

A CLASSIFICATION OF CERTAIN CHARACTERISTICS OF
MUNGBEAN STRAINS AS AN AID TO IMPROVEMENT

By

DONALD JACK BANKS

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Oklahoma State University

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Thesis Approved:

Ralph S. Matlock
Thesis Adviser

H. J. Feaster

James W. ...
Dean of the Graduate School

409783

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INTRODUCTION

The mungbean (Phaseolus aureus Roxb.) is considered a minor crop in the United States, but it has received considerable attention in Oklahoma. The mungbean has been grown in Oklahoma for hay, seed and as a green manure crop. The seeds are used for sprouting and canning as well as livestock feed. Feeding trials have been conducted with beef calves, dairy cattle, swine, sheep and poultry (4, 10, 13, 14, 17, 18)^{1/}. These trials have indicated that mungbean seed and hay are high in protein and could replace a large part of the protein supplement in most rations.

The mungbean is an important food crop in the Orient where the sprouted beans are used in many Oriental dishes. Considerable quantities of mungbeans have been imported into the United States where they are used in making chop suey.

The mungbean is native to southern Asia and is grown throughout the southern half of Asia, the Malayan Islands and southeastern Africa (11). It was introduced into American agriculture as early as 1853, but did not find a prominent place until the Second World War when imports from the Orient were cut off. Oklahoma emerged as the leading producer of mungbeans during this period, supplying most of the seed to restaurants serving Oriental dishes. In 1957, an estimated 28,000 acres were planted to mungbeans in Oklahoma and 20,000 acres were harvested.

^{1/}Numbers in parentheses refer to Literature Cited.

Since mungbeans do contribute to our Oklahoma economy, research on the crop is being conducted at the present time by the Oklahoma Agricultural Experiment Station.

Apparently, very little recent work has been done on the classification of mungbeans. A survey of existing germ plasm and classification of agronomic and botanical characters is an important phase of the mungbean improvement program.

The purpose of this study was to survey the mungbean strains available at the Oklahoma Agricultural Experiment Station and to classify the various characters to aid the mungbean improvement program.

LITERATURE REVIEW

Classification is, according to Lawrence (9), the grouping together of plants whose similarities are greater than their differences.

Turrill (20) has suggested genetics as a method of studying taxonomic problems which cannot be solved by comparative morphology alone. Crane (6) believed that plants, in which we find no morphological differences and whose yields are not significantly different, are the same variety and should not be labeled differently. He suggested a well directed breeding program with properly conducted yield trials to eliminate the prevalence of "alike" varieties.

Anderson (2) has expressed disappointment in the fact that most taxonomic effort has been directed toward plants that are the least interesting and least important to man. He listed Phaseolus as an important genera deserving more taxonomic attention than it has received. Items which he believed should be found in the "inclusive herbarium" for the genus Phaseolus are: (1) pressed specimens of an average leaf, inflorescence and mature pod; (2) a sample of mature seed; (3) notes on flower color, including the keel, wings and standard; (4) notes and measurements as to the extent that the cotyledons remain above or below the ground after germinating; and (5) a photo of a mature plant showing branching habit.

Five Oriental species of Phaseolus have often been confused in the literature, according to Piper and Morse (12). The species are adsuki bean (P. angularis), moth bean (P. aconitifolius), mungbean

(P. aureus), rice bean (P. calcaratus) and urd (P. mungo).

Piper and Morse (12) have used the following key to distinguish the species:

- Leaflets parted into 3 to 5 narrow lobes..... Moth.
- Leaflets entire or occasionally 2 or 3 lobed.
 - Plants and pods very hairy; seeds mostly dull.
 - Pods with short hairs; seeds globose or subglobose, green, rarely brown, blackish or yellow, the testa marked with fine crenulate lines; hilum not concave..... Rice
 - Pods with long hairs; seeds oblong, blackish, the testa not crenulate striate; hilum concave..... Mung.
 - Plants smooth or little hairy; seeds smooth and shiny.
 - Pods constricted between the seeds; hilum not concave..... Urd.
 - Pods not constricted between the seeds; hilum concave..... Adsuki.
 - Pods not constricted between the seeds; hilum concave..... Rice.

There has been a great deal of confusion as to the proper scientific name to use for the mungbean. According to Piper and Morse (12), various botanists had described mungbeans before Linnaeus' time. They stated that Linnaeus, even though aware of the mungbean, did not give it a binomial name. Linnaeus had confused it with the urd and the soybean. He applied such names as P. max L., P. mungo L. and P. radiatus L. to the mungbean even though these names were used for other plants he had described.

Roxburgh named the mungbean in 1832, according to Piper and Morse (12). It was believed that Roxburgh had also confused the mungbean, since he had used Linnaeus' names P. mungo for the green seeded mungbean, P. max for the black seeded mungbean and P. radiatus for the urd. Roxburgh named the golden seeded mungbean P. aureus. He is credited for naming the mungbean, even though he meant the name to apply only to the yellow seeded type.

Piper and Morse (12) described the mungbean as an erect or sub-erect, rather hairy, much branched plant. Height 1 to 4 feet, depending

on the variety. Some types twining more or less at the tips of the stems and branches. The leaves trifoliate with large ovate entire or rarely tri-lobed leaflets. The flowers pale yellow, crowded in clusters of 10 to 25. The plant being somewhat intermediate in growth habit between the cowpea and soybean.

Bailey (3) has given the following description of the mungbean, which is also referred to as the green or golden gram: annual, taller and more erect than P. mungo (which he describes as one to three feet high) sometimes slightly twining at the tips. The calyx-bracts are ovate. The pods are 2 1/2 to 4 inches long, slender and have very short hairs. The seeds are rather small and usually green, but sometimes yellow or brown. The hilum is white and not concave. The germination is epigeal.

Piper and Morse (12) have listed as differences in varieties of mungbeans such characters as habit, plant size, maturity, pod color, seed size and seed color. They listed in their publication of Oriental species of beans notes on 91 lots of seed which they stated represented at least 16 distinct varieties, 11 of which could be distinguished by seed alone. However, they failed to mention the seed characters by which these varieties could be separated.

Caguicla (5) studied 13 varieties of mungbeans and reported the material was very heterozygous. She used the following seed color classes: dull yellow, shiny yellow, brownish yellow, dull green, shiny green, greenish yellow and black. She also noted differences in degree of pubescence, form of leaves, duration of flowering, maturity of seeds, average weight of green material, seed yield and plant height. Mean height ranged from 44.5 centimeters to 125.0 centimeters.

In studies on photoperiod, Allard and Zaumeyer (1) reported P. aureus as bushy and erect under all photoperiods except the 18-hour day, which stimulated a strong twining habit.

A review of the literature indicates more work on classification has been reported on garden and field beans than on mungbeans. Since these species are close relatives and are similar in structure to the mungbean, a review of certain work on the above may be helpful.

Irish (7) based his classification of field beans primarily on the form and color of the seed. For secondary divisions he used plant and pod characters.

Tracy (19) believed that a classification on color and shape of seed in kidney field beans is faulty since it often separates varieties that are very similar in other respects, such as habit. He suggested a classification on major characters, such as: (1) habit of growth, (2) color of pod and (3) pod brittleness followed by subdivisions based on vine habit, pod shape and seed color. In the keys by which he separated various varieties he used 41 characters. Fourteen of these were plant characters, twenty-one were pod and six were seed characters.

A major classification of garden beans by Jarvis (8) was based on growth habit and pod color. The important seed characters he considered were: (1) lines radiating from the hilum to the dorsal margin, (2) length, (3) length-width ratio, (4) thickness, (5) seed and hilum markings, (6) outside and cross section shape, (7) hilum prominence and (8) hypocotyl prominence.

Steinmetz and Arny (16) have questioned the reliability of absolute measurements of seeds as a distinguishing factor in strains of field beans. They reported that pod characters were less affected by

environment than plant characters. They listed the following characters for classifying varieties of common field beans: (1) growth habit; (2) number and length of internodes; (3) character of leaf surface; (4) flower color; (5) time of maturity; (6) pod shape, texture and color; (7) length and width of pods; (8) position, length and shape of spur; and (9) dry seed characters including size, shape and color of seed coat, presence or absence of eye markings and color of eye markings.

They also reported that temperature, moisture, productivity of the soil, and rate and date of planting affect seed size in P. vulgaris. Late and close plantings tended to decrease seed size.

MATERIALS AND METHODS

At the beginning of this study 138 lots of mungbean seed were available for observation. These lots represented 138 different strains or selections. The seeds had originally come from various sources. These sources included (1) plant selections made at the Oklahoma Agricultural Experiment Station, (2) seed from other agricultural experiment stations, (3) selections from farmers' fields, (4) purchases or gifts from seed dealers and (5) seed requested from the Plant Introduction Section of the United States Department of Agriculture.

Plantings were made at the Perkins Agronomy farm June 6, 1957. A July 8, planting was made at the Stillwater Agronomy farm which included five additional strains.

The nurseries were planted with a two-row V-belt planter at the rate of 6 viable seed per foot. The rows were spaced 40 inches apart. Mungbean inoculum was distributed in the row with the seed using a modified planter box equipped with tubes. Some strains were omitted from the observation nursery since they were represented in a replicated variety test at the Perkins Agronomy farm near the observation nursery.

The plot size of the observation nurseries consisted of two-row duplicate plots and single-row duplicate plots 19 feet long. Plot size in the variety test consisted of three replications of 4 rows, 19 feet long.

The mungbeans in the observation nursery at Perkins received two

surface irrigations for a total of approximately five inches of supplemental water. The variety test at Perkins and the plots at the Stillwater farm were not irrigated, but made adequate growth. The total precipitation from planting to maturity was 19 inches for Perkins and 7.4 inches for Stillwater. The plots were hoed and cultivated periodically to control the weeds. Good stands were obtained in plots and growth was rapid as a result of favorable moisture conditions during and immediately after planting.

Notes were taken during the growing season. Observation and measurement notes were taken on several characters to determine the most useful and reliable characters to be used in the classification. The characters studied included (1) growth habit, (2) height, (3) amount of pubescence, (4) color of pubescence, (5) amount of purple pigment, (6) flower color, (7) leaf size, (8) leaf texture, (9) leafiness, (10) lodging, (11) seed productivity and (12) maturity. A discussion of the procedure used for determining the various characteristics follows.

Growth habit. Plants were classed as bush, semi-vine or vine type with respect to habit of growth.

Height. Plant height was measured in decimeters from the ground level to the terminal point of the main stem. Measurements were recorded for the mean height of plants at three positions within each plot. These measurements were taken when most of the plants in each plot were in the late bloom or early pod stage of growth.

Amount of pubescence. Plants were examined to determine if there were any differences in the amount of pubescence on the stems, leaves and pods.

Color of pubescence. The color of the pubescence on the stems was

observed to determine of any differences existed.

Amount of purple pigment. The presence or absence and the degree of purple pigment of the stems and leaves was observed.

Flower color. The flowers were observed at different stages to determine color differences.

Leaf size. Relative leaf size was noted using the Jumbo strain as the standard for a large leaf and the strain Oklahoma 12 as the standard for small leaf. Strains intermediate in size were classed as medium.

Leaf texture. The texture of the leaves was classed as smooth or rough.

Leafiness. The amount of leaves in relation to the stems provided an estimate of the forage value of the strains. Strains were rated as poor, medium or excellent.

Lodging. The amount of lodging was expressed as none to very slight, some lodging or severe lodging.

Seed productivity. Seed yields were classed as excellent, good, fair, or poor and were based on a visual estimate of the number and size of pods per plant.

Maturity. Strains were classified as early, medium early, medium late or late with regard to maturity.

Plant specimens were gathered from many of the strains so that further observations, if necessary, could be made later in the laboratory.

Several pods were collected from each strain at maturity. The pods were collected at random from representative plants for the strain. In the laboratory, the pods were examined for characters that might be useful in the classification. Several pod and seed characters were studied.

Pod length. Ten pods were picked at random from those gathered in the field. The pod length from the junction of the pedicel and the pod to the tip was measured and recorded in centimeters. The measurements were made with a flexible ruler which permitted curved pods to be measured. The variance for the pod lengths was computed for each of the strains. Bartlett's test of homogeneity (15) was applied to the variances to determine the degree of homogeneity among strains.

Number of seeds per pod. Seeds from each of the ten pods were counted as they were measured. Correlations of number of seeds per pod and pod length were computed using ten strains that showed apparent differences in vegetative or fruiting characteristics (15).

Pod color. The pod color was determined by placing the pods in paper plates and observing them under ordinary daylight.

After the pod characteristics were noted, the ten pods were shelled and the seeds obtained were studied for certain seed characteristics.

Seed surface. The surface of the seed was classed as shiny or dull.

Seed color. Seed color was observed and classed as yellow, green, brown or black.

Seed size. The length of five seeds selected at random from each strain was measured in millimeters using a vernier caliper.

Seed shape. Seeds of each strain were observed to determine if there were differences in the seed shapes.

Seed quality. Each strain was rated on seed quality based on a visual observation of the seed sample.

RESULTS AND DISCUSSION

Vegetative Characters

Growth habit. The mungbean strains were classified according to their habit of growth as bush, semi-vine or vine (Appendix Table I). The frequency distribution of strains in each class of growth habit is shown in Table I. The true bush type was easily recognized. These plants had a definite bunchy and stiff appearance. The true vine was also easy to recognize because of the long central stem which was usually wavy and ascending. However, the intermediate types were difficult to classify. These types were slightly wavy at the tips and the stems did not end abruptly. Since they are intermediate between the bush and the vine type, they have been called semi-vine. Two strains contained both bush and vine plants. A typical bush and a typical vine type plant are shown in Figure 1.

