually indistinct (Plate III, No. 132); pods medium in size (Fig. 2B); pod formation on central

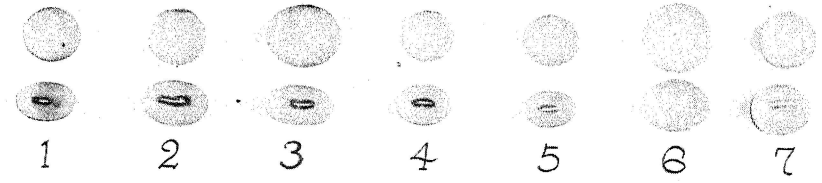
stem prolific, terminating abruptly at the tip (Fig. 4B); stems medium in size; leaves somewhat tapering, rough; plant short (Fig. 3C), bushy (Fig. 6), maturing medium early (115 to 120 days).

Laredo.—Seeds small, flattened, mostly ellipsoidal in lateral outline; testa pattern composed of brown specks on a black ground; testa with little or no gloss; hilum lighter than the testa with an indistinct median line (Plate III, No. 133); pods medium in size (Fig. 2B), slender; pod formation on central stem sparse, diminishing gradually toward the wavy tip (Fig. 4A); stems medium in size, showing a tendency to lodge at maturity; leaves medium in size; plant medium in height (Fig. 3B), bushy, maturing extremely late (150 to 160 days).

S. P. I. 44508.—Seeds mostly large, slightly flattened, mostly ovoidal in lateral outline; testa color black blending into olive or brown; hilum dark brown to reddish brown with a distinct median line (Plate III, No. 134); pods medium in size (Fig. 2B); pod formation on central stem sparse, diminishing gradually toward the tip (Fig. 4A); stems medium in size, showing a tendency to lodge at maturity; leaves medium in size; plant medium in height (Fig. 3B), bushy (Fig. 6), maturing late (140 to 150 days).

