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Ministry of Agriculture
Pahlavi University (Shiraz)
Tabriz University
Ghazvin Development Project
KWPA/Dez Irrigation Project

United States

U. S. Department of Agriculture
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Introduction

Activities of the American team of scientists were changed in mid-year by the decision of the United States to withdraw financial support for the project at the end of calender year 1971. Plans had been made, and considerable effort extended in the first part of the year, to expand regional activities. The later part of the year was consequently devoted largely to close-out operations.

As to regional activities, approximately 400 lots of seed were supplied to cooperators in six countries. This seed included 30 lines of broadbeans to FAO for England; 95 lines of lentils and broadbeans to FAO for Egypt; 35 lines of urd beans, mungbeans, and cowpeas to Nigeria; 62 lines of cowpeas, mungbeans, dry beans, and broadbeans to the Ministry of Agriculture and Kabul University in Afghanistan; 60 lines of lentils, dry beans, and chickpeas to the Ministry of Agriculture and Ankara University in Turkey; and 132 lines of broadbeans, dry beans, snap beans, and cowpeas to CIMMYT in Pakistan.

In addition to seed distribution in the region, American staff members visited Pakistan, Afghanistan, Turkey, Lebanon, Tunisia, and Morocco. Contacts were made with the USAID Mission staffs and with local researchers working with pulse crops. Discussions were held concerning the problems associated with pulse crop production in each country.

Packaging seed of the germplasm collections and the tabulation of field data for the collections were the most important close-out operations. Samples of seed of approximately 7,000 lines of lentils, chickpeas, dry beans, cowpeas, mungbeans, and broadbeans were placed in plastic bags, heat-treated for insect control, and shipped to the United States for preservation at the National Seed Laboratory in Fort Collins, Colorado. Emphasis was given to germplasm lines of origin outside the United States. Field data concerning growth characteristics of these lines were put on punch cards and tape for computer analyses. This information was also sent to the United States.

VARIETAL IMPROVEMENT

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SUMMARY

The varietal improvement program was continued under the leadership of Dr. Amirshahi. Crossing programs were continued in beans (Phaseolus vulgaris) and chickpeas (Cicer arietinum) to combine disease resistance with good agronomic type. Crossing programs were planned for lentils (Lens esculenta cowpeas (Vigna sinensis), and mungbeans (Phaseolus aureus). Yield trials were conducted at several locations. Seed was increased for selected material and germplasm collections. Seed of the collections was packaged for the U. S. National Seed Storage Laboratory.

Considerable time of the Karaj staff was devoted to supervising and observ: yield trials; increasing seed of selected material and germplasm, and packaging seed for the U. S. National Seed Storage Laboratory.

The crossing program in the field was hindered by insects, viruses, and lo humidity. Better insect control and rogueing could reduce insect and virus damage. Shading and enclosing flowers for one or two days after crossing could reduce desication and flower drop. Greenhouse crossing has been hindered by root rot, viruses, and poor growth. Root rot can be reduced by fungicides and reduced watering. Viruses can be reduced by insect control and keeping virus stock separated from crossing material.

Yield trials have been continued at several locations. Results from several locations and years should be analized in a combined analysis to determine the relative magnitude of the variation due to years, locations, and years by location interaction. Variation for years equal to or larger than location variation would indicate all locations could be considered as one for variety recommendations.

Papers

Colchicine pretreatment for chromosome dispersion in beans (Phaseolus vulgaris) by Dr. A. Sarafi in the Journal of Agricultural Research, Faculty of Agr' ' ture, University of Tehran. Vol. 3, No. 2.

Utilization of ionizing irradiation in dry bean breading. A. Sarafi at the Third Iranian Genetic Seminar, Shiraz, Iran.

A study of seed color heredity in two varieties of beans by A. Sarafi, to be published.

The effect of bean common mosaic virus on yield and protein percentage in a susceptable variety of beans. A. Sarafi, to be published.

The effect of growth hormones on percentage of hybrid pods in beans (Phaseolus vulgaris) by A. Sarafi, to be published.

Lentils (Lens esculenta)

Lentil crosses were attempted in the field to combine high yield, root rot resistance, and virus resistance with large-seeded types.

Engineers Khosrowshahin and his assistants attempted crossing Isfahan types with large-seeded types. The Isfahan types (Accessions 33-071-10445, 33-071-10903, 33-071-10885, and 33-071-11139) have resistance to root rot complex, bean yellow mosaic virus, and cucumber mosaic virus. They also have produced high yields where little evidence of disease was apparent. The large-seeded types (33-071-10450, 33-071-10428, and 33-071-10408) have the seed type desired in the market here.

Crosses to incorporate bruchid resistance were also planned, but not made.

Lentil yield trials were continued. The small-seeded types continue to yiel more than the large-seeded types.

The lentil crossing program should be continued in the greenhouse and in the field with modification of the environment to increase the possibility of success. Greenhouse crosses should be made during the winter when the temperature and humidity can be better controlled.

Yield trials have some strains with disease resistance and fair seed type. Further improvement will require results from breeding programs.

Chickpeas (Cicer arietinum)

The major objective in the chickpea breeding program has been to transfer Ascochyta resistance to better agronomic strains. To transfer Ascochyta

resistance to good agronomic strains, I 13 (Accession 12-074-06625) was crossed to material in yield trials and better varieties from other countries by Engineer Jaffari and his assistant in the field and greenhouse.

Evans made crosses between bruchid resistant strains, double-podded strains, Ascochyta resistant strains, high yielding strains, and strains with good seed quality. These crosses were made to combine desirable traits and study the inheritance of the traits. Some of these crosses are being advanced to the F_2 and F_3 generations in the greenhouse. Time will not permit testing for yield or disease and insect resistance this year.

Cuttings of chickpeas were made by several methods in an attempt to multiply plants vegatively to test for disease reaction and to increase seed production. Cuttings can be maintained and rooted, but did not grow well in soil.

Yield trials have continued and tables are presented for locations where data was available. Kaka has some Ascochyta resistance and yields well in trials. Pyrouz does not have Ascochyta resistance, but yields well where Ascochyta is not a problem.

The breeding program needs more emphasis to combine the desirable characters available. Testing for Ascochyta will require refining testing procedures or vegetatively multiplying plants to test and produce seed. Crosses made the past four years should produce material with more desirable traits, but will need more crossing to combine all the presently available desirable traits into one strain.

Beans (Phaseolus vulgaris)

The breeding program in beans was carried out by Dr. Ahmad Sarafi and Engineer M. Moadab. The emphasis in the breeding program has been on resistanc to bean common mosaic virus, protein percentage, yield, and seed quality. Two growth hormones were also studied to determine their effect on seed set after crossing.

Dr. Sarafi crossed Phaseolus vulgaris with Phaseolus coccineus to transfer bean common mosaic virus resistance and bean yellow mosaic virus resistance to Phaseolus vulgaris. The effect of growth hormones on these crosses was also studied.

Wade and Bountiful were crossed to study the effect of virus resistance on seed yields. Other crosses were made to study the effect of different characteristics on seed yield.

Mutation studies were continued studying M3 and M4 generations of irradiated material.

Bean yield trials were continued at several locations. Most strains are susceptable to bean common mosaic virus and other less prevalent virus diseases. Marmar and Naz have some tolerance to bean common mosaic virus, but more breeding work to incorporate better resistance is needed.

Cowpeas (*Vigna sinensis*)

Crosses in cowpeas were planned to combine resistance to cowpea aphid-borne virus, good seed, and plant type were planned. Some crosses have been made, but results are not available at present.

Yield trials were conducted at several locations. Results for reporting locations are presented in the Tables.

As with most other pulse crops, virus resistance is of major importance in cowpeas. Presently available resistant strains should be crossed to several strains with good seed types.

Mungbeans (*Phaseolus aureus*)

Mungbean crosses to combine *Cercospora canescens* resistance and high yield were made by Rudy S. Navarro. Growth hormones (parachlorophenoryacetic acid plus indolbutyric acid) were tested for their effect on flower abscision and seed production. More pods and seed were produced where growth hormones were applied. The test should be repeated with humidity and shading treatments to determine the best conditions for crossing.

Mungbean crosses can be made in the field or greenhouse during the summer. Mungbeans have not grown well in the greenhouse during the winter probably due to cool temperatures and reduced light.

Yield trials were continued at several locations. Tables for reporting locations are presented. Gohar and Partow continue to produce good yields and have resistance to mungbean mosaic virus.

Legend For Lentil Agronomic Data Tables

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

2. Source numbers refer to collection numbers assigned by the Iranian Ministry of Agriculture. Six digit numbers are PI numbers from Plant Science Research Division, ARS, U.S. Department of Agriculture, Beltsville, Maryland, USA.

3. Source indicates area of origin or area in which the seed was collected.

4. Average height of plants at or near maximum growth.

5. Average width of plant row at or near maximum growth.

6. Plants per meter is an average number of plants per meter of row based on one meter sample per replication.

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

11. Indicates number of days after planting the whole plot was ready for harvest.

12. Disease rated 1 to 9: 1 = Free from disease symptoms
    9 = Severe disease symptoms
    For diseases present, see pathology section.

13. Seeds/ten pods indicates the average number of seeds in ten pods.

14. Br = Brown; G = Green; R = Red; GR = Green and Red; L = Light.

15. Average weight (grams) of 1000 seeds.

16. Yield in kilogram per hectare based on 5 or 10 square meter plots.

Table 1.-- Agronomic Data - Lentils - Preliminary Yield Test - Planted April 1, 1970 - RPIP, Karaj, Iran.

(1) Accession Number	(2) Source Number	(3) SOURCE	(7) Stand	(8) Vigor	(9) Pl. to 1st Fl.	(10) Pl. to 1st Mat.	(11) Pl. to Com. Mat.	(12) Disease Rating	(14) Seed Color	(15) 1000 Seeds Weight	(16) Yield per Hectare
33-071-10898	209-66	Isfahan	2	2	55	80	95	1	B	28	1036
33-071-10894	209-80	Isfahan	2	2	55	79	94	2	B	33	1021
33-071-10944	65-212-87	Arasbaran	2	2	56	81	96	2	B	33	983
33-071-10910	210-55	Jiroft	2	2	54	81	96	2	B	27	983
33-071-10445	209-97	Isfahan	2	2	56	79	94	2	B	33	930
33-071-10483	187-89	Shoshtar	2	1	57	82	97	1	B	27	975
33-071-10674	198-80	Arasbaran	2	1	53	82	97	2	LR	26	932
33-071-10166		Gorgan	2	2	55	82	97	1	B	26	915
33-071-10903	209-97	Isfahan	2	1	55	79	94	2	R	25	896
33-071-10146	391	Khaledabad	2	2	54	81	94	2	LG	26	880
33-071-10892	209-82	Isfahan	2	2	56	79	94	2	B	32	879
33-071-10905	209-61	Isfahan	2	2	54	80	95	2	B	30	879
33-071-10879	209-45	Isfahan	2	2	53	79	94	1	B	30	878
33-071-10496	138-44	Bandar, Fars	2	1	57	81	96	1	LG	31	872
33-071-10952	212-27	Arasbaran	2	1	54	80	95	1	B	33	870
33-071-10478	186-56	Shoshtar	2	2	54	79	94	2	B	28	845
33-071-10504	188-63	Bandar, Fars	2	2	54	80	95	2	LG	28	840
33-071-10946	212-77	Arasbaran	2	2	53	82	95	2	B	33	820
33-071-10901	209-63	Isfahan	2	1	51	78	93	1	B	31	815
33-071-10520	188-72	Bandar, Fars	2	2	53	82	97	1	LR	27	795
33-071-10921	210-25	Jiroft	2	1	56	79	94	1	B	35	787
33-071-10882	209-46	Isfahan	2	2	54	79	94	2	B	32	781
33-071-10899	209-65	Isfahan	2	2	54	80	95	2	B	26	770
33-071-10500	188-28	Bandar, Fars	2	2	52	76	94	2	LG	27	720

Yield differences not significant at .05 level.
CV %

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Table 2. -- Agronomic Data - Lentils - Uniform Yield Test - Planted March 6, 1971 - Pahlavi University, Shiraz, Iran.

(1) Accession Number	(2) Source Number	(3) S O U R C E	(4) Plant Height	(5) Plant Width	(7) Stand	(9) Pl. to 1st Fl.	(13) Seeds per 10 Pods	(14) Seed Color	(15) 1000 Seeds Weight	(16) Yield per Hectare
33-071-11136	217	Isfahan	42	31	1	77	12	Br	30	2000
33-071-10444	209-73	Isfahan	40	30	1	76	13	Br	26	1767
33-071-10445	209-97	Isfahan	39	28	1	77	14	Br	30	1750
33-071-10440	209-25	Isfahan	39	32	1	77	11	Br	29	1608
33-071-11139	209-68	Isfahan	42	31	1	77	15	Br	31	1582
33-071-10439	210-41	Jiroft	39	28	1	76	11	Br	28	1482
33-071-10885	209-70	Isfahan	40	30	1	76	12	Br	23	1307
33-071-10417		Ardabil	36	29	2	76	13	G	26	1069
33-071-10903	209-97	Isfahan	35	33	1	77	13	G	23	1021
33-071-11014	2-42-4467	Fars	42	35	1	77	14	G	26	991
LSD 5%										81

Table 3.- Agronomic Data - Lentils - Uniform Yield Test - Planted April 1, 1971 - RPIP, Karaj, Iran

(1)	(2)	(3)	(7)	(8)	(9)	(10)	(11)	(12)	(14)	(15)	(16)
Accession Number	Source Number	S O U R C E	Stand	Vigor	Pl. to 1st Fl.	Pl. to 1st Mat.	Pl. to Com. Mat.	Disease Rating	Seed Color	1000 Seeds Weight	Yiel per Hecta
33-071-10445	209-97	Isfahan	2	2	53	84	98	1	B	32	1340
33-071-10440	209-25	Isfahan	2	1	52	81	95	2	B	30	1202
33-071-11139	209-68	Isfahan	2	1	53	82	96	2	B	33	1117
33-071-10903	209-97	Isfahan	2	1	54	83	97	1	R	23	1113
33-071-10417		Ardabil	2	2	50	81	94	2	LR	28	1047
33-071-10439	210-41	Jiroft	2	1	53	80	94	2	LB	29	995
33-071-10444	209-73	Isfahan	2	1	48	79	93	2	B	23	934
33-071-11014	2-42-4467	Fars	2	1	50	83	97	1	LG	30	920
33-071-10885	209-70	Isfahan	2	1	54	78	94	2	B	26	908
33-071-11136	217	Isfahan	2	2	55	78	92	2	B	31	903
LSD 5%											261
CV %											20

Table 4. -- Agronomic Data - Lentils - Uniform Advanced Yield Test 2 - Planted November 10, 1970 - Dezful, Iran.

(1) Accession Number	(2) Source Number	(3) SOURCE	(4) Plant Height	(9) Pl. to 1st Fl.	(10) Pl. to 1st Mat.	(11) Pl. to Com. Mat.	(16) Yield per Hectare
33-071-10582	192-48	Karaj	62	120	139	183	972
33-071-10588	192-67	Karaj	61	123	141	182	907
33-071-10430		Tabriz	65	130	146	183	776
33-153-10048	178971	Turkey	64	123	140	182	758
33-032-10253	299224	Chile	63	127	145	182	670
33-032-10202	299164	Chile	65	128	146	183	662
33-071-10418		Ardabil	63	125	143	184	572
33-032-10199	299160	Chile	62	126	145	183	568
33-032-10254	299225	Chile	63	130	146	183	492
33-032-10210	299174	Chile	65	130	147	184	452
LSD 5%							177
CV %							21

Table 5. -- Agronomic Data - Lentils - Uniform Advanced Yield Test 2 - Planted April 6, 1971 - Ghazvin, Iran

(1)	(2)	(3)	(4)	(5)	(6)	(13)	(16)
Accession Number	Source Number	S O U R C E	Plant Height	Plant Width	Plants/ Meter	Seeds Per 10 Pods	Yield per Hectare
33-071-10430		Tabriz	21	14	23	12	694
33-071-10588	192-67	Karaj	21	14	22	12	689
33-032-10254	299225	Chile	21	16	20	12	686
33-153-10048	178-971	Turkey	22	15	24	12	652
33-032-10202	299164	Chile	19	13	21	12	647
33-071-10418		Ardabil	22	15	21	12	608
33-071-10582	192-48	Karaj	23	17	23	11	593
33-032-10253	299224	Chile	21	17	24	12	585
33-032-10210	299174	Chile	20	17	21	12	565
33-032-10199	299160	Chile	21	14	21	11	532

Yield differences not significant at .05 level.

CV % 27

Table 6. -- Agronomic Data - Lentils - Uniform Advanced Yield Test 2 - Planted March 6, 1971 - Pahlavi University, Shiraz, Iran.

(1)	(2)	(3)	(4)	(5)	(7)	(9)	(13)	(14)	(15)	(16)
Accession Number	Source Number	S O U R C E	Plant Height	Plant Width	Stand	Pl. to 1st Fl.	Seeds per 10 pods	Seed Color	1000 Seeds Weight	Yield per Hectare
33-032-10202	299104	Chile	37	28	1	76	15	G	26	1532
33-032-10253	299224	Chile	39	30	1	76	15	Br	30	1233
33-032-10254	299225	Chile	36	30	1	77	13	Br	28	866
33-032-10199	299160	Chile	36	26	2	76	14	G	33	827
33-071-10583	192-48	Karaj	37	24	2	76	14	Br	35	803
33-071-10588	192-67	Karaj	35	26	2	76	13	G	37	778
33-071-10430		Tabriz	38	30	2	76	14	G	33	644
33-071-10418		Ardabil	33	24	2	76	14	G	36	620
33-032-10210	299174	Chile	34	27	2	76	13	G	30	590
33-153-10048	178971	Turkey	30	25	2	76	11	G	38	381
LSD 5%										49

Table 7. -- Agronomic Data - Lentils - Uniform Advanced Yield Test 2 - Planted April 3, 1971 - Tabriz University, Tabriz, Iran.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(9)	(10)	(11)	(13)	(15)	(16)
Accession Number	Source Number	S O U R C E	Plant Height	Plant Width	Plants /Meter	Stand	Pl. to 1st Fl.	Pl. to 1st Mat.	Pl. to Com.Mat.	Seeds per 10 pods	1000 Seeds Weight	Yield per Hectare
33-032-10202	299164	Chile	25	16	17	2	64	102	112	15	41	696
33-152-10048	178-971	Turkey	22	14	16	2	65	101	112	15	43	665
33-071-10582	192-48	Karaj	16	12	14	2	65	101	112	15	39	636
33-071-10588	192-67	Karaj	21	11	14	2	63	102	111	15	34	624
33-071-10418		Ardabil	21	12	16	2	64	103	113	13	42	611
33-032-10253	299224	Chile	23	15	16	2	66	102	114	15	30	590
33-071-10430		Tabriz	21	11	16	2	64	102	113	15	41	575
33-032-10210	299174	Chile	21	12	15	3	66	101	113	13	45	558
33-032-10254	299225	Chile	20	16	14	2	65	102	114	15	43	555
33-032-10199	299160	Chile	21	12	15	2	64	102	113	15	35	552
LSD 5%												103
CV %												13

Table 8. -- Agronomic Data - Lentils - Dryland Uniform Advanced Yield Test 1 - Planted March 23, 1971 - Tabriz University, Tabriz, Iran

(1) Accession Number	(2) Source Number	(3) SOURCE	(4) Plant Height	(5) Plant Width	(6) Plants /Meter	(7) Stand	(9) Pl. to 1st Fl.	(10) Pl. to 1st Mat.	(11) Pl. to Com.Mat.	(13) Seeds per 10 Pods	(14) Seed Color	(15) 1000 Seeds Weight	(16) Yield per Hectare
33-085-11147	127	Lebanon	16	8	29	1	70	107	113	15	G	47	290
33-071-10408		Ahar	17	8	23	1	71	107	113	15	G	40	267
33-071-10450	64	Karaj	18	8	29	1	73	109	113	15	GR	54	260
33-071-10437		Ghazvin	18	7	22	1	73	107	113	15	GR	46	255
33-071-10428		Moghan	19	8	23	1	73	107	113	15	GR	42	240
33-071-10436		Ghazvin	19	6	19	1	71	109	113	15	G	42	238
33-071-10411		Moghan	17	7	26	1	71	107	113	15	G	52	232
33-071-10425		Ahar	17	7	31	1	71	107	113	15	G	43	231
33-071-11175	176	Arasbaran	19	7	25	1	71	109	113	15	G	43	207
33-039-11177	142	Cyprus	16	8	32	1	71	110	116	15	G	46	205
LSD 5%													65
CV %													21

Table 9. -- Agronomic Data - Lentils - Uniform Advanced Yield Test 2 - Planted April 1, 1971 - RPIP Karaj, Iran

(1) Accession Number	(2) Source Number	(3) SOURCE	(7) Stand	(8) Vigor	(9) Pl. to 1st Fl.	(10) Pl. to 1st Mat.	(11) Pl. to Com. Mat.	(12) Disease Rating	(14) Seed Color	(15) 1000 Seeds Weight	(16) Yield per Hectare
33-032-10202	299164	Chile	2	2	49	84	93	2	B	35	702
33-032-10253	299224	Chile	3	2	50	85	99	2	B	31	699
33-071-10582	192-48	Karaj	3	2	43	81	95	3	LR	33	655
33-071-10588	192-67	Karaj	3	2	45	81	95	2	LG	42	594
33-071-10430		Tabriz	3	2	47	83	97	2	LG	45	551
33-032-10254	299225	Chile	3	2	49	85	99	2	B	29	525
33-032-10199	299160	Chile	3	2	49	84	98	3	LG	40	511
33-153-10048	178-971	Turkey	2	2	49	83	97	2	LG	36	505
33-032-10210	299174	Chile	3	2	50	84	98	2	LG	40	500
33-071-10418		Ardabil	3	2	48	83	97	3	LG	38	445
LSD 5%											101
CV %											14

Table 10.-- Agronomic Data - Lentils - Uniform Advanced Yield Test 1 - Planted November 10, 1970 - Dezful, Iran.

(1) Accession Number	(2) Source Number	(3) SOURCE	(4) Plant Height	(9) Pl. to 1st Fl.	(10) Pl. to 1st Mat.	(11) Pl. to Com. Mat.	(16) Yield per Hectare
33-071-10450	64	Karaj	62	124	142	182	884
33-071-10425		Ahar	63	122	137	180	770
33-071-11175	176	Arasbaran	63	119	143	181	756
33-071-10436		Ghazvin	64	122	140	182	725
33-071-10408		Ahar	62	123	141	181	724
33-071-10428		Moghan	63	122	142	181	714
33-085-11147		Lebanon	63	118	138	179	700
33-071-10437		Ghazvin	64	122	143	181	680
33-071-11177	142	Cyprus	64	121	137	181	646
33-071-10411		Moghan	63	122	139	182	616

Yield differences not significant at .05 level.
CV %

19

Table 11.- Agronomic Data - Lentils - Uniform Advanced Yield Test 1 - Planted April 5, 1971 - Ghazvin, Iran

(1)	(2)	(3)	(4)	(5)	(6)	(13)	(16)
Accession Number	Source Number	S O U R C E	Plant Height	Plant Width	Plants /Meter	Seeds Per 10 Pods	Yield per Hectare
33-071-10436		Ghazvin	21	14	26	12	631
33-071-10450	64	Karaj	21	15	27	12	627
33-071-10411		Moghan	22	13	26	12	519
33-071-10408		Ahar	22	16	23	12	512
33-071-10428		Moghan	20	15	24	12	470
33-071-11175	176	Arasbaran	19	13	26	12	434
33-085-11147	127	Lebanon	23	15	27	12	392
33-039-11177	142	Cyprus	21	14	32	13	378
33-071-10425		Ahar	22	15	27	12	329

Yield differences not significant at .05 level.

CV % 44

Table 12. -- Agronomic Data - Lentils - Uniform Advanced Yield Test 1 - Planted April 7, 1971 - Ministry of Agriculture, Meziayeh, Iran.

(1) Accession Number	(3) SOURCE	(4) Plant Height	(5) Plant Width	(7) Stand	(9) Pl. to 1st Fl.	(13) Seeds per 10 Pods	(14) Seed Color	(15) 1000 Seeds Weight	(16) Yield per Hectare
33-071-10428	Moghan	30	27	1	52	10	G	49	800
33-085-11147	Lebanon	37	29	1	52	10	G	49	795
33-071-11175	Arasbaran	30	22	1	52	10	LG	49	785
33-071-10450	Karaj	33	25	1	53	10	G	49	765
33-071-10436	Ghazvin	34	25	1	52	10	LG	49	690
33-071-10408	Iran	33	26	1	52	10	LG	49	655
33-071-10411	Moghan	37	27	1	53	10	LG	60	610
33-071-10437	Ghazvin	37	29	1	53	10	LG	49	595
33-071-10435	Iran	31	22	1	53	10	LG	50	583
33-039-11177	Cyprus	35	24	1	53	10	LG	49	540

Yield differences not significant at .05 level.
CV %

25

Table 13. -- Agronomic Data - Lentils - Uniform Advanced Yield Test - Planted March 6, 1971 - Pahlavi University, Shiraz, Iran.

