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U. S. Department of Agriculture, Agricultural Research Service

U. S. Agency for International Development

Cooperating

Iran

Plan Organization

Karaj Agricultural College

Ministry of Agriculture

Pahlavi University

India

Indian Council of Agricultural Research

Indian Agricultural Research Institute

Agricultural Universities

State Departments of Agriculture

STAFF

IRAN

Administrative

- P.H. van Schaik - Regional Project Coordinator, transferred to India, May 1967.
- Lillian Mahvi - Admin. Assistant, resigned October, 1967.
- Bernice Ryan - Admin. Assistant, replaced Mrs. Mahvi.
- Jerry Ellini - Clerk-typist.
- Jafar Afshar - Government relations advisor.

Breeding

- K.H. Evans - RPIP
- Mohamed Moaddab - RPIP
- Mehdi Khosro-shahin. - GOI/Plan Org.
- Jamshid Jafari - GOI/Plan Org.
- Ali Ellini - GOI/Plan Org.
- Ahmad Sarrafi - Karaj College.

Soils-Agronomy

- G.M. Horner - Iran Project Leader since May, 1967.
- Masoud Mojtehedi - RPIP

Pathology

- W.J. Kaiser - RPIP
- M. Okhovat - RPIP
- Darioush Danesh - GOI/Plan Org.

Entomology

- S.W. Wilson - RPIP
- G.R. Rassoulian - RPIP
- Karim Kamali - GOI/Plan Org.

INDIA

Administrative

- P.H. van Schaik	-	Regional Project Coordinator
- W.E. Lansing	-	Administrative Officer
- R.K. Sharma	-	Administrative Assistant
- Nanak Singh	-	Secretary
- P.C. Bector	-	Senior-clerk

Breeding

- R.M. Matsuura	-	RPIP
- V.R. Gadwal	-	RPIP
- J.P. Narayan	-	RPIP
- J.L. Tiwari	-	RPIP
- L.M. Jeswani	-	GOI/AICPP - IARI
- S.P. Singh	-	GOI/AICPP - IARI

Soils-Agronomy

- R.J. Davis	-	RPIP
- C.S. Saraf	-	RPIP
- S.N. Kapoor	-	RPIP
- S.L. Choudhury	-	GOI/AICPP - IARI

Pathology

- F.J. Williams	-	RPIP
- B. Baldev	-	RPIP
- K.S. Amin	-	RPIP
- G.S. Grewal	-	GOI/AICPP - IARI

Entomology

- K.E. Gibson	-	RPIP
- P.V. Ranga Rao	-	GOI/AICPP - IARI (resigned October, 1967)

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TABLE OF CONTENTS

Summary..... 1

Introduction..... 1

IRAN

Varietal Improvement..... 3

- New Varieties..... 3
- Lentils..... 10
- Chickpeas..... 18
- Beans..... 44
- Cowpeas..... 73
- Mungbeans..... 80

Soil and Crop Management..... 86

- Summary..... 86
- Date of Planting..... 86
- Plant Population density..... 87
- Herbicides..... 93
- Irrigation - Diseases..... 93
- Irrigation - fertilization..... 96
- Irrigation - fertilization, Pahlavi University, Shiraz.. 99

Plant Pathology..... 103

- Summary..... 103
- Beans..... 104
- Broadbeans..... 108
- Chickpeas..... 108
- Cowpeas..... 118
- Mungbeans..... 118

Entomology..... 128

- Mites..... 129
- Aphids..... 130
- Crop protection..... 130
- Stored pulse pests..... 130
- Insect sterilization..... 130
- Insect Collection..... 135
- Nematology..... 136

INDIA

Varietal Improvement..... 139

Germplasm and Breeding Program..... 139
Coordinated Varietal Trials..... 140
Variety Release..... 141

Soil and Crop Management..... 150

Fertility - spacing experiments (Chickpeas)..... 150
Fertility - spacing and fertility-inoculum (Moong & urd)... 152
Fertility - spacing and plant population (pigeon peas)..... 169

Plant Pathology..... 173

Chickpeas..... 173
Mungbeans..... 174
Urdbeans..... 175
Pigeon peas..... 176
Field peas..... 177

Entomology..... 178

Rabi - 1966/67..... 178
Bruchids..... 178
Protective Sprays..... 182
Observations..... 183
Miscellaneous..... 184

Kharif - 1967..... 185
Flea beetles..... 185
Protective Sprays..... 187
Observations..... 187
Miscellaneous..... 189

TABLES

IRAN

Agronomic Data:

1 Lentils, Preliminary Yield Test, Varamin....12
2 Lentils, Preliminary Yield Test, Karaj....13
3 Lentils, Uniform Yield Test, Ghazvin....14
4 Lentils, Uniform Yield Test, Varamin....15
5 Lentils, Uniform Yield Test, Shiraz....16
6 Lentils, Uniform Yield Test, Karaj....17
7 Chickpeas, black, Preliminary Yield Test, Shiraz....20
8 Chickpeas, black, Preliminary Yield Test, Karaj....23
9 Chickpeas, white, Preliminary Yield Test, Shiraz....26
10 Chickpeas, white, Preliminary Yield Test, Karaj....29
11 Chickpeas, white, Preliminary Yield Test, Shiraz....32
12 Chickpeas, white, Preliminary Yield Test, Karaj....34
13 Chickpeas, black, Uniform Yield Test, Shiraz....35
14 Chickpeas, black, Uniform Yield Test, Varamin....36
15 Chickpeas, black, Uniform Yield Test, Karaj....37
16 Chickpeas, black, Advanced Yield Test, Shiraz....38
17 Chickpeas, white, Uniform Yield Test, Shiraz....39
18 Chickpeas, white, Advanced Yield Test, Varamin....40
19 Chickpeas, white, Advanced Yield Test, Karaj....41
20 Chickpeas, white, Advanced Yield Test, Shiraz....42
21 Chickpeas, International Yield Test, Shiraz....43
22 Chickpeas, International Yield Test, Karaj....43
23 Beans, Pinto, Preliminary Yield Test, Shiraz....46
24 Beans, Pinto, Preliminary Yield Test, Karaj....47
25 Beans, Red, Preliminary Yield Test, Shiraz....48
26 Beans, Red, Preliminary Yield Test, Karaj....51
27 Beans, white, Preliminary Yield Test, Shiraz....56
28 Beans, white, Preliminary Yield Test, Karaj....59
29 Beans, Pinto, Uniform Yield Test, Shiraz....63
30 Beans, Pinto, Uniform Yield Test, Varamin....64
31 Beans, Pinto, Uniform Yield Test, Karaj....65
32 Beans, Red, Uniform Yield Test, Shiraz....66
33 Beans, Red, Uniform Yield Test, Varamin....67
34 Beans, Red, Uniform Yield Test, Karaj....68
35 Beans, white, Uniform Yield Test, Shiraz....69
36 Beans, white, Uniform Yield Test, Varamin....70
37 Beans, white, Uniform Yield Test, Karaj....71
38 Beans, International Yield Test, Karaj....72
39 Cowpeas, Preliminary Yield Test, Karaj....76
40 Cowpeas, Uniform Yield Test, Varamin....78
41 Cowpeas, Uniform Yield Test, Karaj....79
42 Mungbeans, Preliminary Yield Test, Karaj....82
43 Mungbeans, Uniform Yield Test, Varamin....84
44 Mungbeans, Uniform Yield Test, Karaj....85
45 Effect of Date of Planting on Yield of Lentils & Chickpeas....88
46 Relation of Date of Planting to Grain Yield of Pulse Crops....89

47 Influence of Row & Plant Spacings on growth of Chickpeas..... 90
48 Influence of Row & Plant Spacings on growth of Dry-beans..... 91
49 Influence of Row & Plant Spacings on growth of Cowpeas..... 92
50 Effect of herbicides on weed control & yield of Pulse crops..... 94
51 Influence of Frequency of Irrigation of Yield of Lentils..... 95
52 Influence of Irrigation & fertilization on Yield of Chickpeas..... 97
53 Influence of Irrigation & fertilization on Yield of Cowpeas..... 98
54 Disease Survey of 1967 Bean Variety Trial for BCMV.....105
55 Seed transmission of bean common mosaic virus.....104
56 Natural infection of Chickpeas with bean yellow mosaic virus.....115
57 Pathogenicity of 8 isolates of Rhizoctonia solani to Mungbeans....126
58 Vertical distribution of Rhizoctonia solani in a mungbean plant...127
59 Effect of Insecticides on mite populations in mungbeans.....129
60 Effect of Gamma Radiation on spodoptera exigua (Pupates).....131
61 Effect of Gamma Radiation on spodoptera exigua (larvae).....132
62 Effect of Gamma Radiation on spodoptera exigua (adults).....133
63 Effect of Gamma Radiation on Eggs of spodoptera exigua.....134
64 Effect of topical & oral application of chemosterilants.....135
65 Relative resistance of mungbean strains to nematode.....137

INDIA

66 Yields of Mungbean Coordinated varietal trials.....142
67 Yields of Urd Coordinated varietal trials.....143
68 Yields of Cowpea Coordinated varietal trials.....144
69 Yields of Arhar Coordinated varietal trials.....145
70 Yields of Bengal gram Coordinated varietal trials.....146
71 Yields of Lentil Coordinated varietal trials.....147
72 Yields of Khesari Coordinated varietal trials.....148
73 Yields of Peas Coordinated varietal trials.....149
74 Influence of Row & Plant spacing on Yield of Chickpeas.....151
75 Influence of fertilization on Yield of Cicer.....151
76 Result of Soil analysis at different locations.....156
77 Yield, as affected by differential doses of N,P,K.....157
78 Yield data, as affected by different levels.....159
79 Yield data, as affected by different fertility levels.....160
80 Yield data, as affected by different fertility levels.....163
81 Yield data, due to varying fertility levels of late Urd beans.....166
82 Yield of Arhar (variety T21) as affected by varying plant popu....169
83 Yield of Arhar as affected by row spacing & fertility levels.....170
84 Disease rating of Phaseolus aureus varieties.....174
85 Disease rating of Phaseolus mungo varieties.....176
86 Effect of insecticide applications in the field on bruchid.....180

FIGURES

IRAN

P-1 Mean seed yield of Chickpeas (var.67-5024) for all treatments (fertility irrigation)..... 101
P-2 Yield of Chickpeas as affected by irrigation..... 102
1 Effect of bean common mosaic virus..... 106
2 Symptoms of pea leaf rolls virus in Bountiful bean..... 107
3 Broadbean plants infected with pea leaf roll virus..... 109
4 Chickpea plants infected with alfalfa mosaic virus..... 110
5 Chickpea plants infected with some strains of bean yellow mosaic 111
6 Cucumber mosaic virus on Chickpeas..... 112
7 Field inoculation studies of Chickpea plants 113
8 Weight of seed (grams) from Chickpeas as effected by diff.viruses 114
9 Seed of Chickpea plants infected with bean yellow mosaic..... 116
10 Greenhouse inoculation studies of Macrophomina phaseoli..... 117
11 Effect of isolates of AMV and CAMV on Cowpeas..... 119
12 Effect of Cowpea aphid-borne mosaic virus (CAMV)..... 120
13 Symptoms of Cowpea plants infected with alfalfa mosaic virus.... 121
14 Virus extract reactions..... 122
15 Bountiful bean plants infected with bean common mosaic virus.... 123
16 Effect of mungbean mosaic virus (MMV)..... 124
17 Mungbean seedlings infected with Rhizoctonia solani..... 125
18 & 19 Relationship of within row and between row spacing on Yield of Chickpeas..... 153
20 Effect of fertility levels on yield of chickpeas..... 154
21 Effect of different levels of N,P,&K on yield of mungbeans..... 158
22 Effect of spacing and fertility on yield of early mungbean..... 161
23 Effect of plant spacing on yield of early mungbeans..... 162
24 Effect of spacing & fertility on yield of late mungbeans..... 164
25 Effect of within row spacing on yield of late mungbeans..... 165
26 Effect of spacing & fertility on yield of early urdbeans..... 167
27 Effect of within row distance on yield of early urdbeans..... 168
28 Effect of spacing and fertility on yield of late urd beans..... 171
29 Effect of within row spacing on yield of late urd beans..... 172

SUMMARY

Iran

- From the large germplasm collections in India and Iran seed materials were sent to or exchanged with Nigeria, Rhodesia, U.A.R., Turkey, Lebanon, Jordan, Pakistan, Thailand, Vietnam, Malaysia, Japan, the Philippines, Dominican Republic and Chile.

- Discussions were held with Ministry of Agriculture and Plan Organization officials to obtain greater participation - both technical and financial from the Government of Iran in the pulse crop work. As a result, Iran, with the start of its next five-year plan in March 1968 has agreed to contribute 10 million rials per year ($133,000). This will handle essentially all local support costs for the RPIP operations at Karaj and Ministry of Agriculture work at several stations throughout Iran. This is in addition to the green-house - laboratory building already constructed at Karaj and contributions of facilities and services made by other institutions including Pahlavi University, Gazvin Development Project and Dez Irrigation Project.

- A two-day work planning meeting was held in January 1967 at Karaj, attended by U.S. and Iranian project technicians, Karaj College and Ministry of Agriculture staff, Cooperators from Pahlavi University in Shiraz and the Ghazvin Development Project (cooperative program between Iran and Israel). In this meeting the 1967 program was formulated.

- A workshop was held July 17-20, 1967, attended by delegates from Turkey and India. Delegates from Pakistan and other countries were unable to attend because of visa and passport difficulties.

- Dr. Glenn Horner, Soil Scientist - agronomist, presented a paper - "Irrigation of Cowpeas in Iran", - at the CENTO Conference on Agricultural Extension, in Ismir Turkey, April 20, 1967.

- Investigations conducted between 1964 and 1967 supplied information on

(1) Growth characteristics of local and introduced types of five major pulse crops - beans, mungbeans, cowpeas, chickpeas, and lentils,

(2) identification and control of diseases and insects and

(3) soil and crop management practices to increase crop yields.

- The end of the 1967 crop season saw the following specific accomplishments:

Breeding

- Several strains were outstanding in yield tests and have been recommended to the Ministry of Agriculture for seed increase and release. These are:

(1) White bean strain No.49, originating in Shiraz area. It has yielded an average of 15% more than varieties in tests at 7 locations over 3 years.

(2) Red bean strain No.50 originating in Esfahan area, with an average of 20% greater yield.

(3) Pinto bean strain No.446 (Accession 65-071-00446). It originated from Esfahan, yields equal to U.S. pinto varieties but has a more acceptable seed type for the local market.

(4) Chickpea strains No.416 M and 438 M with yield advantages of 9% over the average of other varieties in the same tests.

(5) Cowpea strains No.50 and No.4002. Strain No.50 originated in Turkey. Strain No.4002 was collected in the Meshed area of Iran but is unlike the indigenous material and so similar to some of the U.S. cowpea varieties like Blackeye No.7 that the question of its real origin arises.

Soil and Crop Management

- Improved cultural practices such as correct planting date, seeding rates, fertilization and irrigation have been shown to improve yields as much as 300 to 400% over those presently obtained by farmers.

- Planting data experiments have shown the correct date of planting for all major pulse crops.

- Sufficient seed should be planted to obtain 300,000 to 400,000 plants per hectare.

- Maximum yields depend on adequate levels of both moisture and fertility Chickpea yields were increased by 1.98 tons per hectare or 14% as a result of fertilization and irrigation. Lower increases were obtained if either fertilization or moisture was lacking. Similar results were found in cowpeas and dry beans.

- Phosphorus fertilization responses were found when phosphorus content of soil was 2-3 ppm. or less. Yields were not increased by nitrogen fertilization.

- Fungal diseases in lentils were found to be more serious under high moisture as a result of frequent irrigations. High fertility had this effect also.

Pathology

- Bean common mosaic virus (BCMV) reduces yield up to 68%. It was found to be seed transmitted through more than 50% of the seed of many varieties. Out of 1952 bean lines in the nursery 29 showed at least some resistance.

- Bean yellow mosaic virus (BYMV) damages broadbeans and chickpeas most years. Seed transmission is very slight in both crops but mechanical and aphid transmission are rapid. Yield reductions were found as high as 75-90%.

- Alfalfa mosaic virus attacks chickpeas, reducing yields of infected plants from 72 to 96%. No resistance has as yet been found.

- Cowpea aphid-borne mosaic virus (CAMV) is widespread and severely damaging to cowpeas, reducing yields as much as 80%. Six varieties out of 54 tested, showed resistance.

- Pathogens associated with various root-rot diseases were isolated and identified.

- Several other viruses as well as fungal diseases are being studied.

Entomology

- Although 1967 trials in general were very inconclusive because of low insect infestations, the following recommendations have been made on the basis of 3 years work:

(1) Bean butterfly (*Lycaena baeticae*) - Crop: Cowpea
Recommendations: DDT and Toxaphene, Diazinon, Dimethoate, Dylox and Malathion.

(2) Jassids (*Epoasca sp.*) - Crop: all pulses
Recommendations: Diazinon, Sevin, Carbophenothion, Malathion, Ethion, and Dimethoate.

(3) Mites (*Tetranychus bimaculatus*) - Crop: dry beans and mungbeans.
Recommendations: Tedion, Kelthane, and Ethion.

(4) Seed corn maggot (*Hylemya cilicrura*) - Crop: dry beans.
Recommendations: no insecticide, but minimum damage if crop planted after soil temperature at planting depth reaches 18°C.

(5) Cotton bollworm (*Heliothis zea*) - Crop: chickpeas
Recommendations: DDT - Lindane, Sevin.

Work was continued on control of pests of stored seed (primarily Bruchum sp.). After some setbacks in the investigations with the chemicals Bromodan and Alodan (Hoechst Chemical Company), results have again been encouraging. After further work both in Iran and in India a final report and regional recommendation will probably be made in 1968.

- Evaluation for possible genetic resistance to the major insect pests was started but did not yield any conclusive results.

- Preliminary irradiation trials indicated that sterility can be induced in the adults, pupae, and larvae of beet armyworm (Spodoptera exigua). The work is continuing.

- Results of chemosterilant work have not been encouraging.

- Studies on nematodes conducted in cooperation with the Ministry of Agriculture, Plant Pest Control Institute showed degrees of resistance to Melloidegyne nemotodes among 10 varieties of mungbeans. However field and greenhouse trials did not agree sufficiently to make the results conclusive.

India

General

In 1967 the four senior counterparts to U.S. technicians in plant breeding, Agronomy, pathology and entomology were officially appointed. However before the end of the year the entomologist resigned to accept another position. Many other positions in the All-India Coordinated Pulse Project are still vacant including that of the Coordinator. The two regional centers and four subcenters as provided for in the Project have not been officially sanctioned and therefore no provisions for work there are available.

No progress has been made on construction of the Pulses Research Building at IARI, New Delhi. Without this it is very difficult to effect good cooperation and coordination among workers in different disciplines. Physical facilities of offices, laboratories and research farm are make-shift and totally inadequate to conduct research on the number of crops and disciplines involved in this program. A request for additional power for the presently occupied laboratories which was made in early 1966 has not been filled. The cold storage facility constructed from RPIP funds in 1967 for germplasm storage is also without power.

- The Regional Pulse Improvement Project is using its resources to carry on research at IARI and other Institutions with whatever assistance and support is available from official funds or through voluntary cooperation.

So far we have had more research crop failures than successes. The 1966-67 rabi crop (planted in November 1966 and harvested in March-April 1967) of the large germplasm collection of chickpeas at Delhi was completely lost primarily due to high salinity in the land assigned for it. A similar fate befell the germplasm collection of pigeon peas due to a killing frost in January 1967.

- The 1967 monsoon season with ample rains, although contributing to a bumper foodgrain crop in general, ruined most of the Pulse Project's efforts due to repeated and prolonged flooding of fields at IARI and other locations. Data from many other trials must be considered unreliable because land was not ready in time for planting, labor crews were not available to keep weeds from choking out the crops or irrigation water was not available when critically needed.

- On the positive side there are strong indications that pulses are getting more attention than they have so far received. More and more state departments of Agriculture and Agricultural Universities are making appointments of specific pulse crop specialists in breeding and other disciplines where thus far there were either none or they were combined with other crops such as millets. This is the case in the states of Bihar, West Bengal, Uttar Pradesh, Punjab, Andhra Pradesh, Rajasthan, Madras, Mysore.

- A pulse crop workshop was held at IARI in New Delhi in February 1967 attended by about 75 workers from all over India.

Breeding

- Germplasm collections were enlarged through collections within India, introductions from outside India and through transfer of the RPIP/Iran collections of chickpeas, mungbeans, lentils and cowpeas. Because this is the first time that breeding material is being introduced into India there is a great interest and demand for seed of the collections.

- The release of an early maturing variety of mungbean was announced by the Indian Agricultural Research Institute. "Basaikhi" mung appears to be well suited as a summer crop between the end of wheat harvest in April and beginning of Kharif planting in July, in areas of Northern India where a water supply for irrigation is assured.

- Several lines of Khesari (Lathyrus sativus) have been found with from a trace to 0.15 percent of the neurotoxic compound, B-N-oxalyl amino alanine. These lines are presently being tested for possible direct use as varieties or as breeding material to help overcome the crippling effect of lathyrism in areas where this crop is grown and consumed.

Soil and Crop Management

- Considerable increases in yield can be obtained in all pulse crops, using presently available varieties by proper management practices. For instance a yield of 1416 lbs. per acre of chickpea was obtained with 50 lbs. of N and 100 lbs. of P_2O_5 per acre and close plant spacing (12" between rows and 4½" between "plants").

- With mungbean and urdbean yields of over 1400 lbs. per acre were obtained using 100 lbs. per acre NPK fertilizer and 5 x 20 cm. plant spacing (400,000 plants/A). In these crops it was also found that short season varieties yield as much as those which occupy the land much longer.

- Using an early maturing (150 days) variety of pigeonpeas a yield of over 4500 kg/Hectare was obtained with high plant populations. The average farmers' yield for this crop using long season varieties (250 days) is less than 1000 kg/hectare.

- With present emphasis in India on increased foodgrain production, early maturing varieties fit better into multiple cropping systems.

- Rhizobial studies with pulses are difficult in India because of the many leguminous crops and weeds present. There appear to be many native rhizobia present which are highly competitive but not efficient in nitrogen fixation.

Plant Pathology

- Chickpea wilt, probably the most destructive disease of this crop, is due to complex of several organisms. Two pathogens have been definitely identified. No satisfactory resistance has yet been found.

- Pigeon pea wilt causes an estimated loss of 40 million rupees or 2600 metric tons of grain. Development of resistant varieties appears feasible. Studies have been conducted on the presence of different strains of the pathogen. Some 600 collections of wilted plants were made and isolates obtained from them. Breeding material is being screened for resistance.

- Out of 681 lines of mungbeans, 203 showed field resistance to yellow mosaic, 264 to leaf crinkle, and 9 to bacterial blight.

- Among 20 released varieties of mungbeans, 2 had acceptable field resistance to yellow mosaic, 172 to leaf crinkle, and several showed varying degrees of resistance to fungal and bacterial diseases.

- Two viruses have been isolated from cowpeas. Studies on their specific identification are in progress.

Entomology

Various species of Bruchids are among the most destructive of pulse crops pests. Tests were conducted in the field in 1967 on chickpeas, lentils, and dry peas to evaluate the possibility of field control. Laboratory studies of bruchid control in stored seed were also started in 1967.

- No accurate estimates are available of the amount of foodgrains lost due to storage insects. It is safe to say however that 5 - 10% is a conservative estimate. On the basis of 12 million tons production of pulses in India, 5% means 600,000 tons of high protein foodgrains lost annually. It appears from preliminary results that a safe, easy to use and inexpensive insecticide is available which, with one application to the seed right after harvest, gives long lasting protection.

- Field trials were also conducted to find suitable controls for flea beetles which damage kharif (summer) crops of mungbeans, urdbeans, and cowpea.

INTRODUCTION

This report contains the details of the research program of the Regional Pulse Improvement Project in Iran and India during 1967.

A summary of results for 1967 was prepared earlier as a separate report.

The Regional Pulse Improvement Project originated in 1963 as the result of a Participating Agency Service Agreement between the U.S. Agency for International Development (USAID) and the U.S. Department of Agriculture, Agricultural Research Service (ARS). The purpose of this PASA was to have ARS personnel do research on the grain legumes (pulse crops) in the Near East, South Asia and Far East regions with the objective to improve production through better varieties and production practices, and to help establish continuing improvement programs on these important human nutrition crops.

The potential of the host countries to participate in this work was considered and after a survey of eight countries, Iran and India were selected as locations for two research teams. They were selected because of the local government interest, the importance of the crops, and the facilities for research and training available.

A Memorandum of Understanding with the Government of Iran was signed in May, 1964, providing for participation in project operations of the Plan Organization, the Ministry of Agriculture, and Karaj Agricultural College of Tehran University. A Cooperative Agreement was signed to provide for U.S. reimbursement to Iranian agencies for personnel provided in addition to the counterpart positions to be filled by the Plan Organization. A similar agreement was formed in 1966 with the Pahlavi University in Shiraz for cooperative research. Project operations started in Iran in August, 1964.

In India, the Memorandum of Understanding was not signed until April, 1965. To counterpart the Pulse Improvement Project, the Council of Agricultural Research of the Indian Government initiated the Project for the Intensification of Coordinated Research for the Improvement of Pulses at the Indian Agricultural Research Institute, New Delhi, and six regional centers and sub-stations throughout India. The first American personnel arrived at post late in 1965. The first full-time counterpart appointments under the Government of India scheme were made in the fall of 1966.

Each U.S. team consists of a plant-breeder, soils scientist-agronomist, plant pathologist, and entomologist. The project's overall activities are coordinated by a research agronomist coordinator and administrative officer. A biochemist position on the team in India is expected to be filled in early 1968.

I R A N

VARIETAL IMPROVEMENT

Karaj (Karaj College)
Dr. Kenneth H. Evans
Engineers Jamshid Jaffari
Mehdi Khosrowshahin, Ali Ellini
Mohammad Moadab, and Ahmad Sarrafi

Seed and Plant Improvement Institute
Ministry of Agriculture
Engineer Parviz Parvaneh

Shiraz (Pahlavi University)
Dr. Mansour Niknejad
Engineer M. Khosh-Khui

The germplasm collection was enlarged by transfer of the Indian collection to Iran. Other material added to the collection includes: 380 chickpeas and 120 bean strains from Mr. Nihat Canitez, Eskisehir, Turkey; 213 lentil samples and 25 cowpea strains from the U.S.D.A., Beltsville, Maryland; 5 mungbean strains from Dr. Mohammad Aslam, Lyalpur, West Pakistan; and 12 Phaseolus samples from Japan.

Germplasm was distributed to the following locations: 60 lentil samples to Dr. Zaumeyer, U.S.D.A., Beltsville, Maryland; 32 lentil and 380 chickpea strains to Mr. Nihat Canitez, Eskisehir, Turkey; 240 chickpea strains and 10 lentil strains to Dr. Mohammad Abul-Aziz, Tarnab, West Pakistan; and 280 chickpea strains to Dr. Mohammad Aslam, Lyalpur, West Pakistan. Seed was also distributed to Jordan, Lebanon, Costa Rica, and Nigeria, Seed distributed in Iran is not listed.

The new lentil and chickpea material contains many strains with desirable seed type. Some of these may be useful as varieties or as breeding material.

On the basis of RPIP results, strains of four crops were recommended for increase and release. The Ministry of Agriculture has named nine of the recommended strains and is increasing them for release.

Following are the variety descriptions and comparative performance of these recommended varieties.

Black Chickpea (Pyrouz)

RPIP Accession No. 12-071-05436 - Tested as strain No. 416M
Origin: Gull, Khorasan Province.

Variety Characteristics

Length of growing period: 119 days
Disease rating: relatively good
Grain yield (experimental conditions): 2100 kg/ha.
1000 Seed weight: 140 gm.
Plant height: 26 cm.
Seed shape: slightly elongated, wrinkled
Seed coat color: brownish
Cooking time: 28 minutes
Taste: sweet and floury

Black Chickpea (KA KA)

RPIP Accession No. 12-071-5437 - Tested as strain No. 438M.
Origin: Karaj, Iran.

Variety Characteristics

Length of growing period: 119 days
Disease rating: relatively good
Grain Yield (experimental conditions): 2100 kg/ha.
1000 seed weight: 116 gm.
Plant height: 26 cm.
Seed shape: small and wrinkled
Seed coat color· uniform black
Cooking time: 28 minutes
Taste: Sweet.

Agronomic Data Chickpea (Black) Yield Test, Average of Data from Eleven Tests; 1965-67, Iran.

(1) Accession Number	(4) Source	(6) Plant Height	(13) Days to Maturity	(17) 100-Seed	(18) Yield	Protein*	Palatability**
12-071-05436	Gharye-gole, Iran	26	119	14.0	2110	25.2	21
12-071-05437	Karaj, Iran	26	119	11.6	2110	27.7	21
12-071-05429	Karaj, Iran	29	119	11.5	2020	27.9	20
12-071-05446	Karaj, Iran	27	120	11.8	2020	27.2	18
12-071-05430	Gharye-gole, Iran	25	120	14.5	2020	25.9	21
12-071-05452	Gharye-gole, Iran	27	119	13.7	2010	26.3	22
12-071-05444	Gharye-gole, Iran	29	121	14.6	2010	26.4	18
12-071-05442	Iran	32	120	12.5	2000	27.7	18
12-071-05447	Karaj, Iran	25	120	11.4	1980	28.4	21
12-071-05438	Gharye-gole, Iran	27	118	13.0	1980	26.3	17
12-071-05432	Karaj, Iran	29	119	12.2	1980	27.8	18
12-071-05439	Karaj, Iran	28	120	12.4	1970	27.0	19

* Protein percentage based on total solids. Determined by Kheldahl method.
** Palatability, maximum rating: 30

White Bean (MARMAR)

RPIP Accession No. 65-971-00042 - Tested as strain No. 49
Origin: Shiraz, Iran

Variety Characteristics

Length of growing period: 99 days
Disease rating: good
Grain yield (experimental conditions): 2200 kg/ha.
1000 Seed weight: 260 gm.
Plant height: 32 cm.
Seed shape: kidney
Seed coat color: bright white
Cooking time: 60 minutes

Agronomic Data, Bean (White) Yield Test, Average of Data From Nine Tests; 1965-67, Iran

(1) Accession Number	(2) Source	(3) Flower color	(9) Days to Comp. Mat.	(10)* Dis-ease Rating	(14) Seed color	(15) Seed shape	(16) Seed size	(17) Yield
65-071-00042	Shiraz, Iran	W	99	2	W	F	26	2260
65-071-00040	Kermanshah, Iran	W	102	2	W	F	26	2250
65-071-00424	Karaj, Iran	W	102	2	W	F	25	2180
65-071-00064	Bojnourd, Iran	W	102	2	W	F	25	2150
65-071-00050	Karaj, Iran	W	104	3	W	F	25	2140
65-071-00054	Isfahan, Iran	W	103	3	W	F	24	2130

* Disease rated by pathology section, August 1967, for Bean Common Mosaic Virus.

Red Bean (NAZ)

RPIP Accession No. 65-071-00582 - Tested as strain No. 50
Origin: Isfahan, Iran

Variety Characteristics

Length of growing period: 100 days
Disease rating: Fair
Grain yield (experimental conditions): 2200 kg/ha.
1000 Seed weight: 250 gm.
Plant height: 28 cm.
Seed shape: flat (cylindrical)
Seed coat color: dark red
Cooking time: 55 minutes
Taste: sweet and floury -

Agronomic Data, Bean (Red) Yield Test, Average of Data From Nine Tests; 1965-67, Iran

(1) Accession Number	(2) Source	(3) Flower Color	(9) Days to Complete Maturity	(10)* Disease Rating	(14) Seed Color	(15) Seed Shape	(16) Seed Size	(17) Yield
65-071-00582	Esfahan, Iran-(50)	W	100	5	DR	F	24	2180
65-071-00430	Iran, Unknown	W	96	4	DR	F	25	2180
65-071-00431	Iran, Unknown	W	102	2	R	F	27	2160
65-071-00047	Iran, Min. 394	LP	103	2	DP	C	34	1750
65-071-00057	Iran, Min. 2394	LP	102	2	DP	C	35	1500

* Disease rated by pathology section, August 1967, for Bean Common Mosaic Virus.

Pinto Bean (SHAAD)

RPIP Accession No. 65-071-00446
Origin: Isfahan, Iran

Variety Characteristics

Length of growing period: 103 days
Disease rating: Fair
Grain yield (experimental conditions): 1500 kg/ha.
1000 Seed weight: 410 gm.
Plant height: 32 cm.
Seed shape: oval, flat
Seed coat color: light brown
Cooking time: 35 minutes
Taste: sweet
Comment: Although susceptible to Bean common Mozaic virus, it produces higher yields and is more acceptable on the Iranian market than other pinto types.

Agronomic Data, Bean (pinto) Yield Test, Average of data from seven tests; 1965-67, Iran

(1) Accession Number	(2) Variety or Source	(3) Flower color	(9) Days to Complete Maturity	(10)* Disease rating	(15) Seed Shape	(16) Seed Size	(17) Yield
65-071-00455	Torbat-heidarieh, Iran.	P	101	3	F	26	1950
65-071-00445	Kermanshah, Iran	P	101	4	F	28	1900
65-157-00068	Pinto 114	W	91	4	F	35	1530
65-071-00452	Guchan, Iran	P	106	7	F	23	1510
65-071-00446	Esfahan, Iran	P	103	8	F	41	1490
65-157-00072	Pinto 111	W	90	6	F	32	1440
65-071-00449	Guchan, Iran	P	107	8	F	27	1370
65-071-00458	Esfahan, Iran	LP	105	8	P	40	1160
65-071-00460	Kermanshah, Iran	LP	114	8	P	31	970
65-071-00463	Abasabad-Torbat, Iran.	LP	120	9	P	41	840

* Disease rated by pathology section August 1967 for Bean Common Mosaic Virus.

Cowpea (KARMAN

RPIP Accession No. 62-153-00057 - USDA PI No.179555. Tested as strain No.50
Origin: Turkey

Variety Characteristics

Length of growing period: 87 days
Disease rating: good
Grain yield (experimental conditions): 1700 kg/ha
1000 Seed weight: 220 gm.
Plant height: 32 cm.
Seed shape: kidney
Seed coat color: bright cream with brown dot
cooking time: 35 minutes
Taste: starchy sweet
Comment: This variety has a good marketing preference.

Cowpea (PARASTOO)

RPIP Accession No. 62-157-00347
Origin: U.S.A. (Variety name: Early Ramshorn) and
Accession No. 62-071-10003 (Origin: Mashad, Iran) although considered for release were not recommended for seed increase and release as yet primarily because of limited testing data. They are both very attractive to the market with large black eyed white seed but further testing for performance and disease resistance is necessary.

Agronomic Data, Cowpea Yield test, average of data from ten tests, 1965-67, Iran

(1) Accession Number	(4) Source of Variety	(6) Plant Type	(12) Days to 1st Maturity	(13)* Dis-ease	(17) Seed color	Seed per pod	Seed size	Yield
62-157-00296	Blackeye # 7	SE	81	3	MW	9	L	1796
62-157-00316	Calara	B	81	2	MW	10	ML	1758
62-157-00341	Davis-Pea	SE	84	1	CrP	12	ML	1754
62-153-00057	Turkey 50	B	87	1	CrW	10	L	1752
62-069-00276	India	B	86	3	CrP	10	M	1747
62-085-00065	Lebanon	BP	83	2	CrP	10	M	1700
62-157-00358	Institute 0154	B	87	1	Sp Br	12	M	1684
62-000-10001	Unknown	E	83	1	CrP	10	S	1670
62-110-00234	Nigeria	B	81	2	MW	10	ML	1659
62-157-00442	Texas-Crea m	SE	84	2	CrW	10	M	1599
62-069-00278	India	E	95	1	P	13	ML	1473
62-157-00470	Princess Ann	SE	81	4	CrW	9	L	1466

* Cowpea mozaic virus rated by pathology section August 1966.

Mungbean (PARTOW)

RPIP Accession No. 48-157-10307. USDA, PI No. 31287 - Tested as Strain No.3
Origin: U.S.A., Beltsville.

Variety Characteristics

Length of growing period: 73 days
Disease rating: good
Grain yield (experimental conditions): 1400 kg/ha
1000 Seed weight: 40 gm.
Plant height: 34 cm.
Seed shape: round
Seed coat color: dark green
Cooking time: 25 minutes
Taste: starchy

Mungbean (GHOHAR)

RPIP Accession No. 48-069-10075. USDA, PI No.183136 - Tested as Strain No.72
Origin: India

Variety Characteristics

Length of growing period: 75 days
Disease rating: good
Grain yield (experimental conditions): 1200 kg/ha.
1000 Seed weight: 50 gm.
Plant height: 38 cm.
Seed shape: large, short oval
Seed coat color: bright green
Cooking time: 25 minutes
Taste: starchy

Agronomic Data, Mung bean Uniform Yield Test. Average of Data from seven tests. 1965-67, Iran

(1) Accession Number	(2) Source	(5) Plant Type	(6) Plant Height	(10) Days to 1st Mat.	(11)* Dis-ease Rating	(15) Seeds per pod	(16) Seed color	(17) 100 Seeds weight	(19) Yield
48-157-10307	Beltsville,USA	B	34	73	1	9	DG	4.0	1360
48-157-10023	Beltsville,USA	B	45	76	1	10	DG	4.7	1307
48-157-10004	Beltsville,USA	B	30	72	4	9	DG	4.7	1247
48-069-10105	India	B	46	76	1	10	DG	4.5	1239
48-033-10045	China	B	36	72	2	10	DG	4.7	1231
48-069-10066	India	SP	40	79	1	10	DG	5.2	1231
48-157-10022	Beltsville,USA	B	50	78	2	10	DG	4.4	1215
48-082-10103	Korea	B	41	75	1	11	DG	5.1	1196
48-069-10075	India	SP	38	75	1	9	DG	5.0	1185
48-069-10078	India	SE	45	78	2	10	DG	4.5	1135
48-069-10104	India	SP	37	78	1	10	DG	5.0	1123
48-071-10087	Iran	SP	39	75	2	10	DG	5.3	1082

* Disease rating made by Pathology Section August 1966.

LENTILS

Dr. Kenneth H. Evans
Engineer Mehdi Khosrowshahin

Germplasm

Some germplasm accessions were lost and others reduced to a few seeds due to root rot in 1965 and 1966 at Karaj. The 1967 nursery was planted in Ghazvin to reduce root rot losses. New accessions and other strains were grown in cooperation with the Ghazvin Department Project. An increased seed supply and some data in the absence of root rot were obtained.

Yield Trials

Preliminary yield trials at Karaj and Varamin (Tables 1 and 2) include some more acceptable market types, as well as small seeded types. The small seed, root rot resistant types yielded more even in the absence of any root rot symptoms.

The advanced yield trials (Tables 3 to 6) contain some of the strains with good root rot resistance and high yield, but have less desirable seed type.

A preliminary market survey in Tehran indicates the small seeded types range in price from 6 to 8 rials per kilo, while large seeded types range from 12 to 27 rials per kilo. The higher prices (near 27 rials) are being paid for large greenish lentils. These results indicate a breeding program could be very successful if good seed types were combined with desirable agronomic characters.

Legend for Lentil Agronomic Data Tables 1-6

(1) Numbers assigned to collection maintained by the Regional Pulse Improvemen Project.

(2) Strain numbers refer to entry numbers assigned in 1966.

(3) Source numbers refer to collection numbers assigned by the Ministry of Agriculture.

(4) Source indicates area of origin or area in which the seed was collected.

(5) Plants per meter is an average number of plants per meter of row ba sed on one meter sample per replication.

(6) Rated 1 to 9: 1 = complete stand; 9 = poor stand.

(7) Rated 1 to 9: 1 = vigorous plants; 9 = weak plants.

(8) Days from planting to first opened flower.

(9) Indicates number of days after planting the first pod in plot reached full maturity, ready for harvest.

(10) Indicates number of days after planting the whole plot was ready for harvest.

(11) Seeds/five pods indicates the average number of seeds in five pods.

(12) Br = brown; G = green; R = red; GR = green and red.

(13) Average weight (grams) of 100 seeds.

(14) Yield in kilograms per hectare ba sed on 5 or 10 square meter plots

TABLE 1. Agronomic Data, Lentil Preliminary Yield Test, Planted March 11, 1967, RPIP, Varamin, Iran

(1) Accession Number	(2) Strain Number	(4) Source	(6) Stand	(7) Vigor	(8) Days to 1st flower	(9) Days to 1st Mat.	(11) Seeds 5 Pods	(12) Seed Color	(13) Seed Size	(14) Yield Kilo/hectare
33-071-10443		I-Esfahan	2	1	65	101	8	Br	2.6	1334
33-071-10444		I-Esfahan	1	2	66	101	8	Br	2.4	1307
33-071-10441		I-Esfahan	2	1	67	101	8	LR	2.9	1264
33-071-10440		I-Esfahan	2	2	68	101	8	Br	2.8	1195
33-071-10438		I-Esfahan	1	2	67	101	8	Br	3.2	1156
33-071-10439		I-Jiroft	2	1	64	100	8	Br	2.9	1146
33-071-10445		I-Esfahan	2	2	65	100	9	Br	3.1	1049
33-071-10442		I-Esfahan	2	1	65	100	8	Br-LR	2.9	1011
33-071-10421		I-Ghazvin	3	3	62	100	7	G-R	4.6	824
33-071-10408		I-Ahar	2	1	65	100	8	G	4.8	798
33-071-10428		I-Moghan	2	1	66	100	8	G-R	4.8	714
33-071-10414		I-Zanjan	3	2	66	100	7	G-R	3.8	712
33-071-10424		I-Moghan	2	2	62	100	6	G-R	4.0	699
33-071-10422		I-Moghan	2	2	62	100	7	G-R	4.1	681
33-071-10423		I-Miyaneh	2	2	64	100	7	G-R	4.0	674
33-071-10435		I-Ghazvin	2	2	61	100	7	G-R	3.9	665
33-071-10413		I-Tabriz	3	2	66	99	8	G-R	4.7	657
33-071-10420		I-Ardebil	3	2	64	100	7	G-R	4.3	651
33-071-10436		I-Ghazvin	2	1	68	100	7	G-R	5.2	650
33-071-10407		I-Ghare-aghaj	3	2	66	100	7	G-R	4.0	634
33-071-10429		I-Moghan	2	2	64	100	8	G-R	4.6	618
33-071-10432		I-Ardebil	3	2	63	98	6	G-R	4.9	614
33-071-10437		I-Ghazvin	3	2	63	100	8	G-R	4.9	612
33-071-10406		I-Zanjan	3	3	65	98	8	G-R	4.6	612
33-071-10425		I-Ahar	4	3	65	100	6	G-R	4.6	607
33-071-10416		I-Ardebil	3	3	64	100	6	G-R	4.4	600
33-071-10417		I-Ardebil	3	2	65	100	8	G-R	4.3	599
33-071-10409		I-Ardebil	4	3	63	100	8	G-R	4.8	599
33-071-10419		I-Ghare-aghaj	3	2	64	99	6	G-R	4.4	595
33-071-10411		I-Moghan	4	3	66	99	6	G-R	5.1	577
33-071-10427		I-Zanjan	2	1	63	100	8	G-R	4.3	576
33-071-10430		I-Tabriz	3	2	63	100	6	G-R	4.1	553
33-157-10431	51	U.S.A.	2	1	61	100	7	R	3.8	541
33-071-10433		I-Ardebil	3	2	63	100	6	G-R	4.2	533
33-071-10415		I-Ardebil	2	2	63	100	5	G-R	4.7	538
33-071-10410		I-Khoy	3	2	66	99	8	G-R	4.9	537
33-071-10434		I-Ardebil	3	2	64	100	6	G-R	4.0	515
33-071-10418		I-Ardebil	4	3	64	99	8	G-R	4.2	435
33-071-10426		I-Khoy	3	2	64	100	6	G-R	4.0	343
33-071-10412		I-Moghan	6	4	65	100	6	G-R	4.4	199
CV %										18
LSD .05										268

TABLE 2. Agronomic Data, Lentils Preliminary Yield Test, Planted March 18, 1967, RPIP, Karaj, Iran

(1) Accession Number	(2) Strain Number	(3) Source Number	(4) Source	(5) Plants /Meter	(6) Stand	(7) Vigor	(8) Days to First Flower	(9) Days to First Maturity	(10) Days to Complete Maturity	(11) Seeds/ 5 pods	(12) Seed Color	(13) Seed Size	(14) Yield Kilo/ hectare
33-071-10444		209-73	I-Esfahan	49	2	2	64	99	113	8	Br	2.4	945
33-071-10438		209-74	I-Esfahan	44	2	2	68	100	114	8	Br	3.3	795
33-071-10445		209-68	I-Esfahan	43	2	3	69	99	116	9	Br	3.5	784
33-071-10440		209-25	I-Esfahan	43	2	2	70	99	116	7	Br	3.2	749
33-071-10442		209-53	I-Esfahan	50	2	2	67	100	115	7	Mix	3.2	738
33-071-10443		209-27	I-Esfahan	45	2	3	67	98	109	7	G-R	2.7	819
33-071-10439		210-56	I-Jiroft	36	2	2	65	99	118	7	Br	3.7	613
33-071-10441		209-9	I-Esfahan	50	3	3	67	100	114	7	R	3.4	536
33-071-10435			I-Ghazvin	36	3	3	63	99	110	8	G-R	4.0	533
33-071-10421			I-Ghazvin	41	2	4	63	98	112	6	G-R	4.7	526
33-071-10416			I-Ardebil	32	3	4	64	100	114	8	G-R	4.5	521
33-071-10430			I-Tabriz	34	3	3	63	99	114	6	Mix	4.8	519
33-071-10422			I-Moghan	37	3	4	63	97	108	7	G-R	4.5	497
33-157-10431	51		U.S.A.	38	3	3	65	100	115	7	Mix	4.6	490
33-071-10407			I-Ghare-aghaj	30	4	3	64	99	116	8	G-R	3.9	490
33-071-10417			I-Ardebil	37	4	4	65	100	114	7	G-R	5.0	487
33-071-10437			I-Ghazvin	28	3	4	63	99	111	7	G-R	5.1	475
33-071-10414			I-Zanjan	29	4	4	66	99	117	7	Mix	4.0	467
33-071-10424			I-Moghan	35	2	4	64	99	114	7	G-R	4.4	464
33-071-10418			I-Ardebil	31	4	4	64	99	112	6	G-R	5.2	459
33-071-10427			I-Zanjan	33	4	3	63	99	111	7	G-R	4.5	454
33-071-10420			I-Ardebil	34	4	4	64	99	115	6	G-R	5.2	449
33-071-10434			I-Ardebil	35	4	3	63	99	114	6	G-R	4.2	444
33-071-10436			I-Ghazvin	31	4	4	63	99	114	6	G-R	5.1	440
33-071-10419			I-Ghare-aghaj	32	4	4	64	99	112	7	G-R	4.7	439
33-071-10408			I-Ahar	24	3	5	64	98	112	7	G-R	4.4	437
33-071-10423			I-Miyaneh	33	3	4	64	99	114	6	G-R	5.1	432
33-071-10433			I-Ardebil	39	3	4	64	99	114	7	G-R	4.5	432
33-071-10415			I-Ardebil	31	3	4	64	99	113	7	G-R	5.0	430
33-071-10425			I-Ahar	30	4	4	63	99	115	8	Mix	4.7	423
33-071-10409			I-Ardebil	32	4	4	64	99	118	8	G-R	4.5	420
33-071-10411			I-Moghan	32	4	4	64	99	114	6	G-R	5.4	417
33-071-10426			I-Khoy	35	3	3	64	100	116	8	G-R	4.0	412
33-071-10413			I-Tabriz	30	4	4	64	99	115	6	G-R	4.6	405
33-071-10428			I-Moghan	26	4	4	64	98	115	6	G-R	5.2	388
33-071-10410			I-Khoy	28	4	4	65	99	117	6	G-R	4.9	386
33-071-10432			I-Ardebil	21	4	4	65	99	117	7	G-R	4.6	351
33-071-10429			I-Khorosloo	30	4	5	63	98	112	6	Mix	4.6	348
33-071-10406			I-Zanjan	38	4	5	64	99	116	7	G-R	4.7	334
33-071-10412			I-Moghan	5	9	9	72	101	119	6	G-R	4.2	275
CV %													27
LSD 1%													247

TABLE 3. Agronomic Data, Lentils Uniform Yield Test, Planted March 13, 1967, RPIP, Ghazvin, Iran

(1) Accession Number	(2) Strain Number	(3) Source Number	(4) Source	(5) Plants/ Meter	(6) Stand	(7) Vigor	(8) Days to First Flower	(10) Days to Complete Maturity	(11) Seeds/ 5 pods	(12) Seed Color	(13) Seed Size	(14) Yield Kilo/ Hectare
33-071-10885	1000	209-70	I-Esfahan	58	4	2	71	125	6	Br	2.7	854
33-071-10903	992	209-48	I-Esfahan	56	4	4	78	129	6	R	2.7	714
33-071-11137	6	2-42-5803	I-Arasbaran	55	4	3	69	131	7	G-R	3.7	707
33-071-11143	7	3-42-4601	I-Esfahan	47	3	3	70	132	6	G-R	3.4	522
33-071-11146	19	2-42-4474	I-Fars	46	4	4	74	127	6	G	3.0	506
33-071-11136	59	64-62	I-Esfahan 217	44	4	4	76	129	6	Br	2.8	459
33-071-11135	22	2-42-4531	I-Fars	48	4	3	73	127	6	G-R	3.0	453
33-071-11138	15	2-42-4559	I-Esfahan	39	5	5	75	131	7	G	2.7	419
33-071-11140	18	2-42-4516	I-Fars	41	5	5	78	131	6	G	2.8	389
33-071-11139	1017	209-68	I-Esfahan	38	5	4	76	129	6	Br	3.0	322
CV %												33
LSD 1%												341

TABLE 4. Agronomic Data, Lentils Uniform Yield Test, Planted March 11, 1967, RPIP, Varamin, Iran

(1) Accession Number	(2) Strain Number	(3) Source Number	(4) Source	(6) Stand	(7) Vigor	(8) Days to First Flower	(9) Days to First Maturity	(11) Seeds/ 5 pods	(14) Yield Kilo/hectare
33-071-11138	15	2-42-4559	I-Esfahan	3	2	66	99	8	1709
33-071-11140	18	2-42-4516	I-Fars	2	2	63	98	7	1668
33-071-10885	1000	3-42-4601	I-Esfahan	3	1	67	101	8	1663
33-071-10903	992	209-48	I-Esfahan	5	1	68	99	8	1606
33-071-11139	1017	209-68	I- Esfahan	3	2	68	102	8	1603
33-071-11136	59	217-64-62	I-Esfahan	3	1	68	99	8	1588
33-071-11135	22	2-42-4531	I-Fars	3	2	64	99	8	1373
33-071-11146	19	2-42-4474	I-Fars	2	2	64	98	7	1228
33-071-11137	6	2-42-5803	I-Arasbaran	3	2	66	101	7	1074
33-071-11143	7	3-42-4601	I-Esfahan	3	2	66	100	8	1010
CV %									23
LSD .05									479

TABLE 5. Agronomic Data, Lentils Uniform Yield Test, Planted March 15, 1967, RPIP, Shiraz, Iran

(1) Accession Number	(2) Strain Number	(3) Source Number	(4) Source	(8) Days to First Flower	(12) Seed Color	(13) Seed Size	(14) Yield Kilo Hectare
33-071-11136	59	64-62	I-Esfahan	78	Br	3.0	1057
33-071-11139	1017	209-68	I-Esfahan	78	Br	3.3	1054
33-071-11146	19	2-42-4474	I-Fars	77	G-R	3.0	1041
33-071-10885	1000	209-70	I-Esfahan	77	Br	2.9	1036
33-071-10903	992	209-48	I-Esfahan	78	R	2.5	1028
33-071-11135	22	2-42-4531	I-Fars	76	G-R	2.7	1017
33-071-11140	18	2-42-4516	I-Fars	77	G-R	2.8	965
33-071-11138	15	2-42-4559	I-Esfahan	78	G-R	2.6	875
33-071-11137	6	2-42-5803	I-Arasbaran	76	G-R	3.2	571
33-071-11143	7	2-42-4601	I-Esfahan	76	G-R	3.0	397
CV %							18
LSD 1%							322

TABLE 6. Agronomic Data, Lentils Uniform Yield Test, Planted March 18, 1967, RPIP, Karaj, Iran

(1) Accession Number	(2) Strain Number	(3) Source Number	(4) Source	(5) Plants/ Meter	(6) Stand	(7) Vigor	(8) Days to First Flower	(9) Days to First Maturity	(10) Days to Complete Maturity	(11) Seeds/ 5 pods	(12) Seed Color	(13) Seed size	(14) Yield Kilo/ Hecta
33-071-10885	1000	209-70	I-Esfahan	25	2	2	69	101	115	8	Br	3.0	899
33-071-11139	1017	209-68	I-Esfahan	27	2	2	69	101	115	9	Br	3.4	876
33-071-10903	992	209-48	I-Esfahan	28	2	2	70	101	115	10	R	2.6	862
33-071-11136	59	64-62	I-217 Esfahan	26	3	2	71	100	115	9	Br	3.4	859
33-071-11140	18	2-42-4516	I-Fars	29	2	3	66	100	115	8	G-R	3.0	846
33-071-11138	15	2-42-4559	I-Esfahan	27	2	2	70	101	115	8	Mix	2.7	832
33-071-11146	19	2-42-4474	I-Fars	30	2	2	70	101	115	9	G-R	3.1	791
33-071-11135	22	2-42-4531	I-Fars	32	3	3	68	100	114	7	G-R	3.0	674
33-071-11143	7	3-42-4601	I-Esfahan	20	3	4	68	99	113	9	Mix	3.0	459
33-071-11137	6	2-42-5803	I-Arasbaran	26	3	3	66	101	115	7	Mix	3.1	441
CV %													12
LSD .05													224

CHICKPEAS

Dr. Kenneth H. Evans
Engineer Jamshad Jaffari
Engineer Mohammad Moadab

Germplasm:

The germplasm collection has been increased by the addition of several accessions with good seed type from Turkey. These will be evaluated along with the Indian material which has less desirable seed type.

Yield Tests

Preliminary yield tests were planted at Karaj and Shiraz to evaluate material for yield and other characters. Some entries in the black chickpea preliminary yield test were high yielding in both locations (Tables 7-10). The better strains will be considered for the uniform test in 1968.

The preliminary yield test of white chickpeas was divided into two tests. One test (Tables 11 and 12) contains the material which has been tested in 1966, and the other test contains new material. The preliminary yield tests contain several strains with desirable seed type. Some strains may be advanced to the uniform yield test on the basis of yield and seed type.

On the basis of College and Ministry of Agriculture uniform tests, two black chickpea strains (416 M and 438 M) were recommended for increase and release. These two strains have been named by the Ministry of Agriculture and will be increased in 1968.

Strain No. 416 M has a brown seed coat and 438 M has a black seed coat. Both strains averaged 9% higher in yield than the mean of other varieties when all locations were considered.

The better seed types in the uniform white chickpea test (Tables 17 to 19) yield less than most other entries; no recommendations can be made until a market survey is completed. A preliminary market survey indicates smooth, large white seed is a much preferred type.

The Iranian strains in the International Yield Test (Tables 21 and 22) performed better in Iran than strains from other countries. This test was conducted in cooperation with other countries and varieties were entered by Pakistan, UAR, and Jordan. Seed for the trial was sent to these countries and Turkey but no results have as yet been received.

Legend for Chickpea Agronomic Data Tables 7 to 22

(1) Numbers assigned to collection maintained by the Regional Pulse Improvement Project.

(2) Numbers assigned in 1964 single row nursery.

(3) Source numbers are numbers assigned to populations or collections by the Iranian Ministry of Agriculture; 6 digit numbers are PI numbers from Crops Research Division, ARS, U.S. Department of Agriculture, Beltsville, Maryland, U.S.A.

(4) Source indicates origin of seed either country or section of Iran.

(5) W = white; P = purple; LP = light purple.

(6) Average plant height in centimeters.

(7) Average plant width in centimeters.

(8) Average number of plants per meter based on one meter of row per replication.

(9) Rated 1 to 9: 1= complete stand, 9= poor stand

(10) Rated 1 to 9: = vigorous plants; 9 = weak plants.

(11) Days from planting to first opened flower.

(12) Indicates number of day after planting the first pod in plot reached full maturity, ready for harvest.

(13) Indicates number of days after planting the whole plot was ready for harvest.

(14) Disease rated 1 to 9: 1 = free from disease symptoms; 9 = seven disease symptoms included yellowing and wilting.

(15) Average number of seeds per pod.

(16) Br = brown; W = white; Bl = black; Cr = cream; Y = yellow; Gr = green; L = light.

(17) Average weight (in grams) of 100 seeds.

(18) Yield in kilograms per hectare based on 5 or 10 square meters per plot.

TABLE 7 Agronomic Date, Chickpea (black) Preliminary Yield Test, Planted March 10 , 1967, Pahlavi University

(1) Accession Number	(2) Strain Number	(3) Source Number	(4) Source	(5) Flower color	(9) Stand	(10) Vigor	(11) Days to 1st.Flower	(12) Days to First Maturity	(13) Days to complete Maturity	(14) Disease rating	(15) Seeds per pod	(16) Seed color	(17) 100 Seeds Weight	(18) Yield
12-071-04529	295	-	Esfahan	P	1	3	71	108	127	1	1.6	BL	11	2854
12-071-04433	2216	221	"	P	1	2	68	105	131	1	1.6	BL	12	2770
12-071-04570	2340	193	Kermanshah	LP	1	3	70	108	126	1	1.6	BL	13	2670
12-071-05301	3016	154	Gharyeh-gole	P	2	3	67	107	133	1	1.8	BL	11	2626
12-071-04467	2247	221	Esfahan	P	2	2	66	103	141	1	1.6	BL	16	2614
12-071-04268	276	326	Esfahan 221	P	3	4	66	109	131	1	1.6	BL	14	2609
12-071-05326	3038	154	Gharyeh-gole	P	1	4	65	106	129	2.5	1.7	BL	14	2587
12-071-04663	2424	172	Ardabil	P	1	1	68	108	137	1	1.4	BL	12	2581
12-071-04775	2542	173	"	LP	3	3	68	106	129	1.5	1.6	BL	12	2567
12-071-05126	2858	174	Ahar	P	1	2	65	113	128	1	1.7	BL	14	2565
12-071-05403	3121	164	Moghan	P	1	2	67	103	134	1	1.5	BL	10	2542
12-071-05130	2862	179	Ahar	P	2	3	71	103	129	1	1.6	BL	10	2519
12-071-04748	2518	173	Ardabil	P	1	2	68	106	136	1	1.7	BL	10	2514
12-071-04450	2231	221	Esfahan	P	2	2	66	106	128	1	1.6	BL	15	2510
12-071-04705	2478	172	Ardabil	P	1	3	71	108	132	1	1.6	BL	10	2492
12-071-04440	2222	221	Esfahan	P	2	1	68	104	128	1	1.4	BL	11	2493
12-071-04482	2261	221	"	P	2	3	69	108	130	1.5	1.5	BL	15	2488
12-071-04282	291	129	"	P	2	4	65	104	132	1	1.6	BL	14	2457
12-071-04475	2254	221	"	P	1	4	65	103	129	1	1.5	BL	14	2457
12-071-04526	292	-	"	P	3	2	67	106	127	1	1.4	BL	14	2441
12-071-04467	2247	221	"	P	1	3	66	106	128	1	1.6	BL	14	2425
12-071-05108	2842	174	Ahar	P	4	2	68	104	131	1	1.5	BL	13	2423
12-071-05132	2864	174	Ahar	P	3	4	67	106	126	1	1.4	BL	15	2406
12-071-04269	277	-	Ghazvin	P	2	3	67	108	129	1	1.5	BL	14	2401
12-071-04462	2243	221	Esfahan	P	3	2	68	106	131	1	1.5	BL	11	2401
12-071-04279	287	315-1	Karaj 47	P	3	1	68	106	128	1	1.7	BL	15	2386
12-071-05176	2903	174	Ahar	P	2	2	71	108	134	1	1.8	BL	12	2377
12-071-04284	293	-	Esfahan	P	3	2	68	108	130	1	1.8	BL	12	2369
12-071-04407	2192	221	"	P	3	3	71	107	127	1	1.5	BL	14	2366
12-071-05331	3043	154	Gharyeh-gole	P	4	2	65	108	128	1	1.5	BL	11	2359

Continued..

