



Performance of the Fourth International Mungbean Nursery

Summary of the First Four
International Mungbean Nurseries

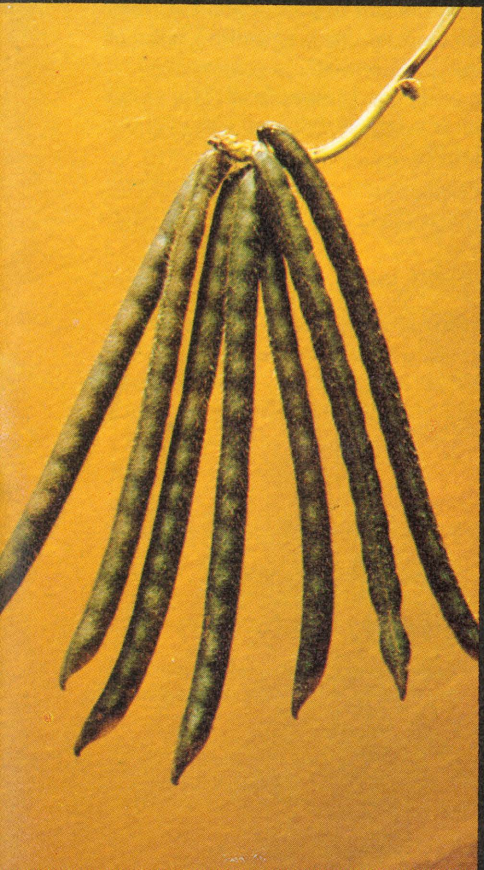
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PREFACE

The International Mungbean Nursery was started in 1972 to obtain information on (a) the range of adaptation of the mungbean species, (b) the range of adaptation of specific mungbean cultivars, and (c) characteristics of the mungbean plant influencing adaptation. In addition to the useful information that has been collected on each of these questions, some of which will be discussed later in this report, the nursery has served as a means of distributing superior cultivars to mungbean research workers in many countries. Its value in this respect grows as cooperators make seed available of superior local cultivars so that they may become entries in the nursery. Perhaps the greatest utility of the nursery is that it has identified a network of mungbean research workers around the world and provided, for the first time, some communication among them.

Since the International Mungbean Nursery was started a comprehensive mungbean breeding project has been initiated at the Asian Vegetable Research and Development Center (AVRDC) located at Shanhua, Taiwan. The AVRDC breeding program is now solidly established. It is logical therefore that they assume responsibility for the International Mungbean Nursery. With the Fifth International Mungbean Nursery, the phasing over of the nursery to AVRDC is being implemented.

Mungbeans are not a commercial crop in Missouri. Research on mungbeans was initiated at the University of Missouri-Columbia to provide students in Plant Breeding and International Agriculture with thesis research relevant to the tropical countries. The mungbean has served this purpose admirably. The International Mungbean Nursery was born from the necessity of developing contacts with mungbean research workers in a variety of environments and to learn from them the limitations in production that they encounter. In the process significant research problems have been identified some of which have been utilized as thesis research problems. This research is continuing.

Thanks are expressed here to the cooperators with the International Mungbean Nursery who have contributed to its success thus far. It is hoped that each will give the same fine cooperation to the research workers at AVRDC.

J. M. Poehlman

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Performance of the Fourth International Mungbean Nursery.

Summary of the First Four International Mungbean Nurseries.¹

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INTRODUCTION

Data from the Fourth International Mungbean Nursery (IMN) have been received from 22 test locations in 13 countries. Performance data at each location and a summary overall locations are included in this report. Summaries are also included over all test locations for the four nurseries conducted thus far. These include 10 test locations for the First IMN (1972-73), 18 test locations for the Second IMN (1973-74), and 24 test locations for the Third IMN (1974-75), in addition to the 22 test locations for the Fourth IMN (1975-76).

Performance data from the First, Second, and Third IMN's have been reported previously in Missouri Agricultural Experiment Station Special Reports 158, 171, and 180, respectively.

MATERIALS AND METHODS

Mungbean Strains

Thirty strains of mungbeans were grown in the Fourth IMN. The entries, listed in Table 1, included eight strains previously grown in the First, Second and Third IMN's, four strains previously grown in the Second and Third IMN's, and nine strains previously grown in the Third IMN. The nine remaining strains in the Fourth IMN were new entries in 1975. The new entries are M304 and M358 from Korea, M394 and M1956 from the Philippines, M467 from India, M530 from Iran, M1645 and M2069 from Taiwan, and M2070 from the USA. Local strains were included as checks at five locations.

Seed Distribution and Nursery Plans

Seed for planting the old entries and the new entry M358 were grown at Columbia, Missouri. Seeds for planting the remaining new entries were received from several sources. M304, M1645 and M2069 came from the Asian Vegetable Research and Development Center, Taiwan; M394 and M1956 came from the University of the Philippines, Los Baños, and the International Rice Research Institute, Los Baños, Philippines, respectively; M467 came from the Punjab Agricultural University, Ludhiana, India; M530 came from the University of Teheran, Karaj, Iran; and M2070 from the Oklahoma Agricultural Experiment Station, Stillwater, Oklahoma. Seeds were

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treated with the fungicide Thiram (tetramethylthiuramdisulfide) before distribution. The overall plan for the nursery was the same as for the preceding IMN's with seed being sent to plant three replications in a randomized block design. Approximately 90 seeds were included for planting each replication, however, the plot size varied with the cooperator.

Nursery Sites

Seeds for planting the Fourth IMN were sent to cooperators requesting the nursery insofar as possible. In order to evaluate the range in adaptation of the mungbean species as well as the range in adaptation of specific cultivars, it was desirable to have the nursery grown in a wide range of climatic conditions. This was accomplished since the nursery sites from which data were reported varied from 2° S to 49° N latitude and from 9 m to 1650 m elevation. Four of the sites were in North America, two in South America, three in Africa, and thirteen in Asia. The location, latitude, elevation and approximate growing season of each test site where the Fourth IMN was grown is given in Table 2. Names and addresses of the cooperators for each test site are included in Tables 3 through 24.

Planting Dates and Growing Season

Planting dates are available for 21 of the 22 locations from which data were reported for the 4th IMN. Two of the nurseries were planted in April, three in May, six in June, five in July, three in August, and one in each October and November. Seed for the 4th IMN was distributed for most nurseries early in April and while most cooperators reported prompt delivery, receipt of the seed was delayed to a few cooperators which resulted in a later planting date than they desired. For cooperators who want to plant in February or March it is expected that in the future seed will be made available in time to permit the earlier planting date.

The growing season (date of planting to date of final harvest) varied from 45 days at Korat, Thailand, to 156 days at Adama/Nazareth, Ethiopia. Climatic factors which result in short growing seasons such as that at Korat are short photoperiods and high mean temperatures. The previous shortest growing season had been at Suphanburi, Thailand, (59 days) in the 1st IMN. At 10 of the test locations the growing season exceeded 100 days. These included all locations at latitudes exceeding 30° N and all locations with elevation of 750 meters or above except one (Palmira, Colombia). These observations confirm previous observations in the IMN's that long photoperiods and low mean temperatures delay flowering and extend the growing season.

Reporting Data

Procedures for recording notes and reporting data were sent to cooperators in order to obtain uniformity needed for efficient, data summarization. The cooperators are commended for following the suggestions closely. Data on the following observations were reported from four or more of the stations where the nurseries were grown:

Yield: yield in kg/ha of clean harvested seed.

Days to first flower: number of days from date of planting to date of first open flower.

Days to first ripe pod: number of days from date of planting to date of first ripe pod.

Height: measured in cm from ground level to tip of the main stem.

Pods per plant: number of pods with mature seed from a random sample of five or more plants.

Seeds per pod: average number of seeds per pod from a random sample of ten or more pods.
1000-seed weight: Weight in grams of a sample of 100 or more seeds, expressed on a 1000-seed weight basis.

Disease scores: Disease reaction scored on a scale of 1 (resistant) to 5 (susceptible). A score of 1 denotes a high level of resistance and a score of 5 denotes susceptibility.

Table 1. LIST OF MUNGBEAN STRAINS INCLUDED IN THE FOURTH INTERNATIONAL MUNGBEAN NURSERY, 1975-76

Entry number	Missouri ^a accession number	USDA ^b P. I. number	AVRDC ^c number	Name	Country which strain originated
1	M4	368268	3372	Shining Moong 1	India
2	M14	368278	3373	Jalagaon 781	India
3	M15	368279	3374		Taiwan
4	M76	413233	1968	Oklahoma 12	U. S. A.
5	M90	223711	1969		India
6	M118 ^d	180311	1978		India
7	M304 ^d	273487	2007		Korea
8	M317	298915	2010		China
9	M333	374146	3092		India
10	M339	362327	3096	Myungnokdu	Korea
11	M350	362322	2984	Kyungkojaerae	Korea
12	M358 ^d	362301	3109	Chungbukjaerae	Korea
13	M374 ^d	369768	1381	MG 50-10A (green)	Philippines
14	M394 ^d	369788	1387	CES 55 (UPLB)	Philippines
15	M409	378023	3376		Peru
16	M411	370637	2248	Hybrid 45	India
17	M467 ^d	378039	2273	ML-6	India
18	M475	385295	3161	Kanke Multipurpose	India
19	M530 ^d	385300	3179	48-071-10827	Iran
20	M531	385301	3180	48-071-10961	Iran
21	M533	377902	2268	ML-1	India
22	M1132	413246	3387	Lincoln	U. S. A.
23	M1133	413247	3388	O. S. U. ^e M-966-71-10	U. S. A.
24	M1134	413248	3389	O. S. U. M-967-71-15	U. S. A.
25	M1135	413249	3390	O. S. U. M-967-71-22	U. S. A.
26	M1136	413250	3391	O. S. U. M-968-71-1	U. S. A.
27	M1645 ^d	413506	2013	TN-1	Taiwan
28	M2069 ^d	413611	2808	Taiwan Local	Taiwan
29	M2070 ^d	413294	3405	O. S. U. M967-71-17	U. S. A.
30	M1956 ^d	413603	1944	MG 50-10A (yellow)	Philippines

^a Accession number of the Missouri Agricultural Experiment Station, Columbia, Missouri.

^b Accession number of the United States Department of Agriculture.

^c Accession number of the Asian Vegetable Research and Development Center, Shanhua, Taiwan.

^d New entry in International Mungbean Nursery.

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Table 2. LOCATION, LATITUDE, ELEVATION AND GROWING SEASON FOR EACH TEST SITE WHERE THE FOURTH INTERNATIONAL MUNGBEAN NURSERY WAS GROWN

LOCATION OF TEST	LATITUDE DEGREES	ELEVATION m	April	May	June	July	1975 Aug	Sept.	Oct.	Nov.	Dec.	Jan.	1976 Feb.	March
Guayaquil, Ecuador	2° 20' S	17												
Palmira, Colombia	3° 32' N	1000												
Miri, Sarawak, Malaysia	4° 7' N	20												
Adama - Nazareth, Ethiopia	8° 22' N	1560												
Melka Werer, Ethiopia	9° 16' N	750												
Kobbo - Wollo, Ethiopia	12° 9' N	1450												
Los Baños, Philippines (BPI)	14° 20' N	15												
Los Baños, Philippines (BPI)	14° 20' N	15												
Los Baños, Philippines (UPLB)	14° 20' N	15												
Korat, Thailand	14° 38' N	110												
Phra Puttabat, Thailand	14° 41' N	94												
Shanhua, Tainan, Taiwan	23° 6' N	9												
Khumaltar, Nepal	27° 40' N	1360												
Pantnagar, Uttar Pradesh, India	29° 22' N	244												
Ludhiana, Punjab, India	30° 56' N	154												
Normal, Alabama, U.S.A.	34° 39' N	196												
Karaj, Iran	35° 8' N	1300												
Jinju, Kyung-nam, Korea	35° 11' N	25												
Stillwater, Oklahoma, U.S.A.	36° 2' N	274												
Suwon, Korea	37° 16' N	37												
Columbia, Missouri, U.S.A.	38° 49' N	228												
Morden, Manitoba, Canada	49° 25' N	311												

RESULTS AND DISCUSSION

Performance data for the 30 strains in the 4th IMN are recorded for specific test locations in Tables 3 through 24. Data reported for local check strains are included in the means for that location. A summary over 21 of the 22 test locations is given in Table 25. Data from Ludhiana, Punjab, India, are not complete because some of the strains were killed by MYMV and are not included in the summary. The 'Coefficient of Variation' and 'Least Significant Difference' are given for locations from which replicated data were reported.

Yields

Seed yields are summarized from 20 test locations. The average yield over the 20 locations was 744 kg/ha. This compares with 715 kg/ha for the 3rd IMN, 752 kg/ha for the 2nd IMN, and 866 ka/ha for the 1st IMN.

Average yields exceeding 1000 kg/ha over all entries were reported from four locations: Melka Werer, Ethiopia (1771 kg/ha); Shanhua, Taiwan (1423 kg/ha); Karaj, Iran (1262 kg/ha); and Stillwater, Oklahoma, USA, (1164 kg/ha). The 1771 kg/ha is the highest average yield reported for an International Mungbean Nursery exceeding a 1534 kg/ha average yield reported in the 2nd IMN, also from Melka Werer, and a 1519 kg/ha average yield reported in the 1st IMN from Melkassa, Ethiopia. Both of the IMN tests grown at Melka Werer were irrigated. At Melka Werer the 4th IMN was planted in July and had a growing season extending for 118 days. The long growing season undoubtedly contributed to the large yield of seed harvested at that location.

