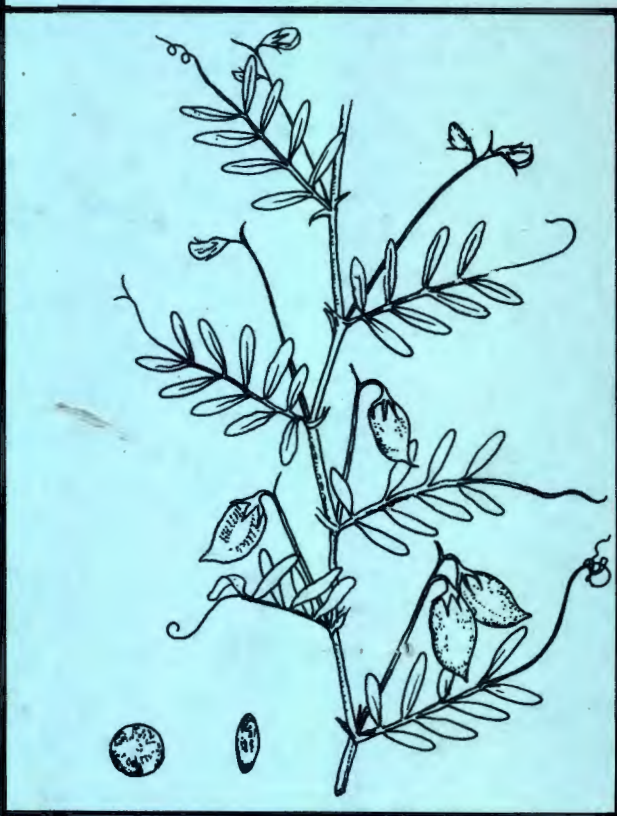


FOOD LEGUME NURSERIES

1979-1980



INTERNATIONAL NURSERY REPORT No. 4

FOOD LEGUME NURSERIES 1979-1980

THE INTERNATIONAL CENTER FOR AGRICULTURAL RESEARCH IN THE DRY AREAS
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July 1982

PREFACE

A number of nurseries and trials were supplied by the Food Legume Program (FLIP) of ICARDA to cooperating scientists within and out-side the ICARDA regaion for 1979/80 growing season. This report summarises the data returned by the cooperating scientists on these trials and nurseries, which include replicated yield trials, non-replicated screening and disease nurseries and agronomic trials.

The report has been prepared by FLIP staff at ICARDA, and it is hoped that the results and discussion will be of practical use and interest to the cooperating legume scientists. Any comments or suggestions arising from this report would be welcomed.

FLIP, ICARDA

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1. INTRODUCTION

The international cooperative program on food legume improvement is coordinated by the International Center for Agricultural Research in the Dry Areas (ICARDA). The main objective of the program is to provide a mechanism for the multi-location testing of genetic material of chick-pea, faba beans and lentils originating from national and international programs.

The testing aims at evaluating genotypic performance for both seed yield and reaction to biotypes of locally occurring pests and diseases. It is hoped that through such testing, firstly, it will prove possible to identify both superior genotypes which are adapted to specific environments, and genotypes which have a wide adaptation. Secondly, that the performance data from a number of widely differing environments will help the breeder to reduce the number of seasons required for evaluation prior to cultivar release. In addition the program will permit the dissemination of elite germplasm and segregating populations to interested scientists, who can exercise their own selection to develop superior cultivars well adapted to their conditions.

Through the distribution of agronomic trials it is hoped that agronomic research on these legumes will be encouraged and the information on optimum agronomic practices for different agro-ecological conditions would become available.

This report summarises the data received from various yield trials, screening nurseries, disease nurseries and agronomy trials conducted by the cooperating scientists during 1979/80 season.

2. ICARDA INTERNATIONAL TRIALS AND NURSERIES FOR THE 1979/80 SEASON

2.1 DESCRIPTION

The following gives a brief account of the trials and nurseries that were distributed by ICARDA, in the three different crop improvement programs, during 1979/80.

2.1.1 Adaptation Trial (AT).

The environmental conditions vary greatly both within and between the countries in which the three food legume species are grown. This diversity may hinder the improvement of the crop species by the inability to conduct sufficient breeder's trials in all the relevant countries. However, it may be possible to meaningfully group the different legume growing areas into a few agro-ecological zones. The identification of such zones is of major importance in breeding for wider adaptability, and would also allow ICARDA to serve the national programs better through the development and distribution of locally adapted materials.

Insufficient information is available on the relationship between key agro-ecological variables and legume crop performance to be able to confidently predict such zones. In the absence of this information, it is felt that the best way to characterise the different environments is through the study of a uniform set of diverse genotypes grown in the main legume production areas over several years. This idea was first discussed at the 1978 regional food legume workshop and the first adaptation trials were distributed for 1978/79 season. The results from that set of trials were presented in the 1978/79 report. More genotypes had been added in the trial during 1979/80 to increase the diversity and thus to fulfil the objective of the trial better.

2.1.2 International Yield Trials (IYT).

There is yet insufficient data to group the countries in the ICARDA region into agro-ecological zones. Thus to identify heavy yielding genotypes, with either specific or wide adaptation, it is essential to test genetic material emerging from ICARDA and other national breeding programs in a wide range of environments, encompassing the major production zones in the different countries.

The IYTs are replicated trials which test advanced materials that have previously shown above average performance. The trials of both faba beans and lentils had been separated in large and small-seeded types. The IYTs permit an assesment of yield performance (G) across a range of environments (E) and provide an estimate of the relative size of $G \times E$ interactions in that growing season. This should both allow national programs to identify genotypes best adapted to their local conditions, and provide ICARDA with information that will rationalise crossing programs for the different countries.

2.1.3 International Screening Nurseries (ISN).

The ISNs form an adjunct to the IYTs by providing an initial evaluation of a large number of advanced lines (F_5/F_6) and elite germplasm, encompassing a wide range of genetic diversity, in non-replicated trials in the environments utilized for the IYTs. The results thus provide a basis on which genotypes can be advanced to the IYTs and provide national programs with the opportunity to practice selection in a greater range of material than provided in the IYTs. Like IYTs the ISNs were also separated in large and small-seeded sets for faba beans and lentils.

2.1.4 International F_3 (IF_3T) and F_4 Trials (IF_4T).

Genotypes tested in the IYTs and in the ISNs tend to be relatively advanced breeding material that is approaching homozygosity, so nullifying

any chances for reselection in superior performing genotypes. In contrast the F_3 and F_4 bulk trials comprise early generation segregating material, thus permitting breeders in the national programs the chance to practice their own selection in the populations best adapted to the local environment. In addition the trials allow estimates to be made of cross performance and interactions across a range of environments, which will additionally assist in identifying parents to be used in hybridisation programs for the different countries.

2.1.5 International Disease and Pest Nurseries (I-N).

The development of cultivars resistant to pathogens and pests prevalent in the main legume growing areas is essential if stable seed yields are to be achieved. However, there is presently little information available on the incidence and severity of legume diseases and pests in the different areas. The international Disease and Pest Nurseries were formulated to rectify this situation and aim to test a relatively large number of genotypes, in an unreplicated design, in a range of locations covering a number of countries. The nursery results will thus furnish information on the incidence and severity of the disease and pest in differing geographic areas, and provide a means for the identification of resistant genotypes. These together should greatly assist the plant breeder in developing genotypes that combine a heavy seed yield with a stable parasite resistance. The disease nurseries available for distribution in the 1979/80 season were a Faba bean and a Chickpea International Ascochyta Blight Nursery (IABN). A Faba bean International Orobanche Nursery (FBION) was also distributed.

2.1.6 International Agronomy Trials.

In many countries the legume crops tend to be neglected in favour of the cereal crops, resulting in poorer management and fewer agronomic inputs. To combat this trend it is essential to develop suitable agronomic management

practices for legumes that, if adopted, would increase both seed yields, and a farmer's income, and hence improve economic well-being in a country. Also the use of such practices should permit the full benefit to be gained from the cultivation of the potentially heavy seed yielding cultivars that emerge from plant breeding programs. As a first step in this direction one trial available for distribution in the 1978/79 season was a fertility-cum-plant population trial (FPPT) for all three crops. Interest in this trial was shown by several cooperators. Hence in the 1979/80 season two trials were developed to get information on major components of agronomic management. The first was a 'Fertility-cum-Inoculation Trial' (FIT) and the second was a 'Date of Planting-cum-Plant Population Trial' (DPPT).

2.2 DISTRIBUTION AND LIST OF COOPERATORS

In Table 2.1 is given a list of the trials and nurseries distributed from ICARDA to the different countries, in Table 2.2 a list of the cooperators, and in Table 2.3 details on some of the locations at which the trials were grown. Data were returned on 233 of the trials and nurseries, representing 39% of the number distributed.

2.3 DESIGN, ANALYSIS AND MANAGEMENT

2.3.1 Design and Analysis

The designs used for the individual trials and nurseries are given in the crop reports. However, it will be noted that although the International Yield and F_3 and F_4 Trials were designed as lattices, all the data presented from these trials were derived from analyses undertaken as randomised blocks. Without computer facilities this permitted a more rapid analysis of the results, which was necessitated by the need to make speedy selection decisions about the entries to be included in the next season's international trials. However, in the future it is hoped to undertake the lattice analyses and report on the comparative efficiency of the two different designs.

Table 2.1. Distribution of trials and nurseries during 1979/80.

Country		CHICKPEAS								FABA BEANS								LENTILS								Total			
		CAT	CIYT	CIYT-W	CISN	CIF4T	CIABN	CDPPT	CFIT	FBAT	FBITY-L	FBITY-S	FBISN-L	FBISN-S	FBIF4T	FBABN	FBION	FBDPPT	FBFIT	LAT	LIYT-L	LIYT-S	LISN-L	LISN-S	LIF3T	LIF4T	LDPPT	LFIT	Total
1.	AFGHANISTAN	1	1		1		1			1		1		1	1					1		1		1				2	13
2.	ALGERIA	2	1	1	2	2	2		2	1	1	1	1	1	1	1	1		2	2	1		1	1					27
3.	ARGENTINA	1	1		1								1	1						2	2	2	2	1		1			15
4.	BANGLADESH				1	1		1	1													1	1	2		1	1	1	11
5.	CANADA						1																						1
6.	CHILE	2	2		1	2	1		1											2	3		2	1				1	18
7.	COSTA RICA				1								1	1								1	1						5
8.	CYPRUS		1	1	1	1	1	1															1						6
9.	EGYPT	1	1		1	1				1	1	1	1	1	1		1		4		1		1	1	1	1		4	24
10.	ETHIOPIA	1	1		1	1				1		1		1	1			1	1	1	1	1	1	1		1			16
11.	W. GERMANY													1															1
12.	GREECE			1			1																						2
13.	GUATEMALA	1								1	1		1		1			1	1	1	1	1				1	1		12
14.	INDIA	2	4		2	3	4	2	1	2		2	2	1				1	1	2		4	6	6		2	1		48
15.	ITALY									2	2				2		1												7
16.	IRAN	1	1		1					1	1	1	1	1	1					1		1		1					12
17.	IRAQ	1	2			3				2	1	1	2	1					3		1	1	1	1	1			3	23
18.	JORDAN	4	2	2	3		1	4	1	3	1	1	1	2			1	3	1	3	2	2	1	1			1	2	42
19.	LEBANON	1	1							1		2	1								1		1						8
20.	LIBYA	1		1	1					1	1		2	1						1			1						9
21.	MEXICO	3	3		3	3														1	1	1	1	1		1			18
22.	MOROCCO		2	1	1	1	1			1	1						1	1		1	1	1							13
23.	NEPAL	1																					1	1					3
24.	PAKISTAN	4	4		4	4	4	4	4	1	1	2	1		1			2	2	3		4	2	3		2	4	4	60
25.	PERU												1	1															2
26.	PORTUGAL				1								1	1								1	1	1					6
27.	QATAR				1								1	1								1	1						5
28.	SPAIN	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1										17
29.	SUDAN	1			1	1				1		1	1	1	1		1	1	4		1	1		1					16
30.	SYRIA	3	5	3	3		1	1	1	2	2	2	2	2	2	1		1	1		2	3	4	3	3		1	1	49
31.	TUNISIA						1																						1
32.	TURKEY	3	3	1	3	2	3			1	1	1	1	1	1	1					2	2	2	3	3	1	1	1	37
33.	U.S.A.	1	1		1		1													1	1		1			1			8
34.	YEMEN	1	1							1								1	1		1	1	1			1			9
35.	ICARDA	2	2	3	2	2	3	1	2	1	1	1	1	1	1	1	1	3	3	3	3	3	3	3	2	2	1	2	53
TOTAL		39	40	15	38	28	27	15	14	26	16	16	23	23	16	5	8	16	25	32	23	35	35	33	4	12	11	22	597

Table 2.2. Latitude, longitude, altitude and rainfall for some of the locations for 1979/80. season.

Country	Location	Latitude	Longitude	Altitude(m)	Rainfall(mm)
Afghanistan	Kabul	43° 33' N	69° 12' E	1803	-
	Balkh	36° 42' N	67° 13' E	378	54
Algeria	Alger	35° 30' N	00° 40' E	490	434
Argentina	Salta	25° 20' N	64° 40' E	625	134
Bangladesh	Dacca	23° 46' N	90° 23' E	7.2	-
	Mymensingh	24° 46' N	90° 24' E	18	381
Canada	Saskatoon	52° 00' N	106° 00' W	300	-
Chile	Valdivia	39° 48' N	74° 24' E	12	-
	Chillan	37° 09' S	72° 02' W	350	741
	Graneros	34° 00' S	70° 00' W	479	120
Cyprus	Nicosia	35° 40' N	33° 20' E	150	433
Egypt	Giza	30° 45' N	31° 00' E	6	-
Ethiopia	Debre Zeit	08° 47' N	39° 00' E	1900	646
W. Germany	Stuttgart	49° 00' N	09° 00' E	420	-
Greece	Larissa	39° 40' N	22° 30' E	70	695
Guatemala	Ciudad	14° 40' N	90° 40' W	1790	431
India	New Delhi	38° 20' N	77° 06' E	227	-
Italy	Bari	40° 20' N	18° 10' E	50	546
Iran	Karaj	50° 35' N	58° 50' E	1300	-
Iraq	Abu Ghraib	33° 20' N	44° 25' E	35	96
	Mosul	36° 43' N	43° 09' E	222	490
Jordan	Jubeiha	32° 02' N	35° 52' E	980	-
Lebanon	Terbol	34° 00' N	36° 00' E	950	-
	Tel Amara	33° 55' N	35° 28' E	950	-
Libya	Zawia	32° 40' N	12° 50' E	50	115
Morocco	Rabat	33° 59' N	06° 52' W	25	-
Nepal	Birganj	27° 20' N	84° 35' E	100	47
Pakistan	Lahore	31° 19' N	74° 09' E	225	22
	Faisalabad	31° 30' N	73° 10' E	213	-
	Islamabad	33° 41' N	73° 07' E	683	1066
Peru	Lima	12° 02' S	79° 19' W	3312	-
Qatar	Doha	25° 48' N	51° 18' E	50	93
Spain	Sevilla	05° 60' N	37° 27' E	50	276
	Cordoba	38° 00' N	06° 00' E	200	-
Sudan	Hudeiba	17° 34' N	33° 56' E	351	-
Tunisia	Ariana	37° 20' N	09° 30' E	165	-
Turkey	Ankara	39° 50' N	32° 40' E	902	360
	Izmir	38° 35' N	27° 04' E	10	627
	Diyarbakir	37° 55' N	40° 12' E	660	664
U.S.A.	Washington	46° 46' N	117° 12' W	776	565
ICARDA	Tel Hadya	36° 40' N	37° 20' E	392	426
	Lattakia	35° 40' N	35° 40' E	7	-

- Not available

Table 2.3. LIST OF COOPERATORS FOR FLIP 1979/80 INTERNATIONAL NURSERIES

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For the International Screening Nurseries (ISNs) which included both test and check entries, an augmented design, as proposed by Federer (1956) ⁽¹⁾ was used. This design permits some adjustment of seed yields for block differences, and the calculation of standard errors for the comparison of entry means.

Only the data on seed yield have been analysed statistically, and the term 'significant' has been used to denote a probability level (P) equal or less than 0.05. The coefficients of variation given in the different tables were calculated using an error mean square (EMS) from the relevant analysis of variance. The EMS was also used to calculate the appropriate least significant difference (LSD), which was used to test whether a genotype's performance differed significantly from that of the control (local check). The LSD is not appropriate for testing differences between any pair of genotypes in a trial.

2.3.2 Management

For all except the agronomic trials it was emphasised that the materials should be planted at the farmer's normal planting date, and that the locally recommended practices should be used with respect to fertiliser, pesticides, herbicides and irrigation.

For each trial or nursery, observations were requested on plant stand (1-5; rating 1= perfect), days to 50% flowering, plant height (cm) and yield (kg/ha). Other characters were optional e.g. plant width (cm), plant type (erect, semi-erect or prostrate), height of lowest pods (cm), disease damage rating (1-5; 1= free from disease), insect damage rating (1-5), lodging (1-5; 1= no lodging), vigour rating, a visual estimate of yield potential (1-5; 1= very vigorous), shattering (1-5; 1= no shattering), days to maturity, branching (1-5; 1= very few branches) and virus (1-5; 1= free of virus).

(1) Federer, W.T. (1956). Augmented designs. *Hawaii Planters Record*, 55, 191-208, 1956

In addition, cooperators were requested to send information on the altitude, temperature, rainfall, number and dates of irrigations, dates of planting and harvest, herbicides, pesticides and fertilizers applied (indicating type, rate and date of application), names and titles of people conducting the nursery and any other relevant information which could be of value in interpreting the data.

3.1. CHICKPEA ADAPTATION TRIAL (CAT)

3.1.1. Material

The ten genotypes in the CAT were all kabuli types originating in the countries located in the West Asia, North Africa, Anatolia Plateau, Indian sub-continent and Nile Valley. Eight genotypes are land races, L 550 developed through hybridization in India and Giza 1 developed through pure line selection in Egypt. All the genotypes are widely cultivated in their respective countries and together form the excellent material for adaptation study.

3.1.2. Methods and Management

The trial design was a randomized block with four replications. The recommended plot size was 4 rows of 4 m length with an inter- and intra- row spacing of 30 cm and 10 cm, respectively.

Thirty nine sets of trial were distributed to cooperators in 21 countries. The results have been returned from 19 locations. However, the results reported in this document are only from 13 locations because the trials were destroyed in Turkey (Hymana and Izmir), Algeria (Saida) and Pakistan (Islamabad) by Ascochyta blight, in Egypt (Bahtim) by birds, and in Nepal (Birganj) by root-rot and wilt complex disease. The seed was never received by the cooperators in India due to non-clearance at the National Bureau of Plant Genetic Resources at New Delhi and in Mexico due to non-delivery by the air line. The cooperators in other countries never made any communication. The available information on agronomic practices employed at different locations is given in Table 3.1.1.

3.1.3. Results and Discussion

The data for days to flower are given in Table 3.1.2. On an average the genotypes flowered in 38 days at Terbol and 146 days at Setif. The mean days to flower for cultivars had a narrow difference, Lebanese Local was earliest to flower (73 days) and Cyprus Local was the late most in flowering (79 days).

Table 3.1.1. Agronomic data for different locations for the CAT during 1979/80.

Country	Location	Planting date	Harvesting date	Crop (1) duration (days)	Fertilizer (kg/ha)			Irrigation	Insecticide
					N	P ₂ O ₅	K ₂ O		
AFGHANISTAN	Balkh	14- 4-80	22- 7-80	79	30	20		8	
ALGERIA	Setif	17-12-79	3- 7-80						
ARGENTINA	Tucuman	1- 5-80		98					
ETHIOPIA	Debre Zeit			117					
GUATEMALA	Chimaltenango	15- 8-80	1- 4-81		50	50		0	Cuptan Volalon-Thiodan Benlate-Dithane
JORDAN	University	16- 3-80	8- 7-80						
LEBANON	Terbol	26- 4-80		79	100	300		2	
LIBYA	Jendoubah	10-12-79	10- 7-80			95		0	Bazuddin
PAKISTAN	Faisalabad	4-11-79	15- 5-80					1	
SPAIN	Sevilla	4- 4-80							
SYRIA	Tel Hadya	20- 2-80	5- 7-80	118	30	30			
U.S.A.	Pullman	23- 4-80	24- 9-80	154					Cygon

(1) Days from planting to maturity averaged over all entries.

Table 3.1.2. Days to flower for entries in the CAT at different locations during 1979/80.

Entry	Varietal name	Origin	AFGHANISTAN Balkh	ALGERIA Setif	ARGENTINA Tucuman	ETHIOPIA Debre Zeit	LEBANON Terbol	PAKISTAN Faisalabad	SYRIA Tel-Hadya	U.S.A. Pullman	Mean
ILC 519	Giza I	Egypt	56	146	60	52	36	92	79	73	74
1919	L-550	India	56	145	74	51	37	94	79	73	76
1922	Rabat	Morocco	58	146	74	52	44	-	81	73	75
1929	Syrian Local	Syria	57	148	66	54	36	102	81	73	77
1930	Lebanese Local	Lebanon	61	147	60	52	36	-	81	73	73
1931	Turkish Local	Turkey	64	146	74	52	38	98	80	72	78
1932	Jordanian Local	Jordan	66	147	66	54	37	-	80	73	75
1933	Baladi	Sudan	68	146	60	52	36	90	77	72	75
1934	Iranian Local	Iran	69	146	60	49	44	-	83	73	75
3256	Cyprus Local	Cyprus	74	147	66	52	36	103	82	74	79
Location mean			63	146	66	52	38	97	80	73	

The data for days to maturity are shown in Table 3.1.3. The cultivars matured earliest at Terbol and Balkh, and latest at Pullman. The difference in maturity of cultivars was very small. Thus the major difference in days to flower and maturity arises among locations rather than among genotypes.

The data on plant height revealed that the genotypes grew tallest at Chimaltenange (63 cm) and shortest at Tel Hadya (27 cm). On an average Iranian Local attained the maximum height (46 cm) and L 550 attained the minimum height (36 cm).

The seed yield is given in Table 3.1.4. The 'F' test was significant at all the locations. The percent coefficient of variation varied from 16.9 at Pullman to 50.8 at Jendoubah with an average of 33.42, which was rather high. The location mean for seed yield in kg/ha varied from 183 at Jendoubah (Libya) to 3244 at Pullman (U.S.A.), a difference of 18 times between the lowest and the highest yielding sites.

The cultivar L 550 produced the highest yield of 1199 kg/ha and ranked first at 3 sites, second at 1 site and third at 3 sites. It was, however, one of the poorest yielding genotypes at Jendoubah (Libya) and Chimaltenange (Guatemala). The Sudanese Local was the lowest yielder on an average and also at most of the sites except Faisalabad and Debre-Zeit. Syrian Local and Cyprus Local were the other two genotypes which did well across the locations, whereas Giza 1 and Lebanese Local were among the poorest yielding genotypes.

The correlations between the seed yield of the entries at different locations are given in Table 3.1.5. It was interesting to note that Pullman (USA) exhibited significant and positive correlation with Balkh (Afghanistan), Tel Hadya (Syria) and Terbol (Lebanon). Among these, Tel Hadya and Terbol further exhibited significant association among themselves indicating some similarities in the expression of the chickpea lines at these three sites, in general, no definite trend could be established. The meaningful zoning of the region based on the adaptation trial would be obtained after the data are collected for some more years.

Table 3.1.3. Days to maturity for entries in the CAT at different locations during 1979/80.

Entry No.	AFGHANISTAN Balkh	ARGENTINA Tucuman	ETHIOPIA Debre Zeit	LEBANON Terbol	SYRIA Tel Hadya	U.S.A. Pullman	Mean
ILC 519	76	92	116	76	119	154	105
1919	77	104	120	77	117	154	108
1922	82	104	123	82	119	154	110
1929	77	92	115	77	113	154	105
1930	80	92	124	80	119	154	107
1931	80	104	114	80	118	154	108
1932	77	92	118	77	119	154	107
1933	71	104	115	71	117	154	108
1934	89	92	109	89	120	154	108
3256	78	104	114	78	118	154	109
Location mean	79	98	117	79	118	154	

Table 3.1.4. Seed yield (Y=kg/ha) and rank (R) of entries in the CAT at different locations during 1979/80.

Entry	AFGHANISTAN		ALGERIA		ARGENTINA		ETHIOPIA		GUATEMALA		JORDAN		LEBANON		LIBYA		PAKISTAN		SPAIN		SYRIA		U.S.A.		Mean	
	Balkh		Setif		Tucuman		Debre-Zeit		Chimaltenango		Univ.		Terbol		Jendoubah		Faisalabad		Sevilla		Tel-Hadya		Pullman			
	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R
ILC 519	376	9	262	7	664	6	750	4	424	6	467	6	293	7	157	7	521	10	1930	5	1451	5	3103	8	878	9
1919	765	3	1261	1	721	5	1214	1	394	7	413	7	348	2	131	8	1935	1	2236	3	1597	3	3392	5	1199	1
1922	582	6	262	7	933	1	304	8	581	2	495	5	301	5	224	3	1144	5	2250	2	1529	4	3234	7	1049	5
1929	1082	1	-	-	914	2	649	5	397	9	524	3	334	4	107	9	1183	4	1784	7	1409	6	3518	2	1123	2
1930	1080	2	286	5	795	3	1071	2	524	5	515	4	299	6	270	2	596	9	1613	9	1284	7	3339	6	964	8
1931	471	8	928	3	763	4	298	9	603	1	381	9	284	8	288	1	1113	6	1656	8	1767	2	3395	4	1059	4
1932	573	7	238	9	639	8	435	7	535	4	592	1	345	3	202	4	1204	3	2109	4	1259	8	3050	9	977	7
1933	257	10	286	5	660	7	801	3	124	10	396	8	156	10	105	10	1412	2	1862	6	915	10	2381	10	778	10
1934	592	5	1012	2	542	10	56	10	566	3	-	-	259	9	175	5	900	7	1234	10	1169	9	3405	3	985	6
3256	695	4	393	4	636	9	515	6	380	8	589	2	362	1	174	6	810	8	2263	1	2270	1	3622	1	1109	3
Location mean 647			548		727		609		451		487		298		183		1082		1894		1465		3244			
C.V. %			36.13		38.27		18.22		37.93		35.17		24.70		20.90		50.80		31.40		22.70		29.50		16.90	
S.E. entry $\pm$			116.95		185.75		66.20		115.54		79.33		60.00		31.2		46.6		160.7		215.2		215.9		116.95	

Table 3.1.5. Correlations ⁽¹⁾ (df=8) between the seed yield of entries in the CAT at different locations during 1979/80.

Country	Location	ALGERIA Setif	ARGENTINA Tucuman	ETHIOPIA Debre-Zeit	GUATEMALA Chimaltenango	JORDAN Univ.	LEBANON Terbol	LIBYA Jendoubah	PAKISTAN Islamabad	SPAIN Sevilla	SYRIA Tel Hadya	U.S.A. Pulman
AFGHANISTAN	Balkh	0.10	0.47	0.33	0.22	0.41	0.57	0.09	-0.06	-0.09	0.16	0.65 [*]
ALGERIA	Setif		-0.18	0.00	0.19	-0.50	0.13	-0.06	0.52	-0.27	0.15	0.41
ARGENTINA	Tucuman			0.16	0.16	-0.06	0.20	0.16	0.12	0.25	0.09	0.20
ETHIOPIA	Debre Zeit				-0.49	-0.20	0.08	-0.27	0.27	0.30	-0.09	-0.16
GUATEMALA	Chimaltenango					0.21	0.45	0.78 ^{**}	-0.31	-0.22	0.23	0.58
JORDAN	University						0.60	0.03	-0.42	0.24	0.25	0.36
LEBANON	Terbol							0.15	-0.01	0.45	0.67 [*]	0.79 ^{**}
LIBYA	Jendoubah								-0.40	-0.19	0.24	0.29
PAKISTAN	Faisalabad									0.36	-0.11	-0.19
SPAIN	Sevilla										0.47	-0.03
SYRIA	Tel Hadya											0.69 [*]

(1) * $P \leq 0.05$

** $P \leq 0.01$

3.2. CHICKPEA INTERNATIONAL YIELD TRIAL (CIYT)

3.2.1. Material

The 24 test entries in the CIYT originated from Jordan, India, Iran, Sudan, Syria, Tunisia, Turkey and the U.S.A. comprised 23 kabuli and 1 desi genotypes. The remaining one entry was to be supplied by the local cooperators. The former 24 genotypes were homozygous, derived from the germplasm collection, and had shown a superior seed yield either regionally or internationally in ICARDA's trials. Cooperators were free to use the genotypes in their breeding programmes or for release as commercial cultivars.

3.2.2. Methods and Management

The trial design was a 5 x 5 quadruple lattice (4 replicates), although results have been analyzed as a randomised block. The suggested plot size was 4 rows, 4 m long with an inter- and intra-row spacings of 0.30 m and 0.10 m respectively.

Forty two sets of the trial were despatched to cooperators in 21 countries. Due to various reasons 8 sets did not reach the cooperators in India, Mexico and Iran. The results have been returned from 18 locations, although included in the report is only from 15 locations. The trial was destroyed by birds in Egypt and by Ascochyta blight in Faisalabad (Pakistan) and Algeria. The information on agronomic practices are given in Table 3.2.1.

3.2.3. Results and Discussion

The data on days to flowering are presented in Table 3.2.2. The location means varied from 28 days in Arbil to 152 days in Izmir. The genotype ILC 19 took the least time to flower and ILC 263 took the longest to flower. The days to maturity nearly followed the same pattern as that of days to flower. The genotypes matured earliest at Arbil and the latest at Lahore. The range for maturity was very narrow, 111 days for ILC 613 to 117 days for ILC 1178 and ILC 1308.

Table 3.2.1. Agronomic data for different locations for the CIYT during 1979/80.

Country	Location	Planting date	Harvesting date	Crop (1) duration (days)	Fertilizer (kg/ha)			Irrigation	Chemicals
					N	P ₂ O ₅	K ₂ O		
AFGHANISTAN	Balkh	13- 4-80	22-7-80	81	30	20		8	
ARGENTINA	Tucuman			99					
CHILE	Graneros	16-10-79	20-1-80	117				2	Treflon
CYPRUS	Laxia	9- 2-80	20-6-80	131		70			
ETHIOPIA	Debre Zeit			115					
IRAQ	Arbil	18- 4-80	6-7-80	65	200	100			
JORDAN	University	16- 3-80	7-7-80						
LEBANON	Terbol	26- 4-80		77	100	300		2	
NEPAL	Birgunj	18-11-79	1-4-80	141	20	20			
PAKISTAN	Lahore	19-11-79	21-4-80	158	16.8	101	56	2	
SPAIN	Sevilla	4- 4-80							
SYRIA	Kafr Antoon								
	Tel Hadya	19- 2-80	2-7-80	118	30	50	0		
TURKEY	Ankara	28- 3-80	4-8-80	122					
U.S.A.	Pullman			154					Cygon

(1) Days from planting to maturity averaged over all entries.

Table 3.2.2. Days to flowering for entries in the CIYT at different locations during 1979/80.

Entry	Origin	AFGHANISTAN Balkh	ARGENTINA Tucuman	CHILE Graneros	CYPRUS Laxia	ETHIOPIA Debre Zeit	IRAQ Arbil	JORDAN University	LEBANON Terbol	NEPAL Birgunj	PAKISTAN Islamabad	
ILC	4	Jordan	72	60	56	80	53	28	62	37	87	-
	16	Jordan	61	65	60	76	52	28	61	38	82	132
	19	Jordan	68	60	54	77	53	27	53	36	82	-
	23	Iran	62	66	59	79	55	28	63	37	89	-
	205	Sudan	65	60	50	77	52	28	55	36	91	116
	237	U.S.A	68	74	59	78	55	30	62	39	87	132
	262	U.S.A	68	66	59	82	54	30	60	38	95	-
	263	U.S.A	71	74	58	82	51	30	63	41	95	132
	268	Iran	70	60	56	78	55	28	61	37	91	-
	295	Iran	70	60	59	76	54	27	54	37	82	132
	480	Turkey	65	66	59	78	52	25	63	40	93	132
	493	Turkey	55	60	55	75	53	24	61	35	90	132
	517	Turkey	66	66	59	79	52	24	62	40	91	132
	610	Tunisia	63	74	56	75	50	28	63	37	90	132
	613	Iran	70	74	54	79	52	29	62	35	87	132
	897	Iran	63	60	58	81	50	26	53	38	90	135
	998	Iran	67	62	58	78	53	27	51	36	92	132
	1028	Iran	64	74	54	76	52	29	60	36	86	132
NEC	1096	Iran	65	60	58	84	54	29	64	39	92	-
ILC	1178	Iran	67	74	58	80	52	30	63	39	87	-
	1298	U.S.A	72	66	59	78	49	28	64	38	86	132
	1308	U.S.A	69	60	58	80	51	23	60	37	92	-
	1920	India	68	74	56	80	55	29	54	39	90	132
	1929	Syria	68	60	56	78	52	27	62	37	89	-
Local check			70	66	60	75	52	27	62	39	84	124
Location mean			67	66	57	78	53	28	60	38	89	131

The location mean for plant height varied from 23 cm at Arbil to 57 cm at Pullman. The genotype ILC 237 attained 39 cm height and was the tallest genotype, whereas ILC 19 and ILC 1028 with 31 cm height were the shortest genotypes across the location Table 3.2.3.

The data on seed yield are given in Table 3.2.5. The 'F' test was significant at all the locations. The coefficient of variation ranged from 11.6 % at Pullman to 49.0 % at Lahore with a mean of 22.9 %. There was a large variation among the location means, from 359 kg/ha at Laxia to 3244 kg/ha at Pullman. The number of test entries that were significantly better than the local check were 23 at Seville, 12 at Graneros, 10 at Terbol, 4 each at Debre Zeit and Azaz, 2 at Ankara and 1 each at Balkh and Jordan University.

The genotypes ILC 493 and ILC 610 on an average gave the highest seed yield of 1163 kg/ha. These were followed by ILC 4 (1124 kg/ha), ILC 237 (1114 kg/ha) and ILC 480 (1094 kg/ha). The difference in yield between the highest and the lowest yielding genotype was of 202 kg/ha.

The correlations between seed yield of entries at different locations are given in Table 3.2.6. The correlation between seed yield at Tel Hadya was positive and significant with Laxia (Cyprus), Terbol and Kafr Antoon and none was negatively significant. This suggests that it would be difficult to predict the performance of genetic stock developed at Tel Hadya for other locations.

The five highest yielding entries at the individual locations are shown in Table 3.2.7. The first five entries were the entries furnished from Tel Hadya at all the locations except at Lahore and Zaragoza where the local entries held fifth and third rank, respectively. This suggests the usefulness of the nursery to the cooperators. Each one of them found a few genotype for the use in their breeding programme.

The seed yield of entries expressed in percentage of the local check that were tested in CRPT in 1977/78 and CIYT in 1978/79 and 1979/80 are given in Table 3.2.8. Some of the lines including ILC 1929 and ILC 263 in Jordan; ILC 493 in Lebanon; ILC 480, ILC 493 and ILC 1298 in Syria showed fairly consistent behaviour over years and gave better yield than the local check.

Table 3.2.3. Plant height (cm) of entries in the CIYT at different locations during 1979/80.

Entry		AFGHANISTAN Balkh	ARGENTINA Tucuman	CHILE Graneros	CYPRUS Laxia	ETHIOPIA Debre Zeit	IRAQ Arbil	JORDAN Univ.	LEBANON Terbol	PAKISTAN Lahore	SYRIA Tel Hadya	TURKEY Ankara	U.S.A. Pullman	Mean
ILC	4	21	34	34	24	45	23	27	24	57	26	30	56	33
	16	29	35	43	25	34	25	26	25	45	25	29	56	33
	19	23	31	30	22	38	21	26	22	53	28	25	55	31
	23	32	35	38	29	33	22	26	26	52	28	29	59	34
	205	21	32	35	27	31	23	24	27	63	27	31	59	33
	237	40	38	45	27	43	22	29	34	66	32	34	61	39
	262	27	34	34	26	36	22	24	24	52	26	29	58	33
	263	23	36	27	26	40	25	30	25	51	28	26	61	33
	268	30	37	39	23	38	23	25	23	53	24	28	56	33
	295	28	30	39	26	38	24	27	27	57	29	26	57	34
	480	31	37	34	26	40	25	26	28	58	30	26	56	35
	493	28	33	41	25	37	25	23	26	58	28	33	57	35
	517	27	37	38	23	34	25	25	27	62	30	28	58	35
	610	27	35	40	24	38	24	24	28	56	30	29	55	34
	613	23	29	35	22	45	22	21	22	54	24	33	54	32
	897	24	38	40	24	39	22	27	26	57	27	30	58	34
	998	31	33	33	25	39	23	26	24	55	26	28	56	33
	1028	23	26	29	22	38	23	23	22	54	23	30	57	31
NEC	1096	31	44	41	24	42	24	26	26	52	26	29	57	35
ILC	1178	30	37	43	26	40	22	30	29	59	28	31	60	36
	1298	31	34	31	27	40	25	27	28	58	28	30	58	35
	1308	33	35	35	24	36	22	27	28	59	27	28	57	34
	1920	25	28	33	21	41	23	24	22	54	25	29	53	32
	1929	28	36	31	26	38	22	26	24	51	27	30	55	33
Local check		31	38	46	23	37	24	30	23	59	25	26	62	
Location mean		28	34	37	25	38	23	26	26	56	27	29	57	

Table 3.2.4. Days to maturity for entries in the CIYT at different locations during 1979/80.

Entry		AFGHANISTAN Balkh	ARGENTINA Tucuman	CHILE Graneros	ETHIOPIA Debre Zeit	IRAQ Arbil	LEBANON Terbol	NEPAL Birgunj	PAKISTAN Lahore	SYRIA Tel Hadya	TURKEY Ankara	U.S.A. Pullman	Mean
ILC	4	80	104	120	115	64	75	144	159	118	126	154	114
	16	77	104	125	110	65	79	137	160	118	126	154	114
	19	80	92	116	123	65	75	135	160	118	129	154	113
	23	78	92	116	102	70	74	144	160	117	122	154	112
	205	76	104	105	100	63	73	141	155	117	122	154	110
	237	86	92	111	106	65	80	145	158	117	115	154	112
	262	84	92	114	124	64	73	145	160	119	122	154	114
	263	84	104	117	116	63	74	143	161	120	122	154	114
	268	83	92	124	130	64	76	143	159	117	126	154	115
	295	80	104	114	112	64	77	138	156	118	122	154	113
	480	86	104	115	96	44	79	145	156	117	119	154	110
	493	81	92	121	116	65	78	143	156	118	126	154	114
	517	83	104	115	114	58	81	132	155	118	115	154	112
	610	84	104	121	110	63	80	144	158	118	119	154	114
	613	82	95	120	116	58	73	138	156	117	115	154	111
	897	79	92	121	110	68	78	141	158	118	122	154	113
	998	79	95	115	107	69	76	144	157	118	126	154	113
	1028	79	92	114	112	70	71	136	155	117	115	154	110
NEC	1096	84	104	124	130	67	80	-	158	118	126	154	115
ILC	1178	80	104	123	128	72	78	144	157	120	122	154	117
	1298	84	104	109	98	70	80	144	160	118	119	154	113
	1308	84	104	120	128	69	76	144	159	118	126	154	117
	1920	82	104	111	112	68	73	136	158	119	119	154	112
Local check	1929	81	92	115	125	69	76	140	160	118	122	154	114
		79	104	123	128	69	82	143	155	119	129	154	
Location mean		81	99	117	115	65	77	141	158	118	122	154	

Cont'd. 3.2.4. (CIYT)

Entry	Origin	PAKISTAN Lahore	SYRIA Tel Hadya	T U R K E Y		U.S.A Pillman	Mean
				Ankara	Izmir		
ILC 4	Jordan	106	77	80	153	73	73
16	Jordan	112	81	83	153	71	77
19	Jordan	108	78	78	153	73	71
23	Iran	110	77	80	152	73	74
205	Sudan	85	76	74	152	73	73
237	U.S.A	108	78	80	152	71	78
262	U.S.A	111	80	81	153	73	75
263	U.S.A	112	79	83	152	73	80
268	Iran	106	78	78	152	72	73
295	Iran	88	73	80	148	72	74
480	Turkey	108	79	83	152	73	78
493	Turkey	105	76	81	153	72	75
517	Turkey	109	79	83	152	72	78
610	Tunisia	106	77	80	152	72	77
613	Iran	104	78	74	153	72	77
897	Iran	109	79	80	152	73	76
998	Iran	106	79	78	152	72	76
1028	Iran	99	76	74	152	72	76
NEC 1096	Iran	112	81	83	152	72	75
ILC 1178	Iran	108	79	78	152	73	74
1298	U.S.A	107	80	83	154	72	78
1308	U.S.A	110	79	83	154	72	73
1920	India	108	80	80	153	73	78
1929	Syria	107	76	78	154	72	73
Local check	-	109	78	83	152	73	
Location mean		106	78	80	152	72	

Table 3.2.5. Seed yield (Y = kg/ha) and rank (R) of entries in the CIYT at different locations, and 100-seed weight at Tel Hadya in Syria, during 1979/80.