(1) Accession Number	(2) Source Number	(3) SOURCE	(4) Plant Height	(5) Plant Width	(7) Stand	(9) Pl. to 1st Fl.	(13) Seeds per 10 pods	(14) Seed Color	(15) 1000 Seeds Weight	(16) Yield per Hectare
33-071-10408		Ahar	25	34	2	76	13	G	31	868
33-071-10436		Ghazvin	27	32	2	76	13	G	28	823
33-071-10437		Ghazvin	27	29	2	76	15	G	30	805
33-071-10428		Moghan	22	33	2	75	14	G	28	665
33-071-10450	64	Karaj	31	30	1	76	29	G	32	587
33-085-11147	127	Lebanon	24	34	2	75	13	G	33	462
33-071-11175	176	Arasbaran	24	28	3	75	12	G	30	351
33-071-10425		Ahar	28	33	2	76	14	G	32	319
33-039-11177	143	Cyprus	24	28	4	76	15	G	33	188
33-071-10411		Moghan	30	27	3	75	9	G	34	148
LSD 5%										49

Table 14. -- Agronomic Data - Lentils - Uniform Advanced Yield Test 1 - Planted April 2, 1971 - Tabriz University, Tabriz, Iran.

(1) Accession Number	(2) Source Number	(3) S O U R C E	(4) Plant Height	(5) Plant Width	(6) Plants /Meter	(7) Stand	(9) Pl.to 1st Fl.	(10) Pl.to 1st Mat.	(11) Pl.to Con.Mat.	(13) Seeds per 10 Pods	(15) 1000 Seeds Weight	(16) Yield per Hectare
33-071-10437		Ghazvin	22	12	16	1	65	102	115	15	39	602
33-071-10428		Moghan	23	11	15	2	65	103	114	15	40	581
33-039-11177	142	Cyprus	23	11	15	1	65	102	116	15	39	579
33-071-10450	64	Karaj	25	14	16	1	65	102	113	15	46	574
33-085-11147	127	Lebanon	22	12	13	2	65	103	115	15	40	570
33-071-11175	176	Arasbaran	21	12	14	2	65	104	115	15	40	562
33-071-10411		Moghan	25	12	15	2	65	101	113	15	44	533
33-071-10436		Ghazvin	23	12	15	1	65	103	114	15	40	521
33-071-10425		Ahar	25	13	16	2	65	103	115	15	43	486
33-071-10408		Ahar	22	16	15	1	65	102	113	15	36	478
LSD 5%												110
CV %												16

Table 15. -- Agronomic Data - Lentils - Dryland Uniform Yield Test 2 - Planted March 26, 1971 - Tabriz University, Tabriz, Iran.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(9)	(10)	(11)	(13)	(14)	(15)	(16)
Accession Number	Source Number	S O U R C E	Plant Height	Plant Width	Plants /Meter	Stand	Pl. to 1st Fl.	Pl. to 1st Mat.	Pl. to Com.Mat.	Seeds per 10 Pods	Seed Color	1000 Seeds Weight	Yield per Hectare
33-153-10048	178-971	Turkey	18	8	24	1	69	93	110	15	LG	45	462
33-071-10588	192-67	Karaj	17	10	20	1	69	93	108	15	LG	51	426
33-071-10430		Tabriz	19	8	20	1	69	94	110	15	LG	47	392
33-071-10582	192-48	Karaj	17	9	28	1	70	97	108	14	LG	44	379
33-032-10253	299224	Chile	19	7	31	1	71	96	107	15	LG	33	355
33-032-10199	299160	Chile	19	7	31	1	69	94	110	15	LG	51	325
33-032-10202	299164	Chile	20	6	25	1	71	96	110	15	GR	32	321
33-032-10254	299225	Chile	21	12	31	1	73	98	111	15	GR	40	316
33-071-10418		Ardabil	23	8	23	1	69	94	109	14	GR	46	309
33-032-10210	299174	Chile	23	8	25	1	71	96	110	15	G	52	304
LSD 5%													84
CV %													18

Table 16-- Agronomic Data - Lentils - Uniform Advanced Yield Test 1 - Planted April 1, 1971 - RPIP Karaj, Iran

(1)	(2)	(3)	(7)	(8)	(9)	(10)	(11)	(12)	(14)	(15)	(16)
Accession Number	Source Number	S O U R C E	Stand	Vigor	Pl. to 1st Fl.	Pl. to 1st Mat.	Pl. to Com. Mat.	Disease Rating	Seed Color	1000 Seeds Weight	Yield per Hectare
33-071-10403		Ahar	2	2	49	81	95	2	LG	34	641
33-071-10428		Moghan	3	2	47	80	94	2	LG	31	597
33-071-10450	64	Karaj	3	2	49	80	94	2	LG	42	560
33-071-10436		Ghazvin	3	2	48	80	94	2	B	37	516
33-071-11147	127	Lebanon	3	2	46	79	93	3	LG	37	473
33-071-10425		Ahar	3	2	47	81	95	2	LG	39	470
33-071-10437		Ghazvin	3	2	48	83	97	3	B	32	460
33-071-11175	176	Arasbaran	3	2	47	79	93	2	LG	34	395
33-039-11177	142	Cyprus	2	2	49	81	95	3	LG	36	353
33-071-10411		Moghan	3	2	47	82	96	3	LG	39	287
LSD 5%											126
CV %											20.7

Legend for Chickpea Agronomic Data Tables

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

(2) Source numbers are numbers assigned to populations or collections by the Iranian Ministry of Agriculture; six digit numbers are PI numbers from Plant Science Division, ARS, U. S. Department of Agriculture, Beltsville, Maryland, U.S.A.

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

(4) W = White; P = Purple; LP = Light Purple.

(5) Average plant height in centimeters.

(6) Average plant width in centimeters.

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

(8) Rated 1 to 9: 1 = Complete stand 9 = Poor stand.

(9) Rated 1 to 9: 1 = Vigorous plants 9 = Weak plants.

(10) Days from planting to first opened flower.

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

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

(13) Disease rated 1 to 9: 1 = Free from disease symptoms; 9 = Severe disease symptoms including yellowing and wilting.

(14) Average number of pods per plant.

(15) Average number of seeds per 10 pods.

(16) Br = Brown; W = White; Bl = Black; Cr = Cream; Y = Yellow; Gr = Green; Li = Light; D = Dark.

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

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

Table 17. -- Agronomic Data - Black Chickpeas - Uniform Yield Test 2 - Planted April 8, 1971 - Ministry of Agriculture, Rezaieh, Iran.

(1)	(2)	(3)	(4)	(5)	(6)	(8)	(9)	(10)	(14)	(15)	(16)	(17)	(18)
Accession Number	Source Number	S O U R C E	Flower Color	Plant Height	Plant Width	Stand	Vigor	Pl. to 1st Fl.	Pods per Plant	Seeds per 10 Pods	Seed Color	100 Seeds Weight	Yield per Hectare
12-071-04287		Isfahan	P	44	40	1	1	52	28	20	BL	14	2820
12-071-04279	174	Ahar	P	43	32	1	1	52	37	16	BL	15	2720
12-071-04439	221	Isfahan	P	41	37	1	1	52	37	16	BL	14	2620
12-071-05436	175	Pyrouz	P	28	34	1	1	52	28	10	LiBr	17	2360
12-071-05132	174	Kaka	P	34	32	1	1	51	35	13	BL	14	2350
12-071-04282	129	Isfahan	P	41	37	1	1	52	27	20	BL	15	2320
12-071-05331	154	Gharyehgole	P	39	34	1	1	52	44	15	BL	14	2180
12-071-04509	193	Kermanshah	P	43	39	1	1	52	55	16	BL	15	2160
12-071-04432	231	Isfahan	P	37	33	1	1	52	41	17	BL	15	2140
12-074-10010	I 13	Israel	P	44	41	1	1	52	32	13	BL	28	2120

Table 18. -- Agronomic Data - Black Chickpeas - Uniform Yield Test 2 - Planted March 31, 1971 - Tabriz University, Tabriz, Iran.

(1)	(2)	(3)	(5)	(6)	(7)	(8)	(10)	(11)	(12)	(14)	(15)	(16)	(17)	(18)
Accession Number	Source Number	S O U R C E	Plant Height	Plant Width	Plants /Meter	Stand	Pl. to 1st Fl.	Pl. to 1st Mat.	Pl. to Com. Mat.	Pods per Plant	Seeds per 10 Pods	Seed Color	100 Seeds Weight	Yield per Hectare
12-071-04509	193	Kermanshah	15	42	31	2	66	104	113	16	15	BL	16	1889
12-071-04439	221	Isfahan	15	40	26	2	65	103	110	15	15	BL	15	1851
12-071-04282	129	Isfahan	14	39	25	2	65	102	112	16	15	BL	17	1802
12-074-10010	I 13	Israel	16	43	30	2	67	108	114	19	15	BL	27	1738
12-071-04279	174	Ahar	15	40	30	2	66	100	110	15	15	BL	16	1736
12-071-04287		Isfahan	15	40	28	2	67	101	110	15	15	BL	15	1640
12-071-05331	154	Gharyeh-gole	16	40	27	2	66	104	111	15	15	BL	16	1595
12-071-04432	221	Isfahan	16	44	29	2	65	99	108	15	15	BL	16	1576
12-071-05132	174	Kaka	14	38	23	2	66	102	111	14	15	BL	16	1556
12-071-06465	175	Gharyeh-gole	15	45	25	2	65	103	109	14	15	LiBr	18	1543
LSD 5%														281
CV %														12

Table 19.-- Agronomic Data - Black Chickpeas - Dryland Uniform Yield Test 2 - Planted March 25, 1971 - Tabriz University, Tabriz, Iran.

(1)	(2)	(3)	(5)	(6)	(7)	(8)	(10)	(11)	(12)	(14)	(15)	(16)	(17)	(18)
Accession Number	Source Number	S O U R C E	Plant Height	Plant Width	Plants /Meter	Stand	Pl.to 1st Fl.	Pl.to 1st Mat.	Pl.to Com.Mat.	Pods per Plant	Seeds per 10 Pods	Seed Color	100 Seeds Weight	Yield per Hectare
12-071-04432	231	Isfahan	20	27	22	1	67	94	110	19	15	BL	15	732
12-071-04439	221	Isfahan	21	15	20	1	69	94	110	15	15	BL	14	713
12-071-04279	174	Ahar	22	15	20	1	67	94	110	15	15	BL	14	713
12-071-04282	129	Isfahan	25	18	17	1	67	94	110	20	15	BL	15	683
12-071-05132	174	Kaka	26	21	24	1	67	92	104	10	14	BL	14	673
12-071-05331	154	Gharyeh-gole	23	21	20	1	72	97	113	19	15	BL	14	644
12-071-04509	193	Kermanshah	22	18	26	1	67	94	109	22	15	BL	14	644
12-071-04287		Isfahan	25	20	25	1	71	97	110	17	15	BL	14	639
12-071-06465	175	Gharyeh-gole	22	26	20	1	69	93	104	22	15	LiBr	17	613
12-074-10010	I 13	Israel	31	25	23	1	71	102	114	18	15	BL	27	509
LSD 5%														118
CV %														14

Table 20. -- Agronomic Data - Black Chickpeas - Uniform Yield Test 2 -- Planted March 11, 1971 -- Ministry of Agriculture, Varamin, Iran.

(1)	(2)	(3)	(4)	(5)	(6)	(8)	(9)	(10)	(14)	(15)	(18)
Accession Number	Source Number	S O U R C E	Flower Color	Plant Height	Plant Width	Stand	Vigor	Pl. to 1st Fl.	Pods per Plant	Seeds per 10 Pods	Yield per Hectare
12-071-05331	154	Gharyehgole	P	35	50	2	2	55	35	20	2178
12-071-04287		Isfahan	P	36	45	2	2	56	35	16	2072
12-071-04509	193	Kermanshah	P	40	50	3	3	55	66	20	2004
12-074-10010	I 13	Israel	P	45	50	1	1	61	30	20	1992
12-071-04432	231	Isfahan	P	33	55	3	3	56	96	14	1958
12-071-04439	221	Isfahan	P	33	50	2	2	55	35	10	1910
12-071-05436	175	Pyrouz	P	31	46	3	3	56	93	10	1890
12-071-05132	174	Kaka	P	40	45	3	3	56	93	10	1820
12-071-04282	129	Isfahan	P	33	50	2	2	55	96	16	1800
12-071-04279	174	Ahar	P	42	45	2	2	56	36	20	1780

Yield differences not significant at .05 level.
CV %

21

Table 21. -- Agronomic Data - Black Chickpeas - Uniform Yield Test 2 - Planted March 23, 1971 - RPIP Karaj, Iran

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(15)	(16)	(17)	(18)
Accession Number	Source Number	S O U R C E	Flower Color	Plant Height	Plant Width	Plants /Meter	Stand	Vigor	Pl. to 1st Fl.	Pl. to 1st Mat.	Pl. to Com.Mat.	Disease Rating	Seeds per 10 Pods	Seed Color	100 Seeds Weight	Yield per Hectare
12-071-05132	174	Kaka	P	22	36	20	2	1	54	87	102	2	17	BL	11	1245
12-071-10010	I 13	Israel	P	34	45	33	1	1	62	92	108	1	13	BL	23	1193
12-071-04287		Isfahan	P	23	35	23	2	1	55	87	100	3	15	BL	11	1159
12-071-05436	175	Pyrouz	P	18	34	19	1	1	54	87	101	4	10	LiBr	15	1151
12-071-04432	231	Isfahan	P	20	33	23	1	2	54	86	96	3	16	BL	11	1110
12-071-04439	221	Isfahan	P	22	35	26	2	2	52	85	97	4	17	BL	12	1104
12-071-04282	129	Isfahan	P	21	35	23	1	2	53	85	96	3	15	BL	12	1017
12-071-05331	154	Gharyehgole	P	21	32	25	2	3	54	87	98	4	18	BL	12	903
12-071-04509	193	Kermanshah	P	21	34	23	2	3	53	84	97	4	17	BL	11	900
12-071-04279	174	Ahar	P	22	32	26	3	2	53	86	95	4	19	BL	11	896
LSD 5%																217
CV %																26

Table 22 . -- Agronomic Data - Black Chickpeas - Uniform Yield Test 1 - Planted November 10, 1970 - Dezful, Iran.

(1) Accession Number	(2) Source Number	(3) S O U R C E	(5) Plant Height	(10) Pl. to 1st Fl.	(11) Pl. to 1st Mat.	(12) Pl. to Com. Mat.	(16) Seed Color	(18) Yield per Hectare
12-071-05132	174	Kaka	80	97	119	193	BL	2112
12-071-05301	154	Gharyehgole	76	100	123	189	BL	1940
12-071-10054	171	Ardabil	80	101	120	195	BL	1834
12-071-10050	174	Ardabil	80	102	122	195	BL	1826
12-071-05093	174	Ahar	75	101	120	191	BL	1792
12-071-05442	251514	Iran	80	100	121	197	BL	1760
12-071-04244		Ardabil	78	99	118	193	BL	1726
12-071-05432	154	Karaj	76	97	121	195	BL	1706
12-071-05436	175	Pyrouz	81	99	130	200	LiBr	1692
12-071-05451	175	Gharyehgole	80	102	132	196	LiBr	1432

Yield differences not significant at .05 level.
CV %

19

Table 23. -- Agronomic Data - Black Chickpeas - Uniform Yield Test 1 - Planted April 4, 1971, Ghazvin Development Project, Ghazvin, Iran.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(12)	(15)	(16)	(17)	(18)
Accession Number	Source Number	S O U R C E	Flower Color	Plant Height	Plant Width	Plants /Meter	Pl. to Com.Mat.	Seeds Per 10 Pods	Seed Color	100 Seeds Weight	Yield per Hectare
12-071-04244		Ardabil	P	29	34	27	109	12	BL	11	2467
12-071-05093	174	Ahar	P	30	40	21	109	13	BL	11	2384
12-071-05436	175	Pyrouz	P	24	38	19	109	14	LiBr	15	2253
12-071-10050	174	Ardabil	P	31	41	19	109	14	BL	12	2206
12-071-10054	171	Ardabil	P	29	38	30	109	13	BL	11	2016
12-071-05132	174	Kaka	P	27	40	20	109	13	BL	11	1972
12-071-05442	251514	Iran	P	33	41	17	109	14	BL	11	1963
12-071-05451	175	Gharyehgole	P	26	38	16	109	14	LiBr	15	1950
12-071-05432	154	Karaj	P	27	35	26	109	13	BL	10	1913
12-071-05301	154	Gharyehgole	P	27	36	24	109	14	BL	11	1631

Yield differences not significant at .05 level.
CV % 21

Table 24. -- Agronomic Data - Black Chickpeas - Uniform Yield Test 1 - Planted March 29, 1971 - Ministry of Agriculture, Gorgon, Iran.

(1) Accession Number	(2) Source Number	(3) S O U R C E	(4) Flower Color	(5) Plant Height	(10) Pl. to 1st Fl.	(14) Pods per Plant	(15) Seeds per 10 Pods	(16) Seed Color	(17) 100 Seeds Weight	(18) Yield per Hectare
12-071-05436	175	Pyrouz	P	30	48	15	20	LiBr	19	994
12-071-05442	251514	Iran	P	28	45	31	20	BL	13	992
12-071-04244		Ardabil	P	28	46	24	20	BL	13	982
12-071-05132	174	Kaka	P	33	44	23	20	BL	13	974
12-071-10050	174	Ardabil	P	35	46	32	20	BL	14	932
12-071-05301	154	Gharyehgole	P	26	44	32	20	BL	12	926
12-071-05432	154	Karaj	P	31	44	20	20	BL	13	896
12-071-05093	174	Ahar	P	27	44	26	20	BL	13	894
12-071-10054	171	Ardabil	P	28	41	20	20	BL	13	810
12-071-05451	175	Gharyehgole	P	24	49	24	20	LiBr	15	752

Table 25. -- Agronomic Data - Black Chickpeas - Uniform Yield Test 1 - Planted April 8, 1971 - Ministry of Agriculture, Rezaieh, Iran.

(1) Accession Number	(2) Source Number	(3) S O U R C E	(4) Flower Color	(5) Plant Height	(6) Plant Width	(8) Stand	(9) Vigor	(10) Pl. to 1st Fl.	(14) Pods per Plant	(15) Seeds per 10 Pods	(16) Seed Color	(17) 100 Seeds Weight	(18) Yield per Hectare
12-071-05301	154	Gharyehgole	P	43	40	1	1	50	35	13	BL	15	3100
12-071-05432	154	Karaj	P	37	34	1	1	50	30	20	BL	15	3010
12-071-05451	175	Gharyehgole	P	34	35	1	1	50	28	13	LiBr	18	2950
12-071-05083	174	Ahar	P	44	38	1	1	50	35	16	BL	15	2860
12-071-04244		Ardabil	P	42	36	1	1	50	31	13	BL	15	2830
12-071-05436	175	Pyrouz	P	32	37	1	1	50	57	10	LiBr	17	2810
12-071-10050	174	Ardabil	P	39	34	1	1	50	27	13	BL	15	2790
12-071-10054	171	Ardabil	P	34	34	1	1	50	21	14	BL	15	2790
12-071-05132	174	Kaka	P	36	34	1	1	50	48	15	BL	15	2780
12-071-05442	251514	Iran	P	39	33	1	1	50	35	12	BL	15	2750

Table 26. -- Agronomic Data - Black Chickpeas - Uniform Yield Test 1 - Planted March 6, 1971 - Pahlavi University, Shiraz, Iran.

(1)	(2)	(3)	(5)	(6)	(8)	(9)	(10)	(15)	(16)	(17)	(18)
Accession Number	Source Number	S O U R C E	Plant Height	Plant Width	Stand	Vigor	Pl. to 1st Fl.	Seeds per 10 pods	Seed Color	1000 Seeds Weight	Yield per Hectare
12-071-10050	174	Ardabil	25	27	6	8	73	14	B	12	578
12-071-05132	174	Kaka	30	31	6	7	70	14	B	13	452
12-071-05093	174	Ahar	29	28	6	7	70	15	B	13	383
12-071-05442	251514	Iran	30	28	6	8	70	14	B	12	383
12-071-05436	175	Pyrouz	27	24	7	8	75	12	LiBr	13	377
12-071-10054	171	Ardabil	29	30	6	9	70	15	B	10	370
12-071-05451	175	Gharyehgole	26	27	6	8	74	12	LiBr	12	319
12-071-05432	154	Karaj	22	25	7	9	70	13	B	11	251
12-071-05301	154	Gharyehgole	25	25	7	9	73	13	B	11	191
12-071-04244		Ardabil	25	23	8	9	71	11	B	11	185
LSD 5%											65

Table 27. - Agronomic Data - White Chickpeas - Uniform Yield Test 2 - Planted March 27, 1971 - Tabriz University, Tabriz, Iran.

(1)	(2)	(3)	(5)	(6)	(7)	(8)	(10)	(11)	(12)	(14)	(15)	(16)	(17)	(18)
Accession Number	Source Number	S O U R C E	Plant Height	Plant Width	Plants /Meter	Stand	Pl.to 1st Fl.	Pl.to 1st Mat.	Pl.to Com.Mat.	Pods per Plant	Seeds per 10 Pods	Seed Color	100 Seeds Weight	Yield per Hectare
12-071-10031	169	Ardabil	36	25	14	1	71	111	128	14	15	W	30	1976
12-071-10033	111	Isfahan	37	30	14	1	71	112	126	15	14	W	32	1828
12-071-10029	125	Karaj	35	25	14	1	70	111	128	15	14	W	31	1799
12-071-02518	232	Darehgaz	31	26	16	1	72	112	130	14	15	W	35	1799
12-071-10026	162	Shahpour	32	23	15	2	71	110	127	15	14	W	31	[illegible]
12-071-10034	153	Karaj	34	24	14	1	72	111	129	14	15	W	30	1714
12-071-10032	152	Karaj	35	26	14	1	72	111	127	15	14	W	31	1713
12-071-02089	254	Karaj Selection	39	28	13	1	69	110	129	15	14	W	32	1658
12-071-10020	169	Ardabil	40	30	12	1	72	114	133	16	14	W	27	1541
12-071-10025	111	Isfahan	32	24	15	2	72	109	127	15	15	W	32	1519
LSD 5%														224
CV %														10

Table 28.- Agronomic Data - Black Chickpeas - Dryland Uniform Yield Test 1 - Planted March 23, 1971 - Tabriz University, Tabriz, Iran.

(1) Accession Number	(2) Source Number	(3) S O U R C E	(5) Plant Height	(6) Plant Width	(7) Plants /Meter	(8) Stand	(10) Pl.to 1st Fl.	(11) Pl.to 1st Mat.	(12) Pl.to Com.Mat	(14) Pods per Plant	(15) Seeds per 10 Pods	(16) Seed Color	(17) 100 Seeds Weight	(18) Yield per Hectare
12-071-04244		Ardabil	23	14	25	1	72	96	110	14	15	BL	14	557
12-071-05442	251514	Iran	20	13	24	1	69	95	110	15	15	BL	15	546
12-071-05132	174	Kaka	22	13	24	1	71	95	110	14	15	BL	13	534
12-071-05436	175	Pyrouz	21	15	23	1	72	97	110	15	15	LiBr	16	521
12-071-10054	171	Ardabil	22	14	22	1	73	97	112	15	15	BL	13	511
12-071-05432	154	Karaj	23	14	24	1	74	97	112	15	15	BL	15	506
12-071-10050	174	Ardabil	22	13	24	1	73	98	115	15	15	BL	15	505
12-071-05451	175	Gharyeh-gole	22	13	24	1	70	95	110	15	15	LiBr	17	499
12-071-05301	154	Gharyeh-gole	23	14	25	1	72	96	110	14	15	BL	14	494
12-071-05093	174	Ahar	23	13	25	1	71	95	110	15	15	BL	15	473

Yield differences not significant at .05 level.
CV %

15

Table 29. -- Agronomic Data - Black Chickpeas - Uniform Yield Test 1 -- Planted March 11, 1971 -- Ministry of Agriculture, Varamin, Iran.