In contrast to the above high yields some yields reported were pitifully low. At seven locations mean yields were below 500 kg/ha. At several locations the nursery was a failure and yields were not reported. Reasons for the low yields at some locations are known. At Pantnagar and Ludhiana, India, the nurseries were severely damaged by MYMV. At Khumaltar, Nepal, low temperatures due to the high elevation reduced plant growth and yield. At Normal, Alabama, an unidentified leaf spot complex damaged all strains. It is assumed that the low yields at Korat, Thailand, where the growing season was only 45 days, were associated with high temperatures and perhaps insufficient moisture (three irrigations were given). Insufficient moisture was also reported from Nayagarh, India, and Tandojam, Pakistan, where nurseries were reported to be a failure and no data returned.

In the future it would be useful if cooperators would attempt to identify and report reasons for low yields. The information could help in locating germplasm resistant to local hazards and diseases, or prompt use of improved cultural practices. For example, knowledge that MYMV was the cause of low yields at Ludhiana and Pantnagar has helped in identifying strains resistant to the MYMV disease. This will be discussed later in this report.

Mungbean strains M1134 (from Oklahoma) and M409 (from Peru) ranked highest in yield over all locations with average yields of 1009 and 953 kg/ha, respectively. Both produced spectacular yields in the irrigated test at Melka Werer, 6907 kg/ha for M409 and 5800 kg/ha for M1134. These yields exceed the previous high yields of 3032 kg/ha for M409 and 2694 kg/ha for M317, also at Melka Werer, in the 2nd IMN. Other locations at which these two strains were high in yield in the 4th IMN were Adama-Nazareth and Kobbo, Ethiopia, and Guayaquil, Ecuador. M409 ranked second in yield over all locations in the 2nd IMN but only ranked 18th and M1134 ranked 19th in the 3rd IMN.

Mungbean strain M333 ranked 3rd over all locations with an average yield of 905 kg/ha. M333, which ranked among the five highest yielding strains at 9 of the 20

locations reporting yields, ranked 2nd in yield in the 3rd IMN. The identity of M333 is not known. It originated from a seed lot purchased in a market in Calcutta so is presumed to be grown as a commercial variety in India. M118 and M76 ranked 4th and 5th, respectively, for yield in the 4th IMN. M76 had ranked 4th in the 1st IMN and M118 had ranked 7th in the 3rd IMN.

M350 and M317 which had ranked 1st and 2nd in yield over the first three IMN's ranked 9th and 10th, respectively. However, M350 ranked among the first five strains in yield at six locations, and M317 ranked among the first five strains at four locations indicating that these strains continue to demonstrate high yield potential. M1133 which ranked 1st in the 3rd IMN ranked 14th in the 4th IMN.

Days to First Flower

The mean days to first flower for the 30 mungbean strains averaged over 21 locations was 45 days. Flowering occurred earliest at Los Baños (November planting at BPI); Shanhua, Taiwan; and Phra Puttabat, Thailand (32 days); Miri, Sarawak, and Korat, Thailand (33 days); June planting Los Baños at BPI (34 days); UPLB, Los Baños (35 days); Guayaquil, Ecuador (36 days); and Melka Werer, Ethiopia (38 days). All of these locations except Shanhua, Taiwan, are below 15° latitude. The planting at Shanhua was made in October when daylengths are less than 12 hours. Three locations below 15° latitude required more than 45 days to flower but each of the three locations was at a high elevation, Palmira, Colombia (1000 m); Adama/Nazareth, Ethiopia (1560 m); and Kobbo, Ethiopia (1450 m). Except for Shanhua, average days to flower exceeded 40 days at all locations above 20° latitude with the longest period (79 days) at Morden, Canada, where the latitude is between 49° and 50° N.

Individual mungbean strains averaged over all locations ranged from 42 to 50 days in flowering. M374 was earliest (42 days) and M1134 was latest (50 days). M1134 and M409 were the latest strains to flower at Melka Werer, Ethiopia, where they produced such exceptionally high yields. M409 was the latest strain to flower in the 2nd and 3rd IMN's and M1134 was the second latest in the 3rd IMN.

Days to First Ripe Pod

Days to first ripe pod were reported from three locations only. The days to first flower at these three locations averaged 37.4 and the days to first ripe pod 57.6 so that an average of 20.2 days were required for pod maturity. This is comparable to 20.0 days reported in the 2nd IMN.

Height

Height of plant, reported from 21 locations, averaged 50 cm over all. The shortest average height was at Melka Werer, Ethiopia, and the tallest at Jin-ju, Korea. The shortest strain was M530 (40 cm) and the tallest M409 (68 cm). M409 was the tallest strain in the 2nd and 3rd IMN's. The average height of M1134, the highest yielding strain, was 56 cm ranking it sixth among the 30 strains.

Pods per Plant

Pods per plant were reported from 18 locations and averaged 21 overall. The six strains with the highest number of pods per plant were M1134 (35), M411 (29), M533 (29), M333 (28), M409 (28), and M467 (28). Pods per plant is a component of yield and the three highest yielding strains - M1134, M409, and M333 - ranked high in pods per plant. M411 ranked first and M533 ranked second for pods per plant in each the 2nd and the 3rd IMN.

Seeds per Pod

Seeds per pod over 19 locations averaged 11.4, higher than the 10.4 reported for the 3rd IMN. The five strains with the largest number of seeds per pod were M2069 (12.6), M2070 (12.6), M15 (12.5), M1135 (12.4) and M1645 (12.4). None of these strains were among the higher yielding strains even though seeds per pod is a component of yield. M1134, which ranked first in yield, had 11.4 seeds per pod; M409, which ranked second in yield, had 11.2 seeds per pod; and M333, which ranked third in yield, had 11.1 seeds per pod. M15 ranked 3rd and M1135 ranked 2nd for seeds per pod in the 3rd IMN.

1000-Seed Weight

Seed weight was reported from 18 locations. The five strains with the largest 1000-seed weight were M1956 (66g), M394 (65g), M317 (61g), M374 (59g) and M15 (57g). M1956 and M394 are new in the 4th IMN. M317 ranked first, M374 ranked second, and M15 ranked fourth for 1000-seed weight in the 3rd IMN; and M374 ranked first, M317 ranked third, and M15 ranked fifth for 1000-seed weight in the 2nd IMN. 1000-seed weight is a component of yield, yet none of these strains ranked above eighth in yield. M1134 and M409, the two highest yielding strains, had 1000-seed weights of 41g and 44g, respectively.

Disease and Insect Scores

Observations on diseases were reported for one or more diseases from 16 locations. Virus (unidentified) was reported from five locations, mungbean yellow mosaic virus from five locations, mildew from eight locations, and *Cercospora* leaf spot from seven locations. In addition, unidentified leaf spots were reported from two locations. Insect damage by white striped blister beetle was reported from one location.

a. Virus

Although virus infection was reported from five locations, the specific virus was not identified and it is not known whether the same virus disease, or virus complex, is being observed at the different locations. The symptoms most commonly reported were leaf crinkling, rugose appearance, dwarfing, and flower abortion. With data summarized over the five locations, the strains with the lowest virus scores were M358 (1.2); M333 and M339 (1.3); M4, M14, and M1134 (1.4); and M409 (1.5). Highest scores were for strains M1645 (3.4), M394 (3.2), and M533 (3.1). Among the strains with low virus scores, M1134 ranked first, M409 ranked second and M333 ranked third in yield. By contrast M1645, M394 and M533 ranked 26th, 20th, and 22nd in yield. M333, M1134, and M409 had the lowest virus score in the 3rd IMN. Field observations that virus resistance is necessary for high yield over a wide range of test locations is verified with this data, however, identification of the virus, or virus complex, being observed at the different locations is needed.

b. Mungbean Yellow Mosaic Virus

Mungbean yellow mosaic virus (MYMV) was summarized from five locations. Mungbean strains with lowest average scores were M467 (1.4), M304 (1.5), M90 (1.7), and M533 (1.7). Strains M467 (ML-6) and M533 (ML-1) were developed for MYMV resistance at Ludhiana, India. The most relevant data on MYMV reaction were sent from Ludhiana, India, (Table 10). The observations from Ludhiana were not included in the summary because there was a large amount of data missing as many strains were killed by the MYMV. Yield and MYMV scores of the five highest yielding strains at Ludhiana are listed on the following page.

Entry	Acc. No.	Name	Yield kg/ha	MYMV Score
Local check		ML-5*	900	4.0
21	M533	ML-1*	589	3.3
16	M411	Hybrid 45	449	4.0
17	M467	ML-6*	409	3.0
15	M409	(Peru)	152	4.0

*Varieties developed at Punjab Agricultural University, Ludhiana, India.

These data take on added significance with awareness that strains ML-5, ML-1, and ML-6 were developed at Ludhiana with MYMV as a major objective in their breeding, and that Hybrid 45 has been frequently utilized at Ludhiana as a parent strain to contribute MYMV resistance. Nine other strains for which yields were reported from Ludhiana averaged only 32 kg/ha, and 17 strains were so severely damaged or even killed and were not harvested. The performance of these strains at Ludhiana is supported by data from Pantnagar, India, a location where MYMV is frequently severe also. The two highest yielding strains at Pantnagar were M467 (ML-6) and M533 (ML-1), each with 666 kg/ha. The next highest yielding strains were M333 with 266 kg/ha and M411 with 233 kg/ha. ML-5 was not grown at Pantnagar. There are few strains in mungbean which have resistance to MYMV. The resistance in ML-1, ML-5, ML-6, and Hybrid 45 is the best that has been identified in the International Mungbean Nurseries. These strains are not immune to MYMV, which accounts for the high virus scores reported above. But the five strains produced substantially higher yields at Ludhiana than the remainder of the strains, all of which were given a MYMV score of 5.

c. Mildew

Mildew was reported from eight locations. At five locations the average mildew score was 2.0 or less indicating rather light infections. Highest average mildew scores were reported from UPLB, Los Baños, Philippines (3.2); BPI, Los Baños (2.8); and Guayaquil, Ecuador (2.5). Mungbean strains with lowest mildew scores were M358, M15, M1132, M1135, and M2070 and strains with highest scores were M118 and M333. M15 had the lowest mildew score and M333 the highest score in the 3rd IMN.

d. Cercospora Leaf Spot

Cercospora leaf spot was reported from eight locations but data from one location, Pantnagar, India, was not included in the summary because more than half of the strains at Pantnagar were free of infection. Heaviest infections were reported from Los Baños, Philippines, and Phra Puttabat, Thailand. Strains with lowest infection scores were M533 (2.0), M411 (2.5), M467 (2.7), M409 (2.8), and M1134 (2.8). M533, M411, M467, and M409 were the strains with lowest MYMV scores, also. Highest scores were recorded for M358 (4.2), M339 (4.1), and M304 (4.0). Mean scores of 3 or higher were recorded for 24 of the 30 strains in the 4th IMN. M411 and M533 had the lowest *Cercospora* leaf spot scores in the 3rd IMN.

SUMMARY OF THE FIRST, SECOND, THIRD, AND FOURTH INTERNATIONAL MUNGBEAN NURSERIES

In the International Mungbean Nurseries some of the lower yielding strains are replaced each year with new strains. Only eight strains have been continued throughout the first four IMN's. A summary of agronomic and disease data for the eight mungbean strains grown at 68 test locations in the First, Second, Third, and Fourth IMN's are

reported in Table 26. Mungbean strains M350, M317, and M118 ranked 1st, 2nd, and 3rd, respectively, among the eight strains over 61 locations from which yield data were reported. Mungbean strain M350 ranked 1st in yield in the First and Second IMN's, 4th in the Third IMN, and 9th in the Fourth IMN. Mungbean strain M317 ranked 2nd in yield in the First IMN, 4th in the Second IMN, 3rd in the 3rd IMN, and 6th in the 4th IMN. These two strains have consistently maintained high average yields over most of the test locations in the first four IMN's.

SUMMARY OF THE SECOND, THIRD AND FOURTH INTERNATIONAL MUNGBEAN NURSERIES

Twelve mungbean strains were grown in each the Second, Third, and Fourth IMN's. A summary of agronomic and disease data for the 12 strains grown at 59 test locations in the Second, Third, and Fourth IMN's are reported in Table 27. The four highest yielding strains in order of yield over 53 locations from which yield data were reported are M350, M409, M317, and M118. These data show that, in addition to M350, M317, and M118, M409, a strain new in the Second IMN, also has a high potential for yield. Other mungbean strains new in the Second IMN which have been continued in later nurseries are M411, M374, and M533, but none of these new strains ranked higher than seventh in yield over the 53 test locations.

SUMMARY OF THE THIRD AND FOURTH INTERNATIONAL MUNGBEAN NURSERIES

Twenty-one mungbean strains were grown both in the Third and Fourth IMN's. A summary of agronomic and disease data for the 21 strains over 41 test locations in the Third and Fourth IMN's is reported in Table 28. The five highest ranking strains in order of yield from the 38 test locations from which yield data were reported were M333, M1134, M1133, M118, and M1132. All of these strains except M118 were grown in the 3rd and 4th IMN's only. M350, M409, and M317, strains high in yield in the early mungbean nurseries ranked seventh, eighth, and sixth, respectively. Other strains new in the Third IMN which are included in the summary are M339, M475, M531, M1135, and M1136, none of which ranked higher than 12th over the 41 test locations.

