INTERNATIONAL NURSERY REPORT No 5

FOOD LEGUME NURSERIES

1980-1981

THE INTERNATIONAL CENTER FOR AGRICULTURAL RESEARCH IN THE DRY AREAS

P. O. Box : 5466 Aleppo-Syria

july 1983

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FOOD LEGUME IMPROVEMENT PROGRAM

THE INTERNATIONAL CENTER FOR AGRICULTURAL RESEARCH IN THE DRY AREAS

(ICARDA), P.O.Box 5466,

Aleppo, SYRIA.

July 1983

PREFACE

A number of trials and nurseries were supplied by the Food Legume Improvement Program (FLIP) of ICARDA to cooperating scientists within and outside the ICARDA region for 1980-81 growing season. Many of these trials and nurseries were also grown at different ICARDA sites in Syria and Lebanon. This report summarises the data returned by the cooperating scientists and those obtained at ICARDA sites from these trials and nurseries.

The report has been prepared by FLIP staff at ICARDA. It is hoped that the results and discussion contained in this report will be of interest and use to the cooperating scientists. Any comments or suggestions on the report would be most 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 dis-semination 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 international yield trials, screening nurseries, disease nurseries and agronomy trials conducted by the cooperating scientists and ICARDA during 1980-81.

2. ICARDA INTERNATIONAL TRIALS AND NURSERIES FOR THE 1980-81 SEASON

2.1. DESCRIPTION

The following gives a brief account of the trials and nurseries that were distributed by ICARDA, for the three food legumes, faba bean, lentil and kabuli chickpea, during 1980-81.

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. 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. Entries in the trial during 1980-81 season were more or less same as in the 1979-80 season.

2.1.2. International Yield Trials (IYT).

In order 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. These trials permit an assessment of yield performance (G) across a range of environments (E) and provide an estimate of the relative size of G x E interactions in that growing season. They also allow national programs to identify genotypes best adapted to their local conditions, and provide ICARDA with information that will rationalise crossing programs for different countries.

As in the past there were separate large- and small-seeded trials of lentils and faba beans during 1980-81. In addition, a trial of large-seeded kabuli type chickpeas (greater than 40g per 100 seeds) was also distributed for those countries where large seed is preferred.

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, ecompassing 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 Trials (IF_3T).

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 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 accross a range of environments, which will additionally assist in identifying parents to be used in hybridisation programs for the different countries.

The F_3Ts in 1980-81 season were developed separately for different major environmental conditions. Thus two trials in lentil, three trials in chickpeas and two trials in faba beans were distributed.

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. The aim of these nurseries is 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 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 nursery available for distribution in the 1980-81 season was a Chickpea International Ascochyta Blight Nursery (CIABN). 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 other 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 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 yielding cultivars that emerge from plant breeding programs. During 1980-81 three trials were distributed. These included a weed control trial (WCT) in addition to the fertility-cum-inoculation trial (FIT) and date of planting-cum-plant population trial (DPPT) which were started in 1979-80.

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. Weather conditions during the cropping season for some of the locations are given in Fig. 1. Data were returned on 314 of the trials and nurseries, representing 42% of the number distributed.

Table 2.1. Distribution of trials and nurseries during 1980-81.

Country	FBAT	FBIYT-L	FBIYT-S	FBISN-L	FBISN-S	FBIF3T	FBIF3T-E	FBION	FBDPPT	FBFIT	FBWCT	CAT	CIYT	CIYT-W	CIYT-L	CISN	CIF3T-A	CIF3T-B	CIF3T-C	CIABN	CIABN-D	CDPPT	CFIT	CWCT	LAT	LIYT-L	LIYT-S	LISN-L	LISN-S	LIF3T-N	LIF3T-S	LDPPT	LFIT	LWCT	Total
Afghanistan	1			1	1	1						3	3	2		1		1							2	2	2	1	1	1					23
Algeria		1		3	3	1		1	1	1	2	4	1	4	1	1	1			3			3	4	1	3		3			1	3	4	50
Argentina	1	1			1				1	1	1	3	3		3	1						2	1	2	3	2	2	1	1			1		2	33
Bangladesh																1		1				2	1				1				1	2	1		10
Canada															1																				1
Chile	1	1		2		1						5	2		5	5		4				3	3	2	3	5	1	5	1	2		3	3	2	59
China				1	1																														2
Cyprus		1	1								1		1	1	1							1		1											8
Ecuador				1	1																				2										
Egypt	1	1	1	2	2		2	3		4	2	1	1	1	1	1		1					1	1	1	1	2		1		1		1	2	35
Ethiopia	1		1	1	1	1	1		3	1	2													2										2	16
Greece				1	1									1						1															4
Guatemala	1			1		1				1						1							1		1	1	1	1	1		1		1		13
W. Germany	1			1	1	1																													4
Honduras				1	1				1	1			1			1						1	1		1							1	1		11
India												1	1	1	1	1	1	1	1	1	1	2	2		1	1	1	1	1		1	2	2		24
Iraq	1			3	1							3	1	3		3									2	2		2	1						22
Italy	1	1						1								1																			4
Japan				1	1																														2
Jordan	1	1		1	1				2		1	2	2	3	2	2	1			2		5	4	4	3	3	3	2	2	1	1	5	4	4	62
Lebanon		1		2	1				1	1	1	2	2	2		1						1	1	1		1	2	1	1					1	23
Libya	1	1		2			1			1		1	1	1												1									10
Mexico												1			1	1		1						1	1	1	1	1		1					10
Morocco		1	1	1	2			1	3			3	3	1	1	1				2						2	2	1	1						26
Nepal				1	1						1													2				1	1		1			1	9
Oman	1	1											2	1	1							2	1		1	1	2								13
Pakistan				1	1							3	2	5	1	1	2		3	7	3	1	2	4	5		2	3	3		3	1	1	3	57
Peru		1		1	1																														3
Poland				1	1																														2
Spain	2	1	2		3	1		3					1	2	2											1	1								19
Sudan					2		3	1		1	1																									8
Turkey	1	1	2	1	1	1						3	5	5	3	5	4			4	1				2	3		4		4					50
Tunisia	1	1		1		1				1	3		3	2	4	1	2	1		3			1	3	2	2		2			1		1	3	39
U.S.A.												2	1	1	1	2									1											8
ICARDA	4	4	4	4	4	4	3	2	2	1	1	3	4	4	2	3	1	1	1	3	1	3	2	1	3	3	3	4	4	2	2	1	1	1	86
total	20	19	12	35	33	13	10	12	14	14	16	44	38	42	30	33	11	10	5	26	6	23	24	27	35	35	26	33	20	11	13	17	19	25	751

Table 2.2. List of cooperators for FLIP 1980-81 International Nurseries

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Table 2.3. Latitude, longitude, altitude and rainfall for some of the locations from which data was received for 1980-81 season.

Country	Location	Latitude	Longitude	Altitude (m)	Rainfall (mm)
AFGHANISTAN	Kabul	34° 27' N	69° 07' S	1825	107
ARGENTINA	Pergamina	30° 00' N	60° 30' E	50	778
	Salta	25° 31' N	63° 22' E	278	18
CANADA	Saskatoon	52° 00' N	106° 00' W	300	224
CHILE	Valdivia	39° 48' N	74° 24' E	12	589
	Chillan	36° 58' N	72° 06' E	400	547
	Graneros	34° 00' S	70° 00' W	479	132
CHINA	Peking	30° 18' N	120° 10' E	4.6	914
CYPRUS	Nicosia	35° 08' N	33° 24' E	150	327
ECUADOR	Quito	00° 36' N	77° 50' W	2700	315
EGYPT	Sakha	30° 45' N	31° 00' E	6	NA(1)
	Sids	31° 00' N	23° 30' E	30	NA
ETHIOPIA	Debre Zeit	38° 58' E	08° 44' E	1900	594
GREECE	Saloniki	40° 00' N	22° 00' E	10	160
	Larissa	39° 00' N	22° 00' E	70	356
W. GERMANY	Stuttgart	49° 00' N	09° 00' E	420	329
INDIA	New Delhi	28° 00' N	77° 00' E	227	88
IRAQ	Arbil	36° 11' N	44° 00' E	414	871
	Dohouk	36° 50' N	43° 05' E	480	704
ITALY	Bari	41° 07' N	NA	NA	520
JAPAN	Kagawa-Ken	34° 16' N	134° 08' E	80	1340
JORDAN	Marrow	32° 33' N	35° 31' E	580	386
	Hisban	31° 43' N	35° 48' E	785	NA
	Ramtha	32° 34' N	36° 01' E	520	181
LEBANON	Beka'a	33° 55' N	36° 04' E	995	853
	Terbol	34° 00' N	36° 00' E	890	NA
LIBYA	Tripoli	32° 40' N	12° 50' E	50	158

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Cont'd Table 2.3.

Country	Location	Latitude	Longitude	Altitude (m)	Rainfall (mm)
MEXICO	Mexico	20° 31' N	100° 49' E	50	158
MOROCCO	Merchouch	33° 30' N	6° 48' W	400	241
NEPAL	Kathmandu	27° 40' N	85° 20' E	1360	385
PAKISTAN	Islamabad	33° 00' N	73° 00' E	683	333
	Lahore	31° 19' N	74° 05' E	225	181
	Faisalabad	31° 00' N	73° 00' E	213	123
PERU	Lima	11° 00' N	74° 00' E	3000	NA
POLAND	Plock	52° 19' N	19° 24' E	130	254
SPAIN	Madrid	40° 32' N	0° 24' E	620	227
	Cordoba	37° 51' N	40° 51' W	110	225
SYRIA	Tel Hadya	36° 40' N	37° 20' E	392	372
	Lattakia	35° 40' N	35° 40' E	7	NA
TURKEY	Ankara	39° 55' N	32° 40' E	902	419
	Diyarbakir	37° 55' N	40° 12' E	660	583
U.S.A.	Pullman	46° 46' N	117° 12' W	776	550
	California	38° 00' N	122° 00' W	60	NA

(1) Not Available

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. 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 that 0.05. The coefficients of variation given in the different tables were calculated using an error mean sum of squares (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 fertilizer, 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),

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

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).

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)

Material

The Chickpea Adaptation Trial included ten entries, eight of which are the land races and are widely grown in different countries of the region. These land races have been chosen considering that these may be diverse and help in classification of countries into agro-ecological zones. Two others viz. ILC 1919 and ILC 519 are the genotypes developed through hybridization and pure line selection in India and Egypt, respectively and are cultivated very widely.

Methods and Management

The design of the trial was randomised complete block with four replications. The recommended plot size was four rows, each four meter long and with inter-and intra row spacings of 0.30m and 0.10m, respectively.

Forty four sets of trials were distributed to co-operators in 18 countries. But the results were received for 13 trials from 10 countries. The agronomic data provided by the co-operators are given in Table 3.1.1.

Results and Discussion

The data on days to flowering, days to maturity and plant height for different genotypes at different locations are given in Table 3.1.2, 3.1.3 and 3.1.4 respectively. Mean days to flower was the least for Dohouk in Iraq (49 days) and was followed by Arbil and Kabul with 51 days to flower. However, Behira in Egypt and New Delhi in India, were the locations where the genotypes took maximum number of days to flower, i.e. 111 and 99 days, respectively. For days to maturity, almost same pattern was observed as that of days to flowering the genotype ILC 1934 which was latest in flowering at most of locations

Table 3.1.1. Agronomic data for different locations for the CAT during 1980/81.

Country	Location	Planting date	Crop (1) duration (days)	Fertilizer (kg/ha) N	P_2O_5	K_2O	Irrigation	Insecticide
AFGHANISTAN	Kabul	22.10.80	107	30	60		5	
EGYPT	Behira	26.11.80	161	15	30		4	
INDIA	New Delhi	28.10.80		15	40		1	Hildan
IRAQ	Arbil	19.3.81	82					
IRAQ	Dohouk	19.3.81	73					
JORDAN	Hisban	22.2.81	119	2	5			
LEBANON	Kfardan	10.3.81	114					
LEBANON	Terbol	1.4.81	93					
LIBYA	El-Safsaf	21.3.81					3	
MEXICO	Celaya	3.12.80	127				1	
SYRIA	Tel Hadya	22.2.81	106	30	50		5	
U.S.A	Davis	4.5.81	106	309				Imidan,Cygon
U.S.A	Pullman	5.8.81	125					

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

was also latest in maturity. The similarity in days to flowering and days to maturity at specific locations may be due to agro-ecological similarities.

The perusal of plant height data (Table 3.1.4) revealed that the mean maximum height was obtained at Behira (71 cm) in Egypt. It is worth mentioning that at this location the mean flowering and maturity was very late. Further the genotypic means across locations also revealed that the genotype ILC 1934 which flowered and, matured very late, possessed the maximum height this shows that plant height might be positively correlated with days to flowering and days to maturity.

The seed yield for different entries at different locations are presented in Table 3.1.5. The analysis of variance for different locations revealed that the differences among the entries were significant at all the locations except Tunisia. The coefficient of variation for different locations ranged from 11.1 to 46.9%. The locations including Hisban (46.9%), Elsafsaf (35.9%) and Pullman (41.1%) had very high coefficient of variation as compared to others. The mean yield ranged from 814 kg/ha at Hisban to 3527 kg/ha at Behira. The highest yield up to 4375 kg/ha was recorded for ILC 519 at Behira. The genotype ILC 1919 gave the highest yield of 1810 kg/ha across the locations and was followed by ILC 1929 (1758 kg/ha), ILC 1922 (1756 kg/ha), ILC 1931 (1699 kg/ha), ILC 519 (1652 kg/ha), ILC 1932 (1611 kg/ha) etc. The genotype, ILC 1933 was the poorest yielder (1269 kg/ha).

The mean seed yield for three years across locations is given in Table 3.1.6. Because of different locations each year the characterisation of countries into different agro-ecological zones seems difficult. However, the stability of genotypes can be predicted from the performance across locations and years. The genotype ILC 1919 ranked first in 1979/80 and 1980/81 and second in 1978/79 and produced the highest seed yield on an average of three years. Similarly ILC 1929 maintained its second rank throughout three years

and ILC 1929 was first in 1978/79, 4th in 1979/80 and 3rd in 1980/81. On the contrary, the genotype ILC 1934 and ILC 519 were among the poor rankers in almost all the years.

The correlations between the seed yields of the entries in the CAT at different locations during 1980/81 are given in Table 3.1.7. Most of the correlations as also in the previous year, were not significant indicating that the grouping of locations on the basis of seed yield is not feasible or there are wide genotype x location interactions.

Table 3.1.2. Days to flowering for entries in the CAT at different locations during 1980/81.

Entry	Varietal names	Origin	AFGHANISTAN Kabul	EGYPT Behira	INDIA New Delhi	IRAQ Arbil	IRAQ Dohouk	JORDAN Hisban	LEBANON Kfar-dan	LEBANON Terbol	MEXICO Mexico	SYRIA Tel Hadya	U.S.A. Pull-man	MEAN
ILC 519	Giza 1	Egypt	48	103	95	51	49	66	76	55	69	65	59	67
1919	L-550	India	51	111	96	52	50	64	75	55	70	65	59	68
1922	Rabat	Morocco	52	112	97	51	46	65	78	58	79	67	59	69
1929	Syrian Lcoal	Syria	51	105	101	52	50	62	74	55	70	66	59	68
1930	Lebanese Local	Lebanon	51	106	106	50	50	66	75	58	74	66	59	69
1931	Turkish Local	Turkey	49	105	98	50	49	65	75	56	73	66	59	68
1932	Jordanian Local	Jordan	50	118	100	52	47	64	75	56	75	66	59	69
1933	Baladi	Sudan	47	120	89	52	48	63	75	56	65	65	59	67
1934	Iranian Local	Iran	53	124	106	52	50	66	82	60	80	69	59	73
3256	Cyprus Local	Cyprus	54	103	99	52	50	66	74	58	76	67	59	69
Location mean			51	111	99	51	49	65	76	57	73	66	59	

Table 3.1.3. Days to maturity for entries in the CAT at different locations during 1980/81

Entry	AFGHANISTAN Kabul	EGYPT Behira	IRAQ Arbil	IRAQ Dohouk	JORDAN Hisban	LEBANON Kfardan	LEBANON Terbol	MEXICO Mexico	SYRIA Tel Hadya	U.S.A. Davis	U.S.A. Pullman	MEAN
ILC 519	104	161	83	75	119	114	94	126	105	107	125	111
1919	107	162	81	72	119	112	91	126	104	107	125	110
1922	108	161	83	72	119	114	95	128	107	108	125	111
1929	106	162	81	73	119	114	92	126	106	113	125	111
1930	107	162	81	73	119	114	91	128	106	109	125	110
1931	106	163	83	73	119	114	94	129	106	107	125	111
1932	108	160	81	72	119	114	91	126	106	107	125	110
1933	105	162	82	73	119	112	89	112	104	90	125	107
1934	108	160	83	74	119	116	102	142	112	112	125	114
3256	109	157	82	74	119	114	91	127	106	104	125	110
Location mean	107	161	82	73	119	114	93	127	106	106	125	

Table 3.1.4. Plant height (cm) of entries in the CAT at different locations during 1980/81.

I L C	AFGHANISTAN Kabul	EGYPT Behira	I R A Q		LEBANON		MEXICO Mexico	SYRIA Tel Hadya	U.S.A. Pull-man	MEAN
			Arbil	Dohouk	Kfardan	Terbol				
519	36	78	39	27	38	36	43	33	33	40
1919	35	60	38	25	31	29	34	26	29	34
1922	40	76	38	30	39	34	39	31	30	40
1929	39	67	36	26	37	33	40	29	27	37
1930	35	74	36	29	35	30	34	27	28	36
1931	34	65	38	29	38	31	38	31	30	37
1932	35	70	35	26	38	30	37	30	33	37
1933	37	66	36	30	38	34	39	31	31	38
1934	40	89	40	29	42	41	52	33	37	45
3256	34	66	40	28	36	31	35	29	27	36
	37	71	38	28	37	33	39	30	31	

Table 3.1.5. Seed yield (Y= kg/ha) and rank (R) of entries in the CAT at different locations during 1980/81.

ENTRY	EGYPT Behira		INDIA New Delhi		IRAQ Arbil		IRAQ Dohouk		JORDAN Hisban		LEBANON Kfardan		LEBANON Terbol		LIBYA El-Safsaf		MEXICO Mexico		SYRIA Tel Hadya		TUNISIA Tunis		U. S. A. Davis		U. S. A. Pullman		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	R	Y	R
ILC 519	4375	1	2310	4	1071	2	1219	6	1104	2	1397	8	1322	7	890	9	1298	7	1113	8	1156	8	3178	7	1049	5	1652	5
1919	3750	3=	3411	1	917	6	995	10	696	8	1556	4	1415	5	1517	1	1804	2	1364	6	1023	9	3929	2	1149	2	1810	1
1922	3750	3=	2557	2	833	8	1271	3	865	3	1460	7	1487	4	1296	4	1685	3	1320	7	1174	6	4278	1	855	7	1756	3
1929	3743	5	1945	8	1107	1	1266	4	813	5	1464	6	1701	1	1340	3	1887	1	1399	3	1210	4	3848	3	1128	3	1758	2
1930	3403	6	1810	9	821	9	1224	5	1107	1	1590	2	1409	6	1477	2	1315	6	1499	1	1203	5	2815	8	973	6	1588	7
1331	4236	2	2232	5	952	5	1198	7	839	4	1566	3	1233	9	914	8	1482	5	1404	2	1422	3	3512	4	1100	4	1699	4
1332	3125	7=	2214	6	1036	3	1182	8	789	7	1469	5	1492	3	1279	5	1161	8	1389	4	1572	1	3461	5	775	3	1611	6
1933	2778	10	2318	3	1012	4	1141	9	797	6	1302	10	1255	8	939	7	976	10	1101	9	1165	7	1297	10	420	10	1269	10
1934	2986	9	1469	10	857	7	1323	1	528	10	1349	9	1085	10	-	-	1643	4	1051	10	809	10	2420	9	1289	1	1401	9
3256	3125	7=	2089	7	774	10	1313	2	607	9	1666	1	1668	2	1254	6	1024	9	1376	5	1499	2	3349	6	846	8	1584	8
Location mean	3527		2235		938		1213		814		1482		1407		1212		1427		1302		1223		3209		959			
C.V.%	26.3		19.7		19.4		22.7		46.9		11.9		21.9		35.9		26.8		11.1				19.8		41.1			
SE ±	464.3		719.9		90.9		137.4		191.2		87.8		153.7		217.8		191.5		72.0				366.4		196.7			

Table 3.1.6. Seed yield (y=kg/ha) and ranking (R) of different entries in CAT during 1978/79, 1979/80 and 1980/81.

ENTRY	1978/79		1979/80		1980/81		Average		Av.Rank	
	Y	R	Y	R	Y	R	Y	R	Y	R
ILC 519	921	(6)	878	(8)	1652	(5)	1150	(7)	6.33	(6)
ILC 1919	1107	(3)	1199	(1)	1810	(1)	1372	(1)	1.66	(1)
ILC 1922	1157	(1)	1049	(4)	1756	(3)	1321	(3)	2.66	(3)
ILC 1929	1140	(2)	1123	(2)	1758	(2)	1340	(2)	2.00	(2)
ILC 1930	1029	(5)	964	(7)	1588	(7)	1194	(5)	6.33	(6)
ILC 1931	729	(8)	1059	(3)	1699	(4)	1162	(6)	5.00	(4)
ILC 1932	1090	(4)	977	(6)	1611	(6)	1226	(4)	5.33	(5)
ILC 1933	-		778		1269		1024			
ILC 1934	888	(7)	985	(5)	1401	(8)	1091	(8)	6.66	(8)
ILC 3256	-		1109		1584		1346			

Table 3.1.7. Correlations [1] (df=8) between the seed yield of entries in the CAT at different locations during 1980/81.

Country	Location	INDIA	I R A Q		JORDAN	LEBANON		LIBYA	MEXICO	SYRIA	TUNISIA	U. S. A.	
		New Delhi	Arbil	Dohouk	Hisban	Kfardan	Terbol	El-Safsaf	Mexico	Tel Hadya	Tunis	Davis	Pullman
EGYPT	-Behira	0.33	0.29	-0.14	0.53	0.22	0.04	-0.22	0.44	0.20	0.04	0.60	0.49
INDIA	-New Delhi		0.08	-0.82**	0.03	0.18	0.16	0.18	0.20	0.16	0.02	0.40	-0.12
IRAQ	-Arbil			-0.27	0.28	-0.50	0.04	-0.39	0.09	-0.20	0.09	-0.06	-0.07
IRAQ	-Dohouk				-0.11	-0.02	0.12	-0.14	-0.08	-0.12	0.06	-0.02	0.14
JORDAN	-Hisban					0.01	0.04	-0.16	-0.12	0.22	0.14	0.05	-0.12
LEBANON	-Kfardan						0.53	0.46	-0.01	0.83**	0.51	0.54	0.21
LEBANON	-Terbol							0.47	0.06	0.63*	0.53	0.56	-0.14
LIBYA	-El.Safsaf								0.43	0.57	-0.13	0.43	0.27
MAXICO	-Mexico									0.14	-0.52	0.59	0.73*
SYRIA	-Tel Hadya										0.58	0.58	0.08
TUNISIA	-											0.25	-0.43
U.S.A.	-California												0.46

(1) * $P \leq 0.05$
** $P \leq 0.01$

3.2. CHICKPEA INTERNATIONAL YIELD TRIAL (CIYT)

Material

The Chickpea International Yield Trial (CIYT) comprised 24 test entries and one check to be supplied by the co-operator. These 24 entries were derived from the germplasm collections maintained at Tel Hadya which have shown a superior performance either in regional or international trials conducted by ICARDA. Co-operators were free to use these entries in their breeding programmes or for release as cultivars.

Methods and Management

The design of the trial was a 5x5 quadruple lattice (with four replications) but the results were analysed for a completely randomised block design. The suggested plot size was 4 rows, each 4m long, with an inter-and intra-row spacings of 0.30m and 0.10m, respectively.

Thirty eight sets of trials were distributed to the co-operators in 22 countries. Results were, however, received from 14 countries for 20 trials. The information on the agronomic practices received from the co-operators is given in Table 3.2.1.

Results and Discussion

The data on days to flowering days, to maturity and plant height are given in Tables 3.2.2, 3.2.3, and 3.2.4, respectively. Dohouk in Iraq was the location where the genotypes flowered at the earliest i.e. in 43 days and was followed by Arbil, Kabul and Diyarbakir flowering in 52, 53 and 54 days, respectively. At Shandweel and New Delhi the genotypes flowered in 94 and 91 days respectively. It seems that the temperature and day length during the early growth periods were not sufficient for allowing the genotypes to flower at the places

Table 3.2.1. Agronomic data for different locations for the CIYT during 1980/81.

Country	Location	Planting date	Crop (1) duration (days)	Fertilizer (Kg/ha) N	P_2O_5	K_2O	Irrigation	Insecticide
AFGHANISTAN	Kabul	22.4.81	109	30	60	-	5	-
CYPRUS	Nicosia	6.3.81	-	22	50	-	-	-
EGYPT	Shandweel	6.11.80	140	35	70	-	2	-
INDIA	New Delhi	27.10.80	-	15	40	-	1	Hildan
IRAQ	Arbil	11.3.81	122	100	100	-	-	-
IRAQ	Dohouk	23.3.81	65	-	-	-	-	-
JORDAN	Hisban	21.2.81	119	2	5	-	-	-
LEBANON	AUB	21.5.81	-	30	100	-	13	-
LEBANON	Kfardan	10.3.81	114	-	-	-	-	-
LEBANON	Terbol	25.3.81	100	-	-	-	-	-
LIBYA	El.Safsaf	21.3.81	-	-	-	-	-	-
MOROCCO	Merchouch	23.2.81	-	-	-	-	-	-
MOROCCO	Zememra	20.4.81	91	-	-	-	4	-
PAKISTAN	Faisalabad	10.11.80	-	18	46	-	1	-
SYRIA	Tel Hadya	16.2.81	115	30	30	-	1	-
SYRIA	Kafar Antoon	-	-	-	-	-	-	-
TURKEY	Ankara	20.3.81	122	20	60	-	-	-
TURKEY	Diyarbakir	11.4.81	85	40	60	-	-	-
U.S.A.	Pullman	5.8.81	125	-	-	-	-	Imidan,Cygon

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

like New Delhi and Shandweel as compared to other locations where the crop was grown during spring. At Pullman in USA and Arbil in Iraq all the genotypes flowered at the sametime whereas at other locations wide range of variation was observed in flowering behaviour. In general, the days to flowering and days to maturity showed a similar pattern with respect to location means. The genotypic means across locations for days to flowering ranged from 63 for ILC 642 to 69 days for ILC 262, ILL 161 and ILC 464; and for days to maturity from 110 to 112 days. The plant height data revealed that the genotypes were tallest at Shandweel with 64cm height and shortest at Ankara in Turkey with 24cm height (Table 3.2.4.). The genotypic means across locations, however, ranged from 32cm for ILC 1920 to 39 cm for ILC 237.

The seed yield and rank of different genotypes at each location is given in Table 3.2.5. The analysis of variance for the design revealed that the differences among the entries were significant at all the locations except for Oman and Tunisia. The co-efficient of variation for the design (Table 3.2.5) ranged from 10.5 per cent at Tel Hadya to 55.2 per cent at Faisalabad. At Faisalabad, high C.V. seems to be due to Ascochyta blight. The least significant difference calculated for each location revealed that 13 entries exceeded the local check at Kafar Antoon, whereas at other locations including Terbol, AUB, Nicosia, Tel Hadya, Pullman, Shandweel, Diyarbakir and Faisalabad, the local check was significantly exceeded by 5,4,4,3,2, 1,1 and 1 entries, respectively. The genotypic mean at locations ranged from 206 kg/ha at Faisalabad to 2606 kg/ha at Diyarbakir. The highest yield of 3063 kg/ha was recorded for ILC 35 at Diyarbakir. On an average across locations, ILC 576 gave the highest yield of 1247 kg/ha and was followed by ILC 237 (1219 kg/ha), ILC 464 and ILC 295 (1179 kg/ha), ILC 66 (1157 kg/ha), ILC 35 (1156 kg/ha) etc. The five highest yielding entries at each location are given in Table 3.2.6. The perusal of this table revealed that the genotypes ILC 35, -66, -237, -263, -295, -464, -1920 and -1929 maintained their position at least among the first five at least at 5 or more locations. At Cyprus, Faisalabad, Kafar Antoon, and Pullman, some of these genotypes excelled

the check by a margin of even more than 100 per cent. These genotypes could be of practical significance to the national programs. The two genotypes, namely ILC 237 and ILC 493, which were among the top five higest yielding entries in 1979-80 were also among the top five during 1980-81. It seems that these genotypes were widely adapted.

The correlations between the location means for seed yield are given in Table 3.2.7. Most of these correlations were not significant. This exhibits that genotype location interactions maybe well pronounced in the existing material or in other words most of the existing genotypes may not be widely adapted.

Table 3.2.2. Days to flowering for entries in the CIYT at different locations during 1980/81.

ENTRY		ORIGIN	AFGHANISTAN	CYPRUS	EGYPT	INDIA	I R A Q		JORDAN	LEBANON		SYRIA	TURKEY		U.S.A.	MEAN
			Kabul	Nicosia	Shand-weel	New Delhi	Arbil	Dohouk	Hisban	Kfar-dan	Terbol	Tel Hadya	Ankara	Diyar-bakir	Pull-man	
ILC	4	Jordan	54	62	91	96	52	41	69	78	63	74	73	55	59	67
	23	Iran	54	69	89	88	52	41	70	74	63	75	75	52	59	66
	35	Syria	51	67	92	100	52	43	69	74	62	72	73	53	59	67
	66	Iraq	47	67	91	83	52	43	63	71	61	70	74	52	59	64
	161	Tunisia	54	68	102	104	52	41	73	78	64	75	77	55	59	69
	237	Spain	54	68	92	94	52	43	69	76	67	73	73	55	59	67
	260	Turkey	51	66	92	65	52	42	66	75	62	72	73	52	59	64
	262	"	55	65	101	107	52	41	71	76	64	74	73	54	59	69
	263	"	54	65	95	100	52	43	70	76	66	73	73	54	59	68
	294	Iran	55	66	92	104	52	43	71	78	67	75	73	55	59	68
	295	"	49	66	91	82	52	43	66	74	62	72	73	54	59	65
	463	Turkey	50	66	90	91	52	44	78	76	64	72	77	52	59	67
	464	"	56	67	104	103	52	44	68	76	67	73	73	56	59	69
	480	"	51	61	101	93	52	42	71	78	65	74	73	55	59	67
	493	Unknown	51	62	91	75	52	42	68	74	62	73	73	54	59	64
	501	Turkey	54	67	99	98	52	43	71	74	62	75	77	53	59	68
	576	Lebanon	51	68	91	101	52	43	69	74	63	74	73	54	59	67
	610	Unknown	54	67	104	93	52	44	71	74	62	74	73	55	59	68
	642	Iran	48	65	91	58	52	43	63	74	61	71	76	52	59	63
	750	"	55	62	91	100	52	44	70	78	64	74	73	57	59	68
	1298	USA	53	60	100	87	52	44	71	75	62	75	73	56	59	67
	1345	Afghanistan	56	68	91	93	52	44	72	77	65	75	73	56	59	68
	1920	India	55	62	93	104	52	42	71	76	64	74	73	56	59	68
	1929	Syria	51	63	92	70	52	42	68	71	62	73	73	53	59	64
Local check			51	66	89	79	52	41	68	74	64	72	71	53	59	
Location mean			53	65	94	91	52	43	69	75	64	73	74	54	59	

Table 3.2.3. Days to maturity for entries in the CIYT at different locations during 1980/81.

ENTRY	AFGANISTAN	EGYPT	I R A Q		JORDAN	LEBANON		SYRIA	TURKEY		U.S.A.	MEAN
	Kabul	Shand-weel	Arbil	Dohouk	Hisban	Kfardan	Terbol	Tel Hadya	Ankara	Diyar-bakir	Pullman	
ILC 4	110	140	122	67	119	114	97	114	122	85	125	110
23	111	139	122	67	119	114	98	116	122	84	125	111
35	112	141	122	65	119	114	103	115	122	85	125	111
66	108	141	122	65	119	112	97	114	122	85	125	110
161	110	143	122	64	119	114	104	114	122	86	125	111
237	109	141	122	66	119	114	105	116	122	86	125	111
260	109	141	122	65	119	114	99	116	122	86	125	111
262	111	141	122	65	119	112	100	115	122	86	125	111
263	108	140	122	64	119	112	103	114	122	85	125	110
294	106	139	122	65	119	114	103	116	122	85	125	111
295	107	140	122	65	119	114	99	114	122	84	125	110
463	107	139	122	65	119	114	99	115	122	85	125	110
464	116	140	122	61	119	116	107	118	122	87	125	112
480	111	140	122	64	119	114	102	116	122	85	125	111
493	109	139	122	64	119	112	101	115	122	85	125	110
501	108	140	122	64	119	114	98	115	122	85	125	110
576	109	141	122	64	119	114	98	116	122	86	125	111
610	110	142	122	65	119	114	101	116	122	86	125	111
642	111	141	122	66	119	114	98	114	122	84	125	111
750	109	140	122	63	119	112	98	116	122	87	125	110
1298	110	142	122	62	119	114	102	115	122	86	125	111
1345	108	139	122	65	119	114	99	116	122	86	125	110
1920	109	138	122	64	119	112	98	114	122	85	125	110
1929	107	141	122	66	119	114	98	115	122	85	125	110
Local check	108	141	122	65	119	114	97	113	122	85	125	
Location mean	109	140	122	65	119	114	100	115	122	85	125	

Table 3.2.4. Plant height (cm) of entries in the CIYT at different locations during 1980/81.

ENTRY	AFGANISTAN	CYPRUS	EGYPT	I R A Q		L E B A N O N			SYRIA	TURKEY		U.S.A.	Mean
	Kabul	Nicosia	Shand-weel	Arbil	Dohouk	AUB	Kafr-dan	Terbol	Tel Hadya	Ankara	Diyar-bakir	Pullman	
ILC 4	38	26	59	33	34	23	38	31	32	22	34	35	34
23	44	30	68	32	36	25	39	33	34	22	36	37	36
35	38	31	51	31	33	25	38	34	34	22	31	37	34
66	37	29	63	34	33	23	37	31	33	21	35	32	34
161	39	29	65	27	41	27	37	33	34	20	35	34	35
237	41	30	71	30	38	31	42	35	40	27	40	45	39
260	34	28	64	31	37	26	38	35	38	22	39	38	36
262	38	32	65	35	40	26	40	34	35	22	39	32	37
263	38	30	70	29	36	23	40	34	35	23	36	35	36
294	38	32	64	33	30	30	38	35	40	29	36	38	37
295	38	32	63	32	25	29	39	33	37	26	39	38	36
463	38	29	62	33	33	31	39	34	32	25	36	33	35
464	38	31	71	34	27	30	42	34	38	27	36	39	37
480	39	29	65	33	28	32	41	33	36	26	39	34	36
493	38	29	66	32	29	25	39	32	33	25	33	34	35
501	38	29	69	32	30	28	39	34	33	23	39	36	36
576	40	30	67	35	33	25	37	31	32	25	34	38	36
610	38	31	60	33	32	25	40	31	34	24	36	37	35
642	40	28	62	35	26	27	38	30	36	24	31	36	34
750	43	27	66	30	31	31	37	33	34	24	31	36	35
1298	41	28	56	30	29	30	39	31	34	23	34	37	34
1345	40	30	66	33	34	32	40	38	36	24	38	38	37
1920	38	28	55	26	32	28	35	30	31	22	31	32	32
1929	40	31	62	35	36	26	38	33	32	22	35	31	35
Local check	43	25	66	31	35	28	36	29	34	26	35	41	
Location mean	39	29	64	32	33	27	39	33	35	24	36	36	

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 1980/81.

ENTRY	CYPRUS Nicosia		EGYPT Shandweel		INDIA New Delhi		IRAQ Arbil		IRAQ Dohouk		JORDAN Hisban		LEBANON AUB		LEBANON Kfardan		LEBANON Terbol		LIBYA ElSafsaf		MOROCCO Merchouch		MOROCCO Zemamra		OMAN Muscat		PAKISTAN Faisalabad		SYRIA Tel Hadya		SYRIA Kafar Antoon		TUNISIA Tunis		TURKEY Ankara		TURKEY Diyarbakir		U.S.A. Pullman		MEAN		100 seed weight (g)
	Y	R	Y	R	Y	P	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	Y	R	
ILC 4	283	23	1333	14	1826	5	864	6	1292	23	575	13	545	2	1558	8	1373	15	1370	17	768	14	893	11	368	18	333	3	1798	23	1492	3	1837	1	393	25	2652	9	1287	14	1142	9	27.7
23	301	22	1250	15	1708	13	655	22	1385	15	643	7	312	19	1451	17	1256	21	1565	8	714	18	1027	2	368	18	83	24	1844	19	1131	12	1088	18	420	23	2823	6	1156	20	1059	21	32.0
35	555 (1)	3	764	25	1669	17	806	9	1521	3	600	11	356	14	1559	7	2003	5	1346	19	839	10	982	5	465	7	182	15	2082	4	1068	16	1033	22	526	11	3063	1	1692	4	1156	6	37.9
66	451	9	1097	21	1693	14	921	3	1365	16	581	12	440	6	1465	16	1761	7	1459	12	607	24	1027	2	443	12	250	8	2268	1	825	24	1408	7	460	20	2351	2	1673	5	1157	5	27.4
161	422	14	1514	10	1388	22	831	7	1297	22	683	5	505	4	1213	25	2435	2	1660	4	732	16	893	11	443	12	109	21	1772	25	1433	4	1119	16	510	16	2547	16	996	23	1125	14	34.4
237	453	8	1889	5	1294	25	788	10	1453	8	614	10	253	23	1495	13	2350	3	1363	21	1027	3	982	5	465	7	260	6	2156	2	998	22	1404	8	552	8	2436	19	2157	2	1219	2	31.2
260	266	24	1972	4	1628	18	715	17	1326	21	491	17	384	12	1566	6	1082	24	1286	18	625	23	670	21	512	5	109	21	1980	9	1561	2	1106	17	456	21	2829	5	1523	9	1104	18	37.6
262	545	4	1111	20	1607	19	720	16	1484	5	570	14	411	8	1517	10	1728	8	1395	16	804	11	759	16	368	18	167	17	1907	13	1081	14	1237	13	460	19	2601	12	831	25	1065	20	31.7
263	319	20	1014	22	1672	16	769	12	1563	1	639	8	346	17	1633	2	2278	4	1412	14	1045	2	893	11	360	21	125	19	2118	3	1163	9	1054	21	513	14	2937	3	1200	18	1153	7	32.1
294	438	10	1764	6	1604	20	775	11	1516	4	628	9	223	24	1244	24	1621	9	1415	13	607	24	714	18	493	6	219	11	1898	14	1183	8	1275	12	622	5	2413	21	1629	6	1114	17	29.0
295	365	18	2167	2	1909	4	670	20	1344	18	487	18	409	9	1467	15	1610	10	1609	6	661	21	938	8	424	15	313	4	2082	4	1071	15	1190	14	637	4	2794	7	1433	11	1179	3	30.6
463	386	17	1194	18	1815	6	687	19	1344	18	355	24	519	3	1590	4	1810	6	1278	22	777	12	625	23	535	3	182	15	2001	7	1282	6	1556	3	651	3	2500	18	1223	15	1116	16	28.3
464	306	21	2000	3	1536	21	950	2	1391	14	830	1	65	25	1481	14	2443	1	1294	20	955	7	670	21	341	23	125	19	1811	21	1565	1	1122	15	690	1	2124	25	1184	19	1144	8	41.9
480	463	7	1569	8	2083	3	902	4	1292	23	372	22	348	16	1515	11	1422	14	1517	9	741	15	804	15	396	16	438	1	1923	12	1161	10	905	25	638	2	2647	10	1223	15	1120	15	27.7
493	421	15	2375	1	1779	9	812	8	1349	17	706	3	389	11	1392	20	1296	17	1409	15	857	9	1027	2	465	7	229	10	2014	6	1120	13	1551	4	511	15	2558	14	1319	13	1179	3	26.7
501	405	16	903	24	1763	10	655	22	1339	20	508	15	419	7	1569	5	1236	22	1987	1	723	17	625	23	346	22	260	6	1828	20	1019	19	1003	24	587	6	2519	17	1063	21	1038	23	29.3
576	478	6	1597	7	1310	24	882	5	1494	5	667	6	598	1	1525	9	1594	12	1498	10	973	6	759	16	673	1	271	5	1965	11	1338	5	1461	5	526	11	2358	22	2977	1	1247	1	26.6
610	434	5	1000	23	1807	7	967	1	1396	13	472	20	352	15	1423	19	1352	16	1653	5	902	8	938	8	596	2	188	14	1988	8	1151	11	1370	9	533	10	2747	8	1216	17	1128	12	25.7
642	433	12	1417	13	1805	8	755	13	1401	12	478	19	403	10	1284	21	1263	20	1165	23	1009	5	982	5	526	4	104	23	1878	16	1270	7	1062	19	465	18	2436	19	1504	10	1082	19	29.8
750	435	11	1194	18	1727	12	596	25	1286	25	357	23	359	13	1429	18	1206	23	1494	11	696	19	893	11	382	17	146	18	1883	15	981	23	1322	11	503	17	2305	23	1528	8	1036	24	18.0
1298	424	13	1528	9	1760	11	638	24	1458	7	335	25	310	20	1281	22	1286	19	1765	2	777	12	1071	1	438	14	193	13	1854	18	1000	21	1450	6	545	9	2915	4	1544	7	1129	11	27.8
1345	364	19	1222	16	1333	23	750	14	1448	10	503	16	295	22	1246	23	1604	11	1127	24	643	22	491	25	319	24	248	9	1797	24	1030	18	1029	23	519	13	2232	24	1866	3	1042	22	26.7
1320	585	2	1222	16	2495	2	669	21	1453	8	402	21	304	21	1647	1	1045	25	1593	7	1018	4	714	18	465	7	365	2	1872	17	1011	20	1694	2	397	24	2551	15	1053	22	1128	12	18.3
1929	600	1	1500	11	1690	15	690	18	1526	2	733	2	470	5	1498	12	1501	13	1664	3	1071	1	938	8	452	11	42	25	1976	10	1065	17	1356	10	423	22	2598	13	982	24	1139	10	31.9
Local check	249	25	1472	12	2708	1	733	15	1432	11	695	4	321	18	1630	3	1294	18	-		696	19	714	18	-		203	12	1801	22	752	25	1056	20	576	7	2612	11	1406	12			
Location mean	418		1443		1744		768		1406		557		373		1467		1594		1472		811		841		443		206		1940		1150		1268		527		2506		1427				
C.V. %	44.3		38.1		23.3		26.5		12.9		34.5		33.8		17.5		29.5		27.7		35.8		38.7				55.2		10.5		20.7				17.3		11.4		36.7				
L.S.D. 5%	261.5		776.5		575.4		287.0		255.4		316.8		178.0		363.7		664.6		576.9		410.2		460.7				234.3		288.6		336.8				128.6		419.5		738.2				
No.of entries sig. exceeding local check.	4		1		0		0		0		0		4		0		5		0		0		0				1		3		13				0		1		2				

(1) Seed yield values under lined, significantly exceeded the local check.

Table 3.2.6. The five heaviest seed yielding entries at the individual locations in the CIYT.

Rank	CYPRUS Nicosia	EGYPT Shandweel	INDIA New Delhi	IRAQ Arbil	IRAQ Dohouk	JORDAN Hisban	LEBANON AUB	LEBANON Kfardan	LEBANON Terbol	LIBYA El.Safsaf
1	ILC 1929	ILC 493	Loc.check	ILC 610	ILC 263	ILC 464	ILC 576	ILC 1920	ILC 464	ILC 501
2	1920	295	ILC 1920	464	1929	1929	4	263	161	1298
3	35	464	480	66	35	493	463	Loc.check	237	1929
4	262	260	295	480	294	Loc.check	161	463	263	161
5	610	237	4	576	262 (1)	161	1929	501	35	610
					576					

MOROCCO Merchouch	MOROCCO Zememra	OMAN Muscat	PAKISTAN Faisalabad	SYRIA Tel Hadya	SYRIA Kafar-Antoon	TUNISIA Tunis	TURKEY Ankara	TURKEY Diyar-bakir	U.S.A. Pullman
ILC 1929	ILC 1298	ILC 576	ILC 480	ILC 66	ILC 464	ILC 4	ILC 464	ILC 35	ILC 576
263	23	610	1920	237	260	1920	480	66	237
237	66	463	4	263	4	463	463	263	1345
1920	493	642	295	35	161	493	295	1238	35
642	35	260	576	295	576	576	294	260	66
	237								
	642								

(1) The brackets indicate entries having the same rank.

Table 3.2.7. Correlations (1) (df=22) between the seed yield of entries in the CIYT at different locations during 1980/81 (local check excluded from the calculations).

Country Location	EGYPT Shand-weel	INDIA New Delhi	IRAQ Arbil	IRAQ Dohouk	JORDAN Hisban	LEBANON AUB	LEBANON Kfar-dan	LEBANON Terbol	LIBYA El Safsaf	MOROCCO Mer-chouch	MOROCCO Zeme-mra	OMAN	PAKISTAN Faisal-abad	SYRIA Tel Hadya	SYRIA Kafar Antoon	TUNISIA Tunis	TURKEY Ankara	TURKEY Diyar-bakir	U.S.A. Pullman
CYPRUS - Nicosia	-0.28	0.22	-0.02	0.42*	-0.08	0.13	0.05	-0.07	0.26	0.38	0.16	0.32	0.12	0.19	-0.52*	0.16	-0.15	0.03	-0.01
EGYPT - Shandweel		-0.13	0.09	-0.21	0.29	-0.21	-0.24	0.04	-0.16	-0.02	0.07	0.13	0.08	0.03	0.34	0.11	0.28	-0.28	0.18
INDIA - NewDelhi			-0.21	-0.21	-0.51*	-0.01	0.38	-0.55**	0.26	0.06	0.07	-0.05	0.42*	-0.04	-0.20	0.25	-0.10	0.27	-0.50*
IRAQ - Arbil				-0.05	0.42*	-0.04	-0.04	0.40	-0.23	0.14	0.06	0.25	0.22	0.19	0.34	0.02	0.22	-0.05	0.20
IRAQ - Dohouk					0.31	-0.22	0.06	0.26	-0.10	0.49*	0.03	0.14	-0.23	0.25	-0.27	-0.05	-0.13	0.13	0.22
JORDAN - Hisban						-0.13	-0.05	0.54**	-0.11	0.30	0.10	-0.07	-0.37	0.06	0.31	-0.08	-0.08	-0.15	0.05
LEBANON- AUB							0.17	-0.20	0.17	-0.05	0.10	0.38	0.07	0.10	0.08	0.31	-0.34	0.21	0.12
LEBANON- Kfardan								-0.04	0.07	0.32	-0.15	-0.01	0.23	0.35	0.03	0.19	-0.10	0.27	-0.11
LEBANON- Terbol									-0.23	0.23	0.01	-0.14	-0.20	0.25	0.18	-0.22	0.36	-0.10	0.08
LIBYA - El-Safsaf										-0.03	0.22	-0.03	0.11	-0.12	-0.32	0.03	0.02	0.26	-0.27
MOROCCO- Merchouch											0.20	0.25	-0.16	0.12	0.06	0.19	-0.16	-0.14	0.03
MOROCCO- Zememra												0.13	-0.17	0.39	-0.30	0.17	-0.30	0.55**	-0.01
OMAN													-0.02	0.29	0.17	0.32	-0.01	0.04	0.50*
PAKISTAN- Faisalabad														0.07	-0.22	0.26	0.25	-0.03	0.21
SYRIA - Tel Hadya															-0.41	0.08	0.04	0.49*	0.29
SYRIA - KafarAntoon																-0.02	0.11	-0.25	-0.04
TUNISIA																	-0.35	-0.05	0.11
TURKEY - Ankara																		-0.27	0.09
TURKEY - Diyarbakir																			-0.18

(1) * $P \leq 0.05$
** $P \leq 0.01$

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

Material

The material for CIYT-W comprised 19 test entries originating from Spain, USSR, Afghanistan, India, Turkey and USA, and a local check to be supplied by the local co-operator. The test entries were identified as resistant to ascochyta blight and were rated as high yielders in different trials conducted at Tel Hadya (Syria) and Terbol (Lebanon). These genotypes were homozygous and selected from the germplasm collection. The co-operators were free to use the genotypes in their breeding programmes or for release as commercial cultivars.

Methods and Management

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

Forty two sets of trials were distributed to co-operators in 20 countries. The results were returned from 18 locations in 12 countries. The information on the agronomic practices have been supplied by a number of co-operators and is presented in Table

Results and Discussion

The data pertaining to days to flowering, days to maturity and plant height are presented in Tables 3.3.2, 3.3.3, and 3.3.4, respectively. The location mean for days to flowering ranged from 62 days at Arbil in Iraq to 172 days at American University of Beirut in Lebanon. The genotypic values for days to flowering ranged from 133 days for ILC 49 to 146 days for ILC 196. There was a wide range of variation among days to flower at New Delhi in India as compared to other locations. The location mean for days to maturity nearly followed the same pattern as that of days to flower. The genotype matured earliest in 112 days

Table 3.3.1. Agronomic data for different locations for the CIYT-W during 1980/81.

Country	Location	Planting date	Crop (1) duration (days)	Fertilizer (kg/ha) N	P_2O_5	K_2O	Irrigation	Insecticide
GREECE	Larissa	24.11.80.	203	-	60		-	Phosdzin
INDIA	New Delhi	27.10.80	-	15	40		1	Hildan
IRAQ	Arbil	18.3.81	112	100	100		-	
JORDAN	Hisban	30.11.80	199	2	5		-	
JORDAN	Marrow	23.11.80	194	2.	5		-	
LEBANON	AUB	15.11.80	207	30	100		-	
LEBANON	Terbol	20.11.80	209	-	-		-	
LIBYA	El-Safsaf	16.12.80	-	-	-		-	
MOROCCO	Douyet	11.12.80	-	-	-		-	
MOROCCO	Merchouch	2.12.80	159	-	-		2	
MOROCCO	Zememra	-	-	-	-		2	
PAKISTAN	Faisalabad	10.11.80	-	18	46		1	
SPAIN	Cordoba	3.12.80	-	-	-		2	
SYRIA	Tel Hadya	12.11.80	208	30	50		-	
SYRIA	Jinderis						-	
SYRIA	Lattakia						-	
TURKEY	Diyarbakir	17.11.80	215	40	60		-	

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

at Arbil (Iraq) and latest in 215 days at Diyarbakir (Turkey). There was very little variation among the genotypes for days to maturity. ILC 249 was the earliest to nature (190 days) and ILC 196 was the latest one (199 days).

The plant height ranged between 41cm of American University of Beirut to 62 cm at Larissa (Greece) and Diyarbakir (Turkey). The genotypes viz. ILC 72, ILC 196, ILC 202, and ILC 3279 had plant height equal to or more than 60cm.

The data on seed yield for 18 locations are given in Table 3.3.5. The analysis of variance (ANOVA) for different locations revealed that the differences between the genotypic means were significant at all the locations except Hisban in Jordan. The coefficient of variation ranged from 7.4% at Diyarbakir in Turkey to 46.3% at Faisalabad in Pakistan with a mean of 22.7%. There was a large variation among the location means, from 330 kg/ha at Faisalabad in Pakistan to 3359 kg/ha at Larissa in Greece. The number of entries that were significantly better than the local check were 19 each at Larissa (Greece) and Cordoba (Spain); 14 each at Zememra (Morocco) and Diyarbakir (Turkey); 7 at Terbol and 6 at AUB in Lebanon; and two each at Al Ismalia (Egypt) and Marrow (Jordan). The cultivar ILC 484 on an average gave the highest yield of 2147 kg/ha and was followed by ILC 482 (2124 kg/ha), ILC 249 (1946 kg/ha), ILC 194 (1932 kg/ha) and ILC 1407 (1924 kg/ha) etc. The genotype ILC 196 gave the poorest yield of 1321 kg/ha.

The correlations between the seed yields of entries based over location means are given in Table 3.3.6. The mean yields at Tel Hadya did not show significant correlation with any other location. However, the seed yields at Jinderis another site of ICARDA exhibited significant and positive associations with seed yields at Al-Ismailia (Egypt), Larissa (Greece), Arbil (Iraq), AUB and Terbol (Lebanon), El-Safsaf (Libya) and Diyarbakir (Turkey). Terbol, another site of ICARDA, showed significant correlation with Al - Ismailia (Egypt) Larrisa (Greece), AUB (Lebanon), Jinderis and Lattakia (Syria) and Diyarbaker (Turkey). Mean yield

at Marraw (Jordan), and Douyet (Morocco) also did not exhibit significant association with any other location. It, therefore, appears that the performance of genetic stock developed at Tel Hadya may not provide any guideline for predicting their performance at other locations. But it seems that Terbol could serve this role to some extent.

The five highest yielding entries at the individual locations are shown in Table 3.3.7. The first five entries were the entries furnished from Tel Hadya at all the locations except at New Delhi (India) and Faisalabad (Pakistan), Douyet and Merchouch (Morocco) and Jinderis (Syria) where the local entries held first, first, second, fourth and fourth rank respectively. The entries including ILC 482, ILC 249, ILC 484 and ILC 2555 seemed to be more promising as these were among the first five ranks more frequently than others.