(1) Accession Number	(2) Source Number	(3) S O U R C E	(4) Flower Color	(5) Plant Height	(6) Plant Width	(8) Stand	(9) Vigor	(10) Pl. to 1st Fl.	(15) Seeds per 10 Pods	(18) Yield per Hectare
12-071-05436	175	Pyrouz	P	37	67	3	3	55	10	2454
12-071-05451	175	Gharyehgole	P	30	50	3	3	56	14	2276
12-071-05093	174	Ahar	P	40	55	2	2	55	16	2250
12-071-05442	251514	Iran	P	35	58	2	2	56	16	2246
12-071-05132	174	Kaka	P	45	46	2	2	56	16	2110
12-071-10050	174	Ardabil	P	42	50	2	2	56	14	2092
12-071-05301	154	Gharyehgole	P	34	45	2	2	55	14	2086
12-071-04244		Ardabil	P	47	55	3	3	55	20	1894
12-071-05432	154	Karaj	P	47	45	2	2	55	14	1858
12-071-10054	171	Ardabil	P	32	45	3	3	54	16	1776

Yield differences not significant at .05 level.
CV % 15

Table 30. -- Agronomic Data - Black Chickpeas - Uniform Yield Test 1 - Planted March 23, 1971 - RPIP Karaj, Iran

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(15)	(16)	(17)	(18)
Accession Number	Source Number	SOURCE	Flower Color	Plant Height	Plant Width	Plants /Meter	Stand	Vigor	Pl. to 1st Fl.	Pl. to 1st Mat.	Pl. to Com.Mat.	Disease Rating	Seeds per 10 Pods	Seed Color	100 Seeds Weight	Yield per Hectare
12-071-05132	174	Kaka	P	24	37	27	2	1	54	36	101	2	19	BL	11	1188
12-071-10050	174	Ardabil	P	22	37	27	1	1	55	87	101	3	19	BL	12	1159
12-071-04244		Ardabil	P	24	39	25	2	2	54	87	99	4	15	BL	11	1144
12-071-05436	175	Pyrouz	P	17	37	21	2	1	55	85	101	4	13	LiBr	15	1115
12-071-05451	175	Gharyehgole	P	17	37	20	1	1	56	85	98	4	12	LiBr	15	1086
12-071-05093	174	Ahar	P	22	36	27	2	1	53	85	98	3	18	BL	11	1078
12-071-05301	154	Gharyehgole	P	21	38	24	2	2	55	86	97	4	21	BL	11	1052
12-071-05432	154	Karaj	P	21	35	26	2	2	52	83	97	3	18	BL	10	975
12-071-05442	251514	Iran	P	23	34	26	2	2	54	83	96	4	10	BL	11	951
12-071-10054	171	Ardabil	P	22	36	22	2	2	48	84	101	4	16	BL	11	948

Yield differences not significant at .05 level.

CV % 15

Table 31. -- Agronomic Data - White Chickpeas - Uniform Yield Test 2 - Planted November 10, 1970, Dezful, Iran.

(1) Accession Number	(2) Source Number	(3) S O U R C E	(5) Plant Height	(10) Pl. to 1st Fl.	(11) Pl. to 1st Mat.	(12) Pl. to Com. Mat.	(16) Seed Color	(18) Yield per Hectare
12-071-10026	162	Shahpour	85	103	120	191	W	2154
12-071-10020	169	Ardabil	83	108	125	192	W	2008
12-071-10025	111	Isfahan	85	109	130	193	W	1916
12-071-10029	152	Karaj	83	99	122	190	W	1740
12-071-02089	254	Karaj Selection	85	102	125	192	W	1702
12-071-10031	169	Ardabil	79	105	122	191	W	1682
12-071-02518	232	Darehgaz	80	109	128	192	W	1666
12-071-10032	152	Karaj	82	110	132	195	W	1632
12-071-10033	111	Isfahan	79	109	128	192	W	1502
12-071-10034	153	Karaj	90	109	127	192	W	1394

Yield differences not significant at .05 level.
CV % 23

Table 32.-- Agronomic Data - White Chickpeas - Uniform Yield Test 2 - Planted April 4, 1971 - Ghazvin Development Project, Ghazvir., Iran.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(12)	(15)	(16)	(17)	(18)
Accession Number	Source Number	S O U R C E	Flower Color	Plant Height	Plant Width	Plants /Meter	Pl. to Com.Mat.	Seeds Per 10 Pods	Seed Color	100 Seeds Weight	Yield per Hectare
12-071-10025	111	Isfahan	W	36	43	18	111	13	W	27	3265
12-071-10029	125	Karaj	W	35	45	25	111	13	W	25	2931
12-071-10020	169	Ardabil	W	35	42	20	111	13	W	26	2591
12-071-02089	254	Karaj Selection	W	35	43	22	111	12	W	29	2547
12-071-10034	153	Karaj	W	31	41	16	111	13	W	32	2449
12-071-02518	232	Darehgaz	W	32	46	21	111	13	W	30	2363
12-071-10033	111	Isfahan	W	31	46	21	111	13	W	27	2344
12-071-10026	162	Shahpour	W	35	44	24	111	13	W	23	2314
12-071-10031	169	Ardabil	W	36	44	19	111	13	W	24	2213
12-071-10032	152	Karaj	W	33	45	20	111	13	W	31	1976
LSD 5%											640
CV %											19

Table 33 . -- Agronomic Data - Black Chickpeas - Uniform Yield Test 2 - Planted November 10, 1970 - Dezful, Iran.

(1) Accession Number	(2) Source Number	(3) SOURCE	(5) Plant Height	(10) Pl. to 1st Fl.	(11) Pl. to 1st Mat.	(12) Pl. to Com. Mat.	(16) Seed Color	(18) Yield per Hectare
12-074-10010	I 13	Israel	80	88	124	193	BL	2352
12-071-05436	175	Pyrouz	74	99	126	195	LiBr	2076
12-071-05132	174	Kaka	76	99	117	196	BL	2048
12-071-05331	154	Gharyehgole	72	98	115	193	BL	1915
12-071-04509	193	Kermanshah	74	99	116	195	BL	1914
12-071-04282	129	Isfahan	75	102	116	193	BL	1910
12-071-04279	174	Ahar	74	99	118	195	BL	1892
12-071-04287		Isfahan	77	95	122	194	BL	1818
12-071-04432	231	Isfahan	76	100	119	195	BL	1774
12-071-04439	221	Isfahan	75	100	117	195	BL	1648
LSD 5%								672
CV %								21

Table 34.- Agronomic Data - Black Chickpeas - Uniform Yield Test 1 - Planted March 30, 1971 - Tabriz University, Tabriz, Iran.

(1) Accession Number	(2) Source Number	(3) S O U R C E	(5) Plant Height	(6) Plant Width	(7) Plants /Meter	(8) Stand	(10) Pl.to 1st Fl.	(11) Pl.to 1st Mat.	(12) Pl.to Com.Mat.	(14) Pods per Plant	(15) Seeds per 10 Pods	(16) Seed Color	(17) 100 Seeds Weight	(18) Yield per Hectare
12-071-05442	251514	Iran	32	19	15	2	70	101	109	14	15	BL	16	1504
12-071-05132	174	Kaka	28	19	15	2	66	101	110	15	15	BL	15	1476
12-071-05093	174	Ahar	29	18	16	3	66	102	107	15	15	BL	14	1432
12-071-05301	154	Gharyeh-gole	35	19	16	2	66	101	109	16	15	BL	15	1365
12-071-05436	175	Pyrouz	33	19	14	2	66	104	110	15	15	LiBr	17	1351
12-071-05432	154	Karaj	37	20	16	2	65	100	109	15	15	Bl	15	1336
12-071-10050	174	Ardabil	30	19	14	2	66	102	111	15	14	BL	16	1322
12-071-04244		Ardabil	33	20	16	2	66	100	110	15	14	BL	16	1305
12-071-05451	175	Gharyeh-gole	34	19	14	2	65	103	110	14	15	LiBr	17	1285
12-071-10054	171	Ardabil	34	20	14	2	66	102	111	16	15	BL	15	1256
LSD 5%														58
CV %														3

Table 35. -- Agronomic Data - White Chickpeas - Uniform Yield Test 1 - Planted March 29, 1971 - Ministry of Agriculture, Gorgon, Iran.

(1) Accession Number	(2) Source Number	(3) SOURCE	(4) Flower Color	(5) Plant Height	(10) Pl. to 1st Fl.	(14) Pods per Plant	(15) Seeds per 10 Pods	(16) Seed Color	(17) 100 Seeds Weight	(18) Yield per Hectare
12-071-05473	249982	Iran	W	37	50	29	10	W	33	1310
12-071-10025	111	Isfahan	W	31	50	32	10	W	30	1270
12-071-10013	129	Moghan	W	36	49	33	10	W	33	1222
12-071-10014	162	Shahpour	W	34	49	42	10	W	32	1188
12-071-05468	3	Karaj Selection	W	31	48	35	10	W	30	1150
12-071-10017	111	Isfahan	W	26	49	20	10	W	38	1096
12-071-10016	129	Moghan	W	35	47	25	10	W	33	982
12-071-05466	18	Karaj Selection	W	26	48	40	10	W	35	866
12-071-05456	34	Karaj Selection	W	33	49	38	10	W	27	784
12-071-10015	129	Moghan	W	26	46	29	10	W	26	780

Table 36. -- Agronomic Data - White Chickpeas - Uniform Yield Test 2 - Planted April 8, 1971 - Ministry of Agriculture, Rezaieh, Iran.

(1)	(2)	(3)	(4)	(5)	(6)	(8)	(9)	(10)	(14)	(15)	(16)	(17)	(18)
Accession Number	Source Number	S O U R C E	Flower Color	Plant Height	Plant Width	Stand	Vigor	Pl. to 1st Fl.	Pods per Plant	Seeds per 10 Pods	Seed Color	100 Seeds Weight	Yield per Hectare
12-071-10029	125	Karaj	W	41	46	1	1	55	68	10	W	29	1[illegible]
12-071-10031	169	Ardabil	W	44	46	1	1	56	36	12	W	29	1[illegible]20
12-071-10025	111	Isfahan	W	38	39	1	1	59	80	13	W	31	1[illegible]0
12-071-10026	162	Shahpour	W	38	37	1	1	58	58	12	W	27	1760
12-071-10032	152	Karaj	W	32	38	1	1	57	59	12	W	29	1[illegible]0
12-071-10033	111	Isfahan	W	36	38	1	1	58	67	12	W	29	1[illegible]70
12-071-02518	232	Darehgaz	W	38	39	1	1	57	37	12	W	32	1[illegible]50
12-071-10020	169	Ardabil	W	42	44	1	1	55	77	10	W	25	1500
12-071-10034	153	Karaj	W	33	34	1	1	58	63	10	W	35	1490
12-071-02089	254	Karaj Selection	W	41	40	1	1	57	53	10	W	32	1440

Table 37. -- Agronomic Data - White Chickpeas - Uniform Yield Test 2 - Planted March 6, 1971 - Pahlavi University, Shiraz, Iran.

(1)	(2)	(3)	(5)	(6)	(8)	(10)	(13)	(15)	(16)	(17)	(18)
Accession Number	Source Number	S O U R C E	Plant Height	Plant Width	Stand	Pl. to 1st Fl.	Disease Rating	Seeds per 10 pods	Seed Color	100 Seeds Weight	Yield p Hectar
12-071-10020	169	Ardabil	48	45	2	76	1	11	Cr	25	786
12-071-10034	153	Karaj	38	37	6	75	3	10	Cr	28	466
12-071-02089	254	Karaj	41	38	6	75	4	12	Cr	26	466
12-071-10029	125	Karaj	35	34	6	73	4	12	Cr	24	406
12-071-02518	232	Darehgaz	38	37	7	77	4	12	Cr	29	329
12-071-10032	152	Karaj	39	33	7	77	4	11	Cr	23	286
12-071-10025	111	Isfahan	42	37	7	77	4	14	Cr	25	223
12-071-10026	162	Shahpour	34	32	7	72	5	10	Cr	24	142
12-071-10031	169	Ardabil	37	33	8	74	5	11	Cr	20	115
12-071-10033	111	Isfahan	36	30	7	77	5	10	Cr	24	104
LSD 5%											81

Table 38. -- Agronomic Data - White Chickpeas - Uniform Yield Test 1 - Planted March 28, 1971 - Tabriz University, Tabriz, Iran.

(1) Accession Number	(2) Source Number	(3) S O U R C E	(5) Plant Height	(6) Plant Width	(7) Plants /Meter	(8) Stand	(10) Pl.to 1st Fl.	(11) Pl.to 1st Mat.	(12) Pl.to Com.Mat.	(14) Pods per Plant	(15) Seeds per 10 Pods	(16) Seed Color	(17) 100 Seeds Weight	(18) Yield per Hectare
12-071-10014	162	Shahpour	35	24	14	1	70	111	129	17	15	W	34	1804
12-071-10025	111	Isfahan	33	23	15	1	70	108	129	16	15	W	29	1695
12-071-10013	129	Moghan	30	22	13	1	69	109	127	14	15	W	29	1670
12-071-05468	3	Karaj Selection	34	23	14	1	69	106	124	15	15	W	27	1556
12-071-10015	129	Moghan	31	23	12	2	68	107	129	16	15	W	36	1527
12-071-05456	34	Karaj Selection	34	27	14	2	69	108	126	15	15	W	28	1520
12-071-10016	129	Moghan	30	26	12	1	68	110	128	16	15	W	33	1498
12-071-05473	249982	Iran	33	23	12	1	71	109	126	15	14	W	29	1483
12-071-05466	18	Karaj Selection	28	19	14	1	69	109	128	15	15	W	33	1466
12-071-10017	111	Isfahan	38	30	12	1	71	109	131	15	15	W	41	1436
LSD 5%														141
CV %														7

Table 39.- Agronomic Data - White Chickpeas - Dryland Uniform Yield Test 2 - Planted March 24, 1971 - Tabriz University, Tabriz, Iran.

(1)	(2)	(3)	(5)	(6)	(7)	(8)	(10)	(11)	(12)	(14)	(15)	(16)	(17)	(18)
Accession Number	Source Number	S O U R C E	Plant Height	Plant Width	Plants /Meter	Stand	Pl. to 1st Fl.	Pl. to 1st Mat.	Pl. to Com. Mat.	Pods per Plant	Seeds per 10 Pods	Seed Color	100 Seeds Weight	Yield per Hectare
12-071-02518	232	Darehgaz	25	17	21	2	70	98	113	15	15	W	30	604
12-071-10029	125	Karaj	20	17	12	2	73	100	116	12	15	W	30	527
12-071-02089	254	Karaj Selection	29	18	10	2	70	98	113	17	15	W	31	517
12-071-10032	152	Karaj	19	14	12	2	72	98	112	14	15	W	32	509
12-071-10031	169	Ardabil	20	15	11	2	72	98	112	11	15	W	28	492
12-071-10025	111	Isfahan	17	13	10	2	70	100	113	12	15	W	29	451
12-071-10033	111	Isfahan	23	13	16	2	73	100	113	14	15	W	34	429
12-071-10026	162	Shahpour	21	14	11	2	72	98	112	10	15	W	28	425
12-071-10034	153	Karaj	23	14	15	2	70	100	112	10	15	W	29	378
12-071-10020	169	Ardabil	24	17	9	2	76	106	116	10	15	W	27	319
LSD 5%														102
CV %														17

Table 40. -- Agronomic Data - White Chickpeas - Uniform Yield Test 2 -- Planted March 11, 1971 -- Ministry of Agriculture, Varamin, Iran.

(1)	(2)	(3)	(4)	(5)	(6)	(8)	(9)	(10)	(14)	(15)	(18)
Accession Number	Source Number	S O U R C E	Flower Color	Plant Height	Plant Width	Stand	Vigor	Pl. to 1st Fl.	Pods per Plant	Seeds per 10 Pods	Yield per Hectare
12-071-10033	111	Isfahan	W	43	55	3	3	60	42	12	2260
12-071-10025	111	Isfahan	W	41	50	1	1	58	44	12	2078
12-071-10032	152	Karaj	W	36	60	2	2	60	30	10	2048
12-071-10020	169	Ardabil	W	45	56	1	1	58	45	10	2038
12-071-10031	169	Ardabil	W	46	60	2	2	58	70	10	2038
12-071-10029	152	Karaj	W	42	50	1	1	57	50	10	1990
12-071-02518	232	Darehgaz	W	36	60	2	2	61	45	10	1956
12-071-10034	153	Karaj	W	33	50	2	2	60	30	12	1758
12-071-02089	254	Karaj Selection	W	42	55	2	2	57	35	10	1746
12-071-10026	162	Shahpour	W	43	55	2	2	57	40	10	1442
LSD 5%											305
CV %											15

Table 41. -- Agronomic Data - White Chickpeas - Uniform Yield Test 2- Planted March 23, 1971 - RPIP Karaj, Iran

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(15)	(17)	(18)
Accession Number	Source Number	S O U R C E	Flower Color	Plant Height	Plant Width	Plants /Meter	Stand	Vigor	Pl. to 1st Fl.	Pl. to 1st. Mat.	Pl. to Com. Mat.	Disease Rating	Seeds Per 10 Pods	100 Seeds Weight	Yield per Hectare
12-071-10032	152	Karaj	W	24	50	19	2	1	57	93	108	3	10	31	1937
12-071-10025	111	Isfahan	W	26	48	23	2	1	56	94	108	2	12	28	1778
12-071-02518	232	Darehgaz	W	24	49	16	3	1	56	94	106	4	10	30	1679
12-071-10020	169	Ardabil	W	27	50	22	2	1	57	97	112	1	11	26	1646
12-071-10033	111	Isfahan	W	22	47	19	4	2	57	92	106	3	10	27	1537
12-071-10029	125	Karaj	W	25	48	13	3	1	56	93	109	5	12	25	1472
12-071-10026	162	Shahpour	W	26	47	19	3	2	55	91	107	4	10	23	1467
12-071-10031	169	Ardabil	W	28	51	23	3	1	56	93	108	4	10	24	1452
12-071-02089	254	Karaj Sel.	W	26	46	23	3	2	52	91	108	4	10	29	1434
12-071-10034	153	Karaj	W	25	48	26	4	2	57	92	104	4	11	32	1292
LSD 5%															305
CV %															15

Table 42 . -- Agronomic Data - White Chickpeas - Uniform Yield Test 1 Planted November 10, 1970 - Dezful, Iran.

(1) Accession Number	(2) Source Number	(3) SOURCE	(5) Plant Height	(10) Pl. to 1st Fl.	(11) Pl. to 1st Mat.	(12) Pl. to Com. Mat.	(16) Seed Color	(18) Yield per Hectare
12-071-10014	162	Shahpour	90	103	121	192	W	2206
12-071-05456	34	Karaj Selection	91	93	122	192	W	1816
12-071-05466	18	Karaj Selection	89	99	124	193	W	1781
12-071-05468	3	Karaj Selection	90	92	121	192	W	1722
12-071-10013	129	Moghan	91	101	125	192	W	1648
12-071-10017	111	Isfahan	90	102	122	193	W	1581
12-071-10015	129	Moghan	90	96	122	192	W	1578
12-071-05473	249982	Iran	88	112	132	192	W	1424
12-071-10025	111	Isfahan	90	110	129	192	W	1350
12-071-10016	129	Moghan	89	97	125	193	W	1304
LSD 5%								437
CV %								21

Table 43. -- Agronomic Data - White Chickpeas - Uniform Yield Test 1 - Planted April 4, 1971 - Ghazvin Development Project, Ghazvin, Iran.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(12)	(15)	(16)	(17)	(18)
Accession Number	Source Number	S O U R C E	Flower Color	Plant Height	Plant Width	Plants /Meter	Pl. to Com.Mat.	Seeds Per 10 Pods	Seed Color	100 Seeds Weight	Yield per Hectare
12-071-10016	129	Moghan	W	32	43	17	110	12	W	32	3553
12-071-05473	249982	Iran	W	38	43	17	110	13	W	29	3345
12-071-10025	111	Isfahan	W	38	46	24	110	13	W	27	3326
12-071-10017	111	Isfahan	W	40	40	15	110	13	W	40	3247
12-071-10015	129	Moghan	W	35	50	21	110	13	W	29	3195
12-071-05468	3	Karaj Selection	W	36	42	23	110	13	W	25	3082
12-071-10014	162	Shahpour	W	41	49	22	110	13	W	30	3060
12-071-10013	129	Moghan	W	33	43	18	110	13	W	31	2972
12-071-05456	34	Karaj Selection	W	35	39	17	110	12	W	24	2875
12-071-05466	18	Karaj Selection	W	34	40	21	110	12	W	27	2838

Yield differences not significant at .05 level.
CV %

16

Table 44 -- Agronomic Data - White Chickpeas - Dryland Uniform Yield Test 1 - Planted March 22, 1971 - Tabriz University, Tabriz, Iran.

(1)	(2)	(3)	(5)	(6)	(7)	(8)	(10)	(11)	(12)	(14)	(15)	(16)	(17)	(18)
Accession Number	Source Number	S O U R C E	Plant Height	Plant Width	Plants /Meter	Stand	Pl. to 1st Fl.	Pl. to 1st Mat.	Pl. to Com.Mat.	Pods per Plant	Seeds per 10 Pods	Seed Color	100 Seeds Weight	Yield per Hectare
12-071-10025	111	Isfahan	24	10	13	2	73	100	115	15	15	W	27	685
12-071-10014	162	Shahpour	24	13	18	2	72	98	112	131	20	W	30	654
12-071-05468	3	Karaj Selection	23	16	22	2	73	102	117	19	13	LiCr	30	630
12-071-10017	111	Isfahan	20	15	21	2	74	100	114	15	15	W	31	611
12-071-05473	249982	Iran	24	14	19	2	73	102	114	16	15	W	33	606
12-071-05466	18	Karaj Selection	21	13	23	2	73	100	113	21	14	W	33	574
12-071-10013	129	Moghan	25	14	22	2	74	100	115	19	15	W	32	551
12-071-05456	34	Karaj Selection	23	17	21	2	75	103	117	16	15	W	31	549
12-071-10015	129	Moghan	20	15	19	2	75	100	115	15	15	W	32	543
12-071-10016	129	Moghan	26	12	26	2	73	102	114	17	14	W	32	534
LSD 5%														104
CV %														12

Table 45.-- Agronomic Data - White Chickpeas - Uniform Yield Test 1 - Planted April 8, 1971 - Ministry of Agriculture, Rezaieh, Iran.

(1)	(2)	(3)	(4)	(5)	(6)	(8)	(9)	(10)	(14)	(15)	(16)	(17)	(18)
Accession Number	Source Number	S O U R C E	Flower Color	Plant Height	Plant Width	Stand	Vigor	Pl. to 1st Fl.	Pods per Plant	Seeds per 10 Pods	Seed Color	100 Seeds Weight	Yield per Hectare
12-071-05456	34	Karaj Selection	W	39	38	1	1	53	50	12	W	29	2800
12-071-05466	18	Karaj Selection	W	44	42	1	1	53	51	11	W	34	2640
12-071-05473	249982	Iran	W	46	45	1	1	54	43	10	W	29	2450
12-071-10025	111	Isfahan	W	42	44	1	1	55	22	11	W	35	2450
12-071-10017	111	Isfahan	W	40	42	1	1	55	26	10	W	36	2440
12-071-10014	162	Shahpour	W	40	41	1	1	57	46	10	W	30	2380
12-071-10013	129	Moghan	W	37	37	1	1	53	27	13	W	35	2310
12-071-05468	3	Karaj Selection	W	42	45	1	1	53	84	10	W	31	1880
12-071-10016	129	Moghan	W	36	34	1	1	52	58	10	W	34	1860
12-071-10015	129	Moghan	W	38	38	1	1	53	34	10	W	44	1810

Table 46. -- Agronomic Data - White Chickpeas - Uniform Yield Test 1 - Planted March 6, 1971 - Pahlavi University, Shiraz, Iran.