TABLE I
FREQUENCY DISTRIBUTION OF GROWTH HABIT

Growth Habit	No. of Strains	Percent
Bush	105	76.1
Semi-vine	27	19.6
Vine	4	2.9
Bush & vine	2	1.4

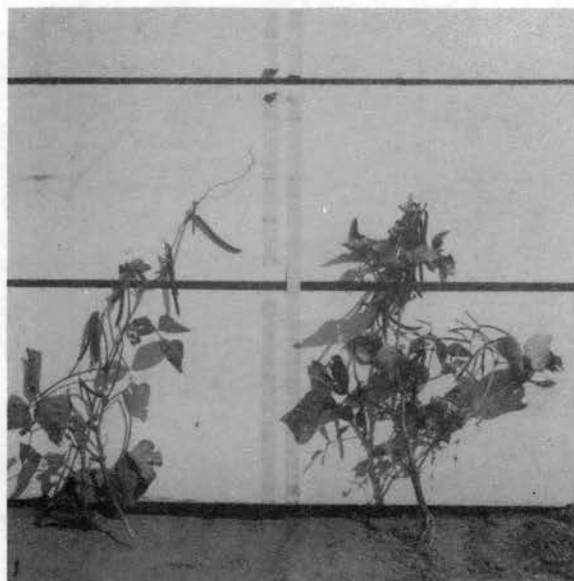


Figure 1. Growth habit types. The plant on the left, showing the vine habit of growth, is S-12-127-1. On the right is Okla. -12, a bush type plant.

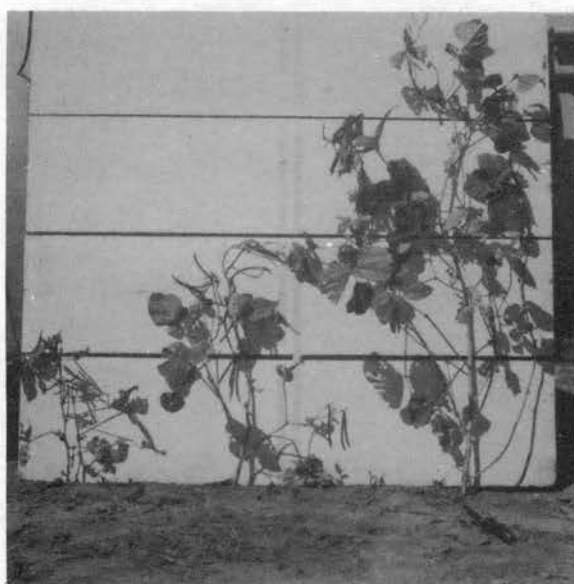


Figure 2. Plant height. Short, medium and tall plant types are shown from left to right. The strains are Okla. -12, Perdue 3 and Golden, respectively. The black horizontal lines on the back board are at one foot intervals.

Plant height. Plants representing each of the three height classes are shown in Figure 2. The mean plant heights among strains ranged from 3.0 to 11.0 decimeters (Figure 3). The strains in this study were grouped in the following three classes; short - 3.0 to 5.0 decimeters, medium - 5.5 to 8.0 decimeters and tall - 8.5 to 11.0 decimeters (Appendix Table II). Intra-strain plant heights were fairly uniform, however, inter-strain heights were variable.

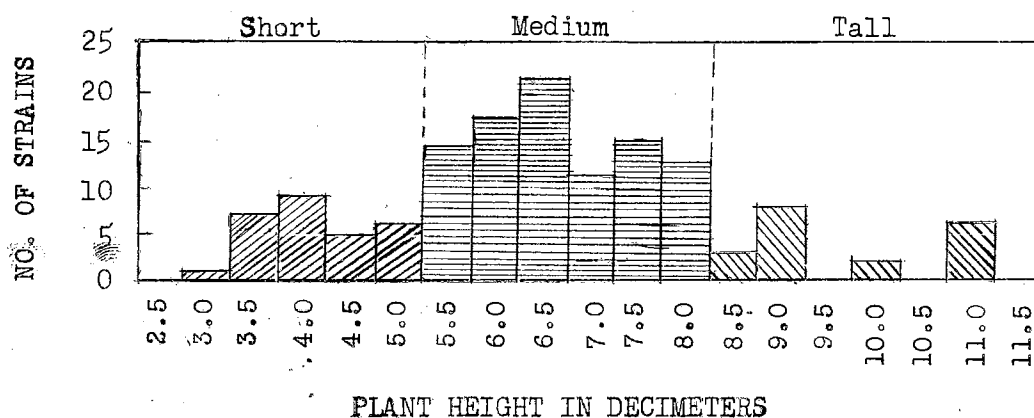


Figure 3. Frequency histogram of plant height of 138 mungbean strains grown at Perkins and Stillwater, 1957.

Amount of pubescence. All of the strains showed some pubescence on both the plant and the pods. Pubescence was greatest on the young leaves, the terminal portions of the plant and the young pods. There appeared to be a difference in the amount of pubescence on the leaves, the lower portions of the plants and the pods. All young leaves and pods had a great amount of pubescence in all strains. As the plant matured, the amount of pubescence was reduced. There appeared to be a difference in the amount of pubescence retained as the leaves and pods matured. These differences are extremely difficult to ascertain. Differences in leaf pubescence are not included in this report. However, eight strains appeared to have more pubescence than most strains.

These include Mungo (Ga.), P.I. 212907, P.I. 212908, P.I. 212909 (Mungo), P.I. 213015, P.I. 214334, P.I. 217955 and P.I. 223711.

Pubescence color. The color of the pubescence varied from a light brown to white. All strains had brown pubescence on the young stems, leaves and pods. Difficulty was encountered in trying to classify the color of the pubescence. The amount of light available and the position from which the plant was observed had the effect of changing the shade of color. Pubescence on the lower portions of the stem appeared to be more white in appearance. Apparently, lack of sunlight has some affect on the lack of color on the lower portions on the stems. White pubescence was particularly noted on the lower stems where the stand was thick and shading was prevalent. The color of pubescence does not appear to be of any value in the classification of mungbean strains because of the inconsistency of the color shades.

Amount of purple pigment. There appeared to be some differences in the amount of purple color in the leaves and stems of some of the strains. Some plants had very little purple color on the stems while other plants had greater amounts of purple color. Differences in the amount of color were quite variable within strains as well as between strains. Five strains were noted, however, that were completely devoid of any purple color. These strains were P.I. 212907, P.I. 212908, P.I. 213015, P.I. 214334 and P.I. 223711. The purple color, if present, is easily found at the base of the leaflet. Young seedlings will show the color as a purple tinge on the upper portions of the hypocotyl. The degree of purple color when present appears to be of little value in classification since the degree is difficult to establish. The absence or presence of the color appears to be a dependable character and may be helpful in identifying strains in the seedling stage.

Leaf size. Leaf size classification is shown in Appendix Table III. The frequency distribution according to leaf size is shown in Table II. Since leaf size between strains seemed to form a continuous distribution from small to large size, classification was difficult in some cases. The difference between small and large type leaves was evident, but those in the medium group were the most numerous and difficult to classify. One factor that tended to complicate this classification was the variation of leaf size on a single plant. This classification was based on the central leaf as it appeared to be the most consistent.

TABLE II
FREQUENCY DISTRIBUTION OF LEAF SIZE

Leaf Size	No. of Strains	Percent
Small	17	12.3
Medium	104	75.4
Large	17	12.3

Leaf texture. A difference among strains was noted in the texture of the leaves. The strains are classified as smooth or rough in Appendix Table IV. The term rough means those leaves that appeared somewhat wrinkled in appearance. A strain with smooth leaves is shown in Figure 4 and one with rough leaves is shown in Figure 5. A frequency distribution of the leaf textures is shown in Table III. Strains with the smooth texture leaves were generally the short or dwarf types.

Leafiness. The strains were classified as poor, medium or excellent on the basis of the leafiness character (Appendix Table V). The excellent types are those strains that exhibited many leaves with a

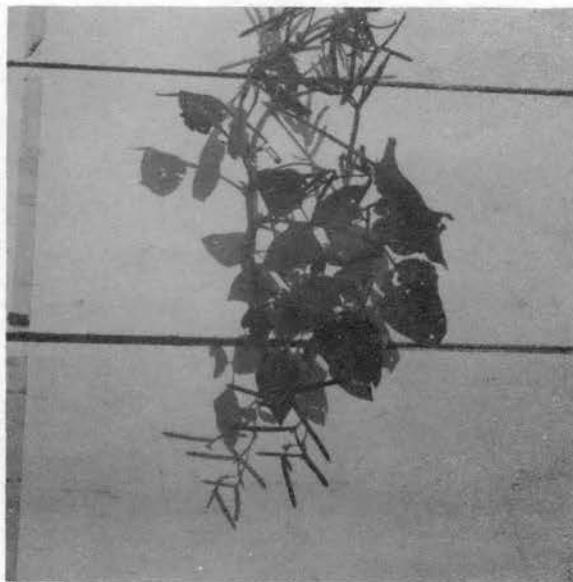


Figure 4. P. I. 227754 illustrates the smooth leaf type characteristic.

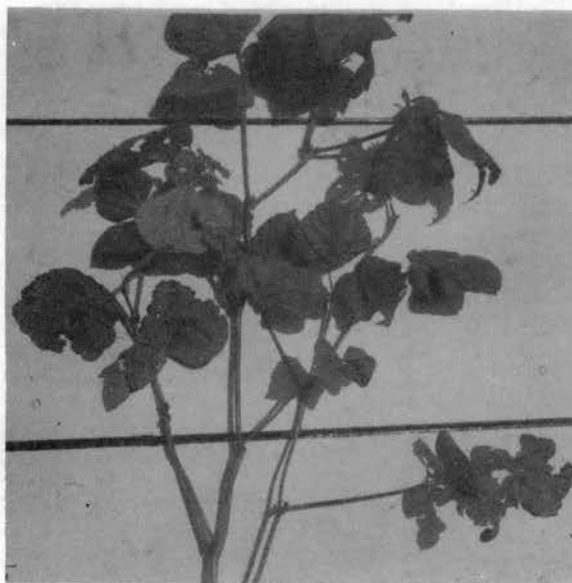


Figure 5. P. I. 200840 illustrates the rough or wrinkled leaf appearance.

very small amount of stem tissue. Since leaves are more desirable than stems in determining forage value, an estimate of the leafiness of a plant may be a good estimate of the forage value of the plant. Table IV shows the distribution of types based on leafiness. The leafier strains generally were poor seed producers. Figure 6 shows a strain rated excellent and a strain rated poor in leafiness.

TABLE III
FREQUENCY DISTRIBUTION OF LEAF TEXTURE

Texture	No. of Strains	Percent
Smooth	11	8.0
Medium	56	40.6
Rough	71	51.4

TABLE IV
FREQUENCY DISTRIBUTION OF LEAFINESS

Leafiness	No. of Strains	Percent
Poor	13	9.4
Medium	76	55.1
Excellent	49	35.5

Lodging. The strains are classified as to the amount of lodging in Appendix Table VI. Table V illustrates the distribution of the lodging character. High winds caused much lodging which apparently resulted from the rank growth under the high moisture conditions.

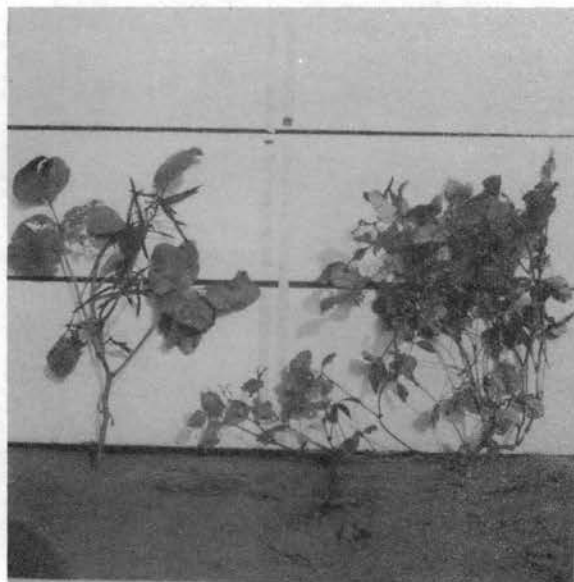


Figure 6. Jumbo (left) and P. I. 218103 (right) show poor and excellent leafiness.

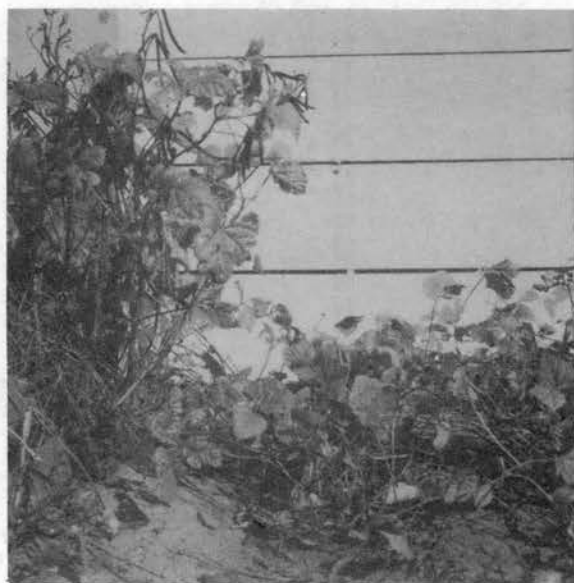


Figure 7. OK 55-78 (left) and Chivel 8726 (right) show none to very slight and severe lodging.

Lodging was probably more severe than usual. Figure 7 shows two strains differing in the amount of lodging. Strains that exhibited severe lodging would probably have high combine losses.

TABLE V
FREQUENCY DISTRIBUTION OF LODGING

Degree of Lodging	No. of Strains	Percent
None to slight	26	18.8
Some	69	50.0
Severe	43	31.2

Maturity. The mungbean strains were classified as early, medium early, medium late or late according to time of maturity (Appendix Table VII). Table VI shows the distribution of maturity types. The pods on the individual plants of each strain failed to mature uniformly. However, pods on early maturing strains tended to mature more evenly than pods on later maturing strains. The plants were considered mature when approximately 85% of the pods were ready for harvesting. Thirty plant introduction strains were late in maturing and some failed to set much seed after blooming (see Figure 10). Since some mungbeans are reported to respond to short day length, it would appear that some of these strains might be better adapted in a more southern location (1).

TABLE VI
FREQUENCY DISTRIBUTION OF MATURITY

Maturity	No. of Strains	Percent
Early	21	15.2
Medium early	59	42.8
Medium late	28	20.3
Late	30	21.7

Fruiting Characters

Flower color. The open flowers of all strains were light yellow in color. The bases of the wings and keel tended to show a light purple tinge in most strains. However, five strains were noted that had no purple tinge. The strains exhibiting this lack of purple tinge were the same strains that were noted earlier as being devoid of the purple pigment. The flowers of these strains appeared to be a more brilliant yellow than flowers showing the purple tinge.