Entry	AFGHANISTAN		ARGENTINA		CHILE		CYPRUS		ETHIOPIA		IRAQ		JORDAN		LEBANON		PAKISTAN		S P A I N			
	Balkh		Tucuman		Graneros		Laxia		Debre Zeit		Arbil		Univ.		Terbol		Lahore		Sevilla		Zaragoza	
	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R
ILC 4	982	11	670	15	<u>2813</u>	1	318	19	<u>1333</u>	2	738	17=	<u>876</u>	1	1004	6=	241	23	<u>1647</u>	22	333	23
16	1152	6	808	1	<u>1657</u>	8	360	12	<u>1151</u>	3	905	1	619	17	879	16	274	22	<u>1662</u>	20	417	18
19	1175	4	693	13	<u>1750</u>	6=	275	24	799	8	810	6=	757	5	834	23	367	19	<u>2027</u>	9	396	20
23	1044	8	747	2	<u>1625</u>	9=	420	5	494	16	738	17=	548	23	<u>1063</u>	3=	559	16	<u>1656</u>	21	313	24
205	699	19	522	25	1500	13=	287	23	<u>1418</u>	1	762	16	533	24	868	19	714	13	<u>2047</u>	7	267	25
237	992	10	746	5	1282	17=	383	7	595	12	738	17=	595	19	<u>1063</u>	3=	843	7	<u>2167</u>	3	635	8
262	371	25	642	20	<u>1625</u>	9=	417	6	230	21	786	10	849	2	<u>1064</u>	2	212	24	<u>1688</u>	19	392	21
263	<u>1656(1)</u>	1	602	23	<u>1532</u>	12	330	18	563	13	881	2	794	3	932	12	171	25	<u>2007</u>	10	423	17
268	1244	5	737	8	<u>1609</u>	11	295	21	682	10	810	6=	730	6	878	17	644	14	<u>1926</u>	13	371	22
295	821	15	648	18	583	24	425	4	873	5	762	15	627	16	894	15	1325	1	<u>1765</u>	17	496	15
480	727	18	698	12	646	23	496	1	398	19	833	3=	683	8	<u>1135</u>	1	1191	2	<u>2044</u>	8	500	14
493	731	17	547	24	<u>2625</u>	2	453	3	393	18	786	11=	611	18	<u>1004</u>	6=	1076	4	1449	24	573	11
517	464	24	772	3	500	25	368	10	548	14	810	6=	563	22	854	21	716	12	<u>2140</u>	5	719	5=
610	1385	2	701	11	<u>2458</u>	3	363	11	294	20	738	17=	675	9=	916	13	867	6	<u>1928</u>	12	527	13
613	824	14	623	21	<u>2042</u>	5	224	25	182	23	714	23=	635	12=	818	24	500	17	<u>2155</u>	4	621	9
897	1276	3	745	6=	<u>1750</u>	6=	331	17	135	24=	738	17=	762	4	877	18	314	21	<u>1855</u>	14	875	2
998	868	13	615	22	<u>1500</u>	13=	338	16	135	24=	833	3=	635	12=	868	20	316	20	<u>2058</u>	6	485	16
1028	648	21	651	17	750	21	305	20	744	9	643	25	571	20=	<u>956</u>	10	1149	3	<u>2553</u>	1	569	12
NEC 1096	562	22	712	9	<u>2146</u>	4	292	22	405	17	786	11=	571	20=	<u>1010</u>	5	718	11	<u>1582</u>	23	583	10
ILC 1178	1021	9	745	6=	1182	17=	353	14	202	22	738	17=	722	7	841	22	637	15	<u>1819</u>	16	402	19
1298	911	12	757	4	667	22	382	8	821	7	714	23=	627	15	<u>975</u>	9	753	10	<u>1735</u>	18	771	4
1308	733	16	686	14	1396	16	345	15	513	15	833	3=	667	11	<u>1004</u>	6=	766	9	<u>1980</u>	11	1073	1
1920	494	23	666	16	813	20	354	13	833	6	786	11=	484	25	938	11	841	8	<u>2503</u>	2	719	5=
1929	670	20	707	10	1496	15	476	2	<u>1000</u>	4	786	11=	675	12=	903	14	377	18	<u>1852</u>	15	683	7
Local	1050	7	644	19	1125	19	381	9	680	11	810	6=	637	12=	685	25	1034	5	1107	25	813	3
Location mean	906		684		1487		359		620		779		676		940		664		1894		558	
C.V.%	30.5		21.9		19.2		29.1		32.2		16.8		21.3		19.5		49.0		16.0			
L.S.D. 5%	389.6		211.9		403.9		147.9		282.9		185.5		238.0		259.3		460.1		427.8			
No. of entries	1		0		12		0		4		0		1		10		0		23			

significantly exceeded local check

(1) Seed yield values underlined, significantly

(2) Measured at Tel Hadya only.

Table 3.2.5. Cont'd.

Entry	S Y R I A				TURKEY		U.S.A.		Mean		100-Seed weight (g)
	Kafr Antoon	Tel Hadya			Ankara	Pullman			Y	R	
ILC 4	881	8	1101	14	972	21	2955	22	1124	3	34.25
16	869	9	1093	16	1085	17	3172	15	1083	8	36.03
19	929	5	1124	11	798	24	2913	24	1050	13	32.85
23	<u>979</u>	2	1139	8	929	22	2926	23	1014	20	36.08
205	409	25	732	25	1016	19	2646	25	961	24	15.00
237	820	14	1182	4	1003	20	3670	3	1114	4	36.00
262	<u>1079</u>	1	1395	1	1107	14	3055	20	994	23	34.53
263	864	10	1094	15	1104	11	3106	17	1077	9	36.28
268	690	22	1031	20	1198	12	3239	12	1072	11=	26.18
295	<u>957</u>	4	1104	11	1098	15=	3710	2	1073	10	32.98
480	<u>965</u>	3	1142	6	1424	5	3534	5	1094	5	31.83
493	819	15	1130	10	1496	4	3758	1	1163	1=	29.28
517	807	16	1066	19	<u>1574</u>	2	3665	4	1038	15=	29.23
610	923	6	1166	5	1113	13	3398	6=	1163	1=	29.80
613	804	17	970	23	865	23	3264	11	1016	18=	19.58
897	861	11	999	22	<u>1602</u>	1	3177	14	1086	7	32.35
998	783	18	1139	7	1357	6	3186	13	1008	21	28.30
1028	690	22=	1183	3	1054	18	3104	18	1038	15=	20.40
NEC 1096	830	13	946	24	1265	8	3006	21	1028	17	24.88
ILC 1178	766	20	1077	17	1209	10	3143	16	997	22	36.25
1298	868	7	1101	13	1219	9	3327	9	1043	14	32.15
1308	781	19	1134	9	1098	15=	3372	8	1092	6	35.00
1920	604	24	1076	18	735	25	3398	6=	1016	18=	20.48
1929	832	12	1022	21	1524	3	3071	19	1072	11=	35.90
Local	694	21	1248	2	1277	7	3319	10			
Location mean	821		1096		1169		3244				
C.V. %	20.9		16.1		16.1		11.6				
L.S.D. 5%	242.1		249.8		267.1		532.9				
No. of entries	4		0		2		0				

significantly exceeded local check

(1) Seed yield values underlined are significantly better than local check

(2) Measured at Tel Hadya only.

Table 3.2.6. Correlations ⁽¹⁾ (df = 22) between the seed yield of entries in the CIYT at different locations during 1979/80 (local check excluded from the calculations).

Country	Location	ARGENTINA	CHILE	CYPRUS	ETHIOPIA	IRAQ	JORDAN	LEBANON	PAKISTAN	SPAIN		SYRIA		TURKEY	U.S.A.
		Tucuman	Graneros	Laxia	Debre Zeit	Arbil	Univ.	Terbol	Lahore	Sevilla	Zaragoza	Kafr Antoon	Tel Hadya	Ankara	Pullman
AFGHANISTAN	Balkh	0.19	0.31	-0.24	-0.02	0.19	0.40*	-0.27	-0.24	-0.14	-0.24	0.17	-0.04	-0.08	-0.15
ARGENTINA	Tucuman		-0.23	0.14	-0.04	0.04	-0.01	0.05	-0.21	-0.12	0.20	0.35	0.19	0.10	0.12
CHILE	Graneros			-0.26	-0.06	0.01	0.39	-0.00	-0.29	-0.51*	-0.25	0.12	-0.07	-0.08	-0.30
CYPRUS	Laxia				-0.05	0.16	-0.03	0.55**	0.29	-0.31	0.07	0.45*	0.43*	0.44*	0.45*
ETHIOPIA	Debre Zeit					0.08	-0.12	-0.09	0.01	0.00	-0.27	-0.35	-0.36	-0.32	-0.30
IRAQ	Arbil						0.15	-0.04	-0.35	-0.20	-0.07	0.12	0.02	0.19	0.06
JORDAN	University							0.03	-0.44*	-0.34	-0.20	0.49*	0.35	0.11	-0.23
LEBANON	Terbol								0.34	-0.21	0.04	0.39	0.47*	0.01	0.17
PAKISTAN	Lahore									0.15	0.11	-0.15	0.01	-0.11	0.43*
SPAIN	Sevilla										0.22	-0.49*	-0.05	-0.30	0.07
	Zaragoza											-0.04	0.03	0.30	0.46*
SYRIA	Kafr Antton												0.69**	0.13	0.21
	Tel Hadya													-0.06	0.33
TURKEY															0.30

(1) * $P \leq 0.05$

** $P \leq 0.01$

Table 3.2.7. The five heaviest seed yielding entries at the individual locations in the CIYT.

Rank	AFGHANISTAN Balkh		ARGENTINA Tucuman		CHILE Graneros		CYPRUS Laxia		ETHIOPIA Debre Zeit		IRAQ Arbil		JORDAN Univ.		LEBANON Terbol	
1	ILC	263	ILC	16	ILC	4	ILC	480	ILC	205	ILC	16	ILC	4	ILC	480
2		610		23		493		1929		4		263		262		262
3		897		517		610		493		16		480 (1)		263		23
4		19		1298		1096		295		1929		998		897		237
5		268		237		613		23		295		1308		19		1096

Rank	PAKISTAN Lahore		SPAIN				SYRIA				TURKEY Ankara		U.S.A. Pullman	
			Seville		Zaragoza		Kafr Antoon		Tel-Hadya					
1	ILC	295	ILC	1028	ILC	1308	ILC	262	ILC	262	ILC	897	ILC	493
2		480		1920		897		23		Local check		517		295
3		1028		237		Local check		480		1028		1929		237
4		493		613		1298		295		237		493		517
5		Local check		517		517		19		610		480		480
						1920								

(1) The brackets indicate the entries which had the same rank.

Table 3.2.8. Seed yield of entries expressed as percentage of the local check that were tested in CRPYT in 1977/78 and CIYT in 1978/79 and 1979/80.

Entry No.		JORDAN			LEBANON			SYRIA		
		1977/78	1978/79	1979/80	1977/78	1978/79	1979/80	1977/78	1978/79	1979/80
ILC	19	94	-	119	86	-	121	88	-	106
ILC	263	-	178	125	-	79	136	89 [*]	123	101
ILC	480	87	154	108	84	101	<u>166</u>	<u>180</u>	108	108
ILC	493	95	123	96	106	128	<u>147</u>	107	118	100
ILC	1298	70	-	99	90	-	<u>142</u>	103	-	101
ILC	1920	107	137	76	78	126	137	113	104	87
ILC	1929	112	135	106	97	110	132	88	111	95
NEC	1096	112	94	90	93	75	<u>147</u>	128	90	91
Local check		100	100	100	100	100	100	100	100	100

* The yield of ILC 263 was taken from CRN during 1977/78.

3.3. CHICKPEA INTERNATIONAL YIELD TRIAL-WINTER (CIYT-W)

3.3.1. Material

The eight test entries originated from Turkey, the U.S.A. and the USSR. In addition, ILC 1929 was furnished as a susceptible check and the local check was supplied by the local cooperator. The test entries were identified as resistant to Ascochyta blight and high yielding at Tel Hadya. These genotypes were homozygous and selected from the germplasm collection. The cooperators were free to use the genetic stock in their own breeding programmes or for release as commercial cultivars.

3.3.2. Methods and Management

The trial design was a randomised block with four replicates. The suggested plot size was a 4 rows of 4 m long with inter- and intra-row spacing of 0.30 m and 0.10 m, respectively.

Fifteen sets of trials were distributed in nine countries. The results were returned from ten locations covering eight countries. The results from Libya have not been included because it is a traditionally winter sown area. Information on the agronomic practices have been supplied from a number of locations, the details are given in Table 3.3.1.

3.3.3. Results and Discussion

The data on days to flower, days to maturity and plant height are given in Table 3.3.2., 3.3.3., and 3.3.4. respectively. The location mean for days to flower ranged from 80 days at Laxia to 241 days at Ankara. The data on maturity was available only from two locations which do not permit meaningful discussion. The location mean for plant height varied from 34cm at Ankara and Jendoubah to 67cm at Larissa.

The data on seed yield are given in Table 3.3.5. The 'F' test was significant at all the locations. The coefficient of variation ranged from 5.7 % at Jordan University to 30.3 % at Terbol. Though the seed

Table 3.3.1. Agronomic data for different locations for the CIYT-W during 1979/80.

Country	Location	Planting date	Harvesting date	Crop (1) duration (days)	Fertilizer (kg/ha)			Irrigation	Insecticide
					N	P ₂ O ₅	K ₂ O		
ALGERIA	Khroub								
CYPRUS	Laxia	9- 2-80	20- 6-80			70			
GREECE	Larissa	12-12-79	16- 7-80						
JORDAN	University								Phosdein
LEBANON	Terbol								
MOROCCO	Douyet								
SYRIA	Gelline								
	Lattakia								
	Tel Hadya	17-11-79	11- 6-80	277	30	50			

(1) Days from planting to maturity averaged over all entries.

Table 3.3.2. Days to flowering for entries in the CIYT-W at different locations during 1979/80.

Entry	Origin	CYPRUS Laxia	GREECE Larissa	JORDAN Univ.	SYRIA		TURKEY Ankara	Mean
					Lattakia	Tel-Hadya		
ILC 184	USSR	84	149	101	172	-	244	150
190	USSR	76	141	95	153	-	244	142
195	USSR	88	149	105	172	159	244	153
202	USSR	86	150	104	179	162	235	153
215	USA	76	143	99	163	158	244	147
249	USA	75	142	95	151	158	244	144
482	Turkey	75	149	96	153	157	235	144
1929	Syria	75	146	100	-	-	244	141
3279	USSR	87	155	104	183	159	235	154
Local check		75	149	102	165	158	244	
Location mean		80	147	100	166	159	241	

Table 3.3.3. Days to maturity for entries in the CIYT-W at different locations during 1979/80.

Entry	SYRIA	TURKEY	Mean
	Tel Hadya	Ankara	
ILC 184	216	278	247
190	218	278	248
195	207	278	243
202	208	270	239
215	218	278	248
249	218	278	248
482	208	270	239
1929	-	287	287
3279	207	270	239
Local check	218	287	
Location mean	213	227	

Table 3.3.4. Plant height (cm) for entries in the CIYT-W at different locations during 1979/80.

Entry	CYPRUS	GREECE	JORDAN	LIBYA	SYRIA	TURKEY	Mean
	Laxia	Larissa	Univ.	Jendoubah	Tel Hadya	Ankara	
ILC 184	26	63	38	33	-	38	40
190	26	62	39	37	-	33	39
195	33	71	41	37	52	30	44
202	45	77	48	39	61	38	51
215	30	66	37	32	38	30	39
249	26	62	38	31	40	33	38
482	25	62	33	29	44	23	36
1929	26	60	29	28	-	33	35
3279	43	84	50	40	63	45	54
Local check	28	67	40	35	38	33	
Location mean	31	67	39	34	48	34	

yield from Laxia is included in the Table, it has been ignored from further consideration because the trial was conducted during spring. The location mean varied just below 1.0 t/ha to over 3.0 t/ha with an average of 2.1 t/ha.

The cultivar ILC 482 gave the highest seed yield of 2323 kg/ha and ranked first at four locations including Larissa, Jordan University, Gelline and Tel Hadya, second at Lattakia; third at Terbol, fourth at Khroub and fifth at Douyet. Secondly this cultivar showed wide adaptation. Thirdly, it had the largest seed size among the test entries. Finally it had resistance reaction to Ascochyta blight. Thus this cultivar seems to be a good candidate for multilocation tests and on on-farm trials. It certainly holds a great promise.

The year 1978/79 was the first year when the Ascochyta blight and cold tolerant genotypes were tested during winter in the region where the crop is exclusively grown as a spring-sown crop. The result was quite encouraging. The highest yielding cultivar ILC 482 produced 2.3 t/ha across the locations during winter against 1.2 t/ha seed yield produced by the highest yielding cultivar ILC 493 during spring. Also the grand location mean was twice as great during winter as that of spring. Thus it is evident that introduction of winter sowing of chickpea is poised for a major break through in chickpea production in the region.

Table 3.3.5. Seed yield (Y=kg/ha) and rank (R) of entries in the CIYT-W and different locations and 100 seed weight at Tel Hadya in Syria, during 1979/80.

Entry	ALGERIA		CYPRUS		GREECE		JORDAN		LEBANON		MOROCCO		SYRIA						Mean		100 seed ⁽²⁾ weight (g)
	Khroub		Laxia		Larissa		Univ		Terbol		Douyet		Gelline		Lattakia		Tel Hadya		Y	R	
	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R			
ILC 184	<u>3578</u> ⁽¹⁾	3	303	9	<u>2503</u>	2	1071	9	3342	4	3583	2	<u>1743</u>	3	<u>1816</u>	5	<u>362</u>	5	2033	4	25.6
190	<u>3987</u>	2	379	5	<u>2471</u>	3	1381	3	2738	6	3000	8=	1350	9	<u>2306</u>	1	231	6	1983	5	26.1
195	<u>2977</u>	7	319	8	<u>2440</u>	4	1113	7	2362	9	3000	8=	<u>1884</u>	2	<u>2000</u>	4	<u>1607</u>	3	1967	6	25.2
202	<u>2992</u>	6	326	7	1820	7	1106	8	2094	10	3042	7	1626	5	<u>1806</u>	6	<u>1313</u>	4	1792	7	26.2
215	2609	8	401	4	1755	9	1268	5	2552	8	3062	6	1375	8	1187	8	178	7	1599	8	38.8
249	<u>4286</u>	1	500	1	2206	5	1401	2	2769	5	3917	1	1414	7	<u>2093</u>	3	125	9	2079	2	27.6
482	<u>3469</u>	4	483	2	<u>2646</u>	1	<u>1440</u>	1	3352	3	3275	5	<u>2163</u>	1	<u>2185</u>	2	<u>1894</u>	1	2323	1	29.8
1929	281	10	460	3	2031	6	1141	6	3672	2	1521	10	1308	10	-	-	-	-	1488	9	-
3279	<u>3094</u>	5	288	10	1797	8	1060	10	3972	1	3417	4	<u>1735</u>	4	1361	7	<u>1796</u>	2	2058	3	26.0
Local check	2010	9	346	6	1719	10	1298	4	2734	7	3500	3	1451	6	1038	9	131	8			
Location mean	2928		380		2139		1328		2959		3132		1605		1754		873				
C.V.%	15.1		28.0		21.2		5.7		30.3				13.0		28.12		13.2				
L.S.D. 5%	642.7		154.8		656.7		111.2		1538.0				259.0		723.6		168.6				
No of entries significantly exceeded local check	7		0		4		1		0				4		6		5				

(1) Seed yield values underlined, significantly exceeded the local check

(2) Measured at Tel Hadya only.

3.4. CHICKPEA INTERNATIONAL SCREENING NURSERY (CISN)

3.4.1. Material

One hundred entries originating in 16 countries were tested in CISN. The trial also included three checks, one kabuli (ILC 1929), one desi (NEC 1091) and one local check supplied by the cooperators. All the test entries were homozygous selections from the kabuli collection except seven genotypes that were developed through hybridization by the ICARISAT centre in India. All the test entries had shown superior performance in ICARDA's regional trial. Cooperators were free to choose the genetic stock for their own use in their breeding programs.

3.4.2. Methods and Management

Each of the 100 genotypes were to be planted in a single non-replicated row of 4 m, with three genotypes planted repeatedly in a block of 20 entries. The recommended inter-and intra-row spacing were 0.30 m and 0.10 m, respectively.

Thirty five sets of trials were distributed to cooperators in twenty one countries. The results from eight locations from eight countries were returned.

3.4.3. Results and Discussion

The data pertaining to ancilliary characters, viz. days to flowering, days to maturity, and plant height are presented in Table 3.4.1. The range of variation was 82 to 101 days for days flower, 123-134 days to mature and 33-41 cm for plant height.

The seed yield data received from eight locations are given in Table 3.4.2. The coefficient of variation being high (42.18%) for Afghanistan, moderate for Turkey (31.45%) and Lebanon (30.41%) and in the range of

Table 3.4.1. Values for three agronomic characters for entries in the CISON during 1978/79.

Entry	Origin	Days to flowering	Days to maturity	Plant height (cm)
ILC 7	Jordan	91	127	34
12	Jordan	39	127	39
29	Jordan	87	125	33
35	Syria	36	125	37
45	Iraq	87	127	36
47	Iraq	93	126	36
50	Iraq	36	125	36
66	Iraq	82	124	38
69	Iraq	89	126	38
71	Iraq	38	124	34
85	Spain	93	127	41
125	Spain	91	127	39
127	Spain	97	125	43
152	Greece	91	127	41
161	Tunisia	91	129	37
165	Tunisia	101	134	36
171	Tunisia	99	127	37
176	Morocco	97	126	40
231	U.S.A.	91	125	35
232	U.S.A.	88	125	33
260	U.S.A.	88	125	37
289	Iran	90	126	37
293	Iran	90	125	41
294	Iran	93	128	41
384	Iran	94	127	40

Entry	Origin	Days to flowering	Days to maturity	Plant height (cm)	100 seed weight (g)
ILC 408	Iran	84	126	35	
417	Iran	93	126	36	
451	Turkey	91	127	38	
456	Turkey	92	127	41	
463	Turkey	87	125	37	
464	Turkey	91	125	41	
468	Turkey	91	127	37	
475	Turkey	91	128	39	
489	Turkey	90	128	35	
501	Turkey	89	127	34	
509	Turkey	89	129	38	
515	Turkey	94	129	38	
523	Egypt	90	129	41	
564	Lebanon	92	129	37	
570	Lebanon	90	127	34	
576	Lebanon	88	127	33	
585	Egypt	91	128	36	
591	Egypt	92	128	37	
596	Algeria	90	126	35	
624	Tunisia	90	126	35	
635	Iran	90	127	36	
642	Iran	87	125	38	
650	Iran	90	125	38	
653	Iran	94	131	38	
750	Iran	93	126	36	

Cont'd. ILC 771

Entry	Origin	Days to flowering	Days to maturity	Plant height (cm)	100 seed weight (1)
ILC 771	Iran	94	130	38	
870	Iran	94	126	34	
864	Iran	94	127	36	
900	Iran	90	124	33	
921	Iran	92	126	36	
953	Iran	96	126	37	
1061	Iran	93	125	35	
1079	Iran	92	126	35	
1094	Iran	94	127	37	
1102	Iran	98	128	33	
1108	Iran	89	126	36	
1117	Iran	87	126	33	
1145	Iran	95	130	38	
1164	Iran	89	125	37	
1167	Iran	95	131	40	
1175	Iran	93	128	36	
1194	Iran	92	127	36	
1201	Iran	89	128	39	
1263	U.S.A.	89	127	40	
1266	U.S.A.	92	128	36	
1269	U.S.A.	90	126	36	
1273	U.S.A.	93	126	34	
1309	U.S.A.	93	125	37	
1317	Afghanistan	88	123	37	
1345	Afghanistan	93	127	38	

Cont'd.. ILC 1347

Entry	Origin	Days to flowering	Days to maturity	Plant height(cm)	100 seed weight(1)
ILC 1347	Afghanistan	90	123	38	
1390	Afghanistan	85	119	36	
1558	Afghanistan	91	125	35	
1567	Afghanistan	93	126	37	
1573	Afghanistan	92	126	38	
1589	Afghanistan	86	121	37	
1782	India	87	126	35	
1837	Iran	85	120	33	
1838	Unknown	88	124	38	
1851	Unknown	89	124	39	
1865	Iran	89	127	37	
1878	Unknown	92	127	37	
1885	India	87	131	35	
1922	Morocco	91	127	37	
3256	Cyprus	100	128	37	
3280	Afghanistan	90	124	38	
3281	U.S.A.	90	127	34	
ICCL 78159	ICRISAT-India	87	122	36	
78160	ICRISAT-India	91	126	34	
78164	ICRISAT-India	83	122	34	
78166	ICRISAT-India	83	123	35	
78173	ICRISAT-India	85	123	36	
78174	ICRISAT-India	88	127	35	
78175	ICRISAT-India	90	125	36	
No. 6540	Pakistan	94	128	34	
NEC 1091		97	129	39	
ILC 1929		93	126	35	
Local check		78	113	35	

Table 3.4.2. Seed yield ($Y = \text{kg. ha}^{-1}$) and rank (R) of entries in the CISM at different locations during 1979/80.

Entry No.		AFGHANISTAN		ALGERIA		CYPRUS		LEBANON		SPAIN		SYRIA		TURKEY		U.S.A.		Mean	
		Balkh		Tiaret		Laxia		Terbol		Sevilla		Tel Hadya		Ankara		Pullman		Y	R
		Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R		
ILC	7	1146	4	1487	14	669	47	357	47	1023	61	1185	61	1195	31	2286	77	1168	36
	12	579	54	1424	20	712	37	172	96	945	74	1800	15	-	-	1822	91	1065	65
	29	1082	5	1169	45	781	21	340	53	1223	35	1266	52	1822	3	2615	48	1287	13
	35	598	49	1232	40	969	4	247	81	1349	22	2385	2	-	-	2520	59	1329	9
	45	509	64	627	97	725	33	323	59	1188	41	1851	13	921	62	2353	74	1062	67
	47	898	17	1551	10	912	7	312	63	1269	28	2370	3	1649	10	3182	17	1518	2
	50	681	35	596	98	725	33	106	97	1497	6	1718	17	-	-	2547	54	1124	51
	66	1649	1	1169	45	787	18	244	82	1381	14	2281	5	769	74	3002	26	1410	4
	69	968	8	723	93	819	14	451	24	789	85	1474	34	1711	6	2804	36	1217	24
	71	923	15	1360	25	944	5	382	42	1318	25	1837	14	1191	33	3142	18	1387	5
	85	0	99	468	101	506	89	381	43	646	98	1135	68	1008	50	3868	7	1001	80
	125	0	99	532	99	581	71	329	58	572	102	891	88	1016	49	3603	9	940	91
	127	0	99	914	83	537	83	67	98	448	103	1135	68	-	-	4206	3	1044	73
	152	0	99	1424	20	575	74	304	67	777	87	1246	54	1569	14	3891	5	1223	22
	161	38	97	341	102	700	40	251	79	1210	37	2180	6	-	-	3909	4	1233	20
	165	273	83	691	94	444	97	-	99	942	76	1224	57	1204	29	-	-	796	99
	171	273	83	1105	62	637	56	221	88	645	99	1083	74	1025	47	-	-	713	102
	176	178	93	1869	3	787	18	181	95	766	91	1402	41	1914	4	5495	1	1562	1
	231	133	94	1296	29	0	103	313	62	864	81	2091	8	428	89	-	-	732	101
	232	38	97	1169	45	637	56	514	15	860	82	1535	27	1705	7	2504	61	1120	52

Cont'd... ILC 260...

Table Cont'd. ...

Entry No.	AFGHANISTAN		ALGERIA		CYPRUS		LEBANON		SPAIN		SYRIA		TURKEY		U.S.A.		Mean	
	Balkh		Tiaret		Laxia		Terbol		Sevilla		Tel Hadya		Ankara		Pullman			
	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R
ILC 260	303	79	1901	2	652	52	517	14	723	95	1446	38	-	-	2706	42	1178	33
289	1590	2	1392	23	627	59	433	30	1168	43	876	89	-	-	2927	32	1288	12
293	1036	6	1774	4	652	52	249	80	922	77	1135	68	2004	1	2175	83	1243	19
294	201	90	1392	23	727	32	566	7	983	65	1669	20	1655	9	2657	46	1231	21
384	571	56	1137	52	614	62	373	46	1094	50	839	90	1003	53	2778	40	1051	68
408	418	72	1073	66	539	82	0	99	1048	55	476	99	978	56	2301	76	854	96
417	520	63	755	92	483	91	192	93	1171	42	417	100	-	-	2274	79	830	97
451	889	18	946	80	671	46	445	26	584	101	1032	77	1648	11	2368	72	1073	63
456	762	29	1328	26	583	70	305	65	853	83	1083	74	1850	2	2850	34	1202	28
463	399	74	691	94	933	6	305	65	1194	40	1246	54	1073	42	3882	6	1215	25
464	237	85	1296	29	908	8	377	44	1428	11	1600	24	696	80	2490	62	1129	47
468	569	58	1232	40	677	44	530	12	1466	10	681	96	781	72	3197	15	1142	42
475	460	67	1551	10	671	45	573	6	1631	3	1288	48	726	77	3859	8	1345	8
489	428	70	1296	29	983	3	611	3	772	89	1555	26	179	90	2535	55	1045	72
501	842	26	1296	29	758	25	357	47	1494	7	1696	18	450	88	756	99	956	89
509	282	81	1296	29	564	76	243	83	1525	4	1444	39	919	63	963	97	904	95
515	473	66	1424	20	552	78	340	53	1487	8	1466	35	913	65	2179	82	1104	55
523	963	10	1551	10	877	9	225	86	1228	34	1681	19	789	70	4423	2	1467	3
564	409	73	1296	29	614	62	349	51	1046	56	1029	79	712	78	-	-	767	100
570	900	16	659	96	827	12	332	57	1843	2	1288	48	878	67	2531	57	1157	40

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Cont'd.. ILC 576...

Table

Cont'd. ...

Entry No.	AFGHANISTAN		ALGERIA		CYPRUS		LEBANON		SPAIN		SYRIA		TURKEY		U.S.A.		Mean	
	Balkh		Tiaret		Laxia		Terbol		Sevilla		Tel Hadya		Ankara		Pullman			
	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R
ILC 576	673	37	994	77	1012	1	574	5	1201	39	819	93	1674	8	2415	67	1170	35
585	539	62	994	77	787	18	376	45	1231	32	701	95	712	78	2019	87	920	94
591	864	21	994	77	762	23	290	71	1284	27	1271	51	1267	25	2059	85	1099	59
596	717	33	1185	44	712	37	457	22	1118	49	1160	64	1080	41	2370	71	1100	58
624	876	20	866	86	731	31	396	38	1136	47	1301	47	1260	26	1834	90	1050	70
635	947	13	930	81	719	36	357	47	1379	15	967	84	-	-	2595	50	1128	48
642	953	12	1248	39	869	10	342	52	1231	32	1619	22	1134	37	2392	70	1223	22
650	1169	3	1089	65	681	43	314	61	979	67	1108	73	1610	12	2185	81	1142	42
653	698	34	930	81	494	90	261	75	819	84	634	97	748	75	2784	39	921	93
750	755	30	866	86	706	39	442	27	1469	9	2316	4	1058	43	2532	56	1268	17
771	278	82	1312	27	446	94	217	89	982	66	1237	56	627	84	3115	20	1027	75
870	590	50	1121	61	446	94	403	36	1232	31	1266	52	951	58	2511	60	1065	65
864	450	69	1025	73	627	59	222	87	894	78	1022	80	939	60	3214	14	1049	71
900	361	76	1153	49	446	94	427	31	1362	19	1170	62	829	69	2953	30	1088	60
921	106	95	1153	49	314	101	297	70	1039	58	992	82	1721	5	2061	86	960	87
953	80	96	1312	27	733	29	260	77	967	69	1400	42	1196	30	2673	45	1077	62
1061	208	89	1631	7	527	86	199	91	1076	51	1318	46	1596	13	3020	25	1197	30
1079	0	99	1439	19	733	29	281	94	1220	36	1200	60	1177	35	3408	12	1182	32
1094	399	74	1471	17	533	85	187	94	1031	60	1281	50	-	-	3335	13	1177	34
1102	182	92	1694	5	652	52	197	92	1245	30	1481	32	1538	17	3507	11	1312	10

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Cont'd.. ILC 1108...

Table

Cont'd. ...

Entry No.	AFGHANISTAN		ALGERIA		CYPRUS		LEBANON		SPAIN		SYRIA		TURKEY		U.S.A.		Mean	
	Balkh		Tiaret		Laxia		Terbol		Sevilla		Tel Hadya		Ankara		Pullman			
	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R
ILC 1108	654	42	850	88	779	22	469	21	945	74	1520	29	1091	40	2697	44	1126	49
1117	201	90	1041	71	760	24	402	37	1039	58	1906	11	1215	28	2589	51	1144	41
1145	985	7	1105	62	548	79	316	60	738	94	1032	77	-	-	2837	35	1080	61
1164	348	77	1041	71	723	35	405	35	1059	52	1476	33	740	76	1792	92	948	90
1167	310	78	1296	29	548	79	442	27	1163	45	1320	45	585	85	2621	47	1036	74
1175	424	71	1169	45	535	84	809	1	957	70	1150	67	647	83	2215	80	988	82
1194	564	59	1487	14	791	17	537	10	887	79	824	92	532	87	1787	93	926	92
1201	297	80	1487	14	660	49	449	25	770	90	1513	31	945	59	2972	28	1137	45
1263	660	41	1583	8	591	67	689	2	1058	53	1224	57	783	71	2305	75	1112	54
1266	233	87	1296	29	435	98	395	39	957	70	1395	43	1004	52	2400	68	1014	78
1269	662	40	1965	1	739	27	336	56	1335	24	1451	37	976	57	2793	38	1282	14
1273	668	38	1647	6	796	16	548	8	1260	29	1111	72	1033	45	3028	23	1261	18
1309	579	54	1455	18	821	13	299	68	1408	12	1518	30	1018	48	2798	37	1362	7
1317	496	65	1073	66	664	48	243	83	782	86	600	98	875	68	2978	27	964	86
1345	586	52	1519	13	833	11	311	64	1046	56	3555	1	926	61	2163	84	1367	6
1347	560	60	1201	42	564	76	233	85	641	100	1014	81	775	73	3194	16	1023	76
1390	789	27	1137	52	627	59	298	69	1374	16	837	91	902	66	3023	24	1123	52
1558	847	25	1105	62	452	93	272	79	953	72	1074	76	1432	21	2275	78	1051	68
1567	611	46	1137	52	396	100	255	78	953	72	1785	16	1452	20	2703	43	1061	38
1573	605	48	1073	66	208	102	261	75	751	92	1133	71	1097	39	2717	41	981	83

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Cont'd..ILC 1589...

Table

Cont'd. ...

Entry No.	AFGHANISTAN		ALGERIA		CYPRUS		LEBANON		SPAIN		SYRIA		TURKEY		U.S.A.		Mean	
	Balkh		Tiaret		Laxia		Terbol		Sevilla		Tel Hadya		Ankara		Pullman			
	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R
ILC 1589	590	50	1137	52	579	72	395	39	1354	21	933	85	1183	34	2413	68	1073	63
1782	966	9	1583	8	685	42	480	19	1004	63	1585	25	1163	36	2963	29	1304	11
1837	552	61	1137	52	654	50	475	20	1210	37	911	86	1484	19	2576	53	1125	50
1838	679	36	1010	74	548	79	457	22	1373	17	785	94	534	86	2585	52	996	81
1851	755	30	1137	52	735	28	498	17	1303	26	1155	65	993	55	3062	22	1205	26
1865	755	30	1264	37	1004	2	426	32	1508	5	1155	65	1005	51	2486	63	1200	29
1878	864	21	1137	52	573	75	495	18	1912	1	1407	40	1345	23	2427	64	1270	16
1885	583	53	1137	52	585	68	535	11	1342	23	1333	44	1349	22	2427	64	1161	38
1922	851	24	1010	74	510	88	440	29	1357	20	911	86	-	-	2900	33	1140	44
3256	615	45	818	89	691	41	595	4	1384	13	1214	59	1282	24	2932	31	1191	31
3280	611	46	882	84	466	92	420	34	676	97	992	82	666	81	1855	89	821	98
3281	235	86	787	90	610	64	384	41	773	88	2140	7	1566	16	3125	19	1203	27
ICCL 78159	452	68	1073	66	654	50	540	9	749	93	1874	12	-	-	2368	72	1101	57
78160	764	28	1264	37	598	66	425	33	879	80	1614	23	1033	45	1269	95	981	83
78164	961	11	1010	74	579	72	350	50	972	68	2044	9	996	54	837	98	969	85
78166	885	19	1073	66	585	68	526	13	1120	48	1533	28	918	64	1017	96	957	88
78173	936	14	1201	42	610	64	207	90	1023	61	1162	63	1103	38	3080	21	1165	37
78174	637	43	787	90	816	15	340	53	1051	54	1985	10	658	82	1886	88	1020	77
78175	866	21	500	100	635	58	276	73	1370	18	1459	36	1567	15	3531	10	1275	15
No. 6540	229	88	882	84	516	87	500	16	987	64	1637	21	1512	18	1783	94	1006	79
Local check means	571	56	-	-	408	99	492	19	702	96	1319	47	1194	32	2423	66	1016	-
NEC 1091 means	629	44	1124	60	639	55	279	75	1140	46	1197	63	1225	27	2601	49	1104	55
ILC 1929 means	665	39	1150	51	746	26	382	45	1167	44	1372	44	1038	44	2527	58	1131	46
Location mean	581		1163		652		365		1094		1354		1103		2662			
C.V. %	42.18		17.36		20.73		30.41		14.20		23.31		31.45		22.63			
SE. of the check	117.34		88.28		55.45		52.23		63.70		135.12		162.05		254.79			
SE. of variety VS check	317.75		253.57		150.16		141.44		172.51		365.92		438.83		689.96			

17.36 to 23.31 % for other countries revealed that within the location the environmental variation was high in the former cases and low in the later. The location mean was the highest for the U.S.A. (2662 kg/ha) as compared to others where the seed yields varied from 365 kg/ha (in Lebanon) to 1354 kg/ha (in Syria). The rankings and the L.S.D. values for different environments revealed that 7, 22, 8, 2, 23, 16, 8 and 13 genotypes excelled the check by a significant margin in Afghanistan, Algeria, Cyprus, Lebanon, Spain, Syria, Turkey and the U.S.A. respectively.

The best five entries at individual locations are given in Table 3.4.3. There seems to be no co-herence in the performance of different genotypes across the locations. Nevertheless a few genotypes, ILC 176, ILC 576, ILC 293, and ILC 1865, maintained their ranking among the first five in at least two locations. The seed yield (expressed as percentage of the location mean) of the six entries with heaviest overall mean seed yield across locations is given in Table 3.4.4. The genotype ILC 171 exhibited above average mean at all the locations and ILC 47 at 7 locations, ILC 523 and ILC 66 at 6 locations, ILC 1345 at 4 locations and ILC 176 at 3 locations. The performance of ILC 523 was also among the top five during 1978-79.