(1) Accession Number	(2) Strain Number	(3) Source Number	(4) Source	(5) Flower color	(9) Stand	(10) Vigor	(11) Days to First Flower	(12) Days to First Maturity	(13) Days to Complete Maturity	(14) Disease rating	(15) Seeds per pod	(16) Seed color	(17) 100 Seeds Weight	(18) Yield
12-071-05321	3034	154	Gharyeh-gole	P	1	3	68	106	129	1	1.8	BL	14	2349
12-071-04632	2396	172	Ardabil	P	2	3	71	107	130	1	1.7	BL	11	2341
12-071-04681	2458	172	Ardabil	P	3	4	67	104	128	1	1.7	BL	14	2317
12-071-04619	2384	172	Ardabil	P	1	2	68	105	131	1	1.5	BL	11	2297
12-071-05055	2794	174	Ahar	P	3	3	66	106	132	1	1.6	BL	14	2293
12-071-05486	2432	172	Ardabil	P	3	2	68	106	135	1	1.5	BL	11	2287
12-071-05131	2863	174	Ahar	P	3	3	66	105	129	1	1.6	BL	12	2279
12-071-04276	284	327-1	Ghazvin	P	1	3	67	104	130	1	1.5	BL	15	2275
12-071-04620	2385	172	Ardabil	P	3	2	66	104	128	1	1.5	BL	10	2271
12-071-04708	2482	173	Ardabil	P	2	4	67	103	127	1	1.5	BL	11	2271
12-071-04618	2383	172	Ardabil	P	1	3	71	107	132	1	1.6	BL	12	2270
12-071-04940	2691	175	Gharyeh-gole	P	2	4	66	106	129	1	1.5	BL	13	2247
12-071-04432	2215	221	Esfahan	P	2	4	66	105	127	1	1.6	BL	12	2241
12-071-04799	2564	173	Ardabil	P	1	2	70	107	129	1	1.6	BL	10	2230
12-071-05089	2825	174	Ahar	P	2	3	64	104	126	1	1.6	BL	12	2222
12-071-04458	2239	221	Esfahan	P	2	3	68	106	128	1	1.7	BL	13	2211
12-071-04937	2688	175	Gharyeh-gole	P	1	2	66	103	128	1	1.6	BL	14	2210
12-071-04509	2285	193	Kermanshah	P	2	5	68	106	131	1	1.5	BL	12	2207
12-071-04536	2309	193	Kermanshah	P	1	4	67	108	127	1.5	1.6	BL	11	2181
12-071-04573	2343	193	Kermanshah	P	3	5	66	104	129	1	1.4	BL	11	2175
12-071-04789	2555	173	Ardabil	LP	2	3	70	106	133	1	1.6	BL	10	2167
12-071-04409	2194	221	Esfahan	P	1	3	65	105	128	1	1.6	BL	14	2166
12-071-05300	3015	154	Gharyeh-gole	P	1	3	65	105	128	1	1.8	BL	12	2155
12-071-04623	2388	172	Ardabil	P	1	3	61	106	131	1	1.6	BL	11	2142
12-071-05185	2911	174	Ahar	LP	3	4	71	106	129	1	1.7	BL	11	2133
12-071-04795	2560	173	Ardabil	P	5	4	68	104	137	1	1.6	BL	11	2130
12-071-04413	2198	221	Esfahan	P	1	2	68	106	126	1	1.6	BL	14	2121
12-071-04445	2226	221	Esfahan	P	2	3	69	104	128	1	1.6	BL	12	2115
12-071-04428	2211	221	Esfahan	P	2	3	68	107	131	1	1.7	BL	10	2115
12-071-04466	2246	221	Esfahan	P	2	4	68	106	131	1.5	1.7	BL	15	2114
12-071-05093	2829	174	Ahar	P	2	3	68	105	130	2	1.5	BL	14	2106
12-071-04439	2221	221	Isfahan	P	2	3	65	104	127	1	1.6	BL	11	2102
12-071-04479	2258	221	Isfahan	P	5	2	67	104	129	1	1.4	BL	14	2070
12-071-04491	2269	221	Esfahan	P	1	2	67	104	131	1	1.6	BL	14	2057

Continued.

(1) Accession Number	(2) Strain Number	(3) Source Number	(4) Source	(5) Flower color	(9) Stand	(10) Vigor	(11) Days to First Flower	(12) Days to First Maturity	(13) Days to complete Maturitty	(14) Disease rating	(15) Seeds per pod	(16) Seed color	(17) 100 Seeds Weight	(18) Yield
12-071-04270	278	49	Ardabil	P	2	5	68	105	133	1	1.5	BL	11	2051
12-071-04693	2469	172	"	P	1	2	71	108	131	1	1.6	BL	10	2044
12-071-04512	438	154	Karaj	P	1	4	66	104	128	1	1.6	BL	15	2042
12-071-05406	3134	C-727	Pakistan	P	2	3	76	113	135	1	1.1	DCr	18	2024
12-071-04655	2416	172	Ardabil	P	3	3	68	107	129	1	1.6	BL	13	2019
12-071-05373	3080	154	Gharyeh-gole	P	2	3	68	105	127	1.5	1.7	BL	14	2007
12-071-04833	2595	173	Ardabil	P	1	4	68	106	132	3	1.4	BL	11	1996
12-071-04653	2415	172	"	P	3	1	71	108	128	1	1.7	BL	13	1971
12-071-04689	2465	172	"	P	1	3	71	104	129	1	1.4	BL	12	1970
12-071-05401	3117	173	"	P	1	4	68	104	129	1	1.3	BL	11	1958
12-071-04661	2422	172	"	P	2	4	71	107	130	1	1.6	BL	10	1951
12-071-04796	2561	173	"	P	3	5	70	108	136	1	1.6	BL	10	1946
12-071-05080	2817	174	Ahar	P	3	3	69	107	127	1	1.8	BL	12	1924
12-071-04476	2255	221	Esfahan	P	1	2	66	106	127	1	1.5	BL	14	1912
12-071-04244	305	-	Ardabil	P	2	2	66	104	128	1	1.5	BL	15	1910
12-071-04787	2553	173	"	P	2	3	68	106	133	1	1.6	BL	10	1908
12-071-04407	2192	221	Esfahan	P	3	4	69	106	127	1	1.6	BL	14	1902
12-071-05487	2433	172	Ardabil	P	2	2	71	106	134	1	1.6	BL	10	1899
12-071-04461	2242	221	Esfahan	P	2	3	66	103	126	1	1.4	BL	13	1846
12-071-04267	275	325	Kermanshahan 193	P	1	4	66	107	138	1	1.5	BL	14	1834
12-071-04260	268	221	Iran 222771	P	2	4	68	103	132	1	1.6	BL	12	1832
12-071-04463	2244	221	Esfahan	P	3	4	71	105	131	1	1.5	BL	12	1830
12-071-04691	2467	172	Ardabil	P	3	4	70	106	132	1	1.6	BL	10	1827
12-071-04887	2643	173	"	P	2	2	70	108	134	1	1.7	BL	10	1824
12-071-04481	2260	221	Esfahan	P	3	4	68	106	128	1	1.5	BL	11	1823
12-071-05006	2750	175	Gharyeh-gole	P	2	4	67	103	128	1	1.3	BL	16	1818
12-071-05130	2862	174	Ahar	LP	3	3	71	106	137	1	1.6	BL	13	1796
12-071-05387	3092	154	Gharyeh-gole	P	4	4	67	106	128	1	1.8	BL	13	1790
12-071-05378	3084	154	"	P	4	2	66	103	128	1	1.7	BL	12	1771
12-071-04476	2255	221	Esfahan	P	2	3	67	108	128	1	1.5	BL	13	1752
12-071-04492	2270	193	Kermanshah	P	3	5	64	101	126	1	1.4	BL	12	1698
12-071-05048	2788	174	Ahar	P	2	4	66	103	127	2.5	1.6	BL	14	1647
12-071-04980	2727	175	Gharyeh-gole	P	2	4	66	103	132	1.5	1.6	BL	14	1639
12-071-04475	2254	221	Esfahan	P	2	4	68	105	126	1	1.5	BL	12	1618
12-071-04255	307	-	Ghazvin	P	3	4	68	105	129	1	1.5	BL	14	1566
12-071-04261	269	222	Iran 222772	P	3	4	66	104	142	1	1.4	BL	16	1535

TABLE 8 Agronomic Data, Chickpea (black) preliminary Yield Test, Planted March 22,1967, Karaj, Iran.

(1) Accession Number	(2) Strain Number	(3) Source Number	(4) Source	(5) Flower Color	(6) Plant Height	(7) Plant Width	(8) Plants/ Meter	(9) Stand	(10) Vigor	(11) Days to First Flower	(12) Days to First Maturity	(13) Days to complete Maturity	(14) Disease rating	(15) Seeds/ pod	(17) 100 Seeds Weight	(18) Yield
12-071-04482	6125	221	Esfahan	P	29	45	19	2	1	64	101	120	3	1.7	11.0	2650
12-071-04466	6121	221	"	LP	24	41	21	2	2	65	101	120	3	1.7	12.3	2640
12-071-04467	6041	221	"	P	24	48	22	3	1	65	104	121	2.5	1.7	14.2	2640
12-071-05331	6086	154	Gharyeh-gole	P	24	46	18	3	1	66	102	119	2.5	1.6	11.1	2600
12-071-04439	6088	221	Esfahan	P	23	41	18	2	1	62	101	119	3	1.8	11.3	2430
12-071-04799	6083	173	Ardabil	P	17	41	19	2	2	65	99	119	3.5	1.6	9.8	2420
12-071-04407	6124	221	Esfahan	P	28	43	22	3	1	65	101	119	3	1.7	10.5	2390
12-071-05301	6061	154	Gharyeh-gole	LP	26	41	23	3	1	67	102	119	3	1.7	11.5	2390
12-071-05130	6087	174	Ahar	LP	20	38	20	3	2	67	99	119	3.5	1.7	10.1	[illegible]
12-07104623	6082	172	Ardabil	P	19	46	19	2	2	62	100	118	3.5	1.8	9.7	2370
12-071-05131	6085	174	Ahar	P	26	45	19	3	1	67	100	118	3	1.5	11.4	2340
12-071-04413	6103	221	Esfahan	LP	26	43	19	3	1	67	102	120	2.5	1.6	10.1	2340
12-071-05378	6060	154	Gharyeh-gole	LP	26	47	19	3	1	66	102	120	2.5	1.7	11.2	2340
12-071-05387	6075	154	Gharyeh-gole	P	24	41	22	2	1	63	100	119	2.5	1.5	11.6	2330
12-071-04526	6092	-	Esfahan	P	26	48	17	3	1	62	102	120	3	1.6	11.3	2320
12-071-04529	6093	-	Esfahan	LP	24	37	23	3	1	67	102	119	3	1.6	10.9	2320
12-071-04445	6122	221	Esfahan	P	25	39	16	2	1	65	101	120	3	1.7	13.3	2280
12-071-05055	6045	174	Ahar	P	28	46	21	3	1	64	102	118	3	1.9	10.8	2230
12-071-05185	6100	174	Ahar	P	17	47	20	2	2	67	102	120	3	1.9	9.8	2190
12-071-05487	6080	172	Ardabil	P	18	41	21	3	2	66	100	119	3.5	1.8	8.9	2170
12-071-05326	6062	154	Gharyeh-gole	P	26	43	19	3	1	62	100	120	3	1.7	12.1	2170
12-071-05126	6033	174	Ahar	P	25	35	17	3	1	63	102	120	2	1.7 BL	10.6	2140
12-071-04440	6074	221	Esfahan	P	23	41	20	3	1	66	102	120	3	1.6 BL	11.5	2120
12-071-04475	6081	221	"	LP	25	38	21	2	2	64	100	119	3	1.5 BL	11.1	2110
12-071-04748	6055	173	Ardabil	P	20	42	20	2	2	64	101	118	3	1.5 BL	9.4	2110
12-071-04461	6090	221	Esfahan	P	23	42	20	3	1	62	101	118	3	1.5 BL	11.3	2090
12-071-05108	6032	174	Ahar	LP	25	44	18	2	1	64	100	119	2.5	1.6 BL	11.6	2080
12-071-04789	6065	173	Ardabil	P	21	39	19	3	2	63	100	118	3.5	1.7 BL	9.4	2070
12-071-04481	6084	221	Esfahan	P	22	37	15	2	2	64	100	119	2.5	1.5 BL	11.1	2070
12-071-05176	6123	174	Ahar	P	19	37	20	3	2	65	99	119	3	1.7 BL	11.7	2060
12-071-04255	6025	-	Ghazvin	P	23	39	18	3	1	65	101	119	3	1.7 BL	11.6	2040
12-071-04428	6069	221	Esfahan	P	22	36	17	3	2	62	101	119	3	1.7 BL	11.5	2030
12-071-04458	6113	221	Esfahan	LP	28	43	22	3	1	66	100	120	3	1.7 BL	11.5	2030
12-071-04833	6102	173	Ardabil	P	18	42	22	3	2	64	99	119	3	1.7 BL	14.3	2020
12-071-04433	6095	221	Esfahan	LP	26	43	20	2	1	67	101	119	3.5	1.7 BL	11.2	1990

Continued..

TABLE 8

(1) Accession Number	(2) Strain Number	(3) Source Number	(4) Source	(5) Flower Color	(6) Plant Height	(7) Plant Width	(8) Plants/ Meter	(9) Stand	(10) Vigor	(11) Days to First Flower	(12) Days to First Maturity	(13) Days to complete Mat.	(14) Disease rating	(15) Seeds/ pod	Seed color	(17) 100 seeds Weight	(18) Yield
12-071-04570	6098	193	Kermanshah	P	20	39	21	3	1	65	98	119	3	1.8	BL	9.8	1980
12-071-05321	6126	154	Gharyeh-gole	LP	21	38	20	2	2	65	98	119	3.5	1.6	BL	12.2	1980
12-071-04661	6070	172	Ardabil	P	18	36	23	3	2	64	99	118	4	1.5	BL	9.5	1970
12-071-04691	6089	172	"	P	19	47	25	2	2	65	101	118	3.5	1.7	BL	9	1970
12-071-04261	6031	2227	72 Iran	P	19	33	20	3	2	65	99	119	3	1.5	BL	11.1	1960
12-071-04282	6035	221	Esfahan	P	26	39	18	3	1	64	100	119	3.5	1.7	BL	11.4	1950
12-071-04244	6013	-	Ardabil	P	25	38	18	3	2	64	100	119	3	1.8	BL	11.0	1951
12-071-04681	6097	172	Ardabil	P	17	33	20	3	2	66	98	119	3.5	1.4	BL	12	1920
12-071-04284	6064	-	Esfahan	LP	22	37	21	3	2	65	100	118	3	1.5	BL	11.9	1920
12-071-05486	6099	172	Ardabil	P	20	37	24	2	2	65	101	120	3	1.5	BL	10.8	1920
12-071-04632	6094	172	"	P	18	42	21	2	2	66	99	119	3	1.5	BL	9.1	1910
12-071-04572	6020	154	Karaj	P	24	37	16	3	2	62	98	119	3	1.8	BL	11.2	1900
12-071-04536	6066	193	Kermanshah	LP	23	39	22	3	2	67	100	118	3	1.9	BL	10.8	1860
12-071-05089	6076	174	Ahar	P	20	37	23	2	2	65	100	120	2.5	1.5	BL	11.8	1860
12-071-04479	6096	221	Esfahan	P	21	40	19	3	1	65	101	119	3.5	1.7	BL	11.2	1840
12-071-04663	6052	173	Ardabil	P	18	42	25	2	2	67	99	118	3	1.5	BL	9	1830
12-071-04693	6068	172	Ardabil	P	19	37	23	3	2	65	98	118	4	1.6	BL	9.8	1820
12-071-04432	6109	221	Esfahan	P	22	35	21	3	2	64	100	119	3	1.7	BL	9.7	1820
12-071-04689	6104	172	Ardabil	P	28	37	19	2	2	64	97	117	4.5	1.6	BL	11.3	1810
12-071-05403	6071	164	Moghan	P	19	34	24	2	2	62	99	118	3	1.6	BL	11.4	1810
12-071-04620	6054	173	Ardabil	P	19	46	19	3	2	63	99	117	3	1.5	BL	9.8	1810
12-071-04619	6073	172	"	P	20	32	22	3	2	64	99	118	3	1.3	BL	9.6	1800
12-071-04268	6042	221	Esfahan (326)	P	21	42	19	2	1	62	99	119	3	1.6	BL	11.9	1790
12-071-05300	6077	154	Gharyeh-gole	P	22	37	16	3	1	62	100	119	3.5	1.9	BL	12.2	1770
12-071-04279	6044	47	315-1 Karaj	P	25	43	19	3	1	63	99	117	3	1.8	BL	11.2	1720
12-071-05080	6056	174	Ahar	P	25	55	19	3	2	65	101	117	3	1.5	BL	11.3	1700
12-071-04476	6127	221	Esfahan	P	23	35	20	3	2	65	98	119	3.5	1.8	BL	11.6	1690
12-071-04462	6079	221	Esfahan	P	20	40	20	3	1	63	100	119	3	1.6	BL	11.3	1680
12-072-04703	6072	172	Ardabil	P	16	38	22	3	2	66	100	118	3.5	1.5	BL	9.7	1668
12-071-04653	6063	172	Ardabil	LP	16	38	21	3	2	65	98	117	3.5	1.6	BL	11.1	1663
12-071-05401	6053	173	Ardabil	P	19	38	24	2	2	63	99	118	3.5	1.3	BL	9.7	1658
12-071-04509	6115	193	Kermanshah	P	23	38	19	3	2	64	100	119	3.5	1.6	BL	10.6	1658
12-071-04787	6059	173	Ardabil	P	19	39	22	2	2	65	98	119	3	1.4	BL	9.2	1655

Continued.

TABLE 8

(1) Accession Number	(2) Strain Number	(3) Source Number	(4) Source	(5) Flower color	(6) Plant Height	(7) Plant Width	(8) Plants/ Meter	(9) Stand	(10) Vigor	(11) Days to First Flower	(12) Days to First Maturity	(13) Days to complete Maturity	(14) Disease rating	(15) Seeds/pod	Seed color	(17) 100 seeds weight	(18) Yield
12-071-04491	6040	221	Esfahan	LP	22	39	20	3	1	68	100	119	3	1.6	BL	11.3	1655
12-071-04270	6067	49	Ardabil	LP	18	36	21	3	2	66	99	118	4	1.6	BL	10.1	1653
12-071-04407	6047	221	Esfahan	LP	21	30	19	3	2	67	100	118	3	1.4	BL	11	1648
12-071-04887	6058	173	Ardabil	P	20	36	20	3	2	66	100	119	3.5	1.7	BL	9	1625
12-071-04450	6036	221	Esfahan	P	22	35	17	3	1	62	100	118	3.5	1.5	BL	11.9	1625
12-071-04269	6118	-	Ghazvin	P	24	33	19	3	1	62	100	119	3.5	1.8	BL	10.1	1588
12-071-04708	6114	173	Ardabil	P	18	32	19	3	3	63	97	117	3	1.6	BL	10.6	1558
12-071-05132	6107	174	Ahar	P	22	35	15	3	2	66	100	119	3.5	1.6	BL	13.1	1548
12-071-04467	6034	221	Esfahan	LP	21	35	17	3	1	65	99	118	3	1.9	BL	11.3	1533
12-071-04276	6039	3274	Ghazvin	P	22	38	20	3	2	62	98	118	3	1.6	BL	10.9	1520
12-071-04618	6108	172	Ar dabil	P	18	39	19	2	2	66	99	119	4	1.6	BL	11.3	1520
12-071-05048	6110	174	Ahar	P	17	33	20	3	2	61	99	119	3.5	1.7	BL	11.3	1508
12-071-04775	6117	173	Ardabil	P	19	31	19	3	2	66	96	117	4.5	1.7	BL	9.6	1505
12-071-05093	6105	174	Ahar	P	29	43	19	3	2	65	99	119	3	1.6	BL	9.7	1500
12-071-04655	6119	172	Ardabil	P	21	35	24	3	2	64	99	119	3	1.6	BL	12.1	1483
12-071-04409	6046	221	Esfahan	P	22	39	21	3	1	64	100	117	3	1.7	BL	11.1	1480
12-113-05406	6057	C-727	Pakistan	P	24	30	17	3	1	68	102	119	2	1.5	LBr		1462
12-071-04267	6038	325	Kermanshah	P	18	38	23	2	3	62	98	117	3	1.5	BL		1460
12-071-04795	6051	173	Ardabil	P	18	36	18	3	2	64	100	118	3	1.9	BL		1455
12-071-04937	6106	175	Gharyeh-gole	P	22	32	18	3	2	65	100	119	4	1.4	BL		1435
12-071-05373	6120	154	Gharyeh-gole	LP	23	36	18	3	1	67	99	118	3	1.9	BL		1425
12-071-04980	6043	175	Gharyeh-gole	P	22	39	19	3	2	62	97	117	3	1.6	BL		1420
12-071-04573	6091	193	Kermanshah	P	16	31	21	3	2	62	98	117	3.5	1.7	BL		1405
12-071-05006	6101	175	Gharyeh-gole	P	21	38	14	3	2	62	99	119	4	1.9	BL		1377
12-071-05130	6049	174	Ahar	P	17	39	22	2	2	63	100	117	4	1.4	BL		1352
12-071-04796	6078	173	Ardabil	P	17	37	21	3	2	65	99	118	3.5	1.5	BL		1350
12-071-04940	6116	175	Gharyeh-gole	P	17	30	22	3	2	62	96	117	4	1.5	BL		1295
12-071-04463	6111	221	Esfahan	P	17	33	20	3	2	65	98	119	3.5	1.4	BL		1290
12-071-04492	6112	193	Kermanshah	P	22	32	19	3	2	62	97	118	4	1.7	BL		1262
12-071-04476	6050	221	Esfahan	P	18	36	18	3	3	62	100	117	3.5	1.7	BL		1260
12-071-04475	6037	221	Esfahan	P	21	36	21	3	2	64	100	119	3.5	1.5	BL		1162
12-071-04260	6048		Iran-222771	P	16	38	19	3	2	62	98	117	4	1.7	BL		1125

TABLE 9 Agronomic Data Chickpea (white) Preliminary Yield Test II Planted March 1967, Pahlavi University, Shiraz, Iran.

(1) Accession Number	(2) Strain Number	(3) Source Number	(4) SOURCE	(5) Flower Color	(9) Stand	(10) Vigor	(11) Days to First Flower	(12) Days to First Maturity	(13) Days to Complete Maturity	(14) Disease Rating	(15) Seeds/ Pod	(16) Seed Color	(17) 100 Seeds Weight	(18) Yield
12-071-02276	462	220	Esfahan	W	3	1	89	131	145	1	1.6	Cr	26	5044
12-071-03116	1265	169	Ardabil	P	7	2	76			1.5	1	LCr	26	4987
12-071-02275	461	220	Esfahan	W	4	2	83	126	149	1	1.1	W	25	4936
12-071-02089	261	454	Karaj Selection	W	8	2	80	122	149	2	1.2	Cr	34	4826
12-071-02300	483	220	Esfahan	W	4	1	89	135	149	1	1.2	W	22	4798
12-071-02384	1017	170	Ardabil	P	3	2	76	126	137	1	1.2	LCr	21	4781
12-071-03062	1207	169	Ardabil	P	4	2	79	119	145	1.5	1.7	LCr	21	4750
12-071-02596	759	230	Nishabour	W	4	2	76	125	149	2	1.7	W	20	4741
12-071-02274	460	220	Esfahan	W	6	2	81	122	141	1.5	1.2	Cr	25	4717
12-071-03300	1445	111	Varamin	P	5	2	76	122	145	1.5	1.1	DCr	30	4705
12-071-03393	1532	168	Mamaghan	P	2	2	69	116	142	1	1	LCr	19	4621
12-071-02188	382	241	Ghochan	W	3	1	89	129	136	1	1.4	W	24	4497
12-071-02840	1003	170	Ardabil 33	P	2	3	76		148	1	1	LCr	25	4461
12-071-03718	1846	162	Shahpour	P	2	2	73	122	145	1	1.1	LCr	23	4453
12-071-03464	1596	161	Mamaghan	P	2	2	76	118	145	1	1.1	LCr	26	4448
12-071-02298	481	220	Esfahan	W	4	2	88	126	150	1.	1.5	W	23	4438
12-071-02655	828	230	Nishabour	W	2	2	76	114	145	1.5	1.6	LCr	21	4418
12-071-02818	979	230	Nishabour	W	2	2	76	116	135	1	1.4	W	19	4408
12-071-02569	734	230	Nishabour	W	3	3	74	114	145	1	1.7	LCr	17	4392
12-071-05471	310	241	Ghochan	W	2	5	71	116	148	1	1.3	LCr	19	4352
12-071-03420	1556	161	Mamaghan	P	3	2	76	112	147	1	1.4	LCr	20	4349
12-071-02469	637	106	Fars	W	2	2	81	126	136	1	1.4	W	20	4340
12-071-02695	868	182	Shiraz	W	4	3	78	125	145	1	1.3	W	17	4272
12-071-03235	1380	111	Varamin	P	3	1	76	120	143	1	1.2	DCr	28	4268
12-071-01837			Ghazvin	W	5	2	69	122	144	1	1.2	LCr	25	4248
12-071-02729	898	182	Shiraz	W	4	3	79	119	137	1.5	1.4	W	20	4205
12-071-03696	1829	162	Shahpour	P	5	2	76	116	145	1	1.2	W	24	4178
12-071-02516	681	232	Daragas	W	3	2	77	119	144	2	1.1	LCr	39	4149
12-071-02295	479	220	Esfahan	W	4	1	91	130	138	1	1.3	W	24	4148
12-071-03298	1443	111	Varamin	P	4	1	73	114	145	2	1.2	DCr	31	4145
12-071-02290	474	220	Esfahan	W	2	1	85	126	137	1	1.5	W	27	4117
12-071-02053	229	424	Karaj Selection	W	5	2	67	112	150	2.5	1.2	W	32	4102
12-071-02569	734	230	Nishabour	W	3	3	74	114	145	1	1.7	LCr	17	4101
12-071-01980	161	302-3	Ghochan	P	2	2	81	122	145	1	2.0	RBL	11	4028

Continued...

TABLE 9

(1) Accession Number	(2) Strain Number	(3) Source Number	(4) S O U R C E	(5) Flower Color	(9) Stand	(10) Vigor	(11) Days to First Flower	(12) Days to First Maturity	(13) Days to complete Maturity	(14) Disease Rating	(15) Seeds per pod	(16) Seed Color	(17) 100 Seeds Weight	(18) Yield
12-071-02758	924	182	Shiraz	P	4	2	76	122	143	1	1	LY	17	4028
12-071-03459	1591	161	Mamaghan	P	2	2	78	116	145	1	1.2	YCr	21	4000
12-071-02214	406	241	Ghochan	W	4	2	74	119	147	1	1.4	LCr	21	3996
12-071-05406	301M	111	Esfahan	P	3	2	76	116	145	1	1.2	DCr	26	3977
12-071-02896	1054	170	Ardebil	W	8	8	82	134	149	2	1	W	28	3876
12-071-03289	1435	111	Varamin	W	2	3	72	122	145	2	1.2	Cr	31	3831
12-071-03351	1493	168	Mamaghan	W	5	2	79	121	136	1.5	1.5	LCr	21	3827
12-071-03250	1395	111	Varamin	P	7	2	76	122	149	1	1	LCr	24	3796
12-071-02179	374	241	Ghochan	W	3	3	72	112	145	1.5	1.2	LCr	21	3761
12-071-02441	612	106	Fars	W	4	2	75	118	145	2	1.4	W	16	3761
12-071-01952	134	230	Fars 251025	P	3	2	75	120	144	1.5	1.3	LY	20	3644
12-071-03069	1213	169	Ardabil	W	8	2	81	120	135	1	1.4	W	20	3636
12-071-02244	433	241	Ghochan	W	2	2	78	116	145	1	1.3	W	20	3611
12-071-02302	485	220	Esfahan	W	4	3	76	114	145	1	1.3	LCr	20	3584
12-071-02906	1055	170	Ardabil	W	4	2	78	125	143	1	1.2	W	18	3572
12-071-01919	86	-	Karaj Selection	W	3	33	75	119	145	1.5	1.4	DCr	33	3503
12-071-02684	856	230	Nishabour	W	1	2	72	112	136	1.5	1.2	LCr	20	3480
12-071-02479	646	106	Fars	W	3	2	76	120	145	1.5	1.4	W	19	3473
12-071-03456	1589	161	Mamaghan	P	5	2	75	117	143	1.5	1	LCr	27	3313
12-071-03306	1451	111	Varamin	P	4	2	72	114	145	2.5	1	DCr	29	3307
12-071-03226	1370	111	Varamin	P	3	3	76	118	149	1.5	1.1	DCr	29	3292
12-071-02095	267	460	Karaj S	P	3	2	76	118	145	1.5	1.3	DYCr	27	3285
12-071-02346	525	241	Ghochan	W	3	3	71	112	145	1.5	1.5	LCr	23	3268
12-071-03073	1217	169	Ardabil	W	7	2	73	121	149	1.5	1.2	W	20	3268
12-071-02246	435	241	Ghochan	W	2	2	71	112	146	1.5	1.4	LCr	19	3172
12-071-05470	332	217	Torbat-e-Heidarieh	W	2	3	76	126	147	1	1.1	W	16	3157
12-071-02519	682	232	Dareh-Gaz	W	5	2	81	120	145	1.5	1.1	Cr	36	3107
12-071-02732	901	182	Shiraz	W	4	2	76	122	142	1	1.2	W	19	3017
12-071-02631	800	230	Nishabour	W	5	2	76	120	141	1	1.4	LCr	16	2964
12-071-02565	731	230	Nishabour	W	4	2	78	122	143	1	1.2	W	16	2962
12-071-03295	1441	111	Varamin	P	3	3	73	116	143	1.5	1.2	DCr	27	2932
12-071-02892	1050	170	Ardabil	P	4	2	77	120	143	1.5	1	W	28	2929
12-071-02733	902	182	Shiraz	W	5	2	81	117	137	1.5	1.4	W	20	2877
12-071-02738	906	182	Shiraz	W	5	2	83	121	142	1.5	1.4	W	20	2877

Continued..

TABLE 9

(1) Accession Number	(2) Strain Number	(3) Source Number	(4) S O U R C E	(5) Flower Color	(9) Stand	(10) Vigor	(11) Days to First Flower	(12) Days to First Maturity	(13) Days to complete Maturity	(14) Disease Rating	(15) Seeds per pod	(16) Seed Color	(17) 100 Seeds Weight	(18) Yield
12-071-03232	1375	111	Varamin	P	3	2	73	122	147	1	1.3	Cr	27	2848
12-071-03455	1588	161	Mamaghan	P	5	2	76	125	146	1.5	1	W	28	2843
12-071-02770	935	182	Shiraz	W	4	3	76	121	145	1.5	1.8	W	17	2843
12-071-03631	1768	153	Karaj	P	4	2	76	116	149	1	1	W	23	2840
12-071-02613	776	230	Nishabour	W	5	9	71	112	135	2	1.4	Cr	23	2823
12-071-02693	865	182	Shiraz	W	5	3	81	122	147	2.5	1.1	W	18	2636
12-071-03523	1659	152	Karaj	P	4	2	79	114	147	1.5	1.2	DCr	19	2611
12-071-03421	1557	161	Mamaghan	P	4	1	76	122	145	1	1.2	DCr	16	2520
12-071-02845	1008	170	Ardabil	P	4	4	76	120	149	1	1.2	DCr	28	2506
12-071-02306	489	220	Esfahan	W	5	3	81	146	147	1	1.2	Cr	23	2472
12-071-03233	1376	111	Varamin	P	5	3	76	122	145	1	1.1	DCr	26	2408
12-071-02791	954	230	Nishabour	W	3	2	79	122	137	1.5	1.2	W	19	2394
12-071-02270	456	220	Esfahan	W	4	3	85	124	146	1	1.7	W	23	2372
12-071-02842	1005	170	Ardabil	P	6	2	76	118	121	1	1.2	LCr	25	2327
12-071-02841	1004	170	Ardabil	P	4	2	76	122	147	1.5	1.0	LCr	24	2307
12-071-03243	1388	111	Varamin	P	4	2	73	116	145	2	1.1	DCr	28	2272
12-071-03230	1373	111	Varamin	P	3	3	76	122	150	1	1.4	LCr	22	2248
12-071-02210	402	241	Ghochan	W	5	2	71	114	149	1	1	Cr	21	2226
12-071-02653	825	230	Nishabour	W	3	3	77	122	145	1	1.9	W	20	2122
12-071-03578	1707	153	Karaj	P	5	3	73	122	148	1	1	YCr	22	1999
12-071-03430	1565	161	Mamaghan	P	3	2	76	120	145	1	1.3	DCr	19	1931
12-071-02384	560	241	Ghochan	W	3	2	69	116	143	1.5	1.6	LCr	19	1736
12-071-02789	952	230	Nishabour	P	5	2	76	114	138	1.5	1.4	DBr	18	1659
12-071-02339	518	220	Esfahan	W	5	2	87	134	150	1	1.2	W	24	1508
12-071-02700	872	182	Shiraz	W	5	2	79	122	145	2	1.4	W	19	1467
12-071-02220	411	241	Ghochan	W	5	2	74	118	141	1	1.4	Cr	21	1464
12-071-02711	882	182	Shiraz	W	4	2	79	122	145	1	1.6	W	19	1439
12-071-02744	912	182	Shiraz	W	2	2	81	122	149	1	1.2	W	16	1387
12-071-02308	490	220	Esfahan	W	5	3	83	126	141	1	1.3	W	24	1310
12-071-03252	1397	111	Varamin	P	3	2	76	116	146	1	1.2	DCr	29	883
12-071-01963	146	317	Amrsdak	W	7	3	73	122	140	2.5	1.0	Cr	26	439
12-071-02272	458	220	Esfahan	W	6	3	89	135	147	1	1.8	LCr	21	42

TABLE 10 Agronomic Data, Chickpea (white) Preliminary Yield Test II, Planted March 22, 1967, Karaj, Iran.

(1) Accession Number	(2) Strain Number	(3) Source Number	(4) SOURCE	(5) Flower color	(6) Plant Height	(7) Plant Weight	(8) Plants/ Meter	(9) Stand	(10) Vigor	(11) Days to First Flower	(12) Days to First Maturity	(13) Days to complete Maturity	(14) Disease Rating	(15) Seeds/ pod	(16) Seed color	(17) 100 Seeds Weight	(18) Yield
12-071-03116	1265	169	Ardabil - IR	LP	29	60	25	2	2	67	110	126	2.0	1.3	LCr	21.9	3558
12-071-02758	5138	182	Shiraz - IR	LP	28	39	23	2	2	70	113	130	1.5	1.3	Cr	13.5	3340
12-071-02179	374	241	Ghochan - IR	Wh	22	42	19	2	3	65	111	129	3.0	1.3	W	18.4	3260
12-071-03295	1441	111	Varamin - IR	LP	30	42	14	3	3	68	110	123	2.5	1.2	Cr	25.1	3230
12-071-03306	1451	111	Varamin - IR	LP	27	43	20	3	2	67	109	123	2.5	1.2	Cr	26.0	3180
12-071-03062	1207	169	Ardabil - IR	LP	28	48	20	2	2	69	112	127	2.5	1.0	Cr	16.8	3170
12-071-02274	460	220	Esfahan - IR	LP	29	53	20	2	2	72	117	130	2.0	1.4	W	20.6	3060
12-071-02655	828	230	Nishabour - IR	Wh	25	44	16	2	3	67	109	129	3.0	1.3	W	19.3	3050
12-071-03718	1848	162	Shapour - IR	LP	27	40	17	3	2	68	113	126	3.0	1.1	LCr	18.4	3020
12-071-03464	1596	161	Mamaghan - IR	LP	32	46	19	2	2	67	112	130	3.0	1.0	LCr	23.3	3020
12-071-03250	1395	111	Varamin - IR	LP	26	49	18	3	2	67	109	127	2.5	1.1	Cr	22.0	3010
12-071-02469	637	106	Fars - IR	Wh	25	45	20	2	3	70	113	129	3.0	1.1	W	18.3	2980
12-071-03420	1556	161	Mamaghan - IR	LP	31	43	25	2	2	68	111	129	2.0	1.4	LCr	15.4	2960
12-071-03696	1829	162	Shapour - IR	LP	26	64	20	2	2	67	109	126	2.0	1.1	LCr	20.9	2930
12-071-02840	1003	170	Ardabi - IR	LP	32	52	19	2	2	67	114	125	2.5	1.2	LCr	23.0	2920
12-071-02441	612	106	Fars - IR	Wh	26	46	21	2	3	68	112	129	2.0	1.6	W	13.4	2920
12-071-03636	1768	153	Karaj - IR	LP	29	49	20	2	2	67	112	125	2.5	1.2	Cr	20.1	2920
12-071-02346	525	241	Ghochan - IR	Wh	24	36	16	3	3	66	109	128	3.5	1.1	W	19.3	2900
12-071-03430	1565	161	Mamaghan - IR	LP	27	42	20	3	2	70	113	128	2.5	1.2	Cr	16.1	2890
12-071-02695	868	182	Shiraz - IR	Wh	31	47	25	2	2	68	116	129	2.0	1.4	W	15.7	2900
12-071-02276	462	220	Esfahan - IR	Wh	30	58	17	3	2	69	118	132	2.5	1.0	W	20.2	2890
12-071-01952	134	251025	Iran	LP	26	38	21	2	2	68	113	129	3.0	1.2	LCr	16.5	2880
12-071-03456	1589	161	Mamaghan - IR	LP	29	46	21	2	2	67	113	127	2.5	1.1	LCr	21.9	2830
12-071-03298	1443	111	Varamin - IR	LP	23	43	15	3	3	67	110	123	3.5	1.1	Cr	26.1	2830
12-071-02298	481	220	Esfahan - IR	Wh	33	53	20	2	2	70	118	132	1.5	1.2	W	21.6	2800
12-071-02738	906	182	Shiraz - IR	Wh	28	39	21	2	2	69	112	131	2.0	1.3	W	17.4	2790
12-071-02653	825	230	Nishabour - IR	Wh	26	34	22	2	2	67	112	131	3.0	1.2	W	16.6	2770
12-071-02306	489	220	Esfahan - IR	Wh	28	60	20	3	2	69	118	132	2.5	1.3	W	20.6	2760
12-071-03421	1557	161	Mamaghan - IR	LP	31	50	23	2	2	70	113	124	1.5	1.0	LCr	15.9	2730
12-071-03235	1380	111	Varamin - IR	LP	25	42	22	3	3	68	109	125	3.5	1.1	Cr	26.4	2600
12-071-02095	267	460	Karaj Sel - IR	LP	24	37	17	3	3	68	107	129	4.0	1.0	DCr	26.6	2600
12-071-02613	776	230	Nishabour - IR	Wh	23	39	19	3	4	67	109	127	3.5	1.5	W	19.5	2590
12-071-03523	1657	152	Karaj - IR	LP	27	42	18	3	3	68	110	125	2.5	1.3	LCr	15.8	2580
12-071-02906	1055	170	Ardabil - IR	Wh	22	40	24	2	3	67	115	133	2.0	1.2	W	16.0	2580
12-071-03351	1493	168	Mamaghan - IR	Wh	28	44	20	2	3	69	113	130	3.0	1.5	W	17.3	2560
12-071-03300	1445	111	Varamin - IR	LP	26	44	16	3	3	68	113	124	3.0	1.2	Cr	25.9	2550

Continued.....

TABLE 10

(1) Accession Number	(2) Strain Number	(3) Source Number	(4) S O U R C E	(5) Flower color	(6) Plant Height	(7) Plant Width	(8) Plants/ Meter	(9) Stand	(10) Vigor	(11) Days to First Flower	(12) Days to First Maturity	(13) Days to complete Maturity	(14) Disease Rating	(15) Seeds/ pd	(16) Seed color	(17) 100 seeds Weight	(18) Yield
12-071-02384	1017	170	Ardabil - IR	LP	31	51	20	3	2	69	112	128	3.0	1.0	LCr	18.7	2530
12-071-02841	1004	170	Ardabil - IR	LP	24	49	19	3	2	68	111	127	2.5	1.1	LCr	21.3	2520
12-071-03233	1376	111	Varamin - IR	LP	25	45	16	3	3	67	108	126	3.0	1.1	Cr	26.8	2520
12-071-02842	1005	170	Ardabil - IR	LP	29	45	20	3	3	67	112	126	3.0	1.0	LCr	21.4	2510
12-071-02295	479	220	Esfahan - IR	Wh	35	61	17	2	2	71	118	132	2.0	1.3	W	21.2	2500
12-071-02744	912	182	Shiraz - IR	Wh	38	48	25	3	2	69	114	128	3.0	1.5	W	16.8	2480
12-071-03578	1707	153	Karaj - IR	LP	25	43	20	3	2	69	110	125	3.0	1.0	LCr	19.6	2450
12-071-02339	518	226	Esfahan - IR	Wh	29	58	17	3	2	70	118	134	2.0	1.1	W	25.2	2420
12-071-03455	1588	161	Mamaghan- Ir	LP	33	41	15	2	2	68	113	130	3.0	1.1	LCr	24.9	2420
12-071-03226	1370	111	Varamin - IR	LP	26	42	17	3	2	67	108	125	3.0	1.0	PCr	27.9	2400
12-071-02565	731	230	Nishabour - IR	Wh	26	45	22	3	2	68	111	130	3.0	1.6	W	16.6	2400
12-071-02569	734	230	Nishabour - IR	Wh	26	31	20	2	3	66	107	126	4.0	1.4	W	18.9	2380
12-071-03069	1213	169	Ardabil- IR	Wh	25	43	20	2	2	69	110	129	3.0	1.3	W	17.0	2350
12-071-02729	898	182	Shiraz - IR	Wh	25	43	22	3	3	70	112	128	3.0	1.0	W	17.1	2340
12-071-02244	433	241	Ghochan - IR	Wh	20	38	17	3	4	64	109	127	3.5	1.5	W	17.4	2340
12-071-02732	901	182	Shiraz - IR	Wh	26	42	23	2	3	68	114	130	3.0	1.3	W	16.7	2340
12-071-02684	856	230	Nishabour - IR	Wh	21	36	17	3	4	66	107	126	4.0	1.2	W	17.5	2340
12-071-02631	800	230	Nishabour - IR	Wh	25	48	18	3	3	67	112	131	3.0	1.3	W	16.4	2280
12-071-03073	1217	169	Ardabil	Wh	28	39	25	2	3	67	110	133	3.0	1.3	W	15.0	2280
12-071-03459	1591	161	Mamaghan - IR	LP	24	43	20	2	3	67	111	129	3.0	1.2	LCr	17.8	2260
12-071-02272	458	220	Esfahan - IR	Wh	29	51	20	3	3	66	117	132	3.0	1.4	W	19.5	2210
12-071-02275	461	220	Esfahan - IR	Wh	32	50	19	3	2	72	118	132	2.0	1.0	W	24.0	2210
12-071-02845	1008	170	Ardabil - IR	LP	30	48	16	3	3	67	112	125	3.0	1.0	Cr	26.6	2190
12-071-02770	935	182	Shiraz - IR	Wh	26	42	18	2	2	70	112	128	3.0	1.3	W	18.4	2170
12-071-02791	954	230	Nishabour - IR	Wh	24	41	23	3	3	70	113	128	3.0	1.0	W	17.2	2150
12-071-02270	456	220	Esfahan - IR	Wh	32	53	17	3	2	74	117	132	3.0	1.3	W	21.1	2140
12-071-02300	483	220	Esfahan - IR	Wh	32	57	16	3	2	74	117	152	2.0	1.2	W	22.0	2140
12-071-03393	1532	168	Mamaghan -IR	Wh	23	46	17	3	4	67	112	129	3.0	1.2	W	21.3	2130
12-071-01980	161	302	Ghazvin - IR	Wh	29	40	16	4	3	68	109	127	4.0	1.1	W	28.6	2120
12-071-02818	979	230	Nishabour - IR	Wh	22	40	21	3	3	66	107	126	3.0	1.5	W	18.7	2110
12-071-03232	1357	111	Varamin - IR	LP	28	43	17	3	3	68	109	126	3.0	1.1	LCr	20.6	2110
12-071-03252	1397	111	Varamin - IR	LP	26	38	19	3	3	67	107	124	3.5	1.3	Cr	26.3	2110
12-071-03230	1373	111	Varamin - IR	LP	24	46	20	3	3	68	114	131	3.0	1.4	LCr	21.4	2100
12-071-01963	146	317	Amrodak - IR	Wh	23	42	19	3	4	66	108	132	3.0	1.4	W	21.0	2100
12-071-02302	485	220	Esfahan - IR	Wh	18	44	17	2	4	65	109	128	3.5	1.3	W	18.9	2060
12-071-02290	479	220	Esfahan - IR	Wh	29	49	18	3	2	75	115	129	3.0	1.2	W	20.6	2060
12-071-02596	759	230	Nishabour - IR	Wh	29	37	22	3	3	69	111	129	3.0	1.4	W	16.08	2060

Continued.....

TABLE 10

(1) Accession Number	(2) Strain Number	(3) Source Number	(4) S O R C E	(5) Flower color	(6) Plant Height	(7) Plant Width	(8) Plants/ Meter	(9) stand	(10) Vigor	(11) Days to First Flower	(12) Days to First Maturity	(13) Days to complete Maturity	(14) Disease Rating	(15) Seed pd	(16) seed color	(17) 100 Seeds Weight	(18) Yield
12-071-05470	332	217	Torvate-Heidarieh	Wh	24	32	27	3	3	69	111	127	3.0	1.3	W	16.8	2000
12-071-02519	682	232	Dareh-Gaz - IR	Wh	26	37	16	4	3	69	109	126	3.5	1.2	W	34.5	1960
12-071-02220	411	241	Ghochan - IR	Wh	23	43	21	2	4	64	109	130	4.0	1.1	W	19.9	1950
12-071-02479	646	106	Fars - IR	LP	28	34	18	2	3	69	110	129	3.0	1.2	W	16.8	1950
12-071-02210	402	241	Ghochan - IR	Wh	25	31	19	2	4	63	107	131	3.5	1.0	W	19.8	1950
12-071-02733	902	182	Shiraz - IR	Wh	27	33	22	2	3	70	111	128	3.0	1.4	W	16.5	1920
12-071-05463	301M	111	Esfahan -IR	LP	24	42	13	4	3	67	107	126	4.0	1.3	Cr	23.1	1910
12-071-02188	382	241	Ghochan - IR	Wh	30	43	19	3	2	72	118	131	2.0	1.3	W	21.5	1890
12-071-03243	1388	111	Varamin - IR	LP	24	38	18	3	3	67	109	123	3.5	1.2	Cr	24.8	1880
12-071-02246	435	241	Ghochan- IR	Wh	20	43	18	3	3	65	107	127	4.0	1.3	W	19.1	1860
12-071-02711	882	182	Shiraz - IR	Wh	24	33	19	3	2	70	110	124	3.0	1.2	W	16.7	1830
12-071-02693	865	182	Shiraz - IR	Wh	27	39	22	3	3	69	110	124	3.0	1.1	W	17.6	1820
12-071-02700	872	182	Shiraz - IR	Wh	23	35	22	3	4	69	109	126	3.0	1.2	W	17.5	1750
12-071-02789	952	230	Nishabour - IR	LP	25	39	17	3	3	67	107	125	4.0	1.1	LBr	18.9	1750
12-071-02214	406	241	Ghoochan-IR	Wh	22	47	17	3	3	65	108	130	4.0	1.4	W	19.4	1710
12-071-02896	1054	170	Ardabil - IR	Wh	27	42	17	4	3	68	110	129	4.0	1.0	W	25.0	1690
12-071-02308	490	220	Esfahan - IR	Wh	24	42	17	3	3	72	117	130	3.0	1.3	W	22.0	1650
12-071-03289	1435	111	Varamin - IR	Wh	23	41	17	4	3	67	109	124	4.0	1.1	W	31.2	1640
12-071-02892	1050	170	Ardabil - IR	LP	32	41	17	4	2	67	110	128	4.5	1.0	La	24.8	1630
12-071-02384	560	241	Ghochan - IR	Wh	22	37	18	4	4	65	107	127	4.0	1.4	W	19.0	1550
12-071-01919	86	-	Karaj - IR	Wh	25	34	15	4	3	68	107	127	4.0	1.3	W	30.3	1510
12-071-02443	614	106	Fars - IR	Wh	21	37	17	2	3	67	108	127	4.0	1.1	La	15.8	1470
12-071-02516	681	232	Dareh-Gaz - IR	Wh	29	50	17	4	3	68	110	127	3.5	1.1	W	36.3	1450
12-071-05471	310	241	Ghochan - IR	Wh	20	40	17	2	3	63	108	127	3.5	1.3	W	18.3	1420
12-071-01837	-	-	Ghazvin - IR	Wh	20	34	17	4	3	64	107	126	4.5	1.0	W	22.4	1420
12-071-02053	229	424	Karaj - IR	Wh	20	33	19	3	4	66	108	130	4.0	1.2	W	23.6	1380
12-071-02089	261	454	Karaj Rel. - IR	Wh	27	39	18	4	3	66	110	128	4.0	1.1	W	33.1	1250

TABLE 11 Agronomic Data, Chickpea (White) Preliminary Yield Test 1, Pahlavi University, Shiraz, Iran. Planted March 1967

(1) Accession number	(2) Strain number	(3) Source number	(4) Source	(5) Flower color	(9) stand	(10) Vigor	(11) Days to 1st Flower	(12) Days to 1st Maturity	(13) Days to Comp. Maturity	(14) Disease rating	(15) Seed per pod	(16) Seed color	(17) 100 Seed Weight	(18) Yield
12-071-02446	617	106	Fars	W	4	1	77	119	143	1 .	1.0	LCr	160	4717
12-071-03468	1641 S.R	161	Mamaghan	P	2	3	74	119	145	1.5	1.0	GrCr	20	4514
12-071-06359	797	230	Nishabour	P	2	2	72	116	143	1.5	1.6	Dbr	15	4469
12-071-02443	614	106	Fars	W	2	2	71	117	143	2	1	W	16	4457
12-071-03645	1779	153	Karaj	P	2	2	74	117	143	1.5	1.1	W	20	4284
12-071-03243	1388	111	Varamin	P	2	2	71	116	136	2	1.2	DCr	29	4281
12-071-03471	1602	161	Maghan	P	3	2	72	119	143	1.5	1.3	DCr	20	4277
12-071-02478	645	106	Fars	W	3	1	74	119	143	1.5	1.6	W	16	4254
12-071-03458	1631 S.R	161	Maghan	P	5	3	72	119	143	1.5	1.2	GrCr	20	4174
12-071-06364	794	230	Nishabour	P	2	2	73	112	143	2	1.2	GrCr	15	4085
12-071-02643	813	230	Nishabour	W	4	2	72	119	147	1.5	1.5	LCr	16	4021
12-071-02629	795	230	Nishabour	W	2	3	71	112	143	2	1.4	LCr	16	4004
12-071-02815	976	230	Nishabour	W	2	3	70	115	141	2	1.2	LCr	20	3992
12-071-03233	1376	111	Varamin	P	3	2	70	116	140	1.5	1.2	DCr	28	3975
12-071-02770	935	182	Shiraz	W	3	3	72	119	143	2	1.2	W	16	3975
12-071-03244	1389	111	Varamin	P	3	2	72	112	145	1	1.1	GrCr	24	3917
12-071-02243	432	241	Ghochan	W	2	2	67	114	143	2	1.3	LCr	20	3851
12-071-05470	332	217	Torbathaidarieh	W	3	2	74	119	143	2.5	1.4	W	16	3840
12-071-02650	822	230	Nishabour	W	2	2	72	112	142	1.5	1.4	Cr	17	3824
12-071-02639	809	230	Nishabour	W	2	2	72	116	143	1.5	1.4	LCr	16	3763
12-071-02765	931	182	Shiraz	W	2	2	74	119	141	1	1.2	W	18	3727
12-071-02244	433	241	Ghochan	W	2	2	69	116	142	1.5	1.3	Cr	16	3695
12-071-03005	1156	169	Ardabil	W	2	2	70	112	145	3	1.1	Cr	26	3695
12-071-02734	907-SR	182	Shiraz	W	3	2	77	119	143	1.5	1.1	W	16	3693
12-071-02345	524	241	Ghochan	W	2	2	71	115	145	1.5	1.4	LCr	20	3685
12-071-02629	795	230	Nishabour	W	2	3	71	112	143	2	1.4	LCr	16	3592
12-071-03253	1398	111	Varamin	W	4	2	71	117	143	1.5	1.1	W	20	3563
12-071-03886	2014	217	Torbathaidarieh	W	3	3	74	117	144	1.5	1.6	LCr	15	3413
12-071-02814	975	230	Nishabour	P	2	2	73	112	143	2	1.2	GrCr	15	3392
12-071-03378	1517	168	Mamaghan	W	4	3	71	119	143	1.5	1.2	Cr	21	3384
12-071-02252	440	241	Ghochan	W	2	2	67	112	143	2.5	1.3	LCr	19	3377
12-071-03251	1396	111	Varamin	W	4	2	72	119	143	1.5	1.2	Cr	30	3327
12-071-02968	1122	169	Ardabil	W	3	2	67	119	145	2.5	1	LCr	25	3309

Continued....

TABLE 11 Agronomic Data, Chickpea (White) Preliminary Test, I Pahlavi University, Shiraz, Iran.

(1) Accession Number	(2) Strain Number	(3) Source Number	(4) Source	(5) Flower color	(9) Stand	(10) Vigor	(11) Days to 1st Flower	(12) Days to 1st Maturity	(13) Days to Comp. Maturity	(14) Disease rating	(15) Seed per pod	(16) Seed color	(17) 100 Seed Weight	(18) Yield
12-071-03455	1588	161	Mamaghan	P	3	2	74	119	145	1.5	1.2	W	25	3299
12-071-01919	86	84	Karaj	W	5	2	72	112	143	2.5	1	Lbr	30	3291
12-071-02448	618	106	Fars	W	3	3	71	116	143	2	1.4	W	18	3286
12-071-03233	1406	111	Varamin	P	4	2	72	116	140	1.5	1	Cr	26	3250
12-071-05471	310	241	Ghochan	W	4	3	67	119	143	1.5	1.2	W	22	3215
12-071-02259	446	2241	Ghochan	W	3	2	69	112	143	1.5	1.4	W	19	3243
12-071-03028	1176	169	Ardabil	P	3	3	72	116	139	2.5	1.3	G rw	18	3201
12-071-02653	825	230	Nishabour	W	2	2	74	115	143	2.5	1.6	Cr	12	3169
12-071-02249	437	241	Ghochan	W	3	2	70	112	143	1.5	1.4	Cr	16	3136
12-071-02442	613	106	Fars	W	2	3	74	118	144	2	1.3	W	15	3077
12-071-02651	823	230	Nishabour	W	2	2	73	112	139	1	1.4	LCr	18	3061
12-071-01921	88	88	Karaj-S	W	2	3	72	112	141	3	1.2	W	24	3023
12-071-03081	1225	169	Ardabi	P	3	3	72	116	144	1.5	1.4	LCp	20	2977
12-071-02450	620	106	Fars	W	3	2	72	112	138	1.5	1.6	LCr	16	2869
12-071-06342	2013	217	Torbatheidarieh	P	2	2	74	116	143	1.5	1.4	Lbp	14	2775
12-071-02479	646	106	Fars	W	3	3	74	117	141	2	1.4	W	18	2454

TABLE 12 Agronomic Data, Chickpeas (white) Preliminary Yield Test I Planted March 21, 1967, Karaj, Iran.

(1) Accession Number	(2) Strain Number	(3) Source Number	(4) Source	(5) Flower Color	(6) Plant Height	(7) Plant Width	(8) Plants/ Meter	(9) Stand	(10) Vigor	(11) Days to First Flower	(12) Days to First Maturity	(13) Days to complete Maturity	(14) Disease Rating	(15) Seeds/ pod	(16) Seed color	(17) 100. Seed Weight	(18) Yield
12-071-03645	1779	153	Karaj	LP	29	53	17	1	1	69	114	126	1.5	1.2	LCr	19	2538
12-071-03243	1388	111	Varamin	LP	22	45	21	2	2	67	109	124	3	11	Cr	23.5	2387
12-071-02446	617	106	Fars	W	25	45	29	4	2	71	113	125	3	12	W	16.6	2377
12-071-02734	907S.R66	182	Shiraz	W	36	42	24	2	2	67	113	125	3	12	W	18.3	2308
12-071-03455	1588	161	Moghan	LP	29	52	19	3	2	67	113	127	3	10	LCr	25.9	2304
12-071-03244	1389	111	Varamin	LP	22	44	22	3	3	68	109	127	3	12	LCr	23.2	2262
12-071-03468	1641S.R.66	161	Moghan	LP	23	39	26	2	2	68	113	127	2	10	LCr	19.5	2259
12-071-03886	2014	217	Torbat-e-Heidarieh	W	21	41	25	2	2	67	110	125	3.5	17	W	16.1	2231
12-071-03233	1406	111	Varamin	LP	27	41	17	3	3	68	110	124	4	10	LCr	17.6	2198
12-071-03471	1602	161	Moghan	LP	23	51	19	4	3	67	109	125	3.5	13	Cr	20.3	2193
12-071-03458	1631 S.R.66	161	Moghan	LP	26	51	22	3	3	67	109	129	3.5	11	Cr	20.5	2173
12-071-02185	380	241	Ghochan	W	19	43	25	2	4	62	108	126	4	11	W	19.7	2162
12-071-06342	2013	217	Torbat-e-Heidarieh	LP	26	46	32	2	1	68	114	125	1.5	14	LBr	11.8	2149
12-071-02442	613	106	Fars	W	27	40	26	4	2	67	111	125	3	13	W	16.7	2131
12-071-02653	825	230	Nishabour	W	20	39	23	3	3	67	110	126	3.5	15	W	16.1	2123
12-071-02770	935	182	Shiraz	W	20	40	24	2	2	67	113	125	2.5	12	W	16.8	2117
12-071-06359	797	230	Nishabour	LP	20	41		3	3	67	107	123	4	15	Br	16.4	2092
12-071-02765	931	182	Shiraz	W	25	38	24	3	2	68	109	125	3	12	W	16.6	2060
12-071-03253	1398	111	Varamin	W	22	42	21	3	2	67	110	126	3.5	11	W	20.6	2048
12-071-02815	976	230	Nishabour	W	22	49	20	2	3	62	108	126	3.5	12	W	17.4	2031
12-071-02345	524	241	Ghochan	W	16	39	18	3	4	62	106	125	4	14	W	23.7	2021
12-071-03081	1225	169	Ardabil	LP	21	44	23	3	3	69	112	125	3	11	LCr	19.2	1960
12-071-05470	332	217	Torbat-e-Heidarieh	W	25	48	29	2	2	67	112	127	2.5	10	W	16.2	1959
12-071-02651	823	230	Nishabour	W	21	38	22	3	3	66	106	123	4	12	W	19.8	1942
12-071-03028	1176	69	Ardabil	LP	21	38	24	3	3	68	106	123	4	11	Cr	18	1932
12-071-02643	813	230	Nishabour	W	17	43	21	2	4	63	109	126	3.5	11	W	18.3	1912
12-071-02478	645	106	Fars	W	26	41	26	2	2	69	111	125	3	11	W	16.6	1905
12-071-03378	1517	168	Moghan	W	21	40	22	3	3	65	110	126	3.5	11	LCr	24.9	1905
12-071-02443	614	106	Fars	W	20	38	20	3	3	66	107	125	4.5	12	LCr	17.6	1900
12-071-02479	646	106	Fars	W	20	38	24	3	2	67	109	125	3	10	W	16	1887
12-071-03233	1376	111	Varamin	LP	22	45	18	3	3	66	108	124	3	13	DCr	28.2	1870
12-071-02244	433	241	Ghochan	W	19	40	23	3	3	62	108	125	3	14	W	16.6	1852
12-071-02448	618	106	Fars	W	23	33	23	3	3	67	110	124	3.5	12	W	16.5	1838
12-071-02650	822	230	Nishabour	W	17	33	24	2	3	67	107	124	3.5	17	W	28	1836
12-071-02629	795	230	Nishabour	W	21	42	20	3	4	63	105	124	4.5	13	W	18.3	1832
12-071-02814	975	230	Nishabour	W	21	34	25	3	3	64	106	125	4.5	14	W	20.8	1812
12-071-02243	432	241	Ghochan	W	16	39	20	3	4	60	108	128	3.5	12	W	20.3	1774
12-071-05471	310	241	Ghochan	W	18	36	20	3	3	62	106	124	4	14	W	18.1	1742
12-071-02249	437	241	Ghochan	W	17	38	20	3	4	63	106	124	4	12	W	19.4	1738
12-071-02639	809	230	Nishabour	W	18	34	21	3	4	65	106	124	5	14	W	19.9	1725
12-071-06364	794	230	Nishabour	LP	22	40	24	2	3	67	106	127	4	15	Cr	14.6	1701
12-071-01919	86	84	Karaj	W	19	39	16	4	3	64	107	125	4.5	13	W	30.1	1684
12-071-02252	440	241	Ghochan	W	19	43	21	3	3	62	106	125	3.5	13	W	20.0	1668
12-071-02259	446	241	Ghochan	W	16	39	21	3	3	63	106	124	4.5	12	W	20.0	1649
12-071-02968	1122	169	Ardabil	W	20	35	21	3	4	65	107	127	4	10	Lcr	23.6	1601
12-071-03251	1396	111	Varamin	W	21	42	15	4	3	69	108	126	4	10	W	23.1	1572
12-071-02450	620	106	Fars	W	22	35	25	3	3	67	109	124	3.5	13	W	15.4	1552
12-071-01921	88	86	Karaj	W	24	42	18	3	3	67	107	124	4.5	10	W	27.4	1406
12-071-03005	1156	169	Ardabil	W	22	34	18	4	3	65	109	125	4.5	10	W	27.8	1389

TABLE 13 Agronomic Data, Chickpea (black) Uniform Yield Test, Planted March 1967, Pahlavi University, Shiraz, Iran.