Pod length. Pod length between strains and within strains was quite variable. The variances for ten sub-samples for each strain were calculated. Bartlett's test of homogeneity gave a chi square value of 451.7. This large a value indicates a highly significant difference in the variances of pod lengths within strains. Pod length of the strains were classified as short, medium or long in Appendix Table VIII and their distributions are presented graphically in Figure 8.

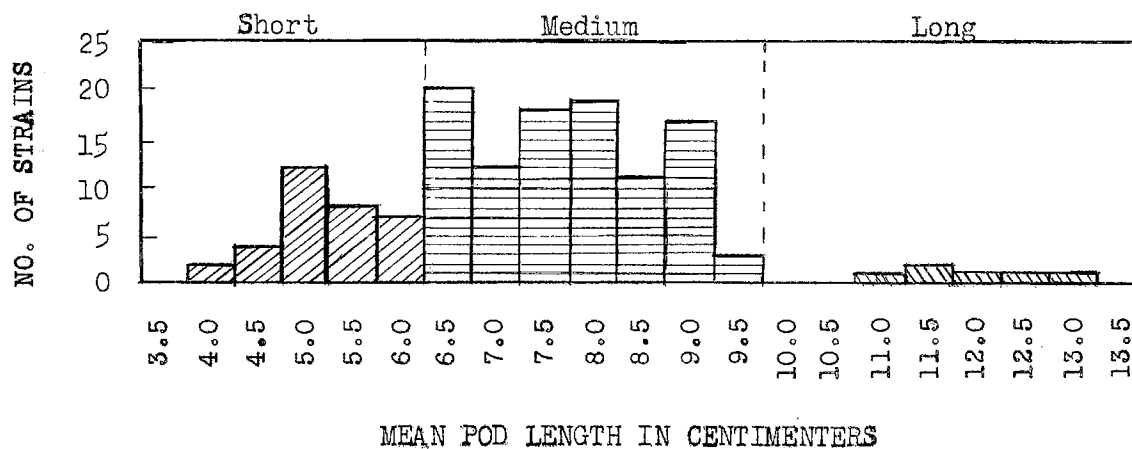


Figure 8. Frequency histogram of mean pod length of 138 mungbean strains grown at Perkins and Stillwater, 1957.

Mean number of seeds per pod. The strains were classified as few, medium or many as to the average number of seeds per pod (Appendix Table IX). The distribution of average seeds per pod is illustrated in Figure 9. The results of a simple linear correlation of number of seeds per pod and pod length are shown in Table VII. Their values ranged from 0.326 to 0.896. Five strains showed highly significant correlations, two strains showed significant correlations and three strains were not significantly correlated. It appears that the number of seeds per pod and pod length are not always as closely correlated as one might expect.

Pod color. Although there are varying degrees of pod color, yellow, brown and black appear to be the most useful in the classification. Since these colors form a continuous distribution from one class to another, classification of pod color was often very difficult. The yellow colored class (which includes greenish-yellow to yellow) is fairly definite; however, the brown class includes considerable variation from a light brown to a very dark brown color. There is the possibility of putting some of the very dark brown colors in the black

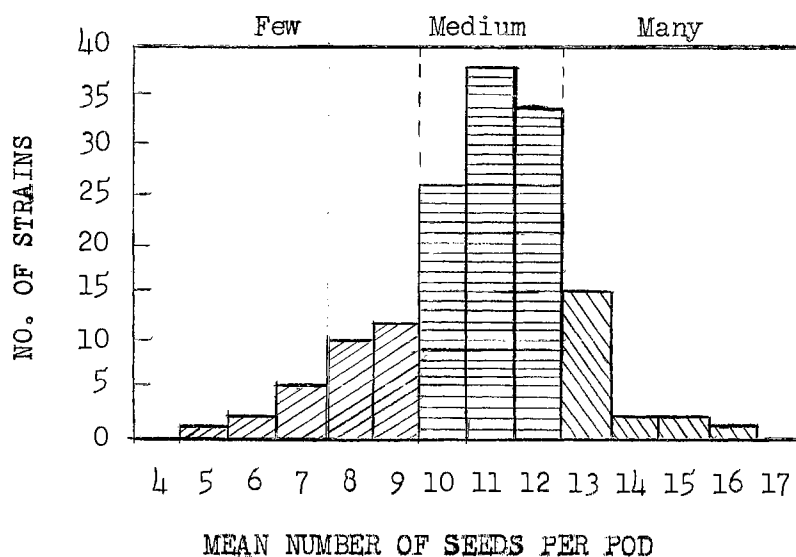


Figure 9. Frequency histogram of mean number of seeds per pod of 138 mungbean strains grown at Perkins and Stillwater, 1957.

TABLE VII

CORRELATION COEFFICIENTS OF SEEDS PER POD AND
POD LENGTH OF TEN MUNGBEAN STRAINS

Variety	Correlation Coefficient ^{1/}
Chivel 8726	0.522
Golden	0.751*
Ill. 3	0.326
Jumbo (Palecek)	0.890**
Korean 8343	0.765**
Okla. - 12	0.612
P.I. 223711	0.714*
Purdue	0.896**
Pusa	0.847**
Stritzaka	0.803**

^{1/}Calculations based on 10 pods for each strain.

*Significant

**Highly significant

class. Some variation of pod color was noted on single plants. The lighter colored pods were usually located near the top of the plant, while the dark colors were located in lower positions, indicating that pods tend to turn a darker color with maturity. Color class distribution is shown in Table VIII. The classification of strains based on pod color is shown in Appendix Table X.

TABLE VIII
FREQUENCY DISTRIBUTION OF POD COLOR

Pod Color	No. of Strains	Percent
Yellow	19	13.8
Brown	94	68.1
Black	24	17.4
Mixed	1	0.7

Seed productivity. The strains were rated as excellent, good, fair or poor according to their productivity (Appendix Table XI). The distribution of seed productivity ratings is shown in Table IX. Although a variety yield test will give a more accurate comparison of seed productivity, an estimate by observation can eliminate those strains which are poor producers. Only the strains rated good or excellent in this study show any promise of possessing desirable seed production factors. Figure 10 shows a comparison between an excellent seed producer and a poor seed producer.

Seed surface. Seed surface was one of the easiest characters to recognize. The strains were classified as dull or shiny on the basis of seed surface (Appendix Table XII). Table X shows the frequency

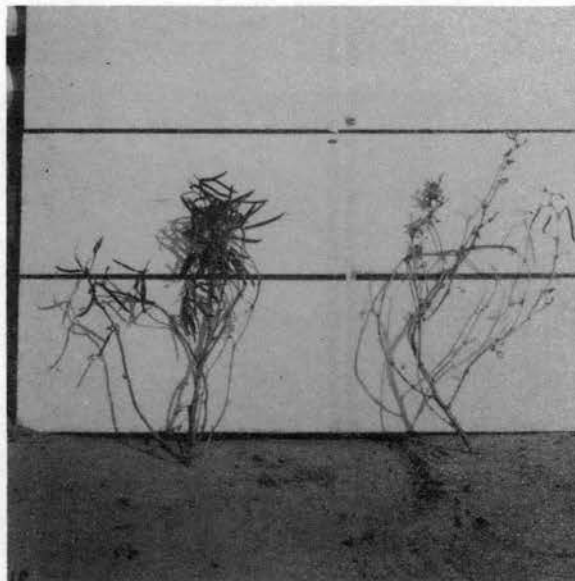


Figure 10. S-12-201 (left) and P. I. 223003 (right) show excellent and poor seed productivity. The leaves have been removed.

distribution of seed surface types. The seed surface character seems to be very important since most commercial sprouters insist on the shiny or so called "Oriental" types of mungbeans. Yellow seeds may be either shiny or dull. However, shiny yellow seeds are not as glossy in appearance as are the shiny green seeds.

TABLE IX
FREQUENCY DISTRIBUTION OF SEED PRODUCTIVITY

Estimated Yield	No. of Strains	Percent
Poor	41	29.7
Fair	33	23.9
Good	33	23.9
Excellent	31	22.5

TABLE X
FREQUENCY DISTRIBUTION OF SEED SURFACE

Surface	No. of Strains	Percent
Shiny	105	76.1
Dull	28	20.3
Mixed	5	3.6

Seed color. Seed color was quite easy to distinguish. The strains were classified as yellow, green, brown or black on the basis of their seed colors (Appendix Table XIII). The distribution of seed colors is shown in Table XI. The black types were somewhat mottled while the

other colors appeared to be uniformly one color, except for the white hilums. Although there appears to be variations in the green color, distinct shades were difficult to determine. The color green in this classification includes shades of green varying from olive green to light green.

TABLE XI
FREQUENCY DISTRIBUTION OF SEED COLOR

Color	No. of Strains	Percent
Yellow	5	3.6
Green	124	89.9
Brown	3	2.2
Black	6	4.3

Seed size. The strains were classified as small, medium small, medium large or large on seed size (Appendix Table XIV). Figure 11 shows the distribution of average seed sizes. Although the seeds examined appeared fairly uniform in size, environmental factors may have an effect making the value of absolute measurements questionable.

Seed shape. The strains were classified on seed shape as square, round or intermediate ends (Appendix Table XV). The class intermediate includes those strains that had both square and round seed ends. In most cases the distinction of class was fairly easy. However, in some instances classification was difficult and strains were put in the intermediate class if there was a doubt as to which class it belonged. Table XII shows the frequency distribution of seed shape. The shape of the seed ends appears to be a fairly good character to use in classifying the strains.

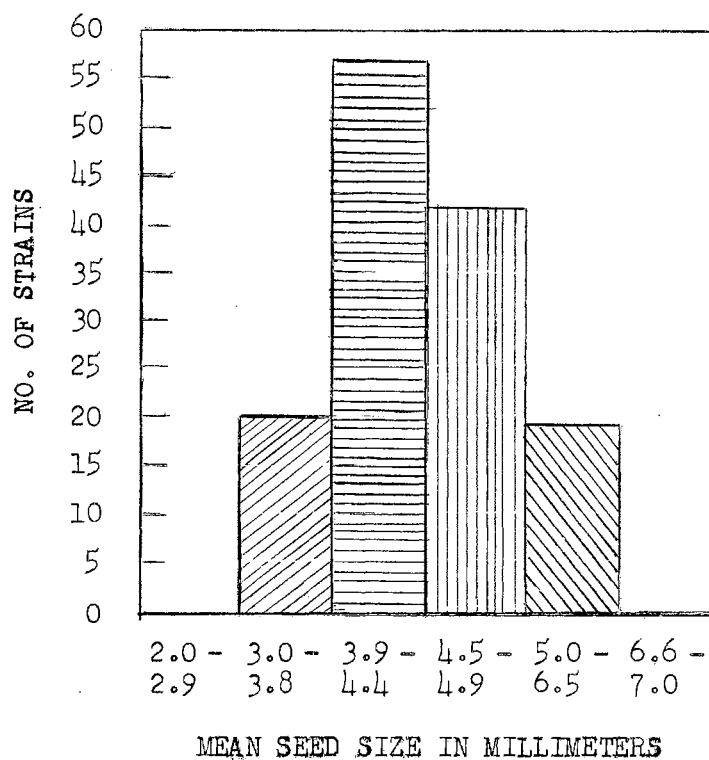


Figure 11. Frequency histogram of mean seed size of 138 mungbean strains grown at Perkins and Stillwater, 1957

TABLE XII
FREQUENCY DISTRIBUTION OF SEED SHAPE

Shape	No. of Strain	Percent
Round	46	33.3
Intermediate	48	34.8
Square	44	31.9

Seed quality. The strains were classified as poor, fair, good or excellent based on this character (Appendix Table XVI). The distribution of seed quality is shown in Table XIII. Demands of the commercial sprouters largely determine the seed quality factors. This classi-

fication of seed quality is based on those factors considered important by the commercial sprouters. Strains rated poor on seed quality had one or more of the following undesirable characteristics: (1) small seed, (2) lack of uniformity of size and shape, (3) lack of plumpness (wrinkled seed coats) and (4) discolored and diseased seed.

TABLE XIII
FREQUENCY DISTRIBUTION OF SEED QUALITY

Quality	No. of Strains	Percent
Poor	47	34.1
Fair	61	44.2
Good	24	17.4
Excellent	6	4.3

Summaries of the vegetative and fruiting characteristics studied in 1957, are shown in Appendix Tables XVII and XVIII, respectively.

SUMMARY AND CONCLUSIONS

A survey of 138 mungbean strains was conducted at the Perkins and Stillwater Agronomy farms in the summer of 1957. Notes were taken during the growing season and further studies were made in the laboratory to determine the most useful agronomic and botanical characters to be used in a classification.

The characters that appeared to be most useful in the classification were:

- | | |
|---|------------------------------|
| (1) Growth habit | (9) Seed productivity |
| (2) Height | (10) Number of seeds per pod |
| (3) Absence or presence of purple plant pigment | (11) Pod color |
| (4) Leaf size | (12) Seed surface |
| (5) Leaf texture | (13) Seed color |
| (6) Leafiness | (14) Seed size |
| (7) Lodging | (15) Seed shape |
| (8) Maturity | (16) Seed quality |

Pod length and number of seeds per pod appeared to be highly correlated in some strains but only slightly correlated in other strains.

There was a highly significant difference in the variances of pod length of the different strains.

This study was not designed as a genetic study; however, some assumptions may be made from the data collected. Seed color, seed

surface and absence or presence of purple plant pigment formed discontinuous distributions and are probably controlled by only one or two factor pairs. Pod color, although forming color classes of yellow, brown and black, appeared to form continuous distributions from one class to the other indicating that pod color is not controlled by a single factor pair.

Further genetical and breeding studies on mungbeans are needed to establish the breeding behavior of the various characters. This classification furnishes a starting point for such studies.

Further studies are needed to determine the dependability of the expression of the characters in this classification under various environmental conditions.