RANGE OF ADAPTATION OF THE MUNGBEAN SPECIES

One of the objectives of the International Mungbean Nursery was to study the range of adaptation of the mungbean species. Data has not been accumulated from a sufficiently wide sample of geographic and climatic areas to adequately answer this question. However, adaptation appears to be much broader than anticipated. Most of the IMN data comes from Asia, the area where the mungbean originated and where it is most widely grown as a commercial crop. From Africa, data is available from only one country, Ethiopia, but yields reported from irrigated plots at Melka Werer exceeded the highest yields from all other locations by a wide margin in two seasons. From South America, data is available only from Colombia in four seasons and from Ecuador in one season. In addition to Colombia, Peru grows mungbeans for domestic use and export, but so far, no IMN data has been received from Peru. Neither has IMN data been returned from Central America although nurseries have been sent to several countries. In the United States, data is available from the states of Oklahoma, Missouri, and Alabama, with good yields reported at each location in certain seasons. The IMN has been grown at Morden, Canada, each year. There, only early maturing varieties produce seed. Late varieties fail to flower before frost in some years, in other years they may flower but fail to produce seed.

From all of the data received an important fact stands out, mungbeans are a short-day, warm-season crop. Long photoperiods and cool temperatures are climatic factors that may limit production; little success has been attained when the IMN's were grown above 40° latitude or below 20 C mean temperature. With short photoperiods and high mean temperatures mungbean is a short season crop, flowering in 30-40 days. Under these conditions mungbeans fit well into multiple cropping systems. In long photoperiods and low mean temperatures, flowering requires 50-80 days, with varieties differing in their photoperiod-temperature response. Some of the mungbean nurseries have been grown at elevations between 1000 and 1500 feet. While the effect of high elevation is to reduce the mean temperature, this may be partially offset if the crop is grown in a period with abundant sunshine. Factors which have caused most of the failures of the IMN's are inadequate soil moisture, early frost in northern latitudes, typhoons or rain storms which destroy the crop, insects such as bean shoot fly, and disease.

ADAPTATION OF MUNGBEAN STRAINS TO LOCAL ENVIRONMENTS

The summaries on mungbean strains reported in Tables 25 to 28 identify strains with broad general adaptation (M118, M350, M317, M333, M409, M1133 and M1134) if high yield over a large number of test locations is used as the criterion. They do not necessarily identify adaptation of strains to local environments. This is illustrated by the following comparison of yield rankings of strains M350 and M409, the strains ranking first and second, respectively, at 53 locations from which yield data were reported for the Second, Third and Fourth IMN's:

Test location	Number of trials	Yield rank among 12 strains in 2nd, 3rd, and 4th IMN's.	
		M350	M409
Philippines	3	1	12
Korea	5	1	12
Thailand	7	1	12
Ethiopia	8	9	1
Iran	3	11	2

These results show M350 to be clearly superior to M409 in yield in three S.E. Asian countries and M409 to be superior to M350 in Ethiopia and Iran. In the 3rd and 4th IMN's the strain M1134 also ranked high in yield in Ethiopia and Iran and poorly in the S.E. Asian countries. The explanation is not immediately apparent but may be associated with the higher elevations at which the mungbean strains have been grown in Ethiopia and Iran and the late maturity of the M409 and M1134 strains.

Differential strain response to photoperiod has been reported in each of the IMN's. This becomes more important in adaptation as the latitude of the test location becomes greater. At Morden, Canada, (latitude 49° 25' N) all strains flowered in the First and Second IMN's but less than half of the strains ripened seeds in sufficient quantity to be harvested. In the Third IMN only 17 of 30 strains flowered before frost at Morden. These data emphasize that only strains with low sensitivity to photoperiod may be grown successfully at Morden. At Columbia, Missouri (latitude 38° 49' N), extremely late strains do not ripen sufficient pods before frost to produce high yields.

Disease is another factor that may affect adaptation. Mungbean yellow mosaic virus is an important disease in Pakistan and India and MYMV resistance is needed for varieties to be consistently high yielding in those countries. The data from the Fourth IMN at

Ludhiana, and Pantnagar, India, have already been cited in this report as an example of the importance of MYMV resistance at those locations. At seven test locations where the Second, Third and Fourth IMN's were grown in India and Pakistan the MYMV resistant strains, M533 and M411, were highest in yield and also had the lowest MYMV scores. A local virus, tentatively identified as a strain of cucumber mosaic virus, has reduced yields of mungbean strains susceptible to the virus at Columbia, Missouri. The strains highest in yield at Columbia in the first four IMN's were M118, M4, and M90, strains that also had the lowest CMV scores. Mildew has been a common disease at Columbia, Missouri; Suwon, Korea; Palmira, Colombia; Shanhua, Taiwan; and other locations. Resistance to mildew sufficient to affect yields has not been apparent in strains which have been grown in the IMN's. A similar situation may be noted for Cerospora leaf spot which is reported most frequently from Asian countries and from Palmira, Colombia.

Table 3. AGRONOMIC AND DISEASE DATA FOR THE FOURTH INTERNATIONAL MUNGBEAN NURSERY GROWN AT Morden, Manitoba, Canada

Cooperator: Mark D. Stauffer, Research Station, Morden, Manitoba, Canada ROG 1J0

Entry	Acc.	Days to first flower	Ht cm
1	M4	73	48
2	M14	86	44
3	M15	84	48
4	M76	82	48
5	M90	90	41
6	M118	90	50
7	M304	73	49
8	M317	78	52
9	M333	76	54
10	M339	88	38
11	M350	78	51
12	M358	86	48
13	M374	65	50
14	M394	79	51
15	M409	80	49
16	M411	70	51
17	M467	69	50
18	M475	80	47
19	M530	82	47
20	M531	80	45
21	M533	80	42
22	M1132	71	45
23	M1133	80	48
24	M1134	86	50
25	M1135	88	49
26	M1136	88	48
27	M1645	74	55
28	M2069	66	52
29	M2070	76	46
30	M1956	64	49
Mean		78.7	48.1
CV		1.2	6.9
LSD (.05)		1.5	5.5

Latitude: 49° 25' N

Elevation: 311 m

Precipitation during test:

Irrigation water applied: none

Number replications: three

Date planted: May 27, 1975

Date harvested:

Plot size (length x width): 5m x 75cm

Plot area: 3.75m²

Nodulation: poor

Table 4. AGRONOMIC AND DISEASE DATA FOR THE FOURTH INTERNATIONAL MUNGBEAN NURSERY GROWN AT Palmira, Colombia, S. A.

Cooperator: Edgar Guzman Acuña, Instituto Colombiano Agropecuario, Palmira, Colombia, S. A.

Entry	Acc.	Yield rank	Yield kg/ha	Days to first flower	Ht cm	Pods per plant	Seeds per pod	Disease Scores		
								Mungbean yellow mosaic virus (1-5)	Mildew (1-5)	Cercospora leaf spot (1-5)
1	M4	21	687	39	34	13	12	-	1.5	2.5
2	M14	13	827	41	42	13	11	0.5	2.5	3.0
3	M15	2	1020	41	42	14	10	0.5	2.0	3.0
4	M76	9	850	42	38	14	11	-	1.5	3.0
5	M90	24	627	40	34	13	10	0.5	2.0	3.5
6	M118	22	680	40	39	30	12	-	1.5	2.5
7	M304	3	980	41	42	12	14	-	1.5	3.5
8	M317	8	870	43	53	10	13	0.5	2.0	2.5
9	M333	1	1280	41	44	29	11	1.5	1.5	3.0
10	M339	15	800	40	29	17	10	-	1.0	4.0
11	M350	7	893	41	38	20	23	-	1.5	3.5
12	M358	18	757	40	23	17	13	0.5	-	3.5
13	M374	4	970	40	38	15	11	-	1.0	2.0
14	M394	14	817	40	47	8	12	-	3.0	2.5
15	M409	29	337	46	41	9	9	-	2.0	1.5
16	M411	25	610	41	43	31	12	1.0	3.0	2.5
17	M467	26	563	40	49	25	12	-	3.0	3.0
18	M475	5	930	39	40	23	11	-	2.0	4.0
19	M530	20	697	39	26	20	10	-	1.0	4.0
20	M531	6	930	39	33	17	10	-	2.0	3.5
21	M533	28	460	41	53	14	9	0.5	2.0	2.0
22	M1132	17	760	42	42	13	11	1.0	2.0	2.5
23	M1133	12	830	41	43	12	12	1.5	1.0	1.5
24	M1134	23	630	46	47	14	12	-	2.0	1.0
25	M1135	19	720	41	41	10	11	3.5	2.0	1.0
26	M1136	16	770	41	44	8	14	1.5	2.0	2.0
27	M1645	27	503	45	58	14	12	0.5	2.0	1.5
28	M2069	11	837	43	59	13	15	1.0	2.5	2.0
29	M2070	10	840	41	44	10	10	1.5	1.5	3.0
Mean			774.9	40.9	41.6	15.8	11.8	0.6	1.8	2.7
CV			29.6	2.9	11.2				32.4	29.1
LSD (.05)			374.4	19.5	7.6				9.6	1.3

Latitude: 3° 32' N

Elevation: 1000 m

Precipitation during test: 303.8 mm

Irrigation water applied:

Number replications: three

Date planted: April 25, 1975

Date harvested: July 21, 1975

Plot size (length x width): 1m x 60cm

Plot area: 0.6m²

Nodulation: good

Table 5. AGRONOMIC AND DISEASE DATA FOR THE FOURTH INTERNATIONAL MUNGBEAN NURSERY GROWN AT Guayaquil, Ecuador

Cooperator: Hector Buestán, and Alfonso Ponce, Instituto Nacional de Investigaciones Agropecuarias, Estacion Experimental Boliche, Guayaquil, Ecuador

Entry	Acc.	Yield rank	Yield kg/ha	Days to first flower	Ht cm	Pods per plant	Seeds per pod	1000 seed wt gm	Disease Scores		
									Virus (1-5)	Mungbean yellow mosaic virus (1-5)	Mildew (1-5)
1	M4	16	780	34	34	20	10	43	2.0	1.0	3.5
2	M14	23	646	36	31	16	9	58	3.0	1.0	1.7
3	M15	13	793	36	28	11	12	64	2.7	3.3	1.7
4	M76	26	597	38	34	18	11	41	3.3	2.0	2.8
5	M90	14	787	36	29	14	9	52	3.0	1.0	2.2
6	M118	11	844	36	34	14	9	48	2.7	1.0	3.5
7	M304	18	751	37	29	11	12	58	5.0	1.0	4.0
8	M317	8	1071	37	41	10	12	63	4.7	1.0	2.8
9	M333	5	1178	33	41	23	10	41	1.7	1.3	3.3
10	M339	31	396	34	26	11	9	42	1.7	3.3	4.0
11	M350	28	531	36	31	21	9	53	4.0	2.0	2.2
12	M358	20	724	34	23	12	9	44	1.0	2.0	3.2
13	M374	21	701	38	30	13	10	70	5.0	1.0	2.3
14	M394	12	843	38	35	19	9	76	5.0	1.0	1.8
15	M409	1	1689	40	62	34	11	47	2.3	1.0	1.2
16	M411	15	783	36	29	19	10	44	1.7	1.0	4.0
17	M467	24	645	35	29	21	10	33	2.3	1.0	3.7
18	M475	6	1164	36	27	15	9	59	4.3	1.0	2.2
19	M530	27	543	35	21	13	9	49	4.0	3.0	3.3
20	M531	30	411	35	25	16	10	69	3.7	1.3	2.3
21	M533	9	941	37	37	33	11	35	4.7	1.0	3.2
22	M1132	10	851	36	29	13	13	50	2.7	1.7	1.7
23	M1133	25	638	37	29	14	11	56	3.0	1.7	2.8
24	M1134	2	1622	37	49	29	11	44	1.3	1.0	1.8
25	M1135	29	521	36	29	10	12	60	3.7	4.0	3.0
26	M1136	17	758	37	28	10	11	58	4.7	1.3	2.7
27	M1645	3	1452	39	48	24	11	57	5.0	1.0	1.0
28	M2069	4	1335	38	43	17	14	54	3.0	1.7	0.7
29	M2070	22	690	35	29	10	12	51	3.0	1.7	2.5
30	M1956	19	728	37	33	13	10	79	3.7	2.3	1.8
31	Paciencia	7	1142	37	33	14	11	-	2.7	2.0	1.0
Mean			856.6	36.3	33.3	16.8	10.6	53.3	3.2	1.6	2.5
CV			31.2	0.4	6.6	21.8	13.1	11.0	22.1	52.5	20.4
LSD (.05)			437.3	0.2	3.5	6.0	2.3	10.0	1.2	1.4	0.9

Latitude: 2° 20' S

Elevation: 17m

Precipitation during test:

Irrigation water applied: 3 irrigations

Number replications: three

Date planted: July 23, 1975

Date harvested: October 1, 1975

Plot size (length x width): 5m x 75cm

Plot area: 3.75m²

Nodulation: poor

Table 6. AGRONOMIC AND DISEASE DATA FOR THE FOURTH INTERNATIONAL MUNGBEAN NURSERY GROWN AT Adama-Nazareth, Ethiopia

Cooperator: Habtu Assefa and Lars Ohlander, Institute of Agricultural Research, National Horticultural Center, Nazareth, Ethiopia