Table 3.4.3. The five heaviest seed yielding entries at the individual locations in the CISON

Rank	AFGHANISTAN Balkh	ALGERIA Tiaret	CYPRUS Laxia	LEBANON Terbol	SPAIN Sevilla	SYRIA Tel Hadya	TURKEY Ankara	U.S.A. Pullman
1	ILC 66	ILC 1269	ILC 576	ILC 1175	ILC 1878	ILC 1345	ILC 293	ILC 176
2	289	260	1865	1263	570	35	456	523
3	650	176	489	489	475	47	29	127
4	7	293	35	3256	509	750	176	161
5	29	1102	71	576	1865	66	921	152

Table 3.4.4. Seed yield, expressed as percentage of the location mean, of the six entries with the heaviest mean seed yield across location (in descending order) in the CISON.

Entry	Location (1)							
	1	2	3	4	5	6	7	8
ILC 176	31	161	121	50	70	104	164	206
47	155	133	140	85	116	175	150	120
523	166	133	135	61	112	124	72	166
66	284	101	121	67	126	168	69	113
71	159	117	145	105	120	136	108	118
1345	101	131	128	85	96	263	84	81

(1) Locations 1 to 8 are in the same order as those in Table 3.4.3.

3.5. CHICKPEA INTERNATIONAL F_4 TRIAL (CIF $_4$ T)

3.5.1. Material

The material for CIF $_4$ T comprised 23 F_4 populations, one ICARDA check (ILC 1929) and one check to be supplied by the local cooperator. These F_4 populations were developed by hybridization between different genotypes originating from different countries. There was more variation between and within populations which the cooperators were free to practice for their own selections and use.

3.5.2. Methods and Management

The trial was conducted using 5 x 5 quadruple lattice (with four replications) but the results were analysed using randomised block design. The suggested plot size was 4 rows of 4 m length with inter-and intra-row spacings of 0.30 m and 0.10 m, respectively. Twenty five sets of trials were distributed to the cooperators in 14 countries. The results were not received from 12 locations from 3 each from India and Mexico, 2 from Pakistan and 1 each from Chile, Morocco, Sudan and Turkey.

The data were analysed for 11 locations.

The agronomic data with respect to different locations are given in Table 3.5.1.

3.5.3. Results and Discussion

The ancilliary data with respect to days to flowering, days to maturity and plant height are given in Table 3.5.2. The days to flowering and days to maturity ranged from 76 to 96 and 123 to 132, respectively, whereas plant height varied from 33 to 51 cms.

The seed yield performance of the populations is given in Table 3.5.3. The C.V. ranged from 19.3 % to 46.5 %. The highest C.V. was reported by Ethiopia. The perusal of Table revealed that none of the bulks exceeded the local check in Algeria, Bangladesh, Cyprus, Ethiopia and Lebanon.

Table 3.5.1. Agronomic data for different locations for the CIF₄T during 1979/80

Country	Location	Planting date	Harvesting date	Crop (1) duration (days)	Fertilizer (kg/ha)			Irrigation	Insecticide
					N	P ₂ O ₅	K ₂ O		
ALGERIA	Sidi Bel Abbas	15-12-77		161		200			
BANGLADESH	Dacca	17-11-79		140	70	140		2	
CHILE	Graneros	16-10-79	20- 1-80	119				2	
CYPRUS	Laxia	9- 2-80	20- 6-80			70			
EGYPT	Giza	19-11-79	4- 5-80	149					
ETHIOPIA	Debre Zeit								
LEBANON	Terbol	26- 4-80		82	100	300		2	
PAKISTAN	Faisalabad	4-11-79	15- 5-80					1	
SPAIN	Sevilla	4- 4-80							
SYRIA	Tel Hadya	20- 2-80	5- 7-80	118	30	50			

(1) Days from planting to maturity averaged over all entries.

Table 3.5.2. Mean values for three agronomic characters for entries in the CIF₄T during 1979/80.

Entry	Days to flowering	Days to maturity	Plant height cm.
X77Sd 19	88	130	45
23	90	132	43
28	80	128	37
37	85	129	35
83	77	125	33
113	80	123	39
132	84	127	40
135	85	127	41
138	85	130	51
165	79	127	40
166	84	127	41
172	87	129	42
174	83	124	36
175	84	125	36
180	88	127	38
181	85	128	42
184	87	130	48
185	90	132	51
192	90	131	45
193	90	131	46
204	79	124	39
212	83	130	43
217	85	131	41
ILC 1929	76	128	38

Table 3.5.3. Seed yield (Y=kg/ha) and rank (R) of entries in the CIF₄T at different locations during 1979/80.

Entry	ALGERIA		BANGLADESH		CHILE		CYPRUS		EGYPT		ETHIOPIA		LEBANON		PAKISTAN		SPAIN		Mean		
	Sidi-Bel-Abbes		Dacca		Graneros		Laxia		Giza		Debre Zeit		Terbol		Faisalabad		Seville				
	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	
X77Sd	19	2488	11	210	20	708	24	268	24	2625	18	137	21	407	3	940	15	1450	20	1026	22
	23	2464	13	236	19	1750	10	344	21	3018	11	66	23=	263	23	617	24	1678	13	1160	19
	28	2321	17	324	9	2094(1)	5	340	23	2548	21	238	15	295	20=	650	23	1945	8	1195	16
	37	1750	24=	506	1	1266	20	365	17	3030	10	411	7	353	8	1130	10	1999	7	1201	15
	83	2821	4=	386	4	2104	4	427	5	3637	7	1190	2	308	16	905	16	2210	3	1554	2
	113	2262	18=	336	8	1141	21	369	16	2714	17	905	3	318	14	956	14	2145	4	1238	11=
	132	2476	12	291	15	1479	12	357	19	3232	9	256	14	419	2	1364	4	1521	19	1266	10
	135	2821	4=	469	2	1328	16=	378	15	2869	14	298	10	300	19	743	22	1391	22	1177	18
	138	3036	2	298	12	1891	8	386	11	3988	4	196	17	256	24	1056	11	2256	2	1485	3
	165	2655	7	296	13	2594	1	410	8	2905	13	83	22	346	9	1173	8	1708	11	1352	8
	166	3083	1	384	5	1359	13=	528	2	5280	1	185	18=	323	13	1028	12	1839	10	1557	1
	172	1750	24=	268	16	1031	23	342	22	2071	25	286	11	252	25	898	17	1392	21	921	24
	174	2607	8	303	11	1063	22	346	20	2345	23	363	8	303	17	1667	3	2071	5	1230	13=
	175	2024	21	427	3	2016	6	248	25	2583	20	482	6	295	20=	1898	2	2309	1	1365	7
	180	1905	23	208	21	1563	11	418	7	2512	22	143	20	371	4	824	20	1246	24	1021	23
	181	2548	10	239	18	2313	2	429	4	3655	6	280	12=	303	18	889	18	1643	15	1367	6
	184	2262	18=	292	14	2297	3	387	10	4508	2	208	16	310	15	1252	6	1640	16	1462	4
	185	2560	9	174	24	1344	15	379	14	3792	5	65	23=	268	22	1201	7	1663	14	1272	9
	192	2881	3	176	23	1297	18=	360	18	2744	15	280	12=	353	7	1361	5	1692	12	1238	11=
	193	2393	14=	255	17	1328	16=	390	9	2595	19	185	18=	328	12	864	19	1553	18	1099	21
	204	2940	22	167	25	703	25	384	12	4161	3	625	4	338	11	1966	1	2025	6	1368	5
	212	2357	16	305	10	1797	9	427	6	2929	12	357	9	341	10	1167	9	1386	23	1230	13=
	217	2726	6	189	22	1359	13=	476	3	2726	16	58	25	355	6	556	25	1554	17	1111	20
ILC	1929	2095	20	340	7	2000	7	538	1	2230	24	500	5	360	5	810	21	1859	9	1192	17
Local check		2393	14=	383	6	1297	18=	379	13	3625	8	1476	1	425	1	994	13	991	25		
Location mean	2425		298		1565		387		3133		371		328		1076		1727				
C.V. %	26.6		30.0		26.0		35.2		27.3		46.5		19.3		26.6		19.4				
L.S.D. 5%	915.2		126.5		576.2		192.8		1207.8		244.2		89.5		405.1		472.7				
No. of entries significantly exceeded local check	0		0		8		0		1		0		0		3		19				

(1) Seed yield values underline, significantly exceeded the local check

However, eight entries in Chile, 1 in Egypt, 3 in Pakistan and 19 in Spain excelled the local check by significant margin. At Graneros (Chile), x77Sd 165 exceeded the local check by 100 percent, at Giza (Egypt) the population x77Sd 166 exceeded the local check by a margin of 45 %, at Faisalabad (Pakistan) by 98 % and at Seville (Spain) by a margin of 133 %. These results indicated that sufficient improvement in seed yield was possible in the national program, if selections are practiced in these populations for development of pure lines.

The cross x77Sd 83 showed almost consistent ranking across locations and may lead to genotypes with wide adaptation. Most other populations had different rankings at different locations. The seed yields of the populations at different locations were correlated (Table 3.5.4). It was observed that the correlations between Sidi-Bel-Abbes (Algeria) and Giza (Egypt), Seville (Spain) and Debre Zeit (Ethiopia), and seville (Spain) and Faisalabad (Pakistan) were significant. This exhibited that the results obtained from the one of the correlated pair may be applicable to either of the two. The absence of associations among different locations may be due to abrupt G x E interactions.

Table 3.5.4. Corroletions⁽¹⁾ (df=22) between the seed yield of entries in the CIF₄T at different locations during 1979/80.
(Local check excluded from the calculations).

Country	Location	BANGLADESH Dacca	CHILE Graneros	CYPRUS Laxia	EGYPT Giza	ETHIOPIA Debre Zeit	LEBANON Terbol	PAKISTAN Faisalabad	SPAIN Sevilla
ALGERIA	Sidi-Bel-Abbes	-0.05	0.16	0.26	0.40 ⁺	-0.14	-0.09	-0.18	0.08
BANGLADESH	Dacca		0.22	0.00	0.01	0.38	-0.11	-0.01	0.38
CHILE	Graneros			0.24	0.13	-0.02	-0.20	-0.17	0.15
CYPRUS	Laxia				0.33	0.03	0.12	-0.36	-0.11
EGYPT	Giza					0.01	-0.14	0.20	0.21
ETHIOPIA	Debre Zeit						-0.03	0.21	0.58 ^{**}
LEBANON	Terbol							0.08	-0.32
PAKISTAN	Faisalabad								0.41 ⁺

(1) * $P \leq 0.05$

** $P \leq 0.01$

3.6. CHICKPEA INTERNATIONAL ASCOCHYTA BLIGHT NURSERY (CIABN)

The main objective of the nursery was to test the performance of the lines found promising at ICARDA and ICRISAT at other locations in the blight endemic countries, identify lines with resistance across the locations, obtain information on the variability in the blight pathogen and share the material with the national cooperators. This was the second year of the operation of the nursery.

The entries included in CIABN mainly consisted of those found resistant at ICARDA and some in propagator screening at ICRISAT. A few of the lines reported resistant by other workers in the national programs for which seed was available were also included. The nursery comprised of 50 resistant/tolerant entries. The entries included originated from the USSR, Spain, Turkey, Iran, Tunisia, the U.S.A., Afghanistan, Ethiopia, India, Morocco and Pakistan and consisted of both kabuli and desi types. During this year, 26 sets were distributed. The results from 13 locations in five countries were returned but results from only 7 locations were worth considering.

3.6.1. Methods and Management

The seed of each line (50 seeds) was suggested to be planted in a single row plot, 4m long in two replications. The seed of a susceptible check, ILC 1929, was furnished to be sown after every two test entries, to serve as a spreader-cum-indicator row. The cooperators were advised wherever possible to sow the nursery during winter in an endemic area. Debris method of inoculation was suggested and if the level of infection was insufficient, spray with spore suspension prepared from infected plants in the field was suggested.

A 1-9 rating scale was suggested for scoring the lines :
Where 1 = Highly resistant, 3 = Resistant, 5 = Tolerant, 7 = Susceptible and 9 = Highly susceptible.

3.6.2. Results and Discussion

The susceptible check ILC-1929 showed more than 7 rating at all the seven locations indicating very high disease pressure. The reaction of the lines is presented in Table 3.6.1. Three lines, namely, ILC-191, -202 and -3279 were rated resistant (1-4 rating) at all the seven locations. Other lines such as ILC-194, -195, -200, -201, NEC-138-2 and -1256 showed 1-6 rating across the locations and are considered promising. Ten lines showed susceptible reaction across the locations. The above resistant lines should be preferred over the other lines for use in the breeding program. The performance of the lines in different countries is discussed below.

Syria : On the basis of two years testing at two locations, 6 lines, namely ILC 182, -183, -191, -200, -201 and -202 were resistant. The lines such as ILC 430, -616 and -618 were susceptible. Some lines such as ILC-190, -192, -210 which were found resistant in 1978-79 were found susceptible in the next year of testing. The disease reaction of some of the resistant lines also slightly changed towards susceptible side (Table 3.6.2).

Turkey : On the basis of two years testing in Turkey ten lines viz. ILC 182, 183, 191, 192, 194, 195, 200, 201, 202 and NEC 138-2 were identified as resistant.

Algeria : On the basis of two years data, out of 18 lines only two lines viz. ILC 618 and ILC 430 showed more than 5 rating.

Lebanon : Thirty eight out of the 50 lines showed resistant to tolerant reaction. The lines found susceptible at this location were also found susceptible at most of the other locations.

Pakistan : Several of the lines were found susceptible at either of the two locations. Only four lines; ILC-191, ILC -195, ILC -202 and ILC-3279 were found resistant at both the locations.

Table 3.6.1. Reaction of entries of chickpea international Ascochyta blight nursery during the 1979/80.

Entry	Origin	Rating on 1-9 scale								Mean
		SYRIA		LEBANON	TURKEY	ALGERIA	PAKISTAN			
		Tel Hadya	Lattakia	Terbol	Izmir	S.B.A.	Islamabad	Faisalabad		
ILC	182	USSR	3	2	3	4	1	5	7	3.6
	183	USSR	3	4	3	5	2	5	8	4.3
	190	USSR	6	7	3	8	3	9	9	6.4
	191	USSR	3	3	3	4	3	1	4	3.0
	192	USSR	8	6	5	5	3	1	7	5.0
	194	USSR	3	5	3	5	2	1	5	3.4
	195	USSR	5	3	3	6	3	1	4	3.6
	200	USSR	3	3	3	3	1	1	6	2.9
	201	USSR	3	3	3	3	3	1	5	3.0
	202	USSR	3	1	3	4	2	1	4	2.6
	210	USSR	5	6	3	8	3	9	9	6.1
	215	USSR	7	6	3	8	1	9	9	6.1
	248	USSR	6	5	3	8	2	9	9	6.0
	430	Iran	9	9	8	9	5	9	9	8.3
	482	Turkey	4	5	3	8	1	3	9	4.7
	616	Tunisia	9	9	9	9	5	9	9	8.4
	618	Tunisia	9	9	9	9	7	9	9	8.7
	1757	Afghanistan	5	8	3	6	3	9	9	5.9
	2380	Unknown	3	3	3	3	3	1	9	3.6
	2459	India	5	7	3	6	3	3	8	5.0
	2532	Unknown	6	7	3	9	4	9	9	6.7
	2585	Ethiopia	6	7	3	9	3	9	9	6.6
	2919	Afghanistan	5	7	4	6	4	9	9	6.3
	3000	Unknown	7	8	5	7	4	8	9	6.9
	ILC	3279	USSR	3	3	3	3	3	1	2
4131		Unknown	5	7	3	6	3	4	6	4.9
77Ms	73022-2	ICARDA	4	6	3	6	3	9	9	5.7
77Ms	73131-12	ICARDA	7	8	4	9	3	9	8	6.9
NEC	138-2	USSR	5	3	3	5	2	1	7	3.7

1 = Highly resistant, 5 = Tolerant, 9 = Highly susceptible.

Table 3.6.1. Cont'd.

Entry	Origin	Rating on 1-9 scale							Mean	
		SYRIA		LEBANON	TURKEY	ALGERIA	PAKISTAN			
		Tel Hadya	Lattakia	Terbol	Izmir	S.B.A.	Islamabad	Faisalabad		
NEC	1256	Iran	5	5	3	5	3	2	5	4.0
ICC	150	ICRISAT-India	9	9	9	9	6	9	9	8.6
	280	ICRISAT-India	5	5	3	6	2	9	9	5.6
	931	ICRISAT-India	9	9	9	9	8	9	9	8.9
	1009	ICRISAT-India	9	9	9	9	9	9	9	9.0
	1465	ICRISAT-India	9	9	9	9	9	9	9	9.0
	1911	ICRISAT-India	9	9	8	9	9	9	9	8.9
	2153	ICRISAT-India	9	9	9	9	8	9	9	8.9
	2156	ICRISAT-India	9	9	9	9	6	9	9	8.6
	2160	ICRISAT-India	3	3	2	5	3	2	9	3.9
	2232	ICRISAT-India	5	7	3	6	3	6	9	5.6
	3259	ICRISAT-India	9	9	9	9	9	9	9	9.0
	3277	ICRISAT-India	9	9	9	9	9	9	9	9.0
	3330	ICRISAT-India	9	9	9	9	9	9	9	9.0
	4935	ICRISAT-India	3	3	3	6	3	9	9	5.1
	6067	ICRISAT-India	5	3	3	6	3	9	9	5.4
	7513	ICRISAT-India	5	5	3	6	2	3	8	4.6
	7514	ICRISAT-India	5	7	3	6	3	3	9	5.1
	7520	ICRISAT-India	5	7	3	6	3	3	9	5.1
G	543	ICRISAT-India	5	5	3	7	5	6	8	5.6
G	549		5	5	3	7	3	6	8	5.7
Mean rating for susceptible check			9.0	9.0	9.0	9.0	7.6	9.0	8.9	

Table 3.6.2. Reaction of common entries of chickpea international Ascochyta blight nursery during 1978/79 and 1979/80.

Entry		Syria						Lebanon	Turkey			
		Tel Hadya		Mean	Lattakia		Mean	Terbol	Izmir		Mean	Eskishehir
		1978/79	1979/80		1978/79	1979/80			1978/79	1979/80		
ILC	182	1	3	2.0	3	2	2.5	3	5	4	4.5	5
ILC	183	1	3	2.0	3	4	3.5	3	3	5	4.0	5
ILC	190	7	6	6.5	3	7	5.0	3	5	8	6.5	7
ILC	191	1	3	2.0	3	3	3.0	3	4	4	4.0	3
ILC	192	1	8	4.5	3	6	4.5	5	3	5	4.0	3
ILC	194	1	3	2.0	3	5	4.0	3	3	5	4.0	5
ILC	195	3	5	4.0	3	3	3.0	3	3	6	4.5	3
ILC	200	3	3	3.0	3	3	3.0	3	3	3	3.0	3
ILC	201	1	3	2.0	1	3	2.0	3	2	3	2.5	3
ILC	202	3	3	3.0	3	1	2.0	3	3	4	3.5	3
ILC	210	3	5	4.0	5	6	5.5	3	7	8	7.5	5
ILC	248	3	6	4.5	5	5	5.0	3	7	8	7.5	9
ILC	430	5	9	7.0	7	9	8.0	8	9	9	9.0	7
ILC	482	3	4	3.5	3	5	4.0	3	5	8	6.5	5
ILC	616	9	9	9.0	7	9	8.0	9	9	9	9.0	9
ILC	618	9	9	9.0	9	9	9.0	9	9	9	9.0	9
NEC	138-2	3	5	4.0	3	3	3.0	3	3	5	4.0	3
NEC	1256	3	5	4.0	5	5	5.0	3	6	5	5.5	7

Table 3.6.2. Cont'd.

Entry	Algeria			Pakistan		Mean		Over all Mean
	Sidi-Bel-Abbes		Mean	Islamabad	Faislabad	1978/79	1979/80	
	1978/79	1979/80		1979/80	1979/80			
ILC 182	1	1	1.0	5	7	2.8	3.6	3.2
ILC 183	1	2	1.5	5	8	2.6	4.3	3.4
ILC 190	1	3	2.0	9	9	4.6	6.4	5.5
ILC 191	3	3	3.0	1	4	2.8	3.0	2.9
ILC 192	3	3	3.0	1	7	2.6	5.0	3.8
ILC 194	1	2	1.5	1	5	2.6	3.4	3.0
ILC 195	3	3	3.0	1	4	3.0	3.6	3.3
ILC 200	1	1	1.0	1	6	2.6	2.9	2.8
ILC 201	1	3	2.0	1	5	1.6	3.0	2.3
ILC 202	1	2	1.5	1	4	2.6	2.6	2.6
ILC 210	1	3	2.0	9	9	4.2	6.1	5.2
ILC 248	1	2	1.5	9	9	5.4	6.0	5.7
ILC 430	9	5	7.0	9	9	2.4	8.3	7.9
ILC 482	3	1	2.0	3	9	3.8	4.7	4.2
ILC 616	1	5	3.0	9	9	7.0	8.4	7.7
ILC 618	9	7	8.0	9	9	9.0	8.7	8.8
NEC 138-2	3	2	2.5	1	7	3.0	3.7	3.3
NEC 1256	3	3	3.0	2	5	4.8	4.0	4.4

Thus in all the five countries where the nursery was conducted at least some resistant lines were identified and can be used in the breeding program.

Physiological races

The reaction of the entries across the locations provide useful information on the existing variability in the pathogen. The isolates in Turkey & Pakistan appear to be more virulent than the isolates in Syria, Afghanistan and Lebanon. The line ILC -215 which was susceptible in Syria showed resistance in Lebanon and Algeria. Many of the lines found resistant in Syria, Algeria and Lebanon showed susceptible reaction in Pakistan and Turkey which between them again showed considerable variation. Based on the reaction of these fifty lines the isolates of A.rabiei at the seven locations where the nursery was conducted can broadly be categorised into 4 groups. In the first group are Tel Hadya and Lattakia isolates, in the second group Terbol and Sidi-Bel-Abbes isolates, in the 3rd Izmir and Islamabad isolates and in the 4th, Faisalabad isolate. Before coming to any definite conclusion on the physiologic races testing under controlled conditions is necessary.

4. FABA BEAN INTERNATIONAL TRIALS AND NURSERIES

Introduction

Six trials or nurseries of faba beans were available to cooperators in 1979/80 season, namely, the adaptation trials (FBAT), the international yield trial of large seeded types (FBIYT-L) and of small seeded types (FBIYT-S), the international screening nursery of large seeded types (FBISN-L) and of small seeded types (FBISN-S), and the international F₄ nursery (FBIF₄N). The main results reported by cooperators are presented in the following pages.

4.1. FABA BEAN ADAPTATION TRIAL (FBAT)

4.1.1. Material

The eleven entries in the 1979-80 FBAT are listed below:

Entry No.	Variety	Origin	ILB No.	Year Entered	R E M A R K S
1	Jordan Local	Jordan	1818 ^{**}	1978-79	Local, unselected
2	Giza 3	Egypt	1819 [*]	1978-79	Released cultivar
3	Giza 4	Egypt	1820 [*]	1978-79	Released cultivar
4	Lebanese Local	Lebanon	1817 ^{**}	1978-79	Local, unselected
5	Lebanese Small	Lebanon	1816 [*]	1978-79	Local, unselected
6	Turkish Local	Turkey	1821 ^{**}	1978-79	Local, unselected
7	Aquadulce	Spain	1266 ^{**}	1978-79	Released cultivar
8	Hudeiba 72	Sudan	460 [*]	1979-80	Released cultivar
9	Syrian Local Small	Syria	1811 [*]	1978-79	Local, mass selected
10	Syrian Local Large	Syria	1814 ^{**}	1978-79	Local, mass selected
11	Violetta di Policoro	Italy	1822 ^{**}	1979-80	Released cultivar

* Var. minor types.

** Var. major types

The eleven test entries in the FBAT included five minor and six major types. They originated from eight different countries. All entries are widely grown in their country of origin. The choice of entries was made to provide a range of diversity needed for the classification of countries into agro-ecological zones

4.1.2. Methods and Management

The trial design was a randomized complete block with four replicates. The recommended plot size was four rows, each of 4m long, with an inter-and intra-row spacing of 0.40m and 0.15m, respectively.

Twenty seven sets of the trial were dispatched to cooperators in 18 countries. Results were returned from 12 trials covering eight countries. Seed requests in 1979-80 for this trial were almost double than that of last year. As a result, more data is reported this year than last. Most cooperators furnished the agronomic results with brief description of cultural practices, and they are summarized in Table 4.1.1.

4.1.3. Results and Discussion

The data on days to flowering are given in Table 4.1.2. The location means varied from 52 days in Ethiopia to 124 days in Terbol. The entry Hudeiba 72 was the earliest to flower (84 days), while the entries Turkish Local and Syrian Local Large were the latest (95 days).

The seed yield results are given in Table 4.1.3. The highest mean seed yield was obtained from Bari in Italy (3993 kg/ha) and the lowest from Giza in Egypt (47 kg/ha). This low yield may be due to the severe virus infection reported from Giza. Also, the coefficient of variation (C.V.) for yield in Giza was extremely high (130.6%), and probably stemmed from a non-uniform virus infection among plots.

Table 4.1.1. Agronomic data for different locations for the FBAT during 1979/80.

Country	Location	Planting Date	Crop (1) Duration (days)	Fertilizer kg/ha			Irrigation	Insecticide
				N	P ₂ O ₅	K ₂ O		
Egypt	Giza	1-12-79	172	19	75		4	
Ethiopia	Debre Zeit	4-7-80	145					
Iraq	Baghdad	17-11-79	168	80	80		12	
Italy	Bari	27-11-79	225		300			
Lebanon	Tel Amara	11-2-80	109	100	75			
Libya	Zawia	6-11-79	198		30		6	Dimecron
Spain	Sevilla	6-12-79	163	125				
Syria	-Lattakia	5-11-79						
	-Tel Hadya	10-11-79						

(1) Days from planting to harvest.

Table 4.1.2. Mean number of days to flower for entries in the FBAT at different locations during 1979/80.

ILB	Varietal Name	Origin	LIBYA	EGYPT	ETHIOPIA	'IRAQ Baghdad	LEBANON		SYRIA			ITALY		SPAIN	Mean
			Zawia	Giza	Debre- Zeit		Terbol	Tel-Amara	Latt.	TH-Rain	TH-Irrig.	Bari	Lecce	Sevilla	
1818	Jordan Local	Jordan	63	63	49	73	120	75	101	103	105	104	100	83	87
1819	Giza 3	Egypt	72	61	50	76	120	70	94	104	109	105	100	85	87
1820	Giza 4	Egypt	72	63	48	73	121	71	87	105	110	105	99	86	87
1817	Lebanese Large	Lebanon	87	74	56	86	126	77	99	105	110	110	102	90	94
1816	Lebanese Small	Lebanon	88	70	53	83	124	74	108	105	110	108	103	86	93
1821	Turkish Local	Turkey	93	76	53	91	131	70	96	105	113	112	103	92	95
1266	Aquadulce	Spain	90	74	55	83	128	72	98	105	110	109	103	90	93
460	Hudeiba 72	Sudan	62	55	49	65	121	69	94	105	105	105	99	80	84
1811	Syrian L.S.	Syria	73	68	51	77	124	68	101	105	109	106	100	35	89
1814	Syrian L.L.	Syria	90	78	55	88	128	73	108	106	111	111	102	91	95
1822	Violetta di Policoro	Italy	83	73	54	82	125	76	96	106	110	109	102	92	92
Mean			79	69	52	80	124	72	98	105	109	108	101	87	91

Table 4.1.3. Seed yield (Y = kg/ha) and rank (R) of entries in the FBAT at different locations during 1979/80.

ILB	Varietal Name	LIBYA		EGYPT		ETHIOPIA		IRAQ		LEBANON	
		Zawia		Giza		Debre-Zeit		Baghdad		Terbol	
		Y	R	Y	R	Y	R	Y	R	Y	R
1822	Violetta di Policoro	1568	5	24	6	1371	4	1541	7	4167	1
1817	Lebanese Large	2032	1	23	8	585	8	1644	6	4074	2
1266	Aquadulce	1725	3	26	5	950	6	2534	1	3046	6
1821	Turkish Local	1395	6	19	9	264	10	2147	2	3875	4
1814	Syrian L.L.	1141	9	19	10	181	11	1781	4	3014	7
1820	Giza 4	1741	2	56	4	1534	2	1988	3	2694	8
1818	Jordan Local	1222	8	76	2	1351	5	1106	9	3944	3
1819	Giza 3	1683	4	24	7	1420	3	1663	5	2639	10
1816	Lebanese Small	1358	7	18	11	521	9	1266	8	3546	5
1811	Syr.Loc.S.	1016	10	76	3	2164	1	744	10	2690	9
460	Hudeiba 72	722	11	170	1	934	7	684	11	1051	11
Location mean		1419		47		1025		1554		3158	
C.V. %		44.4		130.6		21.29		42.1		23.1	
S.E. entry		315.2		30.6		109.13		326.9		364.1	

Table 4.1.3. Cont'd.

ILB	Varietal Name	S Y R I A						I T A L Y				S P A I N	
		TH - Irrig.		TH - Rain.		Lattakia		Bari		Lecce		Sevilla	
		Y	R	Y	R	Y	R	Y	R	Y	R	Y	R
1822	Violettadi Policoro	4888	1	3103	1	1239	5	5000	4	5175	1	2184	3
1817	Lebanese Large	4853	2	2502	3	1480	4	4967	5	4458	5	2749	1
1266	Aquadulce	4633	4	2255	9	1510	3	5004	3	5025	2	2226	2
1821	Turkish Local	4833	3	2577	2	1202	6	5383	1	4542	4	1332	10
1814	Syrian L.L.	4529	5	2450	4	693	8	5104	2	4896	3	1636	8
1820	Giza 4	3308	8	2428	5	283	10	3833	6	3233	8	1711	7
1818	Jordan Local	3563	6	2318	8	1536	2	3304	9	1788	10	1755	6
1819	Giza 3	3104	10	2337	7	297	9	3525	7	3283	7	1924	4
1816	Lebanese Small	3562	7	2348	6	1606	1	3458	8	2394	9	1377	9
1811	Syr.Loc.S.	3223	9	1824	10	800	7	3075	10	3379	6	1762	5
460	Hudeiba 72	1173	11	1547	11	247	11	1265	11	908	11	1136	11
Location mean		3791		2335		990		3993		3553		1799	
C.V. %		10.6		8.8		48.0		12.5		20.1		15.6	
S.E. entry		199.87		103.11		237.5		248.6		357.8		140.0	

The average seed yields for 1979-80 and for a two year period are shown in Table 4.1.4. Over 11 locations, the Italian entry Violetta di Policoro had the highest average seed yield of all entries in 1979-80. While the entry Hudeiba 72 had the lowest mean seed yield. Over a 2 year period, the entry Lebanese L.L. (ILB 1817) had the highest seed yield followed by Aquadulce (ILB 1266), while the small seeded Syrian cultivar (ILB 1811) had the lowest seed yield.

The correlation between the seed yield of entries at different locations during 1979-80 is shown in Table 4.1.5. A combined analysis of variance over 2 years was not possible, since the locations differed between years (except for Lattakia and Tel Hadya). The most striking features of the correlation matrix is the similarity in the performance of entries at locations in Lebanon, Syria and Italy, with the respective correlations being generally significant positive and large. A number of other inter location correlations were significant but similarity in performance could not be linked to any geographical pattern. From a dissimilarity view point entry performance at Giza in Egypt appeared to be the opposite of that at a majority of other locations, with many of the relevant correlations being significant, large and negative. Also entry performance in Ethiopia and Spain showed hardly any similarity or dissimilarity with that at any of the other locations.

Last years data on the same trial showed little association between locations in Syria and the trial was not grown in any country in Europe. It will indeed be interesting to see if the grouping of Syria, Lebanon and Italy is apparent in future years.

Table 4.1.4. Average seed yields of entries in the FBAT over several locations for 1979-80 and 1978-80 period.

ILB No.	Varietal Name	78-79		79-80		Mean 78-80	
		Y	R	Y	R	Y	R
1822	Violetta di Policoro	-		2751	1	-	
1817	Leb.L.L.	2245	4	2670	2	2458	1
1266	Aquadulce	2238	5	2630	3	2434	2
1821	Turkish Local	1295	9	2506	4	1901	9
1814	Syr.L.L.	1507	8	2313	5	1910	8
1820	Giza 4	2483	2	2074	6	2279	3
1818	Jord.L.	2117	7	1997	7	2057	6
1819	Giza 3	2523	1	1991	8	2257	4
1816	Leb.L.S.	2259	3	1950	9	2105	5
1811	Syr.L.S.	2129	6	1887	10	2008	7
460	Hudeiba 72	-		894	11	-	

Table 4.1.5. Correlations ⁽¹⁾ (df=9) between the seed yield of entries in the FBAT at different locations during 1979/80.

Country / Location	EGYPT	ETHIOPIA	IRAQ	LEBANON	S Y R I A			ITALY		SPAIN
	Giza	Debre-Zeit	Baghdad	Terbol	TH-Irrig.	TH-Rain	Lattakia	Bari	Lecce	Sevilla
Libya - Zawia	-0.69 [*]	-0.07	0.69 [*]	0.55	0.62 [*]	0.63 [*]	0.30	0.63 [*]	0.56	0.77 ^{**}
Egypt - Giza		0.32	-0.68 [*]	-0.74 ^{**}	-0.86 ^{**}	-0.77 ^{**}	-0.46	-0.86 ^{**}	-0.76 ^{**}	-0.46
Ethiopia - Debre Zeit			-0.39	-0.22	-0.36	-0.23	-0.30	-0.42	-0.24	0.14
Iraq - Baghdad				0.35	0.67 [*]	0.54	0.20	0.79 ^{**}	0.72 [*]	0.35
Lebanon - Terbol					0.85 ^{**}	0.81 ^{**}	0.78 ^{**}	0.74 ^{**}	0.54	0.50
Syria - TH-Irrig.						0.80 ^{**}	0.63 [*]	0.97 ^{**}	0.88 ^{**}	0.58
TH-Rainfed							0.40	0.79 ^{**}	0.68 [*]	0.45
Lattakia								0.47	0.28	0.37
Italy - Bari									0.92 ^{**}	0.52
- Lecce										0.58

(1) * $P \leq 0.05$

** $P \leq 0.01$

4.2. FABA BEAN INTERNATIONAL YIELD TRIAL - LARGE SEEDED (FBIYT-L)

4.2.1. Material

A total of sixteen test entries were included in the FBIYT-L (Table 4.2.2.). Two of the sixteen entries were added by the cooperators as local checks. Ten of the remaining fourteen entries were commercially released cultivars and/or improved populations, while the other four entries were selections from crosses made at ICARDA's station at Aleppo. Cooperators were free to use the genetic material in their own breeding programmes and/or for release as commercial cultivars.

4.2.2. Methods and Management

The trial design was a 4 x 4 lattice, although the results have been analysed as a randomized block. The suggested plot size was four rows, each of 4m long, with an inter-and intra-row spacing of 0.50m, and 0.10m, respectively.

Seventeen sets of the trial were distributed to cooperators in 12 countries. Results were reported from 10 trials covering seven countries. Agronomic data furnished by the cooperators are given in Table 4.2.1.

4.2.3. Results and Discussion

Data on number of days to flowering, to maturity and plant height are given in Table 4.2.2., 4.2.3., and 4.2.4. respectively. For number of days to flower the location means varied from 67 days in Egypt to 129 days in Terbol. Undoubtedly, the cool extended weather in Terbol (a high altitude station) delayed the flowering. Over all locations, the entry Giza 3 was the earliest to flower (95 days), while the entry New Mammoth was the latest (108 days).

Table 4.2.1. Agronomic data for different locations for the FBIYT-L during 1979/80.

Country	Location	Planting Date 1979	Crop (1) Duration (days)	Fertilizer kg/ha			Irrigation	Insecticide
				N	P ₂ O ₅	K ₂ O		
Egypt	Giza	21-11	157	18	35		3	
Iraq	Ninevah	17-11	202	42	46		2	Malathion & Diathen & Eikten
Italy	Bari	26-11	227		500			
	Lecce	13-12	202		500			
Lebanon	Terbol	5-11	212	100	300			
Libya	Zawia	11-11	199		30		6	Dimecron
Spain	Sevilla	6-12	157	125				
Syria	Lattakia	5-11						
	Tel Hadya	10-11						

(1) Days from planting to harvest.

Table 4.2.2. Number of days to flower for entries in the FBIYT-L at different locations during 1979/80.

Entry		Selection	Origin	LIBYA Zawia	EGYPT Giza	IRAQ Ninevah	LEBANON Terbol	SYRIA Tel Hadya Rain. Irrig.		ITALY Bari Lecce		SPAIN Sevilla	Mean	
							Lattakia							
ILB	19	74TA 51	Syria	89	70	116	135	105	105	108	108	101	95	103
	22	74TA 59	Syria	89	70	115	130	94	105	108	108	101	92	101
	24	74TA 63	Iraq	89	70	114	125	85	105	108	107	101	92	100
	1266	Aquadulce	Spain	89	65	114	126	115	108	108	107	103	94	103
	1269	New Mammoth	U.K.	93	76	119	138	126	106	109	110	103	95	108
	-	Local Check A	-	88	60	115	130	87	108	109	107	103	96	
	1270	Seville Giant	U.K.	89	75	114	131	101	106	110	108	102	94	103
	1799	39 MB	Syria	77	65	109	125	93	104	105	105	97	92	97
	1805	Elegant 5MCI	Syria	84	68	109	124	94	105	106	106	98	92	99
	1812	Syr.Med.Shortpod	Syria	88	65	115	125	94	105	106	107	99	92	100
	-	Local check B	-	76	60	108	128	89	105	110	108	100	95	
	1813	Syr.Med.Longpod	Syria	91	70	118	136	119	108	109	109	102	94	106
	1814	Syr.L. Shortpod	Syria	93	70	118	129	121	106	109	110	102	95	105
	1815	Lattakia Local	Syria	79	65	109	120	98	106	105	106	97	92	98
	1817	Lebanese Large	Lebanon	89	65	117	131	113	108	105	107	101	94	103
	1819	Giza 3	Egypt	76	65	109	123	71	105	106	105	100	92	95
Mean				86	67	114	129	100	106	108	107	101	94	102

Table 4.2.3. Number of days to maturity for entries in the FBIYT-L at different locations during 1979/80.

ILB	Selection	LIBYA Zawia	EGYPT Giza	IRAQ Ninevah	LEBANON Terbol	ITALY		Mean
						Bari	Locce	
19	74TA 51	179	156	201	215	204	180	189
22	74TA 59	179	156	201	211	203	180	188
24	74TA 63	179	156	203	213	204	180	189
1266	Aquadulce	179	156	203	210	204	181	189
1269	New Mammoth	172	156	204	211	205	180	188
-	Local check A	172	156	203	211	207	182	
1270	Seville Giant	172	156	205	210	205	181	188
1799	39 MB	172	156	203	211	204	179	188
1805	Elegant 5MCI	172	156	202	211	203	181	188
1812	Syr.Med.Shortpod	172	156	204	210	204	181	188
-	Local check B	172	156	201	209	202	180	
1813	Syr.Med.Longpod	172	156	204	213	203	181	188
1814	Syr.L.Longpod	179	156	204	215	204	182	190
1815	Lattakia Local	179	156	204	213	204	179	189
1817	Lebanese Large	172	156	202	214	202	180	188
1819	Giza 3	172	156	203	213	208	180	189
Mean		175	156	203	212	204	180	189

Table 4.2.4.Plant height (cm) of entries in the FBIYT-L at different Locations during 1979/80.

ILB	Selection	LIBYA Zawia	EGYPT Giza	IRAQ Ninevah	LEBANON Terbol	SYRIA		ITALY		Mean
						TH-Rain.	TH-Irrig.	Bari	Lecce	
19	74TA 51	78	71	92	106	68	86	67	64	79
22	74TA 59	68	67	81	109	69	85	64	63	76
24	74TA 63	75	63	95	120	69	85	62	63	79
1266	74TA 63	75	63	95	120	69	85	62	63	79
1269	New Mammoth	70	57	83	110	66	81	65	58	74
-	Local check A	64	79	97	109	75	89	66	55	
1270	Seville Giant	58	59	66	104	53	65	55	53	64
1799	39MB	59	56	84	105	65	79	61	65	72
1805	Elegant 5MCI	68	64	82	111	66	76	69	66	75
1812	Syr.Med,Shortpod	67	62	93	115	64	86	67	63	77
-	Local check B	68	75	84	110	70	89	66	59	
1813	Syr.Med.Longpod	73	60	97	111	70	86	69	55	78
1814	Syr.Large Shortpod	77	76	103	119	78	89	65	68	84
1815	Lattakia Local	65	70	82	113	65	78	63	65	75
1817	Lebanese Large	66	64	84	114	64	84	68	74	77
1819	Giza 3	70	71	96	111	66	86	70	63	79
Mean		68	67	87	111	67	83	65	62	76

The genotypic differences for days to maturity were similar to those for flowering. The location means for plant height varied from 62cm in Lecce (Italy) to 111cm in Terbol (Lebanon). Over all locations, the entry Seville Giant was the shortest, while the entry Syrian Large short pod was the tallest.