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APPENDIX

APPENDIX TABLE I

GROWTH HABIT CLASSIFICATION OF 138 MUNGBEAN STRAINS
GROWN AT PERKINS AND STILLWATER, 1957

	Bush		Semi-Vine	Vine
Golden	Pusa 23-8394	P.I. 217954	Chivel 8726	Korean 8343
Green	Pusa 28	P.I. 217955	Indian 8262	S-12-127-1
Green Mung	Pusa 288344-1	P.I. 217956	Th x P-188	S-12-200
(Ga.)	Pusa 288344-3	P.I. 217957	P.I. 211066	S-125
Ill. 3	S-12-126	P.I. 218103	P.I. 211735	
Ill. 3-3	S-12-128-1	P.I. 219699	P.I. 211736	
Jumbo	S-12-128-4	P.I. 220108	P.I. 212109	
Jumbo	S-12-128-6	P.I. 220303	P.I. 212319	
(Palecek)	S-12-186	P.I. 220672	P.I. 212907	
Jumbo	S-12-201	P.I. 220816	P.I. 212908	
(Texas)	S-12-204	P.I. 222116	P.I. 213015	
K 853-1	S-12-213	P.I. 222816	P.I. 214062	
Korean 2310	S-12-701	P.I. 223280	P.I. 214063	
M.B. Indian	S-12-2320	P.I. 223522	P.I. 214334	
Mungo (Ga.)	S-185	P.I. 223523	P.I. 220304	
O. Mungs	Sel. 44	P.I. 223710	P.I. 220305	
Okla. - 12	Stritzaka	P.I. 226658	P.I. 220815	
OK 55-1	Stritzaka	P.I. 227754	P.I. 223002	
OK 55-5	12-9	P.I. 229707	P.I. 223003	
OK 55-6	Stritzaka		P.I. 223281	
OK 55-10	12-87		P.I. 223711	
OK 55-25	Th x P-62		P.I. 223802	
OK 55-26	Th x P-226188		P.I. 227041	
OK 55-35	328-38-211		P.I. 227247	
OK 55-41	329-28		P.I. 227248	
OK 55-44	P.I. 164301		P.I. 227291	
OK 55-47	P.I. 164301-3		P.I. 229708	
OK 55-48	P.I. 164336-4			
OK 55-51	P.I. 164720			
OK 55-64	P.I. 164778			
OK 55-67	P.I. 179960-1			
OK 55-69	P.I. 183065			
OK 55-70	P.I. 197019			
OK 55-77	P.I. 207504			
OK 55-78	P.I. 211067			
OK 55-79	P.I. 211612			
OK 55-81	P.I. 211613			
OK 55-82	P.I. 211614			
OK 55-90	P.I. 211615			
OK 55-92	P.I. 211737			
OK 55-99	P.I. 212614			
Purdue	P.I. 212909			
Purdue 2-1	(Mungo)			
Purdue 2-2	P.I. 214335			
Purdue 3	P.I. 215650			
Pusa	P.I. 217953			

 Bush and Vine

 S-12-199
 Yreba Mung

APPENDIX TABLE II

PLANT HEIGHT CLASSIFICATION OF 138 MUNGBEAN STRAINS
GROWN AT PERKINS AND STILLWATER, 1957

Short 3 to 5 dm.	Medium 5.5 to 8 dm.	Tall 8.5 to 11 dm.
Ill. 3-3	Chivel 8726	328-38-211
Korean 2310	Green	329-28
Korean 8343	Green Mung (Ga.)	P.I. 164301
O. Mungs	Ill. 3	P.I. 164301-3
Okla. - 12	Indian 8262	P.I. 164336-4
OK 55-1	Jumbo	P.I. 164720
OK 55-6	Jumbo (Palecek)	P.I. 164778
OK 55-26	Jumbo (Texas)	P.I. 179960-1
OK 55-35	K 853-1	P.I. 183065
OK 55-41	M.B. Indian	P.I. 207504
OK 55-44	Mungo (Ga.)	P.I. 211066
OK 55-67	OK 55-5	P.I. 211067
OK 55-69	OK 55-10	P.I. 211612
OK 55-79	OK 55-25	P.I. 211613
OK 55-90	OK 55-47	P.I. 211614
S-12-186	OK 55-48	P.I. 212109
S-12-201	OK 55-51	P.I. 212319
S-12-204	OK 55-64	P.I. 214062
S-12-213	OK 55-70	P.I. 214063
S-12-2320	OK 55-77	P.I. 214335
S-185	OK 55-78	P.I. 217954
Stritzaka 12-9	OK 55-81	P.I. 217955
Stritzaka 12-87	OK 55-82	P.I. 217956
Yreba Mung	OK 55-92	P.I. 217957
P.I. 212909	OK 55-99	P.I. 218103
(Mungo)	Purdue	P.I. 219699
P.I. 227754	Purdue 2-1	P.I. 220108
P.I. 229708	Purdue 2-2	P.I. 220303
	Purdue 3	P.I. 220304
	Pusa	P.I. 220305
	Pusa 23-8394	P.I. 220815
	Pusa 28	P.I. 220816
	Pusa 288344-1	P.I. 222116
	Pusa 288344-3	P.I. 222816
	S-12-126	P.I. 223002
	S-12-127-1	P.I. 223003
	S-12-128-1	P.I. 223280
	S-12-128-4	P.I. 223281
	S-12-128-6	P.I. 223522
	S-12-200	P.I. 223523
	S-12-701	P.I. 223710
	S-125	P.I. 226658
	Sel. 44	P.I. 227247
	Stritzaka	P.I. 227248
	Th x P-62	P.I. 229707
	Th x P-188	
	Th x P-226188	
		Golden
		S-12-199
		P.I. 197019
		P.I. 211615
		P.I. 211735
		P.I. 211736
		P.I. 211737
		P.I. 212614
		P.I. 212907
		P.I. 212908
		P.I. 213015
		P.I. 214334
		P.I. 215650
		P.I. 217953
		P.I. 220672
		P.I. 223711
		P.I. 223802
		P.I. 227041
		P.I. 227291

APPENDIX TABLE III

LEAF SIZE CLASSIFICATION OF 138 MUNGBEAN STRAINS
GROWN AT PERKINS AND STILLWATER, 1957

Small	Medium		Large	
Korean 2310	Chivel 8726	Th x P-62	P.I. 223280	Green
Korean 8343	Golden	Th x P-188	P.I. 223281	Jumbo
O. Mungs	Green Mung	Th x P-226188	P.I. 223522	Jumbo (Palecek)
Okla. - 12	(Ga.)	328-38-211	P.I. 223523	Jumbo (Texas)
S-12-127-1	Ill. 3	329-28	P.I. 223710	OK 55-26
S-12-186	Ill. 3-3	P.I. 164301	P.I. 223802	OK 55-35
S-12-213	Indian 8262	P.I. 164301-3	P.I. 227041	OK 55-41
S-12-2320	K 853-1	P.I. 164336-4	P.I. 227247	OK 55-47
S-125	M.B. Indian	P.I. 164720	P.I. 227248	OK 55-48
S-185	Mungo (Ga.)	P.I. 179960-1	P.I. 227291	OK 55-51
Stritzaka	OK 55-1	P.I. 183065	P.I. 229707	OK 55-77
12-9	OK 55-5	P.I. 197019	P.I. 229708	P.I. 164778
Stritzaka	OK 55-6	P.I. 207504		P.I. 212907
12-87	OK 55-10	P.I. 211066		P.I. 212908
Yreba Mung	OK 55-25	P.I. 211067		P.I. 213015
P.I. 218103	OK 55-44	P.I. 211612		P.I. 214334
P.I. 220815	OK 55-64	P.I. 211613		P.I. 223711
P.I. 226658	OK 55-67	P.I. 211614		
P.I. 227754	OK 55-69	P.I. 211615		
	OK 55-70	P.I. 211735		
	OK 55-78	P.I. 211736		
	OK 55-79	P.I. 211737		
	OK 55-81	P.I. 212109		
	OK 55-82	P.I. 212319		
	OK 55-90	P.I. 212614		
	OK 55-92	P.I. 212909		
	OK 55-99	(Mungo)		
	Purdue	P.I. 214062		
	Purdue 2-1	P.I. 214063		
	Purdue 2-2	P.I. 214335		
	Purdue 3	P.I. 215650		
	Pusa	P.I. 217953		
	Pusa 23-8394	P.I. 217954		
	Pusa 28	P.I. 217955		
	Pusa 288344-1	P.I. 217956		
	Pusa 288344-3	P.I. 217957		
	S-12-126	P.I. 219699		
	S-12-128-1	P.I. 220108		
	S-12-128-4	P.I. 220303		
	S-12-128-6	P.I. 220304		
	S-12-199	P.I. 220305		
	S-12-200	P.I. 220672		
	S-12-201	P.I. 220816		
	S-12-204	P.I. 222116		
	S-12-701	P.I. 222816		
	Sel. 44	P.I. 223002		
	Stritzaka	P.I. 223003		

APPENDIX TABLE IV

LEAF TEXTURE CLASSIFICATION OF 138 MUNGBEAN STRAINS
GROWN AT PERKINS AND STILLWATER, 1957

Smooth	Medium	Rough
Korean 8343	Chivel 8726	328-38-211
O. Mungs	Green	329-28
Okla. - 12	Ill. 3	P.I. 164301
S-12-127-1	Ill. 3-3	P.I. 164301-3
S-12-186	Indian 8262	P.I. 164336-4
S-12-2320	K 853-1	P.I. 164778
S-125	Korean 2310	P.I. 179960-1
S-185	OK 55-1	P.I. 183065
Stritzaka	OK 55-6	P.I. 214063
12-87	OK 55-10	P.I. 223522
Yreba Mung	OK 55-26	P.I. 223802
P.I. 227754	OK 55-35	
	OK 55-41	
	OK 55-44	
	OK 55-67	
	OK 55-69	
	OK 55-79	
	OK 55-81	
	OK 55-82	
	OK 55-90	
	Purdue	
	Purdue 2-1	
	Purdue 2-2	
	Purdue 3	
	Pusa	
	Pusa 23-8394	
	Pusa 28	
	Pusa 288344-1	
	Pusa 288344-3	
	S-12-126	
	S-12-128-1	
	S-12-128-4	
	S-12-128-6	
	S-12-199	
	S-12-200	
	S-12-201	
	S-12-204	
	S-12-213	
	S-12-701	
	Sel. 44	
	Stritzaka	
	Stritzaka	
	12-9	
	Th x P-62	
	Th x P-188	
	Th x P-226188	
	Golden	P.I. 217956
	Green Mung	P.I. 217957
	(Ga.)	P.I. 218103
	Jumbo	P.I. 219699
	Jumbo	P.I. 220108
	(Palecek)	P.I. 220303
	Jumbo(Texas)	P.I. 220304
	M.B. Indian	P.I. 220305
	Mungo (Ga.)	P.I. 220672
	OK 55-5	P.I. 220815
	OK 55-25	P.I. 220816
	OK 55-47	P.I. 222116
	OK 55-48	P.I. 222816
	OK 55-51	P.I. 223002
	OK 55-64	P.I. 223003
	OK 55-70	P.I. 223280
	OK 55-77	P.I. 223281
	OK 55-78	P.I. 223523
	OK 55-92	P.I. 223710
	OK 55-99	P.I. 223711
	P.I. 164720	P.I. 226658
	P.I. 197019	P.I. 227041
	P.I. 207504	P.I. 227247
	P.I. 211066	P.I. 227248
	P.I. 211067	P.I. 227291
	P.I. 211612	P.I. 229707
	P.I. 211613	P.I. 229708
	P.I. 211614	
	P.I. 211615	
	P.I. 211735	
	P.I. 211736	
	P.I. 211737	
	P.I. 212109	
	P.I. 212319	
	P.I. 212614	
	P.I. 212907	
	P.I. 212908	
	P.I. 212909	
	(Mungo)	
	P.I. 213015	
	P.I. 214062	
	P.I. 214334	
	P.I. 214335	
	P.I. 215650	
	P.I. 217953	
	P.I. 217954	
	P.I. 217955	

APPENDIX TABLE V

LEAFINESS CLASSIFICATION OF 138 MUNGBEAN STRAINS
GROWN AT PERKINS AND STILLWATER, 1957

Poor	Medium	Excellent
Jumbo	Ill. 3	Stritzaka 12-87
Korean 2310	Ill. 3-3	Th x P-62
Mungo (Ga.)	Jumbo (Palecek)	Yreba Mung
OK 55-25	Jumbo (Texas)	328-38-211
OK 55-48	K 853-1	329-28
OK 55-51	Korean 8343	P.I. 164301
OK 55-64	M.B. Indian	P.I. 164301-3
OK 55-81	O. Mungs	P.I. 164720
OK 55-82	Okla. - 12	P.I. 179960-1
Pusa	OK 55-1	P.I. 207504
S-12-127-1	OK 55-5	P.I. 211066
S-12-701	OK 55-6	P.I. 211735
P.I. 164778	OK 55-10	P.I. 211736
	OK 55-26	P.I. 212319
	OK 55-35	P.I. 212907
	OK 55-41	P.I. 212908
	OK 55-44	P.I. 213015
	OK 55-47	P.I. 214063
	OK 55-67	P.I. 214334
	OK 55-69	P.I. 219699
	OK 55-70	P.I. 220305
	OK 55-77	P.I. 220672
	OK 55-79	P.I. 220816
	OK 55-90	P.I. 222116
	OK 55-92	P.I. 223281
	OK 55-99	P.I. 223522
	Purdue	P.I. 223711
	Purdue 2-1	P.I. 227247
	Purdue 2-2	P.I. 227754
	Purdue 3	
	Pusa 23-8394	P.I. 217953
	Pusa 28	P.I. 217954
	Pusa 288344-1	P.I. 217955
	Pusa 288344-3	P.I. 217956
	S-12-126	P.I. 217957
	S-12-128-4	P.I. 218103
	S-12-186	P.I. 220108
	S-12-199	P.I. 220303
	S-12-201	P.I. 220304
	S-12-204	P.I. 220815
	S-12-213	P.I. 222816
	S-12-2320	P.I. 223002
	S-125	P.I. 223003
	S-185	P.I. 223280
	Sel. 44	P.I. 223523
	Stritzaka	P.I. 223710
	Stritzaka 12-9	P.I. 223802
		P.I. 226658
		P.I. 227041
		P.I. 227248
		P.I. 227291
		P.I. 229707
		P.I. 229708

(Mungo)