PLATE I

1. S. P. I. 37246
2. Easycook
3. Edward
4. Pinpu
5. Easycook Selection
6. Yokotenn
7. S. P. I. 40371
8. Thurnoko
9. Kentucky
10. Wea
11. Mandarin
12. Haberlandt
13. Aksawa
14. Toyonago
15. S. P. I. 37062 Selection
16. Elton
17. Manchu Selection I
18. S. P. I. 37062
19. Aksarben
20. Hollybrook Selection
21. Nemo
22. Mikado
23. Midwest
24. Ito San
25. Minsoy
26. Manchu Selection II
27. Amherst
28. Manchu
29. Habaro
30. A K
31. S. P. I. 37241
32. Ohio 9001
33. S. P. I. 37261
34. Hollybrook
35. S. P. I. 37261 Selection
36. Mammoth Yellow
37. Kentucky Selection
38. Lexington
39. Chiquita
40. S. P. I. 44210
41. Sherwood
42. S. P. I. 30745
43. Tokio Selection
44. S. P. I. 37053
45. S. P. I. 40114
46. Hongkong
47. S. P. I. 38455
48. Brooks
49. Hoosier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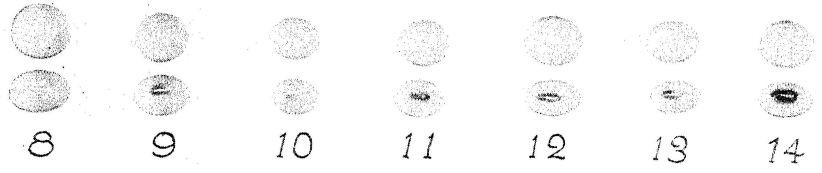
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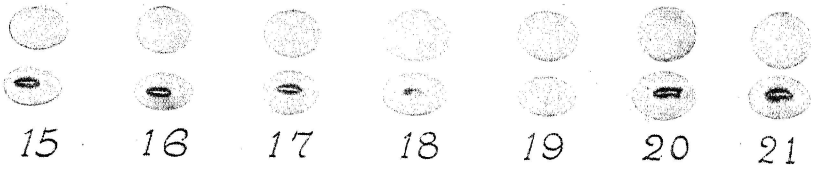
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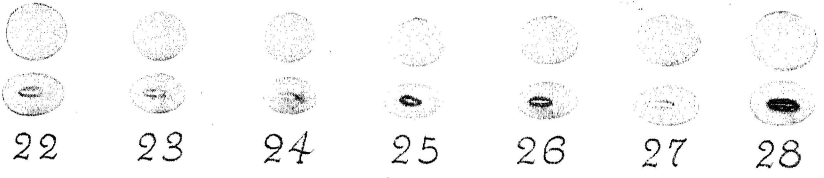
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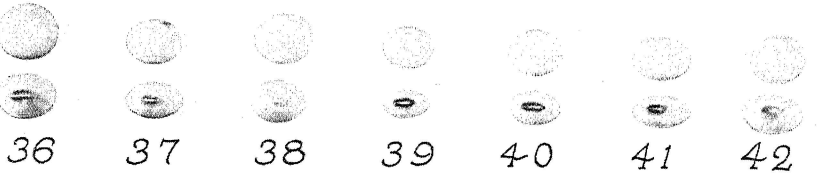
29 30 31 32 33 34 35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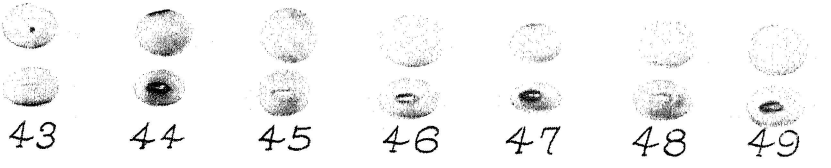
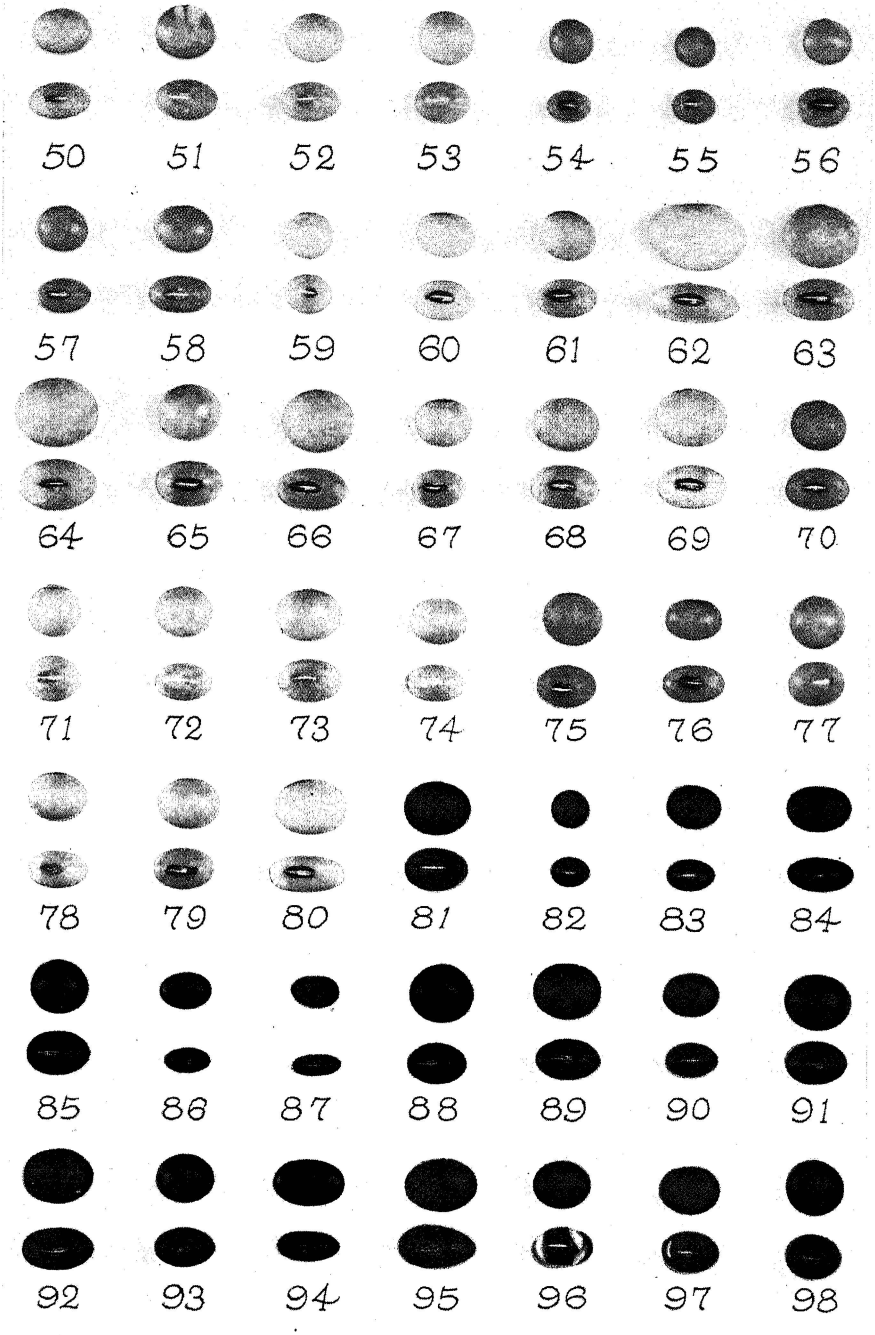