The average of two years results of the common entries in both the years 1979/80 and 1980/81 are given in Table 3.3.8. It is intresting to note that both ILC 482 and ILC 249 maintained their superiority. In both the years. In addition to these two new genotypes ILC 484, and ILC 2555 need special attention in the next year for further evaluation and confirmation of this year results.

The mean yield of the CIYT-W over all the locations and genotypes was 83% higher than that of CIYT conducted during spring which conforms the last years results

Table 3.3.2. Days to flowering for entries in the CIYT-W at different locations during 1980/81.

Entry	Origin	GREECE Larissa	INDIA New Delhi	IRAQ Arbil	JORDAN Hisban	JORDAN Marrow	LEBANON AUB	LEBANON Terbol	PAKISTAN Lahore	SYRIA Tel Hadya	TURKEY Diyar-bakir	MEAN
ILC 72	Spain	166	103	62	147	151	176	164	139	163	180	145
182	USSR	164	108	62	142	148	170	157	129	157	171	141
191	"	167	100	62	147	146	175	162	139	161	177	144
194	"	154	101	62	139	148	170	153	123	153	163	137
195	"	167	108	62	147	149	175	162	131	161	176	144
196	"	169	111	62	149	149	175	165	139	162	177	146
200	"	162	101	62	144	147	172	157	130	157	171	140
202	"	167	80	62	146	147	172	162	128	159	177	140
236	Afghanistan	157	57	62	139	144	173	155	124	156	176	134
249	India	150	83	62	138	142	171	150	116	156	160	133
482	Turkey	159	89	62	138	142	171	153	116	150	158	134
484	"	157	94	62	138	143	170	150	122	150	160	135
1276	U S A	158	82	62	140	144	172	155	122	155	167	136
1407	Afghanistan	160	88	62	140	143	170	155	123	155	164	136
2548	Unknown	155	100	62	141	145	171	155	126	155	163	137
2555	"	163	107	62	145	147	172	157	127	159	165	140
2906	Afghanistan	158	80	62	140	144	172	153	124	155	163	135
2912	"	158	77	62	139	147	171	153	123	154	165	135
3279	USSR	169	96	62	146	147	173	165	139	159	179	144
Local check		167	97	62	141	145	173	157	99	-	160	
Location mean		161	93	62	142	146	172	157	126	157	169	

Table 3.3.3. Days to maturity for entries in the CIYT-W at different locations during 1980/81.

ENTRY	GREECE Larissa	IRAQ Arbil	JORDAN Hisban	JORDAN Marrow	LEBANON AUB	LEBANON Terbol	SYRIA Tel Hadya	TURKEY Diyarbakir	MEAN
ILC 72	205	112	199	212	213	213	211	218	198
182	202	112	199	192	206	208	206	215	193
191	202	112	199	192	210	212	207	215	194
194	202	112	199	190	207	207	204	214	192
195	202	112	-	192	213	213	210	217	194
196	205	112	199	212	213	216	212	219	199
200	202	112	199	191	206	208	206	215	192
202	205	112	199	205	209	212	208	217	196
236	202	112	199	189	208	207	208	215	193
249	202	112	199	191	206	207	-	215	190
482	202	112	199	189	205	207	206	214	192
484	202	112	199	189	205	207	205	214	192
1276	202	112	199	189	205	207	207	214	192
1407	202	112	199	189	204	209	206	215	192
2548	202	112	199	191	205	207	206	215	192
2555	202	112	199	190	206	207	216	214	193
2906	202	112	199	189	204	208	208	214	192
2912	202	112	199	191	206	207	207	214	192
3279	205	112	199	-	209	213	206	217	194
Local check	202	112	199	202	208	214	-	214	
Location mean	203	112	199	194	207	209	208	215	

Table 3.3.4. Plant height (cm) of entries in the CIYT-W at different locations during 1980/81.

ENTRY	GREECE Larissa	IRAQ Arbil	J O R D A N Hisban	J O R D A N Marrow	LEBANON AUB	LEBANON Terbol	SYRIA Tel Hadya	TURKEY Diyarbakir	MEAN
ILC 72	79	48	52	60	52	60	66	73	61
182	63	35	49	51	41	53	46	66	51
191	69	44	47	54	49	51	48	69	54
194	59	40	48	51	43	47	41	61	49
195	65	52	49	53	39	55	47	64	53
196	73	56	48	67	48	56	59	70	60
200	60	40	48	50	41	52	48	66	51
202	70	58	53	63	46	58	62	70	60
236	53	36	47	44	34	42	40	55	44
249	63	35	44	49	40	46	-	55	47
482	58	45	46	49	42	46	41	61	49
484	55	36	46	47	36	49	38	60	46
1276	53	32	43	44	32	43	39	58	43
1407	53	37	46	48	42	49	39	59	47
2548	58	40	47	48	37	45	40	59	47
2555	59	50	47	53	43	50	38	60	50
2906	60	32	46	49	33	45	38	59	45
2912	55	30	47	46	35	47	40	58	45
3279	75	66	54	67	53	58	66	76	64
Local check	55	33	48	49	32	44	-	47	-
Location mean	62	42	48	52	41	50	46	62	

Table 3.3.5. Seed yield (Y= kg/ha) and rank (R) of entries in the CIYT-W at different locations and 100 seed weight at Tel Hadya during 1980/81.

Entry	EGYPT		GREECE		INDIA		IRAQ		JORDAN				LEBANON			
Name	Al-Ismailia		Larissa		New Delhi		Arbil		Hisban		Marrow		A U B		Terbol	
	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R
ILC 72	861	18	3302	14	1677	7	513	20	892	17	1355	19	715	12	1781	12
182	1361	6	3216	15	1104	18	652	18	1163	14	1852	7	768	11	1943	6
191	806	19	3367	12	1432	13	515	19	952	16	2027	5	833	8=	1757	14
194	1285	9	3544	8	1904	3	863	11	1455	9	1783	9	982	4	1869	9
195	1201	10	3401	11	1609	10	798	14	1547	6	2165	2	679	15	1738	15
196	431	20	2742	19	1279	16	879	9	1072	15	1267	20	453	20	1487	20
200	868	17	3211	16	831	20	665	16	1490	8	1582	13	929	5	1989	4
202	1035	15	3010	18	1010	19	654	17	1278	12	1645	12	634	17	1793	10
236	1438	5	3555	7	1578	11	814	13	1507	7	1743	10	655	16	1763	13
249	2167(1)	1	4070	1	1773	6	1156	1	1885	4	1372	17	1226	1	2654	1
482	1792	2	4063	2	1805	4	1146	2	2036	3	2118	4	833	8=	2354	2
484	1306	8	3354	13	1669	8	1087	4	2250	2	2154	3	923	6	1929	7
1276	1313	7	3576	6	1536	12	987	6	1389	10	1361	18	786	10	1556	19
1407	1722	3	3508	10	1779	5	1039	5	2453	1	1738	11	857	7	1614	18
2548	1188	11	3974	3	1659	9	676	15	1347	11	1815	8	1036	3	1871	8
2555	1167	13	3815	4	2018	2	869	10	767	19	2209	1	1209	2	2137	3
2906	1181	12	3536	9	1240	17	1136	3	1242	13	1510	15	708	13=	1636	16
2912	1694	4	3604	5	1380	14	899	8	1757	5	1546	14	708	13=	1788	11
3279	917	16	3164	17	1286	15	986	7	778	18	1954	6	619	18	1988	5
Local check	1160	14	1169	20	2635	1	861	12	291	20	1418	16	584	19	1626	17
Location mean	1244		3359		1560		860		1378		1731		807		1864	
C.V. %	33.2		13.0		26.3		23.2				30.4		25.9		9.5	
L.S.D. 5%	583.9		618.7		579.9		283.2				745.1		296.3		249.0	
No. of entries significantly exceeding local check	2		19		0						2		6		7	

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

Cont'd. ...

Cont'd. ...

Table .

Entry	LIBYA		MOROCCO						PAKISTAN		SPAIN		SYRIA						TURKEY		Mean		100 seed
Name	El-Safsaf		Douyet		Merchouch		Zememra		Faisalabad		Cordoba		Tel Hadya		Jinderis		Lattakia		Diyarbakir				weight
	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	
ILC 72	1170	17	1273	6	1270	15	2202	8	83	20	3213	4	2058	12	2344	18	3268	7	3005	12	1721	15	26.1
182	1183	16	1154	7	1254	16	2143	9=	161	19	3350	2	2333	7	2731	14	3158	9	3026	10	1808	10	19.5
191	1300	14	1385	3=	1381	9=	2500	4=	245	15	3221	3	1968	13	2615	15	3554	4	2794	16	1814	8	20.5
194	1423	10	1385	3=	1349	11	2857	2	203	17	2858	8	2576	2	3412	5	2118	15	2914	14	1932	4	19.0
195	1267	15	913	14	1492	7	3214	1	427	5	2925	7	1762	16	1518	20	3711	2	3029	9	1855	7	23.6
196	754	19	104	19	1032	18	1429	16	164	18	2671	10	1487	17	1993	19	2355	13	2173	20	1321	19	24.4
200	1614	4	1042	10	1667	2=	2024	12=	333	10	2608	13	2487	5	2855	8	3183	8	3090	8	1804	11	18.7
202	1440	9	997	12	889	19=	2500	4=	266	13	2442	16	2152	9	2348	17	2889	10	2647	18	1646	17	24.6
236	1384	11	1138	8	1397	8	2143	9=	380	9	2496	15	1851	14	2825	10	1560	19	3008	11	1735	13	17.5
249	1640	3	945	13	1857	1	1071	19=	276	12	2783	9	0	19	3762	3	3452	5	3662	1	1986	3	-
482	1478	7	1517	1	1127	17	1071	19=	440	4	2613	12	2490	3	4302	1	3406	6	3641	2	2124	2	29.4
484	1939	1	708	17	1667	2=	2024	12=	497	2	2621	11	3118	1	4011	2	4257	1	3134	7	2147	1	32.1
1276	1596	6	703	18	1317	13=	2262	6=	417	6=	2054	19	2138	10	2757	13	1583	18	2873	15	1678	16	18.2
1407	1605	5	1125	9	1381	9=	2738	3	417	6=	2175	18	2223	8	2794	11	2283	14	3187	6	1924	5	18.9
2548	1656	2	885	15	1317	13=	2143	9=	240	16	3083	5	2461	6	2546	16	2723	12	2983	13	1867	6	18.3
2555	1356	13	1320	5	1556	5	2261	7=	307	11	3483	1	950	18	3124	7	2758	11	3468	3	1739	12	22.0
2906	1452	8	0	20	1333	12	1310	17	417	6=	2379	17	1800	15	3244	6	1696	17	3268	5	1616	18	19.0
2912	1383	12	1018	11	1524	6	2024	12=	453	3	2517	14	2133	11	2827	9	2030	16	3324	4	1812	9	19.3
3279	942	16	854	16	889	19	1667	15	250	14	3013	6	2488	4	2777	12	3706	3	2783	17	1726	14	24.1
Local check	-	-	1427	2	1651	4	1190	18	616	1	538	20	0	19	3473	4	0	20	2583	19			-
Location mean	1399		995		1367		2039		330		2652		2137		2913		2826		3030				
C.V. %	18.2		43.6		19.4		24.9		46.3		18.6		10.5		21.2		14.9		7.4				
L.S.D. 5%	359.6		613.7		437.3		719.2		216.7		706.4		320.5		872.6		594.7		318.2				
No. of entries significantly exceeding local check			0		0		14		0		19				0				14				

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

Table 3.3.6. Correlations[1] (df= 17) between the seed yield of entries in the CIYT-W at different locations during 1980/81 (local check excluded from the calculations).

Country	Location	GREECE Larissa	INDIA New Delhi	IRAQ Arbil	JORDAN Hisban	JORDAN Marrow	LEBANON AUB	LEBANON Terbol	LIBYA El-Safsaf	MOROCCO Douyet	MOROCCO Merchouch	MOROCCO Zememra	PAKISTAN Faisalabad	SPAIN Cordoba	SYRIA Tel Hadya	SYRIA Jinderis	SYRIA Lattakia	TURKEY Diyarbakir
EGYPT	-Al Ismailia	0.75**	0.44	0.57*	0.69**	0.08	0.48*	0.56*	0.55*	0.30	0.46*	-0.19	0.48*	-0.28	-0.24	0.54*	-0.08	0.79**
GREECE	-Larissa		0.66**	0.40	0.36	0.22	0.71**	0.60**	0.55*	0.36	0.47*	-0.22	0.34	0.03	-0.28	0.50*	-0.07	0.82**
INDIA	-New Delhi			0.34	0.27	0.32	0.53*	0.29	0.24	0.38	0.31	0.12	0.13	0.17	-0.23	0.33	-0.01	0.45
IRAQ	-Arbil				0.55*	0.02	0.17	0.29	0.29	-0.34	0.18	-0.51*	0.61**	-0.51*	-0.17	0.59**	-0.12	0.46*
JORDAN	-Hisban					0.08	0.21	0.18	0.67**	0.07	0.41	-0.03	0.67**	-0.60**	0.17	0.42	0.03	0.45
JORDAN	-Marrow						0.25	0.25	0.16	0.45	0.05	0.31	0.30	0.42	0.29	0.13	0.51*	0.27
LEBANON	-AUB							0.66**	0.62**	0.40	0.67**	-0.03	0.06	0.29	-0.31	0.60**	0.19	0.66**
LEBANON	-Terbol								0.28	0.43	0.37	-0.46*	-0.01	0.33	-0.37	0.57*	0.49*	0.70**
LIBYA	-El.Safsaf									0.15	0.60**	0.07	0.58**	-0.37	0.17	0.60**	0.04	0.55*
MOROCCO	-Douyet										0.11	0.35	-0.13	0.39	0.11	0.12	0.26	0.37
MOROCCO	-Merchouch											0.04	0.36	0.03	-0.34	0.43	0.11	0.60**
MOROCCO	-Zememra												-0.02	0.11	0.28	-0.45	-0.03	-0.28
PAKISTAN	-Faisalabad													-0.61**	0.17	0.31	-0.11	0.46*
SPAIN	-Cordoba														-0.16	-0.12	0.50*	0.03
SYRIA	-Tel Hadya															0.02	0.11	-0.26
SYRIA	-Jinderis																0.07	0.60**
SYRIA	-Lattakia																	0.12

(1) * P $\leq$ 0.05
** P $\leq$ 0.01

Table 3.3.7. The five heaviest seed yielding entries at the individual locations in the CIYT-W

Rank	EGYPT	GREECE	INDIA	IRAQ	J O R D A N		LEBANON		LIBYA	M O R O C C O		
	Al-Ismailia	Larissa	New Delhi	Arbil	Hisban	Marrow	AUB	Terbol	El-Safsaf	Douyet	Merchouch	Zememra
1	ILC 249	ILC 249	Loc.check	ILC 249	ILC 1407	ILC 2555	ILC 249	ILC 249	ILC 484	ILC 482	ILC 249	ILC 195
2	482	482	ILC 2555	482	484	195	2555	482	2548	Loc.check	200	194
3	1407	2548	194	2906	482	484	2548	2555	249	191	484	1407
4	2912	2555	482	484	249	482	194	200	200	194	Loc.check	191
5	236	2912	1407	1407	2912	191	200	3279	1407	2555	2555	202

(1)

PAKISTAN	SPAIN	S Y R I A			TURKEY
Faisalabad	Cordoba	Tel Hadya	Jinderis	Lattakia	Diyarbakir
Loc.check	ILC 2555	ILC 484	ILC 482	ILC 484	ILC 249
ILC 484	182	194	484	195	482
2912	191	482	249	3279	2555
482	72	3279	Loc.check	191	2912
195	2548	200	194	249	2906

(1) The brackets indicate entries having the same rank.

Table 3.3.8. The mean yield (Y= kg/ha) and rank (R) of the common entries in the year 1979/80 and 1980/81 in CIYT-W.

E N T R Y	1979/80		1980/81		Average	
	Y	R	Y	R	Y	R
ILC 195	1967	(6)	1855	(7)	1911	(3)
ILC 202	1792	(7)	1646	(17)	1719	(5)
ILC 249	2079	(2)	1986	(3)	2032	(2)
ILC 482	2323	(1)	2124	(2)	2223	(1)
ILC 3279	2058	(3)	1726	(14)	1907	(4)

3.4. CHICKPEA INTERNATIONAL YIELD TRIAL-LARGE SEEDED

Material

The Chickpea International Yield Trial-Large Seeded (CIYT-L) comprised 24 test entries which performed well in different ICARDA trials and one local check to be used by the co-operators. These test entries were derived from the germplasm collections maintained at Tel Hadya which have shown a superior performance either in regional or international trials conducted by ICARDA. The co-operators were free to use these entries in their breeding programmes or for release as cultivars.

Methods and Management

The trial design was 5x5 lattice with four replications but the results were analysed as a randomised complete block design. The recommended plot size was 4 rows, each of 4m long with an inter-and intra-row spacing of 0.30, and 0.10m respectively.

Thirty sets of trials were distributed to the co-operators in 19 countries. Results were received from 17 trials covering 15 countries. Information on the agronomic practices was supplied from a number of locations and the details are given in Table 3.4.1.

Results and Discussion

The data on days to flowering, days to maturity and plant height were received from a few locations and are presented in Tables 3.4.2 , 3.4.3, and 3.4.4, respectively. The perusal of location means revealed that the lines flowered at the earieliest in 62 days in Nicosia (Cyprus) and latest in 125 days in Graneros (Chile). On the basis of days to flowering, the locations could be grouped as late (Graneros), medium (New Delhi), and early (Nicosia, Terbol, Tel Hadya, Ankara and Valdivia). The relative differences between the locations

Table 3.4.1. Agronomic data for different locations for the CIYT-L during 1980/81.

Country	Location	Planting date	Crop duration days	Fertilizer (kg/ha) N	P_2O_5	K_2O	Irrigation	Insecticide
CANADA	Saskatoon	4.5.81	-	-	-	-	-	-
CHILE	Graneros	17.6.81	177	-	-	-	2	Tamaron
CHILE	Valdivia	28.10.80	-	-	150	50	-	-
CYPRUS	Nicosia	6.3.81	-	22	50	-	-	-
INDIA	New Delhi	27.10.80	-	15	40	-	1	Hildan
JORDAN	Marrow	17.3.81	117	-	-	-	-	-
LEBANON	Terbol	25.3.81	105	-	-	-	-	-
MOROCCO	Merchouch	23.2.81	-	-	-	-	-	-
PAKISTAN	Faisalabad	10.11.80	-	18	46	-	1	-
SPAIN	Cordoba	18.3.81	-	-	-	-	1	-
SYRIA	Tel Hadya	22.2.81	109	30	50	-	1	-
SYRIA	Izra'a							
SYRIA	Gelline							
TURKEY	Ankara	22.3.81	122	20	60	-	-	-
U.S.A.	Davis	5.1.81	111	309		-	4	-

showed a similar pattern for days to flowering and days to maturity. The location means for plant height ranged from 29cm at Nicosia in Cyprus to 41cm at Graneros in Chile. The genotypic means for days to flower, days to maturity and plant height ranged from 75 for ILC 165 to 83 days for ILC 171; 122 for ILC 83 to ILC 127 days for ILC 91 and ILC 100; and 31cm for ILC 35, ILC 232, ILC 624 and ILC 650 to 37cm for ILC 199 respectively. Obviously the range for genotypic means for these three characters was small.

The seed yield and rank of genotypes for each location are given in Table 3.4.5. The analyses of variance for seed yield at different locations revealed that the differences among the genotypes were significant except at Oman and Tunisia. The co-efficient of variation ranged from 14% at Davis to 64.7% at faisalabad with a mean of 32.58. The variation among the location means was also very high, ranging from 266 kg/ha at Faisalabad to 3257 kg at Davis.

The least significant difference (LSD) revealed that 8, 7, 2, 2, 1 and 1 entries at Nicosia, Cardoba, Marrow, Terbol, Tel Hadya and Izra'a, respectively exceeded the local checks by a significant margin. So these lines could be usefully exploited directly or indirectly in the national programmes at these locations. The genotypes ILC 464 and ILC 604, on an average gave the highest and second highest yields of 1187 and 1172 kg/ha, respectively. The range in mean yield across the locations for different genotypes was 808 kg/ha to 1187 kg/ha.

The correlations between different locations for seed yield is given in Table 3.4.6. The correlation between Tel Hadya and Cordoba was significant which indicated that the performance of the genetic stock developed at Tel Hadya (Syria) could help in predicting the usage of such material at Cordoba in predicting the usage of such material at Cordoba in spain, whereas it would be difficult to predict the performance of the genetic stock developed at Tel Hadya for other locations. Similarly the significant and positive correlation

between Terbol and Graneros and Alsharkia revealed some similarity in the overall performance of these genotypes. Two other associations, viz. between Saskatoon and Ankara; and Alsharkia and New Delhi were also significant and positive and thereby exhibited some degree of resemblance in these locations.

The performance of the five best entries at each of the 16 locations is given in Table 3.4.7. In most of the locations the entries supplied from Tel Hadya were among the first five ranks. This emphasises the usefulness of the international nursery to the co-operators.

Table 3.4.2. Days to flowering for entries in the CIYT-L at different locations during 1980/81.

ENTRY		Origin	CHILE		CYPRUS	INDIA	LEBANON	SYRIA	TURKEY	MEAN
			Graneros	Valdivia	Nicosia	New Delhi	Terbol	Tel Hadya	Ankara	
ILC	35	Spain	124	65	60	93	65	66	70	78
	83	"	125	77	63	88	64	66	71	79
	90	"	134	77	59	105	62	69	71	82
	91	"	125	77	54	103	65	67	71	80
	100	"	128	77	60	108	65	68	71	82
	102	"	127	77	65	95	63	70	71	81
	114	"	117	71	61	91	65	66	71	77
	134	"	129	77	61	75	65	66	70	78
	135	"	119	71	64	93	64	66	70	78
	136	"	128	71	65	89	64	65	71	79
	155	Greece	118	77	62	86	63	66	71	78
	165	Tunisia	108	71	63	87	63	65	70	75
	171	"	127	77	64	107	65	69	71	83
	232	Syria	127	65	64	90	64	68	71	78
	451	Turkey	126	71	62	102	66	66	71	81
	464	"	129	77	60	105	64	66	70	82
	496	"	129	77	61	106	65	67	71	82
	510	"	128	77	62	104	63	68	70	82
	582	Lebanon	126	77	55	104	65	71	70	81
	596	Algeria	124	65	66	92	64	66	71	78
	604	"	130	77	62	98	65	66	70	81
	620	Morocco	128	77	66	102	64	66	71	82
	624	Tunisia	127	65	63	100	64	66	71	79
	650	Iran	126	65	61	103	64	66	71	79
Local check			128	77	64	94	63	66	70	
Location mean			125	73	62	97	64	67	71	

Table 3.4.3. Days to maturity for entries in the CIYT-L at different locations during 1980/81.

	ENTRY	CHILE Graneros	JORDAN Marrow	LEBANON Terbol	SYRIA Tel Hadya	TURKEY Ankara	U.S.A. Davis	MEAN
ILC	35	176	116	108	108	122	112	124
	83	178	115	105	108	122	106	122
	90	177	117	102	110	122	110	123
	91	178	118	107	110	122		127
	100	178	118	109	110	122		127
	102	177	118	103	110	122	108	123
	114	176	118	107	110	122	109	124
	134	177	115	106	109	122	106	123
	135	177	118	105	109	122	112	124
	136	177	118	106	110	122	110	124
	155	176	118	105	110	122	112	124
	165	178	118	107	110	122	112	125
	171	177	118	103	110	122	112	124
	232	176	116	105	108	122	115	124
	451	173	118	108	108	122	106	123
	464	178	118	106	110	122	114	125
	496	176	116	110	110	122	117	125
	510	177	118	102	110	122		126
	582	177	116	103	110	122		126
	596	178	116	105	110	122		126
	604	177	118	107	107	122	111	124
	620	177	118	104	110	122	106	123
	624	177	116	102	108	122		125
	650	177	113	103	109	122	112	123
Local check		176	113	100	108	122	120	
Location mean		177	117	105	109	122	111	

Table 3.4.4. Plant height (cm) of entries in the CIYT-L at different locations during 1980/81.

ENTRY		CHILE Graneros	CYPRUS Nicosia	JORDAN Marrow	LEBANON Terbol	SYRIA Tel Hadya	TURKEY Ankara	MEAN
ILC	35	38	27	30	40	31	22	31
	83	36	30	33	37	37	28	34
	90	34	27	34	34	36	24	32
	91	41	29	35	37	36	28	34
	100	49	27	40	41	37	29	37
	102	41	31	32	35	37	29	34
	114	45	31	34	38	37	29	36
	134	43	34	36	37	35	30	36
	135	45	30	36	38	38	30	36
	136	44	29	39	40	36	29	36
	155	35	27	34	37	36	27	33
	165	49	27	33	35	36	28	35
	171	45	28	38	36	38	30	36
	232	39	29	34	31	32	21	31
	451	38	28	35	41	34	27	34
	464	44	27	34	35	36	29	34
	496	43	27	34	38	35	30	35
	510	40	30	35	32	37	28	34
	582	38	29	35	36	31	26	33
	596	39	29	32	36	37	24	33
	604	40	29	30	35	33	27	32
	620	43	31	37	36	35	28	35
	624	36	26	31	37	33	22	31
	650	35	28	32	35	33	23	31
Local check		45	28	36	34	30	27	
Location mean		41	29	34	36	35	27	

Table 3.4.5. Seed yield (Y = kg/ha) and rank (R) of entries in the CIYT-L at different locations and 100-seed weight at Tel Hadya during 1980/81.

ENTRY	CANADA Saskatoon		CHILE Granceros		CYPRUS Nicosia		EGYPT Al-Sharkia		INDIA New Delhi		JORDAN Marrow		LEBANON Terbol		MOROCCO Merchouch		OMAN		PAKISTAN Faisalabad		SPAIN Cordoba		SYRIA Tel Hadya		SYRIA Izra'a		SYRIA Gelline		TUNISIA		TURKEY Ankara		U.S.A. Davis		MEAN		100-seed weight (g)
	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	Y	R	Y	R	
ILC 35	407	24	547	4=	614(1)	8	1167	2	1398	11	1170	14	2702	5	857	4=	806	12	120	24	958	6	1191	10	426	7=	1167	9	1447	2	502	22			967	15	39.0
83	725	12	500	7=	517	16	604	16	1063	20	1098	17	1779	19	768	10=	1336	3	240	14	700	20	1060	15	443	4	1056	17	1194	11	555	15	3453	8	1007	8	40.1
30	559	20	188	24=	688	6	306	25	1036	22	1484	8	1907	16	768	10=	1611	1	203	18	750	18	881	24	334	22	1160	10=	1014	22	559	14	3413	7	932	10	34.7
91	773	9	797	1	804	1	1153	4	1216	15	1263	11	2532	6	768	10=	903	9	161	20	592	24	969	22	254	24	979	18	845	25	549	16	-		910	18	32.7
100	419	23	500	7=	803	2	347	23	977	25	1770	4	1673	22	759	14=	361	24	271	11=	758	16	1224	7=	437	5	931	20	1139	14	564	13	-		808	24	47.8
102	736	11	469	10	591	13=	319	24	1117	17	2118	2	1929	15	759	14=	861	11	130	23	813	12=	1355	4	357	18	1188	5	1055	19	647	8	3867	2	1077	5	36.4
114	351	25	422	13	449	24	1163	3	1484	9	2214	1	2384	8	830	9	736	15=	271	11=	783	14	1106	14	404	9	1174	6=	1305	4	482	24	3109	14	1098	4	48.0
134	864	6	313	18	591	13=	472	21	1013	23	845	21	2498	7	589	23	542	20	294	7	875	10	989	21	388	12	1250	1	1298	5	532	18	3253	10	976	14	39.2
135	880	5	438	12	606	11	764	12=	1003	24	819	22	2933	2	589	21=	1389	2	214	16	625	23	1166	12	457	3	1174	6=	1047	20	622	9	2374	17	1006	9	42.1
136	633	15	344	17	549	18	889	7	1753	2	1109	16	2015	13	741	16	417	23	211	17	675	21	1041	16	397	11	1076	15=	878	24	484	23	3105	15	960	16	53.2
155	474	22	359	15=	764	3	819	9	1143	16	1195	12	1688	21	478	25	556	19	307	6	567	25	949	23	245	25	1236	3	1537	1	540	17	2246	18	888	20	42.7
165	595	16=	609	2	501	22	764	12=	1667	3	1293	10	2806	3	839	7=	444	22	229	15	942	7	1590	1	341	21	1160	10=	1331	3	654	7	2920	16	1099	3	43.8
171	563	19	250	21	466	23	486	19	1078	18	1732	5	1648	23	688	17	917	8	189	19	779	15	995	20	370	15	1118	13	1089	16	744	3	3572	4	981	12	40.3
232	566	18	297	19=	559	17	722	14	1073	19	739	23	1695	20	661	18=	736	15=	284	10	1008	4=	1410	3	426	7=	1215	4	1147	13	599	11	3574	3	983	11	33.0
451	957	4	234	22	635	7	1125	5	1281	14	1646	7	2354	9	866	2=	792	13	286	9	754	17	1036	17	377	13	882	23	1186	12	582	12	3155	13	1068	6	38.8
464	1052	3	531	6	507	21	833	8	1521	5	1449	9	3811	1	554	24	764	14	409	3	813	12=	998	19	548	1	965	19	1255	7	757	2	3410	8	1187	1	41.2
496	797	8	359	15=	610	9	514	17=	1039	21	880	20	1216	25	875	1	931	7	149	21	888	9	1223	9	400	10	896	21	1073	18	714	5	3223	12	929	17	43.2
510	862	7	547	4=	546	19	514	17=	1490	8	995	18	1966	14	768	10=	708	17	292	8	892	8	1242	6	313	23	861	24	1248	8	811	1	-		878	22	41.8
582	595	16=	453	11	744	5	813	10	1453	10	1728	6	2290	11	643	20	639	18	263	13	821	11	715	25	344	20	806	25	1212	10	458	25	-		874	23	38.7
596	686	14	391	14	593	12	792	11	1495	7	711	24	2731	4	857	4=	472	21	328	5	1008	4=	1453	2	368	16	1104	14	1015	21	516	20	-		908	19	43.7
604	1131	1	297	19=	607	10	1097	6	1523	4	1967	3	2066	12	661	18=	1028	5	354	4	1029	3	1157	13	467	2	1174	6=	1247	9	725	4	3395	9	1172	2	36.5
620	516	21	484	9	519	20	458	22	1365	12	1111	15	2343	10	848	6	944	6	464	2	733	19	1008	18	428	6	1243	2	1087	17	517	19	3232	11	1018	7	41.9
624	704	13	219	23	583	15	646	15	1500	6	1193	13	1862	17	839	7=	889	10	107	25	1042	2	1298	5	376	14	1076	15=	1258	6	600	10	-		887	21	37.3
650	768	10	188	24=	753	4	479	20	1346	13	502	25	1781	18	866	2=	1139	4	133	22	1129	1	1224	7=	346	19	889	22	1112	15	509	21	3441	6	977	13	36.9
Local check	1097	2	578	3	377	25	1507	1	2422	1	982	19	1525	24	589	21=	-	-	740	1	646	22	1178	11	361	17	1153	12	959	23	675	6	3884	1			32.4
Location mean	708		413		601		750		1338		1280		2165		738		829		266		823		1138		385		1077		1159		596		3257				
C.V. %	24.3		50.2		27.4		33.7		22.9		57.2		43.6		29.8				64.6		22.8		24.6		31.7		24.1				17.8		14.0				
L.S.D. 5%	243.0		291.9		232.6		357.2		433.2		1035.8		1335.2		311.5				243.1		264.9		396.6		172.2		366.0				149.9		647.9				
No.of entries sig. exceeding local check	0		0		8		0		0		2		2		0				0		7		1		1		0				0		0				

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

Table 3.4.6. The five heaviest seed yielding entries at the individual locations in the CIYT-L during 1980/81.

Rank	CANADA Saskatoon	CHILE Graneros	CYPRUS Nicosia	EGYPT Al-Sharkia	INDIA New Delhi	JORDAN Marrow	LEBANON Terbol	MOROCCO Merchouch	OMAN
1	ILC 604	ILC 91	ILC 91	Loc.check	Loc.check	ILC 114	ILC 464	ILC 496	ILC 90
2	Loc.check	165	100	ILC 35	ILC 136	102	135	451	135
3	464	Loc.check	155	114	165	604	165	650	83
4	451	35 (1)	650	91	604	100	596	35	650
5	135	510	582	451	464	171	35	596	604

PAKISTAN Faisalabad	SPAIN Cordoba	SYRIA Tel Hadya	SYRIA Izra'a	SYRIA Gelline	TUNISIA	TURKEY Ankara
Loc.check	ILC 650	ILC 165	ILC 464	ILC 134	ILC 155	ILC 510
ILC 620	624	596	604	620	35	464
464	604	232	135	155	165	171
604	232	102	83	232	114	604
596	596	624	100	102	134	496

(1) The brackets indicate the entries having the same rank.

Table 3.4.7. Correlations (1) (df = 22) between the seed yield of entries in the CIYT-L at different locations during 1980/81. (local check excluded from the calculations).

Country	Location	CHILE Granc-ros	CYPRUS Nico-sia	EGYPT Al-Shar-kia	INDIA New Delhi	JORDAN Marrow	LEBANON Terbol	MOROCCO Mer-chouch	OMAN	PAKIS-TAN Faisal abad	SPAIN Cor-doba	SYRIA Tel Hadya	SYRIA Izra'a	SYRIA Gelline	TUNISIA	TURKEY Ankara
CANADA	- Saskatoon	-0.08	-0.05	0.10	0.08	-0.11	0.28	-0.21	0.23	0.17	0.16	-0.01	0.28	-0.27	-0.15	0.54**
CHILE	- Graneros		0.06	0.26	0.14	0.08	0.43*	0.01	-0.25	0.09	-0.35	0.08	-0.07	-0.10	-0.03	0.05
CYPRUS	- Nicosia			-0.04	-0.33	-0.09	-0.24	-0.11	0.04	-0.23	-0.18	-0.29	-0.45*	-0.37	-0.11	-0.36
EGYPT	- Al.Sharkia				0.47*	0.18	0.43*	-0.01	-0.19	0.08	-0.08	-0.09	0.05	-0.01	0.20	-0.20
INDIA	- New Delhi					0.08	0.39	0.25	-0.39	0.18	0.32	0.17	0.05	-0.13	0.11	-0.04
JORDAN	- Marrow						0.01	-0.05	-0.06	0.06	-0.23	-0.24	0.08	0.02	0.12	0.10
LEBANON	- Terbol							-0.19	-0.11	0.36	-0.07	-0.02	0.35	0.09	0.11	-0.01
MOROCCO	- Merchouch								0.06	-0.34	0.37	0.41	-0.09	-0.25	-0.26	-0.16
OMAN										-0.23	-0.08	-0.24	0.12	0.07	-0.24	0.12
PAKISTAN	- Faisalabad										-0.14	-0.19	0.35	0.15	0.18	0.08
SPAIN	- Cordoba											0.57**	0.19	-0.08	0.20	0.15
SYRIA	- Tel Hadya												0.09	0.18	0.04	0.26
SYRIA	- Izra'a													0.09	0.04	0.20
SYRIA	- Gelline														0.20	-0.15
TUNISIA																0.05
TURKEY	- Ankara															

(1) * $P \leq 0.05$
** $P \leq 0.01$

3.5. CHICKPEA INTERNATIONAL SCREENING NURSERY (CISN)

Material

Sixty eight entries including 38 originating in 12 countries and thirty developed through hybridization at ICARDA's principal station at Tel Hadya were tested in CISN. The trial also included three checks, ILC 480 and ILC 1929 and one local check to be supplied by the co-operator. All these test entries were homozygous and had shown superior performance in ICARDA's regional trial. Co-operators were free to use any of these materials for their use in breeding programs.

Methods and Management

Each of these 68 entries were suggested to be planted in a single non-replicated row 4m long, with three genotypes planted repeatedly in a block of 20 entries. The recommended inter - and intra -row spacings were 0.30 to 0.60m and 0.10m, respectively.

Thirty three sets of trials were distributed to co-operators in 21 countries. The results were returned from 11 locations from 9 countries. The details with respect to agronomic practices were received from some locations and are given in Table 3.5.1.

Results and Discussion

The data on days to flowering, days to maturity and plant height are presented in Table 3.5.2. The range of variation was 65 to 77 days for days to flowering; 110 to 114 days for days to maturity; and 28 to 43 cm for plant height. The correlations among these characters and yield (Table 3.5.6.) revealed that plant height and seed yield were positively correlated. So the tall types seem to give more yield and were late in maturity.

Table 3.5.1. Agronomic details for different locations for the CISN during 1980/81.

Country	Location	Planting date	Fertilizer (kg/ha)			Irrigation	Insecti-cide	Herbici-des
			N	P_2O_5	K_2O			
EGYPT	Bahteem	2/12	6.3	9.2		3		
INDIA	New Delhi	30/10	15	40		1	Mildon	
JORDAN	Jubeiha	12/11	2	5				
LEBANON	Kfardan	12/3						
	Terbol	1/4						
PAKISTAN	Faisalabad	10/11	30	46		1		
SYRIA	Tel Hadya	3/3	30	50		1		
TURKEY	Ankara	19/3	20	60				
	Diyarbakir	11/4	40	60				
U.S.A.	Pullman	8/5					Imidan, Cygon	Tolban, (Pre-emergence)

The data on seed yield and ranking of different entries in the trial at each location and avearaged over location are given in Table 3.5.3. The location mean ranged from 99 kg/ha at Faisalabad in Pakistan to 2563 kg/ha at Diyarbakir in Turkey with an overall overage of 1327 kg/ha. The co-efficient of variation was the least (15.7%) at Kafardan (Lebanon) and was the highest (86.2%) at Pullman in U.S.A. with an overall mean of 38.0%. The standard errors of the each location when compared with the entry yield in kg/ha, revealed that 30, 6, 12, 19, 14, 10, 8, 4, 3 and 1 entries significantly out yielded the local check at Mexico; Ankara and Diyarbakir (Turkey), Pullman (U.S.A.), Kfardan and Terbol (Lebanon), Faisalabad (Pakistan), Jubeiha (Jordan), Tel Hadya (Syria), and New Delhi (India), respectively. This suggests the usefulness of materials to the national programs.

There were wide genotypic differences for the seed yield per hectare with a range of 1011 kg to 1660 kg/ha. The genotype FLIP 80 -3 gave the highest yield of 1660 kg/ha. The five highest yielding entries at individual location are given in Table 3.5.4, and the seed yield of the six entries with the heaviest seed yield across locations expressed as percentage of the location mean is given in Table 3.5.5. The perusal of Table 3.5.6 reveals that there was no co-herence in the performance of different genotypes across the locations. The genotype ILC 591, however, maintained its performance among the first five in atleast 3 and the genotypes ILC 471, ILC 232, ILC 1102, ILC 604, FLIP 80-2 and FLIP 80-15, in at least two locations.

Table 3.5.2. Values for three agronomic characters for entries in the CISN during 1980/81.

Entry Name		Origin	Days to flowering	Days to maturity	Plant height (cm)
ILC	29	Jordan	72	111	34
	45	Iraq	73	111	31
	47	Iraq	70	112	32
	69	Iraq	73	112	31
	102	Spain	74	113	35
	231	USA	65	113	35
	232	Syria	73	113	34
	289	Iran	73	112	33
	307	Iran	72	113	35
	362	Iran	72	112	34
	391	Unknown	75	112	34
	430	Iran	75	114	36
	451	Turkey	72	112	36
	456	Turkey	74	112	36
	471	Turkey	73	113	36
	475	Turkey	73	113	37
	489	Turkey	73	113	35
	515	Turkey	74	113	36
	523	Egypt	73	114	35
	570	Lebanon	73	111	33
	591	Egypt	76	112	37
	596	Algeria	74	112	34
	598	Algeria	74	112	34
	604	Algeria	72	112	37
	608	India	75	113	34
	624	Tunisia	74	112	32
	653	Iran	74	113	36
	860	Iran	77	112	34
	953	Iran	76	112	34
	1062	Iran	76	113	33
	1079	Iran	66	113	36

Cont'd./...

Entry Name	Origin	Days to flowering	Days to maturity	Plant height (cm)
ILC 1102	Iran	72	111	33
1164	Iran	75	111	33
1201	Iran	68	112	36
1269	Iran	74	111	35
1289	Turkey	74	112	36
1309	Unknown	74	113	33
1885	India	71	112	32
FLIP 80- 1	Syria	73	111	35
- 2	Syria	71	111	33
- 3	Syria	72	112	30
- 4	Syria	73	112	28
- 5	Syria	73	112	33
- 6	Syria	73	111	30
- 7	Syria	72	111	32
- 8	Syria	72	112	31
- 9	Syria	72	112	32
-10	Syria	73	111	32
-11	Syria	75	112	30
-12	Syria	74	113	43
-13	Syria	74	112	31
-14	Syria	76	111	30
-15	Syria	73	111	29
-16	Syria	72	112	29
-17	Syria	73	112	32
-18	Syria	73	112	30
-19	Syria	72	111	36
-20	Syria	74	112	33
-21	Syria	73	113	32
-22	Syria	73	112	33
-23	Syria	73	112	32
-24	Syria	74	112	33
-25	Syria	76	111	31
-26	Syria	73	111	33
-27	Syria	72	110	34

Cont'd./...

Entry Name.	Origin	Days to flowering	Days to maturity	Plant height (cm)
FLIP 80-28	Syria	70	110	31
-29	Syria	72	112	31
-30	Syria	75	112	30
ILC 480	Turkey	73	113	35
ILC 1929	Syria	73	111	33

Table 3.5.3. Seed yield (Y= kg/ha) and rank (R) of entries in the CISN at different locations during 1980/81.

Entry Name		EGYPT Bahteem		INDIA New Delhi		JORDAN Jubeiha		LEBANON Kfardan		LEBANON Terbol		MEXICO Mexico		PAKISTAN Faisalabad		SYRIA Tel Hadya		TURKEY Ankara		TURKEY Diyarbakir		U.S.A. Pullman		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
ILC	23	259	67	1973	28	1319	20	2320	10	1594	36	1655	58	-	-	1110	34	263	64	2722	25	344	31	1356	34
	45	703	53	2573	9	1161	27	1887	33	1317	61	1988	44	59	53	1339	7	203	66	2533	35	310	33	1279	46
	47	2370	5	348	69	1336	18	1801	42	520	71	1988	44	51	57	1199	20	331	61	2867	16	304	36	1192	52
	69	2037	13	773	64	1277	21	2312	11	1161	66	2072	41	65	52	1681	1	271	63	2422	44	304	36	1306	41
	102	1898	16	1448	47	1261	22	2277	12	1421	52	2294	32	69	49	888	61	814	10	1978	65	351	29	1336	37
	231	1064	36	1598	44	1377	14	2407	7	1637	34	3044	11	90	38	1301	13	697	23	2422	44	966	5	1509	14
	232	2037	13	623	66	1677	5	1801	42	1334	58	1905	48	57	55	1370	5	569	41	2867	16	651	12	1354	35
	289	2314	8	1073	59	969	39	2147	17	1854	20	3377	4	111	27	1186	22	380	59	2933	14	591	15	1539	9
	307	1481	23	1373	52	952	42	1645	50	1854	20	3100	10	90	38	1320	11	388	58	2567	34	1007	3	1434	24
	362	2370	5	1298	53	1336	18	1801	42	1092	70	1738	55	132	20	932	55	524	49	2822	19	763	7	1346	36
	391	1481	23	1698	40	1069	34	2052	22	2269	6	2850	16	163	7	1180	23	737	19	2122	62	997	4	1510	12
	430	2620	4	1023	60	736	54	2234	14	1334	58	1711	56	142	12	977	48	834	8	2367	52	704	10	1334	38
	451	1838	16	638	65	1002	36	1671	49	1161	66	2266	34	132	20	958	51	283	62	2800	21	713	9	1235	51
	456	787	51	1098	58	1344	17	2485	5	1585	39	2905	15	122	24	1205	18	1023	5	3089	9	366	28	1455	21
	471	2898	1	1223	55	1627	7	1887	33	1351	55	3377	4	132	20	1135	32	798	12	2589	31	716	8	1612	4
	475	1064	36	2098	24	1577	8	2061	21	1525	44	1850	52	153	9	1021	44	745	18	2811	20	641	13	1413	29
	489	2176	9	1798	36	994	38	935	71	1204	65	2266	34	-	-	1047	41	685	27	2444	42	-	-	1505	16
	515	1018	40	2273	19	814	49	1919	30	2815	1	1905	48	87	40	1296	15	579	37	3063	12	555	18	1484	18
	523	1851	18	2123	22	839	48	1859	35	1776	24	2377	28	66	50	1093	37	1058	4	2396	50	139	53	1416	27
	570	1629	19	1398	50	1964	4	2413	6	1646	33	1544	61	108	28	1138	31	616	35	3085	11	248	42	1435	22
	591	2629	3	3023	5	739	52	1547	56	1732	28	2377	28	108	28	985	47	756	17	2830	18	1092	2	1619	2
	596	1574	21	2723	7	2397	1	1919	30	1343	56	1905	48	128	23	763	67	648	32	2419	48	348	30	1469	20
	598	2351	7	1398	50	1397	13	2586	2	1559	40	2322	31	108	28	1093	37	993	6	3130	7	552	19	1590	5
	604	435	62	1873	31	1056	35	2075	18	2079	10	2488	25	170	5	1334	8	1094	2	2685	28	305	35	1418	25
	608	407	63	2523	11	1431	12	2335	9	1126	69	1627	60	181	4	1042	42	688	26	2574	33	392	27	1302	43
	624	851	48	1298	53	881	46	2248	13	2165	7	1766	54	108	28	1201	19	579	37	2430	43	480	21	1273	48
	653	629	56	1848	32	906	45	1988	25	1992	12	2738	18	118	25	687	71	1070	3	2796	22	273	40	1368	33
	860	796	50	2298	17	689	56	2162	15	2425	3	1266	65	149	10	966	49	1156	1	1796	69	430	23	1285	45
	953	963	43	2473	12	1356	16	2006	24	1905	17	2461	27	139	15	1461	2	808	11	2463	41	239	44	1479	19
	1062	2129	11	1573	46	1089	33	1599	51	1473	49	2100	39	97	35	934	54	567	42	2274	58	161	51	1272	49
	1079	1046	38	2548	10	1472	10	2378	8	1672	31	1933	47	76	45	1322	10	824	9	2352	55	1208	1	1530	10
	1102	1101	35	3123	4	997	37	2508	3	1473	49	2377	28	108	28	1125	33	571	40	3130	7	133	54	1513	11
	1164	407	63	1448	47	2214	2	2508	3	1559	40	1488	62	139	15	1150	27	547	44	2241	59	5	60	1246	50
	1201	2074	12	3148	3	1364	15	2153	16	1213	64	2100	39	56	56	1093	37	784	14	2407	49	0	61	1490	17
	1269	1946	15	3206	2	1628	6	1466	61	2110	8	2035	42	87	40	1165	25	870	7	2689	27	556	16	1614	3
	1289	57	68	2306	16	1112	30	1380	64	1677	30	2757	17	201	2	1140	28	757	16	2422	44	556	16	1306	41
	1309	0	69	1806	34	953	31	1137	69	1894	18	1201	66	66	50	1190	21	488	53	2200	60	184	47	1011	70
	1885	557	60	1881	30	80	69	1726	47	1764	25	2646	20	139	15	1444	3	545	46	3133	6	393	26	1300	44
FLIP	80-1	0	69	2381	13	1212	23	1076	70	1937	13	3979	3	76	45	905	58	701	21	2700	26	596	14	1414	28
	80-2	830	44	1806	34	1987	3	3189	1	2110	8	3146	7	170	5	1343	6	693	24	2144	61	0	61	1588	6
	80-3	668	54	1831	33	-	-	1726	47	1877	19	4590	2	35	60	1171	24	653	31	2389	51	-	-	1660	1
	80-4	751	52	1656	41	770	51	1483	60	1747	27	2118	37	108	28	924	56	520	50	2344	56	0	61	1128	61
	80-5	1001	42	1906	29	1095	32	2072	19	2630	2	2979	14	87	40	1394	4	737	19	1889	68	0	61	1435	22

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Table 3.5.3, Seed yield (Y= kg/ha) and rank (R) of entries in the CISN at different locations during 1980/81.

Entry Name	EGYPT Bahteem		INDIA New Delhi		JORDAN Jubeiha		LEBANON Kfardan		LEBANON Terbol		MEXICO Mexico		PAKISTAN Faisalabad		SYRIA Tel Hadya		TURKEY Ankara		TURKEY Diyarbakir		U.S.A. Pullman		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
FLIP 80-6	1612	20	3856	1	1195	26	1916	32	1548	43	2590	23	201	2	1216	16	368	60	2089	63	0	61	1508	15
80-7	1140	33	2231	21	578	61	1804	41	2024	11	3313	6	139	15	1019	45	701	21	2600	30	0	61	1413	29
80-8	1362	26	1731	39	653	57	1968	27	1937	13	3146	7	149	10	1298	14	641	33	1333	71	306	34	1329	40
80-9	1334	27	2281	18	720	55	1553	55	2284	5	3146	7	14	66	1330	9	790	13	2756	24	831	6	1548	7
80-10	1029	39	2006	27	520	65	1986	26	1920	16	2035	42	76	45	1305	12	661	29	3089	9	0	61	1329	39
80-11	1251	29	1781	37	561	62	1466	61	1833	23	2118	37	139	15	759	68	641	33	2056	64	0	61	1146	59
80-12	890	44	2031	26	212	68	1830	39	1504	46	1868	51	160	8	1095	36	778	15	1978	65	0	61	1122	62
80-13	0	69	2331	15	320	67	1310	67	1591	38	2646	20	97	35	962	50	528	47	2422	44	112	55	1119	64
80-14	583	57	2923	6	389	66	1584	52	1386	54	1794	53	80	43	860	64	421	56	2781	23	183	48	1180	53
80-15	2666	2	2073	25	789	50	1429	63	1507	45	3044	11	142	12	892	60	261	65	3137	5	677	11	1510	12
80-16	2139	10	2673	8	939	43	1325	65	1732	28	2266	34	226	1	714	69	546	45	2493	37	230	45	1389	31
80-17	1500	22	2123	22	872	47	1844	36	1750	26	1044	67	80	43	937	53	606	36	1637	70	395	25	1162	55
80-18	305	66	248	70	1105	31	1584	52	1421	52	3044	11	101	34	1140	28	417	57	3215	3	55	57	1148	57
80-19	805	49	123	71	-	-	1489	59	1594	36	2627	22	17	63	1140	28	453	54	3415	2	48	59	1156	56
80-20	583	57	873	63	739	52	1758	45	1551	42	1655	58	142	12	1108	35	674	28	2470	38	86	56	1057	68
80-21	889	46	1598	44	614	59	1844	36	1144	68	2488	25	0	67	949	52	445	55	2315	57	55	57	1121	63
80-22	1333	28	1198	56	955	40	1567	54	1836	22	544	69	44	58	905	58	574	39	2470	38	280	39	1064	67
80-23	666	55	1423	49	547	64	1931	28	1663	32	2294	32	17	63	924	56	502	51	2470	38	195	46	1148	57
80-24	1194	31	1648	42	1147	28	1255	68	1334	58	1044	67	38	59	1051	40	494	52	2359	53	167	50	1066	66
80-25	389	65	1648	42	914	44	1498	57	1317	61	1405	64	0	67	689	70	526	48	2981	13	455	22	1074	65
80-26	1222	30	2373	14	614	59	1498	57	1490	47	266	70	59	53	873	63	-	-	1948	67	155	52	1049	69
80-27	1139	34	1023	60	1489	9	2035	23	1620	35	2738	18	-	-	886	62	-	-	2581	32	411	24	1546	8
80-28	1472	25	998	62	1464	11	1325	65	1317	61	266	70	17	63	1038	43	-	-	3470	1	320	32	1168	54
80-29	861	47	623	66	555	63	1931	28	1343	56	2572	24	28	61	771	66	-	-	2359	53	248	42	1129	60
80-30	583	57	473	68	622	58	1758	45	1447	51	4988	1	28	61	790	65	-	-	3215	3	273	40	1417	26
Local check means	491	61	2238	20	1206	25	1805	40	1485	48	1701	57	114	26	998	46	660	30	2500	36	176	49	-	-
ILC 480 means	1160	32	1763	38	1210	24	1836	38	2420	4	1951	46	72	48	1157	26	692	25	2603	29	288	38	1377	32
ILC 1929 means	1014	41	1163	57	1125	29	2065	20	1924	15	1451	63	95	37	1206	17	559	43	2886	16	550	20	1276	47
Location mean	1223		1775		1065		1864		1660		2263		99		1088		633		2563		363			
C.V. %	65.3		44.6		43.6		15.7		23.3		29.7		34.4		29.3		30.0		15.9		86.2			
SE.for two check mean	410.2		543.7		364.2		210.9		320.0		357.7		22.8		231.9		135.2		298.5		206.0			
SE.for variety vs	748.9		992.7		664.9		385.1		584.3		653.1		41.6		423.4		246.8		544.9		376.2			
C.D. 5%	1240		3231		1871		2190		2069		2354		156		1421		907		3045		552			
No. of entries exceeding significantly the local check	0		1		4		14		10		30		8		3		6		12		19			

Table 3.5.4. The five heaviest seed yielding entries at the individual locations in the CISN

Rank	EGYPT Bahteem	INDIA New Delhi	JORDAN Jubeiha	LEBANON Kfardan	LEBANON Terbol	MEXICO Mexico	PAKISTAN Fasialabad	SYRIA Tel Hadya	TURKEY Ankara	TURKEY Diyarbakir	U.S.A. Pullman
1	ILC 471	FLIP 80-6	ILC 596	FLIP 80-2	ILC 515	FLIP 80-30	FLIP 80-16	ILC 69	ILC 860	FLIP 80-28	ILC 1079
2	FLIP 80-15	ILC 1269	ILC 1164	ILC 598	FLIP 80-5	FLIP 80-3	ILC 1289	ILC 953	ILC 604	FLIP 80-19	ILC 591
3	ILC 591	ILC 1201	FLIP 80-2	ILC 1164	ILC 860	FLIP 80-1	FLIP 80-6	ILC 1885	ILC 653	FLIP 80-18	ILC 307
4	ILC 430	ILC 1102	ILC 570	ILC 1102	ILC 480	ILC 289	ILC 608	FLIP 80-5	ILC 523	FLIP 80-30	ILC 391
5	ILC 47	ILC 591	ILC 232	ILC 456	FLIP 80-9	ILC 471	ILC 604	ILC 232	ILC 456	FLIP 80-15	ILC 231
	ILC 362						FLIP 80-2				

(1) The brackets indicate the entries having the same rank.