(1)	(2)	(3)	(4)	(5)	(6)	(8)	(9)	(10)	(15)	(16)	(17)	(18)
Accession Number	Source Number	S O U R C E	Flower Color	Plant Height	Plant Width	Stand	Vigor	Pl. to 1st Fl.	Seeds per 10 pods	Seed Color	100 Seeds Weight	Yield per Hectare
12-071-05468	3	Karaj	W	41	46	5	4	72	10	Cr	24	1082
12-071-10025	111	Isfahan	W	46	47	4	4	77	13	Cr	23	884
12-071-05456	34	Karaj	W	43	44	6	4	70	11	Cr	22	851
12-071-05473	249982	Iran	W	37	42	6	4	76	12	Cr	23	734
12-071-10014	162	Shahpour	W	39	42	7	5	72	13	Cr	25	656
12-071-05466	18	Karaj	W	43	52	5	5	72	11	Cr	22	527
12-071-10016	129	Moghan	W	41	43	6	5	75	11	Cr	20	506
12-071-10013	129	Moghan	W	41	42	7	6	72	10	Cr	23	439
12-071-10017	111	Isfahan	W	42	33	8	6	76	10	Cr	26	259
12-071-10015	129	Moghan	W	30	36	8	7	77	9	Cr	23	219
LSD 5%												32

Table 47. -- Agronomic Data - White Chickpeas - Uniform Yield Test 1 -- Planted March 11, 1971 -- Ministry of Agriculture, Varamin, Iran

(1) Accession Number	(2) Source Number	(3) SOURCE	(4) Flower Color	(5) Plant Height	(6) Plant Width	(8) Stand	(9) Vigor	(10) Pl. to 1st Fl.	(14) Pods per Plant	(15) Seeds per 10 Pods	(18) Yield per Hectare
12-071-05456	34	Karaj Selection	W	43	55	2	2	55	35	12	2440
12-071-05473	249982	Iran	W	30	40	2	2	58	39	14	2100
12-071-05468	3	Karaj Selection	W	33	50	3	3	55	44	14	2000
12-071-10014	162	Shahpour	W	38	50	1	1	56	54	10	1980
12-071-10025	111	Isfahan	W	41	60	2	2	60	84	14	1840
12-071-10016	129	Moghan	W	36	55	2	2	55	57	10	1740
12-071-10013	129	Moghan	W	48	46	1	1	56	60	10	1580
12-071-10017	111	Isfahan	W	35	55	1	1	59	57	12	1540
12-071-10015	129	Moghan	W	48	60	1	1	55	38	10	1390
12-071-05466	18	Karaj Selection	W	40	50	2	2	56	45	12	1380

Yield differences not significant at .05 level.
CV %

34

Table 48. -- Agronomic Data - White Chickpeas - Uniform Yield Test 1 - Planted March 23, 1971 - RPIP Karaj, Iran

(1) Accession Number	(2) Source Number	(3) SOURCE	(4) Flower Color	(5) Plant Height	(6) Plant Width	(7) Plants /Meter	(8) Stand	(9) Vigor	(10) Pl. to 1st Fl.	(11) Pl. to 1st Mat.	(12) Pl. to Com. Mat.	(13) Disease Rating	(15) Seeds Per 10 Pods	(17) 100 Seeds Weight	(18) Yield per Hectare
12-071-10025	111	Isfahan	W	26	44	21	2	1	56	94	113	4	12	27	1629
12-071-05473	249982	Iran	W	23	47	19	3	2	55	94	109	4	12	29	1612
12-071-10014	162	Shahpour	W	27	47	21	2	1	56	96	110	2	10	30	1611
12-071-10017	111	Isfahan	W	28	45	13	3	1	56	95	113	4	11	40	1578
12-071-05456	34	Karaj Sel.	W	22	43	25	2	2	51	92	109	4	11	24	1551
12-071-05466	18	Karaj Sel.	W	25	46	22	3	2	51	95	114	4	10	27	1484
12-071-10013	129	Moghan	W	24	42	23	3	2	51	93	109	5	11	31	1457
12-071-10015	129	Moghan	W	24	43	18	3	2	50	91	107	5	10	29	1450
12-071-05468	3	Karaj Sel.	W	25	41	25	2	2	51	93	111	4	10	25	1365
12-071-10016	129	Moghan	W	23	39	19	3	3	51	92	106	5	11	32	1115
LSD 5%															240
CV %															12

Légend for Beans Agronomic Data Tables

(1) Numbers 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 collections by the Iranian Ministry of Agriculture; six digit numbers are PI numbers from Plant Science Division, ARS, U.S. Department of Agriculture, Beltsville, Maryland, U.S.A.

(3) W = White; P = Purple; LP = Light Purple.

(4) V = Viney; B = Bushy.

(5) Average number of plants per meter, based on one meter of row 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) Disease rated 1 to 9: 1 = Free from disease symptoms; 9 = Severe disease symptoms.

(12) First column: C = Curved; S = Straing. Second column: C = Cylindrical; F = Flat.

(13) S = Short; M = Medium; L = Long; VL = Very Long.

(14) Average of 10 pods per replication.

(15) W = White; Cr= Cream; R = Red; P = Purple: Br = Brown; Pi = Pink; Y = Yellow; Bl = Black; M = Mottled; S = Spotted; L = Light; D = Dark.

(16) R = Reniform; RC = Reniform Compressed; RE = Reniform Elongated; OG = Oblong globular; SC = Subcylindric; OC = Oblong Cylindric; OB = Oblong; SG = Subglobular; O = Oval.

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

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

Table 40.-- Agronomic Data - Red Beans - Preliminary Yield Test - Planted May 17, 1971 - Karaj, Iran.

(1) Accession Number	(2) SOURCE	(3) Flower Color	(4) Plant Type	(5) Plants /Meter	(6) Stand	(7) Vigor	(8) Pl. to 1st Fl.	(9) Pl. to 1st Mat.	(10) Pl. to Com. Mat.	(11) Disease Rating	(12) Pod Shape	(13) Pod Size	(15) Seed Color	(16) Seed Shape	(17) 100 Seeds Weight	(18) Yield per Hectare
65-153-01282	Turkey	W	V	24	2	3	40	81	100	2	CF	M	P	OB	27	2383
65-153-01616	Turkey	W	V	23	1	3	40	81	101	3	CF	M	LP	OB	30	2006
65-000-02615	Unknown	W	V	24	2	3	39	77	90	3	CF	M	R	OB	29	1869
65-071-00582	Naz	W	V	24	2	3	40	81	99	3	CF	M	P	OB	28	1792
65-000-02612	Unknown	W	V	23	2	4	39	75	92	3	CF	M	R	OB	30	158[illegible]
65-000-02602	Unknown	W	V	23	2	4	40	75	94	3	CF	M	R	OB	26	1556
65-000-02613	Unknown	W	V	22	1	4	41	74	94	3	CF	M	R	OB	31	1462
65-062-00832	Guatamala	W	V	23	2	3	39	87	108	2	CF	M	LR	HB	35	1392
65-002-01034	Afgharistan	W	V	23	2	3	43	83	103	3	CF	M	R	OB	28	1345
65-069-01534	India	W	V	26	1	2	45	84	109	2	CF	M	R	OB	30	1294
LSD 5%																420
CV %																17

Table 50.-- Agronomic Data - White Beans - Preliminary Yield Test - Planted May 17, 1971 - Karaj, Iran

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(15)	(16)	(17)	(18)
Accession Number	S O U R C E	Flower Color	Plant Type	Plants /Meter	Stand	Vigor	Pl. to 1st Fl.	Pl. to 1st Mat.	Pl. to Com.Mat.	Disease Rating	Pod Shape	Pod Size	Seed Color	Seed Shape	100 Seeds Weight	Yield per Hectare
65-153-02066	Turkey	W	V	24	2	3	40	71	101	2	CF	M	W	OB	32	2036
65-153-01938	Turkey	W	V	22	2	2	39	74	107	2	CF	M	W	RC	47	2032
65-153-01846	Turkey	W	B	22	2	2	38	70	100	1	SF	M	W	RE	39	1923
65-000-02578	Unknown	W	V	23	1	3	40	79	98	2	CF	M	W	OB	28	1878
65-071-00042	Marmar	W	V	24	2	3	40	77	95	2	CF	M	W	R	26	1751
65-153-01801	Turkey	W	V	22	2	2	40	76	105	2	CF	M	W	RC	49	1702
65-153-02274	Turkey	W	V	24	2	3	39	78	97	3	CF	M	W	R	27	1665
65-153-02551	Turkey	W	B	19	3	2	37	79	99	2	SF	M	W	RE	42	1605
65-153-02503	Turkey	W	B	18	3	2	37	79	99	2	SF	M	W	RE	43	1502
65-071-00772	Iran	W	V	22	1	3	40	78	98	2	CF	M	W	R	25	1463

Yield differences not significant at .05 level.
CV % 17

Table 51.-- Agronomic Data - Pinto Beans - Special Yield Test - Planted May 17, 1971 - Karaj, Iran

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(15)	(16)	(17)	(18)
Accession Number	S O U R C E	Flower Color	Plant Type	Plants /Meter	Stand	Vigor	Pl. to 1st Fl.	Pl. to 1st Mat.	Pl. to Com. Mat.	Disease Rating	Pod Shape	Pod Size	Seed Color	Seed Shape	100 Seeds Weight	Yield per Hectare
65-153-01297	Turkey	LP	V	23	2	2	39	83	103	1	SF	M	LRM	OC	40	2388
65-157-00068	Pinto 114	W	V	24	2	3	37	72	99	2	CF	M	CrM	OC	32	2211
65-153-02167	Turkey	LP	V	23	3	3	38	82	108	2	SF	M	LPiM	SG	36	1944
65-032-00793	Chile	LP	V	22	3	3	36	82	107	3	SF	M	LPiM	OC	39	1807
65-071-00446	Shad	LP	V	24	2	3	39	81	107	2	SF	M	CrM	OC	39	1772
65-153-02141	Turkey	LP	V	23	3	1	38	85	108	2	SF	M	PiM	SG	43	1670
65-153-00930	Turkey	LP	V	14	5	1	40	86	111	2	SF	M	PiM	OC	39	1520
65-071-00601	Isfahan	LP	V	24	2	2	37	82	108	2	SF	M	PiM	OG	40	1284
65-071-00593	Isfahan	LP	V	23	3	3	38	80	106	3	SF	M	PiM	SG	35	1259
LSD 5%																544
CV %																22

Table 52. -- Agronomic Data - Red beans - Special Yield Test - Planted May 17, 1971 - Karaj, Iran

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(15)	(16)	(17)	(18)
Accession Number	S O U R C E	Flower Color	Plant Type	Plants /Meter	Stand	Vigor	Pl. to 1st Fl.	Pl. to 1st Mat.	Pl. to Com.Mat.	Disease Rating	Pod Shape	Pod Size	Seed Color	Seed Shape	100 Seeds Weight	Yield per Hectare
65-071-00713	Darehgaz	W	V	27	2	1	50	103	124	2	CF	M	R	R	25	2395
65-071-00538	Darehgaz	W	V	28	2	1	46	103	124	2	CF	M	R	R	23	2375
65-032-01627	Chile	W	V	23	1	3	38	79	103	3	CF	M	R	R	23	2324
65-071-00582	Naz	W	V	25	1	3	39	79	106	3	CF	M	R	R	25	2273
65-035-00876	Congo	W	V	26	2	3	38	78	107	3	CF	M	LP	OB	26	2215
65-071-00569	Nishabour	W	V	31	1	1	46	103	124	1	CF	M	R	R	22	2064
65-071-00537	Nishabour	W	V	29	1	1	48	104	125	1	CF	M	R	R	21	1996
65-071-00580	Darehgaz	W	V	22	1	3	38	77	107	3	CF	S	P	OB	23	1947
65-007-00292	Argentina	W	V	28	1	1	51	103	124	1	CF	M	R	R	22	1857

Yield differences not significant at .05 level.
CV % 20

Table 53 . -- Agronomic Data - White Beans - Special Yield Test - Planted May 17, 1971, Karaj, Iran.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(15)	(16)	(17)	(18)
Accession Number	SOURCE	Flower Color	Plant Type	Plants /Meter	Stand	Vigor	Pl. to 1st Fl.	Pl. to 1st Mat.	Pl. to Com. Mat.	Disease Rating	Pod Shape	Pod Size	Seed Color	Seed Shape	100 Seeds Weight	Yield per Hectare
65-071-00505	Shiraz	W	V	26	1	3	39	81	104	2	CF	M	W	R	29	2194
65-153-01735	Turkey	W	V	22	1	2	39	84	113	3	CF	M	W	RC	51	2057
65-153-02252	Turkey	W	V	28	1	2	43	87	121	1	CF	M	W	OB	23	1960
65-071-00515	Gnochan	W	V	24	2	2	40	82	108	2	CF	M	W	OB	23	1831
65-071-00212	Iran	W	V	23	2	2	39	88	120	3	CF	M	W	R	40	1731
65-157-00014	U.S.A.	W	V	24	2	3	40	76	102	3	CF	M	W	OB	22	1712
65-071-00042	Marmar	W	V	25	2	3	40	76	103	2	CF	M	W	R	26	1627
65-071-00638	Shiraz	W	V	25	1	2	39	83	119	2	CF	M	W	R	22	1615
65-071-00353	Arak	W	V	24	1	3	39	74	100	3	CF	M	W	R	27	1586

Yield differences not significant at .05 level.
CV % 22

Table 54. -- Agronomic Data - Pinto Beans - Advanced Yield Test - Planted May 17, 1971 - Karaj, Iran.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(15)	(16)	(17)	(18)
Accession Number	S O U R C E	Flower Color	Plant Type	Plants /Meter	Stand	Vigor	Pl. to 1st Fl.	Pl. to 1st Mat.	Pl. to Com.Mat.	Disease Rating	Pod Shape	Pod Size	Seed Color	Seed Shape	100 Seeds Weight	Yield per Hectare
65-153-01297	Turkey	LP	V	24	2	3	41	82	115	2	SF	M	LPiM	OC	40	1659
65-153-01724	Turkey	LP	V	23	3	3	39	82	116	2	SF	M	LPiM	SG	40	1479
65-153-02167	Turkey	LP	V	21	2	3	39	81	117	2	SF	M	LPiM	SG	34	1451
65-032-00793	Chile	LP	V	22	2	3	38	81	116	3	SF	M	LPiM	OC	43	1323
65-071-00396	Jiroft	LP	V	22	2	2	49	83	119	3	SF	M	LPiM	OG	41	1222
65-071-00446	Shad	LP	V	22	3	2	37	81	116	4	SF	M	LPiM	OC	40	1219
65-137-01650	Africa	LP	V	23	2	2	43	84	117	2	SF	M	LPiM	OC	42	1203
65-153-01722	Turkey	LP	V	24	3	3	37	81	118	4	SF	M	LPiM	SG	39	1154
65-153-02141	Turkey	LP	V	22	3	3	38	82	117	4	SF	M	LPiM	SG	41	1082
65-153-02261	Turkey	LP	V	26	2	3	37	82	117	3	SF	M	LPiM	SG	37	917
LSD 5%																341
CV %																20

Table 55. -- Agronomic Data - Red Beans - Advanced Yield Test - Planted May 5, 1971 - Pahlavi University, Shiraz, Iran.

(1)	(2)	(6)	(8)	(14)	(15)	(17)	(18)
Accession Number	SOURCE	Stand	Pl. to 1st Fl.	Seeds per Pod	Seed Color	100 Seeds Weight	Yield per Hectare
65-071-00582	Naz	1	60	5	R	29	3223
65-071-00734	Nishabour	1	60	[illegible]	R	24	3187
65-071-00727	Iran	1	56	[illegible]	R	24	3060
65-071-00713	Darehgaz	1	59	5	R	26	3034
65-071-00702	Torbat Heidarieh	1	59	5	R	29	3030
65-071-00536	Torbat Heidarieh	1	59	[illegible]	R	25	2984
65-085-00100	Lebanon	1	57	5	R	30	2974
65-071-00537	Nishabour	1	60	5	R	25	2804
65-007-00292	Argentine	1	60	5	R	26	2591
65-071-00721	Darehgaz	1	60	[illegible]	R	26	2541

Table 56. -- Agronomic Data - Red Beans - Advanced Yield Test - Planted April 15, 1971 - Ministry of Agriculture, Varamin, Iran

(1) Accession Number	(2) SOURCE	(3) Flower Color	(6) Stand	(7) Vigor	(8) Pl. to 1st Fl.	(14) Seeds per pod	(18) Yield per Hectare
65-071-00536	Torbat-Heidarieh	W	3	3	40	4	1004
65-071-00702	Torbat-Heidarieh	W	3	3	39	4	954
65-071-00582	Naz	W	3	3	39	4	934
65-071-00727	Unknown	W	3	3	38	4	702
65-085-00100	Lebanon	W	3	3	38	4	678
65-071-00713	Darehgaz	W	2	2	44	4	580
65-071-00537	Nishabour	W	2	2	47	4	568
65-071-00734	Nishabour	W	1	1	47	5	538
65-071-00721	Darehgaz	W	2	2	46	4	420
65-007-00292	Argentina	W	2	2	46	4	318
LSD 5%							308
CV %							37

Table 57. -- Agronomic Data - Red Beans - Advanced Yield Test - Planted May 17, 1971 - Karaj, Iran

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(15)	(16)	(17)	(18)
Accession Number	S O U R C E	Flower Color	Plant Type	Plants /Meter	Stand	Vigor	Pl. to 1st Fl.	Pl. to 1st Mat.	Pl. to Com. Mat.	Disease Rating	Pod Shape	Pod Size	Seed Color	Seed Shape	100 Seeds Weight	Yield per Hectare
65-071-00537	Nishabour	W	V	26	2	1	54	105	119	2	CF	M	R	R	35	1972
65-071-00721	Darehgaz	W	V	24	2	1	54	104	119	2	CF	M	R	R	22	1893
65-071-00713	Darehgaz	W	V	26	2	1	53	104	119	2	CF	M	R	R	21	1892
65-071-00536	Torbat-Heidarieh	W	V	25	1	3	43	81	101	3	CF	M	LP	R	22	1873
65-007-00292	Argentina	W	V	27	2	1	53	104	119	2	CF	M	R	R	21	1836
65-071-00734	Nishabour	W	V	25	2	1	53	104	119	2	CF	M	R	R	23	1823
65-071-00702	Torbat-Heidarieh	W	V	22	2	3	42	80	101	3	CF	M	R	OB	29	1807
65-071-00582	Naz	W	V	24	2	3	43	81	101	4	CF	M	LP	R	25	1611
65-085-00100	Lebanon	W	V	27	2	1	43	81	102	3	CF	M	R	OB	26	1239
65-071-00727	Unknown	W	V	25	2	5	43	78	100	5	CF	M	R	OB	25	1105
LSD 5%																357
CV %																18

Table 58. -- Agronomic Data - White Beans - Advanced Yield Test - Planted May 5, 1971 - Pahlavi University, Shiraz, Iran.

(1)	(2)	(6)	(8)	(14)	(15)	(17)	(18)
Accession Number	S O U R C E	Stand	Pl. to 1st Fl.	Seeds per Pod	Seed Color	100 Seeds Weight	Yield per Hectare
65-071-00899	Unknown	1	59	4	W	27	3437
65-071-00695	Isfahan	1	58	4	W	27	3318
65-071-00638	Shiraz	1	59	4	W	24	3200
65-071-00643	Shiraz	1	58	4	W	27	3154
65-071-00675	Karaj	1	59	4	W	28	3084
65-071-00671	Karaj	1	59	4	W	29	2924
65-071-00042	Marmar	1	57	4	W	28	2907
65-085-00690	Lebanon	1	58	4	W	27	2798
65-071-00212	Iran	1	54	3	W	40	2764
65-071-00674	Karaj	1	57	4	W	29	2607

Table 59. -- Agronomic Data - White Beans - Advanced Yield Test - Planted April 15, 1971 - Ministry of Agriculture, Varamin, Iran

(1) Accession Number	(2) SOURCE	(3) Flower Color	(6) Stand	(7) Vigor	(8) Pl. to 1st fl.	(14) Seeds per pod	(18) Yield per Hectare
65-071-00643	Shiraz	W	2	2	40	3	582
65-071-00671	Karaj	W	3	3	46	4	552
65-071-00042	Marmar	W	2	2	40	5	536
65-071-00699	Unknown	W	2	2	40	4	534
65-071-00674	Karaj	W	3	3	39	4	490
65-071-00695	Isfahan	W	3	3	39	3	482
65-085-00690	Lebanon	W	2	2	40	4	474
65-071-00638	Shiraz	W	2	2	40	4	454
65-071-00212	Iran	W	2	2	39	3	422
65-071-00675	Karaj	W	3	3	41	4	366

Yield differences not significant at the .05 level.
CV %

59

Table 60 . -- Agronomic Data - White Beans - Advanced Yield Test - Planted May 17, 1971, Karaj, Iran.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(15)	(16)	(17)	(18)
Accession Number	S O U R C E	Flower Color	Plant Type	Plants /Meter	Stand	Vigor	Pl.to 1st Fl.	Pl.to 1st Mat.	Pl.to Com.Mat.	Disease Rating	Pod Shape	Pod Size	Seed Color	Seed Shape	100 Seeds Weight	Yield per Hectare
65-071-00675	Karaj	W	V	24	2	4	44	80	99	4	CF	M	W	R	27	1759
65-071-00638	Shiraz	W	V	28	2	1	45	81	117	3	CF	M	W	R	22	1733
65-071-00674	Karaj	W	V	24	2	4	41	79	99	4	CF	M	W	OB	26	1575
65-071-00643	Shiraz	W	V	25	3	3	41	80	99	3	CF	M	W	OB	26	1548
65-071-00671	Karaj	W	V	23	3	3	46	82	102	3	CF	M	W	R	29	1535
65-071-00699	Iran	W	V	26	3	4	42	79	98	4	CF	M	W	OB	27	1519
65-071-00695	Isfahan	W	V	24	2	3	42	81	100	4	CF	M	W	OB	27	1500
65-071-00042	Marmar	W	V	25	2	3	42	79	98	4	CF	M	W	R	27	1464
65-071-00212	Iran	W	V	25	2	3	41	85	118	3	CF	M	W	RC	37	1462
65-085-00690	Lebanon	W	V	25	2	4	43	79	97	4	CF	M	W	R	27	1420

Yield differences not significant at .05 level.
CV % 20

Table 61. -- Agronomic Data - Pinto Beans - Uniform Advanced Yield Test - Planted May 5, 1971 - Pahlavi University, Shiraz, Iran.

(1)	(2)	(6)	(8)	(14)	(17)	(18)
Accession Number	S O U R C E	Stand	Pl. to 1st Fl.	Seeds per Pod	100 Seeds Weight	Yield per Hectare
65-157-00068	USA	1	53	4	35	2583
65-071-00446	Shad	1	54	3	47	2511
65-152-00930	Turkey	1	54	3	53	2324
65-071-00615	Ghouchan	1	54	4	42	2264
65-071-00601	Isfahan	1	53	4	40	2228
65-071-00605	Isfahan	1	55	3	43	2204
65-071-00604	Isfahan	1	55	4	44	2168
65-071-00457	Isfahan	1	55	4	40	2135
65-071-00543	Isfahan	1	55	4	43	2038
65-071-00594	Isfahan	1	52	3	37	2038

Table 62. -- Agronomic Data - Pinto Beans - Uniform Advanced Yield Test - Planted May 14, 1971 - Tabriz University, Tabriz, Iran.

(1)	(2)	(3)	(5)	(6)	(8)	(9)	(10)	(13)	(14)	(17)	(18)
Accession Number	S O U R C E	Flower Color	Plants /Meter	Stand	Pl. to 1st Fl.	Pl. to 1st Mat.	Pl. to Com. Mat.	Pod Size	Seeds per Pod	100 Seeds Weight	Yield per Hectare
65-157-00068	USA	W	17	1	52	87	136	M	4	44	1692
65-071-00615	Ghouchan	W	13	1	53	96	135	M	5	49	1507
65-153-00930	Turkey	W	16	1	54	98	140	M	4	45	1478
65-071-00605	Isfahan	W	15	1	53	95	137	M	5	46	1427
65-071-00446	Shad	W	14	2	53	97	132	M	4	48	1388
65-071-00593	Isfahan	W	16	1	53	96	139	M	5	47	1274
65-071-00604	Isfahan	W	16	1	53	96	142	M	5	46	1236
65-071-00594	Isfahan	W	13	1	53	95	138	M	4	48	1175
65-071-00601	Isfahan	W	15	1	53	95	140	M	4	46	1130
65-071-00457	Isfahan	W	13	1	54	100	142	M	5	41	1055
LSD 5%											159
CV %											9

Table 63.-- Agronomic Data - Pinto Beans - Uniform Advanced Yield Test - Planted May 17, 1971 - Karaj, Iran.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(15)	(16)	(17)	(18)
Accession Number	S O U R C E	Flower Color	Plant Type	Plants /Meter	Stand	Vigor	Pl. to 1st Fl.	Pl. to 1st Mat.	Pl. to Com.Mat.	Disease Rating	Pod Shape	Pod Size	Seed Color	Seed Shape	100 Seeds Weight	Yield per Hectare
65-157-00068	Pinto 114	W	V	26	2	3	37	68	83	3	CF	M	CrM	OC	36	1947
65-071-00446	Shad	LP	V	25	2	2	41	77	115	2	SF	M	CrM	OC	42	1343
65-153-00930	Turkey	LP	V	24	2	2	41	81	120	3	SF	M	PiM	OC	41	1123
65-071-00593	Isfahan	LP	V	24	2	3	39	79	118	3	SF	M	PiM	SC	39	953
65-071-00605	Isfahan	LP	V	23	2	3	40	79	117	4	SF	M	PiM	SG	38	937
65-071-00457	Isfahan	LP	V	22	3	2	41	80	121	2	SF	M	PiM	SG	34	897
65-071-00604	Isfahan	LP	V	23	2	3	38	80	118	3	SF	M	PiM	OG	39	883
65-071-00603	Isfahan	LP	V	23	2	3	39	80	118	3	SF	M	PiM	OG	45	864
65-071-00594	Isfahan	LP	V	22	2	3	39	79	118	4	SF	M	PiM	SG	40	840
65-071-00601	Isfahan	LP	V	25	2	3	40	78	120	3	SF	M	PiM	OG	35	795
LSD 5%																330
CV %																25

Table 64. -- Agronomic Data - Red Beans - Uniform Advanced Yield Test - Planted May 5, 1971 - Pahlavi University, Shiraz, Iran.