(1) Accession Number	(2) Strain number	(3) Source number	(4) Source	(5) Flower color	(9) Stand	(10) Vigor	(11) Days to 1st flower	(12) Days to 1st maturity	(13) Days to Comp. Maturity	(14) Disease rating	(15) Seeds per pod	(16) Seed color	(17) 100 Seed Weight	(18) Yield
12-071-05428	417M	175	Gharye-gole	LP	1	1	68	107	127	1	1.2	BCr	16	2671
12-071-05430	412M	175	" "	P	1	1	66	107	128	1	1.3	Grcr	18	2550
12-071-04255	307	-	Ghazvin	P	1	2	66	105	127	1	1.6	BL	16	2539
12-071-05436	416M	175	Gharye-gole	P	1	2	66	107	124	1	1.2	DCr	16	2529
12-071-05442	231	251514	Iran	P	1	1	68	107	128	1	1.8	BL	14	2527
12-071-05451	410M	175	Gharye-gole	P	1	2	66	104	128	1	1.2	DCr	19	2349
12-071-05450	411M	175	" "	P	1	2	68	103	133	1	1.3	Grcr	16	2333
12-071-05432	428M	154	Karaj	P	1	1	64	103	128	1	1.6	BL	15	2317
12-071-05434	449M	164	Moghan	P	1	2	66	104	124	1	1.4	BL	14	2212
12-071-05437	438M	154	Karaj	P	1	2	66	105	124	1	1.7	BL	15	2194
12-071-05441	303	-	Azarshahr	P	1	3	66	104	129	1	1.6	BL	16	2185
12-071-04244	305	-	Ardabil	P	1	2	66	104	128	1	1.4	BL	16	2161
12-071-05444	415M	175	Gharye-gole	P	1	3	66	108	128	1.5	1.1	GrCr	18	2156
12-071-05429	426M	159	Karaj	P	2	2	66	103	127	1	1.6	BL	14	2142
12-071-05431	450M	164	Moghan	P	1	2	68	103	129	1	1.4	BL	13	2097
12-071-05446	440M	154	Karaj	P	1	2	66	103	128	1.5	1.6	BL	15	2074
12-071-05452	419M	175	Gharye-gole	P	1	2	67	104	127	1	1.2	DCr	16	2066
12-071-05433	439M	154	Karaj	P	1	2	68	104	129	1	1.7	BL	14	2049
12-071-05442	448M	164	Moghan	P	1	2	71	106	127	1	1.6	BL	15	2041
12-071-05438	401M	175	Gharye-gole	LP	1	2	71	108	124	1	1.5	GrCr	16	2020
12-071-05439	424M	154	Karaj	P	1	2	65	103	128	1.5	1.7	BL	16	1992
12-071-05449	427M	154	"	P	1	3	66	104	126	1	1.7	BL	15	1969
12-071-05447	934M	154	"	P	1	2	66	103	128	1	2.4	BL	15	1956
12-071-05440	425M	154	"	LP	1	3	66	107	128	1	1.5	BL	14	1917
12-071-05435	404M	175	Gharye-gole	LP	1	2	71	106	125	1	1.1	GrCr	17	1872

TABLE 14. Agronomic Data, Chickpea (black) Uniform Yield Test, Planted March 17, 1967, Varamin, Iran

(1) Accession Number	(2) Strain number	(3) Source number	(4) Source	(5) Flower color	(9) Stand	(10) Vigor	(11) Days to 1st flower	(12) Days to 1st maturity	(13) Days to complete mat.	(14) Disease rating	(16) Seed color	(18) Yield
12-071-05432	428M	154	Karaj	P	1	2	59	106	123	2	BL	3470
12-071-05482	2428	172	Ardabil	P	2	2	58	106	122	2	LBr	3370
12-071-05437	438M	154	Karaj	P	1	2	59	105	122	2	BL	3370
12-071-05132	2864	174	Ahar	P	1	2	59	106	121	2	BL	3310
12-071-04255	307	-	Ghazvin	P	1	2	60	108	120	2	BL	3270
12-071-05093	2829	174	Ahar	P	1	2	60	104	118	2	BL	3250
12-071-05439	424M	154	Karaj	P	1	2	59	106	122	2	BL	3220
12-071-05321	3034	154	Gharye-gole	P	1	2	61	107	123	2	BL	3200
12-071-05442	231	-	Iran 251514	P	1	2	60	106	122	2	BL	3180
12-071-05444	415M	175	Gharye-gole	P	2	2	62	107	124	2	LBr	3080
12-071-05429	426M	154	Karaj	P	1	2	61	105	122	2	BL	3080
12-071-05434	449M	164	Moghan	P	2	2	60	103	119	2	BL	3080
12-071-05451	410M	175	Gharye-gole	P	2	2	60	105	122	2	LBr	3080
12-071-04244	305	-	Ardabil	P	1	2	62	105	120	2	BL	3020
12-071-05435	404M	175	Gharye-gole	P	2	2	61	105	120	2	LBr	3020
12-071-05440	425M	154	Karaj	P	2	1	59	106	123	2	BL	3000
12-071-05129	2861	174	Ahar	P	2	2	61	106	124	2	BL	2970
12-071-05438	401M	175	Gharye-gole	P	2	2	61	104	119	2	LBr	2930
12-071-05433	439M	154	Karaj	P	2	2	61	105	120	2	BL	2930
12-071-05452	419M	175	Gharye-gole	P	2	2	60	104	119	2	LBr	2910
12-071-05450	411M	175	Gharye-gole	P	2	2	60	107	123	2	LBr	2910
12-071-05441	303	-	Azarshahr	P	2	2	58	105	121	2	BL	2890
12-071-05431	450M	164	Moghan	P	2	2	60	105	122	2	BL	2830
12-071-05442	448M	164	Moghan	P	1	2	62	103	118	2	BL	2770
12-071-05446	440M	154	Karaj	P	1	2	60	103	119	2	BL	2770
12-071-05449	427M	154	Karaj	P	2	2	59	102	119	2	BL	2680
12-071-05428	417M	175	Gharye-gole	P	2	2	61	104	119	2	LBr	2640
12-071-05430	412M	175	Gharye-gole	P	2	3	60	105	122	2	LBr	2560
12-071-05436	416M	175	Gharye-gole	P	2	2	60	105	121	2	LBr	2470
12-071-05447	434M	154	Karaj	P	2	3	59	104	122	2	BL	2430
CV %												13
LSD .05												570

TABLE 15 Agronomic Data, Chickpea (black) Uniform Yield Test Planted March 21, 1967, Karaj, Iran.

(1) Accession Number	(2) Station Number	(3) Source Number	(4) Source	(5) Flower Color	(6) Plant height	(7) Plant Width	(9) Stand	(10) Vigor	(11) Days to First Flower	(12) Days to First Maturity	(13) Days to Complete Maturity	(14) Disease rating	(15) Seeds/ pod	(16) Seed color	(17) 100 Seeds Weight	(18) Yield
12-071-05451	410M	175	Gharye-gole	P	22	33	3	3	65	94	113		1.5	LBr	13.9	1700
12-071-05442	231		Iran	P	24	31	3	3	63	94	114		1.5	BL	11.6	1550
12-071-05429	426M	154	Karaj	P	19	36	3	3	64	95	113		1.6	BL	10.6	1490
12-071-05446	440M	154	Karaj	P	18	37	3	3	64	94	114		1.7	BL	10.6	1480
12-071-05437	438M	154	Karaj	P	19	37	3	3	64	94	113		1.8	BL	10.9	1460
12-071-05432	428M	154	Karaj	P	21	34	3	2	63	96	113		1.8	BL	11.8	1430
12-071-05132	2864	174	Ahar	P	17	35	3	4	65	93	114		1.4	BL	12.3	1340
12-071-05321	3034	175	Gharye-gole	LP	17	30	4	4	66	94	113		1.4	BL	11.7	1310
12-071-04255	307	-	Ghazvin	P	18	34	3	3	64	94	113		1.5	BL	12.4	1300
12-071-04244	305	-	Ardabil	P	18	33	4	4	63	94	113		1.2	BL	11.2	1300
12-071-05439	424M	154	Karaj	P	19	27	3	3	64	95	114		1.6	BL	11.6	1290
12-071-05449	427M	154	Karaj	P	23	32	3	2	64	94	113		1.8	BL	10.1	1290
12-071-05431	450M	164	Moghan	P	20	33	3	3	64	94	113		1.5	BL	9.6	1280
12-071-05450	411M	175	Gharye-gole	P	21	44	3	2	63	94	113		1.8	LBr	12.9	1250
12-071-05441	303	-	Azarshahre	LP	19	33	3	3	65	96	113		1.7	BL	10.1	1250
12-071-05093	2829	174	Ahar	P	20	36	3	3	63	94	114		1.6	BL	12.6	1240
12-071-05447	434M	154	Karaj	P	19	37	3	3	64	94	113		1.7	BL	10.2	1200
12-071-05435	404M	175	Gharye-gole	P	21	34	4	3	63	94	113		1.7	LBr	11.3	1200
12-071-05452	419M	175	Gharye-gole	P	18	33	4	3	64	95	112		1.4	LBr	12.6	1150
12-071-05442	448M	164	Moghan	P	18	33	4	4	64	94	113		1.3	BL	10.0	1130
12-071-05438	401M	175	Gharye-gole	P	20	40	4	3	63	94	113		1.6	LBr	11.9	1130
12-071-05430	412M	175	Gharye-gole	P	19	33	3	3	63	94	113		1.6	LBr	13.2	1110
12-071-05482	2428	172	Ardabil	P	21	31	4	3	62	94	113		1.3	LBr	13.3	1060
12-071-05129	2861	174	Ahar	P	21	39	3	3	63	94	113		1.5	BL	9.2	1060
12-071-05444	415M	175	Gharye-gole	P	21	35	3	3	64	94	112		1.5	LBr	13.8	1060
12-071-05428	417M	175	Gharye-gole	P	20	41	4	4	63	94	113		1.3	LBr	12.4	1060
12-071-05436	416M	175	Gharye-gole	P	19	37	3	3	63	94	114		1.4	LBr	13.2	1020
12-071-05440	425M	154	Karaj	P	19	34	3	3	63	95	114		1.6	BL	9.6	1020
12-071-05434	449M	164	Moghan	P	17	40	3	3	63	94	112		1.6	BL	10.2	880
12-071-05433	439M	154	Karaj	P	21	33	3	3	64	95	115		1.4	BL	9.2	850

TABLE 16 Agronomic Data, Chickpea (black) advanced Yield Test Planted March 10, 1967, Pahlavi University, Shiraz, Iran.

(1) Accession Number	(2) Strain Number	(3) Source Number	(4) Source	(5) Flower Color	(9) Stand	(10) Vigor	(11) Days to 1st Flower	(12) Days to 1st Maturity	(13) Days to Full Maturity	(14) Disease rating	(15) Seed per pod	(16) Seed color	(17) 100 Seed Weight	(18) Yield
12-071-05321	3034	154	Gharyeh-gole	P	3	3	68	105	129	2	1.8	BL	14	3244
12-071-05132	2864	174	Ahar	P	2	3	71	108	129	1	1.6	BL	14	3067
12-071-05093	2829	174	"	P	2	4	68	107	127	1	1.4	BL	14	2795
12-071-05437	438	154	Karaj	P	1	2	66	105	124	1	1.7	BL	15	2707
12-071-05447	434	154	"	P	1	2	66	103	128	1	2.4	BL	15	2570
12-071-05452	419	175	Gharyeh-gole	P	1	2	67	104	127	1	1.2	DCr	16	2548
12-071-05129	2861	174	Ahar	P	1	3	68	107	130	1	1.6	BL	12	2472
12-071-05482	2428	172	Ardabil	P	4	4	68	107	129	1	1.4	GrCr	16	2354
12-071-05433	439	154	Karaj	P	1	2	68	104	129	1	1.7	BL	14	2004

TABLE 17 Agronomic Data, Chickpea (white) Uniform Yield Test, Planted March 10, 1967, Pahlavi University, Shiraz, Iran.

(1) Accession Number	(2) Strain Number	(3) Source Number	(4) Source	(5) Flower Color	(9) Stand	(10) Vigor	(11) Days to First Flower	(12) Days to First Maturity	(13) Days to Full Maturity	(14) Disease Rating	(15) Seed/pod	(16) Seed color	(17) 100 Seed Weight	(18) Yield
12-071-05475	313	161	Moghan	PK	2	1	76	123	152	1	1.2	YCr	23	3562
12-071-05464	313M	170	Ardebil	PK	3	2	77	123	150	1.5	1.2	LCr	20	3519
12-071-05461	323	169	Ardebil	PK	2	1	77	124	101	1.5	1.1	Cr	25	3260
12-039-05462	331	32	Cyprus	PK	1	1	73	123	150	1.5	1.2	DCr	27	3209
12-071-05465	335	170	Ardabil	PK	2	2	77	124	150	1	1.2	W	25	3092
12-071-05454	336	170	Ardabil	PK	2	3	77	124	153	1.5	1.2	W	26	2991
12-071-05460	302	129	Moghan	PK	2	2	77	123	148	1.5	1.1	Cr	31	2947
12-071-05457	340	170	Ardabil	PK	2	1	77	119	148	1	1	W	21	2841
12-071-05463	301	111	Esfahan	PK	3	2	73	118	148	1.5	1.1	Cr	29	2778
12-071-05458	329	37	Karaj	P	1	2	71	117	152	1.5	1.1	Cr	22	2742
12-071-05472	347	-	Karaj	PK	2	2	77	121	152	2	1.2	W	24	2734
12-071-05453	328	170	Ardabil	PKw	3	2	77	123	150	2	1.3	LCr	26	2661
12-071-05456	34	-	Karaj Selection	W	3	2	71	117	146	3	1.1	Cr	24	2617
12-071-05469	322	169	Ardabil	P	2	2	80	121	150	1	1.2	DCr	24	2608
12-071-05467	309	230	Nishabour	W	2	2	71	117	150	2	1.3	LCr	20	2596
12-071-05452	329	170	Ardabil	PK	2	2	71	119	149	1.5	1.2	YCr	26	2563
12-071-05459	80	-	Karaj Selection	P	3	2	77	117	150	2	1.3	Cr	29	2503
12-071-05476	312	153	Karaj	W	2	2	74	121	148	1.5	1.4	LCr	25	2448
12-071-05470	332	217	Torbat-Heidarieh	W	2	2	77	119	150	2	1.2	W	20	2363
12-071-05455	317	162	Shahpour	W	3	2	77	121	150	1.5	1.2	LCr	24	2310
12-071-05468	3	-	Karaj Selection	W	2	2	71	115	153	2	1.2	LCr	30	2246
12-071-05474	339	170	Ardabil	W	2	2	77	115	148	1.5	1.5	LCr	21	2210
12-071-05466	18	-	Karaj Selection	W	2	3	69	117	142	3.0	1.1	LCr	25	2197
12-071-05471	310	241	Ghazvin	W	2	3	69	121	152	2	1.5	W	20	2172
12-071-05473	225	249982	Iran	W	2	2	77	124	148	1.5	1.1	Cr	34	1948

TABLE 18. Agronomic Data, Chickpea (white) Advanced Yield Test, Planted March 17, 1967, Varamin, Iran

(1) Accession number	(2) Strain number	(3) Source number	(4) Source	(5) Flower color	(9) Stand	(10) Vigor	(11) Days to 1st flower	(12) Days to 1st maturity	(13) Days to complete mat.	(14) Disease rating	(16) Seed color	(18) Yield
12-071-03515	1649	152	Karaj	LP	1	2	61	110	130	2.5	DCr	4080
12-071-05452	329M	170	Ardabil	LP	1	1	63	109	127	1.8	Cr	3970
12-071-05476	312M	153	Karaj	W	1	2	60	110	125	2.5	Cr	3970
12-071-05460	302M	129	Moghan	LP	1	2	60	110	126	2.3	DCr	3950
12-071-05456	34	-	Karaj	W	1	2	60	109	126	2.5	DCr	3910
12-071-03269	1415	111	Varamin	LP	1	1	62	110	127	2.0	DCr	3890
12-071-05458	329M	37	Karaj	LP	1	2	62	111	130	2.0	DCr	3830
12-071-05472	347M	-	Karaj	LP	1	1	61	109	125	2.3	Cr	3770
12-071-05457	340M	170	Ardabil	LP	1	2	64	112	128	2.0	DCr	3720
12-071-05459	80	-	Karaj	LP	1	2	61	110	127	2.3	DCr	3710
12-071-05471	310	241	Ghouchan	W	2	2	58	110	128	2.5	Cr	3700
12-039-05462	331	32	Cyprus	P	1	1	61	109	126	2.3	DCr	3660
12-071-05465	335M	170	Ardabil	W	1	2	62	110	130	2.3	Cr	3640
12-071-05454	336M	170	Ardabil	LP	1	2	65	111	129	2.3	DCr	3620
12-071-05468	3	-	Karaj	W	1	2	62	111	130	2.5	Cr	3580
12-071-05461	323M	162	Ardabil	LP	1	2	64	110	129	2.0	DCr	3470
12-071-05475	313M	161	Moghan	W	1	1	62	112	130	2.0	LCr	3470
12-071-03662	1796	162	Shahpour	LP	2	1	61	112	130	2.0	YCr	3450
12-071-05464	331M	170	Ardabil	LP	1	1	64	110	129	1.8	Cr	3430
12-071-05469	322M	169	Ardabil	LP	1	1	65	108	125	1.8	DCr	3410
12-071-05470	332	217	Torbat-heidarieh	W	1	2	63	112	130	2.3	Cr	3410
12-071-05474	339M	170	Ardabil	W	1	2	63	108	123	2.0	Cr	3410
12-071-05463	301M	111	Esfahan	LP	1	2	60	108	123	2.0	DCr	3390
12-071-05466	18	-	Karaj	W	2	2	59	113	130	2.0	Cr	3390
12-071-05453	328M	170	Ardabil	LP	1	2	62	111	127	2.3	Cr	3370
12-071-05467	309	230	Nishabour	W	2	1	60	109	128	2.3	Cr	3330
12-071-03459	1591	161	Moghan	LP	2	2	63	111	129	2.0	Cr	3290
12-071-05455	317M	162	Shahpour	W	1	2	62	110	127	2.8	Cr	3100
12-071-05473	225	249982	Iran	W	1	2	64	111	126	2.5	Cr	3100
12-071-02695	868	182	Shiraz	W	1	2	67	109	128	2.3	W	2910
CV %												12
LSD .05												630

TABLE 19 Agronomic Data, Chickpea (white) Advanced Yield Test, Planted March21, 1967, Karaj Iran

(1) Accession Number	(2) Strain Number	(3) Source Number	(4) Source	(5) Flower Color	(6) Plant Height	(7) Plant Width	(9) Stand	(10) Vigor	(11) Days to First Flower	(12) Days to First Maturity	(13) Days to complete Maturity	(14) Disease Rating	(15) Seed/ Pod	(16) Seed color	(17) 100 S Seeds Weight	(18) Yield
12-071-05469	322M	169	Ardabil	LP	24	40	2	1	67	109	123	2	1.0	Cr	18.1	2300
12-071-05464	331M	170	Ardabil	LP	27	41	3	1	68	107	126	2.5	1.1	LCr	13.9	2170
12-071-05452	329M	170	Ardabil	LP	22	38	3	2	66	107	125	3	1.0	LCr	23.9	2130
12-07103662	1796	162	Shahpour	W- LP	23	45	2	1	66	108	125	3	1.0	LCr	19.4	2120
12-071-05475	313M	161	Moghan	LP	24	40	3	2	67	109	125	2.5	1.1	LCr	19.1	2080
12-071-03269	1415	111	Varamin	LP	24	44	3	2	67	107	124	3	1.0	DCr	25.9	2070
12-071-05457	340M	170	Ardabil	LP	26	45	3	1	68	107	125	3	1.0	Cr	23.3	2070
12-071-05454	336M	170	Ardabil	LP	28	44	2	2	67	107	125	2.5	1.1	Cr	22.9	2060
12-071-05456	34	-	Karaj Selec	W	25	38	3	2	63	105	124	4	1.0	W	24.8	1380
12-071-05461	323M	169	Ardabil	LP	24	43	2	2	67	106	126	3	1.0	Cr	21.3	1980
12-071-05463	301M	111	Esfahan	LP	27	36	3	2	67	106	126	3.5	1.2	Cr	23.3	1970
12-071-05453	328M	170	Ardabil	LP	24	43	3	1	67	107	125	3	1.0	Cr	24.8	1970
12-071-05458	329M	37	Karaj	LP	23	40	3	1	66	108	125	3	1.1	Cr	19.4	1950
12-071-05465	335M	170	Ardabil	LP	28	45	3	1	67	108	125	3	1.1	LCr	19.9	1950
12-071-03459	1591	161	Moghan	LP	22	42	2	2	66	106	124	3.5	1.0	LCr	17.0	1920
12-039-05462	331	32	Cyprus	LP	24	39	3	2	66	106	123	3	1.2	Cr	25.2	1890
12-071-02695	868	182	Shiraz	W	24	43	2	1	68	110	125	2	1.0	W	13.8	1880
12-071-05472	347M	-	Karaj	LP	27	44	3	1	67	108	127	3	1.1	LCr	20.3	1870
12-071-03515	1649	152	Karaj	LP	24	40	3	2	66	104	124	3	1.1	Cr	18.7	1820
12-071-05459	80	-	Karaj - Selec	LP	24	35	2	2	66	106	126	4.5	1.0	Br	27.3	1750
12-071-05467	309	230	Nishabour	W	17	45	2	2	62	104	125	4.5	1.3	W	18.8	1670
12-071-05460	302M	129	Moghan	LP	22	37	3	2	67	105	125	4	1.0	Cr	25.1	1640
12-071-05470	332	217	Torbat-e-Heidarieh	W 23	38	3	2	64	106	126	4	1.0	W	17.9	1590	
12-071-05476	312M	153	Karaj	W	28	37	3	3	64	104	123	4.5	1.3	W	18.2	1530
12-071-05471	310	241	Ghochan	W	17	41	2	3	61	105	125	4.5	1.1	W	17.9	1470
12-071-05474	339M	170	Ardabil	W	27	40	2	2	65	104	126	5	1.0	W	19.1	1450
12-071-05455	317M	162	Shahpour	W	24	39	2	2	64	105	127	3.5	1.2	W	21.9	1450
12-071-05473	225	-	Iran -249982	W	26	37	3	2	66	106	125	4.5	1.0	W	30.1	1400
12-071-05468	3	-	Karja Selec	W	25	34	3	1	62	104	126	4	1.1	W	30.4	1380
12-071-05466	18	-	Karaj Selec	W	20	32	3	3	62	105	126	5	1.0	W	27.2	1060

TABLE 20 Agronomic Data, Chickpea (White) advanced Yield Test, Planted March 1967, Pahlavi University, Shiraz, Iran.

Accession Number	Strain Number	Source Number	Source	Flower Color	Stand	Vigor	Days to 1st Flower	Days to 1st Maturity	Days to Full Maturity	Disease rating	Seed per pod	Seed color	100 seeds weight	Yield
12-071-03459	1591	161	Mamaghan	PK	7	2	79	117	158	1.5	1.3	LCr	18	1322
12-071-03662	1796	162	Shahpour	PK	7	3	77	117	158	2	1.2	LCr	18	1284
12-071-05463	301	111	Esfahan	PK	3	2	73	118	148	1.5	1.1	Cr	29	996
12-071-05461	323	169	Ardabil	PK	2	1	77	124	.	1.5	1.1	Cr	25	957
12-071-05460	302	129	Moghan	PK	2	2	77	123	148	1.5	1.1	Cr	31	919
12-071-02695	828	182	Shiraz	W	8	2	83	128	154	1	1.2	W	10	907
12-071-03515	1649	152	Karaj	PK	8	3	80	117	156	1	1.5	DCr	15	824
12-071-05472	347	-	"	PK	2	2	77	121	152	2	1.2	W	24	691
12-071-03269	1415	111	Varamin	PK	8	3	80	124	156	1.5	1.3	DCr	23	616

TABLE 21 Agronomic Data, Chickpea International Yield Test Plant March 1967, Pahlavi University, Shiraz, Iran.

(1) Accession Number	(2) Strain Number	(3) Source Number	(4) Source	(5) Flower color	(6) Plant Height	(7) Plant Width	(9) Stand	(10) Vigor	(11) Days to First Flower	(12) Days to First Maturity	(13) Days to Complete Maturity	(14) Disease rating	(15) Seeds/ pod	(16) Seed color	(17) 100 seeds Weight	(18) Yield
12-071-05465	335	170	Iran, Ardabil	PK	33	57	1	1	50	94	116	1	1.2	LCr	20	3548
12-071-05472	347	-	" Karaj	PK	30	60	1	1	50	94	116	1	1.2	LCr	20	3472
12-071-05475	313	161	" Moghan	PK	31	59	1	1	57	96	116	1	1.1	LCr	17	3465
12-155-10002	-	1	U.A.R.(Giza)	W	28	56	1	1	40	79	104	1.5	1.5	Cr	30	2785
12-079-10004	-	-	Jordan	W	27	51	2	1	42	88	108	1.5	1.2	W	40	2522
12-113-10006	-	C727	Pakistan	P	31	52	1	1	57	89	106	1	1.4	BrCr	17	2512
12-113-10005	-	1	" (Punjab)	W	27	51	2	2	46	89	109	2	1.2	Cr	20	2432
12-113-10007	-	C612	Pakistan	P	23	46	1	2	46	91	108	2.5	1.5	BrCr	10	2382
12-155-10003	-	F13	U.A.R.	W	29	50	1	1	40	79	106	1.5	1.2	LCr	24	2379
12-155-10001	-	P1	U.A.R.	W	26	46	1	1	39	79	104	2	1.4	W	12	1828

TABLE 22. Agronomic Data, Chickpea International Yield Test, Planted March 21, 1967, Karaj, Iran.

(1) Accession Number	(2) Strain Number	(3) Source Number	(4) Source	(5) Flower color	(6) Plant Height	(7) Plant Width	(8) Plant Number	(9) Stand	(10) Vigor	(11) Days to first Flower	(12) Days to firs Mat.	(13) Days to Comp. Mat.	(14) Disease Rating	(15) Seeds/ pod	(16) Seed color	(17) 100 Seeds Weight	(18) Yield
12-071-05472	347M	-	Karaj-IR	LP	31	48	17	3	2	74	85	103	2.0	1.2	Cr	21.8	2765
12-113-10007	-	C612	Pakistan	LP	20	35	20	4	2	74	79	97	3.0	1.6	LBr	13.3	2295
12-113-10006	-	C727	Pakistan	LP	27	38	19	3	2	77	80	97	2.5	1.3	LBr	15.6	1962
12-071-05475	313M	161	Moghan-IR	LP	24	38	20	3	1	76	84	103	2.5	1.0	Cr	20.4	1902
12-071-05465	335M	170	Ardabil-IR	LP	28	40	15	2	2	74	82	100	2.5	1.2	Cr	20.5	1675
12-155-10003	-	F13	U.A.R.	W	23	37	19	3	2	66	80	97	4.0	1.5	W	22.4	1645
12-113-10005	-	-	Pakistan (Punjab)	W	20	42	16	4	2	65	80	100	3.5	1.4	W	20.3	1322
12-155-10002	-	GIZA	U.S.R.(Giza1)	W	27	41	16	3	2	67	80	95	4.4	1.0	W	27.4	1105
12-079-10004	-	-	Jordan	W	22	36	14	3	2	70	80	99	3.5	1.0	W	37.3	1065
12-155-10001	-	P	U.A.R.	W	24	35	21	4	2	64	80	96	4.0	1.5	W	11.3	822

BEANS

Dr. Kenneth H. Evans
Engineer Ahmad Sarrafi

Germplasm

The germplasm nursery was grown again in 1967 at Karaj and about 1,200 of the more promising accessions were grown at Pahlavi University in Shiraz. The germplasm nursery contains several colors of beans that are new to Iran. Presently, many of the better looking accessions are probably only useful as breeding material. A preliminary market survey indicates large red and cranberry pinto beans are higher priced than other types. White beans are also used, but have a lower market value. The black, brown, and U.S. type into beans are not found in the markets. Most shopkeepers feel there is no market for new types of beans.

Yield Trials

The bean yield trials were divided into white, red, and pinto color classes. Beans of other colors were included in with the class nearest their color. The disease ratings for Karaj were made by RPIP pathologists. Several strains of pinto beans produced higher yields than the two U.S. pinto checks in the pinto preliminary yield tests (Tables 23 and 24). In the preliminary red bean test (Tables 25 and 26), five Iranian strains yielded more than the check variety, the check variety ranked 15th and 19th in the two tests. Seven accessions in the preliminary white bean trial (Tables 27 and 28) yielded more than accession number 65-071-00042, the check variety.

The uniform yield test of pinto beans (Tables 29 to 31) contain some strains which have low market value. The two highest yielding accessions, 65-071-00445 and 65-071-00455, have some disease tolerance, but seed of low market value. Accession 65-071-00446 from Esfahan yields about equal to Pinto 111 and Pinto Columbia. It has acceptable seed type and has been recommended to the Ministry of Agriculture for increase and release.

Strain No.50 (accession 65-071-00582) has been recommended for increase and release as a red bean variety. Strain No.50 produced an average of 300 kilos per hectare, or 17% more than the average of other Iranian strains common to 9 tests.

Strain No.49 (accession 65-071-00042) has been selected from the uniform yield tests (Tables 35 to 38) and recommended to the Ministry of Agriculture for increase and release. In 9 RPIP trials, strain 49 yielded 250 kilos per hectare, or 11% more than the mean of other varieties in the tests.

Legend for Bean Agronomic Data Tables 23-38

(1) Number assigned to collection maintained by the Regional Pulse Improvement Project.

(2) Indicates variety name or area of origin. Numbers are numbers assigned to populations or collection by the Iranian Ministry of Agriculture; 6-digit numbers are P.I. numbers from Crops Research Division, ARS, U.S. Department of Agriculture, Beltsville, Maryland, U.S.A.

(3) W = white; Pu = purple; Lpu = light purple.

(4) V = viney; B = bushy.

(5) Rated 1 to 9: 1 = complete stand; 9 = poor stand.

(6) Rated 1 to 9: 1 = vigorous plants; 9 = weak plants.

(7) Days from planting to first opened flower.

(8) Indicates number of days after planting the first pod in plot reached full maturity, ready for harvest.

(9) Indicates number of days after planting the whole plot was ready for harvest.

(10) Disease rated 1 to 9: 1 = free from disease; 9 = severe disease symptoms.

(11) First column: C = curved; S = straight.
Second column: C - cylindrical; F = flat.

(12) S = short; M = medium; L = long.

(13) Average of ten pods per replication.

(14) W = white; Cr = cream; Y = yellow; Br = brown; Bk = black; P = pink; L = light; D = dark; M = mottled.

(15) C = cylindrical; F = flat; P = plump.

(16) Average weight (grams) of 100 seeds.

(17) Yield in kilograms per hectare based on 5 or 10 square meter plots

TABLE 23 Agronomic Data, Bean (Pinto) Preliminary Yield Planted May, 11, 1967, Shiraz, Iran.

(1) Accession Number	(2) S O U R C E	(3) Flower Color	(4) Plant Type	(5) Stand	(6) Vigor	(7) Days to First Flower	(8) Days to First Maturity	(9) Days to Complete Maturity	(10) Disease Rating	(11) Pod Shape	(12) Pod Length	(13) Seeds /Pod	(15) Seed Shape	(16) Seed Size	(17) Yield
65-071-00-617	Kermanshah	P	V	3	3	57	93	114	4	CF	M	4	F	27	2757
65-071-00-615	Ghouchan	P	V	2	2	57	95	116	5	SF	S	4	F	25	2726
65-071-00-755	Ghouchan	P	V	2	2	57	94	117	7	SF	M	4	F	25	2533
65-071-00-206	Iran, 142, 900	P	V	2	2	57	95	118	3	SF	M	4	F	32	2510
65-071-00-606	Esfahan	W	V	2	3	53	92	116	5	SF	M	3	F	32	2406
65-071-00-618	Ghouchand	W	V	3	2	58	96	114	7	SF	S	4	F	24	2399
65-071-00-609	Ghouchan	P	V	3	3	59	97	115	6	SF	S	4	F	24	2397
65-096-00-123	Mexico 165, 420	P	V	1	3	54	102	128	5	SF	S	4	F	12	2379
65-071-00-023	Malayer	W	V	2	3	56	94	115	5	CF	M	4	F	27	2373
65-071-00-607	Dashtsar, Amol	P	V	2	3	57	94	116	6	SF	M	4	F	22	2357
65-071-00-063	Bojnourd 13	P	V	3	3	58	98	116	5	SF	M	4	F	22	2343
65-071-00-096	Ardakan Mini 179	W	V	2	2	55	89	122	5	SF	M	3	F	31	2319
65-071-00-611	Ghouchan	P	V	2	3	58	96	116	6	SF	S	4	F	24	2263
65-071-00-612	Ghouchand	P	V	3	3	57	96	114	7	SF	M	4	F	28	2253
65-071-00-619	Ghouchan	P	V	2	3	57	95	120	5	CF	M	3	F	32	2250
65-071-00-036	Hamedan	P	V	2	3	57	96	116	5	SF	M	4	F	27	2186
65-071-00-616	Ghouchan	P	V	2	2	57	92	117	8	SF	M	3	F	25	2050
65-071-00-614	Ghouchan	P	V	2	2	57	95	116	5	SF	S	4	F	25	2030
65-071-00-448	Ghouchan	P	V	3	4	57	95	116	6	SF	M	4	F	22	1997
65-157-00-005	Resistant Tender Green	P	B	3	4	40	89	121	3	SC	6	4	C	30	1920
65-157-00-072	Pinto III	W	V	3	3	40	75	100	4	SF	M	4	F	32	1833
65-069-00-241	India - 164, 778	LP	B	3	6	65	86	115	5	SF	M	4	F	30	1706
65-157-00-068	Pinto Columbia	W	V	3	4	40	76	97	3	SF	M	3	F	32	1680
65-071-00-600	Dashtsar, Amol	LP	B	4	6	41	87	116	5	SF	M	3	C	33	1624
65-071-00-594	Esfahan, I	LP	V	3	4	49	90	121	3	SF	M	4	C	42	1470
65-071-00-457	Esfahan, I	LP	V	4	5	57	98	128	5	SF	M	3	C	41	1446
65-007-00-293	Argentina, 162,566	LP	V	4	5	50	88	120	4	SF	L	3	F	28	1320
65-071-00-599	Esfahan	LP	V	3	5	46	93	121	5	SC	M	4	F	44	1284
65-157-00-294	Maryland USA,149,484	P	V	6	5	47	100	114	4	SC	L	5	F	27	1264
65-071-00-601	Esfahan	LP	V	4	4	46	89	124	3	SC	M	4	C	42	1177
65-071-00-593	Esfahan	LP	V	3	4	47	88	122	3	SC	M	4	F	42	1070
65-071-00-604	Esfahan	LP	V	3	4	46	90	120	4	SF	M	3	C	42	1064
65-071-00-605	Esfahan	LP	V	3	4	47	100	121	4	CF	M	3	C	37	1050
65-165-00-296	Africa, 146, 787	LP	V	4	4	46	93	125	5	SC	M	4	C	40	1033
65-071-00-603	Esfahan	LP	V	3	5	46	92	121	4	SC	M	4	C	40	997
65-071-00-602	Esfahan	LP	V	5	5	46	78	122	4	SF	M	4	C	40	800
CV%															21
L.S.D .05															576

TABLE 24. Agronomic Data, Bean (pinto) Preliminary Yield Test, Planted May 24, 1967, RPIP, Karaj, Iran

(1) Accession Number	(2) Source	(3) Flower Color	(4) Plant type	(5) Stand	(6) Vigor	(7) Days to 1st flower	(8) Days to 1st Maturity	(9) Days to Complete maturity	(10) Disease rating	(11) Pod shape	(12) Pod size	(13) Seeds per pod	(14) Seed color	(15) Seed shape	(16) Seed size	(17) Yield
65-071-00594	I-Esfahan	LP	V	3	1	49	87	118	7	SC	M	4	Cr-M	P	39	2024
65-071-00618	I-Ghouchan	W	V	2	1	52	86	101	8	CF	M	4	R-M	F	24	1996
65-071-00096	I-Ardakan 179	P	V	2	1	53	87	103	5	CF	M	4	Cr-M	F	28	1838
65-157-00005	Resistent tender green	P	B	2	1	46	91	120	1	SC	L	6	Cr-M	C	29	1808
65-071-00611	Ghouchan-I	P	V	2	1	52	88	103	6	CC	S	4	R-M	F	26	1736
65-071-00448	I-Ghouchan	P	V	1	1	57	87	100	9	CC	S	4	R-M	F	22	1714
65-071-00036	I-Hamadan	P	V	2	1	55	89	102	4	CF	M	4	Cr-M	F	29	1662
65-071-00609	I-Ghouchan	P	V	1	1	56	89	101	8	CC	M	5	R-M	F	24	1646
65-071-00607	I-Dashtsar Amol	P	V	1	1	51	85	98	8	CC	M	4	R-M	F	24	1626
65-071-00063	I-Bojnurd	P	V	1	1	55	88	99	8	CC	M	5	R-M	F	24	1626
65-071-00612	I-Ghouchan	P	V	2	1	49	87	102	8	CC	M	5	R-M	F	28	1620
65-071-00619	I-Ghouchan	P	V	1	1	52	87	100	5	CF	M	5	R-M	F	27	1608
65-096-00123	Mexico 165,420	P	V	1	1	47	88	117	7	CC	M	4	Bl	F	12	1566
65-071-00617	I-Kermanshah	P	V	2	1	51	85	97	2	CF	M	5	Cr-M	F	26	1522
65-071-00023	I-Malayer	W	V	2	1	52	87	100	3	CF	M	5	Cr-M	F	25	1474
65-071-00755	I-Ghouchan	P	V	1	1	50	86	99	7	CC	S	4	R-M	F	22	1462
65-071-00616	I-Ghouchan	P	V	2	1	54	88	100	8	CC	S	5	R-M	F	26	1446
65-071-00615	I-Ghouchan	P	V	1	1	54	88	100	7	CC	S	4	R-M	F	25	1418
65-071-00614	I-Ghouchan	P	V	2	1	53	85	97	7	CC	S	4	R-M	F	24	1346
65-071-00606	I-Esfahan	W	V	1	1	50	84	98	5	CF	M	4	Cr-M	F	25	1170
65-157-00072	Pinto 111	W	V	2	2	46	76	92	4	CF	M	5	Cr-M	F	31	1062
65-071-00602	I-Esfahan	W	V	3	1	46	94	108	7	SC	M	4	Cr-M	P	36	10444
65-157-00068	Pinto Columbia	W	V	1	3	45	74	88	3	CF	M	5	Cr-M	F	30	962
65-069-00241	India 164,778	W	B	2	2	47	87	105	4	CF	M	4	Cr-M	F	25	928
65-071-00599	I-Esfahan	LP	V	2	2	50	84	112	8	CC	M	4	Cr-M	P	43	838
65-071-00603	I-Esfahan	W	V	2	1	46	88	110	8	CF	M	4	Cr-M	P	37	810
65-071-00600	I-Dashtsar Amol	LP	V	1	2	54	90	107	6	CC	M	4	Cr-M	P	32	788
65-071-00601	I-Esfahan	W	V	3	1	46	84	110	7	SC	M	5	Cr-M	P	35	614
65-071-00605	I-Esfahan	LP	V	2	1	47	89	119	9	CC	M	4	Cr-M	P	35	588
65-165-00296	Africa 146,787	LP	V	3	1	47	90	106	8	CF	M	4	Cr-M	P	36	580
65-071-00206	I- 142,900	P	V	1	1	64	89	114	2	CC	M	5	Cr-M	F	31	578
65-007-00293	Argentina 162,566	W	V	3	1	46	84	98	7	CC	M	4	R-M	F	27	576
65-071-00604	I-Esfahan	W	V	3	1	47	87	121	8	SC	M	4	Cr-M	P	36	534
65-157-00294	Maryland USA 149,484	LP	B	3	3	46	88	108	2	SC	L	6	Cr-M	C	25	510
65-071-00457	I-Esfahan	LP	V	3	1	61	96	123	8	CC	M	4	Cr-M	P	35	501
65-071-00593	I-Esfahan	LP	V	3	2	46	90	110	4	SC	M	4	Cr-M	P	37	490
CV %																35
LSD.05																592

TABLE 25 Agronomic Data, Beans (Red) Preliminary Yield Test, Planted May 11, 1967, Shiraz, Iran

(1) Accession Number	(2) Source	(3) Flower color	(4) Plant Type	(5) Stand	(6) Vigor	(7) Days to First Flower	(8) Days to First Maturity	(9) Days to Complete Maturity	(10) Disease Rating	(14) Seed Color	(15) Seed Shape	(16) Seed Size	(17) Yield
65-071-00-569	Nishabour	W	BV	2	2	63	102	111	3	R	F	25	3065
65-071-00-397	Sabzevar	W	V	2	2	57	99	110	3	DR	F	25	3013
65-071-00-339	Fars Min: 104	W	V	2	2	57	99	109	2	R	F	28	2844
65-071-00-739	Unknown	W	V	[illegible]	[illegible]	57	99	109	4	DR	F	29	2835
65-071-00-538	Safarghaleh, Darehgaz	W	BV	3	1	62	100	112	2	LR	F	25	2753
65-071-00-733	Barmadam, Nishabour	W	VB	2	2	63	102	111	2	OR	F	26	2650
65-071-00-389	Ghouchan	W	BV	2	3	57	96	109	2	R	F	20	2646
65-071-00-727	Unknown	W	V	2	2	57	99	106	2	LR	F	30	2642
65-071-00-749	Barmadan, Nishabour	W	V	2	2	62	99	111	3	R	F	20	2579
65-071-00-292	Argentina 162, 565	W	VB	2	2	60	113	111	2	DR	F	23	2537
65-071-00-735	Nishabour	W	V	2	1	62	102	111	3	DR	F	25	2507
65-071-00-748	Bermadan, Nishabour	W	VB	2	2	53	100	111	3	DR	F	21	2504
65-071-00-742	Unknown	W	V	2	2	57	96	110	3	R	F	27	2485
65-071-00-728	Unknown	W	V	2	2	57	96	106	3	DR	DR	30	2477
65-062-00-111	Guatmala, 164, 897	W	VB	2	2	61	102	109	3	R	F	26	2463
65-071-00-744	Torbate-Heidarieh	W	V	2	2	57	96	110	3	DR	F	34	2405
65-071-00-703	Unknown	W	V	3	3	57	96	106	3	DR	F	32	2387
65-071-00-534	Torbate-Heidarieh	W	V	2	2	50	99	109	2	DR	F	30	2363
65-071-00-582	Esfahan	W	V	2	2	57	95	110	3	DR	F	24	2349
65-071-00-707	Safarghaleh, Darhgaz	W	V	3	3	66	101	111	3	R	F	24	2338
65-071-00-740	Dastfar, Amol	W	B	2	3	62	100	114	6	B	F	28	2326
65-071-00-750	Nishabour	W	BV	3	2	57	99	109	4	R	F	21	2295
65-071-00-726	Torabte-Heidarieh	W	V	2	2	57	99	107	2	DR	F	25	2282
65-071-00-708	Kermanshahan	W	V	2	3	57	99	107	4	R	F	25	2282
65-071-00-405	Bam	W	V	2	2	57	96	109	3	DR	F	27	2265
65-071-00-753	Darehgaz	W	V	2	3	63	96	111	5	DR	F	20	2246
65-071-00-702	Torbate-Heidarieh	W	V	5	2	57	96	107	3	LR	F	30	2234
65-071-00-731	Barmadan, Nishabour	W	VB	2	2	57	99	111	2	R	F	27	2230
65-071-00-475	Chamchal, Kermanshah	W	V	3	2	57	96	109	3	CR	F	29	2327
65-071-00-103	Fars Min: 104	W	V	2	2	57	96	106	3	CR	F	25	2226
65-071-00-713	Safarghaleh, Darehgaz	W	V	2	2	63	99	104	3	R	F	26	2213
65-071-00-537	Nishabour	W	V	2	2	63	102	111	2	R	F	25	2809
65-071-00-743	Torbate-Heidarieh	W	V	2	2	57	96	109	3	DR	F	25	2195
65-071-00-306	Safargaleh Min:Darehgaz 235	W	V	2	1	62	96	110	2	LR	F	22	2183
65-071-00-700	Safarghaleh, Darehgaz	W	VB	2	2	59	99	109	3	R	F	20	2179

Continued.....

TABLE 25

Accession Number	S O U R C E	Flower Color	Plant Type	Stand	Vigor	Days to First Flower	Days to First Maturity	Days to complete Maturity	Disease Rating	Seed Color	Seed Shape	Seed Size	Yield
65-071-00-734	Nishabour	W	VB	2	2	64	79	111	3	R	F	25	2167
65-071-00-717	Ghouchan	W	V	2	3	62	99	107	5	DR	F	20	2153
65-071-00-710	Kermanshah	W	V	2	2	57	96	105	2	R	F	32	2147
65-071-00-709	Safarghaleh, Darehgaz	W	V	2	2	57	99	111	3	R	F	20	2143
65-071-00-719	" "	W	V	3	2	62	98	110	3	LR	F	19	2134
65-071-00-722	" "	W	V	2	3	57	97	107	5	LR	F	20	2133
65-071-00-711	Ghouchan	W	V	2	2	57	99	107	2	Br	F	26	2130
65-085-00-746	Lebanon	W	V	2	3	54	99	106	2	DV	F	25	2111
65-071-00-560	Safarghaleh, Darehgaz	W	VB	2	1	63	101	108	3	DR	F	30	2085
65-071-00-394	Nishabour	W	VB	2	2	63	102	110	2	LR	F	23	2062
65-071-00-577	Ghouchan	W	V	2	1	57	99	111	2	R	F	25	2049
65-117-00-262	Paraguay, 155, 213	W	BV	2	6	57	97	111	2	Br	F	18	2047
65-117-00-261	" 155, 212	W	BV	2	2	64	99	109	2	PV	F	18	2038
65-071-00-730	Barmadan, Nishabour	W	V	2	2	62	96	111	3	R	F	24	2031
65-071-00-564	Kermanshah	W	V	2	1	57	96	102	3	R	F	31	2030
65-071-00-732	Barmadan, Nishabour	W	V	3	4	57	96	111	2	DR	F	22	2027
65-071-00-752	Safarghaleh, Darehgaz	W	V	2	2	62	96	111	4	R	F	47	2014
65-071-00-701	Torbate-Heidarieh	W	V	2	3	56	97	105	3	DR	F	25	2005
65-071-00-709	Safarghaleh, Darehgaz	W	V	2	3	57	99	100	2	R	F	25	2005
65-071-00-724	Torbate-Heidarieh	W	V	2	2	57	96	108	3	DR	F	25	1987
65-027-00-172	Canada. 136, 692	W	V	2	4	54	97	109	5	LR	F	21	1982
65-071-00-729	Unknown	W	V	3	2	57	99	106	2	DR	F	22	1477
65-071-00-721	Safarghaleh, Darehgaz	W	V	2	2	62	98	111	2	R	F	25	1965
65-085-00-100	Lebanon Min: 132	W	V	2	2	57	99	104	3	DR	F	25	1962
65-071-00-704	Unknown	W	V	2	2	57	96	106	3	DR	F	24	1946
65-071-00-741	Ghouchan	W	V	2	2	57	96	110	6	R	F	22	1946
65-071-00-480	Esfahan	P	V	2	3	57	99	107	6	LCr	F	25	1936
65-071-00-747	Safarghaleh, Darehgaz	W	VB	2	4	57	99	111	6	R	F	25	1922
65-071-00-738	Ghouchan	W	V	2	2	58	96	107	6	LR	F	23	1909
65-071-00-479	Esfahan	W	V	2	3	57	96	107	2	BL	F	30	1880
65-071-00-705	Unknown	W	V	2	2	57	96	104	3	R	F	32	1872
65-157-00-076	California Light Red Kidney	W	V	2	1	62	99	112	3	BR	F	23	1868
65-071-00-483	Ghouchan	W	V	2	2	57	96	113	1	Cr	F	27	1841
65-096-00-124	Mexico 165, 419	P	V	3	3	54	89	104	5	Br	C	10	1830

Continued.....

TABLE 25

(1) Accession Number	(2) S O U R C E	(3) Flower Color	(4) Plant Type	(5) Stand	(6) Vigor	(7) Days to First Flower	(8) Days to First Maturity	(9) Days to complete maturity	(10) Disease Rating	(14) Seed color	(15) Seed Shape	(16) Seed Size	(17) Yield
65-071-00-361	Rasht	W	V	2	2	57	96	107	4	Dr	F	24	1819
65-096-00-125	Mexico 165, 433	P	B	3	4	54	94	107	4	Br	F	15	1806
65-157-00-018	Contender	P	B	2	2	50	95	106	4	Cr	F	25	1785
65-071-00-476	Ghouchan	P	V	2	3	57	96	107	6	Cr	F	23	1780
65-071-00-725	Torbate-Heidarieh	W	V	2	2	57	96	107	3	Dr	F	25	1765
65-032-00-269	Chilie 15, 071	P	VB	2	3	52	99	109	4	Cr	F	37	1765
65-071-00-745	Unknown	W	V	2	4	57	96	107	3	Dr	F	22	1764
65-071-00-718	Kermanshah	W	V	2	2	57	96	102	2	Cr	F	26	1758
65-071-00-472	Dashtsar, Amol	P	V	2	2	57	96	111	5	W	F	26	1758
65-071-00-723	Safarghaleh, Daregaz	W	V	2	2	57	96	111	2	R	F	13	1757
65-071-00-478	Dashtsar, Amol	P	B	2	3	51	96	107	4	Cr	F	30	1757
65-033-00-218	China 113, 367E	P	V	3	2	54	99	107	4	B1	F	30	1753
65-032-00-271	Chilie 151, 027	P	B	3	3	63	96	113	3	B1	F	20	1736
65-071-00-589	Red Kidney	P	B	3	2	47	97	109	4	R	F	37	1688
65-071-00-062	Cramberry, Bojnurd	P	V	2	2	64	102	110	4	Cr	F	33	1685
65-071-00-477	Esfahan	W	V	2	3	57	97	106	2	Br	F	26	1676
65-071-00-716	Ghouchan	W	V	2	4	57	99	107	4	R	F	20	1674
65-071-00-543	Esfahan	W	V	2	3	57	96	107	5	Dr	F	25	1670
65-071-00-751	Safarghaleh-Darehgaz	W	V	2	2	57	96	113	3	Dr	F	20	1598
65-071-00-715	Esfahan	W	V	2	3	57	99	107	4	Cr	F	25	1580
65-071-00-720	Safarghaleh-Darehgaz	W	V	2	3	64	99	111	3	Dr	F	22	1576
65-071-00-706	Barmadan, Nishabour	W	V	2	2	57	96	100	2	R	F	27	1574
65-076-00-140	Mexico 165, 417	P	V	2	3	53	97	106	4	B1	C	13	1518
65-027-00-176	Canada 136, 699	W	V	2	3	52	99	103	1	Cr	F	28	1516
65-027-00-071	Canada Red Mexican 36	W	B	3	3	49	94	109	3	R	F	25	1513
65-071-00-736	Kermanshah	W	V	2	3	62	102	111	3	LR	F	20	1492
65-157-00-017	Metissc	W	B	3	2	47	96	109	4	WB1	F	25	1448
65-071-00-754	Kermanshah	W	B	2	2	57	96	107	2	Cr	F	20	1430
65-071-00-714	Safarghaleh,Darehgaz	W	VB	2	3	62	106	115	4	R	F	18	1350
65-071-00-352	Golpayegan	P	B	4	3	53	96	106	5	R	C	41	1329
65-071-00-737	Kermanshah	W	B	2	5	52	95	104	4	Cr	C	32	1282
CV%													23
LSD .05													706

TABLE 26. Agronomic Data, Beans (red) Preliminary Yield Test, Planted May 24, 1967, RPIP, Karaj, Iran

(1) Accession Number	(2) Source	(3) Flower Color	(4) Plant type	(5) Stand	(6) Vigor	(7) Days to 1st flower	(8) Days to 1st Maturity	(9) Days to complete maturity	(10) Disease rating	(11) Pod shape	(12) Pod size	(13) Seeds per pod	(14) Seed color	(15) Seed shape	(16) Seed size	(17) Yield
65-071-00538	I-Safarghaleh Darehgaz	W	V	2	1	59	100	120	7	CF	M	6	R	F	25.7	3360
65-071-00735	I-Nishabour	W	V	2	1	56	96	125	6	CF	M	5	DR	F	29	3137
65-071-00733	I-Barmadan Nishabour	W	V	2	1	62	98	116	6	CF	M	6	DR	F	29.2	3043
65-071-00731	I-Barmadan Nishabour	W	V	2	1	68	88	120	6	CF	M	5	R	F	30.5	2897
65-071-00475	I-Chamchac Kermanshah	W	V	1	1	51	84	102	3	CF	M	6	CR	F	30.1	2844
65-117-00261	Paraguay 1551212	P	V	2	1	66	97	121	4	SC	L	7	Bk	C	26.0	2841
65-071-00394	I-Nishabour	W	V	2	1	62	98	120	6	CF	M	5	R	F	24.0	2816
65-071-00707	I-Safarghaleh Darehgaz	W	V	2	1	64	96	120	8	CF	M	5	R	F	26	2751
65-071-00734	I-Nishabour	W	V	2	1	62	98	121	6	CF	M	5	R	F	24.5	2710
65-071-00744	I-Torbat-heidarieh	W	V	2	1	53	86	107	4	CF	M	5	DR	F	30	2699
65-071-00730	I-Barmadan Nishabour	W	V	2	1	59	96	115	7	CF	M	5	R	F	25	2570
65-071-00062	I-Bojnurd	P	V	1	1	60	92	110	7	CF	M	5	Cr	F	34	2556
65-071-00713	I-Safarghaleh Darehgaz	W	V	2	1	65	100	118	7	CF	M	5	R	F	24	2548
65-071-00749	I-Barmadan Nishabour	W	V	2	1	56	90	113	8	CF	M	5	R	F	21	2540
65-071-00582	I-50 Esfahan	W	V	1	1	59	87	114	7	CF	M	5	DR	F	26	2478
65-071-00721	I-Safarghaleh Darehgaz	W	V	3	1	61	100	118	6	CF	M	5	R	F	26	2361
65-032-00271	Chilie 151227	P	V	4	3	60	95	119	3	CC	M	5	Bk	F	22	2354
65-071-00720	I-Safarghaleh Darehgaz	W	V	2	1	60	95	115	6	Cf	M	5	Dr	F	23	2321

Continued.....

TABLE. 26

(1) Accession Number	(2) Source	(3) Flower Color	(4) Plant type	(5) Stand	(6) Vigor	(7) Days to 1st flower	(8) Days to 1st maturity	(9) Days to complete maturity	(10) Disease rating	(11) Pod shape	(12) Pod size	(13) Seeds per pod	(14) Seed color	(15) Seed shape	(16) Seed size	(17) Yield
65-071-00569	I-Nishabour	W	V	2	1	65	99	120	7	CF	M	5	R	F	26	2314
65-062-00111	Guatmala 164,897	W	V	3	1	56	90	117	3	SC	L	5	L-Br	F	29	2310
65-071-00719	I-Safarghaleh Darehgaz	W	V	2	1	57	88	114	5	CC	M	5	R	F	19	2301
65-071-00751	I-Safarghaleh Darehgaz	W	V	2	1	60	98	120	8	CF	M	5	R	F	20	2298
65-071-00577	I-Ghouchan	W	V	2	1	59	100	122	6	CF	M	5	R	F	25	2283
65-071-00389	I-Ghouchan	W	V	1	1	58	94	122	6	CF	M	5	R	F	23	2240
65-071-00560	I-Safarghaleh Darehgaz	W	V	2	1	67	99	120	6	CF	M	5	R	F	27	2230
65-071-00405	I-Bam	W	V	2	1	50	87	108	7	CF	M	5	DR	F	28	2214
65-071-00742	I-Unknown	W	V	2	1	49	80	110	7	CF	M	5	DR	F	27	2202
65-071-00728	I-Unknown	W	V	2	2	54	85	108	4	CC	M	5	DR	F	29	2165
65-007-00292	Argentina	W	V	2	1	65	96	118	8	CR	M	6	R	F	29	2163
65-071-00537	I-Nishabour	W	V	2	1	62	95	122	8	CF	M	5	R	F	26	2121
65-071-00736	I-Kermanshah	W	V	2	1	61	91	117	7	CF	M	6	LR	F	20	2120
65-071-00477	I-Esfahan	W	V	2	1	46	85	112	4	CF	M	4	L-Br	F	26	2100
65-096-00125	Mexico	LP	V	2	1	56	94	121	8	CC	S	5	Bk	F	17	2088
65-027-00176	Canada 136,699	W	V	3	1	51	85	110	6	CC	M	5	Cr	C	23	2042
65-071-00103	I-Fars 104	W	V	2	1	56	88	108	6	CF	M	5	DR	F	24	2041
65-071-00702	I-Torbat-heidarieh	W	V	3	1	58	87	107	5	CF	M	5	R	F	30	2037
65-071-00753	I-Safarghaleh Darehgaz	W	V	2	2	58	95	119	8	CF	M	5	DR	F	23	2016
65-071-00712	I-Safarghaleh Darehgaz	W	V	2	1	61	96	121	6	CF	M	4	R	F	20	2014
65-157-00071	Redmerican 36	W	V	3	1	47	84	109	5	CF	M	5	R	F	29	1997
65-071-00361	I-Rasht	W	V	3	1	51	87	111	7	CF	M	5	DR	F	24	1991
65-071-00750	I-Nishabour	W	V	2	1	50	87	117	9	CF	M	5	R	F	23	1983
65-071-00704	I-Unknown	W	V	2	1	52	87	110	4	CF	M	5	DR	F	23	1972

Continued.....