Table 3.5.5. Seed yield, expressed as % of the location mean, of the six entries with the heaviest seed yield across locations in the CISN.

Entry	LOCATION (1)										
	1	2	3	4	5	6	7	8	9	10	11
FLIP 80-3	55	103	-	93	113	203	35	108	103	93	-
ILC 591	215	170	69	83	104	105	109	91	119	110	301
ILC 1269	159	181	153	79	127	90	88	107	137	105	153
ILC 471	237	69	153	101	81	149	133	104	126	101	197
ILC 598	192	79	131	139	94	103	109	101	157	122	152
FLIP 80-2	73	102	187	171	127	139	172	123	109	84	-

(1) Locations 1 to 11 are in the same order as those in Table 3.4.3.

Table 3.5.6. Correlations (1) between three agronomic characters and seed yield based on means across locations in the CISN

Character	Days to maturity	Plant height	Seed yield
Days to 50% flowering	0.01	-0.05	-0.20
Days to maturity	-	0.39**	0.05
Plant height	-	-	0.23*

(1) * $P \leq 0.05$
** $P \leq 0.01$

3.6. CHICKPEA INTERNATIONAL F_3 TRIAL - A (CIF_3T-A)

Material

The material for Chickpea International F_3 Trial - A comprised 10 F_3 populations, one ICARDA check (ILC 482) and one check to be supplied by the local co-operator. The F_3 populations were derived from different crosses involving parents having resistance to ascochyta blight and high yield and wide adaptation originating from different countries. The material was assumed to provide a wide range of variation, with which the co-operators were free to practice their own selections.

Methods and Management

The trial was conducted using randomised complete block design with three replications. The recommended plot size was 4 rows of 4m length with inter- and intra-row spacings of 0.30m and 0.10m, respectively. Eleven sets of trials were distributed to the co-operators in seven countries. The results were received from six trials in six countries. The data were , however, analyseable for four trials. The agronomic data for different locations are given in Table 3.6.1.

Results and Discussion

The data on mean values for days to flowering, days to maturity and plant height is given in Table 3.6.2. The range for days to flowering and days to maturity was respectively of the order of 106 to 113 and 163 to 165 days; and for plant height from 32 to 38 cm.

The seed yield of these populations along with checks is given in Table 3.6.3. The ANOVA revealed that the population differed with respect to their mean seed yields. The co-efficient of variation was within the acceptable limits for all the sites except Rabat (Morocco), where it was very high (47%). The location mean at Rabat was very low and so was at Ankara in Turkey. Both in New Delhi and Tel Hadya (Syria),

none of the populations exceeded the local check by a significant margin. At Tel Hadya, however, a few populations gave almost equal yield with that of the local check and thus were useful for making selections of plants having better performance with respect to yield and other characters. The correlations between different locations were of lower magnitude (Table 3.6.4.).

Table 3.6.1. Agronomic data for different locations for the CIF_3T-A during 1980/81

Country	Location	Planting date	Crop duration (1) (days)	Fertilizer (kg/ha) N	P_2O_5	K_2O	Irrigation	Insecticide
INDIA	New Delhi	20.10.80	-	15	40	-	1	Hildan
MOROCCO	Rabat	6.04.81	111	-	-	-	-	-
SYRIA	Tel Hadya	12.11.80	207	30	50	-	-	-
TURKEY	Ankara	23.03.81	122	20	60	-	-	-

(1) Days from planting to maturity averaged overall entries.

Table 3.6.2. Mean values for three agronomic characters for entries in the CIF3T-A during 1980/81.

Entry		Days to flowering	Days to maturity	Plant height (cm)
X79TH	1	111	164	36
	6	113	165	36
	23	112	165	35
	25	110	164	35
	29	110	165	34
	45	110	165	35
	50	112	165	38
	53	110	164	32
	76	111	165	33
	123	112	165	35
ILC	482	106	163	33

Table 3.6.3. Seed yield (Y= kg/ha) and rank (R) of entries in the CIF3T-A at different locations during 1980/81.

Entry	Pedigree	INDIA New Delhi		MOROCCO Rabat		SYRIA Tel Hadya		TURKEY Ankara		MEAN	
		Y	R	Y	R	Y	R	Y	R	Y	R
X 79TH 1	ILC 118 x ILC 183	2372	2	122	16	1881	8	700	1	1269	5=
6	112 x 262	1382	12	253	6	1990	7	575	7	1050	11
23	262 x 183	2326	3	503(1)	1	1779	9	616	3	1306	2
25	262 x 194	2024	5=	267	5	2784	1	498	12	1393	1
29	51 x 200	2024	5=	212	8	1662	10	556	9	1114	10
45	618 x 183	1906	8	226	7	2137	6	602	5	1218	7
50	591 x 200	1691	10	316	4	2490	3	696	2	1298	3
53	52 x 183	1979	7	372	3	2188	5	561	8	1275	4
76	625 x 200	2292	4	375	2	1622	11	547	11	1209	8
123	1929 x 200	1847	9	208	9	2205	4	553	10	1203	9
ILC 482		1646	11	128	11	2702	2	600	6	1269	5=
Local check		3194	1	194	10	-		608	4		
Location mean		2057		265		2131		593			
C.V. %		16.3		47.0		14.6		18.2			
L.S.D. 5%		567		210		530		182			
No.of entries significantly exceeding local check		0		1		-		0			

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

Table 3.6.4. Correlations (df= 9) between the seed yield of entries in the CIF3T-A at different locations during 1980/81 (local check excluded from the calculations).

Country	Location	MOROCCO Rabat	SYRIA Tel Hadya	TURKEY Ankara
INDIA	New Delhi	0.31	-0.49	0.07
MOROCCO	Rabat		-0.30	-0.14
SYRIA	Tel Hadya			-0.07

3.7. CHICKPEA INTERNATIONAL F_3 TRIAL -B (CIF_3T-B)

Material

The material for Chickpea International F_3 Trial - B comprised 23 F_3 populations, one ICARDA check (ILC 1929) and one check to be supplied by the co-operators. The F_3 populations were derived from different crosses involving diverse parents from different countries. The material was assumed to provide a wide range of variation within which the co-operators were free to practice their own selection.

Methods and Management

The trial was suggested to be conducted using randomised complete block design with three replications. The recommended plot size was 4 rows of 4m length with inter- and intra-row spacings of 0.30m and 0.10m, respectively. Ten sets of trials were distributed to the co-operators in 8 countries. The results were received from five trials in five countries. The data were, however, analyseable for 4 trials. The agronomic data for different locations is given in Table 3.7.1.

Results and Discussion

The data on mean values for days to flowering, days to maturity and plant height are given in Table 3.7.2. The range for these characters was 67 to 87 days, 119 to 122 days and 38 to 47cm respectively.

The data on seed yield for these populations are given in Table 3.7.3. The ANOVA revealed that the populations differed with respect to their mean seed yields. The co-efficient of variation was within the acceptable limits except at Shandweel where it was relatively high (37.9%). None of the entries exceeded the local check by a significant margin at any of the locations. However, numerically 7 populations at Shandweel in Egypt and 3 populations at Tel Hadya in Syria exceeded

the local checks. The selections in these populations could be useful. On the average of these locations, the population ILC 523 x ILC 898 gave the highest yield and was followed by ILC 1920 x ILC 622, ILC 1353 x ILC 295, and ILC 1096 x ILC 523. The correlations between locations were of very low magnitude (Table 3.7.4.).

Table 3.7.1. Agronomic data for different locations for the CIF_3T-B during 1980/81.

Country	Location	Planting date	Crop[1] duration (days)	Fertilizer (kg/ha) N	P_2O_5	K_2O	Irrigation	Insecticide
EGYPT	Shandweel	6.12.80	141	35	70	-	2	-
INDIA	New Delhi	28.10.80	-	15	40	-	1	Hildan
MEXICO	Mexico	14.12.81	123	-	-	-	2	Diazivrin
SYRIA	Tel Hadya	22.02.81	109	30	50	-	1	

(1) Days from planting to maturity averaged overall entries.

Table 3.7.2. Mean values for three agronomic characters for entries in the CIF3T-B during 1980/81.

Entry		Days to flowering	Days to maturity	Plant height (cm)
X 79TH	7	76	122	47
	21	77	121	42
	61	75	121	38
	68	78	121	42
	69	72	120	43
	74	78	121	42
	84	78	121	45
	86	78	121	45
	89	81	122	42
	92	70	120	41
	94	70	120	41
	103	77	121	42
	110	87	120	45
	111	79	121	39
	117	76	119	42
	121	78	120	38
	126	76	121	40
	130	77	121	45
	133	77	120	46
	134	69	119	41
	174	75	120	42
	177	78	120	41
	179	73	122	46
ILC	1929	67	120	39

Table 3.7.3. Seed yield (Y= kg/ha) and rank (R) of entries in the CIF_3T-B at different locations during 1980/81.

Entry		Pedigree	EGYPT Shandweel Y	R	INDIA New Delhi Y	R	MEXICO Mexico Y	R	SYRIA Tel Hadya Y	R	MEAN Y	R
X79TH	7	ILC 112 x ILC 868	1667	4=	1247	24	960	17=	1748	7	1406	13
	21	96 x 1281	1296	17	1490	17	794	21	1490	15	1268	18
	61	16 x 896	1333	14=	1365	20	675	24	1908	1	1320	16
	68	50 x 864	1037	20	1257	22	706	23	1386	23	1097	24
	69	50 x 891	1556	7	1618	12	984	16	1317	25	1369	14
	74	924 x 816	981	22	1528	15	889	19	1413	21	1203	23
	84	591 x 237	917	24	1611	13	1524	2	1721	8	1443	10
	86	591 x 360	1463	10	1524	16	1087	12	1817	2	1473	8
	89	953 x 1113	944	23	1378	19	1079	13	1432	19	1208	22
	92	1353 x 493	1352	13	1701	9	817	20	1344	24	1304	17
	94	1353 x 295	1370	12	1955	4	1302	6=	1795	3	1606	3
	103	523 x 898	1667	4=	2170	3	1302	6=	1406	22	1636	1
	110	1126 x 864	1889	2	1212	25	1048	14	1783	6	1483	7
	111	1126 x 432	648	25	1531	14	1159	8	1525	12	1216	21
	117	1043 x 482	1685	3	1799	7	1016	15	1494	14	1499	5
	121	1920 x 622	1574	6	2250	2	1119	10	1594	11	1634	2
	126	1929 x 860	1019	21	1802	6	762	22	1459	17	1261	19
	130	263 x 1922	1333	14=	1944	5	667	25	1706	9	1413	12
	133	868 x 1922	1472	8=	1330	21	1389	4	1784	5	1494	6
	134	868 x 1919	1333	14=	1740	8	1310	5	1427	20	1453	9
	174	249 x 812	1148	18	1691	10	1143	9	1481	16	1366	15
	177	1096 x 13	1111	19	1434	18	960	17=	1522	13	1257	20
	179	1096 x 523	2037	1	1656	11	1103	11	1448	18	1561	4
ILC	1929		1389	11	1253	23	1413	3	1662	10	1429	11
Local check			1472	8=	2326	1	1540	1	1786	4		
Location mean			1348		1633		1070		1578			
C.V. %			37.9		26.6		26.6		18.3			
L.S.D. 5%			842.7		715.5		467.6		475.3			
No.of entries significantly exceeding local check			0		0		0		0			

Table 3.7.4. Correlations (df=22) between the seed yield of entries in the CIF3T-B at different locations during 1980/81 (local check excluded from the calculations).

		INDIA New Delhi	MEXICO Mexico	SYRIA Tel Hadya
EGYPT	Shandweel	0.14	0.07	0.17
INDIA	New Delhi		0.11	-0.23
MEXICO	Mexico			0.17

3.8. CHICKPEA INTERNATIONAL F_3 TRIAL-C (CIF_3T-C)

Material

The material for Chickpea International F_3 Trial-C comprised 19 F_3 populations derived from crosses involving diverse parents from different countries, and one local check to be used by the co-operators. The material was assumed to provide a wide range of variation, within which the co-operators were free to practice their own selection.

Methods and Management

The trial was conducted using randomized complete block design with three replications. The recommended plot size was 4 rows of 4m length with inter- and intra-row spacings of 0.30m and 0.10m, respectively. Five sets of trials were distributed to the co-operators in three countries and the results were received from four trials from which only three were analyseable. The agronomic data for different locations is given in Table 3.8.1.

Results and Discussion

The data on mean values for days to flowering, days to maturity and plant height is given in Table 3.8.2. The range for these characters was 126 to 133 days, 212 to 215 days, and 29 to 47cm, respectively. The data on seed yield along with CV and LSD for different locations is given in Table 3.8.3. The ANOVA of the design revealed the differences among the means of populations at all the locations. The location mean at Faisalabad in Pakistan was very low (433kg/ha) but 11 populations at this location were significantly better than the local check. At Delhi in India, the populations X 79TH 44 and X 79TH 54 were the promising having seed yields approaching to the check, the single plants from these could be of use in breeding programs. At Tel Hadya the crosses X79TH2, X79TH52, X79TH157 etc. can be of some significance for individual plant selection.

The correlations between location means (Table 3.8.4) revealed the negative association between Tel Hadya in Syria and New Delhi in India with respect to seed yield of these populations.

Table 3.8.1. Agronomic data for different locations for the CIF_3T-C during 1980/81.

Country	Location	Planting date	Crop[1] duration (days)	Fertilizer (kg/ha) N	P_2O_5	K_2O	Irrigation	Insecticide
INDIA	New Delhi	20.10.80		15	40	-	1	Hildan
PAKISTAN	Faisalabad	10.11.80		18	46		1	
SYRIA	Tel Hadya	13.11.80	213	30	50			

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

Table 3.8.2. Mean values for three agronomic characters for entries in the CIF3T-C during 1980/81.

Entry	Days to flowering	Days to maturity	Plant height (cm).
X 79TH 2	130	213	44
11	126	213	36
30	126	212	34
44	132	213	29
47	130	213	36
48	128	212	34
51	126	212	37
52	129	212	37
54	131	215	34
108	131	212	37
113	130	212	35
119	129	213	34
124	129	214	34
150	132	213	46
157	133	213	47
165	133	212	46
166	133	213	42
169	133	214	37
170	132	214	32

Table 3.8.3. Seed yield (Y= kg/ha) and rank (R) of entries in the CIF3T-C at different locations during 1980/81.

Entry		Pedigree	INDIA New Delhi		PAKISTAN Faisalabad		SYRIA Tel Hadya		MEAN	
			Y	R	Y	R	Y	R	Y	R
X 79TH	2	ILC 118 x ICC 5127	1891	9	490	5	2167	1	1516	1
	11	130 x 7513	1701	17	556(1)	2	1696	7	1318	7
	30	51 x 7514	1242	20	569	1	1636	8	1149	18
	44	816 x 4935	2839	2	396	15	799	19	1345	5
	47	618 x 5127	1828	13	453	9=	1375	16	1219	17
	48	618 x 7513	1901	7	385	16	1470	13	1252	13
	51	591 x 7514	1523	19	418	13	1730	6	1224	15
	52	591 x 7520	1870	10 =	552	3	1870	2	1431	3
	54	52 x 5127	2552	3	472	8	869	18	1298	8
	108	1126 x 7513	1776	16	297	18	1764	4	1279	11=
	113	1043 x 7514	1798	15	453	9=	1412	14	1221	16
	119	1920 x 7520	2198	4	486	6	1393	15	1359	4
	124	1929 x 4935	2005	6	479	7	1258	17	1247	14
	150	72 x NEC 1096	1625	18	250	19	1551	11	1142	19
	157	201 x 74TA1740	2042	5	542	4	1848	3	1477	2
	165	72 x ICC 7513	1813	14	420	12	1760	5	1331	6
	166	196 x ICC 7513	1896	8	370	17	1570	10	1279	11=
	169	ICC 7513 x ILC 26	1865	12	448	11	1535	12	1283	10
	170	ICC 7513 x ILC 573	1870	10=	404	14	1593	9	1289	9
	Local check		2849	1	224	20	-			
Location mean			1954		433		1542			
C.V. %			33.3		35.5		20.3			
L.S.D. 5%			921.4		217.7		442.5			
No.of entries significantly exceeding local check			0		11					

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

Table 3.8.4. Correlations (1) (df = 17) between the seed yield of entries in the CIF3T-C at different locations during 1980/81 (local check excluded from the calculations).

		PAKISTAN Faisalabad	SYRIA Tel Hadya
INDIA	New Delhi	-0.04	-0.67**
PAKISTAN	Faisalabad		0.15

(1) ** $P \leq 0.01$

3.9. CHICKPEA INTERNATIONAL ASCOCHYTA BLIGHT NURSERY (CIABN)

Material

The nursery comprised 40 resistant/tolerant entries. The entries included originated from the USSR, Spain, Turkey, Iran, the USA, Afghanistan, India, Morocco and Pakistan and consisted of both kabuli and desi types. Twenty-six sets were distributed in 10 countries. The results were returned from only 10 locations in 7 countries. The disease did not develop at four locations, hence results were considered from six locations only.

Methods and Management

Adequate seed of each test entry was supplied to be planted in a single row plot of 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 co-operators were advised, where ever posible 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 the freshly 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.

Results and Discussion

The susceptible check ILC-1929 showed more than 8 rating at all the six locations indicating very high disease pressure. The reaction of the lines is presented in Table 3.9.1. Eleven lines lines, namely, ILC 72.-191,-194.-196, -484.-2380.- 2956, -3279.ICC 1903, ICC 5127 and Pch 15, showed resistant reaction across locations. Another 11 lines, viz. ILC -182,-200.-201, -202, 2548, NEC 138-2,

ICC 2160, -7513,-7514,-7520 and Pch 128, were found promising None of the lines was found susceptible across the locations. The results of the common entries in CIABN on the basis of last three years data are presented in Table 3.9.2. and discussed below countrywise.

Syria: On the basis of three years testing at two locations, 17 lines, namely, ILC -72, -182, -183, -191, -194, -200, -201, -202, -482,-2380, -2548, -2956, -3279, 77 Ms 73022-2, Pch -15, and -128 were found resistant. Fourteen lines, viz. ILC -195, -236, -244, -248, NEC -138-2, -1256, G 543, G 549, ICC-280, -1903, -2160, -4935, -5127, and -7513 were found promising.

Turkey: Six lines, namely, ILC -191, -200, -201, -202,-2380 and-3279 were found promising.

Algeria: A very large number of lines, some for two years and others for one year were found resistant.

Pakistan: Eleven lines, namely, ILC -72,-191, -194, -484, -2956, -3279, ICC -1903, -5127, -7514, and Pch 15 were found resistant for 1 to 2 years at 2 to 4 locations. Another 11 lines, viz. ILC -182, -200, -201, -202, -2380, -2548, NEC 138-2, ICC -2160, -7513, -7520 and Pch -128 were found promising.

Lebanon: Thirty-four and 2 lines were found resistant and tolerant, respectively, during 1979/80.

Lines showing different reactions at different locations suggest the possibility of existence of physiological variation for the pathogen.

Table 3.9.1. Reaction of entries of Chickpea International Ascochyta Blight Nursery during the 1980/81.

Entry		Origin	Rating on 1-9 scale						
			SYRIA		PAKISTAN				
			Tel Hadya	Lattakia	Islamabad	Tarnab	Faisalabad	Lahore	Mean
ILC	72	Spain	3	3	3	3	3	3	3.0
	182	USSR	3	3	5	3	3	3	3.2
	183	USSR	3	3	3	3	5	3	3.2
	191	USSR	3	3	3	3	3	3	3.0
	194	USSR	3	3	3	4	3	3	3.2
	195	USSR	5	3	3	3	3	3	3.3
	196	USSR	3	3	4	3	3	3	3.2
	200	USSR	3	3	4	3	5	3	3.5
	201	USSR	5	3	5	3	5	3	4.0
	202	USSR	5	3	5	4	5	3	4.2
	215	USA	7	3	8	7	7	7	6.5
	482	Turkey	3	3	6	5	6	6	4.8
	484	Turkey	3	3	3	4	4	4	3.5
	1695	Afghanistan	3	3	7	4	6	3	4.3
	1757	Afghanistan	4	3	7	5	7	5	5.2
	2380	Unknown	3	3	4	3	4	2	3.2
	2548	Unknown	3	3	4	3	5	4	3.7
	2555	Unknown	6	3	7	6	8	6	6.0
	2956	USSR	3	3	3	3	3	3	3.0
	3257	USSR	4	3	7	5	7	6	5.4
	3279	USSR	3	3	3	3	3	3	3.0
77MS	73022-2	ICARDA	4	3	6	7	8	6	5.7
NEC	138-2	USSR	6	3	5	4	4	2	4.4
	1256	Iran	5	3	6	5	3	5	4.5
ICC	280	ICRISAT	5	3	8	6	8	5	5.8
	1903	ICRISAT	5	3	3	3	3	3	3.3

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

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Cont'd table 3.9.1. Reaction of entries of Chickpea International Ascochyta Blight Nursery during the 1980/81.

Entry		Origin	Rating on 1-9 scale						
			SYRIA		PAKISTAN				
			Tel Hadya	Lattakia	Islamabad	Tarnab	Faisalabad	Lahore	Mean
ICC	2160	ICRISAT	3	3	3	3	4	5	3.5
	2232	ICRISAT	5	3	3	5	9	5	5.0
	4131	Unknown	4	3	7	3	4	5	4.3
	4935	ICRISAT	3	3	7	5	6	5	4.8
	5127	ICRISAT	3	3	3	3	4	3	3.2
	6067	ICRISAT	3	3	7	6	7	5	5.2
	7513	ICRISAT	4	3	3	5	3	3	3.5
	7514	ICRISAT	4	3	3	4	3	3	3.3
	7520	ICRISAT	4	3	3	3	3	5	3.5
G	543	Punjab-India	3	3	7	5	7	7	5.3
G	549	Punjab-India	3	3	7	5	5	5	4.7
AUG	480	Punjab-Pakistan	5	3	7	6	7	6	5.7
Pch	15	Morocco	3	3	3	3	2	2	2.7
Pch	128	Morocco	3	3	3	3	4	5	3.5
Mean rating of the susceptible check			9	9	8	9	9	9	

Table 3.9.2. Reaction of common entries of Chickpea International Ascochyta Blight Nursery (CIABN) during 1978/79, 1979/80 and 1980/81.

Entry	SYRIA								LEBANON	TURKEY			
	Iel Hadya				Lattakia				Terbol	Izmir			Eskishehir
	1978/79	1979/80	1980/81	Mean	1978/79	1979/80	1980/81	Mean	1979/80	1978/79	1979/80	Mean	1978/79
ILC 182	1	3	3	2.3	3	2	3	2.7	3	5	4	4.5	5
ILC 183	1	3	3	2.3	3	4	3	3.3	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	3	2.3	3	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	3	2.3	3	5	3	3.7	3	3	5	4.0	5
ILC 195	3	5	5	4.3	3	3	3	3.0	3	3	6	4.5	3
ILC 200	3	3	3	3.0	3	3	3	3.0	3	3	3	3.0	3
ILC 201	1	3	5	2.3	1	3	3	2.3	3	2	3	2.5	3
ILC 202	3	3	5	3.7	3	1	3	2.3	3	3	4	3.5	3
ILC 210	3	5	-	4.0	5	6	-	5.5	3	7	8	7.5	5
ILC 215	-	7	7	7.0	-	6	3	4.5	3	-	8	8.0	-
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	3.3	3	5	3	3.7	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
ILC 1757	-	5	4	4.5	-	8	3	5.5	3	-	6	6.0	-
ILC 2380	-	3	3	3.0	-	3	3	3.0	3	-	3	3.0	-
ILC 3279	-	3	3	3.0	-	3	3	3.0	3	-	3	3.0	-
NEC 138-2	3	5	6	4.7	3	3	3	3.0	3	3	5	4.0	3
NEC 1256	3	5	5	4.3	5	5	3	4.3	3	6	5	5.5	7
77MS 73022-2	3	4	4	3.7	3	6	3	4.5	3	6	6	6.0	7

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Cont'd Table 3.9.2. Reaction of common entries of Chickpea International Ascochyta Blight Nursery (CIABN) during 1978/79, 1979/80, 1980/81.

Entry	ALGERIA			PAKISTAN						MEAN			Over all
	Sidi-Bel-Abbes			Islamabad			Faislabad						
	1978/79	1979/80	Mean	1979/80	1980/81	Mean	1979/80	1980/81	Mean	1978/79	1979/80	1980/81	Mean
ILC 182	1	1	1.0	5	5	5.0	7	3	5.0	2.8	3.6	4.7	3.70
ILC 183	1	2	1.5	5	3	4.0	8	5	6.5	2.6	4.3	4.7	3.87
ILC 190	1	3	2.0	9	-	9.0	9	-	9.0	4.6	6.4	-	5.50
ILC 191	3	3	3.0	1	3	2.0	4	3	3.5	2.8	3.0	3.0	2.93
ILC 192	3	3	3.0	1	-	1.0	7	-	7.0	2.6	5.0	-	3.80
ILC 194	1	2	1.5	1	3	2.0	5	3	4.0	2.6	3.4	3.0	3.00
ILC 195	3	3	3.0	1	3	2.0	4	3	3.5	3.0	3.6	3.5	3.37
ILC 200	1	1	1.0	1	4	2.5	6	5	5.5	2.6	2.9	3.7	3.07
ILC 201	1	3	2.0	1	5	3.0	5	5	5.0	1.6	3.0	4.5	3.03
ILC 202	1	2	1.5	1	5	3.0	4	5	4.5	2.6	2.6	4.5	3.23
ILC 210	1	3	2.0	9	-	9.0	9	-	9.0	4.2	6.1	-	5.15
ILC 215	-	1	1.0	9	8	8.5	9	7	8.0	-	-	6.3	6.30
ILC 248	1	2	1.5	9	-	9.0	9	-	9.0	5.4	6.0	-	5.70
ILC 430	9	5	7.0	9	-	9.0	9	-	9.0	2.4	8.3	-	5.35
ILC 482	3	1	2.0	3	6	4.5	9	6	7.5	3.8	4.7	4.5	4.33
ILC 616	1	5	3.0	9	-	9.0	9	-	9.0	7.0	8.4	-	7.70
ILC 618	9	7	8.0	9	-	9.0	9	-	9.0	9.0	8.7	-	8.85
ILC 1757	-	3	3.0	9	7	8.0	9	7	8.0	-	6.1	5.3	5.70
ILC 2380	-	3	3.0	1	4	2.5	9	4	6.5	-	3.6	3.5	3.55
ILC 3279	-	3	3.0	1	3	2.0	2	3	2.5	-	2.6	3.0	2.80
NEC 138-2	3	2	2.5	1	5	3.0	7	4	5.5	3.0	3.7	4.5	3.73
NEC 1256	3	3	3.0	2	6	4.0	5	3	4.0	4.8	4.0	4.3	4.37
77MS 73022-2	1	3	2.0	9	6	7.5	8	8	8.0	4.0	5.6	5.3	4.97

4. FABA BEAN INTERNATIONAL TRIALS AND NURSERIES

Introduction :

Seven international trials or nurseries of faba bean were available to cooperators in 1980-81. These were the adaptation trial (FBAT), the international yield trial - large seeded (FBIYT-L), the international yield trial-small seeded (FBIYT-S), the international screening nursery-large seeded (FBISN-L), the international screening nursery - small seeded (FBISN-S), the international F_3 trial (FBIF3T) and the international F_3 trial-early (FBIF3T-E). For each nursery an attempt was made to balance previous entries and new entries to keep the nursery current and meaningful. Also, results of entries which were planted in more than one year were summarized to examine their stabilities performance.

4.1. FABA BEAN ADAPTATION TRIAL (FBAT)

Material

The twelve entries in the 1980-81 FBAT are listed below :

Entry No.	Variety	Origin	ILB No.	Year entered	Remarks
1	Jordan Local	Jordan	1818**	1978-79	Local, mass-selected
2	Giza 3	Egypt	1819*	1978-79	Released cultivar
3	Giza 4	Egypt	1820*	1978-79	"
4	Lebanese Local Large	Lebanon	1817**	1978-79	Local, mass-selected
5	Lebanese Local Small	Lebanon	1816*	1978-79	" "
6	Turkish Local	Turkey	1821**	1978-79	" "
7	Aquadulce	Spain	1266**	1978-79	Released cultivar
8	Hudeiba 72	Sudan	460*	1979-80	"
9	Syrian Local Small	Syria	1811*	1978-79	Local, mass-selected
10	Syrian Local Large	Syria	1814**	1978-79	" "
11	Violetta di Policora	Italy	1822**	1979-80	Released cultivar
12	New Mammoth	U.K.	1269**	1980-81	"

* Var. minor types ** Var. major types

The twelve test entries in the FBAT originated from nine different countries, and were either local mass-selected populations or released cultivars. In both cases the varieties are widely grown in their country of origin. Five of the twelve entries were var. minor and seven were var. major types. The assumption was made that such a choice of genotypes

will provide a range of diversity needed for the classification of countries into agro-ecological zones (see 2.1.1.).

Methods and Management

The trial design was a randomized complete block with four replicates. The recommended plot size was four rows, each 4m long with an inter- and intra-row spacing of 0.50m and 0.15m, respectively.

Twenty sets of the trial were dispatched to cooperators in 18 countries. Results were received from ten trials covering eight countries. Agronomic data provided by cooperators is summarized in Table 4.1.1.

Results and Discussion

Mean number of days to flowering for the entries at different locations is given in Table 4.1.2.The location means varied from 66 days in West Germany to 124 days in Lebanon. Across all tests, the entries Hudeiba 72 and Jordan local were the earliest to flower with 88 days , while the entry Turkish local was the latest with 100 days. The entries Giza 3 and Giza 4 flowered as early as Jordan local and Hudeiba 72 at several locations, therefore, we have been using them as source of earliness in our crossing program.

Mean number of days to maturity for the entries at different locations is shown in Table 4.1.3. Days to maturity was earliest at Debre Zeit in Ethiopia and latest at Terbol in Lebanon. The Terbol location was noted to have had a cool rainy season.Of the twelve test genotypes, Hudeiba 72 (ILB 460) was the earliest to maturity in Egypt, Ethiopia and Spain (Madrid). However, at Bari, Italy Hudeiba 72 (ILB 460) was the latest to mature.

Table 4.1.1.Agronomic date for different locations for the FBAT during 1980/81.

Country	Location	Planting date	Crop[1] Duration (days)	Fertilizer kg/ha N	P_2O_5	K_2O	Irrig.	Insec. or fungicide
ARGENTINA	Salta	3. 6.81	162				3	Parathion,Thiophonate
EGYPT	Sids	24.11.80	162	38	75		5	
ETHIOPIA	Debre Zeit	25. 6.81	137					
ITALY	Bari	2.12.80	205	25	105			
LEBANON	Terbol	14.11.80	233					
LIBYA	Tripoli	6.11.80	175		100			Primore
SPAIN	Cordoba	26.11.80	201		50		3	Sevin
SYRIA	Tel Hadya	13.11.80			50		3	

(1) Days from planting to harvest.

Table 4.1.2. Days to flowering for entries in the FBAT at the different locations during 1980/81.

ENTRY	Varietal	Origin	EGYPT Sids	ITALY Bari	LEBANON Terbol	LIBYA Tripoli	SPAIN Madrid	SYRIA Tel Hadya		W.GERMANY Stuttgart	MEAN
								Irrigated	Rainfed		
ILB 1818	Jordan local	Jordan	63	96	119	75	81	105	104	64	88
1819	Giza 3	Egypt	65	96	123	74	82	105	110	68	90
1820	Giza 4	"	65	95	124	75	83	105	109	66	90
1817	Lebanese large	Lebanon	80	99	125	100	86	109	115	67	98
1816	Lebanese small	"	73	99	124	104	86	106	111	67	96
1821	Turkish local	Turkey	85	100	129	107	86	109	115	67	100
1266	Aquadulce	Spain	78	99	124	100	84	104	111	66	96
460	Hudeiba 72	Sudan	60	97	125	66	80	103	106	65	88
1811	Syrian Loc.Small	Syria	69	97	121	82	85	105	110	64	92
1814	Syrian Loc.Large	"	79	96	126	99	86	108	113	67	97
1822	Violetta di Policoro	Italy	75	99	128	97	86	106	111	66	96
1269	New Mammoth	U.K.	78	96	118	100	85	108	113	65	95
Location mean			73	97	124	90	84	106	111	66	

Table 4.1.3.Days to maturity for entries in the FBAT at different locations during 1980/81.

ENTRY	EGYPT	ETHIOPIA	Italy	LEBANON	LIBYA	SPAIN		SYRIA		MEAN
	Sids	Debre Zeit	Bari	Terbol	Tripoli	Cordoba	Madrid	Tel Hadya		
								Irrigated	Rainfed	
ILB 1818	153	115	192	200	163	191	142	186	175	169
1819	155	116	191	200	167	192	143	187	175	170
1820	155	119	191	200	166	194	144	186	175	170
1817	160	122	192	200	167	191	147	188	175	171
1816	155	116	191	200	166	191	147	186	175	170
1821	165	122	192	200	171	191	147	189	175	172
1266	160	121	190	200	170	192	145	187	175	171
460	150	106	195	200	166	194	141	185	175	168
1811	154	113	192	200	168	191	146	186	174	169
1814	164	123	191	204	172	192	147	189	174	173
1822	158	122	190	200	169	193	147	187	175	171
1269	159	124	190	200	170	191	146	185	175	171
Location mean	157	118	191	200	168	192	145	187	175	

Giza 3, Giza 4 and Jordan local also were early maturing at several locations. Study of the genetic control of days to flowering and to maturity for the four early varieties (Hudeiba 72, Jordan local, Giza 3 and Giza 4) would help in planning more efficiently the strategy of breeding for earliness.

Mean plant height of the entries at different locations is given in Table 4.1.4. The location means for plant height varied from 43cm in Argentina to 106cm in Ethiopia. Over eight test sites, Jordan local (ILB 1818) was the shortest with 57cm, and Syrian local large (ILB 1814) was the tallest with 74 cm.

The mean seed yield and rank of entries at different locations is given in Table 4.1.5. The location means varied greatly with the extremes represented by 1199 kg/ha in Ethiopia and 4930 kg/ha in Egypt. The low performance of the genotypes in Ethiopia as well as in Libya could be due to the unadaptation and/or the poor environment. The coefficient of variation for yield was high in Argentina (29%) and in Spain (41%), while the remainder sites showed a reasonable range (16-23%). The cultivar New Mammoth (ILB 1269) released in U.K. had the heaviest mean seed yield across all locations. It ranked first in seed yield at three sites, and 2nd, 3rd, and 5th at two sites each. The relatively low genotype x environment interaction would suggest that New Mammoth may possess genes for wide adaptation. A large number of crosses were made with New Mammoth and segregates are now being evaluated in advanced yield tests. The entry Violetta di Policoro (ILB 1822) from Italy and Giza 4 (ILB 1820) from Egypt ranked 2nd and 3rd in seed yield overall locations, respectively, though ranking orders from one location to another were not as stable as that of New Mammoth.

Average seed yields of the entries over several locations for one, two, and three years period from 1978-79 to 1980-81 are shown in Table 4.1.6. The cultivar Violetta di Policoro was tested for two years and New Mammoth for

Table 4.1.4.Plant height (cm) of entries in the FBAT at different locations during 1980/81.

ENTRY	ARGENTINA Salta	ETHIOPIA Debre Zeit	ITALY Bari	LEBANON Terbol	LIBYA Tripoli	SPAIN Madrid	SYRIA Tel Hadya		MEAN
							Irrigated	Rainfed	
ILB 1818	34	91	44	56	49	55	75	54	57
1819	38	111	42	64	63	69	86	64	67
1820	49	101	43	70	63	65	88	65	68
1817	44	112	45	63	64	60	78	59	66
1816	46	112	43	65	62	60	85	60	67
1821	41	106	46	61	75	64	80	61	67
1266	40	110	50	63	78	61	80	63	68
460	41	89	43	66	67	59	76	50	61
1811	46	130	48	59	71	61	81	55	69
1814	45	100	48	73	72	68	103	80	74
1822	48	103	45	54	68	55	66	61	63
1269	48	109	47	60	68	61	80	59	67
Location mean	43	106	45	63	67	62	82	61	

only one year, therefore, it remains to be seen whether or not, they will maintain their high yielding ability for the coming year. Mean seed yield and rank of entries in the FBAT at different locations for two years 1979-81 is summarized in Table 4.1.7. It was evident that at most individual locations yield performance of the genotypes was specifically related to their adaptation, for example, Syrian local large yielded best in Syria, Lebanese local large ranked first in Lebanon, Violetta di Policoro was the best in Italy and Giza 4 ranked 2nd in Egypt. However,Violetta di Policoro had mostly high yields and Hudeiba 72 mostly low yields across locations.

The correlations among different locations for seed yield during 1980-81 is given in Table 4.1.8,and for two years (1979-80 and 1980-81) in Table 4.1.9.The tested genotypes were from different countries and most likely were lacking wide adaptation, as a result few highly significant correlations were found among locations. It was striking to note that results of one as well as two years clearly showed that Ethiopia correlated negatively and significantly with Syria, and negatively with Lebanon, Italy and Spain. On the other hand, the correlation was positive and significant between Ethiopia and Egypt. Interlocation correlations between Syria, Lebanon, Italy and Spain were very similar in value and magnitude for one and two years. Probably, this was due to the similarity of environments among those countries. Two years results showed that Libya did not correlate significantly with any other location , while one year results indicated only one significant correlation with Argentina (0.67*). It remains to be seen, if these interlocation correlations will hold over years, if so then advanced breeding materials developed in Egypt could be used more directly in Ethiopia, whereas advanced breeding materials developed in Syria could be used more directly in Lebanon, Italy, and Spain. These results also are in harmony with our present breeding strategy, where we have divided the ICARDA region into three sub-regions; West Asia, North Africa, and Nile Valley. Breeding materials developed in each sub-region should have direct

Table 4.1.5. Seed yield (Y = kg/ha) and rank (R) of entries in the FBAT at different locations during 1980/81.

ENTRY	ARGENTINA Salta		EGYPT Sids		ETHIOPIA Debre Zeit		ITALY Bari		LEBANON Terbol		LIBYA Tripoli		SPAIN Cordoba		SYRIA Tel Hadya				MEAN	
															Irrigated		Rainfed			
	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R
ILB 1818	1244	12	5177	6	1535	4	1717	10	2486	9	1483	10	827	12	3231	10	2292	7	2221	9
1819	2428	4	5785	4	2058	2	2167	6	2532	8	1953	4	1363	9	3373	9	1991	10	2628	5
1820	2569	3	5910	2	1465	6	2083	7	2370	10	1703	6	1619	8	3819	7	2208	9	2638	3
1817	1644	11	5056	7	472	10	1783	9	2912	2	1680	7	2610	4	4015	6	2319	5	2499	8
1816	1929	8	3736	11	631	8	1992	8	2565	7	1440	11	1009	11	4129	4	2231	8	2185	10
1821	1932	7	2885	12	213	11	2183	4	2954	1	1512	9	1765	7	3624	8	2380	4	2161	11
1266	2257	5	4063	10	623	9	2533	3	2657	6	2246	1	2456	5	4205	3	2657	2	2633	4
460	1694	10	4810	8	1909	3	1158	12	1579	12	1519	8	1256	10	1868	12	972	12	1863	12
1811	2238	6	6306	1	2644	1	1375	11	1968	11	2022	3	1979	6	2860	11	1500	11	2544	6
1814	1716	9	4111	9	143	12	2175	5	2671	5	1328	12	2985	2	4732	2	2963	1	2536	7
1822	3088	1	5851	3	1172	7	2608	2	2750	4	1927	5	2637	3	4040	5	2301	6	2930	2
1269	2647	2	5476	5	1519	5	2733	1	2755	3	2160	2	2997	1	4918	1	2582	3	3087	1
Location mean	2115		4930		1199		2042		2517		1748		1959		3734		2200			
C.V.%	29.0		18.8		21.6		23.4		16.2		17.4		40.9		18.6		18.4			
S.E. entry	307		465		129		239		204		152		400		347		202			

Table 4.1.6. Average seed yields (kg/ha) and rank (R) of entries in the FBAT over several locations for one, two and three years period from 1978 to 1981.

ILB No.	Varietal Name	One year						Two years		Three years (27)*	
		1978-79 (7)*		1979-80 (11)*		1980-81 (9)*		1978-80		1978-81	
		kg/ha	R	Kg/ha	R	Kg/ha	R	Kg/ha	R	Kg/ha	R
1822	Violetta di Policoro	-	-	2751	1	2930	2	-	-	2832	2
1817	Lebanese L.L.	2245	4	2670	2	2499	8	2505	1	2503	4
1266	Aquadulce	2238	5	2630	3	2633	4	2478	2	2529	3
1821	Turkish Local	1295	9	2506	4	2161	11	2035	7	2077	11
1814	Syrian L.L.	1507	8	2313	5	2536	7	2000	8	2178	7
1820	Giza 4	2483	2	2074	6	2638	3	2233	3	2368	5
1818	Jordan Local	2117	7	1997	7	2221	9	2044	6	2103	10
1819	Giza 3	2523	1	1991	8	2628	5	2198	4	2341	6
1816	Lebanese L.S.	2259	3	1950	9	2185	10	2070	5	2108	9
1811	Syrian L.S.	2129	6	1887	10	2544	6	1981	9	2169	8
460	Hudeiba 72	-	-	894	11	1863	12	-	-	1330	12
1269	New Mammoth	-	-	-	-	3087	1	-	-	3087	1

* No. of locations reported.

Table 4.1.7.Mean seed yield (Y = kg/ha) and rank (R) of entries in the FBAT at different locations for two years (1979-81)

ILB No.	Varietal Name	LEBANON Terbol		SYRIA-Tel Hadya Irrigated		SYRIA-Tel Hadya Rainfed		ETHIOPIA Debre Zeit		ITALY Bari		LIBYA*1		EGYPT*2		SPAIN*3		MEAN	
		Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R
1818	Jordan Local	3215	4	3397	8	2305	7	1443	4	2511	9	1353	9	2627	5	1291	9	2268	9
1819	Giza 3	2586	8	3239	9	2164	9	1739	2	2846	7	1818	3	2905	4	1644	7	2368	6
1820	Giza 4	2532	9	3564	7	2318	6	1500	3	2958	6	1722	5	2983	2	1665	6	2405	5
1817	Lebanese L.L.	3493	1	4434	3	2411	5	529	9	3375	5	1856	2	2540	6	2680	1	2665	2
1816	Lebanese L.S.	3056	5	3846	6	2290	8	576	8	2725	8	1399	8	1877	10	1193	11	2120	10
1821	Turkish local	3415	3	4229	5	2479	3	239	10	3783	2	1454	7	1452	11	1549	8	2325	7
1266	Aquadulce	2852	6	4419	4	2456	4	787	7	3769	3	1986	1	2045	9	2341	3	2582	3
460	Hudeiba 72	1315	11	1521	11	1260	11	1422	5	1212	11	1121	11	2490	7	1196	10	1442	11
1811	Syrian L.S.	2329	10	3042	10	1662	10	2404	1	2225	10	1519	6	3191	1	1871	5	2280	8
1814	Syrian L.L.	2843	7	4631	1	2707	1	162	11	3640	4	1235	10	2065	8	2311	4	2449	4
1822	Violetta di Policoro	3459	2	4464	2	2702	2	1272	6	3804	1	1748	4	2938	3	2411	2	2850	1

*1 Mean of Zawia and Tripoli

*2 Mean of Giza and Sids

*3 Mean of Sevilla and Cordoba.

impact in a specific zone ,until more widely adapted cultivars are developed. Correlations among three agronomic characters and seed yield based on mean values across two years (1979-80 and 1980-81) are summarized in Table 4.1.10. Days to maturity was significantly correlated with days to flowering (0.79^{**}). This means that selection in early x late cross for earlier heading segregants may lead simultaneously to select early maturity lines. Most taller entries are expected to be late in maturity ($r = 0.85^{**}$).

Table 4.1.6. Correlations[1] (df = 10) among different locations in the FBAT during 1980/81 for seed yield.

Locations	EGYPT Sids	ETHIOPIA Debre Zeit	ITALY Bari	LEBANON Terbol	LIBYA Tripoli	SPAIN Cordoba	SYRIA Tel Hadya Irrigated	SYRIA Tel Hadya Rainfed
Argentina - Salta	0.45	0.24	0.62*	0.15	0.67*	0.40	0.31	0.09
Egypt - Sids		0.79**	-0.12	-0.35	0.46	0.06	-0.19	-0.35
Ethiopia - Debre Zeit			-0.42	-0.70*	0.40	-0.34	-0.60*	-0.71**
Italy - Bari				0.75**	0.44	0.55	0.83**	0.78**
Lebanon - Terbol					0.06	0.45	0.80**	0.86**
Libya - Tripoli						0.40	0.17	0.03
Spain - Cordoba							0.65*	0.53
Syria - TH-Irrigated								0.92**

(1) * $P \leq 0.05$
** $P \leq 0.01$

Table 4.1.9. Correlations[1] (df= 9) among different locations in the FBAT during two years 1979/81 for seed yield.

Locations	Syria-Tel Hadya		Ethoipia	Italy	Libya	Egypt	Spain
	Irrigated	Rainfed	Debre Zeit	Bari			
Lebanon - Terbol	0.86**	0.85**	-0.50	0.80**	0.40	-0.29	0.43
Syria - TH- Irrigated		0.94**	-0.62*	0.96**	0.47	-0.35	0.68*
Syria - TH- Rainfed			-0.60*	0.93**	0.40	-0.32	0.53
Ethiopia - Debre Zeit				-0.59	0.09	0.85**	-0.26
Italy - Bari					0.54	-0.36	0.67*
Libya						0.26	0.59
Egypt							0.12

1) * $P \leq 0.05$

** $P \leq 0.01$

Table 4.1.10. Correlations (df= 9) among three agronomic characters and seed yield based on mean values across two years (1979/80 and 1980/81) in the FBAT.

Trait	Days to maturity	Plant height	Seed yield
Days to 50% flowering	0.79**	0.55	0.57
Days to maturity		0.85**	0.56
Plant height			0.44

1) * $P \leq 0.05$
** $P \leq 0.01$

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

Material

The FBIYT-L comprised 16 entries, consisting of five elite lines from ICARDA advanced yield tests, five released cultivars, five open-pollinated improved populations and one local check (to be added by the cooperator). The materials of the trial could be used by the cooperator either directly and/or indirectly.

Methods and Management

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

Twenty sets of the trial were distributed to cooperators in 17 countries. Results were reported from 12 trials covering ten countries. Agronomic data furnished by the cooperators is summarized in Table 4.2.1.

Results and Discussion

Data on flowering, maturity and plant height are given in Tables 4.2.2, 4.2.3, and 4.2.4, respectively. Flowering was earliest in Chile (56 days) and latest in Lebanon, AUB, (137 days). Of the sixteen test genotypes, 39MB (ILB 1799) was the earliest to flower (94 days), and both Syrian local large (ILB 1814) and New Mammoth (ILB 1269) were the latest (102 days). Some other entries were as early as 39MB at a specific location, but it is worth noting that there was a large difference between the flowering of 39MB and the location mean at Egypt and Libya. For days to maturity the location means ranged from 169 days in Libya to 202 days in Lebanon. The mean difference for days to flowering was eight days, and for days to maturity was

Table 4.2.1. Agronomic date for different locations for the FBIYT-L during 1980/81.

Country	Location	Planting date	Crop Duration (days)(1)	Fertilizer Kg/ha N	P_2O_5	K_2O	Irrig.	Herb.	Insec.
ARGENTINA	Salta	4.6. 81	161				3		Parathion
CHILE	Valdivia	24.10.80	109	40	150	50		Linuron	Thiophonate
CYPRUS	Nicosia	17.12.80	154	21	48		2	Treflan	
EGYPT	Sakha	27.11.80	155	35	75		3		
ITALY	Bari	2.12.80	207	25	105				
LEBANON	AUB	18.11.80	234	30	100		4		Metasystox
LEBANON	Terbol	14.11.80	233						
LIBYA	Tripoli	9.11.80	175		100				Primore
OMAN									
PERU	Lima	12. 9.80	290						
SYRIA	Tel Hadya	10.11.80			50		3		

(1) Days from planting to harvest.

Table 4.2.2. Days to flowering for entries in the FBIYT-L at different locations during 1980/81.

ENTRY		Varietal Name	Origin	CHILE Valdivia	CYPRUS Nicosia	EGYPT Sakha	ITALY Bari	LEBANON AUB	LEBANON Terbol	LIBYA Tripoli	SYRIA Tel Hadya Irrigated	SYRIA Tel Hadya Rainfed	MEAN
ILB	19	74TA 51	Syria	54	88	65	94	136	123	95	105	108	96
	22	74TA 59	"	52	86	78	92	137	125	96	104	105	97
	24	74TA 63	"	52	86	78	94	137	123	98	105	105	98
	1266	Aquadulce	Spain	54	87	80	92	137	124	99	106	104	98
	1269	New Mammoth	U.K.	59	90	80	98	138	125	106	109	111	102
	1270	Reina Blanca	"	54	89	80	90	137	120	103	105	104	98
	1799	39 MB	Syria	52	86	63	91	135	121	89	104	101	94
	1805	Elegant 5MCI	"	54	87	78	91	136	118	91	106	106	96
	1812	Syr. Med. Shortpod	"	61	88	78	93	136	128	102	109	110	101
	1813	Syr. Med. Longpod	"	64	89	78	98	136	125	105	109	109	101
	1814	Syr.Large Shortpod	"	61	90	80	99	137	130	104	109	110	102
	1815	Lattakia local	"	52	86	60	98	136	124	92	109	104	96
	1817	Lebanese local large	Lebanon	57	87	65	96	137	121	103	109	105	98
	1819	Giza 3	Egypt	59	86	70	94	137	126	94	106	108	98
	1933	Sevilla Giant	U.K.	61	89	80	99	137	124	104	109	114	102
	-	Local check		57	77	60	88	137	125	72	108	110	
		Location mean		56	87	73	94	137	124	97	107	107	

Table 4.2.3.Days to maturity for entries in the FBIYT-L at different locations during 1980/81.

ENTRY	CHILE Valdivia	ITALY Bari	LEBANON Terbol	LIBYA Tripoli	SYRIA Tel Hadya		MEAN
					Irrigated	Rainfed	
ILB 19	125	189	201	173	189	175	175
22	125	189	201	170	189	175	175
24	125	189	201	171	190	175	175
1266	125	188	200	169	189	175	174
1269	125	192	206	171	189	179	177
1270	125	189	200	165	189	175	174
1799	125	188	201	168	189	175	174
1805	125	189	200	171	189	175	175
1812	125	189	202	170	191	179	176
1813	125	196	204	169	191	178	177
1814	125	196	202	173	191	179	178
1815	125	192	200	169	189	176	175
1817	125	189	205	170	189	176	176
1819	125	191	202	169	190	176	176
1933	125	196	201	167	190	178	176
Local check	125	189	200	166	190	176	
Location mean	125	191	202	169	190	176	

Table 4.2.4. Plant height (cm) of entries in the FBIYT-L at different locations during 1980/81.

ENTRY	ARGENTINA Salta	CHILE Valdivia	CYPRUS Nicosia	ITALY Bari	LEBANON		LIBYA Tripoli	SYRIA Tel Hadya		MEAN
					AUB	Terbol		Irrigated	Rainfed	
ILB 19	49	80	96	54	45	73	68	111	84	75
22	45	70	93	47	46	68	69	111	79	71
24	52	55	95	45	40	70	71	108	80	70
1266	46	60	93	55	39	64	70	100	76	67
1269	45	80	71	46	39	60	62	94	61	68
1270	36	60	86	52	35	51	55	88	65	61
1799	43	60	85	47	38	60	70	95	65	64
1805	41	60	90	49	41	66	71	104	78	71
1812	-	70	85	53	40	56	60	94	65	62
1813	50	75	81	44	39	58	57	101	64	65
1814	45	90	91	46	45	59	73	106	75	71
1815	47	85	99	45	43	68	60	103	69	71
1817	48	75	85	47	41	65	62	103	73	69
1819	43	60	78	49	47	65	53	100	71	62
1933	53	80	95	52	42	64	63	98	65	73
Loc.check	-	120	84	50	42	66	53	110	73	
Location mean	46	74	88	49	41	63	64	102	71	

only four days. This suggestes that some genotypes flowered early but they have took a longer period for maturity. For plant height the location means ranged from 41cm in Lebanon (AUB) to 102cm at Syria (Tel Hadya-irrigated). Of the sixteen test genotypes, Reina Blanka (ILB 1270) was the shortest (61cm) and 74TA 51 (ILB 19) was the tallest (75cm).