(1) Accession Number	(2) SOURCE	(6) Stand	(8) Pl. to 1st Fl.	(14) Seeds per Pod	(15) Seed Color	(17) 100 Seeds Weight	(18) Yield per Hectare
65-071-00744	Torbat Heidarieh	1	59	5	R	33	3620
65-071-00596	Nishabour	1	59	5	R	29	3350
65-071-00707	Darehgaz	1	60	5	R	31	3303
65-071-00538	Darehgaz	1	59	5	R	24	3290
65-071-00731	Nishabour	1	60	5	R	23	3190
65-157-00589	USA Red Kidney	1	58	5	R	24	3160
65-071-00582	Naz	1	56	4	R	38	3130
65-071-00431	Unknown	1	58	5	R	32	2980
65-071-00566	Isfahan	1	60	5	R	28	2781
65-085-00440	Lebanon	1	60	4	R	26	2701

Table 65. -- Agronomic Data - Red Beans - Uniform Yield Test - Planted May 15, 1971 - Tabriz, University, Tabriz, Iran.

(1) Accession Number	(2) SOURCE	(3) Flower Color	(5) Plants /Meter	(6) Stand	(8) Pl. to 1st Fl.	(9) Pl. to 1st Mat.	(10) Pl. to Com. Mat.	(13) Pod Size	(14) Seeds per Pod	(17) 100 Seeds Weight	(18) Yield per Hectare
65-071-00569	Nishabour	W	18	1	59	95	136	M	5	28	2413
65-071-00538	Darehgaz	W	20	1	59	96	136	M	5	27	2333
65-085-00440	Lebanon	W	17	2	55	91	133	M	5	29	2224
65-071-00731	Nishabour	W	17	1	57	91	137	M	5	31	2151
65-071-00707	Darehgaz	W	16	1	55	91	138	M	5	26	2077
65-071-00431	Unknown	W	15	1	56	90	133	M	5	30	1968
65-071-00566	Isfahan	W	16	2	52	89	134	M	4	25	1815
65-071-00744	Torbat Heidarieh	W	16	1	58	88	134	M	5	30	1789
65-071-00582	Naz	W	16	1	54	87	132	M	5	27	1512
65-157-00589	USA Red Kidney	W	13	2	52	91	139	M	5	38	1131
LSD 5%											263
CV %											11

Table 66.-- Agronomic Data - Red Beans - Uniform Advanced Yield Test - Planted April 15, 1971 - Ministry of Agriculture, Varamin, Iran.

(1) Accession Number	(2) SOURCE	(3) Flower Color	(6) Stand	(7) Vigor	(8) Pl. to 1st Fl.	(14) Seeds per pod	(18) Yield per Hectare
65-071-00744	Torbat-Heidarieh	W	2	2	41	4	1016
65-085-00440	Lebanon	W	2	2	43	4	848
65-071-00582	Naz	W	2	2	39	4	774
65-071-00731	Nishabour	W	2	2	42	3	740
65-071-00431	Unknown	W	1	1	38	4	694
65-071-00707	Darehgaz	W	2	2	42	4	662
65-157-00589	Red Kidney	W	3	3	40	4	632
65-071-00569	Nishabour	W	2	2	43	4	560
65-071-00566	Isfahan	W	3	3	40	4	556
65-071-00538	Darehgaz	W	2	2	43	4	554

Yield differences not significant at .05 level.
CV % 38

Table 67. -- Agronomic Data - Red Beans - Uniform Advanced Yield Test - Planted May 18, 1970 - Karaj, Iran

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(15)	(16)	(17)	(18)
Accession Number	S O U R C E	Flower Color	Plant Type	Plants /Meter	Stand	Vigor	Pl. to 1st Fl.	Pl. to 1st Mat.	Pl. to Com. Mat.	Disease Rating	Pod Shape	Pod Size	Seed Color	Seed Shape	100 Seeds Weight	Yield per Hectare
65-071-00569	Nishabour	W	V	25	2	1	55	103	120	2	CF	M	R	R	23	2081
65-071-00538	Darehgaz	W	V	28	2	1	58	104	120	2	CF	M	R	R	22	1916
65-071-00731	Nishabour	W	V	23	1	1	51	104	120	2	CF	M	R	R	25	1874
65-071-00451	Iran	W	V	25	2	3	42	91	102	3	CF	M	Pi	R	27	1842
65-071-00707	Darehgaz	W	V	25	2	1	48	85	104	2	CF	M	R	R	24	1782
65-085-00440	Lebanon	W	V	24	2	3	47	83	102	3	CF	M	LR	R	25	1627
65-071-00582	Nar	W	V	24	2	4	43	81	102	4	CF	M	R	R	25	1627
65-071-00566	Isfahan	W	V	28	2	3	44	82	103	3	CF	M	R	R	22	1607
65-071-00744	Torbat-Heydarieh	W	V	25	2	3	47	82	102	3	CF	M	LP	R	29	1500
65-157-00589	Red Kidney	LP	B	20	3	3	40	80	103	5	CF	M	R	RE	35	928
LSD 5%																321
CV %																15

Table 68. -- Agronomic Data - White Beans - Uniform Advanced Yield Test - Planted May 5, 1971 - Pahlavi University, Shiraz, Iran.

(1)	(2)	(6)	(8)	(14)	(15)	(17)	(18)
Accession Number	S O U R C E	Stand	Pl. to 1st Fl.	Seeds per Pod	Seed Color	100 Seeds Weight	Yield per Hectare
65-071-00042	Marmar	1	58	4	W	27	3703
65-071-00680	Kermanshah	1	58	4	W	27	3650
65-071-00040	Kermanshah	1	58	4	W	29	3586
65-157-00014	USA	1	59	4	W	28	3147
65-071-00517	Ghouchan	1	59	4	W	26	3034
65-071-00505	Shiraz	1	58	4	W	29	2980
65-153-00757	Turkey	1	56	4	W	38	2964
65-071-01948	Shiraz	1	58	4	W	29	2897
65-071-00658	Dashtsar Amol	1	55	4	W	39	2641
65-071-00515	Ghouchan	1	61	[illegible]	W	26	2631

Table 69. -- Agronomic Data - White Beans - Uniform Yield Test - Planted May 13, 1971 - Tabriz University, Tabriz, Iran.

(1)	(2)	(3)	(5)	(6)	(8)	(9)	(10)	(13)	(14)	(17)	(18)
Accession Number	S O U R C E	Flower Color	Plants /Meter	Stand	Pl.to 1st Fl.	Pl.to 1st Mat.	Pl.to Com.Mat.	Pod Size	Seeds per Pod	100 Seeds Weight	Yield per Hectare
65-071-00515	Ghouchan	W	15	2	55	99	140	M	5	24	1749
65-071-00517	Ghouchan	W	16	3	56	95	135	M	5	23	1697
65-071-00040	Kermanshah	W	14	2	56	97	135	M	4	23	1657
65-071-00608	Kermanshah	W	16	2	55	95	135	M	5	25	1655
65-071-01948	Shiraz	W	14	2	56	97	139	M	5	24	1637
65-153-00757	Turkey	W	10	3	55	97	138	M	5	37	1591
65-157-00014	USA	W	13	2	56	97	133	M	5	25	1504
65-071-00042	Marmar	W	16	2	56	97	134	M	4	31	1453
65-071-00505	Shiraz	W	14	3	55	96	135	M	5	27	1370
65-071-00658	Dashtsar Amol	W	16	2	54	106	144	M	5	46	586
LSD 5%											177
CV %											9

Table 70. -- Agronomic Data - White beans - Uniform Advanced Yield Test - Planted April 15, 1971 - Ministry of Agriculture, Varamin, Iran.

(1) Accession Number	(2) SOURCE	(3) Flower Color	(6) Stand	(7) Vigor	(8) Pl. to 1st Fl.	(14) Seeds per pod	(18) Yield per Hectare
65-071-01948	Shiraz	W	1	1	39	5	658
65-071-00517	Ghouchan	W	1	1	40	5	562
65-071-00505	Shiraz	W	2	2	39	4	644
65-153-00757	Turkey	W	1	1	39	6	598
65-071-00680	Kermanshah	W	2	2	39	4	592
65-071-00658	Dashtsar-Amol	W	2	2	38	3	508
65-071-00040	Kermanshah	W	2	2	40	4	482
65-071-00042	Marmar	W	3	3	40	4	479
65-071-00515	Ghouchan	W	2	2	39	3	476
65-157-00014	USA	W	2	2	40	4	460

Yield differences not significant at .05 level.
CV % 30

Table 71.-- Agronomic Data - White Beans - Uniform Advanced Yield Test - Planted May 17, 1971 - Karaj, Iran

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(15)	(16)	(17)	(18)
Accession Number	S O U R C E	Flower Color	Plant Type	Plants /Meter	Stand	Vigor	Pl.to 1st Fl.	Pl.to 1st Mat.	Pl.to Com.Mat.	Disease Rating	Pod Shape	Pod Size	Seed Color	Seed Shape	100 Seeds Weight	Yield per Hectare
65-071-00515	Ghochan	W	V	28	1	2	46	82	103	2	CF	M	W	OB	22	1860
65-071-00517	Ghochan	W	V	27	2	3	44	79	98	3	CF	M	W	OB	24	1779
65-071-00040	Kermanshah	W	V	28	3	2	43	76	99	3	CF	M	W	R	24	1783
65-071-00658	Dashtsar-Amol	W	V	25	2	2	40	82	113	3	CF	M	W	RC	43	1750
65-071-01948	Shiraz	W	V	26	2	1	45	80	99	4	CF	M	W	OB	26	1662
65-071-00680	Kermanshah	W	V	28	1	4	43	77	97	4	CF	M	W	OB	25	1659
65-071-00042	Marmar	W	V	26	2	4	42	77	97	3	CF	M	W	R	25	1620
65-071-00505	Shiraz	W	V	26	2	3	44	77	104	4	CF	M	W	R	28	1609
65-157-00014	U.S.A.	W	V	28	2	3	43	76	93	4	CF	M	W	OB	24	1484
65-153-00757	Turkey	W	V	26	1	3	39	76	101	4	CF	M	W	RE	40	1452
LSD 5%																361
CV %																20

Legend for Cowpea Agronomic Data Tables

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

(2) Source numbers refer to PI numbers from Plant Science Division, ARS, U.S. Department of Agriculture, Beltsville, Maryland. "C" numbers are strains obtained from Oklahoma State University Other three and four digit numbers are numbers asigned by the Iranian Ministry of Agriculture.

(3) Source indicates variety name or area of origin.

(4) Flower color: PR = Purple; W = White; WPR = Mixed White and Purple flower

(5) Plant type: E = Erect; SE = Semi-erect; B = Bushy; P = Prostrate; BP = Bushy Prostrate.

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

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

(8) Plants per meter is an average number of plants per meter of row based on one meter sample per replication.

(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.

(14) Pod shape: S = Straight; C = Curved; M = Mixture of straight and curved.

(15) Pod color: Br = Brown; 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 replication.

(18) Seed Color: Gr = Green; Cr = Cream; P = Pink; M = Milky; Bk = Black; Br = Brown; Bl = Blue; W = White; Y = Yellow ; R = Red; Pu = Purple; Sp = Spotted; D = Dark; L = Light.

(19) Eye color: Cr = Cream; P = Pink; M = Milky; Bk = Black; Br = Brown; G = Green; Bl = Blue; W = White; Y = Yellow; R = Red; Pu = Purple; D = Dark; L = Light.

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

(22) 100 seeds weight - average weight (in grams) of 100 seeds.

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

Table 72 -- Agronomic Data - Cowpeas - Preliminary Yield Test - Planted April 15, 1971 - Ministry of Agriculture, Varamin, Iran.

(1) Accession Number	(2) Source Number	(3) SOURCE	(4) Flower Color	(6) Plant Height	(7) Plant Width	(9) Stand	(10) Vigor	(11) Pl. to 1st Fl.	Pods/ Plant	(17) Seeds per Pod	(23) Yield per Hectare
62-157-00347	293505	Parastoo	W	40	55	2	2	57	15	9	2660
62-071-10003	238	Meshed	W	45	45	3	3	62	10	8	2490
62-071-01432	178	Isfahan	W	50	53	4	4	59	22	10	2218
62-157-00316	293477	California Black eye	W	55	68	4	4	63	16	8	2130
62-157-00287	293449	Bunch	W	55	65	3	3	63	10	11	2026
62-071-01446	179	Isfahan	W	60	65	3	3	59	10	8	2002
62-155-00224	250587	Egypt	W	55	45	4	4	57	12	9	1982
62-069-00070	183363	India	W	45	50	4	4	60	15	9	1886
62-153-00057	179555	Kamran	W	60	48	3	3	64	20	10	1848
62-157-00295	293458	Black Eye No. 5	W	50	40	5	5	60	16	8	1612

Yield differences not significant at .05 level.
CV %

26

Table 73. -- Agronomic Data - Cowpeas - Preliminary Yield Test - Planted May 23, 1971 - Karaj, Iran.

(1) Accession Number	(2) Source Number	(3) SOURCE	(4) Flower Color	(5) Plant Type	(6) Plant Height	(7) Plant Width	(8) Plants /Meter	(9) Stand	(10) Vigor	(11) Pl. to 1st Fl.	(12) Pl. to 1st Mat.	(13) Disease Rating	(14) Pod Shape	(15) Pod Color	(16) Pod Size	(17) Seeds per pod	(18) Seed Color	(21) Shatter	(23) Yield per Hectare
62-157-00295	293458	Black Eye No. 5	W	SE	33	33	16	3	3	56	73	4	S	LY	S	8	W	1	1611
62-157-00287	293449	Bunch	W	E	35	41	16	3	2	58	81	3	S	LBr	M	9	W	1	1265
62-157-00316	293477	Calif. Black Eye	W	SE	35	36	16	3	2	57	77	3	S	LY	M	9	W	2	1235
62-071-10003	238	Meshed	PR	E	35	41	15	3	2	60	78	3	S	LY	M	9	W	2	1207
62-071-01432	187	Isfahan	PR	SE	30	35	17	3	3	55	75	3	S	LY	S	8	W	1	1206
62-069-00070	183363	India	W	E	33	41	16	3	2	61	81	3	S	W	M	10	Cr	1	1188
62-071-01445	179	Isfahan	PR	E	37	40	20	2	2	59	77	3	S	LY	M	9	W	1	1144
62-157-00347	293505	Parastoo	W	SE	38	35	15	3	2	57	76	3	S	LY	S	8	W	1	1102
62-153-00057	179555	Kamran	W	E	35	36	18	2	1	65	85	2	S	W	M	10	Cr	1	1053
62-155-00224	250587	Egypt	PR	SE	34	29	17	3	2	57	75	4	S	W	S	9	W	2	868

Yield differences not significant at .05 level.
CV %

22

Table 74.- Agronomic Data - Cowpeas - Uniform Advanced Yield Test - Planted May 5, 1971 - Pahlavi University, Shiraz, Iran.

(1)	(2)	(3)	(6)	(7)	(9)	(11)	(17)	(22)	(23)
Accession Number	Source Number	S O U R C E	Plant Height	Plant Width	Stand	Pl. to 1st Fl.	Seeds per Pod	100 Seeds Weight	Yield per Hectare
62-157-00347	293505	Parastoo	50	45	2	64	10	25	1901
62-071-10003	238	Meshed	42	51	1	70	11	23	1878
62-071-00472	2-42-1375	Karaj	41	53	1	71	13	21	1778
62-085-00065	181833	Lebanon	36	55	1	67	12	13	1625
62-110-00234	255765	Nigeria	42	49	2	64	10	16	1548
62-153-00057	179555	Kamran	47	53	1	70	10	23	1482
62-157-00318	293480	Calara	45	55	1	64	12	16	1442
62-157-00470	6420	Princess Ann	49	47	2	56	10	20	1409
62-157-00296	293459	Blackeye No. 7	48	47	2	64	9	24	1325
62-157-00353	293513	Giant Ramshorn	61	56	2	65	8	22	1275

Table 75. -- Agronomic Data - Cowpeas - Uniform Advanced Yield Test - Planted at Tabriz University, Tabriz, Iran.

(1)	(2)	(3)	(8)	(6)	(7)	(9)	(11)	(12)	(17)	(18)	(22)	(23)
Accession Number	Source Number	S O U R C E	Plants /Meter	Plant Height	Plant Width	Stand	Pl. to 1st Fl.	Pl. to 1st Mat.	Seeds per Pod	Seed Color	100 Seeds Weight	Yield per Hectare
62-157-00347	293505	Parastoo	15	30	21	2	71	99	9	W	22	1715
62-071-00472	2-42-1375	Karaj	16	34	27	2	72	100	8	W	25	1619
62-085-00065	181833	Lebanon	14	32	23	1	75	102	7	W	13	1570
62-157-00296	293459	Black Eye No. 7	16	32	25	2	72	98	7	W	23	1565
62-071-10003	238	Meshed	14	34	27	2	71	100	9	W	21	1552
62-110-00234	255765	Nigeria	15	31	24	2	71	97	7	W	17	1536
62-153-00057	179555	Kamran	16	36	26	1	74	100	8	Cr	23	1530
62-157-00470	642 C	Princess Ann	14	31	26	2	71	100	8	W	20	1495
62-157-00353	293513	Giant Ramshorn	15	37	27	2	72	100	8	W	23	1485
62-157-00316	293480	Calara	18	32	23	2	71	98	8	W	22	1349
LSD 5%												132
CV %												6

Table 76. -- Agronomic Data - Cowpeas - Uniform Advanced Yield Test - Planted April 15, 1971 - Ministry of Agriculture, Varamin, Iran.

(1)	(2)	(3)	(4)	(6)	(7)	(9)	(10)	(11)	(17)	(23)
Accession Number	Source Number	S O U R C E	Flower Color	Plant Height	Plant Width	Stand	Vigor	Pl. to 1st Fl.	Seeds per pod	Yield per Hectare
62-071-00472	150	Karaj	W	55	53	2	2	58	8	2300
62-157-00353	293513	Giant Ramshorn	W	42	50	2	2	59	7	2114
62-085-00065	181833	Lebanon	W	30	43	4	4	57	12	2014
62-071-10003	238	Meshed	W	50	45	2	2	60	10	2008
62-157-00318	293430	Calara	W	40	40	4	4	55	11	1996
52-157-00347	293505	Parastoo	W	48	35	3	3	55	8	1822
62-153-00057	179555	Kamran	W	50	50	2	2	62	10	1790
62-157-00296		Black Eye No. 7	W	42	40	3	3	55	7	1742
62-157-00470	642 C	Princess Ann	W	50	50	3	3	57	11	1632
62-110-00234	255765	Nigeria	W	35	46	3	3	56	10	1572

Yield differences not significant at .05 level.
CV % 19

Table 77. - Agronomic Data - Cowpeas - Uniform Advanced Yield Test - Planted May 23, 1961 - RPIP Karaj, Iran.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(12)	(23)
Accession Number	Source Number	S O U R C E	Flower Color	Plant Type	Plant Height	Plant Width	Plants/ Meter	Stand	Vigor	Pl. to 1st Fl.	Pl. to 1st Mat.	Disease Rating	Pod Shape	Pod Color	Pod Size	Seeds per Pod	Seed Color	Shatter	Yield per Hectare
62-157-00347	293505	Parastoo	W	SE	45	35	16	2	2	56	74	3	S	LY	S	9	W	1	1059
62-071-10003	238	Meshed	PR	SE	38	38	16	3	3	57	75	2	S	LY	M	9	W	2	1035
62-071-00472	2-42-1375	Karaj	W	E	40	41	14	2	3	58	79	2	S	LY	M	10	W	1	1033
62-153-00057	179555	Kamran	W	SE	39	44	13	2	2	62	82	2	S	W	M	11	Cr	1	998
62-110-00234	255765	Nigeria	PR	SE	32	39	16	3	3	54	72	2	S	LY	S	8	W	2	953
62-085-00065	181833	Lebanon	PR	B	22	35	17	3	2	61	78	3	S	LY	M	10	Cr	1	933
62-157-00353	293513	Giant Ramshorn	W	E	50	38	13	3	2	58	77	2	S	LY	M	10	W	1	905
62-157-00318	293480	Calara	PR	SE	31	39	19	3	3	54	71	2	S	LY	M	9	W	1	891
62-157-00296	293459	Black Eye No. 7	PR	E	41	33	14	3	2	55	75	2	S	LY	S	11	W	1	881
62-157-00470	642 C	Princess Ann	PR	SE	38	35	14	3	3	57	74	3	S	LBr	M	10	W	2	644

Yield differences not significant at .05 level
CV %

28

Legend for Mungbean Agronomic Data Tables

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

(2) Three digit numbers are Iranian Ministry of Agriculture numbers, six digit numbers refer to PI numbers from Plant Science Division, ARS, U.S. Department of Agriculture, Beltsville, Maryland, USA.

(3) Indicates variety name or area of origin.

(4) E = Erect; B = Bushy; P = Prostrate; SP = Semi-prostrate.

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

(6) Number of plants per meter of row, based on one meter sample per replication.

(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 open 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) Pod Size: S = Small; M = Medium; L = Large.

(13) Average number of seeds per 10 pods based on ten pods/replication.

(14) Average weight (in grams) of 1000 seeds.

(15) Yield in kilograms based on 5 m^2 or 10m^2 plots.

Table 78. -- Agronomic Data - Mungbeans - Preliminary Yield Test - Planted June 2, 1971 - RPIP Karaj, Iran.

(1) Accession Number	(2) Source Number	(3) SOURCE	(4) Plant Type	(7) Stand	(8) Vigor	(9) Pl. to 1st Fl.	(10) Pl. to 1st Mat.	(11) Disease Rating	(12) Pod Size	(13) Seeds per 10 Pods	(14) 100 Seeds Weight	(15) Yield per Hectare
48-071-10961	210	Sari	SE	2	1	57	77	1	L	112	54	1016
48-071-10293	218	Zahedan	B	2	1	67	87	2	L	96	47	1003
48-071-10865	218	Zahedan	B	2	1	62	79	1	L	116	49	968
48-071-10539	217	Kermanshah	E	2	1	58	79	1	M	110	47	907
48-071-10827	224	Darehgaz	B	2	1	57	76	1	L	106	48	894
48-071-10913	215	Karaj	E	2	2	65	82	2	S	104	35	892
48-071-10829	224	Darehgaz	B	3	1	57	76	1	L	108	63	879
48-071-11167		Iran	SE	2	2	61	81	2	S	100	39	873
48-071-10429	214	Isfahan	E	1	1	58	78	2	S	102	32	870
48-071-10421	214	Isfahan	SE	2	2	66	88	2	S	104	31	866
48-071-10681	223	Isfahan	E	2	1	64	77	1	L	112	43	855
48-071-10414	216	Jiroft	B	2	2	63	84	2	L	114	57	850
48-071-10808	224	Darehgaz	E	2	1	65	83	1	M	102	52	837
48-069-11007		Dezful		2	1	69	89	2	L	114	51	830
48-071-10288	215	Karaj		2	1	63	80	1	L	118	52	825
48-071-10960	211	Nosratabad		1	1	60	80	2	M	106	45	805
48-071-10707	222	Sari		2	1	57	76	1	L	108	63	800
48-071-10862	218	Zahedan		2	2	64	80	2	M	106	38	795
48-071-11168		Iran		1	1	60	80	1	L	100	63	785
48-071-10677	223	Isfahan		1	1	63	82	1	M	112	49	779
48-071-10962	184	Shiraz		2	2	54	73	1	M	108	44	762
48-071-10957	223	Isfahan		2	2	59	78	2	L	104	45	753
48-157-11087		USA Berken		2	1	60	77	2	M	112	62	742
48-071-10523	217	Kermanshah		1	2	62	83	2	S	104	27	725
48-157-11085	M 1	USA Kiloga		2	2	61	80	2	M	98	44	717

Table 79. -- Agronomic Data - Mungbeans - Advanced Yield Test - Planted May 5, 1971 - Pahlavi University, Shiraz, Iran.

(1)	(2)	(3)	(5)	(7)	(9)	(13)	(14)	(15)
Accession Number	Source Number	S O U R C E	Plant Height	Stand	Pl. to 1st Fl.	Seeds per 10 Pods	1000 Seeds Weight	Yield per Hectare
48-071-10783	226	Karaj	46	1	65	80	45	1672
48-071-10865	218	Zahedan	51	1	67	106	53	1568
48-071-10926	215	Karaj	43	1	65	105	44	1523
48-071-11089	15279	Kerman	49	1	66	108	45	1452
48-071-10810	224	Darehgaz	52	1	67	113	41	1434
48-157-11085	M 1	USA Kiloga	49	1	66	113	50	1412
48-071-10855	218	Zahedan	45	1	66	90	50	1400
48-071-10757	226	Karaj	40	2	65	97	45	1364
48-071-10283	215	Karaj	52	1	66	114	42	1159
48-071-10292	215	Karaj	58	1	67	111	43	1114

Table 80. - Agronomic Data - Mungbeans - Advanced Yield Test - Planted April 15, 1971 - Ministry of Agriculture, Varamin, Iran.