Entry	Acc.	Yield rank	Yield kg/ha	Days to first flower	Ht cm	Pods per plant	Seeds per pod	1000 seed wt gm	Disease Scores			
									Virus (1-5)	Mungbean yellow mosaic virus (1-5)	Mildew (1-5)	Unknown leaf spot (1-5)
1	M4	14	601	44	29	36	10	47	1.4	2.7	0.8	0.5
2	M14	10	739	46	31	37	7	54	2.6	1.7	1.0	0.5
3	M15	9	763	49	33	28	12	57	2.3	3.7	1.3	0.5
4	M76	5	917	48	31	55	10	38	3.5	1.3	0.8	0.7
5	M90	13	663	45	31	34	8	57	2.0	1.2	1.0	0.7
6	M118	4	932	46	38	69	9	48	1.5	3.7	1.3	0.5
7	M304	18	512	48	33	39	11	46	4.0	0.3	1.8	2.3
8	M317	17	540	49	36	23	11	56	3.3	2.0	0.8	1.8
9	M333	6	880	47	33	42	10	42	0.4	4.4	0.7	0.8
10	M339	26	343	47	24	25	9	37	0.8	4.0	0.7	0.8
11	M350	20	491	47	36	45	10	39	2.8	2.0	0.5	1.3
12	M358	19	508	45	22	33	9	43	0.7	4.3	0.5	0.5
13	M374	25	348	48	31	40	8	49	3.2	0.4	0.5	2.3
14	M394	28	268	51	38	49	8	55	4.5	0.1	0.7	2.3
15	M409	2	2431	53	64	165	11	46	1.3	2.2	1.2	0.7
16	M411	16	559	47	28	39	9	35	2.1	1.5	1.2	2.0
17	M467	23	387	49	34	51	9	30	3.6	0.5	2.0	2.0
18	M475	11	702	45	30	35	8	50	2.3	2.9	0.8	1.3
19	M530	12	682	46	21	29	9	49	1.3	3.0	0.5	0.5
20	M531	21	457	46	25	25	9	58	2.9	1.5	0.3	0.8
21	M533	30	221	50	34	62	9	35	4.4	1.1	0.8	0.7
22	M1132	3	1190	47	36	44	11	49	2.0	3.7	0.5	0.7
23	M1133	7	839	47	35	39	10	53	2.1	3.7	1.0	0.7
24	M1134	1	2569	54	49	131	11	44	1.5	3.0	1.2	0.5
25	M1135	24	370	47	28	26	99	62	1.7	3.1	0.7	0.5
26	M1136	8	828	48	36	46	11	57	2.3	4.0	0.8	0.8
27	M1645	22	454	53	45	44	8	40	4.8	2.0	0.7	1.7
28	M2069	27	342	51	45	37	8	44	4.3	1.0	0.7	2.7
29	M2070	15	576	48	34	29	11	58	1.2	4.2	0.5	0.5
30	M1956	29	264	48	30	25	9	59	3.9	0.8	0.5	1.7
Mean			712.6	48.0	34.1	46.0	9.5	47.9	2.5	2.3	0.9	1.1
CV			30.7	2.1	12.2	29.4	10.9	7.9	30.7	29.9	53.4	70.9
LSD (.05)			357.6	1.6	6.8	22.1	1.7	6.2	1.2	1.1	0.8	1.3

Latitude: 8° 22' N
 Elevation: 1,560 m
 Precipitation during test: 739 mm
 Irrigation water applied: none
 Number replications: three

Date planted: July 2, 1975
 Date harvested: Sept. 30-Dec. 5, 1975
 Plot size (length x width): 5m x 75cm
 Plot area: 3.75m²
 Nodulation:

Table 7. AGRONOMIC AND DISEASE DATA FOR THE FOURTH INTERNATIONAL MUNGBEAN NURSERY GROWN AT Kobb, Ethiopia

Cooperator: Ato Fekadu Alemayehu, Kobb Institute of Agricultural Research, Kobb, and Lars Ohlander, National Horticultural Center, Nazareth, Ethiopia

Entry	Acc.	Yield rank	Yield kg/ha	Days to first flower	Days to first ripe pod	Ht cm	1000 seed wt gm	White striped blister beetle (1-5)
1	M4	14	193	45	65	27	45	1.7
2	M14	15	177	43	64	27	50	1.3
3	M15	10	237	45	65	33	50	2.0
4	M76	5	499	45	65	38	43	1.8
5	M90	19	110	43	64	18	48	1.5
6	M118	12	200	43	65	27	47	1.6
7	M304	21	86	51	65	20	43	1.0
8	M317	29	18	51	65	22	48	1.2
9	M333	13	194	45	65	33	50	1.0
10	M339	22	77	43	65	20	47	1.3
11	M350	27	29	43	65	20	48	1.7
12	M358	23	72	43	65	13	47	1.5
13	M374	28	24	43	65	20	52	1.0
14	M394	30	20	43	65	22	47	1.2
15	M409	4	529	49	71	50	50	1.5
16	M411	16	152	50	65	30	42	1.3
17	M467	24	55	43	65	23	38	1.0
18	M475	18	113	43	65	22	50	1.5
19	M530	7	436	45	65	22	43	1.7
20	M531	11	230	40	65	28	48	1.3
21	M533	26	47	45	65	28	43	1.8
22	M1132	6	494	45	65	35	50	1.7
23	M1133	9	398	45	65	32	52	1.3
24	M1134	1	1006	52	73	52	50	1.3
25	M1135	2	566	45	65	37	55	1.8
26	M1136	8	435	45	65	33	55	1.3
27	M1645	17	113	52	65	33	43	1.8
28	M2069	20	95	52	68	27	48	2.0
29	M2070	3	556	45	65	35	52	2.2
30	M1956	25	66	43	65	18	42	1.5
Mean			240.8	45.5	65.5	28.1	47.6	1.5
CV			69.2		1.5	14.8	12.1	
LSD (.05)			272.2		1.6	6.8	9.4	

Latitude: 12° 9' N

Elevation: 1450 m

Precipitation during test: 605 mm

Irrigation water applied:

Number replications: three

Date planted: July 15, 1975

Date harvested: September 24 to October 29, 1975

Plot size (length x width): 4m x 90 cm

Plot area: 3.6m²

Nodulation:

Table 8. AGRONOMIC AND DISEASE DATA FOR THE FOURTH INTERNATIONAL MUNGBEAN NURSERY GROWN AT Melka Werer, Ethiopia

Cooperator: Gurmau Dabi, Institute of Agricultural Research, Melka Werer, and Lars Ohlander, National Horticultural Center, Nazareth, Ethiopia

Entry	Acc.	Yield rank	Yield kg/ha	Days to first flower	Ht cm	Pods per plant	Seeds per pod	1000 seed wt gm
1	M4	14	1603	33	20	23	10	49
2	M14	10	1837	35	25	20	10	56
3	M15	12	1770	37	26	19	12	62
4	M76	5	2333	38	22	24	11	38
5	M90	9	1840	36	20	16	9	56
6	M118	6	2323	36	23	29	10	47
7	M304	25	813	36	27	16	9	53
8	M317	4	2480	37	37	19	12	61
9	M333	7	2020	36	28	30	10	39
10	M339	23	1060	37	14	14	8	40
11	M350	17	1377	37	30	15	12	42
12	M358	29	550	37	11	10	9	40
13	M374	28	563	39	30	16	9	56
14	M394	26	750	39	33	12	9	60
15	M409	1	6907	42	47	65	11	48
16	M411	24	1043	36	26	19	9	34
17	M467	27	717	37	25	13	10	30
18	M475	8	1990	35	23	17	10	53
19	M530	19	1263	37	16	14	10	53
20	M531	16	1397	35	23	15	8	57
21	M533	20	1117	38	26	23	9	38
22	M1132	3	2783	35	28	22	12	53
23	M1133	11	1823	35	27	15	11	55
24	M1134	3	5800	42	46	76	11	49
25	M1135	18	1310	38	28	12	10	62
26	M1136	13	1690	40	26	14	9	58
27	M1645	22	1097	41	41	16	11	41
28	M2069	15	1407	41	40	14	13	50
29	M2070	21	1103	39	26	13	10	60
30	M1956	30	367	40	21	4	8	58
Mean			1771.1	37.5	27.2	20.6	10.1	49.9
CV			23.3	6.1	11.9	41.7	15.3	5.5
LSD (.05)			672.8	3.7	5.3	14.0	2.5	4.5

Latitude: 9° 16' N

Elevation: 750m

Precipitation during test: 416 mm

Irrigation water applied: four irrigations

Number replications: three

Date planted: July 16, 1975

Date harvested: Sept. 24 to Nov. 11, 1975

Plot size (length x width): 4m x 80cm

Plot area: 3.2m²

Nodulation: medium

Table 9. AGRONOMIC AND DISEASE DATA FOR THE FOURTH INTERNATIONAL MUNGBEAN
BURSERY GROWN AT Ludhiana, Punjab, India

Cooperator: T. S. Sandhu and K. S. Gill, Department of Plant Breeding, Punjab Agricultural
University, Ludhiana, Punjab, India

Entry	Acc.	Yield rank	Yield kg/ha	Days to first flower	Ht cm	Pods per plant	Seeds per pod	1000 seed wt gm	Disease Scores
									Mungbean yellow mosaic virus (1-5)
1	M4	13	19	39	55	2	10	32	5.0
2	M14	11	21	37	52	2	10	31	5.0
3	M15	-	-	-	-	-	-	-	-
4	M76	-	-	37	50	-	-	-	5.0
5	M90	-	-	40	54	-	-	-	5.0
6	M118	10	36	37	51	3	10	30	5.0
7	M304	9	38	35	55	22	10	28	5.0
8	M317	14	17	33	52	2	10	30	5.0
9	M333	6	65	32	58	3	10	29	5.0
10	M339	7	57	39	44	3	10	31	5.0
11	M350	12	20	34	49	2	9	29	5.0
12	M358	-	-	35	51	-	-	-	5.0
13	M374	8	45	36	44	3	9	28	5.0
14	M394	-	-	36	41	-	-	-	5.0
15	M409	5	152	39	41	25	9	23	4.0
16	M411	3	449	38	41	51	9	23	4.0
17	M467	4	409	38	39	46	10	27	4.0
18	M475	-	-	35	46	-	-	-	5.0
19	M530	-	-	35	49	-	-	-	5.0
20	M531	-	-	36	37	-	-	-	5.0
21	M533	2	589	36	47	55	11	25	3.3
22	M1132	-	-	35	42	-	-	-	5.0
23	M1133	-	-	-	-	-	-	-	-
24	M1134	-	-	-	-	-	-	-	-
25	M1135	-	-	38	48	-	-	-	5.0
26	M1136	-	-	41	45	-	-	-	5.0
27	M1645	-	-	39	46	-	-	-	5.0
28	M2069	-	-	33	47	-	-	-	5.0
29	M2070	-	-	-	-	-	-	-	-
30	M1956	-	-	32	40	-	-	-	5.0
31	ML-5	1	900	31	48	68	11	26	4.0
32	M550	-	-	39	52	-	-	-	5.0
Mean			201.3	36.3	47.4	18.9	9.9	27.9	4.8

Latitude: 30° 56' N

Elevation: 154 m

Precipitation during test: 303 mm

Irrigation water applied: none

Number replications: three

Date planted: August 7, 1975

Date harvested: November 4, 1975

Plot size (length x width): 4m x 45cm

Plot area: 1.8m²

Nodulation: medium

Table 10. AGRONOMIC AND DISEASE DATA FOR THE FOURTH INTERNATIONAL MUNGBEAN NURSERY GROWN AT Pantnagar, Uttar Pradesh, India

Cooperator: S. P. S. Beniwal, Dept. of Plant Pathology, G. B. Pant University of Agriculture and Technology, Pantnagar, Uttar Pradesh, India

Entry	Acc.	Yield rank	Yield kg/ha	Days to first flower	Ht cm	Pods per plant	Seeds per pod	1000 seed wt gm	Virus (1-5)	Disease Scores	
										Mungbean yellow mosaic virus (1-5)	Cercospora leaf spot (1-5)
1	M4	10	157	43	60	8	11	48	2.0	5.0	0.0
2	M14	8	157	41	65	9	14	65	0.0	4.0	0.0
3	M15	18	133	42	57	12	15	62	3.0	4.0	2.0
4	M76	9	157	44	55	12	10	35	2.0	4.0	0.0
5	M90	25	80	40	50	13	12	45	1.0	4.0	0.0
6	M118	19	133	41	52	9	8	48	3.0	4.0	2.0
7	M304	22	100	36	45	12	10	50	1.0	4.0	1.0
8	M317	5	233	42	65	10	14	63	3.0	4.0	0.0
9	M333	3	266	40	62	8	12	45	3.0	4.0	0.0
10	M339	23	100	40	56	12	12	48	3.0	3.0	0.0
11	M350	24	100	36	54	13	12	53	3.0	5.0	0.0
12	M358	12	133	42	55	8	16	50	3.0	5.0	3.0
13	M374	14	133	34	40	10	12	58	2.0	5.0	1.0
14	M394	6	233	39	47	13	12	70	2.0	5.0	1.0
15	M409	29	67	46	52	11	10	30	2.0	5.0	1.0
16	M411	4	233	43	65	13	8	43	2.0	3.0	0.0
17	M467	1	666	34	60	11	11	40	1.0	3.0	0.0
18	M475	30	33	39	65	13	9	50	3.0	5.0	0.0
19	M530	13	133	41	53	13	12	55	2.0	5.0	1.0
20	M531	26	67	43	52	12	11	60	2.0	5.0	0.0
21	M533	2	666	40	51	14	10	40	2.0	3.0	0.0
22	M1132	15	133	44	45	18	11	58	3.0	4.0	0.0
23	M1133	16	133	48	56	20	13	53	2.0	5.0	2.0
24	M1134	20	100	51	52	18	13	30	3.0	5.0	3.0
25	M1135	28	67	42	48	15	12	61	3.0	5.0	1.0
26	M1136	21	100	45	55	13	10	30	3.0	5.0	1.0
27	M1645	17	133	42	57	19	10	50	4.0	5.0	1.0
28	M2069	27	67	45	51	18	11	50	3.0	5.0	0.0
29	M2070	7	200	42	49	12	12	60	4.0	5.0	1.0
30	M1956	11	157	40	54	17	13	65	3.0	5.0	0.0
Mean			169.0	41.5	54.3	12.8	11.5	50.5	2.4	4.4	