TABLE. 26

(1) Accession Number	(2) Source	(3) Flower Color	(4) Plant type	(5) Stand	(6) Vigor	(7) Days to 1st flower	(8) Days to 1st maturity	(9) Days to complete maturity	(10) Disease rating	(11) Pod shape	(12) Pod size	(13) Seeds per pod	(14) Seed color	(15) Seed shape	(16) Seed size	(17) Yield
65-071-00708	I-Kermanshah	W	V	2	1	48	84	110	6	CF	M	6	R	F	26	1969
65-071-00740	I-Dashtsar, Amol	P	V	2	1	66	93	120	9	CF	M	4	Bk	F	28	1951
65-071-00714	I-Safarghaleh Darehgaz	W	V	2	1	62	97	121	7	CF	M	5	R	F	21	1949
65-071-00700	I-Safarghaleh Darehgaz	W	V	2	1	65	99	122	7	CC	M	5	R	F	20	1945
65-085-00746	Lebanon	W	V	2	1	50	85	102	6	CC	M	5	Cr	F	27	1938
65-085-00100	Lebanon 132	W	V	2	1	45	79	96	3	CF	M	5	R	F	29	1913
65-071-00723	I-Safarghaleh Darehgaz	W	V	2	1	55	92	121	7	CF	M	5	R	F	18	1907
65-071-00752	I-Safarghaleh Darehgaz	W	V	2	1	52	84	108	7	CC	M	5	DR	F	24	1904
65-071-00745	I-Unknown	W	V	2	1	53	88	109	7	CF	M	5	DR	F	24	1895
65-071-00306	I-Safarghaleh Darehgaz 235	W	V	2	1	55	95	120	7	CF	M	5	R	F	23	1867
65-071-00534	I-Torbat-heidarieh	W	V	3	1	55	84	111	4	CF	M	5	DR	F	28	1844
65-071-00339	I-Fars 104	W	V	2	1	52	82	101	4	CF	M	5	R	F	28	1843
65-071-00732	I-Barmadan Nishabour	W	V	2	1	49	82	105	6	CF	M	5	DR	F	24	1822
65-071-00472	I-Dashtsar-Amol	P	V	1	1	49	86	105	9	CF	S	4	Cr	F	23	1808
65-071-00729	I-Unknown	W	V	2	2	45	78	100	4	CC	M	5	DR	F	24	1783
65-117-00262	Paraguay 155, 213	P	V	3	2	59	97	124	3	SC	M	5	Bk	F	22	1774
65-071-00725	I-Torbat-heidarieh	W	V	2	1	51	85	109	4	CF	M	5	DR	F	24	1746
65-071-00743	I-Torbat-heidarieh	W	V	2	1	51	87	102	5	CC	M	5	DR	F	28	1714
65-071-00711	I-Ghouchan	W	V	2	1	50	84	105	2	CC	M	5	D-Br	F	24	1680
65-071-00724	I-Torbat-heidarieh	W	V	2	1	54	85	106	4	CF	M	5	DR	F	24	1677
65-071-00703	I-Unknown	W	V	2	1	53	86	107	4	CC	M	5	DR	F	30	1686
65-071-00476	I-Ghouchan	W	V	2	1	57	89	107	9	CF	M	5	Cr	F	26	1659
65-071-00722	I-Safarghaleh Darehgaz	W	V	2	1	51	84	106	8	CF	M	5	L-R	F	20	1617

Continued.....

TABLE. 26

(1) Accession Number	(2) Source	(3) Flower Color	(4) Plant type	(5) Stand	(6) Vigor	(7) Days to 1st flower	(8) Days to 1st maturity	(9) Days to complete maturity	(10) Disease rating	(11) Pod shape	(12) Pod size	(13) Seeds per pod	(14) Seed color	(15) Seed shape	(16) Seed size	(17) Yield
65-071-00483	I-Ghouchan	W	V	2	1	53	85	112	6	CC	M	5	Y	F	28	1607
65-071-00397	I-Sabzevar	W	V	2	1	49	87	117	5	CC	M	4	DR	F	25	1592
65-071-00727	I-Unknown	W	V	2	1	52	85	106	3	CF	M	5	R	F	26	1581
65-071-00701	I-Torbat-heidarieh	W	V	2	2	53	89	107	6	CC	S	5	DR	F	22	1564
65-071-00543	I-Esfahan	W	V	2	1	53	90	116	8	CF	M	4	DR	F	24	1559
65-071-00748	I-Barmadan Nishabour	W	V	2	1	63	97	120	6	CF	M	4	DR	F	24	1533
65-096-00124	Mexico 165,419	LP	V	2	1	54	90	121	8	CC	S	5	Bk	C	14	1489
65-157-00076		LP	B	2	1	58	87	113	8	SF	M	5	R	F	28	1447
65-071-00706	I-Barmadan Nishabour	W	V	2	1	45	78	100	3	CF	M	5	R	F	29	1443
65-071-00726	I-Torbat-heidarieh	W	V	2	2	57	88	113	3	CC	M	4	DR	F	22	1440
65-071-00564	I-Kermanshah	W	V	2	1	44	78	95	3	CF	M	4	R	F	29	1429
65-071-00717	I-Ghouchan	W	V	2	1	61	87	119	8	CF	S	5	Br	F	20	1378
65-071-00739	I-Unknown	W	V	2	2	50	83	100	5	CF	M	5	DR	F	27	1377
65-071-00709	I-Safarghaleh Darehgaz	W	V	1	2	46	79	93	3	CC	M	5	R	F	29	1371
65-071-00741	I-Ghouchan	W	V	3	2	60	92	122	9	CC	S	4	R	F	22	1365
65-071-00480	I-Esfahan	P	V	2	1	61	97	118	9	CF	M	4	Cr	F	25	1320
65-157-00017		W	B	2	1	52	96	119	8	SC	L	5	Bk	F	23	1307
65-071-00017	I-Safarghaleh Darehgaz	W	V	2	1	59	95	119	9	CF	M	5	R	F	23	1248
65-033-00218	China 113,367E	LP	B	2	1	49	84	112	7	CF	M	5	Bk	F	26	1234
65-071-00479	I-Esfahan	P	V	2	2	47	82	114	6	CF	M	5	Bk	C	27	1212
65-032-00269	Chilie 1511071	P	V	3	2	48	82	106	7	CF	M	4	Cr	F	36	1190
65-071-00705	I-Unknown	W	V	3	2	47	78	96	4	CF	M	4	R	F	26	1166
65-071-00710	I-Kermanshah	W	V	3	2	43	77	93	3	CC	M	5	R	F	28	1161

Continued.....

TABLE. 26

(1) Accession Number	(2) Source	(3) Flower Color	(4) Plant type	(5) Stand	(6) Vigor	(7) Days to 1st flower	(8) Days to 1st maturity	(9) Days to complete maturity	(10) Disease rating	(11) Pod shape	(12) Pod size	(13) Seeds per pod	(14) Seed color	(15) Seed shape	(16) Seed size	(17) Yield
65-157-00018	Comtender	W	V	2	2	45	88	116	4	SC	L	6	Cr	F	24	1155
65-071-00738	Ghouchan, I	W	V	2	1	55	88	118	9	CC	S	4	R	F	23	1075
65-071-00718	I-Kermanshan	W	V	2	2	44	80	111	5	CF	M	4	R	F	29	1068
65-027-00172	Canada 1361692	W	V	2	2	53	88	120	9	CF	M	5	R	F	24	987
65-071-00716	I-Ghouchan	W	V	2	1	60	95	120	9	CC	S	4	R	F	23	979
65-071-00478	I-Dashtsar, Amol	L-PU	B	2	2	54	93	118	8	SC	M	5	Cr	C	23	978
65-027-00176	Canada 136,699	W	V	2	2	47	80	111	7	CF	M	5	D-Ye	F	24	967
65-071-00715	I-Esfahan	W	V	2	1	52	90	118	8	CF	M	5	L-R	F	23	938
65-096-00140	Mexico 165,417	LP	V	1	1	50	93	127	8	CC	S	5	Bk	F	12	932
65-071-00737	I-Dashtsar, Amol	P	B	2	2	53	89	118	7	SC	L	4	Cr	C	30	898
65-157-00589	Red Kidneys	W	B	3	2	48	88	118	9	SF	L	4	LR	F	39	826
65-071-00352	I-Golpayegan	W	V	5	2	50	91	121	9	CC	L	4	R	C	41	648
CV %																24
LSD .05																427

TABLE 27 Agronomic Data, Beans (white) Preliminary Yield Test Planted May 11, 1967, Shiraz, Iran

(1) Accession Number	(2) SOURCE	(4) Plant Type	(7) Days to First Flower	(9) Days to Complete Maturity	(10) Disease Rating	(11) Pod Shape	(12) Pod Length	(13) Seeds per pod	(14) Seed color	(16) Seed Size	(17) Yield
65-071-00678	Chamchal,Kermanshah	V	54	106	2	CF	M	4	W	25	3028
65-071-00376	Shiraz	V	55	107	2	CF	M	5	W	30	2914
65-071-00679	Chamchal,Kermanshah	V	58	107	2	CF	M	4	W	25	2887
65-085-00688	Lebanon	V	51	106	2	CF	M	5	W	25	2828
65-071-00051	Min. 1365 Z	P	55	108	3	CF	M	5	W	30	2743
65-071-00697	Esfahan, Z	B	59	107	3	CF	M	4	W	20	2726
65-071-00515	Daghian,Ghouchan	V	57	109	4	CF	M	4	W	20	2723
65-071-00677	Chamchal,Kermanshah	V	56	107	2	CF	S	5	W	25	2704
65-071-00622	Karaj	B	54	109	2	CF	M	4	W	30	2705
65-071-00675	Karaj	B	57	107	3	CF	M	4	W	20	2704
65-071-00042	Shiraz	V	56	108	3	CF	M	4	W	25	2704
65-071-00652	Esfahan	B	55	104	3	CF	M	4	W	25	2764
65-071-00660	Daghian,Ghouchan	V	55	108	[illegible]	Sf	M	5	W	25	2644
65-085-00687	Lebanon	V	56	107	3	CF	M	4	W	25	2617
65-071-00628	Karaj, I	B	55	105	2	CF	M	4	W	25	2588
65-071-00683	Shiraz, I	V	55	108	3	CF	M	4	W	25	2579
65-071-00672	Karaj, I	V	56	106	1	CF	M	5	W	25	2574
65-085-00690	Lebanon	B	56	105	2	CF	M	5	W	25	2563
65-071-00694	Ghouchan, I	V	58	107	3	CF	S	4	W	20	2562
65-071-00663	Daghian,Ghouchan	V	59	110	5	CF	M	4	W	20	2556
65-071-00693	Shiraz	V	58	106	3	CF	M	4	W	30	2543
65-085-00698	Lebanon	V	55	105	2	SF	M	5	W	30	2540
65-071-00649	Unknown	V	54	107	3	CF	L	4	W	25	2535
65-071-00692	Dashtsar, Amol	V	55	106	2	SF	M	5	W	25	2535
65-071-00680	Chamchal,Kermanshah	B	52	106	2	CF	M	4	W	25	2531
65-071-00644	Shiraz	B	55	107	3	CF	M	4	W	30	2516
65-071-00671	Karaj	B	58	107	4	SF	L	5	W	30	2505
65-071-00621	Karaj	V	56	105	2	CF	M	3	W	30	2496
65-071-00629	Karaj	BV	58	107	3	CF	M	5	W	20	2494
65-071-00638	Shiraz, I	BV	56	107	2	SF	M	5	W	30	2491
65-071-00699	Unknowns	V	54	102	3	CF	M	4	W	25	2482

Continued.....

TABLE 27

(1) Accession Number	(2) S O U R C E	(4) Plant Type	(7) Days to First Flower	(9) Days to complete Maturity	(10) Disease Rating	(11) Pod Shape	(12) Pod Length	(13) Seeds per Pod	(14) Seed color	(16) Seed Size	(17) Yield
65-071-00335	Varamin	V	55	103	4	SF	M	6	W	25	2480
65-071-00661	Daghiam, Ghouchan	V	58	107	6	SF	M	4	W	25	2464
65-071-00512	Unknwon	V	57	107	1	CF	S	4	W	25	2461
65-071-00695	Esfahan	BV	55	105	4	CF	S	4	W	30	2456
65-085-00689	Lebanon	BV	55	104	3	SF	M	5	W	25	2439
65-071-00650	Unknown	V	53	107	1	CF	S	4	W	30	2433
65-071-00212	140-302 Iran	V	51	114	1	SF	L	3	W	45	2429
65-071-00666	Ghouchan	B	54	106	2	CF	M	4	W	25	2411
65-085-00646	Lebanon	V	51	103	2	CF	S	4	W	25	2400
65-071-00685	Shiraz-I	V	58	107	2	SF	M	4	W	25	2399
65-085-00645	Lebanon	BV	56	104	2	SF	M	5	W	30	2395
65-071-00657	Dashtsar, Amol	V	57	105	2	SF	M	5	W	30	2385
65-071-00643	Shiraz, I	BV	55	105	2	CF	S	4	W	30	2378
65-071-00662	Daghian, Ghouchan	V	57	111	6	SF	M	4	W	25	2372
65-071-00664	Chalatkou, Darehgaz	V	58	105	2	CF	M	5	W	30	2369
65-071-00104	Sarab, Min.:158	B	57	105	3	CF	M	5	W	25	2367
65-071-00651	Esfahan	V	51	104	2	CF	M	4	W	30	2367
65-071-00098	Fars	BV	56	106	3	CF	M	5	W	25	2364
65-071-00679	Karaj	V	51	103	2	CF	M	5	W	30	2360
65-071-00654	Esfahan	V	51	105	3	CF	M	4	W	25	2355
65-071-00642	Shiraz	V	58	104	3	CF	M	4	W	25	2351
65-027-00145	Canada 136, 680	BV	54	105	6	SF	S	5	W	20	2345
65-071-00314	Varamin Min.375	BV	51	106	2	CF	M	5	W	25	2342
65-071-00684	Shiraz	V	57	107	1	CF	M	4	W	25	2321
65-071-00637	Shiraz	BV	56	105	2	SF	M	4	W	30	2287
65-071-00623	Karaj	B	56	105	1	CF	M	3	W	25	2285
65-071-00636	Kermanshah, Champal	B	56	105	2	CF	M	4	W	25	2281
65-071-00633	" "	B	56	105	2	CF	M	4	W	25	2279
65-071-00634	" "	V	54	102	2	CF	S	4	W	30	2277
65-071-00626	Karaj - Iran	B	57	111	3	CF	M	4	W	20	2264
65-071-00696	Esfahan	B	57	104	5	SF	M	4	W	25	2262
65-071-00673	Karaj	BV	56	104	3	SF	M	5	W	25	2258
65-071-00675	Karaj	V	52	105	2	CF	M	5	W	25	2256
65-071-00693	Chalatkou, Daregaz	B	59	109	7	CF	M	5	W	25	2248

Continued

TABLE 27

(1) Accession Number	(2) SOURCE	(4) Plant Type	(7) Days to First Flower	(9) Days to complete Maturity	(10) Disease Rating	(11) Pod Shape	(12) Pod Length	(13) Seeds per Pod	(14) Seed color	(16) Seed Size	(17) Yield
65-071-00670	Karaj	V	55	105	2	CF	M	4	W	20	2247
65-071-00021	Ghouchan	V	56	106	3	SF	M	4	W	25	2241
65-071-00682	Shiraz	V	56	101	3	CF	M	3	W	30	2229
65-071-00620	Karaj	BV	57	106	3	CF	M	4	W	30	2221
65-071-00681	Shiraz	V	58	105	2	CF	M	W	W	25	2209
65-071-00635	Kermanshah, Chamchal	B	56	110	3	CF	M	5	W	30	2205
65-071-00641	Shiraz	BV	57	105	2	CF	M	5	W	25	2202
65-071-00495	Unknown, Z.	BV	57	106	3	CF	M	4	W	30	2200
65-085-00686	Lebanon	BV	59	102	3	CF	M	4	W	25	2198
65-071-00659	Daghian, Ghouchan	B	57	109	5	SF	M	4	W	25	2197
65-071-00655	Esfahan	V	57	107	4	CF	S	4	W	20	2192
65-071-00640	Shiraz	B	54	105	3	CF	M	4	W	30	2194
65-071-00667	Ghouchan	BV	56	107	4	CF	M	4	W	30	2169
65-071-00691	Unknown	BV	56	105	3	CF	M	4	W	25	2158
65-071-00627	Karaj	B	55	107	2	CF	M	3	W	30	2141
65-153-00190	Turkey, 1650008	B	51	112	2	SF	L	4	W	35	2131
65-157-00010	Blue Lake	V	57	107	3	SC	L	4	W	30	2121
65-071-00656	Dashtsar, Amol	V	54	102	2	CF	N	4	W	25	2120
65-071-00625	Karaj	B	56	110	3	CF	M	5	W	30	2089
65-157-00069	GN, 123	BV	51	104	2	SF	M	4	W	30	2076
65-071-00019	Isfahan	BV	54	107	2	CF	M	4	W	25	2075
65-071-00698	Unknown	V	57	107	3	CF	M	4	W	20	2050
65-071-00631	Kermanshah, Chamcahl	B	54	104	2	CF	M	5	W	30	2049
65-071-00665	Chalatkou, Daregaz	BV	56	107	6	CF	M	4	W	20	2046
65-071-00632	Kermanshah, Chamchal	BV	56	105	2	SF	M	4	W	25	2045
65-157-00081	Michigan	B	51	105	2	SF	S	4	W	20	2018
65-071-00624	Karaj	BV	56	113	3	CF	S	5	W	30	2004
65-071-00630	Kermanshah, Chamchal	V	53	106	4	CF	S	4	W	30	1995
65-085-00647	Lebanon	B	56	104	2	SF	M	4	W	25	1980
65-071-00653	Esfhan	V	58	104	2	CF	M	5	W	25	1926
65-096-00120	Mexico 165,427	V	50	109	4	SF	M	4	W	20	1843
65-071-00658	Dashtsar, Amol	V	51	118	2	CF	S	4	W	35	1841
65-027-00070	Canada Red Mexican 37	V	51	112	4	SF	BS	4	W	30	1833
65-118-00288	Peru 163, 372	B	59	112	1	SC	L	6	W	15	1757
65-143-00284	Switzerland 164, 096	V	51	105	2	SC	L	5	W	20	1398

TABLE 28. Agronomic Data, Bean (white) Preliminary Yield Test, Planted May 25 1967, RPIP, Karaj, Iran

(1) Accession Number	(2) Source	(3) Flower Color	(4) Plant type	(5) Stand	(6) Vigor	(7) Days to 1st flower	(8) Days to 1st maturity	(9) Days to complete maturity	(10) Disease rating	(11) Pod shape	(12) Pod size	(13) Seeds per pod	(14) Seed color	(15) Seed shape	(16) Seed size	(17) Yield
65-071-00512	I-Unknown	W	V	1	1	47	85	98	4	CF	M	5	W	F	25	2839
65-071-00658	I-Dashtsar-Amol	W	V	3	1	44	85	121	5	CF	L	4	W	F	43	2698
65-071-00621	I-Karaj	W	V	2	1	48	85	99	3	CF	M	6	W	F	27	2548
65-071-00515	I-Daghian Ghouchan	W	V	2	1	49	85	102	6	CF	M	5	W	F	22	2500
65-071-00633	I-Kermanshah Chamchal	W	V	2	1	46	83	96	3	CF	M	5	W	C	23	2465
65-071-00660	I-Daghian Ghouchan	W	V	3	1	44	86	107	7	CF	M	5	W	F	25	2434
65-071-00680	I-Kermanshah Chamchal	W	V	2	1	43	80	97	3	CF	M	4	W	F	25	2392
65-071-00626	I-Karaj	W	V	3	1	52	88	105	4	CF	M	5	W	F	20	2350
65-157-00081	Michigan	W	V	4	1	46	84	108	2	CC	S	5	W	C	19	2326
65-071-00622	I-Karaj	W	V	2	1	45	84	96	4	CC	M	4	W	C	27	2317
65-071-00677	I-Kermanshah Chamchal	W	V	2	1	41	82	99	3	CC	M	5	W	F	26	2294
65-071-00663	I-Daghian Ghouchan	W	V	2	1	51	91	112	8	CF	M	5	W	C	23	2285
65-071-00051	I-Min. 1365	W	V	2	1	46	82	97	4	CC	M	5	W	F	25	2281
65-071-00678	I-Chamchal Kermanshah	W	V	2	1	44	85	99	3	CC	M	5	W	C	26	2275
65-071-00620	I-Karaj	W	V	2	1	43	82	97	3	CF	M	5	W	F	29	2670
65-071-00694	I-Ghouchan	W	V	2	1	46	86	105	5	CC	M	5	W	F	19	2230
65-071-00698	I-Unknown	W	V	2	1	50	84	101	6	CC	M	5	W	C	17	2226
65-071-00696	I-Esfahan	W	V	3	1	46	82	99	7	CF	M	5	W	F	24	2220
65-071-00697	I-Esfahan	W	V	2	1	48	84	98	4	CF	M	5	W	F	22	2209
65-071-00675	I-Karaj	W	V	2	1	46	82	98	3	CC	M	5	W	F	28	2204
65-071-00655	I-Esfahan	W	V	2	1	47	86	103	5	CC	M	5	W	C	20	2203
65-071-00644	I-Shiraz	W	V	2	1	42	84	98	3	CC	M	5	W	F	29	2193
65-071-00685	I-Shiraz	W	V	2	1	44	82	97	3	CF	M	5	W	F	26	2191

Continued.

(1) Accession Number	(2) Source	(3) Flower Color	(4) Plant type	(5) Stand	(6) Vigor	(7) Days to 1st flower	(8) Days to 1st maturity	(9) Days to complete maturity	(10) Disease rating	(11) Pod shape	(12) Pod size	(13) Seeds per pod	(14) Seed color	(15) Seed shape	(16) Seed size	(17) Yield
65-071-00042	I-Shiraz 10	W	V	2	1	43	80	95	4	CF	M	5	W	F	25	2188
65-071-00314	I-Varamin 375	W	V	2	1	43	83	99	4	CC	M	5	W	C	25	2168
65-071-00682	I-Shiraz	W	V	2	1	50	84	98	4	CF	M	5	W	F	25	2148
65-071-00661	I-Daghian Ghouchan	W	V	3	1	48	87	109	9	CF	M	5	W	F	25	2148
65-071-00672	I-Karaj	W	V	2	1	43	79	96	4	CF	M	5	W	F	25	2147
65-071-00652	I-Esfahan	W	V	2	1	43	79	98	3	CC	M	5	W	F	23	2096
65-071-00654	I-Esfahan	W	V	2	1	46	81	96	4	CC	M	5	W	C	27	2086
65-071-00657	I-Dashtsar-Amol	W	V	3	1	46	80	97	4	CF	M	5	W	F	25	2085
65-071-00671-	I-Karaj	W	V	2	1	46	83	99	4	CF	M	5	W	F	28	2084
65-071-00639	I-Shiraz	W	V	3	1	45	81	101	4	CF	M	5	W	C	26	2083
65-071-00674	I-Karaj	W	V	2	2	41	79	96	3	CC	M	5	W	F	26	2079
65-071-00662	I-Daghian Ghouchan	W	V	2	1	49	86	105	8	CF	M	5	W	F	23	2078
65-071-00659	I-Daghian Ghouchan	W	V	2	1	49	86	107	7	CF	M	5	W	F	24	2051
65-071-00495	I-Unknown	W	V	2	1	50	84	98	5	CF	M	5	W	F	25	2042
65-071-00679	I-Chamchal Kermanshah	W	V	2	1	44	92	98	7	CF	M	4	W	F	25	2038
65-153-00190	Turkey 165, 008	W	V	3	1	46	89	114	2	CC	L	4	W	C	36	2035
65-071-00636	I-Chamchal Kermanshah	W	V	2	1	52	86	102	3	CC	M	5	W	C	20	2033
65-071-00695	I-Esfahan	W	V	2	1	45	82	97	6	CF	M	4	W	F	26	2025
65-071-00628	I-Karaj	W	V	2	1	42	81	94	2	CC	M	4	W	C	26	2024
65-071-00642	I-Shiraz	W	V	2	1	44	79	94	3	CF	M	5	W	F	26	2001
65-071-00623	I-Karaj	W	V	2	2	47	81	99	4	CF	M	5	W	F	26	2001
65-071-00699	I-Unknown	W	V	2	2	40	81	97	3	CF	M	5	W	F	24	1999
65-071-00653	I-Esfahan	W	V	2	1	47	82	94	4	CF	M	5	W	F	22	1969
65-071-00693	I-Darehgaz Chalathuk	W	V	3	1	53	91	113	3	CF	M	5	W	F	23	1962

Continued.....

TABLE. 28

(1) Accession Number	(2) Source	(3) Flower Color	(4) Plant type	(5) Stand	(6) Vigor	(7) Days to 1st flower	(8) Days to 1st maturity	(9) Days to complete maturity	(10) Disease rating	(11) Pod shape	(12) Pod size	(13) Seed per pod	(14) Seed color	(15) Seed shape	(16) Seed size	(17) Yield
65-071-00651	I-Esfahan	W	V	2	1	43	79	95	3	CF	M	5	W	C	28	1948
65-071-00692	I-Dashtsar, Amol	W	V	3	1	41	82	99	4	CF	M	5	W	F	25	1944
65-071-00641	I-Shiraz	W	V	2	1	46	80	96	4	CF	M	6	W	F	25	1943
65-071-00629	I-Karaj	W	V	2	1	52	85	99	3	CF	M	5	W	F	22	1937
65-071-00691	I-Unknown	W	V	1	1	43	80	96	6	CF	M	5	W	C	25	1937
65-085-00645	Lebanon	W	V	2	1	45	83	96	2	CC	M	5	W	F	26	1934
65-071-00637	I-Shiraz	W	V	2	1	45	81	94	4	CF	M	6	W	F	27	1925
65-071-00640	I-Shiraz	W	V	2	1	42	82	97	4	CC	M	4	W	C	27	1917
65-157-00010	Blue Lake	W	V	2	1	46	85	105	3	CC	L	5	W	F	27	1914
65-071-00335	I-Varamin, 382	W	V	2	1	45	83	98	4	CF	M	5	W	F	23	1903
65-071-00666	I-Ghouchan	W	V	2	2	43	82	98	2	CF	M	5	W	F	26	1900
65-071-00625	I-Karaj	W	V	2	1	49	84	97	3	CF	M	5	W	F	25	1886
65-085-00646	Lebanon	W	V	2	1	45	82	97	2	CF	M	5	W	F	29	1871
65-071-00656	I-Dashtsar, Amol	W	V	3	1	43	79	96	4	CF	M	5	W	F	26	1869
65-071-00686	Lebanon	W	V	2	1	47	82	96	3	CC	M	5	W	C	22	1866
65-085-00690	Lebanon	W	V	2	1	43	79	94	3	CC	M	5	W	C	25	1860
65-071-00670	I-Karaj	W	V	2	1	42	78	95	4	CF	M	5	W	F	24	1849
65-071-00684	I-Shiraz	W	V	3	1	45	80	96	3	CF	M	5	W	F	25	1832
65-071-00676	I-Karaj	W	V	2	1	44	82	97	3	CF	M	5	W	F	25	1829
65-071-00650	I-Unknown	W	V	2	1	45	84	97	2	CC	M	5	W	F	26	1829
65-071-00019	I-Esfahan	W	V	3	1	44	80	94	3	CF	M	5	W	F	25	1828
65-085-00648	Lebanon	W	V	3	2	45	81	97	4	CF	M	5	W	F	27	1819
65-096-00120	Mexico 165,427	W	V	3	2	46	87	110	5	CF	M	5	W	F	22	1818
65-071-00681	I-Shiraz	W	V	2	1	45	82	98	3	CF	M	5	W	F	26	1797
65-071-00098	I-Fars	W	V	2	1	45	85	101	3	CC	S	4	W	C	21	1791
65-071-00649	I-Unknown	W	V	2	2	41	81	97	2	CF	M	5	W	F	25	1790
65-071-00104	I-Sarab	W	V	2	1	47	81	97	5	CC	M	5	W	C	25	1783
65-071-00627	I-Karaj	W	V	1	2	43	84	95	2	CC	M	4	W	F	27	1771
65-071-00683	I-Shiraz	W	V	2	1	46	82	102	5	CF	M	5	W	F	23	1767
65-071-00021	I-Ghouchan	W	V	2	1	44	83	106	6	CF	M	5	W	F	24	1759
65-071-00643	I-Shiraz	W	V	3	1	44	83	101	3	CC	M	5	W	F	26	1756

Continued.....

TABLE. 28

(1) Accession Number	(2) Source	(3) Flower Color	(4) Plant type	(5) Stand	(6) Vigor	(7) Days to 1st flower	(8) Days to 1st maturity	(9) Days to complete maturity	(10) Disease rating	(11) Pod shape	(12) Pod size	(13) Seed per pod	(14) Seed color	(15) Seed shape	(16) Seed size	(17) Yield
65-071-00638	I-Shiraz	W	V	2	2	47	84	97	3	CF	M	5	W	F	27	1751
65-071-00630	I-Kermanshah Chamchal	W	V	2	2	41	84	97	3	CF	M	4	W	C	27	1738
65-071-00212	Iran 140,302	W	V	3	1	46	92	120	2	CF	M	4	W	F	41	1735
65-071-00673	I-Karaj	W	V	2	1	46	81	100	3	CC	M	5	W	F	22	1724
65-118-00288	Peru, 163,372	W	V	3	1	59	97	116	1	SC	L	6	W	P	17	1711
65-157-00069	Great Northern 123	W	V	3	1	42	81	98	6	CF	M	5	W	F	28	1698
65-085-00689	Lebanon	W	V	2	1	43	78	94	4	CC	M	5	W	C	24	1686
65-085-00688	Lebanon	W	V	2	2	42	83	95	3	CC	M	4	W	F	25	1648
65-071-00376	I-Shiraz	W	V	3	2	45	82	101	4	SF	S	4	W	C	26	1646
65-071-00624	I-Karaj	W	V	3	2	45	85	96	3	CF	M	5	W	F	27	1644
65-071-00664	I-Chalat-kou Darehgaz	W	V	2	1	44	78	95	3	CF	M	5	W	F	26	1633
65-071-00631	I-Kermanshah Chamchal	W	V	2	2	45	82	96	2	CF	M	5	W	F	27	1607
65-071-00635	I-Kermanshah Chamchal	W	V	2	1	47	84	99	3	CC	M	5	W	C	26	1583
65-085-00687	Lebanon	W	V	2	1	45	81	95	2	CF	M	5	W	F	25	1582
65-071-00632	I-Kermanshah Chamchal	W	V	3	1	42	80	93	2	CF	M	5	W	F	24	1568
65-071-00665	I-Chalat-kou Darehgaz	W	V	3	1	55	89	110	7	CF	M	5	W	F	24	1568
65-071-00667	I-Ghouchan	W	V	3	2	45	80	97	3	CF	M	5	W	F	26	1551
65-085-00647	Lebanon	W	V	3	2	42	81	97	2	CF	M	5	W	F	24	1534
65-071-00634	I-Kermanshah Chamchal	W	V	3	1	44	82	95	3	CC	M	5	W	C	25	1373
65-027-00145	Canada 136,680	W	V	4	2	45	89	112	6	CF	S	6	W	PL		1193
65-027-00070	Canada	W	V	3	2	45	87	114	4	CF	M	5	W	F	20	1060
65-143-00284	Switzerland 164.096	W	V	2	2	43	89	105	2	CC	L	5	W	C	19	1034

TABLE 29. Agronomic Data, Bean (Pinto) Uniform Yield Test, Planted May 10, 1967, Shiraz, Ira

(1) Accession number	(2) Source	(3) Flower color	(4) Plant type	(5) Stand	(6) Vigor	(7) Days to 1st flower	(8) Days to 1st maturity	(9) Days to complete maturity	(10) Disease rating	(11) Pod shape	(12) Pod length	(13) Seeds per pod	(15) Seed shape	(16) Seed size	(17) Yield
65-071-00445	I-Kermanshah	P	V	2	2	58	94	110	3	CF	M	4	F	27	2822
65-071-00455	I-Torbat-heidarieh	P	V	3	2	57	94	110	2	CF	M	4	F	27	2730
65-157-00072	Pinto 111	W	V	2	4	46	80	98	3	CF	M	3	F	32	2183
65-071-00452	Ghouchan-I	P	V	1	2	59	92	116	5	SF	S	4	F	22	2164
65-071-00449	I-Chouchan	P	V	1	4	57	93	110	7	SF	M	4	F	28	2094
65-157-00068	Pinto Columbia	W	V	1	3	45	80	98	3	CF	M	4	F	35	2050
65-071-00446	I-Esfahan	LP	B	3	5	48	89	117	5	CF	M	4	F	40	1708
65-071-00460	I-Kermanshah	LP	B	2	4	55	97	105	5	SF	M	4	F	31	1622
65-071-00463	I-Abasabad-torbat	LP	V	3	4	56	96	130	5	SF	M	3	F	41	1535
65-071-00458	I-Esfahan	LP	V	2	5	47	88	119	4	SF	M	4	C	40	1489

TABLE 30. Agronomic Data, Beans (pinto) Uniform Yield Test, Planted April 23, 1967, RPIP, Varamin, Iran

(1) Accession Number	(2) Variety or Source	(3) Flower Color	(4) Plant type	(5) Stand	(6) Vigor	(7) Days to 1st flower	(8) Days to 1st maturity	(9) Days to complete maturity	(10) Disease rating	(11) Pod shape	(12) Pod length	(13) Seed per pod	(14) Seed color	(15) Seed shape	(16) Seed size	(17) Yield
65-071-00455	I-Torbat-heidarieh	P	V	1	1	41	81	106	1.3	CF	M	6	Pi-M	F	24	1980
65-157-00068	Columbia Pinto	W	V	1	2	35	72	98	1.0	CF	M	5	Cr-M	F	38	1950
65-071-00445	I-Kermanshah	P	V	1	1	42	78	108	1.3	CF	M	5	Cr-M	F	28	1930
65-157-00072	Pinto 111	W	V	1	2	34	70	98	1.3	CF	M	4	Cr-M	F	30	1580
65-071-00452	I-Ghouchan	P	V	1	1	43	85	109	2.6	CC	S	5	Pi-M	Pl	21	1470
65-071-00449	I-Ghouchan	P	V	1	1	43	89	117	5.0	CC	M	5	Pi-M	F	25	1400
65-071-00458	I-Esfahan	LP	V	1	2	47	77	105	1.3	SC	M	5	Cr-M	Pl	38	1370
65-071-00446	I-Esfahan	LP	V	2	2	44	73	103	1.3	SC	L	5	Cr-M	C	39	1310
65-071-00463	I-Abasabad Torbat	LP	V	2	1	48	104	121	1.6	SC	M	5	Cr-M	Pl	40	720
65-071-00460	I-Kermanshah	LP	V	3	1	49	106	120	1.3	SC	M	5	Cr-M	Pl	30	500
CV %																18
LSD .05																370

TABLE 31. Agronomic Data, Beans (Pinto) Uniform Yield Test, Planted May 24, 1967, RPIP, Karaj, Iran

(1) Accession Number	(2) Variety or Source	(3) Flower Color	(4) Plant type	(5) Stand	(6) Vigor	(7) Days to 1st flower	(8) Days to 1st maturity	(9) Days to complete maturity	(10) Disease rating	(11) Pod shape	(12) Pod length	(13) Seed per pod	(14) Seed color	(15) Seed shape	(16) Seed size	(17) Yield
65-071-00455	I-Torbat-heidarieh	P	V	1	1	47	83	97	1	CF	M	5	R-M	F	26	2058
65-071-00445	I-Kermanshah	P	V	2	1	49	83	96	2	CF	M	5	Cr-M	F	27	2018
65-071-00452	I-Ghouchan	P	V	2	1	51	85	102	3	CF	M	5	R-M	F	25	1950
65-071-00449	I-Ghouchan	P	V	2	1	53	88	102	3	CF	M	4	R-M	F	27	1877
65-157-00068	Pinto columbia	W	V	2	1	43	75	87	2	CF	M	4	Cr-M	F	33	1411
65-157-00072	Pinto 111	W	V	2	2	42	75	87	2	CF	M	4	Cr-M	F	32	1315
65-071-00446	I-Esfahan	W	V	3	1	43	[illegible]	98	2	CF	M	4	Cr-M	F	40	1272
65-071-00458	I-Esfahan	W	V	2	1	44	86	104	2	SC	M	4	Cr-M	P	41	862
65-071-00463	I-Abasabad Torbat	W	V	3	1	49	102	128	1	SC	M	4	Cr-M	P	41	579
65-071-00460	I-Kermanshah	W	V	3	1	58	103	129	1	SC	M	5	Cr-M	P	30	536
CV %																35
LSD .05																395

TABLE 32. Agronomic Data, Bean (red) Uniform Yield Test, Planted May 10, 1967, Shiraz, Iran

(1) Accession number	(2) Source	(3) Flower color	(4) Plant type	(5) Stand	(6) Vigor	(7) Days to 1st flower	(8) Days to 1st maturity	(9) Days to complete maturity	(10) Disease rating	(12) Pod size	(14) Seed color	(16) Seed size	(17) Yield
65-071-00536	I-Torbat-heidarieh	W	V	8	5	74	110	125	2	M	DR	22	3056
65-071-00540	I-Torbat-heidarieh	W	V	3	5	76	110	128	3	M	R	22	3014
65-085-00440	Lebanon	W	V	3	4	75	111	126	5	M	R	25	2871
65-071-00565	I-Dashtsar	W	V	3	5	74	110	125	4	M	R	22	2787
65-071-00431	I-Unknown	W	V	3	4	70	109	123	3	M	R	27	2748
65-071-00541	I-Esfahan	W	V	3	5	77	110	121	4	M	DR	26	2709
65-071-00535	I-Torbat-heidarieh	W	V	3	5	80	113	127	3	L	R	21	2699
65-071-00481	I-Ghouchan	W	V	2	5	75	112	125	4	M	Cr	25	2699
65-071-00580	I-Darehgaz	W	V	3	5	78	111	126	2	9	R	20	2696
65-071-00573	I-Unknown	W	V	3	5	71	109	120	3	8	DR	20	2684
65-071-00539	I-Nishabour	W	V	3	6	81	112	121	3	M	DR	20	2634
65-071-00430	I-Unknown	W	V	4	5	70	107	120	3	M	DR	24	2547
65-071-00566	I-Esfahan	W	V	3	4	70	110	120	3	M	R	20	2546
65-071-00551	I-Esfahan	W	V	3	4	70	106	120	4	M	DR	22	2533
65-071-00581	I-Darehgaz	W	V	2	6	81	113	126	2	M	R	20	2396
65-071-00563	I-Nishabour	W	V	3	6	59	110	125	2	M	DR	17	2392
65-085-00434	Lebanon	W	V	3	5	72	107	120	4	M	DR	23	2384
65-071-00557	I-Kermanshah	W	V	3	6	74	109	124	4	M	DR	25	2365
65-071-00582	I-Esfahan, 50	W	V	3	5	72	108	119	3	M	DR	22	2334
65-071-00534	I-Torbat-heidarieh	W	V	4	5	70	110	123	3	M	DR	23	2248
65-071-00484	I-Ghouchan	P	V	2	5	73	110	124	5	M	Bk	20	2171
65-157-00004	Wade	P	B	5	5	57	107	123	2	L	DP	40	1733
65-071-00057	I-Min. 2394	P	B	6	4	57	107	123	2	L	DP	39	1700
65-071-00589	I-Min. Red kidney	P	B	4	4	61	106	124	6	L	R	26	1691
65-071-00047	I-Min. 394	P	B	6	4	57	106	124	2	L	DP	36	1537

TABLE 33. Agronomic Data, Beans (red) Uniform Yield Test, Planted April 23, 1967, RPIP, Varamin, Iran

(1) Accession Number	(2) Variety or source	(3) Flower color	(4) Plant type	(5) Stand	(6) Vigor	(7) Days to 1st flower	(8) Days to 1st maturity	(9) Days to complete maturity	(10) Disease rating	(11) Pod shape	(12) Pod length	(13) Seed per pod	(14) Seed color	(15) Seed shape	(16) Seed size	(17) Yield
65-085-00440	Lebanon	W	V	2	1	44	90	116	2	CF	M	5	LR	[illegible]	25	2080
65-071-00430	I-Unknown	W	V	3	2	45	86	112	1	CC	M	5	Br	[illegible]	25	2020
65-071-00534	I-Torbat-heidarieh	W	V	2	1	44	87	106	2	CF	M	6	DR	F	28	2000
65-071-00536	I-Torbat-heidarieh	W	V	2	1	42	82	107	2	CC	M	5	DR	F	20	1850
65-071-00557	I-Kermanshah	W	V	2	2	41	88	110	2	CF	M	5	Br	F	25	1790
65-085-00434	Lebanon	W	V	2	1	44	88	117	2	CF	M	5	DR	F	23	1790
65-071-00541	I-Esfahan	W	V	1	2	43	87	110	2	CF	M	5	DR	F	25	1790
65-071-00573	I-Unknown	W	V	2	2	42	85	104	2	CF	M	5	DR	F	23	1720
65-071-00551	I-Esfahan	W	V	2	2	43	86	107	3	CF	M	5	DR	F	23	1720
65-071-00582	I-Esfahan 50	W	V	2	1	42	83	114	2	CF	M	5	DR	F	25	1700
65-071-00431	I-Unknown	W	V	2	1	42	86	110	2	CF	M	5	LR	F	25	1620
65-071-00047	I-Min. 394	LP	B	2	2	42	82	106	2	SC	L	5	DP	C	34	1580
65-157-00004	Wade	LP	B	3	2	43	85	113	2	CC	L	5	DP	C	34	1470
65-071-00566	I-Esfahan	W	V	2	1	43	86	117	2	CF	M	5	R	F	20	1450
65-071-00484	I-Ghouchan	P	V	1	1	42	86	118	4	CF	M	5	Bl	F	19	1290
65-157-00589	Red Kidney	LP	B	3	2	42	80	109	3	SC	M	4	LR	F	38	1250
65-071-00539	I-Nishabour	W	V	1	1	46	99	119	1	CF	M	5	R	F	20	1080
65-071-00481	I-Ghouchan	W	V	3	1	43	97	117	4	CC	S	5	Cr	F	18	1080
65-071-00563	I-Nishabour	W	V	2	1	49	95	118	2	CF	M	5	R	F	18	950
65-071-00565	I-Dashtsar	W	V	2	1	49	95	118	3	CF	M	5	R	F	25	930
65-071-00057	I-Min. 2394	LP	B	48	3	42	85	112	2	CC	M	5	DP	C	33	890
65-071-00535	I-Torbat-heidarieh	W	V	2	1	52	98	120	2	CF	M	5	R	F	20	470
65-071-00580	I-Darehgaz	W	V	2	1	51	102	122	2	CF	M	5	R	F	23	370

CV % 21
LSD .05 450

TABLE 34. Agronomic Data, Beans (red) Uniform Yield Test, Planted May 24, 1967, RPIP, Karaj, Iran

(1) Accession number	(2) Variety or Source	(3) Flower color	(4) Plant type	(5) Stand	(6) Vigor	(7) Days to 1st flower	(8) Days to 1st maturity	(9) Days to complete maturity	(10) Disease rating	(11) Pod shape	(12) Pod length	(13) Seed per pod	(14) Seed color	(15) Seed shape	(16) Seed size	(17) Yield
65-071-00580	I-Darehgaz	W	V	1	1	56	91	121	3	CF	M	5	R	F	25	3269
65-071-00581	I-Darehgaz	W	V	2	1	61	95	121	2	CF	M	5	R	F	24	3189
65-071-00535	I-Torbat-heidarieh	W	V	2	1	55	94	118	2	CF	M	5	R	F	25	3138
65-071-00539	I-Nishabour	W	V	1	1	60	92	118	2	CF	M	5	R	F	23	2993
65-071-00582	I-Esfahan 30	W	V	2	1	47	86	96	2	CF	M	5	DR	F	25	2950
65-071-00481	I-Ghouchan	W	V	1	1	52	89	110	3	CF	S	5	LBr	F	19	2895
65-071-00563	I-Nishabour	W	V	1	1	55	98	117	2	CF	M	5	DR	F	21	2855
65-071-00536	I-Torbat-heidarieh	W	V	2	1	45	87	100	3	CF	M	5	DR	F	22	2828
65-071-00540	I-Dashtsar	W	V	2	1	61	93	118	2	CF	M	5	R	F	25	2752
65-071-00565	I-Dashtsar	W	V	1	1	54	105	114	3	CF	M	5	R	F	27	2619
65-071-00431	I-Unknown	W	V	2	1	47	82	96	2	CF	M	4	R	F	30	2588
65-071-00551	I-Esfahan	W	V	1	1	46	83	97	3	CF	M	5	DR	F	25	2501
65-085-00440	Lebanon	W	V	2	1	53	87	103	3	CF	M	5	R	F	28	2455
65-085-00434	Lebanon	W	V	2	1	48	85	98	3	CF	M	5	DR	F	27	2356
65-071-00541	I-Esfahan	W	V	2	1	53	87	99	3	CF	M	5	DR	F	26	2287
65-071-00534	I-Torbat-heidarieh	W	V	2	1	51	85	97	2	CF	M	5	DR	F	29	2252
65-071-00566	I-Esfahan	W	V	2	1	46	85	99	2	CF	M	5	R	F	23	2133
65-071-00573	I-Unknown	W	V	2	1	47	83	97	3	CF	M	5	DR	F	25	2129
65-071-00430	I-Unknown	W	V	1	1	45	80	93	2	CF	M	4	DR	F	25	2113
65-071-00484	I-Ghouchan	P	V	2	1	48	88	100	3	CF	M	5	BC	F	21	2034
65-071-00557	I-Kermanshah	W	V	2	1	46	83	97	3	CF	M	5	DR	F	27	1974
65-071-00057	I-Min. 2394	LP	B	3	1	42	87	105	1	SC	L	4	DPu	C	34	1819
65-071-00047	I-Min. 394	LP	B	4	1	47	88	113	1	SC	L	4	DPu	C	32	1818
65-157-00004	Wade	LP	B	3	1	46	88	105	1	SC	L	4	DPu	C	35	1642
65-157-00589	Red kidney	W	B	3	1	45	84	107	4	SF	L	4	R	F	37	1041

TABLE 35 Agronomic Data, Bean (White) Uniform Yield Test, Planted May 10, 1967, Shiraz, Iran

(1) Accession Number	(2) SOURCE	(3) Flower color	(4) Plant Type	(5) Stand	(6) Vigor	(7) Days to First Flower	(8) Days to First Maturity	(9) Days to complete Maturity	(10) Disease Rating	(11) Pod Shape	(12) Pod Size	(13) Seeds per Pod	(14) Seed color	(15) Seed Shape	(16) Seed Size	(17) Yield
65-071-00525	Isfahan-Iran	W	V	3	3	64	-	109	2	CF	M	4	W	-	24	2879
65-071-00506	" "	W	V	3	2	64	-	108	3	CF	M	4	W	-	24	2822
65-071-00490	Unknown	W	V	3	1	64	-	111	4	CF	M	4	W	-	21	2800
65-071-00[illegible]	Kermanshah	W	V	2	2	64	-	107	2	CF	M	5	W	-	24	2749
65-071-0[illegible]	Unkown, I.	W	V	2	2	64	-	111	3	CF	M	5	W	-	18	2714
65-121-[illegible]	Lebanon 73	W	V	3	3	61	-	107	3	CF	M	5	W	-	21	2706
65-071-[illegible]	Karaj, I.	W	V	2	2	61	-	109	3	CF	M	5	W	-	22	2692
65-071-00042	Shiraz, Iran	W	V	3	3	64	-	109	2	CF	M	4	W	-	24	2686
65-071-00054	Isfahan, Il	W	V	3	3	64	-	109	3	CF	M	4	W	-	19	2679
65-071-00474	Isfahan, I.	P	V	2	2	62	-	111	7	CF	M	4	LCr	-	25	2631
65-071-00516	Darehgaz, I.	W	V	2	3	62	-	107	4	CF	S	4	W	-	24	2615
65-071-00517	Ghouchan, I.	W	V	3	2	63	-	109	2	CF	M	4	W	-	20	2605
65-157-00014		W	V	3	3	61	-	108	3	CF	M	4	W	-	21	2598
65-071-00470	Kermanshah, I.	W	B	2	2	64	-	109	3	CF	M	4	Cr	-	22	2578
65-071-00505	Shiraz, I.	W	V	3	3	61	-	107	3	CF	S	3	W	-	26	2553
65-071-00515	Ghouchan, I.	W	V	1	1	64	-	111	3	CF	M	4	W	-	18	2546
65-071-00503	Karaj, I.	W	V	4	2	62	-	108	3	CF	M	4	W	-	24	2513
65-157-00067	Great Northern40	W	V	3	3	48	-	100	1	CF	M	4	W	-	26	2501
65-157-00073	Great Northern 31	W	V	3	4	48	-	105	3	CF	S	3	W	-	29	2479
65-071-00064	Bojnourd, I.	W	V	3	3	61	-	108	2	CF	M	4	W	-	23	2420
65-071-00050	Karaj, I.	W	B	3	3	62	-	109	3	CF	M	4	W	-	22	2380
65-085-00494	Lebanon	W	V	2	2	64	-	109	2	CF	M	4	W	-	14	2371
65-157-00069	Great Northern	W	V	3	4	51	-	102	2	CF	M	4	W	-	25	2304
65-071-00497	Ghouchan, I	W	V	3	1	64	-	109	6	CF	M	4	W	-	20	2113
65-071-00052	Min 1396, I	P	B	4	5	48	-	105	5	CC	L	3	LCr	-	27	2081

TABLE 36. Agronomic Data, Beans (white) Uniform Yield Test, Planted April 23, 1967, RPIP, Varamin, Iran

(1) Accession number	(2) Variety or Source	(3) Flower color	(4) Plant type	(5) Stand	(6) Vigor	(7) Days to 1st flower	(8) Days to 1st maturity	(9) Days to complete maturity	(10) Disease rating	(11) Pod shape	(12) Pod length	(13) Seeds per pod	(14) Seed color	(15) Seed shape	(16) Seed size	(17) Yield
65-071-00470	I-Kermanshah	W	V	2	1	44	87	106	2	CF	M	5	Cr	F	25	1660
65-071-00042	I-Shiraz	W	V	3	2	43	81	104	2	CF	M	6	W	F	24	1470
65-157-00014	Haubres St. andres	W	V	2	1	45	79	109	2	CF	M	5	W	F	22	1470
65-121-00583	Lebanon, 3	W	V	3	2	46	85	109	2	CF	M	6	W	F	20	1470
65-071-00505	I-Shiraz	W	V	2	1	45	85	110	2	CF	M	5	W	F	28	1450
65-071-00503	I-Karaj	W	V	2	2	46	92	100	2	CF	M	5	W	F	27	1450
65-071-00517	I-Ghouchan	W	V	3	1	46	83	103	1	CF	M	5	W	F	22	1430
65-071-00515	I-Ghouchan	W	V	2	1	45	87	115	2	CF	M	5	W	F	19	1410
65-071-00516	I-Darehgaz	W	V	3	2	45	85	104	2	CC	M	5	W	F	28	1410
65-071-00040	I-Kermanshah	W	V	2	2	44	84	105	2	CC	M	5	W	F	25	1370
65-157-00073	Great Northern 31	W	V	3	2	43	78	105	2	CF	M	5	W	F	35	1350
65-071-00424	I-Karaj	W	V	3	1	44	83	112	2	CF	M	6	W	F	25	1310
65-071-00054	I-Esfahan	W	V	3	1	45	86	110	2	CF	M	5	W	F	25	1300
65-071-00525	I-Esfahan	W	V	2	2	43	86	107	2	CF	M	5	W	F	25	1310
65-071-00506	I-Esfahan	W	V	3	1	44	88	104	2	CC	M	5	W	F	25	1270
65-071-00064	I-Bojnurd	W	V	4	1	45	83	112	2	CF	M	6	W	F	24	1200
65-157-00067	Great Northern 1140	W	V	4	2	38	73	100	1	CF	M	5	W	F	30	1200
65-157-00069	Great Northern 123	W	V	4	2	45	74	100	1	CF	M	5	W	F	30	1200
65-071-00513	I-Unknown	W	V	2	1	47	90	113	3	CF	M	6	W	F	19	1180
65-085-00494	Lebanon	W	V	3	1	47	89	115	2	CC	M	5	W	F	19	1160
65-071-00050	I-Karaj	W	V	4	2	44	82	109	2	CC	M	5	W	F	25	1020
65-071-00490	I-Unknown	W	V	2	1	48	91	116	3	CF	M	6	W	F	21	1000
65-071-00424	I-Esfahan	P	V	2	1	44	89	116	5	CC	M	5	Cr	F	20	890
65-071-00497	I-Ghouchan	W	V	2	1	45	90	116	3	CF	M	5	W	F	20	850
65-071-00052	I-Min. 1396	P	B	4	3	39	89	108	2	CC	L	5	Cr	C	38	770
CV %																24
LSD .05																430

TABLE 37. Agronomic Data, Beans (white) Uniform Yield Test, Planted May 24, 1967, RPIP, Karaj, Iran

(1) Accession Number	(2) Variety or source	(3) Flower color	(4) Plant type	(5) Stand	(6) Vigor	(7) Days to 1st flower	(8) Days to 1st maturity	(9) Days to complete maturity	(10) Disease rating	(11) Pod shape	(12) Pod length	(13) Seed per pod	(14) Seed color	(15) Seed shape	(16) Seed size	(17) Yield
65-071-00515	I-Ghouchan	W	V	2	1	50	88	102	2	CF	M	5	W	F	23	2784
65-071-00503	I-Karaj	W	V	2	1	44	80	94	2	CF	M	5	W	F	27	2767
65-071-00505	I-Shiraz	W	V	2	1	49	87	100	2	CF	M	5	W	F	28	2584
65-085-00494	Lebanon	W	V	2	1	52	87	101	2	CF	M	5	W	F	20	2543
65-071-00513	I-Unknown	W	V	2	1	53	86	97	2	CC	M	5	W	C	20	2529
65-071-00470	I-Kermanshah	W	V	2	1	45	84	97	2	CF	M	5	Cr	F	28	2416
65-071-00042	I-Shiraz	W	V	2	1	44	80	96	2	CF	M	5	W	F	25	2297
65-071-00525	I-Esfahan	W	V	2	1	45	82	96	3	CF	M	4	W	F	25	2218
65-071-00474	I-Esfahan	P	V	2	1	46	86	99	3	CF	M	5	Cr	F	24	2185
65-071-00424	I-Karaj	W	V	2	1	45	82	95	2	CF	M	5	W	F	25	2141
65-071-00490	I-Unknown	W	V	2	1	48	85	102	3	CF	M	5	W	F	26	2136
65-071-00497	I-Ghouchan	W	V	2	1	50	86	101	3	CF	M	4	W	F	24	2095
65-071-00064	I-Bojnourd	W	V	2	1	45	81	93	2	CF	M	5	W	F	24	2076
65-121-00583	Lebanon 3	W	V	2	1	45	81	92	2	CF	M	5	W	F	26	2069
65-071-00050	I-Karaj	W	V	2	1	44	81	93	2	CF	M	5	W	F	25	2050
65-071-00040	I-Kermanshah	W	V	2	1	43	82	95	2	CF	M	5	W	F	27	1997
65-157-00014	Haubres St. Andres	W	V	2	1	44	82	94	2	CF	M	5	W	F	26	1970
65-071-00054	I-Esfahan	W	V	2	1	46	82	95	2	CF	M	5	W	F	23	1915
65-071-00506	I-Esfahan	W	V	2	1	43	82	95	2	CF	M	4	W	F	26	1856
65-071-00517	I-Ghouchan	W	V	2	1	46	82	95	1	CC	M	5	W	F	23	1855
65-157-00073	Great Northern 31	W	V	2	1	40	79	92	2	CF	M	4	W	F	32	1747
65-071-00516	I-Darehgaz	W	V	2	1	42	82	96	3	CF	M	4	W	F	26	1694
65-157-00067	Great Northern 1140	W	V	3	2	37	76	87	1	CF	M	4	W	F	28	1479
65-157-00069	Great Northern 123	W	V	2	1	40	80	92	2	CF	M	4	W	F	27	1440
65-071-00052	Min. 1396,I	LP	B	3	2	37	83	96	1	CC	L	5	Cr	C	38	1076
CV %																12
LSD .05																234

TABLE 38. Agronomic Data, Beans International Yield Test, Planted May 24, 1967, RPIP, Karaj, Iran

(1) Accession number	(2) Variety or Source	(3) Flower color	(4) Plant type	(5) Stand	(6) Vigor	(7) Days to 1st flower	(8) Days to 1st maturity	(9) Days to complete maturity	(10) Disease rating	(11) Pod shape	(12) Pod length	(13) Seeds per pod	(14) Seed color	(15) Seed shape	(16) Seed size	(17) Yield
65-091-00582	I-Esfahan	W	V	1	1	56	85	97	2	CF	M	5	DR	F	27	2115
65-085-00440	Lebanon	W	V	1	1	59	86	98	3	CF	M	5	R	F	30	2065
65-071-00042	I-Shiraz	W	V	2	1	50	83	97	2	CF	M	5	W	F	28	1898
65-153-00757	Turkey-outrak	W	B	1	1	47	85	100	2	SC	L	4	W	F	45	1674
65-153-00756	Turkey-Bodur	W	B	2	1	46	87	105	3	SC	L	4	W	F	33	1558
65-157-00589	Red-kidney	LP	B	2	1	47	83	99	4	SF	L	5	L	F	39	1255
65-157-00069	Great Northern 157	W	B	2	2	45	76	88	3	CF	M	5	W	F	32	1231
65-157-00005	Resistent tender green	P	B	2	1	47	87	104	3	SC	L	6	PuM	C	31	1212
65-157-00004	Wade	LP	B	3	1	46	85	101	2	SC	L	5	Pu	C	35	1116
65-157-00072	Pinto 111	W	V	1	1	46	98	91	5	CF	M	5	CrM	F	34	1144

CV % 12.24
LSD .05 120

COWPEAS

Dr. Kenneth H. Evans
Engineer Ali Ellini

Germplasm

The germplasm collection was grown to increase the seed supply and obtain data on new accessions. Mosaic virus severely limits seed production on some lines and also affects agronomic characters. Some strains appear to be resistant or tolerant to the most common mosaic virus.

The large seeded blackeyed types are preferred, while most other types have little or no market value.

Yield Trials

Yields in the preliminary trial (Table 39) ranged from 2,000 kilos to 5 kilos per hectare; strains 713 and 97 produced high yields again this season. Some of the late maturing strains did not mature many pods before frost, and therefore produced little seed.

In the uniform yield trial (Tables 40 and 41), strains 175 and 50 continue to be high yielding. Strains 50 and 4002 have been recommended for increase and release. In addition to high yield, strain 50 has shown field resistance to mosaic virus. Initial inoculation tests indicated strain 50 as resistant, but recent tests have shown it to be susceptible. Strain 4002 has mosaic virus tolerance, good seed and plant type, but only average yield. Since mosaic virus is prevalent and reduces yield considerably, susceptible varieties may be reduced considerably in yield under farm conditions.

Legend for Cowpea Agronomic data Tables 39 to 41

(1) Numbers assigned to collection maintained by the Regional Pulse Improvement Project.

(2) Strain numbers refer to entry numbers assigned in 1964 introduction nursery.

(3) Source numbers refer to P.I. numbers from New Crops Research Branch, CRD, ARS, USDA, Beltsville, Maryland, USA. "C" numbers are strains obtained from Oklahoma State University. Other 3 or 4 digit numbers are numbers assigned by the Iranian Ministry of Agriculture.

(4) Source indicate variety name or area of origin.

(5) Flower color: P=purple, W=white, WP=mixed white and purple flowers.

(6) Plant type: E=erect; SE=semierect; B=bushy; P=prostrate; BP=bushy prostrate.

(7) Plant height (in centimeters) at near full plant growth.

(8) Plant width (in centimeters) at near full plant growth.

(9) Rated 1 to 9:1=complete stand; 9=poor stand.

(10) Rated 1 to 9:1=vigorous plants; 9=weak plants.

(11) Days from planting to first opened flower.

(12) Days from planting to first mature pod ready for harvest.

(13) Rated 1 to 9: 1=free from disease symptoms; 9=severe disease symptoms major disease mosaic virus. See pathology section for diseases present.