For each location, the seed yield and rank of genotypes is given in Table 4.2.5. The location means varied greatly with the extremes represented by 840 kg/ha in Oman and 4942 kg/ha in Syria (Tel Hadya-irrigated). It is worth mentioning that Argentina reported a large number of missing plots and Oman did not report the replication data, which resulted in no statistical analysis for both locations. The coefficients of variation for yield were very high in Peru (48.5%) and in Egypt (41.8%). 'F' tests indicated that genotypic differences were significant at all locations. A least significant difference was calculated to indicate the genotypes which significantly exceeded the local check (Table 4.2.5.). The local check was significantly exceeded by no genotypes at six sites, by one at Peru, by two at Tel Hadya (irrigated), and by three at both Tel Hadya (rainfed) in Syria and Libya. Excluding Argentina and Oman (not analyzed statistically), these genotypes exceeded the local check by a range of 17% at Tel Hadya (rainfed) in Syria to 51% in Libya. The local check ranked first in seed yield only at one location (Cyprus). Across locations Elegant 5MCI (ILB 1805) had the heaviest mean seed yield with 2705 kg/ha. At every location except at Lebanon (AUB) and Syria (rainfed) Elegant 5MCI was in the top six high yielding entries, indicating that it may possess genes not only for higher yield but also for wide adaptation.

The five heaviest seed yielding entries at the individual locations are listed in Table 4.2.6.The local check appeared five times, i.e., at Chile Cyprus, Egypt, Lebanon (Terbol), and Peru. In Table 4.2.6 Reina Blanca (ILB 1270) and 74TA 63 (ILB 24) appeared nine times each and Elegant 5MCI (ILB 1805)

Table 4.2.5.Seed yield (Y = kg/ha) and rank (R) of entries in the FBIYT-L at different locations during 1980/81.

ENTRY		ARGENTINA Salta		CHILE Valdivia		CYPRUS Nicosia		EGYPT Sakha		ITALY Bari		LEBANON AUB		LEBANON Terbol		LIBYA Tripoli		OMAN		PERU Lima		SYRIA Tel Hadya Irrigated		SYRIA Tel Hadya Rainfed		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	R
ILB	19	2028	8	900	8	3575	8	2188	2	2983	4	1103	13	3650	3	1660	10	1109	4	1531	3	5754	2	4755	4	2603	4
	22	1937	9	994	6	3414	9	1861	5	2617	9	1404	6	3446	7	1401	15	1084	5	917	9	5198	6	4488	10	2397	7
	24	2254	4	784	12	3619	7	2500	1	3000	3	1414	5	3783	1	2002	4	1209	3	828	11	5375	3	4907	1	2639	3
	1266	1700	10	1062	4	3624	6	1361	11	2975	5	1303	12	3346	8	1857	5	1084	5	830	10	4916	9	4875	3	2411	6
	1269	1300	12	577	15	2136	15	1229	12	1675	13	994	16	2729	15	1591	12	959	8	1055	7	4593	11	2539	15	1781	14
	1270	2247	5	1263	1	3730	4	1819	7	3200	1	1607	2	3183	10	2246	2	751	10	1821	2	5245	4	4894	2	2667	2
	1799	2169	6	907	7	3300	11	1222	13	2592	10	1064	15	3117	12	1808	6	1293	2	1038	8	5088	8	4657	6	2354	9
	1805	2306	3	1178	2	3975	3	1847	6	3033	2	1328	9	3658	2	2387	1	1084	5	1108	6	5942	1	4611	7	2705	1
	1812	-	-	568	16	2292	14	1153	14	1467	14	1478	4	2798	14	1526	14	459	13	498	15	4610	10	3361	13	1837	13
	1813	2887	1	868	9	2436	13	778	16	1383	15	1394	7	3568	5	1683	9	901	9	703	12	4245	15	3125	14	1998	12
	1814	1012	14	624	14	3323	10	1875	4	1825	12	1827	1	3183	10	1651	11	484	12	540	14	5097	7	4705	5	2179	11
	1815	2129	7	1141	3	4006	2	1674	8	2767	6	1338	8	3283	9	1740	8	361	15	1161	5	4559	13	4534	8	2391	8
	1817	2475	2	854	11	3082	12	1535	10	2375	11	1521	3	3491	6	2130	3	1460	1	673	13	5199	5	4171	12	2414	5
	1819	1233	13	756	13	2102	16	833	15	1200	16	1071	14	2198	16	868	16	583	11	268	16	4215	16	2273	16	1467	15
	1933	1697	11	866	10	3679	5	1639	9	2733	8	1321	11	3029	13	1769	7	167	16	2124	1	4468	14	4190	11	2307	10
Local check		-	-	1028	5	4512	1	2160	3	2758	7	1327	10	3571	4	1585	13	459	13	1372	4	4565	12	4500	9		
Location mean		1955		898		3300		1605		2411		1343		3252		1744		840		1029		4942		4162			
C.V.%				29.7		17.4		41.8		25.6		27.5		18.1		20.3				48.5		16.0		23.1			
L.S.D. 5%				381		818		957		879		528		839		506				711.4		1133		1373			
No.of entries significantly exceeding local check				0		0		0		0		0		0		3				1		2		3			

Table 4.2.6.The five heaviest seed yielding entries at the individual locations in the FBIYT-L during 1980/81.

Rank	ARGENTINA Salta	CHILE Valdivia	CYPRUS Nicosia	EGYPT Sakha	ITALY Bari	LEBANON AUB	LEBANON Terbol	LIBYA Tripoli	OMAN	PERU Lima	SYRIA Tel Hadya Irrigated	SYRIA Tel Hadya Rainfed
1	ILB 1813	ILB 1270	Loc.check	ILB 24	ILB 1270	ILB 1814	ILB 24	ILB 1805	ILB 1817	ILB 1933	ILB 1805	ILB 24
2	ILB 1817	ILB 1805	ILB 1815	ILB 19	ILB 1805	ILB 1270	ILB 1805	ILB 1270	ILB 1799	ILB 1270	ILB 19	ILB 1270
3	ILB 1805	ILB 1815	ILB 1805	Loc.check	ILB 24	ILB 1817	ILB 19	ILB 1817	ILB 24	ILB 19	ILB 24	ILB 1266
4	ILB 24	ILB 1266	ILB 1270	ILB 1814	ILB 19	ILB 1812	Loc.check	ILB 24	ILB 19	Loc.check	ILB 1270	ILB 19
5	ILB 1270	Loc. check	ILB 1933	ILB 22	ILB 1266	ILB 24	ILB 1813	ILB 1266	ILB 22 *	ILB 1815	ILB 1817	ILB 1814
									ILB 1266			
									ILB 1805			

* The brackets indicate entries having the same rank.

appeared eight times. Mean seed yield and rank of entries at different locations for two years (1979-80 and 1980-81) and for one year 1980-81 at South American locations are given in Table 4.2.7. The entries Elegant SMCI, Reina Blanca, and 74TA 63 ranked 1st, 2nd and 4th in seed yield, respectively, and were among the most frequent genotypes in Table 4.2.6. These three genotypes and others which have performed well at each individual location could be of practical value in national breeding programs. However, further testing is required to establish the yield potentiality of these cultivars. Correlations among different locations during 1980-81 for seed yield are given in Table 4.2.8. Tel Hadya locations in Syria correlated significantly with Cyprus, Egypt, Italy, Lebanon (Terbol), and Libya. High significant interlocation correlations were found between Peru and Italy; Libya with both Italy and Lebanon (Terbol); Lebanon (Terbol) with Argentina and Cyprus; Italy with Chile, Cyprus and Egypt; Egypt and Cyprus; and Cyprus with Chile. Correlations among different locations during two years (1979-80 and 1980-81) for seed yield are shown in Table 4.2.9. Much fewer significant correlations were observed over two years as compared to one year, for example Egypt did not correlate significantly with any other location, Lebanon with only Iraq & Oman. It remains to be seen if the highly significant correlations over two years will be maintained in their value and magnitude over years. Of special importance are those correlations found between Tel Hadya (the main breeding station) and other locations, where the breeding materials developed at Tel Hadya could be used more directly at these locations. Correlations among three agronomic characters and seed yield based on mean values across two years (1979-80 and 1980-81) are given in Table 4.2.10. Days to maturity correlated positively and significantly with days to 50% flowering (0.57^{*}); and also with plant height (0.59^{*}). Similar results were obtained in the FBAT and the same interpretation could be applied here. The negative and significant r value (-0.55^{*}) between days to maturity and seed yield was unexplainable for two reasons, first all other r values in this report were nonsignificant and second it is expected that most of the late maturing lines are higher yielders as compared to the early ones.

Table 4.2.7. Mean seed yield (Y = kg/ha) and rank (R) of entries in the FBIYT-L at different locations for two years (1979-80 and 1980-81) and for one year (1980-81) at South America Locations.

ILB No.	Varietal Name	LEBANON Terbol		Syria-Tel Hadya Irrigated		Syria-Tel Hadya Rainfed		ITALY		IRAQ		*1		LIBYA*2		EGYPT*3		South*4 America		Mean	
		Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R
19	74TA 51	3205	12	4895	2	3642	2	3654	4	3363	5	1799	11	1417	12	2786	3	1486	3	3095	6
22	74TA 59	3561	5	4596	6	3354	8	3446	8	3205	9	2021	7	1339	14	2172	11	1283	9	2962	10
24	74TA 63	3473	8	4637	5	3630	4	3432	9	3375	4	2043	6	1821	5	2746	5	1289	8	3145	4
1266	Aquadulce	2965	13	4432	11	3709	1	3702	3	2981	11	2170	4	1795	7	2572	6	1197	10	3041	7
1269	New Mammoth	3485	6	4128	13	2471	13	3182	10	3380	3	1680	13	1584	10	2256	10	977	11	2771	13
1270	Reina Blanca	3481	7	4660	3	3569	6	3938	2	2802	12	2139	5	2199	1	3231	1	1777	1	3253	2
1799	39 MB	3360	10	4648	4	3635	3	3542	7	3241	7	1808	10	1859	3	1807	14	1371	6	2988	9
1805	Elegant 5MCI	3753	2	5064	1	3610	5	4031	1	3208	8	2231	3	2008	2	2382	9	1531	2	3286	1
1812	Syr.Med.Short pod	3392	9	4477	9	2942	11	3098	11	3261	6	1726	12	1458	11	2006	13	533	14	3113	5
1813	Syr.Med.long pod	3671	3	4257	12	2819	12	3002	12	3640	1	1825	9	1601	9	2110	12	1486	3	2866	12
1814	Syr.large short pod	3594	4	4450	10	3512	7	2936	13	3058	10	1871	8	1808	6	2459	8	725	13	2961	11
1815	Lattakia local	3227	11	4503	7	3187	10	3586	6	2750	14	2250	2	1786	8	2950	2	1477	5	3030	8
1817	Lebanese L.L.	3811	1	4494	8	3197	9	3590	5	3543	2	2251	1	1857	4	2780	4	1334	7	3190	3
1819	Giza 3	2652	14	3755	14	2117	14	2334	14	2784	13	1268	14	1341	13	2529	7	752	12	2348	14
Local check		3405		4140		3506		3904		3113		2544		1733		2999		1200		3168	

*1 Mean of Cyprus, Spain and Syria (Lattakia).

*2 Mean of Zawia and Tripoli

*3 Mean of Giza and Sakha

*4 Mean of Argentina, Chile and Peru.

Table 4.2.8. Correlations[1] (df = 13) among different locations in the FBIYT-L during 1980/81 for seed yield.

Locations	CHILE Valdivia	CYPRUS Nicosia	EGYPT Sakha	ITALY Bari	LEBANON AUB	LEBANON Terbol	LIBYA Tripoli	OMAN	PERU Lima	SYRIA Tel Hadya Irrigated	SYRIA Tel Hadya Rainfed
Argentina - Salta	0.63*	0.45	0.21	0.48	-0.06	0.66**	0.51*	0.51*	0.31	0.29	0.35
Chile - Valdivia		0.73**	0.26	0.73**	0.07	0.43	0.53*	0.15	0.48	0.38	0.57*
Cyprus - Nicosia			0.73**	0.92**	0.28	0.64**	0.63*	0.06	0.57*	0.62*	0.91**
Egypt - Sakha				0.74**	0.31	0.63*	0.47	0.18	0.40	0.75**	0.75**
Italy - Bari					0.07	0.63*	0.68**	0.29	0.65**	0.69**	0.86**
Lebanon - AUB						0.31	0.35	-0.21	-0.09	0.15	0.41
Lebanon - Terbol							0.67**	0.51*	0.22	0.66**	0.71**
Libya - Tripoli								0.36	0.43	0.62*	0.64**
Oman									-0.20	0.56*	0.24
Peru - Lima										0.23	0.41
Syria - TH - Irrigated											0.71**

1) * $P \leq 0.05$
** $P \leq 0.01$

Table 4.2.9. Correlations[1] (df = 12) among different locations in the FBIYT-L during two years 1979-80 and 1980-81 for seed yield.

Locations	Syria - Tel Hadya		Italy	Iraq +	Argentina + Chile	Libya	Egypt
	Irrigated	Rainfed	Bari	Oman	+ Peru		
Lebanon-Terbol	0.49	0.31	0.40	0.61*	0.52	0.40	-0.12
Syria-TH-Irrigated		0.85**	0.84**	0.17	0.66**	0.45	0.15
Syria-TH-Rainfed			0.77**	0.01	0.70**	0.55*	0.22
Italy-Bari				0.02	0.83**	0.64*	0.35
Iraq + Oman					0.01	-0.18	-0.43
Argentina + Chile + Peru						0.66**	0.42
Libya							0.42

1) * $P \leq 0.05$

** $P \leq 0.01$

Table 4.2.10. Correlations (df=12) among three agronomic characters and seed yield based on mean values across two years (1979/80 and 1980/81) in the BIYT-L

Traits	Days to maturity	Plant height	Seed yield
Days to 50% flowering	0.57*	0.12	-0.01
Days to maturity		0.59*	-0.55*
Plant height			-0.05

* $P \leq 0.0.5$

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

Material

The FBIYT-S comprised 23 test entries, 16 of them had performed well in the same trial of last year and the remainder were among the heaviest yielding entries in the International Screening Nursery Small Seeded (FBISN-S) in 1979-80. Two local checks were added by the cooperator to make a total of 25 entries. The test entries originated from 11 different countries.

Methods and Managements

The trial design was 5x5 quadruple lattice (4 replications), although the results were analyzed as a randomized complete block. The recommended plot size was four rows, each 4m long, with an inter- and intra-row spacing of 0.50 and 0.10m, respectively.

Fourteen sets of the trial were distributed to cooperators in 11 countries. Results were reported from eight trials covering seven countries. Agronomic data furnished by cooperators are given in Table 4.3.1.

Results and Discussion

At the locations where agronomic data was recorded, the data on number of days to flowering, to maturity, and plant height are given in Tables 4.3.2, 4.3.3 and 4.3.4, respectively. For days to flowering the two extreme locations were Debre Zeit in Ethiopia with 57 days and Terbol in Lebanon with 123 days. Both local checks in Cyprus and in Egypt both local checks and Hudeiba 72 were the earliest to flower. In Ethiopia and Syria Hudeiba 72 flowered earlier than any other entry including the checks. Over all locations Hudeiba 72 from Sudan was the earliest genotype

Table 4.3.1. Agronomic date for different locations for the FBIYT-S during 1980/81.

Country	Location	Planting date	Crop Duration (days)(1)	Fertilizer N	Fertilizer P_2O_5	Fertilizer K_2O	Irrig.	Herb.	Insec.or fungicide
CYPRUS	Nicosia	22.12.80	175	21	48			Treflan	Maloran
EGYPT	Sids	24.11.80	161	38	75		5		
ETHIOPIA	Debre Zeit	25. 6.81	169						
LEBANON	Terbol	14.11.80	233						
SPAIN	Cordoba	26.11.80	201		50		3		Sevin
SYRIA	Tel Hadya	13.11.80			50		3		
TURKEY	Ankara	5. 3.81	131	20	60				Primore

(1) Days from planting to harvest.

Table 4.3.2. Days to flowering for entries in the FBIYT-S at different locations during 1980/81.

ENTRY	Varietal Name	Origin	CYPRUS Nicosia	EGYPT Sids	ETHIOPIA Debre Zeit	LEBANON Terbol	SYRIA Tel Hadya		TURKEY Ankara	MEAN
							Irrigated	Rainfed		
ILB 5	74TA 12	Cyprus	85	66	55	125	105	101	72	87
9	74TA 22	China	86	73	57	125	106	103	73	89
16	77MS 88252	Syria	86	78	63	118	105	106	74	90
18	77TA 80023	Syria	86	70	56	120	108	105	75	89
29	75TA 26062	Iraq	83	68	55	121	105	101	74	87
30	74TA 85	Iraq	86	73	57	124	105	103	74	89
31	74TA 87	Iraq	86	73	57	120	106	106	74	89
49	74TA 133	U.K.	87	75	56	123	106	105	73	89
207	75TA 26333	Turkey	85	73	56	125	106	104	72	89
269	74TA 367	Spain	86	76	56	121	105	104	74	89
274	74TA 374	Lebanon	86	73	55	120	105	105	74	88
287	77MS 88323	Lebanon	86	74	57	120	106	104	73	89
298	77MS 88218	Spain	89	80	66	125	109	104	76	93
352	77MS 88158	Egypt	86	71	54	125	106	103	72	88
359	76TA 56202	Egypt	86	69	56	124	108	101	73	88
360	74TA 498	Egypt	85	70	56	120	105	100	74	87
372	78MS 88362	Algeria	88	80	66	125	105	108	75	92
460	Hudeiba 72	Sudan	81	60	52	124	101	95	72	84
1266	78S 49172	U.K.	85	68	58	125	105	103	73	88
1812	Local medium shortpod	Syria	85	74	56	130	106	104	75	90
1817	78S 49892	Lebanon	85	69	56	124	104	101	72	87
1819	Giza 3	Egypt	86	68	56	125	105	103	76	88
78S 33011	(FLIP 80-1)X74TA 7	-	85	69	56	124	105	103	74	88
	Local check A	-	80	60	54	125	105	105	82	
	Local check B	-	80	59	55	125	108	100	83	
	Location mean		85	71	57	123	106	103	74	

Table 4.3.3.Days to maturity for entries in the FBIYT-S at different locations during 1980/81.

Entry	EGYPT Sids	ETHIOPIA Debre Zeit	LEBANON Terbol	SPAIN Cordoba	SYRIA Tel Hadya		TURKEY Ankara	MEAN
					Irrigated	Rainfed		
ILB 5	153	120	203	191	189	175	120	164
9	155	117	202	191	189	175	120	165
16	159	121	203	192	189	175	120	166
18	154	119	203	191	188	175	121	164
29	154	117	204	193	188	175	121	165
30	155	121	204	191	190	175	121	165
31	154	120	202	193	188	175	120	165
49	156	121	202	191	190	175	120	165
207	155	119	203	191	188	175	121	165
269	159	124	202	193	188	175	121	166
274	153	120	204	194	188	175	121	165
287	155	117	201	192	188	175	120	164
298	163	125	201	194	188	175	120	167
352	154	121	205	193	189	175	120	165
359	154	122	205	193	190	178	119	166
360	154	116	203	191	188	175	120	164
372	161	117	204	192	190	175	120	166
460	150	108	205	191	187	175	120	162
1266	155	124	206	194	189	175	120	166
1812	156	119	205	193	188	175	120	165
1817	153	121	206	195	188	175	121	166
1819	153	118	208	191	188	178	119	165
78S 33011	155	115	203	194	187	175	120	164
Loc.check A	150	114	200	192	188	175	125	
Loc.check B	150	111	200	191	190	175	123	
Location Mean	155	119	203	192	189	175	121	

Table 4.3.4. Plant height (cm) of entries in the FBIYT-S at different locations during 1980/81.

Entry	CYPRUS Nicosia	ETHIOPIA Debre Zeit	LEBANON Terbol	SYRIA Tel Hadya		TURKEY Ankara	MEAN
				Irrigated	Rainfed		
ILB 5	51	126	66	98	78	65	81
9	54	121	65	104	76	62	80
16	56	125	69	96	70	63	80
18	56	125	70	99	74	67	82
29	58	116	74	101	77	66	82
30	55	122	70	104	77	63	82
31	58	135	71	96	78	66	84
49	56	128	68	103	81	59	83
207	56	130	70	101	76	61	82
269	55	120	71	99	78	66	82
274	54	114	66	104	75	63	79
287	59	118	73	99	79	62	82
198	61	132	73	111	73	64	86
352	61	130	75	104	80	72	87
359	55	127	78	108	81	69	86
360	54	123	75	100	68	59	80
372	56	120	70	100	76	67	82
460	64	125	66	75	71	60	77
1266	61	124	73	103	76	64	84
1812	54	124	64	95	73	61	79
1817	56	123	66	95	74	59	79
1819	44	123	65	90	69	53	74
78S 33011	60	107	71	84	71	62	76
Loc.check A	54	124	78	94	71	60	
Loc.check B	55	119	76	105	61	58	
Location Mean	56	123	71	99	75	63	

and 77 MS 88218 from Spain was the latest. The relative values of the genotypes for mean number of days to maturity per location and across locations were similar to that for flowering (Table 4.3.3) with Hudieba 72 (ILB 460) the earliest at 162 days, and 77MS 88218 (ILB 298) the latest at 167 days. Mean plant height was shortest in Cyprus with 56cm and tallest in Ethiopia with 123cm (Table 4.3.4). It is worth mentioning that differences were large for the three traits and most of the extreme genotypes were consistant in their performance across locations.

For each of the eight test environments the seed yield and rank of the genotypes are given in Table 4.3.5 and the five heaviest seed yielding genotypes are listed in Table 4.3.6. In the latter table the local check ranked first in seed yield at four locations; and second at one location. Of the remaining 23 genotypes, ILB 5 appeared at four locations, and ILB 16, 29, 31, 287 and 78S 33011 appeared at three locations. 'F' tests indicated that genotypic differences were significant at all locations. A least significant difference was calculated to indicate the genotypes which significantly exceeded the local check (Table 4.3.5). The lightest mean yield trial was in Cyprus, and the heaviest was in Egypt. The light seed yield at Cyprus might have been due to the onset of unfavourable distribution of rainfall, where it was above normal during January and February and below normal during December, April and May. In Cyprus, Egypt, Ethiopia and Lebanon the local checks surpassed all other genotypes tested for seed yield. At other locations there were genotypes that exceeded the local check, but only in Turkey was the difference significant, and this because of very poor performance of the local checks. The coefficient of variation for yield was highest in Spain (34%) and lowest in Lebanon (11.5%).

Across all locations, the best yields were with ILB 16, ILB 29, ILB 9, and ILB 5 (Table 4.3.5). Yield potentiality of ILB 5 across environments appeared

Table 4.3.5.Seed yield (Y = kg/ha) and rank (R) of entries in the FBIYT-S at different locations during 1980/81.

ENTRY	CYPRUS Nicosia		EGYPT Sids		ETHIOPIA Debre Zeit		LEBANON Terbol		SPAIN Cordoba		SYRIA Tel Hadya Irrigated		SYRIA Tel Hadya Rainfed		TURKEY Ankara		MEAN	
	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R
ILB 5	988	12	4708	9	858	12	4255	3	1554	20	5056	2	3764	3	1520	3	2838	4
9	1133	7	4660	12	677	18	4269	2	2631	4	4512	16	3523	7	1325	11	2841	3
16	938	14	4458	14	363	22	4171	6	3333	1	5029	3	3462	10	1593	1	2918	1
18	1142	5	4340	17	677	18	3870	10	1607	19	4508	17	3377	11	1398	6	2615	14
29	1013	10	5038	5	506	21	3778	12	2503	5	4852	8	3882	1	1370	9	2868	2
30	783	21	4184	18	808	15	3644	17	2652	3	4691	12	3556	6	1223	16	2693	11
31	888	18	4156	19	820	14	3995	7	2440	6	4923	4	3824	2	1530	2	2822	5
49	1142	5	4674	11	968	11	3731	14	2235	8	4865	7	3491	9	1377	8	2810	6
207	1029	8	4472	13	524	20	4185	4	2230	9	4155	21	3142	19	1248	15	2623	13
269	963	13	3719	23	822	13	3694	16	2193	11	4699	11	3240	16	1358	10	2586	15
274	992	11	4344	16	805	16	3977	9	2104	13	4913	6	3242	15	1215	17	2699	10
287	650	24	4802	8	1078	7	4176	5	1349	22	5069	1	3574	5	1317	12	2752	8
298	1313	3	2771	25	360	23	3745	13	1357	21	4377	18	2880	21	1200	18	2250	21
352	892	17	3872	22	1643	4	3176	22	1979	15	3927	23	3222	17	1417	5	2516	18
359	875	19	4684	10	1183	6	3708	15	1702	18	4163	20	2977	20	1387	7	2585	16
360	929	16	4892	7	979	10	3787	11	2173	12	4845	9	3245	14	955	21	2726	9
372	783	21	4424	15	283	25	3519	20	1929	16	4572	15	3748	4	1090	20	2544	17
460	750	23	5500	4	1687	3	2944	24	1071	24	2258	25	1723	25	747	23	2085	22
1266	1192	4	5014	6	727	17	3523	19	1863	17	4634	14	3292	13	1277	14	2690	12
1812	850	20	3910	21	342	24	3290	21	2199	10	4914	5	3219	18	1312	13	2505	19
1817	933	15	3986	20	1054	8	3028	23	1318	23	4186	19	3338	12	810	22	2332	20
1819	404	25	3677	24	988	9	2915	25	134	25	2694	24	2736	23	1138	19	1836	23
78S 33011	1017	9	5806	3	1307	5	3593	18	2036	14	4028	22	2817	22	1418	4	2753	7
Loc.check A	1879	1	5955	1	4081	1	4310	1	2875	2	4730	10	3514	8	680	24		
Loc.check B	1582	2	5913	2	3419	2	3991	8	2307	7	4672	13	2281	24	593	25		
Location mean	1002		4558		1078		3731		1991		4451		3243		1220			
C.V.%	24.3		17.0		27.8		11.5		34.1		12.0		14.8		16.8			
L.S.D. 5%	345		1094		423		608		961		757		679		289			
No.of entries significantly exceeding best local check	0		0		0		0		0		0		0		20			

Table 4.3.6.The five heaviest seed yielding entries at the individual locations in the FBIYT-S during 1980/81

Rank	CYPRUS	EGYPT	ETHIOPIA	LEBANON	SPAIN	SYRIA		TURKEY
						Tel Hadya		
	Nicosia	Sids	Debre Zeit	Terbol	Cordoba	Irrigated	Rainfed	Ankara
1	Loc. check A	Loc. check A	Loc. check A	Loc. check A	ILB 16	ILB 287	ILB 29	ILB 16
2	Loc. check B	Loc. check B	Loc. check B	ILB 9	Loc.check A	ILB 5	ILB 31	ILB 31
3	ILB 298	78S 33011	ILB 460	ILB 5	ILB 30	ILB 16	ILB 5	ILB 5
4	ILB 1266	ILB 460	ILB 352	ILB 207	ILB 9	ILB 31	ILB 372	78S 33011
5	ILB 18 *	ILB 29	78S 33011	ILB 287	ILB 29	ILB 1812	ILB 287	ILB 352
	ILB 49 *							

* The brackets indicate entries having the same rank.

to be better, since its occurrence amongst the best five genotypes was more than any other genotype tested. Also the entries ILB 16, ILB 29, and ILB 31 showed a good range of adaptation in addition to their excellent overall yield ranking. Other genotypes have shown a more specific adaptation, such as ILB 460 and 78S 33011 for Egypt and Ethiopia; and ILB 287 for Syria and Lebanon. Latter results may be explained on the basis that ILB 460 has originated in Sudan, while ILB 287 originated in Lebanon.

So far results of seed yield for only one year has been discussed. There were 16 genotypes in the FBIYT-S that were previously tested in 1979-80. Mean seed yield and rank of those 16 entries at different locations for two years (1979-80 and 1980-81) are summarized in Table 4.3.7. Results indicate that a few genotypes yielded better than the local check within each location, except in Ethiopia and Egypt, where the local check yielded best. Across all locations, ILB 29 ranked first in seed yield followed by both ILB 5 and ILB 16, ILB 287, and ILB 274. Also, ILB 287 was among the best five genotypes in Ethiopia, Lebanon, both environments in Syria, and Egypt. Therefore, ILB 287 might be considered with ILB's 5, 16 and 29 as source populations to breed for wide adaptation.

Correlations among different locations for one year 1980-81 and for two years (1979-80 and 1980-81) for seed yield are given in Tables 4.3.8 and 4.3.9, respectively. Results in both tables show a similar pattern. The results point out the negative associations between Ethiopia and all other countries, except Egypt. Also, Egypt are not correlate significantly with any other location. On the other hand, there are significant associations among most of the West Asian countries. These results are in harmony with results obtained in the FBAT which strongly suggest that breeding materials developed in the main breeding station at Tel Hadya could be effectively by the national

Table 4.3.7. Mean seed yield (Y = kg/ha) and rank (R) of entries in the FBIYT-S at different locations for two years 1979-80 and 1980-81.

ILB No.	ETHIOPIA Debre Zeit 79-81		LEBANON Terbol 79-81		SYRIA-TH Irrigated 79-81		SYRIA-TH Rainfed 79-81		Egypt*1 79-81		*2 79-81		Mean 79-81	
	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R
5	795	7	3533	9	4567	1	3149	2	2370	5	1193	9	2601	2
9	653	11	3732	3	4178	8	2898	9	2351	6	1415	2	2538	6
16	386	14	3914	1	4418	3	2995	6	2242	8	1649	1	2601	2
29	665	10	3565	8	4423	2	3445	1	2550	2	1358	4	2668	1
31	741	9	3576	7	4196	7	3126	4	2087	11	1364	3	2515	7
207	600	12	3579	6	3859	12	2838	11	2254	7	1245	6	2396	10
269	873	6	3058	13	4137	10	2745	12	1872	15	1201	8	2314	12
274	784	8	3785	2	4357	5	2915	8	2182	10	1240	7	2544	5
287	933	5	3720	4	4379	4	3064	5	2429	4	898	14	2571	4
298	410	13	3347	12	3770	13	2611	13	1404	16	1164	10	2118	14
352	1345	2	2945	14	3528	14	2842	10	1975	12	1163	11	2300	13
360	1096	4	3398	11	4164	9	2559	14	2467	3	1120	12	2467	8
372	345	15	3475	10	3949	11	3130	3	2232	9	1118	13	2375	11
460	1642	1	2079	16	1533	16	1470	16	2896	1	663	15	1714	16
1812	342	16	3652	5	4337	6	2935	7	1968	13	1274	5	2418	9
1819	1278	3	2840	15	2541	15	2328	15	1877	14	457	16	1887	15
Local check	3290		3630		4162		2673		3096		1379		3038	

*1 Mean of Giza and Sids

*2 Mean of Cyprus, Spain, Turkey and Syria (Lattakia).

Table 4.3.8. Correlations[1] (df = 21) among different locations in the FBIYT-S during 1980/81 for seed yield.

Locations	EGYPT Sids	ETHIOPIA Debre Zeit	LEBANON Terbol	SPAIN Cordoba	SYRIA Tel Hadya Irrigated	SYRIA Tel Hadya Rainfed	TURKEY Ankara
Cyprus - Nicosia	-0.02	-0.31	0.41	0.40	0.42*	0.19	0.25
Egypt - Sids		0.36	0.13	0.16	-0.07	-0.12	-0.03
Ethiopia - Debre Zeit			-0.43*	-0.39	-0.56**	-0.53*	-0.26
Lebanon - Terbol				0.55**	0.69**	0.56**	0.59**
Spain - Cordoba					0.65	0.51*	0.48*
Syria - TH - Irrigated						0.84**	0.54**
Syria - TH - Rainfed							0.53*

1) * $P \leq 0.05$
** $P \leq 0.01$

Table 4.3.9. Correlations[1] (df=14) among different locations in the FBIYT'S during the two years 1979-80 and 1980-81.

Locations	Lebanon	Syria-TH		Egypt	Cyprus+Spain+
	Terbol	Irrigated	Rainfed		Turkey+Lattakia
Ethiopia-Debre Zeit	-0.79**	-0.71**	-0.67**	0.36	-0.69**
Lebanon-Terbol		0.91**	0.83**	-0.14	0.72**
Syria-TH-Irrigated			0.89**	-0.17	0.76**
Syria-TH-Rainfed				-0.16	0.66**
Egypt					-0.08

1) * $P \leq 0.05$
** $P \leq 0.01$

Table 4.3.10. Correlations[1] (df= 14) among three agronomic characters and seed yield based on means values across two years (1979/80 and 1980/81) in the BIYT-S.

Traits	Days to maturity	Plant height	Seed yield
Days to 50% flowering	0.74**	0.21	0.40
Days to maturity		0.25	0.08
Plant height			0.18

1) ** $P \leq 0.0.1$

programs in West Asia, while genetic stocks developed in Egypt will have a good chance to do well in Ethiopia. Correlations among three agronomic characters and seed yield based on mean values across two years (1979-80) are shown in Table 4.3.10. The only significant association is between number of days to 50% flowering and days to maturity (0.74^{**}). This association has been repeatedly shown in previous trials.

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

Material:

The FBISN-L comprised 62 entries, originated from a large number of countries, and three check entries, two of them were provided (both were major type) with the third to be supplied by the local cooperator. Some of the entries were selected based on a limited number of yield tests in ICARDA regional trials, released cultivars, and others chosen from the last year nursery. 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.

Methods and Management:

The sixty two entries were planted in a single non-replicated row of 4m, with three check genotypes, the provided two repeated six times and the local check repeated ten times. The value of the repeated check entries gave some assessment for environmental variation. The recommended inter-and intra-row spacing was 0.50cm and 0.10m, respectively. Thirty four sets of the trial were distributed to cooperators in 23 countries. Results were reported from 16 trials covering 13 different countries.

Results and Discussion :

Means for number of days to flowering, and to maturity, and for plant height are given in Table 4.4.1, derived as a mean across 16, 12, and 14 locations, respectively. Values for four agronomic traits across several locations for entries planted during two years (1979-81) are listed in Table 4.4.2. Number of days to flowering varied from 88 days for ILB 37 (74 TA 109) to 103 days for ILB 1813 and ILB 1817 (78S 49895); days to maturity from 158 days for ILB 37 (74TA 109) to 168 days

Table 4.4.1.Values for three agronomic characters across several locations for entries in the FBISN-L during 1980/81.

ENTRY Selection	ILB	Country of Origin	Days to flowering	Days to maturity	Plant height (cm)
78S 49907	10	Jordan	102	166	77
74TA 12	12	Syria	97	165	78
-	17	"	97	163	78
78S 49044	17	"	99	165	79
74TA 51	19	"	100	167	80
74TA 59	22	"	97	161	77
75TA 26052	23	Iraq	99	162	71
74TA 63	24	"	96	161	79
79S 97518	27	"	98	162	75
75TA 26062	29	"	95	162	72
74TA 91	32	"	99	165	75
75TA 26083	32	"	95	161	77
78S 49841	34	"	98	163	80
74TA 109	37	"	88	158	76
76TA 56297	41	"	97	164	77
77TA 88311	263	Spain	102	167	78
78S 48426	268	"	96	163	78
78SL 48821	269	"	95	162	68
-	272	"	97	163	66
74TA 374	274	Lebanon	97	166	72
76TA 56356	282	"	99	166	68
78SL 48590	282	"	97	163	72
78S 48476	285	"	92	162	80
-	370	Algeria	99	163	67
74TA 516	371	"	97	164	74
76TA 56246	398	Tunisia	102	166	71
78S 49456	431	Algeria	99	167	70
79S 97510	444	Iraq	98	162	86
79S 97513	444	"	97	164	81
79S 97514	444	"	98	163	82
78S 49694	605	Canada	96	166	76
-	775	Iraq	95	163	79
79S 97607	1107	Turkey	97	163	73
Aquadulce	1266	Spain	100	163	81
New Mammoth	1269	U.K.	97	162	70
Reina Blanca	1270	U.K.	100	162	69
Black Romi SVI	1796	Syria	97	166	71
Elegant 10MB V	1803	"	98	166	70
5 MC I	1805	"	98	165	72
8 MC I	1806	"	96	167	76
6 MC II	1807	"	98	163	70
Medium Longpod	1813	"	103	166	72
79S I	1814	"	98	162	73
79S 331	1814	"	98	162	68
79S 355	1814	"	98	163	78
79S 373	1814	"	102	168	82
79S 544	1814	"	97	164	84
Lattakia loc.	1815	"	99	166	73
Leban.loc.large	1817	Lebanon	100	167	76
76TA 56809	1817	Lebanon	98	164	76
78S 49895	1817	"	103	168	66
79S 97534	1817	"	95	164	76
Turkish local	1821	Turkey	101	167	75
FLIP 80-14 X75TA	2		95	162	78
FLIP 80-15 X75TA	36		97	163	82
FLIP 80-16 X75TA	43		97	163	79
FLIP 80-17 X75TA	49		97	162	75
FLIP 80-18 X75TA	49		98	162	72
FLIP 80-19 X75TA	55		99	162	71
FLIP 80-20 X75TA	115		98	161	73
FLIP 80-21 X75TA	215		99	162	71
Sevilla Giant means		U.K.	102	166	72
Syrian Large means		Syria	99	164	81
Number of locations			16	12	14

Table 4.4.2. Values for four agronomic characters across several locations for entries planted during two years (1979-81) in the FBISN-L.

ILB No.	Country of Origin	Yield	50% Fl days	Mat. days	Plant height
10	Jordan	2048	100	170	73
12	Syria	2081	91	167	74
17	Syria	2010	95	168	76
19	Syria	1910	95	169	77
22	Syria	1854	94	166	75
24	Iraq	2105	92	166	77
32	Iraq	2023	94	168	73
32	Iraq	1851	93	166	76
34	Iraq	1854	95	168	78
37	Iraq	1804	90	165	76
41	Iraq	1532	92	168	72
268	Spain	2114	94	167	73
274	Lebanon	2125	92	169	70
282	Lebanon	2430	95	169	66
285	Lebanon	1944	88	167	75
398	Tunisia	2075	99	170	75
431	Algeria	1874	94	171	70
605	Canada	1953	88	168	74
1266	Spain	2120	94	167	78
1269	U.K.	1932	97	169	71
1270	U.K.	2200	98	168	65
1796	Syria	1752	91	168	71
1805	Syria	1832	94	167	69
1806	Syria	2173	91	169	71
1813	Syria	1866	100	171	74
1815	Syria	1912	93	169	70
1817	Lebanon	2165	96	169	74
1817	Lebanon	1833	96	170	73
1817	Lebanon	1832	99	172	67
1821	Turkey	2175	99	170	75
FLIP 80 - 16x75TA 43		2157	95	168	77
FLIP 80 - 17x75TA 49		2111	96	167	70

for ILB 1814 (79 373) and ILB 1817 (78S 49895); and plant height from 66cm for ILB 1817 (78S 49895) and ILB 272 to 86cm, for ILB 444 (79S 97510) (Table 4.4.1). ILB 37 was the earliest to flowering and to maturity, while selection 78S49895 (ILB 1817) was the latest to flowering and to maturity. Correlations of 0.63^{**} and 0.60^{**} were observed between days to flowering and to maturity in 1980-81 (Table 4.4.8) and across 1979-81 Table (4.4.9), respectively. No significant correlation was found between plant height and either flowering or maturity in 1980-81, but two years data showed a correlation value of -0.36^{*} between plant height and maturity. Only one year data (1980-81) showed a positive and high significant correlation between seed yield and plant height with a value of 0.35^{**}

Seed yield and rank of genotypes at 12 locations and the overall mean are given in Table 4.4.3. Some idea of the environmental variation can be gained from the coefficients of variation (CV) given for the check entries. The CV ranged from 16.3% in Libya to 42.5% in Pakistan.

The five heaviest seed yielding genotypes at each individual location are listed in Table 4.4.4. List of entries appearing more than twice in Table 4.4.4., name of country, and overall rank of these entries in seed yield are given in Table 4.4.5. The local check was evident at three locations, namely, Afghanistan, Ethiopia and Poland (Table 4.4.4). Considering all locations, three selections namely 74TA 59, 79S 37534 and 76TA 56356 appeared four times among the five heaviest seed yielding entries (Table 4.4.5). The latter two selections were not only high in frequency of appearance in Table 4.4.4 but also ranked first and second in seed yield across all locations.

Seed yield expressed as a percentage of the location mean of the six entries which the heaviest mean seed yield across locations is summarized in Table 4.4.6. It is evident that more than one genotype yielded better than the local check at all individual locations, except at Ethiopia and Poland,

Table 4.4.3.Seed yield (Y = kg/ha) and rank (R) of entries in the FBISN-L at different locations during 1980/81.

ENTRY		AFGHANISTAN Kabul		EGYPT Sakha		ETHIOPIA Debre Zeit		IRAQ Dahouk		LEBANON AUB		LEBANON Terbol		LIBYA Tripoli		PAKISTAN Islamabad		PERU Lima		POLAND Plock		SYRIA Tel Hadya Irrigated		SYRIA Tel Hadya Rainfed		MEAN	
Pedigree	ILB	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
78S 49907	10	893	17	1198	18	79	55	3692	18	1092	41	3393	47	3038	1	1178	2	2007	27	2701	11	4960	38	3332	36	2297	26
74TA 12	12	813	25	1309	17	952	18	3142	32	992	46	5540	3	2038	17	-		1807	31	2681	12	5167	32	3532	24	2543	6
-	17	967	10	475	51	86	54	1742	59	992	46	2577	57	1880	27	-		1307	44	2228	30	3056	60	2732	55	1640	57
78S 49044	17	907	14	975	24	279	49	1292	62	792	54	3688	38	2038	17	-		1707	37	2621	13	2382	9	3566	22	2204	33
74TA 51	19	813	25	1642	6	99	53	1842	56	1567	15	4874	7	1722	34	428	19	1807	31	3381	3	4006	51	4199	8	2198	35
74TA 59	22	887	19	1975	2	386	47	2242	52	1967	3	5096	4	1670	37	428	19	-		3175	4	4567	44	3832	15	2384	19
75TA 26052	23	567	41	475	51	-		1492	61	817	53	2949	54	1617	38	578	14	-		1608	44	2975	61	2899	47	1452	62
74TA 63	24	1587	2	1809	4	799	27	2092	54	1842	5	4763	8	1854	31	428	19	807	53	2428	22	5893	19	3399	31	2308	24
79S 97518	27	987	8	-		506	41	3442	24	692	59	4022	25	1485	50	678	7	1807	31	1995	37	5279	28	2799	51	2154	40
75TA 26062	29	620	36	1475	9	1799	5	1742	59	1217	35	3614	43	2222	10	-		-		1875	38	3842	56	4332	6	2274	27
74TA 91	32	627	35	-		1362	11	2558	46	1558	16	3824	36	1117	64	-		-		2984	5	5234	29	2910	46	2464	12
75TA 26083	32	773	28	383	54	482	42	2308	51	1708	10	3195	51	1196	63	478	16	740	54	2450	21	6338	10	4110	9	2045	49
78S 49841	34	620	36	549	47	76	56	3858	14	1308	26	3861	35	1538	46	-		440	56	2924	7	4256	49	2877	49	2028	51
74TA 109	37	1033	7	549	47	-		2808	43	758	57	4639	9	1459	51	628	10	440	56	2470	19	5116	33	3444	30	1945	52
76TA 56297	41	1080	6	772	33	-		2858	41	658	60	1528	62	2249	8	-		2640	12	2310	26	5190	30	3244	39	2048	46
77TA 88311	263	1193	4	1327	16	43	57	3058	37	1483	18	3935	29	2380	4	-		2440	17	2470	19	6264	12	2644	57	2476	11
78S 48426	268	860	21	1772	5	2250	2	3108	33	983	48	2491	58	1512	48	328	25	1640	38	2497	18	5538	24	3510	27	2207	32
78SL 48821	269	900	16	1938	3	1543	8	2358	50	533	62	3898	32	1591	41	1078	4	2640	12	2257	27	3879	53	2744	53	2113	42
-	272	173	61	-		-		1058	64	458	64	713	64	1512	48	-		440	56	1697	42	1375	63	2577	59	909	63
74TA 374	274	847	23	660	42	1283	12	3458	23	1033	9	3972	27	2064	14	478	16	3140	6	3490	2	4760	42	3177	43	2422	15
76TA 56356	282	984	9	1198	18	2069	3	3025	38	1442	19	4256	18	2863	2	-		4790	1	1806	40	5733	21	4486	2	2968	2
78SL 48590	282	1091	5	1364	14	683	29	5275	5	1292	28	3330	49	2178	12	-		2390	21	2833	9	6126	13	4332	6	2804	3
78S 48476	285	758	29	1531	8	909	23	3675	19	1392	23	3627	42	1915	26	-		2590	14	2219	31	4637	43	3199	42	2405	16
-	370	24	63	586	45	29	59	4425	8	1117	40	1145	63	1415	53	-		1040	50	1333	51	2414	62	2699	56	1475	61
74TA 516	371	698	33	753	34	596	34	3325	27	1292	28	3553	44	1994	21	-		2340	21	2606	14	5288	26	3866	13	2392	18
76TA 26246	398	704	31	753	34	516	40	3475	22	1242	32	4479	13	1520	47	244	29	1790	34	2019	36	6288	11	3232	40	2189	37
78S 49456	431	438	50	864	26	529	39	3825	15	892	51	2590	56	1547	43	-		2440	17	1493	46	4481	45	3966	11	2097	44
78S 97510	444	551	45	753	34	316	48	5425	3	1667	12	3886	34	1678	35	644	8	1840	29	2939	6	3163	59	3532	24	2200	34
79S 97513	444	378	52	1198	18	603	33	7025	1	1242	32	3478	45	2047	15	1044	5	1440	42	1286	52	5288	26	3799	16	2402	17
79S 97514	444	824	24	1475	9	656	30	4175	12	1692	11	3330	49	1389	54	644	8	1740	36	2419	23	4918	40	4366	5	2302	25
78S 49694	605	876	20	846	27	530	38	3542	21	492	63	4343	17	1336	56	-		1215	47	1439	48	5955	17	2788	52	2124	41
-	775	1636	1	1457	11	830	25	2242	52	792	54	4935	6	1994	21	-		1515	40	2533	16	7881	1	3255	38	2693	4
79S 97607	1107	782	27	846	27	150	52	2492	48	767	56	4009	26	1863	28	-		1515	40	1373	49	4940	39	2555	60	1936	54
Aguadulce	1266	702	32	1179	21	476	43	3342	26	1267	30	4380	15	2205	11	-		2915	10	1213	53	6481	6	3288	37	2495	9
New Mammoth	1269	889	18	1457	11	1416	10	2992	39	642	61	4084	22	2415	3	1178	2	3015	8	1359	50	7629	2	3355	35	2536	7
Reina Blanca	1270	556	42	2235	1	1643	6	3442	24	1742	7	3676	39	2310	7	-		2565	16	1466	47	5577	22	2288	63	2500	8
Black Rom1SV1	1796	569	40	-		250	51	2942	40	1392	23	3898	32	1863	28	-		2215	23	1713	41	5044	35	2821	50	2271	28
Elegant 10MBV	1803	736	30	-		403	46	1792	57	967	49	3972	27	2336	6	-		1165	49	1619	43	5185	30	2588	58	2076	46
5 MC I	1805	576	39	512	49	550	37	1792	57	1667	12	4158	20	2363	5	178	33	865	52	2119	34	7563	3	3701	19	2170	39
8 MC I	1806	556	42	457	53	36	58	4242	11	1442	19	4121	21	2047	15	-		2415	20	2253	23	5577	22	2888	48	2367	21
6 MC II	1807	-		679	38	641	31	2408	49	1542	17	2442	59	1757	33	-		1224	45	488	62	3861	54	2490	61	1594	58
Med.Longpod	1813	242	60	-		828	26	3108	33	1092	41	2923	55	1573	42	1194	1	2574	15	615	60	3743	58	3490	29	1944	53
79S I	1814	496	47	901	25	928	20	5408	4	1592	14	3664	40	1863	28	494	15	2824	11	1281	53	6676	5	3724	17	2486	10
79S 331	1814	116	62	-		608	32	2858	41	742	58	1553	61	2020	19	-		1824	30	981	57	1372	64	2737	54	1481	60
79S 355	1814	962	11	512	49	555	36	4308	10	2267	1	3405	46	1942	23	594	13	1574	39	421	63	6469	7	3697	26	2226	31

Cont'd Table 4.4.3. Seed yield (Y = kg/ha) and rank (R) of entries in the FBISN-L at different locations during 1980/81.

ENTRY		AFGHANISTAN Kabul		EGYPT Sakha		ETHIOPIA Debre Zeit		IRAQ Dahouk		LEBANON AUB		LEBANON Terbol		LIBYA Tripoli		PAKISTAN Islamabad		PERU Lima		POLAND Plock		SYRIA Tel Hadya Irrigated		SYRIA Tel Hadya Rainfed		MEAN	
Pedigree	ILB	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
79S 373	1814	629	34	679	38	428	45	3708	17	1867	4	3182	52	1547	43	-		2024	25	975	58	4343	48	3524	26	2082	45
79S 544	1814	849	22	679	38	448	44	5508	2	1742	7	4627	10	1942	23	-		1424	43	501	61	5491	25	3724	17	2449	13
Lattakia loc.	1815	902	15	790	32	915	22	3208	31	1017	45	3368	48	2020	19	-		4224	3	881	59	4098	50	3390	32	2256	29
Lebanese large	1817	962	11	735	37	1161	15	3258	29	1217	35	3664	40	1599	39	194	31	3924	4	1281	53	4861	41	3390	32	2187	38
76TA 56809	1817	922	13	679	38	701	28	2758	44	892	51	3182	52	1205	62	194	31	3024	7	368	64	3787	57	3924	12	1803	56
78S 49895	1817	311	59	309	55	-	-	4475	7	950	50	2187	60	1231	61	228	30	-		1075	56	3646	55	1944	64	1487	59
79S 97534	1817	324	57	-		1612	7	1075	63	2150	2	5779	1	1836	32	-		4474	2	2368	25	5735	20	5544	1	3090	1
Turkish local	1821	464	48	1142	22	1185	13	4325	9	1775	6	5076	5	1284	59	278	26	2124	24	2555	15	6068	14	4377	4	2554	5
FLIP 80-14 X75TA		578	38	809	30	1532	9	3225	30	1250	31	5706	2	1442	52	378	22	1224	45	2155	33	6424	8	4444	3	2431	14
FLIP 80-15 X75TA	36	518	46	-		1032	17	3075	35	1150	38	4076	23	1389	54	278	26	2024	25	2388	24	4994	36	3577	21	2227	30
FLIP 80-16 X75TA	43	378	52	1364	14	925	21	3275	28	1400	21	4595	11	1310	57	628	10	474	55	2515	17	5950	18	3510	27	2194	36
FLIP 80-17 X75TA	49	338	55	1586	7	1805	4	2525	47	1150	38	5380	15	1547	43	-		1774	35	2921	8	4350	47	3844	14	2384	19
FLIP 80-18 X75TA	49	464	48	586	45	1165	14	3075	35	1025	43	4039	29	1599	39	-		124	59	2061	35	4972	37	3210	41	2029	50
FLIP 80-19 X75TA	55	418	51	809	30	1139	16	4175	12	1200	37	4224	19	1942	23	628	10	2424	19	1855	39	5965	16	3544	23	2360	22
FLIP 80-20 X75TA	115	324	57	642	44	932	19	2625	45	1300	27	4595	11	1310	57	378	22	874	51	2168	32	6039	15	4024	10	2101	43
FLIP 80-21 X75TA	215	338	55	1086	23	845	24	1925	55	1025	43	3743	37	1257	60	278	26	1174	48	2248	29	6750	4	2477	62	1929	55
Local check		1293	3	1435	13	4842	1	3825	15	1333	25	4414	14	2175	13	750	6	2917	9	4491	1	3970	52	3363	34		
Sevilla Giant		361	54	843	29	573	35	4867	6	1242	32	3926	30	2241	9	475	18	3492	5	1496	45	5077	34	3174	44	2314	23
Syrian large		552	44	648	43	253	50	3633	20	1400	21	3911	31	1671	36	358	24	1863	28	2718	10	4450	46	3161	45	5052	47
Location mean		691		994		798		3207		1249		3758		1799		544		1953		2017		5052		3393			
C.V.%		29.7		34.9		29.1		25.3		32.9		22.6		16.3		42.5		26.0		21.3		32.7		30.9			
SE. Checks		126		196		318		600		252		533		192		130		414		356		848		577			
SE. Checks VS test entries		272		424		686		1296		545		1152		414		280		894		770		1832		1245			

Table 4.4.4. The five heaviest seed yielding entries at the individual locations in the FBISN-L during 1980-81.