(1)	(2)	(3)	(5)	(7)	(8)	(9)	(13)	(15)
Accession Number	Source Number	S O U R C E	Plant Height	Stand	Vigor	Pl. to 1st Fl.	Seeds per 10 Pods	Yield per Hectare
48-071-10926	215	Karaj	60	3	3	56	96	1790
48-071-11089	15279	Kerman	45	3	3	56	90	1680
48-071-10855	218	Zahedan	40	3	3	57	76	1600
48-071-10292	215	Karaj	55	3	3	60	116	1520
48-071-10783	226	Karaj	50	3	3	59	80	1460
48-071-10283	215	Karaj	45	3	3	57	112	1376
48-071-10757	226	Karaj	43	4	4	55	112	1366
48-157-11085	M 1	USA Kiloga	50	5	5	60	100	1270
48-071-10810	224	Darehgaz	45	3	3	58	120	1048
48-071-10865	218	Zahedan	38	5	5	58	100	960
LSD 5%								548
CV %								31

Table 81. -- Agronomic Data - Mungbeans - Advanced Yield Test - Planted June 2, 1971 - RPIP Karaj, Iran.

(1) Accession Number	(2) Source Number	(3) SOURCE	(4) Plant Type	(7) Stand	(8) Vigor	(9) Pl.to 1st Fl.	(10) Pl.to 1st Mat.	(11) Disease Rating	(12) Pod Size	(13) Seeds per 10 Pods	(14) 100 Seeds Weight	(15) Yield per Hectare
48-071-10855	218	Zahedan	E	2	2	61	84	1	M	119	51	1146
48-071-11089	15279	Kerman	SE	1	2	60	79	1	M	98	44	1125
48-071-10292	215	Karaj	E	2	2	63	83	2	M	108	43	1070
48-071-10783	226	Karaj	SE	1	2	61	80	1	L	114	50	1034
48-071-10810	224	Darehgaz	E	1	1	63	84	1	M	100	44	1030
48-071-10926	215	Karaj	SE	1	2	62	81	1	L	102	42	952
48-157-11085	M 1	USA Kiloga	SE	2	2	63	87	1	L	114	55	941
48-071-10757	226	Karaj	B	2	2	56	84	1	M	112	42	935
48-071-10283	215	Karaj	E	2	2	60	80	1	M	104	47	913
48-071-10865	218	Zahedan	E	2	2	63	85	1	M	76	58	818

Table 82. -- Agronomic Data - Mungbeans Uniform Advanced Yield Test - Planted May 5, 1971 - Pahlavi University, Shiraz, Iran.

(1)	(2)	(3)	(5)	(7)	(9)	(13)	(14)	(15)
Accession Number	Source Number	S O U R C E	Plant Height	Stand	Pl. to 1st Fl.	Seeds per 10 Pods	1000 Seeds Weight	Yield per Hectare
48-069-10104	212908	India	49	1	67	12	41	1625
48-071-10282	215	Karaj	45	1	67	12	43	1452
48-157-10307	31287	Partow	44	1	66	12	43	1434
48-157-11156	921 V	USA	46	1	66	10	49	1425
48-157-11155	906 V	USA	38	2	66	12	41	1407
48-071-10293	218	Zahedan	45	1	67	11	51	1372
48-069-10075	183136	Gohar	31	3	65	10	68	1352
48-033-10045	171435	China	44	1	65	12	49	1304
48-157-11153	903 V	USA	45	1	67	12	46	1297
48-157-10023	31728	Beltsville	50	1	67	11	51	1209

Table 83. -- Agronomic Data - Mungbeans - Uniform Advanced Yield Test - Planted April 15, 1971 - Ministry of Agriculture, Varamin, Iran.

(1) Accession Number	(2) Source Number	(3) SOURCE	(5) Plant Height	(7) Stand	(8) Vigor	(9) Pl. to 1st Fl.	(13) Seeds per 10 Pods	(15) Yield per Hectare
48-069-10104	212098	India	35	5	5	58	108	1340
48-157-10023	31728	Beltsville	48	4	4	58	132	1250
48-157-10307	31287	Partow	40	4	4	55	112	1154
48-069-10075	183136	Gohar	25	6	6	56	94	1138
48-157-11155	906 V	USA	40	5	5	57	94	1122
48-033-10045	171435	China	70	5	5	54	112	1064
48-157-11157	921 V	USA	54	5	5	61	94	1036
48-158-11153	903 V	USA	50	5	5	61	98	930
48-071-10293	218	Zahedan	45	5	5	58	96	806
48-071-10382	215	Karaj	45	3	3	57	116	716

Yield differences not significant at .05 level.
CV %

Table 84-- Agronomic Data - Mungbeans - Uniform Advanced Yield Test - Planted June 2, 1971 - RPIP Karaj, Iran.

(1)	(2)	(3)	(4)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Accession Number	Source Number	S O U R C E	Plant Type	Stand	Vigor	Pl.to 1st Fl.	Pl.to 1st Mat.	Disease Rating	Pod Size	Seeds per 10 Pods	1000 Seeds Weight	Yield per Hectare
48-157-11153	903 V	USA	SE	2	1	63	86	2	L	116	53	1168
48-157-11155	906 V	USA	E	1	1	58	80	1	L	114	43	1159
48-157-10023	31728	Beltsville	B	2	1	61	82	1	M	114	53	1142
48-071-10293	218	Zahedan	E	1	1	61	83	1	L	104	50	1134
48-071-10282	215	Karaj	E	1	1	60	79	1	M	112	43	1130
48-033-10045	171435	China	SE	1	1	55	79	1	M	98	48	1065
48-157-11156	921 V	USA	SE	2	2	66	86	2	L	96	46	995
48-069-10104	212908	India	SE	2	2	57	78	2	M	118	44	911
48-069-10075	183136	Gohar	B	2	1	56	79	1	L	104	63	866
48-157-10307	31287	Partow	E	2	1	56	79	1	L	112	47	844

SOIL AND CROP MANAGEMENT

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Plant Population Density

A range of plant population densities for lentils was obtained by varying spacing between plants within the row and by placing one or two rows on 50-cm wide beds. With two rows per bed, the rows on each bed were spaced 20 cm apart. Plants were spaced within each row so as to result in population densities ranging from 300,000 to 1,200,000 plants per hectare. The spacing pattern was attained by thinning to the desired rates.

Grain yields of lentils (Table 85) for all treatments were much lower in 1971 than in 1970. However, the treatments had the same general effect both years. Closer row spacing, with two rows per 50-cm bed, increased yields as compared with a single row per bed. The effect of row spacing was less pronounced at the lowest population density, and was not significant at the 5% level.

Spacing between plants was not significant at populations of 450,000 or more plants per hectare with one row per bed and at 600,000 or more with two rows per bed.

These data show that a population of lentils as low as 300,000 plants per hectare will result in decreased yields. Also, higher yields of lentils can be obtained by spacing the rows less than 50 cm. apart. However, for dry beans, chickpeas, and cowpeas, previous tests showed no yield increase from planting more than one row on 50-cm beds.

Irrigation and Plant Population Density

A split-plot test involving frequency of irrigation and plant population density was conducted with chickpeas and cowpeas. The irrigation treatments were started following two blanket irrigations given to obtain plant emergence. Each irrigation was continued until the soil became moist across the whole bed, which indicated that the soil moisture content reached field capacity in the root zone following each irrigation.

Table 85. -- Influence of spacing between rows and plants within the row on grain yield of lentils at Karaj.

Plants/m of row	Plants per hectare	Grain yield, tons/ha		
		1970	1971	Mean
	One row per bed			
15	300,000	2.15 d 1/	0.83 a	1.49 d
22.5	450,000	2.47 bc	1.13 ab	1.80 bc
30	600,000	2.80 b	1.10 abc	1.95 b
37.5	750,000	2.48 bc	1.21 ab	1.85 bc
	Two rows per bed			
7.5	300,000	2.27 cd	0.97 c	1.62 cd
15	600,000	3.16 a	1.24 ab	2.50 a
22.5	900,000	3.15 a	1.36 a	2.26 a
30	1,200,000	3.27 a	1.34 a	2.31 a

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

The yields of neither chickpeas or cowpeas were significantly effected by irrigating at 6-, 9-, or 12-day intervals (Table 86). Irrigating at 12-day intervals tended to result in lower yields than irrigating at the shorter intervals. This trend was obtained in previous years also.

No significant yield increase resulted from plant populations greater than 300,000 plants per hectare. These results were also in agreement with those obtained previously There were no significant interactions between irrigation frequency and plant population density.

Irrigation Frequency and Level

The treatments consisted of irrigating dry beans at intervals of 6, 9, and 12 days, with specific amounts of water applied. A specific quantity of water was applied to each plot at each irrigation, representing 3 levels of irrigation for each irrigation frequency. Based on previous soil moisture data, these levels were calculated to equal the amount of water required to restore soil moisture in the root zone to 100, 80, and 60 percent of field capacity. The amounts applied at each irrigation ranged from 3 cm for the 6-day frequency to 10 cm for the 12-day. During the 72-day irrigation season, 60, 48, and 36 cm of water were applied at each irrigation frequency. It was estimated that the 60-cm level raised the moisture content to field capacity at each irrigation. The plots were established with closed-end furrows of zero grade. The amount of water required for each plot at each irrigation was measured by means of siphons set at specific heads for specific periods of time.

Yields of dry beans were depressed by extending the intervals between irrigations and by reducing the amount of water applied at each irrigation (Table 87). Results for 1970 are given for comparison. Irrigating at the 60-cm per season level at 9- and 12-day intervals did not maintain yield as well in 1971 as in 1970. Yields were reduced to the greatest extent by extending the interval between irrigations to 9 or 12 days and reducing the amount of water applied at teach irrigation to a level below that required to restore soil moisture to approximately field capacity. These data indicate that, with a limited supply of water, it would be advantageous from a yield standpoint to apply moderate amounts of water at short intervals of time than to apply large amounts at long intervals.

Table 86. -- Influence of irrigation frequency and plant population density on grain yield of chickpeas and cowpeas at Karaj.

Irrigation frequency (days)	Plants per hectare 1/	Grain yield, tons/ha	
		Chickpeas	Cowpeas
6	200,000	1.29 b 2/	1.07 b
	300,000	1.74 a	1.28 ab
	400,000	1.77 a	1.36 a
	500,000	1.95 a	1.30 ab
Mean		1.69	1.25
9	200,000	1.04 b	1.16 b
	300,000	1.54 a	1.52 a
	400,000	1.65 a	1.43 a
	500,000	1.71 a	1.51 a
Mean		1.48	1.40
12	200,000	0.97 b	1.11 a
	300,000	1.36 a	1.32 a
	400,000	1.62 a	1.15 a
	500,000	1.53 a	1.12 a
Mean		1.37	1.18

1/ Planted in rows apaced 50 cm apart.

2/ Figures within a column for each irrigation treatment followed by the same letter are not significantly different at the 5% level.

Table 87. -- Influence of frequency of irrigation and the quantity of water applied at each irrigation on the grain yield of dry beans at Karaj.

Irrigation frequency (days)	Number of Irrigations 1/	Water applied (cm)		Grain yield, tons/ha		
		Each irrigation	Season Total	1970	1971	Mean
6	12	5.0	60	1.63 a 2/	1.66 a	1.65 a
		4.0	48	1.24 abc	1.09 bc	1.17 bc
		3.0	36	0.70 de	0.69 d	0.70 de
9	8	7.5	60	1.57 ab	1.18 b	1.38 ab
		6.0	48	0.64 e	0.80 cd	0.72 de
		4.0	36	0.55 e	0.61 d	0.58 e
12	6	10.0	60	1.15 bcd	0.76 cd	0.96 cd
		8.0	48	0.57 e	0.68 d	0.63 de
		6.0	36	0.44 e	0.52 d	0.48 e

1/ Irrigation treatments were started following establishment of stand with two blanket irrigations.

2/ Figures within a column followed by the same letter are not significantly different at the 5% level.

PLANT PATHOLOGY

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SUMMARY

The biology of two viruses, bean yellow mosaic (BYMV) and pea leaf roll (PLRV), affecting broadbeans (Vicia faba) was studied under field conditions in Southwestern Iran. In field trials with 20 broadbean types, BYMV was transmitted in less than 1% of the seeds, but was subsequently spread by aphids to 4-34% of the plants in 15 weeks to 93-100% after 22 weeks. Incidence of BYMV in all lines at harvest, 31 weeks after planting, was over 99%, while that of PLRV was less than 5%. Seed transmission of BYMV ranged from 0.1 - 2.4% in 45 of 56 broadbean lines from 14 countries included in replicated yield trials. There was no transmission of PLRV in seed of inoculated or naturally infected broadbean plants. Seed transmission of BYMV in farmers' broadbean plantings in Southwestern Iran was usually less than 0.3%, but most plants were virus-infected at maturity and annual production was reduced by 20% or more. In nature, broadbeans were colonized by several aphid species which were vectors of both viruses. BYMV was stylet-borne by Aphis craccivora, A. fabae, Acyrthosiphon pisum, A. sesbaniae, and Myzus persicae. PLRV was transmitted by all aphid species in a circulative manner. Various annual and perennial legumes were alternate and overwintering hosts of BYMV and PLRV and their aphid vectors.

Isolates of Ascochyta rabiei from diseased chickpea (Cicer arietinum) from India, Iran, Turkey, and West Pakistan varied greatly in growth rate, sporulation and colony appearance. Maximum spore production on various nutrient media occurred with 8% chickpea seed meal agar (CSMA), while mycelial growth was usually greatest on CSMA or oatmeal agar. The optimum temperature for growth and sporulation was 20 C or less. Exposure to continuous light on potato-dextrose agar increased mycelial growth rates and conidial production, while zonation occurred in most isolates exposed to alternating light and dark periods. Wavelengths of light in the near-ultraviolet and blue regions of the electromagnetic spectrum were responsible for

increased growth and sporulation. In inoculation studies, A. rabiei infected bean, chickpea, and cowpea, but was highly pathogenic only to chickpea. Of numerous chickpea lines tested, only one black-seeded type was highly resistant to most isolates of the pathogen. On dried chickpea stem pieces, pycnidial formation occurred at temperatures of 10-30 C, but developed soonest at 20 C. Pycnidia formed at 20 C in 46 hr in continuous light, 50 hr in alternating light and dark, and 68 hr in continuous dark. The fungus survived over 2 years in naturally-infected chickpea tissue at temperatures of 10-35 C, relative humidities of 0-30%, and on the soil surface. Ascochyta lost its viability rapidly at 65-100% relative humidity and at soil depths of 10-40 cm. With Ascochyta-infected chickpea seed, emergence was greatly increased and disease development reduced by treatment of seed with some fungicides, especially Thiabendazole and Benlate. Treatment of disease-free chickpea seed with various fungicides did not protect the foliage from subsequent infection by the pathogen.

Pea leaf roll virus is not mechanically transmitted in juice from virus-infected plants to healthy test plants. The virus, whose host range is restricted to the Leguminosae, is transmitted by several aphid species in a circulative (persistent) manner. Aphid vectors of PLRV in Iran were Aphis craccivora, A. fabae, A. gossypii, Acyrthosiphon pisum, A. sesbaniae, and Myzus persicae. The virus is also transmitted by grafting, but not by dodder (Cuscuta app.) or in seed from PLRV-infected plants. PLRV is widely distributed in all major pulse producing regions of Iran infecting all food legumes cultivated except mungbeans. Yields of food legumes infected with the virus are drastically reduced and mortality high, especially with plants infected in the seedling stage. The incidence of PLRV is greatly affected by the date of planting.

Annual and perennial plants were found to be important alternate and overwintering hosts of several viruses affecting pulses in Iran. The natural host range of seven pulse viruses included plants from 39 genera and 15 families. Cucumber mosaic virus had the largest host range affecting plants in 33 genera from 14 families.

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Broadbeans (Vicia faba)

Studies on the field biology of the two most important viruses affecting broadbeans in Khuzestan Province (Southwestern Iran), bean yellow mosaic (BYMV) and pea leaf roll (PLRV), were continued at the Khuzestan Water and Power Authority's Agricultural Experiment Station at Safiabad.

Seed transmission and spread of BYMV in nature. -- Seed transmission and subsequent spread of BYMV was recorded in 20 broadbean lines included in a replicated yield trial at Safiabad. All lines were grown the previous year at the same location and had become heavily infected with BYMV by harvest time. Seed transmission occurred in 60% of the lines, ranging from 0.1 to 0.9% (Table 88). Spread of BYMV increased from 4 to 34% at 15 weeks to 93 to 100% after 22 weeks. By harvest time (31 weeks) all plants were infected with BYMV. The incidence of PLRV was less than 5%. Aphids encountered most frequently in the broadbean trials were Aphis craccivora and Acyrthosiphon sesbaniae, both efficient vectors of BYMV and PLRV.

Seed transmission of BYMV in 56 broadbean lines. -- Broadbean seed of 56 lines from 14 countries was grown in replicated yield trials at Safiabad in 1967 and 1968. In both years the incidence of BYMV at harvest time was over 95%. In 1969 a survey was made of the trial for the occurrence of seed transmission of BYMV. The virus was seed-borne in 80% of the lines (Table 89). Seed transmission of 0.1 to 0.5% occurred in 32 of the 56 lines. The incidence of seed-borne infection exceeded 2% in only 1 line (Table 89). By harvest time, over 95% of the plants were virus infected. No seed transmission of PLRV was observed, and at harvest less than 4% of the plants were infected with this virus.

Effect of natural infection by BYMV and PLRV on yield of broadbean and subsequent seed transmission. -- In a 5 ha planting of Algerian broadbean at Safiabad, plants infected singly with BYMV and PLRV were tagged at three stages of growth: seedling, flowering, and pod set. The planting was seeded in October, 1970 and harvested the following May. There was less than 0.3% transmission of BYMV in this seed lot. Data on number of pods and seeds, and on seed weight were recorded from tagged plants in May, 1971. Largest yield reductions with both viruses occurred in plants infected in the seedling stage (Table 90). Yield of plants infected with PLRV were reduced by 80 to 100%, and those with BYMV by 0 to 36% (Table 90). Since no virus-free plants were found at the end of the trial, yield comparisons were made with the BYMV pod set series which had the highest yield.

Seed from infected plants was planted in the greenhouse. Transmission of BYMV occurred in seed of broadbean plants infected naturally at different stages of growth. Transmission ranged from 0.17% at pod set to 0.4% at flowering (Table 90). PLRV was not transmitted in seed of infected plants.

Aphid vectors of BYMV and PLRV. -- Aphid species collected from healthy and diseased broadbeans in Iran were Aphis craccivora, A. fabae, Acyrthosiphon pisum, A. sesbaniae, and Myzus persicae. All aphid species transmitted BYMV in a stylet-borne manner, acquiring and transmitting the virus in brief

feeding periods of less than 1 min (Table 91). Transmission of BYMV ranged from 70% with Aphis fabae to 20% with Acyrthosiphon pisum and A. sesbaniae (Table 91).

PLRV was transmitted by aphid species in a circulative manner (Table 91). However, in several transmission trials using single aphids, M. persicae failed to transmit the virus. With groups of 10 aphids, there was less than 3% transmission of PLRV. Aphids needed longer feeding periods (1-3 hr) on PLRV-infected plants to acquire the virus. Aphis craccivora was the most efficient vector of PLRV, with 71.4% of the aphids transmitting the virus.

Alternate hosts of BYMV and PLRV. -- In the broadbean growing region of Southwestern Iran only annual and perennial legumes were found to be infected with BYMV and PLRV in nature (Table 92). Many of these alternate hosts were also important reservoirs of aphid species that were vectors of both viruses. Aphid migrations from surrounding crops into broadbean fields shortly after seeding accounted for the rapid spread of BYMV from seed-borne infected seedlings to plants within and adjacent to broadbean plantings. Although several food, forage, and non-economic legumes were naturally infected by PLRV in Khuzestan Province, the most important and widely cultivated alternate and overwintering host of the virus was alfalfa (Medicago sativa L.).

Discussion. -- Seed transmission is an important mechanism of survival and spread of BYMV in broadbeans in Southwestern Iran. Although alternate hosts contribute to the spread of BYMV into broadbean fields, the most important initial source of the virus in broadbean plantings appears to be infected seed. BYMV was not seed-borne in other pulse crops cultivated in Iran. With PLRV which is not seed-transmitted, alternate hosts are essential in perpetuating the virus from one broadbean crop to another. In all areas of Iran where PLRV affects food legumes, alfalfa was found to be the major perennial overwintering host of the virus and several of it's aphid vectors.

It is not known whether different strains of PLRV occur in Iran. The isolates of PLRV affecting broadbeans in Southwestern Iran appear to be more virulent than those infecting V. faba in England when comparing the effects of virus infection on plant growth, yield, and mortality. Infection of broadbeans with BYMV or PLRV in the early stages of plant development drastically reduced plant vigor and productivity, with PLRV causing the largest yield reductions and highest plant mortality.

Broadbeans cultivated in Iran are colonized by different aphid species, most of which are vectors of several virus diseases affecting this crop, including BYMV and PLRV. Broadbeans and other leguminous crops and weeds in

Southwestern Iran are colonized most frequently and abundantly by Aphis craccivora which is an important vector of BYMV and PLRV. Myzus persicae was an efficient vector of BYMV but failed to transmit PLRV when single aphids were used in greenhouse transmission studies. However, when groups of 10 aphids were used, the virus was transmitted to less than 3% of the plants.

Due to economic reasons, chemical control of aphid vectors transmitting BYMV and PLRV from reservoir hosts to broadbean plantings is not feasible. To locate sources of resistance to both viruses, 110 broadbean lines from 19 countries were screened in greenhouse and field trials over a 5-year period. Although all lines tested were susceptible to both viruses, PLRV caused the greatest reduction in plant growth and mortality. In field trials at Safiabad, a few local broadbean types consistently produced larger yields than introduced lines, even though almost all plants were infected with BYMV prior to harvest. Until higher yielding, disease or insect resistant broadbean lines are found, farmers in Southwestern Iran are encouraged to cultivated the local types which are preferred by the inhabitants of this region.

Chickpeas (Cicer arietinum)

Chickpeas (Cicer arietinum) are the most important food legume grown in many pulse producing and consuming countries of the Middle East and Southeast Asia. Numerous diseases affect Cicer in this region of the world. In areas where rainfall and/or high humidity occur during part of the growing season Ascochyta blight, caused by the foliar pathogen, A. rabiei (Pass.) Lab., is a disease of major importance which is frequently responsible for large reductions in yield and reduced seed quality.

This study was undertaken to determine the effects of various nutritional and environmental factors on growth, sporulation, pathogenicity, and survival of isolates of A. rabiei from India, Iran, Turkey, and West Pakistan.

Effects of different nutrient media on growth and sporulation. -- Isolates of A. rabiei from India, Iran, Turkey, and West Pakistan varied greatly in growth rate, sporulation, and colony appearance on different solidified nutrient media (Table 93). Maximum spore production occurred on 8% chickpea seed meal agar (CSMA), whereas maximum mycelial growth usually occurred on CSMA or oatmeal agar (OMA). There was an abundant formation of orange spore masses on CSMA and OMA with little formation of aerial mycelia or black pycnidia. When the concentration of CSMA was reduced to 1%, conidial production was decreased by 67-93%. Formation of dark masses of pycnidia was common on some media, e.g. potato-dextrose agar (PDA), malt

agar, and mycological agar. Spore production was most abundant on CSMA with the Iranian isolate and least abundant with the West Pakistani isolate (Table 93). Growth rate and conidial production of all isolates were poor on several agar media tested, especially nutrient, Czapek solution, and yeast extract. In comparison with these media, spore production on CSMA was increased by 23-97 times.

Effects of temperature on growth and sporulation. -- The optimum temperature for mycelial growth and conidial production on PDA varied among the four *Ascochyta* isolates from various countries, but was always 20 C or less (Table 94). As temperatures increased above 25 C, spore production and mycelial growth decreased rapidly and ceased at 30 and 32 C, respectively. On CSMA the optimum temperature for mycelial growth and conidial formation in all isolates except West Pakistan 8 was 20 C. At 10, 15, and 20 C there was an abundant formation of orange spore masses. However, at 25 and 28 C the color of the colonies became black due to pycnidial formation and spore production dropped off rapidly (Table 94). At 30 C conidia were detected only with the Turkish isolate. No growth occurred at 32 C, even when cultures were transferred to 20 C at the end of an experiment.

Responses to light. -- Light had striking effects on growth and sporulation of various isolates of *A. rabiei*. On PDA and CSMA mycelial growth was always greater in cultures exposed to continuous light than continuous dark (Table 95). On PDA exposure to light increased spore production in all isolates by 2-11 times and stimulated mycelial growth. The effects of light on conidial production were greatest with the Iranian isolate and least with the West Pakistani isolate. On CSMA continuous light increased spore formation in two of four isolates studied, but the differences were less than those with PDA (Table 95).