(14) Pod shape: S=straight; C=curved.

(15) Pod color: Pu=purple; P=pink; Cr=cream; W=white; Y=yellow; G=green; L=light; D=dark.

(16) Pod size: VL=very large; L=large; M=medium; S=small.

(17) Seeds per pod is average based on five random pods per r(cation.

(18) Seed color: Cr=cream; P=pink; M=milky; Bk-black; Br=Brown; Gr=green; Bl=blue W=white; Y=yellow; R=red; Pu=purple; Sp=spotted; D=dark; L=light.

(19) Shattering rated 1 to 9: 1=no less of seed from shattering; 9=considerable loss of seed from shattering.

(20) Seed size; L=large approximately 24 grams per 100 seeds;
M=medium, approximately 15 grams per 100 seeds.
S=small, approximately 8 grams per 100 seeds.

(21) Eye color: Cr=cream; P=pink; M=milky; Bk=black; Pu=purple; Sp=spotted: Bl=blue; W=white; D=dark; L=light.

(22) Yield in kilograms per hectare based on 10 M^2 plots.

TABLE 39. Agronomic Data, Cowpeas Preliminary Yield Test, Planted June 8, 1967, RPIP, Karaj, Iran

(1) Accession Number	(2) Strain number	(3) Source number	(4) Source	(5) Flower color	(6) Plant type	(7) Plant height	(8) Plant width	(9) Stand	(10) Vigor	(11) Days to 1st flower	(12) Days to 1st maturity	(13) Disease rating	(14) Pod shape	(15) Pod color	(16) Pod size	(17) Seeds per pod	(18) Seed color	(19) Shattering	(20) Seed size	(21) Eye color	(22) Yield
62-071-10004	713	177	R.A. Nishabour	P	SE	49	52	3	3	67	96	4	S	LBr	M	11	CrW	2	M	GBr	2071
62-043-00012	12	151562	Dom-Rep	W	B	46	49	3	2	70	100	3	S	PBr	M	12	CrW	3	MS	GBr	1855
62-071-10006	795	184	Chamchal	P	SE	51	42	3	4	70	98	7	S	PBr	MS	11	CrP	2	MS	GBr	1822
62-023-00141	97	200867	Burma	P	SE	34	45	2	2	67	93	2	S	YW	L	16	BCrGr	2	MS	Br	1782
62-157-00290	290	293560	Red-spekled crowder	P	SE	54	55	2	1	73	107	2	S	YBr	L	11	PuR	7	ML	Br	1778
62-136-00201	131	225921	Africa	W	SE	39	44	3	3	64	85	3	S	PuBr	ML	13	CrBk	3	ML	Br	1674
62-110-00113	79	189378	Nigeria	W	B	35	48	4	3	72	104	3	S	YW	ML	12	LCr	2	M	DBr	1670
62-071-10008	814	179	Esfahan	W	SE	48	49	3	4	68	97	6	S	PuBr	ML	11	CrW	2	ML	Bk	1602
62-117-00018	18	152199	Paraguay	P	SE	37	45	3	2	68	95	3	S	YP	L	15	BGr	2	MS	DBr	1576
62-157-00336	226	293493	Corn field English	W	SE	41	39	3	2	77	103	3	S	YP	M	12	CrW	3	MS	GBr	1545
62-071-10007	811	179	Esfahan	W	SE	50	46	3	3	69	95	6	S	PuBr	ML	10	CrW	2	L	Bk	1541
62-110-00075	62	185647	Africa	P	SE	58	58	2	2	73	102	3	S	PBr	ML	14	CrP	1	M	YBr	1522
62-110-00242	157	255781	Nigeria	P	SE	55	48	2	2	76	101	3	S	YP	ML	13	CrP	2	MS	GBr	1502
62-110-00249	160	255784	Nigeria	P	SE	60	52	3	2	76	103	3	S	PBr	ML	14	CrP	2	MS	GBr	1426
62-071-00197	128	223420	Iran	P	SE	44	45	3	3	64	87	5	S	PBr	M	10	CrP	2	M	GBr	1401
62-110-00102	72	186467	Nigeria	P	SE	43	49	3	3	82	106	3	S	YP	L	15	LG	2	ML	GBr	1397
62-157-00286	185	293448	Alabama Brown-eye	P	SE	57	58	2	1	81	104	2	S	PBr	L	14	BrCr	1	M	YBr	1385
62-038-00155	105	208771	Cuba	P	SE	45	53	3	2	72	97	3	S	YPu	L	15	Bk	4	ML	Br	1378
62-008-00078	63	186360	Australia	P	SE	54	54	3	2	82	107	3	S	PuBr	ML	14	CrP	3	MS	GBr	1374
62-069-00070	58	183363	India	W	SE	51	49	4	2	64	92	4	S	YP	M	9	CrW	1	ML	Br	1311
62-071-00472	828	150	Karaj	W	SE	47	42	3	3	67	96	5	S	PBr	M	12	CrW	2	MS	GBr	1306
62-157-00291	190	293454	Azulgrand	P	SE	48	46	3	2	69	92	3	S	YW	L	15	BG	3	M	DBr	1269
62-157-00355	246	293516	Hib-canel	P	SE	39	46	3	2	65	88	2	S	PBr	L	13	CrP	1	ML	YBr	1236
62-152-00350	241	293508	Early-silver Crowder	P	SE	39	47	3	1	62	90	2	S	YW	ML	13	BG	7	M	Br	1224
62-071-10009	826	183	Dasht-sar Amol	P	SE	54	53	3	2	71	105	3	S	YP	ML	13	CrP	1	M	GBr	1184
62-071-00203	133	227397	Iran	P	SE	50	42	3	3	69	99	5	S	YBr	M	12	CrP	2	M	GBr	1156
62-157-00316	213	293477	California Bk. eye	W	E	31	32	4	3	58	79	3	S	PBr	ML	9	CrW	2	L	Bk	1156

Continued.....

TABLE. 39

(1) Accession Number	(2) Strain number	(3) Source number	(4) Source	(5) Flower color	(6) Plant type	(7) Plant height	(8) Plant width	(9) Stand	(10) Vigor	(11) Days to 1st flower	(12) Days to 1st maturity	(13) Disease rating	(14) Pod shape	(15) Pod color	(16) Pod size	(17) Seeds per pod	(18) Seed color	(19) Shattering	(20) Seed size	(21) Eye color	(22) Yield
62-157-00441	304	293574	Texas-cream	W	SE	45	33	3	3	59	82	2	S	YBr	ML	12	CrW	1	ML	Br	1150
62-157-00381	263	293533	Long-pod cream	W	SE	53	51	2	2	73	105	3	S	YBr	ML	10	CrW	2	M	GBr	1116
62-157-00342	233	293500	Dixilee	P	SE	34	46	5	3	67	90	4	S	PBr	MS	12	CrP	4	S	GBr	1105
62-110-00107	75	188704	Nigeria	P	SE	56	48	3	2	75	100	2	S	PBr	L	14	CrP	1	MS	YBr	1063
62-157-00440	303	293593	Taylor	W	SE	57	52	2	2	74	100	3	S	PBr	ML	11	CrW	2	M	GBr	1048
62-069-00023	23	163142	India	P	SE	52	43	2	1	71	100	3	S	PBr	ML	14	CrP	2	M	YBr	930
62-071-10005	778	173	Mamaghan	P	SE	54	49	3	4	73	106	5	S	PBr	M	12	CrP	1	MS	GBr	927
62-157-00417	287	293557	Red Cow-pea	P	SE	53	51	3	2	74	104	3	S	PBr	L	13	R	5	MS	DBr	925
62-157-00339	230	293497	Cream long pod	W	SE	38	49	3	2	60	79	3	S	YBr	ML	12	CrW	3	M	Br	861
62-062-00219	142	244571	Guatemala	P	SE	62	52	2	2	80	108	3	S	PBr	L	13	BrCr	1	M	GBr	844
62-157-00338	229	293496	Cream crowd lady	W	SE	39	51	3	2	67	100	3	S	PBr	ML	10	CrW	2	MS	GBr	784
62-123-00051	45	175962	Turkey	P	SE	51	53	3	3	77	102	3	S	PBr	M	13	CrP	1	ML	YBr	780
62-071-00216	139	229734	Iran	W	SE	55	54	3	2	72	104	3	S	PBr	M	12	CrW	4	M	Bk	779
62-153-00038	36	170861	Turkey	P	SE	47	53	3	3	69	101	2	S	YP	ML	13	LCr	1	M	GBr	677
62-071-00196	127	223023	Iran	P	SE	61	47	3	3	76	107	4	S	YBr	ML	11	LCr	4	MS	GBr	574
62-110-00264	167	255812	Nigeria	P	E	55	51	2	2	80	117	2	S	YBr	ML	13	BrCr	1	MS	GBr	433
62-157-00303	203	14020	Brabham	P	E	61	49	2	2	91	116	2	S	PBr	ML	12	BrCr	2	MS	GBr	394
62-157-00447	300	14024	Victor	P	E	61	56	2	2	88	120	3	S	YPu	ML	13	BGr	2	MS	Br	268
62-026-00103	73	186471	Cameroon	P	E	68	49	3	3	88	126	4	S	YW	L	12	CrW	1	M	GBr	167
62-019-00004	4	177076	Brazil	P	SE	53	51	3	2	86	123	3	C	PBr	L	16	R	1	M	Br	51
62-096-00115	81	190191	Mexico	P	E	59	46	3	2	72	110	2	S	YP	ML	12	CrP	2	ML	GBr	6
62-034-00006	6	147561	Colombia	P	SE	57	54	3	2	85	115	4	S	PuBr	L	16	R	1	M	Br	5

TABLE 40. Agronomic Data, Cowpeas Uniform Yield Test, Planted May 2, 1967, RPIP, Varamin, Iran

(1) Accession Number	(2) Strain Number	(3) Source number	(4) Source	(5) Flower color	(6) Plant type	(9) Stand	(10) Vigor	(11) Days to 1st flower	(12) Days to 1st maturity	(13) Disease rating	(14) Pod shape	(15) Pod color	(16) Pod size	(17) Seeds per pod	(18) Seed color	(19) Shattering	(20) Seed size	(21) Eye color	(22) Yield
62-157-00347	238	293505	Early Ramshorn	W	SE	3	3	63	89	5	S	YBr	MS	7	CrW	3	L	Bk	1246
62-153-00057	50	179555	Turkey	W	BP	4	4	68	92	5	S	YP	ML	10	CrW	4	ML	Br	1082
62-157-00353	244	293513	Giant Bk eye Ramshorn	W	SE	5	4	65	91	5	S	YPu	L	8	CrW	3	L	Bk	1079
62-157-00470	325	G672	Princess-Ann	WP	E	6	4	62	90	4	S	PuBr	L	10	CrW	3	ML	Bk	1070
62-069-00276	175	271257	India	P	BP	4	3	68	91	4	S	YP	L	11	CrP	3	M	Br	1054
62-085-00065	53	181833	Lebanon	P	BP	4	4	66	90	4	C	YBr	L	11	CrP	3	MS	DBr	1016
62-110-00234	151	255765	Nigeria	P	B	4	4	63	91	4	S	YBr	M	11	CrW	5	M	Bk	1002
62-157-00358	249	0154	Institute	P	BP	3	3	68	92	3	S	YP	L	11	BGr	3	ML	DBr	953
62-157-00442	305	293575	Texas-Cream	W	SE	5	4	68	90	5	S	YBr	ML	11	CrW	5	M	GBr	935
62-157-00436	300	293570	Spekled Purple-Hull	P	SE	3	3	71	94	4	S	DPu	L	11	BrPu	3	ML	GBr	926
62-157-00296	195	293459	Black-eye #7	W	SE	4	4	63	90	4	S	YP	ML	8	CrW	3	ML	Bk	874
62-069-00278	177	271259	India	P	B	5	3	82	104	3	S	YBr	L	14	CrP	2	ML	Br	861
62-071-10003	-	-	Meshed	W	B	8	6	67	91	6	S	PBr	ML	10	CrW	3	ML	Bk	846
62-153-00050	41	173827	Turkey	P	E	3	3	76	103	4	S	YBr	L	14	CrP	3	MS	GBr	821
62-153-00066	54	182316	Turkey	P	E	3	3	68	94	4	S	YBr	ML	12	CrP	4	M	GBr	800
62-157-00316	215	293480	Calara	P	B	4	4	62	90	4	S	PBr	ML	9	CrW	4	ML	Bk	771
62-157-00309	210	293474	Cabbage-pea	W	SE	6	5	67	93	5	S	YBr	ML	11	MCr	3	MS	GBr	767
62-157-00356	247	293517	Holstein	W	SE	4	3	67	89	5	S	YBr	ML	11	BkW	4	ML	Br	765
62-035-00110	76	189230	Bell-Congo	P	SE	4	3	70	92	4	S	YPu	L	12	Bk	4	M	GBr	734
62-000-10001	327	-	Unknown	P	SE	4	3	67	91	4	S	YBr	MS	11	CrP	6	MS	Br	704
62-157-00341	232	293499	Davis-Pea	P	SE	4	4	69	93	4	S	Pu	ML	14	CrP	7	ML	GBr	678
62-157-00437	301	293571	Swanee	P	E	4	3	69	92	3	S	YBr	L	13	LP	3	M	GBr	655
62-153-00050	44	175959	Turkey	P	E	3	2	73	99	3	S	PBr	L	14	CrP	3	MS	GBr	594
62-071-10002	K-Ch	-	I-Karaj	WP	SE	4	3	85	104	5	S	YBr	M	10	CrP	3	M	BGr	549
62-157-00446	308	293581	Victor	P	E	2	2	88	106	3	S	YP	L	14	BrGr	6	MS	DBr	509
CV %																			21
LSD .05																			990

TABLE 41. Agronomic Data, Cowpea Uniform Yield Test, Planted June 8, 1967, RPIP, Karaj, Iran

(1) Accession Number	(2) Strain Number	(3) Source number	(4) Source	(5) Flower color	(6) Plant type	(7) Plant height	(8) Plant width	(9) Stand	(10) Vigor	(11) Days to 1st flower	(12) Days to 1st maturity	(13) Disease rating	(14) Pod shape	(15) Pod color	(16) Pod size	(17) Seeds per pod	(18) Seed color	(19) Shattering	(20) Seed size	(21) Eye color	(22) Yield
62-157-00358	249	0154	Institute	P	SE	36	44	3	3	70	94	2	S	YW	VL	14	SpBl	1	ML	Br	1468
62-069-00276	175	271257	India	P	B	29	38	3	3	73	92	3	C	YW	L	11	CrP	2	M	LBr	1461
62-000-10001	327	-	Unknown	P	E	38	43	3	3	63	82	3	S	YBr	MS	10	CrP	6	S	LBr	1380
62-157-00356	247	293517	Holstein	W	SE	33	39	3	3	67	90	3	S	LBr	L	12	BkW	2	ML	Br	1375
62-085-00065	53	181833	Lebanon	WP	B	30	40	3	3	62	83	3	C	YBr	L	11	CrP	2	ML	GBr	1359
62-071-10002		-	I-Karaj	WP	SE	42	48	3	4	74	98	5	S	YBr	M	10	LCr	2	ML	LBr	1322
62-153-00057	50	179555	Turkey	W	SE	40	47	4	3	71	95	3	C	YW	ML	10	CrP	2	L	LBr	1312
62-157-00316	215	293480	Calara	W	SE	31	50	3	3	61	82	3	S	YBr	ML	9	CrW	3	ML	Bk	1279
62-157-00353	244	293513	Giant-Bk eye Ramshorn	W	E	42	38	3	3	63	83	3	S	LBr	ML	8	CrW	2	L	Bk	1270
62-157-00442	305	293575	Texas-Cream No. 40	W	E	36	38	3	3	63	82	3	S	YBr	ML	10	CrW	3	M	GBr	1186
62-071-10003	4002	-	I-Mashhad	W	E	35	38	3	3	64	85	3	S	YBr	L	10	CrW	3	L	Bk	1129
62-069-00278	177	271259	India	P	SE	42	47	3	2	79	101	2	S	LBr	L	14	CrP	1	ML	LBr	1088
62-157-00296	195	293459	Black eye No. 7	W	E	35	30	3	3	61	78	3	S	YBr	ML	8	CrW	2	L	Bk	1054
62-157-00347	238	293505	Early Ramshorn Bk. eye	W	E	36	30	4	3	59	80	4	S	LBr	ML	9	CrW	2	L	Bk	1050
62-035-00110	76	189230	Bel.-Congo	P	SE	41	43	3	3	74	95	3	S	BrPu	ML	12	Bk	2	M	Br	1035
62-157-00341	232	293499	Davis Pea	P	SE	35	40	3	2	66	87	3	S	DBr	L	8	CrP	4	ML	YG	1033
62-110-00234	151	255765	Nigeria	WP	SE	25	39	4	3	60	80	3	S	LBr	ML	10	CrW	3	ML	Bk	1027
62-157-00436	300	293570	Spekled purple-hull	P	SE	42	43	3	2	76	100	3	S	DPu	VL	14	SpCrBr	2	L	LG	983
62-157-00470	325	C642	Princess Ann	P	E	39	38	4	3	59	81	3	S	LBr	ML	9	CrW	2	L	Bk	887
62-153-00066	54	182316	Turkey	P	SE	45	47	3	3	75	102	3	S	YBr	L	12	CrP	2	M	GBr	870
62-157-00309	210	293474	Cabbage-Pea	W	SE	43	44	4	3	67	94	3	C	WY	ML	10	CrW	2	M	GBr	854
62-153-00050	44	175959	Turkey	P	SE	48	43	3	2	78	106	2	S	LBr	L	13	CrP	1	MS	LBr	836
62-153-00045	41	173827	Turkey	P	SE	51	51	3	2	79	104	2	C	LBr	L	13	CrP	2	MS	YBr	803
62-157-00437	301	293571	Swanee	P	SE	49	48	3	2	83	107	2	S	YBr	L	13	CrP	1	M	LBr	604
62-157-00446	308	293581	Victor	P	SE	55	47	3	2	94	117	2	S	YW	ML	15	SpBk	2	MS	Br	126
CV %																					28
LSD.05																					345

MUNGBEANS

Dr. Kenneth H. Evans
Engineer Mehdi Khosrowshahin

Germplasm

Much of the mungbean geermplasm are USDA plant introductions. Many of the introductions are heterogeneous. Plant selections were made in the 1966 introductions on the basis of plant and pod characteristics. Unfortunately, most of the plant selections were lost.

Yield Trials

The mungbeans in the Karaj trials were stunted and produced little plant growth as indicated by plant height measurements (Tables 42 and 44). The material in the Preliminary Yield Trial continued to look more virus susceptible than the Uniform Yield Trial.

Two strains, No. 3 and No. 72, were selected from the Uniform Yield Trial on the basis of yield, seed size, and virus rating. Both strains were rated as having no mosaic in 1966 by the pathology section. Strain 3 produced 20% more yield than the Iranian check, but has medium to small seed. Strain 72 produced 9% greater yield than the Iranian check and has medium to large seed.

Legend for Mungbean Agronomic Data Tables 42 to 44

(1) Numbers assigned to collection maintained by the Regional Pulse Improvement Project. The numbers for the preliminary yield trial 1966 have been charged by changing the first numeral after the 2nd dash from a 0 to a 1.

(2) Strain numbers refer to numbers assigned in the 1964 Introduction Nursery, USDA and Iranian Ministry of Agriculture. These numbers coincide with those reported in Progress Report No. 3 and No. 4.

(3) Three-digit numbers are Iranian Ministry of Agriculture numbers, Six-digit numbers refer to P.I. numbers from New Crops Research Branch, CRD, ARS, USDA, Beltsville, Maryland, U.S.A.

(4) Indicates variety name or area of origin.

(5) E = erect; B=bushy; P=prostrate; SP=semi-prostrate; SE=semi-erect.

(6) Plant height measured in centimeters at near full plant growth.

(7) Rated 1 to 9: 1=complete stand; 9=poor stand

(8) Rated 1 to 9: 1=vigorous plants; 9=weak plants

(9) Days from planting to first opened flower

(10) Days from planting to first mature pod, ready for harvest.

(11) Rated 1 to 9: 1=free from disease symptoms; 9=severe disease symptoms.

(12) S=straight; M=moderatly curved; C=curved

(13) L=light; M=medium; D=dark

(14) L=large, M=medium; S=small

(15) Average number of seeds per pod, based on ten pods per replication.

(16) LG=light green; G=green; DG=dark green; Y=yellow

(17) Average weight of 100 seeds

(18) L=light; M=medium; D=dark

(19) Yield in kilograms per hectare based on 5 m^2 plots.

TABLE 42. Agronomic Data, Mungbean Preliminary Yield Test, Planted June 8, 1967, RPIP Karaj, Iran

(1) Accession Number	(3) Source Number	(4) Source	(5) Plant type	(6) Plant height	(7) Stand	(8) Vigor	(9) Days to 1st flower	(10) Days to 1st maturity	(11) Disease rating	(12) Pod shape	(13) Pod color	(14) Pod size	(15) Seeds per 5 pods	(16) Seed color	(17) 100 seed weight	(18) Leaf color	(19) Yield
48-071-10757	226	Karaj	P	17	1	2	58	78	3	M	L	L	4.7	LG	5.9	D	1138
48-071-10293	218	Zahedan	P	26	2	2	60	77	4	M	M	M	5.5	LG	4.8	L	1012
48-071-10865	218	Zahedan	P	19	1	2	62	77	3	S	L	M	5.4	LG	4.3	D	944
48-071-10326	217	Kermanshah	SP	23	1	2	59	78	4	M	L	M	5.2	G	3.8	D	976
48-071-11089	-	Kerman	B	31	1	1	57	77	4	C	D	L	5.2	LG	4.9	D	976
48-071-10783	226	Karaj	P	18	1	2	60	79	3	M	L	L	5.1	LG	5.4	L	972
48-071-10864	218	Zahedan	P	17	1	2	61	80	3	M	L	L	5.1	LG	5.3	L	966
48-157-11085	-	Kiloga	SP	20	2	3	53	70	4	M	M	L	5.0	LG	4.9	D	962
48-071-10855	218	Zahedan	P	21	1	2	59	78	3	M	L	L	5.2	G	5.0	L	952
48-071-10282	215	Karaj	P	20	2	2	58	76	3	M	L	L	5.1	LG	5.4	L	940
48-071-10810	224	Darehgaz	P	21	3	2	59	76	3	C	D	L	4.8	LG	4.9	D	936
48-071-10681	223	Esfahan	SP	21	1	2	60	75	5	M	D	M	5.1	LG	4.2	D	894
48-071-10962	184	Shiraz	SP	18	1	4	51	65	6	M	M	M	5.0	LG	4.5	D	884
48-071-10965	116	Dezful	SP	26	1	2	53	69	4	C	M	M	5.1	LG	3.8	D	884
48-157-11087	-	Berken	SP	23	2	2	57	72	4	C	D	L	5.9	LG	5.4	D	880
48-071-10923	215	Karaj	B	24	2	2	55	74	5	M	M	L	5.7	G	4.2	D	868
48-071-10294	427	Jiroft	B	23	1	2	59	80	5	C	M	M	4.8	G	3.3	M	852
48-071-10926	215	Karaj	B	21	1	1	57	74	4	M	D	L	5.1	LG	5.2	D	832
48-071-10285	215	Karaj	SP	25	1	2	52	68	5	M	M	M	4.3	G	3.8	D	832
48-071-10811	224	Darehgaz	SP	23	1	2	59	73	5	C	M	M	5.3	G	3.4	M	830
48-071-10300	215	Karaj	SP	23	1	3	57	73	5	C	M	M	4.9	G	3.9	M	824
48-071-10668	223	Esfahan	E	29	1	1	59	76	4	M	D	L	5.8	G	4.2	D	804
48-071-10954	399	Dashtsar	B	28	2	2	58	75	5	M	D	L	5.6	LG	4.3	D	798
48-071-10698	222	Sari	SP	21	2	3	57	77	5	M	M	M	4.2	G	3.4	L	769
48-071-10326	217	Kermanshah	SP	22	1	2	58	77	5	M	L	M	4.6	G	3.7	L	760
48-071-10314	213	Mamaghan	SP	18	2	3	62	91	5	M	M	M	4.8	G	3.8	L	748
48-071-10678	223	Esfahan	SP	24	1	2	52	72	4	M	D	L	5.8	LG	4.8	D	738
48-071-10386	216	Jiroft	SP	23	1	3	59	78	6	M	M	M	5.0	G	3.1	M	734
48-071-10411	216	Jiroft	SP	22	2	3	59	72	7	M	M	M	5.1	G	3.3	M	716
48-071-10295	223	Esfahan	B	22	1	2	59	81	5	C	M	M	4.6	G	3.4	M	716
48-071-10283	215	Karaj	B	25	2	2	58	77	4	C	D	L	5.8	G	4.7	D	714
48-071-10809	224	Darehgaz	SP	25	1	2	61	78	4	C	D	M	4.5	Y	4.2	D	712
48-071-10382	216	Jiroft	B	23	1	2	60	78	6	M	M	M	4.7	G	3.3	L	702
48-071-10955	203	Jiroft	B	28	1	2	58	73	4	M	D	M	5.4	G	4.0	D	690

Continued.....

TABLE. 42

(1) Accession Number	(3) Source Number	(4) Source	(5) Plant type	(6) Plant height	(7) Stand	(8) Vigor	(9) Days to 1st flower	(10) Days to 1st maturity	(11) Disease rating	(12) Pod shape	(13) Pod color	(14) Pod size	(15) Seeds per 5 pods	(16) Seed color	(17) 100 seed weight	(18) Leaf color	(19) Yield
48-071-10396	216	Jiroft	B	26	2	2	59	77	5	M	M	M	5.3	G	3.1	L	680
48-157-11086	-	Oklahama 12	SP	21	2	3	51	69	5	M	D	L	4.8	LG	4.5	D	676
48-071-10292	215	Karaj	B	27	1	2	59	76	4	M	D	L	4.3	G	4.8	D	670
48-071-10667	223	Esfahan	E	25	1	2	61	79	5	M	D	L	4.7	G	3.4	D	670
48-071-10288	215	Karaj	SP	23	1	3	59	76	6	M	M	M	5.0	G	3.4	L	670
48-069-10308	164644	India	SP	23	2	2	59	73	6	C	M	M	4.8	G	3.2	M	662
48-071-10293	215	Karaj	SP	21	1	2	59	78	6	M	M	M	5.1	G	3.2	L	660
48-071-10303	225	Darehgaz	SP	21	1	2	60	77	6	M	M	S	5.0	G	3.0	L	654
48-071-10690	222	Sari	SP	23	2	3	59	74	6	M	M	M	3.9	G	3.3	D	644
48-071-10566	221	Neyshapour	SP	27	1	2	56	81	5	M	M	M	4.8	G	3.2	L	640
48-071-10383	216	Jiroft	SP	25	1	3	59	77	5	M	M	M	4.9	G	3.3	L	632
48-071-110137	217	Nosratabad	SP	21	1	3	61	75	5	M	M	M	4.7	G	2.8	M	624
48-071-10301	215	Karaj	SP	22	2	3	61	81	6	M	M	M	4.2	DG	3.5	M	616
48-071-10870	215	Karaj	B	18	2	2	54	74	5	M	M	M	5.3	LG	3.9	D	612
48-071-10393	216	Jiroft	SP	24	2	3	59	77	6	M	M	M	4.8	G	3.2	M	600
48-071-10377	216	Jiroft	SP	19	2	4	54	72	6	M	M	S	4.5	G	3.2	M	592
48-071-10318	214	Esfahan	SP	18	2	4	59	72	6	M	M	S	4.4	G	3.0	D	586
48-071-10391	216	Jiroft	SP	27	1	2	59	77	6	C	M	L	4.0	G	3.0	L	578
48-071-10414	216	Jiroft	SP	21	2	2	59	71	6	M	M	M	4.7	G	3.5	M	574
48-071-10298	222	Sari	SP	20	2	3	61	80	6	M	M	S	4.7	G	3.4	L	572
48-071-10408	216	Jiroft	SP	26	2	3	59	76	6	C	M	M	4.4	G	3.1	L	562
48-071-10286	215	Karaj	SP	21	2	3	60	77	6	M	M	M	5.0	G	3.3	D	568
48-071-10406	216	Jiroft	SP	24	2	3	59	80	5	C	M	M	4.9	G	3.2	L	560
48-071-10733	222	Sari	SP	25	1	3	56	78	6	M	M	M	5.1	G	3.3	L	560
48-071-10925	215	Karaj	B	26	1	2	57	73	5	M	D	M	5.1	G	4.7	D	530
48-069-11020	-	Dezful	B	28	2	1	60	82	4	C	L	L	4.3	LG	6.5	D	492
48-071-10381	216	Jiroft	SP	16	2	4	56	71	6	M	M	M	4.3	G	2.9	M	484
48-069-10991	-	Dezful	E	42	2	1	58	81	5	M	L	M	4.8	G	5.2	D	416
48-069-11019	-	Dezful	E	28	2	1	60	84	5	S	L	M	4.5	G	6.2	D	388
48-069-11035	-	Dezful	E	30	1	1	60	81	4	M	L	L	5.1	LG	5.8	D	312
CV%																	22
LSD .05																	127

TABLE 43. Agronomic Data, Mungbean Uniform Yield Test, Planted May , 1967, RPIP, Varamin, Iran

(1) Accession Number	(2) Strain Number	(3) Source number	(4) Source	(7) Stand	(8) Vigor	(9) Days to 1st flower	(10) Days to 1st maturity	(11) Disease rating	(19) Yield
48-069-10105	180	271492	India	1	1	70	85	3	1680
48-071-10964	-	156 Min.	Karaj	4	3	69	81	5	1390
48-071-10293	-	218	Zahedan	1	1	78	90	1	1330
48-069-10066	63	180311	India	2	1	67	84	2	1140
48-071-10282	-	215 Min.	Karaj	2	1	71	84	1	1080
48-157-10019	16	31569	Beltsville U.S.A.	1	1	61	74	2	1060
48-157-10023	20	31728	Beltsville U.S.A.	3	3	67	81	4	1040
48-069-10323	178	271490	India	3	2	70	84	4	1020
48-071-10963	24	167-1 Min.	Moghan	3	3	70	85	3	970
48-071-10107	13	167-2 Min.	Moghan	4	3	70	84	3	970
48-157-10004	1	31080	Beltsville U.S.A.	3	2	67	85	4	950
48-071-10108	15	167-3 Min.	Moghan	2	2	67	80	2	910
48-033-10045	42	171435	China	3	3	71	78	3	910
48-062-10296	-	227754	Guatemala	1	1	80	86	2	870
48-069-10104	105	212908	India	2	2	69	84	3	870
48-157-10307	3	31287	Beltsville U.S.A.	3	3	66	79	5	850
48-071-10087	84	201869	Iran	3	2	69	84	3	810
48-157-10022	19	31710	Beltsville U.S.A.	1	1	72	84	4	770
48-069-10078	75	183458	India	4	3	75	86	4	720
48-069-10077	74	183407	India	2	2	68	81	3	700
48-069-10075	72	183136	India	3	2	70	84	3	660
48-082-10103	185	273487	Korea	3	3	67	83	4	580
48-071-10284	-	217	Nosratabad	3	2	73	83	7	500
48-076-10290	-	286298	Ivory Coast	4	4	82	86	6	410

TABLE 44. Agronomic Data, Mungbean Uniform Yield Test, Planted June 8, 1967, RPIP, Karaj, Iran

(1) Accession Number	(2) Strain number	(3) Source number	(4) Source	(5) Plant type	(6) Plant height	(7) Stand	(8) Vigor	(9) Days to 1st flower	(10) Days to 1st maturity	(11) Disease rating	(12) Pod shape	(13) Pod color	(14) Seeds per pod	(16) Seed color	(17) 100 seed weight	(18) Leaf color	(19) Yield
48-071-10282	-	215	Karaj	P	23	2	2	52	73	4	M	L	5.0	LG	5.2	L	974
48-033-10045	42	171435	China	SP	18	3	2	47	66	4	M	D	4.8	G	4.5	D	942
48-071-10963	24	167	Moghan	SP	20	2	2	50	69	4	M	D	5.2	LG	4.5	M	890
48-157-10004	1	31080	USA Beltsville	SP	18	3	2	46	61	5	M	M	5.0	LG	4.4	M	888
48-069-10323	178	271490	India	SP	21	2	2	56	72	4	M	D	4.6	LG	4.5	D	884
48-157-10307	3	31287	USA Beltsville	SP	19	3	2	46	66	4	M	M	5.1	LG	3.9	D	880
48-071-10293	48-071-00293	218	Zahedan	P	20	2	2	56	77	3	S	L	4.9	LG	4.8	L	840
48-076-10290	48-076-00290	286298	Ivory coast	SP	22	2	2	57	73	6	M	M	4.8	G	3.5	L	838
48-069-10075	72	183136	India	SP	25	2	2	54	74	3	M	D	5.0	G	4.9	M	830
48-071-10108	15	157(3)	Moghan	SP	23	3	2	50	71	4	M	L	4.8	LG	5.0	D	803
48-082-10103	185	273487	Korea	B	26	2	2	53	69	5	M	D	4.8	LG	4.8	D	802
48-069-10104	105	212908	India	P	19	3	2	54	70	4	M	D	4.8	LG	4.7	D	798
48-071-10964	22	156	Karaj	SP	24	3	2	48	66	5	M	D	5.2	LG	4.3	D	770
48-157-10023	20	31728	USA Beltsville	SP	18	3	3	50	66	4	M	M	4.8	LG	4.4	M	768
48-157-10019	16	31569	USA Beltsville	SP	21	3	3	46	63	4	M	M	5.4	LG	4.5	D	766
48-069-10066	63	180311	India	SP	22	2	3	52	66	4	M	D	5.2	LG	5.0	M	744
48-069-10105	180	271492	India	SP	36	2	1	58	74	4	M	D	5.2	LG	4.9	D	738
48-157-10022	19	31710	USA Beltsville	B	25	2	3	55	71	5	C	D	4.9	LG	4.5	D	710
48-071-10087	84	201869	Iran	SP	20	3	2	49	68	5	M	D	5.7	LG	4.8	D	692
48-071-10107	13	167 (2)	Moghan	SP	21	3	2	55	71	4	C	D	5.0	LG	4.4	D	662
48-071-10284	48-071-00284	217	Nosratabad	B	24	2	2	62	78	6	M	M	5.0	G	2.8	M	652
48-069-10078	75	183458	India	SP	26	2	2	54	74	4	M	D	4.9	G	4.7	D	646
48-062-10296	48-062-00296	227754	Guatemala	SP	23	2	2	60	79	4	M	M	5.0	G	3.5	L	636
48-071-10109	-	156	Karaj	SP	22	3	2	60	77	6	M	M	4.7	G	3.2	L	530
48-069-10077	74	183407	India	SP	23	3	2	52	69	4	M	D	4.7	LG	4.2	D	494
CV %																	22
LSD .05																	98

SOIL AND CROP MANAGEMENT

Glenn M. Horner
Massoud Mojtehedi
Mohammad Moadab

Summary

Investigations conducted during the last three years showed that yields of pulse crops were increased by certain planting, fertilization, and irrigation practices. These yield increases were in addition to those obtained by growing superior varieties and controlling diseases and pests.

The optimum planting date varied with the crop and location. At Karaj, highest yields were obtained when lentils were planted in mid-March, chickpeas in early April, dry beans and cowpeas in mid-May, and mungbeans in late May.

Crop yields were highest with seeding rates that gave 300,000 to 400,000 plants per hectare on 50-cm. rows.

Phosphate fertilizer increased yields markedly on soils that had low soil test values. Nitrogen fertilization gave only small yield increases when the plants were adequately nodulated.

Soil moisture availability at critical growth stages, as controlled by irrigation frequency, was a dominant factor affecting pulse crop yields. Highest yields were obtained by maintaining soil moisture above two-thirds of field capacity during bloom and early maturity stages of growth.

Maximum yields were dependent upon the use of all these cultural practices. When this was done, the yields were three to four times greater than those obtained by farmers using conventional methods.

Date of Planting

This study was expanded in 1967 to include fall and winter planting dates and a second location (Varamin) for lentils and chickpeas. Five planting dates were used for dry beans, cowpeas, and mungbeans, instead of four dates previously.

The first three fall plantings emerged within a normal period, but seed planted from November 21, 1966, to January 29, 1967, did not emerge until late February. Therefore, these winter planting dates actually represented an early February planting. There were no appreciable differences in plant growth between the winter planting dates.

Fall plantings of lentils and chickpeas were more successful at Varamin than at Karaj (Table 45). Varamin is at a lower elevation and has warmer temperatures. Winter injury at Karaj, especially to chickpeas, occurred to plants that had emerged prior to the occurrence of freezing conditions.

At Varamin, the highest yields of lentils were obtained with October plantings, and yields of both lentils and chickpeas decreased when planted later than March 13. There was little effect of date of planting at Karaj, except for reduced yields for the early fall plantings. Yields at Karaj were generally low, partially caused by disease.

The highest yields of dry beans and cowpeas were obtained from plantings made during the first half of May (Table 46). For mungbeans, the optimum planting period extended to the first of June. Yields of all three crops were markedly reduced when planted as early as April 15, or as late as the middle of June. Part of the yield reduction from early planting was caused by a greater infestation of seed corn maggot at this date. This insect infestation destroyed some of the seed and thinned the stand.

Plant Population Density

Yields of chickpeas, dry beans, and cowpeas increased with an increase in the number of plants per unit area (Tables 47, 48, and 49). This trend continued to the level of approximately 300,000 plants per hectare, at which point the trend levelled off. Yields were not significantly higher with a plant population of 400,000 per hectare, but were markedly lower at 100,000. The effect of plant population density on yield was most pronounced with chickpeas and least with cowpeas. For chickpeas, the yield at 100,000 plants per hectare was 57% of the yield at 400,000. Similar values were 65% for drybeans and 83% for cowpeas. Straw yields followed the same general trend as grain yields.

Decreasing the space between rows tended to increase yields on a unit area basis. From practical considerations, however, the optimum row spacing is probably 50 cm., where furrow irrigation and mechanical cultivation are practiced.

Close spacing between plants in the row (high rates of seeding) decreased the number of pods per plant but increased seed size. Spacing between rows had no significant effect on pods per plant or seed size.

Table 45. Effect of Date of Planting on Yield of Lentils and Chickpeas - RPIP, KARAJ, 1967

Planting Date (1966-1967)	Seed Yield, Tons per hectare			
	Lentils		Chickpeas	
	Karaj	Varamin	Karaj	Varamin
October 10	0.04	0.99	0.29 1/	1.08 1/
October 23	0.04	0.82	0.36 1/	3.55
November 7	0.03	0.66	0.34 1/	3.67
November 21	0.02	0.54	0.63	3.82
December 4	0.05	0.41	0.34	2.83
December 18	0.07	0.50	-	3.82
January 1	0.07	0.46	0.80	2.94
January 15	0.14	0.61	-	4.00
January 29	0.07	0.38	0.82	3.23
February 27	0.11	0.43	0.74	3.34
March 13	0.09	0.41	0.66	4.10
March 27	0.09	0.19	0.67	2.06
April 9	0.12	-	0.72	1.82
April 22	0.08	-	0.58	0.44

1/ Winter injury caused by feezing

2/ Rabbit damage.

Table 46. Relation of Date of Planting to Grain Yield of Several Pulse Crops - RPIP, KARAJ, 1967

Planting date (1967)	Seed Yield, tons per hectare		
	Dry beans	Cowpeas	Mungbeans
April 15	0.78 c 1/	1.20 c	0.53 b
May 1	0.98 ab	2.43 a	0.94 a
May 16	1.06 a	2.09 b	1.09 a
June 1	0.87 bc	1.40 c	0.91 a
June 17	0.73 c	1.28 c	0.45 b

1/ Figures followed by the same letter are not significantly different at the 5% level.

Table 47. Influence of Row and Plant Spacings on Growth of Chickpeas
RPIP, KARAJ, 1967

Spacing between rows (cm.)	Plants per hectare 100,000	200,000	300,000	400,000	Mean
	Grain Yield, tons per hectare				
40	0.87	1.14	1.34	1.42	1.19 a[1/]
50	0.85	1.01	1.49	1.44	1.20 a
60	0.56	0.99	1.25	1.28	1.02 b
70	0.60	0.83	1.01	0.98	0.86 c
Mean	0.72 c	0.99 b	1.27 a	1.28 a	
	Straw yields tons, per hectare				
40	1.50	1.92	1.66	2.20	1.82 a
50	1.46	1.65	2.18	2.03	1.83 a
60	1.01	1.45	1.60	1.93	1.50 b
70	0.99	1.18	1.56	1.43	1.29 c
Mean	1.24 c	1.55 b	1.75 a	1.90 a	
	Pods per plant				
40	41	33	27	22	31 a
50	41	33	29	25	32 a
60	40	33	28	26	32 a
70	43	27	29	23	31 a
Mean	41 a	32 b	28 bc	24 c	
	Seed weight, gm. per seed				
40	0.171	0.181	0.185	0.196	0.183 a
50	0.171	0.178	0.192	0.192	0.183 a
60	0.159	0.176	0.173	0.192	0.175 b
70	0.170	0.178	0.177	0.186	0.178 ab
Mean	0.168 c	0.178 b	0.182 b	0.192 a	

1/ Figures followed by the same letter are not significantly different at the 5% level.

Table 48. Influence of Row and Plant Spacings on Growth of Dry-Beans
RPIP, KARAJ, 1967

Spacing between rows (cm.)	Plants per hectare				Mean
	100,000	200,000	300,000	400,000	
	Grain yield, tons per hectare				
40	1.75	2.52	2.67	2.95	2.47 a 1/
50	1.80	2.28	2.72	2.54	2.34 ab
60	1.80	2.29	2.30	2.54	2.23 b
70	1.32	1.98	2.09	2.30	1.92 c
mean	1.67 c	2.266	2.44 ab	2.58 a	
	Straw yield, tons per hectare				
40	1.65	2.39	2.59	2.51	2.29 a
50	1.71	1.87	2.12	2.03	1.93 b
60	1.58	1.72	1.70	2.26	1.82 b
70	1.12	1.62	1.82	1.96	1.63 c
mean	1.52 c	1.90 b	2.06 ab	2.19 a	
	Pods per plant				
40	12.2	10.2	12.2	9.7	11.1 a
50	13.3	11.6	10.9	9.5	11.3 a
60	13.4	9.9	11.3	9.6	11.1 a
70	13.5	10.3	11.5	10.5	11.5 a
mean	13.1 a	10.5 b	11.5 b	9.8 c	
	Seed weight, gm. per seed				
40	0.309	0.324	0.329	0.338	0.325 a
50	0.310	0.320	0.329	0.330	0.322 a
60	0.316	0.326	0.313	0.337	0.321 a
70	0.305	0.327	0.314	0.317	0.316 b
mean	0.310 c	0.324 b	0.322 b	0.331 a	

1/ Figures followed by the same letter are not significantly different at the 5% level.

Spacing between rows (cm.)	Plants per hectare 100,000	200,000	300,000	400,000	Mean
	Grain yield, tons per hectare				
40	2.02	2.21	2.55	2.62	2.35 a 1/
50	1.84	2.20	2.20	2.34	2.15 b
60	2.00	2.23	2.05	2.18	2.12 b
70	1.97	2.12	2.33	2.30	2.18 b
mean	1.96 c	2.19 b	2.28 ab	2.36 a	
	Straw yield, tons per hectare				
40	2.91	3.99	4.12	4.36	3.85 a
50	2.72	3.90	4.18	3.98	3.70 a
60	2.53	3.48	3.62	3.76	3.35 b
70	2.41	3.57	3.83	3.63	3.36 b
Mean	2.64 b	3.74 a	3.94 a	3.93 a	
	Pods per plant				
40	11.9	8.5	6.1	6.0	8.1 a
50	13.5	7.7	6.2	5.4	8.2 a
60	13.9	8.3	7.4	5.7	8.8 a
70	14.6	7.9	6.3	7.2	9.0 a
Mean	13.5 a	8.1 b	6.5 c	6.1 c	
	Seed weight, gm. per seed				
40	0.240	0.246	0.253	0.248	0.247 a
50	0.232	0.246	0.249	0.258	0.246 a
60	0.243	0.245	0.244	0.252	0.246 a
70	0.239	0.256	0.259	0.262	0.254 a
mean	0.238 b	0.248 ab	0.251 a	0.255 a	

1/ Figures followed by the same letter are not significantly different at the 5% level.

Herbicides

Four herbicides were applied at the following rates: none, one-half, one, one and one-half, and two times the recommended rate. Dates of application were April 15 for Lorox and Treflan and July 1 for Eptam and Dacthal. The first two herbicides were not entirely comparable with the other two with respect to weed control because of the difference in application dates.

The herbicides varied in their effectiveness for weed control and toxicity to the different pulse crops (Table 50). Lorox was most effective for control of broadleaf weeds, even at one-half of the recommended rate, although at this rate it was not as effective as Treflan for grasses. The weed population was less for the July application of Eptam and Dacthal, neither of which effectively controlled broadleaf weeds.

Treflan produced toxic symptoms on cowpeas and mungbeans at all rates, on lentils at the two higher rates, and on chickpeas at the highest rate. No toxicity from Lorox was observed on any of the pulse crops. Most of the Lorox treated area produced higher yields than the untreated, where a greater weed growth existed for six weeks (when all plots were weeded). Eptam and Dacthal had no apparent effect on the growth of the crops, although weed competition was not as severe on these plots.

Irrigation - Disease

Lentils in the varietal yield tests during the two preceding years were severely damaged by diseases, primarily root rot. It was suspected that this disease problem was associated with high soil moisture conditions, which was caused by the practice of irrigating approximately once a week. Field studies were conducted in 1967 to determine the effects of frequency of irrigation, crop variety, and soil fertility level on the growth of lentils and the occurrence of disease.

Disease symptoms, consisting of yellowing of leaves, stunted growth, and eventual dying of the plants, were more severe for the susceptible varieties and with fertilization (nitrogen and phosphorus). The irrigation effects on the occurrence of disease were variable. For the resistant varieties, disease was very slight where unfertilized, even at the highest moisture level. Fertilization, however, increased the occurrence of disease, especially where irrigated every six days. Disease was most severe for susceptible varieties irrigated every six days. The effects of disease resulted in reduced grain yields, which was reflected in higher straw-grain ratios (Table 51).

Table 50. Effect of herbicides on weed control and yield of pulse crops
RPIP, KARAJ, 1967

Herbicide (1)		Weeds (2)		Seed Yield, tons per hectare				
Kind	Rate	Broad -leaf	Narrow -leaf	Beans	Cow-peas	Mung-beans	Chick-peas	Lentils
Lorox	0	223	130	0.77	0.83	0.31	0.35	0.25
	0.5	37	61	1.08	0.98	0.36	0.57	0.26
	1.0	21	19	0.96	0.99	0.43	0.61	0.33
	1.5	25	17	0.91	1.11	0.42	0.49	0.21
	2.0	31	13	1.07	1.13	0.37	0.61	0.25
Treflan	0	223	130	0.77	0.83	0.31	0.35	0.25
	0.5	160	10	0.82	0.69	0.27	0.55	0.21
	1.0	127	17	0.82	0.76	0.25	0.45	0.24
	1.5	112	19	0.82	0.67	0.22	0.60	0.08
	2.0	63	7	0.96	0.69	0.15	0.31	0.06
Eptam	0	105	10	0.59	0.58	0.24		
	1.5	97	3	0.58	0.62	0.21		
	3.0	90	5	0.49	0.64	0.25		
	4.5	75	2	0.71	0.68	0.27		
	6.0	80	2	0.52	0.53	0.20		
Dacthal	0	105	10	0.59	0.58	0.24		
	5.0	87	7	0.73	0.56	0.21		
	10.0	83	6	0.57	0.63	0.25		
	15.0	95	5	0.52	0.61	0.21		
	20.0	83	5	0.42	0.75	0.29		

1/ Lorox and Treflan were applied and crops planted April 15, 1967, while Eptam and Dacthal were applied and crops planted July 1, 1967. Rates of application given in kilograms of active ingredient per hectare.

2/ Number of weeds per 10 square meters. Counts were taken six weeks following the application of the herbicides.

Table 51. Influence of Frequency of Irrigation of Yield of Lentils
RPIP, KARAJ, 1967

Variety and fertilization	Frequency of irrigation, days			
	6	12	18	Delayed 1/
	Grain yield tons/ha.			
Resistant varieties: 2/				
Unfertilized	0.76	0.66	0.74	0.70
Fertilized	0.55	0.55	0.62	0.59
Susceptible varieties: 3/				
Unfertilized	0.26	0.29	0.28	0.23
Fertilized	0.10	0.23	0.20	0.16
	Straw yield, tons/ha.			
Resistant varieties:				
Unfertilized	1.23	1.13	1.10	1.01
Fertilized	1.13	0.97	1.05	1.00
Susceptible varieties:				
Unfertilized	0.97	0.97	0.93	0.82
Fertilized	0.84	0.83	0.79	0.72
	Straw - grain ratio			
Resistant varieties:				
Unfertilized	1.67	1.72	1.69	1.48
Fertilized	2.19	1.84	1.76	1.75
Susceptible varieties:				
Unfertilized	3.77	3.36	3.34	3.65
Fertilized	7.36	3.70	4.00	4.58

1/ First irrigation (following emergence) at time of first bloom, then irrigated every 12 days.

2/ Two varieties which showed high resistance to fungal diseases in previous tests.

3/ Two varieties which showed low resistance to fungal diseases in previous tests.

Irrigation - Fertilization

Combination irrigation and fertilization treatments and their effects on grain yields of chickpeas, dry beans, and cowpeas are given in Tables 52 and 53.

Irrigating to maintain high soil moisture after full bloom resulted in the highest yield of chickpeas. For dry beans and cowpeas, yields were not significantly different where soil moisture was maintained at the high or medium level during bloom and early maturity stages of growth. Yields of all three crops were decreased by allowing the soil moisture to approach the wilting point during this period.

Nitrogen fertilization did not significantly increase yields. Phosphorus, however, resulted in markedly higher yields (available phosphorus of soil was 2-3 p.p.m. P).

The combination of phosphorus fertilization and adequate moisture resulted in the highest yield. For chickpeas with no fertilization, high soil moisture after bloom increased yield by 0.48 ton per hectare above that of the low moisture treatment. But at high fertility, the same irrigation treatments had a yield differential of 1.34 tons. Similarly, fertilization increased yields by 0.46 and 1.50 tons, respectively, under low and high soil moisture levels. The combination of high levels of both moisture and fertility increased the yield of chickpeas by 1.98 tons or 140% above that for low soil moisture and no fertilization. Results for dry beans and cowpeas followed a similar pattern, although the yield increases were smaller.

Table 52. Influence of irrigation and fertilization on yield of chickpeas
RPIP, KARAJ, 1967

Soil Moisture When irrigated 1/		Number of irrigations	Grain yield, tons per hectare				
			Fertilization 2/				
To full bloom	After full bloom		None	N	P	NP	Mean
			Chickpeas T/Ha				
High	High	13	2.07	2.23	3.19	3.16	2.66a 3/
High	Medium	10	1.31	1.53	2.19	2.64	1.92b
Medium	High	11	1.71	2.33	3.61	3.51	2.79a
Medium	Medium	8	1.79	1.64	2.30	2.37	2.03b
Low	Medium	7	1.40	1.44	2.04	2.04	1.73b
Medium	Low	7	1.49	1.56	1.99	2.23	1.82b
Low	Low	6	1.33	1.48	1.94	2.06	1.70b
Mean			1.59b	1.74b	2.47a	2.57a	
			Dry beans, T./Ha.				
High	High	12	2.81	2.87	3.51	3.44	3.17a
High	Medium	9	2.78	2.83	3.31	3.26	3.04ab
Medium	High	1[illegible]	2.78	2.99	3.13	3.11	3.00ab
Medium	Medium	8	2.48	2.78	3.15	3.05	2.86ab
Low	Medium	7	2.21	2.36	2.65	3.04	2.57bc
Medium	Low	6	1.98	2.01	2.46	2.37	2.20c
Low	Low	5	1.76	1.97	2.25	2.37	2.09c
Mean			2.40c	2.54b	2.92a	2.99a	

1/ High : Two-thirds of available soil moisture at field capacity remained. Medium: One-third of available soil moisture remained and Low: plants began to wilt.

2/ Fertilizer rates: 100 kg N (ammonnium nitrate) and 150 kg P (concentrated phosphate) per hectare.

3/ Figures followed by the same letter are not significantly different at the 5% level.

Table 53. Influence of irrigation and fertilization on yield of cowpeas
RPIP. KARAJ. 1967

Soil moisture when irrigated 1/				Grain yield, tons per hectare				
				Fertilization 2/				
Pre-Bloom	Bloom	Post-bloom	Number of Irrigations	None	N	P	NP	Mean
High	High	High	13	1.83	1.91	2.19	2.07	2.00 ab
High	Medium	Medium	10	1.63	1.84	2.03	2.18	1.92 ab
Medium	High	Medium	10	1.88	2.04	2.37	2.23	2.13 a
Medium	Medium	High	9	1.73	1.80	2.07	2.06	1.91 ab
Medium	Medium	Medium	8	1.89	2.07	2.12	2.35	2.11 a
Low	Medium	Medium	7	1.66	1.83	1.89	2.01	1.85 ab
Medium	Low	Medium	7	1.38	1.79	1.99	1.75	1.73 b
Medium	Medium	Low	7	1.67	1.50	1.83	2.05	1.76 b
Low	Low	Low	5	1.46	1.17	1.60	1.46	1.42 c
Mean				1.68b	1.77b	2.01a	2.01a	

1/ High: Two-thirds of available soil moisture at field capacity remained, Medium: One-third of available soil moisture remained, and Low: plants began to wilt.

2/ Fertilizer rates: 100 kg. N. (ammonium nitrate) and 150 kg (concentrated superphosphate) per hectare.

3/ Figures followed by the same letter are not significantly different at the 5% level

SOIL AND CROP MANAGEMENT
Pahlavi University
Shiraz, Iran

B. Bahrani
P. Pessarar.
A. Amin-Lari

Irrigation Frequency - Fertilization

Chickpeas were irrigated at intervals of 7 (W_1), 10 (W_2), and 14 (W_3) days and given applications of fertilizer as follows:

N_oP_o, N_oP_1, N_oP_2, N_1P_1, and N_1P_2; where N_o = no N, N_1 = 60 kg. N/ha., P_o = no P, P_1 = 45 kg. P/ha., and P_2 = 90 kg. P/ha.

The experimental design consisted of irrigation as main plots, nitrogen as sub-plots, and phosphorus as sub-sub-plots with four replications. Irrigation was by the basin method; the basins were 20 m. x 3 m. as sub-sub-plots. The amount of water applied was measured with Parshal flumes. The number of irrigations and the total depth of water applied are as follows:

	Treatments		
	W_1	W_2	W_3
Irrigations:	15	11	8
Depth, cm.:	72.5	56.3	41.7

Plants on the dry plots (W_3) matured earlier and were shorter than those on the wet (W_1) and intermediate (W_2) plots. There were no observable differences between plants on the W_1 and W_2 plots.

The effects of irrigation and fertilization on seed yields of chickpeas are shown in Figure 1. Differences between the three irrigation treatments are statistically significant at the 1% level. Yields for W_1 were approximately double those for W_3. Phosphorus increased yields (P_1 significantly greater than P_o at 5% level), particularly at the high soil moisture level. Nitrogen had no significantly higher than for W_2 and W_3.

Figure 2 shows the relation between seed yields and the amount of water applied. A regression analysis gives a value of r = 0.808.

Irrigation Frequency and Method

Chickpeas were irrigated at intervals of 6 (W_1), 9(W_2), and 12 (W_3) days. Each frequency treatment was applied with both the basin (MB) and the furrow (MF) irrigation methods, frequency as main plots and method as sub-plots in a split plot design with four

replications. The amount of water applied and the runoff from the furrows were measured with Parshal flumes. The number of irrigations and the total depth of water applied are as follows:

	W_1		W_2		W_3	
	MF	MB	MF	MB	MF	MB
Irrigations:	16	16	12	12	10	10
Depth, cm.:	73.7	71.7	56.2	54.7	44.8	45.0

Seed, straw, and root yields are summarized in Table P-1.

Table P-1. Effect of Irrigation on Yields of Chickpeas

Method	Irrigation Frequency		
	W_1	W_2	W_3
		Seed Yield, Kg./Ha.	
Basin	2439	1246	1176
Furrow	2444	1384	1140
		Straw Yield, Kg/Ha.	
Basin	2156	1146	942
Furrow	1731	1170	963
		Root Yield, Gm./Plot	
Basin	0.76	0.54	0.39
Furrow	1.03	0.58	0.49

The effect of irrigation frequency was statistically significant, but method of irrigation was not.

The basin method had an irrigation efficiency of 45.4, which was significantly higher than the 35.5 value for the furrow method.