43 44 45 46 47 48 49

PLATE I

PLATE II

50. Columbia
51. S. P. I. 37294
52. S. P. I. 46689
53. Tokio
54. S. P. I. 37298
55. S. P. I. 37301
56. Tashing
57. Guelph
58. Green
59. Verea
60. S. P. I. 19186
61. S. P. I. 30746
62. Hahto
63. Hahto Selection
64. Early Green
65. Early Green Selection
66. S. P. I. 19981-1
67. Yosho
68. F. C. 1829
69. Okute
70. S. P. I. 44510
71. Hope Selection
72. Hope
73. Yosho Selection
74. Morse
75. S. P. I. 44212
76. S. P. I. 30594
77. Illinois 178
78. Shingto
79. Shingto Selection
80. Sonoma
81. Buster Brown
82. S. P. I. 1492
83. Buster Brown Selection
84. Chestnut
85. Ohio 9035 Selection
86. S. P. I. 20409
87. Barchet
88. S. P. I. 37396
89. Ohio 9035
90. Hamilton
91. Early Brown
92. Mammoth Brown
93. Ogemaw
94. Virginia
95. Biloxi
96. Auburn
97. Trenton
98. Eda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92 93 94 95 96 97 98

PLATE II

PLATE III

99. Merko
100. S. P. I. 1492 Selection
101. Ito San Cross
102. Riceland
103. Chernie
104. Watson Black
105. Early Black
106. Black Champion
107. Ebony
108. Arlington
109. Wisconsin Black
110. Jet
111. Wing Jet
112. Hybrid 5-L-3
113. Buckshot
114. Royal
115. Tarheel Black
116. Cloud
117. Kingston
118. Fairchild
119. Sooty
120. Nuttall
121. Peking
122. Wilson
123. Manchuria
124. Meyer
125. Taha
126. Black Eyebrow
127. Laredo Selection
128. S. P. I. 47131
129. Otootan
130. Taha Selection
131. Black Eyebrow Selection I
132. Black Eyebrow Selection II
133. Laredo
134. S. P. I. 44508