Rank	AFGHANISTAN Kabul		EGYPT Sakha		ETHIOPIA Debre Zeit		IRAQ Dohouk		LEBANON AUB		LEBANON Terbol	
	Selection	ILB	Selection	ILB	Selection	ILB	Selection	ILB	Selection	ILB	Selection	ILB
1	-	775	Reina Blanca	1270	Local check		79S 97513	444	79S 355	1814	79S 97534	1817
2	74TA 63	24	74TA 59	22	78S 48426	268	79S 544	1844	79S 97534	1817	FLIP 80-14 X75TA	2
3	Local check		78SL 48821	269	76TA 56356	282	79S 97510	444	74TA 59	22	74TA 12	12
4	77TA 88311	263	74TA 63	24	FLIP 80-17 X75TA	49	79S 1	1814	79S 373	1814	74TA 59	22
5	78SL 48590	282	78S 48426	268	75TA 26062	29	78SL 48590	282	74TA 63	24	Turkish local	1821

Rank	LIBYA Tripoli		PAKISTAN Islamabad		PERU Lima		POLAND Plock		SYRIA Tel Hadya Irrigated		SYRIA Tel Hadya Rainfed	
	Selection	ILB	Selection	ILB	Selection	ILB	Selection	ILB	Selection	ILB	Selection	ILB
1	78S 49907	10	Medium longpod	1813	76TA 56356	282	Local check			775	79S 97534	1817
2	76TA 56356	282	78S 49907	10*	79S 97534	1817	74TA 374	274	New Mammoth	1269	76TA 56356	282
3	New Mammoth	1269	New Mammoth	1269*	Lattakia local	1815	74TA 51	19	5 MC 1	1805	FLIP 80-14 X75TA	2
4	77TA 88311	263	78SL 48821	269	Lebanese large	1817	74TA 59	22	FLIP 80-21 X75TA	215	Turkish local	1821
5	5 MC 1	1805	79S 97513	444	Sevilla Giant		74TA 91	32	79S 1	1814	79S 97514	444

* The brackets indicate entries having the same rank.

Table 4.4.5. List of entries that appeared more than twice in table 4.34, name of the country and overall rank of these entries in seed yield.

ILB No.	Selection	Freq.	Name of the country	Rank
22	74TA 59	4	Egypt, Lebanon (2 locations), Poland	19
282	76TA 56356	4	Ethiopia, Libya, Peru, Syria	2
1817	79S 97534	4	Lebanon (2 locations), Peru, Syria	1
24	74TA 63	3	Afghanistan, Egypt, Lebanon	24
1269	New Mammoth	3	Libya, Pakistan, Syria	7
	Local check	3	Afghanistan, Ethiopia, Poland	

Table 4 4.6. Seed yield expressed as a % of location mean, of the six entries with heaviest mean seed yield across locations in the FBISN-L.

Entry Selection	ILB	Afghanistan-Kabul	Egypt - Sakha	Ethiopia-Debre Zeit	Iraq - Dahouk	Lebanon - AUB	Lebanon - Terbol	Libya - Tripoli	Pakistan-Islamabad	Peru - Lima	Poland - Plock	Syria-TH-Irrigated	Syria-TH-Rainfed
79 S 97534	1817	47	-	202	34	172	154	102	-	229	117	114	163
76TA 56356	282	142	121	259	94	115	113	159	-	245	90	113	132
78SL 48590	282	158	137	86	164	103	89	121	-	122	140	121	128
-	775	237	147	104	70	63	131	111	-	78	126	156	96
Turkish local	1821	67	115	148	135	142	135	71	51	109	127	120	129
74TA 12	12	118	132	119	98	79	147	113	-	93	133	102	104

where the local check ranked first. Seed yield and rank of entries which were planted over the two year period (1979-80 and 1980-81) at different locations are summarized in Table 4.4.7. Two years results of some locations which have similar environments were grouped to allow a meaningful discussion. The entries 76TA 56356, Reina Blanca, Turkish local, 8MCI, and Lebanese local large were the heaviest seed yielding genotypes. One year as well as two years results have shown that the entry 76TA 56356 has a good yield potentiality across a wide range of environments, since it ranked among the best five entries in Ethiopia, Libya, Peru, Syria, Lebanon, Argentina and Peru, and Afghanistan and Pakistan. Across two years, the entry 74TA 63 has improved its overall ranking in seed yield, while the entry 74TA 59 has moved from 19th to 24th place. Both entries have yielded quite well in Qattar and Libya and also in Poland and Spain.

Table 4.4.7. Seed yield (Y = kg/ha) and rank (R) of entries in the FBISN-L at different locations for two years 1979-80 and 1980-81.

		1		2		3		4		5		6		7		8		9		Mean	
ILB No.	Selection No.	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R
10	78S 49907	2021	10	2157	18	3404	19	2839	20	1658	9	1110	1	79	27	2156	12	3008	19	2048	14
12	74TA 12	2147	5	2263	16	2715	27	3348	5	1110	20	711	6	952	10	2119	14	3360	8	2081	12
17	78S 49044	2083	8	2471	8	2476	29	3207	7	995	26	1008	2	279	24	2221	9	3353	10	2010	16
19	74TA 51	1959	13	2279	14	2082	31	3225	6	1188	17	683	7	99	26	2710	1	2968	22	1910	21
22	74TA 59	2024	9	2371	13	2009	32	2883	17	624	31	575	13	386	23	2636	2	3178	13	1854	24
24	74TA 63	2124	6	1988	22	2648	28	3916	1	896	28	841	3	799	15	2256	7	3477	6	2105	11
32	74TA 91	1700	20	3067	1	2431	30	2891	16	1004	24	443	23	1362	6	2375	5	2936	25	2023	15
32	75TA 26083	1596	21	1425	31	2831	25	2990	13	1062	22	587	12	482	21	2048	17	3639	4	1851	26
34	78S 49841	1457	24	1808	24	3376	20	2857	19	1459	13	540	16	76	28	2368	6	2744	27	1854	24
37	74TA109	1518	22	2466	10	2752	26	2871	18	362	32	628	10	-		2593	4	3050	18	1804	30
41	76TA 56297	562	32	2077	29	2979	24	1665	31	1066	21	676	8	-		1791	23	2970	21	1532	32
268	78S 48426	1470	23	2702	5	3596	13	2218	28	1006	23	503	20	2250	1	2079	15	3202	12	2114	9
274	74TA 374	2172	4	1771	26	3741	9	2443	25	1849	5	566	14	1283	7	2626	3	2676	31	2125	7
282	76TA 56356	1884	16	2390	11	3468	18	3453	3	2531	1	828	4	2069	2	1755	25	3495	5	2430	1
285	78S 48476	1819	17	2832	3	3141	21	2214	29	1307	15	616	11	909	13	1921	18	2738	28	1944	18
398	76TA 56246	1780	19	2168	17	3896	8	3090	10	1516	11	340	26	516	20	1689	26	3678	2	2075	13
431	78S 49456	1928	14	2748	4	3568	14	1628	32	1304	16	231	32	529	19	1833	20	3099	16	1875	22
605	78S 49694	2084	7	1482	30	4102	6	2824	21	1143	19	650	9	530	18	1801	21	2960	23	1953	17
1266	Aquadulce	1095	25	2148	19	4502	4	3366	4	1806	6	475	21	476	22	1855	19	3359	9	2120	8
1269	New Mammoth	1021	27	1537	29	3641	11	2898	15	1553	10	780	5	1416	5	1428	28	3116	15	1932	19
1270	Reina Blanca	919	29	3051	2	4930	1	3080	11	1359	14	340	27	1643	4	1769	24	2708	29	2200	2
1796	Black Romi SVI	974	28	2467	9	3620	12	2416	26	962	27	521	18	250	25	1798	22	2757	26	1752	31
1805	5 MCI	1039	26	1989	21	3515	16	2372	27	997	25	329	29	550	17	2245	8	3455	7	1832	28
1806	8 MCI	1982	12	2537	7	4720	2	3050	12	1801	7	340	27	36	29	2145	13	2946	24	2173	4
1813	Medium long pod	730	31	2267	15	3948	7	2694	22	1775	8	553	15	828	14	1307	30	2692	30	1866	23
1815	Lattakia local	2397	1	1628	27	3513	17	2476	23	1906	4	538	17	915	12	1218	31	2613	32	1912	20
1817	Lebanese loc. large	916	30	1901	23	4541	3	3098	9	2077	2	463	22	1161	9	1681	27	3648	3	2165	5
1817	76TA 56809	1892	15	1573	28	3091	22	2471	24	1964	3	513	19	701	16	1121	32	3170	14	1833	27
1817	78S 49895	1809	18	938	32	4357	5	2048	30	683	10	354	25	-		1475	29	2989	20	1832	28
1821	Turkish local	2175	3	1804	25	3546	15	3125	8	1474	12	297	30	1185	8	2213	10	3752	1	2175	3
FLIP 80-16	X75TA 43	2188	2	2390	11	3702	10	3494	2	874	29	385	24	925	11	2195	11	3263	11	2157	6
FLIP 80-17	X75TA 49	2011	11	2576	6	3085	23	2981	14	1147	18	243	31	1805	3	2064	16	3086	17	2111	10

1. Mean of Qatar and Libya (Sebha, Zawia, Tripoli).
2. Mean of Egypt (Giza, Sakha).
3. Mean of Iraq (Baghdad, Nineveh, Dohouk)
4. Mean of Lebanon (AUB, Terbol)
5. Mean of Argentina, Peru.
6. Mean of Afghanistan, Pakistan.
7. Mean of Ethiopia
8. Mean of Poland, Spain
9. Mean of Syria (Lattakia and TH Rainfed Irrigated)

Table 4.4.8. Correlations (1) (df = 61) among three agronomic characters and seed yield based on means across locations in the FBISN-L.

Traits	Days to maturity	Plant height	Seed yield
Days to 50% flowering	0.63**	-0.17	-0.03
Days to maturity		-0.05	0.08
Plant height			0.35**

(1) * $P \leq 0.05$
** $P \leq 0.01$

Table 4.4.9. Correlations(1) (df = 30) among three agronomic characters and seed yield based on mean values across location in the BISN-L during two years 1979 - 80 and 1980-81.

T R A I T S	DAYS TO MATURITY	PLANT HEIGHT	SEED YIELD
Days to 50% flowering	0.60**	-0.17	0.19
Days to maturity		-0.36*	0.04
Plant height			-0.14

(1) * $P \leq 0.05$

**. $P \leq 0.01$

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

Material :

The FBISN-S comprised 58 entries, originated 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 cooperators. Some of the entries were selected based on a limited number of yield tests in ICARDA regional trials, and others were chosen from last year's nursery.

Methods and Management

The fifty eight entries planted in a single non-replicated row of 4m, with three check genotypes, the provided two were repeated six times and the local check repeated nine times. The value of the repeated check entries gave some assessment for environmental variation. The recommended inter- and intra-row spacing was 0.50m and 0.10m, respectively. Thirty three sets of the trial were distributed to cooperators in 22 countries. Results were reported from ten trials covering nine different countries.

Results and Discussion :

Means for number of days to flowering, and to maturity, and for plant height are given in Table 4.5.1, derived as a mean across 15, 14, and 13 locations, respectively, while Table 4.5.2 gives means for entries grown two years (1979-81). Mean number of days to flowering ranged from 85 to 96 days; days to maturity from 156 to 165 days, and plant height from 67 to 85cm (Table 4.5.1). For flowering and maturity, more than one genotype had expressed one side of the range. Selection FLIP 80-9 x 75TA 146 was the earliest to flower and to maturity, while selection 78S 35228 (ILB 207) was the latest for both traits. Significant and positive correlations

Table 4.5.1. Values for three agronomic characters across several locations for entries in the FBISN-S during 1980/81.

ENTRY Selection	ILB	Country of Origin	Days to flowering	Days to maturity	Plant height (cm)
74TA 12	5	Jordan	85	159	78
74TA 22	9	"	93	163	78
77MS 88252	16	Syria	96	164	81
78S 49264	22	"	89	160	75
75TA 26062	29	Iraq	91	163	82
74TA 84	30	"	89	159	78
74TA 87	31	"	93	164	77
74TA 95	33	"	88	160	84
74TA 109	37	"	92	163	80
78S 49288	112	Ethiopia	88	159	82
78S 49923	139	Morocco	95	164	81
78S 49925	143	"	96	164	83
75TA 26333	207	Turkey	95	163	82
78S 35228	207	"	96	165	75
74TA 367	269	Spain	93	164	84
78S 48586	276	Lebanon	94	163	83
78S 48428	277	"	89	160	84
78S 48589	281	"	87	159	84
77TA 88118	285	"	92	163	79
77MS 88321	286	"	90	156	82
77MS 88322	286	"	88	160	81
77MS 88323	287	"	90	159	80
77MS 88324	287	"	89	158	78
75TA 26467	295	Uruguay	91	160	82
78S 49121	308	Spain	90	158	79
77MS 88338	317	U.K.	90	163	79
78S 48603	317	"	94	164	79
78S48434	320	Japan	94	164	85
75Kf 26501	322	"	91	162	76
77TA 88138	328	China	90	161	78
78S 48437	336	Sweden	94	163	79
78S 48504	339	Egypt	96	163	76
77MS 88165	356	"	90	159	78
74TA 498	360	"	92	162	76
79S 97173	363	"	95	165	82
78S 49395	407	Tunisia	92	164	77
77MS 88410	421	Iran	95	164	80
78S 49451	428	Sudna	90	165	80
78S 35513	905	Egypt	91	160	75
78S 97330	1105	Turkey	96	163	67
78S 49171	1266	Spain	94	165	77
Reina Blanca	1270	U.K.	91	159	67
78S 48561	1816	Lebanon	92	161	74
76TA 56267	1816	"	89	157	80
78S 49893	1817	"	89	160	78
78S 49896	1817	"	88	158	79
FLIP 80-2 X 75TA 4			85	158	77
FLIP 80-3 X 75TA 4			90	159	69
FLIP 80-4 X 75TA 14			88	159	74
FLIP 80-5 X 75TA 14			89	160	73
FLIP 80-6 X 75TA 27			91	158	74
FLIP 80-7 X 75TA 35			91	159	70
FLIP 80-8 X 75TA 146			90	160	72
FLIP 80-9 X 75TA 146			85	156	72
FLIP 80-10 X 75TA 146			88	159	68
FLIP 80-11 X 75TA 193			88	159	74
FLIP 80-12 X 77Sd 11			86	159	72
FLIP 80-13 X 77TA 48			91	157	78
Syrian Large means		Syria	92	162	81
Giza 3 means		Egypt	91	163	76
Number of locations			15	14	13

Table 4.5.2. Values for three agronomic characters across several locations for entries which were planted during two years (1979-81) in the FBISN-S.

ILB No.	50% fl. days	Maturity days	Plant height
5	85	170	71
9	89	173	75
16	94	175	74
29	90	174	74
30	88	171	72
31	92	173	74
33	87	171	80
37	91	172	76
207	95	173	78
269	90	173	80
277	87	169	76
285	90	172	74
286	93	169	74
286	92	171	76
287	92	171	74
287	91	170	75
295	91	172	77
317	88	173	73
320	95	174	75
322	94	174	69
328	89	171	71
336	94	173	74
356	91	170	73
360	91	172	72
421	94	174	79
428	90	174	75
905	93	170	71
1266	92	174	75
1817	92	171	73
1817	91	170	73
FLIP 80-2 X75TA 4	88	170	75
FLIP 80-4 X75TA 14	87	170	71

were observed between flowering and maturity for entries grown two years (0.77**) and those grown only one year (0.46**) (Tables 4.5.8 and 4.5.9). For plant height, selection 78S 97330 and Reina Blanca were the shortest and selection 78S 48434 (ILB 320) was the tallest (Table 4.5.1).

Seed yield and rank of genotypes at ten locations and overall means are given in Table 4.5.3 and the five heaviest seed yielding genotypes at each individual location are listed in Table 4.5.4. Among the latter the local check was evident at four locations, namely, Egypt, Ethiopia, Peru, and Poland . The local check ranked first in seed yield in Ethiopia and Poland. List of entries appearing more than twice in Table 4.5.4 name of country, and overall rank of these entries in seed yield are given in Table 4.5.5. Selection 74TA 22 which developed by ICARDA ranked first in seed yield over all locations and appeared four times among the five heaviest seed yielding entries. It appeared in Lebanon, Pakistan. Syria, and Turkey. The overall ranking of the selection FLIP 80-9 X 75TA 146 in seed yield was 34th, however, it appeared three times among the five heaviest yielding entries. These results suggested that the selection FLIP 80-9 X 75TA146 possesses specific adaptation to Ethiopia, Poland and Turkey.

Seed yield expressed as a percentage of the location mean, of the six entries with the heaviest mean seed yield across locations is listed in Table 4.5.6. These entries showed the highest seed yield percentage above the location mean in one or more site, namely, 74TA 367 in Afghanistan and Lebanon; 74TA 87 in Egypt and Poland; 78S 48589 in Ethiopia; 74TA 22 in Pakistan and Turkey; 78S 49451 in Peru; and 74TA 109 in Syria.

Seed yield and rank of entries which were planted during two years (1979-80 and 1980-81) at different locations are given in Table 4.5.7. Most of the countries which reported their results in 1979-80 either did not replant or reported their results in 1980-81, therefore, data from countries with similar environments and/or having high correlations were grouped to allow

Table 4.5.3.Seed yield (Y = kg/ha) and rank (R) of entries in the FBISN-S at different locations during 1980/81.

ENTRY		AFGHANISTAN Kabul		EGYPT Sids		ETHIOPIA Debre Zeit		LEBANON Terbol		PAKISTAN Islamabad		PERU Lima		POLAND Plock		SYRIA Tel Hadya				TURKEY Ankara		MEAN	
																Irrigated		Rainfed					
Pedigree	ILB	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R
74TA 12	5	854	1	5562	47	148	52	4966	8	-	-	1327	21	2067	27	4726	23	3920	5	2682	13	2917	14
74TA 22	9	674	7	8006	9	68	53	5410	4	1542	2	1452	19	2874	7	6548	2	3454	13	3682	1	3372	1
77MS 88252	16	454	21	6673	32	-		4595	14	342	50	977	30	2627	11	6074	5	3954	3	2976	7	2867	16
78S 49264	22	400	30	6562	34	188	51	5077	6	692	24	1127	27	2194	21	4777	20	2420	46	2469	22	2591	30
75TA 26062	29	440	26	5784	43	755	41	5706	1	842	19	902	34	2707	10	6155	4	3620	9	-		2990	11
74TA 84	30	280	50	7228	21	528	44	5410	4	542	34	1252	23	2434	15	5762	8	3020	28	2309	31	2877	15
74TA 87	31	454	21	9173	1	368	46	4299	18	592	32	2727	7	3127	3	5192	13	3454	13	2296	32	3168	4
74TA 95	33	520	16	7173	22	335	47	4077	21	442	42	2027	11	2900	5	6214	3	3220	19	3029	6	2994	10
74TA 109	37	380	32	8228	7	-		5484	3	992	11	2227	9	2627	11	7051	1	3820	6	2416	23	3323	2
78S 49288	112	494	17	6840	27	768	40	3151	34	442	42	927	32	2367	16	5555	9	2920	31	3629	2	2709	22
78S 49923	139	269	53	6960	24	2178	11	4456	15	2758	1	918	33	2265	19	2286	52	2543	43	2407	24	2705	23
78S 49925	143	43	61	5738	45	2377	9	2493	47	858	15	1068	28	2105	25	2582	51	1776	58	2407	24	2145	51
75TA 26333	207	443	24	7265	19	2111	12	4197	19	1108	8	1218	25	2331	17	3027	49	3143	22	3567	3	2842	17
78S 35228	207	369	35	7627	14	1505	25	4123	20	508	38	1368	20	1158	55	2197	53	2309	48	-		2352	41
74TA 367	269	796	2	2404	16	2351	10	5567	2	-		493	43	2131	23	4153	33	3043	26	2340	28	3142	5
78S 48586	276	656	8	6738	30	2078	13	3938	25	508	38	-		1391	50	3679	40	2576	42	2033	37	2622	26
78S 48428	277	543	15	8488	3	2945	6	3641	27	508	38	-		2098	26	3153	45	2909	32	2247	34	2948	12
78S 48589	281	603	12	9127	2	2778	7	4641	11	858	15	-		2898	6	3471	43	3209	20	2020	38	3289	3
77TA 88118	285	396	31	7793	13	2065	14	4988	9	1008	9	-		1711	39	5079	14	2876	33	1780	46	3072	7
77MS 88321	286	616	11	7238	20	4485	2	3271	32	858	15	-		731	58	3782	39	3443	15	1927	41	2928	13
77MS 88322	286	365	37	5099	55	2051	16	950	59	1142	5	-		949	56	1772	58	3809	7	2607	16	2083	52
77MS 88323	287	291	47	5515	49	1471	26	2543	45	1142	5	-		796	57	6009	7	4143	1	2620	15	2726	20
77MS 88324	287	285	48	6043	40	1217	30	4061	22	642	29	-		1491	45	4876	19	3409	16	3167	4	2800	19
75TA 26467	295	258	55	6543	35	644	43	2506	46	642	29	68	48	1669	40	5276	11	3543	11	1833	44	2299	43
78S 49121	308	365	37	7543	15	1404	27	2135	52	692	24	168	47	2016	29	5498	10	2642	40	2553	18	2502	32
77MS 88338	317	358	40	7293	17	2064	15	3135	35	492	41	518	41	1436	47	3972	37	2976	30	1647	48	2390	40
78S 48603	317	371	34	5654	46	484	45	2320	49	392	45	1243	24	1236	52	4965	16	3043	26	2527	19	2224	47
78S 48434	320	351	41	6543	35	1991	19	1876	54	392	45	518	41	1963	31	4750	21	2109	51	1607	49	2211	48
75TA 26501	322	431	28	5154	53	3051	5	2802	40	1392	3	668	36	1423	48	4172	32	2743	37	2353	26	2419	39
77TA 88138	328	491	18	6265	38	1571	23	2765	42	1142	5	1068	28	2116	24	4980	15	3143	22	-		2616	27
78S 48437	336	283	49	6784	28	2022	17	3617	28	-		3535	2	1591	41	3651	41	3198	21	2327	29	3001	9
78S 48504	339	189	57	6034	41	862	37	3357	31	-		1885	15	1538	44	2133	55	2265	49	2007	39	2253	46
77MS 88165	356	303	45	6701	31	3182	4	3950	24	-		1285	22	1565	42	4000	36	2065	52	2313	30	2819	18
74TA 498	360	256	56	6256	39	1615	22	3876	26	1375	4	1585	17	1965	30	4177	31	2598	41	2207	35	2592	29
79S 97173	363	443	24	4923	56	1002	33	4617	13	375	47	1535	18	1858	35	4718	24	2665	38	2353	26	2449	36
78S 49395	407	469	19	5534	48	1075	32	1765	55	775	20	3135	3	1865	34	4251	30	2665	38	2793	11	2433	37
77MS 88410	421	276	52	5867	42	1248	29	5061	7	525	35	1910	14	2191	22	3925	38	2365	47	1260	52	2463	35
78S 49451	428	295	46	6534	37	1962	20	4320	17	725	21	3135	3	1765	37	5992	7	3065	24	2967	8	3077	6
78S 35513	905	456	20	6784	28	1542	24	4432	16	225	52	2760	6	2438	14	4333	29	2198	50	1820	45	2699	24
78S 97330	1105	689	6	6923	26	975	34	3432	30	-		1985	12	1205	53	3577	42	2765	36	1193	53	2275	45
78S 49171	1266	436	27	3423	60	773	39	2962	37	608	31	2218	10	1469	46	4893	17	3620	9	2949	9	2336	42
Reina Blanca	1270	416	29	5228	52	1293	28	4629	12	1008	9	4218	1	2743	9	4649	26	3720	8	2576	17	3049	8

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Table 4.5.3.Seed yield (Y = kg/ha) and rank (R) of entries in the FBISN-S at different locations during 1980/81.

ENTRY		AFGHANISTAN Kabul		EGYPT Sids		ETHIOPIA Debre Zeit		LEBANON Terbol		PAKISTAN Islamabad		PERU Lima		POLAND Plock		SYRIA Tel Hadya				TURKEY Ankara		MEANS	
																Irrigated		Rainfed					
Pedigree	ILB	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R
78S 48561	1816	269	53	8090	8	226	49	2444	48	558	33	618	37	616	59	3101	47	2854	34	1349	51	2013	54
76TA 56267	1816	623	10	8284	6	839	38	2111	53	858	15	1618	16	1423	48	4671	25	3354	17	1936	40	2572	31
78S 49893	1817	363	39	7840	12	906	36	3074	36	958	12	618	37	1776	36	4019	34	3054	25	2149	36	2476	33
78S 49896	1817	309	44	5284	51	959	35	2592	44	708	22	18	49	1929	33	4886	18	3520	12	2749	12	2296	44
FLIP 80-2 X75TA 4	78S 33005	636	9	8367	5	1766	21	3222	33	358	48	-		1309	51	4471	28	3987	2	2629	14	2675	25
FLIP 80-3 X75TA 4	79S 77914	49	60	4006	57	746	42	1370	58	708	22	-				1930	56	1887	54	-		1188	59
FLIP 80-4 X75TA 14	79S 33024	149	59	6951	25	1193	31	2777	41	358	48	-		1163	54	4019	34	3353	18	1776	47	2174	50
FLIP 80-5 X75TA 14	79S 79068	316	43	3867	59	2019	18	888	60	658	27	-		123	60	1360	59	1787	57	-		1224	58
FLIP 80-6 X75TA 27	79L 10826	747	5	5784	43	-		2641	43	175	53	1202	26	1938	32	3439	44	2543	43	2296	32	2077	53
FLIP 80-7 X75TA 35	79L 10873	280	50	2728	61	-		1382	57	25	55	477	44	1565	42	380	61	1709	59	1149	54	970	60
FLIP 80-8 X75TA 146	79S 78263	774	4	7867	11	-		4049	23	525	35	952	31	2611	13	3076	48	2443	45	1896	43	2420	38
FLIP 80-9 X75TA 146	79S 78264	367	36	7895	10	3749	3	2827	39	175	53	552	40	2945	4	2172	54	843	61	3162	5	2469	34
FLIP 80-10 X75TA 146	79S 78978	780	3	3978	58	-		567	61	425	44	327	45	2238	20	2876	50	1809	55	2496	20	1550	56
FLIP 80-11 X75TA 193	79S 79029	167	58	5117	54	-		2271	50	325	51	327	45	2051	28	1091	60	1809	55	-		1462	57
FLIP 80-12 X77Sd 11	79S 77058	580	13	6617	33	309	48	2197	51	525	35	602	39	2811	8	1913	57	1475	60	1536	50	1857	55
FLIP 80-13 X77TA 48	79S 76714	447	23	7173	22	-		2864	38	925	13	2277	8	3165	2	4750	21	3009	29	2496	20	2711	21
Local check means		547	14	8431	4	5979	1	4667	10	925	13	2930	5	4192	1	5264	12	2806	35	1102	55		
Syr. local means		379	33	5458	50	197	50	3605	29	692	24	1930	13	2316	18	4630	27	3944	4	2840	10	2599	28
Giza 3 means		336	42	7269	18	2570	8	1690	56	658	27	745	35	1713	38	3121	46	1978	53	1918	42	2200	49
Location mean		424		6545		1360		3406		708		1310		1933		4130		2861		2316			
C.V.%		42.7		19.1		43.1		23.3		39.5		43.5		37.4		23.9		15.2		20.6			
SE. checks		104		780		726		447		173		514		592		599		256		232			
SE. checks VS test entries		224		1684		1568		965		374		1028		1279		1295		552		501			

Table 4.5.4. The five heaviest seed yielding entries at the individual locations in the FBISN-S

Rank	AFGHANISTAN Kabul		EGYPT Sids		ETHIOPIA Debre Zeit		LEBANON Terbol		PAKISTAN Islamabad	
	Selection	ILB	Selection	ILB	Selection	ILB	Selection	ILB	Selection	ILB
1	74TA 12	5	74TA 84	31	Local check		75TA 26062	29	78S 49923	139
2	74TA 367	269	78S 48589	281	77MS 88321	286	74TA 367	269	74TA 22	9
3	FLIP 80-10 X75TA	146	78S 48428	277	FLIP 80-9 X75TA	146	74TA 109	37	75TA 26501	322
4	FLIP 80- 8 X75TA	146	Local check		77MS 88165	356	74TA 22	9 [1)	74TA 498	360
5	FLIP 80- 6 X75TA	27	FLIP 80-2 X75TA	4	75TA 26501	322	74TA 84	30]	77MS 88322	286]
									77MS 88323	287
									77MS 88138	328]

Rank	PERU Lima		POLAND Plock		SYRIA Tel Hadya				TURKEY Ankara	
					Irrigated		Rainfed			
	Selection	ILB	Selection	ILB	Selection	ILB	Selection	ILB	Selection	ILB
1	Reina Blanca	1270	Local check		74TA 109	37	77MS 88323	287	74TA 22	9
2	78S 48437	336	FLIP 80-13 X77TA	48	74TA 22	9	FLIP 80-2 X75TA	4	78S 49288	112
3	78S 49395	407]	74TA 87	31	74TA 95	33	77MS 88252	16	75TA 2633	207
4	78S 49451	428]	FLIP 80- 9 X75TA	146	75TA 26062	29	Syrian large	1814	77MS 88324	287
5	Local check		74TA 95	33	77MS 88252	16	74TA 12	5	FLIP 80-9 X75TA	146

1) The brackets indicate entries having the same rank

Table 4.5.5. List of entries that appeared more than twice in table 4.35, name of the country and overall rank of these entries in seed yield.

ILB No.	Selection	Freq	Name of the country	Rank
-	Local check	4	Egypt, Ethiopia, Peru, Poland	
9	74TA 22	4	Lebanon, Pakistan, Syria, Turkey	1
FLIP 80-9	X75TA 146	3	Ethiopia, Poland, Turkey	34

Table 4.5.6. Seed yield expressed as a % of location mean, of the six entries with the heaviest mean seed yield across locations in the FBISN-S.

Entry		Afghanistan	Egypt	Ethiopia	Lebanon	Pakistan	Peru	Poland	Syria		Turkey
									Tel Hadya		
Selection	ILB	Kabul	Sids	Debre Zeit	Terbol	Islamabad	Lima	Plock	Irrigated	Rainfed	Ankara
74TA 22	9	159	122	5	159	218	111	149	159	121	159
74TA 109	37	90	126	-	161	140	170	136	171	134	104
78S 48589	281	142	139	204	136	121	-	150	84	112	87
74TA 87	31	107	140	27	126	84	208	162	126	121	99
74TA 367	269	188	113	173	163	-	38	110	101	106	101
78S 49451	428	70	99	144	127	102	239	91	145	107	128

summarizing two years results. It was found that selection 74TA 22 which ranked 1st in seed yield over all locations in 1980-81, also maintained its ranking over the two year period (Table 4.5.7). It was followed in ranking by selections 74TA 87, 75TA 26062, 78S 49451, and 74TA 367. The following entries were among the best five yielding entries in specific countries, i.e., selection 74TA 22 in Algeria and Lebanon, Afghanistan and Pakistan, Turkey and Iraq, and Syria locations; selection 74TA 87 in Poland and Spain Egypt and Libya and Quatar, Argentina and Peru, and Syria locations; selection 75TA 26062 in Algeria and Lebanon, Poland and Spain, and Turkey and Iraq; and selection 78S 49451 in Argentina and Peru, and Syria locations.

Table 4.5.7. Seed yield (Y=kg/ha) and rank (R) of entries which planted during two years (1979-80 and 1980-81) in the FBISN-S at different locations.

ILB No.	Selection No.	Ethiopia Debre Zeit		Algeria & Lebanon		Poland & Spain		Egypt, Libya & Qatar		Afghanistan & Pakistan		Turkey & Iraq		Syria Lattakia & Tel Hadya		Argentina & Peru		Mean	
		Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R
ILB 5	74TA12	641	26	3883	5	2474	6	2668	31	854	2	2708	11	3121	11	1151	7	2188	8
9	74TA 22	519	27	4315	2	2356	9	3858	8	1108	1	3108	4	3609	3	1142	9	2502	1
16	77MS 88252	217	32	4151	3	2586	3	3394	19	398	26	2455	18	3295	6	822	16	2165	11
29	75TA 26062	467	28	4548	1	2518	4	3368	20	641	12	3333	2	3263	8	1066	10	2401	3
30	74TA 84	406	29	3679	6	2363	8	3617	14	411	24	2721	10	3049	13	1027	11	2159	12
31	74TA 87	669	25	3536	9	2747	2	4437	4	523	14	2915	6	3356	5	1542	1	2466	2
33	74TA 95	317	30	3450	11	2481	5	3636	12	481	19	2881	7	3251	9	970	13	2183	9
37	74TA 109	220	31	3670	7	2786	1	3521	15	436	22	2875	8	3478	4	799	19	2223	7
207	75TA 26333	1118	20	2834	26	1978	22	3425	18	776	6	3050	5	2774	16	779	21	2092	17
269	74TA 367	1468	11	3220	15	2331	10	4033	7	796	5	2837	9	2459	25	1144	8	2286	5
277	78S 48428	1949	5	3034	21	2205	14	3772	9	526	13	2390	19	2266	32	798	20	2118	16
285	77TA 88118	1521	9	2929	23	1849	26	3740	10	702	9	1557	32	3294	7	805	17	2050	21
186	77MS 88321	2735	1	2740	27	1089	32	3620	13	737	7	2330	21	2740	18	713	24	2088	19
286	77MS 88322	1512	10	1876	32	1582	30	2878	29	736	8	2570	14	2392	31	803	18	1794	32
287	77MS 88323	1137	19	2312	30	1652	29	2793	30	692	10	2377	20	3675	1	735	23	1922	27
287	77MS 88324	1157	18	2865	24	1548	31	3292	21	464	20	2550	15	2973	14	655	25	1938	26
295	75TA 26467	973	22	2486	29	2028	19	3045	25	450	21	2083	25	3124	10	569	26	1845	31
317	77MS 88338	1978	4	2711	28	1712	27	3459	17	425	23	1690	30	2454	26	849	15	1910	28
320	78S 48434	1377	12	2960	22	2096	16	4661	3	372	27	1837	27	2444	27	329	30	2010	23
322	75TA 26501	2154	2	2242	31	1989	21	3680	11	212	32	2010	26	2567	22	293	32	1893	29
328	77TA 88138	1294	15	3035	20	2399	7	4214	5	817	3	1827	28	3090	12	414	29	2136	13
336	78S 48437	1265	16	2865	24	1890	25	4205	6	283	30	2297	22	2634	20	1295	5	2092	17
356	77MS 88165	2122	3	3538	8	2057	17	3074	24	303	29	2590	13	2433	28	912	14	2129	14
360	74TA 498	1551	8	3498	10	2259	11	2989	28	816	4	1737	29	2420	29	977	12	2031	22
421	77MS 88410	886	23	3222	14	2045	18	3278	22	401	25	1664	31	2414	30	1216	6	1891	30
428	78S 49451	1316	13	3413	12	2242	12	2997	27	510	17	3117	3	3635	2	1506	2	2342	4
905	78S 35513	1316	13	3138	18	2219	13	3285	23	341	28	2244	24	2540	23	1388	3	2059	20
1266	78S 49171	781	24	3131	29	2028	19	1939	32	522	15	3408	1	2659	19	1341	4	1976	25
1817	78S 49893	978	21	3371	13	2183	15	4710	2	661	11	2508	16	2634	20	772	22	2227	6
1817	78S 49896	1217	17	3917	4	1965	23	3477	16	509	18	2508	16	2917	15	487	27	2125	15
FLIP 80-2	X75TA 4	1773	7	3173	16	1706	20	4892	1	522	15	2248	23	2766	17	322	31	2175	10
FLIP 80-4	X75TA 14	1879	6	3140	17	1915	24	3030	26	254	31	2622	12	2518	24	466	28	1978	24

Table 4.5.8. Correlations[1] (df = 58) among three agronomic characters and seed yield based on means across locations in the BISN-S.

Traits	Days to maturity	Plant height	seed yield
Days to 50% flowering	0.77**	0.17	0.08
Dayts to maturity		0.27*	0.17
Plant height			0.53**

(1) * $P \leq 0.05$
** $P \leq 0.01$

Table 4.5.9. Correlations[1] (df=30) among three agronomic characters and seed yield based on mean values across locations in the BISN-S during two years (1979-1981).

Traits	Days to maturity	Plant height	Seed yield
Days to 50% flowering	0.46**	0.09	-0.25
Days to maturity		0.20	0.13
Plant height			0.07

1) **$P \leq 0.01$

4.6. FABA BEAN INTERNATIONAL F_3 TRIAL ($FBIF_3T$)

Material

The $FBIF_3T$ was composed of 34 F_3 populations, and two checks, one to be supplied by the local cooperator. The F_3 populations originated from crosses among heavy yielding lines, commercial cultivars, local adapted populations, and widely adapted genotypes. The material should have provided a wide range of intra- and inter-population variation, within which cooperators were free to practice their own selection.

Methods and Management

The trial design was 6 x 6 lattice (3 replications), although the results have been analyzed as a randomized complete block. The suggested plot size was four rows, each four meter long, with an inter- and intra-row spacing of 0.50m and 0.10m, respectively.

Twelve sets of the trial were distributed to cooperators in ten countries. Results were returned from five trials covering four countries. Agronomic practices employed at the different locations are given in Table 4.6.1.

Results and Discussion

Means for number of days to flowering, and to maturity and for plant height across four locations are listed in Table 4.6.2. Five and four days difference between the earliest and the latest population was observed for number of days to flowering and to maturity, respectively. Entry X79 L 12 was one of the earliest in flowering but the latest in maturity. Plant height varied from 65 cm for x79 L 153 to 84 cm for ILB 1814.

Table 4.6.1. Agronomic date for different locations for the FBIF$_3$T during 1980/81.

Country	Location	Planting date	Crop Duration (days)[1]	Fertilizer kg/ha N	P_2O_5	K_2O	Irrig.	Insec.
AFGHANISTAN	Kabul	22. 4.81	111	30	60		5	
LEBANON	Terbol	15.11.80	233					
SPAIN	Cordoba	1.12.80	196		50		3	Sevin,
SYRIA	Tel Hadya	12.11.80			50		3	

(1) Days from planting to harvest.

Table 4.6.2. Values for three agronomic characters across several locations for entries in the FBIF$_3$T during 1980/81.

Entry		Days to flowering	Days to maturity	Plant height (cm)
X 79S	67	99	170	79
	68	98	169	74
	69	96	169	73
	70	97	169	72
	71	97	168	73
	72	96	168	70
	73	97	167	74
	77	97	169	69
	78	98	168	73
	86	96	169	75
	87	97	168	77
	91	96	168	79
	92	98	166	71
	93	97	168	70
	94	94	168	72
	97	95	169	70
	98	96	168	71
	99	96	168	66
	103	95	166	74
	107	94	166	72
	111	97	168	74
	125	96	168	70
	145	98	169	72
X 79L	12	94	171	74
	16	96	170	73
	24	97	168	73
	92	96	169	71
	96	96	169	70
	99	97	169	66
	100	95	170	73
	121	97	168	72
	130	96	167	72
	151	97	168	70
	153	95	169	65
ILB	1814	97	169	84
Number of locations		4	4	4

The seed yield and rank of the populations at the five test sites and overall mean are summarized in Table 4.6.3. 'F' tests indicated that the populations differed significantly in seed yield at all locations. None of the tested populations exceeded the local check significantly. The following populations should be given more attention, where they have ranked among the best five populations across all locations i.e., X79S 98, X79S 91, X79L 92, X79L 99, and X79S 94. It is worth noting that the second and the third entry are two different selections from the same cross (ILB 1814 (Syria) X 78TH 44445 (Lebanon); the second and the fifth share one common parent (ILB 1814); while the first and the third share ILB 1812, and the fourth population stemmed from a cross between ILB 1817 (Lebanon) X 74TA 63 (Iraq).

Correlations among different locations for seed yield are given in Table 4.6.4. The unadaptation of the tested populations across environments may account for the low and nonsignificant correlations obtained.

Table 4.6.3. Seed yield (Y = kg/ha) and rank (R) of entries in the FBIF3T at different locations during 1980/81.

Cross No.	AFGHANISTAN Kabul		LEBANON Terbol		SPAIN Cordoba		SYRIA Tel Hadya				MEAN	
							Irrigated		Rainfed			
	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R
X 79S 67	253	25	4370	2	663	35	3894	12	3852	7	2606	16
68	234	27	3895	12	1599	23	4158	2	3469	16	2671	9
69	337	9	4759	1	806	34	3805	15	3401	22	2622	13
70	289	13	4370	2	1520	26	3443	23	3444	18	2613	14
71	358	8	3796	17	972	32	3632	19	3593	12	2470	21
72	184	35	3426	28	1008	30	3123	31	3377	23	2224	33
73	279	15	4105	7	1726	18	3565	20	3512	13	2637	11
77	292	12	3574	26	294	36	3989	8	3426	20	2315	28
78	254	24	4222	5	1468	27	2967	32	3340	24	2450	22
86	268	19	3809	16	1532	24	3481	22	2852	35	2388	26
87	453	3	3852	14	1722	19	4351	1	3052	30	2686	7
91	506	2	4099	8	2337	9	3790	16	3926	6	2932	2
92	263	20	4111	6	1294	29	4015	7	3463	17	2629	12
93	233	28	4019	10	1984	13	2936	33	3414	21	2517	19
94	238	26	3580	25	2615	6	4037	6	3981	5	2890	5
97	226	30	3401	31	1603	22	3293	26	2704	36	2245	31
98	279	15	4068	9	2925	3	3741	17	3815	8	2966	1
99	284	14	3840	15	2163	11	3377	24	2901	34	2513	20
103	278	17	3691	19	976	31	3889	13	4068	1	2580	17
107	257	23	3784	18	1524	25	2404	36	3204	28	2235	32
111	191	34	3679	20	2341	8	3640	18	3494	15	2669	10
125	422	5	3630	22	1667	21	3351	25	2981	31	2410	24
145	397	7	3315	33	952	33	3148	30	3765	9	2315	28
X 79L 12	258	22	2383	36	1671	20	3256	27	3438	19	2201	34
16	277	18	3574	26	1397	28	2928	34	3253	26	2286	30
24	261	21	3414	30	1758	4	3231	29	3765	9	2686	7
92	331	11	3932	11	2468	7	4109	4	3654	11	2899	3
96	218	31	3605	23	2663	5	3236	28	3327	25	2610	15
99	332	10	3389	32	3167	2	4077	5	3500	14	2893	4
100	214	32	3062	35	1940	15	3889	13	2914	33	2404	25
121	446	4	3599	24	2012	12	2588	35	3136	29	2356	27
130	406	6	3426	28	1968	14	4116	3	4037	2	2791	6
151	202	33	3148	34	1889	16	3960	10	2981	31	2436	23
153	230	29	3667	21	1802	17	3952	11	3216	27	2573	18
Syrian Large ILB 1814	178	36	4228	4	3187	1	3564	21	4006	3		
Local check	752	1	3864	13	2310	10	3984	9	4000	4		
Location mean	302		3741		1803		3581		3452			
C.V.%	47.7		16.8		37.5		22.0		17.4			
L.S.D. 5%	235		1031		1107		1288		985			
No.of entries significantly exceeding local check	0		0		0		0		0			

Table 4.6.4. Correlations (df = 33) among different locations in the $FB1F_3T$ during 1980/81 for seed yield (local check excluded from the calculations).

Locations	LEBANON Terbol	SPAIN Cordoba	SYRIA Tel Hadya	
			Irrigated	Rainfed
Afghanistan - Kabul	0.10	-0.08	0.09	0.11
Lebanon - Terbol		-0.10	0.10	0.22
Spain - Cordoba			0.06	0.16
Syria - TH - Irrigated				0.27

4.7. FABA BEAN INTERNATIONAL F_3 TRIAL EARLY (FBIF3T-E)

Material

The FBIF3T-E comprised 33 F_3 populations, and three check entries, two to be supplied by the local cooperator. The F_3 populations stemmed from crosses between early x high yielding lines; early x widely adapted genotypes; early x early lines; and early x commercial cultivars. The material should have provided a wide range of intra- and inter-population variation for earliness within which cooperators were free to practice their own selection.

Methods and Management

The trial design was 6 x 6 lattice (4 replications), although the results have been analyzed as a randomized complete block. The suggest plot size was four rows each four meter long, with an inter- and intra-row spacing of 0.50m and 0.10m, respectively. Nine sets of the trial were distributed to cooperators in six countries. Results were returned from four trials covering three countries. Agronomic practices employed at the different locations are given in Table 4.7.1.

Results and Discussion

Means for number of days to flowering, and to maturity and for plant height across four locations are listed in Table 4.7.2. Days to flowering ranged from 95 days for X79S 102 to 102 days for X79S 122, and days to maturity from 169 days for X79S 114 to 180 days for X79S 122. Plant height varied from 84cm for X79S 109 to 103cm for X79S 120.

Seed yield and rank of entries at the four test sites and the overall mean across locations are summarized in Table 4.7.3. 'F' tests indicated that genotypic differences were significant at all locations. A least significant

Table 4.7.1.Agronomic date for different locations for the FBIF$_3$T-E during 1980/81

Country	Location	Planting date	Crop[1] Duration (days)	Fertilizer kg/ha N	P_2O_5	K_2O	Irrig.
ETHIOPIA	Debre Zeit	24.6 .81	139				
LEBANON	Terbol	14.11.80	233				1
SYRIA	Tel Hadya	13.11.80			50		3

(1) Days from planting to harvest.

difference was calculated to indicate the genotypes which significantly exceeded the local check (Table 4.7.3). None of the tested populations exceeded the local check significantly.

Across all locations, the best four heaviest seed yielding populations were X79S 100, X79S 108, X79S 11 and X79S 105. Selecting for earliness within and among the previous listed populations with 3-4 backcrosses to the high yielding parent will likely improve the yield level while maintaining earliness. The pedigree of the best four populations indicated that Giza 3 from Egypt was a common parent for three populations and Giza 4 for one population, however, the number of crosses made with Giza 4 was almost double than that made with Giza 3. These results suggested that Giza 3 is a better parent as compared with Giza 4.

Correlations among different locations for seed yield are given in Table 4.7.4. All correlations were nonsignificant except that between rainfed and irrigated in Tel Hadya, Syria (0.71^{**}).

Table 4.7.2.Values for three agronomic characters across several locations for entries in the FBIF$_3$T-E during 1980/81.

ENTRY		Days to flowering	Days to maturity	Plant height (cm)
X 79S	11	99	171	93
	12	99	172	92
	56	98	172	86
	63	101	173	98
	100	97	171	92
	101	99	172	85
	102	95	171	90
	104	99	172	94
	105	98	172	90
	106	98	171	87
	108	98	172	89
	109	98	171	84
	110	96	171	88
	112	100	171	87
	113	98	172	94
	114	98	169	86
	116	99	173	85
	117	99	171	88
	118	98	171	89
	120	101	179	103
	122	102	180	99
	124	100	176	95
	126	98	174	87
	144	100	174	92
	148	99	171	102
	152	101	176	90
X 79L	52	98	174	89
	53	97	173	91
	90.	98	174	92
	103	99	173	92
	110	97	173	89
	111	99	171	90
	113	99	171	91
ILB	1814	101	175	91
Number of locations		4	4	4

Table 4.7.3. Seed yield (Y = kg/ha) and rank (R) of entries in the FBIF$_3$T-E at different locations during 1980/81.

Cross No.	ETHIOPIA Debre Zeit		LEBANON Terbol		SYRIA Tel Hadya				MEAN	
					Irrigated		Rainfed			
	Y	R	Y	R	Y	R	Y	R	Y	R
X 79S 11	1229	20	2389	22	4874	2	3432	5	2981	4
12	1262	17	1694	35	4869	3	3068	9	2723	12
56	1331	10	2278	26	3442	28	2309	29	2340	25
63	983	28	2278	26	2673	35	2512	20	2112	31
100	1044	25	3074	9	4530	6	3383	6	3008	2
101	1157	23	2546	17	4453	8	2710	16	2717	13
102	1222	21	2083	32	3521	25	2710	16	2384	23
104	1361	7	2806	13	4307	10	2994	11	2867	8
105	1351	8	3148	8	3968	17	3259	7	2932	5
106	1367	6	3417	6	3328	29	2123	33	2559	19
108	882	29	3352	7	3952	18	3753	2	2985	3
109	1317	11	2907	10	3537	24	2383	25	2536	20
110	1266	16	2342	23	3495	27	2086	34	2297	29
112	821	32	2194	29	3705	20	2525	19	2311	27
113	1027	27	2120	30	4172	14	2735	14	2514	21
114	1287	14	2500	21	3041	32	2432	24	2315	26
116	1348	9	4130	1	3300	30	2353	26	2783	11
117	1543	5	2509	20	4194	12	3000	10	2812	10
118	1629	4	2343	23	3278	31	1765	35	2254	30
120	374	34	1843	34	3023	33	2333	27	1893	32
122	659	33	1685	36	2832	34	2191	31	1842	33
124	849	31	2722	15	4122	15	3765	1	2865	9
126	1782	3	2259	28	3994	16	2333	27	2592	18
144	1029	26	2824	11	3879	19	2877	13	2652	15
148	1312	12	1963	33	3641	22	2296	30	2303	28
152	271	35	2519	19	2572	36	1105	36	1617	39
X 79L 52	1082	24	2759	14	4696	5	3086	8	2906	6
53	1308	13	2287	25	3521	25	2494	22	2403	22
90	863	30	3426	5	4522	7	2716	15	2882	7
103	1254	18	3454	4	3542	23	2136	32	2597	17
110	1248	19	2093	31	3652	21	2481	23	2369	24
111	1267	15	2528	18	4184	13	2506	21	2621	16
113	1174	22	2630	16	4262	11	2700	18	2692	14
ILB 1814	36	36	4093	2	4446	9	3642	3	3054	1
Local check A	2883	2	3852	3	4723	4	3556	4		
Local check B	3278	1	2824	11	4907	1	2944	12		
Location mean	1225		2663		3865		2686			
C.V. %	34.4		34.3		13.9		22			
L.S.D. 5%	687		1864		878		965			
No. of entries signi- ficantly exceeding best local check	0		0		0		0			

Table 4.7.4. Correlations[1] (df = 32) among different locations in the F_8IF_3T-E during 1980/81 for seed yield (local checks excluded from calculations).

Locations	LEBANON Terbol	SYRIA Tel Hadya	
		Irrigated	Rainfed
Ethiopia - Debre Zeit	-0.13	0.13	-0.11
Lebanon - Terbol		0.18	0.28
Syria - TH - Irrigated			0.71**

1) * $P \leq 0.05$

** $P \leq 0.01$

5. LENTIL INTERNATIONAL TRIALS AND NURSERIES

In the lentil international trials and 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)

Material

The test entries in the LAT comprised a wide range of genetic material including 14 land races, selections, and cultivars from the major lentil producing regions. These included from U.S.A. to Morocco and India, and from USSR to Sudan. It was hoped that such a diverse set of cultivars would provide the variability necessary for the classification of countries into agro-ecological zones.

Methods and Management

The trial design was randomized complete blocks with four replications. There was, in addition to the 14 test cultivars, provision for two local checks. The recommended plot size was 4 rows, each 4m long with an inter-and intra-row spacing petween plants of 0.25m and 0.02m respectively. Cooperators were, however, urged to use the practices that are locally recommended for lentil cultivation. The agronomic data for the different locations are given in Table 5.1.1.

Table 5.1.1. Agronomic data for different locations for the LAT during 1980-81.

Country	Location	Planting Date	Crop Duration (days)	Fertilizer (kg/ha) N	P_2O_5	K_2O	Crop Husbandry
ARGENTINA	Pergamino	6.5.81	140				
CHILE	Chillan	25.5.81	199		90		
ECUADOR	Quito		176	13.5	40.5	13.5	3 Irrig.-Dithane
EGYPT	Mallawi	25.11.80	146	100	200		3 Irrig.
INDIA	New Delhi	17.11.80	148	40	40		1 Irrig.-Metasystox
IRAQ	Dohouk	24.11.80	192	100	100		
JORDAN	Hisban	30.11.80	190	2	5		
JORDAN	Ramtha	9.11.80	186	2	5		
LEBANON	Kfardan	1.12.80	179				
LEBANON	Terbol	26.11.80	185				
PAKISTAN	Faisalabad	25.11.80					3 Irrig.
PAKISTAN	Islamabad	18.11.80	174	20	50		
PAKISTAN	Punjab	8.11.80	186				3 Irrig.
SYRIA	Tel Hadya	10.12.80	168				
TURKEY	Diyarbakir	15.11.80	208	40	60		
U.S.A.	Washington	8.5.81	112				Tolban, Cygon, Imidan

There were 44 requests for LAT,and 32 sets of the trial were despatched. Amongst these, thirteen data books were returned from ten countries; namely Argentina, Chile, Ecuador, Egypt, India, Iraq, Jordan, Pakistan, Turkey and U.S.A.

Results and Discussion (Tables 5.1.2 to 5.1.4)

The time to flower was shortest in Washington State, U.S.A. where there were long summer days with photoperiods of more than 15 hours. By contrast, the lentils were latest into flower at Diyarbakir in Turkey, which is at 660m elevation and has a relatively cool and late spring.

Amongst the entries, the cultivars from Egypt, India and Sudan,namely Giza 9, Pant-L-639 and Silaim were the earliest to flower by a mean of a week. Their earliness was particularly striking in Argentina, Egypt, India and Pakistan. These growing environments all had a photoperiod prior to flowering of 12 hours or less. These three cultivars appear to have less delay in time to flower in short days than the other entries in LAT, confirming the results of the previous year. These three cultivars are the product of local selection pressure for early flowering under short day conditions.