At each location the seed yield and rank of entries are given in Table 4.2.5. and the five highest yielding entries are listed in Table 4.2.6. The highest mean seed yield of the entries was in Iraq, and the lowest was in Lattakia, the latter stemming from a heavy disease infection and insect attack. Over all locations, the entry Lebanese Large ranked first for seed yield, followed by Sevilla Giant, while Giza 3 was the lowest.

The local checks yielded the best at five locations, namely Zawia (Libya), Ninevah (Iraq), Bari and Lecce (Italy), and Sevilla (Spain) Table 4.2.6. Although, there was a fluctuation in rank among the five heaviest seed yielding entries, these entries were the most frequent in the list of the five heaviest yielding entries at individual locations (Table 4.2.6).

Correlations between the seed yield of entries at different locations are given in Table 4.2.7. The majority of the correlations were low, reflecting the changes in performance across the different locations, and the probable occurrence of genotype x environment interactions. However, as in the FBAT (Table 4.1.5). There was an indication of similarity in the performance of entries in Lattakia (Syria), Lebanon and Italy.

Table 4.2.5. Seed yield (Y = kg/ha) and rank (R) of entries in the FBIYT-L at different locations during 1979/80.

ILB	Selection	LIBYA		EGYPT		IRAQ		LEBANON		S Y R I A						I T A L Y				SPAIN		MEAN	
		Zawia		Giza		Ninevah		Terbol		Lattakia		TH-Irrig.		TH-Rain.		Bari		Lecce		Sevilla		Y. R.	
		Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R
1817	Lebanese Large	1584	11	4025	4	5625	6	4130	2	1598	1	3789	12	2222	13	4804	5	3671	2	2072	2	3352	1
1270	Seville Giant	2152	2	4642	1	4853	16	3778	6	635	13	4075	6	2243	12	4675	8	3179	4	2052	3	3228	2
1813	Syr.Med.longpod	1519	13	3442	8	6378	2	3773	7	1113	3	4268	3	2513	7	4621	9	2675	11	1927	5	3223	3
1812	Syr.Med.Shortpod	1389	14	2858	14	6063	3	3986	4	1081	4	4343	2	2522	6	4729	6	2933	7	1806	6	3171	4
1269	New Mammoth	1576	12	3283	10	5800	4	4241	1	1119	2	3662	15	2402	9	4688	7	3033	5	1786	8	3159	5
1805	Elegant SMC1	1628	9	2917	13	5331	9	3847	5	925	10	4186	5	2608	2	5029	3	3296	3	1793	7	3156	6
1814	Syr.L.Shortpod	1964	3	3042	11	5631	5	4005	3	733	12	3803	11	2318	11	4046	2	3013	6	1556	13	3111	7
1815	Lattakia Local	1832	5	4225	2	5138	12	3171	11	1062	6	4446	1	1839	16	4404	12	2692	10	1681	11	3049	8
1799	39 MB	1910	4	2392	16	5188	11	3602	9	522	15	4208	4	2613	1	4492	10	2838	9	1602	12	2937	9
1266	Aquadulce	1733	7	3783	7	4878	15	2583	16	904	11	3947	9	2543	4	4429	11	2504	12	1981	4	2929	10
22	74TA 59	1276	15	2992	12	5325	10	3676	8	962	9	3993	8	2220	14	4275	14	2438	14	1688	10	2885	11
24	74TA 63	1639	8	2483	15	5541	8	3162	12	963	8	3899	10	2352	10	3863	15	2496	13	1547	14	2795	12
19	74TA 51	1174	16	3383	9	5616	7	2759	15	531	14	4035	7	2528	5	4325	13	2300	15	1292	16	2794	13
1819	Giza 3	1814	6	4225	2	4984	14	3106	13	326	16	3295	16	1961	15	3467	16	1738	16	1375	15	2629	14
	Local check A	1585	10	3792	6	5125	13	3417	10	1050	7	3725	13	2591	3	5112	1	2867	8	1776	9		
	Local check B	2176	1	3883	5	6409	1	3060	14	1080	5	3698	14	2432	8	4988	4	3763	1	2335	1		
	Location mean	1685		3460		5493		3519		913		3961		2369		4559		2840		1767		3030	
	C.V. %	38.5		25.9		12.4		25.7		44.2		12.5		9.9		11.1		23.8		19.2			
	L.S.D. 5%	926.9		1280.4		972.9		1291.0		576.2		709.9		338.1		725.1		967.2		484.4			
No. of entries significantly 0 exceeding best local check.				0		0		0		0		1		0		0		0		0			

Table 4.2.6. The five heaviest seed yielding entries at the individual locations in the FBIYT-L during 1979/80.

Rank	LIBYA Zawia		EGYPT Giza		IRAQ Ninevah		LEBANON Terbol		SYRIA Lattakia	
	Selection	ILB	Selection	ILB	Selection	ILB	Selection	ILB	Selection	ILB
1	Local check L		Sevilla Giant	1270	Local check B		New Mammoth	1269	Lebanese Large	1817
2	Seville Giant	1270	Lattakia local	1815	Syr.Med.longpod	1813	Lebanese large	1817	New Mammoth	1269
3	Syr.L.shortpod	1814	Giza 3	1819	Syr.Med.shortpod	1812	Syr.L. shortpod	1814	Syr.Med.longpod	1813
4	39 MB	1799	Lebanese large	1817	New Mammoth	1269	Syr.Med.shortpod	1812	Syr.Med.shortpod	1812
5	Lattakia local	1815	Local check B		Syr.L.shortpod	1814	Elegant 5MCI	1805	Local check B	

Rank	SYRIA Tel Hadya - Irrigated		SYRIA Tel Hadya - Rainfed		ITALY Bari		ITALY Lecce		SPAIN Sevilla	
	Selection	ILB	Selection	ILB	Selection	ILB	Selection	ILB	Selection	ILB
1	Lattakia local	1815	39 MB	1799	Local check A		Local check B		Local check B	
2	Syr.Med.shortpod	1812	Elegant 5MCI	1805	Syr.L.shortpod	1814	Lebanese large	1817	Lebanese large	1817
3	Syr.Med.longpod	1813	Local check A		Elegant 5MCI	1805	Elegant 5MCI	1805	Sevilla Giant	1270
4	39MB	1799	Aquadulce	1266	Local check B		Sevilla Giant	1270	Aquadulce	1266
5	Elegant 5MCI	1805	74TA 51	19	Lebanese large	1817	New Mammoth	1269	Syr.Med.longpod	1813

Table 4.2.7. Correlations ⁽¹⁾ (df=12) between the seed yield of entries in the FBIYT-L at different locations during 1979/80.

Country/Location ⁽²⁾	EGYPT Giza	IRAQ Ninevah	LEBANON Terbol	SYRIA			ITALY		SPAIN Sevilla
				Latt.	TH-Irrig.	TH-Rain.	Bari	Lecce	
Libya - Zawia	0.35	-0.54 [*]	0.08	-0.30	-0.11	-0.29	0.08	0.19	0.2
Egypt - Giza		-0.41	-0.16	0.00	-0.20	-0.62 [*]	-0.12	-0.02	0.33
Iraq - Ninevah			0.47	0.48	0.21	0.36	0.33	0.21	0.05
Lebanon - Terbol				0.46	0.03	0.09	0.63	0.72 ^{**}	0.42
Syria - Lattakia					0.23	0.01	0.44	0.62 [*]	0.65 [*]
- TH. Irrig.						0.28	0.44	0.30	0.27
- TH. Rainf.							0.43	0.25	0.13
Italy - Bari								0.85 ^{**}	0.54 [*]
- Lecce									0.68 ^{**}

(1) * $P \leq 0.05$

** $P \leq 0.01$

(2) The local checks were excluded from the calculations.

4.3. FABA BEAN INTERNATIONAL YIELD TRIAL-SMALL SEEDED (FBIYT-S)

4.3.1. Material

The FBIYT-S comprised 23 entries which had performed well in the International Screening Nursery Small Seeded (FBISN-S) in 1978-79. Two local checks were added by the cooperator to make a total of 25 entries. The entries originated from 14 different countries. Cooperators were free to use the entries in their crosses and/or for release as commercial cultivars.

4.3.2. Methods and Management

The trial design was a 5 x 5 quadruple lattice (4 replications), although the results have been analyzed as a randomized block. The suggested plot size was four rows, each of 4m long, with an inter-and intra-row spacing of 0.50 and 0.10m, respectively.

Eighteen sets of the trial were distributed to the cooperators in 10 countries. Results were reported from seven trials covering five countries. Agronomic data furnished by the cooperators are given in Table 4.3.1.

4.3.3. Results and Discussion

Some cooperators furnished agronomic data on number of days to flowering, to maturity and plant height which are given in Tables 4.3.2., 4.3.3. and 4.3.4. respectively. Over all entries, mean number of days to flower was 62 days (earliest) in Ethiopia and 136 days in Terbol (latest). Over all locations, the entry Hudeiba 72 was the earliest (81 days), while the entry ILB 159 was the latest (103 days). Limited data (3 trials) were available on maturity, which may result in the observed small genotypic differences in maturity (163-170 days). Although, there were large differences among the seven locations in plant height, there were small genotypic differences.

Table 4.3.1. Agronomic data for different locations for the FBIYT-S during 1979/80.

Country	Location	Planting Date	Crop (1) Duration (days)	Fertilizer kg/ha			Irrigation
				N	P2O5	K2O	
Egypt	Giza	30-11-79	173	19	75	-	4
Ethiopia	Debre Zeit	4-7-80	144	-	-	-	-
Lebanon	Tel Amara	11-2-80		100	75	-	-
	Terbol	5-11-79		100	300	-	-
Pakistan	Islamabad	17-11-79	174	-	-	-	-
Syria	Lattakia	5-11-79					
	Tel Hadya	10-11-79					

(1) Number of days from planting to harvest.

Table 4.3.2. Number of days to flower for entries in the FBIYT-S at different locations during 1979/80.

Entry	Selection			Origin	EGYPT Giza	ETHIOPIA Debre Zeit	LEBANON		S Y R I A			PAKISTAN Islamabad	Mean
							Terbol	Tel Amara	Lattakia	Tel Hadya			
										Rain	Irrigation		
ILB	5	74TA	12	Cyprus	70	60	133	67	92	104	106	75	88
	9	74TA	22	China	73	60	138	69	104	104	108	90	93
	16	77MS 88252		Syria	74	63	139	68	121	105	108	89	96
	29	75TA 26062		Iraq	66	60	130	64	95	105	106	75	88
	31	74TA	87	Iraq	71	64	136	71	112	106	109	83	94
	32	75TA 26083		Iraq	71	61	134	72	115	105	108	85	94
	159	77MS 88293		Greece	86	64	145	80	130	110	115	91	103
	-	Local check A			58	58	139	79	89	105	106	-	-
	207	75TA 26333		Turkey	70	64	136	73	99	105	106	78	91
	218	77MS 88030		Turkey	78	64	143	69	123	108	108	91	98
	269	74TA	367	Spain	71	62	135	68	94	105	106	79	90
	274	74TA	374	Lebanon	71	61	135	74	105	105	109	85	93
	286	77MS 88322		Lebanon	75	64	140	66	119	105	106	89	96
	287	77MS 88323		Lebanon	70	63	135	73	115	105	109	78	94
	298	77MS 88218		Spain	80	64	143	70	121	109	108	89	98
	322	75TA 26501		Japan	66	61	133	72	89	105	106	78	89
	-	Local check B			61	58	136	80	91	105	106	-	-
	352	77MS 88158		Egypt	69	60	136	74	94	105	106	75	90
	360	74TA	498	Egypt	66	61	136	73	85	105	106	75	88
	372	78MS 88362		Algeria	74	62	140	75	122	105	110	90	97
	421	77MS 88410		Iran	76	62	144	66	111	108	111	94	97
	460	Hudeiba 72		Sudan	55	56	125	72	66	101	105	71	81
	1812	Syrian Local		Syria	70	64	135	69	95	105	105	82	91
	1819	Giza 3		Egypt	63	60	133	69	76	105	109	75	86
	1820	Giza 4		Egypt	65	60	133	72	78	104	106	75	87
Mean					70	62	136	71	102	105	108	82	92

Table 4.3.3. Number of days to maturity for entries in the FBIYT-S at different location during 1979/80.

ILB	Selection	L E B A N O N		PAKISTAN Islamabad	Mean
		Terbol	Tel-Amara		
5	74TA 12	213	112	166	164
9	74TA 22	214	114	177	168
16	77Ms 38252	211	116	177	168
29	75TA 26062	213	110	166	163
31	74TA 87	213	111	174	166
32	75TA 26083	211	112	174	166
159	77MS 88293	215	115	177	169
-	Local check A	213	113	-	-
207	75TA 26333	213	111	169	164
218	77MS 88030	213	110	177	167
269	74TA 367	214	109	169	164
274	74TA 374	211	110	174	165
286	77MS 88322	211	113	177	167
287	77MS 88323	211	108	169	163
298	77MS 88218	211	114	177	167
322	75TA 26501	214	113	169	165
-	Local check B	209	115	-	-
352	77MS 88158	214	117	166	166
360	74TA 498	211	114	166	164
372	78MS 88362	210	115	177	167
421	77MS 88410	217	117	177	170
460	Hudeiba 72	213	110	166	163
1812	Syrian Local	211	112	172	165
1819	Giza 3	213	114	166	164
1820	Giza 4	213	113	166	164
Mean		212	113	172	166

Table 4.3.4. Plant height (cm) of entries in the FBIYT-S at different locations during 1979/80.

ILB	Selection	EGYPT	ETHIOPIA	LEBANON		SYRIA		PAKISTAN Islamabad	Mean
				Terbol	Tel-Amara	TH-Rain	TH-Irrig.		
5	74TA 12	95	131	100	52	68	84	95	89
9	74TA 22	89	126	99	48	68	85	103	88
16	77MS 88252	96	128	99	47	64	74	103	87
29	75TA 26062	110	136	100	50	70	83	100	93
31	74TA 87	89	127	99	40	64	74	96	84
32	75TA 26083	98	126	101	45	76	94	109	93
159	77MS 88293	98	133	113	42	75	88	110	94
-	Local check A	90	140	95	39	69	89	-	-
207	75TA 26333	103	136	109	36	68	79	114	92
218	77MS 88030	95	129	99	34	59	69	116	86
269	74TA 367	105	142	99	43	61	71	107	90
274	74TA 374	108	137	98	41	69	84	109	92
286	77MS 88322	99	135	103	42	66	78	99	89
287	77MS 88323	101	138	99	41	76	91	99	92
298	77MS 88218	85	132	96	39	70	79	110	87
322	75TA 26501	84	133	90	42	64	76	102	84
-	Local check B	113	143	96	52	68	85	-	-
352	77MS 88158	109	136	106	48	75	83	117	96
360	74TA 498	88	133	103	42	63	76	97	86
372	78MS 88362	79	133	106	45	75	85	113	91
421	77MS 88410	89	132	105	47	79	89	105	92
460	Hudeiba 72	105	132	84	60	68	74	104	90
1812	Syrian Local	110	120	101	42	68	73	107	89
1819	Giza 3	101	139	96	41	64	73	108	89
1820	Giza 4	93	132	99	40	66	79	108	88
Mean	-	97	133	100	44	69	81	106	90

The yield data from Egypt was unreliable, and therefore were not included in the calculation of overall mean. At each location the seed yield and rank of entries are given in Table 4.3.5., and the five highest yielding genotypes are listed in Table 4.3.6. The highest mean seed yield of the entries was at Tel Hadya irrigated (3326 kg/ha), and the lowest was at Lattakia (458 kg/ha), the latter stemming from a high level of disease infection and insect attack. Over all locations, the entry Syrian Local (ILB 1812) had the highest seed yield (2143 kg/ha), while the entry Hudeiba 72 had the lowest (962 kg/ha). Among the five highest yielding genotypes at each location. The entry Syrian Local (ILB 1812) appeared more frequently in Table 4.3.6. than any other entry. This may have reflected its good adaptation to the Syrian environment as three stations out of seven were from Syria, although it was the second heaviest yielder in Pakistan. Indeed the performance of Syrian local and the local checks in Egypt and Ethiopia (Table 4.3.6) indicate the difficulties in selecting genotypes superior to the locally Syrian cultivars.

Correlations between the seed yield of entries at different locations are given in Table 4.3.7. Clearly entry performance in Ethiopia was the opposite of that in Lebanon and Syria, whereas in the FBAT the correlation between the same locations although not significant showed no strong negative trend. Entry performance in Pakistan showed no relation with any other location, whereas performance at the locations in Syria and Lebanon was again similar as already observed in the FBAT and FBIYT-L (Tables 4.1.5. and 4.2.7).

Table 4.3.5. Seed yield (Y= kg/ha) and rank (R) of entries in the FBIYT-S at different locations during 1979/80.

ILB	Selection	EGYPT Giza		ETHIOPIA Debre-Zeit		LEBANON Terbol		S Y R I A						PAKISTAN Islamabad		Mean	
		Y	R	Y	R	Y	R	Lattakia		TH-Irrig.		TH-Rain.		Y	R	Y	R
								Y	R	Y	R	Y	R				
1812	Syrian Local	26	17	341	22	4014	1	735	2	3759	7	2650	2	1359	2	2143	1
29	75TA 26062	62	8	824	11	3352	6	547	11	3994	2	3008	1	984	12	2118	2
274	74TA 374	19	21	763	13	3593	3	650	6	3801	5	2588	4	1297	4	2115	3
16	77MS 88252	26	17	408	20	3657	2	733	3	3807	4	2527	8	1250	5	2064	4
5	74TA 12	31	16	731	14	2810	16	708	4	4078	1	2534	6	1322	3	2031	5
32	75TA 26083	16	23	698	15	3394	5	439	14	3676	9	2614	3	875	16	1949	6
287	77MS 88323	55	9	788	12	3264	7	276	21	3688	8	2553	5	938	14	1918	7
9	74TA 22	41	10	628	18	3194	9	569	10	3844	3	2273	16	891	15	1900	8
31	74TA 87	18	22	661	17	3157	11	596	8	3468	15	2428	12	1022	11	1889	9
322	75TA 26501	83	5	1716	3	2537	20	293	19	3063	21	2242	18	1381	1	1872	10
286	77MS 88322	22	20	889	10	3208	8	585	9	3348	16	2221	19	959	13	1868	11
360	74TA 498	41	10	1212	7	3009	13	423	15	3482	13	1872	23	1163	9	1860	12
372	78MS 88362	39	12	406	21	3431	4	671	5	3325	17	2511	9	781	19	1854	13
207	75TA 26333	35	15	675	16	2972	14	474	13	3562	11	2533	7	719	21	1823	14
352	77MS 88158	77	6	1046	8	2713	18	364	17	3128	20	2462	11	1302	7	1819	15
298	77MS 88218	37	14	459	19	2949	15	784	1	3162	19	2341	15	1166	8	1810	16
269	74TA 367	24	19	923	9	2421	22	290	20	3574	10	2249	17	768	20	1704	17
1819	Giza 3	76	7	1568	5	2764	17	153	23	2388	23	1920	21	1225	6	1670	18
218	77MS 88030	15	24	173	25	2574	19	378	16	3558	12	1930	20	788	18	1567	19
1820	Giza 4	130	3	1361	6	2097	23	70	25	2298	24	1850	24	1150	10	1471	20
421	77MS 88410	38	13	220	24	2505	21	211	22	2884	22	2345	14	575	23	1457	21
159	77MS 88293	12	25	273	23	2032	24	303	18	3213	18	1888	22	669	22	1396	22
460	Hudeiba 72	291	2	1597	4	1213	25	83	24	808	25	1217	25	853	17	962	23
	Local check A	406	1	3334	1	3051	12	493	12	3470	14	2407	13	-	-	-	-
	Local check B	107	4	2324	2	3167	10	623	7	3774	6	2488	10	-	-	-	-
Location mean		69		961		2923		458		3326		2306		1015		1794	
C.V. %				32.6		23.5		67.9		13.5		15.4		37.00			
L.S.D. 5%				441.8		970.1		439.9		934.1		502.3		530.9			
No. of entries significantly exceeding best local check.		-		-		-		-		-		1		-			

Table 4.3.6. The five heaviest seed yielding entries at the individual locations in the FBIYT-S during 1979/80.

Rank	EGYPT Giza		ETHIOPIA Debre Zeit		Lebanon Terbol		Syria Lattakia		Syria Tel Hadya-Irrig.		Syria Tel Hadya-Rainfed		Pakistan Islamabad	
	Selection	ILB	Selection	ILB	Selection	ILB	Selection	ILB	Selection	ILB	Selection	ILB	Selection	ILB
1	Local check A	-	Local check A	-	Syrian Local	1812	77MS 88218	298	74TA 12	5	75TA 26062	29	75TA 26501	322
2	Hudeiba 72	460	Local check B	-	77MS 88252	16	Syrian Local	1812	75TA 26062	29	Syrian Local	1812	Syrian Local	1812
3	Giza 4	1820	75TA 26501	322	74TA 374	274	77MS 88252	16	74TA 22	9	75TA 26083	32	74TA 12	5
4	Local check B	-	Hudeiba 72	460	78MS 88362	372	74TA 12	5	77MS 88252	16	74TA 374	274	74TA 374	274
5	75TA 26501	322	Giza 3	1819	75TA 26083	32	77MS 88362	372	74TA 374	274	77MS 88323	287	77MS 88252	16

Table 4.3.7. Correlations⁽¹⁾ (df= 21) between the seed yield of entries in the FBIYT-S at different locations during 1979/80.

Country /Location ⁽²⁾	LEBANON	S Y R I A			PAKISTAN
	Terbol	Lattakia	TH-Irrig.	TH-Rain.	Islamabad
Ethiopia-Debre-Zeit	-0.52 *	-0.55 **	-0.56 **	-0.44 *	0.40
Lebanon - Terbol		0.80 **	0.80 **	0.82 **	0.25
Syria - Lattakia			0.68 **	0.64 **	0.32
- TH-Irrig.				0.80 **	0.12
- TH-Rain.					0.17

(1) * $P \leq 0.05$

** $P \leq 0.01$

(2) The local checks were excluded from the calculations.

4.4. FABA BEAN INTERNATIONAL LARGE SEEDED SCREENING NURSERY (FBISN-L)

4.4.1. Material

The FBISN-L comprised 50 entries, originating from large number of countries, and three check entries, two of which were provided (On major and one minor type) with the third to be used by the local cooperator. Selection of some of the entries in the nursery was based on a number of yield trials in ICARDA region whilst other entries are released commercial cultivars. The seed source of some of these entries was the ICARDA germ-plasm collection, and had been maintained with a partial control of cross-pollination. Cooperators were free to select between and/or within entries for genetic material that could be used for their own research and/or practical breeding program.

4.4.2. Methods and Management

The fifty entries planted in a single non-replicated row of 4m length, with three check genotypes planted after every 10 test entries to allow some assessment of the environmental variation. The recommended inter-and intra-row spacing was 0.50m and 0.10m, respectively. Twenty five sets of the trial were distributed to cooperators in 17 countries. Results were reported from 14 trials covering 10 different countries.

4.4.3. Results and Discussion

Genotypic values for three agronomic characters across several locations for entries in the FBISN-L during 1979-80 are given in Table 4.4.1. Number of days to flower varied from 79 days for ILB 605 to 97 days for several lines among them ILB 10, and 1269; days to maturity from 169 to 176 days (few lines represented the extremes); and plant height from 61cm for Sevilla Giant (ILB 1270) to 83cm for ILB 444.

The seed yield and rank of the genotypes at different locations during 1979-80 is given in Table 4.4.2. The coefficient of variation (CV) given for each location would give some idea of environmental variation (Table 4.4.2). The CV was high in several locations among them Qatar (Doha), Syria (Lattakia), Pakistan (Islamabad), and Peru (Lima). At individual locations the selection of superior yielding genotypes, for use in national programs, should be based on their performance relative to that of the nearest local check. This is especially important in locations with a high CV.

The five heaviest yielding genotypes at each location, together with their yield expressed as a percentage of the location mean, are listed in Table 4.4.3. Nine of these genotypes (including the local check) occurred in more than two locations, and these are listed in Table 4.4.4. together with their frequency of occurrence at respective locations and their rank for mean seed yield across all locations (Table 4.4.4). As might be expected these eight genotypes (excluding the local check) showed the heaviest mean seed yield across locations. An exception was Sevilla Giant, which ranked third in overall mean seed yield, but only occurred amongst the five heaviest seed yielders in Iraq (Table 4.4.2).

The seed yield of the six heaviest yielding genotypes across locations expressed as percentage of location mean is given in descending order for each location in Table 4.4.5. Although all six genotypes showed considerable variation between locations, both Lebanese local and Aquadulce were relatively stable in that they exceeded the location mean, 11 out of thirteen times. Aquadulce also ranked first in 1978/79 FBISN and showed a similar stability across five locations in four countries. Thus it would seem that this genotype does indeed possess a superior and stable performance and may prove to be a valuable parent in crossing programs. The performance of Lebanese local was also encouraging and merits further examination in the future. The remaining four genotypes showed a more specific adaptation to individual locations, although the lack of replication and small plot size detracts from reaching any definite conclusions about adaptation and stability.

Table 4.4.1. Genotypic values for three agronomic characters across several locations for entries in the FBISN-L during 1979/80.

Entry		ILB	Country of Origin	Number of Days to Flowering (1)	Number of Days to maturity (2)	Plant (3) height (cm)
Selection						
78S	49907	10	Jordan	97	174	68
74TA	12	12	Cyprus	85	169	69
78S	49044	17	Syria	91	170	73
74TA	51	19	"	89	171	73
74TA	59	22	"	90	170	72
74TA	63	24	Iraq	88	170	74
76TA	56824	24	"	89	170	73
74TA	91	32	"	89	170	70
75TA	26083	32	"	90	171	74
78S	49841	34	"	91	173	76
74TA	109	37	"	92	171	75
76TA	56297	41	"	87	171	66
78S	48426	268	Spain	91	170	68
74TA	374	274	Lebanon	87	171	68
76TA	56356	282	"	90	171	63
78S	48476	285	"	84	172	70
78S	49222	396	Spain	94	171	75
76TA	56246	398	"	95	174	78
78S	49456	431	Algeria	89	174	70
76TA	56263	444	Iraq	96	176	83
78S	49694	605	Canada	79	169	72
Aquadulce		1266	U.K.	88	171	75
New Mammoth		1269	U.K.	97	176	71
Sevilla Giant		1270	U.K.	96	174	61
Abu Ghraib 9		1565	Iraq	89	170	62
Abu Ghraib 22		1567	Iraq	88	170	66
Algerian Local		1790	Algeria	94	174	66
Iraq Local		1791	Iraq	94	173	69
Windsor W		1793	Syria	83	170	68
Romi 1045 IV		1795	"	84	170	69
Black Romi S VI		1796	"	84	170	71
Cyprus K Sel.		1797	"	82	167	70
Aquadulce 39 MB		1799	"	87	169	67
8 MA I		1801	"	90	170	68
Longpod 6 MB I		1802	"	87	170	64
5 MC I		1805	"	90	169	66

Count'd.....

Table 4.4.1. Genotypic values for three agronomic characters across several locations for entries in the FBISN-L during 1979/80.

Selection	Entry	Cross/No. ILB	Country of Origin	Number of Days to Flowering (1)	Number of Days to Maturity (2)	Plant height (3) (cm)
8 MC I		1806	Syria	85	170	66
15 MC II		1808	"	86	171	67
9 MA II		1809	"	88	173	71
Syr.med.Longpod		1813	"	96	175	76
Lattakia Local		1815	"	87	171	66
Lebanese Large		1817	Lebanon	91	170	72
76TA 56269		1817	"	93	175	76
76TA 56809		1817	"	93	176	70
78S 49895		1817	"	94	175	67
78S 49897		1817	"	93	171	63
Turkish Local		1821	Turkey	97	172	75
F578S 33120	X75TA	43		93	172	74
F578S 33137	X75TA	49		95	171	64
F578S 33326	X75TA	215		97	169	65
Syr.Loc.Med.		1812	Syria	90	171	71
Syr.Loc.Large		1814	"	94	175	76
Local Check				89	171	81

Notes :

- (1) Mean of data from Egypt, Guatemala, Iraq, Lebanon, Libya, Pakistan, Peru, Qatar, Spain, Lattakia and Tel Hadya-Syria
- (2) Mean of data from Iraq, Lebanon, Libya, Pakistan and Peru
- (3) Mean of data from Argentina, Egypt, Guatemala, Iraq, Lebanon, Libya, Pakistan, Peru, Qatar and Tel Hadya-Syria

Table 4.4.2. Yield (Y/kg/ha) and rank (R) of entries in the FBISN-L at different locations during 1979-80.

Entry No.	ILB	Selection	LIBYA				EGYPT		IRAQ				QATAR		LEBANON		S Y R I A				PAKISTAN		SPAIN		ARGENTINA		PERU		MEAN			
			Sebha		Zawia		Giza		Baghdad		Nineveh		Deha		Terbol		Lattakia		TH-Irrig.		TH-Rain.		Islamabad		Sevilla		Salta		Lima			
			Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R
1	10	78S 49907	2947	10	1409	27	3117	20	2433	27	4087	39	690	41	4032	10	657	40	3962	9	2129	37	1260	1	1610	41	2763	4	205	24	2236	16
2	12	74TA 12	3062	8	1767	12	3217	19	767	52	4237	38	1721	4	3514	21	544	46	3708	20	3849	2	610	2	1557	44	1293	36	230	21	2149	23
3	17	78S 49044	3412	3	1757	13	3967	8	2100	37	4037	41	1127	28	5143	1	404	49	3935	10	2476	24	1110	2	1820	31	913	47	365	6	2376	8
4	19	74TA 51	2617	19	1967	10	2917	28	2267	33	2137	53	1533	7	-	-	571	45	4128	4	1936	41	810	3	2037	18	1468	31	290	13	1900	45
5	22	74TA 59	3612	2	1752	14	2767	34	1600	48	2187	52	1065	30	1588	50	631	42	3815	11	3043	8	410	19	2096	13	1063	45	180	30	1844	50
6	24	74TA 63	2947	10	1852	11	2167	47	1767	46	4087	39	1846	3	5143	1	991	24	4188	2	2916	10	510	8	2083	14	1693	25	190	28	2332	7
7	24	76TA 56824	2262	27	1236	37	3267	18	1433	51	3687	47	1533	7	4365	7	1057	19	2935	42	2583	21	260	30	1578	43	2143	15	300	1	2046	36
8	32	74TA 91	3212	6	1188	40	3067	23	2100	37	2637	51	1283	17	3291	29	697	37	3215	32	2616	20	260	30	1766	34	1793	23	215	23	1956	41
9	32	75TA 26083	2492	24	1288	33	2467	38	2600	19	3587	48	1408	9	4069	8	1104	18	3788	14	2856	13	510	8	1645	39	2213	12	230	21	2162	22
10	34	78S 49841	1737	42	1273	34	3067	23	1933	43	4337	36	1283	17	3402	25	771	35	4002	8	1816	45	460	15	1811	33	3643	1	295	12	2131	26
11	37	74TA 109	2500	22	767	51	4383	5	2211	34	3237	49	1346	12	3217	30	893	26	2913	43	2883	12	223	33	2716	2	618	49	30	45	1996	37
12	41	76TA 56297	1450	47	741	52	3383	17	2044	40	4037	41	1033	33	2810	39	1026	21	3266	28	2123	38	273	26	1271	52	358	51	200	26	1715	51
13	268	78S 48426	2215	30	1620	17	3633	11	2544	23	5137	27	533	47	3180	31	853	28	3726	18	2383	27	323	24	1660	38	1133	41	245	17	2084	33
14	274	74TA 374	2865	13	1383	28	2883	29	1878	44	5887	14	2377	1	1625	48	1006	23	2700	48	1736	49	373	20	1762	35	2293	11	115	38	2063	35
15	282	76TA 56356	2200	31	1252	36	3583	12	3044	13	4337	36	1221	22	4662	3	1433	6	2913	43	2909	11	673	4	1703	37	2328	9	475	4	2338	6
16	285	78S 48476	2270	26	2341	7	4133	6	711	53	5037	28	752	40	1625	48	673	39	3100	36	2083	40	473	10	1622	40	1093	44	240	19	1868	47
17	396	78S 49222	2790	17	2699	4	4133	6	1711	47	5537	20	502	48	3995	11	1160	16	3126	34	2776	14	323	24	1727	36	793	48	340	8	2258	15
18	398	76TA 56246	2050	35	2831	3	3583	12	2378	30	5837	15	721	41	3551	20	1446	5	4286	1	2536	23	73	48	1359	50	2758	5	0	46	2386	4
19	431	78S 49456	2850	14	2346	6	4633	3	3044	13	3837	46	971	36	1402	51	1700	2	3593	23	1756	46	23	51	2173	11	1123	43	350	7	2131	26
20	444	76TA 56263	1725	43	3267	1	6383	1	3044	13	3987	43	1377	11	3477	22	1020	22	3380	26	2356	28	423	16	1327	51	0	52	0	46	2269	13
21	605	78S 49694	2690	18	3152	2	2117	48	1544	49	7220	2	1158	25	3637	17	802	33	3508	24	1745	47	423	16	2163	12	2215	13	0	46	2313	10
22	1266	Aquadulce	2930	12	2288	8	3117	20	3544	4	6620	7	2033	2	4452	5	1268	11	4015	7	1745	47	248	32	2496	4	2505	8	0	46	2661	2
23	1269	New Mammoth	3820	1	873	47	1617	52	2211	34	5720	17	471	49	3970	12	588	44	2242	53	1665	50	273	26	1496	48	1645	26	0	46	1699	46
24	1270	Seville Giant	2960	9	1341	31	3867	9	4878	2	6470	8	1065	30	3822	14	315	52	3815	11	1545	52	123	45	2072	17	1275	37	238	20	2413	3
25	1565	Abu Ghraib 9	3295	4	1083	43	3117	20	3544	4	6270	13	721	41	3563	19	335	50	3788	14	1845	43	373	20	2374	6	1270	38	53	44	2259	14
26	1567	Abu Ghraib 22	3110	7	1157	41	3867	9	3544	4	6770	5	1596	5	2526	42	268	53	2562	49	2412	26	623	5	2350	8	1395	32	273	15	2318	9
27	1790	Algerian Local	2155	33	1546	22	2717	36	2711	18	5420	23	1158	25	2563	41	695	38	3148	33	1432	53	473	10	1885	22	1471	30	0	46	1955	43
28	1791	Iraq Local	2430	25	846	49	2617	37	2378	30	4420	34	1346	12	3007	35	322	51	3788	14	2285	31	23	51	2339	9	1586	29	0	46	1956	41
29	1793	Windsor W	1045	53	1499	24	2867	31	3044	13	7220	2	1065	30	3452	23	542	47	3388	26	1832	44	373	20	1952	21	1626	27	58	43	2140	25
30	1795	Romi 10MB IV	1235	50	1346	29	2117	48	3211	10	8420	1	1190	24	3341	27	815	32	3122	35	2718	18	273	26	1430	49	1351	34	0	46	2183	20

Cont'd.../2

FBISN-L -81 Table 4.4.2. Cont'd.

Entry No.	ILB	Selection	LIBYA		EGYPT		IRAQ				QATAR		LEBANON		S Y R I A						PAKISTAN		SPAIN		ARGENTINA		PERU		MEAN			
			Sebha		Zawia		Giza		Baghdad		Nineveh		Doha		Terbol		Lattakia		TH-Irrig.		TH-Rain.		Islamabad		Sevilla		Salta		Lima			
			Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R
31	1796	Black Romi S	2008	37	1711	15	2467	38	2600	19	5320	25	815	37	1958	47	1366	7	2946	40	1607	51	473	10	1882	23	518	50	155	34	1845	49
32	1797	Cyprus K Sel.	1458	45	1532	23	3817	31	4100	3	4820	30	1002	34	3365	26	773	34	3053	37	2220	35	473	10	2660	3	918	46	145	35	2095	31
33	1799	Aquadulce 39MB	1458	45	1427	26	2767	34	2600	19	6770	5	1221	22	2810	39	626	43	3240	31	2714	19	473	10	1837	30	1133	41	265	16	2096	30
34	1801	8 MA I	1833	40	1569	21	2417	43	2100	37	6320	11	1158	25	3180	31	1260	12	3253	29	2107	39	223	10	2736	1	1333	35	185	29	2119	28
35	1802	Lonpod 6 MBI	2818	15	1343	30	2967	27	3267	7	5570	19	658	46	2958	38	513	48	2520	51	2260	32	223	33	1882	23	1848	22	160	31	2071	34
36	1805	5 MCI	1348	49	964	45	3467	14	2433	27	6320	11	252	53	1291	52	846	30	2866	45	2300	30	223	33	2371	7	2068	16	60	40	1915	44
37	1806	8 MCI	2168	32	1232	38	4617	4	3100	11	6820	4	408	50	3588	18	1033	20	3000	39	2234	34	123	45	2037	18	2788	3	200	26	2382	5
38	1808	15 MC II	1213	51	864	48	2117	48	3100	11	5370	24	815	37	3143	33	633	41	2773	47	2167	36	73	48	1604	42	1943	20	160	31	1855	48
39	1809	9 MA II	1873	39	943	46	2867	30	3267	7	5620	18	377	52	2032	46	1246	13	3673	21	2354	29	73	48	2326	10	2623	7	205	24	2106	29
40	1813	Syr.med.Longpod	1908	38	1606	18	2267	45	3267	7	5470	21	690	44	4069	8	853	28	3453	25	1920	42	223	33	1999	20	2693	6	60	40	2177	21
41	1815	Lattakia Local	2795	16	2655	5	2467	38	2544	23	4787	31	773	39	3044	34	862	27	2471	52	2242	33	173	41	1555	45	1206	39	288	14	1990	38
42	1817	Lebanese Local	3235	5	2081	9	3067	23	5378	1	4987	29	1242	20	4414	6	1995	1	4177	3	3816	3	223	33	2081	15	2066	17	243	18	2786	1
43	1817	76TA 56269	2010	36	1439	25	2817	31	2544	23	3887	45	1554	6	3007	35	1575	4	3017	38	3189	6	173	41	1874	25	1601	28	533	3	2087	32
44	1817	76TA 56809	1795	41	1602	19	2467	38	1878	44	4637	33	992	35	3341	27	1315	9	3711	19	3116	7	423	16	1874	25	2301	10	568	1	2145	24
45	1817	78S 49895	2495	23	1313	32	1567	53	2211	34	6387	9	1242	20	3007	35	1135	17	4124	5	4096	1	523	7	1874	25	1726	24	323	9	2287	12
46	1817	78S 49897	2550	21	1260	35	2017	51	2878	17	5437	22	710	43	3970	12	1208	15	3244	30	3442	5	273	20	1818	32	2026	18	398	5	2230	17
47	1821	Turkish Local	2130	34	1097	42	2467	38	2378	30	3937	44	398	51	2526	42	1628	3	2937	41	3749	4	148	43	1871	29	2166	14	133	36	1969	40
48		F5 78S 33120	2250	28	792	50	3417	16	2044	40	5787	16	1117	29	4489	4	1275	10	2804	46	2776	14	148	43	1874	25	2016	19	133	36	2209	18
49		F5 78S 33137	1410	48	981	44	3567	14	2044	40	4687	32	1273	19	3415	24	742	36	3744	17	2749	16	148	43	1207	53	1361	33	308	10	1974	39
50		F5 78S 33326	1170	52	708	53	2217	46	1544	49	3087	50	1304	14	2489	45	822	31	2544	50	2976	9	223	33	1555	45	1176	40	113	39	1567	52
Location mean			2324		1538		3094		2546		5065		1096		3278		940		3379		2467		349		1903		1693		199		2136	
C.V. %			28.45		29.39		23.06		26.95		27.53		33.47		17.89		30.17		12.91		27.52		60.79		22.53		23.89		72.94			
S.E. for check			381.19		278.94		503.06		424.00		926.00		280.46		375.23		225.55		312.67		449.06		104.76		288.00		356.29		120.57			
S.F. variety vs check			762.37		557.88		1006.11		849.00		1853.00		560.92		750.45		451.10		625.34		898.12		222.23		576.00		755.80		241.14			
Local check means			1508	44	1684	16	5020	2	2567	22	5180	26	1394	10	2496	44	1348	8	3800	13	2437	25	-	-	2444	5	-	-	568	1	2537	-
Syr.L.L. means			2616	20	1602	19	2360	44	2467	26	6370	10	1288	16	3770	15	980	25	3649	22	2583	21	190	40	1544	47	2797	2	59	42	2305	11
Syr.L.med.means			2231	29	1216	39	2970	26	2433	27	4410	35	1294	15	3681	16	1217	14	4036	6	2721	17	355	23	2079	16	1919	21	157	33	2194	19

Table 4.4.3. The five heaviest seed yielding entries at each individual and their yield % of the location mean in the FBISN-L during 1979-80

Rank	LIBYA			LIBYA			EGYPT			IRAQ			IRAQ		
	Sebha Selection	ILB	% of Loc. X	Zawia Selection	ILB	% of Loc. X	Giza Selection	ILB	% of Loc. X	Baghdad Selection	ILB	% of Loc. X	Ninevah Selection	ILB	% of Loc. X
1	New Mammoth	1269	164	76TA 56263	444	212	76TA 56263	444	206	Lebanese local	1817	211	Romi 10 MB IV	1795	166
2	74TA 59	22	155	78S 49694	605	205	Local check		162	Sevilla Giant	1270	192	78S 49694	605	143
3	78S 49044	17	146	76TA 56246	398	184	78S 49456	431	150	Cyprus K Sel.	1797	161	Windsor W	1793	143
4	Abu Ghraib 9	1565	142	78S 49222	396	175	8 MCI	1806	149	Aquadulce	1266	139	8 MCI	1806	135
5	Lebanese local	1817	139	Lattakia local	1815	173	74TA 109	37	142	Abu Ghraib	1565	139	Abu Ghraib 22	1567	134

Rank	Qatar			LEBANON			SYRIA			SYRIA			SYRIA		
	Doha Selection	ILB	% of Loc. X	Terbol Selection	ILB	% of Loc. X	Lattakia Selection	ILB	% of Loc. X	Tel Hadya (I) Selection	ILB	% of Loc. X	Tel Hadya (R) Selection	ILB	% of Loc. X
1	74TA 374	274	217	78S 49044	17	157	Lebanese local	1817	212	76TA 56246	398	127	78S 49895	1817	166
2	Aquadulce	1266	185	74TA 63	24	157	78S 49456	431	181	74TA 63	24	124	74TA 12	12	156
3	74TA 63	24	168	76TA 56356	282	142	Turkish local	1821	173	Lebanese local	1817	123	Lebanese local	1817	155
4	74TA 12	12	157	F578S 33120X75TA43	137		76TA 56269	1817	168	74TA 51	19	122	Turkish local	1821	152
5	Abu Ghraib 22	1567	146	Aquadulce	1266	136	76TA 56246	398	154	78S 49895	1817	121	78S 49897	1817	140

Rank	PAKISTAN			SPAIN			ARGENTINA			PERU		
	Islamabad Selection	ILB	%of Loc. $\bar{X}$	Sevilla Selection	ILB	%of Loc. $\bar{X}$	Salta Selection	ILB	%of Loc. $\bar{X}$	Lima Selection	ILB	%of Loc. $\bar{X}$
1	78S 49907	10	361	8MAI	1801	144	78S 49841	34	215	76TA 56809	1817	285
2	78S 49044	17	318	74Ta 109	37	143	Syr.L.L.	1814	166	Local check		285
3	74TA 51	19	232	Cyprus K Sel.	1797	140	8 MCI	1806	165	76TA 56269	1817	268
4	76TA 56356	282	193	Aquadulce	1266	131	78S 49907	10	163	76TA 56356	282	239
5	Abu Ghraib22	1567	179	Local check		128	76TA 56246	398	162	78S 49897	1817	200

Table 4.4.4. List of entries that appeared more than twice in Table 4.4.3., frequency of occurrence and name of the country and overall rank of these entries in seed yield.