Latitude: 29° N

Elevation: 244m

Precipitation during test: 594mm

Irrigation water applied: none

Number replications: one

Date planted: August 10, 1975

Date harvested: October 10 to Oct. 22, 1975

Plot size (length x width): 5m x 50cm

Plot area: 2.5m²

Nodulation: medium

Table 11. AGRONOMIC AND DISEASE DATA FOR THE FOURTH INTERNATIONAL MUNGBEAN NURSERY GROWN AT Karaj, Iran

Cooperator: M. C. Amirshahi, Karaj Agricultural College, University of Teheran, Karaj, Iran

Entry	Acc.	Yield rank	Yield kg/ha	Days to first flower	Ht cm	Pods per plant	Seeds per pod	1000 seed wt gm	Disease Scores
									Mungbean yellow mosaic virus (1-5)
1	M4	3	1617	55	30	65	14	52	1.3
2	M14	23	1053	57	36	32	13	67	1.3
3	M15	15	1308	57	47	22	11	78	1.7
4	M76	29	675	55	29	38	9	33	1.3
5	M90	11	1405	60	38	63	12	63	1.3
6	M118	1	1833	62	44	78	13	52	1.3
7	M304	9	1450	56	42	31	10	59	1.3
8	M317	14	1367	56	43	31	12	77	1.7
9	M333	26	972	56	45	41	10	42	1.3
10	M339	18	1322	55	24	48	10	43	2.0
11	M350	25	995	54	41	29	10	43	1.3
12	M358	4	1603	45	27	83	10	46	2.0
13	M374	5	1540	54	37	35	13	76	1.7
14	M394	28	923	59	49	40	11	78	1.7
15	M409	16	1295	56	39	39	12	65	1.7
16	M411	13	1368	56	55	77	10	55	2.0
17	M467	21	1078	57	43	76	12	34	1.3
18	M475	2	1620	60	48	95	14	67	1.3
19	M530	17	1287	57	35	66	12	54	1.7
20	M531	20	1083	46	27	61	12	59	1.7
21	M533	8	1457	55	50	57	13	38	2.0
22	M1132	10	1407	55	43	51	10	61	2.0
23	M1133	6	1540	56	39	20	11	58	1.3
24	M1134	12	1397	48	31	120	10	50	1.7
25	M1135	7	1528	59	45	23	15	53	1.7
26	M1136	22	1060	58	42	74	12	66	1.7
27	M1645	27	947	55	54	47	14	55	1.7
28	M2069	30	633	54	32	19	8	97	1.7
29	M2070	19	1150	57	42	47	12	68	1.7
30	M1956	24	1033	56	56	39	10	66	1.3
Mean			1261.9	55.6	40.4	51.6	11.4	58.5	1.6
CV			32.7	9.7	22.4	58.3	13.9	10.7	38.9
LSD (.05)			674.7	8.8	14.8	49.1	3.0	10.2	1.0

Latitude: 35° 8'

Elevation: 1300 m

Precipitation during test: none

Irrigation water applied: 12 times

Number replications: three

Date planted: June 3, 1975

Date harvested: October 23, 1975

Plot size (length x width): 4m x 50cm

Plot area: 2m²

Nodulation: medium

Table 12. AGRONOMIC AND DISEASE DATA FOR THE FOURTH INTERNATIONAL MUNGBEAN NURSERY GROWN AT Jin-ju, Kyung-nam, Korea

Cooperator: Mi-suk Ko, Department of Agronomy, Gyeong-sang National University, Jin-ju, Kyung-nam, Korea

Entry	Acc.	Yield rank	Yield kg/ha	Days to first flower	Ht cm	Pods per plant	Seeds per pod	1000 seed wt gm	Disease Score
									Virus (1-5)
1	M4	20	582	44	84	11	15	41	4.0
2	M14	28	447	44	99	12	14	37	1.0
3	M15	15	731	43	86	14	17	50	5.0
4	M76	5	1085	42	79	21	13	32	4.0
5	M90	24	486	53	89	12	13	40	-
6	M118	25	481	49	103	21	14	37	-
7	M304	6	1010	43	79	11	15	46	-
8	M317	3	1153	46	96	9	15	58	-
9	M333	11	790	43	86	13	13	41	-
10	M339	12	770	45	91	16	14	35	4.0
11	M350	2	1193	41	92	11	13	40	-
12	M358	22	537	42	84	10	12	48	-
13	M374	1	1331	40	80	13	14	62	-
14	M394	4	1110	43	96	14	13	58	-
15	M409	30	169	47	115	16	13	42	-
16	M411	10	791	43	119	17	13	28	4.0
17	M467	8	990	40	82	12	13	29	-
18	M475	27	448	45	92	17	13	42	4.0
19	M530	16	623	48	80	14	13	40	-
20	M531	19	589	41	79	11	15	44	-
21	M533	21	579	41	90	12	15	29	4.0
22	M1132	14	744	47	88	18	17	41	-
23	M1133	23	528	49	82	20	15	40	4.0
24	M1134	29	401	49	89	19	14	35	-
25	M1135	26	458	45	90	10	16	51	4.0
26	M1136	17	617	46	95	16	15	45	-
27	M1645	13	758	46	95	13	17	44	-
28	M2069	9	869	44	109	14	15	49	-
29	M2070	18	600	47	85	12	17	51	4.0
30	M1956	7	996	40	71	9	14	71	-
Mean			728.9	44.6	90.1	14.0	14.3	43.5	3.8
CV			31.2	4.5	11.8	35.7	11.5	12.5	
LSD (.05)			371.4	3.2	17.4	8.2	2.7	8.9	

Latitude: 35° 11' N

Elevation: 25m

Precipitation during test: 824.9mm

Irrigation water applied:

Number replications: three

Date planted: June 28, 1975

Date harvested: August 28 to Oct. 28, 1975

Plot size (length x width): 4.5m x 60 cm

Plot area: 2.7m²

Nodulation: Medium

Table 13. AGRONOMIC AND DISEASE DATA FOR THE FOURTH INTERNATIONAL MUNGBEAN NURSERY GROWN AT Suwon, Korea

Cooperator: Hyun Ok Choi and Keun Yong Park, Crops Experiment Station, Office of Rural Development, Suwon, Korea

Entry	Acc.	Yield rank	Yield kg/ha	Days to first flower	Ht cm	Pods per plant	Seeds per pod	1000 seed wt gm	Disease Scores		
									Virus (1-5)	Mildew (1-5)	Cercospora leaf spot (1-5)
1	M4	14	819	52	87	12	15	33	1.3	3.3	3.3
2	M14	19	660	48	87	12	12	34	1.0	2.0	2.3
3	M15	12	903	49	77	10	15	47	1.0	1.7	3.3
4	M76	4	1111	45	63	16	13	31	1.0	2.0	5.0
5	M90	28	479	63	100	10	12	37	1.7	1.7	2.0
6	M118	20	611	61	108	16	12	33	1.3	4.0	2.0
7	M304	6	1076	47	70	12	15	42	1.0	2.3	3.7
8	M317	5	1111	48	92	9	14	65	1.3	2.0	2.7
9	M333	10	964	46	74	14	13	32	1.0	3.7	3.3
10	M339	8	1055	49	85	19	13	35	1.0	3.7	3.3
11	M350	1	1382	46	86	14	13	36	1.0	2.0	2.3
12	M358	2	1361	52	88	15	14	33	1.0	1.0	3.7
13	M374	13	903	45	64	11	13	49	1.0	2.0	2.3
14	M394	3	1139	48	85	13	13	67	1.0	2.0	2.0
15	M409	30	465	51	125	14	14	39	1.0	3.0	3.7
16	M411	9	979	50	115	27	12	21	1.0	1.0	1.0
17	M467	11	938	45	70	15	12	24	1.3	2.0	2.0
18	M475	26	507	47	91	14	12	36	1.3	2.0	2.0
19	M530	22	576	58	83	12	14	38	1.0	2.7	2.3
20	M531	24	521	47	53	10	12	52	1.0	2.7	2.7
21	M533	27	503	47	72	19	11	24	1.3	1.7	1.3
22	M1132	16	763	53	78	13	14	40	1.0	2.0	3.0
23	M1133	23	528	54	76	12	15	38	1.0	2.7	3.3
24	M1134	21	577	56	67	12	13	34	1.0	2.7	3.3
25	M1135	29	475	52	71	9	14	48	1.0	1.3	3.3
26	M1136	25	514	52	80	11	14	44	1.0	1.7	3.0
27	M1645	15	792	48	90	14	14	39	1.3	2.3	3.3
28	M2069	17	757	48	88	10	16	44	1.0	1.7	3.7
29	M2070	18	660	49	87	9	16	48	1.0	1.0	3.3
30	M1956	7	1062	44	53	10	12	56	1.7	2.3	3.0
Mean			806.4	50.0	82.2	13.1	13.5	40.0	1.1	2.2	2.9
CV			24.8	4.4	13.9	25.5	11.9	14.3	28.3	19.4	23.7
LSD (.05)			326.9	3.6	18.8	5.5	2.6	9.3	0.5	0.7	1.1

Latitude: 37° 16' N

Elevation: 37 m

Precipitation during test: 775 mm

Irrigation water applied: once

Number replications: three

Date planted: June 20, 1975

Date harvested: October 7, 1975

Plot size (length x width): 4 m x 60 cm

Plot area: 2.4 m²

Nodulation: medium

Table 14. AGRONOMIC AND DISEASE DATA FOR THE FOURTH INTERNATIONAL MUNGBEAN NURSERY GROWN AT Miri, Sarawak, Malaysia

Cooperator: Ng Thai Tsiung, Tang Tieng Hua, and Ng Heng Leng, Kebuloh Experimental Station, Miri, Sarawak, Malaysia

Entry	Acc.	Yield rank	Yield kg/ha	Days to first flower	Days to first ripe pod	Ht cm	Pods per plant	Seeds per pod	1000 seed wt gm	Disease Scores
										Cercospora leaf spot (1-5)
1	M4	20	777	31	48	48	54	11	51	1.7
2	M14	19	787	33	51	62	45	10	53	2.7
3	M15	26	688	30	51	59	46	12	58	1.7
4	M76	21	765	34	51	66	102	13	37	2.7
5	M90	1	1504	31	49	55	46	12	59	2.3
6	M118	18	851	32	50	59	42	11	57	3.3
7	M304	5	1127	33	51	68	44	14	51	3.3
8	M317	10	1018	33	52	84	35	13	71	1.3
9	M333	16	927	32	48	75	64	11	39	3.3
10	M339	17	881	31	50	47	51	11	44	3.3
11	M350	24	722	31	50	72	65	13	45	3.0
12	M358	7	1069	29	47	42	56	12	49	4.0
13	M374	3	1214	34	53	74	48	12	63	1.7
14	M394	2	1284	33	53	81	49	12	66	2.0
15	M409	30	334	37	59	130	49	14	50	3.0
16	M411	8	1056	32	49	71	90	12	31	3.0
17	M467	11	969	31	48	66	89	11	33	1.7
18	M475	15	947	32	50	57	47	11	60	2.3
19	M530	13	963	31	50	42	34	11	49	2.7
20	M531	23	727	30	50	47	46	12	57	2.7
21	M533	22	754	32	51	77	70	10	34	2.0
22	M1132	6	1121	31	51	59	60	13	60	3.0
23	M1133	14	955	31	51	63	57	12	53	2.7
24	M1134	28	580	37	60	86	41	12	43	2.7
25	M1135	29	384	34	55	55	35	15	64	1.0
26	M1136	27	623	33	53	58	60	13	65	1.0
27	M1645	12	965	36	54	83	42	16	45	1.0
28	M2069	9	1042	34	52	81	42	15	60	2.3
29	M2070	25	708	33	54	77	32	15	63	2.7
30	M1956	4	1210	32	53	75	46	11	68	3.7
Mean			898.3	32.5	51.5	67.3	52.9	12.3	52.5	2.5
CV			21.8	4.5	4.6	13.8	28.3	9.0	9.6	31.4
LSD (.05)			320.0	2.4	3.8	15.2	24.5	1.8	8.2	1.3