The next group of varieties to flower, on average, were Jordan local, 74TA 577 from Mexico and ILL 504 from USSR. They flowered after an average of 121 days. Slightly later were the entries from Lebanon and Syria (ILL 4499, 4400 and 4401), Chilean '78 from U.S.A., and 74TA 138 from Morocco. The latest two entries to flower were from Iran and Turkey.

Plant height varied from 18cm on average in Argentina to 52cms in Iraq. The crop is mechanically harvested in U.S.A. by either a mower or a combine harvester. However the trial in Washington only gave an average height of 31cm. Nevertheless, the cultivar Chilean '78 from U.S.A. was the tallest entry, reflecting the height requirements of a mechanical harvest.

The shortest cultivar was Pant-L-639 which was among the earliest to flower. The other early cultivars, Giza 9 and Silaim, were taller with an average height of 33cm, combining height with earliness. The four tallest entries were macrosperma types (100 seed weight $>$ 4.5g).

Seed yields in LAT varied from 124 kg/ha at Faisalabad in Pakistan to 2020 kg/ha Diyarbakir in Turkey, where the highest cultivar yield was 2868 kg/ha. The precision of the trials also varied considerably from a coefficent of variation of 16.2 per cent at Tel Hadya, Syria to 46.9 per cent at Islamabad in Pakistan.

In the Indo - Pakistan sub-continent the cultivar Pantnagar-L-639 ranked first at both Punjal and New Delhi. This cultivar has been previously found widely adapted in India by the All-India Coordinated Pulse Program. The importance of phenological adaptation for high seed yields can be well illustrated by the results at New Delhi, where only the early entries to flower produced more than 500 kg/ha seed yield. The correlations between cultivar mean yield indicated similarity in performance between Islamabad and Punjal in Pakistan; and between New Delhi and both Faisalabad and Chillan. Results in New Delhi were regatively correlated to performance in such west asian sites as Diyarbakir, Turkey and Dohouk, Iraq.

Amongst the west asian locations there were many significant and positive correlations between cultivar mean yields (Table 5.1.5). These are shown below with solid lines indicating significant positive correlations.

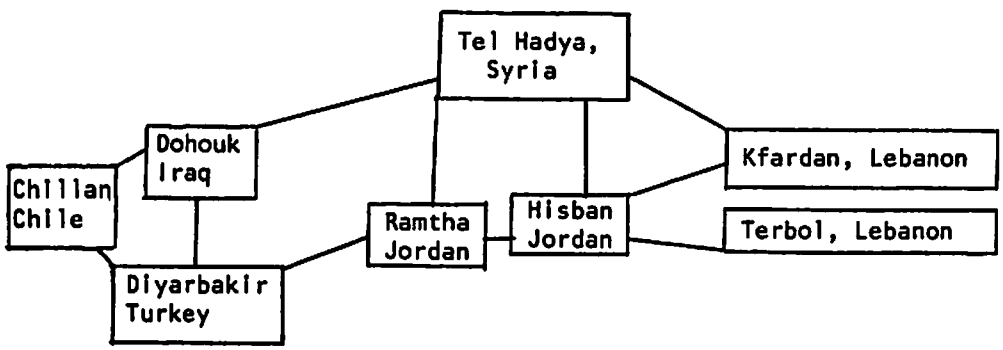

Table 5.1.2.Time to flowering (days) in the LAT at different locations during 1980-81.

Selection	ENTRY ILL	Country of origin	ARGENTINA Pergamino	CHILE Chil-lan	ECUADOR Quito	EGYPT Malla-wi	INDIA New Delhi	IRAQ Do-houk	JORDAN Hisban	JORDAN Ramtha	LEBANON Kfardan	LEBANON Terbol	PAKISTAN Islam abad	PAKISTAN Punjal	SYRIA Tel Hadya	TURKEY Diyar-bakir	U.S.A. Washi-ngton	MEAN
74TA 138	101	Morocco	123	143	90	96	109	144	145	145	137	140	132	139	132	163	59	126
74TA 264	254	Greece	117	136	106	98	113	144	139	159	133	135	132	140	126	161	59	127
74TA 577	499	Mexico	110	138	90	95	98	138	136	150	133	138	122	125	127	158	59	121
-	504	USSR	130	136	90	73	99	141	134	147	133	135	121	135	121	157	59	121
Giza 9	784	Egypt	102	136	89	69	81	130	130	135	133	138	119	103	113	160	59	113
Silaim	1861	Sudan	118	136	90	89	77	132	125	133	133	135	117	103	109	156	60	114
Wint.L.11	1877	Turkey	93	145	114	102	113	144	147	152	137	142	132	138	135	161	59	128
Iran.Local	4351	Iran	134	145	114	106	112	136	153	150	146	149	132	138	136	170	59	132
Jordan Local	4354	Jordan	134	136	89	104	95	141	127	145	133	133	122	130	118	155	59	121
Pant.L.234	4380	India	97	136	89	91	86	140	123	131	133	130	114	119	110	159	59	114
Leb.Local	4399	Lebanon	134	144	98	73	109	138	142	138	137	142	132	139	132	163	59	125
Syr.Loc.L.	4400	Syria	112	136	106	96	118	145	136	152	133	133	132	143	123	160	59	126
Syr.Loc.S.	4401	Syria	109	136	93	102	115	141	127	147	133	133	130	139	121	158	59	123
Chilean 78	4711	U.S.A.	128	139	95	97	105	138	140	155	137	142	132	123	132	161	60	126
Location mean			117	139	97	92	102	139	136	146	135	137	127	129	124	160	59	

Table 5.1.3. Plant height (cm) of entries in the LAT at different locations during 1980-81

Selection	ILL	ARGENTINA Pergamino	CHILE Chillan	ECUADOR Quito	EGYPT Mallawi	INDIA New Delhi	IRAQ Dohouk	JORDAN Hisban	JORDAN Ramtha	LEBANON Kfardan	LEBANON Terbol	PAKISTAN Punjal	SYRIA Tel Hadya	TURKEY Diyar-bakir	U.S.A. Washin-gton	Mean
74TA 138	101	20	29	30	25	38	45	30	19	35	39	34	31	34	30	31
74TA 264	254	21	37	33	25	38	53	33	21	38	46	39	35	31	41	35
74TA 577	499	19	31	35	25	40	57	28	18	32	43	34	30	34	29	33
-	504	16	32	28	26	36	44	30	19	35	46	31	32	36	39	32
Giza 9	784	20	32	37	29	44	47	30	18	35	42	39	31	30	31	33
Silaim	1861	15	35	31	30	41	55	30	18	32	39	36	31	35	30	33
Wint. L 11	1877	18	29	30	23	39	53	33	21	38	48	34	35	39	29	34
Iran. L.	4351	19	21	30	21	32	52	32	21	36	40	30	33	33	29	31
Jord. L.	4354	20	36	35	25	38	36	30	22	36	41	35	31	30	27	32
Pant. L 234	4380	18	28	31	19	46	41	23	17	26	33	39	24	25	27	28
Leb.L.	4399	19	33	26	18	37	63	34	22	37	49	29	32	34	29	33
Syr. L. L.	4400	19	39	30	27	37	57	34	22	38	46	36	35	38	27	35
Syr. L. S.	4401	16	30	31	23	28	52	29	21	32	41	30	32	29	25	30
Chilean 78	4711	20	35	25	30	35	67	35	24	42	53	38	39	44	34	37
Location mean		18	32	31	25	38	52	31	20	35	44	34	32	34	31	

Table 5.1.4.Seed yield (Y=kg/ha) and rank (R) of entries in the LAT at different locations during 1980/81.

Entry Selection	ILL	CHILE Chillan		ECUADOR Quito		EGYPT Mallawi		INDIA New Delhi		IRAQ Dohouk		JORDAN Hisban		Ramtha		LEBANON Kfardan		Terbol		PAKISTAN Faisal-abad		Islam-abad		Punjal		SYRIA Tel Hadya		TURKEY Diyar-bakir		U.S.A. Washing-ton		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	R	Y	R	Y	R
74TA 138	101	2183	1	232	7	2481	1	308	6	1155	4	1189	11	409	9	600	8	268	11	162	2	599	6	216	5	1693	2	2383	8	1225	5	1084	1
74TA 264	254	2067	3	378	5	2370	2	102	10	1203	3	1426	7	642	2	653	5	927	4	97	10	392	9	194	8	1447	5	2568	4	1167	6	1042	2
74TA 577	499	792	10	550	3	2185	3	257	7	858	7	1339	9	438	7	588	9	879	5	150	4	697	4	216	5	1292	9	2550	5	627	13	895	7
-	504	1217	8	787	2	1296	8	947	3	795	13	1429	6	319	10	608	7	1182	2	218	1	743	2	263	3	1383	6	1763	10	2078	1	1002	5
Giza 9	784	600	11	283	6	1065	12	859	4	830	11	990	13	282	12	533	10	397	8	141	5	444	7	253	4	1068	13	1023	13	906	11	691	13
Siliam	1861	325	14	535	4	1250	10	1184	2	438	14	1036	12	319	10	713	3	371	10	153	3	718	3	188	9	1128	11	1179	11	1004	10	703	12
Wint.L.II	1877	2042	4	213	9	1351	7	15	14	858	7	1388	8	489	6	375	12	67	14	130	8	52	13	15	13	1309	8	2743	3	1070	8	808	9
Iran.Loc.	4351	375	13	937	1	1713	4	125	9	1063	6	1490	5	-		402	11	99	13	67	13	19	14	103	11	1104	12	1085	12	1360	2	710	11
Jor.Loc.	4354	1392	7	223	8	1278	9	488	5	1255	1	1763	2	629	3	1115	1	861	6	92	11	750	1	209	7	1840	1	2500	6	1123	7	1035	3
Pant.L.234	4380	392	12	128	10	889	14	1741	1	848	9	500	14	-		329	13	800	7	137	6	249	10	691	1	803	14	440	14	336	14	592	14
Leb.Loc.	4399	1833	5	98	14	1176	11	18	13	1150	5	1629	3	506	5	646	6	204	12	65	14	153	12	9	14	1311	7	2868	1	717	12	826	8
Syr.Loc.L.	4400	1817	6	125	11	1574	5	48	12	1233	2	1624	4	794	1	658	4	1023	3	90	12	438	8	266	2	1684	3	2813	2	1265	3	1030	4
Syr.Loc.S.	4401	942	9	102	13	1491	6	76	11	838	10	1856	1	590	4	970	2	1499	1	103	9	681	5	150	10	1584	4	1488	7	1063	9	962	6
Chilean 73	4711	2133	2	112	12	963	13	129	8	825	12	1196	10	419	8	308	14	393	9	137	6	175	11	78	12	1134	10	1883	9	1261	4	743	10
Location mean		1294		336		1506		450		954		1346		486		607		641		124		436		204		1341		2020		1085			
C.V. %		28.6		19.2		34.5		45.9		31.8		19.6		21.7		25.1		30.9		40.9		46.9		34.9		16.2		24.4		35.9			
S.E.		204.5		33.9		291.7		134.9		152.5		134.2		56.2		78.4		91.8		26.1		97.1		43.2		106.3		259.9		196.3			

Table 5.1.5.Correlations (1) (df = 10) between the seed yield of entries in the LAT at different locations during 1980-81.

		ECUADOR	EGYPT	INDIA	IRAQ	JORDAN		LEBANON		PAKISTAN			SYRIA	TURKEY	U.S.A.
		Quito	Mallawi	New Delhi	Dohouk	Hisban	Ramtha	Kfardan	Terbol	Faisal abad	Islam abad	Punjal	Tel Hadya	Diyar bakir	Washi-ngton
CHILE	Chillan	-0.47	-0.26	-0.71**	0.65*	0.21	0.44	-0.34	-0.26	-0.28	-0.62*	-0.41	0.35	0.70*	0.20
ECUADOR	Quito		0.17	0.68*	-0.46	-0.34	-0.51	-0.05	0.22	0.76**	0.55	0.49	-0.26	-0.28	0.42
EGYPT	Mallawi			-0.28	0.39	0.01	0.24	0.06	0.17	0.05	0.25	0.31	0.41	0.40	0.10
INDIA	New Delhi				-0.60*	-0.53	-0.68*	0.12	-0.02	0.63*	0.57	0.51	-0.34	-0.72**	0.30
IRAQ	Dohouk					0.53	0.71**	0.27	0.11	-0.57	-0.17	0.05	0.72**	0.74**	-0.03
JORDAN	Hisban						0.75**	0.64*	0.59*	-0.56	0.09	-0.14	0.69*	0.47	0.05
JORDAN	Ramtha							0.41	0.41	-0.74**	-0.12	-0.01	0.69*	0.64*	-0.09
LEBANON	Kfardan								0.57	-0.35	0.66*	0.32	0.66*	-0.04	0.05
LEBANON	Terbol									0.01	0.60*	0.53	0.44	-0.12	0.36
PAKISTAN	Faisalabad										0.39	0.39	-0.31	-0.46	0.57
PAKISTAN	Islamabad											0.75**	0.35	-0.38	0.23
PAKISTAN	Punjal												0.28	-0.31	0.35
SYRIA	Tel Hadya													0.48	0.21
TURKEY	Diyarbakir														-0.15

(1) * P ≤ 0.05
** P ≤ 0.01

5.2. LENTIL INTERNATIONAL LARGE SEEDED YIELD TRIAL (LIYT-L-81)

The Lentil International Large Seeded Yield Trial comprised 14 test entries, all of which had a 100 seed weight more than 4.5g. The selections were from germplasm originating in a total of nine countries, and all of these entries had performed well in an earlier Lentil International Screening Nursery. Cooperators were asked to put two local checks in the trial also.

Materials and Methods

The experimental design was randomized complete blocks in three replications. The recommended planting arrangement was for plots of 4 rows, 4m-long and 0.25m apart with 200 plants/m^2. However cooperators were urged to follow the local recommendations for lentil husbandry. The experimental details are given in Table 5.2.1.There were 47 requests for LIYT-L-81, and 30 were despatched. Results were furnished from 10 locations. These were Chillan and Valdivia in Chile, Al Nobaria in Egypt; New Delhi in India; Jubeiha, Jordan; A.U.B. Farm, Lebanon; Al Marj, Libya; Merchouch, Morocco; Ankara and Diyarbakir, Turkey.

Results (Tables 5.2.2 to 5.2.5)

The trial at Valdivia in Chile was planted late, and for this reason the cooperator considered it unrepresentative. The seed yields in Valdivia were low with a mean of 144 kg/ha. The trial will not be discussed further.

In India,at New Delhi the local checks flowered after an average of 83 d, whereas the test cultivars flowered on average four weeks later. The test entries were all macrosperma and too late in flowering to be adapted to Indian conditions.

Table 5.2.1. Agronomic data for different locations for the LIYT-L during 1980-81.

Country	Location	Planting Date	Crop Duration (days)	Fertilizer (kg/ha) N	P_2O_5	K_2O	Crop Husbandry
CHILE	Chillan	25.5.81	198		90		
CHILE	Valdivia	27.10.80	99		150	50	Linuron
EGYPT	Al Nobaria	30.11.80	156	35	70		4 Irrig.
INDIA	New Delhi	17.11.80	151	40	40		1 Irrig.-Metasystox
JORDAN	Jubeiha	1.12.80	185	2	5		
LEBANON	AUB	18.11.80	193	30	100		
LEBANON	Kfardan	26.11.80	181				1 Irrig.
LEBANON	Terbol	1.21.80	181				
LIBYA	Al-Marj	13.1.81	93		100		
MOROCCO	Merchouch	25.11.80	192				
SYRIA	Tel Hadya	10.12.80	166		50		
TURKEY	Ankara	21.12.80	186	20	60		
TURKEY	Diyarbakir	15.11.80	207	40	60		

In the remaining trials the test entries had similar maturity characteristies to the local checks. In Libya the trial mean for flowering was 62 days; this was the lowest amongst the trials. In contrast the plants were latest flower at Diyarbakir in Turkey. Similar results were found for the time to maturity.

The first entry to mature was from Jordan, 78S 26002; whereas both the latest entries to mature were from Chile (ILL 468 and 75Kf 36423).

The plants grew tallest in Terbol, Lebanon where the rainfall was 745mm, and also in India where the late flowering of the entries allowed considerable vegetative growth. The location at which the lentils were shortest was A.U.B. farm, Lebanon. There were entries taller than locals in each location. The shortest entries were 74TA 138 and ILL 1042 from Morocco and Iran respectively. The late entries from Chile were among the tallest.

As has already been mentioned, the macrosperma test entries were completely unadapted to conditions in northern Indian because of they were too late to flower. The average yield of the Indian checks was 1160 kg/ha which contrasts with the 217 kg/ha realized by the exotics.

Yields were highest at Diyarbakir in Turkey (2.1 tons/ha), which is in a major lentil production area.

With the exeptions of India and two locations in Lebanon, there were entries yielding more than the best local at all locations. The highest average yield was given by 78S 26002 from Jordan with a mean of 1134 kg/ha. This entry showed wide adaptability which is illustrated by its ranking among the top six entries in India, all three sites in Lebanon, Libya, Morocco, Syria and both locations in Turkey (Table 5.2.6).

Correlation indices between the genotypic performance in each site were calculated (Table5.2.7). Performance in Chile was very different from that elsewhere. In Egypt under irrigation the genotypes ranked very differently from their values further west in Libya and Morocco under rainfed conditions.

Table 5.2.2.Time to flowering (days) for the entries in LIYT-L at the different locations during 1980-81

Selection	ILL	Origin	CHILE		EGYPT	INDIA	JORDAN	LEBANON			LIBYA	SYRIA	TURKEY		Mean
			Chillan	Valdi-via	Al-Nobaria	New Delhi	Jubeiha	AUB	Kfardan	Terbol	Al-Marj	Tel Hadya	Ankara	Diyar-bakir	
78S 26002	8	Jordan	136	54	112	93	131	154	133	133	53	120	131	155	117
74TA 9	15	Jordan	136	60	110	118	136	156	133	136	67	127	139	161	128
74TA 19	28	Syria	136	58	107	113	133	154	133	135	63	127	139	160	122
74TA 20	30	Syria	136	58	120	127	134	155	133	136	68	126	139	161	124
74TA 138	101	Morocco	139	60	109	111	143	156	137	142	67	134	143	164	125
74TA 260	253	Greece	136	50	111	111	133	155	133	135	67	123	138	159	121
74TA 276	262	Hungary	136	58	106	111	132	156	133	135	53	120	138	159	120
-	468	Chile	140	60	109	122	141	156	137	142	63	133	142	164	126
76TA 66182	915	Spain	138	58	109	110	142	155	137	144	53	132	141	163	124
75kf 35423	983	Chile	139	58	113	123	141	155	137	142	67	132	143	164	126
-	1042	Iran	136	54	100	97	132	156	133	135	60	121	131	156	118
Kurdi 1	2126	Syria	136	60	105	118	132	157	133	135	67	125	138	160	122
Kurdi 3	2128	Syria	136	58	106	119	135	154	133	135	53	126	139	160	121
Syr.L.L.	4400	Syria	136	58	107	118	134	155	133	135	67	123	139	160	122
Local check 1			139	54	110	80	132	156	137	142	-	133	138	163	
Local check 2			140	58	108	85	132	155	137	142	-	121	138	162	
Location mean			137	57	109	110	135	155	135	138	62	126	139	161	

Table 5.2.3.Time to maturity (days) for the entries in LIYT-L at the different location during 1980-81.

ENTRY Selection	ILL	CHILE		EGYPT	INDIA	JORDAN	LEBANON			LIBYA	SYRIA	TURKEY		MEAN
		Chillan	Valdivia	Al-Nobaria	New Delhi	Jubieha	AUB	Kfardan	Terbol	Al Marj	Tel Hadya	Ankara	Diyarbakir	
78S 26002	8	189	99	160	136	177	193	177	178	83	160	186	204	162
74TA 9	15	198	99	157	151	198	192	183	180	97	168	186	208	168
74TA 19	28	200	99	156	155	182	193	183	183	100	167	186	206	168
74TA 20	30	201	99	164	158	182	193	183	182	101	164	186	207	168
74TA 138	101	198	99	157	149	177	191	179	182	97	166	186	207	166
74TA 260	253	198	99	158	147	-	193	179	178	93	165	186	207	164
74TA 276	262	195	99	155	152	-	195	183	177	81	162	186	206	163
-	468	201	99	158	159	198	194	179	183	98	168	186	209	169
76TA 66182	915	198	99	157	150	182	192	179	183	89	168	186	208	166
75kf 36423	983	198	99	160	163	198	193	183	184	103	169	186	209	170
-	1042	189	99	147	152	177	192	183	179	90	161	186	208	164
Kurdi 1	2126	200	99	152	160	-	193	183	182	97	167	186	208	166
Kurdi 3	2128	198	99	155	161	182	190	183	182	81	168	186	206	166
Syr.L.L.	4400	195	99	155	163	-	191	179	182	97	168	186	207	166
Local check 1		203	99	158	128	179	192	179	183	-	170	186	207	
Local check 2		200	99	153	126	-	194	179	184	-	159	186	209	
Location mean		198	99	156	151	185	193	181	181	93	166	186	207	

Table 5.2.4.Plant height (cm) of entries in the LIYT-L at different locations during 1980-81.

ENTRY Selection	ILL	CHILE Chillan	EGYPT Al-Nobaria	INDIA New Delhi	JORDAN Jubeiha	LEBANON AUB	LEBANON Kfardan	LEBANON Terbol	SYRIA Tel Hadya	TURKEY Ankara	TURKEY Diyarbakir	MEAN
78S 26002	8	38	30	36	31	22	32	42	33	29	27	32
74TA 9	15	39	33	40	33	21	36	41	32	31	32	34
74TA 19	28	36	34	37	30	22	34	39	30	30	30	32
74TA 20	30	38	33	44	35	21	38	43	30	30	30	34
74TA 138	101	30	34	39	31	21	31	40	27	29	30	31
74TA 260	253	36	38	41	36	22	35	43	36	30	35	35
74TA 276	262	35	31	44	30	22	31	39	30	27	27	32
-	468	32	34	49	33	24	37	44	33	29	42	36
76TA 66182	915	30	34	37	32	22	32	40	30	28	35	32
75kf 36423	983	30	40	37	32	20	33	42	32	29	35	33
-	1042	37	29	39	27	19	31	39	33	28	28	31
Kurdi 1	2126	40	38	38	32	27	35	41	32	30	35	35
Kurdi 3	2128	38	38	43	32	23	35	45	33	30	33	35
Syr.L.L.	4400	40	36	42	32	23	35	48	31	29	33	35
Local check 1		37	29	42	29	26	36	42	38	30	30	
Local check 2		38	30	42	31	23	36	45	28	29	32	
Location mean		36	34	41	32	22	34	42	32	29	32	

Table 5.2.5.Seed yield (Y = kg/ha) and rank (R) of the entries in the LIYT-L at different locations during 1980-81.

ENTRY			CHILE				EGYPT		INDIA		JORDAN		LEBANON						LIBYA		MOROCCO		SYRIA		TURKEY				MEAN	
Selection		ILL	Chillan		Valdivia		Al-Nobaria		New Delhi		Jubeiha		AUB		Kfardan		Terbol		Al Marj		Merchuch		Tel Hadya		Ankara		Diyar-bakir			
			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
78S 26002		8	1089	15	82	12	252	15	721	3	1731	3	459	3	883	4	1580	6	1684	1	1178	5	2051	1	535	6	2503	3	1134	1
74TA	9	15	2433	1	93	10	809	7	104	13	1663	6	306	9	824	7	1956	1	1408	6	911	11	1291	13	477	10	2187	10	1112	2
74TA	19	28	2178	2	131	11	576	11	167	10	1563	9	315	8	794	10	1750	4	1097	12	1351	2	1296	12	608	4	2553	2	1106	4
74TA	20	30	1989	4	82	12	486	13	63	14	1813	1	289	11	803	9	1167	15	1316	8	1351	2	1592	3	637	1	2357	6	1073	6
74TA	138	101	1989	4	140	8	899	5	254	8	1350	14	319	7	900	3	1372	11	1168	11	778	13	1248	14	196	16	1750	13	951	14
74TA	260	253	1733	12	56	15	809	7	192	9	1319	15	239	14	809	8	1511	7	1261	9	1122	7	1551	5	545	5	2253	9	1031	10
74TA	276	262	1600	14	140	8	1097	3	279	6	1704	4	323	6	778	11	1461	8	1414	5	922	10	1592	3	483	9	1870	11	1051	7
-		468	1889	9	213	5	853	6	108	12	1380	13	401	4	830	6	1711	5	1046	13	1336	4	1359	9	618	3	2303	7	1081	5
76TA	66182	915	1767	11	147	6	1241	1	333	5	1507	10	292	10	550	16	1352	12	1224	10	616	15	1452	7	502	8	1757	12	981	12
75kf	36423	983	2100	3	260	1	1241	1	113	11	1270	16	108	16	758	12	1889	2	672	14	989	8	1354	10	438	13	2420	4	1047	8
-		1042	1011	16	40	16	54	16	258	7	1696	5	221	15	856	5	1350	13	1587	2	-		1778	2	419	14	1617	15	998	13
Kurdi	1	2126	1856	10	64	14	719	9	52	16	1407	11	490	2	589	15	1400	10	1545	3	1411	1	1337	11	409	15	2280	8	1043	9
Kurdi	3	2128	1978	6	147	6	964	4	57	15	1635	7	358	5	644	14	1856	3	1350	7	749	14	1432	8	506	7	2763	1	1111	3
Syr.L.L.		4400	1922	8	240	3	324	14	338	4	1406	12	268	12	694	13	1447	9	1519	4	1144	6	1247	15	459	12	2370	5	1029	11
Local check	1		1644	13	247	2	576	11	1038	2	1622	8	768	1	933	1	1128	16	-		809	12	893	16	464	11	1653	14		
Local check	2		1956	7	227	4	619	10	1282	1	1746	2	259	13	911	2	1274	14	-		944	9	1516	6	630	2	1590	16		
Location mean			1821		144		720		335		1551		338		785		1513		1306		1041		1437		495		2139			
C.V.%			19.9		48.7		-		55.7		22.7		-		31.7		40.7		15.9		20.5		17.4		13.4		14.4			
L.S.D. 5%			603.3		117.1		-		310.8		589.4		-		414.8		1025.6		347.7		356.7		416.9		110.4		512.6			
No.of entries significantly exceeding local check				0		0	-			0		0	-			0		0	-			4		1		0		10		

Table 5.2.6.The five heaviest seed yielding entries at the individual locations in the LIYT-L during 1980-81.

Rank	CHILE				EGYPT		INDIA		JORDAN		LEBANON	
	Chillan		Valdivia		Al-Nobaria		New Delhi		Jubeiha		AUB	
	Selection	ILL	Selection	ILL	Selection	ILL	Selection	ILL	Selection	ILL	Selection	ILL
1	74TA 9	15	75kf 36423	983	76TA 66182	915	Loc.check 2	-	74TA 20	30	Loc. check 1	-
2	74TA 19	28	Loc.check 1	-	75kf 36423	983	Loc.check 1	-	Loc.check 2	-	Kurdi 1	2126
3	75kf 36423	983	Syr.L.L.	4400	-74TA 276	262	78S 26002	8	78S 26002	8	78S 26002	8
4	74TA 20	30(1)	Loc.check 2	-	Kurdi 3	2128	Syr.L.L.	4400	74TA 276	262	-	468
5	74TA 138	101	-	468	74TA 138	101	76TA 66182	915	-	1042	Kurdi 3	2128

Count'd.... Table 5.2.6.The five heaviest seed yielding entries at the individual locations in the LIYT-L during 1980-81.

Rank	LEBANON				LIBYA		MOROCCO		SYRIA		TURKEY			
	Kfardan		Terbol		Al-Marj		Merchuch		Tel Hadya		Ankara		Diyarbakir	
	Selection	ILL	Selection	ILL	Selection	ILL	Selection	ILL	Selection	ILL	Selection	ILL	Selection	ILL
1	Loc.check 1	-	74TA 9	15	78S 26002	8	Kurdi 1	2126	78S 26002	8	74TA 20	30	Kurdi 3	2128
2	Loc.check 2	-	75kf 36423	983	-	1042	74TA 19	28	-	1042	Loc.check 2	-	74TA 19	28
3	74TA 138	101	Kurdi 3	2128	Kurdi 1	2126	74TA 20	30	74TA 20	30	-	468	78S 26002	8
4	78S 26002	8	74TA 19	28	Syr.L.L.	4400	-	468	74TA 276	262	74TA 19	28	75kf 36423	983
5	-	1042	-	468	74TA 276	262	78S 26002	8	74TA 260	253	74TA 260	253	Syr.L.L.	4400

(1) Genotypes in parenthesis had the same yield.

Table 5.2.7. Correlations [1] (df = 11) between the seed yield of entries in the LIYT-L at different locations during 1980-81.

		CHILE	EGYPT	INDIA	JORDAN	LEBANON			LIBYA	MOROCCO	SYRIA	TURKEY	
		Valdivia	Al-Nobaria	New Delhi	Jubeiha	AUB	Kfardan	Terbol	Al-Marj	Merchouch	Tel Hadya	Ankara	Diyarbakir
CHILE	Chillan	0.23	0.26	-0.78**	-0.19	-0.42	-0.07	0.39	-0.47	-0.06	-0.84**	-0.09	0.06
CHILE	Valdivia		0.28	-0.06	-0.44	-0.48	-0.01	0.31	-0.56*	-0.18	-0.42	-0.11	0.06
EGYPT	Al-Nobaria			-0.39	-0.33	-0.41	-0.32	0.22	-0.60*	-0.63*	-0.32	-0.27	-0.45
INDIA	New Delhi				0.20	0.23	0.25	-0.20	0.45	-0.13	0.67*	-0.07	-0.14
JORDAN	Jubeiha					0.33	0.11	-0.11	0.53	0.02	0.54	0.43	0.16
LEBANON	AUB						-0.06	-0.18	0.68**	0.32	0.31	0.05	0.09
LEBANON	Kfardan							0.13	-0.10	0.21	0.25	-0.02	-0.01
LEBANON	Terbol								-0.34	-0.13	-0.20	0.10	0.48
LIBYA	Al-Marj									0.11	0.44	0.01	0.03
MOROCCO	Merchouch										0.10	0.48	0.46
SYRIA	Tel Hadya											0.35	0.15
TURKEY	Ankara												0.50

(1) * $P \leq 0.05$
** $P \leq 0.01$

5.3. LENTIL INTERNATIONAL SMALL SEEDED YIELD TRIAL (LIYT-S-81)

The lentil international small seeded yield trial comprised 23 elite selections from germplasm from a total of 11 countries. The seed size of the entries was less than 4.5g/100 seeds, and they were chosen on the basis of their performance in the Lentil International Screening Nursery.

Materials and Methods

The experimental design utilized was randomized complete blocks with four replications with provision for two local checks. The recommended planting arrangement was for plots of 4 rows, 4m-long with 200 seeds/m^2. But cooperators were urged to follow the local recommendations for crop husbandry. The experimental details are given in Table 5.3.1.Thirty-one requests for the nursery were received . A total of 25 sets of the trial were distributed to 20 countries, and data received from only 10 of these locations. These were Mallawi and Shandoweel in Egypt; Debre Zeit, Ethiopia ; New Delhi, India; Hisban and Marrow in Jordan ; A.U.B., Lebanon; Douyet and Merchuch in Morocco; and Faisalabad in Pakistan.

Results (Table 5.3.2 to 5.3.5).

Results for time to flowering and to maturity, and plant height were received from only Egypt, India, Jordan, Lebanon and Syria. In Egypt and India the local entries were generally earlier than the test entries. In Egypt irrigation was provided and the late entries could reproduce satis factorily. By contrast in India under rainfed conditions the late entries produced only 289 kg/ha on average,whereas the early local checks gave 1445 kg/ha. These results emphasize the need for early maturiting material for rainfed conditions in southern latitudes.

Table 5.3.1.Agronomic data for different locations for the LIYT-S during 1980-81.

Country Location	Planting Date	Crop Duration (days)	Fertilizer (kg/ha) N	P_2O_5	Crop Husbandry
EGYPT - Mallawi	24.11.80	142	100	200	3 Irrig.
EGYPT - Shandweel	15.12.80	147	35	70	2 Irrig.
ETHIOPIA - Debre Zeit					
INDIA - New Delhi	15.11.80	148	40	40	1 Irrig.-Metasystox
JORDAN - Hisban	1.12.80	181	2	5	
JORDAN - Marrow	17.11.80	200	2	5	
LEBANON - AUB	18.11.80	195	30	100	
LEBANON - Kfardan	1.12.80	179			
LEBANON - Terbol	26.11.80	180			1 Irrig.
MOROCCO - Douyet		28.5.81			
MOROCCO - Merchouch	25.11.80	193			
PAKISTAN - Faisalabad	25.11.80	170			3 Irrig.
SYRIA - Tel Hadya	10.12.80	164		50	

The earliest entries to flower were Giza 9 (Egypt), ILL 1744 (Ethiopia), and 76TA 66005 (Jordan). The latest entry was 74TA 309 from Greece. The location where flowering was earliest was Mallawi in Egypt, whereas plants were slowest to flower at A.U.B. farm in Lebanon.

The plants grew tallest at Terbol in Lebanon (41cm) under rainfed conditions, even taller than in Egypt under irrigation. The rainfall at Terbol was 745mm in the season. Growth was least at AUB farm, Lebanon where the average plant height was only 21cm. The range in plant height amongst the entries was from 26 - 34cm. The shortest entry was among the first to flower, and the tallest selection was also the latest. This illustrates the correlation between plant height and time to flower. However Giza 9 is the exception, breaking the correlation, as it is both tall (32cm) and early.

The seed yields were low in Shandoweel, Egypt because of an Orobanche infestation. Yields were also low in India and Pakistan because of the late maturity of the entries. The error coefficients of variation in these locations were 64 and 69% respectively. Let us consider now the remaining locations, which are Mallawi in Egypt; Hisban and Marrow in Jordan; AUB farm, Kfardan and Terbol in Lebanon; Douyet and Merchuch in Morocco; and Tel Hadya, Syria. There were entries that yielded more than the best local check at each location; and the yield advance over this check ranged from 16% at AUB farm, Lebanon to 97% at Mallawi Egypt. These advances in yield were significant, at the 5% level at Mallawi, Marrow, Terbol and Tel Hadya. In these nine Mediterranean locations some entries were exceptional, for example, the three highest yielding entries 76TA 66005, 78S 26013 and 76TA 66088. The first two selections were from Jordanian germplasm, whereas the last mentioned selection is from Iran. These three entries were higher yielding than the best local check in 6,7 and 5 locations respectively out of a total of nine Mediterranean trials, (Table 5.3.6). This emphasizes their wide adaptability and high yields.

The correlation indices between the mean seed yields at different locations indicate the similarity of performance in these locations (Table 5.3.7). The yield in Tel Hadya was correlated to yield in Lebanon and in Morocco. The performance in Lebanon was closely related to the performance in Jordan. The yields at the two sites in the Indo-Pakistan sub-continent were also correlated.

Table 5.3.2.Time to flowering (days) for entries in the LIYT-S at the different locations during 1980/81.

ENTRY Selection	ILL	Country of origin	EGYPT Mallawi	EGYPT Shandweel	INDIA New Delhi	JORDAN Hisban	JORDAN Marrow	LEBANON AUB	LEBANON Kfardan	LEBANON Terbol	SYRIA Tel Hadya	Mean
76TA 66005	1	Jordan	84	91	93	131	138	153	133	131	111	118
78S 26013	16	Jordan	94	111	118	132	149	155	133	135	126	128
76TA 66026	29	Syria	93	98	105	131	144	154	133	132	119	123
76TA 66054	99	Morocco	95	94	94	133	140	155	133	135	118	122
76TA 66088	223	Iran	91	107	117	131	140	154	133	135	118	125
76TA 66116	264	Hungary	90	106	104	133	148	156	133	135	124	125
74TA 305	287	Greece	91	107	103	142	157	156	137	142	134	130
74TA 309	289	Greece	94	112	121	142	154	159	143	151	138	135
75kf 36213	351	Morocco	91	109	87	135	152	156	135	140	130	126
74TA 441	353	Mexico	91	99	101	135	152	157	133	133	126	125
74TA 548	470	Syria	91	107	115	136	149	155	134	133	121	127
74TA 549	470	Syria	89	108	119	134	153	155	133	135	121	127
74TA 572	498	Mexico	91	97	102	137	151	156	135	140	128	126
74TA 580	500	Mexico	90	99	101	135	148	154	133	137	122	124
75kf 37356	752	Lebanon	90	95	97	136	146	155	137	140	125	125
Giza 9	784	Egypt	75	80	79	135	144	154	133	138	114	117
74TA 877	901	Iran	102	112	117	147	144	158	143	144	134	133
-	1744	Ethiopia	101	86	80	129	138	153	133	130	110	118
Wint. 51	1880	Turkey	98	107	121	137	156	156	137	142	130	132
Hamawe white	2129	Syria	89	109	107	135	153	157	135	138	130	128
Hurani 1	2130	Syria	89	99	111	134	148	155	135	138	122	126
Jord. Local	4354	Sudan	90	97	96	131	145	153	133	133	117	122
Syr.Loc.S.	4401	Syria	95	99	108	132	149	155	134	135	121	125
Local check 1			73	71	83	132	140	156	137	142	123	
Local check 2			75	70	81	133	140	156	137	142	135	
Location mean			90	99	102	135	147	155	135	137	124	

Table 5.3.3. Time to maturity (days) for entries in the LIYT-S at the different locations during 1980/81.

Entry Selection	ILL	EGYPT Mallawi	EGYPT Shandweel	INDIA New Delhi	JORDAN Hisban	JORDAN Marrow	L E B A N O N AUB	L E B A N O N Kfardan	L E B A N O N Terbol	SYRIA Tel Hadya	Mean
76TA 66005	1	140	147	147	180	195	194	179	178	162	169
78S 26013	16	140	146	158	177	195	193	177	177	159	169
76TA 66026	29	141	147	146	180	195	196	179	178	159	169
76TA 66054	99	139	147	146	177	195	194	177	177	161	168
76TA 66088	223	144	147	154	177	195	192	181	177	159	170
76TA 66116	264	141	147	148	182	195	193	180	177	163	170
74TA 305	287	142	146	149	191	207	197	181	183	170	174
74TA 309	289	145	147	151	198	206	200	183	187	173	177
75kf 36213	351	140	145	147	186	203	198	183	184	169	173
74TA 441	353	142	148	148	180	195	194	179	177	162	169
74TA 548	470	139	148	153	178	195	193	179	176	160	169
74TA 549	470	140	148	154	178	196	191	179	176	161	169
74TA 572	498	140	147	148	180	203	198	179	181	165	171
74TA 580	500	141	147	147	180	195	198	179	176	163	170
75kf 37356	752	141	149	146	180	203	195	181	183	163	171
Giza 9	784	142	145	139	180	-	195	179	180	166	147
74TA 877	901	148	148	155	182	209	195	179	184	170	174
-	1744	142	146	133	180	203	194	179	174	155	167
Wint. 51	1880	143	145	156	180	203	194	181	178	164	172
Hamawe white	2129	143	147	154	189	203	193	177	182	167	173
Hurani 1	2130	149	146	156	179	203	194	181	183	161	172
Jord.Local	4354	147	146	147	181	203	194	174	182	162	171
Syr.Loc.S.	4401	141	145	150	180	203	191	172	179	160	169
Local check 1		141	145	131	180	203	194	179	184	166	
Local check 2		140	145	133	180	203	195	179	184	173	
Location mean		142	147	148	181	200	195	179	180	164	

Table 5.3.4.Plant height (cm) of entries in the LIYT-S at different locations during 1980/81.

Entry Selection	ILL	EGYPT Mallawi	EGYPT Shandweel	INDIA New Delhi	JORDAN Hisban	JORDAN Marrow	LEBANON AUB	LEBANON Kfardan	LEBANON Terbol	SYRIA Tel Hadya	Mean
76TA 66005	1	30	38	34	27	29	22	34	41	33	32
78S 26013	16	31	36	36	28	26	21	34	39	31	31
76TA 66026	29	33	35	35	27	25	21	33	39	28	31
76TA 66054	99	32	44	37	26	27	21	31	43	29	32
76TA 66088	223	34	36	36	29	28	24	34	42	31	33
76TA 66116	264	32	41	35	24	23	20	31	36	26	30
74TA 305	287	33	41	40	26	25	21	35	43	27	32
74TA 309	289	37	35	43	27	28	22	40	45	31	34
75kf 36213	351	37	36	41	26	29	19	36	48	29	33
74TA 441	353	33	36	39	22	23	19	30	37	25	29
74TA 548	470	27	33	30	25	24	22	32	40	31	29
74TA 549	470	27	37	25	27	21	19	31	35	26	28
74TA 572	498	32	40	43	24	28	18	33	39	30	32
74TA 580	500	30	43	41	26	25	22	33	36	28	32
75kf 37356	752	31	35	41	28	27	22	37	41	29	32
Giza 9	784	32	44	35	25	25	22	35	38	29	32
74TA 877	901	26	42	32	27	20	20	33	41	30	30
-	1744	22	32	28	23	25	17	30	32	24	26
Wint. 51	1880	21	22	31	28	27	21	34	38	30	28
Hamawe white	2129	25	35	32	27	23	19	32	39	27	29
Hurani 1	2130	27	37	36	27	23	21	33	44	29	31
Jord.Local	4354	31	36	35	28	26	23	34	42	30	32
Syr.Loc.S.	4401	25	38	33	27	25	21	33	41	30	30
Local check 1		31	49	35	26	25	27	36	49	32	-
Local check 2		30	46	40	28	26	26	36	45	32	-
Location mean		30	38	36	26	25	21	34	41	29	

Table 5.3.5. Seed yield (Y= kg/ha) and rank (R) of entries in the LIYT-S at different locations during 1980/81.

Selection	ENTRY ILL	EGYPT Mallawi Y	R	EGYPT Shandweel Y	R	ETHIOPIA Debre Zeit Y	R	INDIA New Delhi Y	R	JORDAN Hisban Y	R	JORDAN Marrow Y	R	LEBANON A.U.B. Y	R	LEBANON Kfardan Y	R	LEBANON Terbol Y	R	MOROCCO Douyet Y	R	MOROCCO Merchuch Y	R	PAKISTAN Faisalabad Y	R	SYRIA Tel Hadya Y	R	MEAN Y	R
76TA 66005	1	2958	1	246	7	46	13	406	9	1083	12	1137	6	1335	8	967	15	1471	8	1016	15	1377	9	144	4	2089	2	1098	2
78S 26013	16	1750	9	131	16	-		291	14	918	19	828	17	1844	1	992	12	1463	9	1153	8	1625	3	83	18	2178	1	1105	1
76TA 66026	29	1549	13	131	16	130	11	209	17	1314	4	1367	2	891	14	1248	1	1704	5	769	22	1217	14	74	21	1573	13	937	14
76TA 66054	99	1778	7	256	5	-		434	7	826	22	1046	9	1006	11	1000	11	1100	18	1072	13	1027	21	119	11	1673	10	945	11
76TA 66088	223	2396	3	256	5	-		74	24	1515	1	1085	8	1412	6	983	13	1071	20	1378	1	1123	16	54	25	1803	7	1096	3
76TA 66116	264	1139	16	334	3	926	2	441	6	1101	10	843	16	605	19	778	22	1333	11	1097	11	1485	6	119	11	1528	14	902	16
74TA 305	287	1799	6	201	9	185	8	372	10	843	21	828	17	885	15	1061	4	1021	22	1088	12	1847	1	155	2	1461	17	904	15
74TA 309	289	944	21	57	25	1011	1	172	19	633	25	783	22	209	25	758	23	1020	23	1175	7	1638	2	83	18	1021	24	731	21
75kf 36213	351	1944	4	90	24	196	7	372	10	1133	9	822	20	421	22	917	17	2025	2	844	21	1362	10	141	6	1222	22	884	17
74TA 441	353	2597	2	126	19	898	3	284	15	1165	8	1011	11	592	20	1008	9	1500	7	1213	5	1567	5	121	10	1420	19	1039	4
74TA 548	470	806	23	115	20	-		75	23	893	20	1456	1	1444	4	1003	10	1813	3	1234	4	960	23	85	17	2076	3	997	8
74TA 549	470	1076	18	130	18	-		159	22	1010	15	793	21	733	17	1011	8	1292	13	953	16	1297	13	67	22	1845	5	864	18
74TA 572	498	1688	11	94	23	-		458	5	1346	3	1154	5	505	21	1179	2	1171	15	1363	2	1093	19	88	16	1469	16	967	10
74TA 580	500	1764	8	194	10	-		216	16	1278	6	885	14	694	18	1052	5	1733	4	1100	10	1448	8	139	7	1607	12	1009	6
75kf 37356	752	1410	15	138	15	-		563	3	1085	11	1187	4	811	16	1167	3	1600	6	1119	9	978	22	108	14	1458	18	969	9
Giza 9	784	1000	19	140	14	-		353	12	1029	14	1194	3	373	23	921	16	905	24	875	19	1120	17	83	18	1293	21	774	19
74TA 877	901	667	25	367	2	-		49	25	722	24	643	24	995	13	642	25	1038	21	769	22	1052	20	67	22	1494	15	709	22
-	1744	1139	16	143	13	144	10	431	8	726	23	889	13	274	24	850	20	804	25	769	22	563	25	123	9	786	25	588	23
Wint. 51	1880	861	22	100	22	-		313	13	1410	2	826	19	1005	12	1040	6	2192	1	1328	3	1107	18	56	24	1971	4	1017	5
Hamawe white	2129	1847	5	108	21	183	9	197	18	1007	16	850	15	1394	7	908	18	1317	12	1203	6	1353	11	117	13	1730	8	940	12
Hurani 1	2130	1618	12	193	11	-		163	21	1300	5	730	23	1430	5	1021	7	1092	19	1050	14	837	24	144	4	1682	9	938	13
Jord.Loc.	4354	1729	10	189	12	238	5	463	4	1068	13	1089	7	1568	3	983	13	1371	10	900	17	1585	4	182	1	1672	11	1002	7
Syr.Loc.S.	4401	806	23	217	8	117	12	166	20	921	18	494	25	1327	9	806	21	1113	16	556	25	1183	15	135	8	1342	20	736	20
Local check 1		972	20	447	1	230	6	1535	1	1274	7	1017	10	1320	10	896	19	1108	17	878	18	1485	6	153	3	1837	6		
Local check 2		1500	14	269	4	504	4	1356	2	983	17	1009	12	1586	2	654	24	1242	14	869	20	1303	12	90	15	1146	23		
Location mean		1509		187		370		382		1063		959		986		954		1340		1031		1265		109		1575			
C.V. %		26.3		64.3		45.7		69.0		30.9		25.2		59.6		33.6		43.6		36.7		22.9		63.9		14.8			
L.S.D. 5%		560.9		163.2		242.3		372.9		465.4		398.5		831.0		453.0		825.4		534.2		409.2		98.4		330.3			
No.of entries significantly exceeding best local check.		3		0		3		0		0		1		0		0		1		0		0		0		1			

Table 5.3.6. The five heaviest seed yielding entries at the infividual locations in the LIYT-S during 1980/81.

Rank	EGYPT Mallawi		EGYPT Shandweel		ETHIOPIA Debre Zeit		INDIA New-Delhi		JORDAN Hisban		JORDAN Marrow		LEBANON AUB	
	Selection	ILL	Selection	ILL	Selection	ILL	Selection	ILL	Selection	ILL	Selection	ILL	Selection	ILL
1	76TA 66005	1	Loc.check 1	-	74TA 309	289	Loc.check 1	-	76TA 66088	223	74TA 548	470	78S 26013	16
2	74TA 441	353	74TA 877	901	76TA 66116	264	Loc.check 2	-	Wint.red 51	1880	76TA 66026	29	Loc.check 2	-
3	76TA 66088	223	76TA 66116	264	74TA 441	353	75kf 37356	752	74TA 572	498	Giza 9	784	Jord.Local	4354
4	75kf 36213	351	Loc.check 2	-	Loc.check 2	-	Jord.Local	4354	76TA 66026	29	75kf 37356	752	74TA 548	470
5	Hamawi white	2129	76TA 66054	99 *	Jord.Local	4354	74TA 572	498	Hurani 1	2130	74TA 572	498	Hurani 1	2130
			76TA 66088	223 *										

Rank	LEBANON Kfardan		LEBANON Terbol		MOROCCO Douyet		MOROCCO Merchuch		PAKISTAN Faisalabad			SYRIA Tel Hadya	
	Selection	ILL	Selection	ILL	Selection	ILL	Selection	ILL	Selection	ILL		Selection	ILL
1	76TA 66026	29	Wint.red 51	1880	76TA 66088	223	74TA 305	287	Jord.Local	4354		78S 26013	16
2	74TA 572	498	75kf 36213	351	74TA 572	498	74TA 309	289	74TA 305	287		76TA 66005	1
3	75kf 37356	752	74TA 548	470	Wint.red 51	1880	78S 26013	16	Loc.check 1	-		74TA 548	470
4	74TA 305	287	74TA 580	500	74TA 548	470	Jord.Local	4354	76TA 66005	1	(1)	Wint.red 51	1880
5	74TA 580	500	76TA 66026	29	74TA 441	353	74TA 441	353	Hurani 1	2130		74TA 549	470

* Brackets indicate similar yields.

(1) The brackets indicate entries having the same rank.

Table 5.3.7. Correlations (1) (df = 21) between the seed yield of entries in the LIYT-S at different locations during 1980-81.

		EGYPT	INDIA	JORDAN		LEBANON			MOROCCO		PAKISTAN	SYRIA
		Shandweel	New Delhi	Hisban	Marrow	AUB	Kfardan	Terbol	Douyet	Mercho-uch	Faisal-abad	Tel Hadya
EGYPT	Mallawi	0.04	0.24	0.40	0.25	0.21	0.36	0.10	0.31	0.33	0.37	0.25
EGYPT	Shandweel		-0.08	-0.08	-0.24	0.24	-0.42*	-0.33	-0.24	-0.05	0.14	0.13
INDIA	New Delhi			0.01	0.23	-0.28	0.29	0.04	0.02	0.05	0.44*	-0.22
JORDAN	Hisban				0.27	0.15	0.59**	0.44*	0.39	-0.07	-0.13	0.35
JORDAN	Marrow					0.02	0.60**	0.24	0.30	-0.17	-0.15	0.24
LEBANON	AUB						0.11	0.13	0.10	0.06	0.10	0.77**
LEBANON	Kfardan							0.39	0.34	-0.03	-0.01	0.32
LEBANON	Terbol								0.22	0.14	-0.06	0.43*
MOROCCO	Douyet									0.16	-0.30	0.42*
MOROCCO	Merchouch										0.27	0.15
PAKISTAN	Faisalabad											-0.19

(1) * $P \leq 0.05$
** $P \leq 0.01$

5.4. LENTIL INTERNATIONAL LARGE SEEDED SCREENING NURSERY (LISN-L-81)

The lentil international large seeded screening nursery (LISN-L) comprised 44 test entries which had performed well in trials in both Syria and Lebanon. The seed size of each entry was greater than 4.5 g/100 seeds. Thirty -nine of the entries were selections from germplasm, and they originated from a total of thirteen different countries (Table 5.4.1). The remaining five entries were selections from single'crosses made in Lebanon in 1975. The test entries had performed well in yield trials in both Lebanon and Syria. There was provision for a repeated local check within each location.

Materials and Methods

The test entries were grown in unreplicated single rows which were in an augmented complete blocks design. There were two supplied and repeated checks (ILL 915 ex-Spain; and ILL 4400 ex-Syria) in addition to the local check. The recommended planting arrangement was 200 plants per 4m-long row. But cooperators were urged to follow the local recommendations for crop management. A total of 40 requests were made for LISN-L, 28 set were despatched, and results received from 10 locations. Results were received from Chillan in Chile, New Delhi in India; Arbil in Iraq; Ramtha in Jordan; AUB farm in Lebanon, Kathmandu in Nepal, Faisalabad and Islamabad in Pakistan, and both Ankara and Diyarbakir in Turkey.

Results (Table 5.4.1. to 5.4.3)

The range in mean time to flower across locations varied from 129 days with Precoz (ILL 4605) to 145 days with two entries from Chile, ILL 465 and 75 Kf 36442 (Table 5.4.1). Within this range of 16 days, Precoz was the earliest entry to flower by 7 days, on average. In Chile, Iraq, Jordan, Lebanon Syria and Turkey the local check flowered at the same time as many of the test entries. At these sites the selections were phenologically adapted to the

Table 5.4.1. Values for three agronomic characters for entries in the LISN-L during 1980-81.

Selection	ILL	Country of origin	Time to flowering (days)	Time to maturity (days)	Plant height (cm)
76TA 66012	6	Jordan	138	188	32
-	7	"	138	186	31
78S 26002	8	"	138	185	30
78S 26011	15	"	138	185	31
-	23	"	138	185	31
78S 26032	26	Syria	142	188	33
78S 26033	26	"	140	188	35
75Kf 36009	33	"	143	188	32
74TA 42	46	"	144	191	35
76TA 66043	59	Iraq	142	186	31
78S 26049	100	Morocco	143	189	36
78S 26066	193	Syria	140	186	35
76TA 66098	232	Iran	143	188	35
74TA 265	254	Greece	140	187	33
-	273	"	140	187	35
76TA 66136	323	Yugoslavia	143	188	34
76TA 66137	323	"	142	190	35
-	379	Chile	143	187	32
-	385	"	144	190	32
-	386	"	142	189	32
-	419	"	140	187	33
-	465	"	145	188	33
78S 26131	643	Turkey	144	189	35
-	707	Hungary	140	187	30
78S 26181	841	Lebanon	140	188	33
-	846	"	136	186	33
-	847	"	137	187	32
-	947	Iran	143	189	33
78S 26199	972	Chile	143	190	32
-	975	"	137	185	34

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Cont'd Table 5.4.1. Values for three agronomic characters for entries in the LISN-L during 1980-81.