APPENDIX TABLE VI

 LODGING CLASSIFICATION OF 138 MUNGBEAN STRAINS
 GROWN AT PERKINS AND STILLWATER, 1957

None to Slight	Some	Severe
Golden	Jumbo	Chivel 8726
Green Mung (Ga.)	Korean 2310	Green
Ill. 3-3	M.B. Indian	Ill. 3
Korean 8343	Mungo (Ga.)	Indian 8262
O. Mungs	OK 55-5	Jumbo (Palecek)
Okla. - 12	OK 55-6	Jumbo (Texas)
OK 55-44	OK 55-10	K 853-1
OK 55-70	OK 55-25	OK 55-1
OK 55-77	OK 55-48	OK 55-26
OK 55-78	OK 55-51	OK 55-35
OK 55-79	OK 55-67	OK 55-41
S-12-186	OK 55-69	OK 55-47
S-12-213	Purdue 2-1	OK 55-64
S-12-2320	Pusa	OK 55-81
S-125	S-12-126	OK 55-82
S-185	S-12-127-1	OK 55-90
Yreba Mung	S-12-128-6	OK 55-92
P.I. 197019	S-12-199	OK 55-99
P.I. 211066	S-12-201	Purdue
P.I. 211067	S-12-204	Purdue 2-2
P.I. 211614	Stritzaka 12-9	Purdue 3
P.I. 212909	Stritzaka 12-87	Pusa 23-8394
(Mungo)	Th x P-62	Pusa 28
P.I. 214335	328-38-211	Pusa 288344-1
P.I. 222816	P.I. 164301	Pusa 288344-3
P.I. 223003	P.I. 164336-4	S-12-128-1
P.I. 227754	P.I. 207504	S-12-128-4
	P.I. 211612	S-12-200
	P.I. 211613	S-12-701
	P.I. 211615	Sel. 44
	P.I. 211735	Stritzaka
	P.I. 211736	Th x P-188
	P.I. 211737	Th x P-226188
	P.I. 212109	329-28
	P.I. 212319	P.I. 164301-3
	P.I. 212614	P.I. 164720
	P.I. 214062	P.I. 164778
	P.I. 214334	P.I. 179960-1
	P.I. 215650	P.I. 183065
	P.I. 217953	P.I. 212907
	P.I. 217954	P.I. 212908
	P.I. 217955	P.I. 213015
	P.I. 217956	P.I. 214063
	P.I. 217957	
	P.I. 218103	
	P.I. 219699	
	P.I. 220108	

APPENDIX TABLE VII

MATURITY CLASSIFICATION OF 138 MUNGBEAN STRAINS
GROWN AT PERKINS AND STILLWATER, 1957

Early	Medium Early		Medium Late	Late
Korean 2310	Green	Purdue 2-2	Chivel 8726	P.I. 197019
Korean 8343	Ill. 3	Purdue 3	Golden	P.I. 211066
M.B. Indian	Ill. 3-3	Pusa	Green Mung	P.I. 211067
O. Mungs	Indian 8262	Pusa 23-8394	(Ga.)	P.I. 211612
Okla. - 12	Jumbo	Pusa 28	Mungo (Ga.)	P.I. 211613
OK 55-44	Jumbo	Pusa 288344-1	P.I. 164301	P.I. 211614
OK 55-67	(Palecek)	Pusa 288344-3	P.I. 207504	P.I. 211615
OK 55-69	Jumbo (Texas)	S-12-128-1	P.I. 212319	P.I. 211735
OK 55-79	K 853-1	S-12-128-4	P.I. 212614	P.I. 211736
S-12-126	OK 55-1	S-12-128-6	P.I. 212907	P.I. 211737
S-12-127-1	OK 55-5	S-12-199	P.I. 212908	P.I. 212109
S-12-186	OK 55-6	S-12-200	P.I. 212909	P.I. 217955
S-12-201	OK 55-10	S-12-204	(Mungo)	P.I. 217956
S-12-213	OK 55-25	S-12-701	P.I. 213015	P.I. 218103
S-12-2320	OK 55-26	S-125	P.I. 214062	P.I. 220108
S-185	OK 55-35	Sel. 44	P.I. 214335	P.I. 220303
Stritzaka 12-9	OK 55-41	Stritzaka	P.I. 215650	P.I. 220304
Stritzaka	OK 55-47	Th x P-62	P.I. 217953	P.I. 220305
12-87	OK 55-48	Th x P-188	P.I. 217954	P.I. 220672
Yreba Mung	OK 55-51	Th x P-226188	P.I. 217957	P.I. 220815
329-28	OK 55-64	328-38-211	P.I. 219699	P.I. 222816
P.I. 227754	OK 55-70	P.I. 164301-3	P.I. 220816	P.I. 223002
	OK 55-77	P.I. 164336-4	P.I. 222116	P.I. 223003
	OK 55-78	P.I. 164720	P.I. 223522	P.I. 223280
	OK 55-81	P.I. 164778	P.I. 223523	P.I. 223281
	OK 55-82	P.I. 179960-1	P.I. 223711	P.I. 223710
	OK 55-90	P.I. 183065	P.I. 227247	P.I. 223802
	OK 55-92	P.I. 214063	P.I. 227248	P.I. 226658
	OK 55-99	P.I. 214334	P.I. 229707	P.I. 227041
	Purdue		P.I. 229707	P.I. 227291
	Purdue 2-1			

APPENDIX TABLE VIII

MEAN POD LENGTH CLASSIFICATION OF 138 MUNGBEAN STRAINS
GROWN AT PERKINS AND STILLWATER, 1957.

Short 4.0 - 6.0 cm.	Medium 6.5 - 9.5 cm.	Long 10.0 - 13.0 cm.	
Mungo (Ga.)	Chivel 8726	S-12-128-1 P.I. 220816	Green
P.I. 211066	Golden	S-12-128-4 P.I. 223522	Jumbo (Palecek)
P.I. 211612	Green Mung	S-12-128-6 P.I. 223523	OK 55-1
P.I. 211613	(Ga.)	S-12-186 P.I. 223710	OK 55-26
P.I. 211614	Ill. 3	S-12-199 P.I. 223711	OK 55-35
P.I. 211615	Ill. 3-3	S-12-200 P.I. 227247	OK 55-41
P.I. 211735	Indian 8262	S-12-201 P.I. 227248	
P.I. 211736	Jumbo	S-12-204 P.I. 227754	
P.I. 211737	Jumbo (Texas)	S-12-213 P.I. 229707	
P.I. 212109	K 853-1	S-12-701 P.I. 229708	
P.I. 212319	Korean 2310	S-12-2320	
P.I. 212909	Korean 8343	S-125	
(Mungo)	M.B. Indian	S-185	
P.I. 214335	O. Mungs	Sel. 44	
P.I. 215650	Okla. - 12	Stritzaka	
P.I. 217955	OK 55-5	Stritzaka 12-9	
P.I. 217957	OK 55-6	Stritzaka	
P.I. 218103	OK 55-10	12-87	
P.I. 220108	OK 55-25	Th x P-62	
P.I. 220303	OK 55-44	Th x P-188	
P.I. 220304	OK 55-47	Th x P-226188	
P.I. 220305	OK 55-48	Yreba Mung	
P.I. 220815	OK 55-51	328-38-211	
P.I. 222116	OK 55-64	329-28	
P.I. 222816	OK 55-67	P.I. 164301	
P.I. 223002	OK 55-69	P.I. 164301-3	
P.I. 223003	OK 55-70	P.I. 164336-4	
P.I. 223280	OK 55-77	P.I. 164720	
P.I. 223281	OK 55-78	P.I. 164778	
P.I. 223802	OK 55-79	P.I. 179960-1	
P.I. 226658	OK 55-81	P.I. 183065	
P.I. 227041	OK 55-82	P.I. 197019	
P.I. 227291	OK 55-90	P.I. 207504	
	OK 55-92	P.I. 211067	
	OK 55-99	P.I. 212614	
	Purdue	P.I. 212907	
	Purdue 2-1	P.I. 212908	
	Purdue 2-2	P.I. 213015	
	Purdue 3	P.I. 214062	
	Pusa	P.I. 214063	
	Pusa 23-8394	P.I. 214334	
	Pusa 28	P.I. 217953	
	Pusa 288344-1	P.I. 217954	
	Pusa 288344-3	P.I. 217956	
	S-12-126	P.I. 219699	
	S-12-127-1	P.I. 220672	

APPENDIX TABLE IX

MEAN NUMBER OF SEEDS PER POD CLASSIFICATION OF 138 MUNGBEAN STRAINS GROWN AT PERKINS AND STILLWATER, 1957

Few 5 to 9	Medium 10 to 12		Many 13 to 16
Korean 8343	Chivel 8726	S-12-201	Green
Mungo (Ga.)	Golden	S-12-204	Green Mung (Ga.)
O. Mungs	Ill. 3	S-12-213	Jumbo (Palecek)
Okla. - 12	Ill. 3-3	S-12-701	Jumbo (Texas)
OK 55-44	Indian 8262	S-125	OK 55-1
S-12-2320	Jumbo	Sel. 44	OK 55-51
S-185	K 853-1	Stritzaka	S-12-200
Stritzaka 12-87	Korean 2310	Stritzaka 12-9	P.I. 164301
329-28	M.B. Indian	Th x P-62	P.I. 164336-4
P.I. 197019	OK 55-5	Th x P-188	P.I. 164720
P.I. 211612	OK 55-6	Th x P-226188	P.I. 207504
P.I. 211613	OK 55-10	Yreba Mung	P.I. 211067
P.I. 211614	OK 55-25	328-38-211	P.I. 223523
P.I. 211615	OK 55-26	P.I. 164301-3	P.I. 223711
P.I. 211735	OK 55-35	P.I. 164778	P.I. 227247
P.I. 211737	OK 55-41	P.I. 179960-1	
P.I. 212109	OK 55-47	P.I. 183065	
P.I. 212909	OK 55-48	P.I. 211066	
(Mungo)	OK 55-64	P.I. 211736	
P.I. 217955	OK 55-67	P.I. 212319	
P.I. 218103	OK 55-69	P.I. 212614	
P.I. 219699	OK 55-70	P.I. 212907	
P.I. 220108	OK 55-77	P.I. 212908	
P.I. 220303	OK 55-78	P.I. 213015	
P.I. 220304	OK 55-79	P.I. 214062	
P.I. 220815	OK 55-81	P.I. 214063	
P.I. 222816	OK 55-82	P.I. 214334	
P.I. 223002	OK 55-90	P.I. 214335	
P.I. 223281	OK 55-92	P.I. 215650	
P.I. 226658	OK 55-99	P.I. 217953	
P.I. 227041	Purdue	P.I. 217954	
	Purdue 2-1	P.I. 217956	
	Purdue 2-2	P.I. 217957	
	Purdue 3	P.I. 220305	
	Pusa	P.I. 220672	
	Pusa 23-8394	P.I. 220816	
	Pusa 28	P.I. 222116	
	Pusa 288344-1	P.I. 223003	
	Pusa 288344-3	P.I. 223280	
	S-12-126	P.I. 223522	
	S-12-127-1	P.I. 223710	
	S-12-128-1	P.I. 223802	
	S-12-128-4	P.I. 227248	
	S-12-128-6	P.I. 227291	
	S-12-186	P.I. 227754	
	S-12-199	P.I. 229707	
		P.I. 229708	

APPENDIX TABLE X

POD COLOR CLASSIFICATION OF 138 MUNGBEAN STRAINS
GROWN AT PERKINS AND STILLWATER, 1957

Yellow	Brown		Black	Mixed
Chivel 8726	Ill. 3	Yreba Mung	Green	OK 55-78
Golden	Ill. 3-3	328-38-211	Jumbo	
Green Mung (Ga.)	Indian 8262	P.I. 164301	Mungo (Ga.)	
OK 55-81	Jumbo	P.I. 164336-4	OK 55-1	
S-12-128-1	(Palecek)	P.I. 164720	OK 55-5	
S-12-128-6	Jumbo	P.I. 179960-1	OK 55-6	
P.I. 197019	(Texas)	P.I. 211066	OK 55-10	
P.I. 207504	K 853-1	P.I. 211067	OK 55-25	
P.I. 212907	Korean 2310	P.I. 211612	OK 55-26	
P.I. 212908	Korean 8343	P.I. 211613	OK 55-35	
P.I. 213015	M.B. Indian	P.I. 211614	OK 55-41	
P.I. 214062	O. Mungs	P.I. 211615	OK 55-64	
P.I. 214334	Okla. - 12	P.I. 211735	OK 55-67	
P.I. 217955	OK 55-44	P.I. 211736	OK 55-77	
P.I. 219699	OK 55-47	P.I. 211737	OK 55-79	
P.I. 223522	OK 55-48	P.I. 212109	OK 55-90	
P.I. 223523	OK 55-51	P.I. 212319	S-12-701	
P.I. 223711	OK 55-69	P.I. 212614	Stritzaka	
P.I. 223802	OK 55-70	P.I. 214335	12-9	
	OK 55-82	P.I. 215650	329-28	
	OK 55-92	P.I. 217953	P.I. 164301-3	
	OK 55-99	P.I. 217954	P.I. 164778	
	Purdue	P.I. 217956	P.I. 183065	
	Purdue 2-1	P.I. 217957	P.I. 212909	
	Purdue 2-2	P.I. 218103	(Mungo)	
	Purdue 3	P.I. 220108	P.I. 214063	
	Pusa	P.I. 220303		
	Pusa 23-8394	P.I. 220304		
	Pusa 28	P.I. 220305		
	Pusa 288344-1	P.I. 220672		
	Pusa 288344-3	P.I. 220815		
	S-12-126	P.I. 220816		
	S-12-127-1	P.I. 222116		
	S-12-128-4	P.I. 222816		
	S-12-186	P.I. 223002		
	S-12-199	P.I. 223003		
	S-12-200	P.I. 223280		
	S-12-201	P.I. 223281		
	S-12-204	P.I. 223710		
	S-12-213	P.I. 226658		
	S-12-2320	P.I. 227041		
	S-125	P.I. 227247		
	S-185	P.I. 227248		
	Sel. 44	P.I. 227291		
	Stritzaka	P.I. 227754		
	Stritzaka 12-87	P.I. 229707		
	Th x P-62	P.I. 229708		
	Th x P-188			
	Th x P-226188			