Effect of alternating light and dark periods on zonation. -- When grown on an alternating schedule of 12-hr dark - 12-hr light at 1000 ft-c on PDA, zonation occurred in most isolates of *A. rabiei* tested (Table 96). Zonation was more pronounced in some isolates, especially Iranian isolate 4 from Gorgan. Little or no zonation was evident on CSMA in alternating light and dark periods. Zonation was absent in cultures grown in continuous light or continuous dark. Spore production in diurnal cycles of light/dark was always greater than continuous dark, but was often less than cultures grown in continuous light (Table 96).

Effect of different wavelengths of light on growth and sporulation. -- Exposure of cultures to wavelengths in the near-ultraviolet and blue regions of the electromagnetic spectrum increased the rate of mycelial growth, pycnidial formation, and spore production of all isolates of *A. rabiei*

(Table 97). The largest increase in conidial production (11.3 times) at 50-70 ft-c occurred with the Turkish isolate, and the smallest (2.1 times) with the Indian isolate (Table 97). With some isolates, mycelial growth and spore production were greater in cultures exposed to continuous white light at an intensity of 1000 ft-c than at lower light intensities.

Pathogenicity studies. -- Various test plants, including all food legumes cultivated in Iran, were inoculated with a heavy spore suspension of four Iranian isolates of A. rabiei. Cowpea and bean were the only plants besides chickpea that became infected. Small reddish-brown spots developed on the stems, petioles, and leaves of cowpea and on leaves of bean, but the lesions did not increase in size. Numerous lesions developed within 5-8 days of inoculation on all foliar parts of inoculated chickpeas. Pycnidia developed abundantly in lesions on stems, petioles, leaves, and pods. Lesions increased in size and eventually girdled the stems resulting in death of all inoculated plants. No symptoms developed on noninoculated plants.

Different chickpea lines were inoculated with various isolates of A. rabiei to observe whether there were any differences in pathogenicity between isolates of the fungus and whether any chickpea lines were resistant to infection. There did not appear to be any significant differences in pathogenicity of isolates to white-seeded lines which were generally more susceptible to infection by Ascochyta. However, one black-seeded chickpea line from Israel was highly resistant to most isolates of A. rabiei, although this line was less resistant to some isolates from West Pakistan, indicating that there may be different strains of the pathogen.

Effect of temperature on pycnidial formation. -- Propylene-oxide sterilized chickpea stem pieces were infested with a heavy spore suspension of an Iranian isolate of A. rabiei and plated on WA at different temperatures. In continuous dark, mature pycnidia formed in 68 hr at 20 C, 78 hr at 25 C, 96 hr at 15 C, and 120 hr at 10 and 28 C. Pycnidia occasionally developed after 10 days at 30 C. There was no mycelial growth or pycnidial formation at 32 C. Mature pycnidia formed in 46 hr at 20 C when incubated in continuous light (500 ft-c) and within 50 hr at a 12-hr alternating light and dark sequence.

Survival of the fungus. -- The effect of temperature, relative humidity, and soil on survival of A. rabiei in naturally-infected stem and pod tissue from Iran was observed over a 2-year period. The pathogen survived 115 weeks at temperatures of 20 and 35 C and was still viable after 136 weeks at 10, 15, 30 C, and in a weather station shelter which was exposed to daily fluctuations in temperature and humidity. At relative humidities of 0-30%

the fungus was viable after 128 weeks. However, at relative humidities of 65, 85, 95, and 100% the fungus survived only 18, 8, 5, and 2 weeks, respectively. Ascochyta lost its viability within 8 weeks at soil depths of 10-40 cm, but remained alive for more than 100 weeks on the soil surface.

Control of seed infection with fungicides. -- Chickpea seeds of a white-seeded line susceptible to A. rabiei were inoculated with a heavy spore suspension of four Iranian isolates of the pathogen. Inoculated seeds were treated with 18 fungicides prior to planting in pasteurized soil in the greenhouse.

Emergence of seedlings in many treatments was greatly reduced due to pre-emergence damping-off by A. rabiei. At times several lesions formed on the hypocotyls and foliage of germinated seedlings and often resulted in death of the infected plants. In the inoculated control, seedling emergence was reduced by 54%, and 94% of the surviving plants were infected (Table 98). Most seedlings which survived in the inoculated control series were stunted and chlorotic. However, over 90% of the plants emerged and were healthy in seed treated with Thiabendazole and Benlate, both systemic fungicides. Only a few plants utilizing these fungicides were infected and the number and size of the lesions were restricted.

Effect of treatment of healthy chickpea seeds with fungicides on control of foliar infection by A. rabiei. -- Disease-free seeds of a white-seeded chickpea line susceptible to A. rabiei were treated with six fungicides at three dosage rates per fungicide. Plants were inoculated with a heavy spore suspension of four Iranian isolates of A. rabiei 3-4 weeks after seeding when the plants were 10-15 cm tall. None of the seed treatment fungicides appeared to protect the foliage from subsequent infection, even though several of the fungicides tested were systemics (Table 99). Disease development in all the inoculated series was extensive and mortality high.

Discussion. -- All isolates of A. rabiei from India, Iran, Turkey, and West Pakistan sporulated most abundantly on WA which contained 5-8% crushed chickpea seed. Heavy sporulation occurred when WA was supplemented with chickpea seed from different lines, even resistant types. In a chickpea breeding program where numerous lines are screened for resistance to A. rabiei large quantities of inoculum are needed in greenhouse and field inoculation tests. The use of CSMA in such a program offers several advantages, such as abundant sporulation in a short period of time with many isolates of the pathogen on a medium that can be prepared easily from various sources of chickpea seed.

In Iran, A. rabiei survived over two years in naturally-infected chickpea tissue at various temperatures up to 35 C, relative humidities of 30% or

less, and on the soil surface. Cultures of the pathogen isolated from these tissues after two years were still highly pathogenic to susceptible chickpea lines. Various investigators have indicated the importance of chickpea debris in survival of the pathogen and as a source of infection to subsequent chickpea plantings. However, in Iran the fungus was killed rapidly when infested debris was buried in the soil. Some Ascochyta spp. produce chlamydospores which are resistant structures important in survival. Isolates of A. rabiei from various countries did not form chlamydospores in culture or infected tissue nor were perithecia of the perfect stage (Mycosphaerella rabiei) observed. In Iran, A. rabiei survived in diseased chickpea tissue and seeds as mycelium and/or pycnidia.

Pea Leaf Roll Virus

Numerous diseases affect pulse crops in Iran. In the drier areas of the country virus diseases are an important factor contributing to annual reductions in yield and quality of pulses. One of the viruses affecting most food legumes in all major pulse growing regions of Iran is pea leaf roll (PLRV). This virus has been reported to affect different leguminous crops in Europe, Iran, and New Zealand. Subterranean clover stunt virus which affects Trifolium subteranneum L. and beans in Australia, appears to be closely related to PLRV, if not the same virus.

Virus transmission. -- Various leguminous plants infected with PLRV were ground with a mortar and pestle in 0.01 M phosphate buffer, pH 7.0 and rubbed on Carborundum-dusted leaves of different test plants in the greenhouse (Table 100). No symptoms of PLRV developed on any of the inoculated indicator plants (Table 100), although repeated attempts were made to transmit the virus using various inoculation techniques at different times of the year.

Different species of aphids which colonized pulse crops in nature were used in virus transmission studies with PLRV. Aphids were fed on virus-infected plants in cages in the greenhouse or field for various periods of time before being transferred to healthy indicator plants (Table 100), for a 72-hr inoculation feeding period. Aphids in different stages of development acquired PLRV in 1-3 hr and transmitted the virus through molts, often for the entire life span of the vector. Only plants in the Leguminosae were infected by PLRV (Table 100). Aphid vectors of PLRV in Iran were Aphis craccivora, A. fabae, A. gossypii, Acyrthosiphon pisum, and A. sesbaniae. Myzus persicae occasionally transmitted PLRV, if groups of 10 or more aphids from PLRV-infected plants were fed on individual healthy test plants. PLRV was also transmitted by grafting, but not by dodder (Cuscuta spp.) or in seed from PLRV-infected legumes.

Virus symptoms. -- In Iran, PLRV infected the following food legumes: beans, broadbeans, chickpeas, cowpeas, lentils, and peas. Plants infected with PLRV were usually severely stunted, especially if infection occurred in the early stages of plant development. There was often a proliferation of the axillary buds and a shortening of the internodes. At times there was a twisting, thickening, and rolling of leaves which developed after infection. Chlorosis did not always develop in plants infected with PLRV, but was generally present in diseased broadbeans, chickpeas, lentils, and peas. Flowering was usually sparse and pod formation negligible. Symptoms of PLRV usually appeared within 7 to 14 days after inoculation.

Distribution of PLRV. -- Annually since 1966, disease surveys were made of legume plantings in different regions of the country. Diseased plants with symptoms of PLRV were indexed mechanically on different test plants. Non-viruliferous aphids were also fed on portions of diseased plants for 3-days before being transferred to healthy indicator plants, usually Bountiful bean, Algerian broadbean or Rondo pea. PLRV was widely distributed in all major pulse producing areas of Iran and was isolated from 14 leguminous food, forage, and weed crops (Table 101).

Effect of PLRV on yields. -- Beans, broadbeans, chickpeas, lentils, and peas were inoculated with PLRV in replicated field trials at two stages of plant growth, pre-bloom (3-5 weeks after planting) and full bloom (8-10 weeks after planting), by feeding viruliferous aphids on plants for 3 days. Cowpeas were tagged at both stages of growth after being infected naturally. Plots were sprayed with an insecticide at periodic intervals and were rogued of all unhealthy plants before each inoculation date. At maturity, data were recorded on number of pods and seeds and seed weight per plant. Seed yields of all food legumes were reduced at pre-bloom by 81-100% and by 19-94% at full bloom (Table 101). Largest yield reductions at both inoculation dates occurred with beans, broadbeans, chickpeas, and cowpeas. Mortality of plants infected with PLRV at pre-bloom usually exceeded 50% for most food legumes.

Effect of planting date on incidence of PLRV. -- Two bean varieties susceptible to PLRV, Red Kidney and Wade, were planted at 15 day intervals in replicated field trials at Karaj, Iran. The first of eight dates of planting was on April 17 and the last on July 31, 1971. At periodic intervals plots were surveyed for PLRV and infected plants tagged. Very little infection occurred in the early and late plantings (Table 102). The highest incidence of PLRV occurred in the fifth date of planting (June 15, 1971) when 21% and 16% of the Red Kidney and Wade bean plants were infected, respectively (Table 102).

Discussion. -- PLRV belongs to the group of plant viruses, like potato leaf roll and barley yellow dwarf, which are transmitted in a circulative (persistent) manner by their aphid vectors and are usually not sap transmitted. Most aphids which colonize pulse crops in Iran transmit PLRV, although some are very inefficient vectors, like *Myzus persicae*. In contrast to stylet-borne viruses affecting food legumes, aphid vectors of circulative viruses require longer feeding periods on an infected host to acquire PLRV, but retain the virus for extended periods even through the various molts which occur in the development of an aphid.

PLRV infects many leguminous crops grown in Iran, including all food legumes, except mungbeans. At times PLRV has been a limiting factor in the cultivation of some pulse crops in different areas of the country. On a recent field trip to Turkey, the author found PLRV affecting beans and broadbeans, indicating that PLRV is probably widely distributed in other countries of the Middle East where food legumes are cultivated. Symptoms of PLRV in some food legumes are very characteristic, but insect transmission and host range studies should be utilized in its identification because symptoms of other viruses affecting pulse crops, like curly top of beans, could be confused with those of PLRV.

Preventing the spread of PLRV in food legume crops in Iran by application of costly insecticidal sprays to control the aphid vectors of the virus was not feasible due to the low economic value of these crops. The only effective and economical method of controlling PLRV in Iran is by finding resistance to the virus through plant selection and breeding. In some pulse crops, like broadbeans, no resistance to PLRV was found in over 115 lines which were screened in the field and greenhouse. However, with dry beans, several lines in 1560 types screened in field trials at Karaj, Iran were highly resistant or immune to the virus. Additional screening of the pulse germplasm in the greenhouse and at various field locations in Iran will be required before acceptable pulse varieties containing resistance to PLRV, and preferably other diseases, can be released to the farmer. Until resistant varieties of food legumes are available, it is recommended that pulse plantings be located some distance from important reservoir hosts of the virus, especially alfalfa.

Natural Hosts of Pulse Viruses

Pulse crops cultivated in different regions of Iran are affected by several viruses which are transmitted by insect vectors, especially aphids. Disease surveys have been made annually since 1966 of pulse producing areas in Iran. Plant species growing in or adjacent to pulse plantings which

appeared to be virus infected were collected and indexed on test plants. Viruses which were isolated from diseased plants were subsequently identified by various techniques, including symptomatology, host range studies, physical property tests, vector-virus relationships, serology, and electron microscopy.

Seven viruses were identified as affecting one or more pulse crops cultivated in Iran. These viruses were alfalfa mosaic (AMV), bean common mosaic (BCMV), bean yellow mosaic (BYMV), cowpea aphid-borne mosaic (CAMV), cucumber mosaic (CMV), pea enation mosaic (PEMV), and pea leaf roll (PLRV). Annual and perennial plants in 15 families were hosts of one or more viruses affecting pulses (Table 103). CMV which had the largest host range infected plants in 33 genera from 14 families. The host ranges of several viruses, especially BCMV, CAMV, and PEMV, were restricted to one or two species of pulse crops. Some perennial plants were important overwintering hosts of these viruses and their insect vectors, e.g. Melilotus alba for BYMV and Medicago sativa for AMV and PLRV.

Table 88 . -- Seed transmission and subsequent spread of bean yellow mosaic virus in 20 lines of broadbean (*Vicia faba*) in replicated field trials in Southwestern Iran. a/

Line No.	Country Of Origin	No. Plants	No. Seed-Borne b/	% Seed Transmission	% Virus Infection (Weeks after planting)		
					15	19	22
1	Poland	903	1	0.1	20	78	100
2	England	903	0	0	15	49	100
3	West Germany	881	0	0	22	58	100
4	Italy	982	1	0.1	6	38	100
5	Spain	954	0	0	20	64	100
6	Japan	1086	1	0.1	4	28	100
7	Iran	910	3	0.3	17	43	99
8	Iran	963	0	0	9	49	100
9	Turkey	1067	3	0.3	8	39	99
10	Turkey	941	3	0.3	11	48	100
11	Iran	1085	4	0.4	21	60	100
12	Iran	875	0	0	11	30	100
13	Cyprus	826	2	0.2	6	36	100
14	Iran	950	0	0	10	44	100
15	Iran	1189	0	0	15	53	100
16	Iran	1088	4	0.4	26	73	100
17	Turkey	928	8	0.9	34	73	100
18	Iran	971	0	0	7	26	93
19	Iran	1039	4	0.4	25	74	100
20	Iran	1072	3	0.3	20	65	98

a/ Plots (4 rows wide, 5 m long with 4 replications/line) were seeded October 12, 1967 and harvested May 20, 1968.

b/ Seedlings were assessed for BYMV symptoms when plants were in the 2-4 leaf stage.

Table 89. -- Seed transmission of bean yellow mosaic virus in 56 broad-bean lines grown in yield trials in Southwestern Iran. a/

% Virus Transmission b/	No. Lines Infected	% Infection
0	11	19.6
0.1 - 0.5	32	57.1
0.6 - 1.0	10	17.9
1.1 - 1.5	2	3.6
1.6 - 2.0	0	0
2.1 - 2.5	1	1.8

a/ Replicated plots were 4 rows wide and 5 m long with 200-250 seeds/plot.

b/ Surveys for seed transmission were made when plants had 2-4 compound leaves.

Table 90 . -- Effect of natural infection by bean yellow mosaic (BYMV) and pea leaf roll (PLRV) viruses at three stages of plant development on yield of Algerian broadbean in Southwestern Iran, and subsequent observations on seed transmission of these viruses.

Virus	Stage of Plant Development	Mean Per Plant			Decrease in Seed Weight a/	% Seed Transmission b/
		No. Pods	No. Seeds	Weight (g)		
BYMV	Pod Set	12.9	32.6	35.3	----	0.17
BYMV	Flowering	10.5	28.7	27.9	20.8	0.43
BYMV	Seedling	8.8	21.9	22.6	36.0	0.25
PLRV	Pod Set	7.7	16.8	7.1	80.5	0
PLRV	Flowering	0.4	0.5	0.6	98.3	0
PLRV	Seedling	0	0	0	100	0

a/ Yield comparisons were made with BYMV at pod set as there were no virus-free plants at the time of harvest.

b/ Each figure for % seed transmission of BYMV was based on 1150 to 2000 seeds.

Table 91 . -- Transmission of bean yellow mosaic (BYMV) and pea leaf roll (PLRV) viruses by different aphid species to broadbean.

Aphid species	Transmission [a]			
	BYMV		PLRV	
	No.	%	No.	%
Aphis craccivora Koch	13/20[b]	65	65/91	71.4
A. fabae Scop.	14/20	70	25/119	21.0
Acyrthosiphon pisum (Harris)	4/20	20	50/125	40.0
A. sesbaniae David	4/20	20	78/123	63.4
Myzus persicae (Sulz.)	12/20	60	0/133	0

a/ At the termination of the acquisition feeding period, aphids were transferred to healthy broadbeans, 1 aphid/plant, for 24 hr (BYMV) or 72 hr (PLRV). With BYMV both nymphs and adult apterae were used, whereas with PLRV, only adult apterae were used.

b/ Numerator is the number of plants infected; denominator is the number of plants inoculated.

Table 92. -- Annual and perennial hosts of bean yellow mosaic (BYMV) and pea leaf roll (PLRV) viruses in Southwestern Iran.

Host	BYMV	PLRV
Cicer arietinum L.	+ a/	+
Lens esculenta Moench	+	+
Medicago hispida Gaertn.	+	+
M. lupulina L.	+	+
M. sativa L.		+
Melilotus indica (L.) All.	+	+
Phaseolus vulgaris L.	+	+
Pisum sativum L.	+	+
Vicia faba L.	+	+
Vigna sinensis (L.) Savi ex Hassk.		+

a/ + indicates recovery of the virus.

Table 93 . . -- Effects of different nutrient media on growth and sporulation of four isolates of *Ascochyta rabiei* for 16 days at 20 C.

Nutrient Media	% Media Concentration	*Ascochyta* Isolates							
		India 1		Iran 3		Turkey 7		West Pakistan 8	
		MG a/	Sp b/	MG	Sp	MG	Sp	MG	Sp
Chickpea Seed Meal	8	50	315	52	472	51	462	43	97
Chickpea Seed Meal	1	39	54	36	32	51	32	36	32
Oatmeal	7.2	49	275	62	406	54	113	42	37
Malt Extract	2.5	35	186	39	81	45	54	28	50
Lima Bean	2.3	40	122	37	98	37	60	43	62
Mycological	3.5	34	111	40	52	42	34	42	23
Potato-Dextrose	--- c/	40	115	39	27	48	69	27	5
Bean Pod	2.2	29	103	34	224	30	59	31	62
Peptone	2.5	29	96	30	49	26	12	38	29
Czapek Solution	4.9	26	62	24	23	28	8	20	1
Corn Meal	1.7	32	38	33	15	42	24	20	19
Yeast Extract	1.0	28	17	36	60	24	16	33	14
Nutrient	2.3	26	14	25	7	28	9	25	3

a/ MG = Linear mycelial growth (mm) in tubes (20x200 mm).

b/ Sp = Spores/cc x 10^6

c/ All nutrient media, except chickpea seed meal agar and potato-dextrose agar, were from Difco Laboratories.

Table 94 . -- Effect of temperature on growth and sporulation of four isolates of *Ascochyta rabiei* on two nutrient media for 16 days.

Temperature °C	Potato-Dextrose Agar								Chickpea Seed Meal Agar, 8%							
	Ascochyta Isolate								*Ascochyta* Isolate							
	India 1		Iran 3		Turkey 7		West Pakistan 8		India 1		Iran 3		Turkey 7		West Pakistan 8	
	MG[a]	Sp[b]	MG	Sp	MG	Sp	MG	Sp	MG	Sp	MG	Sp	MG	Sp	MG	Sp
10	14	18	20	11	16	15	20	8	21	23	26	78	23	54	23	23
15	25	58	27	15	41	47	25	23	43	144	35	242	44	196	45	137
20	40	115	39	27	48	69	27	5	50	315	52	472	51	462	43	97
25	25	2	35	3	23	1	25	1	33	71	47	127	32	88	36	44
28	9	0	20	tr [c]	21	tr	13	tr	7	1	18	2	18	3	15	1
30	1	0	5	0	10	0	4	0	2	0	4	0	3	tr	1	0
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

a/ MG = Linear mycelial growth (mm) in tubes (20 x 200 mm).

b/ Sp = Spores/cc x 10^6

c/ tr = less than 0.5 x 10^6 spores/cc.

Table 95 . -- Growth and sporulation of four isolates of *Ascochyta rabiei* on two nutrient media in continuous light or dark for 16 days at 20 C.

Ascochyta Isolate	Continuous Light [a]				Continuous Dark			
	PDA [b]		CSMA [b]		PDA		CSMA	
	Mycelial Growth [c] (mm)	Spores/cc x 10^6	Mycelial Growth (mm)	Spores/cc x 10^6	Mycelial Growth (mm)	Spores/cc x 10^6	Mycelial Growth (mm)	Spores/cc x 10^6
India 1	55	270	55	258	40	115	50	315
Iran 3	70	297	65	440	39	27	52	472
Turkey 6	50	87	47	239	35	8	26	36
West Pakistan 8	45	33	52	129	27	5	43	97

a/ Light intensity of 1000 ft-c.

b/ PDA = potato-dextrose agar; CSMA = 8% chickpea seed meal agar.

c/ Measurements of linear mycelial growth were made in pyrex tubes (20x200 mm).

Table 96 . -- Effect of continuous and alternating dark and light periods on sporulation of five isolates of *Ascochyta rabiei* on potato-dextrose agar for 16 days at 20 C.

Ascochyta Isolate	Sporulation [a]		
	Continuous Light [b]	Alternating Light-dark [c]	Continuous Dark
India 1	270	194 [d]	115
Iran 2	82	53	8
Iran 3	297	149	27
Iran 4	310	344	119
Iran 5	44	70	12

a/ Spores/cc x 10^6

b/ Light intensity of 1000 ft-c.

c/ 12-hr light - 12-hr dark.

d/ Zonation occurred in all isolates, except Iran 2.

Table 97 . -- Effects of radiation of different wavelengths on mycelial growth and sporulation of four isolates of *Ascochyta rabiei* on potato-dextrose agar for 12 days at 20 C.

Filter Color a/	Filter No.	Mycelial Growth (mm) b/				Sporulation c/			
		Ascochyta Isolates				*Ascochyta* Isolates			
		India 1	Iran 3	Turkey 6	West Pakistan 9	India 1	Iran 3	Turkey 6	West Pakistan 9
No Filter d/	----	44	50	40	44	413	318	89	30
Clear	3850	32	50	38	30	144	138	93	44
Blue	9782	36	50	40	42	156	134	113	37
Green	4010	28	42	36	25	67	83	43	19
Orange	3482	31	35	18	18	61	35	25	16
Red	2408	31	26	21	18	105	32	10	9
Dark	----	28	28	25	20	75	36	10	10

a/ The light intensity beneath each Corning glass filter was 50-70 ft-c.

b/ Fungi were cultured in petri dishes (15 x 52 mm).

c/ Spores/cc x 10^6

d/ Light intensity of 1000 ft-c.

Table 98. -- Effect of seed treatment fungicides on emergence of chickpea seed inoculated with *Ascochyta rabiei*. a/

Fungicide	Fungicide Rate g/kg Seed	% Emergence b/	% Healthy
Control (non-inoculated)	---	99	99
Thiabendazole 60 W	3.0	94 c/	91
Benlate 50 W	3.0	93.5	90
Daconil 2787 75 W	3.0	79	56.5
Vitavax 75 W	3.7	78.5	54.5
Zineb 75 W	3.0	78.5	53
Difolatan 65 W	3.0	78	60.5
Dithane M-45 80 W	3.0	77.5	70
Ceresan 7.7 W	2.0	76.5	69
Dyrene 50 W	3.7	76	56.5
Maneb 80 W	3.0	74.5	65
Captan 75 W	3.0	74	63.5
Botran 75 W	3.0	74	58
Terraclor 75 W	2.0	69	56
Demosan 65 W	3.7	62.5	42
Terracoat L 21	2.0	60	27
Cupravit Blue 35 W	3.7	57	8.5
Plantvax 75 W	3.7	51	9.5
Control (inoculated)	---	46	6
Dexon 70 W	2.0	35.5	4.5

a/ Seeds inoculated with a heavy spore suspension of 4 Iranian isolates of *A. rabiei*.

b/ Results are the average of 2 experiments consisting of 4 replications/experiment with 25 seeds/replication.

c/ Results of 1 experiment.