Selection	ILL/Cross	Country of origin	Time to flowering (days)	Time to maturity (days)	Plant height (cm)
75Kf 36421	983	Chile	142	189	33
75Kf 36442	998	"	145	188	33
-	1042	Iran	137	186	30
-	1241	"	143	188	35
75Kf 36822	1397	"	141	187	37
75Kf 36931	1522	"	143	188	25
-	1574	"	142	187	33
Cyprus Local	4368	Cyprus	139	186	32
Precoz	4605	Argentina	129	181	31
79Sh 4806	X75TA 49		138	189	36
79Sh 4809	X75TA 49		141	189	36
79Sh 4867	X75TA 30		142	189	35
79Sh 4890	X75TA 49		143	189	35
79Sh 4908	X75TA 82		142	191	34
Check 1	4400	Syria	140	188	34
Check 2	915	Spain	143	189	32

growth conditions. However in India, Nepal and Pakistan the situation was radically different, Precoz was the only entry to flower within two weeks of the local check. Thus, in New Delhi Precoz flowered after 60 days, the local check after 85 days and the next entry not until 97 days. Again, in Nepal the local check and Precoz both flowered after 99 days, whereas the next entry flowered two weeks later after 112 days. The significance of these results lie in the fact that the local check was always microsperma or small seeded in these south Asian locations in contrast to the macrosperma Precoz. Precoz is the first macrosperma genotype to be phenologically adapted to south Asia, where bold seeds are wanted in many breeding programs. Precoz was the highest yielding entry in both New Delhi and Islamabad; (Table 5.4.2) will be useful to national programs in south Asia either as a direct introduction or as a parent in hybridization.

In the Mediterranean area the highest yielding entry was 78S 26066, a single plant selection from a Syrian germplasm accession. It performed better than the local check in five out of the seven locations in West Asia. In addition it flowered after a mean of 140 days and was 35cm tall an average.

Correlation indices (Table 5.4.3) showed that time to flowering and time to maturity were strongly correlated indicating the lack of genetic variation for the time for pod ripening. The time to maturity was positively correlated to plant height, although 75Kf 36822 from Iran was both the tallest entry and amongst the earliest to mature.

Table 5.4.2.Adjusted seed yield (Y = kg/ha) and rank (R) of entries in the LISN-L at different locations during 1980/81.

ENTRY		CHILE		INDIA		IRAQ		JORDAN		LEBANON				NEPAL		PAKISTAN				SYRIA		TURKEY				Mean	
Selection	ILL	Chillan		New Delhi		Arbil		Ramtha		AUB		Terbol		Kathmandu		Faisalabad		Islamabad		Tel Hadya		Ankara		Diyarbakir			
		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 66012	6	9	47	849	3	1797	19	608	16	244	25	983	7	311	36	18	35	975	3	429	15	1205	33	1673	34	758	23
-	7	209	46	549	7	1091	33	708	7	255	23	397	38	631	24	90	26	309	32	386	18	2165	7	1984	19	731	30
78S 26002	8	342	41	149	19	757	41	853	3	241	27	781	14	231	41	197	6	500	21	579	4	1437	26	1873	24	662	39
78S 26011	15	1009	19	149	19	1851	15	697	8	176	42	650	21	831	17	0	39	309	32	433	14	725	43	1207	44	670	35
-	23	276	45	149	19	651	45	-		176	41	630	22	721	20	18	35	392	26	623	1	1223	32	984	46	531	46
78S 26032	26	542	38	149	19	957	38	1064	1	275	20	1973	1	831	17	18	35	267	37	579	4	2041	13	1651	35	862	10
78S 26033	26	342	41	99	28	1824	17	686	9	166	43	428	32	91	45	0	39	284	35	609	2	3303	1	1984	19	818	19
75Xf 36009	33	942	23	149	19	1024	36	741	6	234	30	630	22	551	28	0	39	642	14	529	7	1028	36	1284	41	646	40
74TA 42	46	1009	19	99	28	571	46	564	19	144	44	731	17	441	32	0	39	684	13	519	8	2468	4	1829	26	755	26
76TA 66043	59	1209	12	69	34	1837	16	919	2	298	15	680	20	341	35	0	39	892	6	383	19	956	39	1262	42	737	28
78S 26049	100	1009	19	33	36	1091	33	593	17	416	4	1067	5	954	12	36	32	714	12	360	28	1637	18	2236	14	846	14
78S 26066	193	942	23	63	35	1957	10	438	24	329	12	997	6	1164	6	0	39	589	15	417	16	2758	2	2636	5	1024	1
76TA 66098	232	409	39	83	31	2171	8	260	36	255	23	310	42	424	33	36	32	297	34	344	33	1353	29	2403	7	695	32
74TA 265	254	676	32	33	36	2397	7	549	21	301	13	411	33	614	25	0	39	506	19	360	28	2136	9	2347	9	861	12
-	273	1342	7	33	36	1797	19	460	22	400	7	310	42	804	19	108	19	464	22	360	28	1300	31	2747	3	844	17
76TA 66136	323	2009	1	3	41	1824	17	-		294	17	310	42	404	34	143	10	339	29	367	23	1531	19	2647	4	897	6
76TA 66137	323	1409	6	23	39	1691	22	-		266	21	209	46	254	39	0	39	173	42	344	33	2047	12	3014	2	857	13
-	379	1609	3	1023	2	1024	36	-		239	28	441	31	554	27	0	39	214	38	370	22	1407	27	2147	15	821	18
-	385	1276	10	83	31	1251	31	-		301	13	108	47	604	26	36	32	381	27	380	20	1087	35	1836	25	668	37
-	386	1076	16	23	39	1757	21	-		236	29	411	33	904	14	18	35	381	27	254	44	1513	20	1759	30	757	25
-	419	876	25	86	30	722	43	390	28	359	10	933	9	1047	8	221	1	450	23	280	41	1496	23	2325	12	765	22
-	465	1142	15	136	25	3282	1	-		188	37	579	25	497	30	131	12	325	30	134	47	980	37	1903	22	845	16
78S 26131	643	1009	19	76	33	1855	14	390	28	424	3	1286	2	697	21	78	28	742	10	474	12	1389	28	3259	1	973	5
-	707	742	28	236	14	1415	29	679	10	429	2	882	11	1297	4	131	12	200	39	367	23	1460	25	2314	13	846	14
78S 26181	841	1209	12	136	25	1655	23	656	11	415	5	832	13	1047	8	131	12	717	11	294	39	2207	6	2459	6	980	4
-	846	809	27	156	18	2402	6	445	23	521	1	377	39	977	11	114	18	784	8	397	17	873	41	1236	43	758	23
-	847	742	28	286	11	1655	23	301	34	209	36	468	29	647	23	96	24	284	35	300	38	696	44	1736	31	618	43
-	947	1342	7	286	11	2455	4	-		35	46	377	39	217	42	203	4	117	44	350	31	2313	5	1792	27	862	10

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Cont'd Table 5.4.2.Adjusted seed yield (Y = kg/ha) and rank (R) of entries in the LISN-L at different locations during 1980/81.

ENTRY		CHILE		INDIA		IRAQ		JORDAN		LEBANON				NEPAL		PAKISTAN				SYRIA		TURKEY				MEAN	
Selection	ILL	Chillan		New Delhi		Arbil		Ramtha		AUB		Terbol		Kathmandu		Faisalabad		Islamabad		Tel Hadya		Ankara		Diyarbakjr			
		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
78S 26199	972	1476	5	316	10	1575	27	401	27	54	45	731	17	697	21	96	24	909	5	324	37	1709	16	2347	9	886	7
-	975	742	28	136	25	3255	2	634	12	13	47	781	14	877	15	203	4	950	4	364	25	625	46	1959	21	878	9
75Kf 36421	983	1076	16	349	8	2104	9	304	33	231	32	441	30	527	29	209	2	314	31	347	32	868	42	1762	29	711	31
75Kf 36442	998	676	32	149	19	1957	10	149	38	263	22	562	26	447	31	66	29	398	25	257	43	974	38	1618	37	626	42
-	1042	676	32	-		1891	13	593	17	404	6	714	19	847	16	59	31	564	17	577	6	654	45	1729	32	792	21
-	1241	676	32	0	42	957	38	371	30	215	34	411	33	97	44	66	29	189	40	464	13	1508	21	1496	39	538	45
75Kf 36822	1397	342	41	199	15	1157	32	627	13	343	11	401	37	17	47	102	22	564	17	584	3	1916	14	1396	40	637	41
75Kf 36931	1522	409	39	-		891	40	616	14	281	19	411	33	47	46	155	9	772	9	484	11	1490	24	2051	17	692	34
-	1574	609	36	0	42	1637	25	438	24	234	30	532	27	247	40	209	2	189	40	330	36	956	39	1107	45	541	44
Cyprus Local	4368	876	25	0	42	691	44	793	4	360	9	613	24	267	38	119	16	814	7	374	21	1508	21	2373	8	732	29
Precoz	4605	609	36	1049	1	1931	12	-		215	34	886	10	307	37	102	22	1231	1	290	40	174	47	584	47	670	35
79Sh 4806X75TA-49		342	41	0	42	757	41	616	14	298	15	1189	4	1047	8	119	16	981	2	510	10	2165	7	1651	36	806	20
79Sh 4809X75TA-49		1298	9	333	9	1073	35	327	32	294	17	747	16	121	43	125	15	0	45	363	26	2136	9	2092	16	742	27
79Sh 4867X75TA-30		1164	14	633	5	2406	5	404	26	186	38	949	8	1401	2	143	10	0	45	273	42	1122	34	1903	22	882	8
79Sh 4890X75TA-49		1764	2	833	4	2673	3	282	35	185	39	485	28	1101	7	108	19	-		153	46	1709	16	1692	33	999	3
79Sh 4908X75TA 82		698	31	183	17	273	47	193	37	219	33	848	12	1401	2	161	8	503	20	199	45	1869	15	1792	27	695	32
Local check mean.		1560	4	610	6	1611	26	556	20	242	26	317	41	3034	1	194	7	158	43	362	27	2670	3	2011	18	-	
Check 1 mean		1213	11	254	13	1549	28	742	5	373	8	1198	3	1170	5	104	21	581	16	511	9	2059	11	2329	11	1007	2
Check 2 mean		1053	18	184	16	1312	30	371	30	182	40	222	45	938	13	79	27	437	24	341	35	1305	30	1558	38	665	38
Location mean		910		232		1584		537		264		652		695		90		489		390		1535		1914			
C.V. %		31.1		80.7		37.1		20.7		41.9		18.9		14.4		47.3		45.2		10.8		40.6		16.9			
S.E. checks		251.1		178.3		349.5		72.7		70.5		69.4		155.7		37.6		112.1		27.5		516.8		211.2			
S.E. check v.test entry		502.2		356.6		698.9		145.4		141.1		138.9		311.5		75.2		224.1		55.0		1033.6		422.4			

The five heaviest seed yielding entries at the in dividual location in the LISN-L during 1980/81.

Rank	CHILE Chillan		INDIA New Delhi		IRAQ Abril		JORDAN Ramtha		LEBANON AUB		LEBANON Terbol	
	Selection	ILL	Selection	ILL	Selection	ILL	Selection	ILL	Selection	ILL	Selection	ILL
1	76TA 66136	323	Precoz	4605	-	465	78S 26032	26	-	846	78S 26032	26
2	79Sh 4890 X 75TA 49		-	379	-	975	76TA 66043	59	-	707	78S 26131	643
3	-	379	76TA 66012	6	79Sh 4890 X 75TA 49		78S 26002	8	78S 26131	643	Check 1	-
4	Loc.check	-	79Sh 4890 X 75TA 49		-	947	Cyprus Loc.	4368	78S 26049	100	79Sh 4806 X 75TA 49	
5	78S 26199	972	79Sh 4867 X 75TA 30		79Sh 4867 X 75TA 30		Check 1	-	78S 26181	841	78S 26049	100

Rank	NEPAL Kathmandu		PAKISTAN Faisalabad		PAKISTAN Islamabad		SYRIA Tel Hadya		TURKEY Ankara		TURKEY Diyarbakir	
	Selection	ILL	Selection	ILL	Selection	ILL	Selection	ILL	Selection	ILL	Selection	ILL
1	Loc.check	-	-	419	Precoz	4605	-	23	78S 26033	26	78S 26131	643
2	79Sh 4867 X 75TA 30 (1)		-	1574	79Sh 4806 X 75TA 49		78S 26033	26	78S 26066	193	76TA 66137	323
3	79Sh 4908 X 75TA 82		75Kf 36421	983	76TA 66012	6	75Kf 36822	1397	Loc.check	-	-	273
4	-	707	-	947	-	975	78S 26002	8	74TA 42	46	76TA 66136	323
5	Check 1	-	-	975	78S 26199	972	78S 26032	26	-	947	78S 26066	193

(1) Parenthesis indicate similar yields.

Table 5.4.3. Correlations (1) between three agronomic characters and seed yield based on means across locations in the LISN-L during 1980-81.

	Time to maturity	Plant height	Seed yield
Time to 50% flowering	0.77 **	0.23	0.15
Time to maturity		0.38 *	0.23
Plant height			0.28

(1) * $P \leq 0.05$

** $P \leq 0.01$

5.5. LENTIL INTERNATIONAL SMALL SEEDED SCREENING NURSERY (LISN-S-81)

The lentil international small seeded screening nursery (LISN-S) comprised 62 test entries from a total of 14 countries. All the entries had an average seed size of less than 4.5g/100 seeds. Six of the entries were selections from crosses made at ICARDA; amongst the other entries four were Indian introductions from Pantnagar, and one from Ludhiana. There were six entries supplied from Pakistan. The remaining entries were selections from germplasm made at ICARDA, which had performed well in yield trials in both Lebanon and Syria.

Materials and Methods

The nursery was executed in single unreplicated rows in an augmented complete blocks design. There were three checks, two of which were supplied (ILL 1744 and ILL 4400); the third check was locally supplied. The recommended planting was for a single row, 4m - long with 200 seeds at 200 seeds/m^2. Cooperators were, however, urged to use locally recommended lentil husbandry techniques. A total of 24 sets of LISN-S were requested, and 15 were supplied. Data was received back from seven locations, which were Mallawi, Egypt; Debre Zeit, Ethiopia; New Delhi, India; Ramtha, Jordan; A.U.B., Lebanon; Kathmandu, Nepal; and Islamabad, Pakistan.

Results (Table 5.5.1 to 5.5.4)

The lentils were quickest to flower at Mallawi in Egypt, and slowest into flower at A.U.B. in Lebanon. However for maturity the lowest average value came from India, where the time for pod-filling was shorter than that in Egypt. The variation amongst the entries in average time to flower was from 118 - 139 days. The earliest entries were from Ethiopia, India and Pakistan and the latest lines to flowering and maturity came from southern Europe and Turkey (e.g. 74TA 305, 74TA 374, 78S 26112). The results for time to maturity were strongly correlated to those for time to flower (r = 0.86; Table).

Table 5.5.1. Values for three agronomic characters for the entries across locations in the LISN-S during 1980-81.

Selection	ILL	Country of origin	Time to flowering (days)	Time to maturity (days)	Plant height (cm)
76TA 66005	1	Jordan	122	174	33
76TA 66015	8	"	125	174	31
78S 26003	8	"	126	172	33
78S 26004	9	"	127	172	31
78S 26009	13	"	131	172	33
78S 26013	16	"	133	172	30
76TA 66021	17	"	129	174	31
78S 26014	17	"	130	169	32
78S 26018	19	"	123	172	32
78S 26023	22	"	129	173	35
78S 26024	23	"	130	173	31
78S 26028	24	Syria	129	171	33
78S 26030	25	"	134	177	32
74TA 22	31	"	135	173	31
76TA 66030	31	"	132	173	30
-	40	"	132	173	30
-	52	Iraq	133	174	31
74TA 72	54	"	134	173	36
-	112	Turkey	131	172	34
-	203	Ethiopia	133	175	31
75kf 36107	207	"	133	176	34
74TA 209	210	Costa Rica	138	179	34
76TA 66088	223	Iran	128	172	33
74TA 290	272	Greece	139	179	32
74TA 305	287	"	135	180	33
74TA 374	321	Hungary	135	181	30
-	346	Mexico	133	175	34
-	347	"	133	174	33
75kf 36209	348	"	134	177	35
-	351	"	132	177	32
74TA 435	351	"	129	172	35

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Cont'd.5.5.1. Values for three agronomic characters for the entries across locations in the LISN-S during 1980-81.

Selection	ILL	Country of origin	Time to flowering (days)	Time to maturity (days)	Plant height (cm)
-	356	Mexico	129	171	34
74TA 548	470	Syria	130	171	32
-	472	"	134	171	31
-	475	"	132	173	31
-	487	"	133	172	31
74TA 560	492	"	134	175	31
74TA 581	501	Mexico	134	175	35
74TA 583	502	"	129	178	35
78S 26112	631	Turkey	137	180	38
78S 26142	779	Syria	134	173	35
78S 26177	837	Lebanon	133	174	31
-	975	Chile	125	172	30
-	1712	Ethiopia	119	165	30
-	1734	"	119	166	29
-	1739	"	120	165	27
-	1740	"	120	167	30
Wint.pull 11	1877	Turkey	138	179	39
78S 26303	1888	Syria	133	177	36
Pant.L-406	2501	India	123	168	28
-639	2573	"	121	166	31
-866	2579	"	126	168	31
Pant.LL-19	2583	"	123	166	30
Pant. 258	2769	"	121	166	28
12	4402	Pakistan	120	166	29
162	4403	"	119	166	30
340	4404	Pakistan	119	165	26
9-6	4405	"	120	165	31
18-10	4406	"	118	165	30
18-12	4407	"	118	166	29

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Cont'd. 5.5..1. Values for three agronomic characters for the entries across locations in the LISN-S during 1980-81.

Selection	ILL/Cross	Country of origin	Time to flowering (days)	Time to maturity (days)	Plant height (cm)
79Sh 4816	X75TA 73		128	173	34
79Sh 4826	X75TA 2		134	175	32
79Sh 4831	X75TA 11		132	173	35
79Sh 4903	X75TA 73		132	175	34
79Sh 4906	X75TA 80		134	177	31
79Sh 4907	X75TA 82		132	177	32
Check 1	4401	Syria	129	172	31
Check 2	1744	Ethiopia	120	166	28

On average the tallest entry was Winterlik Pul. 11 (ILL 1877) from Ankara in Turkey. This genotype was also among the latest entries to flowering and maturity. Conversely the shortest line was ILL 4404 from Pakistan, which was amongst the earliest entries to flower. Clearly there is a strong correlation between time to flowering and plant height amongst this material (r = 0.59; Table 5.5.4.

The average seed yield at different locations varied from a low of 178 kg/ha at A.U.B. in Lebanon to 1093 kg/ha produced in Nepal. The local check never ranked higher than fifth amongst the entries, emphasizing the value of introduction as a plant breeding method. There was a striking difference between the performance of entries in Mediterranean (Lebanon, Jordan and Syria) ands southern locations (Egypt, Ethiopia, India, Nepal and Pakistan). There were some entries like Pantnagar L 406 which showed wide adaptation across southern locations but which were poorly adapted to Mediterranean locations. These entries were all early maturing and originated in either India or Pakistan. In contrast in the Mediterranean locations the later maturing entries were more succesful, for example ILL 40, 74TA 548, 76TA 66030 all from Syria and ILL 112 from Turkey. These lines were very poor in southern locations. There was one interesting and important exception to the lack of adaptation across both Mediterranean and Southern locations. This was 76TA 66005 (ILL 1) from Jordan. It had the highest overall mean, was of intermediate maturity, and did well in both zones.

Table 5.5.2. Adjusted seed yield (Y = kg/ha) and rank (R) of entries in the LISN-S at different locations during 1980-81.

ENTRY			EGYPT (1) Mallawi		ETHIOPIA (3) Debre Zeit		INDIA (1) New Delhi		JORDAN (2) Ramtha		LEBANON (2) AUB		LEBANON (2) Terbol		NEPAL (1) Kathmandu		PAKISTAN (1) Islamabad		SYRIA (2) Tel Hadya		Overall mean		Mediterranean mean (2)		Southern mean (1)	
Selection		ILL	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	66005	1	672	29	100	10	2416	5	891	7	164	44	942	25	1145	32	2242	1	544	9	1127	1	643	16	1934	1
76TA	66015	8	1089	12	100	10	266	37	624	20	209	27	942	25	1155	30	992	14	461	18	717	21	665	12	804	27
78S	26003	8	505	40	50	11	316	30	1213	1	178	37	1174	12	1815	12	409	47	458	19	759	12	706	10	847	23
78S	26004	9	894	17	50	11	416	28	1102	2	183	35	841	32	1715	15	1159	7	571	5	860	8	718	6	1097	17
78S	26009	13	255	61	-		0	51	1069	4	218	20	1093	17	665	43	534	37	414	28	531	46	610	20	400	56
78S	26013	16	172	67	-		0	51	1035	5	195	30	1043	23	1345	20	743	25	624	2	644	29	614	19	696	39
76TA	66021	17	755	26	-		316	30	813	7	189	32	639	41	705	40	576	31	434	24	553	42	566	23	532	48
78S	26014	17	1005	14	-		0	51	-		217	22	740	37	1355	19	784	20	314	41	631	31	455	44	713	35
78S	26018	19	450	44	-		416	28	858	9	154	45	689	40	895	38	784	20	574	4	603	34	545	29	698	38
78S	26023	22	533	38	50	11	2616	4	1080	3	148	47	285	60	1245	22	1201	4	528	10	955	4	515	31	1687	3
78S	26024	23	265	59	200	8	2756	3	698	17	280	10	699	39	682	42	1042	11	601	3	878	7	509	33	1493	9
78S	26028	24	459	41	-		1006	13	487	32	172	42	396	54	272	57	376	48	824	1	499	48	468	40	551	45
78S	26030	25	209	65	250	6	686	19	298	46	229	13	750	35	1232	23	543	34	481	15	554	41	393	50	820	25
74TA	22	31	820	20	-		-		454	36	233	11	295	59	12	64	376	48	481	15	381	64	457	43	194	64
76TA	66030	31	1181	9	50	11	886	15	565	28	214	23	1406	8	172	60	543	34	474	17	680	25	768	4	534	46
-		40	1515	1	150	9	656	22	521	29	214	23	1457	4	252	58	376	48	408	29	675	27	823	1	428	54
-		52	1126	11	-		646	23	598	23	222	16	750	35	582	47	376	48	571	5	609	33	653	14	534	46
74TA	72	54	1265	4	-		736	18	665	18	189	32	952	24	212	59	543	34	504	13	633	30	715	7	497	49
-		112	1431	2	250	6	786	17	643	19	213	25	1255	11	652	44	459	45	491	14	741	15	807	2	632	42
-		203	1237	5	50	11	3756	1	576	27	175	39	1053	21	0	65	376	48	521	11	962	3	712	8	1377	12
75kf	36107	207	866	18	350	3	583	24	332	45	181	36	632	42	1380	18	1195	5	341	36	689	23	470	39	1053	19
74TA	209	210	1172	10	-		133	47	-		172	42	380	56	420	53	362	53	268	50	415	57	498	36	305	61
76TA	66088	223	450	44	-		133	47	-		415	3	885	30	78	63	362	53	451	20	396	60	550	28	191	66
74TA	290	272	1228	7	150	9	123	50	-		285	8	228	61	340	55	112	65	158	62	353	65	475	38	192	65
74TA	305	287	672	29	300	4	483	26	276	47	422	2	481	48	2170	8	529	38	444	21	685	24	459	42	1061	18
74TA	374	321	283	57	-		133	47	87	54	308	7	380	56	450	51	529	38	431	25	325	67	298	60	371	58
-		346	200	66	-		263	38	265	50	219	19	834	33	1200	28	779	22	294	43	507	47	362	53	747	31
-		347	589	33	600	2	663	20	421	39	188	34	834	33	1470	16	362	53	281	46	601	35	463	41	832	24
75kf	36209	348	394	48	50	11	583	24	610	21	326	6	885	30	1780	14	779	22	548	8	738	16	553	26	1047	20
-		351	394	48	-		263	38	265	50	199	29	1087	18	480	50	945	16	281	46	489	51	445	47	563	44
74TA	435	351	339	52	-		269	36	472	34	220	17	901	29	1158	29	945	16	321	40	578	39	451	46	791	29
-		356	700	27	800	1	449	27	506	30	127	54	1356	9	958	34	1029	12	301	42	678	26	598	21	812	26

Cont'd.Table 5.5.2. Adjusted seed yield (Y = kg/ha) and rank (R) of entries in the LISN-S at different locations during 1980/81.

ENTRY		EGYPT (1) Mallawi		ETHIOPIA (3) Debre Zeit		INDIA (1) New Delhi		JORDAN (2) Ramtha		LEBANON (2) AUB		LEBANON (2) Terbol		NEPAL (1) Kathmandu		PAKISTAN (1) Islamabad		SYRIA Tel Hadya		Overall mean		Mediterranean mean (2)		Southern mean (1)	
Selection	ILL	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 548	470	1061	13	-	-	249	41	728	14	139	51	1457	4	0	65	1195	5	558	7	673	28	789	3	481	50
-	472	839	19	100	10	0	51	350	44	178	37	1053	21	0	65	612	30	334	38	421	56	551	27	204	63
-	475	450	44	-		0	51	484	33	152	46	1103	15	108	62	570	32	294	43	395	61	497	37	226	62
-	487	672	29	-		0	51	406	41	175	39	1608	3	0	65	529	38	394	31	473	52	651	15	176	67
74TA 560	492	255	61	-		0	51	606	22	405	4	1114	13	0	65	362	53	388	32	391	63	554	25	121	68
74TA 581	501	561	36	-		0	51	139	53	218	20	548	45	958	34	945	16	241	53	451	54	634	17	341	59
74TA 583	502	394	48	-		249	41	439	37	144	50	396	54	518	48	362	53	238	54	343	66	322	56	376	57
78S 26112	631	283	57	10	13	-		417	40	282	9	124	66	1218	26	1029	12	421	27	539	45	305	58	1124	16
78S 26142	779	459	41	-		206	43	595	24	129	53	1100	16	145	61	1070	9	253	51	495	50	507	34	474	51
78S 26177	837	820	20	-		256	40	361	43	175	39	918	27	1285	21	487	41	400	30	588	38	535	30	676	40
-	975	1348	3	-		306	32	595	24	145	49	1070	19	935	37	1154	8	443	22	750	14	720	5	798	28
-	1712	342	51	10	13	-		272	48	111	55	443	50	1465	17	1487	2	237	55	622	32	281	61	1476	10
-	1734	331	54	50	11	1956	7	772	11	83	57	443	50	955	36	1070	9	213	56	728	19	368	51	1327	14
-	1739	337	53	100	10	-		895	6	70	58	544	46	645	45	1237	3	197	58	561	40	409	49	941	22
-	1740	320	55	200	8	-		-		138	52	413	53	1005	33	570	32	193	59	440	55	266	62	788	30
Wint.pull-11	1877	765	25	-		-		272	48	193	31	9	68	435	52	237	62	283	45	313	68	304	59	336	60
78S 26303	1888	792	22	150	9	176	45	406	41	354	5	9	68	695	41	487	41	330	39	406	59	236	65	453	52
Pant.L-406	2501	459	41	-		3006	2	-		104	56	1433	7	2335	7	321	58	53	68	1102	2	512	32	1887	2
Pant.L-639	2573	598	33	10	13	189	44	-		0	64	103	67	1925	11	15	69	17	69	407	58	180	67	710	36
Pant.L-866	2579	959	15	-		289	33	261	52	227	15	608	43	1225	24	682	28	120	67	546	43	435	48	732	32
Pant.LL-19	2583	570	35	-		789	16	-		3	62	709	38	3785	1	432	46	170	61	922	6	363	52	1669	4
Pant. 258	2769	237	63	-		989	14	-		0	64	356	58	3705	2	265	60	243	52	828	9	209	66	1653	5
12	4402	265	59	-		1289	12	-		0	64	134	65	3055	4	265	60	140	65	735	17	135	68	1536	7
162	4403	515	39	-		1989	6	-		0	64	245	62	2155	9	182	64	193	59	754	13	238	64	1442	11
340	4404	681	28	-		1439	11	728	14	0	64	204	63	2955	5	98	66	123	66	779	10	347	54	1497	8
9-6	4405	959	15	-		1489	9	-		3	62	184	64	605	46	98	66	153	63	499	48	325	55	731	33
18-10	4406	1237	5	-		1489	9	-		0	64	417	52	3225	3	98	66	153	63	946	5	452	45	1604	6
18-12	4407	0	68	-		289	33	-		229	13	602	44	1205	27	237	62	206	57	395	61	259	63	577	43
79Sh 4816	X75TA-73	1218	8	-		289	33	-		5	61	1258	10	1155	30	737	26	362	33	718	20	711	9	727	34
4826	2	0	68	350	3	-		506	30	147	48	1743	1	1975	10	654	29	422	26	778	11	564	24	1315	15
4831	11	774	23	350	3	-		428	38	65	59	1662	2	385	54	487	41	339	37	591	37	654	13	436	53
4903	73	218	64	50	11	-		595	24	426	1	905	28	835	39	487	41	356	34	546	43	500	35	661	41

Cont'd. Table 5.5.2. Adjusted seed yield (Y= kg/ha) and rank (R) of entries in the LISN-S at different locations during 1980-81.

Entry		EGYPT (1) Mallawi		ETHIOPIA (3) Debre Zeit		INDIA (1) New Delhi		JORDAN (2) Ramtha		LEBANON (2) AUB		LEBANON (2) Terbol		NEPAL (1) Kathmandu		PAKISTAN (1) Islamabad		SYRIA (2) Tel Hadya		Overall mean		Mediterranean mean (2)		Southern mean (1)	
Selection	ILL/Cross	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R
79Sh 4906	X75TA 80	635	32	-		-		728	14	220	17	1107	14	1785	13	904	19	279	48	707	22	594	22	1345	13
79Sh 4907	X75TA 82	774	23	-		-		739	12	230	12	1056	20	1225	24	737	26	356	34	731	18	631	18	981	21
C H E C K S																									
-	Local check	413	47	292	5	1817	8	729	13	210	26	499	47	2720	6	289	59	443	22	-		-		-	
-	4401	536	37	28	12	173	46	789	10	204	28	1450	6	330	56	774	24	519	12	597	36	700	11	426	55
-	1744	317	56	242	7	658	21	456	35	63	60	452	49	485	49	982	15	269	49	460	53	311	57	708	37
Location mean		645				730		576		178		779		1093		645		358							
C.V. %		42.2				73.5		16.6		24.4		20.5		26.2		35.5		22.7							
SE. check		95.2				374.6		58.3		20.7		87.6		165.2		129.2		49.8							
SE. check vs test entry		219.9				809.3		134.5		47.8		202.3		381.6		298.3		114.9							

(1) Locations included in Southern mean.
(2) Locations included in Mediterranean mean.
(3) Unadjusted values not included in the means.

Table 5.5.3.The five heaviest seed yielding entries at the individual location in the LISN-S during 1980/81.

Rank	EGYPT		ETHIOPIA		INDIA		JORDAN		LEBANON			
									A.U.B.		Terbol	
1	-	ILL 40	-	ILL 356	-	ILL 203	78S 26003	ILL 8	79Sh 4903 X 75TA 73		79Sh 4826 X 75TA 2	
2	-	ILL 112	-	ILL 347	Pant.L.406	ILL 2501	78S 26004	ILL 9	74TA 305	ILL 287	79Sh 4831 X 75TA 11	
3		ILL 975	75KF 36107	ILL 207	78S 26024	ILL 23	78S 26023	ILL 22	76TA 66088	ILL 223	-	ILL 487
4	74TA 72	ILL 54	79Sh 4826 X 75TA 2		78S 26023	ILL 22	78S 26009	ILL 13	74TA 560	ILL 492	74TA 548	ILL 470
5	-	ILL 203 (1)	79Sh 4831 X 75TA 11		79TA 66005	ILL 1	78S 26013	ILL 16	78S 26303	ILL1888	-	ILL 40
	18-10	ILL 4406										

Rank	NEPAL		PAKISTAN		SYRIA	
1	Pant.LL.19	ILL 2583	76TA 66005	ILL 1	78S 26028	ILL 24
2	Pant.258	ILL 2769	-	ILL 1712	78S 26013	ILL 16
3	18-10	ILL 4406	-	ILL 1739	78S 26024	ILL 23
4	12	ILL 4402	78S 26023	ILL 22	78S 26018	ILL 19
5	340	ILL 4404	75KF 36107	ILL 207	78S 26004	ILL 9
			74TA 548	ILL 470	-	ILL 52

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

Table 5.5.4. Correlations[1] between three agronomic characters and seed yield based on means across locations in the LISN-S during 1980-81.

	Time to maturity	Plant height	Seed Yield
Time to 50% flowering	0.86**	0.59**	-0.37**
Time to maturity		0.62**	-0.28*
Plant height			-0.26*

(1) * $P \leq 0.05$

** $P \leq 0.01$

5.6. LENTIL INTERNATIONAL F_3 TRIAL - NORTH (LIF3T - N - 81)

The lentil international F3 trial (LIF3T-N-81) comprised F3 generation bulk populations of 14 single crosses made in 1979 at ICARDA. The crosses were made to recombine such characters as wide adaptation, a high number of seeds per pod, cold tolerance, high harvest index,high yield, a tall erect growth habit, and a vigorous vegetative growth. The parents and crosses are shown in Table 5.6.1.

Materials and Methods

The fourteen F3 generation bulk populations, together with a supplied check (ILL 4400) ex-Syria and a local check, were included in a randomized complete block design with three replications. The experimental details are given in Table 5.6.2.The suggested planting arrangement was 4 rows per plot with each row 4m long, and 0.25m apart at 160 plants per m^2. But cooperators were asked to manage the trial in accordance with the local recommendations for farmers with respect to crop husbandry. A total of twelve sets of LIF3T-N-81 were despatched, and data received from only 3 locations. These were Chillan in Chile, and both Ankara and Diyarbakir in Turkey.

Results (Table 5.6.3 to 5.6.5)

Both flowering and maturity were earliest at Tel Hadya, Syria amongst the locations. The plants took longest to mature at Diyarbakir in Turkey, where the highest average yield was realized (1739 kg/ha).

The crosses had a comparable time to flowering and maturity to the local check at every location except Tel Hadya, Syria, where the local check was earlier to flower than most of the entries. The cross which was quickest to flower was X 79S 258, which had one parent from Ethiopia. The tallest cross,on an average , was X79S 255, which had both Greek and Egyptian parents.

Table 5.6.1. Crosses included in LIF3-N-81.

Cross Number X79 S	Female parent Selection	ILL	Origin	X	Male parent Selection	ILL	Origin
X79 S 40	75kf 36371	936	Ethiopia	X	75kf 36863	1432	Iran
	Wide adaptation			X	High No. seeds/pod		
X79 S 62	Kislik Yesil-31	1879	Turkey	X	75kf 36371	936	Ethiopia
	Cold tolerant			X	Wide adaptation		
X79 S 64	Kislik Yesil-31	1879	Turkey	X	75kf 36627	1169	Iran
	Cold tolerant			X	Wide adaptation		
X79 S 70	Kislik Kirize-51	1877	Turkey	X	74TA 391	333	Turkey
	Cold tolerant			X	High yield, Syria		
X79 S 76	Kislik Yesil-31	1879	Turkey	X	74TA 158	149	Turkey
	Cold tolerant			X	High yield, Syria		
X79 S 80	Kislik Kirize-51	1880	Turkey	X	74TA 158	149	Turkey
	Cold tolerant			X	High yield, Syria		
X79 S 96	75kf 36226	379	Chile	X	74TA 308	289	Greece
	High yield, Syria			X	Vigorous vegetative growth		
X79 S 120	-	500	Mexico	X	75kf 36371	936	Ethiopia
	High harvest index			X	Wide adaptation		
X79 S 121	-	500	Mexico	X	75kf 36612	1155	Iran
	High harvest index			X	Wide adaptation		
X79 S 141	74TA 138	101	Morocco	X	74TA 215	212	Afghanistan
	High yeild			X	Four pods/pedunde		
X79 S 169	-	500	Mexico	X	74TA 276	262	Hungary
	High harvest index			X	Wide adaptation		
X79 S 237	74TA 138	101	Morocco	X	74TA 260	253	Greece
	High yield			X	High yield		
X79 S 255	74TA 260	253	Greece	X	78S 26152	793	Egypt
	High yield			X	Tall erect		
X79 S 258	74TA 260	253	Greece	X	78S 26240	1688	Ethiopia
	High yield			X	Tall erect		

Table 5.6.2. Agronomic data for different locations for the LIF3T-N during 1980-1981

Country	Location	Planting date	Crop duration (days)	Fertilizer (kg/ha)	
				N	P_2O_5
CHILE	Chillan	25.5.81	200	0	90
LEBANON	Terbol	26.11.80	184	0	0
SYRIA	Tel Hadya	16.11.80	170	0	60
TURKEY	Ankara	21.12.80	186	20	60
TURKEY	Diyarbakir	16.11.80	210	0	0

The highest yielding entry over all locations was the supplied check ILL 4400 from Syria. It ranked higher or at par with the local check everywhere. The best cross was X79S 169, whose parents were ILL 500 from Mexico and 74TA 276 from Hungary, an exceptionally widely adapted genotype. Another entry with a good cross mean yield was X 79S 96 which had one Chilean parent with the other from Greece. The correlation indices between seed yield in the different sites are shown in Table 5.6.5 but they were not significant.

Table 5.6.3. Mean values for three agronomic characters for entries in the LIF3T-N during 1980/81.

Entry		Time to Flowering (days)	Time to Maturity (days)	Plant height (cm)
X79 S	40	144	190	29
	62	142	190	32
	64	139	189	33
	70	143	191	33
	76	149	192	36
	80	143	192	35
	96	149	192	36
	120	140	189	33
	121	142	190	30
	141	141	191	37
	169	139	190	33
	237	140	190	35
	255	140	191	38
	258	136	188	35
ILL	4400	138	188	37

Table 5.6.4.Seed Yield (Y = kg/ha) and rank (R) of entries in the LIF3T-N at different locations during 1980-1981.

Entry X79 S	CHILE Chillan		LEBANON Terbol		SYRIA Tel Hadya		TURKEY Diayar-bakir		MEAN	
	Y	R	Y	R	Y	R	Y	R	Y	R
40	1344	9	933	1	933	14	1110	15	1080	12
62	1578	5	389	13	1282	5	1690	11	1235	8
64	1144	13	389	13	1083	11	1330	14	987	14
70	1167	11	289	16	900	16	2003	6	1090	11
76	1433	8	589	7	918	15	2047	4	1247	7
80	833	16	489	12	1216	9	1747	9	1071	13
96	1911	1	539	11	1276	6	1697	10	1356	3
120	1189	10	572	8	1486	1	2120	3	1342	4
121	889	15	350	15	994	13	1443	12	919	15
141	1133	14	544	10	1008	12	2037	5	1181	9
169	1156	12	811	4	1299	4	2300	1	1392	2
237	1544	6	567	9	1171	10	1977	7	1315	5
255	1456	7	628	5	1232	8	1797	8	1278	6
258	1622	4	628	5	1242	7	951	16	1111	10
ILL 4400	1733	2	900	2	1358	2	2207	2	1550	1
Local check	1733	2	817	3	1307	3	1377	13		
Location mean	1367		590		1169		1739			
C.V. %	24.4		48.1		15.8		24.9			
L.S.D. 5%	555.7		472.9		306.9		723.0			
No.of entries significantly exceeding local check	0		0		0		3			

Table 5.6.5. Correlations (df = 13) between the seed yield of entries in the LIF3T-N at different locations during 1980-81.

	LEBANON Terbol	SYRIA Tel Hadya	TURKEY Diyarbakir
CHILE - Chillan	0.34	0.32	-0.03
LEBANON - Terbol		0.25	0.08
SYRIA - Tel Hadya			0.26

5.7. LENTIL INTERNATIONAL F_3 TRIAL - SOUTH (LIF3T-S-81)

The lentil international F_3 Trial South 1981 (LIF3T-S-81) comprised 14 bulk population at the F_3 generation of single crosses made at ICARDA in 1979. All but one of the crosses included an early maturing parent from either Egypt, Ethiopia or Mexico. Details of the parents and crosses are given in Table 5.7.1.The aim of trial was to enable cooperators to test early high yielding crosses in southern latitudes.

Materials and Methods

The fourteen bulk populations were accompanied by a supplied check, ILL 4400 from Syria, and a local check; and planted in a randomized block design with three replications. The recommended planting arrangement was 4 rows, 4m-long and 0.25m apart with 160 plants/m^2. Cooperators were, however, urged to use the crop husbandry locally recommended to farmers for the management of the crop. Details of the management practices utilized are given in Table 5.7.2.A total of 12 sets of LIF3T-S-81 were despatched, and data received from six locations. These were Mallawi, Egypt; New Delhi, India; Kathmandu Nepal; and Faisalabad, Islamabad and Punjal in Pakistan.

Results (Table 5.7.3 to 5.7.5).

Flowering occured after an average of only 83 days in Egypt in the earliest trial. In contrast, plants took an average of 137 days to flower in Lebanon. It was only in Nepal that the local check was the earliest entry to flower; elsewhere some entries were always as early as the local check. It should be noted that the data on time to flower are measured on a plot basis, and with segregating material at the F_3 generation there will be a considerable spread of time to flower amongst individuals within the population. Thus, in crosses with one early parent phenological adaptation to lower latitudes is assured. On average,cross X 7951 was the first to flower. It had Syrian and Egyptian parents.

Table 5.7.1. Details of crosses included in LIF3T-S-81

Cross Number	Female parent			X	Male parent		
	Selection	ILL	Origin		Selection	ILL	Origin
X79 S 1	74TA 19	28	Syria	X	-	789	Egypt
	High yield,		Lebanon	X	Early maturity		
X79 S 2	74TA 19	28	Syria	X	-	813	Egypt
	High yield,		Lebanon	X	Early maturity		
X79 S 3	74TA 19	28	Syria	X	-	826	Egypt
	High yield,		Lebanon	X	Early maturity		
X79 S 4	74TA 19	28	Syria	X	-	828	Egypt
	High yield,		Lebanon	X	Early maturity		
X79 S 18	74TA 276	262	Hungary	X	-	1697	Ethiopia
	Wide adaptation			X	Early maturity		
X79 S 19	74TA 276	262	Hungary	X	-	1747	Ethiopia
	Wide adaptation			X	Early maturity		
X79 S 122	-	500	Mexico	X	75kf 36627	1169	Iran
	High harvest index			X	Wide adaptation		
X79 S 123	74TA 435	350	Mexico	X	75kf 36371	1169	Iran
	High harvest index			X	Wide adaptation		
X79 S 168	-	346	Mexico	X	74TA 276	262	Hungary
	High harvest index			X	Wide adaptation		
X79 S 169	-	500	Mexico	X	74TA 276	262	Hungary
	High harvest index			X	Wide adaptation		
X79 S 197	75kf 36323	882	Iran	X	75kf 36371	936	Ethiopia
	High yield,		Egypt	X	Wide adaptation		
X79 S 213	Giza 9	784	Egypt	X	-	237	USSR
	High yield,		Egypt	X	Tall erect, strong stem		
X79 S 250	74TA 138	101	Morocco	X	78 S 26152	793	Egypt
	Wide adaptation			X	Tall, erect		
X79 S 252	74TA 138	101	Morocco	X	78S 26194	922	Turkey
	Wide adaptation			X	Tall, erect		

Table 5.7.2. Agronomic data for different locations for the LIF3T-S during 1980-1981

Country	Location	Planting Data	Crop Duration (days)	Fertilizer (kg/ha)			Crop Husbandry
				N	P_2O_5	K_2O	
EGYPT	Mallawi	23.11.80	144	50	92	0	3 Irrigations
INDIA	New Delhi	20.11.80	144	40	40	0	1 Irrigations
LEBANON	Terbol	26.11.80	186	0	0	0	Rainfed
NEPAL	Kathmandu	2.11.80	180	20	40	20	Rainfed
PAKISTAN	Faisalabad	25.11.80	-	0	0	0	3 Irrigations
PAKISTAN	Islamabad	18.11.80	175	20	50	0	Rainfed
PAKISTAN	Punjal	8.11.80	191	0	0	0	3 Irrigations
SYRIA	Tel Hadya	16.11.80	166	0	60	0	Rainfed

The tallest cross was X79S 252, which was made between the parents 74TA 138 from Morocco and 78S 26194 from Turkey. Plants grew to an average height of 42cm in Lebanon, where they were slow to flower. This was the location where lentils grew tallest; whereas in Egypt where they were early to flowering and maturity the plants only grew to an average height of 27cm.

The highest yields were recorded at Mallawi in Egypt, whereas the lowest yields were recorded at Faisalabad and Punjal in Pakistan. In the latter two locations the coefficients of variation of the trials were high at 43.5 and 60.5% respectively. Outstanding amongst the crosses were the top three yielders X79S 1, 4, and 169. There were a total of 8 test locations, and from these sites the above three entries produced more than the local check in 5, 6, and 5 locations respectively. This highlights the wide adaptation of the material. Interestingly one of the parents in each of these crosses was macrosperma with a seed size of $>$4.5g/100 seeds. Macrosperma germplasm accessions are not well adapted to these southern locations, because of their late maturity. But when crossed to early material the macrosperma habit can be transferred to a phenology suited to lower latitudes.

The similarity in performance for yield of the sites in the Indo-Pakistan sub-continent (southern locations) was highlighted by the correlation between the entry mean yields at these sites (Table 5.7.5).

Table 5.7.3. Mean values for three agronomic characters for entries in the LIF3T-S during 1980/1981 over all locations.

Entry		Time to Flowering (days)	Time to Maturity (days)	Plant Height (cm)
X79S	1	105	170	35
	2	107	168	33
	3	108	168	33
	4	107	168	36
	18	112	165	32
	19	111	166	33
	122	120	170	33
	123	121	170	33
	168	122	170	35
	169	122	170	35
	197	119	168	33
	213	110	168	33
	250	120	172	36
	252	122	172	39
ILL	4400	124	170	35

Table 5.7.4.Seed yield (Y = kg/ha)and rank (R) of entries in the LIF3T-S at different locations during 1980/81.

X79S	EGYPT Mallawi		INDIA New Delhi		LEBANON Terbol		NEPAL Kathmandu		PAKISTAN						SYRIA Tel Hadya		MEAN	
									Faisal-abad		Islam-abad		Punjal					
	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R
1	2481	1	383	4	1628	2	1607	3	105	9	257	13	100	10	1428	2	999	2
2	1463	13	463	2	1480	3	1237	9	111	7	362	8	217	3	1312	5	831	6
3	1917	4	371	5	1463	4	1200	13	81	15	174	16	113	9	1119	12	805	7
4	1926	3	454	3	1400	7	2137	1	141	3	786	1	167	5	1249	8	1033	1
18	1852	5	300	7	1378	8	1358	6	96	11	441	4	121	8	1151	11	837	5
19	1481	12	217	12	1187	10	1150	15	105	9	459	3	229	2	1214	9	755	8
122	1028	15	188	13	1433	5	1208	11	84	13	243	14	100	10	902	16	648	15
123	1630	6	229	11	903	15	1482	5	90	12	396	7	142	6	1013	14	736	10
168	1593	8	246	10	1244	9	1032	16	141	3	362	8	71	14	1330	4	752	9
169	2435	2	283	9	1856	1	1270	7	147	2	508	2	92	12	1264	6	982	3
197	1500	11	288	8	928	14	1268	8	84	13	417	5	129	7	1022	13	705	11
213	1194	14	313	6	1011	13	1153	14	57	16	271	12	196	4	1401	3	700	12
250	1519	10	175	14	1133	12	1218	10	108	8	354	10	85	13	993	15	698	13
252	1009	16	175	14	1178	11	1208	11	120	5	327	11	58	16	1255	7	666	14
ILL 4400	1611	7	175	14	1422	6	1647	2	168	1	410	6	71	14	1567	1	884	4
Local check	1537	9	921	1	737	16	1598	4	117	6	229	15	500	1	1157	10		
Location mean	1636		324		1274		1361		109		375		149		1211			
C.V. 5%	35.9		36.7		42.9		31.6		43.5		44.2		60.5		28.9			
L.S.D. 5%	979.2		198.2		912.6		716.7		79.4		276.0		150.7		583.9			
No.of entries significantly exceeding local check	0		0		1		0		0		2		0		0			

Table 5.7.5. Correlations[1] (df = 13) between the seed yield of entries in the LIF3T-S at different locations during 1980-81.

	INDIA New Delhi	LEBANON Terbol	NEPAL Kathmandu	PAKISTAN Faisalabad	PAKISTAN Islamabad	PAKISTAN Punjal	SYRIA Tel Hadya
EGYPT - Mallawi	0.46	0.63*	0.41	0.32	0.26	-0.12	0.27
INDIA - New Delhi		0.35	0.40	-0.10	0.24	0.49	0.23
LEBANON - Terbol			0.20	0.47	0.07	-0.21	0.33
NEPAL - Kathmandu				0.39	0.65**	0.04	0.24
PAKISTAN - Faisalabad					0.53*	-0.39	0.49
PAKISTAN - Islamabad						0.23	0.09
PAKISTAN - Punjal							0.02

* $P \leq 0.05$
** $P \leq 0.01$

6. AGRONOMY

6.1. Date of Planting Plant Population Trial (DPPT)

6.1.1. INTRODUCTION

The trial was proposed to find out as to what is the optimum date of planting of faba beans, lentils and chickpeas crops for the different agro-ecological locations in the ICARDA region, and what is the consequence of deviation from this date on the crop performance. The trial also aims at determining the response of the crops 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.

Materials and Methods:

There were four dates of planting for each crop. The four dates for faba beans were as follows: D_1-10 October; D_2-30 October; D_3-20 November and D_4-10 December. However, the cooperators could modify the dates to suit their requirements. For lentils, the four dates were selected as follows: D_1-40 days earlier than the conventional date at each location; D_2-20 days earlier; D_3-at the conventional date and D_4-20 days later than the conventional date. The four dates for chickpeas were as follows: D_1-early winter; D_2-mid winter; D_3-late winter and D_4-early spring.

The population levels were varied by changing the row width keeping the spacing within the row constant. The details of the treatments are given in the appropriate tables.

The experiment was conducted in a single split-plot design with date of planting ascribed to the main plot and the population levels to the subplot. The size of the subplot was $20m^2$ (4m x 5m) for the three crops. The net plot harvested and the seed yields

reported, are derived from the central rows of 4m. The outside rows and 0.5m at either end of the central rows were discarded. Some of the cooperators provided data on monthly maximum and minimum temperatures and total rainfall for the duration of the crop. These are represented in Figure 1.

6.1.2. Faba Bean Date of Planting-Plant Population Trial - (FBDPPT)

RESULTS AND DISCUSSION:

Data were received from Addis Ababa, Ethiopia and Terbol, Lebanon and are represented in Table 6.1.1. The yields were higher at Addis Ababa than at Terbol probably because of the higher rainfall in the Addis Ababa location.

At both locations, planting early increased seed yields. At Addis Ababa, extending planting into early or late July reduced seed yields by 32.6 and 41.4% respectively. Results from these two locations suggested that planting of faba beans should be done early in the season in order to maximize seed yields.

At either location, seed yield was increased by increasing the population levels, however, the increases were not statistically significant, thus implying a high plasticity of the genotypes used at these locations.

6.1.3. Lentils Date of Planting-Plant Population Trial - (LDPPT)

RESULTS AND DISCUSSION:

Data were received from Jubeiha in Jordan and Kfardan and Terbol in Lebanon. These are presented in Table 6.1.2. Yields were higher in Jordan than in Lebanon.

Table 6.1.1. Yield (kg/ha) of fababeans as affected by date of planting and plant population levels in Ethiopia and Lebanon during 1980-81.

TREATMENT	ETHIOPIA Addis Ababa	LEBANON Terbol
4. Date of planting		
D_1	4444	2795
D_2	4556	2787
D_3	2752	1878
D_4	1155	1635
S.E.±	193	159
L.S.D. at 5%	616	508
C.V.%	23.9	27.9
B. Population level		
P_1 - 33.3 plants/m^2	3460	2420
P_2 - 25.0 plants/m^2	3247	2311
P_3 - 20.0 plants/m^2	3193	2211
P_4 - 16.7 plants/m^2	3007	2152
S.E.±	141	89
L.S.D.at 5%	NS	NS
C.V.%	17.5	15.7
D_1	Jun.18	Nov.19
D_2	Jul. 3	Dec.12
D_3	Jul.17	Jan. 9
D_4	Jul.31	Feb.11

Table 6.1.2. Yield (kg/ha) of lentils as affected by date of planting and plant population levels in Jordan and Lebanon during 1980-81.