APPENDIX TABLE XI

SEED PRODUCTIVITY CHARACTERISTICS OF 138 MUNGBEAN STRAINS
GROWN AT PERKINS AND STILLWATER, 1957

Poor	Fair	Good	Excellent
Golden	Chivel 8726	Ill. 3	Jumbo
Green Mung (Ga.)	Green	Jumbo (Palecek)	Jumbo (Texas)
Mungo (Ga.)	Ill. 3-3	Korean 2310	Korean 8343
P.I. 164301	Indian 8262	OK 55-1	M.B. Indian
P.I. 197019	K 853-1	OK 55-5	O. Mungs
P.I. 211067	OK 55-25	OK 55-6	Okla. - 12
P.I. 211612	OK 55-78	OK 55-10	OK 55-47
P.I. 211613	OK 55-82	OK 55-26	OK 55-48
P.I. 211614	Pusa 28	OK 55-35	OK 55-64
P.I. 211615	S-12-128-4	OK 55-41	OK 55-70
P.I. 211735	S-12-128-6	OK 55-44	OK 55-77
P.I. 211736	S-12-199	OK 55-51	Purdue
P.I. 212109	S-12-200	OK 55-67	Purdue 2-1
P.I. 212319	Sel. 44	OK 55-69	Purdue 3
P.I. 212614	Stritzaka	OK 55-79	Pusa
P.I. 214062	Th x P-188	OK 55-81	Pusa 288344-1
P.I. 214335	328-38-211	OK 55-90	S-12-127-1
P.I. 215650	P.I. 183065	OK 55-92	S-12-186
P.I. 217953	P.I. 207504	OK 55-99	S-12-201
P.I. 217954	P.I. 211066	Purdue 2-2	S-12-204
P.I. 217955	P.I. 211737	Pusa 23-8394	S-12-701
P.I. 217956	P.I. 212907	Pusa 288344-3	S-12-2320
P.I. 217957	P.I. 212908	S-12-126	S-125
P.I. 218103	P.I. 212909	S-12-128-1	S-185
P.I. 220108	(Mungo)	S-12-213	Stritzaka 12-9
P.I. 220303	P.I. 214334	Th x P-226188	Stritzaka 12-87
P.I. 220304	P.I. 219699	329-28	Th x P-62
P.I. 220305	P.I. 220816	P.I. 164336-4	Yreba Mung
P.I. 220672	P.I. 223522	P.I. 164720	P.I. 164301-3
P.I. 220815	P.I. 223523	P.I. 213015	P.I. 164778
P.I. 222116	P.I. 223802	P.I. 214063	P.I. 179960-1
P.I. 222816	P.I. 227248	P.I. 223711	
P.I. 223002	P.I. 229707	P.I. 227754	
P.I. 223003	P.I. 229708		
P.I. 223280			
P.I. 223281			
P.I. 223710			
P.I. 226658			
P.I. 227041			
P.I. 227247			
P.I. 227291			

APPENDIX TABLE XII

SEED SURFACE CLASSIFICATION OF 138 MUNGBEAN STRAINS
GROWN AT PERKINS AND STILLWATER, 1957

	Shiny		Dull	Mixed
Chivel 8726	S-12-200	P.I. 223003	Golden	Jumbo (Texas)
Green	S-12-204	P.I. 223280	Mungo (Ga.)	S-12-201
Green Mung	S-12-213	P.I. 223281	OK 55-5	P.I. 212614
(Ga.)	S-12-701	P.I. 223522	OK 55-6	P.I. 214334
Ill. 3	S-12-2320	P.I. 223523	OK 55-10	P.I. 214335
Ill. 3-3	S-185	P.I. 223711	OK 55-25	
Indian 8262	Stritzaka	P.I. 223802	OK 55-82	
Jumbo	12-9	P.I. 226658	OK 55-90	
Jumbo	Stritzaka	P.I. 227041	OK 55-92	
(Palecek)	12-87	P.I. 227247	S-12-128-1	
K 853-1	Th x P-62	P.I. 227248	S-12-128-6	
Korean 2310	Th x P-188	P.I. 227291	S-125	
Korean 8343	Th x P-226188	P.I. 227754	Sel. 44	
M.B. Indian	Yreba Mung	P.I. 229707	Stritzaka	
O. Mungs	328-38-211	P.I. 229708	P.I. 164301	
Okla. - 12	329-28		P.I. 164301-3	
OK 55-1	P.I. 207504		P.I. 164336-4	
OK 55-26	P.I. 211066		P.I. 164720	
OK 55-35	P.I. 211612		P.I. 164778	
OK 55-41	P.I. 211613		P.I. 179960-1	
OK 55-44	P.I. 211614		P.I. 183065	
OK 55-47	P.I. 211615		P.I. 197019	
OK 55-48	P.I. 211735		P.I. 211067	
OK 55-51	P.I. 211736		P.I. 212909	
OK 55-64	P.I. 211737		(Mungo)	
OK 55-67	P.I. 212109		P.I. 214062	
OK 55-69	P.I. 212319		P.I. 214063	
OK 55-70	P.I. 212907		P.I. 217955	
OK 55-77	P.I. 212908		P.I. 223710	
OK 55-78	P.I. 213015			
OK 55-79	P.I. 215650			
OK 55-81	P.I. 217953			
OK 55-99	P.I. 217954			
Purdue	P.I. 217956			
Purdue 2-1	P.I. 217957			
Purdue 2-2	P.I. 218103			
Purdue 3	P.I. 219699			
Pusa	P.I. 220108			
Pusa 23-8394	P.I. 220303			
Pusa 28	P.I. 220304			
Pusa 288344-1	P.I. 220305			
Pusa 288344-3	P.I. 220672			
S-12-126	P.I. 220815			
S-12-127-1	P.I. 220816			
S-12-128-4	P.I. 222116			
S-12-186	P.I. 222816			
S-12-199	P.I. 223002			

APPENDIX TABLE XIII

SEED COLOR CLASSIFICATION OF 138 MUNGBEAN STRAINS
GROWN AT PERKINS AND STILLWATER, 1957

Yellow	Green			Brown
Golden	Chivel 8726	S-12-126	P.I. 212908	OK 55-82
OK 55-90	Green	S-12-127-1	P.I. 213015	P.I. 218103
OK 55-92	Green Mung	S-12-128-1	P.I. 214062	P.I. 220815
OK 55-99	(Ga.)	S-12-128-4	P.I. 214063	
P.I. 211067	Ill. 3	S-12-128-6	P.I. 214334	
	Ill. 3-3	S-12-186	P.I. 214335	
	Indian 8262	S-12-199	P.I. 215650	
	Jumbo	S-12-200	P.I. 217953	
	Jumbo	S-12-201	P.I. 217954	
	(Palecek)	S-12-204	P.I. 217955	
	Jumbo	S-12-213	P.I. 217956	
	(Texas)	S-12-701	P.I. 217957	
	K 853-1	S-12-2320	P.I. 219699	
	Korean 2310	S-125	P.I. 220108	
	Korean 8343	S-185	P.I. 220303	
	M.B. Indian	Sel. 44	P.I. 220304	
	O. Mungs	Stritzaka	P.I. 220305	
	Okla. - 12	Stritzaka 12-9	P.I. 220672	
	OK 55-1	Stritzaka	P.I. 220816	
	OK 55-5	12-87	P.I. 222116	
	OK 55-6	Th x P-62	P.I. 223280	
	OK 55-10	Th x P-188	P.I. 223281	
	OK 55-25	Th x P-226188	P.I. 223522	
	OK 55-26	Yreba Mung	P.I. 223523	
	OK 55-35	328-38-211	P.I. 223711	
	OK 55-41	329-28	P.I. 223802	
	OK 55-44	P.I. 164301	P.I. 226658	
	OK 55-47	P.I. 164301-3	P.I. 227041	
	OK 55-48	P.I. 164336-4	P.I. 227247	
	OK 55-51	P.I. 164720	P.I. 227248	
	OK 55-64	P.I. 164778	P.I. 227291	
	OK 55-67	P.I. 179960-1	P.I. 227754	
	OK 55-69	P.I. 183065	P.I. 229707	
	OK 55-70	P.I. 197019	P.I. 229708	
	OK 55-77	P.I. 207504		
	OK 55-78	P.I. 211066		
	OK 55-79	P.I. 211612		
	OK 55-81	P.I. 211613		
	Purdue	P.I. 211614		
	Purdue 2-1	P.I. 211615		
	Purdue 2-2	P.I. 211735		
	Purdue 3	P.I. 211736		
	Pusa	P.I. 211737		
	Pusa 23-8394	P.I. 212109		
	Pusa 28	P.I. 212319		
	Pusa 288344-1	P.I. 212614		
	Pusa 288344-3	P.I. 212907		
				<u>Black Mottled</u>
				Mungo (Ga.)
				P.I. 212909
				(Mungo)
				P.I. 222816
				P.I. 223002
				P.I. 223003
				P.I. 223710

APPENDIX TABLE XIV

MEAN SEED SIZE CLASSIFICATION OF 138 MUNGBEAN STRAINS
GROWN AT PERKINS AND STILLWATER, 1957

Small 3.0 - 3.8 mm.	Medium Small 3.9 - 4.4 mm.	Medium Large 4.5 - 4.9 mm.	Large 5.0 - 6.5 mm.	
K 853-1	Chivel 8726	P.I. 219699	Ill. 3-3	Green
Pusa 23-8394	Golden	P.I. 220303	Indian 8262	Jumbo
P.I. 164301	Green Mung	P.I. 220304	Jumbo (Texas)	Jumbo (Palecek)
P.I. 207504	(Ga.)	P.I. 220305	Korean 2310	Korean 8343
P.I. 211066	Ill. 3	P.I. 220672	O. Mungs	Mungo (Ga.)
P.I. 211067	M.B. Indian	P.I. 223003	Okla. - 12	OK 55-1
P.I. 211614	OK 55-5	P.I. 223281	OK 55-6	OK 55-26
P.I. 211735	OK 55-25	P.I. 223522	OK 55-10	OK 55-35
P.I. 211737	OK 55-48	P.I. 223710	OK 55-47	OK 55-41
P.I. 220815	OK 55-92	P.I. 226658	OK 55-51	OK 55-44
P.I. 220816	Purdue	P.I. 227247	OK 55-70	OK 55-64
P.I. 222116	Pusa	P.I. 227754	OK 55-81	OK 55-67
P.I. 222816	Pusa 28	P.I. 229707	OK 55-82	OK 55-69
P.I. 223002	Pusa 288344-1		OK 55-90	OK 55-77
P.I. 223280	Pusa 288344-3		OK 55-99	OK 55-78
P.I. 223523	S-12-126		Purdue 2-1	OK 55-79
P.I. 223802	S-12-128-4		Purdue 2-2	S-12-701
P.I. 227041	S-12-128-6		Purdue 3	P.I. 212909
P.I. 227248	S-12-200		S-12-127-1	(Mungo)
P.I. 227291	S-12-201		S-12-128-1	P.I. 217955
	S-12-204		S-12-186	
	Stritzaka		S-12-199	
	12-9		S-12-213	
	Th x P-188		S-12-2320	
	Th x P-226188		S-125	
	Yreba Mung		S-185	
	328-38-211		Sel. 44	
	P.I. 164301-3		Stritzaka	
	P.I. 164336-4		Stritzaka	
	P.I. 164720		12-87	
	P.I. 183065		Th x P-62	
	P.I. 211612		329-28	
	P.I. 211613		P.I. 164778	
	P.I. 211615		P.I. 179960-1	
	P.I. 211736		P.I. 197019	
	P.I. 212109		P.I. 212907	
	P.I. 212319		P.I. 212908	
	P.I. 212614		P.I. 213015	
	P.I. 214062		P.I. 214063	
	P.I. 214335		P.I. 214334	
	P.I. 215650		P.I. 220108	
	P.I. 217953		P.I. 223711	
	P.I. 217954		P.I. 229708	
	P.I. 217956			
	P.I. 217957			
	P.I. 218103			

APPENDIX TABLE XV

SEED SHAPE CLASSIFICATION OF 138 MUNGBEAN STRAINS
GROWN AT PERKINS AND STILLWATER, 1957.

Round	Intermediate	Square
Ill. 3-3	Chivel 8726	Green Mung (Ga.)
Indian 8262	Golden	Ill. 3
Korean 2310	Green	Jumbo (Texas)
Korean 8343	Jumbo	K 853-1
M.B. Indian	Jumbo (Palecek)	OK 55-1
Mungo (Ga.)	OK 55-35	OK 55-5
O. Mungs	OK 55-44	OK 55-6
Okla. - 12	OK 55-47	OK 55-10
OK 55-64	OK 55-51	OK 55-25
OK 55-67	OK 55-69	OK 55-26
OK 55-81	OK 55-70	OK 55-41
OK 55-90	OK 55-77	OK 55-48
OK 55-92	OK 55-78	Pusa 23-8394
OK 55-99	OK 55-79	Sel. 44
Purdue	OK 55-82	Stritzaka
Purdue 2-1	Pusa	Th x P-188
Purdue 2-2	Pusa 28	P.I. 207504
Purdue 3	Pusa 288344-1	P.I. 211066
S-12-126	Pusa 288344-3	P.I. 211614
S-12-127-1	S-12-128-1	P.I. 211737
S-12-128-6	S-12-128-4	P.I. 212109
S-12-186	S-12-200	P.I. 212319
S-12-199	S-12-201	P.I. 212614
S-12-204	S-12-701	P.I. 215650
S-12-213	Th x P-62	P.I. 217954
S-12-2320	Th x P-226188	P.I. 217956
S-125	Yreba Mung	P.I. 219699
S-185	328-38-211	P.I. 220305
Stritzaka 12-9	P.I. 179960-1	P.I. 220672
Stritzaka 12-87	P.I. 183065	P.I. 220815
329-28	P.I. 197019	P.I. 220816
P.I. 164301	P.I. 211067	P.I. 222116
P.I. 164301-3	P.I. 211613	P.I. 222816
P.I. 164336-4	P.I. 211615	P.I. 223002
P.I. 164720	P.I. 211735	P.I. 223003
P.I. 164778	P.I. 211736	P.I. 223280
P.I. 211612	P.I. 214335	P.I. 223523
P.I. 212907	P.I. 217953	P.I. 223710
P.I. 212908	P.I. 217955	P.I. 223802
P.I. 212909 (Mungo)	P.I. 217957	P.I. 226658
P.I. 213015	P.I. 218103	P.I. 227041
P.I. 214062	P.I. 220108	P.I. 227247
P.I. 214063	P.I. 220303	P.I. 227248
P.I. 214334	P.I. 220304	P.I. 227291
P.I. 223711	P.I. 223281	
P.I. 227754	P.I. 223522	
	P.I. 229707	
	P.I. 229708	