1. Brownish-black pods
2. Dark brown pods
3. Greenish-brown pods
4. Straw-colored pods

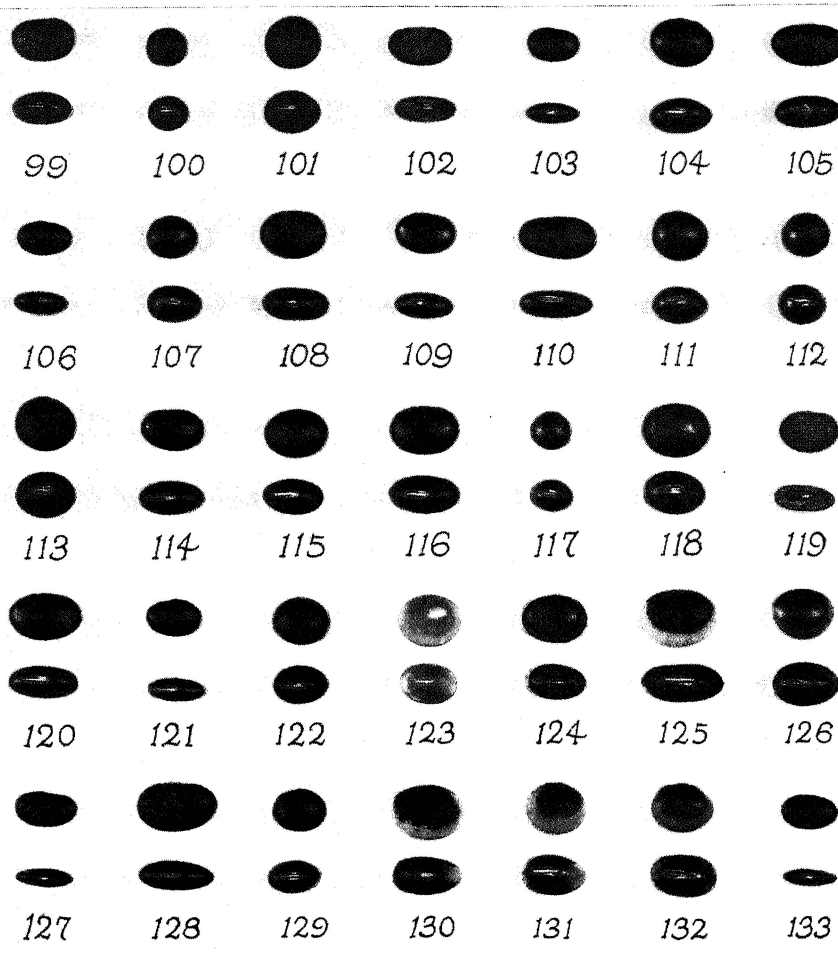
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PLATE III

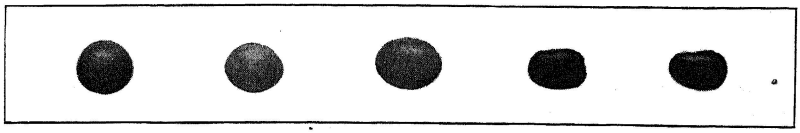

Fig. 1.—Left to right are the forms of soybean seeds distinguished in this classification: globose, ovoidal, ellipsoidal, truncate, subreniform.