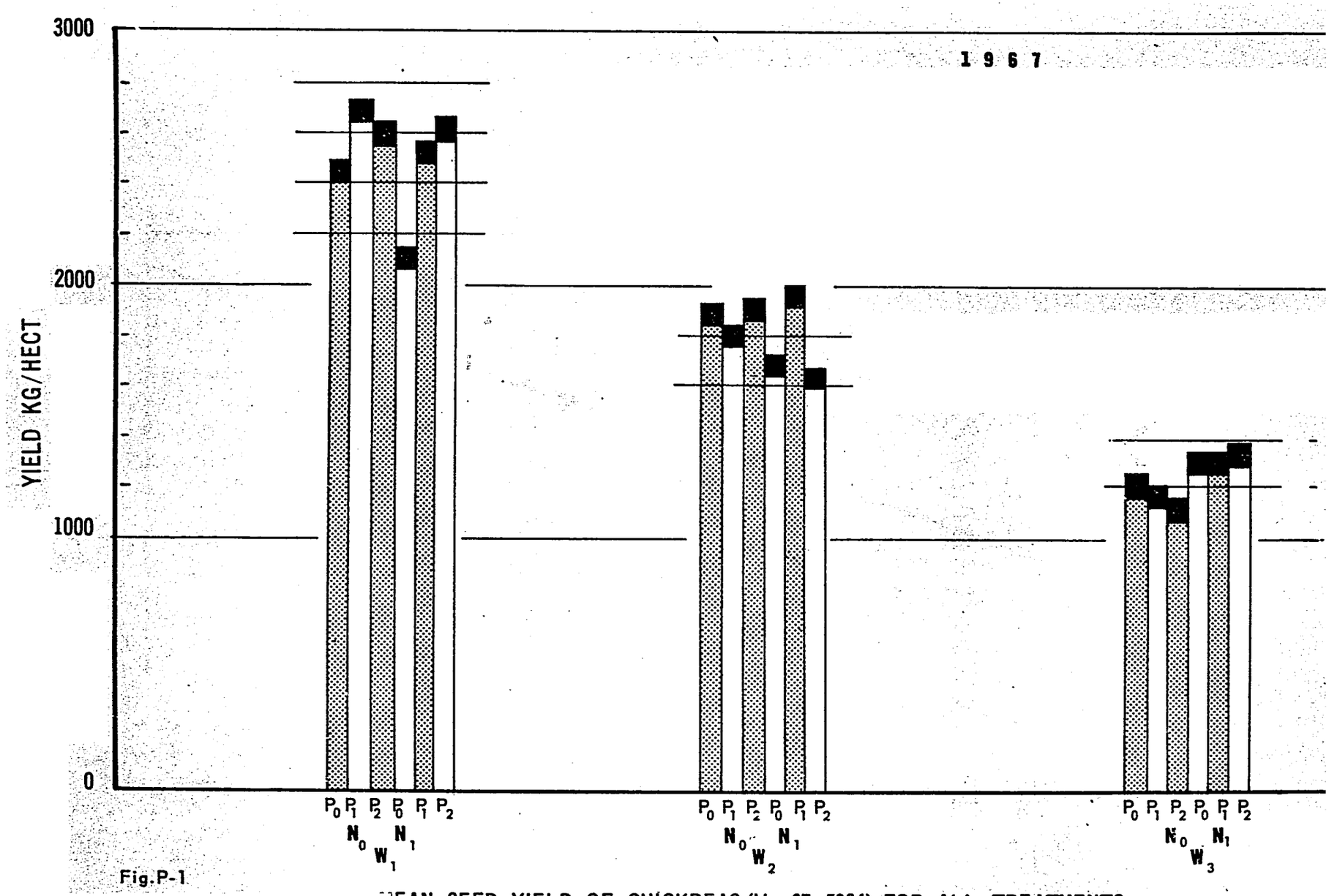

Fig.P-1

MEAN SEED YIELD OF CHICKPEAS (Var.67-5024) FOR ALL TREATMENTS

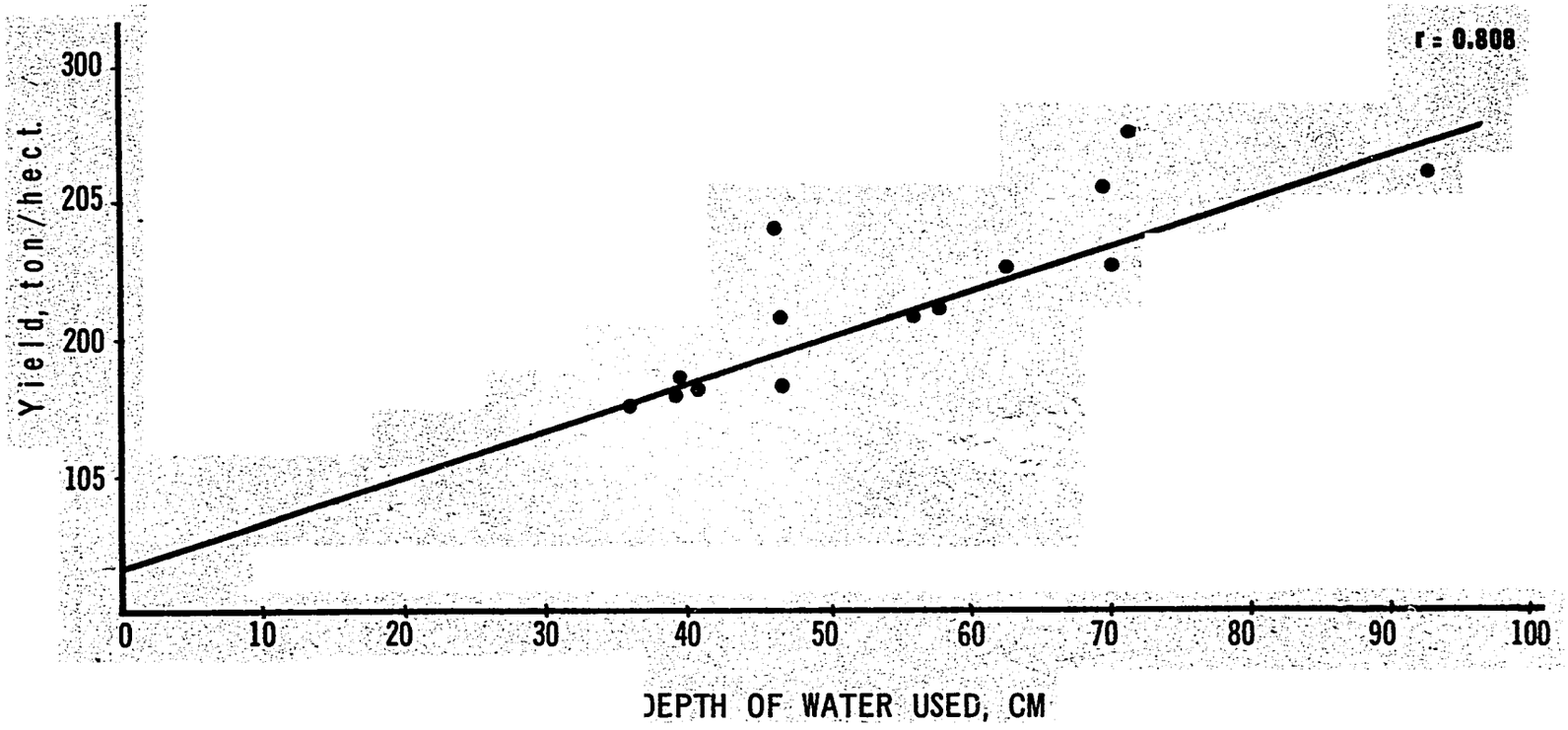
r = 0.808
Yield, ton/hect.
300
205
200
105
0
10
20
30
40
50
60
70
80
90
100
DEPTH OF WATER USED, CM

Fig. P-2

PLANT PATHOLOGY

Walter J. Kaiser - Pathologist
Counterparts: Dariush Danesh
Mahmoud Okhovat
Hossein Mossahebi

Summary

Bean common mosaic virus (BCMV) which is the most widespread and important disease of beans in Iran is transmitted through more than 50% of the seed of many bean varieties tested in Iran. Yield reductions of up to 68% were observed in bean varieties infected with BCMV. Plants infected with BCMV were found in all but 1.5% of 1952 bean lines grown in RPIP observation trials at Karaj College.

No resistance to bean yellow mosaic virus (BYMV) was observed in 85 broad-bean strains grown in observation trials in Khuzestan. This mechanically transmitted virus was found to be seed-borne and aphid transmitted. In 20 strains comprising over 19000 plants there was only 0.2% seed transmission of BYMV. However, by maturity this virus had spread to more than 85% of the plants. A newly discovered aphid-transmitted virus disease, variously known as broadbean yellows, bean leaf roll, pea leaf roll or pea top yellows, was present in 85% of the broadbean strains included in the Khuzestan trial. Infected plants are chlorotic, stunted and sterile. Pea leaf roll virus is not confined to broadbeans, but has been observed in peas and beans, and possibly other pulse crops, including chickpeas and cowpeas.

In Iran chickpeas are naturally infected by three viruses - alfalfa mosaic (AMV) bean yellow mosaic (BYMV), and cucumber mosaic (CMV). All three chickpea viruses are mechanically and aphid transmitted, but apparently not seed-borne. In field inoculation studies seed yields were reduced 72-9% with AMV, 77-92% with BYMV, and 52% with CMV. In a planting of six black and white chickpea lines 5-13% of the plants were naturally infected with BYMV. Seed yields from these virus infected plants were decreased by an average of 98%. Greenhouse tests have proved the pathogenicity of Rhizoctonia solani, Macrophomina solani, Pythium ultimum and Fusarium solani to the roots of chickpea. At times root rot causes serious damage to chickpeas grown in various areas of Iran.

A seed-borne, aphid transmitted virus-tentatively identified as cowpea aphid-borne mosaic virus (CAMV) -- is the most important and widely distributed disease of cowpeas. Greenhouse and field inoculations with this virus decreased seed yields up to 80%. Seed transmission in 26 lines varied from 0 to 30%, and yields from infected plants were decreased from 13-83%. In greenhouse inoculation studies 6 lines out of 54 tested were resistant to CAMV. Alfalfa mosaic virus, which is potentially an important disease when cowpeas are grown adjacent to virus-infected alfalfa, reduced cowpea seed yields in greenhouse and field tests 17 to 76%. This aphid-transmitted virus is apparently not seed-borne in cowpeas. In greenhouse inoculations none of the 54 cowpea lines showed any resistance to AMV.

One of the most economically important diseases of mungbean is an aphid-transmitted, seed-borne virus called mungbean mosaic virus (MMV). This virus, which is a flexuous rod 750 mu in length, appears to be a strain of bean common mosaic virus. In field tests seed transmission in 13 mungbean strains ranged from 0 to 25%. Seed yields from virus infected plants were decreased up to 75%. A crown rot disease of mungbeans caused by Rhizoctonia solani was responsible for 4 to 57% mortality in young plantings of the crop. Greenhouse tests revealed large differences in pathogenicity of Rhizoctonia isolates to mungbean. Sampling of field soil showed Rhizoctonia to be confined to the top 20 cm which is the zone of most abundant root development.

Bean (Phaseolus vulgaris)

Bean common mosaic (BCMV) is one of the most important diseases of bean in Iran. A disease survey conducted in the RPIP variety trial at Karaj showed that BCMV was present in all but 29 selections of 1952 included in the trial (Table 54.) The effect of BCMV on yields and seed transmission was studied in the greenhouse and under natural field conditions. Bean common mosaic virus was seed-borne in more than 50% of the seed of two Iranian varieties and yields from virus infected plants were reduced up to 68% (Table 55). Healthy bean plants were mechanically inoculated in the field at the pre-bloom and full bloom stages with BCMV. Yields from plants inoculated at pre-bloom and full bloom were reduced 67% and 40%, respectively, and BCMV was seed-borne in 25% and 3%, respectively, of the seedlings from inoculated plants (Figure 1).

A newly identified persistent aphid-borne virus, called pea leaf roll virus (PLRV), has been observed infecting beans in the Karaj and Shiraz areas. This virus is called by different names, usually depending upon the symptoms it produces in a particular crop, such as broadbean yellows, bean leaf roll, pea leaf roll or pea top yellows, Infected bean plants are stunted with shortened internodes, and there is pronounced rolling, thickening and crinkling of the leaves (Figure 2 Additional surveys, accompanied by field and greenhouse studies, will be required before we can assess the importance of this virus in bean production.

Table 55. Seed transmission of bean common mosaic virus in two Iranian bean varieties and the effect of virus infection on seed yields.

Bean Variety	Seed Transmission	Grams of Seed from 100 plants		Decrease in Yield
		Healthy	Diseased	
	%			%
1	51	963	310	68
2	51	782	367	53

Table 54. Disease Survey of 1967 Bean Variety Trial at Karaj College for Bean Common Mosaic Virus BCMV)

Trial	Disease Rating %										
	0	1-10	11-20	21-30	31-50	51-60	61-70	71-80	81-90	91-100	Total
	Number of Strains infected with BCMV										
Nursery	28	218	222	191	151	123	219	259	167	68	1656
Preliminary Yield Test	2	19	49	42	17	30	33	29	12	3	236
Advanced Yield Test	0	14	7	10	8	7	4	8	2	0	60
Total	30	251	278	243	176	170	256	296	181	71	1952
% of Strains Diseased	1.5	12.9	14.2	12.4	9.1	8.7	13.1	15.2	9.3	3.6	

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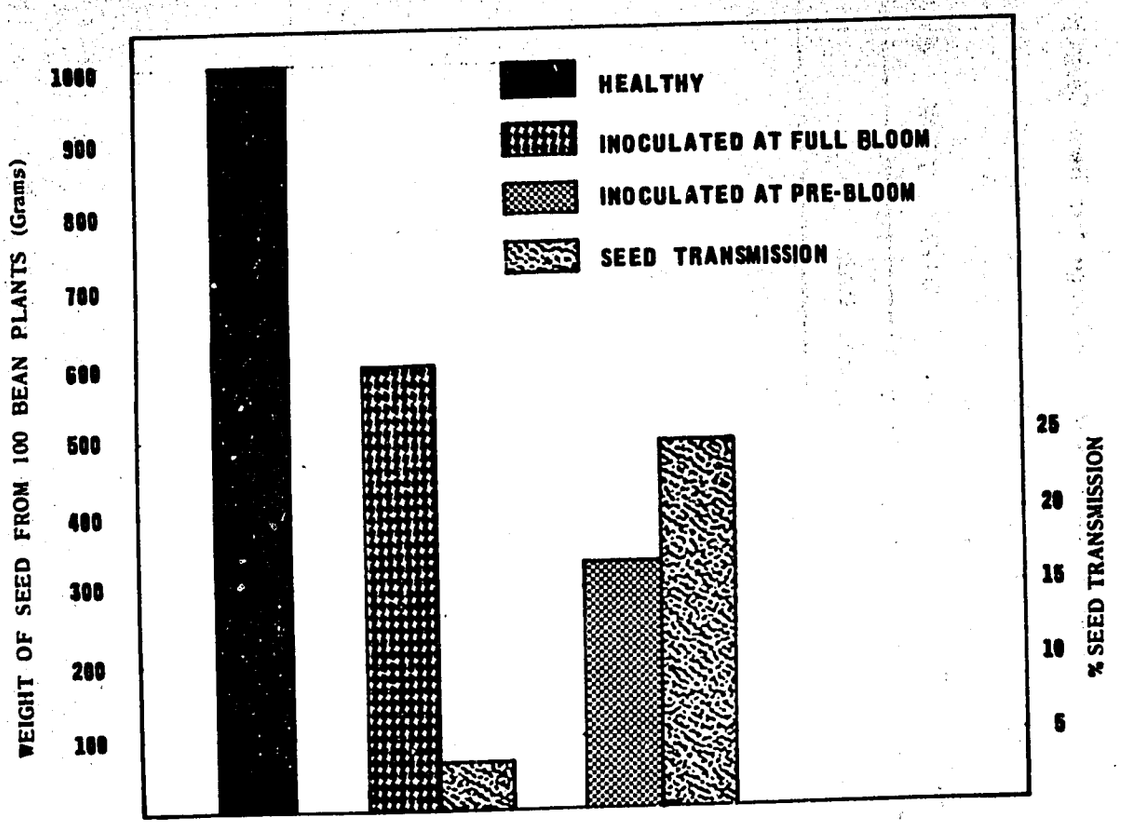

Figure 1. Effect of bean common mosaic virus in field inoculation studies on seed yield of Bountiful bean and per cent seed transmission from infected plants.

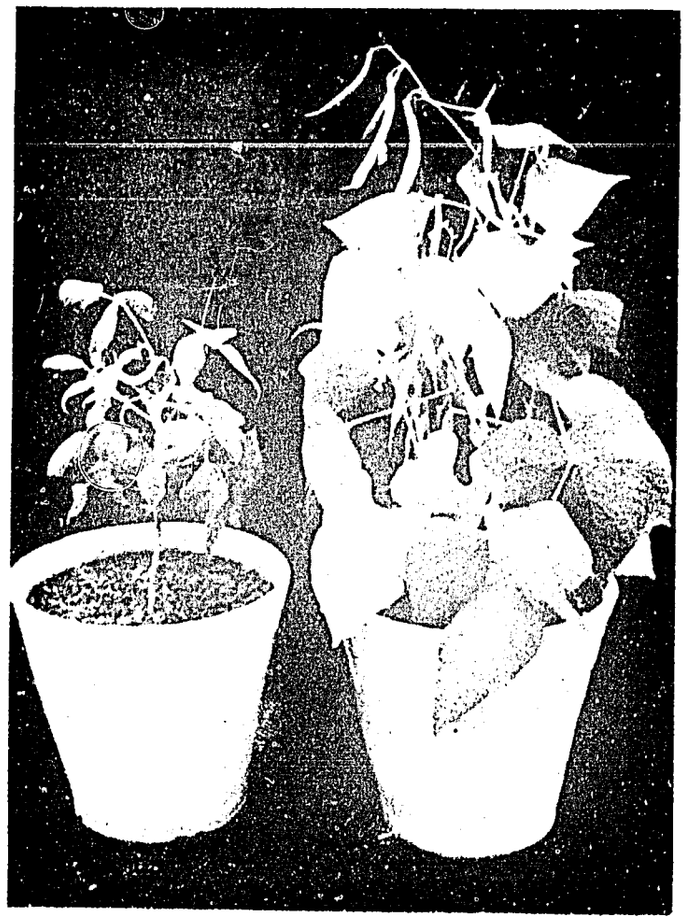

Figure 2. The symptoms of pea leaf roll virus in Bountiful bean are twisting, rolling, and thickening of the leaves and overall stunting of the plant (left). A healthy plant of the same age is included for comparison (right).

Broadbean (Vicia faba)

Bean yellow mosaic virus (BYMV) infects broadbeans yearly throughout Iran. All 85 broadbean lines grown in observation trials in Khuzestan in 1966-1967 were infected with the virus. Bean yellow mosaic virus is seed-borne and aphid-transmitted. In 20 broadbean lines containing over 19,000 plants included in the Khuzestan trial, there was only 0.2% seed transmission of BYMV. However, at maturity 3 months later over 85% of the plants were virus infected. The effect of BYMV on broadbean yields is currently being studied in the greenhouse and field.

In 1966 a new virus was discovered in our broadbean variety trial in Khuzestan. Pea leaf roll virus (PLRV) infected plants in 72 of 85 broadbean lines in the Khuzestan trial. Infected plants, which are stunted, chlorotic and sterile, usually branch profusely and the leaves are leathery and cupped (Figure 3). Pea leaf roll is a persistent aphid-borne virus which is apparently not mechanically transmitted. Two aphids, Aphis craccivora and Acyrthosiphon sesbaniae, which are common to most pulse crops grown in Iran, including broadbeans, have transmitted PLRV from virus infected broadbeans to healthy broadbeans in greenhouse tests. In more detailed studies with A. craccivora, PLRV was transmitted by this aphid from virus infected broadbeans to broadbeans, beans, peas, chickpeas, lentils, Trifolium incarnatum and T. subterraneum, and possibly cowpeas, mungbeans and alfalfa. Immature and mature winged (alatae) and wingless (apterae) aphids transmitted PLRV. Winged and wingless adults continued transmitting PLRV 5 days after being transferred from virus infected to healthy broadbeans. In transmission studies A. craccivora has transmitted BYMV and PLRV simultaneously to healthy broadbeans when fed on broadbeans infected with both viruses.

Chickpea (Cicer arietinum)

In Iran chickpeas are naturally infected by 3 viruses - alfalfa mosaic (AMV), bean yellow mosaic (BYMV), and cucumber mosaic (CMV). These viruses are all mechanically transmitted and aphid-borne, but apparently not seed-borne. The disease symptoms caused by these viruses in chickpeas under natural field condition have all been reproduced in chickpeas inoculated in the greenhouse (Figure 4,5,6).

The effect of virus infection on yields was studied under field and greenhouse conditions by mechanically inoculating chickpea plants with each virus at different stages of growth (Figure 7). In the field tests, yields were reduced 72-96% with AMV, 77-92% with BYMV and 52% with CMV (Figure 8). The reaction of chickpeas inoculated in the greenhouse was generally more severe than those inoculated under field conditions.

In a planting of six black and white chickpea lines at Karaj, field surveys showed that BYMV had spread under natural conditions to 5-13% of the plants, and that yields from infected plants were reduced an average of 98% (Table 56 and Figure 9).

Figure 3. Broadbean plants infected with pea leaf roll virus (right) are stunted and chlorotic when compared to healthy plants (left). The leaves from virus infected plants are dwarfed, leathery and cupped.

Figure 4. Chickpea plants infected with alfalfa mosaic virus (left) are chlorotic and stunted when compared to healthy plants (right). There is often a proliferation of the axillary buds resulting in the formation of numerous small leaflets and a conspicuous phloem discoloration of the stem.

Figure 5. Chickpea plants infected with some strains of bean yellow mosaic virus produce feathery, deformed leaflets. Infected plants are stunted and often chlorotic.

Figure 6. A healthy portion of a chickpea plant (left) adjacent to one infected with cucumber mosaic virus (right). Infected plants are severely stunted and the internodes are shortened. There is excessive development of the axillary buds causing infected plants to have a bushy appearance.

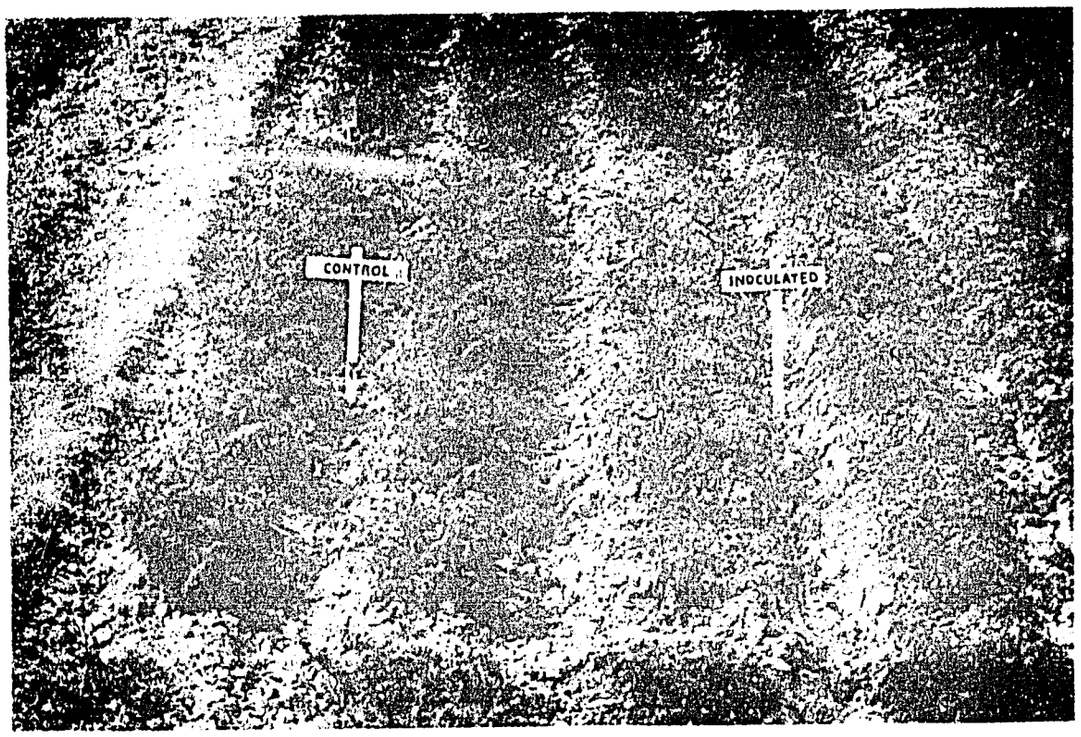

Figure 7 . In field inoculation studies mortality of chickpea plants inoculated with alfalfa mosaic virus (2 rows on right) in the pre-bloom stage was over 82% and yields were reduced by 96%. Surviving plants are stunted and chlorotic when compared to healthy plants (2 rows on left).

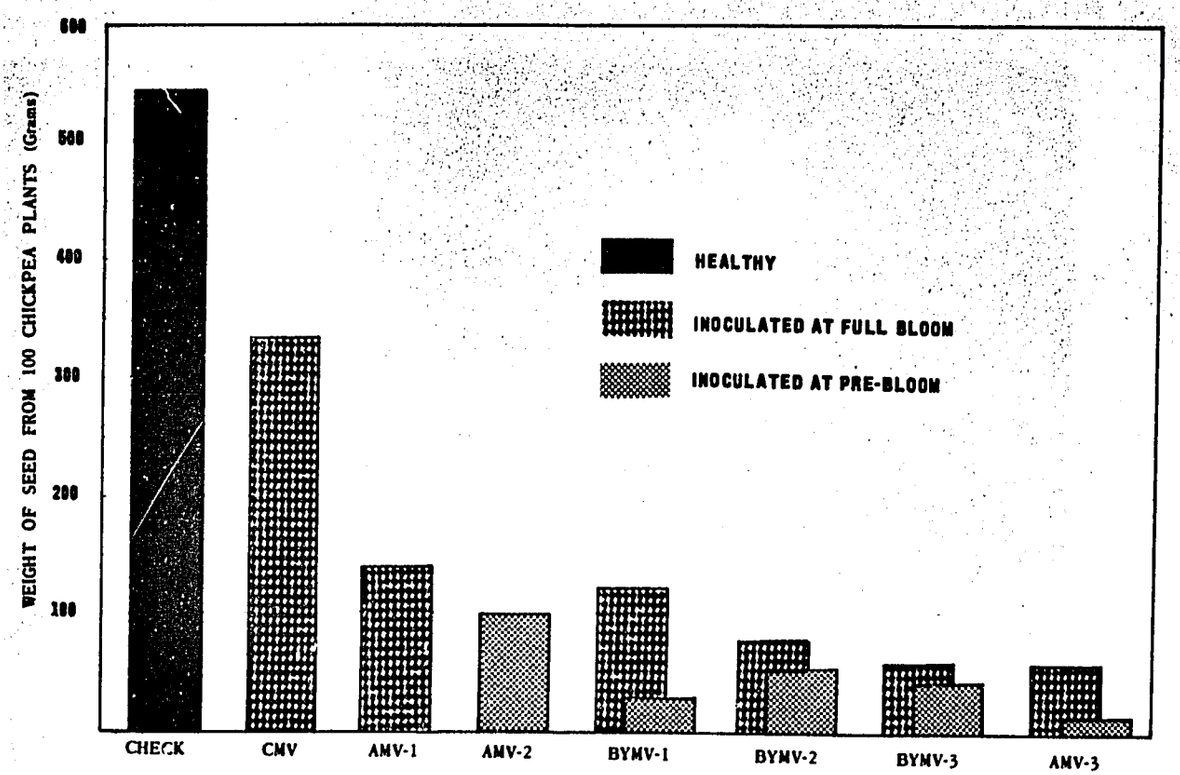

Figure 8. The weight of seed (grams) from 100 chickpea plants inoculated under field conditions at different stages of growth with isolates of alfalfa mosaic virus (AMV), bean yellow mosaic virus (BYMV) and cucumber mosaic virus (CMV).

Pathogenicity tests were conducted with several soil-borne fungi frequently isolated from rotted, necrotic chickpea roots. The fungi were grown in a cornmeal-sand mixture, which was subsequently mixed with pasteurized soil and planted to seed of different chickpea lines. We found that the following fungi were pathogenic to the roots of chickpea: Rhizoctonia solani, Macrophomina phaseoli (Figure 10), Pythium ultimum, and Fusarium spp. Rhizoctonia solani also caused a crown rot of inoculated chickpeas.

Table 56. Natural infection of 6 selections of chickpeas with bean yellow mosaic virus and its effect on yield.

Selection	Diseased	Grams of seed from 25 plants	
		Healthy	Diseased
	%		
W1 a/	7	407	3
W2	6	389	6
W3	13	372	6
B1	5	421	1
B2	10	287	2
B3	6	281	2

a/ W refers to white seeded and B to black seeded chickpea types

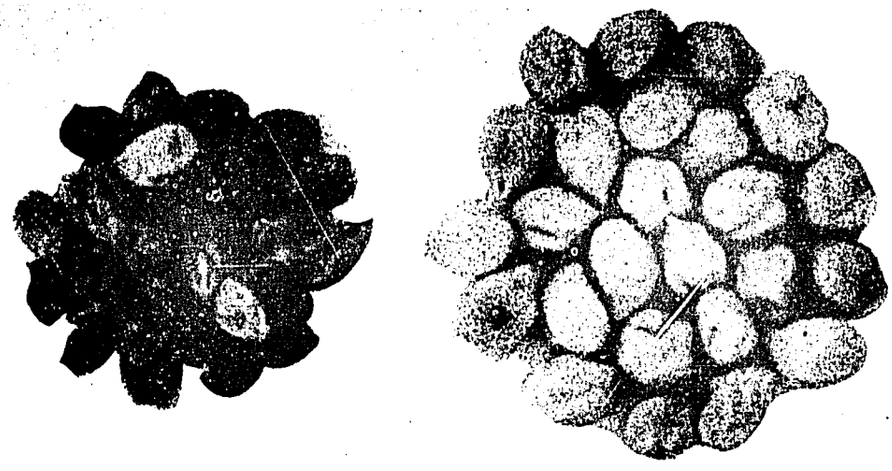

Figure 9. Seed from chickpea plants naturally infected with bean yellow mosaic virus (left) are usually off-colored, shrivelled and deformed in comparison to seed from healthy plants (right). The weight of 25 seeds from healthy and virus infected plants is 5.3 gm. and 2.0 gm., respectively, or a reduction of 62%.

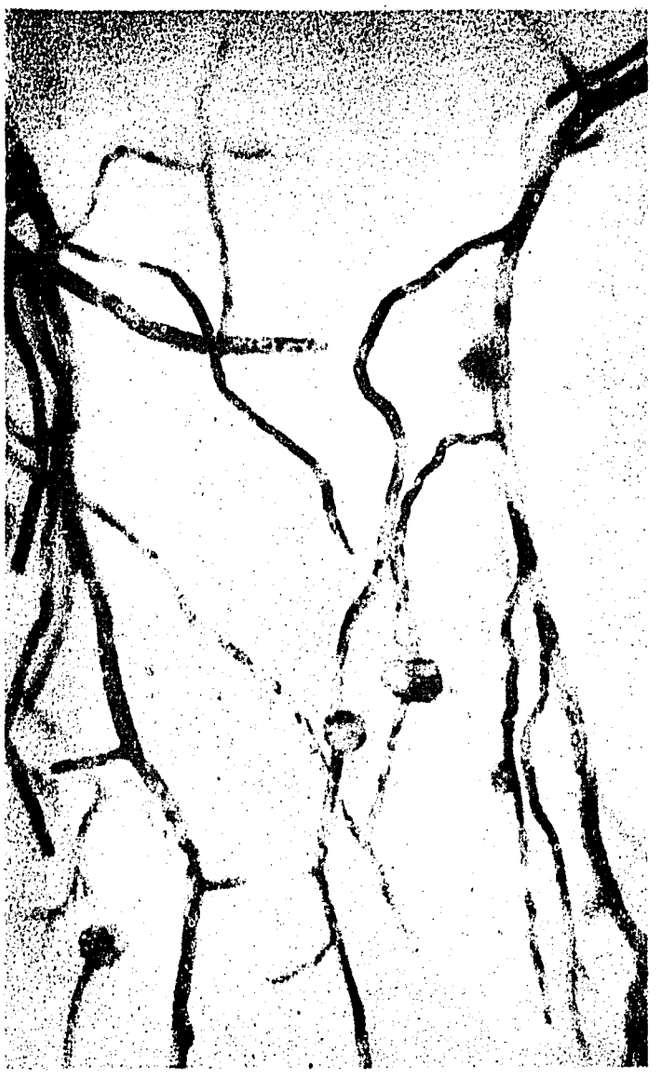

Figure 10. In greenhouse inoculation studies Macrophomina phaseoli was found to be pathogenic to the roots of chickpea. The fungus produces black necrotic areas on the roots of inoculated plants.

Cowpea (Vigna sinensis)

The most important and widespread disease of cowpeas in Iran is caused by a seed-borne, aphid-transmitted virus, tentatively identified as cowpea aphid-borne mosaic virus (CAMV). Cowpeas were mechanically inoculated at pre and full bloom to observe the effect of CAMV on yield and subsequent seed transmission. Seed yields were reduced by 44% at pre-bloom and by 43$ at full bloom (Figure 11). In greenhouse inoculations yields were reduced by 80%.

Seed was collected from plants infected with CAMV from 26 cowpea lines in the RPIP Karaj plots in 1966. The seed was planted in 1967 and observations were made on seed transmission and effect of virus infection on yield. Seed transmission varied from 0 to 30+% and yields were decreased from 13 to 83% (Figure 12).

Another virus disease caused by alfalfa mosaic virus (AMV) was observed in cowpea plantings at Karaj and Shiraz. The disease is a potential treat to cowpeas growing near virus infected alfalfa. Infected plants are stunted and the predominant symptom is a yellow mosaic pattern on the leaves (Figure 13.) and occasionally on the pods. The virus is aphid-transmitted, but does not appear to be seed-borne. Serology has been a very useful tool in diagnosing diseased plants for AMV(Figure 14). Virus inoculations were conducted in the field in essentially the same manner as with CAMV. Seed yields were decreased 17 to 55% (Figure 11). In greenhouse inoculations AMV reduced yields by 76%.

In the greenhouse 54 of the most promising cowpea lines included in the Karaj RPIP trials were screened for resistance to CAMV and AMV.Six lines were found to be highly resistant to CAMV, but none to AMV.

Mungbean (Phaseolus aureus)

An aphid-transmitted, seed-borne virus, called mungbean mosaic virus (MMV), has been found infecting mungbean in most areas where they are grown in Iran. Mungbean mosaic virus is a flexuous rod 750 mu in length, and appears to be a strain of bean common mosaic virus (Figure 15) from studies conducted with host range, symptomatology, physical properties, serology and electron microscopy. In field tests with several mungbean lines seed transmission varied from 0-25+% and yields from virus infected plants were reduced up to 75% (Figure 16).

A collar rot or stem canker disease of mungbean incited by Rhizoctonia solani (Figure 17) caused from 4 to 57% mortality in young plantings of several lines in the RPIP plots at Karaj. In greenhouse inoculation tests large differences were found in the pathogenicity of different Rhizoctonia isolates to mungbeans (Table 57). In the plots at Karaj where collar rot was a serious problem, soil samples were taken at various depths and planted to a susceptible mungbean strain. From observations made on pre-and post emergence damping-off, Rhizoctonia was found to be primarily confined to the top 20 cm of soil (Table 58). None of the 36 lines of mungbean grown in artificially infested soil showed any resistance to Rhizoctonia.

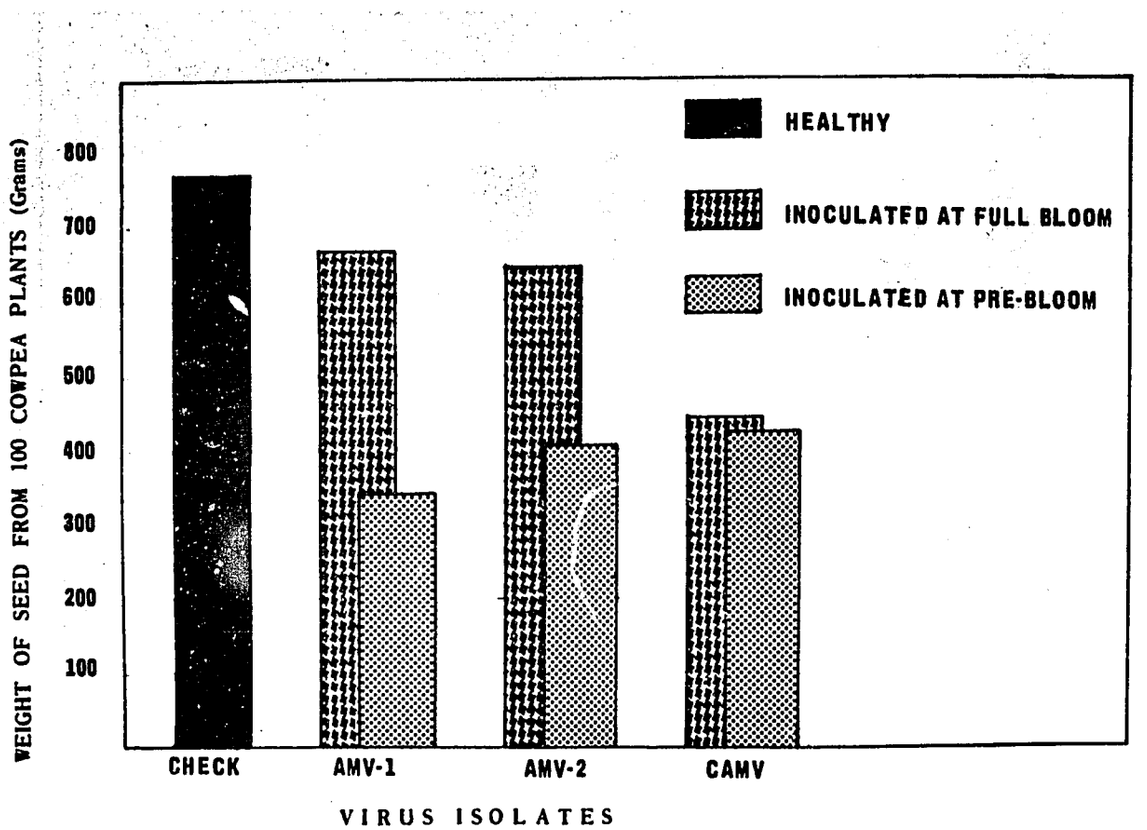

Figure 11. Effect of isolates of alfalfa mosaic virus (AMV) and cowpea aphid-borne mosaic virus (CAMV) in field inoculation studies on yield of Early Ramshorn cowpea.

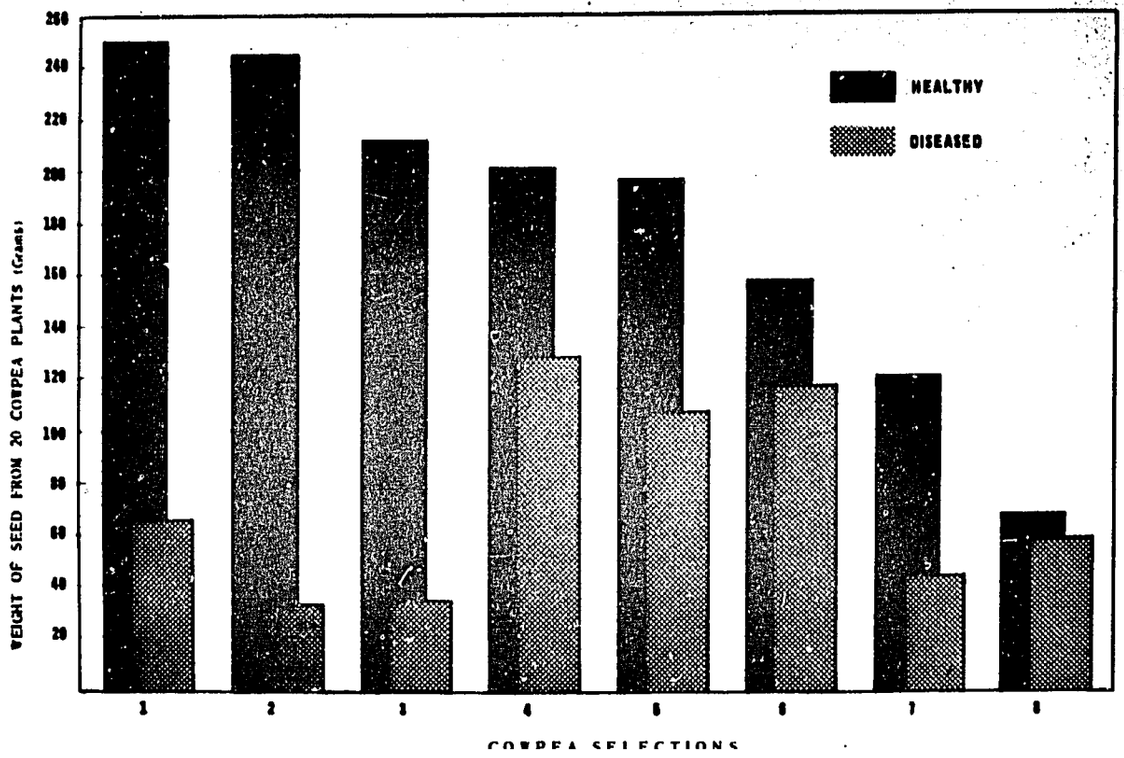

Figure 12. The effect of cowpea aphid-borne mosaic virus (CAMV) under field conditions on seed yields of 8 cowpea lines. The diseased plants were infected from seed.

Figure 13. The most obvious symptom of cowpea plants infected with alfalfa mosaic virus is a conspicuous yellow mottling of the leaves (left); right, healthy plant.

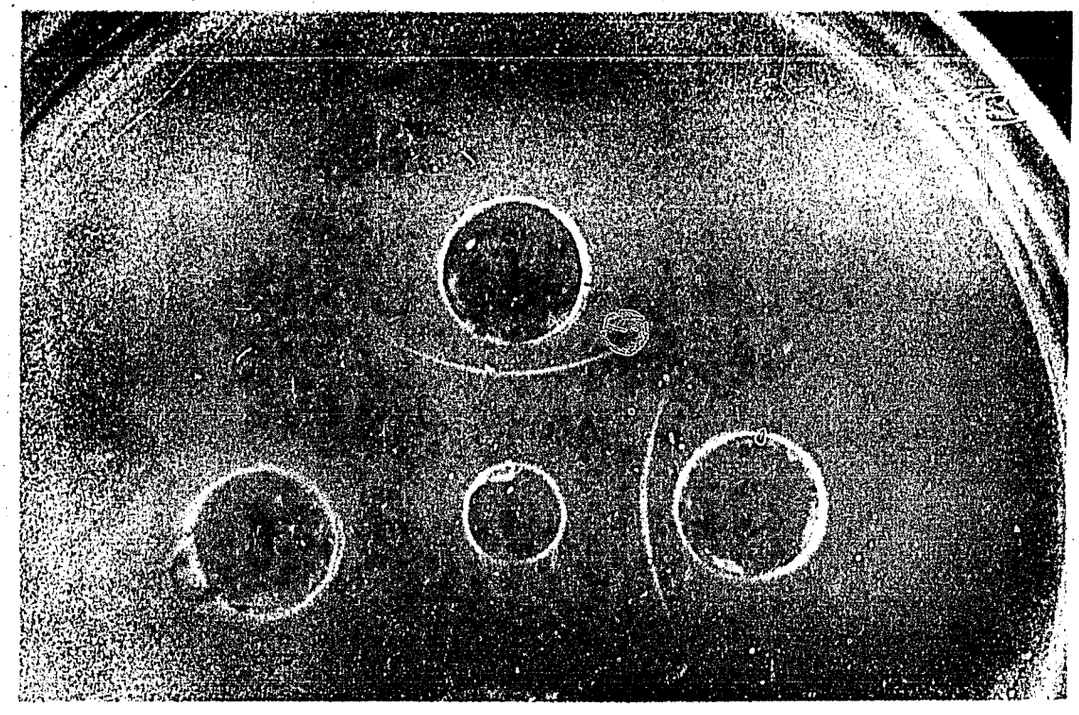

Figure 14. The reaction of crude extracts of virus infected *Nicotiana tabacum* to undiluted antiserum of alfalfa mosaic virus (AMV) in agar-gel diffusion tests. The center well (AS) contained AMV antiserum and the peripheral wells contained virus infected leaf homogenates of (1) a cowpea strain of AMV, (2) an alfalfa strain of AMV, and (3) healthy leaf homogenates of *N. tabacum*.

Figure 15. Bountiful bean plants infected with bean common mosaic virus (middle) and mungbean mosaic virus (right) before flowering are severely stunted and very few pods are formed, and those that do form are usually small and deformed, containing undersized, shrivelled seeds. The leaves of infected plants are twisted, deformed and mottled; left, healthy plants.

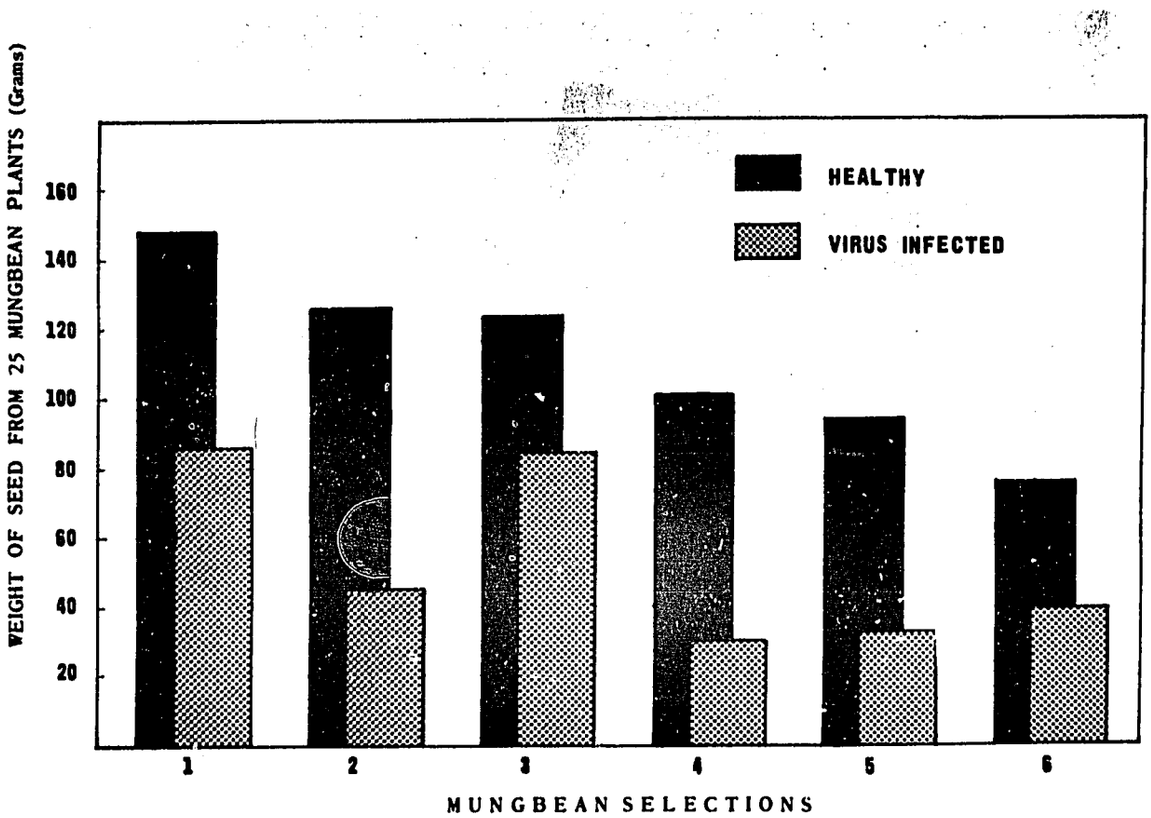

Figure 16. The effect of mungbean mosaic virus (MMV) under field conditions on seed yields of 6 mungbean lines. The diseased plants were infected from seed.

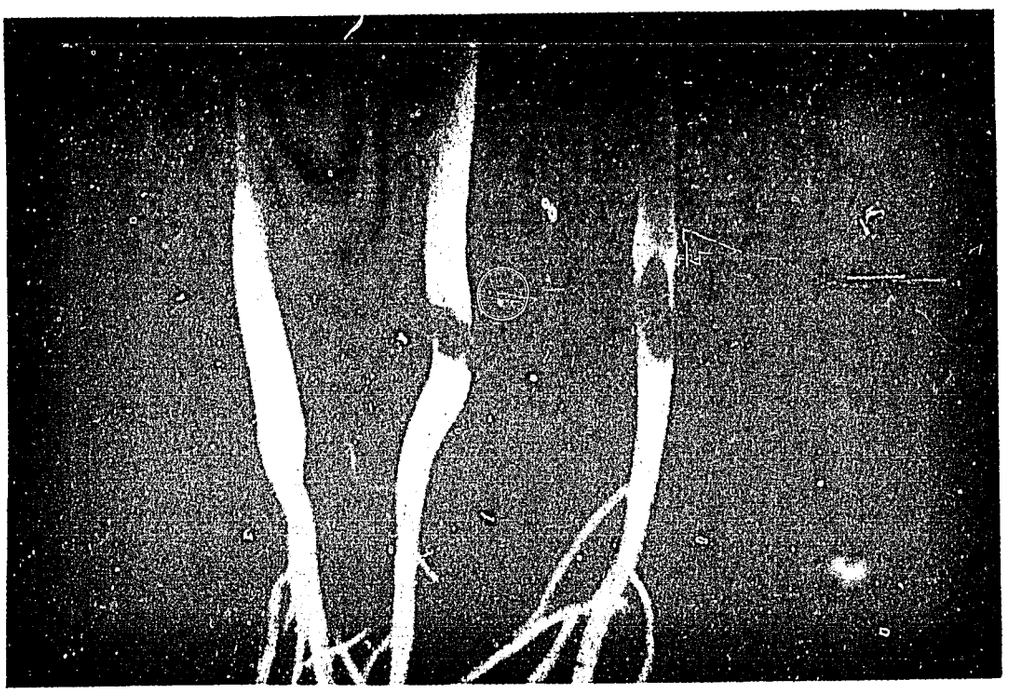

Figure 17. Rhizoctonia solani usually attacks the hypocotyl region of mungbean seedlings growing in natural field soil causing reddish-brown lesions, some of which girdle the stem causing the eventual death of the plant; left, healthy plant.

Table 57. Pathogenicity of 8 isolates of Rhizoctonia solani and one unknown fungus to mungbean (Phaseolus aureus) in greenhouse inoculation tests.

Rhizoctonia isolates	Dead a/ %	Diseased %	Healthy %
Bean	100	0	0
Bean	100	0	0
Bean	82	18	0
Chickpea	100	0	0
Chickpea	0	0	100
Cowpea	100	0	0
Lentil	92	8	0
Melon b/	0	0	100
Mungbean	98	2	0
Check	0	0	100

a/ Average of five replications of 10 plants each.

b/ This isolate is 2-3 nucleate and may be related to Ceratobasidium

Table 58. The vertical distribution of *Rhizoctonia solani* in a mungbean planting at Karaj where damping-off and collar rot were prevalent. Soil samples were taken at 10 cm increments from 4 sites in one field.

Depth (cm)	Emergence a/ 2 weeks %	Emergence a/ 5 weeks %	Seedlings with stem cankers after 5 weeks %
0-10	62 b/ a	50 a	71.1 a
10-20	88 b	83 b	7.5 b
20-30	89 b	90 bc	0.7 b
30-40	93 b	96 c	0.6 b
40-50	94 b	95 c	0.0 b
50-60	94 b	94 c	0.0 b

a/ Average of 4 replications of 40 plants each.

b/ Within each column, all percentages not followed by the same alphabetical letter are significantly different at the 1% level.

ENTOMOLOGY

Karaj College
S.W. Wilson
Karim Kamali
G.Rassoullian
Plant Pest Control
Research Institute (Tehran)
Dr.Omidvar - Nematologist

Insect infestations of economic importance were limited in 1967. However, a number of interesting observations were recorded, as well as the appearance for the first time of a leaf miner Liriomyza congesta since the beginning of RPIP entomology trials in Karaj. In order of their appearance, the following pests occurred in 1967:

Seed corn maggot Hylemya cilicrura adults were observed on chickpeas in the chickpea plots in Karaj on April 29, but no damage was recorded. On June 4, high populations of H. cilicrura larvae were observed on all RPIP dry bean plantings. Damage was extremely light even with an overall infestation of 40% because of the rapid growth of the beans.

Leaf miner Liriomyza congesta larvae were recorded in Karaj on May 9, and by May 11, 100% of the Karaj RPIP chickpea plots were infested with 64% of the leaves showing damage symptoms. Larvae were observed again on June 14, but while the infestation was again almost 100%, leaf defoliation was less than the May infestation.

Thrips (Thrips sp.) were observed in the RPIP agronomy fall plantings of lentils in Varamin on May 19, 1967. Populations were quite high with over 80% of the plants having marked symptoms of damage.

Lentil bruchid Bruchus lentis was recorded for the first time in 1967 in Gazvin on May 22, in the entomology plots. Populations were extremely light with only two adults per 500 sweeps observed. Only trace damage was noted in the seed yields at harvest time.

Bollworm Heliothis zea was observed on chickpeas in Karaj on May 27, No chickpeas appreciable damage was noted until June 8, when light damage was observed. In the Varamin agronomy plots, however, infestations resulted in an overall pod damage of 21%.

Beet armyworm Spodoptera exigua first instar larvae were recorded in all cowpea plots at the Karaj research farm on July 5. Infestations remained at trace levels and never caused appreciable damage.

Mites Tetranychus (bimaculatus complex) were observed on dry beans and mungbeans in the Karaj plots as early as mid-July. Severe infestations did not occur until late August on dry beans, and no actual economic damage was recorded because of pod maturity.

Aphids Acyrthosiphon gossbaniae was observed as early as June 10, in the Karaj dry bean plots, but no infestation of any importance was recorded during the 1967 crop season.

Cowpea weevil Callosobruchus maculatus did not appear in the Karaj plots. However, infestations in up to 32% of the seed were noted in the Ministry of Agriculture plots in Varamin.

Spittle bug (Family Cercopidae) was observed in trace numbers in Karaj on cowpea plots August 24. No damage was recorded. Ministry of Agriculture plots in Varamin had severe populations, but because of the lateness of the infestation (early September) little economic damage occurred. There was a great deal of difficulty, however, in mechanically harvesting their plots because of the spittle bug.

Leaf hopper Empoasca fabae was present from early July to late September in cowpeas and dry beans, but never reached levels of importance.

Bean butterfly Lycaena baeticae did not occur in economic numbers in Varamin, Karaj, or Gazvin. A few scattered larvae were observed in the soils agronomy plots July 18.

Pesticide Trials of Significance

Mites (T. bimaculatus complex)

Table 59. Effect of Four insecticides on mite populations in mungbean, RPIP, Karaj, Iran.

Pesticide	1 day before spray	3 days after	10 days after
Tedion 1 kg/ha.	901	109**	157**
Kelthane 600 gm/ha.	617	125**	105**
Ethion 250 gm/ha.	778	15**	59**
Erysit 300 gm/ha.	939	260	380
Check	801	286	434

Samples: 25 plants per plot x 4 replications with 1.5 cm leaf sections on 5 leaves per plant recorded.

** Significant at 1% level

Aphids (A. sesbaniae) (Soil treated)

Aphid populations in dry beans were too light for valid analysis on the granular treated plots. However, visual observations and seed yield did have interesting results.

Pesticide	Seed weight
Phorate*	4350 gm
Solverex**	4500 gm
Check	6100 gm

* Moderate phyto toxicity was observed. The first growth had whitish gray margins on the leaves (a few leaves had up to 1/3rd of the leaf surface with the symptoms). The symptoms persisted on a few of the terminal leaves until as late as July 15th.

** Light phyto toxicity was observed. The first growth had symptoms similar to the phorate treated plots. However, symptoms were not so severe and they persisted only to July 1.

Application rates were Phorate 5% at one gram per meter and Solverex 10% at 0.5 gram per meter.

Pesticide trials were conducted on leaf miner L. congesta and bollworm H. zea. However, a disease was observed on the entomology chickpeas on June 10, and by June 30, had destroyed over 50% of the leaf miner trial. The H. zea trials suffered the same damage by late July. Because of the extreme variation caused by the disease analysis, results were considered to be invalid.

Crop Protection

Because of extremely low insect populations, limited protection was needed for the other research disciplines. However, a total of five applications of Malathion was applied to the phyto pathology plots to keep disease transmission by insect vectors to a minimum.

Stored Pulse Pests

All RPIP seed storage was treated with Bromadon at a rate of 1½ kilos actual per metric ton of seed. No damage in storage has been observed since treatment immediately following harvest.

Insect Sterilization

The Atomic Energy Commission's traveling exhibition of Atoms for Peace was conducted during November in Tehran, Iran. At this time, their radiation chamber with a Cobalt 60 source was made available for RPIP use. Limited tests conducted on beet armyworm S. exigua resulted in the following data (tables 60 to 63). Although there results show promise, extended trials need to be conducted to draw valid conclusions from this data.

Table 60: Effect of Gamma Radiation on Spodoptera Exigua (pupates) RPIP, Karaj, Iran.

Dosage (K.Rads	No.of Pupae Irrad-iated	No.of dead pupae after Irradiation	No. of emerged adults		No.of eggs laid	Emergence	Emergence %
			Normal adults	Deformated wings			
0	20**	-	17	3	4215	3351	79.50
2	20	0	12	8	2390	2122	88.78
4	20	11	7	2	190	36	18.95
6	20	11	6	3	622	144	23.15
8	20	14	5	1	410	109	26.58
10	20	8	10	2	993	316	31.82
12.5	20	4	8	8	424	200	47.16
25	20	5	9	6	104	9	8.65
50	20	13	3(2+1)	4(3+1)	0	-	-
100	20	19	-	1	-	-	-
200	20	20	-	-	-	-	-
400	20	20	-	-	-	-	-
2*	20	9	8	3	1400	844	60.28

* All Dosages were applied at rate of 580 R/Min. except last 2 K. Rads which was applied at rate of 1900 R/Min.

** 10 Pupae (5 male + 5 Female) in each Replication.

Table 61. Effect of Gamma Radiation on Spodoptera Exigua (Larvae), RPIP, Karaj, Iran

Dose Rads *	No.of larvae Irradiated	No.of dead larvae after Irradiation	Normal	incomplete rupation	Normal	Deformed wings	No.of eggs laid	Egg emergence	Emergence %
0	20	1	15	4	12	3	2885	2817	97.64
2000	20	3	17	-	16	1	2496	2055	82.33
4000	20	2	15	3	8	5	24	9	37.50
6000	20	7	9	4	2	4	-	-	-
8000	20	9	1	10	-	-	-	-	-
10000	20	8	3	9	-	-	-	-	-

* Radiation rate 580 Rads/Min.

Table 62. Effect of Gamma Radiation on Spodoptera exigua (adults) RPIP, Karaj, Iran

Dosage (Rads) *	No.of Adults Irradiated	Average days of survival of adults	No.of Eggs laid	Larval emer-gence	Emergence
0	20*	8.05	5091	4415	86.72
2,000	20	9.15	2702	1847	58.35
4,000	20	10.20	3044	1983	65.14
6,000	20	9.55	2341	729	30.92
8,000	20	9.25	3155	1352	42.85
10,000	20	7.95	2443	367	15.02

* - 10 adults (5 male + 5 female) in each replication.

** - 580 Rads/Min.

Table 63. Effect of Gamma Radiation on Eggs of Spodoptera exigua RPIP, KARAJ, IRAN.

Dosage (Rads)	No. of Eggs Irradiated	Emergence	Emergence %
0	250	237	94.80
2,000	154	134	87.03
4,000	176	24	13.63
6,000	405	10	2.46
8,000	280	28	10.00
10,000	210	25	11.40

Data was taken on December 9, 1967, two days after irradiation.

Statistical analysis shows that there is significant difference between treatments and check at level of 0.005 (99.5%).

All dosages (except 2,000 Rads) had some effect on egg emergence.

Each treatment was replicated twice.

Rate 580 Rads/Min.

Chemosterilization was conducted on beet armyworm (S.exigua) using compounds supplied by the Entomology Research Division. The following table show the summary of results:

Table 64. Effect of topical and oral application of chemosterilants on beet armyworm (S.Exigua) RPIP, KARAJ, IRAN.

Compound	Topical Application Rate (Dosage)	Emergence
ENT 60210	50 mgms/adult	80.6
ENT 60210	100 mgms/adult	82.7
Check	-	78.1

Compound	Oral Application Rate (Dosage in Sucrose Solution)	Emergence %
Hemepa	0.1%	90.36
Hemepa	0.4%	90.65
Hemepa	0.8%	93.56
Check		94.45

All results were negative.

Insect Collection

Field trips were conducted in the areas adjacent to Esfahan, Gazvin, Veramin, Karaj, Shiraz, Tabriz, Gorgan, Mashed, Jiroft, Fasa, Jahrome, Lar, and Bandar Abbas for the purpose of insect collection and survey. In addition, a U.V. light trap was run in the Karaj RPIP plots during the growing season and near the RPIP greenhouse during the winter.

Collections are being prepared and some of them have been identified by either taxonomists from Entomology Research Division, U.S. National Museum, or the French National Museum.

Nematology

Cooperative research was conducted in the Varamin Ministry of Agriculture Experiment Station under the supervision of Dr. Omidvar, Chairman of the Nematology Department of the Research Institute for Plant Pests and Diseases, and the RPIP.

Soil infested with Melloidegyne species was planted with mungbeans, broad beans, chickpeas, cowpeas, lentils and dry beans, both in the field and in the greenhouse. All field plots 36^2 meters were replicated three times and pot trials (four pots per plot) in the greenhouse were replicated four times. All pulse crops were found to be infested, but mungbeans was considered to be the only crop where the infestation was of economic importance.

The ten best mungbean varieties were then tested for resistance in the field and greenhouse. Plots and replications were the same as the initial screening. Tables 64 summarizes the results.

Table 65. Relative resistance of ten mungbean strains to nematode (*Melloidegyne sp.*) under green house and field conditions, 196

Variety No.	Rank	No. of Nematodes*
4	9	708
7	4	299
9	8	808
10	10	112
11	5	356
12	7	594
13	6	588
14	1	182
15	2	183
17	3	225

* (3 replications with 1/2 gram sample/plot)

Field

Variety No.	Rank	No. of Nematodes*
4	2	2010
7	10	0272
9	1	1267
10	7	5232
11	4	2913
12	5	3801
13	9	5586
14	3	2496
15	6	4019
17	8	5392

* (4 replications with 1/2 gram/sample/plot)

Results are considered to be inconclusive because of lack of correlation between greenhouse and field trials.

Nematocide field trials were conducted in Varamin on Pulse Crops to determine most effective chemical control.

Fumazon at 3 cc/meter^2, lignid Basamid at 100 cc/meter^2, Basamid powder at 40 grams/meter^2, Nemagon at 3 cc/meter square, and Nemaphos at 4 cc/meter^2 gave effective nematode control. All plots were 36 meters^2 and replicated 3 times. One half gram samples were taken per plot.