ILB	Selection	Freq	Name of the country	Rank
1817	Lebanese L.L.	5	Libya, Iraq, Syria (3 locations)	1
1266	Aquadulce	4	Iraq, Lebanon, Spain, Qatar	2
398	76TA 56246	4	Libya, Argentina, Syria (2 locations)	4
1806	8 MCI	3	Egypt, Iraq, Argentina	5
282	76TA 56356	3	Lebanon, Peru, Pakistan	6
24	74TA 63	3	Qatar , Lebanon, Syria	7
17	78S 49044	3	Libya, Lebanon, Pakistan	8
1567	Abu Ghraib 22	3	Iraq, Qatar , Pakistan	9
-	Local check	3	Egypt, Spain, Peru	-

Table 4.4.5. Seed yield expressed as a % of location mean, of the six entries with the heaviest mean seed yield across location (in descending order) in the FBISN-L 1979-80.

Entry	Selection No.	Libya		Egypt Giza	Iraq		Qatar Doha	Lebanon Terbol	Syria		Pakistan Islamabad	Spain Sevilla	Argentina Salta	Peru Lima	
		Sebha	Zawia		Baghdad	Ninevah			Lattakia	Tel Hadya					
									(Irrig.)	(Rain.)					
Lebanese Local	ILB 1817	139	135	99	211	98	113	135	212	123	155	64	109	122	122
Aquadulce	ILB 1266	126	149	101	139	131	185	136	135	119	71	71	131	148	-
Seville Giant	ILB 1270	127	87	125	192	128	97	117	34	106	63	35	109	75	120
ILB 398	76TA 56246	88	184	116	93	115	66	108	154	127	103	21	71	162	-
ILB 1806	8 MC 1	93	80	149	122	135	37	109	110	89	91	35	107	165	101
ILB 282	76TA 56356	95	81	116	120	85	111	142	152	86	117	193	89	138	239

4.5. FABA BEAN INTERNATIONAL SMALL SEEDED SCREENING NURSERY (FBISN-S)

4.5.1. Material

The FBISN-S comprised 60 entries, originating from a large number of countries, and three check entries, two of them were provided (one major and one minor type) with the third to be supplied by the local cooperator. Selections of some of the entries was based on a number of yield trials in ICARDA region, while others were released commercial cultivars. The seed source of some of the entries was from ICARDA germplasm collection, in which partial control of cross-pollination had been maintained. Cooperators were free to select between and/or within entries for genetic material that could be used for their own research and/or practical breeding program.

4.5.2. Methods and Management

The sixty entries were planted in a single non-replicated row of 4m, with three check genotypes planted after every 10 test entries to allow some assessment of the environmental variation. The recommended inter-and intra-row spacing was 0.50m and 0.10m, respectively. Twenty five sets of the trial were distributed to cooperators in 18 countries. Results were reported from 12 different countries.

4.5.3. Results and Discussion

Genotypic values for three agronomic traits across several locations are given in Table 4.5.1. Number of days to flower ranged from 84 days for ILB 277 and 78S 49891 to 102 days for ILB 159; days to maturity from 178 days for ILB 277 to 186 days for ILB 16 and X75TA 193; and plant height from 61cm for ILB 322, 338, and X75TA 215 to 74cm for ILB 360.

The seed yield and rank of the entries at different locations are given in Table 4.5.2. Only the mean seed yield of the check genotypes has been given at each location, but some idea of the environmental variations can be gained from the coefficients of variation (CV) and these CV values are given in Table 4.5.2. The CV was high extremely high in Peru (73.5%) and Lattakia (55.1%). The high CV in Lattakia probably reflected occurrence of severe disease and insect attacks, which were not uniformly distributed throughout the trial. At individual locations selection of superior yielding genotypes, for use in national programs, must be based on their performance relative to that of the nearest local check. This is especially important in locations with a high CV.

The five heaviest yielding genotypes at each location, together with their yield expressed as a percentage of the location mean, are listed in Table 4.5.3. Five of these genotypes occurred in more than two locations and are listed in Table 4.5.4., together with their frequency of occurrence at respective locations, and their rank for mean seed yield across all locations (Table 4.5.4). In contrast to the FBISN-L two of the genotypes in Table 4.5.4., namely ILB 18 (77 TA 80023) and ILB 359 (76TA 56202), were not amongst the heaviest mean seed yielders across locations, being ranked 14th and 15th respectively. The seed yield of the six heaviest yielding genotypes across locations, expressed as a percentage of each location, is given in descending order in Table 4.5.5. It is interesting that both the selections from ILB 31 in this trial were among this group of six. The top five exceeded the individual location means at least nine out of twelve times, indicating a reasonable degree of stability. The last genotype, namely, ILB 9 (74TA 22) achieved this seven times, and the two genotypes ranked 14th and 15th referred to earlier, achieved this six times. Thus the performance of these last three genotypes suggests a more limited adaptation to specific environments. However, the small plot size and lack of replication detracts from reaching any firm conclusions about stability and adaptation.

Table 4.5.1. Genotypic values for three agronomic characters across several location for entries in the FBISN-S during 1979-80.

Entry			Country of Origin	Days to (1) Flowering	Days to (2) Maturity	Plant (3) height (cm)
Selection		ILB				
74TA	12	5	Jordan	84	180	63
74TA	22	9	China	84	182	72
77 MS	88252	16	Syria	91	186	66
77TA	80023	18	"	87	182	66
77TA	88800	19	"	87	181	67
75TA	26062	29	Iraq	88	184	66
74TA	84	30	"	87	183	65
74TA	85	31	"	91	182	74
74TA	87	31	"	90	181	71
75TA	26083	32	"	88	181	75
74TA	95	33	"	85	182	75
78S	49053	35	"	93	182	76
74TA	109	37	"	90	181	71
74TA	133	49	U.K.	94	181	79
77MS	88293	159	Greece	102	184	77
75TA	26333	207	Turkey	94	182	73
77MS	88030	218	"	100	184	71
74TA	367	269	Spain	87	182	75
76TA	56791	269	"	88	180	73
77MS	88733	269	"	96	181	71
74TA	374	274	Lebanon	88	181	72
76TA	96035	277	"	84	178	68
77TA	88188	285	"	87	181	68
77MS	88321	286	"	95	182	65
77MS	88322	286	"	96	182	71
77MS	88323	287	Lebanon	94	182	68
77MS	88324	287	"	93	181	71
75TA	26467	295	Uruguay	91	183	71
77MS	88218	298	Spain	98	185	66
77MS	88338	317	U.K.	85	182	67
78S	48434	320	Japan	96	184	64
75TA	26501	322	"	97	185	61
77TA	88138	328	China	88	181	64
78S	48437	336	Sweden	93	182	69
78S	49145	338	Egypt	94	180	61
77MS	88158	352	"	91	184	71
77MS	88165	356	"	92	181	68

Cont'd.../2

Table 4.5.1. Cont'd..

Entry Selection	Cross/No. ILB	Country of Origin	Days to (1) Flowering	Days to (2) Maturity	Plant (3) Height (cm)
78S 49159	356	Egypt	89	182	64
76TA 56202	359	"	90	183	72
74TA 498	360	"	89	182	67
78S 49177	360	"	94	182	74
77MS 88362	372	Algeria	94	184	70
77MS 88410	421	Iran	93	183	78
76TA 56459	428	Sudan	90	182	70
78S 35513	905	Egypt	94	180	67
78S 48171	1266	U.K.	89	182	72
78S 49172	1266	U.K.	88	183	71
76TA 56267	1817	Lebanon	93	181	69
78S 49891	1817	"	84	181	71
78S 49892	1817	"	85	182	70
78S 49893	1817	Lebanon	94	181	67
78S 49896	1817	"	93	182	66
F578S 33005	X75TA 4		91	181	72
F578S 33011	X75TA 7		90	182	70
F578S 33024	X75TA 14		86	181	68
F578S 33261	X75TA 173		87	181	72
F578S 33268	X75TA 182		89	183	72
F578S 33697	X75TA 183		90	180	69
F578S 33698	X75TA 193		101	186	68
F578S 33737	X75TA 215		96	184	61
Syr. Loc. Large			96	184	69
Giza 3			86	180	70
Local check			86	177	72

Notes:

- (1) Mean of data from Algeria, Egypt, Ethiopia, Iraq, Lebanon, Libya, Peru, Qatar, Spain, Lattakia and Tel Hadya - Syria.
- (2) Mean of data from Algeria, Iraq, Lebanon, Libya and Peru.
- (3) Mean of data from Algeria, Argentina, Egypt, Iraq, Lebanon, Libya, Peru, Qatar and Tel Hadya - Syria.

Table 4.5.2. Yield (Y=kg/ha) and rank (R) of entries in the FBISN-S at different locations during 1979-80.

ILB	Selection	ALGERIA		LIBYA		ETHIOPIA		IRAQ		QATAR		LEBANON		S Y R I A						SPAIN		ARGENTINA		PERU		MEAN			
		Ticaret		Zawia		Debre Zeit		Baghdad		Doha		Terbol		Lattakia		TH-Irrig.		TH-Rain.		Sevilla		Salta		Lima		Y	R	Y	R
		Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R				
5	74TA 12	3283	8	1506	49	1134	17	2733	22	935	29	3401	27	464	57	4006	5	2491	20	2880	6	1871	12	254	2	2080	12		
9	74TA 22	4133	1	2601	12	969	32	2533	26	966	28	3401	27	651	47	3813	9	3577	3	1838	56	1901	11	74	38	2205	6		
16	77MS 88252	3383	6	1948	32	434	55	1933	47	1560	9	4475	6	664	45	3126	35	2657	17	2545	21	1486	25	4	63	2018	15		
18	77TA 80023	3433	5	2575	13	464	53	1933	47	1591	8	2772	48	897	33	4439	3	2257	32	2942	5	1406	30	69	39	2065	13		
19	77TA 88800	3033	13	1722	41	1124	19	1533	57	872	30	3735	17	724	40	2739	50	2091	39	2347	33	1506	23	34	55	1788	38		
29	75TA 26062	3833	3	2822	7	179	59	3333	8	1497	11	4105	10	951	31	3173	33	2417	23	2329	34	2081	5	214	4	2245	4		
30	74TA 84	2633	22	2312	17	284	57	3133	14	1310	16	2994	40	1391	17	3759	11	1311	56	2291	37	1636	19	194	7	1937	23		
31	74TA 85	3133	10	2690	10	474	51	3533	5	685	37	3772	16	1144	25	4626	2	2951	8	1804	57	1721	15	264	1	2233	5		
31	74TA 87	2833	18	2954	6	969	32	3533	5	1185	18	3475	24	2044	3	3133	34	2957	7	2366	28	1786	13	114	25	2279	2		
32	75TA 26083	3333	7	2069	23	504	49	4333	1	1372	13	3179	34	2037	4	3386	26	2371	26	2329	34	2061	6	119	23	2258	3		
33	74TA 95	1871	48	3049	3	299	56	2733	22	685	37	4401	7	673	43	3317	28	2829	12	2061	47	846	50	38	52	1900	26		
35	78S 49053	1471	59	3776	1	189	58	2533	26	29	51	1957	61	1106	27	2530	54	1669	51	2166	43	226	58	33	56	1474	60		
37	74TA 109	2421	29	2181	19	439	54	3333	8	154	50	3105	37	773	38	3357	27	2389	24	2944	4	96	61	23	58	1768	45		
49	74TA 133	1521	58	2760	9	549	46	2933	16	0	52	3920	13	1726	10	2984	42	2895	9	3113	2	931	48	213	5	1962	20		
159	77MS 88293	1071	62	2023	26	0	62	733	63	0	52	2179	60	826	35	2370	57	969	60	1247	62	2286	4	63	41	1177	62		
207	75TA 26333	1571	55	2670	11	124	60	2533	26	341	47	2735	49	1299	21	3570	17	2829	12	1625	58	1096	44	23	58	1701	50		
218	77MS 88030	2471	26	2155	21	0	62	2133	42	810	31	3253	31	813	36	2810	46	2242	34	2166	43	2471	3	23	58	1779	41		
269	74TA 367	1471	59	3197	2	584	44	3333	8	1497	11	2623	53	726	39	2224	59	2149	38	2530	22	2891	1	48	46	1939	22		
269	76TA 56791	1471	59	2065	24	1024	27	1733	53	560	44	3105	37	359	59	3264	30	2375	25	3139	1	156	60	168	14	1618	57		
269	77MS 88733	1671	54	2997	5	474	51	2533	26	591	41	2623	53	513	53	3090	36	1375	55	3031	3	511	54	83	33	1624	56		
274	74TA 374	2621	23	1085	58	1537	10	2333	34	1596	6	1228	63	971	30	3430	24	2806	14	2350	32	2634	2	91	31	1890	28		
277	76TA 96035	2121	42	2138	22	952	34	2533	26	690	35	4340	8	677	42	2537	53	2553	18	2312	36	1459	28	136	19	1871	30		
285	77TA 88188	2471	26	1475	50	977	30	1333	59	2003	3	1377	62	1111	26	3670	14	3733	2	1987	52	1534	22	76	37	1813	35		
286	77MS 88321	1571	55	1964	31	1012	29	2733	22	1659	5	3377	29	1791	9	2757	49	1926	45	1447	61	1259	38	166	15	1805	36		
286	77MS 88322	1746	52	1938	34	972	31	2533	26	1596	6	2932	43	1057	28	3470	20	1853	48	2215	40	1399	32	206	6	1826	34		
287	77MS 88323	1571	55	1175	56	802	38	2133	42	1690	4	2821	46	1037	29	3084	37	4100	1	2508	23	1284	37	186	9	1866	31		
287	77MS 88324	1971	46	1611	46	1097	21	1933	47	2221	2	2562	57	1304	20	2604	52	2673	16	1600	60	1184	40	126	21	1741	47		
295	75TA 26467	2021	45	1433	52	1302	14	2333	34	1159	19	2932	43	1564	13	2870	45	2366	27	2386	26	1599	20	41	48	1839	33		
298	77MS 88218	2471	26	1033	59	482	50	2333	34	1128	21	2673	52	717	41	3604	16	2260	31	2203	41	1449	29	91	31	1704	49		
317	77MS 88338	1771	50	1801	38	1892	5	1733	53	1284	17	3228	32	671	44	2117	60	2533	19	1987	51	1784	14	246	3	1754	46		

Cont'd.../2

Table 4.5.2. Cont'd..

ILB	Selection	ALGERIA		LIBYA		ETHIOPIA		IRAQ		QATAR	LEBANON		S Y R I A				SPAIN		ARGENTINA		PERU		MEAN				
		Ticaret		Zawia		Debre Zeit		Baghdad		Doha	Terbol		Lattakia		TH-Irrig.		TH-Rain.		Sevilla	Salta		Lima					
		Y	R	Y	R	Y	R	Y	R		Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R			
320	78S 48434	2133	38	2778	8	762	41	2067	44		4870	4	473	56	3030	41	1857	47	2228	39	429	56	41	48	1879	29	
322	75TA 26501	1683	53	2205	18	1257	15	1667	55		2241	59	653	46	3037	40	2231	35	2555	18	169	59	41	48	1613	58	
328	77TA 88138	2283	36	2162	20	1017	28	1827	52		4056	11	1660	12	3437	22	2231	35	2681	12	4	62	171	11	1957	21	
336	78S 48437	2033	44	1626	45	507	48	2267	38		2944	42	946	32	3444	21	1931	44	2188	42	314	57	36	54	1658	23	
338	78S 49145	2383	31	2010	27	647	43	2067	44	596	40	3130	36	879	34	3077	38	2071	41	2682	11	504	55	16	62	1672	51
352	77MS 88158	2133	38	2036	25	1472	13	2867	17	1346	15	3500	23	639	48	2310	58	857	62	2617	14	1379	33	191	8	1773	41
356	77MS 88165	2683	21	1426	53	1062	25	2867	17	1096	24	3981	12	1506	15	3217	31	1377	54	2549	20	1404	31	46	47	1935	24
356	78S 49159	2133	38	1968	30	1107	20	1267	60	346	46	3167	35	1186	23	2964	43	1877	46	2805	8	829	51	126	21	1648	55
359	76TA 56202	2083	43	2999	4	1607	7	1467	58	2378	1	4981	3	519	52	3197	32	1084	58	2079	46	2004	8	41	48	2037	14
360	74TA 498	1933	47	1926	35	1487	11	1267	60	784	32	4685	5	1146	24	2897	44	1284	57	2553	19	1174	42	171	11	1776	44
360	78S 49177	2133	38	2506	14	1604	8	1867	50	690	35	3216	33	1191	22	3557	18	1553	52	2283	38	2036	7	108	26	1895	27
372	77MS 88362	2308	34	2506	14	559	45	2267	38	1128	21	2698	51	1551	14	3490	19	2246	33	2365	29	1651	18	68	40	1903	25
421	77MS 88410	1758	51	2433	16	524	47	2067	44	1534	10	2846	45	1338	19	2770	48	1673	50	1898	54	1721	15	18	61	1715	48
428	76TA 56459	2408	30	1454	51	669	42	3267	11	1003	27	3512	21	1958	5	4303	4	2859	10	2718	10	1326	36	58	42	2128	9
905	78S 35513	2358	32	1943	33	1089	23	2667	25	1128	21	2623	53	1351	18	2664	51	2153	37	2000	49	1351	35	53	44	1782	39
1266	78S 49171	2808	19	1359	55	789	39	3867	2	1034	26	3623	19	1918	7	3077	38	2486	21	2586	16	1686	17	118	24	2113	10
1266	78S 49172	2708	20	701	62	924	36	2667	3			3623	19	2191	2	3864	8	3140	6	2575	17	1491	24	103	27	2082	11
1817	76TA 56267	2308	34	1533	48	784	40	3267	11	253	48	3512	21	2765	1	3437	22	2846	11	2365	29	1001	46	98	28	2014	16
1817	78S 49891	3158	9	996	60	949	35	3667	3	565	43	2253	58	1725	11	2797	47	2753	15	2838	7	1921	10	83	33	1975	18
1817	78S 49892	3108	11	1996	28	1934	4	3067	15	628	39	5920	1	1405	16	4664	1	3353	4	2462	25	1176	41	133	20	2487	1
1817	78S 49893	3933	2	1580	47	1050	26	2867	17			3105	37	608	49	3673	12	1817	49	2590	15	1539	21	158	16	2175	8
1817	78S 49896	3758	4	1669	43	1475	12	2267	38			5401	2	235	60	3673	12	2271	29	2000	49	1364	34	78	36	2199	7
	F5 78S 33005	2933	16	1417	54	1780	6	1867	50			3364	30	0	62	3393	25	1977	42	2103	45	824	52	143	18	1800	37
	F5 78S 33011	2883	17	1990	29	1550	9	2467	33			2960	41	608	49	3866	7	1977	42	2378	27	899	49	58	42	1967	19
	F5 78S 33024	2983	14	1885	37	2565	2	3467	7	253	48	3660	18	575	51	2373	56	2271	29	2666	13	1214	39	183	10	2008	17
	F5 78S 33261	2208	37	943	61	1200	16	3267	11	753	33	3475	24	62	61	1953	62	757	63	1611	59	989	47	93	30	1441	61
	F5 78S 33268	2983	14	669	63	1090	22	2867	17	753	33	2809	47	0	62	3773	10	2351	28	2465	24	1464	26	153	17	1781	40
	F5 78S 33697	2533	25	1659	44	1085	24	2867	17	1065	25	3883	14	428	58	2106	61	2084	40	1043	63	1049	45	53	44	1655	54
	F5 78S 33698	2583	24	1143	57	1130	18	1667	55			4216	9	502	54	3286	29	964	61	1954	53	779	53	38	52	1660	52
	F5 78S 33737	2333	33	1748	40	850	37	1067	62	534	45	3846	15	1948	6	2413	55	1064	59	1887	55	1099	43	98	28	1574	59
Location mean		2435		1974		983		2476		1030		3328		1043		2789		2225		2311		1334		103		1890	
C.V. %		18.44		31.82		21.27		28.56		24.48		29.59		55.10		8.75		18.05		12.75		23.34		73.52			
SE. for check		262.00		329.20		251.00		385.00		176.21		498.88		327.13		160.35		249.56		176.00		228.62		39.33			
SE. for var.vs.check		530.00		711.14		542.00		831.00		321.71		1077.70		706.67		346.40		539.12		381.00		523.84		84.96			
Check		-		1754	39	3853	1	2200	41	1137	20	2716	50	1824	8	3656	15	2431	22	2786	9	1933	9	170	13	2253	-
Giza 3		1846	49	1811	36	99	61	2300	37	570	42	3444	26	777	37	3923	6	3240	5	2044	48	1460	27	25	57	1848	32
L.L.		3071	12	1711	42	2178	3	2500	32	1348	14	2699	56	484	55	1939	63	1514	53	2353	31	1334		83	33	1778	43

Table 4.5.3. The five heaviest seed yielding entries and their yield % of the location mean at the individual test in the FBISN-5 during 1979/80.

Rank	ALGERIA			LIBYA			ETHIOPIA			IRAQ			QATAR			ARGENTINA		
	Ticaret Selection	ILB	% of Loc. $\bar{x}$	Zawia Selection	ILB	% of Loc. $\bar{x}$	Debre Zeit Selection	ILB	% of Loc. $\bar{x}$	Baghdad Selection	ILB	% of Loc. $\bar{x}$	Doha Selection	ILB	% of Loc. $\bar{x}$	Salta Selection	ILB	% of Loc. $\bar{x}$
1	74TA 22	9	170	78S 49053	35	191	Local check		392	75TA 26083	32	175	76TA 56202	359	231	74TA 367	269	217
2	78S 49893	1817	162	74TA 367	269	162	F578S 33024x75TA 14	261		78S 49171	1266	156	77MS 88324	287	216	74TA 374	274	197
3	75TA 26062	29	157	74TA 95	33	154	Syr.L.L.	1814	222	78S 49172	1266	148	77TA 88188	285	194	77MS 88030	218	185
4	78S 49896	1817	154	76TA 56202	359	152	78S 49892	1817	197	78S 49891	1817	148	77MS 88323	287	164	77MS 88293	159	171
5	77TA 80023	18	141	77MS 88733	269	152	77MS 88338	317	192	74TA 85	31	143	77MS 88321	286	161	75TA 26062	29	156
										74TA 87	31	143						

Rank	LEBANON			SYRIA			SYRIA			SYRIA			SPAIN			PERU		
	Terbol Selection	ILB	% of Loc. $\bar{x}$	Lattakia Selection	ILB	% of Loc. $\bar{x}$	Tel Hadya(I) Selection	ILB	% of Loc. $\bar{x}$	Tel Hadya(R) Selection	ILB	% of Loc. $\bar{x}$	Sevilla Selection	ILB	% of Loc. $\bar{x}$	Lima Selection	ILB	% of Loc. $\bar{x}$
1	78S 49892	1817	178	76TA 56267	1817	265	78S 49892	1817	167	77MS 88323	287	184	76TA 56791	269	136	74TA 85	31	256
2	78S 49896	1817	162	78S 49172	1266	210	74TA 85	31	165	77TA 88188	285	168	74TA 133	49	135	74TA 12	5	247
3	76TA 56202	359	150	74TA 87	31	196	77TA 80023	18	159	74TA 22	9	161	77MS 88733	269	131	77MS 88338	317	239
4	78S 48434	320	146	75TA 26083	32	195	76TA 56459	428		78S 49892	1817	151	74TA 109	37	127	75TA 26062	29	208
5	74TA 498	360	141	76TA 56459	428	188	74TA 12	5	143	Giza 3	1819	146	77TA 80023	18	127	74TA 133	49	207

Table 4.5.4. List of entries that appeared more than twice in Table 4.5.3; name of the country and overall rank of these entries in seed yield.

ILB	Selection		Freq.	Name of the Country	Rank
1817	78S	49892	4	Ethiopia, Lebanon and Syrian (2 locations)	2
29	75TA	26062	3	Algeria, Peru and Argentina	5
31	74TA	85	3	Iraq, Syria, and Peru	6
18	77TA	80023	3	Algeria, Spain, and Syria	14
359	76TA	56202	3	Libya, Qatar, and Lebanon	15

Table 4.5.5. Seed yield expressed as a % of location mean, of the six entries with the heaviest mean seed yield across locations (in descending order) in the FBISN-S during 1979/80.

Entry	Selection	ALGERIA Ticaret	LIBYA Zawia	ETHIOPIA Debre- Zeit	IRAQ Baghdad	QATAR Doha	LEBANON Terbol	S Y R I A			SPAIN Sevilla	ARGENTINA Salta	PERU Lima
								Latt.	TH-Irr.	TH-Rain.			
ILB 1817	78S 48892	128	101	197	124	61	178	135	167	151	107	88	129
31	74TA 87	116	150	99	143	115	104	196	112	133	102	134	111
32	75TA 26083	137	105	51	175	133	96	195	121	107	101	154	116
29	75TA 26062	157	143	18	135	145	123	91	113	109	101	156	208
31	74TA 85	129	136	48	143	67	113	110	165	133	78	129	256
9	74TA 22	170	132	99	102	94	102	62	136	161	80	143	72

4.6. FABA BEAN INTERNATIONAL F₄ TRIAL (FBIF₄T)

4.6.1. Material

The FBIF₄N was composed of 14 F₄ populations, one ICARDA check (ILB 1812), and one check to be supplied by the local cooperator. The F₄ populations originated from crosses between high yielding lines and widely adapted local genotypes. The F₄ populations were selected on the basis of their performance as F₃ populations and with the aim of providing a wide range of intra-and inter-population variation, within which the cooperators were free to practice their own selection.

4.6.2. Methods and Management

The trial design was 4x4 lattice (4 replications), although the results have been analysed as a randomized block. The suggested plot size was four rows each of four meter long, with an inter-and intra-row spacing 0.50m and 0.10m, respectively.

Eighteen sets of the trial were distributed to cooperators in 12 countries. Results were returned from eleven trials covering eight countries. The agronomic practices employed at different locations are shown in Table 4.6.1.

4.6.3. Results and Discussion

Miscellaneous agronomic data are summarized in Table 4.6.2. Number of days to flowering varied from 90 days for x77TA-70, -80, and X77sd-60 to 101 days for X77TA-98. The variation for maturity was small since the range between the earliest and latest population was only three days. The shortest population was X77TA-98 at 79cm, while the tallest was X77sd-77 at 91cm.

The seed yield and rank of entries in the FBIF₄T at different locations during 1979-80 are given in Table 4.6.3. In Algeria the local check had the lowest seed yield, while the local check ranked first in seed yield at Debre Zeit (Ethiopia), Tel Hadya rainfed (Syria), Lecce (Italy) and Sevilla (Spain). Only in Algeria the local check was significantly outyielded by any of the F₄ populations, namely three, whereas in Lebanon and Italy (Bari) it was the cultivar Syrian local which significantly exceeded the check. Clearly, selection within the top three performing F₄ populations in Algeria could produce further yield advances. Also selection within these F₄ populations that were superior, although not significantly, to the local check could also produce superior genotypes.

Over all locations, the Syrian local (ILB 1812) ranked first in seed yield, which reflects its adaptation to the three Syrian locations and its good performance in Lebanon and Italy.

Correlations between the seed yield of the populations at different locations are given in Table 4.6.4. Many of the values were low and/or negative, but as in the FBAT and the FBIYT-L and -S (Tables 4.1.5., 4.2.7. and 4.3.7) the correlations showed that entry performance was similar at locations in Syria and Italy.

Table 4.6.1. Agronomic data for the different locations for the FBIF₄T during 1979/80

Country	Location	Planting Data 1979	Crop (1) Duration (days)	Fertilizer			Irrigation
				N	P205	K20	
Algeria	Sidi-Bel-Abbes	26-11	205	-	200	-	-
Egypt	Giza	21-11	157	18	35	-	3
Ethiopia	Debre Zeit						
Guatemala	Tecpan						
Italy	Bari	26-11	228	-	500	-	-
	Lecce	14-12	202	-	500	-	-
Lebanon	Terbol	5-11		100	300	-	-
Spain	Sevilla	8-12	161	-	125	-	-
Syria	Lattakia	13-11					
	Tel Hadya	15-11					

(1) No.of days from planting to harvest

Table 4.6.2. Mean values for three agronomic characters for entries in the FBIF4T during 1979/80.

Entry		No. of Days to Flower	No. of Days to Maturity	Plant Height (cm)
X77TA	3	93	188	90
	70	90	186	84
	80	90	186	87
	98	101	185	79
	132	91	188	94
Syrian Local		93	186	87
	143	94	186	85
X77Sd	13	97	187	88
	14	91	187	89
	51	92	186	85
	57	92	188	91
	60	90	185	86
	74	92	186	83
	81	95	186	87
	128	92	187	84

Table 4.6.3. Seed yield (Y = kg/ha) and rank (R) of entries in the FBIF&T at different locations during 1979/80.

Entry	ALGERIA		EGYPT		ETHIOPIA		LEBANON		S Y R I A				I T A L Y				SPAIN		GUATEMALA		Mean				
	S.B.A.		Giza		Debre-Zeit		Terbol		Lattakia		TH-Rain		TH-Irrig.		Bari		Lecce		Sevilla		Tecpan		Yean		
	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	
Syrian Local	3356	4	3192	5	341	15	2259	1	3803	1	4428	2	6270	1	5563	1	2663	2	3555	4	517	8	3268	1	
60	2492	13	3683	1	1950	2	1051	11	969	13	3856	4	5312	5	4053	12	2654	3	3795	3	574	5	2763	2	
143	3250	5	3117	8	1038	7	1472	6	2082	4	3978	3	4787	8	5021	2	2208	5	2728	14	560	7	2749	3	
74	2922	9	3250	4	1773	4	1519	5	1272	10	3659	7	4834	7	4333	8	2054	6	3910	2	589	4	2738	4	
X77Sd	13	4011	1	2725	13	498	14	801	15	2646	3	3563	9	4573	11	4263	10	1900	9	3094	10	507	9	2598	5
57	2704	11	3067	9	686	13	1866	2	1543	7	3632	8	5658	2	4321	9	1746	11	2933	12	241	13	2581	6	
14	2792	10	3025	10	1898	3	875	13	1481	8	3425	12	4207	13	4492	5	2250	4	3282	6	656	2	2580	7	
70	2296	14	3167	6	1269	6	1653	3	1670	6	3338	13	4658	10	3796	15	1817	10	2956	11	630	3	2477	8	
80	2950	8	3125	7	1402	5	991	12	802	16	3065	16	4881	6	3975	13	1992	7	3225	7	462	11	2443	9	
132	3361	3	2492	15	1008	8	1343	8	872	14	3537	10	4770	9	3967	14	1513	14	2877	13	980	1	2429	10	
51	2961	7	2858	11	941	9	1208	9	850	15	3727	6	3708	16	4354	6	1904	8	3500	5	484	10	2409	11	
X77TA	3	2692	12	2817	12	636	12	769	16	1448	9	3768	5	4278	12	4583	4	1625	12	3168	8	417	12	2382	12
128	3025	6	3308	2	836	10	1606	4	1200	11	3135	15	4147	14	3533	16	1392	16	3168	8	571	6	2356	13	
81	2150	15	2533	14	626	13	824	14	1043	12	3143	14	5472	3	4075	11	1588	13	2531	15	187	14	2197	14	
98	3472	2	1575	16	180	16	1153	10	2003	5	3462	11	4085	15	4350	7	1458	15	2240	16	109	15	2190	15	
Local check	1879	16	3283	3	3650	1	1394	7	3332	2	5112	1	5403	4	4700	3	3729	1	4303	1	-	-	-	-	
Location mean	2895		2951		1171		1299		1688		3677		4815		4336		2031		3204		499		2544		
C.V. %	34.3		24.2		37.51		41.0		32.1		12.3		20.5		13.4		31.0		20.4		42.19				
L.S.D. 5%	1407.6		1020.2		625.39		761.5		755.5		675.0		1409.2		827.6		899.2		934.1		300.81				
No. of entries significantly exceeding local	3		-		-		1		-		-		-		1		-		-		-		-		

Table 4.6.4. Correlations ⁽¹⁾ (df=13) between the seed yield of entries in the FBIF4T at different locations during 1979/80.

Country / Location	(2)	EGYPT	ETHIOPIA	LEBANON	S Y R I A			ITALY		SPAIN	GUATEMALA
		Giza	Debre-Zeit	Terbol	Lattakia	TH- Rain	TH-Irrig.	Bari	Lecce	Sevilla	Tecpan
Algeria - Sidi Bel Abbas		-0.35	-0.41	0.07	0.51*	0.28	-0.17	0.31	0.01	0.09	0.15
Egypt - Giza			0.62*	0.30	-0.07	0.22	0.32	0.01	0.60*	0.75**	0.41
Ethiopia - Debre Zeit				-0.17	-0.51	-0.14	-0.09	-0.27	0.45	0.59*	0.51
Lebanon - Terbol					0.46	0.45	0.49	0.32	0.22	0.17	0.13
Syria - Lattakia						0.63*	0.41	0.73**	0.38	-0.04	-0.13
- TH Rain.							0.40	0.84**	0.65**	0.37	0.12
- TH Irrig.								0.39	0.47	0.13	-0.10
Italy - Bari									0.57*	0.12	-0.12
- Lecce										0.63*	0.22
Spain - Sevilla											0.42

(1) * = $P \leq 0.05$

** = $P \leq 0.01$

(2) Local check at each location excluded from the calculations.

5. LENTIL INTERNATIONAL TRIALS AND NURSERIES

In the lentil international trials and screening nurseries two descriptors have been given under the 'entry' heading. The 'ILL' descriptor refers to the number originally given to an accession when it was received into the germplasm collection. The 'selector' descriptor refers to a selection made from within an accession and the absence of such a descriptor indicates that the entry comprises the original accession. A varietal name given under the selection descriptor also indicates the original accession.

5.1. LENTIL ADAPTATION TRIAL (LAT)

5.1.1. Material

The fourteen test entries in LAT originated from six continents and were chosen on the basis of their geographic origin to represent as wide a spectrum of the genetic variation in the lentil as possible. Cooperators added two local check entries. The test entries are either cultivated commercially in their country of origin or are single plant selections from such land races. It is hoped that this wide range of genetic diversity will provide the necessary classification of growth environments into different agro-ecological zones.

5.1.2. Methods and Management

The trial design was a 4 x 4 quadruple lattice (4 replications), which was analyzed as a randomized block design. The recommended row length was 4m with 0.25m between rows and a population level of 200 plants/m².

Thirty-two sets of the trials were distributed to 19 countries, and results were received back from ten locations. The available information on the climatic and agronomic characteristics of the growth environments is tabulated (Table 5.1.1. and Figure).

5.1.3. Results and Discussion (Table 5.1.2. to 5.1.4.)

There were striking differences in the time to flower in Egypt, Ethiopia and Pakistan, where the entries from Egypt, Giza 9 (ILL 784), and India, Pantnagar-L-209 (ILL 4378), flowered at the same time as the local check and the other entries flowered three weeks later. In Pakistan high temperatures and moisture stress conditions limit the length of the growing season, and consequently the late flowering genotypes produced very few pods. As a consequence at Islamabad the yields of the entries ranged from 0.1 to 3.5 tons/ha. In Ethiopia some of the late flowering genotypes also produced no pods and yet the highest yield was 3.2 tons/ha, again with ILL 4378 from India. In Egypt where irrigation can be applied the late genotypes could still produce reasonable yields. In Argentina a similar discontinuity in the flowering of the genotypes was observed with the Egyptian (ILL 784), Indian (ILL 4378) and Mexican (ILL 499) entries all flowering at the same time as the local checks and two weeks before all the other entries. (Local check includes any entry from the country of the location under consideration). Jordan was the only other growth environment in which there were deviations amongst the entries from the phenology of local check. The entries from Chile, Greece, Iran, Lebanon, Morocco, and USSR were all at least one week later to flower than the local check. In the remaining environments (Algeria, Lebanon, Syria, Turkey and USA) the entries had a generally similar phenology to the local checks with the exception of Pantnagar-L-209 (ILL 4378) from India which was particularly early in Algeria and Syria.

The time to flower was shortest (73 days) in USA, whereas the time to maturity was briefest in Jordan (110 days). There were only 31 days between the times for flowering and maturity in Jordan because of the onset of temperature and moisture stress conditions during the reproductive period of growth, which hastened senescence.