Table 99. -- Effect of treating healthy chickpea seed with various fungicides on control of foliar infection by *Ascochyta rabiei*. a/

Fungicide	Fungicide Rate g/100 g Seed	Disease Rating b/
Benlate 65 W	0.125	3.4
Benlate	0.250	3.4
Benlate	0.500	3.5
Thiabendazole 60 W	0.125	3.6
Thiabendazole	0.250	3.6
Thiabendazole	0.500	3.3
Vitavax 75 W	0.125	3.7
Vitavax	0.250	3.8
Vitavax	0.500	3.6
Plantvax 75 W	0.125	3.6
Plantvax	0.250	3.8
Plantvax	0.500	3.8
Demosan 65 W	0.125	3.1
Demosan	0.250	3.3
Demosan	0.500	3.5
Captan 75 W	0.125	3.8
Captan	0.250	3.6
Captan	0.500	3.9
Control (inoculated)	-----	3.8
Control (non-inoculated)	-----	0

a/ Plants were inoculated with a heavy spore suspension of 4 Iranian isolates of *A. rabiei* 3-4 weeks after planting.

b/ Disease rating, scale 0-4: 0, no infection; 4, all plants dead. Results are the average of 2 experiments consisting of 6 replications/experiment with 10 seeds/replication.

Table 100. -- Transmission of pea leaf roll virus to various test plants in greenhouse inoculation studies.

Host plants	Transmission	
	Mechanical a/	Aphid b/
Amaranthaceae		
Gomphrena globosa L.	-	-
Chenopodiaceae		
Chenopodium amaranticolor Coste & Reyn.	-	-
Cucurbitaceae		
Cucumis sativus L. 'National Pickling'	-	-
Leguminosae		
Cicer arietinum L. 'Ghazvin'	-	+
Lens esculenta Moench 'Ghazvin'	-	+
Medicago sativa L. 'Yazdi'	-	+
Melilotus alba Desr.	-	-
Phaseolus aureus Roxb. 'Berken'	-	-
P. vulgaris L. 'Bountiful'	-	+
P. vulgaris 'Pinto U.I. 111'	-	-
P. vulgaris 'Topcrop'	-	+
Pisum sativum L. 'Rondo'	-	+
Vicia faba L. 'Algerian'	-	+
Vigna sinensis (L.) Savi ex Hassk. 'Early Ramshorn'	-	+
Solanaceae		
Datura stramonium L.	-	-
Nicotiana glutinosa L.	-	-
N. tabacum L. 'Xanthi-nc'	-	-

a/ Sap of PLRV-infected plants was rubbed on Carborundum-dusted leaves of test plants.

b/ Groups of 5-10 viruliferous aphids were given a 3-day inoculation feeding on individual test plants.

Table 101. -- Effect of pea leaf roll virus on seed yields of six pulse crops in field trials at Karaj, Iran.

Pulse Crop	Healthy Control	Pre-Bloom a/		Full Bloom a/	
	Yield b/ (g)	Yield (g)	% Decrease	Yield (g)	% Decrease
Cicer arietinum L. 'Ghazvin'	2015	1	99	117	94
Lens esculenta Moench 'Ghazvin'	422	40	91	209	50
Phaseolus vulgaris L. 'Bountiful'	786	0	100	32	96
Pisum sativum L. 'Rondo'	369	70	81	299	19
Vicia faba L. 'Algerian'	1950	0	100	220	89
Vigna sinensis (L.) Savi ex Hassk. 'Early Ramshorn'	2700	0	100	25	99

a/ Pre-bloom, plants 6-12 cm tall; full bloom, plants flowering and in very early fruiting stages.

b/ Seed yield from 100 plants.

Table 102. -- Effect of date of planting of two bean varieties on incidence of pea leaf roll virus at Karaj, Iran.

Date of Planting	Red Kidney a/			Wade		
	No. Plants	No. Infected with PLRV	% Transmission	No. Plants	No. Infected with PLRV	% Transmission
April 17, 1971	172	1	0.6	82	3	3.7
May 1	333	0	0	326	1	0.3
May 16	227	6	2.6	217	13	6.0
June 1	262	36	13.7	230	31	13.5
June 15	281	59	21.0	188	30	16.0
July 1	309	17	5.5	307	17	5.5
July 15	269	4	1.5	253	4	1.6
July 31	284	3	1.1	274	0	0

a/ Plots were 2 rows wide and 5 m long with 4 replications/variety/planting date.

Table 103. -- Natural infection of annual and perennial plants by seven viruses affecting pulse crops in Iran.

Hosts [a]	Virus [b]						
	AMV	BCMV	BYMV	CAMV	CMV	PEMV	PLRV
Amaranthaceae							
Amaranthus retroflexus L.					+ [c]		
Boraginaceae							
Heliotropium curassavicum L.					+		
Chenopodiaceae							
Beta vulgaris L.					+		
Chenopodium album L.					+		
Spinacia oleracea L.					+		
Compositae							
Carthamus tinctorius L.	+				+		
Lactuca sp.	+						
Tagetes patula L.					+		
Taraxacum officinale Weber					+		
Zinnia elegans Jacq.					+		
Cruciferae							
Brassica arvensis Rubenh.					+		
Cucurbitaceae							
Cucumis melo L.					+		
Cucumis sativus L.					+		
Cucurbita pepo L.					+		
Fumariaceae							
Fumaria sp.					+		
Iridaceae							
Gladiolus hortulanus Bailey			+				
Labiatae							
Salvia splendens Ker-Gawl.					+		
Leguminosae							
Cassia occidentalis L.			+				
Cicer arietinum L.	+		+		+	+ [d]	+
Lathyrus odoratus L.			+				
L. sativus L.			+				
Lens esculenta Moench	+		+		+		+
Lotus corniculatus L.	+						
Medicago hispida Gaertn.			+		+		+
M. lupulina L.	+		+				+
M. sativa L.	+		+		+		+
Melilotus alba Desr.			+		+		
M. indica (L.) All.			+		+		+
M. officinalis (L.) Lam.	+		+				
Onobrychis sativa Lam.			+				
Phaseolus aureus Roxb.	+	+			+		
P. lunatus L.					+		
P. vulgaris		+	+		+		+
Pisum sativum L.			+		+	+	+
Trifolium alexandrinum L.					+		
T. pratense L.			+				
T. resupinatum L.			+		+		+
T. rytidosemium Boess. & Hoh.	+						
Trigonella foenum-graecum L.			+		+		+
Trigonella sp.							+
Vicia faba L.	+		+		+		+
V. narbonensis L.	+		+				+
V. sativa L.	+		+				
Vigna sinensis (L.) Savi ex Hassk.	+			+	+		+

Table 103. -- Natural infection of annual and perennial plants by seven viruses affecting pulse crops in Iran. (Continued)

Host	Virus						
	AMV	BCMV	BYMV	CAMV	CMV	PEMV	PLRV
Polygonaceae							
Rumex sp.					+		
Portulaceae							
Portulaca oleracea L.	+				+		
Ranunculaceae							
Ranunculus sp.					+		
Scrophulariaceae							
Antirrhinum majus L.					+		
Solanaceae							
Capsicum annuum L.					+		
Datura stramonium L.					+		
Lycopersicon esculentum Mill.					+		
Petunia hybrida Vilm.					+		
Solanum melongena L.					+		
S. nigrum L.	+						

a/ Hosts are listed alphabetically by family and genus.

b/ Viruses are: AMV (alfalfa mosaic); BCMV (bean common mosaic); BYMV (bean yellow mosaic); CAMV (cowpea aphid-borne mosaic); CMV (cucumber mosaic); PEMV (pea enation mosaic); and PLRV (pea leaf roll).

c/ + indicates recovery of the virus.

d/ K. Izadpanah, personal communication.

Entomology

J. M. Schalk - USDA/USAID
M. Esmaeli - Karaj College
J. Morad-Saghi - Karaj College
G. Rassoulian - GOI/Plan Organization

Summary

Entomological activities during 1971 were directed by Dr. Schalk and Engineer Rassoulian. General supervision of the work was given by Drs. Esmaeli and Morad-Saghi of the Karaj College Pest Control Department.

+ + + + + + + + + + +

Because of root rot diseases and project termination, long term insect resistance studies by Dr. Schalk could not be completed.

Low arthropod populations prevented significant differences in pesticide trials from being observed. In case where significant results were observed, there was so much variation that they should be considered doubtful.

Varieties of chickpeas (12-071-10033 and 12-071-10034), cowpeas (62-157-00347 and 62-157-00295), mungbeans (48-069-10075), and white beans (65-171-00643 and 65-071-00042) showed promise for root knot nematode resistance.

Field and laboratory studies with Callosobruchus maculatus, on cowpeas, showed that larvae can survive in green pods and after pod maturity, will emerge as adults in storage. Chickpea lines 12-069-06629, 12-069-00519, and 12-071-05451 are resistant to this bruchid. Line 12-071-10031 was intermediate in resistance to the bruchid and had the better agronomic qualities.

The host range of Aphis craccivora, Acyrthosiphon pisum, and Therioaphis trifolii was studied. Fecundity and longevity were best for all three aphids on Trigonella foenum-graecum, Melilotus alba, and one unidentified weed which will be determined later.

Insect populations

Heavy populations of an aphid, believed to be Therioaphis trifolii, was observed on chickpeas. Samples of this aphid were submitted to the USDA for identification.

Table 104. -- The effect of four insecticides on bollworm (Heliothis armigera) in chickpeas at Varamin and Karaj, Iran 1971.

Insecticide	Rate	Varamin		Karaj	
		% Damage	Weight kg/114m^2	% Damage	Weight kg/114m^2
Sevin	2 kg/ha	3.7	11.30	0.3	5.27
Delnave	700 cc/ha	1.9	11.40	0.0	5.92
Supracide	600 cc/ha	2.2	14.30	0.0	7.07
Nuvacron	600 cc/ha	2.3	11.50	0.0	8.62
Thiodan	700 cc/ha	2.5	14.20	0.0	7.89
Check	----	5.0	6.90	0.0	5.64

No significant difference.

Table 105 -- Screening chickpea varieties for resistance to leaf miner (Liriomyza congesta) in Ghazvin, Iran. 1971.

Variety	% Damage	Weight kg/114m^2
12-071-10029	17.3	1.86
12-071-10020	26.7	0.46
12-071-10031	13.6	1.36
12-071-10032	10.9	2.40
12-071-10025	16.0	3.20
12-071-10026	11.7	1.42
12-071-10036	29.5	2.24
12-071-10033	14.8	3.06
12-071-02089	12.3	1.01
12-071-02518	15.7	1.34

No significant difference.

Table 106. -- Effect of four acaricides on dry beans against *Tetranychus bimaculatus*. Karaj, Iran, 1971.

Insecticide	Average of mites in each treatment (45 leaflets)					
	1st Spray			2nd Spray		
	After 4 days	After 7 days	After 10 days	After 3 days	After 6 days	After 9 days
Tedion	4.8 +	4.3	3.0	0.8	5.3 +	3.0
Kelthane	2.3 +	8.8	2.5	2.3	2.5 +	0.3
Morocide	3.5 +	8.8	3.5	0.5	3.0 +	1.5
Nuvacron	5.0 +	8.0	21.5	31.8	26.5 +	43.5
Check	21.0	15.0	15.8	41.3	134.0	71.8
LSD	13				34.3	

+ Significant at the 5% level.

Because there is variation between the first and second sprayings, no significance should be attributed to this test. Perhaps if the mite population was greater the variability may have been less.

Table 107. -- Screening chickpea varieties for resistance to seed corn maggot (*Hylemia cilicrura*) in Karaj, Iran, 1971.

Variety	% Damage	Weight kg/36m^2
12-071-10029	18	1.86
12-071-10020	14	0.46
12-071-10031	9	1.36
12-071-10032	29	2.40
12-071-10025	19	3.20
12-071-10026	12	1.42
12-071-10034	23	2.24
12-071-10033	12	3.06
12-071-02089	16	1.01
12-071-02518	4	1.34

No significant differences.

Table 108. -- Screening varieties of chickpeas, cowpeas, mungbeans, and white beans to root knot nematode (Meloidogyne sp.) in Varamin, Iran, 1971.

Chickpeas		Cowpeas		Mungbeans		White Beans	
Variety	No. of Nematodes 1/	Variety	% Damage 2/	Variety	% Damage	Variety	% Damage
12-071-10033	58	62-157-00347	32	48-069-10075	23	65-171-00643	34
12-071-10034	75	62-157-00295	35	48-157-10307	30	65-071-00042	35
12-071-10026	108	62-071-01446	39	48-157-11153	31	65-071-00675	36
12-071-02518	117	62-155-00224	41	48-157-10023	33	65-071-00695	38
12-071-10025	149	62-157-00316	42	48-033-10045	35	65-071-00638	38
12-071-10020	190	Mashad Variety	43	48-069-10104	35	65-071-00671	42
12-071-10031	288	62-153-00057	50	48-071-10282	36	65-080-00690	47
12-071-02089	375	62-071-01432	51	48-157-11155	38	65-071-00212	46
12-071-10029	400	62-157-00287	58	48-071-10293	42	65-071-00699	49
12-071-10032	467			48-157-11156	47	65-071-00674	63

1/ Average number of nematodes in 0.5 gr of roots from 4 replications. Total roots/sample was 2 g.

2/ Average percent of infection from infected roots in 4 replications. Rated 0-5: 0 = no injury; 5 = maximum injury.

The first two lines of chickpeas appear to be the most promising for resistance to root knot nematodes and should be tested further. Other lines that show promise for further testing are: cowpeas 62-157-00347, 62-157-00295; mungbeans 48-069-10075; and white beans 65-171-00643, 65-071-00042.

The biology of Callosobruchus maculatus on cowpeas

Field and laboratory studies were conducted on the biology of Callosobruchus maculatus affecting cowpeas. The purpose here was to use this study for applying effective control practices in the field.

Methods

Laboratory tests were conducted in total darkness at 28°C and 50% ± 10% R.H. Information was recorded on emergence of adults from field infected cowpea pods and stems, duration from egg to adult, number of eggs laid per female, number of eggs oviposited per seed, sex ratio, and the maximum number of adults emerged per seed.

In field tests, 15-20 mated females (0-24 hr old) were confined to small cages containing attached cowpea inflorescence, pods of various growth stages, and stems. Each cage contained at least one stem or one or two inflorescence or pods. Females were permitted to oviposite for only 5 days in one test. In another test, females were permitted to oviposite until their death. The cages were left on the pods and stems until harvest (this prevented other arthropod infestations). Harvested pods and stems were then stored at 28°C and 50% ± 10% RH in total darkness.

Oviposition preference studies were conducted using walk-in field cages containing cowpeas at various stages of maturity. Adults, 2000 in all, of both sexes were released seven times every four days during the month of August 1971. Inflorescence and pods of various growth stages were collected and oviposition was recorded.

Field longevity studies were performed by confining adults (0-24 hr old) in small empty cages which were shaded from direct sunlight.

Results and Discussion

The sex ratio favors the female. For every two males produced, there were three females. Oviposition averaged 25 eggs per female. Emergence from egg to adult started after 24 days with peak emergence after 28 days. The total emergence period was 38 days. As many as 31 eggs per seed were oviposited, however, only a maximum of 6-7 emergence holes were recorded per seed (1 emergence hole/adult). It was also observed that newly emerged adults will copulate within closed pods and oviposite on seeds within these pods, thus increasing the primary infestations. Adults also oviposited on green stems, and the eggs hatched, but no emergence resulted.

Emergence seemed to be favored when adults were permitted to oviposite, until death, on inflorescence and young pods (Table 109). A possible reason for greater survival on young pods might be the greater amount of food available (8 pods) to the larvae (334) as compared to the remaining pods (Table 109) and not to the relationship between age of pod and infection.

It was shown in another test (Table 110 ovipositional confinement lasting 5 days) that very young infloresence and pods did not produce any emergence. It was also evident that oviposition was inhibited on the younger reproductive plant parts (only 11 eggs deposited). Greater oviposition and emergence resulted on pods that were larger than 8 cm long. When adults were permitted a free choice of oviposition the ovipositional preference was greater on green pods at least 7 cm long and also mature pods. The smaller pods were least preferred.

Adult longevity in the field lasted as long as 15 days. Mortality began after two days and peaked after seven days. Weather conditions were hot and dry during the day (90-100°F, RH 20%) and cooler and damper at night (58-80°F, RH 58-80%).

These results have shown that the adults can oviposite on green pods. Larv will survive in these green pods and emerge as adults after pod maturity. There fore, an effective chemical control should be applied when the majority of pods are at least 5 cm long. A delay could result in heavy infestations in storage because the newly emerged adults confined within mature pods copulate and oviposite on seeds within the pod and increase the primary infestation.

Table 109. -- Survival of C. maculatus from egg to adult on pods infected by females confined until death, at various stages of growth in the field. At maturity pods were harvested and stored at 28°C and 5 ± 10% RH and emergence recorded.

Growth Stages Infected	No. Pods Observed	No. Eggs	No. Adults Emerged	% Hatching
Pre-bloom & Bloom	8	334	72	21.6
5cmx3mmx5mm 1/ through 6cmx4mmx9mm	3	341	33	9.7
9.5cmx4mmx9mm through 11cmx7mmx16m	4	664	74	11.1
12cmx1cmx4cm	2	646	65	10.1
13cmx1.2cmx4.4cm through 13.5cms9mmx3.2cm	4	510	51	10.0
15cmx1.2cmx3.2cm through 16cmx1.2cmx4.4cm	5	903	90	10.0

1/ pod size, length x width x circumference.

Table 110. -- Susceptability of inflorescence and pods to infestations of C. maculatus in the field. Ovipositing females were confined for 5 days. After maturity pods were harvested and stored at 28°C and 50 ± 10% RH and emergence recorded.

Growth Stages Infected	Condition of pod after adult removal	No. eggs	Adults Emerged	% Emergence
Bloom	withered	0	0	0
Bloom	green	3	0	0
Bloom + 1.5cmx1mmx2mm 1/	green	0	0	0
3cmx1mmx2.5mm	withered	0	0	0
3cmx2mmx5mm	green	0	0	0
7.2cmx4mmx1.6cm	green	8	0	0
8cmx5mmx1.3cm	green	0	0	0
8.5cmx4mmx1.2cm	green	11	1	9
13cmx7mmx2.6cm	green	58	10	17
13cmx6mmx2.6cm	green	71	12	17
13cmx6mmx1.6cm	green	66	3	5
14cmx1cmx2.6cm	yellow green	9	0	0
16cmx6mmx2.2cm	green	37	7	19
16cmx9mmx3.2cm	yellow green	29	6	21
mature	brown	23	7	30
mature	brown	47	8	17
mature	brown	21	4	19

1/ Pod size: Length x width x circumference.

Table 111. -- Screening chickpea lines for resistance to *C. maculatus*. 1/

Accession Number	Country of Origin	Type	Seeds		Total Eggs	Total Emergence Holes	Rating 2/
			Infected	Clean			
12-071-05451	Iran	Smooth Brown	2	18	3	2	HR
12-071-05331	Iran	Smooth Black	19	1	204	55	HS
12-071-10020	Iran	Smooth White	20	0	533	72	HS
12-071-10014	Iran	Smooth White	13	7	203	23	S
12-071-10031	Iran	Smooth White	8	12	50	11	I
12-071-05456	Iran	Smooth White	20	0	347	96	HS
12-071-10013	Iran	Smooth White	20	0	314	137	HS
12-069-06629	India	Rough Brown	3	17	25	3	HR
12-069-00519	India	Rough Brown	0	20	2	0	HR
Check		Smooth White	17	3	234	29	HS

1/ Twenty adult females were confined until death with 20 seeds of each line.

2/ 0-3 seeds infected with emergence holes, Highly resistant, HR; 4-8 seeds infected with emergence holes, Intermediate, I; 9-13 seeds infected with emergence holes, Susceptable, S; 14-20 seeds infected with emergence holes, Highly Susceptable, HS.

Lines 06629, 00519, and 05451 show apparent resistance to this bruchid. However, these lines had poor agronomic qualities (poor appearance) due to seed coat roughness and dark color. The intermediate resistant line 10031 had good appearance. It may be possible to increase the resistance of 10031 by selecting uninfected test seeds. Resistance in lines 06629, 00519, and 05451 may be due to seed coat roughness and toughness.

Table 112. -- The effect of two nematocides on root knot nematodes (Meloidogyne sp.) in Varamin, Iran, 1971.

Nematocide	Tomatoes		Cowpeas		Mungbeans	
	Damage % 1/	No. of Nematodes 2/	Damage %	No. of Nematodes	Damage %	No. of Nematodes
Nemagon 6cc/m^2	55	60	27	113	23	28
Mocap 7g/m^2	65	12	16	12	20	198
Check	58	63	15	121	14	61

1/ Percent of infection from infected roots.

2/ Average number of nematodes in 0.5 gr of roots in 3 replications. Total root sample was 1.5 g.

No significant differences.

Table 113. -- Host ranges of *Therioaphis trifolii*, *Acyrthosiphon pisum*, and *Aphis craccivora*.

Host	Reaction of Aphids to Host								
	T. trifolii			*A. pisum*			*A. craccivora*		
	Reaction	Times Tested	Total Live Aphids	Reaction	Times Tested	Total Live Aphids	Reaction	Times Tested	Total Live Aphids
Amaranthaceae									
Amaranthus retroflexus L.	- 1/	2	0	-	3	0	+	2	28
Boraginaceae									
Heliotropium curassavicum	-	3	0	-	2	0	-	3	0
Chenopodiaceae									
Chenopodium opulifolium Schrad.	-	3	0	-	2	0	-	3	0
Compositae									
Cichorium intybus L.	-	2	0	-	2	0	-	2	0
Cnicus sp.	-	1	0	-	1	0	-	2	0
Erigeron canadensis L.	-	2	0	-	2	0	-	2	0
Convolvulaceae									
Convolvulus arvensis L.	-	2	0	-	2	0	-	1	0
Cruciferae									
Brassica arvensis Rubenh.	-	3	0	-	2	0	-	3	0
Labiatae									
Mentha microphylla C. Koch	-	1	0	-	1	0	+	1	1
Leguminosae									
Cicer arietinum L.	+	10	344	-	3	0	-	3	0
Goebelia alopecuroides	-	1	0	-	1	0	-	1	0
Lens esculenta Moench.	-	1	0	+	1	2	+	11	14
Medicago sativa L.	-	3	0	+	3	45	+	3	40
Melilotus alba Desr.	+	1	14	+	1	239	+	2	42
Onobrychis sativa Lam.	-	2	0	+	1	3	-	1	0
Ononis sp.	-	3	0	+	2	48	+	3	4
Phaseolus vulgaris L.	-	1	0	+	1	15	-	1	0

Table 113. -- Host ranges of *Therioaphis trifolii*, *Acyrthosiphon pisum*, and *Aphis craccivora* (Continued).

Host	Reaction of Aphids to Host								
	T. trifolii			*A. pisum*			*A. craccivora*		
	Reaction	Times Tested	Total Live Aphids	Reaction	Times Tested	Total Live Aphids	Reaction	Times Tested	Total Live Aphids
Leguminosae (Continued)									
Trifolium pratense L.	-	3	0	+	1	2	+	1	1
Trigonella foenum-graecum L.	+	2	64	+	2	37	+	2	113
Vicia faba L.	-	5	0	+	7	581	+	8	690
Vigna sinensis Savi ex Hassk.	-	1	0	-	1	0	-	1	0
Malvaceae									
Malva lotundifolia L.	-	2	0	-	2	0	-	2	0
Plantaginaceae									
Plantago lanceolata L.	-	2	0	-	2	0	-	1	0
Polygonaceae									
Polygonum aviculare L.	-	1	0	-	0	0	-	1	0
Solanaceae									
Datura stramonium L.	-	2	0	-	1	0	-	2	0
Solanum nigrum L.	-	3	0	-	2	0	-	3	0
Unknown, to be determined later									
TSA 2/	+	1	17	+	1	5	+	1	44
NLW	-	2	0	-	2	0	+	2	4

1/ - = complete mortality; + = 1 or more living.

2/ TSA - One thorn/axil - having simple obovate leaf/axil.

NLW - Narrow leaf weed - very pubescent leaf and stems.

The common host for all three aphids were Trigonella foenum-graecum, Melilotus alba, and TSA an unknown. Determination of the unknown plants will be conducted later.

Although Cicer arietinum was a good host for Therioaphis trifolii, the other two aphids performed poorly on it. However, colonies of Aphis craccivora and Acyrthosiphon pisum have been reared on C. arietinum. An explanation being that selection pressure is exerted on the aphids leaving only survivors whose biology is least affected by this host.

A. craccivora and A. pisum reproduced on Medicago sativa and Vicia faba. Ononis sp. and Phaseolus vulgaris proved to be good hosts of A. pisum while Lens esculenta was susceptable to A. craccivora.

The purpose of starting this project was to use the results in determining the host range and vector relationships of these aphids to pulses.