I N D I A

VARIETAL IMPROVEMENT

RPIP
R.M. Matsuura
P.H. van Schaik
J.P. Narain
V.R. Gadwal
J.L. Tiwari
AICPP/IARI
L.M. Jeswani
S.P. Singh

Germplasm and Breeding Program:

A germplasm collection representing a wide range of genetic variability is essential to provide a broad genetic base from which to operate varietal improvement programs.

Although many varieties of pulses have been developed in India the narrow genetic base of the indigenous germplasm is considered one of the reasons for the lack of significant performance improvement.

The germplasm collections of the main pulse crops were enlarged in 1967 and now include the following material:

Crop	Exotic	Indigenous	Total	Countries Represented
Gram (*Cicer arietinum*)	4817	1803	6620	21
Arhar (*Cajanus cajan*)	107	5028	5135	16
Mung (*Phaseolus aureus*)	216*	475	581	15
Urad (*Phaseolus mungo*)	-	310	310	1
Cowpea (*Vigna sinensis*)	706	716	1422	49
Lentil (*Lens esculenta*)	26*	415	441	-
Peas (*Pisum sativum*)	-	407	407	1
Khesari (*Lathyrus sativus*)	87	752	839	7

* Does not include collections recently transferred from Iran.

The gram (chickpea) collection which was planted in 1966 was lost due to high salinity in the field assigned for it at IARI, New Delhi. In November, 1967 the collection was planted again from remnant seed and a good crop was obtained. Although not enough seed was available of all lines, parts of the collection were also grown at Hissar (Punjab/Haryana, major gram states) and Jabalpur (Madhya Pradesh).

The collection of arhar (pigeon peas), which was almost completely lost due to frost in Delhi in January 1967, was transferred to Hyderabad (Andhra Pradesh). Arhar is planted in kharif (June/July), usually as a mixed crop, but occupies the land for as long as 250 days. One of the main objectives is to find varieties which will mature and produce a good crop in about 150-180 days. Out of the 5135 lines 27 were harvested by December 1967 and planted again for an extra generation of seed increase to provide sufficient seed for preliminary trials at several locations in 1968. The range of variability in maturity present in the collection is from 108 to 250 days.

The germplasm nursery of arhar was visited by breeders from several states. Seed of all or part of this material will be grown in several locations in 1968.

The collections of mung, urd and cowpeas were planted at IARI, Delhi in the 1967 kharif season. Because of weather conditions of heavy monsoon rains which caused flooding, uncontrollable weeds, and severe disease incidence the data and seed supply obtained were far from satisfactory.

Collections of lentils, peas, and khesari were planted in the rabi season. The khesari collection thus far has yielded 9 lines with from a trace to 0.20 percent of the neurotoxin (B-N-Oxalyl amino alanine). These lines are being tested for possible direct use as varieties or as b breeding material.

Coordinated Varietal Trials

The varieties of the major pulse crops released in the various states of India were tested in the All India Coordinated Varietal Trials. This is the first time an attempt has been made to exchange varieties and test them uniformly outside of their immediate geographic adaptation area. The 1967 kharif and 1967/68 rabi season constituted the second year of testing of this particular set of varieties. During the 1967 Workshop it was decided to test all varieties for at least two years. Crops, number of varieties and locations were as follows:

Crop	Varieties in tests	Locations
Gram (*Cicer arietinum*)	22	18
Arhar (*Cajanus cajan*)	16	15
Mung (*Phaseolus aureus*)	20	17
Urd (*Phaseolus aureus*)	16	25
Cowpea (*Vigna sinensis*)	8	15
Lentil (*Lens esculenta*)	11	10
Pea (*Pisum sativum*)	6	7
Khesari (*Lathyrus sativus*)	4	

Tables 66 to 73 show the results of the trials conducted in rabi (winter) 1966/67(gram, peas, lentils, khesari) and kharif 1967 (arhar, mung, urd, and cowpea).

In general and with very few exceptions reported yields have been very low. Most tests have given yields comparable to the national average of around 400 kg. per hectare, a very few have been better but in some cases the yields have been almost negligible. This shows that few if any of the varieties thus far produced in India are satisfactory. New germplasm is needed to introduce genes for yielding ability, suitable plant types, disease resistance, etc.

Many ot the reported yields are low because of lack of irrigation, poor seedling emergence, low soil fertility, severe diseases, and insect infestations without effective controls.

If pulse crops can be elevated from a status of "residual crops" growing on left-over land, without fertility and other management inputs many of the presently available varieties should be able to perform much more satisfactory than these tests indicate.

The yields reported in tables 66 to 73 do not allow recommendation of specific varieties for specific areas. More detailed data on performance other than yield is necessary to properly evaluate the varieties. A uniform set of data sheets has been developed for use with the 1968 crops to obtain this.

Variety Release

The release of mungbean variety Pusa Besaikhi was announced by IARI. It was developed from a selection out of T44, a variety from Uttar Pradesh State.

Although considerable work needs to be done to confirm its characteristics it is early maturing and appears to be well suited for cultivation in the summer months between wheat harvest in April and planting of maize, sorghum or millets in June/July in areas of North India where irrigation is available. In a limited number of tests in 1966 and 1967 it flowered in 45 days and matured in about 70 days, giving a yield of about 1000 kg. per hectare. At present no crop is grown during this period of the year and this variety therefore may provide an additional crop of high protein food grains as well as increased revenue to the farmers.

The demand from farmers for seed has far exceeded the very limited amount of seed (100 kilograms) which was available. This indicates the progressive interest on the part of farmers in new crops, new varieties, and new methods.

Table:66. Yields (Kg/hectare) of Mungbean Coordinated Varietal Trials, India, 1967

S. No.	Variety	Origin	BIHAR	DELHI	GUJARAT	MADHYA PRADESH			MADRAS	MAHARASHTRA				PUNJAB	UTTAR PRADESH		WEST BENGAL	
			Dholi	Delhi	Vijapur	Gwalior	Jabalpur	Power Kheda	Coimbatore.	Akola	Amravati	Jalgaon	Kopargaon	Ludhiana	Hardoi	Etawah	Mald	Berhampur.
1.	D2-15	Gujarat	168.18	40.36	140.15	170.00	233.21	38.56	98.76	585.00	52.47	498.93	314.93	688.92	374.59	233.21	228.73	-
2.	D45-6	Gujarat	172.66	141.27	162.57	197.00	426.05	88.12	127.77	577.00	25.54	540.98	387.78	666.50	446.63	243.18	333.87	-
3.	B-1	W.Bengal	145.75	26.68	36.44	223.00	746.71	111.44	84.56	295.00	105.19	894.15	189.41	450.97	259.34	229.47	519.49	806.53
4.	T 44	U.P.	237.69	150.46	53.25	362.00	932.83	174.90	293.21	622.00	49.59	1003.47	471.84	690.17	691.56	448.48	859.35	862.34
5.	T 51	U.P.	163.69	186.12	45.41	300.00	544.90	290.84	309.87	845.00	45.08	981.05	432.61	612.93	361.89	454.46	598.23	1027.53
6.	K 11	M.P.	44.84	40.58	173.78	220.00	1185.11	162.57	219.75	770.00	34.56	723.17	363.13	416.09	633.93	551.63	623.15	603.21
7.	Hyb. 45	M.P.	165.93	123.33	63.06	468.00	829.68	308.77	298.16	692.00	22.54	773.63	480.80	1006.60	605.11	838.67	493.58	604.96
8.	T 2	U.P.	156.95	312.59	19.62	308.00	858.83	218.85	260.49	455.00	73.63	184.99	498.74	911.92	619.52	490.34	529.96	1170.55
9.	No.305	Punjab	572.53	79.83	413.44	520.00	275.81	164.81	137.03	595.00	42.07	255.07	309.30	781.11	489.85	307.96	155.22	-
10.	Jalgaon 781	Mah.	28.03	35.87	63.06	15.00	794.93	115.48	220.98	872.00	42.06	1154.83	252.17	383.70	316.97	282.29	195.59	266.60
11.	B.R.2	Bihar	746.72	30.49	149.96	281.00	170.42	9.41	184.56	202.00	97.60	28.03	107.59	421.08	-	612.93	397.16	-
12.	R.S.4	Rajastan	248.90	47.31	235.45	353.00	313.93	174.90	144.44	875.00	88.65	498.93	282.43	626.13	432.22	340.85	300.48	-
13.	R.S.5	Rajastan	255.63	60.77	133.14	380.00	298.24	270.21	99.56	460.00	70.58	510.14	262.18	629.13	389.00	542.66	231.47	-
14.	Kopargaon	Mah.	145.75	91.93	58.02	268.00	689.53	223.79	208.02	665.00	66.12	1157.64	392.26	597.98	489.86	487.35	686.18	350.81
15.	Khargaoh	M.P.	56.06	70.63	-	139.00	493.32	155.17	222.22	-	-	1025.90	-	219.26	389.00	287.03	413.60	705.87
16.	No.54	Punjab	402.51	70.63	-	212.00	381.21	167.73	219.75	-	-	252.27	-	924.13	576.30	590.51	193.35	207.79
17.	24-2	Punjab	600.96	159.88	-	309.00	209.66	61.66	159.25	-	-	19.62	-	995.39	489.86	457.45	283.79	-
18.	24-3	Punjab	644.69	163.69	-	332.00	206.30	117.72	109.87	-	-	19.62	-	911.92	533.08	475.39	152.48	-
19.	NP 23	I.A.R.I	104.27	77.14	-	215.00	239.93	133.87	52.46	-	-	538.17	-	627.88	259.35	279.55	200.32	374.23
20.	NP 12	I.A.R.I	151.36	49.33	-	155.00	226.48	106.73	108.02	-	-	650.29	-	614.16	360.19	317.68	374.98	523.98

Table 67. Yields (Kg/hectare) of Urd Coordinated Varietal Trials, India, 1967.

S.No.	VARIETY	ORIGIN	LOCATIONS/STATES																
			DELHI	BIHAR		GUJARAT	MADHYA PRADESH			MADRAS	MAHARASHTRA		PUNJAB	UTTAR PRADESH			WEST BENGAL		
			Delhi	Dholi	Ranchi	Jamnagar	Gwalior	Jabalpur	Chindwara	Akola	Jalgaon	Kapar-gaon	Ludhiana	Amrokh	Jhansi	Etawah	Berham-pur	Kalyani	Malda
1.	T.9	U.P.	153.60	280.30	336.36	320.00	856.00	924.76	302.72	322.34	936.20	848.41	560.61	428.29	337.48	1412.74	504.25	1951.17	914.16
2.	T.27	U.P.	-	1233.32	361.28	273.00	651.00	724.07	-	412.04	134.54	230.87	104.64	-	-	1362.28	-	-	544.16
3.	T.65	U.P.	-	330.75	150.74	490.00	594.00	540.86	-	378.40	67.27	190.53	48.58	-	-	1059.55	-	-	383.45
4.	Gwalior 18	M.P.	*93.06	*852.11	*274.07	*245.00	*502.00	*457.44	295.10	448.48	190.60	*256.65	73.25	284.11	267.96	-	106.79	602.46	428.05
5.	No. 1-1	Punjab	154.54	291.51	311.45	773.00	688.00	539.07	260.56	336.36	1323.01	713.92	200.57	-	-	1311.83	89.15	-	656.53
6.	D 6-7	Maharashtra	158.09	313.93	261.62	760.00	290.00	769.59	381.21	381.20	1508.01	571.58	416.09	-	-	462.50	104.85	-	116.11
7.	Sind Kheda	Maharashtra	48.21	381.21	174.41	715.00	431.00	772.28	220.42	563.40	1530.44	447.18	95.42	-	-	-	149.39	-	94,68
8.	B R 61.	Bihar	-	347.57	286.53	125.00	380.00	778.56	-	196.21	Nil	111.78	48.08	-	-	891.37	-	-	410.61
9.	B R 68.	Bihar	-	908.17	286.53	303.00	594.00	461.03	254.06	409.23	84.09	215.18	9.71	-	-	353.18	-	-	154.47
10.	No. 55	Maharashtra	132.07	358.18	274.07	945.00	743.00	808.16	235.45	515.75	1597.71	591.76	39.61	-	-	386.C2	127.25	-	132.30
11.	N 212	Madras	112.34	168.18	224.24	185.00	196.00	101.35	246.66	-	361.58	494.00	27.15	163.02	132.30	-	8.97	99.16	33.63
12.	No. 1766	Madras	133.42	448.48	149.49	668.00	619.00	645.81	112.12	-	697.94	359.76	191.60	191.27	139.12	-	162.57	1485.24	899.46
13.	Khargaon 3	M.P.	32.73	98.66	286.53	763.00	280.00	508.57	283,88	-	1693.01	700.86	77.48	284.11	251.14	-	74.84	778.62	592.75
14.	Mash 48.	Punjab	160.78	672.72	174.48	468.00	794.00	566.87	302.72	-	1098.77	564.86	516.04	693.79	613.29	-	18.22	1076.12	580.79
15.	Mash 35-5	Punjab	133.64	683.93	137.03	450.00	777.00	934.63	265.27	-	1053.93	504.34	332.87	725.64	503.41	-	19.62	997.88	727.79
16.	Mash 41-13	Punjab	200.47	695.14	112.12	478.00	677.00	807.26	-	-	986.65	588.39	325.65	790.00	649.17	-	54.94	1229.60	506.79
			NP 14.		*NP 6														

Table 68. Yields (kg/hectare) of Cowpea Coordinated Varietal Trials, India, 1967

LOCATIONS/STATES

S. No.	Variety	Origin	BIHAR		GUJARAT		MADRAS	PUNJAB	M.P.		UTTAR PRADESH					WEST BENGAL	
			Ranchi Kanke	Pusa	Baroda	Jam-Nagar	Coim-batore	Ludhi-ana	Gwalior	Jhansi	Hardoi	Kanpur	Meerut	Vara-nasi	Etawah	Berhan-pur.	Naga-garh
1.	K 11	M.P.	269.10	-	49.52	-	452.67	212.50	820.00	213.93	322.06	-	-	-	179.39		-
2.	K 14	M.P.	209.30	-	89.69	-	715.22	163.00	970.00	296.16	268.38	-	-	-	528.21		-
3.	K 3-B	M.P.	164.45	-	112.12	-	465.84	43.64	674.00	34.38	161.03	-	-	-	159.43		-
4.	T 2	U.P.	829.72	-	382.15	-	1584.35	1040.63	-	73.10	1395.60	-	-	-	134.54		-
5.	RS 9	Rajas-than.	224.25	-	205.55	-	606.58	296.68	-	334.88	322.06	-	-	-	488.34		-
6.	Meshed	Iran	142.02	-	396.16	-	2058.42	828.64	335.00	18.24	536.77	-	-	-	59.79		-
7.	Blackey-7	USA	209.30	-	569.95	-	1488.46	765.85	-	29.90	1449.27	-	-	-	99.66		-
8.	Early Ramshorn	USA	142.02	-	330.75	-	1144.02	654.25	196.00	22.72	1556.63	-	-	-	84.71		-

Table.70. Yields (Kg/hectare) of Bengal Gram Coordinated Varietal Trials, India, 1967

S.No.	VARIETY	ORIGIN	MAHARASHTRA	MADRAS	PUNJAB	RAJASTHAN		UTTAR PRADESH				ANDHRA PRADESH	BIHAR	GUJARAT		HARYANA	MADHYA PRADESH		
			Jalgaon	Coimbatore	Ludhiana	Sri Ganganagar	Kanpur Pirroom	Meerut	Pant Nagar	Hardoi	Kanpur	Lam	B.S.S. Pusa	Dohad	Baroda	Hissar	Amrokh Jhansi	Gwalior	Rewa
1.	B.G. 482	Andhra Pradesh	726.18	958.12	522.25	305.32	-	1295.63	353.18	1966.02	381.22	69.96	8.97	505.23	876.32	807.30	418.60	437.00	526.52
2.	Col.1	Madras	731.12	864.22	242.04	263.92	113.28	946.80	176.47	1061.13	740.02	56.81	-	333.47	529.83	697.86	313.95	583.00	650.30
3.	Chaffa	Gujarat	726.18	505.37	444.16	343.62	-	1295.64	327.83	1562.40	605.47	63.98	4.18	276.59	470.96	926.90	328.90	505.00	480.34
4.	Dohad Yellow	Gujarat	642.20	931.21	560.32	338.44	286.80	1697.68	398.47	1920.45	470.92	54.71	57.41	603.86	655.98	1106.30	430.56	637.00	560.91
5.	Gwalior-2	Madhya Pradesh	649.61	394.73	564.66	450.22	321.21	1744.12	358.11	143.22	1042.31	53.07	23.32	433.51	321.26	1052.48	358.80	580.00	526.52
6.	S.T.4	Bihar	405.08	710.51	465.84	581.67	381.44	1594.65	307.65	1679.58	1109.58	47.69	5.98	627.62	485.08	1143.37	358.80	637.00	504.00
7.	BR.77	Bihar	266.76	660.87	624.31	910.80	261.70	1443.12	274.11	1145.76	1345.50	9.56	17.94	304.84	392.74	1330.55	321.42	511.00	560.42
8.	BR.17	Bihar	489.06	561.00	767.83	708.97	-	2192.60	378.29	2031.12	504.11	52.02	4.18	416.91	359.10	1303.64	463.45	377.00	593.78
9.	RS.10	Rajasthan	269.23	744.60	804.91	993.60	437.37	1893.61	297.56	1855.35	1098.82	13.45	16.74	299.01	319.58	1417.26	470.92	416.00	795.41
10.	RS.11	Rajasthan	303.81	490.42	591.87	638.59	689.75	1544.79	575.17	1920.45	593.81	7.02	1.19	286.91	513.01	1330.55	201.82	416.00	717.57
11.	Pb. 7	Punjab	118.56	962.91	1221.11	892.17	-	2192.60	630.56	1660.05	1255.80	11.66	37.07	168.11	378.56	956.80	246.67	520.00	859.63
12.	C.235	Punjab	1*274.17	496.40	1350.43	674.82	748.54	2142.77	710.84	1692.60	784.87	14.35	78.93	440.22	391.06	859.32	276.57	529.00	581.03
13.	G.24	Punjab	234.65	744.61	731.35	1285.47	597.97	2641.09	448.92	1803.27	952.61	7.17	35.28	381.93	567.67	1509.95	307.47	496.00	762.73
14.	S.26	Punjab	158.08	605.85	875.02	912.87	756.43	2242.44	307.65	1282.47	1053.97	13.45	1.19	269.87	315.37	1330.55	373.75	502.00	672.73
15.	G.62-404	Madhya Pradesh	711.36	834.32	649.57	762.45	403.27A	1694.28	514.63	1347.57	762.45	60.99	129.16	536.37	480.21	762.45	336.37	446.00	680.29
16.	NP 100	I.A.R.I.	2*217.36	354.66	232.17	522.67	116.15	2092.94	242.18	1529.85	986.70	*56.95	31.09	92.79	359.10	1255.80	313.95	398.00	313.94
17.	E.Gr.742-7	Uttar Pradesh	592.80	968.89	462.10	310.50	374.27	1694.28	428.74	1367.10	919.42	49.33	49.03	300.35	333.87	1412.47	396.17	559.00	336.36
18.	B 75	West Bengal	3*508.82	236.24	356.10	550.62	374.27	1694.28	257.20	1464.75	807.30	35.88	35.88	487.08	424.70	829.42	455.97	448.00	605.89
19.	B 98	West Bengal	390.26	530.49	323.66	545.44	447.41	1993.28	403.63	1339.65	1199.28	29.75	21.52	-	-	1053.67	439.53	532.00	582.90
20.	T 2	Uttar Pradesh	610.09	545.44	767.83	436.77	628.09	1744.12	348.02	1152.27	717.60	53.52	37.67	-	-	1113.47	381.22	392.00	762.30
21.	Gram 736-1	Uttar Pradesh	580.45	687.79	971.15	621.00	256.68	1744.12	660.83	1464.75	583.05	6.57	92.09	-	-	1453.14	403.65	440.00	450.11
22.	T1	Uttar Pradesh	738.53	639.94	448.94	414.00	309.74	1594.62	358.11	2115.75	269.10	43.65	1.19	-	-	1095.53	299.00	466.00	515.76

1*C57-1

2*UJ Pink 2

3*B 75

Table 71. Yields (Kg/hectare) of Lentil Coordinated Varietal Trials, India, 1967

LOCATIONS/STATES

S. No.	Variety	Origin/State	ASSAM	BIHAR	M.P.	RAJASTHAN			UTTAR PRADESH			WEST BENGAL
			Rama	BSS Pusa	Rewa	Banswara	Sri Gangnagar,	Kanpur Pirrcom	Pant-Nagar	Kanpur	Meerut	Kalyani
1.	N.P. 11	I.A.R.I.	-	-	588.63	16.39	262.10	250.00	590.20	437.26	1153.26	10.76
2.	N.P. 47	I.A.R.I.	-	-	201.81	96.14	349.55	73.00	923.19	60.54	1460.79	276.27
3.	T 3.	Punjab	-	-	773.62	294.53	372.58	343.00	953.46	87.45	1460.79	21.53
4.	T 8.	Uttar Pradesh	294.65	390.17	857.72	274.96	294.70	252.00	787.08	246.66	1383.91	16.89
5.	T 36	Uttar Pradesh	272.67	713.08	1210.89	63.84	304.01	387.00	1594.34	280.30	1076.37	69.07
6.	B 25	Bihar	274.44	753.44	824.08	48.19	285.90	422.00	1604.43	347.57	1345.47	83.42
7.	B 62	West Bengal	292.40	614.41	302.72	112.77	299.36	162.00	822.28	71.75	1614.56	140.83
8.	B.77	West Bengal	333.22	502.30	403.63	147.26	245.54	98.00	882.83	183.87	1845.21	158.77
9.	C 31	West Bengal	253.16	614.41	285.90	139.92	144.37	145.00	842.46	224.24	1922.10	259.23
10.	L 9-12	Punjab	163.02	560.60	1009.08	17.36	255.11	449.00	2078.70	470.90	961.05	224.25
11.	N.P.Hyb.1	I.A.R.I	207.64	531.44	-	-	-	-	-	-	-	-

Table 72. Yields (kg/hectare) of Khesari Coordinated Varietal Trials, India, 1967

LOCATIONS/STATES

S. No.	Variety	Origin	BIHAR	UTTAR PRADESH		
			Pusa	Bareilly	Kanpur Pirrcom	Pantnagar
1.	T 2-12	Gujrat	87.60	105.39	680.00	346.39
2.	LC-76	Gujrat	54.42	79.38	560.00	531.47
3.	Rewa-1	M.P.	04.50	39.46	537.00	386.75
4.	Rewa-2	M.P.	85.36	69.81	466.00	507.85

Table 73. Yields (kg/hectare) of Peas Coordinated Varietal Trials, India, 1967

LOCATIONS/STATES

S. No.	Variety	Origin	ASSAM	BIHAR	M.P.	UTTAR PRADESH			
			Rama	BSS Pusa	Indore	Meerut	Kanpur	Pant Nagar	Kanpur
1.	T. 163	Uttar Pradesh	144.56	243.68	91.94	1726.64	2130.28	491.10	760.00
2.	Pea 6113	Uttar Pradesh	237.10	174.16	65.03	1906.04	1950.88	507.85	961.00
3.	T 56	Uttar Pradesh	233.96	67.57	145.76	358.78	874.53	174.91	572.00
4.	T 61	Uttar Pradesh	208.40	106.44	129.31	784.84	1479.98	258.93	656.00
5.	T 19	Uttar Pradesh	194.94	65.48	152.49	717.56	1973.31	285.84	566.00
6.	Early pea.	Madhya Pradesh	119.15	92.69	118.10	56.06	179.39	127.82	159.00

SOIL AND CROP MANAGEMENT

R.J. Davis - RPIP
C.S. Saraf - RPIP
S.N. Kapoor - RPIP
S.L. Choudhry - AICPP-IARI
Other Cooperators.

During the 1967 crop year, the soil and crop management program included studies on fertilization, plant density, rhizobial inoculation, and weed control. The work was done at Delhi, Hissar, Ludhiana (Punjab) Pant Nagar (U.P.) and Jabalpur (M.P.).

Fertility - spacing experiments Chickpeas

In the rabi season (1966-67), a fertilization-spacing experiment on Chickpea (Cicer arietinum) was planted at Delhi and Pant Nagar. This experiment consisted of three spacings between rows (one foot, two feet, and four feet), three plant spacings within rows (four and half inches, nine inches and eighteen inches), and three levels of fertility (1) No fertilizer (2) 25 pounds of nitrogen and 50 pounds off per acre; and (3) 50 pounds of nitrogen and 100 pounds off per acre). A split plot design was used with fertilizer treatments as main plots and spacings as sub-plots. All the treatments were replicated four times. Fertilizer was broadcast and worked in before planting. Size of the main plot was 12 feet x 171 feet and the size of the sub-plot was 12 feet x 15 feet. Between plots 4 foot alleys were left.

The rabi plantings were late, so that the plants did not get a good start before winter set in. Besides, the field assigned at Delhi for pulse experiments was too saline for Cicer which is very sensitive to salinity. As a result, no useful information could be collected from this location.

The crop at Pant Nagar was harvested in the second half of April. Yield data, as influenced by fertilization, row and plant spacings, are tabulated in Tables 74 and 75.

Table 74

Influence of Row and Plant Spacing on Yield of Chick Pea (Cicer arietinum)

(Pant Nagar, U.P. 1966-67)

Sub Treatment		: Yield (Pounds/ac.)
Distance in inches		
Between Row	Within Row	
12	4.5	1466.52
12	9	836.35
12	18	278.78
24	4.5	885.72
24	9	499.48
24	18	191.66
48	4.5	586.60
48	9	261.36
48	18	159.72
S.Em ± (lb./ac.)		283.72

Table 75

Influence of fertilization on yield of Cicer

(Pant Nagar, 1966-67)

Main Treatment in lbs./ac.	: Yield (Pounds/ac.)
0	516.91
(25N, 50P)	595.32
(50N, 100P)	609.84
S.Em ± (lb./ac.)	138.230

Data in Tables 74 and 75 show that there was no significant difference between fertilization levels, and between row and within row spacings. There is, however, an upward trend with higher fertility level and narrower spacings, Graphs in figures 18 and 19 show the effect of between row and within row spacing on yield. Histogram in figure 20 indicates the increase in yield with increasing fertility levels. Although this increase is not significant, it should be pointed out that due to late planting, growth was not optimum. With a plant density, high enough to have covered the entire plot area with foilage a truer response to fertilizer levels would have been obtained.

Fertility-Spacing and Fertility-Inoculum Experiments; mung and urd beans

Experimental Plans

Starting with the Kharif season 1967 uniform trials were initiated at four locations. These experiments will be continued with representative available varieties until it is deemed that enough data has been obtained to both make valid recommendations on existing varieties and to use as a base for testing new lines developed by the breeders. Greater emphasis is being given to the more important crops. Other crops are being studied less intensely by putting out fewer trials per year or are being deferred until later. Initial fertilizer levels used were 0, 50 and 100 kg/ha. of N, P & K. Intermediate levels either between 0 and 50 or between 50 and 100 whatever is indicated by the results of the present trials will be tested later. Spacings varied with the crops and will if necessary be modified until good response is obtained.

Since India is officially converting to the metric system, starting with this season only metric units have been used.

The fertility spacing trials employed three fertility levels, three between row plot spacings and three within row spacings.

The fertility inoculation experiment was a factorial consisting of three levels of N, P and K with inoculation added as a fourth treatment. A split plot design was utilized in the spacing fertility experiment and a randomized complete block design in the fertility inoculation experiment.

The inoculum used was a standard commercial product of the peat type prevalent in the United States. This inoculum is prepared by adsorbing a slurry of bacterial onto finely ground peat. The crop is inoculated by mixing the peat product with the seed after the seed has been slightly but evenly moistened, either with water or a sticking agent. Use of a sticking agent makes for a higher rate of inoculation and was used in these experiments.

A minimum time should elapse between inoculation and planting. In the meantime unplanted seeds should be protected from drying, heat, and the direct rays of the sun.

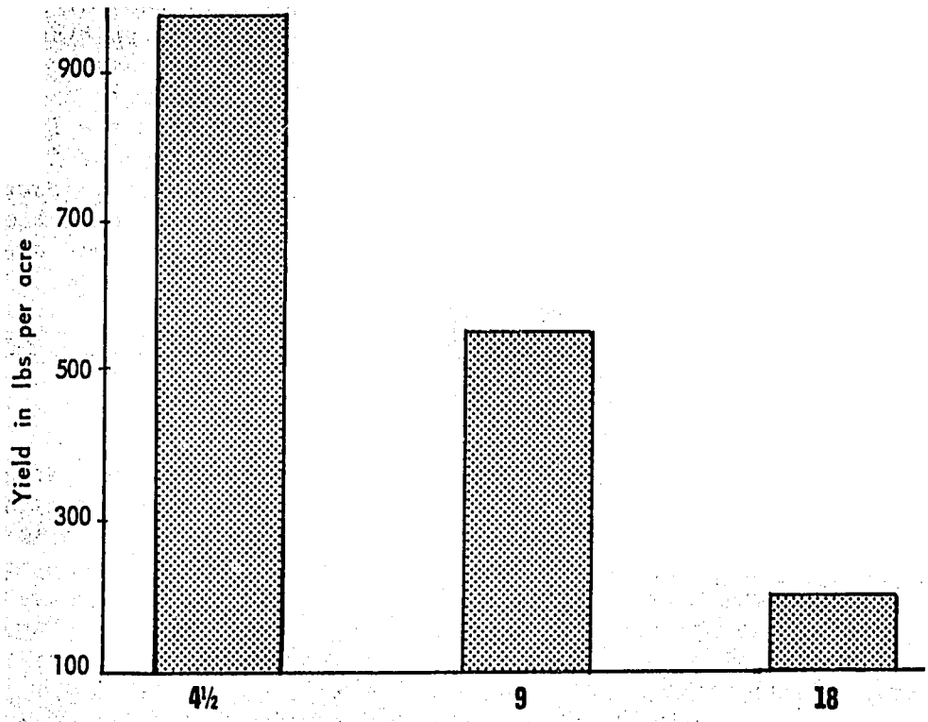

Fig. 18 WITHIN ROW SPACINGS IN INCHES

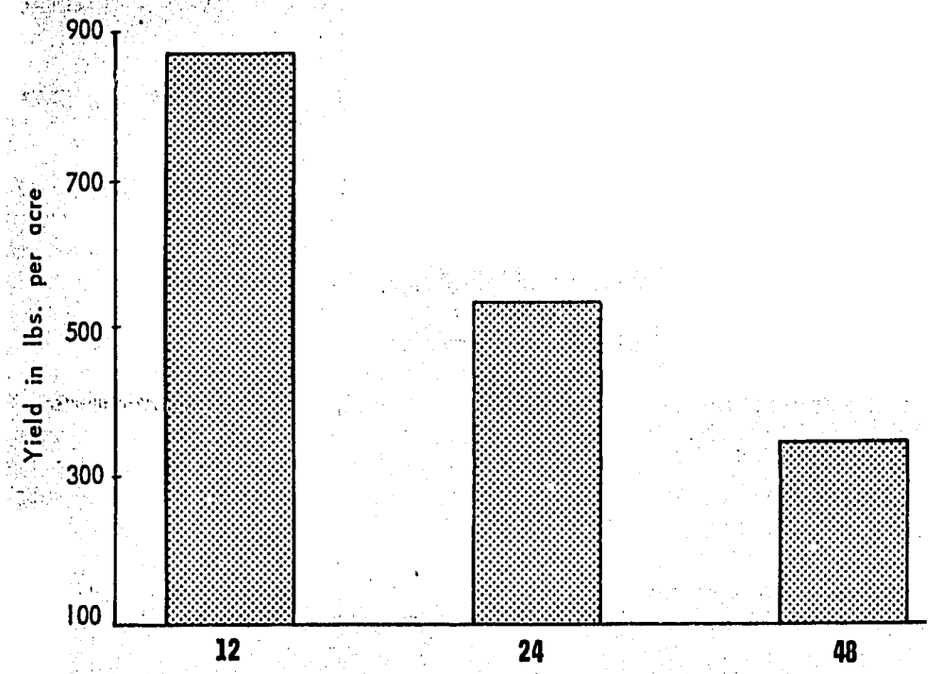

Fig. 19 BETWEEN ROW SPACINGS IN INCHES

Fig. 18 and 19 Relationship of Within row and Between row spacing on yield of chickpea, 1966-67, rabi season, Pant Nagar.

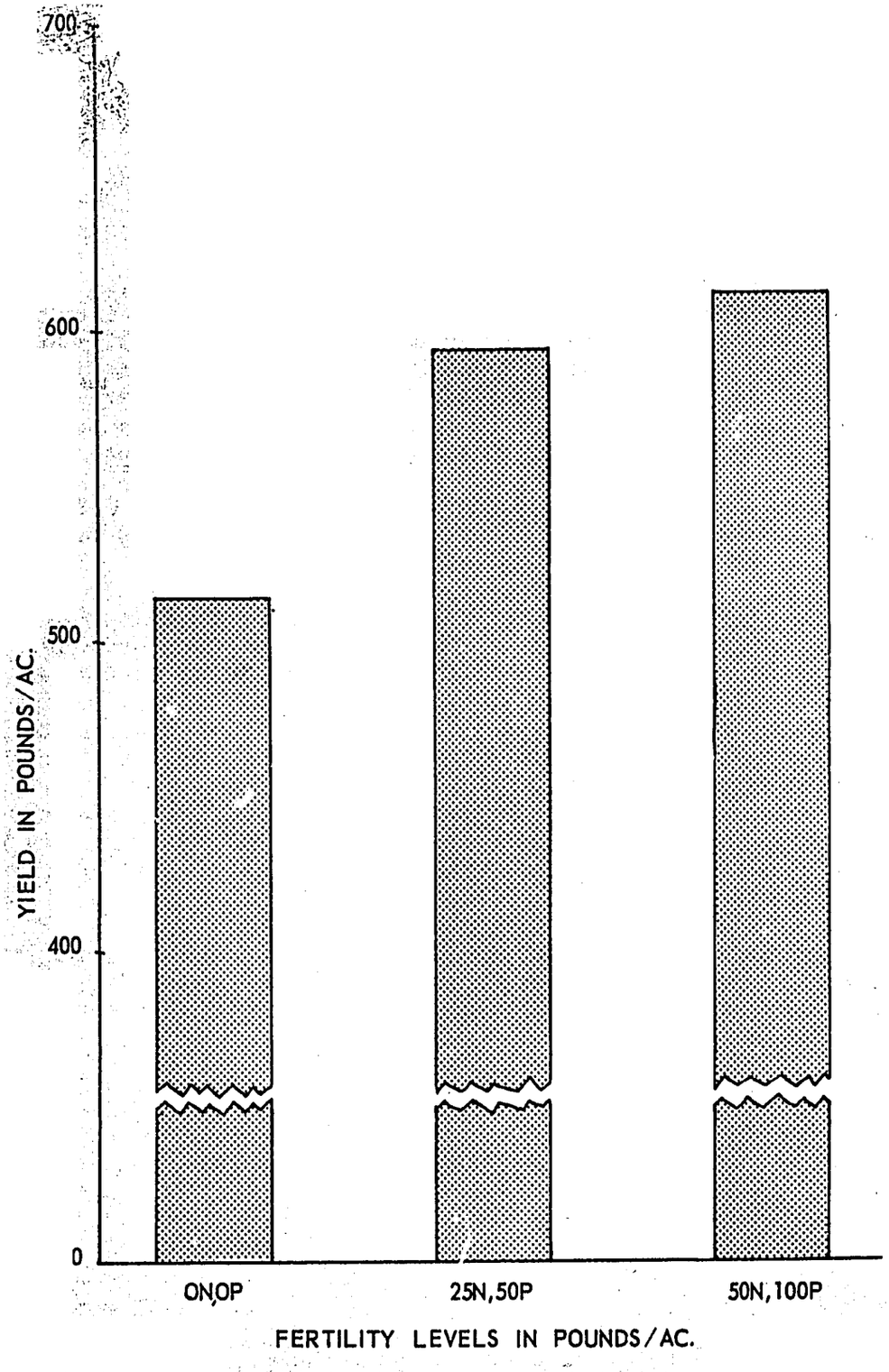

Fig.20 Effect of Fertility Levels on Yield of chick peas
Pant Nagar, 1966-67, Rabi

By adding nitrogen to the factorial (even although theoretically leguminous plants need no added nitrogen) and by using a standard type inoculum as another nitrogen treatment three things were accomplished (1) The possibility of limiting nitrogen affecting the other treatments was avoided (2) Where biological nitrogen fixation was inadequate nitrogen response was obtained along with the other nutrients and (3), If the native rhizobia are not effective the ability of the inoculum to compete with them is measured under conditions that give the inoculum no added advantages over what it would have when used by cultivators.

Fertilizer was applied broadcast and thoroughly worked into the soil before planting, with a roto tiller where available, otherwise with a disk or cultivator. Planting was originally done by hand dibbling putting two seeds per hill to ensure stand and thinning. This proved very slow with the labor usually available. Therefore in the rabi season a gradual switch was made to hand planters and thinning to the proper distance.

Plot size throughout was 3.6 m. x 4 m. A bund space of 0.5 m. was left between plots and alleys and spaces for irrigation channels were left where required. Four replications were employed throughout.

In the Kharif season (1967), fertility-spacing trials on mung beans (Phaseolus aurieus) and urd beans (Phaseolus mungo) both short and long term varieties were conducted at Delhi, Hissar, Ludhiana and Pant Nagar. Treatments consisted of three spacings between rows 20 cm., 30 cm., and 40 cm. in the short term varieties and 30 cm., 60 cm., and 90 cm., in the long term varieties; three plant spacings within rows 5 cm. 10 cm. and 15 cm. in the short term varieties, 10 cm., 20 cm., and 30 cm. in long term varieties, and three levels of fertility 0, 50 and 100 kg. each of nitrogen phosphorus and potassium per hectare. A split plot design was used with fertility levels and row spacings as main plot treatments and plant spacings within rows as sub-plot treatments.

Before conducting experiments soil-samples were taken at all the locations, systematically over the blocks from 0 - 10 cm. depth. The soil samples were analysed and the results of soil tests are presented in Table 76.

TABLE - 76

Result of Soil analysis at different locations

Kharif, 1967

Location	Texture	PH	Conductivity mmhos/cm.	Organic Carbon %	Available P lb/acre
	PROPERTIES STUDIED				
Delhi, IARI Middle Block B.	Sandy loam	8.3	0.35	0.35	16
Pant Nagar	Silt loam	6.5	0.31	0.79	49
Hissar	Sandy loam	8.4	0.27	0.26	27
Jabalpur "North field"	Silt loam	6.8	0.12	0.42	5
Jabalpur "South field"	Silt loam	6.3	0.08	0.49	7
Ludhiana	Sandy	8.5	0.16	0.08	18

Soil analysis data indicate that PH was within the range of normal crop growth at all locations. Conductivity which gives an estimate of soluble salts in soils was not within the danger zone at any location. Pant Nagar Soil has very high organic matter content and Ludhiana soil is very low in organic matter content. The soils at Hissar and Pant Nagar have a higher relative availability of nutrients whereas the Jabalpur soil, has a lower availability of nutrients. Soil at Delhi and Ludhiana are medium in this respect.

Planting at all the locations was completed by the third week of July.

RESULTS:

Monsoon rainfall in 1967 was much heavier than normal. The continuous heavy rains did not permit any time to clear the fields off weeds and excess water stood on the fields during most of July and August.

DELHI

The fertility-spacing experiments on short term varieties of moong and urd crops were affected by continuous heavy rains. Fertility-spacing experiments on long term varieties particularly in Urd (Type-65) had to be harvested prematurely in order to vacate the field for sowing of fall wheat trials. As a result data collected on the long term varieties were erratic and, therefore, had to be rejected.

LUDHIANA

The spacing experiments were severely affected by damping off, nematode trouble and wilt diseases. No valid data, therefore, could be collected from that location either.

PANT NAGAR

All spacing-fertility trials were completely ruined because of excess water, heavy weed populations and hairy caterpillar attack. This caused plant populations in the individual plots to vary so much that no useful data could be collected.

In fertility trials, except in Moong early (T-1), there was a severe attack of hairy caterpillar. In late Urd yellow mozaic virus was so severe that the complete experiment had to be abandoned. In early Urd, (T-9), due to hairy caterpillar attack, there was no uniformity in the plant population and so no useful data could - collected for presentation. Only data from the early Moong (T-1) exper ..t were collected and analysed.

(A) Fertility-Inoculum Experiment (Early Mung bean (Phaseolus aureus) Variety T-1)

This experiment was planted on June 25, 1967 using T-1, a short term variety from U.P.

Yield, as affected by differential doses of N, P, K with and without inoculum, is presented in table 77.

Table - 77

Levels of N kg/ha.	Yield Kg/ha.	Levels of P kg/ha.	Yield Kg/ha.	Levels of K kg/ha.	Yield Kg./ha.
0	483	0	445	0	458
50	506	50	498	50	455
100	462	100	467	100	496
Inoculum No. N	428	-	-	-	-
S.Em ± Kg./ha.	418	S.Em. ± Kg./ha.	357	S.Em.± Kg./ha.	357

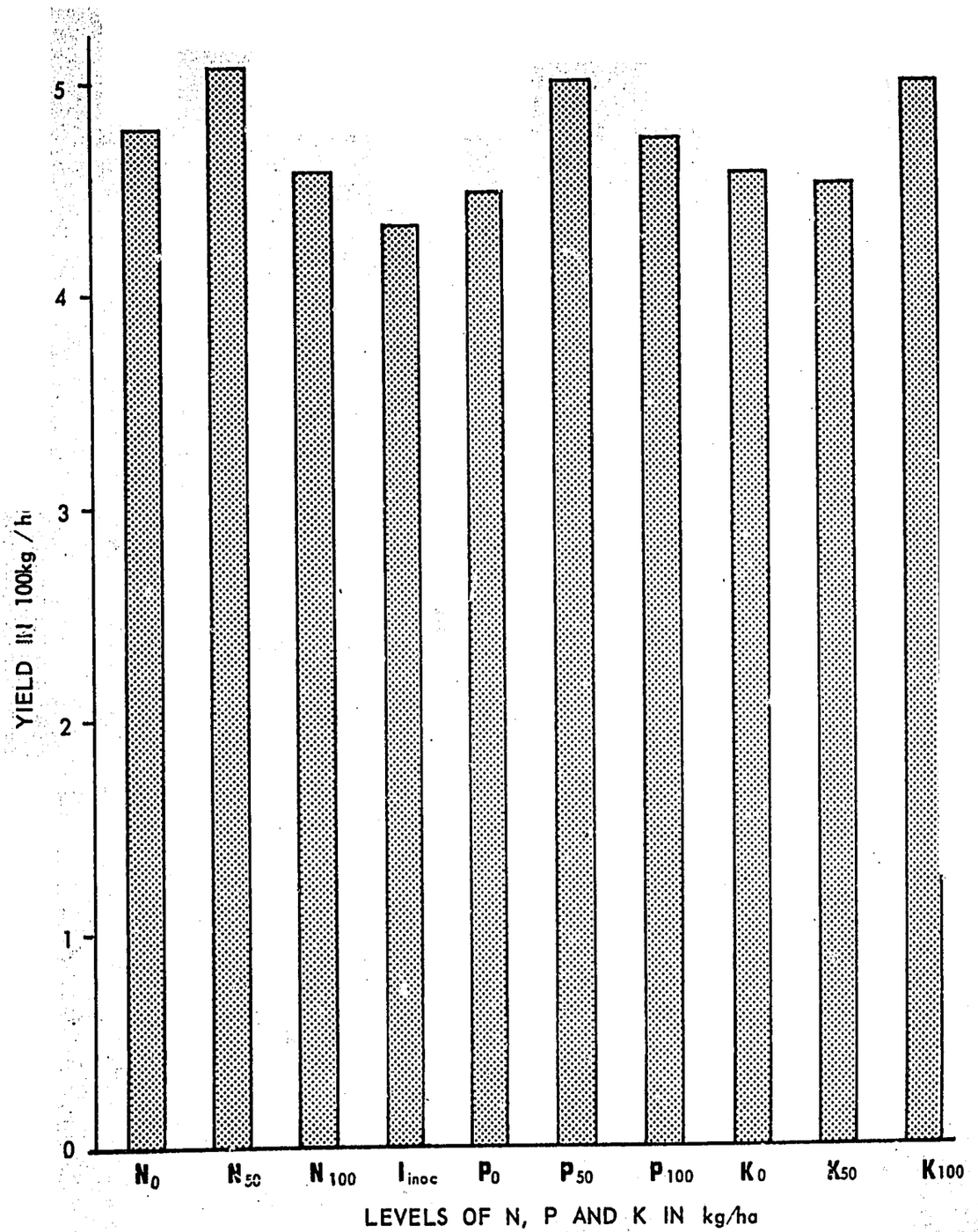

Fig.21 Effect of different levels of N, P and K on yield of Mung beans, Type-I at Pant Nagar, Kharif - 1967.

Data presented in table 77 indicated that the effects due to different treatments were not significant. Interaction effects due to either N, P, or K in all combinations were also not significant. Phosphorus without application of N showed an increasing trend on yield. Potassium seemed to have decreasing effect on yield with nitrogen levels. With highest nitrogen levels, response to Potassium improved, though to a lesser extent Inoculation in combination with potassium at 50 kg. per hectare increased the yield, though the results are statistically not significant. Application of phosphorus beyond 50 kg./ha. and without any potassium application, seemed to have no effect on yield.

Yield data due to different levels of N, P, K and their combinations are graphically presented in Fig. 21.

There were no interaction with any combinations of N, P and K. Phosphorus at 50 kg/ha. without N showed an increasing trend. Potassium showed a decreasing effect with nitrogen levels.

HISSAR

At Hissar location, data on all the four trials were collected, statistically analysed and the results are presented below.

Fertility - Spacing Experiments - (Kharif, 1967)

(A) Early Mung bean (Var. Jalgoan - 781)

This experiment was planted on July 24, 1967, using a short term variety of moong, Jalogan-781 from Maharashtra.

Yield data, as affected by different fertility levels and between row spacings and within row spacings, are given in table 78.

Table - 78

Treatments				
Row Spacing (cm)	Fertility (Kg/ha.N,P&K)	Yield (Kg./ha.)	Within Row Spacing (Sub-Treatments) (cm)	Yield (Kg./ha.)
20	0	1348	5	1519
20	50	1397	10	1463
20	100	1624	15	1450
30	0	1399		
30	50	1421		
30	100	1552		
40	0	1511		
40	50	1389		
40	100	1587		
S.Em.± Kg./ha.)		281	S.Em ± (100 kg./ha.)	321

Data presented show that, though the results are not statistically significant, there was a clear trend of increasing yield with increasing fertility levels. In general, narrow spacing (20 cm. - Row to Row) coupled with highest fertility level (100 kg./ha. each of N, P & K resulted in highest yield of 1624 kg. per hectare. In other spacing treatments also, yield increased due to increasing fertility levels.

Data relating to within row spacings also gave an interesting picture. Narrow spacing of 5 cm. between plants yielded 1519 kg. per hectare as against 1463 and 1450 kg. per hectare in 10 cm. and 15 cm. within row spacings respectively. The results, however, were not significant.

Effects due to different fertility levels and row-spacings and within row spacings are also graphically depicted in Fig. 22 and 23

(B) Late Mung bean (Var. T-6009)

This experiment was planted on July 25, 1967 using a long term variety Type-6009 from U.P. This crop was harvested in the first week of November, 1967.

Yield data, as affected by different fertility levels and between and within row spacings, are presented in table 79.

Table - 79

Treatments				
Row Spacing (cm.)	Fertility (Kg./ha.N,P,K)	Yield Kg/ha.	Within Row Spacings CM	Yield Kg./ha.
30	0	601	10 cm.	583
30	50	603	20 cm.	634
30	100	607	30 cm.	580
60	0	588		
60	50	527		
60	100	530		
90	0	704		
90	50	620		
90	100	613		
S.Em ± (Kg/ha.)		226	S.EM ±(Kg./ha.)	464

Data presented in Table 79 indicated that, with narrow spacing (30 cm. row to row) and increasing fertility the yields showed an increasing trend, though statistically not significant. As the row to row spacings increased from 30 cm. to 60 cm. and 90 cm. and the fertility levels also increased, the yields tended to show a decreasing trend. This showed that with wider spacings between rows, high fertility levels were not remunerative.

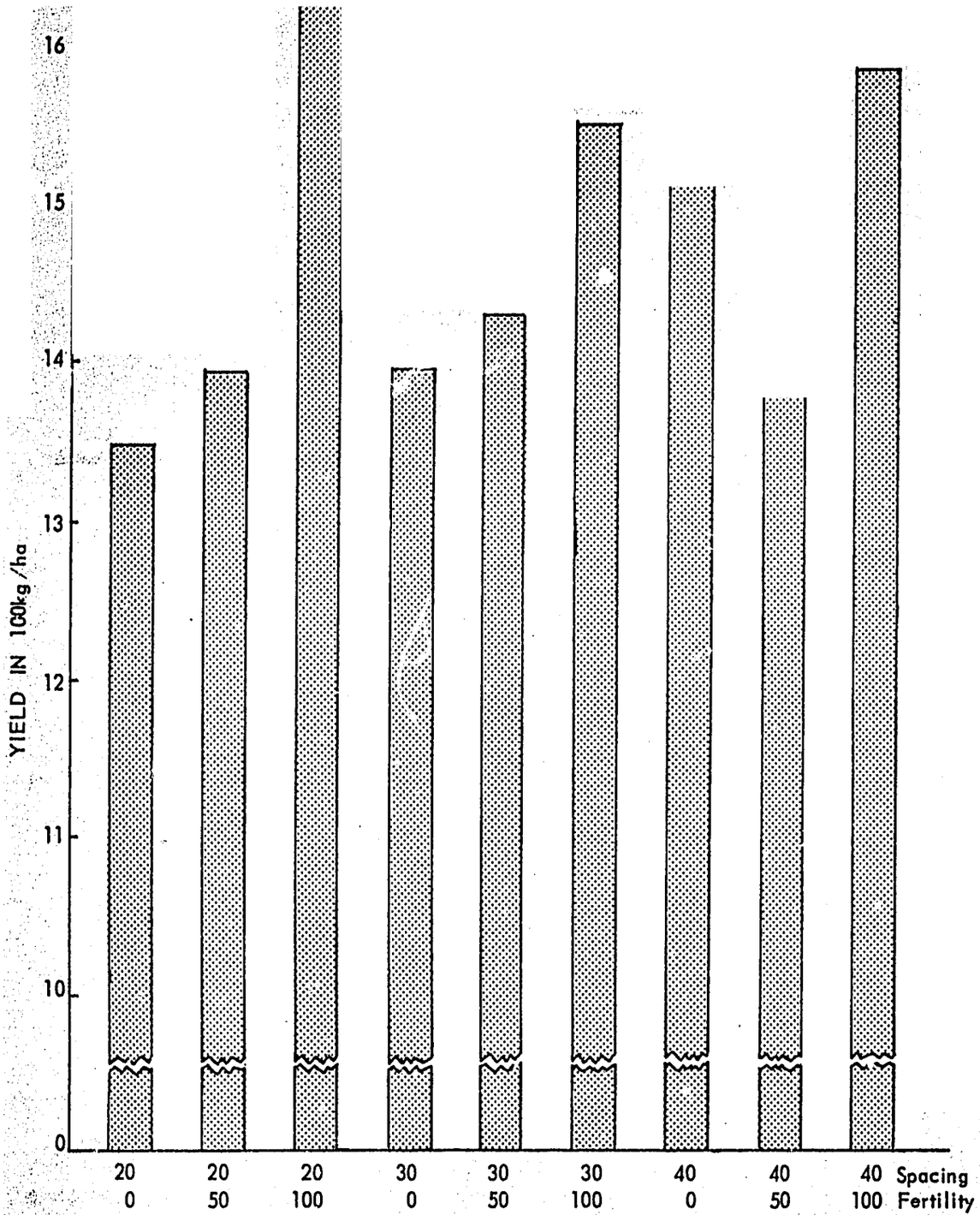

Fig.22 Effect of spacing (in cm.) and fertility (in kg/ha) (Main Treatments) on yield of mung bean-Jalgaon-781, Hissar, Kharif - 1967.

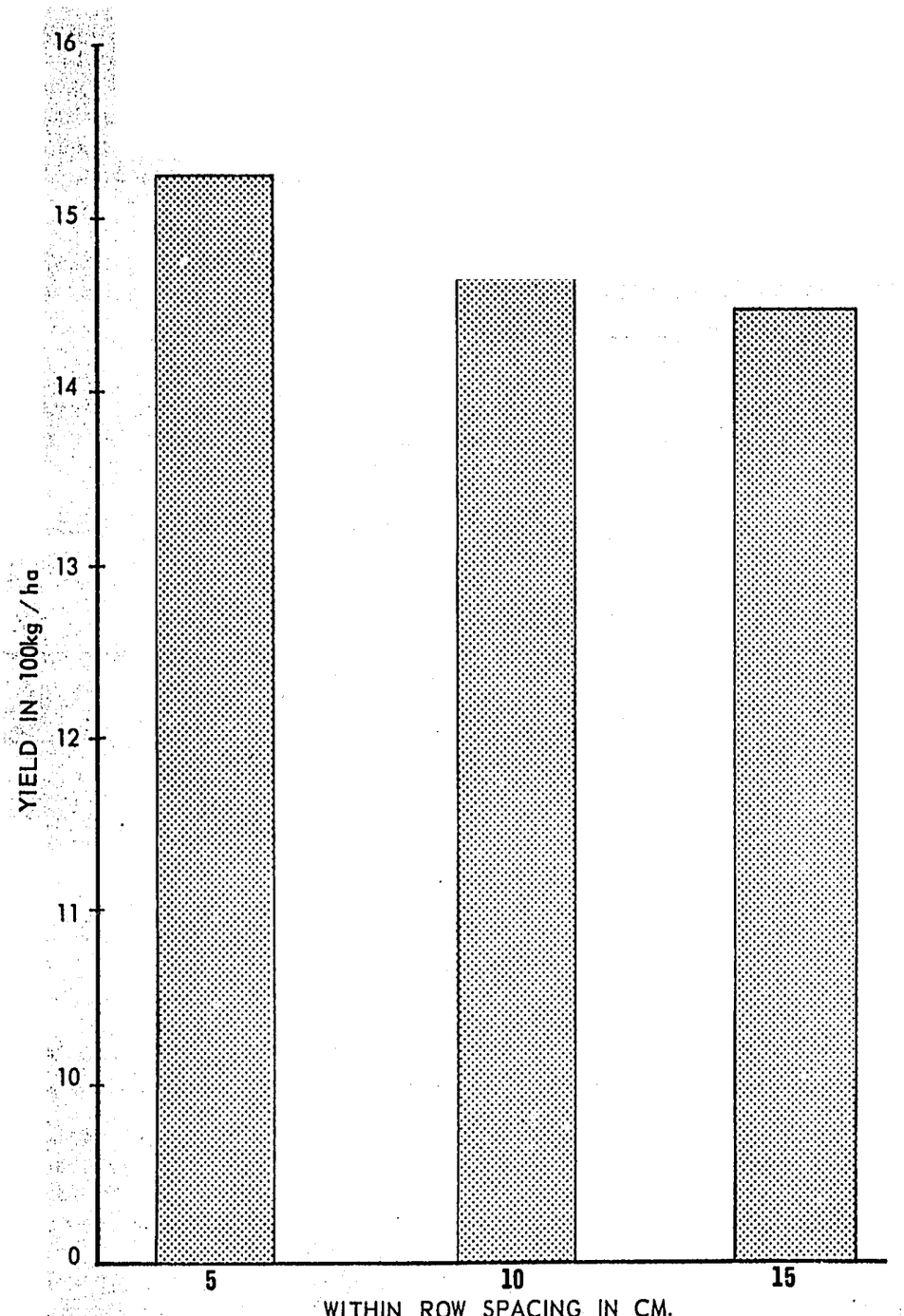

Fig. 23 Effect of plant spacing (in cm.) on yield of early Moong beans var. Jalgaon-781, Hissar, Kharif - 1967

Data regarding within row spacings snowed that narrow spacing of 10 cm. was not effective from the point of view of increasing the yield of late mung crop. It indicated that a spacing of 20 cm. between plants yielded more, though the results were not statistically significant. For long term varieties, spacing of 20 cm. between plants seemed to be optimum. The results, however, need to be confirmed by repeating the experiment, with modifications. The highest spacing of 30 cm. within row showed a decrease in yield, indicating thereby that such wide spacings were not needed for long term varieties.

Effects due to different fertility levels and between row spacings and within row spacings are graphically illustrated in Fig. 24 and 25.

(C) Early Urd Beans (Var. T-9)

This experiment was planted on July 29, 1967 using a short duration variety Type-9 from U.P. The crop was harvested in the second half of October, 1967.

Yield data, as affected by different fertility levels and between and within row spacings, are presented in table 80.

Table - 80

Treatments				
Row Spacing (cm)	Fertility (kg/ha.N.P.K)	Yield Kg./ha.	Within Row spacing cm.	Yield Kg./ha.
20	0	1538	5	1331
20	50	1353	10	1431
20	100	1375	15	1348
30	0	1475		
30	50	1269		
30	100	1229		
40	0	1315		
40	50	1408		
40	100	1389		
S.Em. ± (Kg./ha.)		349	S.Em.±(Kg./ha.)	142

Data indicated that narrow spacing between rows (20 cm. apart) gave higher yields compared to wider spacings (30 and 40 cm.), though the results are statistically not significant. The short term variety of Urd did not seem to respond to high fertility levels, regardless of row to row spacings.

Plants of early urd are generally more of the spreading type as compared to those of early moong (var. Type-1) which are more bushy. Yield data as affected by within row spacings showed that early urd (var.T-9), being a spreading type in growth, responded better with 10 cm. plant to plant spacings. (14, 31 kg./ha.). Increase in spacing beyond 10 cm. or decrease in spacing below 10 cm. showed a decreasing trend in yield.

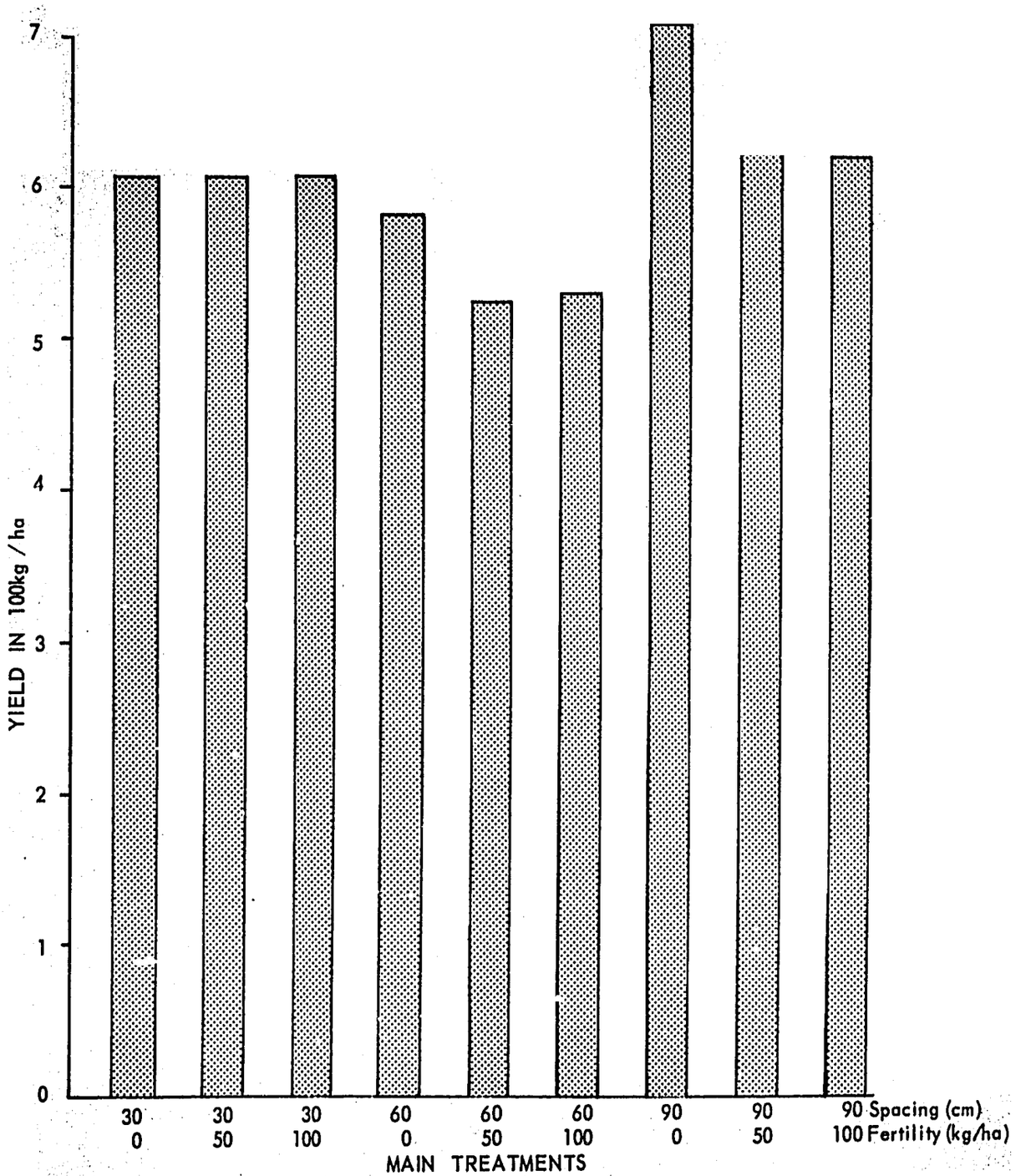

Fig.24 Effect of Spacing and Fertility on yield of Moong late Var-T-6009, Hissar, Kharif - 1967.