The entries grew tallest in Afghanistan (mean 49cm), Egypt (48cm) and Pakistan (48cm). In the last mentioned environment the late flowering genotypes with their extended period of vegetative growth were the tallest entries. Lebanese local (ILL 4349) and ILL 466 from Chile were consistently tall with a mean height of 38cm, whereas the early flowering Pantnagar-L-209 (ILL 4378) and Syrian local small (ILL 4401) were on average the shortest entries being 28 and 30cm in height respectively.

The highest mean yields of trials were reported from Algeria and Turkey, at respectively 2.5 and 2.0 tons/ha, both with error coefficients of variation of less than 16 per cent. At the other end of the spectrum yields of less than 200 kg/ha were realized in Argentina, Jordan and Libya. The extraordinary range in the yield of different genotypes from 0.1 to 3 tons/ha in Ethiopia and Islamabad Pakistan has already been discussed.

There were entries yielding significantly more than the best local check in Lebanon, Libya, Pakistan, Syria and Turkey. This emphasizes the scope for an improvement in yield through plant introduction, since the entries in this trial were not selected on the basis of their yield potential but more for the wide genetic diversity that they represent.

Considering phenological data let us look for similarities between the growth environments. The data clearly show the genotype by environment interaction for time to flower, whereby the genotypes from Egypt (ILL 784) and India (ILL 4378) alone flowered at the same time as the local checks in Argentina, Egypt, Ethiopia and Pakistan. The other genotypes were at least two weeks and sometimes more than three weeks later into flower. This discontinuity for time to flower was not present in the more northern environments. In Argentina, Egypt and Pakistan the photoperiod was 11 hours or less, whereas in the northern group of sites the photoperiod was at least 11.8 h (Afghanistan) up to a maximum of 15.7 h in U.S.A. (Table 5.1.1.). The photoperiod (h) includes the twilight and was taken for each latitude one week prior to the first genotype coming to 50% flower. In Ethiopia,

the other 'early' site, the photoperiod was 12.2 h, but the minimum temperatures in the month prior to flowering were $>12^{\circ}\text{C}$, and higher than in the other environments. It seems that short days (<11 h) and low temperatures have similar effects on the time to flower in lentils; and that lentil genotypes differ in their sensitivity to these factors with Pantnagar-L-209 (ILL 4378) and Giza 9 (ILL 784) being the most insensitive entries. These two factors have a very profound effect on the adaptation of the lentil.

Amongst the more northern sites namely Afghanistan, Algeria, Lebanon, Syria, Turkey and U.S.A. it is possible to take the classification of sites one step further by looking at seed yield. (Jordan and Libya were not included, because there was no flowering data available from Libya and the yield data for Jordan were incomplete; further more both sites gave less than 200 kg/ha and hence an inadequate appraisal of yield potential). Correlations between the mean yields of the test entries in different sites were made (Table 5.1.4.). From these results it is clear that yields in Afghanistan are not strongly correlated with those elsewhere. The yields in Syria were similar to those in Algeria and U.S.A. There was also a correlation between Lebanon and Turkey, the two environments with a long cold winter.

The correlation technique provides a preliminary view of grouping but is based on a single site in a single year and must be regarded as tentative. However the results indicate a grouping as follows :

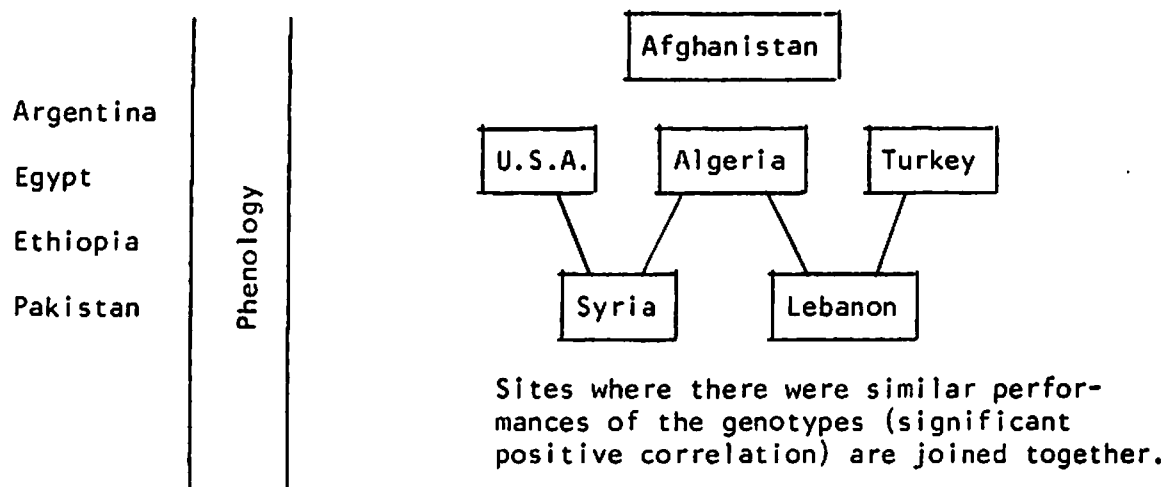


Table 5.1.1. Agronomic data for different locations for the LAT during 1979-80.

Country	Location	Planting date	Crop duration	Photoperiod [*] (h)	Soil type	Fertilizer kg/ha N P ₂ O ₅	No. of Irrigation	Chemical treatments
AFGHANISTAN	Jalalabad	23.12.79	148	11.8		10 60	1	Treflan 3L/ha.
ALGERIA	Khroub	15. 1.80		13.1		0 32		
ARGENTINA	Tucuman	28. 5.80	133	11.0	Silt loam			
EGYPT	Mallawi	26.11.79	152	10.4	Clay loam	15 30	3	
ETHIOPIA	Debre Zeit	21. 7.80	119	12.2	Heavy black	0 0	0	0
JORDAN	University	9.2.80	110	12.8		0 0	0	
LEBANON	Terbol	14.11.79	206	12.5		33 48	0	
LIBYA	Gendoubah	10.12.79			Sandy	0 95	0	Avadex 2L/haBazudin
PAKISTAN	Faisalabad	24.10.79		10.9	Sandy loam	0 0	4	Malathion
PAKISTAN	Islamabad	11.11.79	195	10.9		20 50	0	0
SYRIA	Tel Hadya	16. 1.80	141	12.2		20 60	0	
TURKEY	Diyarbakir	19.11.79	204	13.0			0	
U.S.A.	Pullman	23. 4.80	121	15.7	Silt	0 0	0	Tolban 0.6a.i/ha Lexone 0.3a.i/ha

* Photoperiod in hours including twilight one week prior to the first genotype reaching 50% flowering

Table 5.1.2. Days to flowering in the LAT at different locations during 1979-80.

Selection	Entry	ILL	Origin	AFGHANISTAN Jalalabad	ALGERIA Khroub	ARGENTINA Tucuman	EGYPT Mallawi	ETHIOPIA Debre Zeit	JORDAN Univer- sity	LEBANON Terbol	PAKISTAN Islamabad	SYRIA Tel- Hadya	TURKEY Diyar- bakir	U.S.A. Pullman	Mean
74TA 138		101	Morocco	94	119	95	102	68	82	158	145	103	161	73	109
79 S 62403		254	Australia	91	117	95	96	68	79	160	145	99	160	72	107
-		280	Greece	99	124	103	105	83	83	167	145	109	168	75	142
79 S 62404		466	Chile	95	125	103	104	83	84	163	145	105	164	74	113
74TA 577		499	Mexico	94	118	82	96	64	78	151	145	98	155	73	105
74TA 587		504	USSR	92	113	103	90	68	81	151	145	105	158	74	107
Giza 9		784	Egypt	93	113	82	65	90	76	149	108	96	154	71	100
Winterlickred 51		1880	Turkey	93	120	95	106	73	80	161	139	103	159	75	110
Iranian local		4351	Iran	98	123	95	86	66	81	168	145	110	168	74	110
Jordan. local		4354	Jordan	91	110	103	77	71	74	149	145	96	155	72	104
Pant.L-209		4378	India	90	104	82	72	39	74	149	126	78	154	71	95
Lebanese local		4399	Lebanon	94	121	95	100	62	87	165	145	105	162	75	110
Syr. L.L.		4400	Syria	91	117	103	102	62	78	160	145	99	158	72	108
Syr. L.S.		4401	Syria	91	114	103	100	72	74	154	145	96	155	72	107
Location mean				93	117	94	92	69	79	157	138	100	160	73	

Table 5.1.3. Seed yield (Y = kg/ha) and rank (R) of entries in the LAT at different locations during 1979-80.

Selection	Entry ILL	AFGHANISTAN Jalalabad		ALGERIA Khroub		ARGENTINA Tucuman		EGYPT Mallawi		ETHIOPIA Debre Zeit		JORDAN Univer.		LEBANON Terbol		LIBYA Gendouba		PAKISTAN				SYRIA Tel Hadya		TURKEY Diyar- bakir		U.S.A. Pullman		Mean		
		Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Faisal- abad	Islam- abad			Y	R	Y	R	Y	R	Y	R	
74TA	138	101	645	4	2635	5	116	8	2000	6	217	5	139	11	1045	10	188	5	392	10	50	5	1121	1	1917	11	1872	9	949	7
79 S	62403	254	558	6	2435	9	99	10	2240	2	176	6	217	3	1399	4	196	3	600	6			663	12	2906	3	1962	7	1035	4
-		280	308	11	2352	12	61	14	1318	12	63	11	0		1242	5	75	14	100	11	0		687	11	2281	7	1512	13	769	13
79 S	62404	466	545	8	2771	2	79	12	1375	11	0		0		989	11	123	13	352	11	163	3	933	4	1688	12	2130	6	858	10
74TA	577	499	845	1	2307	13	158	1	1661	10	100	9	163	6	973	12	173	6	933	4	250	1	943	3	2313	6	2153	4	1068	1
74TA	587	504	555	7	2690	4	119	5	2109	4	583	4	146	10	1187	6	195	4	500	7	63	4	1058	2	2042	10	1829	10	1006	6
Giza 9		784	778	2	2000	15	143	2	2010	5	1327	2	178	5	877	13	139	10	708	5	0		859	8	396	15	2148	5	889	8
W. red. 51		1880	300	12	2503	7	91	11	625	16	105	8	163	6	1566	2	171	7	333	12	0		863	7	2792	4	1375	15	837	11
Iran. loc.		4351	78	14	2434	10	136	3	1115	14	0		0		655	16	143	9	283	13	0		627	13	1292	14	1721	12	653	14
Jordan loc.		4354	567	5	2569	6	131	4	1833	9	767	3	240	2	1124	8	279	2	458	9	0		923	5	2677	5	1802	11	1028	5
Pan. L-209		4378	753	3	1576	16	104	9	1901	7	3187	1	77	13	834	15	137	11	3500	1	200	2	222	16	250	16	917	16	1051	3
Leb. loc.		4399	188	13	2427	11	33	16	1172	13	0		133	12	1123	9	62	16	33	16	0		469	14	3240	1	1918	8	831	12
Syr. loc.lrg.	4400	450	9		2487	8	37	15	1849	8	72	10	160	8	1472	3	158	8	500	7	0		884	6	3052	2	2616	2	1057	2
Syr. loc.sml.	4401	445	10		2708	3	117	6	1109	15	125	7	152	9	1884	1	318	1	83	15	0		699	10	2281	7	1481	14	877	9
Location mean		501			2421		102		1594		480		126		1169		168		627		145		782		2081		1817			
C.V. %		38.5			15.8		37.5		26.6		57.0		21.4		23.8		53.7		40.5		-		21.8		13.6		16.0			
S.E. entry ±		276.0			607.1		54.1		641.2		523.0		52.4		380.4		122.3		521.2		-		235.5		398.0		433.9			

Table 5.1.4. Correlation (1) (d.f. = 12) between the seed yields of entries in the LAT at different northern locations during 1979/1980.

	Algeria	Lebanon	Syria	Turkey	U.S.A.
Afghanistan	-.36	-.17	.25	-.40	.12
Algeria		.45	.65*	.62*	.39
Lebanon			.13	.62*	-.02
Syria				.30	.56*
Turkey					.34

(1) * $P \leq 0.05$.

5.2. LENTIL INTERNATIONAL YIELD TRIAL - LARGE SEEDED (LIYT-L)

5.2.1. Material

The LIYT-L comprised 12 test entries with a seed size greater than 4.5g/100 seeds from eight countries and four check entries, two of which were supplied by the cooperator. The test entries were elite selections from germplasm, which had performed well in the lentil international screening nursery.

5.2.2. Methods and Management

The experimental design was 4 x 4 triple lattice (3 replications) that was analyzed as a randomized block design. The recommended plant population was 200 plants/m² with rows 0.25m apart. Information on the management practices was supplied from a number of locations, and the details are given in Table 5.2.1.

Nineteen sets of LIYT-L were distributed to 12 countries, and results received back from only 6 countries.

5.2.3. Results and Discussion (Table 5.2.2. to 5.2.5.)

The shortest mean time to 50% flowering was recorded at 72 days under the long-day conditions (>15.5 h) in U.S.A. In contrast the crop duration was most extended at Terbol, Lebanon where flowering occurred after 158 days and maturity after 204 days. At Tel Amara in Lebanon, a neighbouring location, the time to maturity was only 116 days because the February planting was three months later than in Terbol. In Ethiopia the local checks flowered more than two weeks before any of the test entries. The length of the growing season was limited and the late entries produced little or no seed. Clearly all the test entries were ill-adapted in their phenology to Ethiopian conditions.

The mean time to maturity of the genotypes only varied from 140 to 144 days. However these differences were consistent over sites and were also reflected in genetic differences in the time to flowering. The earliest test entries were 74TA 276 (ILL 262) from Australia and 75Kf 36627 (ILL 1169) from Iran. The two entries from Chile, ILL 467 and 468, were the latest entries and flowered a mean of 103 days from sowing.

The average height of the lentils grown in U.S.A was 36cm and larger than in the other trials; interestingly this was also the environment where lentils were earliest. Clearly there were very high crop growth rates in the Pacific Northwest coast area of U.S.A. In Guatemala and Lebanon there were test entries taller than the largest local check, and positive selection for height could be attempted. The tallest entry was the late entry, ILL 468, from Chile, whereas the two shortest entries were also the earliest. There is evidence for a correlation between height and time to flower amongst this large seeded material.

Seed yields were heaviest in Algeria (mean 3.2 tons/ha) and were lowest at Tel Amara, Lebanon (mean 0.2 tons/ha) as a result of late planting. In Chile the yields were low because of root rot, whereas in Ethiopia the lateness of the test entries was the cause of the poor performance.

Nowhere was the yield advantage of the best entry over the best local significant at 5% (Syrian locals, ILL 4400 and 4401, were considered checks in Syria). However in Algeria two entries yielded more than the best check; in Guatemala there were four such entries; in Tel Amara, Lebanon there were 12; in Terbol, Lebanon there were 9; and in Syria there were seven. In Chile, Ethiopia and U.S.A a local check was the highest yielding entry.

The entry with the highest mean yield was 74TA9 (ILL 15) from Jordan. Its yields were higher than the best local check in all four Mediterranean environments, (Algeria, 103% of best local; Tel Amara, Lebanon,

137%; Terbol, Lebanon, 137% ; Syria, 111%). Although these yields differences do not reach the 5% level of significance, the performance is consistent over Mediterranean sites, where it is clear that improvements in yield are being made. The genotype 74TA 276 (ILL 262) also gave a good performance over the four Mediterranean locations.

Table 5.2.1. Agronomic data for different locations for the LIYT-L during 1979-80.

Country	Location	Planting date	Crop duration	Fertilizer(kg/ha)			No.of Irrigation	Chemical treatments
				N	K ₂ O	P ₂ O ₅		
ALGERIA	Sidi-Bel-Abbas	3.12.79	150					
CHILE	Graneros	19. 8.80	130				7	
ETHIOPIA	Debre Zeit	21. 7.80	114	0	0	0	0	0
GUATEMALA	Santiago	10.12.79	139	50	50	50		Furadan, Metasystox
LEBANON	Terbol	14.11.79	204	33	0	48	0	
LEBANON	Tal Amara	12. 2.80	116	100	0	75	0	
SYRIA	Tel Hadya	16. 1.80	143	20	0	60	0	Supracid 750c.c./ha
U.S.A.	Pullman	23. 4.80	121	0	0	0	0	Tolban 560 ml/ha Lexone 280 ml/ha Cygon air-applied

Table 5.2.2 . Days to flowering for entries in the LIYT-L at the different locations during 1979-80.

Selection	Entry ILL	Country of origin	ALGERIA Sidi-Bel- Abbas	CHILE Graneros	ETHIOPIA Debre Zeit	GUATEMALA Santiago	LEBANON Terbol	LEBANON Tel. Amara	SYRIA Tel Hadya	U.S.A. Pullman	Mean
74TA 9	15	Jordan	103	81	116	85	160	83	99	72	100
74TA 19	28	Syria	105	79	116	83	153	82	99	71	98
74TA 138	101	Morocco	105	81	116	80	160	85	105	72	101
74TA 260	253	Austr.	105	81	110	83	157	84	99	72	99
74TA 264	254	Greece	105	80	116	82	158	86	99	72	100
74TA 276	262	Hungary	105	76	116	79	152	84	99	72	99
-	467	Chile	105	89	116	94	162	88	109	74	105
-	468	Chile	103	87	110	91	165	89	109	74	104
75Kf 36627	1169	Iran	101	74	107	77	156	85	103	72	97
Kurdi 1	2126	Syria	101	81	116	84	158	85	99	71	99
Kurdi 2	2127	Syria	101	82	116	84	159	84	99	73	100
Kurdi 3	2128	Syria	104	80	116	83	158	86	99	72	100
Syr. L.L.	4400	Syria	104	82	116	83	157	83	99	71	99
Syr. L.S.	4401	Syria	103	78	110	80	152	81	96	73	97
Local check 1	-		105	86	110	84	166	88	99	74	
Local check 2	-		101	76	110	79	150	87	99	70	
Location mean			104	81	114	83	158	85	101	72	

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Table 5.2.3. Plant height (cm) of entries in the LIYT-L at different locations during 1979-80.

Selection	Entry	ILL	ALGERIA Sidi-Bel- Abbas	CHILE Graneros	GUATEMALA Santiago	LEBANON Terbol	LEBANON Tel Amara	SYRIA Tel Hadya	U.S.A. Pullman	Mean
74TA 9		15	29	19	30	33	21	29	40	29
74TA 19		28	30	17	31	27	22	29	34	27
74TA 138		101	30	18	32	26	25	28	35	28
74TA 260		253	26	17	38	27	24	30	36	28
74TA 264		254	28	19	35	32	27	29	35	29
74TA 276		262	28	19	29	27	19	27	34	26
-		467	30	20	28	32	23	29	37	28
-		468	28	20	37	31	24	30	37	30
75Kf 36627		1169	28	18	32	28	18	28	32	26
Kurdi 1		2126	30	18	30	27	23	28	37	28
Kurdi 2		2127	30	17	27	28	22	29	36	27
Kurdi 3		2128	30	20	35	27	25	30	34	29
Syr. L.L.		4400	26	19	35	30	24	30	34	28
Syr. L.S.		4401	26	17	31	25	21	27	33	26
Local check 1		-	30	25	37	31	28	29	44	
Local check 2		-	30	23	31	24	28	29	40	
Location mean			29	19	32	28	23	29	36	

Table 5.2.4. Days to maturity for entries in the LUYT-L at different locations during 1979-80.

Selection	Entry	ILL	ALGERIA Sidi-Bel Abbes	CHILE Graneros	ETHIOPIA Debre Zeit	GUATEMALA Santiago	LEBANON Terbol	LEBANON Talamara	SYRIA Tel Hadya	U.S.A. Pullman	Mean
74TA 9		15	150	130	85	141	202	114	142	121	136
74TA 19		28	150	130	89	141	201	115	140	121	136
74TA 138		101	150	130	89	136	208	112	140	121	136
74TA 260		253	150	130	72	136	205	114	145	121	134
74TA 264		254	150	130	84	138	203	116	147	121	136
74TA 276		262	150	130	72	136	199	110	138	121	132
-		467	150	130	-	141	208	118	139	121	144
-		468	150	130	81	141	207	120	141	121	136
75KF 36627		1169	150	130	81	136	202	114	144	121	135
Kurdi 1		2126	150	130	89	141	204	116	145	121	137
Kurdi 2		2127	150	130	89	141	203	118	146	121	137
Kurdi 3		2128	150	130	81	141	205	117	143	121	136
Syr. L.L.		4400	150	130	101	141	206	115	147	121	139
Syr. L.S.		4401	150	130	77	136	198	110	135	121	132
Local check 1			150	130	69	141	206	123	147	121	
Local check 2			150	130	69	138	206	125	145	121	
Location mean			150	130	82	139	204	116	143	121	

Table 5.2.5. Seed yield (Y = kg/ha) and rank (R) of entries in the LIYT-L at different locations during 1979-80.

ENTRY Selection	ILL	ALGERIA Sidi-Bel- Abbes		CHILE Graneros		ETHIOPIA DebreZeit		GUATEMALA Santiago		LEBANON				SYRIA Tel Hadya		U.S.A. Pullman		Mean	
		Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R
74TA 9	15	3583	1	323	7	27	10	1120	10	1236	1	172	9	1052	4	2303	2	1227	1
74TA 19	28	3492	2	333	6	38	9	995	11	844	12	151	11	1087	3	2176	5	1140	3
74TA 138	101	2925	15	479	4	156	4	1474	1	718	15	263	2	1163	1	1694	13	1109	4
74TA 260	253	3233	8	146	15	156	4	989	12	567	16	170	10	912	11	1966	7	1017	11
74TA 264	254	2946	14	219	9	122	6	1316	3	1000	5	123	15	713	15	1926	9	1046	10
74TA 276	262	3333	5	630	2	167	3	906	16	1089	4	235	6	1114	2	2275	3	1219	2
-	467	3350	4	188	11	13	12	1138	8	760	14	218	7	998	6	1887	10	1069	9
-	468	3183	9	276	8	16	11	945	14	789	13	244	5	1018	5	1661	14	1017	11
75Kf 36627	1169	2592	16	583	3	49	8	1246	6	1156	3	288	1	947	9	1758	12	1077	6
Kurdi 1	2126	3238	7	188	11	7	15	1157	7	911	9	249	3	893	12	1943	8	1073	7
Kurdi 2	2127	3025	12	104	16	9	13	1273	4	989	6	126	13	845	13	1024	16	924	14
Kurdi 3	2128	3133	11	182	13	7	15	1138	8	933	8	143	12	997	7	2051	6	1073	7
Syr. L.L.	4400	3263	6	182	13	9	13	1329	2	971	7	247	4	570	16	2245	4	1102	5
Syr. L.S.	4401	3000	13	214	10	116	7	967	13	1167	2	200	8	948	8	1383	15	999	13
Local check 1	-	3167	10	859	1	956	2	922	15	900	10	54	16	740	14	1852	11		
Local check 2	-	3467	3	365	5	1022	1	1264	5	867	11	126	13	943	10	2524	1		
Location mean		3183		329		179		1136		931		188		934		1917			
C.V. %		14.0		28.44		-		16.20		35.6		72.54		28.3		12.89			
L.S.D.		741.8		211.13		-		306.98		552.6		227.33		440.5		411.8			
No. of entries sgnificantly exceeding Local check		0		0				0		0		0		0		0			

Table 5.2.6. The five heaviest seed yielding entries at the individual locations in the LIYT-L during 1979-80.

Rank	ALGERIA		CHILE		ETHIOPIA		GUATEMALA		LEBANON				SYRIA		U.S.A.	
	Sidi-Bel-Abbas		Graneros		DebreZeit		Santiago		Terbol		Tel Amara		Tel Hadya		Pullman	
	Selct.	ILL	Selct.	ILL	Selct.	ILL	Selct.	ILL	Selct.	ILL	Selct.	ILL	Selct.	ILL	Selct.	ILL
1	74TA 9	15	Loc. check		Loc. check		74TA 138	101	74TA 9	15	75Kf 36627	1169	74TA 138	101	Loc. check	
2	74TA 19	28	74TA 276	262	Loc. check		Syr. Loc.L. 4400		Syr. Loc.S. 4401		74TA 138	101	74TA 276	262	74TA 9	15
3	Loc. check		75Kf 36627	1169	74TA 267	262	74TA 264	254	75Kf 36627	1169	Kurdi 1	2126	74TA 19	28	74TA 276	262
4	-	467	74TA 138	101	74TA 138	101 (1)	Kurdi 2	2127	74TA 276	262	Syr. Loc.L. 4400		74TA 9	15	Syr. Loc.L. 4400	
5	74TA 276	262	Loc. check		74TA 260	253	Loc. check		74TA 264	254	-	468	-	468	74TA 19	28

(1) Genotypes in parenthesis had the same yield.

5.3. LENTIL INTERNATIONAL YIELD TRIAL - SMALL SEEDED (LIYT-S)

5.3.1. Material

The LIYT-S comprised 21 test entries with a seed size less than 4.5g/100 seeds from 11 countries together with four check entries. The test entries were selected for the trial on the basis of their performance in the lentil international screening nursery, and are elite selections from germplasm. The four check entries are composed of two Syrian locals (ILL 4400 and 4401) and two local checks supplied by the cooperator.

5.3.2. Methods and Management

The experimental design was 5 x 5 quadruple lattice (four replications), which was analyzed as a randomized block experiment. The suggested plant population was 200 plants/m² with 0.25m between rows. The information on agronomic practices of each growing environment is tabulated wherever the data were received (Table 5.3.1.).

A total of 29 sets of LIYT-S were distributed to 17 countries, and data returned from 10 sites.

5.3.3. Results and Discussion (Table 5.3.2 to 5.3.6)

The lentils were earliest to mature in the sites in Guatemala and Jordan (mean 130 days) and latest in Lebanon (mean 202 days). There were entries earlier in maturity than the earliest local check in Argentina, Guatemala, Jordan, Lebanon and Syria. (The test entries Giza 9 (Egypt), Winterlik Red-51 (Turkey), Jordanian local, and Syrian local large and small were considered as a local checks in their respective home country). The entries Giza 9 (ILL 784) and 79S 5116 (ILL 813) from Egypt and 79S 5120 (ILL 1744) from Ethiopia were particularly quick to flower, consequently they were also early to maturity. The two Syrian entries 74TA 548 (ILL 470)

and 74TA 549 (ILL 470) were later in flowering but were equally early in maturity because of their brief period of pod filling. The latest genotype to flower was 74TA 309 (ILL 289).

In Islamabad (Pakistan) there was little fruiting, the plants had a prolonged period for vegetative growth and consequently the average height (50cm) was greater than in any other site. In contrast the average plant height was only 22cm in Argentina. Some of the test entries were taller than the largest local check in the sites in Argentina, Egypt, Guatemala, Lebanon and Islamabad (Pakistan), indicating the potential for selection for an increase in plant height. Although the tallest genotype 74TA 309 (ILL 209) (mean 41cm) was also the last to mature, there was one other tall entry which was among the earliest to flower namely 79S 5116 (ILL 813) from Egypt.

The seed yields were greatest at Mallawi in Egypt where the overall mean was 1.5 tons/ha and the highest yield was 2.7 tons/ha with Jordanian local (ILL 4354). In Pakistan (Islamabad) the mean yield was low at only 73 kg/ha. In both Lahore and Faisalabad (Pakistan) there was a dramatic range in yields from the locals at more than 2 tons/ha to less than 0.1 tons/ha with some of the late ill-adapted entries. These were the only two sites in which some of the test entries did not yield more than the best local check. In Argentina, Egypt, Guatemala and Lebanon the best entries yielded significantly more than the best local check. In Ethiopia, Jordan, Pakistan (Islamabad) some of the test entries yielded more than the best local but the difference was not significant at the 5% level.

The genotype with the highest mean yield was 74TA 441 (ILL 353) from Mexico. In Argentina, Egypt, Guatemala, Jordan and Lebanon it yielded more than the best local check and these yields expressed as a percentage of the best local are 126, 112, 104, 103, and 107 per cent respectively. Further more, in Afghanistan 74TA 441 ranked first for yield, but unfortunately there was no local check included in the trial as a comparison. 74TA 577 (ILL 500) was another widely adapted genotype, which also originated in Mexico. It ranked among the top seven entries in seven out of the ten environments.

Table 5.3.1. Agronomic data for different locations for the LIYT-S during 1979-80.

Country	Location	Planting date	Crop duration	Fertilizer kg/ha			No. of Irrigation	Chemical treatments
				N	K ₂ O	P ₂ O ₅		
AFGHANISTAN	Jalalabad	23.12.79	141	10		60		
ARGENTINA	Tucuman	29. 5.80	135					
EGYPT	Mallawi	26.11.79	151	50		200	3	
ETHIOPIA	Debre Zeit	21. 7.80	114	0	0	0	0	0
GUATEMALA	Santiago	12.12.79	130	50	50	50		Furadan 40kg/ha Metasystox 1L/ha
JORDAN	University	20. 1.80	130					
LEBANON	Terbol	14.11.79	202	33	0	48	0	
PAKISTAN	Faisalabad	24.10.79	-				4	
PAKISTAN	Islamabad	16.11.79	177	20	0	50	0	Malathion 56L/ha
PAKISTAN	Lahore	19.12.79	152	16	56	100	2	0
SYRIA	Tel Hadya	16. 1.80	139	20	0	60	0	Supracid 750c.c./ha

Table 5.3.2. Days to flowering for entries in the LIYT-S at the different locations during 1979-80.

Selection	ILL	Origin	AFGHANISTAN	ARGENTINA	EGYPT	ETHIOPIA	GUATEMALA	JORDAN	LEBANON	PAKISTAN		SYRIA	Mean
			Jalalabad	Tucuman	Mallawi	Debre Zeit	Santiago	University	Terbol	Islamabad	Lahore	Tel Hadya	
76TA 66026	29	Syria	107	95	94	-	79	78	151	137	116	96	106
76TA 66054	99	Morocco	106	95	103	-	76	81	152	134	111	96	106
76TA 66088	223	Iran	106	103	103	-	81	72	151	135	120	96	107
76TA 66116	264	Hungary	106	103	92	81	76	83	153	133	115	96	104
74TA 309	289	Greece	106	103	93	102	90	99	170	139	113	116	113
74TA 441	353	Mexico	107	95	95	102	78	78	152	133	112	96	105
74TA 548	470	Syria	113	95	92	-	80	80	151	139	121	96	107
74TA 549	470	Syria	107	92	96	-	83	88	158	137	123	96	09
74TA 550	470	Syria	109	93	94	80	81	68	156	139	121	96	104
74TA 565	495	Syria	107	03	95	-	83	91	155	139	112	106	110
74TA 572	498	Mexico	107	95	91	-	79	89	152	137	107	99	106
74TA 577	500	Mexico	110	95	95	81	79	80	152	133	109	98	103
74TA 580	501	Mexico	110	103	95	-	79	69	156	133	108	96	105
Giza 9	784	Egypt	105	82	70	56	74	84	149	124	81	96	92
79 S 5116	813	Egypt	114	82	96	56	75	79	148	132	75	79	94
74TA 877	901	Lebanon	114	95	78	56	95	95	167	139	125	109	107
79 S 5120	1744	Ethiopia	117	82	97	56	73	79	146	133	90	79	95
Winter. red 51	1880	Turkey	110	92	100	-	88	76	162	141	127	102	111
Hamawe white	2129	Syria	116	103	95	81	79	85	155	137	115	99	107
Huranl 1	2130	Syria	108	103	95	81	81	83	153	133	117	96	105
Jordan local	4354	Jordan	109	82	81	72	75	86	147	135	102	96	99
Syr. L.L.	4400	Syria	110	90	104	99	84	86	156	132	117	99	108
Syr. L.S.	4401	Syria	110	103	95	81	81	71	152	133	119	96	104
Local check 1	-	-	-	103	77	56	79	81	164	128	92	96	
Local check 2	-	-	-	85	79	56	84	80	145	133	92	107	
Location mean			109	95	92	75	80	82	154	135	110	97	

Table 5.3.3.. Plant height (cm) of entries in the LIYT-5 at different locations during 1979-80

ENTRY Selection	ILL	AFGHANISTAN	ARGENTINA	EGYPT	GUATEMALA	JORDAN	LEBANON	PAKISTAN		SYRIA	Mean
		Jalalabad	Tucuman	Mallawi	Santiago	Univer.	Terbol	Islamabad	Lahore	Tel Hadya	
76TA 66026	29	48	21	44	31	28	25	54	29	28	34
76TA 66054	99	50	23	44	28	25	30	65	30	29	36
76TA 66088	223	56	21	48	37	28	27	61	34	28	38
76TA 66116	264	43	23	49	32	22	27	58	27	28	34
74TA 309	289	58	27	53	31	30	33	65	36	32	41
74TA 441	353	41	20	51	27	25	28	61	30	28	35
74TA 548	470	45	21	49	28	24	27	50	27	27	33
74TA 549	470	50	17	36	26	22	27	47	23	25	30
74TA 550	470	56	20	50	27	27	27	47	20	27	33
74TA 565	495	53	25	49	35	25	28	53	30	29	36
74TA 572	498	49	22	50	30	25	29	68	28	29	37
74TA 577	500	51	24	50	31	25	28	58	29	29	36
74TA 580	501	58	22	52	34	26	25	57	33	28	37
Giza 9	784	50	22	51	34	26	26	58	32	29	36
79 S 5116	813	52	24	54	41	28	27	60	34	30	39
74TA 877	901	46	20	41	28	28	28	51	21	27	32
79 S 5120	1744	46	21	46	26	25	23	52	25	25	32
W. red 51	1880	54	18	46	29	25	27	59	22	27	34
Hamawe white	2129	41	23	46	32	22	27	52	29	28	33
Murani 1	2130	51	24	50	29	25	27	54	31	28	35
Jordan. Loc.	4354	42	24	49	30	30	29	59	29	27	35
Syr. L.L.	4400	53	21	44	33	27	28	54	33	30	36
Syr. L.S.	4401	48	21	47	29	26	25	53	25	26	33
Local check 1	-	-	21	48	32	30	31	49	39	26	
Local check 2	-	-	20	48	37	30	24	45	40	32	
Location mean		50	22	48	31	26	27	56	29	28	

Table 5.3.4. Days to maturity for entries in the LIYT-S at different locations during 1979/80.

Selection	ILL	AFGHANISTAN Jalalabad	ARGENTINA Tucuman	EGYPT Mallawi	ETHIOPIA Debre Zeit	GUATEMALA Santiago	JORDAN Univer- sity	LEBANON Terbol	PAKISTAN Islamabad	PAKISTAN Lahore	SYRIA Tel Hadya	Mean
76TA 66026	29	123	131	151	102	129	127	200	178	153	138	143
76TA 66054	99	154	131	148	113	118	128	200	178	150	137	146
76TA 66088	223	150	145	149	102	133	129	200	178	154	135	148
76TA 66116	264	148	145	150	109	133	130	198	178	152	137	148
74TA 309	289	153	145	160	123	134	137	214	178	159	144	155
74TA 441	353	153	131	149	105	129	128	197	178	151	136	146
74TA 548	470	123	131	149	105	127	128	194	178	156	134	143
74TA 549	470	125	131	148	112	133	128	195	176	156	135	144
74TA 550	470	135	131	151	117	133	128	196	178	155	135	146
74TA 565	495	143	145	162	118	133	136	202	178	153	138	151
74TA 572	498	163	131	148	118	129	132	201	178	153	137	149
74TA 577	500	145	131	149	115	133	132	203	178	152	139	148
74TA 580	501	156	140	150	105	129	129	203	178	153	137	148
Giza 9	784	130	131	140	105	117	132	205	178	144	142	142
79 S 5116	813	143	129	150	113	129	132	210	178	147	145	148
74TA 877	901	118	131	162	122	136	132	206	178	162	140	149
79 S 5120	1744	122	123	143	112	101	119	196	168	144	136	136
Winter. red 51	1080	138	131	160	122	134	136	198	178	158	139	149
Hamawe white	2129	160	145	150	122	134	132	203	178	154	142	152
Hurani 1	2130	135	145	152	114	133	135	208	178	157	140	150
Jordan local	4354	153	131	151	111	127	128	205	178	153	146	148
Syr.L.L.	4400	146	131	153	122	135	137	201	178	157	141	150
Syr.L.S.	4401	130	145	149	122	134	132	197	178	156	136	150
Local check 1	-	-	145	151	119	134	126	205	171	141	139	
Local check 2	-	-	131	153	119	136	129	206	168	141	149	
Location mean		141	135	151	114	130	130	202	177	152	139	

Table 5.3.5. Seed yield (Y = kg/ha) and rank (R) of entries in the LIYT-5 at different locations during 1979-80.

selection	ENTRY ILL	AFGHANISTAN		ARGENTINA		EGYPT		ETHIOPIA		GUATEMALA		JORDAN		LEBANON		PAKISTAN		SYRIA		Mean					
		Jalalabad		Tucuman		Mallawi		DebreZeit		Santiago		Univer.		Terbol		Faisalabad		Islamabad		Lahore		Tel Hadya			
		Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R		
76TA 66026	29	945	7	213	8	1031	21	0		847	22	264	2	1234	6	325	16	21	14	169	19	865	16	539	17
76TA 66054	99	1145	4	221	6	2047	2	508	7	1047	12	208	15	767	22	342	15	10	20	1008	11	1073	4	759	8
76TA 66088	223	667	17	73	23	1625	14	0		1156	7	311	1	1038	13	117	29	122	3	141	20	1116	3	579	14
76TA 66116	264	892	11	317	2	1901	7	767	5	1317	4	172	20	1192	7	692	5	48	8	812	13	858	18	815	3
74TA 309	289	467	22	342 (1)	1	1115	19	42	17	961	17	108	24	867	18	367	14	21	14	435	17	833	21	506	19
74TA 441	353	1255	1	260	4	1911	6	508	7	1200	6	225	9	1175	9	842	3	0		1030	10	893	14	846	1
74TA 548	470	918	9	188	14	995	22	29	18	935	18	239	7	1537	1	118	20	21	14	81	21	918	9	544	16
74TA 549	470	1033	5	126	19	651	25	0		962	16	253	3	1188	8	218	18	0		20	25	772	22	475	22
74TA 550	470	633	18	196	12	1057	20	0		987	15	221	10	1392	5	83	23	46	9	24	24	889	15	502	20
74TA 565	495	922	8	111	20	1891	9	73	15	1579	1	246	6	911	17	617	9	0		1212	4	1019	5	780	6
74TA 572	498	767	15	206	10	1893	8	23	20	1234	5	211	13	1433	3	450	13	0		1088	9	898	13	746	9
74TA 577	500	1150	3	234	5	1964	4	300	10	1385	3	194	19	975	15	667	7	21	14	1155	6	959	7	819	2
74TA 580	501	1167	2	210	9	1953	5	200	11	1094	11	203	17	1134	11	817	4	28	12	1131	8	918	9	805	4
Giza 9	784	393	23	216	7	1307	16	641	6	867	21	247	5	852	19	683	6	35	10	1131	7	839	20	655	12
79 S 5116	813	818	14	299	3	1714	11	983	2	802	23	158	21	777	21	650	8	27	13	1578	3	730	24	776	7
74TA 877	901	555	21	69	24	693	24	20	21	707	25	108	24	1012	14	33	25	502	1	49	22	861	17	419	23
79 S 5120	1744	983	6	177	16	1172	17	992	1	1112	10	133	22	467	25	100	22	45	19	857	12	738	23	607	13
W. red 51	1880	578	20	104	21	745	23	78	14	1009	13	228	8	1467	2	50	24	21	14	25	23	1135	1	494	21
Hamawe white	2129	733	16	157	18	1750	10	167	12	1001	14	250	4	925	16	558	10	0		611	16	1123	2	662	11
Hurani 1	2130	617	19	103	22	1620	15	71	16	732	24	129	23	700	23	142	19	31	11	713	15	942	8	527	18
Jordan Loc.	4354	878	12	176	17	2708	1	433	9	919	20	219	11	817	20	483	12	152	2	1211	5	846	19	803	5
Syr. L.L.	4400	822	13	53	25	2021	3	27	19	1495	2	211	13	1142	10	492	11	88	5	802	14	1013	6	743	10
Syr. L.S.	4401	905	10	193	13	1167	18	92	13	926	19	203	17	1400	4	242	17	73	6	217	18	905	12	575	15
Local check 1	-			206	10	1698	12	817	3	1154	8	206	16	1097	12	3367	1	97	4	2079	2	917	11		
Local check 2	-			188	14	1667	13	808	4	1139	9	214	12	480	24	2317	2	73	7	2162	1	648	25		
Location mean		838		186		1532		360.9		1063		206		1039		591		-		790		908			
C.V. %		30.22		43.99		22.5		55.20		25.24		29.62		25.0		59.62		-		26.5		17.5			
L.S.D.		357.59		115.5		487.2		362.87		379.26		111.34		367.3		496.7		-		296.2		224.8			
No. of entries significantly exceeding local check		-		1		1		0		1		0		2		0		-		0		0			

(1) Underlined values significantly exceeded the local check

(1) Underlined values significantly exceeded the local check

Table 5.3.6. The five heaviest seed yielding entries at the individual locations in the LIYT-S during 1979-80.