Latitude: 4° 07' N

Elevation: 20m

Precipitation during test: 1114mm

Irrigation water applied: none

Number replications: three

Date planted: July 10-11, 1975

Date harvested: Sept. 4 to October 2, 1975

Plot size (length x width): 3.75m x 3.5m

Plot area: 13.125m²

Nodulation: medium

Table 15. AGRONOMIC AND DISEASE DATA FOR THE FOURTH INTERNATIONAL MUNGBEAN NURSERY GROWN AT Khumaltar, Nepal

Cooperator: Dr. S. N. Lohani and B. B. Mathema, Agronomy Division, Department of Agriculture, Kathmandu, Nepal

Entry	Acc.	Yield rank	Yield kg/ha	Days to first flower	Ht cm	Pods per plant	Seeds per pod	1000 seed wt gm
1	M4	13	86	58	25	4	11	39
2	M14	12	98	62	26	4	9	48
3	M15	20	68	57	22	4	10	57
4	M76	14	82	58	23	4	11	35
5	M90	26	43	-	22	2	9	54
6	M118	11	99	61	23	2	10	40
7	M304	23	59	57	21	3	12	41
8	M317	10	117	61	29	3	11	57
9	M333	2	148	56	27	4	12	43
10	M339	27	41	55	21	3	10	39
11	M350	9	117	61	25	3	11	44
12	M358	32	36	55	19	4	9	43
13	M374	15	78	60	26	2	10	55
14	M394	18	72	59	28	3	10	57
15	M409	28	41	-	25	3	10	46
16	M411	6	128	-	27	5	11	35
17	M467	21	65	57	25	4	11	25
18	M475	22	59	54	22	3	10	36
19	M530	30	37	53	22	4	9	43
20	M531	24	48	55	20	3	10	49
21	M533	4	143	-	29	6	13	34
22	M1132	7	125	56	26	5	13	48
23	M1133	5	142	62	25	4	11	44
24	M1134	3	145	-	27	4	10	44
25	M1135	29	39	62	23	4	10	57
26	M1136	17	76	62	25	4	13	58
27	M1645	8	124	59	31	2	13	45
28	M2069	19	71	61	27	3	13	47
29	M2070	1	160	62	26	4	13	52
30	M1956	33	33	55	25	2	8	60
31	T-1	34	29	56	19	4	10	31
32	T-2	25	44	58	19	2	10	26
33	G91	35	28	57	22	5	11	24
34	G65	31	37	55	19	3	10	44
35	Baisakhi	16	76	57	24	3	11	32
Mean			79.3	58.0	24.2	3.5	10.7	43.2
CV			48.8		11.4	33.2	11.6	14.7
LSD (.05)			63.6		4.5	1.9	2.0	10.4

Latitude: 27° 40' N
 Elevation: 1360m
 Precipitation during test: 1240 mm
 Irrigation water applied: none
 Number replications: three

Date planted: May 30, 1975
 Date harvested: August 5 & September 25, 1975
 Plot size (length x width): 4m x 75cm
 Plot area: 3m²
 Nodulation: not recorded

Table 16. AGRONOMIC AND DISEASE DATA FOR THE FOURTH INTERNATIONAL MUNGBEAN NURSERY GROWN AT Los Baños, Philippines

Cooperator: Benjamin M. Legaspi, Elena Catipon, B. P. I. Economic Garden, Los Baños, Laguna, Philippines

Entry	Acc.	Yield rank	Yield kg/ha	Days to first flower	Days to 50% ripe pod	Ht cm	Pods per plant	Seeds per pod	1000 seed wt gm	Disease Scores
										Cercospora leaf spot (1-5)
1	M4	3	810	32	53	61	19	13	32	5.0
2	M14	17	536	34	55	68	16	11	41	4.7
3	M15	18	530	33	55	61	11	15	38	5.0
4	M76	8	660	34	53	65	22	12	25	3.7
5	M90	19	524	35	55	68	15	10	40	4.0
6	M118	7	663	34	55	77	28	11	43	4.3
7	M304	12	611	33	53	61	17	13	35	5.0
8	M317	28	301	34	55	75	12	14	55	3.7
9	M333	9	659	32	53	74	23	11	30	5.0
10	M339	6	709	33	53	52	22	12	25	5.0
11	M350	11	632	32	53	72	22	11	33	3.0
12	M358	16	552	32	53	43	15	12	30	4.7
13	M374	1	970	32	53	69	16	12	43	5.0
14	M394	4	759	34	55	72	16	12	60	4.7
15	M409	29	233	35	69	103	12	12	20	3.0
16	M411	2	851	34	60	73	34	12	25	2.3
17	M467	10	632	32	53	66	31	11	25	3.7
18	M475	23	439	34	55	70	18	11	40	4.7
19	M530	14	587	32	53	45	16	12	33	5.0
20	M531	27	362	33	53	64	16	11	40	5.0
21	M533	5	755	34	60	80	19	12	20	2.0
22	M1132	22	440	35	55	64	17	13	35	4.7
23	M1133	21	485	34	53	61	14	12	38	5.0
24	M1134	30	115	46	69	74	11	11	32	3.0
25	M1135	26	406	35	55	59	12	14	43	4.7
26	M1136	25	412	35	55	65	12	14	35	5.0
27	M1645	15	562	36	60	84	15	15	30	3.7
28	M2069	20	503	36	60	74	12	15	38	4.3
29	M2070	24	436	34	53	59	14	15	37	5.0
30	M1956	13	608	32	53	59	13	12	54	4.3
Mean			558.1	34.1	55.7	67.3	17.3	12.3	35.8	4.3
CV			23.5	2.6		8.0	19.5	7.0		11.5
LSD (.05)			213.9	1.4		8.8	5.5	1.4		0.8

Latitude: 14° 20' N

Elevation 15 m

Precipitation during test: 476 mm

Irrigation water applied: none

Number replications: three

Date planted: June 20, 1975

Date harvested: August 13-19, 1975

Plot size (length x width): 4m x 60cm

Plot area: 2.4m²

Nodulation: poor

Table 17. AGRONOMIC AND DISEASE DATA FOR THE FOURTH INTERNATIONAL MUNGBEAN NURSERY GROWN AT Los Baños, Philippines

Cooperator: Benjamin M. Legaspi, Elena Catipon, B. P. I. Economic Garden, Los Baños, Laguna, Philippines

Entry	Acc.	Yield rank	Yield kg/ha	Days to first flower	Ht cm	Pods per plant	Seeds per pod	1000 seed wt gm	Disease Scores	
									Mildew (1-5)	Cercospora leaf spot (1-5)
1	M4	23	180	30	25	5	8	44	2.7	3.7
2	M14	13	226	31	30	5	9	53	2.7	3.5
3	M15	24	179	30	29	4	11	56	2.3	3.8
4	M76	28	154	31	27	6	8	38	3.5	3.2
5	M90	20	182	33	25	4	7	46	2.5	3.2
6	M118	17	215	31	26	6	9	48	2.0	3.2
7	M304	19	184	30	30	4	13	47	3.5	2.8
8	M317	12	228	31	41	5	10	55	4.0	2.3
9	M333	9	246	30	34	7	10	43	4.0	2.5
10	M339	16	218	30	24	7	10	42	3.0	2.8
11	M350	3	364	31	42	7	10	42	4.0	2.0
12	M358	29	151	30	25	5	9	44	2.5	3.3
13	M374	15	222	30	32	5	9	60	3.0	2.5
14	M394	4	354	31	40	6	9	51	3.5	2.3
15	M409	5	335	33	39	10	11	38	2.5	2.0
16	M411	2	398	32	28	9	11	41	2.3	2.0
17	M467	10	245	30	34	9	10	34	2.0	2.2
18	M475	18	195	31	32	7	8	50	3.0	2.8
19	M530	21	180	30	24	8	8	50	2.5	2.8
20	M531	8	271	30	26	6	9	53	3.2	2.8
21	M533	1	507	31	36	11	10	32	2.0	1.8
22	M1132	6	327	33	32	6	11	47	2.7	3.0
23	M1133	27	154	31	26	6	9	47	3.0	3.3
24	M1134	22	180	43	33	7	11	44	2.8	2.8
25	M1135	30	150	33	29	5	11	49	2.0	3.3
26	M1136	26	169	33	31	4	10	54	2.0	3.3
27	M1645	14	225	34	50	5	11	42	3.2	2.2
28	M2069	25	174	34	46	6	12	44	3.3	2.2
29	M2070	11	237	30	33	5	11	51	2.7	2.5
30	M1956	7	315	31	33	6	10	62	2.0	2.5
Mean			238.9	31.5	32.1	6.1	9.9	47.0	2.8	2.8
CV			31.4	1.1	15.6	31.4	13.7	15.2	16.0	16.2
LSD (.05)			122.4	0.5	8.2	3.1	2.2	11.6	1.2	0.7

Latitude: 14° 20' N

Elevation: 15 m

Precipitation during test: 436mm

Irrigation water applied:

Number replications: three

Date planted: November 14, 1975

Date harvested: January 15, 1976

Plot size (length x width): 4m x 60cm

Plot area: 2.4m²

Nodulation:

Table 18. AGRONOMIC AND DISEASE DATA FOR THE FOURTH INTERNATIONAL MUNGBEAN NURSERY GROWN AT Los Baños, Laguna, Philippines

Cooperator: Ricardo M. Lantican, Central Experiment Station, UPLB, College, Los Baños, Laguna, Philippines

Entry	Acc.	Yield rank	Yield kg/ha	Days to first flower	Ht cm	Pods per plant	Seeds per pod	1000 seed wt gm	Disease Scores		
									Mungbean yellow mosaic virus (1-5)	Mildew (1-5)	Cercospora leaf spot (1-5)
1	M4	26	657	33	46	10	11	45	1.3	4.3	5.0
2	M14	27	572	36	47	9	10	60	1.3	4.0	5.0
3	M15	11	834	34	49	9	12	57	2.3	3.0	5.0
4	M76	20	796	36	53	13	12	37	1.3	1.3	5.0
5	M90	17	812	36	49	10	10	50	1.0	3.3	5.0
6	M118	16	820	35	47	10	10	41	1.0	4.6	5.0
7	M304	9	842	35	49	7	14	49	1.0	4.3	5.0
8	M317	14	831	36	60	8	12	59	1.0	2.0	5.0
9	M333	15	827	35	53	10	11	43	3.0	4.3	5.0
10	M339	25	661	35	43	10	11	39	3.6	4.3	5.0
11	M350	1	1049	36	59	10	12	42	1.0	2.0	4.6
12	M358	29	550	34	33	8	12	43	3.6	1.3	5.0
13	M374	2	988	34	52	9	13	61	1.0	4.0	5.0
14	M394	3	978	36	54	9	11	74	1.0	2.6	4.6
15	M409	19	798	34	58	10	12	37	1.0	2.6	4.3
16	M411	8	864	36	53	11	11	31	1.6	2.6	4.6
17	M467	21	780	36	58	14	11	33	1.3	2.6	4.3
18	M475	23	747	35	53	11	10	52	1.3	3.0	5.0
19	M530	24	712	35	44	8	11	46	2.3	4.6	5.0
20	M531	28	555	35	50	8	12	47	1.3	5.0	5.0
21	M533	10	835	37	60	13	10	35	1.3	2.6	3.3
22	M1132	5	903	34	56	11	13	48	2.3	2.0	5.0
23	M1133	22	777	34	54	10	12	47	1.3	3.6	5.0
24	M1134	30	382	37	60	12	12	41	1.0	2.0	4.0
25	M1135	12	832	35	55	9	14	48	2.6	2.6	5.0
26	M1136	7	874	35	58	10	12	50	1.6	3.3	5.0
27	M1645	13	832	37	65	9	12	42	1.0	1.6	4.6
28	M2069	6	889	37	67	9	15	47	1.0	3.0	4.3
29	M2070	18	801	35	50	8	13	55	1.6	3.6	5.0
30	M1956	4	928	33	55	8	11	72	2.0	5.0	5.0
Mean			790.9	35.2	53	9.8	11.7	47.7	1.6	3.2	4.8
CV			17.5								
LSD (.05)			273.2								

Latitude: 14° 20 N

Elevation: 15m

Precipitation during test: 236mm

Irrigation water applied:

Number replications: one

Date planted:

Date harvested:

Plot size (length x width):

Plot area:

Nodulation:

Table 19. AGRONOMIC AND DISEASE DATA FOR THE FOURTH INTERNATIONAL MUNGBEAN NURSERY GROWN AT Shanhua, Tainan, Taiwan

Cooperator: Hyo-Guen Park and N. C. Chen, Asian Vegetable Research and Development Center, Shanhua, Tainan 741, Taiwan, Republic of China