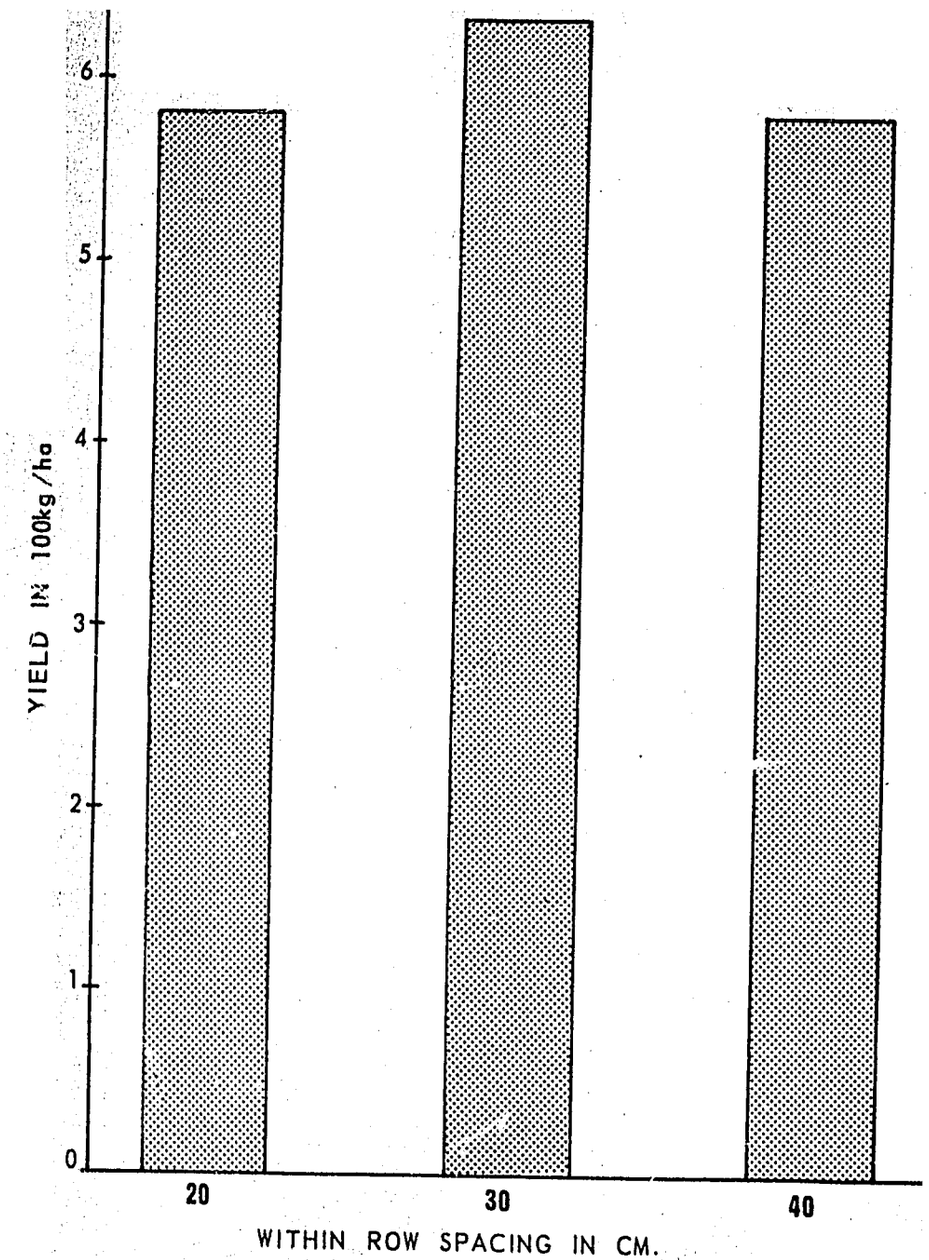

Fig.25 Effect of within row spacing (cm) on yield of Mung late (Var - T - 6009) Hissar, Kharif - 1967

Effects of varying fertility levels and row spacings and within row spacings are graphically shown in Fig. 26 and 27.

(D) Late Urd Bean (Var. 1-1)

This experiment was planted on July 30, 1967 using a long term variety 1-1 from Punjab. The crop was harvested in November, 1967.

Yield data, due to varying fertility levels and between row spacings (Main treatments) and within row spacings (sub-treatments), are tabulated in table 81.

Table - 81

Treatments				
Row Spacing (cm)	Fertility (Kg/ha.N,P,K)	Yield (Kg/ha.)	Within Row Spacing (Cm)	Yield (Kg/ha.)
30	0	1157 a b*	10	1058
30	50	1156 a b	20	1042
30	100	1449 a	30	873
60	0	1054 b c		
60	50	860 b c		
60	100	926 b c		
90	0	854 b c		
90	50	900 b c		
90	100	770 c		
S.Em ± (Kg./ha.)		122	S.Em.±(Kg./ha.)	263
C.D. 5%		361		Not significant

* Treatments showing a common letter are not significantly different from each other.

Data presented show that yield differences due to fertility levels and between row spacings are statistically significant. Narrow spacing with high fertility levels (30 cm. and 100 kg./ha. each of N, P and K) significantly increased the yield. Wider spacings (60 cm. and 90 cm.) showed a significant decrease in yield.

The notations in the table indicate that narrow spacing (30 cm row to row) is significantly superior to other spacings, irrespective of fertility levels. Yield differences in 60 cm. and 90 cm. spacings were not statistically significant.

Yield data of within row spacings (sub-treatments) showed that a narrow spacing (10 cm.) appeared to be better than other spacings (20 cm. and 30 cm. apart). There was a decline in yield due to increase in spacing within row. The results, however, are not statistically significant.

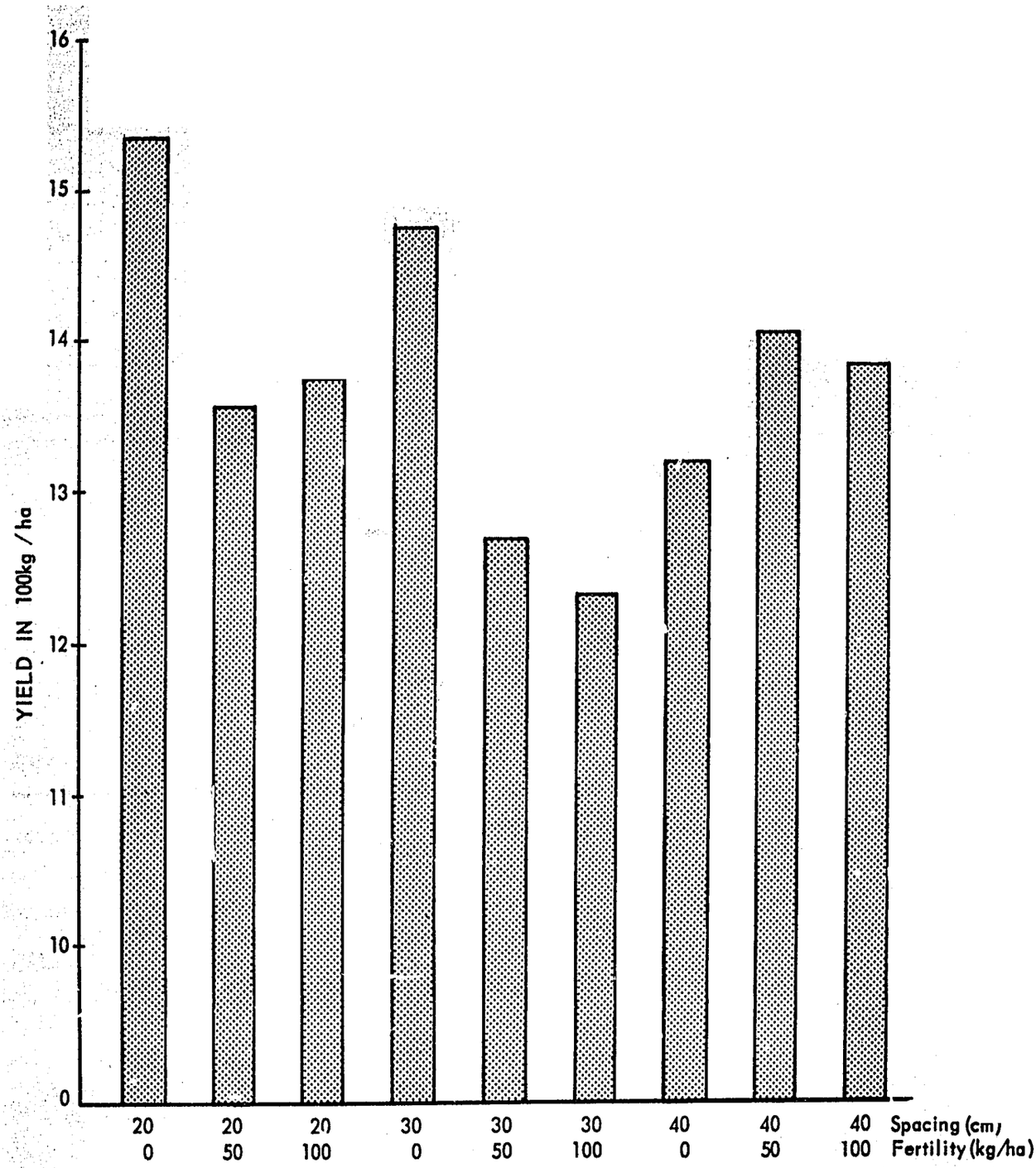

Fig.26 Effect of Spacing and Fertility (main treatment) on yield of Early Urd beans variety T-9, Hissar, Kharif - 1967.

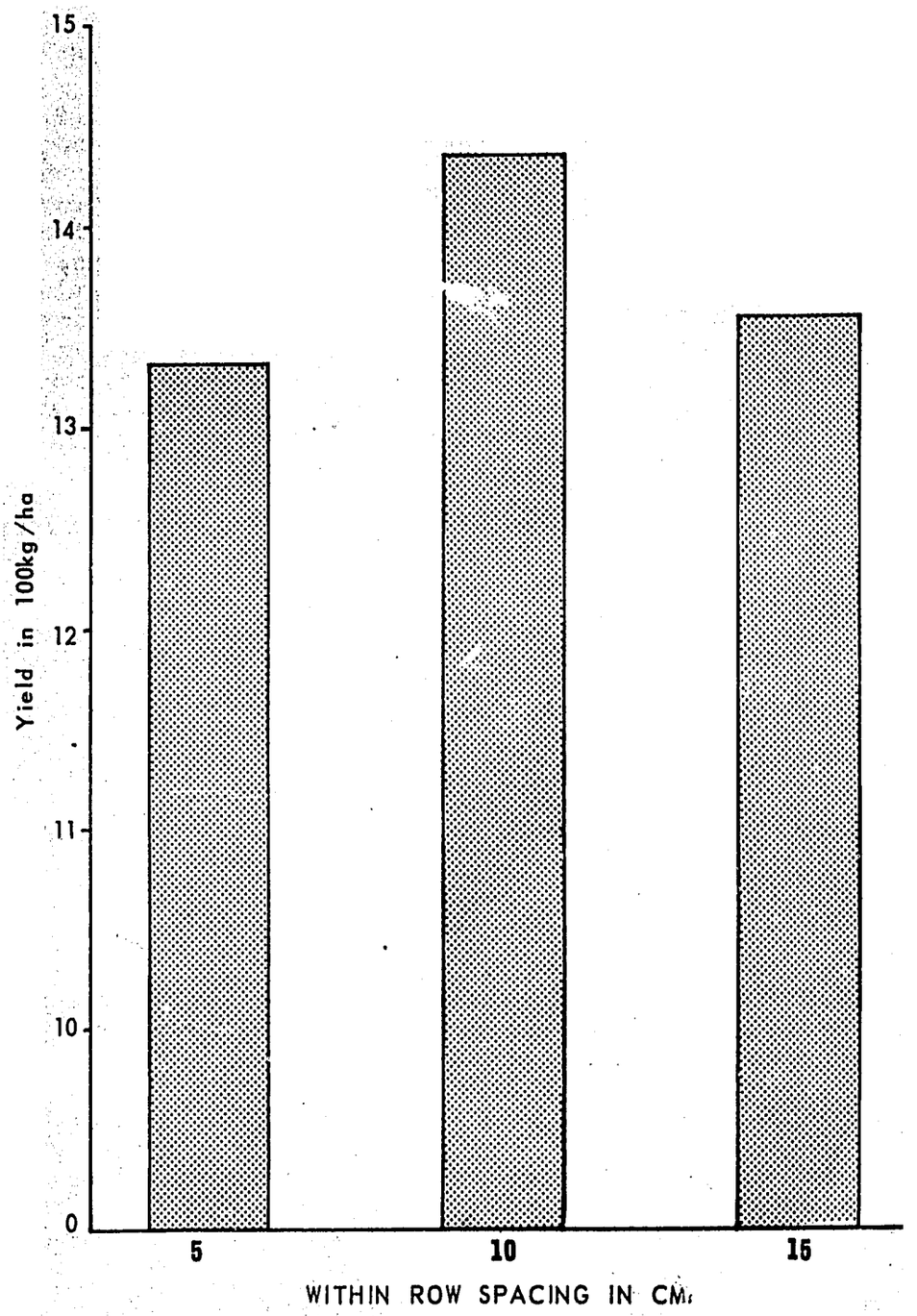

Fig. 27 Effect of within row distance on yield of Urd early variety T-9 at Hissar, *Kharif* 1967.

Effects due to different fertility levels and between row spacings (main treatments) and within row spacings (sub-treatments) are graphically depicted in Fig. 28 and 29.

Fertility Spacing and Plant Population Experiments; Pigeon peas

An exploratory investigation was designed to seek basic information on the response of pigeon pea (common Indian name:arhar) to plant population, spacing and fertility levels. Another trial on the response of this crop to varying levels of N, P & K was also laid out. These trials were located both in the frost-sensitive region (Delhi and Pant Nagar) and frost free region (Jabalpur). Treatments were three plant population rates, (30,000, 40,000 and 50,000 plants/hectare), three row spacings (50,75 and 100 cm.) and three fertility levels (30 N + 40 P + 20 K; 60N+80P+40K; and 90N+120P+60K (kg./ha.)..This experiment was laid out in 3x3 confounded design in block of 9 plots each with one control (40,000 plants/ha. in 75 cm. row spacing with no fertilizer application). Due to flooding during the monsoon season the trials at Delhi and Jabalpur were lost. Data of the Pantnagar location showed significant effects of varying plant population rates.

Table:82. Yield of Arhar (Variety T21) as affected by varying plant populations.

Plants/ha.	Yield (Kg./ha.)
30,000	3532 (c)
40,000	4379 (b)
50,000	5058 (a)
S.Emt (Kg./ha.)	118
C.D. 5%	340

These data show that this variety yielded over 5000 kg./ha. with a population of 50,000 plants/ha. in the Tarai soils of U.P. as against the average yield of about 1200 kg./ha. in that state.

Variety T21 is early maturing. It is ready for harvest in about 160 days from planting as compared to 200-250 days for the normally grown types. It has also a considerably smaller plant structure which explains the response to greater plant densities. The Tarai soils in the Pantnagar area of Uttar Pradesh State are very deep, fertile and high organic matter soils.

Although non-significant the data of Fertility treatments show an increasing trend in yields with increasing levels of fertility.

Table: 83. Yield of Arhar as affected by row spacings and fertility levels

	Yield (Kg./ha.)
	4176
	4358
	4090
S.Em. ± (Kg./ha.)	167

Fertility levels (kg./ha.)			Yield (Kg./ha.)
N	P	K	
30	40	20	4093
60	80	40	4382
90	120	60	4496

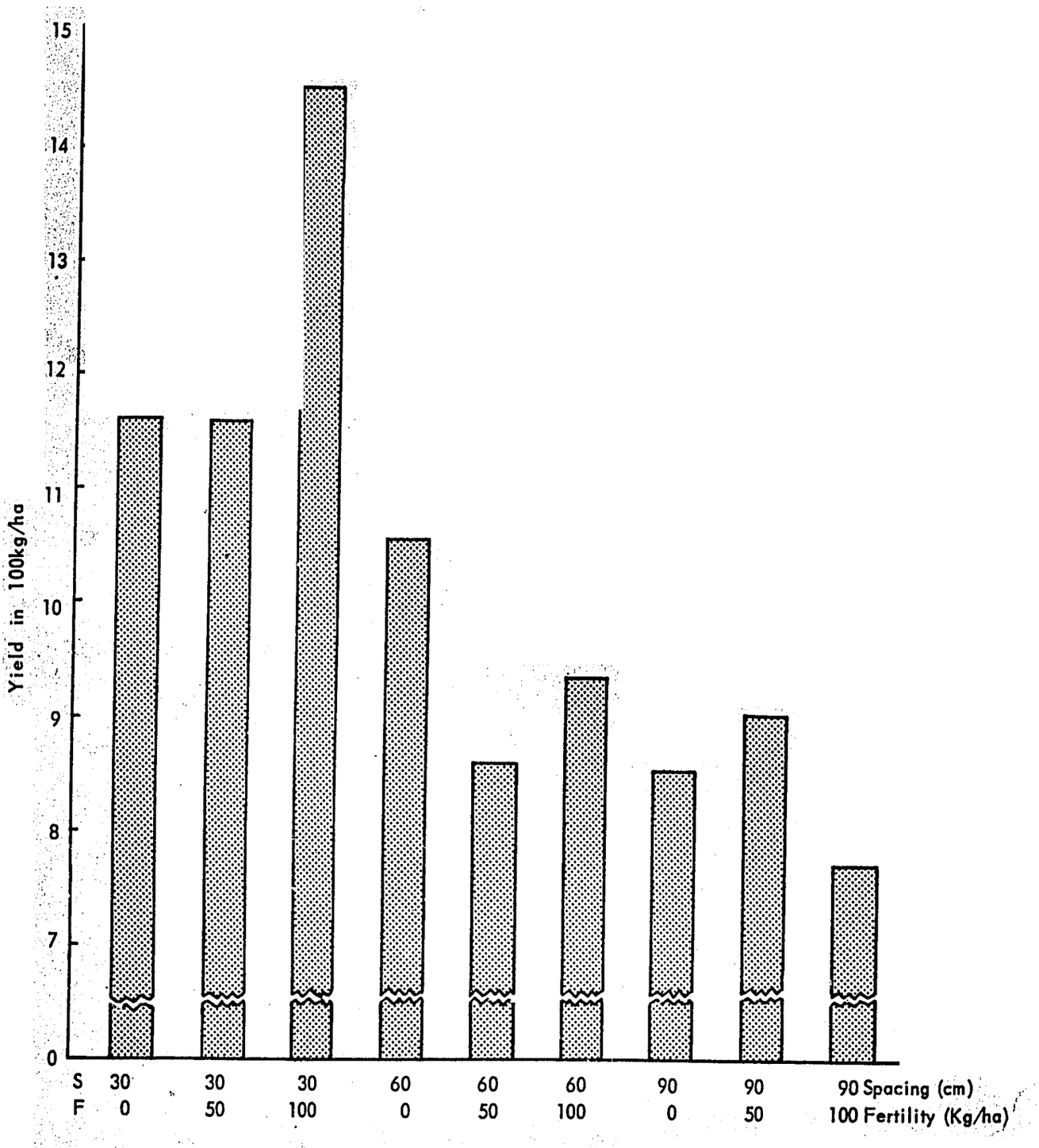

Fig.28 Effect of Spacing and Fertility (Main Treatments) on Yield of Urd late variety 1-1, Hissar, Kharif 1967

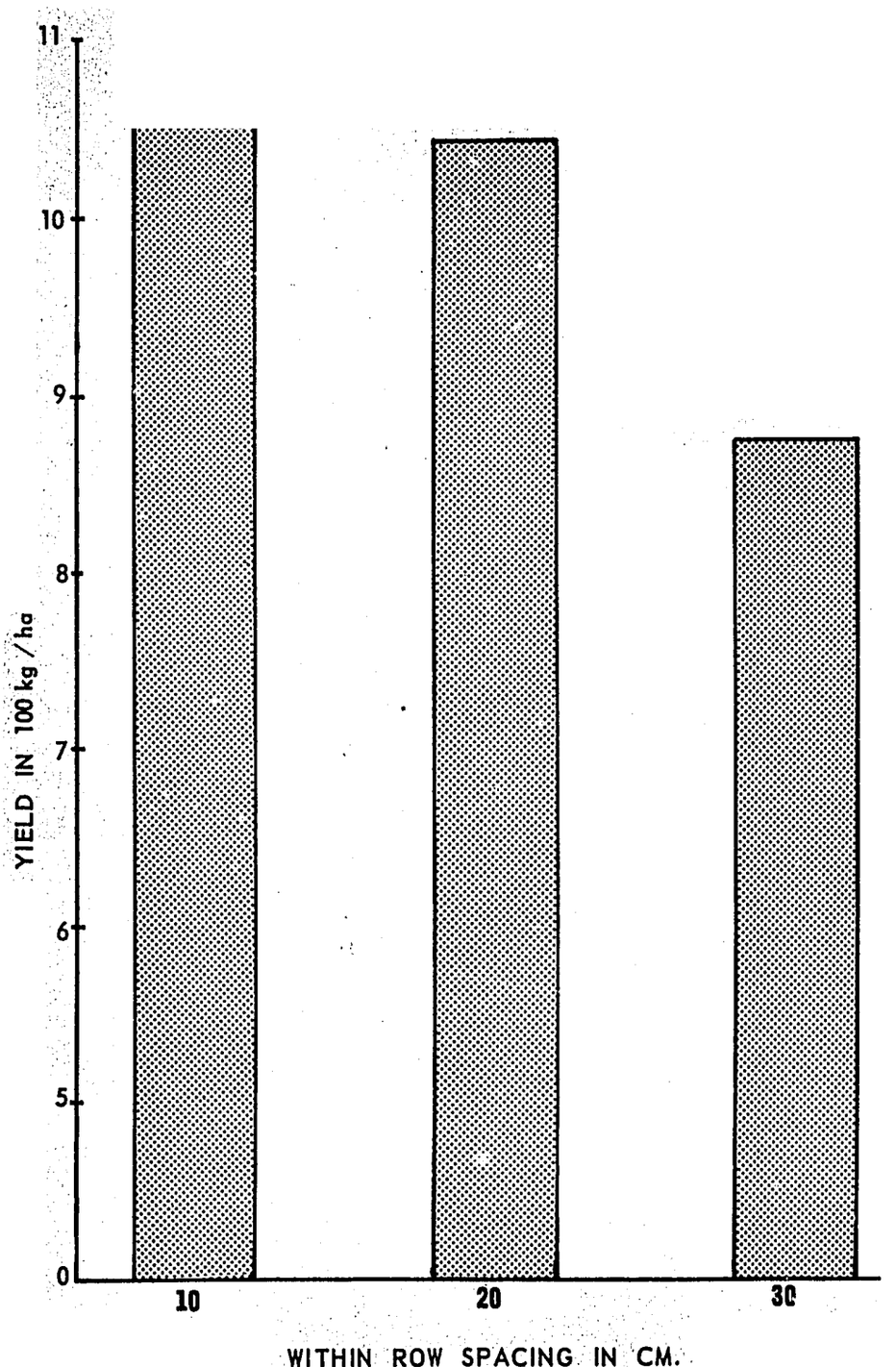

Fig.29 Effect of within row spacing (in cm.) on late Urd variety 1-1, Hissar, Kharif - 1967

PLANT PATHOLOGY

RPIP
F.J. Williams
B. Baldev
K.S. Amin
AICPP/IARI
G.S. Grewal

Cicer arietinum (Chickpeas)

Pathogenicity and resistance - - Twenty three varieties of gram (B 98, BR 17, BR 77, BG 482, G-24, GC2, GC 4, GC 8, GC 49, GC 54, GC 67, C-235, RS-10, CO-1, NP100, S-26, ST-4. Dohad yellow, Chaffa, Pb 7, B-75, G 62-404 and Early Gram), were screened for resistance to Ascochyta rabiei (causal organism of gram blight), under artifical conditions of infection. All were found susceptible, Varieties G 130, G 138, G 139 and L 144 were also found susceptible to blight under field conditions at Gurdaspur and C 104, PB 7 and S 26 at Ludhiana.

Thirty four varieties of gram were tested for comparative resistance to Operculella padwickii (causal organism of foot rot of gram). Twenty eight varieties (ST 4, Bg 3, PB 7, BR 17 Early gram, C-235, Bg 1, Bg 482, G-62-404, B 98, RS 11, BG 2, BG 6, BG 9, Bg 11, GC 2, GC 4, GC 8, GC 49, GC 54, GC 6, T 2, CO-1, Gwalior 2, Chaffa, Dohad yellow, B 75 and Np 100), were highly susceptible when tested in pot cultures. Disease incidence in the above varieties ranged from 77 to 100%. The lowest disease incidence of 47% was recorded in variety GC 67.

Seed Treatment - - Treating NP 58 seed with 3g./kg. of Tritisan, Agrosan GN, Quinolate 15, Ceresan, Captan, or 2g/kg. Semsan or Granesan M or 0.7g/kg. Agrosan 5 W, or 2.5g/kg Puraseed did not increase germination or result in less post-emergence damping off when compared to untreated controls. The experiment was a randomized block with 4 replications, repeated for two years.

Germplasm - - The germ plasm of Cicer was destroyed in 1966-67 at New Delhi by salinity. No particular resistance to salinity was seen. No disease ratings were possible.

Time of Planting - - The effect of time of planting on disease incidence in NP-58 was tested at New Delhi. A randomized block was used, with 4 replications. Plantings were made on Sept.23 and every fortnight until Dec.1. In March, the total number of diseased plants was highest in the first planting, with all other planting dates equal.

Soil amendment - - In 1966 the feasibility of controlling Cicer wilt by soil amendment was tested in a randomized block at New Delhi. Chopped straw of bajra, maize, wheat, gram and berseem were used. Forty cuft of chopped straw was distributed on a 20 x 70ft. area and disced in. Plots receiving no straw were controls. Wilt and drought killed all plants before seed set and there were no differences among treatments in disease onset or incidence.

Miscellaneous diseases - - Sclerotinia sclerotiorum caused some damage in Cicer at New Delhi in 1967-68. Its occurrence was sporadic and no differences in varietal susceptibility were noted. Fusarium was isolated from Cicer at New Delhi and proven pathogenic, but the disease was not serious in 1967-68. Scattered Cicer plants had symptoms of virus diseases at New Delhi. One of the viruses was transmitted mechanically and caused a tip necrosis of young plants.

Phaseolus aureus (mungbeans)

Varietal resistance - - The 21 varieties of mung in the coordinated

TABLE:84. Disease ratings of Phaseolus aureus varieties at New Delhi and Meerut, 1967.

Variety	Meerut		New Delhi					
	Yellow mosaic	Yellow mosaic	Cercospora Leafspot	Bacterial Blight	Top Necrosis	Chocolate Leafspot	Leaf Crinkle	Yield Kg/ha.
D2-15	4.5	1.3	2.1	5.2	6.7	3.7	1.5	40
D45-6	6.8	1.8	2.5	4.1	4.9	3.1	1.3	141
B-1	Dead	1.3	1.8	4.4	7.6	2.8	1.4	27
T-44	1.5	1.1	2.2	5.0	6.8	2.5	1.5	150
T-51	2.5	1.2	1.8	4.8	6.4	3.1	1.1	186
Krishna 11	2.5	1.3	1.4	5.4	8.0	2.9	1.1	41
Hybrid 45	5.8	1.6	1.3	3.3	5.0	3.5	1.2	123
T-2	2.5	1.0	1.7	5.2	6.7	2.7	1.4	312
No.305	6.8	1.6	1.9	3.3	2.9	2.9	1.9	80
Jalagon 781	4.5	1.8	2.1	4.1	6.5	4.2	1.5	36
BR-2	3.5	1.3	1.1	1.4	1.8	1.3	1.1	30
RS-4	6.0	1.7	2.0	5.3	6.7	3.3	1.8	47
RS-5	5.8	1.5	1.9	4.7	6.9	3.3	1.6	61
Kopargaon	2.0	1.1	2.1	4.8	7.9	2.4	1.4	92
Khargon	2.5	1.2	1.8	4.9	7.1	3.5	1.4	71
No.54	6.2	1.7	1.5	3.5	2.6	2.9	2.3	71
24-2	2.0	1.0	1.5	1.8	1.1	1.1	1.1	160
24-3	1.8	1.1	1.5	1.8	1.1	1.1	1.2	164
Np-23	2.0	1.5	2.3	5.2	6.8	3.4	1.1	77
Np-18	dead	1.8	2.0	5.8	7.4	4.9	1.2	49
NP-28	-	1.3	3.3	4.8	6.6	3.8	1.1	-

Rating System, 1-9. 1 = no disease, 9 = all dead from disease. Usually, yield would be considerably reduced when the disease rating is 5 or more.

trials were evaluated for resistance to several diseases at New Delhi and for resistance to yellow mosaic at Meerut. The results are in Table 84.

Yellow mosaic was not serious on mung at New Delhi but was serious at Meerut. Varieties T-44 and 24-3 were most resistant, followed closely by T 51, Krishna 11, T-2, Kopargaon, Khargon 1-1, 24-2 and Np-23.

Bacterial blight was fairly serious at New Delhi. Varieties BR-2, 24-2 and 24-3 were fairly resistant. The same varieties were most resistant to a top necrosis (cause unknown) at New Delhi.

At Jabalpur, varieties Jalagon 781, D 2-15 and NP-18 were most resistant and varieties T-51 and T-2 and Hybrid 45 most susceptible to a Macrophomena leaf spot.

Germ plasm - - The 681 lines of mung germ plasm were scored for disease resistance. Of these, 203 lines were free from yellow mosaic (but yellow mosaic was not severe on mung at New Delhi), 264 lines were free from leaf crinkle, 20 from tip necrosis and 9 from bacterial leaf spot. No line was free from all disease, but lines 327 to 337, 341, 349, 351, 353, 354, 356 to 362, 661 and 664 should be screened under controlled conditions. The remaining lines were moderately to highly susceptible to one or more diseases.

Time of planting - - The possibility of escaping some of the virus diseases by adjusting the time of planting was investigated at New Delhi by planting T-27, T-65 and NP-6 in a randomized block on June 21 and every fortnight until Aug. 8. The incidence of leaf crinkle was highest in the latest planting, but there were no significant differences in yield among times of planting.

Phaseolus mungo (Urd beans)

Varietal resistance - - The 15 varieties of urd in the coordinated trials were scored for disease resistance at New Delhi and Meerut. The results are in Table 85.

Yellow mosaic was very serious on urd at Meerut, where no 1-1, T-65 and T-27 were most resistant. Some varieties were resistant at New Delhi but were not planted at Meerut. They must be tested under more rigorous conditions.

Leaf crinkle was serious at New Delhi. Varieties D 6-7, N212 and T-9 were most resistant, but combining New Delhi and Meerut data, the same 3 varieties were highly susceptible to yellow mosaic. They must be tested under controlled conditions to evaluate the role of cross protection.

Germplasm - - The 310 lines of P.mungo were scored for disease resistance 90 to 100 days after planting at New Delhi. Of these 67 were free from yellow mosaic, 172 from leaf crinkle, 43 from tip necrosis, 104 from Cercospora leaf Spot, 69 from bacterial leaf spot and 4 from brown leaf spot. No single line was resistant to all diseases, but lines 1 to 7, 12, 13, 20, 126, 131, 143, 144, 151, 160, 161, 192, 205, 209, 291 and 298 should be tested under controlled conditions. The remaining lines were moderately to highly susceptible to one or more diseases.

Cajanus cajan (Pigeon peas)

We inoculated 19 selections and 6 varieties of arhar with Fusarium udum, the causal fungus of arhar wilt. The incidence of wilt was above 90% in 16 selections and 3 varieties. Lower disease incidences of 5 to 9% were recorded in varieties NP(WR)15, S 103 and selec ion $R32P_1$.

We collected wilted arhar plants from those districts of Uttar Pradesh, Andhra Pradesh, Maharashtra and Madhya Pradesh wherein arhar production is

TABLE:85. Disease ratings of Phaseolus mungo varieties at New Delhi and Meerut, 1967.

Variety	Meerut	New Delhi		
	Yellow mosaic	Yellow mosaic	Leaf Crinkle	Yield Kg./ha.
T-9	6.8	1.2	2.5	154
Mash 41-13	-	1.0	4.2	200
Mash 35-5	-	1.0	4.5	134
D6-7	8.0	4.7	2.0	158
BR-61	5.8	3.0	3.7	-
T-27	2.3	1.0	6.0	-
Mash 48	-	1.5	6.2	161
BR - 68	4.0	3.0	5.0	-
T-65	2.0	1.0	7.5	-
No.1-1	2.0	1.0	7.7	131
N 212	-	7.7	1.2	112
Sindh Kheda 1	18.0	6.5	3.5	48
Khargon 3	-	6.7	3.5	33
Np-14	-	7.2	3.2	-
No.55	8.0	8.0	3.5	132

Rating System, 1-9. 1 = no disease, 9 = all dead from disease
Usually, yield would be considerably reduced when the disease rating is 5 or more.

concentrated. About 600 collections were made and their pathogenicity will be tested to learn if races of the pathogen exist. On the same trip, estimates of loss of arhar were made. Fusarium wilt, sterility mosaic and yellow mosaic were common and locally severe. Total loss due to wilt was estimated at 5% in the southern area and 1-2% in Uttar Pradesh. Sterility mosaic incidence was a trace to 1% in the areas surveyed.

Wilt of arhar was not prevalent enough at Hydrabad to score the germplasm for resistance. Sterility mosaic and yellow mosaic were present in trace amounts. A portion of one field had nematode damage. At Coimbatore, powdery mildew was serious on arhar and caused extensive defoliation.

Pisum sativum (Field peas)

Time of Planting - - Disease incidence or severity was not related to time of planting of variety Bonneville at New Delhi when plantings were made fortnightly from Sept. 23 to Dec. 1 in a randomized block with 4 replications. The yield from the second planting (Oct. 6) was highest and yields decreased with each later planting date, but the results can be described only as a "trend" since the test was not significant at the 5% level.

Varietal trials - - Varieties Bonneville, Bridger and 326 out-yielded 163 and Early December in a randomized block experiment planted Oct. 6 at New Delhi. There were no differences in disease incidences among varieties. In another variety trial planted Nov.11, Bonneville outyielded NP29, Perfection 3040, Eureka and Early Frosty.

The test did not include Bridger and 326. There were no differences in diseases among varieties. While Bonneville, Bridger and 326 had similar yields, 326 set fruit and matured much later than Bonneville and Bridger.

Rust, pea streak and powdery mildew occurred in the pea trials at New Delhi, but in low incidence.

ENTOMOLOGY

Kenneth E. Gibson - Entomologist
Counterpart: P. V. Ranga Rao

Rabi - 1966-67

Bruchids

The important pulse crops planted in October and early November for the rabi, or winter season, in the Northern India area, are lentils, chickpeas (gram), and dry peas.

These crops are subject to attack by various species of bruchids, to a greater or less degree while still growing in the field. When the mature, infested seed is brought from the field at harvest time, the bruchid population rapidly increases under storage conditions, and severe seed losses usually result.

Although the greatest damage and seed loss occurs in storage, it is felt that if an effective insecticidal control program can be worked out for use in the field, thereby permitting the harvesting and storing of mature seed that is at least relatively free of bruchid infestations, the problem of bruchid control in storage can be minimised, and seed loss, hopefully, reduced to a low figure.

With this in mind, arrangements were made in December of 1966 with staff personnel of U.P. Agricultural University at Pant Nagar, in Uttar pradesh, India for the use of some lentil, chickpea, and dry pea plots on the University farm, for the purpose of conducting some experimental and exploratory trials with field sprays of suitable insecticides, to see if the idea of bruchid control in the field had any merit.

The plantings of lentils and gram had been made on 18 November, 1966, and the dry peas had been planted between 18 and 25 November, 1966.

On 5 January, 1967, these crops were all examined for insects. No noxious insects were apparent on either the gram or the lentils. On the peas there was ample evidence of the presence of leaf miners (apparently dipterous), the larvae of which had tunnelled and splotched the foliage, at that time they did not appear to be of economic significance. Some black aphids were also noted on the peas. These were on the lower leaves of the plants, and were probably black bean aphids (*Aphis fabae*). There was also some slight evidence of the presence of the pea stem-borer, which ordinarily infest the crowns and upper root parts of the plants, mining them and causing the death of infested plants. This is an important and devastating dipterous pest of peas in this area.

Ten rows of each of the 3 crops were selected for experimental plot spraying work, comprising a single variety of the crop in each case. Each 10-row block was divided into 8 plots, which provided 2 replicate plots for each of 3 insecticide treatments, and 2 untreated check plots of each crop. All plots in each crop were randomised.

All of these crops are infested with bruchids of one species or another (some with several) as storage pests. In addition, the peas are infested with pea weevil (Bruchus pisorum), which, in the states at least, has a single generation a year, and is not a storage pest, since it cannot live and reproduce in the mature seed.

On 12 and 13 February, 1967, these plots were experimentally sprayed for bruchid control. The following insecticide materials were used at the rates indicated in the tabulation.

Treatment No.	Material	Application Rate (Pounds actual/acre)
1	DDT (as 50% W.P.)	2 Pounds Per acre.
2	Benzene hexachloride(as 50% W.P.)	1 " " "
3	Diazinon (as 20% E.C.)	1 " " " *
4	Untreated check	

* The second application (on 25 February, 1967) was made at the rate of 1/2 pound of actual toxicant per acre.

The sprays were applied with a 4½ gallon back-pack sprayer, with the pressure maintained by hand pumping, and the spray delivered through a fan-jet nozzle at the end of a rod-gun held directly over the plants.

At the time the first spray application was made, the lentils had a moderate number of blooms, but no pods. The gram plants were just starting to bloom, and no pods were set on at that time. There was some bloom among the pea plants, but no pods were observed. At the time of spray application the lentil plants were 10 to 15 inches high; the gram, 12 to 15 inches high; and the peas, 20 to 24 inches high.

On 25 February, 1967, these plots were sprayed for the second time. Application of the 3 insecticides was made in the same manner and at the same rate as the first application on 12 and 13 February, except as indicated above, the Diazinon was applied at 1/2 pound of actual toxicant per acre when the second application was made.

The plots were examined when the second insecticide application was made, and some small pods were noted on the lentil plants. Blooms were also evident on most of the lentil plants, but blooming had not yet reached its peak. Some small pods were also found on some of the gram plants, which were blooming profusely. There was also a large number of blooms and pods on plants in the pea plots.

No other applications of insecticides were made to these plots and harvest was planned for approximately the middle of April, 1967.

My plans called for me to depart India on Home Leave 2 April, 1967, to be gone approximately 3 months. The responsibility for harvesting and obtaining seed samples from each plot was left with my counterpart. For some unfortunate reason, still unknown to me, samples were available only from the lentil and dry pea plots. I had difficulty finding the seed samples and some incomplete records when I returned to India, so the tangible results of this exploratory, experimental work are fragmentary. After I had found the seed samples, they were examined in December of 1967, at which time bruchid damage to the seed was assessed, and all adult bruchids found in the seed samples, were removed. The following tabulation shows such results as we were able to obtain:

Table 86 - Effect of insecticide applications in the field on bruchid incidence and damage in stored seed.

Treatment No.	Material	Crop	Damage and bruchids Found December, 1967	March, 1968
1	DDT	Lentils	No Damage) No Bruchid)	12 Bruchids
1	DDT	Lentils	No Damage) No Bruchid)	9 Bruchids
2	BHC	Lentils	Slight Seed) damage) No Bruchid)	23 Bruchids
2	BHC	Lentils	Slight Seed) damage) 1 Bruchid)	5 Bruchids
3	Diazinon	Lentils	No Damage) No Bruchids)	3 Bruchids
3	Diazinon	Lentils	No Damage) No Bruchids)	18 Bruchids
4	Untreated Check Lentils.		No Damage) No Bruchids)	9 Bruchids
4	"	"	No Damage) No Bruchids)	41 Bruchids
1	DDT	Peas	No Damage) No Bruchids)	4 Bruchids
1	DDT	Peas	Slight Seed Damage) 1 Bruchid)	3 Bruchids
2	BHC	Peas	Slight Seed Damage) 1 Bruchid)	1 Bruchids
2	BHC	Peas	No Seed Sample) Slight Seed Damage)	-
3	Diazinon	Peas	1 Bruchid) No Damage)	2 Bruchids
3			No Bruchids)	0 Bruchids
4	Untreated Check		Slight Seed Damage) No Bruchids)	2 Bruchids
4	"	"	No Damage) No Bruchids)	2 Bruchids

Various misfortunes and misunderstandings have resulted in this fragmentary data following harvest, which has been quite disappointing. However, some interesting possibilities are indicated, and perhaps some tentative conclusions may be justified.

The adult bruchids found in the lentil seed on 29 March, 1968, were obviously the same species we have been routinely sweeping from experimental field plots of lentils at New Delhi during February and March of 1968. We do not yet have a positive identification of this bruchid. All samples of seed that had been collected from the Pant Nagar plots and brought to New Delhi, had been placed in glass jars with screw tops, which could not have been entered by adult bruchids after the mature seed samples were placed in storage.

Although only one adult bruchid was found in the 8 jars of lentil seed samples when they were examined in December, 1967, and it was dead, and removed at that time, approximately 3 months later, 120 adult bruchidswere found in these 8 jars of seed. Since the jars were tightly closed during this period, obviously there must have been eggs or newly hatched larvae in or on the seed when it was examined in December, 1967. Since these seed samples have been in containers impervious to entrance by bruchids virtually ever since harvest, and since the species involved seems to be the same as the one found prevalent in field plots of lentils in the spring of 1968, it appears that field infestation, for this species at least, can be the source of much greater infestations in storage.

It is also of interest that at the examination of 29 March, there were more than twice as many bruchid adults (50) in the untreated checks as in some of the individual treatments (21 in the DDT; 28 in the BHC; and 21 in the Diazinon). These represent indication rather than well-established scientific facts, but it does appear this particular species of bruchid may originate in mature seed as a field pest, and that a well-worked out program of field application of the proper insecticide, may have real value as a control measure.

Examination of the dry pea seed samples on 29 March, 1968, shows a relatively small adult increase from the time of the December, 1967 examination. The adults recovered were to all appearances Bruchus pisorum and since this is not considered a pest that will breed and increase in mature, stored pea seed, these findings are logical. The adults that were found on 29 March, 1968 may represent some that were mature, but had not emerged from the seed, in December of 1967.

Again, it is of interest that this, as well as some other bruchids, some of which looked like the cowpea weevil, callosobruchus maculatus, were found inpesting peas growing in experimental plots at New Delhi in the Spring of 1968.

Protective Sprays to Pulse Crop Plantings

On 11 February, 1967, the project Lathyrus and lentil plantings on the Experimental Farm at U.P. Agricultural University at Pant Nagar, India were examined for noxious insects. The Lathyrus was well in bloom on this date, and there were many small pods on the plants. The seeds in the pods were extremely small at the time. Both blooms and pods were plentiful on the lentil plants, and in some of the pods the seed had developed to a fair size.

Populations of aphids, black in color, and apparently Aphis fabae, were very heavy on both the Lathyrus and the lentils, and it was obvious that both crops needed to be given a protective spray.

Spraying of these crops for aphid control was started on 11 February and completed on 13 February. The spraying was accomplished with a 4½ gallon, back-pack sprayer, with pressure maintained by hand-pumping. Insecticides used were Diazinon and benzene hexachloride. Both were used at the rate of 1 pound of actual toxicant in 30 gallons of spray per acre.

There was enough emulsifiable concentrate of the Diazinon available to mix only 4½ gallons of spray. When this had been used, the remainder of the lathyrus and lentil plantings were sprayed with benzene hexachloride.

These sprayed plantings were examined again on 25 and 26 February, 1967. Those that had been sprayed with Diazinon were free of aphids, but those sprayed with benzene hexachloride appeared more heavily inpested than prior to the spray application on 12 and 13 February. Apparently the benzene hexachloride had not been effective against the aphids, and since the plants were beginning to show the effects of feeding by the aphids, plans were made for another insecticide application (of Diazinon) to the infested plants as soon as possible.

It was planned to make this application on 4 March, 1967, but an examination of these crops on that date showed that the aphid population had virtually disappeared. Inquiry revealed they had not been sprayed since the heavy infestation was observed on 25 and 26 February. Coccinellid larvae, pupae, and adults were relatively abundant. The only logical conclusion was that the Coccinellids had cleaned up the aphid infestation during the preceding week. It was on extremely effective job - the clean-up was virtually 100 percent. There was no need for spraying these crops on this latter date, and no application was made.

These plantings were last examined on 25 and 26 March, 1967, and there was no indication that the aphid population was increasing again; live aphids were almost non-existent on the plants. This seemed to be a rather unusual and almost startling case of effective biological control. It certainly indicates that predators and parasites are taking their toll of noxius insects in India, and is doubtless reason for strong endorsement of selective insecticides.

Observations

During December of 1966, there was opportunity to observe plantings of pigeon peas, or "red gram", from the environs of Delhi (including an area up to 150 miles east and slightly north), to Coimbatore, which is about 150 miles north of the southern tip of India. Obviously one of the major pests of this crop, and one which seems to be spread throughout India, wherever the crop is grown, is the so-called "pod-borer." Actually, this appears to be a complex of insects, which, I suspect, involves several orders. Probably the main culprit or culprits is (or are), lepidopterous in nature. I suspect two or more families of Coleoptera are involved, including the Bruchidae and Curculionidae, and there appears to be at least one species of Diptera.

This insect complex, as the name "pod-borer" indicates, is responsible for boring into the pods and damaging or destroying the developing seed. As high as 90 percent loss of seeds was observed on plants in some experimental plantings in Coimbatore. Obviously, early attention should be given to the control of this insect complex.

Another pest which attackes this same crop is a black thrip (identity unknown as yet). These thrips have been found inside the blooms of the pigeon pea plants, at a certain stage after the flower petals have opened, but before the flower has withered frequently as many as 50 to 60 thrips have been found inside a single blossom when it was opened, and these plants do not have large blooms - certainly no bigger than a pea plant does. These insects also seem to be geographically wide-spread as pests of this crop; ranging in agricultural areas from the North to the South of India.

The damage done is doubtless rather insidious in that there is no apparent feeding injury. The damage probably comes from a blasting of the blooms, and consequent failure to set on what would otherwise be a normal, full complement of pods.

As long as the thrips are inside the blooms, where obviously they spend most of their time while associated with the pigeon pea plants, they probably would be difficult to reach effectively with non-systemic insecticides. Such materials as dimethoate or demeton may have the most promise.

Another insect that apparently is doing some feeding on the blossoms of red gram or pigeon pea, is the larva of a small blue butterfly, sometimes known as the "bean butterfly", and which has the scientific name Lycaena baetica. It apparently lays its eggs on some outer portion of the bloom, and when the larva hatches it bores through the petals to the interior of the blossom, and feeds there until full-grown. The blooms, of course, are blasted, and worthless for production.

It was found to be a pest of cowpeas in Iran during the summer of 1966, where it was feeding on, and blasting the blooms of that crop. There was also evidence it was doing some pod-boring of cowpeas there.

While sweeping weeds near experimental plantings of pigeon pea at Coimbatore, in Southern India, the adult butterfly was taken in large numbers. In addition to blasting blooms, this insect is also probably responsible for some of the pod-borer damage to pigeon peas.

It is very likely that one or more species of Coccinellids in this country are guilty of extensive leaf-feeding on crops. One species has been noted feeding extensively and voraciously on the foliage of a weed bost on the farm at U.P. Agricultural University at Pantnagar, about 155 miles east of Delhi. It was skeletonizing the foliage of the need host in much the same manner the Mexican bean beetle (Epilachna varivestris) does bean foliage in the states. This foliage feeder is very probably of the genus Epilachna, but may or may not be varivestris. The pattern and number of spots on the back varies widely, and authentic determination is pending. The finger of suspicion points to some other Coccinellids as probable vegetarians also.

Insect vectors of virus diseases on pulse crops, are of course present, since viruses have been reported and noted as wide-spread. The most probable vectors are: (1) - aphids, several species of which have been noticed infesting experimental pulse crop plantings; (2) jassids, or leafhoppers, which build up high populations on some pulse crops, and (3) True white flies or Aleyrodids, which have been identified as the vectors of some of the pulse crop viruses.

Miscellaneous

A portable light trap (20 percent "black" or ultra-violet light) has been operated intermittently in New Delhi since arrival here in October, 1966. Travel and electrical problems interfered with planned nightly operation of the trap. It is planned to put the trap in operation on a nightly basis as soon as possible. This is a rather effective way to get a cross-section of the night-flying insect fauna of an area.

Travel in various parts of India has provided an opportunity for general insect collecting by sweeping with a standard net.

All of this insect material is being sorted, representative series of all collected are pinned and labelled, and will become the nucleus of what it is hoped will eventually be a Project insect collection, not only of pulse crop insects, but representative of the general insect fauna in areas where we work.

Kharif - 1967

The three most important summer, or kharif pulse crops are mungbeans (Phaseolus aureus), urad beans (Phaseolus mungo) and cowpeas (Vigua Sinensis)

Experimental plantings of these 3 crops were made during the first and second weeks of July, 1967, at the IARI farm, New Delhi.

Flea beetles

The first insect problem that developed on these crops after the plants emerged, was flea beetles. The insect is light brown in color, and habitually is very difficult to find on host plants during daylight hours. Apparently it is primarily a nocturnal feeder, and during the hot days protects itself by hiding under the soil surface in close proximity to the plant or plants where feeding took place during the night. Positive identification of this flea beetle has not yet been obtained.

These insects must almost literally sit about and wait for the emerging pulse crops, which were up last year by the middle of July. Severe foliage injury was done to very young plants, sometimes while they were still in the cotyledon stage.

First attempts to control these flea beetles consisted of foliar applications of both DDT and carbaryl (Sevin), applied as wettable powder sprays. DDT was applied at rates varying from one to two pounds of actual toxicant per acre, and carbaryl at rates of one to 1½ pounds of toxicant per acre.

Intermittent, but frequent, and heavy, down pours of rain made it virtually impossible to maintain any sort of spray schedule. Heavy rains frequently closely followed, or even interrupted, spraying operations, and with the thought that the insecticides had been washed away, an application was frequently repeated within 24 hours.

Surprisingly enough, within a period of one week after application, very definite symptoms of phytotoxicity appeared wherever the carbaryl was applied. The phytotoxic symptoms were much more severe where it was thought the first application had been washed off by rain, and was repeated in a day or two. Symptoms were a stippling of the foliage with resultant necrotic spotting, and in severe instances the foliage was twisted and distorted as well as burned. Symptoms were shown on mung beans, urad beans, and cowpeas, with the latter generally showing the most tolerance to the insecticide. Since the formulation of carbaryl was a wettable powder which ordinarily would not be phytotoxic, this effect could only be attributed to the extreme heat and humidity at the time the applications were applied.

This somewhat disturbing occurrence caused the curtailing of the use of carbaryl during the kharif, or summer season, until it is determined if there are some tolerance limits within which this material can be safely used under these climatic conditions.

Since the rains made an attempt to schedule regular applications of a non-phytotoxic material like DDT rather frustrating, another approach was tried.

This approach involved some exploratory tests at the time the pulse crop plantings were made for the kharif season early in July. Granular phorate (Thimet) and Temik (UC21149), were applied in the drill rows with' the seed. Both of these materials are systemic insecticides. Both were applied to 10 row plots, 15 feet long, of cowpeas and mung beans. The seed was dropped in planting furrows by hand, and the granular insecticide materials scattered along the furrows, in the same manner. The insecticides were intimately mixed with the seed. Both materials were applied at the rate of 2 pounds of actual toxicant per acre, as nearly as could be estimated. The distribution of the insecticides, by the nature of the application, was uneven. This was reflected in a spotty phytotoxicity, evident in an uneven pattern along the treated rows.

There were 4 replicate plots of each of the 2 treatments, and 4 of untreated check plots, in each crop (mung beans and cowpeas).

Excellent control of flea beetles, as measured by foliage injury, was obtained with both materials for approximately 6 weeks after planting. Treated plots, for the entire period, showed practically no evidence of flea beetle feeding on the foliage. This was true of both crops. Foliage on untreated check plots of both crops, on the other hand, was thoroughly shot-holed, and badly riddled by flea-beetle attack.

The phytotoxicity was characteristic of organic phosphate systemics applied as soil treatments, even though Temik is a carbonate. It was typically a browning and necrosis of the tips and edges of the leaves of the young plants, and sometimes an irregular stippling of the foliage with small, brown necrotic spots. In no case was the phytotoxicity observed to be severe, and the plants appeared to out grow it without deleterious effects.

At the stage of growth approximately 4 weeks after planting, the plants in the treated plots were about twice the size of those in the untreated checks. This applied to both the plots treated with phorate (Thimet) and those treated with Temik (UC-21149). The only apparent reason for these differences in plant size and vigor was the comparatively heavy feeding damage on the foliage of the untreated checks.

This method of flea beetle control showed much promise, and, as a result, some further experiments were set up about one month after the first ones were planted. Four granular, systemic insecticides were used in the second test. The materials were Disyston, Solvirex (more commonly known as systox or demeton), phorate or Thimet, and Temik (UC-21149). These were applied to the soil in furrows in which seed was to be planted, in 4 replicated plots of each treatment and untreated check, at rates of one half, one, and two pounds of toxicant of each material per acre; 20 treatments (including check) for each crop (mung beans and cowpeas).

This experiment was planned with 2 objectives; (1) to compare the efficiency of the 4 insecticides, and (2) to see if effective flea beetle control could be obtained at an application rate low enough to entirely obviate phytotoxicity.

It is regretted that misfortune was the lot of this second experiment. The young plants emerged nicely, but shortly thereafter, very heavy and frequent rains flooded our fields, for which there was inadequate drainage; the soil applications of insecticides were leached out; in fact, they were probably literally washed away from the plots, and there was almost complete plant loss, due to water actually standing in the fields constantly for over 3 weeks. These crops do not tolerate such excessive moisture, and the experimental planting was lost before any information could be obtained from it.

However, the original planting showed such outstanding flea beetle control that it is felt there is considerable promise in the use of these granular systemic insecticides as soil treatments, and comprehensive experiments along this line are planned for the 1968 kharif season.

Protective Sprays to Pulse Crop Plantings

During the latter part of July, and during August and the fore part of September, 1967, a number of sporadic, small, and apparently incinient infestations of red aphids (species determination not yet received) broke out, appearing exclusively on various experimental plantings of cowpeas. Although the infestations, when found, were generally localized and contained, the populations on all infested plants were very high, indicating a highbiotic potential.

All infestations were sprayed with Diazinon at the rate of 1/2 pound of actual toxicant per acre, in 30 U.S. gallons of spray per acre. The protective spraying was finally extended to cover the entire field of cowpea germ plasm, which was about one and one half acres in extent, and in which a number of small, localized, but wide-spread infestations appeared, about the middle of August. No plots were experimentally sprayed for aphid control; the spraying was all protective in nature.

The Diazinon proved extremely effective against these aphids, in some instances apparently completely controlling infestations a few hours after spraying.

Cbservations:

About the middle of August, 1967, examination of the foliage of some experimental cowpea plantings at New Delhi revealed the presence of a small leaf-miner (larva) which was quite prevalent and wide-spread. The leaves were mined and blotched in much the same fashion as sugarbeet foliage is in the states, by the Dipterous spinach leaf-miner, Pegomya hyoscyami. The leaf tissue between the upper and lower surfaces was tunnelled and eate out. The loss of effective leaf tissue on examined plants was estimated at from one to ten percent.

The larva was small, red in color, and attempts to rear adults from them during the 1967 Kharif season were unsuccessful. Some preserved larvae were sent to the U.S. National Museum and identified as Lepidopterous, and of the family Gracilarridae. Doubtless a specific determination can be obtained when some adults can be reared (or otherwise obtained).

No control work was attempted against these leaf-miners during the 1967 Kharif season. It may not occassion enough damage to require control, but a close watch will be kept for its appearance in the 1968 Kharif season, and if control appears necessary, some insecticide tests will be made against this insect.

Other crops were examined carefully to see if this leaf-miner was hosting on them, but cowpeas were apparently the only cultivated pulse crop that was being attacked in the New Delhi area.

While in Hyderabad, India on 18 August, 1967 occassion was taken to examine some experimental plantings of pigeon peas. These represented a selection of a number of lines or varieties from our germ plasm stock that had already looked promising from a plant breeding stand point, and that were to be screened for tolerance or resistance to insect attack. They had been planted approximately 20 June, 1967.

At the time of examination these plants were from 6 to 10 inches tall, and had received excellent care from an agronomic stand point. The planting had received no insecticide applications, and of course was to receive none during the life of the plants. Observations made were general in nature since a planting plan was not available.

The plants had suffered moderate to severe foliage damage from what was presumed to be flea beetle attack.

There was a moderate incidence of a leaf-roller or leaf-tier, although this was not causing severe injury. A number of the rolled leaves were unrolled, but no larvae were found. Apparently all larvae had pupated, and possibly also emerged as adult moths.

There was considerable evidence in the form of trails in the leaf tissue, of the recent presence of leaf-miner larvae. Here also, although a number of leaves were broken open, no larvae or pupae were found. Full-grown larvae had either dropped from the leaves to pupate, or had pupated within the leaves and the adult flies (if a Dipterous leaf-miner) had emerged.

General observation indicated there were some differences between lines or varieties in the incidence of symptoms of feeding of the various insects mentioned above, but no effort was made at that time to get specific detailed information without a planting plan.

Miscellaneous

The light trap (20 percent black light) was operated nightly in New Delhi during the Kharif season, starting on 1 July, 1967, and continuing throughout the remainder of the calendar year.

The insect catch was heavy practically every night, and strangely enough, some of the heaviest catches were taken on nights when there was intermittent, but heavy, and sometimes continous rain. These nights were very warm in spite of the rain, with the minimum temperatures usually from 83 to 88 degrees (Fahrenheit). Apparently the insects found these warm, humid conditions desirable for flight, and possibly other activity.

On most nights the major portion of the catch was Lepidoptera, although occassionally there would be heavy movements of Coleoptera, Orthoptera, and sometimes Homoptera, with correspondingly heavy catches in the light trap.

Representative series of all types have been pinned and labelled for the Project collection, and the remainder sorted and stored for future need, use or reference.

There are some insect enemies of collected and dried specimens which got into some of the stored material and did considerable damage, and caused appreciable loss. The major culprit was a small red Tenebrionid, the red flour beetle, Tribolium castaneum. Steps were taken to eliminate them in the collected and stored material, and to prevent future infestations of these devastating little creatures.

The pinned and labelled Project collection now numbers between 5,000 and 6,000 specimens. The next, and very important task will be to get identifications on as many species as possible, and get the named specimens properly arranged in suitable storage cabinets.