Rank	AFGHANISTAN Jalalabad		ARGENTINA Tucuman		EGYPT Mallawi		ETHIOPIA Debre Zeit		GUATEMALA Santiago		JORDAN Univer.		LEBANON Terbol	
1	74TA 441	ILL 353	74TA 309	ILL 289	Jordan.loc.	ILL 4354	79 S 5120	ILL 1744	74TA 565	ILL 495	76TA 66088	ILL 223	74TA 66548	ILL 470
2	74TA 580	ILL 501	76TA 66116	ILL 264	76TA 66054	ILL 99	79 S 5116	ILL 813	Syr.Loc.L.	ILL 4400	76TA 66026	ILL 29	W. red. 51	ILL 1880
3	74TA 577	ILL 500	79 S 5116	ILL 813	Syr.Loc.L.	ILL 4400	Local check 1		74TA 577	ILL 500	74TA 549	ILL 470	74TA 572	ILL 498
4	76TA 66054	ILL 99	74TA 441	ILL 353	74TA 577	ILL 500	Local check 2		76TA 66116	ILL 264	Hamawe white	ILL 2129	Syr.Loc.S.	ILL 4401
5	74TA 549	ILL 470	74TA 577	ILL 500	74TA 580	ILL 501	76 TA 66116	ILL 264	74TA 572	ILL 498	Giza 9	ILL 784	74TA 550	ILL 470
... cont'd...														

Rank	PAKISTAN			SYRIA	
	Faisalabad	Islamabad	Lahore	Tel Hadya	
1	Local check	74TA 877	ILL 901	Local check	W. red. 51
2	Local check	Jordan.Loc.	ILL 4354	Local check	Hamawe white
3	74TA 441	ILL 353	76TA 66088	ILL 223	79 S 5116
4	74TA 580	ILL 501	Local check	74TA 565	ILL 495
5	76TA 66116	ILL 264	Syr.loc. L.	ILL 4401	Jordan Loc.
				76TA 565	ILL 495

5.4. LENTIL INTERNATIONAL SCREENING NURSERY- LARGE SEEDED (LISN-L)

5.4.1. Material

There were 52 test entries in LISN-L from a total of 15 countries. The seed weight of all the entries was more than 4.5 kg/100 seed. The test entries were either accessions direct from the germplasm or single plant selections from accessions, all of which had performed well in advanced yield trials in Mediterranean low to middle elevation environments. There were three check entries, Syrian local large (ILL 4400), Syrian local small (ILL 4401), and one local check supplied by the cooperator.

5.4.2. Methods and Management

The experimental design was augmented with the three check entries being repeated within every ten test entries. The suggested plant population was 200 plants/m² with rows 0.25m apart. A total of 32 sets of LISN-L were distributed to 19 countries, and results received from 9 locations.

5.4.3. Results and Discussion (Table 5.4.1 to 5.4.3)

In Islamabad, Pakistan all the test entries flowered more than two weeks after the local check. The reproductive period of growth of the test entries coincided with increasingly stressful environmental conditions, and, as a result, the test entries produced negligible yields. In Nepal the test entries also flowered markedly later than the local check with the exception of 76TA 66136 (ILL 323) from Yugoslavia. In contrast with these two locations, there were entries which flowered before the local check at the sites in Iraq, Lebanon, Syria, Turkey(Diyarbakir) and U.S.A. The earliest entries to flower on average came from Australia, Cyprus, Hungary, Iran, Lebanon, Syria and Turkey.

The site at which plants grew tallest was Pakistan, where the delayed flowering meant an increased time period for vegetative development. The plants were shortest in Ankara, Turkey where the season was brief at 100 days. It was possible to find entries taller than the local check at all the sites except U.S.A. The entry with the greatest mean

height (43cm) was 75Kf 36468 (ILL 1027) from Iran.

The yields in U.S.A. were exceptionally high with some entries giving more than 5 tons/ha (unadjusted yields). It should be noted that the harvested area was only 0.75m^2 /plot.

The low yields of the test entries in Pakistan has already been discussed in relation to their late flowering, and at this site and also Jordan the local check gave the highest yield. However at all the other sites there were entries with more yield than the local check. For example there were more than twenty entries performing better than the local check in Iraq, Lebanon (Tel Amara and Terbol), Nepal, Syria, Turkey (Diyarbakir) and U.S.A.

Outstanding amongst the entries was 78S 26066 (ILL 193) from Syria, which ranked second in both Nepal and USA, fifth in Turkey (Diyarbakir), and sixth in Lebanon (Terbol). 78S 26064 a single plant selection from the same germplasm accession (ILL 193) also performed well across sites.

Table 5.4.1. Values for three agronomic characters for entries in the LISN-L during 1979-80.

Selection	Entry ILL	Country of Origin	Days to flowering	Days to maturity	Plant height (cm)
74TA 9	15	Jordan	118	160	35
78 S 26032	26	Syria	117	159	33
78 S 26033	26	Syria	117	164	34
74TA 19	28	Syria	118	161	35
74TA 20	30	Syria	119	163	35
75Kf 36009	33	Syria	118	162	35
78 S 26038	43	Syria	117	161	34
74TA 42	46	Syria	122	167	37
78 S 26041	50	Iraq	118	166	36
76TA 66043	59	Iraq	119	165	37
74TA 138	101	Morocco	120	161	35
78 S 26064	193	Syria	117	162	35
78 S 26066	193	Syria	118	162	33
76TA 66098	232	Iran	121	163	37
74TA 260	253	Aust.	117	161	35
74TA 264	254	Aust.	119	165	36
74TA 265	254	Aust.	118	159	33
74TA 276	262	Hungary	118	159	32
79 S 64407	273	Greece	120	165	35
74TA 310	290	Greece	121	167	35
76TA 66136	323	Yugoslavia	120	165	36
76TA 66137	323	Yugoslavia	124	165	36
74TA 470	371	Chile	124	161	36
79 S 61422	379	Chile	121	164	34
79 S 61419	385	Chile	124	164	33
79 S 61424	386	Chile	122	164	35
79 S 61417	419	Chile	119	159	33
74TA 539	451	Chile	123	164	36
79 S 62419	465	Chile	123	164	35
79 S 60920	467	Chile	124	164	35
78 S 26127	642	Turkey	117	159	35

Table 5.4.1. Cont'd..

78 S 26131	643	Turkey	119	162	37
79 S 61455	707	Hungary	116	161	33
78 S 26181	841	Lebanon	117	159	32
75Kf 36346	915	Spain	120	162	34
76TA 66181	915	Spain	121	159	34
76TA 66182	915	Spain	122	162	33
79 S 65722	947	Iran	119	163	35
78 S 26199	972	Iran	120	168	36
75Kf 36421	983	Iran	121	163	36
75Kf 36423	983	Iran	124	166	37
75Kf 36412	998	Iran	120	167	39
75Kf 36468	1027	Iran	122	167	43
79 S 61427	1241	Iran	119	168	40
75Kf 36822	1397	Iran	122	167	39
75Kf 36844	1415	Iran	117	162	39
75Kf 36931	1522	Iran	122	167	39
79 S 61432	1574	Iran	118	166	38
Kurdi 1	2126	Syria	120	163	39
Turkish Local	4352	Turkey	123	165	39
Cyprus Local	4368	Cyprus	117	160	36
Tunisian Loc.	4369	Tunisia	124	164	37
Syr. L.Large	4400	Syria	117	160	36
Syr. L.Small	4401	Syria	116	158	32

Table 5.4.2. Adjusted seed yield (Y = kg/ha) and rank (R) of entries in the LISN-L at different locations during 1979/80.

Selection	ENTRY		EGYPT		ETHIOPIA		IRAQ		JORDAN		LEBANON				NEPAL		PAKISTAN		SYRIA		TURKEY				U.S.A.		Mean	
	ILL		Giza		DebreZeit		Baghdad		Univer-		Tel Amara Terbol				Khumaltar		Islamabad		Tel Hadya		Ankara Diyarbakir				Pullman			
	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R
74TA 9	15	35	38		0		485	8	1320	8	293	41	1750	4	1306	19	0		425	41	463	3	2187	20	4500	28	1276	16
78 S 26032	26	0			0		385	17	1265	15	253	46	2350	1	1306	19	0		612	6	342	36	3037	3	5203	9	1473	4
78 S 26033	26	0			40	23	185	41	876	29	333	27	2750	26	886	33	0		385	46	346	34	1937	23	3459	42	1114	42
74TA 19	28	369	5		200	8	300	25	1265	15	313	32	1350	13	1586	12	0		585	11	426	10	2737	9	4905	17	1384	9
74TA 20	30	257	13		57	17	324	22	709	37	303	37	1159	24	1386	17	0		538	15	399	15	2887	6	5176	11	1314	13
75Kf 36009	33	146	30		67	17	429	12	487	46	163	52	1347	14	976	32	0		605	7	0		2287	17	4662	23	1234	18
78 S 26038	43	35	38		13	27	241	32	1209	18	363	22	1497	3	1406	15	0		598	9	371	28	2787	7	5027	13	1383	10
74TA 42	46	0			13	27	423	13	543	43	443	10	1969	2	986	29	85	4	638	4	454	4	1837	29	3500	40	1077	31
78 S 26041	50	174	22		0		225	36	820	33	333	27	1217	19	1606	10	60	5	698	2	398	16	2537	12	4986	14	1299	14
75TA 66043	59	230	17		0		284	26	487	46	243	50	1171	22	1106	25	0		758	1	430	9	2537	12	1973	33	1122	25
74TA 138	101	267	12		133	13	411	15	1117	20	323	30	688	46	2026	3	0		512	21	0		1503	35	3968	34	1202	19
78 S 26064	193	0			13	27	128	47	1339	7	373	20	955	35	1956	4	0		538	15	372	27	3353	1	5806	3	1475	3
78 S 26066	193	0			400	2	255	31	1283	12	313	32	1621	5	2306	2	0		521	18	0		2953	5	6050	2	1690	1
76TA 66098	232	322	9		200	8	657	4	394	51	293	41	688	46	986	29	0		465	32	0		1753	30	4563	26	1125	25
74TA 260	253	0			0		585	5	1283	12	253	46	788	43	1476	13	103	3	365	52	0		2353	15	5752	4	1427	5
74TA 264	254	183	21		80	16	423	13	1228	17	273	43	1416	11	1706	6	0		458	33	0		2153	21	6117	1	1551	2
74TA 265	254	0			133	13	217	38	1283	12	273	43	1421	10	1306	19	41	6	372	50	0		2203	19	5198	10	1362	11
74TA 276	262	0			67	17	474	9	950	26	303	37	1221	18	1686	8	40	7	452	35	0		1903	24	5671	5	1396	7
79 S 61407	273	0			400	2	157	44	339	52	243	50	1021	32	986	29	0		385	46	345	35	1303	44	4455	30	914	45
74TA 310	290	157	29		0		157	44	506	45	253	46	821	40	886	33	17	8	498	24	360	30	2003	22	5441	7	1108	28
76TA 66136	323	0	42		0		38	54	820	33	363	22	904	36	103	55	0		381	48	416	11	1403	40	4919	16	1039	35
76TA 66137	323	174	22		27	24	36	55	431	48	253	46	1047	29	203	53	0		581	13	468	2	1203	50	5514	6	991	37
74TA 470	371	174	22		0		125	48	931	27	403	13	1167	23	653	39	0		347	55	391	19	1903	24	4473	29	1057	32
79 S 61422	379	313	10		267	4	210	39	431	48	313	32	767	44	553	43	0		454	34	406	13	1753	30	4649	24	985	38
79 S 61419	385	230	17		13	27	377	18	431	48	323	30	624	49	703	37	0		54	54	439	8	1553	34	3405	44	844	50
79 S 61424	386	257	13		27	24	222	37	598	42	493	6	1314	15	603	40	0		374	49	395	17	1353	43	3459	42	907	47
79 S 61417	419	341	7		0		114	49	1320	8	403	13	1581	6	1053	28	0		421	42	357	31	2653	11	5176	11	1342	12
74TA 539	451	230	17		13	27	47	53	654	39	383	17	1381	12	752	36	0		507	23	401	14	1453	36	4743	19	1055	33
79 S 62419	465	146	30		0		259	29	543	43	353	25	961	34	583	41	0		427	40	381	22	1853	28	4189	32	970	39
79 S 60920	467	341	7		0		105	50	654	39	393	15	1092	27	1183	24	0		487	25	505	1	1603	32	4514	27	1088	29
78 S 26127	642	0			0		182	42	854	30	313	32	1277	16	1329	18	0		480	29	390	20	3087	2	3779	36	1169	24
78 S 26131	643	165	27		0		182	42	0		373	20	508	50	1599	11	0		620	5	450	5	2687	10	4212	31	1200	20
79 S 61455	707	0			267	4	340	21	1020	21	603	1	1261	17	1849	5	0		446	37	331	38	2337	16	4739	20	1290	15
78 S 26181	841	109	36		0		301	24	1409	6	463	9	1447	8	2599	1	0		566	14	377	23	2787	7	3847	35	1391	8
75Kf 36346	915	359	6		200	8	370	19	965	24	503	5	739	45	1229	23	0		486	26	0		1237	46	3293	46	918	36
76TA 66181	915	81	37		267	4	356	20	1687	2	533	4	825	39	1699	7	0		466	31	0		1387	41	2725	54	1084	30
76TA 66182	915	24	41		200	8	310	23	0		563	3	447	51	1249	22	0		386	45	0		937	54	3590	39	938	44
79 S 65722	947	248	15		200	8	496	7	854	30	483	7	816	41	1649	9	0		640	3	0		1437	38	4766	18	1265	17
78 S 26199	972	165	27		213	7	281	27	854	30	473	8	847	37	1389	16	0		520	19	333	37	987	51	5266	8	1112	27
75Kf 36421	983	26	40		0		408	16	0		383	17	0		560	42	0		360	53	329	39	1237	46	2901	52	776	52

... cont'd

Table 5.4.2. (cont'd)

Selection	ENTRY ILL	EGYPT		ETHIOPIA		IRAQ		JORDAN		LEBANON				NEPAL		PAKISTAN		SYRIA		TURKEY				U.S.A.		Mean	
		Giza		DebreZeit		Baghdad		Univer- sity		Tel Amara		Terbol		Khumaltar		Islamabad		Tel Hadya		Ankara		Diyarbakir		Pullman			
		Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R
75Kf 36423	983	720	1	27	24	258	30	798	35	327	29	847	37	462	46	0		476	30	349	33	670	55	3104	48	801	51
75Kf 36442	998	276	11	67	17	454	10	909	28	377	19	0	52	842	35	0		583	12	0	42	1220	48	4739	20	1175	22
75Kf 36468	1027	526	3	13	27	437	11	631	41	297	39	980	33	243	52	0		370	51	350	32	1420	39	3482	41	874	48
79 S 61427	1241	137	32	0		498	6	965	24	407	12	672	48	293	50	0		603	8	319	41	1870	27	1414	55	718	54
75Kf 36822	1397	248	15	0		1070	1	1131	19	357	24	1447	8	293	50	0		516	20	321	40	970	52	3077	49	943	43
75Kf 36844	1415	443	4	0		942	2	1020	21	0		0		343	48	0		483	27	377	23	1270	45	3739	37	956	41
75Kf 36931	1522	220	20	0		817	3	1020	21	337	26	1113	25	543	44	0		536	17	389	21	970	52	4577	25	1052	34
79 S 61432	1574	137	32	0		237	34	1465	5	567	2	797	42	443	47	0		416	43	374	26	1220	48	2847	53	850	49
Kurdi 1	2126	0		0		260	28	1520	3	297	39	1201	20	1083	27	0		483	27	393	18	2270	18	3077	49	1176	21
Turkish Loc.	4352	137	32	13	27	137	46	743	36	77	53	0		322	49	0		410	44	361	29	1370	42	3333	45	766	53
Cyprus Loc.	4368	0		67	17	209	40	1520	3	307	36	1047	29	1093	26	0		510	22	0		1570	33	3117	47	1172	23
Tunisian Loc.	4369	137	32	13	27	94	51	687	38	7	54	1047	29	193	54	0		450	36	443	6	2370	14	3712	38	914	45
Local check		678	2	547	1	72	52	1750	1	260	45	1079	28	688	38	1072	1	436	39	413	12	1440	37	4719	22		
Syr. L.L.		172	25	47	22	227	35	1314	10	385	16	1477	7	1430	14	0		587	10	375	25	3030	4	4981	15	1398	6
Syr. L.S.		172	25	101	15	238	33	1286	11	425	11	1175	21	528	45	267	2	439	38	441	7	1890	26	2989	51	958	40
Location mean		174		80		317		908		341		1104		1058		31		498		291		1903		4281			
C.V. %		139		-		13.2		31.6		38.9		22.7		19.0		-		13.4		13.5		9.2		19.3			
S.E.check ±		152.9		-		26.4		202.6		133		173.5		142.3		-		42.3		32.1		110.6		523.4			
S.E.check v. testentry ±		305.8		-		52.8		369.9		188		316.7		259.8		-		84.6		52.4		221.2		1046.7			

(1) The overall mean includes all sites except Ethiopia and Pakistan, which show unadjusted values.

Table 5.4.3. The five heaviest seed yielding entries at the individual location in the LISN-L during 1979-80.

Rank	EGYPT Giza	ETHIOPIA DebreZeit	IRAQ Baghdad	JORDAN Univer.	LEBANON		NEPAL Khumaltar
					Tal Amara	Terbol	
1	75Kf 36423 ILL 983	Local check	75Kf 36822 ILL 1397	Local check	79 S 61455 ILL 707	78 S 2603 ILL 26	78 S 26081 ILL 841
2	Local check	78 S 26066 ILL 193	75Kf 36844 ILL 1415	76TA 66181 ILL 915	79 S 61432 ILL 1574	74TA 42 ILL 46	78 S 26066 ILL 193
3	75Kf 36468 ILL 1027	79 S 61407 ILL 273	75Kf 36931 ILL 1522	Kurdi 1 ILL 2126	76TA 66182 ILL 915	78 S 26038 ILL 43	74TA 138 ILL 101
4	75Kf 36844 ILL 1415	79 S 61455 ILL 707	76TA 66098 ILL 232	Cyprus loc. ILL 4368	76TA 66181 ILL 915	74TA 9 ILL 15	78 S 26064 ILL 193
5	74TA 19 ILL 28	76TA 66181 ILL 915	74TA 260 ILL 253	79 S 61432 ILL 1574	75Kf 36346 ILL 915	78 S 26066 ILL 193	79 S 61455 ILL

.. cont'd ..

Rank	PAKISTAN Islamabad	SYRIA Tel Hadya	TURKEY		U.S.A. Pullman
			Ankara	Diyarbakir	
1	Local check	76TA 66043 ILL 59	79 S 60920 ILL 467	78 S 26064 ILL 193	74TA 264 ILL 254
2	Syr. L.Sml. ILL 4401	78 S 26041 ILL 50	76TA 66137 ILL 323	78 S 26127 ILL 642	78 S 26066 ILL 193
3	74TA 260 ILL 253	79 S 65722 ILL 947	74TA 9 ILL 15	78 S 26032 ILL 26	78 S 26064 ILL 193
4	74TA 42 ILL 46	74TA 42 ILL 46	74TA 42 ILL 46	Syr. Loc. L. ILL 4400	74TA 260 ILL 253
5	78 S 26041 ILL 50	78 S 26131 ILL 643	78 S 26131 ILL 643	78 S 26066 ILL 193	74TA 276 ILL 262

(1) Parenthesis indicate similar yields.

5.5. LENTIL INTERNATIONAL SCREENING NURSERY - SMALL SEEDED (LISN-S)

5.5.1. Material

The LISN-S comprised a total of 60 test entries with a seed size of less than 4.5kg/100 seeds coming from 16 countries. The test entries were either accessions direct from the germplasm collection or single plant selections from variable accessions all of which had performed well in yield trials in the Mediterranean low to middle elevation region. There were three check entries, Syrian local large (ILL 4400), Syrian local small (ILL 4401), and a local check introduced by the cooperator.

5.5.2. Methods and Management

The experimental design was augmented with the three checks repeated every ten test entries. The recommended plant population was 200 plants/m² with 0.25m between rows.

A total of 29 sets of LISN-S were despatched to 18 countries, and data received back from 11 sites.

5.5.3. Results and Discussion

In Bangladesh, Ethiopia and Nepal the local check was the first entry to flower. In Pakistan only the test entries from Ethiopia and the Indian sub-continent plus one entry from Jordan 78S 26004 (ILL 9) were as early to mature as the local check. In all these four southern latitude environments there was a wide range in maturity with the late material reaching the pod-filling stage when the environmental conditions were not conducive to growth. As a result the range in yields at these locations was very high.

The shortest growing season (mean 117 days) was in Afghanistan, where there were unfortunately no local checks put in the trial for

comparison. The longest seasons were at Terbol, Lebanon and Diyarbakir, Turkey where there were long winters.

There were entries earlier than the local check in Egypt, Iraq, Jordan, Lebanon, Nepal, Syria and Turkey. The entries which were, on average, quickest to mature originated in either Ethiopia, India or Pakistan. These entries were Pantnagar L-406 (ILL 2501) and Pantnagar L-639 (ILL 2573) from India, all the entries from Pakistan, and ILL 1744 from Ethiopia. The latest entries originated in Costa Rica, Greece, Iran, Mexico and Turkey.

The plants grew tallest in Pakistan (mean 47cm) and were shortest in Jordan and Lebanon (mean 25cm). There were test entries which grew taller than the local check in Algeria, Egypt, Iraq, Jordan, Lebanon, Nepal, Pakistan, Syria and Turkey. This indicates the potential for selection for increased plant height at these locations. The entries with the highest average height (39cm) were 78S 26112 (ILL 631) and Winterlik Red 51 (ILL 1880) from Turkey; and the Egyptian - Giza 9 (ILL 784), which combines height with earliness.

The wide range in yield between the entries in the locations in Southern latitudes has already been mentioned as due to the delayed maturity of entries of a northern origin. For example in both Ethiopia and Pakistan yields varied from zero to 1.2 tons/ha. This is probably due to the higher sensitivity to short photoperiods (<11 hr) and high temperature conditions of the entries of a northern origin. The highest yielding environment was in Algeria (mean 2654kg/ha).

The highest yielding genotype across the Mediterranean locations was 78S 26013 (ILL 16) from Jordan; it performed among the best ten per cent of entries in Algeria, Jordan, Lebanon and Turkey. It performed better than the local in these four sites and also in Iraq. The best entries at sites in Ethiopia and the Indian sub continent originated in those areas. However 78S 26004 (ILL 8) from Jordan showed a wide adaptation across both Mediterranean and India environments by performing better than the local check in Algeria, Egypt, Ethiopia, Iraq, Jordan, Nepal, Pakistan and Syria.

Table 5.5.1. Values for three agronomic characters for entries in the LISN-S during 1979-80.

Selection	ILL	Country of Origin	Days to flowering	Days to maturity	Plant height (cm)
76TA 66005	1	Jordan	123	168	35
78 S 26003	8	Jordan	124	169	35
78 S 26004	9	Jordan	125	171	32
78 S 26009	13	Jordan	125	169	31
78 S 26013	16	Jordan	126	178	37
78 S 26018	19	Jordan	129	178	36
78 S 26024	23	Jordan	126	174	38
78 S 26028	24	Syria	126	168	34
78 S 26030	25	Syria	128	175	31
74TA 22	31	Syria	127	176	32
74TA 72	54	Iraq	129	178	38
75Kf 36075	97	Morocco	131	173	33
76TA 66054	99	Morocco	126	170	29
78 S 26049	100	Morocco	129	178	37
75Kf 36107	207	Ethiopia	132	174	35
74TA 209	210	Costa Rica	136	182	36
74TA 212	211	Greece	137	182	37
76TA 66088	223	Iran	128	169	34
74TA 268	255	Turkey	133	179	37
76TA 66116	264	Hungary	127	172	33
74TA 290	272	Greece	135	184	37
74TA 302	285	Greece	129	175	35
74TA 305	287	Greece	132	173	36
74TA 374	321	Hungary	133	175	31
79 S 60947	346	Mexico	132	173	37
74TA 434	350	Mexico	128	177	34
75Kf 36213	351	Mexico	129	176	36
74TA 549	470	Syria	126	171	29
-	487	Syria	127	170	33
74TA 559	492	Syria	129	172	35
74TA 565	495	Mexico	134	181	38
74TA 572	498	Mexico	128	176	37
75Kf 36241	501	Mexico	130	174	37
74TA 583	502	Mexico	128	173	37
74TA 587	504	U.S.S.R.	128	174	35
78 S 26112	631	Turkey	132	176	39
75Kf 37356	752	Lebanon	124	176	35
Giza 9	784	Egypt	119	170	39
-	833	Egypt	120	171	37
78 S 26177	837	Lebanon	132	171	34
79 S 60930	975	Iran	128	172	34
75Kf 36423	983	Iran	133	174	38
75Kf 36627	1169	Iran	130	174	35

(Cont'd.)

Table 5.5.1. (Cont'd.)

75Kf 36844	1415	Iran	131	182	36
75Kf 36904	1486	Iran	129	176	34
-	1744	Ethiopia	123	162	30
Siliam	1861	Sudan	119	171	37
W. Pullman 11	1877	Turkey	131	181	39
Wint.Red 51	1880	Turkey	130	177	38
78 S 26303	1888	Jordan	129	178	36
Hamawe white	2129	Syria	128	176	33
Hurani 1	2130	Syria	129	177	33
Pant. L-406	2501	India	119	160	32
Pant. L-639	2573	India	119	157	31
12	4402	Pakistan	118	154	33
162	4403	Pakistan	118	161	32
340	4404	Pakistan	118	161	32
9-6	4405	Pakistan	118	159	31
18-10	4406	Pakistan	117	158	31
18-12	4407	Pakistan	118	157	33
Syr.L.Large	4400	Syria	125	173	38
Syr.L.Small	4401	Syria	127	171	33

Table 5.5.2. Adjusted seed yield (Y = kg/ha) and rank (R) of entries in the LISN-S at different locations during 1979-80.

ENTRY Selection	ILL	AFGHANISTAN		ALGERIA		BANGLADESH		EGYPT		ETHIOPIA		IRAQ		JORDAN		LEBANON		NEPAL		PAKISTAN		SYRIA		TURKEY		Mean	
		Jalalabad		Sidi-Bel- Abbas		Jamalpur (1)		Giza		Debre Zeit (1)		Baghdad		Univer- sity		Terbol		Khumal- tar		Islamabad (1)		Tel Hadya		Diyarbakir		(1)	
		Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R
76TA 66055	1	220	53	3639	5	100	21	79	46	667	10	648	16	942	19	1122	25	1174	27	1004	2	447	32	2361	14	1181	14
78 S 26003	8	353	30	3039	20	100	21	384	16	1066	3	326	37	1108	14	1155	22	1594	13	0		730	1	2011	21	1189	13
78 S 26004	9	393	20	3639	5	77	25	745	6	933	7	711	13	1219	10	1503	11	2244	2	1212	1	677	3	1661	34	1421	2
78 S 26009	13	207	57	3639	5	0		79	46	213	34	460	21	1386	7	1574	8	914	41	0		517	18	2111	18	1210	11
78 S 26013	16	180	58	3839	3	0		245	24	200	35	675	15	1553	5	3789	1	894	42	0		557	11	2861	3	1621	1
78 S 26018	19	340	33	3339	14	96	23	912	4	667	10	449	23	0		1575	7	1094	32	0		490	22	1461	39	1208	12
78 S 26024	23	380	22	3039	20	0		1523	1	533	17	443	24	664	25	1705	6	1054	33	0		670	4	2461	10	1327	3
78 S 26028	24	273	41	2489	42	0		79	46	400	24	341	32	1219	10	1039	31	744	51	0		570	8	1811	28	952	37
78 S 26030	25	327	36	3139	19	0		495	14	400	24	329	33	442	32	1355	14	1894	6	0		657	5	2861	3	1278	7
74TA 22	31	367	26	2239	50	0		190	29	133	39	283	40	830	22	1555	9	894	42	210	5	490	22	1511	37	929	40
74TA 72	54	260	42	2756	28	0		125	41	267	30	163	47	479	30	688	48	447	58	425	3	447	32	2794	5	907	45
75Kf 36075	97	753	6	2656	34	0		181	30	267	30	191	46	534	28	1970	3	1017	36	0		414	39	1044	48	973	34
76TA 66054	99	447	16	2957	24	0		0		1000	5	363	29	1090	15	971	38	1097	31	0		387	41	1194	46	925	42
78 S 26049	100	247	45	3156	18	0		0		133	39	119	53	701	24	432	55	927	38	125	12	520	16	2294	16	913	44
75Kf 36107	207	513	12	3556	8	188	12	181	30	733	8	727	12	423	33	1201	18	1197	25	0		360	44	1544	36	1078	22
74TA 209	210	500	14	3006	22	0		14	55	13	56	61	59	145	37	971	38	1437	15	65	17	467	30	1744	32	927	41
74TA 212	211	167	59	1856	55	0		0		40	50	15	63	145	37	971	38	397	61	110	16	474	28	2794	5	741	58
76TA 66088	223	393	20	3356	13	0		0		13	56	459	22	479	30	871	45	1147	28	0		334	47	2494	9	1055	24
74TA 268	255	247	45	2656	34	0		0		133	39	49	60	590	27	1304	15	917	40	0		307	48	2594	8	943	39
76TA 66116	264	380	22	2356	47	112	19	125	41	1200	1	563	18	812	23	1198	19	1027	35	0		254	55	744	51	829	53
74TA 290	272	360	29	2239	50	0		0		0		286	39	620	26	472	54	444	59	0		267	53	1411	40	675	60
74TA 302	285	240	47	2439	44	33	28	560	9	667	10	275	41	1009	16	1132	23	1364	18	25	19	367	43	1311	42	966	35
74TA 305	287	373	24	2739	29	0		449	15	667	10	595	17	1453	6	1065	29	1194	26	0		520	16	1611	35	1111	18
74TA 374	321	333	34	2989	23	0		143	40	40	50	93	56	1120	13	1215	17	724	52	12	21	354	45	1311	42	920	43
79 S 60947	346	440	17	3339	14	140	16	505	13	333	27	351	30	1175	12	1132	23	1134	29	14	20	407	40	1761	31	1138	15
74TA 434	350	453	15	3539	9	125	17	171	38	600	14	345	31	1009	16	989	36	1944	4	0		447	32	1111	47	1112	16
75Kf 36213	351	307	40	3439	12	177	13	32	54	533	17	233	44	0		1065	29	2494	1	0		440	35	2311	15	1290	5
74TA 549	470	720	8	2739	29	0		144	39	0		149	49	0		1460	12	544	56	45	18	480	25	1911	25	1018	30
-	487	213	54	2739	29	0		255	23	40	50	96	55	0		1912	4	594	55	0		434	37	1911	25	1019	28
74TA 559	492	240	47	3939	1	0		0		67	44	69	58	0		901	43	444	59	0		474	28	2461	10	1063	23
74TA 565	495	433	18	2472	43	107	20	97	44	733	8	327	35	0		970	41	1650	10	0		564	10	1511	37	1003	32
74TA 572	498	313	39	3472	10	0		542	10	160	38	329	33	0		1104	26	1420	17	0		544	12	1961	32	1211	10
75Kf 36241	501	260	42	2372	45	113	18	181	30	67	44	412	26	0		987	37	820	49	0		477	26	1311	42	853	50
74TA 583	502	233	50	3472	10	233	9	847	5	267	30	372	28	0		1403	13	1220	23	0		497	21	2211	17	1282	6
74TA 587	504	607	10	2372	45	93	24	958	3	533	17	385	27	0		1237	16	1970	3	0		517	18	1711	33	1220	9
78 S 26112	631	367	26	2672	32	0		125	41	0		126	52	0		571	52	710	53	0		524	15	3011	2	1013	31
75Kf 37356	752	260	42	1872	54	0		181	30	53	49	463	20	0		475	53	1120	30	0		484	24	1811	28	833	52
Giza 9	784	327	36	2572	38	200	10	375	17	600	14	946	10	0		0		1040	34	0		284	51	511	53	865	48
-	833	353	30	2772	27	167	14	181	30	467	23	999	9	0		0		920	39	0		370	42	711	52	901	46
78 S 26177	837	367	26	2672	32	0		97	44	0		219	45	0		1170	21	1320	20	0		504	20	2061	19	1051	25

... cont'd..

Table 5.5.2. (Cont'd.)

ENTRY Selection	ILL	AFGHANISTAN Jalalabad		ALGERIA Sidi-Bel- Abbas		BANGLADESH Jamalpur		EGYPT Giza		ETHIOPIA Debre Zeit		IRAQ Baghdad		JORDAN Univer- sity		LEBANON Terbol		NEPAL Khumal- tar		PAKISTAN Islamabad		SYRIA Tel Hadya		TURKEY Diyarbakir		Mean	
		Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	RR
79 S 60930	975	427	19	2306	48	13	29	69	49	533	17	437	25	0		1029	32	1622	12	0		335	46	1994	22	1027	27
75Kf 36423	983	147	60	2506	39	0		0	56	67	44	34	62	0		612	51	872	45	0		295	49	1794	30	894	47
75Kf 36627	1169	378	24	2806	26	147	15	569	8	40	50	137	50	0		957	42	1422	16	0		541	13	1344	41	1019	28
75Kf 36844	1415	347	32	3206	17	0		292	21	200	35	526	19	0		829	46	1202	24	0		528	14	794	50	966	35
75Kf 36904	1486	587	11	3706	4	69	26	653	7	67	44	156	48	0		1002	35	872	45	0		455	31	1294	45	1091	19
-	1744	107	61	2506	39	53	27	42	50	67	44	690	14	1231	9	880	44	1852	8	0		128	62	294	54	859	49
Siliam	1861	227	51	1606	57	253	8	319	19	533	17	1534	5	1731	2	1029	32	1922	5	133	9	275	52	294	54	993	33
W.Pull-11	1877	213	54	3906	2	0		42	50	0		47	61	1620	4	629	50	632	54	0		288	50	2444	12	1091	19
W. red 51	1880	80	62	2506	39	0		42	50	93	42	108	54	1675	3	2530	2	1882	7	0		475	27	2044	20	1260	8
78 S 26303	1888	213	54	2306	48	0		42	50	40	50	128	51	2175	1	0		1672	9	0		415	38	1944	24	1112	16
Hamawe white	2129	507	13	2589	37	0		264	22	267	30	241	43	960	18	1008	34	874	44	0		684	2	2678	7	1089	21
Hurani 1	2130	227	51	2089	52	0		181	30	13	56	1167	8	516	29	675	49	954	37	0		570	8	878	49	806	54
Pent. L-406	2501	333	34	1189	58	353	5	236	25	400	24	327	35	0		0		74	62	120	13	107	63	0		237	62
Pent. L-639	2573	733	7	1789	56	387	1	181	30	1133	2	2057	1	71	40	1075	28	1524	14	0		187	60	0		952	37
12	4402	827	5	2089	52	349	4	208	27	600	14	919	11	16	41	0		1624	11	0		157	61	0		834	51
162	4403	893	4	1089	59	296	6	542	10	1000	5	1317	7	238	35	0		1224	22	210	5	190	59	0		785	55
340	4404	627	9	1089	59	373	3	1014	2	1066	3	1350	6	182	36	0		754	50	154	8	250	56	0		752	57
9 - 6	4405	1000	1	1089	59	267	7	236	25	533	17	1747	3	293	34	829	46	0		114	14	224	57	0		674	61
18-10	4406	920	3	589	62	200	10	181	30	333	27	1591	4	127	39	1532	10	854	47	158	7	264	54	0		757	56
18-12	4407	960	2	89	63	375	2	542	10	200	35	2010	2	0		1195	20	524	57	133	9	217	58	0		687	59
Local check	-			2950	25	820		338	18	284	29	93	56	917	21	1080	27	1225	21	316	4	614	7	1850	27	-	-
Syr.L.Large	4400	320	38	3317	16	0		199	28	34	55	297	38	936	20	1708	5	1357	19	133	9	647	6	3100	1	1320	4
Syr.L.Small	4401	240	47	2650	36	0		310	20	85	43	242	42	1250	8	0		828	48	113	15	437	36	2383	13	1043	26
Location mean		388		2654		95		280		356		502		557		1029		1107		73		429		1578			
C.V. %		38.6		58.6				95.8				20.2		63.9		26.3		47.0				21.4		18.2			
S.E.checks ±		94.8		277.2				154.9				58.6		252		156.1		300.4				53.0		165.4			
S.E.check test entry ±201				598.9				334.7				126.5		459		357.6		649.0				114.5		357.3			

(1) The values for Bangladesh, Ethiopia, and Pakistan are unadjusted and are excluded from the overall mean.

Table 5.5.3. The five heaviest seed yielding entries at the individual location in the LISN-S during 1979-80.

Rank	AFGHANISTAN Jalalabad	ALGERIA Sidi-Bel- Abbas	BANGLADESH Jamalpur	EGYPT Giza	ETHIOPIA DebreZeit	IRAQ Baghdad	JORDAN Univer.
1	9-6 ILL 4405	74TA 559 ILL 492	Pant.L.639 ILL 2573	78S 26024 ILL 23	76TA 66116 ILL 264	Pant.L.639 ILL 2573	78 S 26303 ILL 1888
2	18-12 ILL 4407	W.Pull-11 ILL 1877	18-12 ILL 4407	340 ILL 4404	Pant.L.639 ILL 2573	18-12 ILL 4407	Silium ILL 1861
3	18-10 ILL 4406	78S 26013 ILL 16	340 ILL 4404	74TA 587 ILL 504	340 ILL 4404	9-6 ILL 4405	W.red 51 ILL 1880
4	162 ILL 4403	76TA66005 ILL 1	12 ILL 4402	78S 26018 ILL 19	78S 26003 ILL 8	18-10 ILL 4406	W.Pull-11 ILL 1877
5	12 ILL 4402	78S 26004 ILL 9 78S 26009 ILL 13	Pant.L.406 ILL 2501	74TA 583 ILL 502	76TA 66054 ILL 99 162 ILL 4403	Silium ILL 1861	78 S 26013 ILL 16

...cont'd

Rank	LEBANON Terbol	NEPAL Khumaltar	PAKISTAN Islamabad	SYRIA Tel Hadya	TURKEY Diyarbakir
1	78 S 26013 ILL 16	75Kf 36213 ILL 351	78 S 26004 ILL 9	78 S 26003 ILL 8	Syr.loc.large ILL 4400
2	W. red. 51 ILL 1880	78 S 26004 ILL 9	76TA 66005 ILL 1	Hamawe white ILL 2129	78 S 26112 ILL 631
3	75Kf 36075 ILL 97	74TA 587 ILL 504	74TA 72 ILL 54	78 S 26004 ILL 9	78 S 26013 ILL 16
4	ILL 487	74TA 434 ILL 350	162 ILL 4403	78 S 26024 ILL 23	78 S 26030 ILL 25
5	Syr.loc.L. ILL 4400	Silium ILL 1861	74TA 22 ILL 31	78 S 26030 ILL 25	74TA 72 ILL 54

(1) The brackets indicate entries with the same yield.

5.6. LENTIL INTERNATIONAL F₃ TRIAL (LIF₃T)

5.6.1. Material

The test entries in LIF₃T were bulk segregating populations at the F₃ generation from single crosses made in 1977 in Tel Amara, Lebanon. LIF₃T comprised 13 such bulk populations and three checks, which were 74TA 434 (ILL 350) from Mexico, Syrian local large (ILL 4400), and one local check.

5.6.2. Methods and Management

The experimental design was 4x4 triple lattice (three replications) which was analyzed as a randomized block. The recommended plant population was 160 plants/m² with 25cm between rows. Details of management practices are given in Table 5.6.1.