APPENDIX TABLE XVI

SEED QUALITY CLASSIFICATION OF 138 MUNGBEAN STRAINS
GROWN AT PERKINS AND STILLWATER, 1957

Poor		Fair	Good	Excellent
Chivel 8726	Golden	328-38-211	Ill. 3-3	Green
Green Mung(Ga.)	Ill. 3	329-28	Indian 8262	Jumbo
K 853-1	Jumbo	P.I. 164336-4	Korean 2310	Jumbo
OK 55-5	(Texas)	P.I. 164720	Korean 8343	(Palecek)
OK 55-6	M.B. Indian	P.I. 183065	Mungo (Ga.)	P.I. 212907
OK 55-25	OK 55-1	P.I. 207504	O. Mungs	P.I. 212908
P.I. 164301-3	OK 55-10	P.I. 211067	Okla. - 12	P.I. 213015
P.I. 197019	OK 55-26	P.I. 211612	OK 55-64	
P.I. 211066	OK 55-35	P.I. 211615	OK 55-67	
P.I. 211613	OK 55-41	P.I. 214062	OK 55-70	
P.I. 211614	OK 55-44	P.I. 214063	OK 55-79	
P.I. 211735	OK 55-47	P.I. 217955	OK 55-81	
P.I. 211736	OK 55-48	P.I. 217956	Purdue 2-2	
P.I. 211737	OK 55-51	P.I. 223710	Purdue 3	
P.I. 212109	OK 55-69	P.I. 227754	S-12-186	
P.I. 212319	OK 55-77		S-125	
P.I. 212614	OK 55-78		S-185	
P.I. 214335	OK 55-82		Stritzaka	
P.I. 215650	OK 55-90		12-87	
P.I. 217953	OK 55-92		P.I. 164301	
P.I. 217954	OK 55-99		P.I. 164778	
P.I. 217957	Purdue		P.I. 179960-1	
P.I. 218103	Purdue 2-1		P.I. 212909	
P.I. 219699	Pusa		(Mungo)	
P.I. 220108	Pusa 23-8394		P.I. 214334	
P.I. 220303	Pusa 28		P.I. 223711	
P.I. 220304	Pusa 288344-1			
P.I. 220305	Pusa 288344-3			
P.I. 220672	S-12-126			
P.I. 220815	S-12-127-1			
P.I. 220816	S-12-128-1			
P.I. 222116	S-12-128-4			
P.I. 222816	S-12-128-6			
P.I. 223002	S-12-199			
P.I. 223003	S-12-200			
P.I. 223280	S-12-201			
P.I. 223281	S-12-204			
P.I. 223522	S-12-213			
P.I. 223523	S-12-701			
P.I. 223802	S-12-2320			
P.I. 226658	Sel. 44			
P.I. 227041	Stritzaka			
P.I. 227247	Stritzaka 12-9			
P.I. 227248	Th x P-62			
P.I. 227291	Th x P-188			
P.I. 229707	Th x P-226188			
P.I. 229708	Yreba Mung			

APPENDIX TABLE XVII

SUMMARY OF VEGETATIVE CHARACTERISTICS OF MUNGBEAN STRAINS OBSERVED IN 1957

Strain	Growth Habit ^{1/}	Plant Height ^{2/}	Leaf Size ^{3/}	Leaf Texture ^{4/}	Leafiness ^{5/}	Lodging ^{6/}	Maturity ^{7/}
Chivel 8726	SV	5.5	M	MR	E	2	ML
Golden	B	11.0	M	R	E	0	ML
Green	B	6.0	L	MR	E	2	ME
Green Mung (Ga.)	B	7.0	M	R	E	0	ML
Ill. 3	B	6.0	M	M	M	2	ME
Ill. 3-3	B	5.0	M	M	M	0	ME
Indian 8262	SV	6.0	M	MR	E	2	ME
Jumbo	B	6.5	L	R	P	1	ME
Jumbo (Palecek)	B	6.0	L	R	M	2	ME

^{1/}B = bush; SV = semi-vine; V = vine

^{2/}Measured in decimeters

^{3/}S = small; M = medium; L = large

^{4/}S = smooth; M = medium; R = rough; H = hairy

^{5/}P = poor; M = medium; E = excellent

^{6/}0 = none to slight; 1 = some; 2 = severe

^{7/}E = early; ME = medium; ML = medium late; L = late

APPENDIX TABLE XVII (Continued)

Strain	Growth Habit	Plant Height	Leaf Size	Leaf Texture	Leafiness	Lodging	Maturity
Jumbo (Texas)	B	7.0	L	R	M	2	ME
K 853-1	B	5.5	M	M	M	2	ME
Korean 2310	B	4.0	S	M	P	1	E
Korean 8343	V	4.0	S	S	M	0	E
M. B. Indian	B	5.5	M	R	M	1	E
Mungo (Ga.)	B	7.0	M	R	P	1	ML
O. Mungs	B	4.0	S	S	M	0	E
Okla. - 12	B	3.5	S	S	M	0	E
OK 55-1	B	5.0	M	M	M	2	ME
OK 55-5	B	7.5	M	R	M	1	ME
OK 55-6	B	5.0	M	M	M	1	ME
OK 55-10	B	5.5	M	M	M	1	ME
OK 55-25	B	7.0	M	R	P	1	ME
OK 55-26	B	4.5	L	M	M	2	ME
OK 55-35	B	4.5	L	M	M	2	ME

APPENDIX TABLE XVII (continued)

Strain	Growth Habit	Plant Height	Leaf Size	Leaf Texture	Leafiness	Lodging	Maturity
OK 55-41	B	4.0	L	M	M	2	ME
OK 55-44	B	3.5	M	M	M	0	E
OK 55-47	B	6.5	L	R	M	2	ME
OK 55-48	B	7.5	L	R	P	1	ME
OK 55-51	B	7.5	L	R	P	1	ME
OK 55-64	B	6.0	M	R	P	2	ME
OK 55-67	B	4.0	M	M	M	1	E
OK 55-69	B	4.0	M	M	M	1	E
OK 55-70	B	6.5	M	R	M	0	ME
OK 55-77	B	6.0	L	R	M	0	ME
OK 55-78	B	7.5	M	R	E	0	ME
OK 55-79	B	4.0	M	M	M	0	E
OK 55-81	B	6.0	M	M	P	2	ME
OK 55-82	B	6.5	M	M	P	2	ME
OK 55-90	B	4.5	M	M	M	2	ME

APPENDIX TABLE XVII (continued)

Strain	Growth Habit	Plant Height	Leaf Size	Leaf Texture	Leafiness	Lodging	Maturity
OK 55-92	B	6.5	M	R	M	2	ME
OK 55-99	B	6.5	M	R	M	2	ME
Purdue	B	6.0	M	M	M	2	ME
Purdue 2-1	B	5.5	M	M	M	1	ME
Purdue 2-2	B	6.0	M	M	M	2	ME
Purdue 3	B	5.5	M	M	M	2	ME
Pusa	B	6.5	M	M	P	1	ME
Pusa 23-8394	B	6.5	M	M	M	2	ME
Pusa 28	B	5.5	M	M	M	2	ME
Pusa 288344-1	B	5.5	M	M	M	2	ME
Pusa 288344-3	B	6.5	M	M	M	2	ME
S-12-126	B	5.5	M	M	M	1	E
S-12-127-1	V	8.0	S	S	P	1	E
S-12-128-1	B	6.5	M	MR	E	2	ME
S-12-128-4	B	6.0	M	M	M	2	ME

APPENDIX TABLE XVII (continued)

Strain	Growth Habit	Plant Height	Leaf Size	Leaf Texture	Leafiness	Lodging	Maturity
S-12-128-6	B	7.5	M	MR	E	1	ME
S-12-186	B	3.0	S	S	M	0	E
S-12-199	B&V	9.0	M	M	M	1	ME
S-12-200	V	6.0	M	MR	E	2	ME
S-12-201	B	4.0	M	M	M	1	E
S-12-204	B	5.0	M	M	M	1	ME
S-12-213	B	3.5	S	M	M	0	E
S-12-701	B	5.5	M	M	P	2	ME
S-12-2320	B	3.5	S	S	M	0	E
S-125	V	8.0	S	S	M	0	ME
S-185	B	3.5	S	S	M	0	E
Sel. 44	B	7.5	M	MR	M	2	ME
Stritzaka	B	7.0	M	M	M	2	ME
Stritzaka 12-9	B	4.5	S	M	M	1	E
Stritzaka 12-87	B	4.5	S	S	M	1	E

APPENDIX TABLE XVII (continued)

Strain	Growth Habit	Plant Height	Leaf Size	Leaf Texture	Leafiness	Lodging	Maturity
Th x P-62	B	5.5	M	M	M	1	ME
Th x P-188	SV	6.5	M	M	E	2	ME
Th x P-226188	B	6.5	M	M	E	2	ME
Yreba Mung	B&V	3.5	S	S	M	0	E
328-38-211	B	6.5	M	M	M	1	ME
329-28	B	5.5	M	M	M	2	E
P. I. 164301	B	7.0	M	MR	M	1	ML
P. I. 164301-3	B	5.5	M	M	M	2	ME
P. I. 164336-4	B	6.5	M	M	E	1	ME
P. I. 164720	B	6.5	M	R	M	2	ME
P. I. 164778	B	6.5	L	M	P	2	ME
P. I. 179960-1	B	7.0	M	M	M	2	ME
P. I. 183065	B	6.5	M	MR	E	2	ME
P. I. 197019	B	9.0	M	R	E	0	L
P. I. 207504	B	8.0	M	R	M	1	ML

APPENDIX TABLE XVII (continued)

Strain	Growth Habit	Plant Height	Leaf Size	Leaf Texture	Leafiness	Lodging	Maturity
P. I. 211066	SV	8.0	M	R	M	0	L
P. I. 211067	B	7.5	M	R	E	0	L
P. I. 211612	B	8.0	M	R	E	1	L
P. I. 211613	B	7.0	M	R	E	1	L
P. I. 211614	B	8.0	M	R	E	0	L
P. I. 211615	B	9.0	M	R	E	1	L
P. I. 211735	SV	10.0	M	R	M	1	L
P. I. 211736	SV	8.5	M	R	M	1	L
P. I. 211737	B	8.5	M	R	E	1	L
P. I. 212109	SV	7.5	M	R	E	1	L
P. I. 212319	SV	7.5	M	R	M	1	ML
P. I. 212614	B	10.0	M	R	E	1	ML
P. I. 212907	SV	11.0	L	RH	M	2	ML
P. I. 212908	SV	11.0	L	RH	M	2	ML
P. I. 212909 (Mungo)	B	4.0	M	R	E	0	ML

APPENDIX TABLE XVII (continued)

Strain	Growth Habit	Plant Height	Leaf Size	Leaf Texture	Leafiness	Lodging	Maturity
P. I. 213015	SV	11.0	L	RH	M	2	ML
P. I. 214062	SV	8.0	M	R	E	1	ML
P. I. 214063	SV	6.0	M	M	M	2	ME
P. I. 214334	SV	11.0	L	RH	M	1	ME
P. I. 214335	B	8.0	M	R	E	0	ML
P. I. 215650	B	9.0	M	R	E	1	ML
P. I. 217953	B	9.0	M	R	E	1	ML
P. I. 217954	B	8.0	M	R	E	1	ML
P. I. 217955	B	8.0	M	R	E	1	L
P. I. 217956	B	8.0	M	R	E	1	L
P. I. 217957	B	8.0	M	R	E	1	ML
P. I. 218103	B	7.0	S	R	E	1	L
P. I. 219699	B	7.5	M	R	M	1	ML
P. I. 220108	B	7.0	M	R	E	1	L
P. I. 220303	B	7.5	M	R	E	1	L

APPENDIX TABLE XVII (continued)

Strain	Growth Habit	Plant Height	Leaf Size	Leaf Texture	Leafiness	Lodging	Maturity
P. I. 220304	SV	7.5	M	R	E	1	L
P. I. 220305	SV	7.5	M	R	M	1	L
P. I. 220672	B	8.5	M	R	M	1	L
P. I. 220815	SV	5.5	S	R	E	1	L
P. I. 220816	B	8.0	M	R	M	1	ML
P. I. 222116	B	7.5	M	R	M	1	ML
P. I. 222816	B	6.0	M	R	E	0	L
P. I. 223002	SV	6.0	M	R	E	1	L
P. I. 223003	SV	6.0	M	R	E	0	L
P. I. 223280	B	6.5	M	R	E	1	L
P. I. 223281	SV	6.5	M	R	M	1	L
P. I. 223522	B	6.5	M	M	M	1	ML
P. I. 223523	B	6.0	M	R	E	1	ML
P. I. 223710	B	7.5	M	R	E	1	L
P. I. 223711	SV	11.0	L	RH	M	1	ML

APPENDIX TABLE XVII (continued)

Strain	Growth Habit	Plant Height	Leaf Size	Leaf Texture	Leafiness	Lodging	Maturity
P. I. 223802	SV	9.0	M	MR	E	1	L
P. I. 226658	B	6.5	S	R	E	1	L
P. I. 227041	SV	9.0	M	R	E	1	L
P. I. 227247	SV	7.0	M	R	M	1	ML
P. I. 227248	SV	5.5	M	R	E	1	ML
P. I. 227291	SV	9.0	M	R	E	1	L
P. I. 227754	B	3.5	S	S	M	0	E
P. I. 229707	B	6.0	M	R	E	1	ML
P. I. 229708	SV	5.0	M	R	E	1	ML

APPENDIX TABLE XVIII

SUMMARY OF FRUITING CHARACTERISTICS OF MUNGBEAN STRAINS OBSERVED IN 1957

Strain	Pod		Seed						
	Mean Length ^{1/}	Color ^{2/}	Mean No. per Pod	Yield ^{3/}	Color ^{4/}	Sur-face ^{5/}	Mean Size ^{6/}	Shape ^{7/}	Qual-ity ^{8/}
Chivel 8726	7.7	Y	11.6	F	G	S	4.3	I	P
Golden	8.0	Y	11.9	P	Y	D	4.3	I	F
Green	12.1	Bl	15.3	F	G	S	5.0	I	E
Green Mung (Ga.)	7.3	Y	13.0	P	G	S	3.9	S	P
Ill. 3	7.0	Br	11.8	G	G	S	3.9	S	F
Ill. 3-3	9.2	Br	12.0	F	G	S	4.8	R	G
Indian 8262	8.9	Br	11.2	F	G	S	4.9	R	G
Jumbo	8.9	Bl	9.7	E	G	S	5.4	I	E