Entry	Acc.	Yield rank	Yield kg/ha	Days to first flower	Ht cm	Pods per plant	Seeds per pod	1000 seed wt gm
1	M4	11	1504	29	51	27	12	52
2	M14	10	1538	30	52	27	11	61
3	M15	19	1372	32	47	19	14	66
4	M76	9	1550	33	58	35	12	44
5	M90	7	1590	32	52	20	10	55
6	M118	14	1466	30	59	27	11	56
7	M304	2	1911	33	53	26	13	58
8	M317	13	1479	35	63	21	13	77
9	M333	5	1615	33	62	31	12	49
10	M339	27	1163	31	44	23	12	43
11	M350	6	1611	33	59	22	12	47
12	M358	29	901	27	32	15	11	56
13	M374	1	1988	33	58	24	12	76
14	M394	4	1733	34	62	18	12	95
15	M409	30	883	34	102	21	12	54
16	M411	17	1405	33	54	38	11	39
17	M467	16	1421	31	52	39	11	35
18	M475	20	1372	31	47	22	11	57
19	M530	23	1254	28	39	19	12	52
20	M531	24	1223	30	39	21	11	58
21	M533	18	1402	32	60	51	11	36
22	M1132	15	1465	31	51	22	13	54
23	M1133	12	1495	31	52	31	11	56
24	M1134	26	1201	36	71	33	12	45
25	M1135	28	1090	32	45	25	15	62
26	M1136	25	1219	33	45	25	13	69
27	M1645	8	1550	35	72	26	15	47
28	M2069	3	1737	36	71	21	15	58
29	M2070	22	1258	33	52	18	14	58
30	M1956	21	1296	33	50	17	12	84
Mean			1423.1	32.1	55.2	25.5	12.2	56.6
CV			19.1	2.9	10.6	24.9	8.3	7.7
LSD (.05)			445.0	1.5	9.5	10.4	1.7	7.2

Latitude: 23° 6' N

Elevation: 9m

Precipitation during test:

Irrigation water applied:

Number replications: three

Date planted: October 4, 1975

Date harvested: December 3-20, 1975

Plot size (length x width): 4m x 75cm

Plot area: 3m²

Nodulation: medium

Table 20. AGRONOMIC AND DISEASE DATA FOR THE FOURTH INTERNATIONAL MUNGBEAN NURSERY GROWN AT Korat, Thailand

Cooperator: Anat Watanasit, Corn and Sorghum Research Center, Korat, and Arwooth Nalampang, Oilseed Crops Section, Department of Agriculture, Bangkhen, Bangkok, Thailand

Entry	Acc.	Yield rank	Yield kg/ha	Days to first flower	Ht cm	Pods per plant	Seeds per pod	1000 seed wt gm	Disease Scores
									Mildew (1-5)
1	M4	8	514	32	46	15	11	49	1.3
2	M14	20	129	32	44	3	8	52	2.5
3	M15	18	147	32	43	6	11	54	1.0
4	M76	16	161	31	46	7	4	34	1.0
5	M90	7	518	32	41	10	10	59	2.7
6	M118	5	527	31	43	15	11	48	4.3
7	M304	23	72	33	45	6	10	50	2.3
8	M317	30	31	33	54	6	6	49	2.7
9	M333	2	769	31	53	47	11	40	2.7
10	M339	1	1010	31	34	27	12	42	1.3
11	M350	13	184	33	50	3	10	40	1.3
12	M358	3	759	30	31	21	10	43	1.0
13	M374	11	210	33	48	7	6	44	3.0
14	M394	22	96	33	48	4	10	61	1.5
15	M409	31	15	33	46	1	7	37	1.3
16	M411	25	67	33	48	8	9	27	1.0
17	M467	19	139	31	49	12	10	33	1.0
18	M475	4	650	31	38	18	9	56	2.7
19	M530	6	520	31	35	12	11	53	1.3
20	M531	17	155	31	43	4	11	56	1.3
21	M533	27	53	33	55	8	7	27	1.0
22	M1132	29	39	33	59	6	8	43	2.0
23	M1133	12	190	31	38	9	9	50	1.7
24	M1134	32	11	38	44	1	7	32	1.0
25	M1135	24	68	33	44	6	12	39	1.2
26	M1136	21	117	33	45	6	9	50	1.0
27	M1645	14	180	35	57	10	10	33	1.0
28	M2069	33	0	35	59	0	5	0	1.0
29	M2070	15	179	33	45	8	11	51	1.3
30	MG50-10A	26	57	32	45	2	7	57	1.7
31	M7A	9	276	34	58	7	9	50	1.8
32	Bl. Pod	28	39	35	62	3	10	46	1.0
33	Local	10	261	35	62	16	9	58	1.5
Mean			246.8	32.6	46.9	9.4	9.1	45.6	1.7
CV			60.6	2.8	8.2				32.2
LSD (.05)			244.5	1.5	6.3				0.9

Latitude: 15°

Elevation: 110 m

Precipitation during test: 673

Irrigation water applied: 3 times

Number replications: three

Date planted: April 21, 1975

Date harvested: June 5, 10, 1975

Plot size (length x width): 4m x 75cm

Plot area: 3m²

Nodulation: none

Table 21. AGRONOMIC AND DISEASE DATA FOR THE FOURTH INTERNATIONAL MUNGBEAN NURSERY GROWN AT Phra Puttabat, Thailand

Cooperator: Anat Watanasit, Phra Puttabat Experiment Station, Phra Puttabat, and Arwooth Nalampang, Oilseed Crops Section, Department of Agriculture, Bangkok, Bangkok, Thailand

Entry	Acc.	Yield rank	Yield kg/ha	Days to first flower	Ht cm	Pods per plant	Seeds per pod	1000 seed wt gm	Disease Scores
									Cercospora leaf spot (1-5)
1	M4	15	931	30	48	20	13	36	5.0
2	M14	27	634	31	44	13	12	47	5.0
3	M15	19	843	31	42	10	14	42	5.0
4	M76	14	953	34	45	16	12	29	4.7
5	M90	13	960	31	44	16	11	43	5.0
6	M118	7	1043	31	40	16	12	38	5.0
7	M304	11	1023	33	49	12	13	43	5.0
8	M317	22	795	35	64	8	13	52	3.7
9	M333	23	747	32	54	18	11	34	5.0
10	M339	12	964	31	34	20	12	35	5.0
11	M350	5	1077	32	56	20	11	38	3.3
12	M358	17	888	29	26	28	11	34	5.0
13	M374	3	1173	33	52	15	12	51	4.3
14	M394	4	1141	34	55	12	12	59	4.7
15	M409	31	241	34	79	5	11	35	2.0
16	M411	2	1287	33	53	27	12	27	2.3
17	M467	10	1027	31	50	19	11	27	1.7
18	M475	16	893	31	39	12	11	47	5.0
19	M530	20	839	31	33	17	12	41	5.0
20	M531	28	625	29	36	16	11	46	4.7
21	M533	1	1393	32	61	34	11	28	1.3
22	M1132	21	817	31	47	15	14	45	4.3
23	M1133	26	657	32	43	14	13	38	5.0
24	M1134	30	339	35	60	14	13	30	3.0
25	M1135	25	717	33	47	11	12	42	4.7
26	M1136	24	727	33	47	12	13	38	5.0
27	M1645	8	1041	35	67	15	14	32	3.7
28	M2069	18	884	35	70	11	13	39	5.0
29	M2070	29	566	32	40	13	15	43	5.0
30	M1956	32	-	-	-	-	-	-	-
31	M7A	9	1040	34	66	15	13	53	3.3
32	Black Pod	6	1046	34	70	12	12	54	3.7
Mean			881.0	32.3	50.2	15.8	12.3	40.2	4.2
CV			26.3	2.3	9.5	20.9		8.2	12.2
LSD (.05)			378.6	1.2	7.8	5.4		5.4	0.8

Latitude: 14° 45'
 Elevation: 94 m
 Precipitation during test: 545 mm
 Irrigation water applied: none
 Number replications: three

Date planted: August 22, 1975
 Date harvested: October 17, 23, 1975
 Plot size (length x width): 4m x 75cm
 Plot area: 3m²
 Nodulation: poor

Table 22. AGRONOMIC AND DISEASE DATA FOR THE FOURTH INTERNATIONAL MUNGBEAN NURSERY GROWN AT Normal, Alabama, U. S. A.

Cooperator: V. T. Sapra, J. L. Hughes, and Larry Walker, Alabama Agricultural and Mechanical University, Normal, Alabama, U. S. A.

Entry	Acc.	Yield rank	Yield kg/ha	first flower	Ht cm	Seeds per pod	Disease Scores
							Leaf spot complex (1-10)
1	M4	1	788	71	65	13	4
2	M14	3	610	82	60	11	5
3	M15	9	478	76	60	13	5
4	M76	20	416	74	70	11	4
5	M90	21	410	83	45	11	5
6	M118	14	460	85	45	11	9
7	M304	13	468	65	80	10	6
8	M317	27	344	76	75	13	9
9	M333	5	579	71	70	11	8
10	M339	6	548	77	45	11	6
11	M350	15	448	74	80	11	4
12	M358	12	471	80	35	10	6
13	M374	23	394	60	90	11	5
14	M394	8	510	76	85	11	4
15	M409	30	266	68	60	13	5
16	M411	4	582	88	90	11	3
17	M467	28	344	76	85	10	5
18	M475	19	425	83	45	11	4
19	M530	7	544	87	45	12	4
20	M531	17	441	78	55	12	3
21	M533	10	477	80	75	11	5
22	M1132	11	475	76	55	14	5
23	M1133	29	334	81	40	13	5
24	M1134	2	713	76	55	13	3
25	M1135	22	402	79	40	12	4
26	M1136	25	370	74	45	11	4
27	M1645	16	445	80	90	11	4
28	M2069	18	437	74	75	14	5
29	M2070	26	348	72	60	12	5
30	M1956	24	386	58	65	10	5
Mean			463.7	76.0	62.8	11.6	4.9

Latitude: 34° 39' N

Elevation: 196m

Precipitation during test:

Irrigation water applied: none

Number replications: two

Date planted: May 15, 1975

Date harvested: Sept. 28, 1975

Plot size (length x width): 4.2m x 75cm

Plot area: 3.15m²

Nodulation: medium

Table 23. AGRONOMIC AND DISEASE DATA FOR THE FOURTH INTERNATIONAL MUNGBEAN NURSERY GROWN AT Columbia Missouri, U. S. A.

Cooperator: Richard E. Swindell and J. M. Poehlman, Department of Agronomy, University of Missouri, Columbia, Missouri, U. S. A.

Entry	Acc.	Yield rank	Yield kg/ha	Days to first flower	Ht cm	Pods per plant	Seeds per pod	1000 seed wt gm	Disease Scores	
									Virus (1-5)	Mildew (1-5)
1	M4	7	1384	51	74	30	10	51	0.2	0.8
2	M14	15	809	52	69	25	9	60	0.2	0.8
3	M15	27	286	57	51	26	9	61	1.2	0.3
4	M76	9	1098	48	63	44	9	51	0.5	1.3
5	M90	11	1019	69	70	21	9	62	0.8	0.8
6	M118	4	1469	63	83	32	9	56	0.5	0.8
7	M304	26	288	53	68	12	7	59	1.8	1.3
8	M317	17	770	53	91	19	11	69	1.0	1.8
9	M333	2	1554	49	81	40	10	45	0.2	1.5
10	M339	8	1144	49	70	34	10	46	0.0	1.7
11	M350	5	1468	52	82	28	12	46	0.8	1.7
12	M358	6	1466	58	72	40	10	43	0.3	0.7
13	M374	14	835	48	64	12	9	61	2.2	2.2
14	M394	29	235	51	69	17	7	59	3.3	1.5
15	M409	13	840	55	90	23	9	50	0.7	0.8
16	M411	20	502	51	65	45	11	40	2.2	1.3
17	M467	19	590	48	70	37	10	35	3.3	2.3
18	M475	12	970	54	73	28	10	56	0.3	0.8
19	M530	1	1749	64	76	36	11	52	0.0	0.8
20	M531	3	1537	50	69	38	11	55	0.2	1.2
21	M533	22	372	52	68	47	10	48	3.0	1.7
22	M1132	21	396	64	71	23	11	49	1.2	0.7
23	M1133	18	724	61	67	40	9	58	0.2	0.7
24	M1134	10	1086	64	79	54	10	49	0.0	0.8
25	M1135	23	360	59	54	10	10	54	0.5	0.8
26	M1136	24	324	65	50	39	12	64	2.0	1.5
27	M1645	30	216	56	76	17	8	48	1.8	2.2
28	M2069	28	252	59	76	8	11	53	3.0	2.3
29	M2070	25	303	60	67	16	9	61	0.5	0.8
30	M1956	16	794	48	65	-	-	80	1.5	2.0
Mean			827.9	55.5	70.9	28.9	9.6	54.0	1.1	1.3
CV			32.8	5.5	16.4				78.9	39.6
LSD (.05)			443.9	5.0	19.0				1.4	0.8

Latitude: 38° 49' N

Elevation: 228m

Precipitation during test: 454mm

Irrigation water applied:

Number replications: three

Date planted: June 2, 1975

Date harvested: Sept. 10 to October 15, 1975

Plot size (length x width): 4.5m x 90cm

Plot area: 4.05m²

Nodulation: medium

Table 24. AGRONOMIC AND DISEASE DATA FOR THE FOURTH INTERNATIONAL MUNGBEAN NURSERY GROWN AT Stillwater, Oklahoma, U. S. A.

Cooperator: J. S. Kirby and Tom Stevens, Department of Agronomy, Oklahoma State University, Stillwater, Oklahoma, U. S. A.