Two sets of LIF₃T were distributed to two countries. Data from both locations was received.

5.6.3. Results and Discussion (Table 5.6.2 to 5.6.4)

In Egypt the local check flowered after 69 days, whereas the first test entry flowered thirty days later. It is clear that none of the entries are early enough for Egyptian conditions. Crop growth was most extended in the locations Terbol, Lebanon and Diyarbakir, Turkey where there was a long period of cold weather in the early spring. The earliest entries to maturity were 77TAX5 and 77TAX9.

The location at which the crop grew tallest was Mallawi in Egypt (mean height 50cm), where irrigation was given. The tallest entry was 77TA X 26 with an average height of 37cm.

The yields were highest in Turkey (mean 1917 kg/ha) and lowest in Syria (628 kg/ha). On average Syrian local large (ILL 4400) was the highest yielding entry. In Egypt, where the test entries were ill-adapted in

in phenology, the local check was the best entry. However in Lebanon, Syria (using Syrian local large as a second check) and Turkey there were entries performing better than the local checks. In particular the crosses 77TA X 9 and 77TA X 12 were excellent in these three environments.

Table 5.6.1. Agronomic data for different locations for the LIF₃T during 1979-80.

Country	Location	Planting date	Crop duration	Fertilizer N	kg/ha P ₂ O ₅	No.of irrigations	Chemical treatments
EGYPT	Mallawi	27.11.79	154	15	30	3	
LEBANON	Terbol	14.11.79	206	33	48	0	
SYRIA	Tel Hadya	16. 1.80	149	20	60	0	Supracid
TURKEY	Diyarbakir	19.11.79	205			0	750 cc./ha

Table 5.6.2. Parents of the crosses in LIF₃T in 1979-80.

Cross Number	Selection	ILL	Origin	X Selection	ILL	Origin
X 77TA						
1	74TA 138	101	Morocco	X 74TA 216	212	Afghanistan
5	74TA 138	101	Morocco	X 74TA 550	470	Syria
7	74TA 138	101	Morocco	X 74Kf 36770	1334	Iran
9	74TA 276	262	Hungary	X 74TA 434	350	Mexico
12	74TA 276	262	Hungary	X 75Kf 36235	479	Lebanon
14	74TA 434	350	Mexico	X 74TA 216	212	Afghanistan
15	74TA 434	350	Mexico	X 74TA 533	445	Chile
16	74TA 434	350	Mexico	X 74TA 550	470	Syria
22	74TA 533	445	Chile	X 75Kf 36770	1334	Iran
23	74TA 550	470	Syria	X 75Kf 216	212	Afghanistan
25	74TA 550	470	Syria	X 75Kf 36770	1334	Iran
26	75Kf 36235	479	Lebanon	X 74TA 216	212	Afghanistan
27	75Kf 36235	479	Lebanon	X 75Kf 36770	1334	Iran

Table 5.6.3. Mean values for 3 agronomic characters for entries in the LIF₃T during 1979-80.

Entry	Days to flowering	Days to maturity	Plant height (cm)
X77TA			
1	134	183	36
5	130	176	33
7	136	177	35
9	130	176	33
12	130	181	33
14	135	178	36
15	136	182	36
16	137	180	35
ILL 4400	130	178	35
22	137	179	36
23	131	177	33
25	131	178	32
26	135	178	37
27	138	178	36
ILL 350	132	179	35

Table 5.6.4. Seed yield (Y = kg/ha) and rank (R) of entries in the LIF₃T at different locations during 1979-80

Entry		EGYPT Mallawi		LEBANON Terbol		SYRIA Tel Hadya		TURKEY Diyarbakir		Mean	
		Y	R	Y	R	Y	R	Y	R	Y	R
X77TA	1	1108	10	874	15	636	6	917	16	884	15
	5	817	15	875	14	567	12	1653	11	978	13
	7	1179	9	1036	13	620	8	1389	14	1056	11
	9	1558	3	1348	4	960	1	2389	3	1564	2
	12	1096	11	1471	1	760	2	2542	2	1467	3
	14	1271	7	1056	12	651	5	1583	13	1140	10
	15	1076	12	1417	3	620	8	2236	5	1335	5
	16	1671	2	1253	7	527	14	1722	10	1293	7
ILL	4400	1450	4	1328	5	280	15	3347	1	1601	1
	22	1354	6	1084	11	620	8	1750	9	1202	9
	23	1413	5	1322	6	613	11	1958	8	1327	6
	25	1025	14	1204	8	667	4	1111	15	1002	12
	26	600	16	556	16	0	16	1583	12	913	14
	27	1204	8	1434	2	700	3	2083	7	1355	4
	350	1042	13	1154	9	631	7	2306	4	283	8
Local check		1775	1	1117	10	567	12	2097	6		
Location mean		1227		1158		628		1917			
C.V. %		37.8		16.11		21.32		13.25			
L.S.D.		773.9		318.56		224.46		423.55			
No. of entries significantly exceeding local check		0		0		1		1			

5.7. LENTIL INTERNATIONAL F₄ TRIAL (LIF₄T)

5.7.1. Material

The fourteen test entries in LIF₄T were bulk populations at the F₄ generation from double crosses made in mid. 1970S in Lebanon. The crosses were selected for inclusion on the basis of their bulk F₃ yields (Table 5.7.1). There were two check entries, namely 74TA 434 (ILL 35) from Mexico and one local check.

5.7.2. Methods and Management

The experimental design was a 4 x 4 triple lattice (three replications), which was analyzed as a randomized block. The recommended plant population was 160 plants/m² with 0.25m between rows.

Twelve sets of LIF₄T were despatched to nine countries, and results were received from only four of these locations.

5.7.3. Results and Discussion (Table 5.7.2. to 5.7.4.)

The time to flowering was shortest in U.S.A. and longest in Pakistan. In U.S.A. the rapid growth was due to the long hours of sunlight (>15.5h). In Pakistan all the test entries flowered at least three weeks later than the local check and consequently were phenologically ill-adapted to conditions at Islamabad giving very poor yields. In Ethiopia there was a similar situation with the test entries flowering considerably later than the local check. The crosses which came to flower first, on average, were X 77TA 160 and X 77TA 170.

The late flowering of the test entries at Islamabad allowed ample time for vegetative growth, which resulted in the tallest average height (mean 41cm) of the locations. The tallest bulk was X 77TA 170.

Yields were highest at Pullman in the U.S.A. and lowest at Islamabad in Pakistan for the reasons mentioned above. The entry with the highest mean yield was the supplied check from Mexico, 74TA 434 (ILL 350). The best bulk population was X 77TA 153, which performed well in the two northern locations. It was a double cross with parents from Afghanistan, Australia, Mexico and Syria.

Table 5.7.1. The origin of the parents used in the crosses in LIF₄T in 1979-80.

Cross number		Female parent				Male parent			
X 77 TA		Selection	ILL		Selection	ILL		Selection	ILL
33	Origin	74TA 177	176	x	74TA 30	35	X	74TA 532	445
		Turkey			Syria			Chile	
34	Origin	74TA 177	176	x	74TA 30	35	X	74TA 392	333
		Turkey			Syria			Turkey	
36	Origin	74TA 178	176	x	74TA 30	35	X	74TA 392	333
		Turkey			Syria			Turkey	
53	Origin	74TA 536	449	x	74TA 217	213	X	74TA 178	176
		Chile			Afghanistan			Turkey	
56	Origin	74TA 177	176	x	74TA 240	226	^	74TA 321	294
		Turkey			Pakistan			Greece	
60	Origin	74TA 308	289	x	74TA 240	226	X	74TA 178	176
		Greece			Pakistan			Turkey	
78	Origin	74TA 536	449	x	74TA 550	470	X	74TA 531	445
		Chile			Syria			Chile	
80	Origin	74TA 177	176	x	74TA 639	555	X	74TA 392	333
		Turkey			Turkey			Turkey	
81	Origin	74TA 308	289	x	74TA 639	555	X	74TA 177	176
		Greece			Turkey			Turkey	
82	Origin	74TA 308	289	x	74TA 639	555	X	74TA 536	449
		Greece			Turkey			Chile	
153	Origin	74TA 260	253	x	74TA 30	35	X	74TA 435	351
		Aust.			Syria			Mexico	
159	Origin	74TA 435	351	x	74TA 30	35	X	74TA 415	345
		Mexico			Syria			Mexico	
160	Origin	74TA 435	351	x	74TA 30	35	X	74TA 415	345
		Mexico			Syria			Mexico	
170	Origin	74TA 177	176	x	74TA 176	173	X	74TA 177	176
		Turkey			Turkey			Turkey	
									Afghanistan

Table 5.7.2. Agronomic data for different locations for the LIF₄T during 1979-80.

Country	Location	Planting date	Crop duration days	Fertilizer(kg/ha)			Chemical treatments
				N	P ₂ O ₅	K ₂ O	
BANGLADESH	Jamalpur	23.11.79	121	34	53.5	0	-
ETHIOPIA	DebreZeit	22.7. 80	98	0	0	0	-
PAKISTAN	Islamabad	11.11.79	186	20	50	0	-
SYRIA	Tel Hadya	16. 1.80	150	20	0	60	-
U.S.A	Pullman	23.4. 80	121	0	0	0	Tolban 560ml/ha Lexone 280ml/ha Cygon-airapplied

Table 5.7.3. Mean values for three agronomic characters for entries in the LIF₄T during 1979-80.

Entry		Days to flowering	Days to maturity	Plant height (cm)
X 77 TA	33	103	144	34
	34	106	146	33
	36	104	145	36
	53	106	145	36
	56	107	146	33
	60	107	145	36
	78	105	146	31
	80	106	145	35
	81	106	146	35
	82	107	146	35
	153	104	145	35
	159	104	144	31
	160	103	143	31
	170	103	145	38
	74 TA 434	105	142	32
Local check				

Table 5.7.4. Seed yield (Y = kg/ha) and rank (R) of entries in the LIF₄T at different locations during 1979-80.

ENTRY		ETHIOPIA DebreZeit		PAKISTAN Islamabad		SYRIA Tel Hadya		U.S.A. Pullman		Mean	
		Y	R	Y	R	Y	R	Y	R	Y	R
X 77TA	33	145	4	30	8	440	7	994	12	402	10
	34	111	6	12	12	200	15	1056	10	345	14
	36	71	10	13	10	440	7	1376	4	475	5
	53	20	16	0		250	14	740	16	253	15
	56	178	2	9	13	460	6	989	13	409	9
	60	78	9	105	2	560	4	1336	6	520	4
	78	93	7	53	3	0		927	14	268	14
	80	58	13	35	5	640	3	846	15	395	11
	81	67	11	31	7	<u>660</u> (1)	2	1039	11	449	8
	82	93	7	35	5	440	7	1281	7	462	6
	153	178	2	0		<u>760</u>	1	1356	5	574	2
	159	56	14	0		540	5	1208	8	451	7
	160	67	11	22	9	400	11	1068	9	389	12
	170	36	15	13	10	320	12	1756	3	531	3
74TA	434	116	5	36	4	407	10	2410	1	742	1
local check		200	1	713	1	320	12	2075	2	-	
Location mean		98		69		427		1277			
C.V. %		-		-		30.2		19.9			
L.S.D. 5%		-		-		337.3		423.4			
No. of entries significantly exceeding local check		-		-		2		0			

(1) Yields significantly greater than the local check at 5% are underlined.

6. INTERNATIONAL AGRONOMY TRIALS

6.1. FERTILITY CUM INOCULATION TRIALS (FIT)

6.1.1. INTRODUCTION

The trials were planned to study the response of faba beans, lentils and chickpeas to the application of fertilizer nutrients and to inoculation with Rhizobium culture under different agro-ecological conditions in the region. The objectives of these trials were to investigate:

- (i) Whether there is a need for application of phosphate
- (ii) Whether there is a need for application of potash
- (iii) Whether the symbiosis with local Rhizobial flora is adequate or there was a need for inoculation
- (iv) Whether the symbiotic N_2 -fixation is limited due to the deficiency of phosphorus and/or potassium
- (v) Whether the symbiotic N_2 -fixation is adequate to meet the nitrogen need of the crop.

Methods and Materials

The basic set of fertility and inoculation treatments was the same for all the three legumes (except for faba beans in Egypt and Sudan). They consisted of (i) an unfertilized uninoculated control; (ii) 50 kg P_2O_5 /ha; (iii) 60 kg K_2O /ha; (iv) inoculation; (v) inoculation + 50 kg P_2O_5 /ha; (vi) inoculation + 60 kg K_2O /ha; (vii) inoculation + 50 kg P_2O_5 + 60 kg K_2O /ha and (viii) 100 kg N/ha (applied in two splits, 50 kg at the time of planting and 50 kg at the start of flowering) for lentil and 120 kg N/ha (applied in two splits) for faba beans and chickpeas.

For faba beans in Egypt and Sudan the treatments were as follows: (i) an unfertilized uninoculated control; (ii) inoculation with local culture; (iii) inoculation with Aleppo culture, (iv) Aleppo inoculum + 36 kg P_2O_5 /ha; (v) Aleppo inoculum + 72 kg P_2O_5 /ha; (vi) Aleppo inoculum + 18 kg N + 72 kg P_2O_5 /ha; (viii) Aleppo inoculum + 36 kg N + 72 kg P_2O_5 /ha and (viii) 120 kg N/ha + 72 kg P_2O_5 /ha.

A randomized complete block design was used with four replications. The size of the plots was 13.5m^2 (2.7m x 5.0m) for all the three crops. The row spacing was 45cm for faba beans (6 rows/plot); 22.5cm for lentils (12 rows/plot) and 30cm for chickpeas (9 rows/plot). The two out side rows and 0.5m at either end of the central rows were discarded. Thus the net plot harvested and the seed yields reported are derived from the central rows of 4m length each.

6.1.2. FAB A BEAN FERTILITY TRIAL (FBFIT)

Results and Discussion

Data were received from 11 locations listed in tables 6.1a and 6.16. The data are presented in two tables because Egypt and Sudan locations received different treatment combinations from the other locations. The seed yields were heaviest in the irrigated location of Ninevah in Iraq and lightest at Wad Medani in Sudan where the crustiness of soils led to a poor establishment.

In the table 6.1a, significant differences between treatments were apparent only at Shoa in Ethiopia and at Tel Hadya in Syria. At Shoa, 50 kg P_2O_5 /ha (T_2); inoculation + 50 kg P_2O_5 /ha (T_5); inoculation + 50 kg P_2O_5 + 60 kg K_2O_5 /ha (T_7) and 120 kg N/ha + 50 kg K_2O_5 + 60 kg K_2O_5 /ha (T_8) increased seed yield by 83.3; 55.9; 62.4 and 303.4 % respectively. At Tel Hadya an increase of 44.8 % in seed yield was given by T_8 . The low and high response to inoculation and nitrogen fertilizer, respectively, at Shoa implies a low nitrogen fixation efficiency of introduced and local Rhizobium and a low nitrogen content in the soil. At Tel Hadya, the moderate seed yield increases due to inoculation and the still higher increases from nitrogen fertilizer suggest that the faba beans in association with naturalised Rhizobium at Tel Hadya were not fixing enough nitrogen which they required.

In the table 6.16 differences between treatments were significant at Gimmeza, Aliab and Zeidals. At Gimmeza the local Rhizobium and Aleppo Rhizobium increased seed yield by 46.8 and 29.4 % respectively. The

addition of P or K fertilizer tended to suppress the beneficial effects of Aleppo culture. On the other hand, 18 kg N/ha seemed to have improved the performance of Aleppo culture in terms of increasing seed yields. At Aliab inoculation with Aleppo culture increased seed yield by 22.0 % of while the other treatments had no significant effects. At Zeidab inoculation with Aleppo culture gave the highest seed yield increases of 39.9 % and the addition of P fertilizers tended to reduce the effect of the inoculum. Results from Egypt and Sudan locations suggest that the application of the appropriate Rhizobium culture was the only major contributing factor to increasing seed yields.

6.1.3. LENTIL FERTILITY TRIAL (LFIT)

Results and Discussion

Data were received from nine locations listed in table 6.2. The seed yields were heaviest at Jamalpur in Bangladesh and lightest at Islamabad in Pakistan. At Islamabad, heavy rainfall after sowing resulted in a poor stand which in turn led to a high coefficient of variation; this together with insect damage contributed to the low yields.

In all the locations, significant differences between the treatments were apparent at Jamalpur in Bangladesh; At Mobaria and Gimmeza in Egypt and at Islamabad in Pakistan. At Jamalpur, inoculation; inoculation + 50 kg P_2O_5 and inoculation + 60 K_2O /ha increased seed yield by 16.7; 23.3 and 22.7 % respectively. At Mobaria, an increase in seed yield of 30.6 % was obtained from inoculation + 50 kg P_2O_5 /ha and the other treatment. Combination had no significant effect. Results of these two locations suggest that the application of P or K and of P at Jamalpur and at Mobaria respectively must have improved the efficiency of symbiosis. At Gimmeza, 50 kg P_2O_5 and inoculation + 60 kg K_2O /ha increased seed yield by 31.8 and 16.1 % respectively. It would appear that at this location there was enough of the appropriate Rhizobia; little K and deficiency of P in the soil.

6.1.4. CHICKPEA FERTILITY TRIAL (CFIT)

Results and Discussion

Data were received from seven locations listed in table 6.3. The heaviest yields were from Jamalpur in Bangladesh and lightest from Tel Hadya spring sown crop in Syria. In addition to the relatively low yields of spring sown chickpea in Syria, the trial at Tel Hadya was also badly damaged by birds.

Significant differences between treatments were found at Ninevah in Iraq; at Kafr Antoon and Tel Hadya winter sown crop in Syria. At Ninevah, inoculation + 60 kg K_2O /ha produced significantly less yield than P or K fertilizer applied separately or in combination. At Kafr Antoon the application of 50 kg P_2O_5 ; 60 kg K_2O and 120 kg N + 50 kg P_2O_5 + 60 kg K_2O /ha increased seed yield by 20.2, 18.7 and 14.8 % respectively. The high yield responses to the P application was consistent with the low availability of P in the soil. The available P in this soil was about 2.0 ppm. At Tel Hadya inoculation and all other fertilizer treatment combinations out yielded the control in the winter grown chickpeas; the highest increase of 82.8 % came from the inoculation treatment (T_4). This high responses to fertilization and inoculation of winter chickpeas as opposed to the spring ones suggests increased nutrient demands by the winter crop at that particular location.

Table 6.1a. Seed yield (kg/ha) of faba beans as affected by the fertility - cum inoculation treatments at various locations during 1979/80.

T R E A T M E N T S	ALGERIA Khroub	ETHIOPIA Shoa	GUATEMALA Patzilia	IRAQ Ninevah	LEBANON Terbol	SYRIA Tel Hadya
T ₁ - Control	3228	1042	1613	6925	2928	1090
T ₂ - Phosphate at 50 kg P ₂ O ₅ /ha	3368	1910	1619	7161	3176	1270
T ₃ - Potash at 60 kg K ₂ O/ha	3608	1219	2570	7067	3174	1194
T ₄ - Inoculation with Rhizobium	3208	1198	2079	6511	3172	1230
T ₅ - Inoculation + Phosphate	3676	1624	1971	6728	2984	1135
T ₆ - Inoculation + Potash	3403	1271	2132	6769	3078	1184
T ₇ - Inoculation + Phosphate + Potash	3356	1692	2471	6256	2826	1220
T ₈ - 120 kg N/ha + Phosphate + Potash	3235	3161	1816	7283	3121	1578
Location mean	3385	1640	2034	6838	3057	1238
S.E. ±	173.8	86.4	348.9	238.6	168.6	76.7
L.S.D. (5%)	N.S.	262.0	N.S.	N.S.	N.S.	225.6
C.V. (%)	10.3	9.1	34.3	7.0	11.0	12.4

Table 6.1.b. Seed yield (kg/ha) of faba beans as affected by the fertility - cum inoculation treatments at various location in EGYPT and SUDAN.

T R E A T M E N T S	EGYPT Gimmeza	S U D A N				
		Aliab	Burgig	Siliam	Zeidab	Wad Medani
T ₁ - Control	2021	1830	888	1626	1252	771
T ₂ - Inoculation with local culture	2967	1637	1202	2107	1436	648
T ₃ - Inoculation with Aleppo culture	2615	2233	1211	2412	1752	742
T ₄ - Aleppo inoculum + 36kg P ₂ O ₅ /ha	2377	1915	853	1173	1569	708
T ₅ - Aleppo inoculum + 72 kg P ₂ O ₅ /ha	2608	1772	1280	1630	1353	769
T ₆ - Aleppo inoculum + 18 kgM + 72kg P ₂ O ₅ /ha	2998	1877	1308	1939	1586	723
T ₇ - Aleppo inoculum + 36 kgM + 72kg P ₂ O ₅ /ha	2610	1933	1163	2053	1575	813
T ₈ - 120 kgM/ha + 72 kg P ₂ O ₅ /ha	2573	1763	1110	2106	1610	848
Location mean	2596	1870	1127	1881	1517	753
S.E. *	98.2	107.8	129.3	257.0	90.4	84.5
L.S.D. (5%)	288.8	317.1	N.S.	N.S.	265.9	N.S.
C.V. (%)	7.6	11.5	23.0	27.3	11.9	22.4

Table 6.2. Yield (kg/ha) of lentils as affected by fertility cum - inoculation treatments at various locations during 1979/80.

T R E A T M E N T S	BANGHLADESH Jamalpur	E G Y P T		GUATEMALA Sacale- pequez	JORDAN Ramtha	LEBANON Terbol	PAKISTAN		SYRIA Tel Hadya	TURKEY Izmir
		Al- Nobaria	Gimmeza				Faisal- abad	Islam- abad		
T ₁ - Control	1995	1644	1285	1792	494	763	663	163	1518	1473
T ₂ - Phosphate at 50 kg P ₂ O ₅ /ha	2035	1657	1694	1556	461	809	433	163	1523	1636
T ₃ - Potash at 60 kg K ₂ O/ha	2106	1465	1283	1954	394	854	541	121	1463	1495
T ₄ - Inoculation + Phosphate	2328	1918	1098	1760	411	1032	467	71	1336	1547
T ₅ - Inoculation + Phosphate	2459	2147	1223	1768	428	839	428	75	1613	1808
T ₆ - Inoculation + Potash	2447	1903	1492	1890	383	827	443	83	1518	1809
T ₇ - Inoculation + Phosphate + Potash	2239	1751	1250	1878	458	811	424	46	1471	1684
T ₈ - kg N/ha + Phosphate + Potash	2249	1707	1363	1829	397	647	515	92	1374	1254
Location mean	2232	1774	1336	1803	428	823	489	102	1477	1589
S.E. ±	76.2	117.4	98.5	185.9	57.4	86.2	63.8	24.4	94.1	175.9
L.S.D. (5%)	224.3	345.5	289.7	N.S.	N.S.	N.S.	N.S.	71.8	N.S.	N.S.
C.V. %	6.8	13.2	14.7	20.6	26.8	20.9	26.1	48.0	12.7	22.2

Table 6.3. Seed yield (kg/ha) of chickpeas as affected by the fertility - cum inoculation treatments at various locations during 1979/80.

T R E A T M E N T S	BANGLADESH Jamalpur	I R A Q		LEBANON Terbol	S Y R I A			
		Arbil	Ninevah		Jinderis-S	Kafr- Antoon-S	Tel Hadya-W	Tel Hadya-S
T ₁ - Control	2269	967	979	1290	1167	1092	648	262
T ₂ - Phosphate at 50 kg P ₂ O ₅ /ha	2638	900	1052	1604	1274	1313	840	302
T ₃ - Potash at 60 kg K ₂ O/ha	2349	915	1076	1395	1162	1296	965	282
T ₄ - Inoculation with Rhizobium	2123	885	945	1221	1148	1027	1185	286
T ₅ - Inoculation + Phosphate	2592	869	931	1295	1170	1159	1100	330
T ₆ - Inoculation + Potash	2455	985	871	1131	1003	1222	1006	332
T ₇ - Inoculation + Phosphate + Potash	2404	870	1029	1250	1024	1224	913	299
T ₈ - 120 kg N/ha + Phosphate + Potash	2480	948	1021	1246	1139	1254	978	315
Location mean	2414	917	988	1304	1136	1198	954	301
S.E. ±	209.8	7.1	40.8	131.2	19.0	49.0	89.1	31.4
L.S.D. (5%)	N.S.	N.S.	120.0	N.S.	N.S.	145.0	262.2	N.S.
C.V. %	17.4	32.4	8.3	20.1	107.7	8.3	18.7	20.9

6.2. DATE OF PLANTING AND PLANT POPULATION TRIALS (DPPT)

6.2.1. INTRODUCTION

The trials were proposed to find out as to what is the optimum date of planting of faba beans, lentils and chickpea crops for the different agro-ecological conditions in the ICARDA region and what would be the consequence of deviation from this date on the crop performance. The trial also aimed at determining the response of the crop to change in plant-population at each of the dates of planting. This would permit identification of optimum population level for each of the dates of planting.

Methods and Materials

The date of planting treatments involved four different dates in each crop. The four dates in faba beans and lentils were selected as follows: D_1 - 40 days earlier than the conventional date of planting in a given location; D_2 - 20 days earlier; D_3 - at the conventional date of planting. For chickpeas, the four dates were selected as follows: D_1 - early winter; D_2 - mid winter; D_3 - later winter and D_4 - early spring.

Different plant populations were obtained by altering the interrow spacing while maintaining a constant intra-row spacing. The details of the spacings and corresponding population levels are given in the relevant tables.

A single split-plot design was used with date of planting treatment in the main-plots and the plant population levels as the sub-plots. Four replications were recommended, although the cooperators had the choice of reducing the replications to three if land was limiting. The cooperators also had the choice of adding and/or modifying the treatments to suit their local condition.

The size of the sub-plots was 20.0m^2 (4m x 5m) for all the three crops. The two out-side rows and 0.5m at either end of the central rows were discarded. Thus the net plot harvested and the seed yields reported were derived from the central rows of 4m.

3g Captan + 3g Benlate /1000g seeds was recommended for seed treatment. The basal fertilizer recommendation was: 30 kg N + 50 kg P_2O_5 /ha for faba beans and 20 kg N + 50 kg P_2O_5 /ha for lentils and chickpeas.

Some cooperators provided data on monthly maximum and minimum temperatures and total rainfall for the duration of the crop. These are dia-grammatically represented in figure.

6.2.2. FABABEAN DATE OF PLANTING AND PLANT POPULATION TRIAL (FBDPPT)

Results and Discussion

Data received from three locations are presented in table 6.4. The heaviest yields were from Shoa, Ethiopia and the lightest from Tel Hadya, Syria.

At all the three locations, there were significant differences between the yields from different sowing dates. At Shoa in Ethiopia, advancing the sowing date 20 and 40 days increased seed yield by 39.0 and 122.2 % respectively while delaying it by 20 days reduced the yield by 75%. A similar trend was observed at Terbol in Lebanon where advancing sowing by 20 and 40 days increased seed yield by 56.0 and 69.8% respectively, and delaying it by 20 days reduced seed yield by 27.7%. At Tel Hadya, the maximum seed yield was obtained at the conventional sowing date: advancing the sowing by 20 and 40 days reduced seed yield by 37.2 and 20.6% respectively while delaying it by 20 days reduced the yield by 240%. It can be concluded that delaying sowing beyond the conventional date of sowing reduces seed yield at all locations, with the exception of Tel Hadya where differences were small because of frost damage to the early planted crop. In locations where

early growth is not limited by low temperatures, advancing sowing date appeared very advantageous.

Significant effects on seed yield by varying the population levels were apparent only at Shoa. Even at this station, the seed yield was significantly reduced only when the population was reduced to the lowest level of 16.7 plants/m². Increasing plant population levels in locations, drier than Shoa could mean increased competition for the limited soil moisture thus leading to no added advantage in yields.

There was no significant interaction between date of planting and plant population treatments.

6.2.3. LENTILS DATE OF PLANTING AND PLANT POPULATION TRIAL (LDPPT)

Results and Discussion

Data were received from the five locations listed in table 6.5. The lowest yields came from Islamabad. At this station there was a poor stand attributed to poor germination resulting from heavy rain-falls after planting.

In all the five locations, differences between date of planting treatments were significant except at Islamabad. At Memensingh, Bangladesh, advancing the date of planting to October and November from December increased seed yields by 34.5 and 71.1% respectively and delaying it for 20 days reduced seed yield by 66.5%. In Guatemala also similar advantage in the yield was obtained by advancing the planting date. At Amman, Jordan, advancing planting date by 20 and 40 days from the conventional date of early January, increased seed yields by 33.4 and 13.2% respectively while delaying it for 20 days reduced seed yield by 57.0%. At Terbol, Lebanon, advancing the date of planting by 20 and 40 days increased seed yields by 20.6 and 15.0% respectively and delaying it for 20 days reduced seed yield by 44.9%. At Tel Hadya, Syria, advancing the date of planting by 20 and 40 days

increased seed yields by 3.7 and 9.8 times respectively and delaying it for 20 days reduced seed yield 2.1 times. Two conclusions could be made from these results: (i) in all locations, considered, delaying and advancing the date of planting 20 days beyond the conventional date reduces and increases seed yields respectively and (ii) advancing the date of planting to 40 days leads to yet more seed yield increases in some locations and to no corresponding increases in others.

Varying the population levels from 333 to 167 plants/m² had no significant effect on seed yield at Terbol; at Tel Hadya and at Islamabad. At Mymensingh, increasing the population levels from 167 to 200 plants/m² had no significant effect on seed yield however raising it to 250 and 333 plants/m² increased seed yield by 33.3 and 23.9% respectively. At Amman, the seed yield was increased by 17.5; 4.3 and 20.9% by raising the population levels from 167 to 200, 250 and 333 plants/m² respectively. With the exception of Mymensingh the positive response to population levels in terms of seed yield seem to be in locations of relatively high rainfalls (fig.).

There was no significant interaction between date of planting and plant population treatments.

6.2.4. CHICKPEAS DATE OF PLANTING PLANT POPULATION TRIAL (CDPPT)

Results and Discussion

Data were received from five locations listed in table 6.6. At all locations, chickpeas planted in early winter produced the highest yield while the spring planted chickpeas yielded lowest. For example the increase in seed yields from late to early winter planting were in the order of 35.4; 23.3; 16.5 and 85.8% at Nicosia (Cyprus); at Amman (Jordan); at Terbol (Lebanon) and at Tel Hadya, (Syria) respectively. At Mymensingh (Bangladesh) chickpeas planted beyond winter failed to flower (D₃ and D₄). In Bangladesh when there is short and mild winter season, winter planting is common. In

Cyprus the spring planted chickpeas failed to mature. From these results it could be concluded that: at all locations, planting in early winter produces higher seed yields and delaying planting beyond winter in certain locations can lead to total crop failure.

Differences amongst plant population treatments were significant only at Amman and at Tel Hadya. At Amman, increasing plant population from 16.7 to 33.3 plants/m² increased seed yield by 32.1%. At Tel Hadya, increasing plant population from 16.7 to 20 and 33.3 plants/m² increased seed yield by 32.9 and 63.5% respectively. The present results seem to suggest that positive responses to increasing population levels in terms of seed yield were apparent only in locations with relatively more rainfall. There was also a tendency for positive responses, to be found more in the early date of planting even though the interaction between date of planting and plant population treatment was not statistically significant.

Fig.1. Monthly maximum and minimum temperature and monthly total rainfall during the cropping season at different locations.

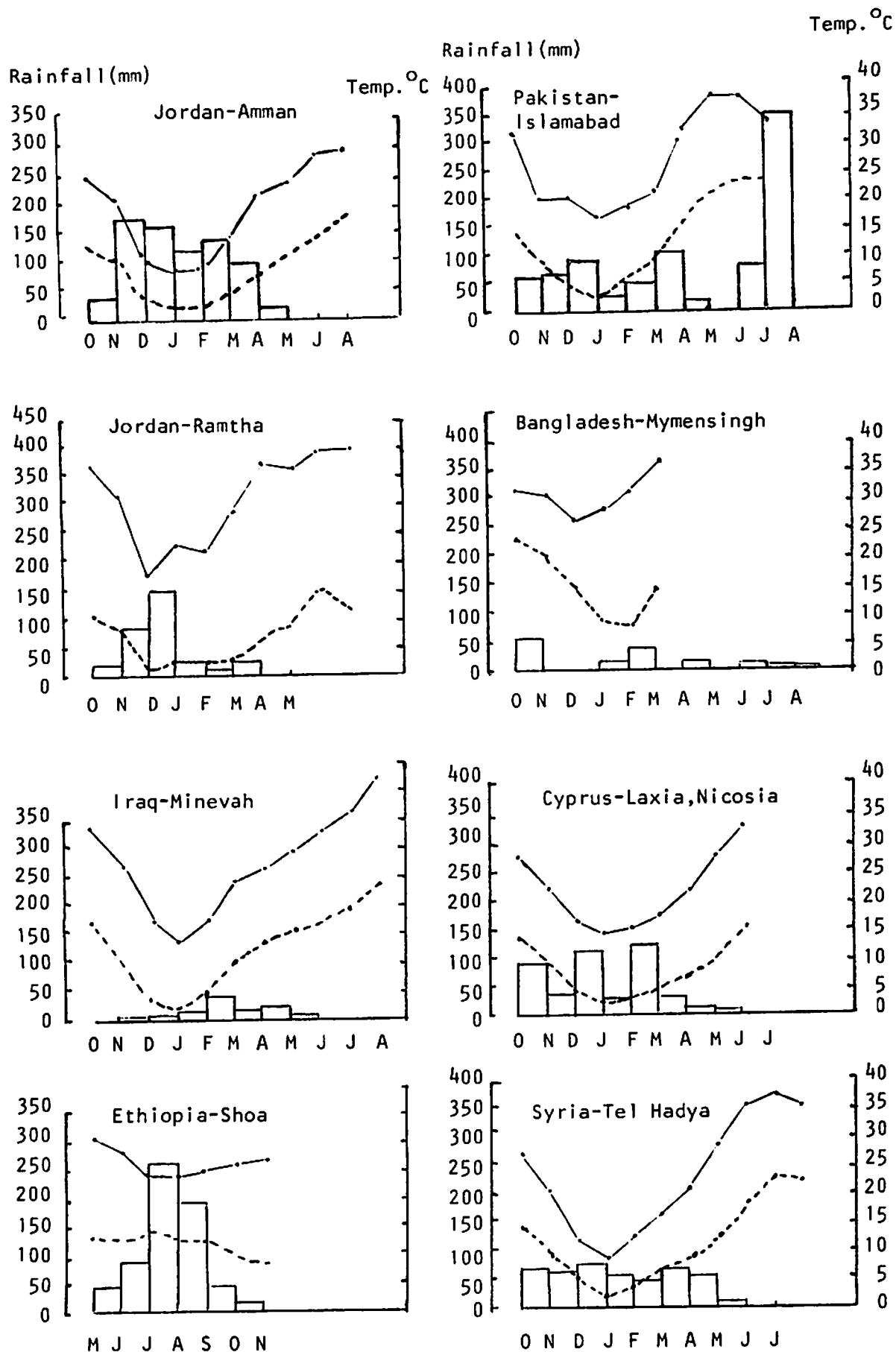


Table 6.4. Seed yield (kg/ha) of faba beans as affected by the date of planting treatments and levels of plant populations at various locations during 1979/80.

T R E A T M E N T S	ETHIOPIA Shoa	LEBANON Terbol	SYRIA Tel Hadya
A. Date of planting			
D ₁ - 40 days Earlier than conventional	5109	2701	1846
D ₂ - 20 days Earlier than conventional	3195	2481	1622
D ₃ - Conventional date	2299	1590	2226
D ₄ - 20 days later than conventional	587	1149	655
S.E. $\pm$	254.4	116.8	-
L.S.D. (5%)	813.8	373.7	416.1
C.V. (%)	36.4	23.6	29.9
B. Population levels			
P ₁ - 33.3 plants/m ² (0.30 x 0.10m)	2890	2048	1572
P ₂ - 25 " (0.40 x 0.10m)	2819	1936	1595
P ₃ - 20 " (0.50 x 0.10m)	2950	1888	1619
P ₄ - 16.7 " (0.60 x 0.10m)	2530	2049	1563
S.E. $\pm$	17.2	83.1	-
L.S.D. (5%)	345.0	N.S.	N.S.
C.V. %	17.2	16.8	18.6
Date of planting			
D ₁	19.6.80	23.10.79	23.10.79
D ₂	3.7.80	6.11.79	11.11.79
D ₃	18.7.80	5.12.79	4.12.79
D ₄	2.8.80	21.12.79	13.1.80

Table 6.5. Seed yield (kg/ha) of lentils as affected by the date of planting treatments and levels of plant populations at various locations during 1979/80.

T R E A T M E N T S	BANGLA- DESH Mymen- singh	GUATE- MALA Sacale- pequez	JORDAN Amman	LEBANON Terbol	PAKIS- TAN Islam- abad	SYRIA Tel Hadya
A. Date of planting						
D ₁ - 40 days earlier than conventional	1728	1948	1571	1207	327	1684
D ₂ - 20 days earlier than conventional	1358	1510	1852	1256	344	635
D ₃ - Conventional date	1010	1106	1388	1050	167	170
D ₄ - 20 days later than conventional	338	240	791	994	75	82
S.E. ±	33.1	147.5	154.6	67.4	14.1	35.9
L.S.D. (5%)	152.1	333.7	534.9	215.0	N.S.	155.2
C.V. (%)	12.0	49.2	38.2	23.9	16.8	55.5
B. Population levels						
P ₁ - 33.3 plants/m ² (30 x 1.5cm)	1175	1078	1530	1151	215	751
P ₂ - 250 " (40 x 1.5cm)	1264	1256	1320	1161	215	677
P ₃ - 200 " (50 x 1.5cm)	1047	1221	1487	1102	199	615
P ₄ - 16.7 " (60 x 1.5cm)	948	1249	1266	1105	285	527
S.E. ±	32.3	83.3	66.4	43.4	48.1	93.9
L.S.D. (5%)	124.4	N.S.	193.9	N.S.	N.S.	N.S.
C.V. (%)	11.7	27.7	16.4	15.4	40.5	162.2
Dates of planting						
D ₁	27.10.79	28.9.80	29.10.79	7.11.79	16.11.79	13.12.79
D ₂	17.11.79	5.10.80	20.11.79	12.12.79	30.11.79	13.1.80
D ₃	8.12.79	5.11.80	5.1.80	3.1.80	15.12.79	6.2.80
D ₄	26.12.79	17.11.80	31.1.80	22.1.80	30.12.79	10.3.80

Table 6.6. Seed yield (kg/ha) of chickpeas as affected by the date of planting treatments and levels of plant populations at various locations during 1979/80.

T R E A T M E N T S	BANGLADESH Mymensingh	CYPRUS Nicosia	JORDAN Amman	LEBANON Terbol	SYRIA Tel Hadya
A. Date of Planting					
D1 - Early winter (Mid Nov.)	528	730	1145	1500	2105
D2 - Mid winter (Mid Dec.)	245	451	1034	1502	1576
D3 - Late winter (Mid Feb.)	-	539	929	1288	1133
D4 - Early spring (Early Mar.)	-	-	680	1010	967
S.E. $\pm$	32.9	58.0	62.0	56.9	-
L.S.D. (5%)	271.7	200.5	198.2	181.9	381
C.V. (%)	34.0	40.4	26.2	17.2	-
B. Population levels					
P1 - 33.3 plants/m ² (0.30 x 0.10m)	406	635	1099	1343	1390
P2 - 25 " (0.40 x 0.10m)	355	628	926	1337	-
P3 - 20 " (0.50 x 0.10m)	385	575	932	1377	1130
P4 - 16.7 " (0.60 x 0.10m)	401	455	832	1244	850
S.E. $\pm$	13.1	55.0	33.2	38.1	-
L.S.D. (5%)	N.S.	N.S.	95.0	N.S.	198
C.V. (%)	9.6	33.3	14.0	11.5	-
Date of planting					
D1	21.11.79	21.12.79	25.11.79	17.11.79	20.11.79
D2	2.1.80	25.1.80	5.1.80	12.12.79	19.12.79
D3	2.2.80	7.3.80	3.2.80	22.1.80	13.2.80
D4	20.2.80	31.3.80	11.3.80	26.3.80	11.3.80

7. ACKNOWLEDGEMENTS :

Our thanks are due to all the donors of ICARDA, and in particular the IDRC, for making this cooperative research effort possible.