^{1/} Measured in centimeters

^{2/} Y = yellow; Br = brown; Bl = black; Mx = mixed

^{3/} F = fair; P = poor; G = good; E = excellent

^{4/} Y = yellow; G = green; Bl = black; Br = brown; M = mottled

^{5/} S = shiny; D = dull

^{6/} Length measured in millimeters

^{7/} I = intermediate; S = square; R = round

^{8/} P = poor; F = fair; G = good; E = excellent

APPENDIX TABLE XVIII (continued)

Strain	Pod		Seed						
	Mean Length	Color	Mean No. per Pod	Yield	Color	Surface	Mean Size	Shape	Quality
Jumbo (Palecek)	12.4	Br	15.8	G	G	S	5.1	I	E
Jumbo (Texas)	9.6	Br	14.7	E	G	S&D	4.5	S	F
K 853-1	6.6	Br	10.2	F	G	S	3.8	S	P
Korean 2310	7.5	Br	10.1	G	G	S	4.7	R	G
Korean 8343	7.3	Br	8.5	E	G	S	5.1	R	G
M. B. Indian	8.5	Br	12.1	E	G	S	4.2	R	F
Mungo (Ga.)	5.6	Bl	7.3	P	Bl M	D	5.3	R	G
O. Mungs	7.3	Br	9.4	E	G	S	4.7	R	G
Okla. - 12	7.5	Br	9.1	E	G	S	4.9	R	G
OK 55-1	13.1	Bl	13.0	G	G	S	5.7	S	F
OK 55-5	7.8	Bl	12.0	G	G	D	4.3	S	P
OK 55-6	8.9	Bl	11.7	G	G	D	4.9	S	P
OK 55-10	9.0	Bl	11.4	G	G	D	4.9	S	F
OK 55-25	7.9	Bl	11.9	F	G	D	4.4	S	P
OK 55-26	11.3	Bl	10.7	G	G	S	6.0	S	F

APPENDIX TABLE XVIII (continued)

Strain	Pod		Seed						
	Mean Length	Color	Mean No. per Pod	Yield	Color	Surface	Mean Size	Shape	Quality
OK 55-35	11.2	B1	10.6	G	G	S	6.5	I	F
OK 55-41	11.6	B1	10.7	G	G	S	5.9	S	F
OK 55-44	8.4	Br	9.0	G	G	S	6.5	I	F
OK 55-47	9.0	Br	11.3	E	G	S	4.7	I	F
OK 55-48	9.2	Br	12.3	E	G	S	4.4	S	F
OK 55-51	8.7	Br	12.9	G	G	S	4.8	I	F
OK 55-64	9.7	B1	11.1	E	G	S	5.1	R	G
OK 55-67	9.1	B1	9.9	G	G	S	5.5	R	G
OK 55-69	9.1	Br	10.0	G	G	S	6.3	I	F
OK 55-70	8.4	Br	11.7	E	G	S	4.5	I	G
OK 55-77	9.2	B1	11.8	E	G	S	5.2	I	F
OK 55-78	9.2	Mx	10.7	F	G	S	5.6	I	F
OK 55-79	9.4	B1	10.2	G	G	S	5.9	I	G
OK 55-81	7.9	Y	11.3	G	G	S	4.8	R	G
OK 55-82	7.5	Br	11.4	F	Br	D	4.5	I	F

APPENDIX TABLE XVIII (continued)

Strain	Pod		Seed						
	Mean Length	Color	Mean No. per Pod	Yield	Color	Surface	Mean Size	Shape	Quality
OK 55-90	8.2	Bl	10.6	G	Y	D	4.9	R	F
OK 55-92	8.0	Br	11.2	G	Y	D	4.3	R	F
OK 55-99	8.5	Br	12.1	G	Y	S	4.5	R	F
Purdue	8.1	Br	11.2	E	G	S	4.4	R	F
Purdue 2-1	9.1	Br	11.7	E	G	S	4.9	R	F
Purdue 2-2	8.8	Br	11.9	G	G	S	4.7	R	G
Purdue 3	9.1	Br	11.2	E	G	S	4.7	R	G
Pusa	6.6	Br	11.0	E	G	S	4.1	I	F
Pusa 23-8394	7.3	Br	11.8	G	G	S	3.8	S	F
Pusa 28	7.0	Br	11.0	F	G	S	4.3	I	F
Pusa 288344-1	7.0	Br	11.5	E	G	S	4.2	I	F
Pusa 288344-3	6.8	Br	10.6	G	G	S	3.9	I	F
S-12-126	7.1	Br	10.1	G	G	S	4.4	R	F
S-12-127-1	7.8	Br	10.3	E	G	S	4.7	R	F
S-12-128-1	7.9	Y	11.5	G	G	D	4.5	I	F

APPENDIX TABLE XVIII (continued)

Strain	Pod		Mean No. per Pod	Seed					
	Mean Length	Color		Yield	Color	Sur- face	Mean Size	Shape	Qual- ity
S-12-128-4	7.4	Br	11.2	F	G	S	4.4	I	F
S-12-128-6	7.8	Y	11.0	F	G	D	4.1	R	F
S-12-186	7.5	Br	11.6	E	G	S	4.7	R	G
S-12-199	8.5	Br	12.3	F	G	S	4.7	R	F
S-12-200	7.9	Br	14.0	F	G	S	4.2	I	F
S-12-201	7.5	Br	10.9	E	G	S&D	4.3	I	F
S-12-204	7.7	Br	10.4	E	G	S	4.4	R	F
S-12-213	8.0	Br	10.8	G	G	S	4.8	R	F
S-12-701	8.5	Bl	10.0	E	G	S	5.3	I	F
S-12-2320	6.6	Br	8.9	E	G	S	4.8	R	F
S-125	7.7	Br	9.7	E	G	D	4.8	R	G
S-185	6.8	Br	8.9	E	G	S	4.6	R	G
Sel. 44	8.1	Br	11.8	F	G	D	4.6	S	F
Stritzaka	7.9	Br	11.4	F	G	D	4.6	S	F
Stritzaka 12-9	7.6	Bl	10.2	E	G	S	4.3	R	F

APPENDIX TABLE XVIII (continued)

Strain	Pod		Seed						
	Mean Length	Color	Mean No. per Pod	Yield	Color	Surface	Mean Size	Shape	Quality
Stritzaka 12-87	7.4	Br	9.4	E	G	S	4.7	R	G
Th x P-62	8.3	Br	11.5	E	G	S	4.5	I	F
Th x P-188	7.1	Br	11.9	F	G	S	4.2	S	F
Th x P-226188	6.7	Br	10.2	G	G	S	4.2	I	F
Yreba Mung	7.2	Br	10.7	E	G	S	4.1	I	F
328-38-211	7.2	Br	11.4	F	G	S	4.0	I	F
329-28	7.3	B1	9.3	G	G	S	4.7	R	F
P. I. 164301	7.2	Br	12.7	P	G	D	3.8	R	G
P. I. 164301-3	7.8	B1	11.3	E	G	D	4.4	R	P
P. I. 164336-4	8.3	Br	14.1	G	G	D	3.9	R	F
P. I. 164720	8.1	Br	13.4	G	G	D	4.4	R	F
P. I. 164778	8.5	B1	10.4	E	G	D	4.5	R	G
P. I. 179960-1	7.8	Br	12.2	E	G	D	4.5	I	G
P. I. 183065	7.0	B1	11.3	F	G	D	4.2	I	F
P. I. 197019	6.6	Y	7.6	P	G	D	4.5	I	P

APPENDIX TABLE XVIII (continued)

Strain	Pod		Mean No. per Pod	Seed					
	Mean Length	Color		Yield	Color	Sur- face	Mean Size	Shape	Qual- ity
P. I. 207504	6.4	Y	12.5	F	G	S	3.8	S	F
P. I. 211066	5.7	Br	10.3	F	G	S	3.8	S	P
P. I. 211067	6.3	Br	12.7	P	Y	D	3.0	I	F
P. I. 211612	4.8	Br	8.0	P	G	S	4.2	R	F
P. I. 211613	4.3	Br	7.0	P	G	S	4.0	I	P
P. I. 211614	4.8	Br	7.9	P	G	S	3.8	S	P
P. I. 211615	3.9	Br	6.9	P	G	S	3.9	I	F
P. I. 211735	5.0	Br	8.4	P	G	S	3.8	I	P
P. I. 211736	5.9	Br	9.8	P	G	S	4.1	I	P
P. I. 211737	4.8	Br	8.4	F	G	S	3.7	S	P
P. I. 212109	5.1	Br	7.6	P	G	S	4.0	S	P
P. I. 212319	5.6	Br	10.4	P	G	S	3.9	S	P
P. I. 212614	6.3	Br	12.0	P	G	S&D	3.9	S	P
P. I. 212907	8.1	Y	11.2	F	G	S	4.7	R	E
P. I. 212908	8.8	Y	12.1	F	G	S	4.7	R	E

APPENDIX TABLE XVIII (continued)

Strain	Pod				Seed				
	Mean Length	Color	Mean No. per Pod	Yield	Color	Surface	Mean Size	Shape	Quality
P. I. 212909 (Mungo)	5.2	Bl	6.2	F	Bl M	D	5.3	R	G
P. I. 213015	8.8	Y	12.3	G	G	S	4.6	R	E
P. I. 214062	6.6	Y	10.8	P	G	D	3.9	R	F
P. I. 214063	8.0	Bl	11.3	G	G	D	4.5	R	F
P. I. 214334	8.5	Y	12.0	F	G	S&D	4.8	R	G
P. I. 214335	5.7	Br	9.7	P	G	S&D	4.4	I	P
P. I. 215650	6.1	Br	10.5	P	G	S	4.0	S	P
P. I. 217953	6.3	Br	10.3	P	G	S	4.3	I	P
P. I. 217954	6.4	Br	11.6	P	G	S	3.9	S	P
P. I. 217955	4.6	Y	6.2	P	G	D	5.2	I	F
P. I. 217956	6.5	Br	10.1	P	G	S	4.0	S	F
P. I. 217957	6.0	Br	10.0	P	G	S	4.0	I	P
P. I. 218103	4.8	Br	6.7	P	Br	S	4.3	I	P
P. I. 219699	6.3	Y	9.3	F	G	S	4.4	S	P
P. I. 220108	4.3	Br	7.1	P	G	S	4.5	I	P

APPENDIX TABLE XVIII (continued)

Strain	Pod		Seed						
	Mean Length	Color	Mean No. per Pod	Yield	Color	Surface	Mean Size	Shape	Quality
P. I. 220303	5.4	Br	9.1	P	G	S	4.0	I	P
P. I. 220304	4.6	Br	7.6	P	G	S	4.2	I	P
P. I. 220305	5.5	Br	9.6	P	G	S	3.9	S	P
P. I. 220672	6.3	Br	10.9	P	G	S	4.0	S	P
P. I. 220815	4.9	Br	8.3	P	Br	S	3.8	S	P
P. I. 220816	6.3	Br	11.3	F	G	S	3.7	S	P
P. I. 222116	6.1	Br	11.3	P	G	S	3.6	S	P
P. I. 222816	4.8	Br	8.1	P	Bl M	S	3.6	S	P
P. I. 223002	5.2	Br	9.1	P	Bl M	S	3.8	S	P
P. I. 223003	5.5	Br	9.6	P	Bl M	S	3.9	S	P
P. I. 223280	5.1	Br	9.5	P	G	S	3.7	S	P
P. I. 223281	5.0	Br	8.1	P	G	S	4.0	I	P
P. I. 223522	6.3	Y	10.9	F	G	S	4.0	I	P
P. I. 223523	7.5	Y	12.8	F	G	S	3.7	S	P
P. I. 223710	6.6	Br	9.8	P	Bl M	D	4.2	S	F

APPENDIX TABLE XVIII (continued)

Strain	Pod		Seed						
	Mean Length	Color	Mean No. per Pod	Yield	Color	Sur-face	Mean Size	Shape	Qual-ity
P. I. 223711	8.8	Y	12.6	G	G	S	4.7	R	G
P. I. 223802	6.1	Y	11.5	F	G	S	3.4	S	P
P. I. 226658	4.1	Br	5.4	P	G	S	4.1	S	P
P. I. 227041	5.4	Br	8.8	P	G	S	3.8	S	P
P. I. 227247	6.8	Br	13.0	P	G	S	3.9	S	P
P. I. 227248	6.5	Br	11.4	F	G	S	3.3	S	P
P. I. 227291	5.9	Br	10.4	P	G	S	3.8	S	P
P. I. 227754	7.3	Br	11.0	G	G	S	4.2	R	F
P. I. 229707	6.4	Br	11.3	F	G	S	4.0	I	P
P. I. 229708	6.4	Br	10.6	F	G	S	4.5	I	P

VITA

Donald Jack Banks

Candidate for degree of

Master of Science

Thesis: A CLASSIFICATION OF CERTAIN CHARACTERISTICS OF MUNGBEAN STRAINS AS AN AID TO IMPROVEMENT

Major Field: Agronomy (Field Crops)

Biographical:

Personal data: Born near Sentinel, Oklahoma, July 11, 1930, the son of Jesse C. (deceased) and Grace M. Banks.

Education: Attended grade school in Port, Oklahoma; attended high school at Port and Sentinel, Oklahoma; graduated from Sentinel High School in 1948; received the Bachelor of Science degree from the Oklahoma State University, with a major in Field Crops, in May, 1953; completed requirements for the Master of Science degree in May, 1958.

Professional experience: Born and reared on a farm; military service, First Lieutenant, United States Army reserve, active duty from August 2, 1953 to March 31, 1957, primary duty, Aviation Officer, helicopter and fixed-wing pilot; Teaching Assistant, Oklahoma State University, 1957-1958.

Member of: Alpha Zeta, Agronomy Club and Phi Sigma.

Date of Final Examination: May, 1958.