Entry	Acc.	Yield rank	Yield kg/ha	Days to first flower	Ht cm	Pods per plant	Seeds per pod	1000 seed wt gm
1	M4	5	1390	44	36	27	11	53
2	M14	23	1002	44	50	17	9	64
3	M15	14	1187	44	38	26	13	65
4	M76	4	1429	42	40	44	10	43
5	M90	17	1147	49	46	23	11	63
6	M118	7	1348	55	40	34	11	56
7	M304	24	995	42	46	19	14	61
8	M317	28	795	47	61	14	12	70
9	M333	3	1481	42	42	57	11	47
10	M339	8	1317	45	28	26	13	45
11	M350	20	1070	42	50	18	12	48
12	M358	6	1378	44	29	32	12	46
13	M374	16	1154	42	59	28	10	71
14	M394	26	902	42	69	12	12	76
15	M409	15	1177	44	52	13	10	53
16	M411	29	663	48	90	19	13	40
17	M467	18	1133	42	60	23	11	41
18	M475	11	1266	51	55	23	10	63
19	M530	1	1880	53	34	27	10	57
20	M531	10	1271	42	46	21	12	64
21	M533	25	908	42	72	31	11	39
22	M1132	22	1014	44	57	12	10	61
23	M1133	2	1580	51	36	17	14	58
24	M1134	9	1316	51	52	34	11	49
25	M1135	13	1249	49	39	21	12	66
26	M1136	12	1250	49	42	16	12	63
27	M1645	30	660	44	56	12	13	53
28	M2069	27	813	42	72	16	12	60
29	M2070	21	1063	49	41	15	11	69
30	M1956	19	1086	42	51	16	11	88
Mean			1164.2	45.5	49.7	23.1	11.5	57.8
CV			17.8	5.0	16.4	37.8	22.4	5.6
LSD (.05)			338.6	3.7	13.3	14.3	4.3	5.2

Latitude: 36° 2' N
 Elevation: 274m
 Precipitation during test: 236mm
 Irrigation water applied: none
 Number replications: three

Date planted: June 19, 1975
 Date harvested: October 14, 1975
 Plot size (length x width): 2.2m x 1m
 Plot area: 2.2m²
 Nodulation: medium

Table 25. AGRONOMIC AND DISEASE DATA FOR THE FOURTH INTERNATIONAL MUNGBEAN NURSERY GROWN AT 21 TEST LOCATIONS IN 1975-76

Entry no	Acc. no	Yield rank	Yield kg/ha	Days to first flower	Days to first ripe pod	Ht cm	Pods per plant no	Seeds per pod no	1000 seed wt gm	Disease Scores			
										Virus (1-5)	Mungbean yellow mosaic virus (1-5)	Mildew (1-5)	Cercospora leaf spot (1-5)
24	M1134	1	1008.6	50	67	56	35	11.4	41	1.4	2.3	1.8	2.8
15	M409	2	952.5	46	66	68	28	11.2	44	1.5	2.2	1.8	2.8
9	M333	3	904.8	43	55	54	28	11.1	41	1.3	2.8	2.7	3.9
6	M118	4	850.0	47	57	51	27	10.7	47	1.8	2.2	2.7	3.6
4	M76	5	814.4	45	56	47	27	10.6	37	2.1	2.0	1.8	3.9
22	M1132	6	812.3	45	57	49	21	12.2	50	2.0	2.7	1.7	3.6
1	M4	7	803.0	43	55	47	22	11.6	45	1.4	2.3	2.3	3.7
13	M374	8	787.0	42	57	50	18	10.8	59	2.7	1.8	2.3	3.3
11	M350	9	786.6	44	56	54	20	11.4	43	2.3	2.3	1.9	3.1
8	M317	10	777.6	46	57	59	14	12.2	61	2.7	1.9	2.3	3.0
19	M530	11	775.3	46	56	40	20	10.9	48	1.7	3.0	2.1	3.8
18	M475	12	773.6	45	57	48	23	10.4	51	2.2	2.3	2.1	3.7
5	M90	13	759.3	47	56	46	19	10.3	52	1.7	1.7	2.0	3.6
23	M1133	14	737.5	46	56	46	20	11.7	50	1.7	2.6	2.1	3.7
10	M339	15	724.5	44	56	40	21	11.4	40	1.3	3.2	2.5	4.1
12	M358	16	723.3	44	55	37	23	11.1	43	1.2	3.4	1.3	4.2
7	M304	17	718.0	44	56	48	16	12.2	50	2.6	1.5	2.6	4.0
16	M411	18	716.1	45	58	58	29	10.9	35	1.8	1.8	2.0	2.5
3	M15	19	713.5	45	57	47	16	12.5	57	2.1	3.0	1.7	3.8
14	M394	20	708.3	45	58	56	17	10.8	65	3.2	1.8	2.1	3.3
21	M533	21	679.5	45	59	55	29	10.7	34	3.1	1.7	1.9	2.0
2	M14	22	674.2	45	57	50	18	10.5	53	1.4	1.9	2.1	3.7
17	M467	23	669.3	43	55	51	28	10.8	32	2.3	1.4	2.3	2.7
28	M2069	24	657.1	46	60	60	15	12.6	52	2.9	2.1	1.9	3.4
27	M1645	25	652.4	47	60	62	19	12.4	44	3.4	2.1	1.8	2.9
26	M1136	26	646.7	47	58	48	21	12.0	53	2.6	2.7	1.9	3.5
20	M531	27	645.0	43	56	42	19	11.0	54	2.0	2.2	2.2	3.8
30	M1956	28	632.6	43	57	48	16	10.5	66	2.8	2.3	2.2	3.7
29	M2070	29	621.7	45	57	49	15	12.6	55	1.9	2.8	1.7	3.8
25	M1135	30	585.6	47	58	46	14	12.4	54	2.0	3.3	1.7	3.3
Mean			743.7	45	58	50	21	11.4	49	2.1	2.3	2.0	3.4
CV			54.7	7.3	3.3	16.3	51.9	13.0	11.2	41.7	32.7	35.7	19.5
LSD (.05)			252.0	2.0	2.6	5.0	7.3	0.48	3.5	1.08	0.94	0.36	0.70

^aNumbers in parenthesis are number of test locations from which data were reported.

Table 26. SUMMARY OF AGRONOMIC AND DISEASE DATA FOR 8 MUNGBEAN STRAINS GROWN IN THE FIRST, SECOND, THIRD, AND FOURTH INTERNATIONAL MUNGBEAN NURSERIES AT 68 TEST LOCATIONS. ^a

Acc. no	Yield rank	Yield kg/ha	Disease Scores									
			Days to first flower	Days to first ripe pod	Ht cm	Pods per plant no	Seeds per pod no	1000 seed wt gm	Virus (1-5)	Mungbean yellow mosaic virus (1-5)	Mildew (1-5)	Cercospora leaf spot (1-5)
		(61) ^b	(63)	(26)	(67)	(35)	(51)	(54)	(26)	(16)	(18)	(17)
M350	1	894.3	44	63	52	23	10.9	43	1.9	1.7	2.5	2.7
M317	2	871.9	46	67	55	16	11.8	61	2.1	1.6	2.6	2.5
M118	3	828.6	47	67	47	26	10.5	48	1.6	2.3	2.8	2.9
M4	4	815.0	43	63	42	23	11.2	46	1.4	2.2	2.6	2.9
M76	5	811.4	44	64	45	27	10.5	38	2.0	1.9	2.7	2.8
M90	6	772.3	48	66	46	21	10.1	54	1.6	2.0	2.4	3.1
M15	7	770.3	46	65	48	18	11.9	57	2.1	2.2	2.1	2.9
M14	8	733.4	47	68	48	20	10.0	55	1.5	1.9	2.3	2.8
Mean		812.2	45.8	65.5	48.0	21.6	10.9	50.3	1.78	1.97	2.49	2.81
CV		30.0	8.5	7.9	16.3	33.6	13.2	10.3	39.2	36.1	25.6	25.9
LSD (.05)		86.9	1.4	2.8	2.6	3.4	0.6	2.0	0.38	0.49	0.48	0.49

^a Nine locations in the 1st IMN, 18 locations in the 2nd IMN, 21 locations in the 3rd IMN, and 20 locations in the 4th IMN.

^b Numbers in parenthesis refer to number of locations from which data were reported.

Table 27. SUMMARY OF AGRONOMIC AND DISEASE DATA FOR 12 MUNGBEAN STRAINS GROWN IN THE SECOND, THIRD AND FOURTH INTERNATIONAL MUNGBEAN NURSERIES AT 59 TEST LOCATIONS. ^a

Acc. no	Yield rank	Yield kg/ha	Disease Scores									
			Days to first flower	Days to first ripe pod	Ht cm	Pods per plant no	Seeds per pod no	1000 seed wt gm	Virus (1-5)	Mungbean yellow mosaic virus (1-5)	Mildew (1-5)	Cercospora leaf spot (1-5)
		(53) ^b	(54)	(20)	(58)	(35)	(45)	(48)	(22)	(14)	(16)	(16)
M350	1	859.9	44	64	52	23	11.1	43	2.1	1.8	2.3	2.8
M409	2	838.1	51	76	66	25	10.7	44	1.5	1.9	2.0	2.5
M317	3	836.6	46	67	55	16	11.8	61	2.3	1.7	2.5	2.6
M118	4	804.6	47	68	47	26	10.5	47	1.8	2.3	2.7	3.1
M4	5	787.5	43	64	43	23	11.2	46	1.7	2.1	2.5	3.0
M76	6	770.6	44	65	45	27	10.5	38	2.1	2.0	2.4	2.9
M411	7	766.0	47	68	54	36	10.6	35	1.5	1.3	2.2	2.0
M90	8	755.7	47	67	45	21	10.1	54	1.8	2.0	2.5	3.2
M374	9	755.5	43	64	45	19	10.3	50	2.5	1.7	2.5	2.7
M15	10	720.1	45	66	47	18	11.9	57	2.2	2.2	2.0	3.0
M14	11	709.5	46	68	49	20	10.0	54	1.7	2.0	2.2	2.9
M533	12	691.3	45	67	55	34	10.5	34	2.2	1.4	2.2	1.7
Mean		774.6	45.7	67.0	50.2	23.9	10.8	47.8	1.93	1.86	2.32	2.70
CV		47.8	8.8	7.0	20.0	51.3	12.5	11.4	46.7	36.1	30.7	29.2
LSD (.05)		141.5	1.2	2.9	3.6	2.81	0.56	2.2	0.48	0.50	0.49	0.55

^a Eighteen locations in the 2nd IMN, 21 locations in the 3rd IMN, and 20 locations in the 4th IMN.

^b Numbers in parenthesis refers to number of locations from which data were reported.

Table 28. SUMMARY OF AGRONOMIC AND DISEASE DATA FOR 21 MUNGBEAN STRAINS GROWN IN THE THIRD AND FOURTH INTERNATIONAL MUNGBEAN NURSERIES AT 41 TEST LOCATIONS.^a

Acc. no	Yield rank	Yield kg/ha	Days to first flower	Days to first ripe pod	Ht cm	Pods per plant no	Seeds per pod no	1000 seed wt gm	Disease Scores			
									Virus (1-5)	Mungbean yellow mosaic virus (1-5)	Mildew (1-5)	Cercospora leaf spot (1-5)
		(38) ^b	(39)	(7)	(41)	(31)	(37)	(36)	(12)	(9)	(12)	(14)
M333	1	881.4	42	63	50	28	10.5	41	1.2	2.3	3.0	3.5
M1134	2	842.3	50	73	53	30	11.0	43	1.2	2.2	2.0	2.9
M1133	3	817.0	46	64	45	22	11.1	51	1.6	2.1	2.3	3.3
M118	4	808.2	46	65	47	26	10.5	47	1.9	2.3	2.8	3.3
M1132	5	807.6	45	64	47	21	12.1	40	2.0	2.3	2.0	3.3
M317	6	804.0	45	65	55	15	11.8	61	2.7	1.8	2.5	2.9
M350	7	801.6	43	64	50	13	11.3	44	2.1	1.7	2.1	3.0
M409	8	800.8	49	72	65	26	10.8	44	1.4	2.1	2.0	2.8
M4	9	782.2	42	63	42	22	11.2	46	1.6	2.4	2.3	3.3
M76	10	762.4	43	65	45	26	10.5	38	2.2	1.9	2.2	3.1
M90	11	730.8	46	65	44	21	10.2	54	1.9	2.3	2.1	3.3
M475	12	726.8	44	64	46	22	10.2	53	2.0	2.5	2.1	3.1
M15	13	719.9	44	64	45	18	12.0	57	2.4	2.3	1.7	3.3
M374	14	719.0	42	64	45	19	10.2	59	2.6	1.6	2.3	2.9
M14	15	705.7	45	65	47	19	10.1	54	1.7	2.0	2.1	3.1
M339	16	705.1	43	63	37	22	11.2	41	1.5	2.5	2.6	3.4
M411	17	704.9	46	65	53	33	10.6	35	1.8	1.4	2.1	2.2
M533	18	665.1	44	66	52	33	10.4	35	2.6	1.5	2.0	1.9
M531	19	637.6	42	64	40	19	10.6	54	1.7	1.9	2.5	3.5
M1136	20	602.7	46	65	46	21	11.8	56	2.3	2.4	1.9	3.0
M1135	21	580.0	46	65	44	16	12.1	56	2.0	2.9	1.8	3.0
Mean		743.1	44.6	65.1	47.5	22.9	11.0	48.5	1.9	2.1	2.2	3.1
CV		48.3	7.9	4.2	17.4	48.1	12.7	11.2	42.9	38.3	29.7	24.7
LSD (.05)		161.5	1.6	4.3	3.6	5.5	0.63	2.5	0.66	2.16	0.51	0.56

^a Twenty-one test locations in the 3rd IMN and 20 locations in the 4th IMN.

^b Numbers in parenthesis refers to number of locations from which data were reported.