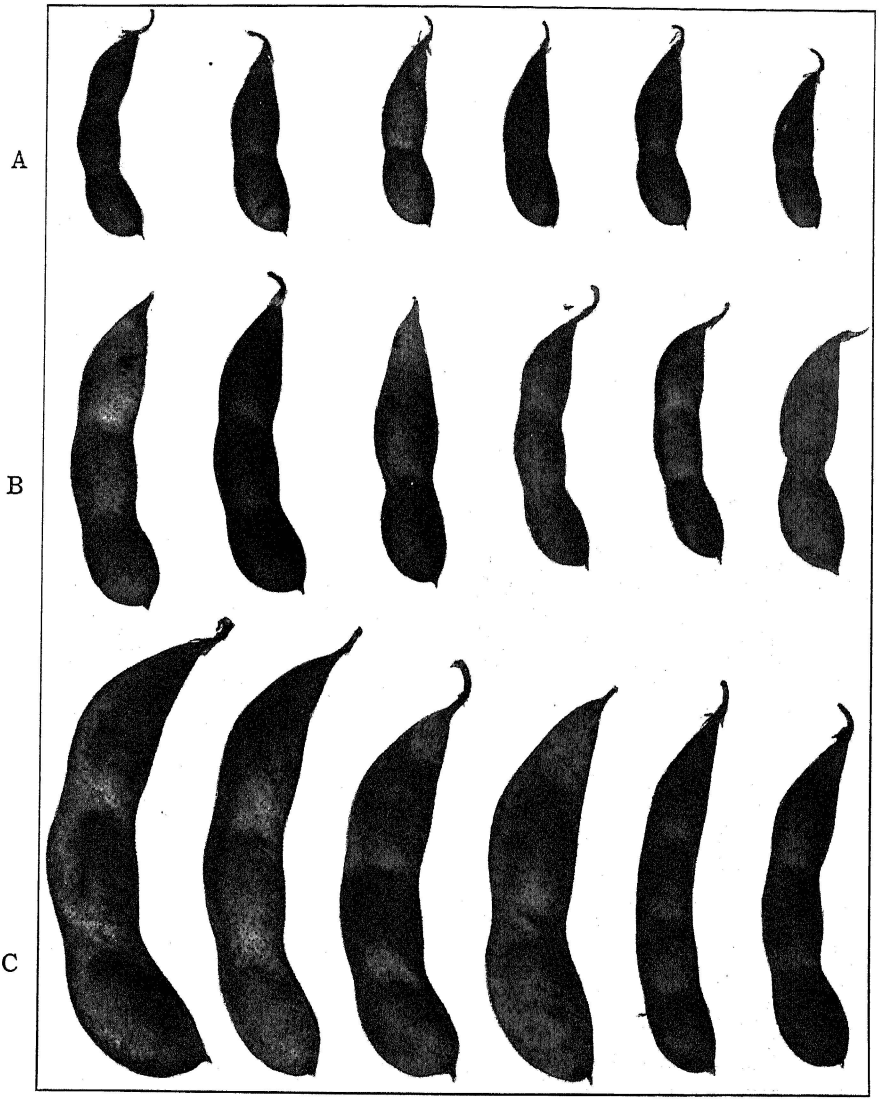

Fig. 2.—The arbitrary grouping of pod sizes is shown by the upper row of small pods, the middle row of medium pods, and the lower row of large pods.

Fig. 3.—Plants representing the relative heights, tall, medium, short, dwarfed, are arranged from left to right in the picture.

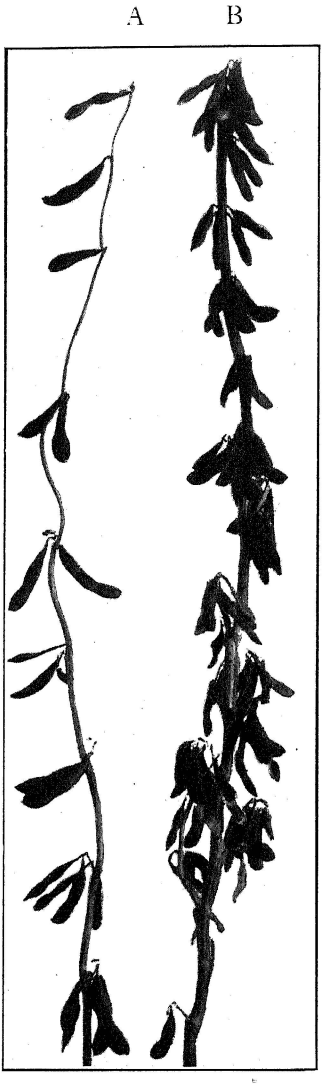

Fig. 4.—The two modes of pod formation in the soybean are suggested by the thin distribution of pods on the central stem at the left, and the dense array of pods on the central stem at the right.

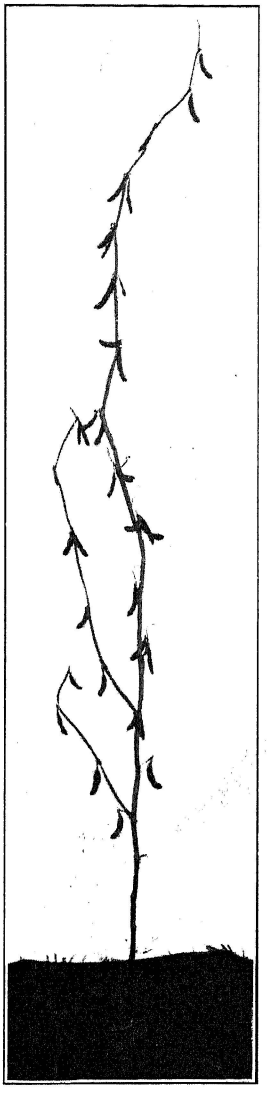

Fig. 5.—The slender type of soybean, denuded to show (1) its erect habit (2) the wavy attenuation of its tip (3) the sparse and uniform distribution of its pods.

Fig. 6.—The bushy, spreading type.

Fig. 7.—The bunchy, compact type.

Fig. 8.—The vining growth characteristic of a few varieties of the soybean is shown here.

Fig. 9.—The erect, stiff type.

Fig. 10.—The extreme degree of lodging shown here is typical of the varieties which are unable to stand erect under their load of ripe seed.

INDEX TO VARIETIES