TREATMENT	JORDAN	LEBANON	
	Jubeiha	Kfardan	Terbol
A. Date of planting			
D_1	1126	558	269
D_2	1261	540	531
D_3	920	262	562
D_4	724	225	366
S.E.±	34	29	49
LSD at 5%	155	92	157
C.V.%	9.7	29.11	45.5
B. Population level			
P_1 - 333.3 plants/m^2	1270	341	395
P_2 - 222.2 plants/m^2	877	445	457
P_3 - 166.7 plants/m^2	1019	402	470
P_4 - 133.3 plants/m^2	866	397	406
S.E.±	38	25	42
LSD at 5%	116	NS	NS
C.V.%	10.6	25.51	38.9
D_1	Nov. 4	Nov.28	Nov. 7
D_2	Dec. 6	Jan. 7	Dec. 3
D_3	Jan. 9	Feb.10	Jan. 9
D_4	Feb.14	Feb.23	Feb.12

At Jubeiha, advancing the date of planting by 34 and 65 days increased seed yields by 37.1 and 22.4% respectively. While delaying planting by 36 days reduced the yields by 22.4%. At Kfardan, advancing the date of planting by 34 and 43 days increased seed yields by 206 and 213% respectively and delaying planting for 13 days reduced yields by 14.1%. At Terbol, advancing the date of planting reduced seed yields, because of severe frost damage during flowering. Thus conventional date gave the highest yield. From these results, it appears that delaying the date of planting beyond the conventional date of planting reduces seed yield of lentils at all locations, however, the effect of advancing the date of planting varies from location to location.

In all the three locations, the effect of varying the plant population levels, on seed yields was significant only at Jubeiha.

6.1.4. Chickpea Date of Planting-Plant Population Trial - (CDPPT)

RESULTS AND DISCUSSION:

Data were obtained from Nicosia in Cyprus and Kfardan and Terbol in Lebanon and are presented in Table 6.1.3. The yields were generally higher in Lebanon than in Cyprus.

At Nicosia, planting early in the winter produced the highest seed yield, however, the differences between other dates were not significant. The low yields from mid and late winter planting were attributed to the low plant stand as a result of bird damage. At Kfardan, the highest yield was obtained from mid winter planting. Delaying planting into late winter and early spring reduced the yield by 7.3 and 27.0% respectively. At Terbol, the highest seed yields was from the late winter planting, advancing the planting into mid and early winter tended to reduce yields but the reductions were not significant. On the other hand, delaying the date of planting upto early spring reduced seed yield by 41.5%. Results from these three locations demonstrate that winter planting gives superior yields to spring planting

Table 6.1.3. Yield (kg/ha) of chickpeas as affected by date of planting and plant population levels in Cyprus and Lebanon during 1980-81.

TREATMENT	CYPRUS	LEBANON	
	Nicosia	Kfardan	Terbol
A. Date of planting			
D_1	807	1020	1431
D_2	559	1049	1458
D_3	469	972	1514
D_4	663	766	886
S.E.±	63	49	102
LSD at 5%	200	157	326
C.V.%	40.1	20.7	30.8
B. Population level			
P_1 - 33.3 plants/m^2	722	997	1432
P_2 - 25.0 plants/m^2	653	922	1348
P3 - 20.0 plants/m^2	617	916	1321
P_4 - 16.7 plants/m^2	505	971	1188
S.E.±	40	35	64
LSD at 5%	115	NS	NS
C.V.%	25.7	14.6	19.4
D_1	Dec.15	Nov.28	Nov. 8
D_2	Jan.27	Jan. 7	Dec.17
D_3	Feb.23	Feb.10	Jan. 9
D_4	Mar.17	Mar.13	Mar.20

in chickpeas. The failure to maximize seed yield from the early winter planting in Lebanon location could be due to colder winter experienced in Lebanon. Cold tolerant genotypes could still increase seed yields when planted in winter in colder locations.

The effect of plant population levels on seed yield was significant only at Nicosia; raising the population from 16.7 to 25.0 and 33.3 plants/m^2 increased seed yield by 29.3 and 43.0% respectively.

6.2. Fertility-cum-Inoculation Trial - (FIT)

6.2.1. INTRODUCTION

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

(i) Whether there is need for application of phosphate and potash
(ii) Whether the naturalized Rhizobia present in the soil were effective or there was a need for artificial inoculation
(iii) Whether the symbiotic nitrogen fixation was adequate in meeting the nitrogen need of the crop
(iv) Whether the symbiotic nitrogen fixation as reflected in terms of crop performance can be improved with starter nitrogen dressing.
(v) Whether the symbiotic nitrogen fixation is affected by the application of phosphorus and/or potassium.

Materials and Methods:

The basic set of fertility and inoculation treatments was the same for all the three crops except for faba beans in Egypt and Ethiopia. The basic treatments consisted of: (i) an unfertilized uninoculated control, (ii) 50kg P_2O_5/ha, (iii) 60kg K_2O/ha,

(iv) inoculation, (v) inoculation + 50kg P_2O_5/ha, (vi) inoculation + 60kg K_2O, (vii) inoculation + 50kg P_2O_5 + 60kg K_2O/ha and (viii) 100kg N + 50kg P_2O_5 + 60kg K_2O/ha. Faba bean trials in Ethiopia received the following additional treatments: (ix) inoculant + 50kg P_2O_5 + 60kg K_2O/ha, (x) inoculant + 30kg N + 50kg P_2O_5/ha, (xi) inoculant + 30kg N + 60kg K_2O/ha, (xii) 60kg N + 50kg P_2O_5 + 60kg K_2O/ha and (xiii) 120kg N + 50kg P_2O_5 + 60kg K_2O/ha.

The faba bean fertility trials in Egypt involved the following treatments: (i) an unfertilized uninoculated control, (ii) inoculation with Wad-Medani culture, (iii) inoculation with Aleppo culture, (iv) Aleppo inoculant + 36kg P_2O_5/ha, (v) Aleppo inoculant + 72kg P_2O_5/ha, (vi) Aleppo inoculant + 18kg N + 72kg P_2O_5/ha, (vii) Aleppo inoculant + 36kg N + 72kg P_2O_5/ha, (viii) 100kg N (½ basal, ½ top dressed) + 72kg P_2O_5/ha and (ix) inoculation with culture from Egypt.

The trials were designed as randomized complete block design and four replications were recommended. The cooperators could reduce the replications to three if land was limiting. The size of the plots was 18.0 m^2 (3.6m x 5.0m) for faba beans and chickpeas and it was 13.0m^2 (2.7m x 5.0m) for lentils. The net plot from which the reported seed yields were obtained, is from the central rows of 4m, leaving the two outside rows and 0.5m at either end.

6.2.2. Faba Beans Fertility-cum Inoculation Trial - (FBFIT)

RESULTS AND DISCUSSION:

Data were received from eight locations listed in Tables 6.2.1. and 6.2.2. They are put in two Tables because the locations in Egypt received a different set of treatment combinations.

Results from the Ethiopian, Lybian and Syrian locations show that inoculation increased seed yield only at Debre Zeit in Ethiopia. Thus suggesting that at the other locations the naturalized Rhizobium

Table 6.2.1. Yield (kg/ha) of faba beans as affected by fertility-cum-inoculation treatment at various locations during 1980/81.

Treatment	Locations				
	ETHIOPIA	LYBIA	SYRIA		
	Debre	Tripoli	Breda	Latta-kia	Tel Hadya
T_1 - Control	379	1272	476	1427	1170
T_2 - 50 kg P_2O_5/ha (P)	702	1856	684	1562	1749
T_3 - 60 kg K_2O/ha (K)	449	1009	566	1475	1365
T_4 - Inoculation with Rhizobium I	1088	1099	438	1614	1042
T_5 - I + P	620	2065	715	1803	1659
T_6 - I + K	1052	1014	431	1730	1233
T_7 - I + P + K	486	1848	747	1417	1347
T_8 - 100kg N + 50kg P_2O_5 + 60kg K_2O/ha	1108	1885	847	2301	1559
T_9 - Inoculant + P + K	836				
T_{10}- Inoculant + N + P	1970				
T_{11}- Inoculant + N + K	876				
T_{12}- 60kg N + 50kg P_2O_5+ 60kg K_2O/ha	1570				
T_{13}- 100kg N + 50kg P_2O_5 + 60kg K_2O/ha	1898				
Location mean	1003	1506	613	1666	1316
C.V. %	15.01	24.70	21.77	29.43	24.03
L.S.D. at 5%	254	547	197	732	465

Table 6.2.2. Yield (kg/ha) of faba beans as affected by fertility-cum-inoculation treatment at various locations in Egypt 1980/81

Treatment	Locations		
	Al Minia	Giza	Kafr Al Sheik
T_1 - Control	3692	514	4939
T_2 - Inoculation with Wad-Medani Culture	4015	551	5194
T_3 - Inoculation with Aleppo Culture	3763	544	4730
T_4 - Same as T_3 + 36kg P_2O_5/ha	3644	417	5018
T_5 - Same as T_3 + 72kg P_2O_5/ha	3439	595	5139
T_6 - Same as T_3 + 18kg N + 72kg P_2O_5/ha	3384	484	5582
T_7 - Same as T_3 + 36kg N + 72kg P_2O_5/ha	3745	782	5336
T_8 - No inoculation: 100kg N/ha (½ basal + ½ top dressing) + 72kg P_2O_5/ha	3676	519	5499
T_9 - Inoculation with culture from Egypt	3796	403	4847
Location mean	3684	534	5143
C.V. %	10.17	33.43	8.42
L.S.D. at 5%	N.S.	N.S.	N.S.

present in the soil was effective. The application of potassium fertilizer had no significant effect on seed yield in all the five locations. On the other hand, 50kg P_2O_5/ha increased seed yield by 85.2, 45.9, 43.7, 9.5 and 49.5% at Debre Zeit, Tripoli, breda, Lattakia and Tel Hadya respectively. The lowest response in Lattakia might suggest a higher phosphorous content in Lattakia soils. In the Syrian and Lybian locations, nitrogen fertilizer application did not significantly out yield inoculation plus phosphorous fertility treatment. This suggested that in the presence of P- the symbiotic nitrogen fixation was adequate in meeting the nitrogen need of the crop. On the other hand, at Debre Zeit, the symbiotic nitrogen fixation was not adequate as is illustrated by the high responses in seed yield from nitrogen application.

In the Egyptian locations, the yields were highest and lowest at Kafr Al Sheik and at Giza respectively. In all the three locations, the treatments did not significantly (P = 0.05) affect seed yield of faba beans. On the other hand, the highest yields were given by Wad-Medani culture at Al Minia, by Aleppo culture plus 36kg N and 72kg P_2O_5/ha at Giza and by Aleppo culture plus 18kg N and 72kg P_2O_5/ha at Kafr Al Sheik. Results from Egyptian locations suggest that faba beans tended to respond more to inoculation with the appropriate Rhizobia than to phosphorous or nitrogen fertilizer, even though the results were not statistically significant.

6.2.3. Lentils Fertility-cum-Inoculation Trial (LFIT)

RESULTS AND DISCUSSION:

Data were received from five locations listed in Table 6.2.3. The heaviest yields came from Arbil in Iraq and the lightest from Islamabad in Pakistan,

At Arbil, inoculation, phosphorous or potassium treatments had no significant effect on seed yield; on the other hand the application

Table 6.2.3. Yield (kg/ha) of lentils as affected by fertilizer-cum inoculation treatments at various locations during 1980/81.

Treatment	IRAQ	JORDAN		LEBANON	PAKISTAN
	Arbil	Jubeiha	Ramtha	Kfardan	Islamabad
T_1 - Control	2222	1053	574	931	208
T_2 - 50kg P_2O_5/ha (P)	2074	1325	597	809	255
T_3 - 60kg K_2O/ha (K)	2222	1326	537	727	192
T_4 - Inoculation with Rhizobium (I)	2046	1226	661	916	214
T_5 - I + P	2000	1133	545	653	201
T_6 - I + K	1852	1188	670	638	170
T_7 - I + P + K	2398	1019	600	794	201
T_8 - 100kg N/ha + 50kg P_2O_5 + 60kg K_2O/ha	1620	1064	581	528	303
Location mean	2054	1167	596	749	218
C.V. %	16.20	13.75	21.30	17.29	30.08
L.S.D. at 5%	N.S.	236	NS	190	N.S.

of nitrogen fertilizer reduced seed yield by 27.1%. These results suggest that soils at this location were lacking neither in the appropriate Rhizobium nor in phosphorous and potash. At Jubeiha in Amman, the application of phosphorous and potassium fertilizers increased seed yield by 25.6 and 25.9% respectively while inoculation tended to increase seed yield, the increases were not statistically significant. At Ramtha, inoculation or fertilizer application had no significant effect on seed yields. At Kfardan, Lebanon, the application of inoculum and phosphrous fertilizer applied separately had no significant effect on seed yield: the application of potassium fertilizer reduced seed yields by 21.9% ; combining inoculation with phosphorous or potassium fertilizers reduced seed yield by approximately 30%, the application of nitrogen with P and K fertilizers reduced seed yield by 43.3%. At Islamabad, Pakistan, the only treatment which affected seed yield substantially was the NPK treatment combination, this increased seed yield by 45.7%. The yields were relatively very low at this location.

Results from these five locations show different responses by lentils towards inoculation and fertilizer application. This should be attributed mainly to the differences in the soils from the different locations.

6.2.4. Chickpea Fertility-cum-Inoculation Trial - (CFIT)

RESULTS AND DISCUSSION:

Data were received from six locations listed in Table 6.2.4. The heaviest yields came from Shandaweel in Egypt and the lightest from Kafr Antoon (winter) in Syria.

At Shandaweel, (Egypt), Arbil (Iraq) and Kfardan, (Lebanon) the application of inoculum or fertilizer-nutrients had no significant effect on seed yields. At Islamabad, the application of K-fertilizer and K-fertilizer plus inoculum increased seed yield by 21.0 and 22.9% respectively; however, these increases were not statistically significant.

Table 6.2.4. Yield (kg/ha) of chickpeas as affected by fertility-cum-inoculation treatments at various locations during 1980/81.

Treatment	EGYPT	IRAQ	LEBANON	PAKISTAN	SYRIA	
	Shandawal	Arbil	Kfardan	Islama-bad	Kafr-Antoon	
					Winter	Spring
T_1 - Control	1333	704	940	1045	492	972
T_2 - 50kg P_2O_5/ha (P)	1250	741	1006	1108	647	983
T_3 - 60kg K_2O/ha (K)	1389	691	923	1264	302	860
T_4 - Inoculation with Rhizobium (I)	1472	685	934	1019	173	993
T_5 - I + P	1111	667	834	1143	835	1111
T_6 - I + K	1667	699	867	1284	326	998
T_7 - I + P + K	1389	620	970	1087	970	1055
T_8 - 100kg N/ha + 50kg P_2O_5/ha + 60kg K_2O/ha	1389	657	790	916	1530	1557
Location mean	1371	683	908	1108	660	1066
C.V. %	25.60	12.51	12.52	26.40	32.77	12.42
L.S.D. at 5%	N.S.	N.S.	N.S.	N.S.	318	195

The fact that results from these four locations show no significant gains in seed yields arising from either inoculation or fertilizer application should suggest that soils at these locations are not lacking in appropriate Rhizobium or in P and K.

At Kafr Antoon, in the winter planted chickpea, inoculation and K-fertilizer had no significant effect on seed yields, on the other hand the application of P-fertilizer, alone increased the yield by 31.5%, P-fertilizer plus inoculation increased yield by 97.2% while N + P + K more than trippled the yield. The positive responses due to P-fertilizer was attributed to the very low P- in the Kafr Antoon soils (1.5 ppm) in 1980/81. The poor response to inoculation coupled with the high responses to N-fertilizer suggest that the chickpea crop, at this location, required more nitrogen than it was able to fix. In the absence of P-fertilizer, the plants developed conspicuous N deficiency symptoms because of poor nodule development. Similar trends were observed in the spring grown chickpeas however, the differences amongst treatments were less pronounced in the spring grown crop. The winter planted crop in Kafr Antoon was affected adversely by Orobanche.

6.3. Weed Control Trial (WCT)

6.3.1. INTRODUCTION

The trial aimed at finding out the magnitude of yield loss that occurs in the faba beans, lentils and chickpeas crops owing to the presence of weeds. It also aimed at assessing the relative merit of some selected weed control treatments under the different agro-ecological conditions in the three crops in the ICARDA region.

Materials and Methods:

The basic treatments involved (i) weedy check, (ii) weed free by repeated hand weeding , (iii) hand weeding twice (30-40, 70-80 DAE) and (iv) - (xiv) herbicide application treatments. The details of these treatments are given in the appropriate tables.

The trials were designed as randomized complete block design with four replications. The plot size was 18.0m^2 (3.6m x 5.0m) for all the three crops. At harvest time the two outside rows and 0.5m at either end of the central rows were discarded. Thus the seed yields described in this report came from the central rows of 4m.

6.3.2. Faba Bean Weed Control Trial (FBWCT)

RESULTS AND DISCUSSION:

Data received from Sakha, (Egypt), Nicosia, (Cyprus) and Terbol (Lebanon) are presented in Table 6.3.1. The yields from Sakha and Terbol were similar (2.8 tons/ha). The yields from Nicosia were much higher (4.1 tons/ha) thus outyielding the other two locations by 46.0% approximately.

At Sakha there were significant differences in seed yields amongst the different treatments. The application of Igran at 3.0kg ai/ha outyielded the weed-free treatment. The following treatments were not significantly outyielded by the weed free treatment: Igran at 2.5 and at 2.0kg a.i./ha and tribunil at 3.0kg a.i./ha. All Maloran dosages produced lower yields than the weedy checks, however, the least effective herbicide was tribunil at 2.5 a.i./ha.

At Nicosia, herbicides were more effective at controlling the weeds than at Sakha: Seven herbicide treatments outyielded the weed free treatment. The best control was given by Maloran at 1.5kg a.i./ha, tribunil at 3.5kg a.i./ha and Igran at 2.5kg a.i./ha; these treatments outyielded the weed free plots by 9.5, 6.6 and 6.2% respectively. The least effective herbicides were : Maloran (1.0kg a.i./ha) and tribunil (2.5kg a.i./ha).

Results from Terbol suggest that there the weeds were not significantly affecting the seed yield. This is illustrated by the fact that the weedy check was not significantly different from the weed free treatment. Consequently the effectiveness of herbicides could not be evaluated under such circumstances.

Table 6.3.1. Yield (kg/ha) of faba beans as affected by weed control treatment at various locations during 1980/81.

Treatment	EGYPT Sakha	Rank	CYPRUS Nicosia	Rank	LEBANON Terbol	Rank	Rank accross location excluding ciyanazine & stomp treatments
T_1- Weedy check	2587	8	3714	13	3337	1	5
T_2- Weed free by repeated hand weeding	3360	2	4120	8	2914	9	4
T_3- Hand weeding twice(30-40 & 70-80 DAE)	3229	4	4187	7	2669	13	6
T_4- Pre-emergence application of Chlorbromuron (Maloran)at 1.0kg a.i./ha	2404	11	3705	14	3036	3	11
T_5- Chlorbromuron at 1.5kg a.i./ha	2456	10	4511	1	2651	14	12
T_6- Chlorbromuron at 2.0kg a.i./ha	2578	9	4318	5	2808	12	8
T_7-Pre-emerg. appl. of methanbenzthiozuron (Tribunil) at 2.5kg a.i./ha	2370	12	3783	12	2976	4	10
T_8- Methabenzthiazuron at 3.0kg a.i./ha	2813	6	3868	11	2870	10	9
T_9- Methabenzthiazuron at 3.5kg a.i./ha	2647	7	4391	2	2958	5	1
T_{10}-Pre-emrg. appl. of terbutryne (Igran) at 2.0kg a.i./ha	2830	5	4338	4	2919	7	3
T_{11}-Terbutryne at 2.5kg a.i./ha	3281	3	4374	3	2915	8	1
T_{12}-Terbutryne at 3.0kg a.i./ha	3411	1	4075	9	2502	15	7
T_{13}-Pre-emerg. appl.of ciyanazine (Bladex) at 0.5kg a.i./ha			4273*	6	2838	11	
T_{14}-Pre-emerg. appl.of ciyanazine " at 1.0kg a.i./ha			4073**	10	3039	2	
T_{15}-Pre-emerg. appl.of ciyanazine " at 2.0kg a.i./ha					2934	6	
Location mean	2831		4123		2891		
C.V. %	12.11		10.68		2.75		
L.S.D. at 5%	495		N.S.		N.S.		

* Used Pendimethalin (stomp) at 1.3kg a.i./ha
** Used " " at 1.6kg a.i./ha

At Sakha and Nicosia locations, the results indicate that Igran at 2.5kg a.i./ha gave the most effective control of weeds, the second best were Igran at 2.0kg a.i./ha and tribunil at 3.5kg a.i./ha.

6.3.3. Lentil Weed Control Trial (LWCT)

RESULTS AND DISCUSSION:

Data were obtained from six locations listed in Table 6.3.2. The highest seed yields came from Al Minia in Egypt (1.7 tons/ha) and the lowest from Terbol in Lebanon (0.05 tons/ha).

At Al Minia,hand weeding treatments did not outyield the weedy check, on the other hand, the application of Prometryne at the rate of 1.0, 1.5 and 2.0kg a.i./ha outyielded the weedy check by 61.7, 50.3 and 32.9% respectively.

Results from Giza location indicate that hand weeding proved better at improving seed yields of lentils than any of the herbicides used. Even weeding twice only outyielded the most effective herbicide (Prometryne at 1.5kg a.i./ha) by 54.1%. Nevertheless, all the herbicides treatments yielded several times higher than the weedy check.

At the American University of Beirut (AUB), the weedy check outyielded all the other treatments. It would therefore, appear that the weeds at this location were not the major constraint for seed yield and some phytotoxicity might have occurred from herbicides. Nevertheless, Prometryne at 1.5kg a.i./ha and tribunil at 1.5kg a.i./ha ranked second and third in terms of the amount of seed yields.

In Kfardan, Lebanon location, the application of a number of herbicides and hand weeding treatments outyielded the weedy check thus indicating a significant suppression in seed yields due to weeds. Ciyanazine at 1.5kg a..i/ha; Prometryne at 2.0kg a.i./ha and Ciyanazine at

Table 6.3.2. Yield (kg/ha) of lentils as affected by weed control treatments at various locations during 1980/81.

Treatment	EGYPT				LEBANON				NEPAL		PAKISTAN		****
	Al Minia	R	Giza Bahtim	R	AUB	R	Kfardan	R	Khomaltar	R	Islamabad	R	
T_1- Weedy Check	1449	10	160	12	442	1	142	15	612	12	113	7	12
T_2- Weed free by Rpt. hand weeding	1398	12	1472	2	133	12	366	5	805	5	164	4	7
T_3- Hand weeding twice (30-40 & 70-80 DAE)	1763	5	1482	1	162	11	309	8	796	6	128	6	4
T_4- Maloran at 1.0kg a.i./ha	1692	6	299	9	208	10	215	13	917	3	101	10	7
T_5- Maloran at 1.5kg a.i./ha	1426	11	366	8	241	7	293	9	781	8	138	5	10
T_6- Maloran at 2.0kg a.i./ha	1910	4	250	10	267	4	358	7	1092	1	69	12	5
T_7- Prometryne at 1.0kg a.i./ha	2343	1	691	6	210	9	240	11	742	10	111	8	5
T_8- Prometryne at 1.5kg a.i./ha	2178	2	962	3	364	2	365	6	993	2	200	1	1
T_9- Prometryne at 2.0kg a.i./ha	1925	3	842	5	171	11	519	2	794	7	181	2	2
T_{10}-Tribunil at 1.5kg a.i./ha	1606	9	224	11	271	3	250	10	852	4	169	3	3
T_{11}-Tribunil at 2.0kg a.i./ha	1639	7	604	7	243	6	144	14	698	11	111	8	11
T_{12}-Tribunil at 2.5kg a.i./ha	1610	8	847	4	119*	13	216	12	774	9	72	11	9
T_{13}-Ciyanazine at 0.5kg a.i./ha					214**	8	377	4					
T_{14}- " at 1.0kg a.i./ha					263***	5	406	3					
T_{15}- " at 1.5kg a.i./ha							572	1					
Location mean	1745		683		236		318		822		130		
C.V. %	25.58		17.19		45.41		37.41		27.20		39.11		
L.S.D. at 5%			170		153		170		N.S.		73		

* Bentazone at 0.25kg a.i./ha
** " at 0.50kg a.i./ha
*** " at 1.00kg a.i./ha

**** Rank across location excluding ciyanazine treatments.

1.0kg and 0.5kg a.i./ha outyielded the weed free treatment by 56.3, 41.8, 10.9 and 3.0% respectively.

At Khomaltar in Nepal, hand weeding and all the herbicides improved seed yields. Maloran at 2.0kg a.i./ha, Prometryne at 1.5kg a.i./ha, Maloran at 1.0kg a.i./ha and tribunil at 1.5kg a.i./ha outyielded the weed free treatment by 35.7, 23.4, 13.7 and 5.8% respectively. In turn, the weed free treatment outyielded the weedy check by 31.5%.

At Islamabad in Pakistan, continuous hand weeding outyielded the weedy check by 45.1%. Some herbicides were even more effective at improving seed yield than continuous hand weeding: Prometryne at 1.5kg and 2.0kg a.i./ha and tribunil at 1.5kg a.i./ha outyielded the weed free treatment by 22.0, 10.4 and 3.0% respectively.

Results from the different locations show that in locations where weeds were suppressing seed yields, seed yield could be improved by hand weeding or by using herbicides. At certain locations, the use of herbicides was more effective than the hand weeding. Although no one herbicide was most effective at all locations, results point out that Prometryne ranked first across seven locations.

6.3.4. Chickpeas Weed Control Trial (CWCT)

RESULTS AND DISCUSSION:

Data were received from six locations listed in Table 6.3.3. In addition to the 12 basic treatments, the locations in Lebanon were used for testing three rates of Ciyanazine. The highest seed yields came from Jinderis in Syria while the lowest came from Kfardan in Lebanon.

Results from Terbol location indicate that seed yield could be improved by hand weeding thus suggesting that weeds at this location

Table 6.3.3. Yield (kg/ha) of chickpeas as affected by weed control treatments at various locations during 1980/81.

Treatment	LEBANON				PAKISTAN		SYRIA						*
	Terbol		Kfardan		Islamabad		Kafr Antoon				Jinderis		
							Winter		Spring				
		Rank		Rank		Rank		Rank		Rank		Rank	
T_1 - Weedy Check	1288	14	383	13	840	9	488	10	1111	12	1904	4	12
T_2 - Weed free by repeated hand weeding	1710	2	990	2	1124	2	501	9	1306	5	2003	2	1
T_3 - Hand weeding twice (30-40 & 70-80 DAE)	1694	3	1112	1	753	11	821	1	1300	6	1841	7	3
T_4 - Maloran 1.5kg a.i./ha pre-emerg.	1440	8	495	5	952	4	582	7	1425	2	1996	3	3
T_5 - " 2.5kg " "	1382	10	447	8	863	7	709	4	1417	3	1850	6	6
T_6 - " 3.5kg " "	1520	7	442	9	833	10	640	5	1289	8	1728	10	8
T_7 -Tribunil 2.5kg " "	1390	9	254	15	913	5	526	8	1461	1	1747	9	7
T_8 - " 3.0kg " "	1325	11	321	14	851	8	372	12	1181	10	1861	5	10
T_9 - " 3.5kg " "	1586	5	428	11	719	12	488	10	1156	11	1713	11	10
T_{10}- Igran 2.0kg a.i./ha pre-emerg.	1319	12	408	12	865	6	598	6	1314	4	1661	12	9
T_{11}- " 3.0kg " "	1318	13	570	4	974	3	754	3	1296	7	2094	1	5
T_{12}- " 4.0kg " "	1748	1	519	7	1144	1	813	2	1214	9	1836	8	2
T_{13}- Ciyanazin 0.5kg a.i./ha	1123	15	442	9									
T_{14}- " 1.0kg a.i./ha	1548	6	521	6									
T_{15}- " 2.0kg a.i./ha	1608	4	789	3									
Location mean	1466		541		902		608		1289		1853		
C.V. %	23.97		27.18		26.33		33.49		9.87		20.40		
L.S.D. at 5%	N.S.		210		343		294		184		N.S.		

* Rank across location without Ciyanazine treatment.

were suppressing yields. Weed free by continuous hand weeding outyielded the weedy check by 32.8%. The use of herbicides proved effective at controlling the weed excepting the lowest rate of ciyanazine (0.5kg a.i./ha). The most effective herbicides were Igran at 4.0kg a.i./ha, ciyanazine at 2.0kg a.i./ha, tribunil at 3.5kg a.i./ha, they yielded 102, 94 and 93% respectively of the weed free treatment.

At Kfardan location, weeding by hand improved seed yield very significantly and weeding twice produced the best results. This treatment outyielded the weedy check by 190%. Hand weeding was superior to all the herbicides used in terms of improving seed yields. However, most herbicides outyielded the weedy check treatments. The most effective herbicides at this location were 2.0kg a.i./ha of ciyanazine and 3.0kg a.i./ha of Igran; they respectively outyielded the weedy check by 106 and 48.8%.

At Islamabad continuous weeding outyielded the weedy check by 33.8%; weeding twice only was not effective. Some herbicides were also effective at controlling weeds: Igran at 4.0kg a.i. and at 3.0kg a.i./ha and Maloran at 1.5kg a.i./ha yielded 102, 87 and 85% of the weed free treatment.

In the winter planted crop at Kafr Antoon, hand weeding improved seed yield and the best results came from the treatments where weeding was done only twice. All the herbicide treatments, except tribunil at 3.0kg a.i./ha outyielded the weedy check treatment. Nevertheless significant improvement in yields were given by Igran at 4.0kg and 3.0kg a.i./ha and by Maloran at 2.5kg a.i./ha; they outyielded the weedy check by 66.6, 54.5 and 45.3% respectively. In the spring sown crop, both hand weeding and herbicide application outyielded the weedy check, in this season, tribunil at 2.5kg a.i./ha; Maloran at 1.5 and 2.5kg a.i./ha and Igran at 2.0kg a.i./ha outyielded the weed free treatment by 11.9, 9.0, 8.0 and 0.6% respectively.

At Jinderis location, which had the highest seed yield there were no significant differences amongst yields from the different treatments.

Considering the mean ranking across the locations repeated hand weeding gave the most effective weed control; Igran at 4.0kg a.i./ha came second; hand weeding twice and Maloran at 1.5kg a.i./ha produce identical results and are ranked third.

7. ACKNOWLEDGEMENTS

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

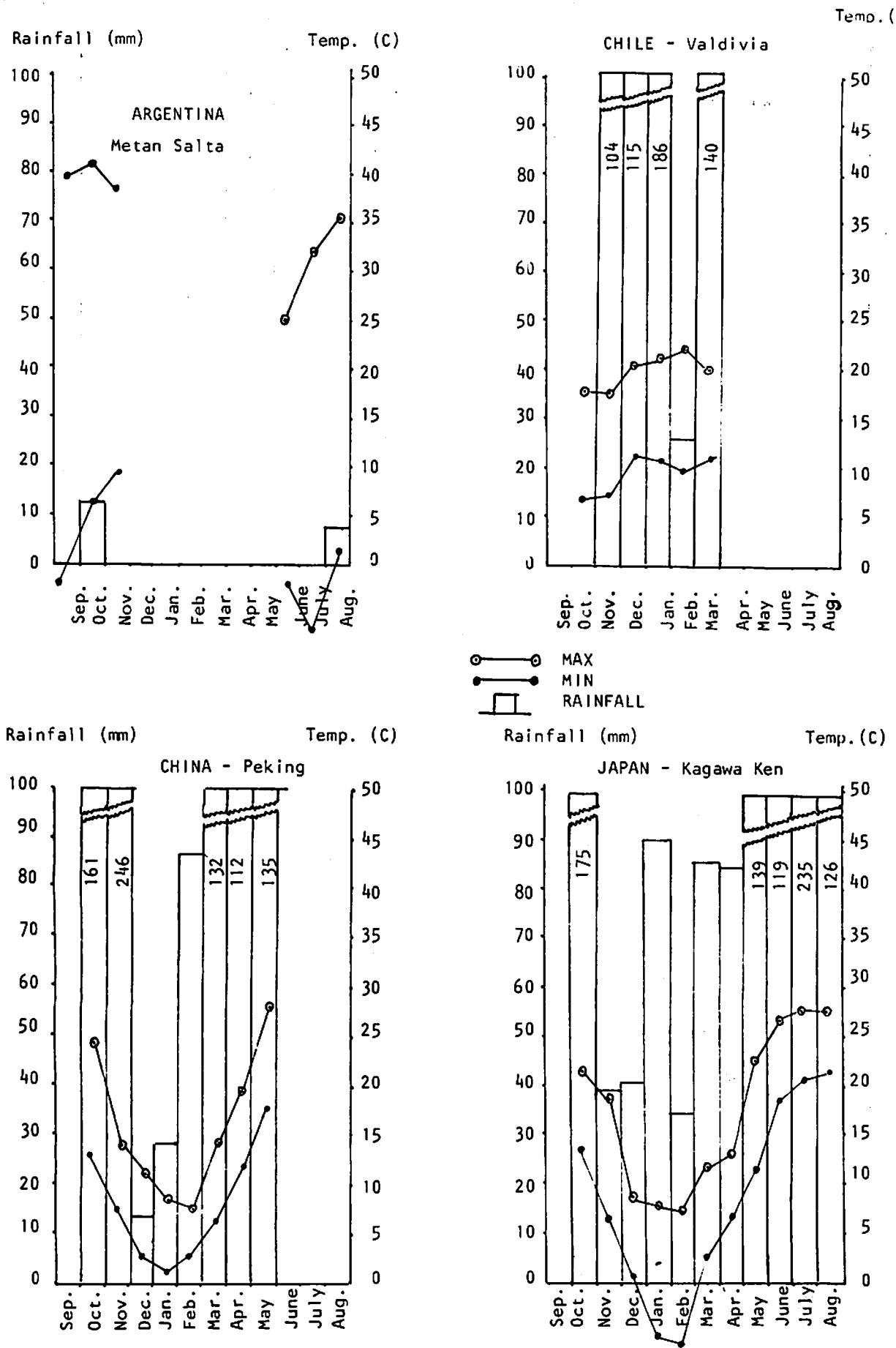
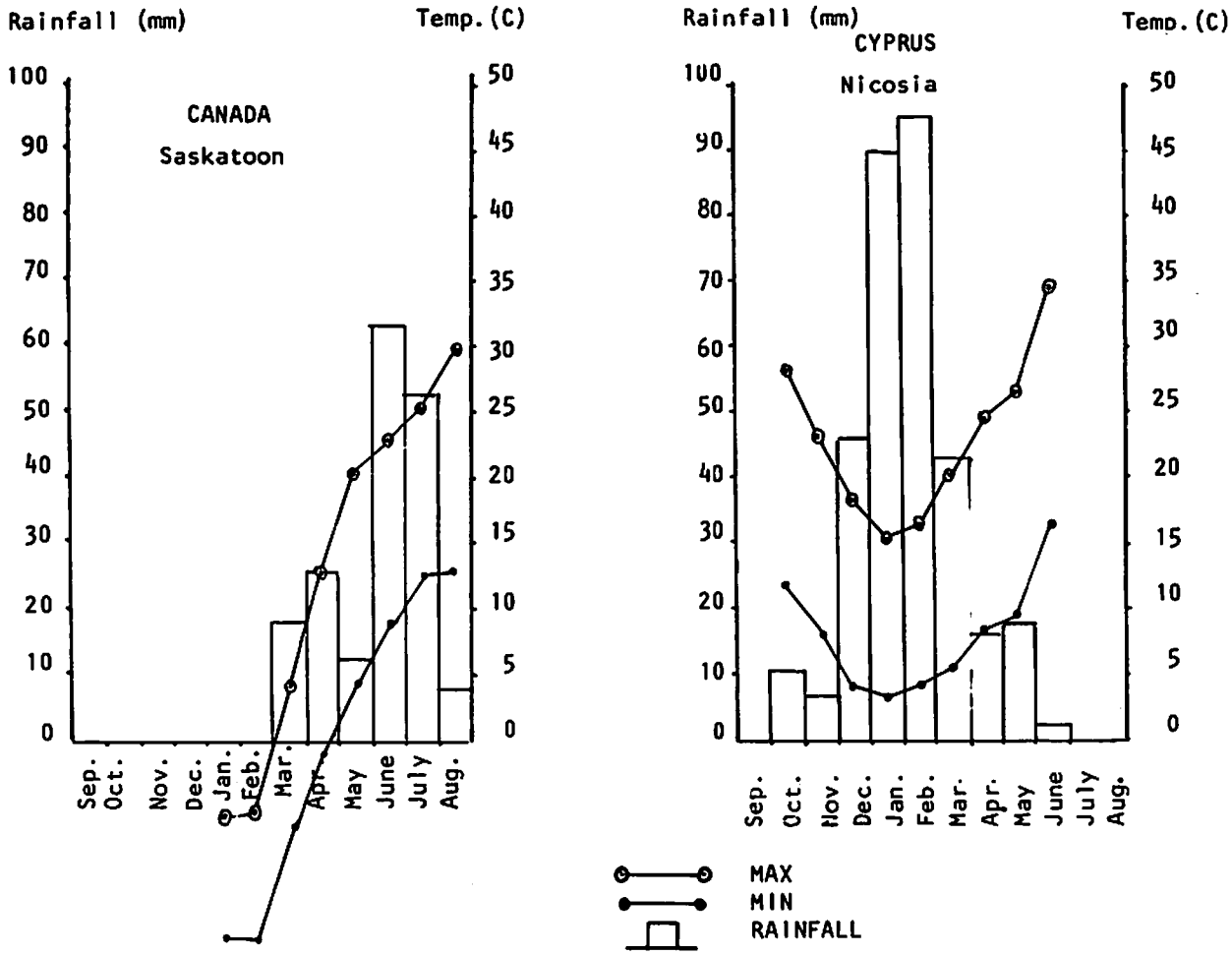


Fig. 1. Monthly maximum and minimum temperature and monthly total rainfall during the cropping season at different locations.


Rainfall (mm)
Temp. (C)
CANADA
Saskatoon
CYPRUS
Nicosia
MAX
MIN
RAINFALL
Sep.
Oct.
Nov.
Dec.
Jan.
Feb.
Mar.
Apr.
May
June
July
Aug.

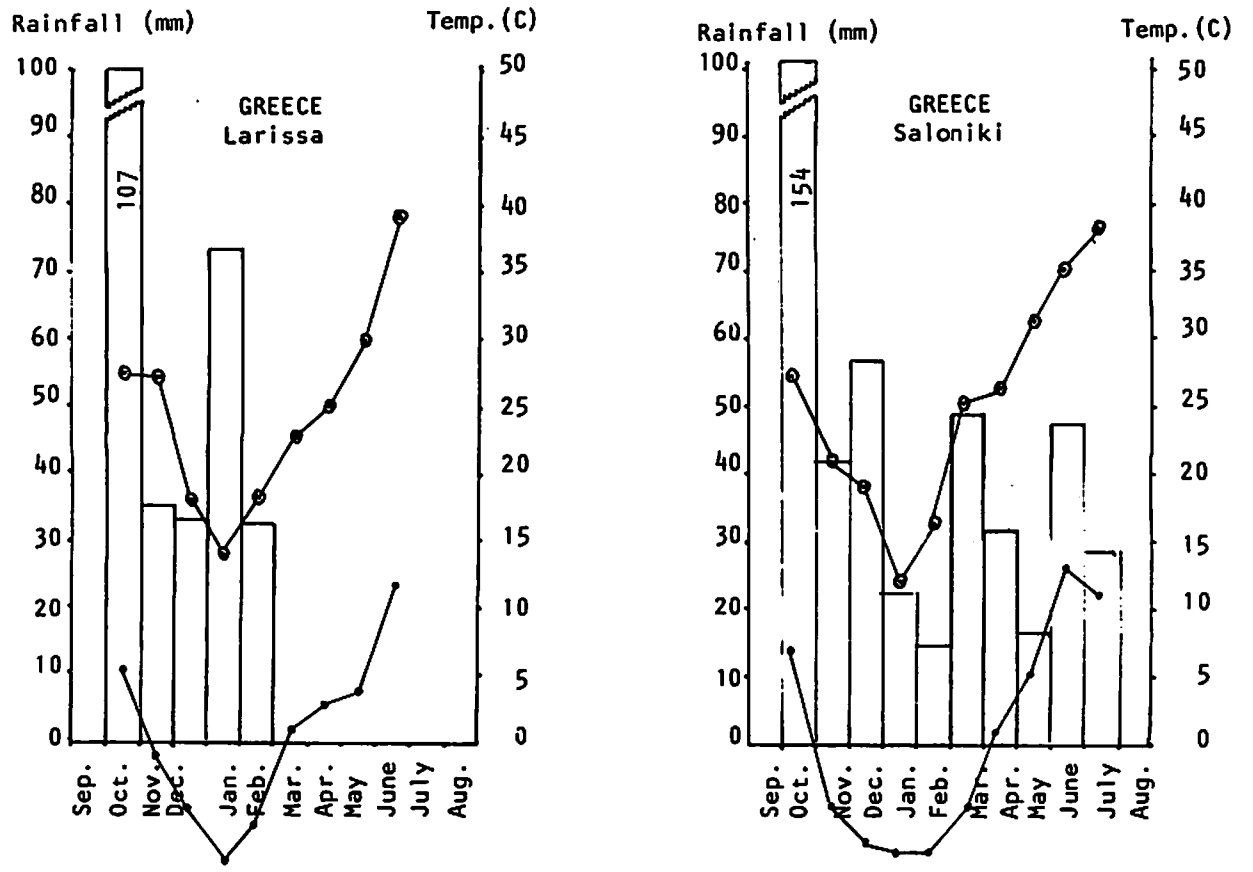
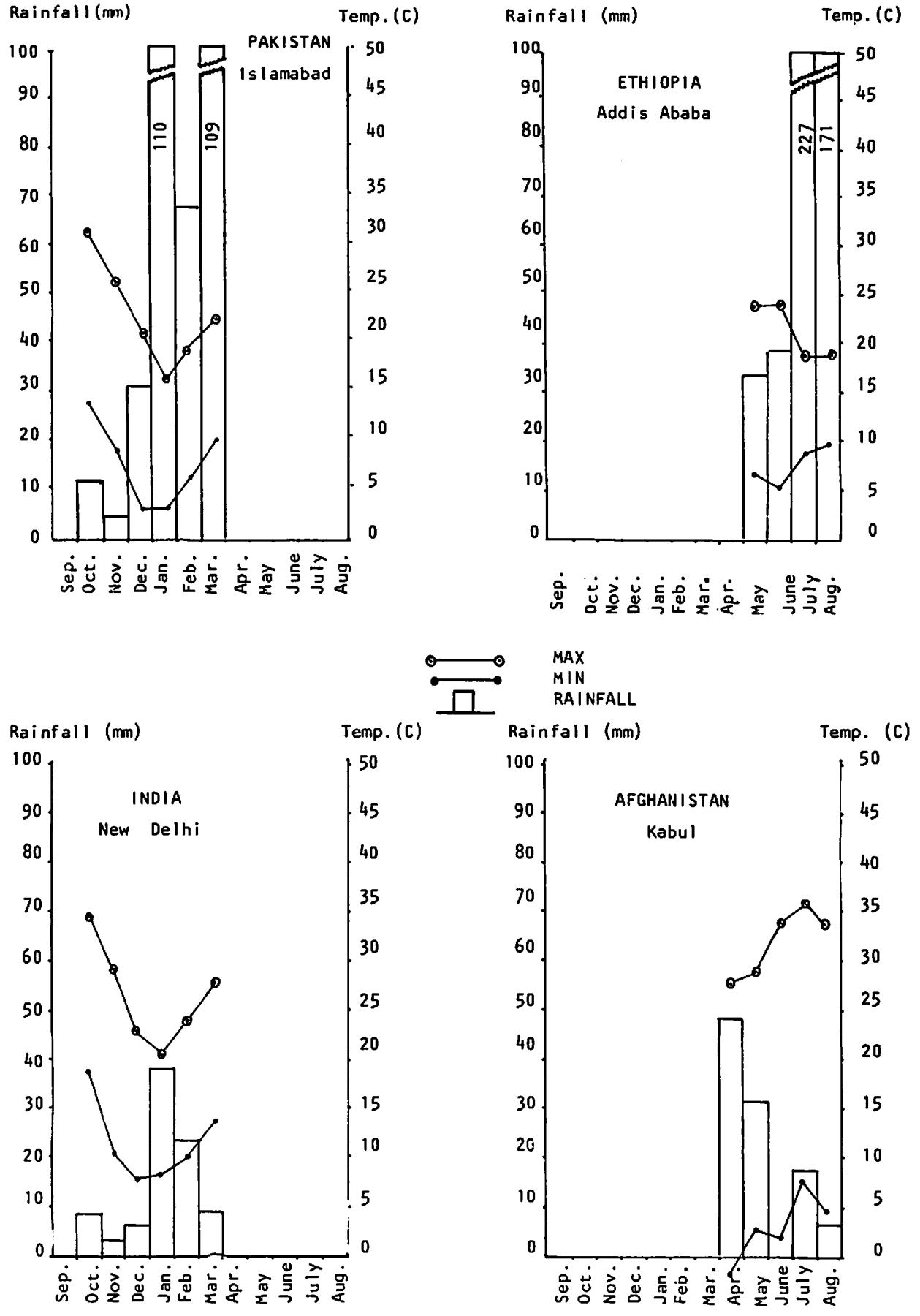

Rainfall (mm)
Temp. (C)
GREECE
Larissa
107
GREECE
Saloniki
154
Sep.
Oct.
Nov.
Dec.
Jan.
Feb.
Mar.
Apr.
May
June
July
Aug.

Fig. 1. cont'd.


Rainfall(mm)
Temp.(C)
PAKISTAN
Islamabad
110
109
Rainfall (mm)
Temp.(C)
ETHIOPIA
Addis Ababa
227
171
MAX
MIN
RAINFALL
Rainfall (mm)
Temp.(C)
INDIA
New Delhi
Rainfall (mm)
Temp. (C)
AFGHANISTAN
Kabul
Sep.
Oct.
Nov.
Dec.
Jan.
Feb.
Mar.
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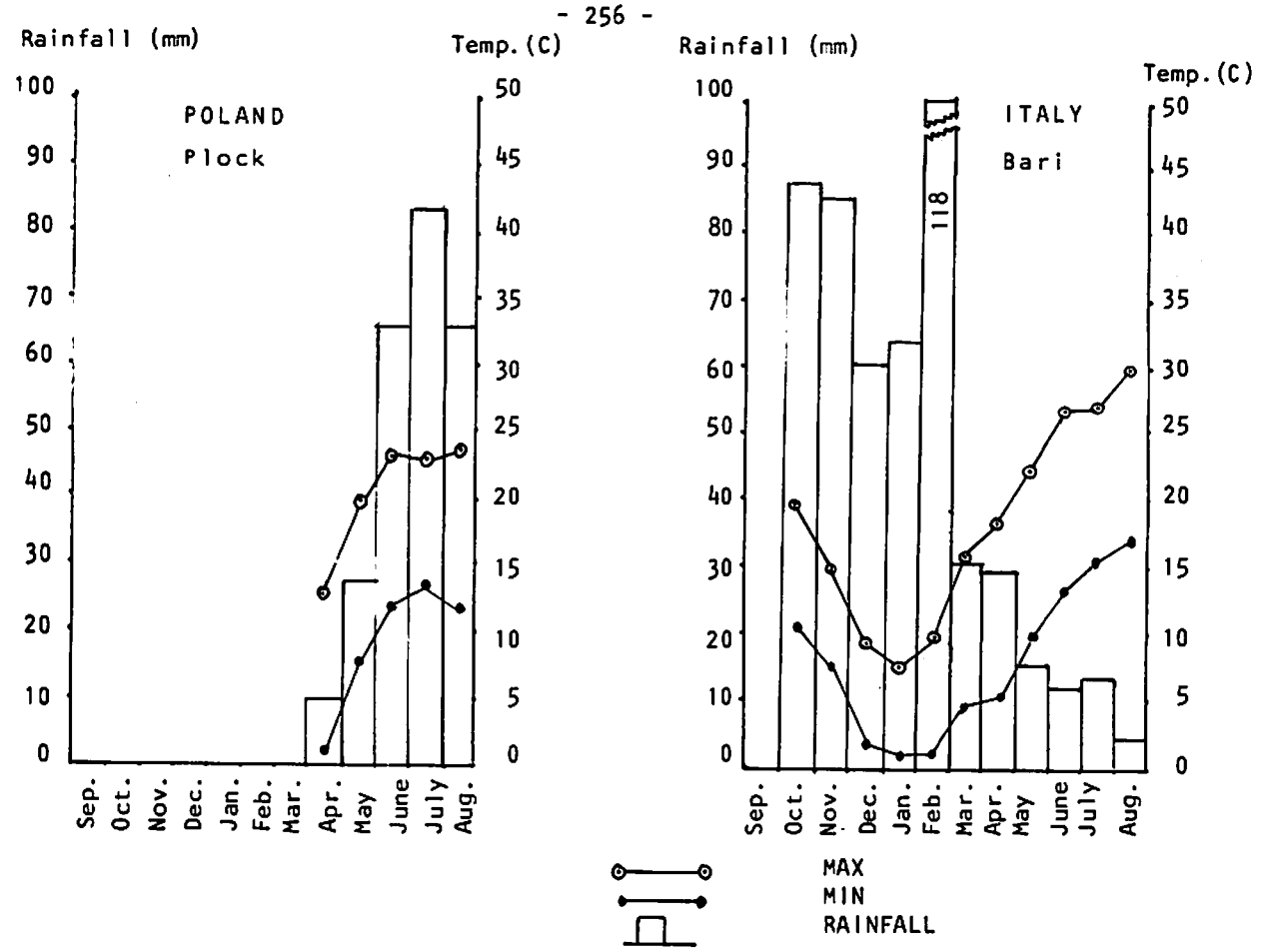
May
June
July
Aug.

Fig. 1. cont'd.


Rainfall (mm)
Temp.(C)
POLAND
Plock
ITALY
Bari
118
MAX
MIN
RAINFALL
Sep.
Oct.
Nov.
Dec.
Jan.
Feb.
Mar.
Apr.
May
June
July
Aug.

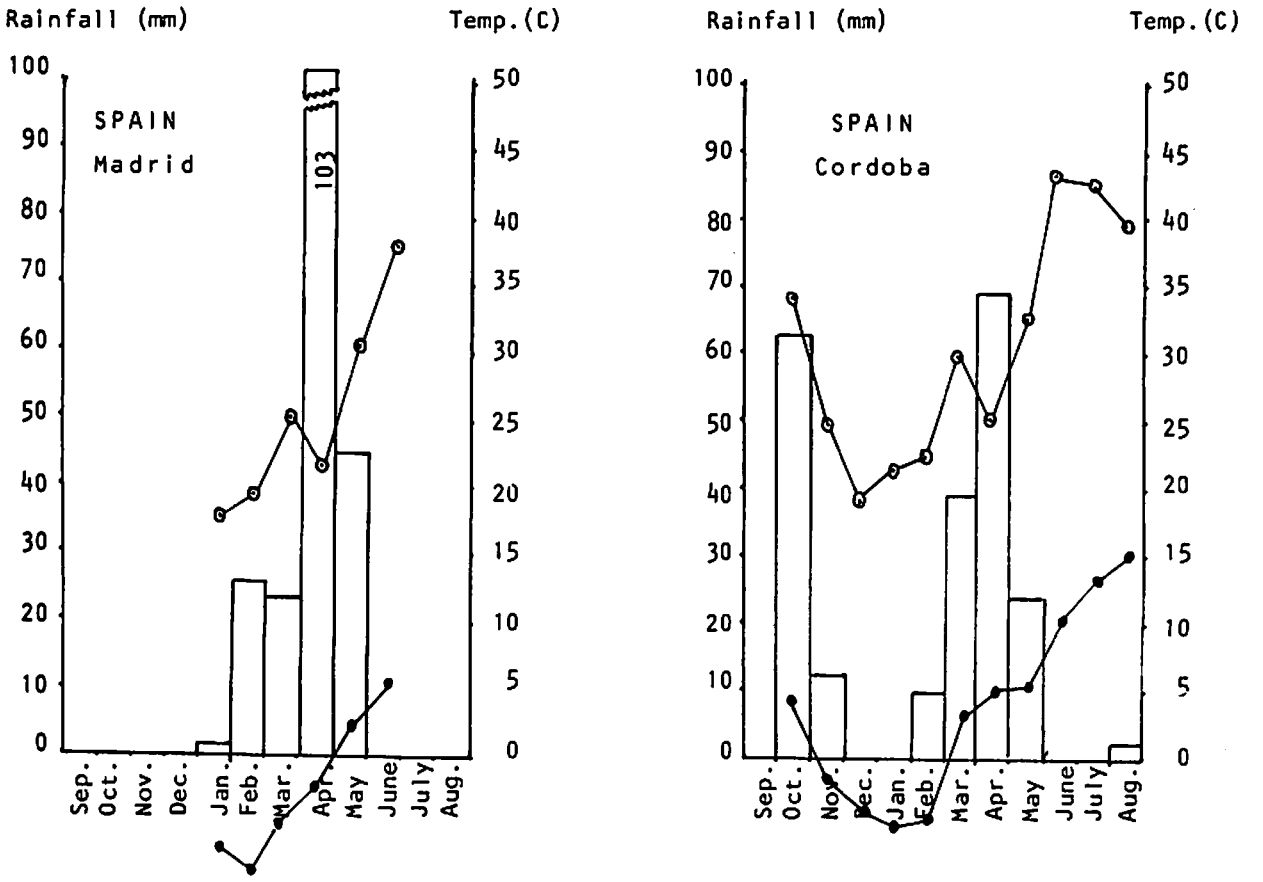
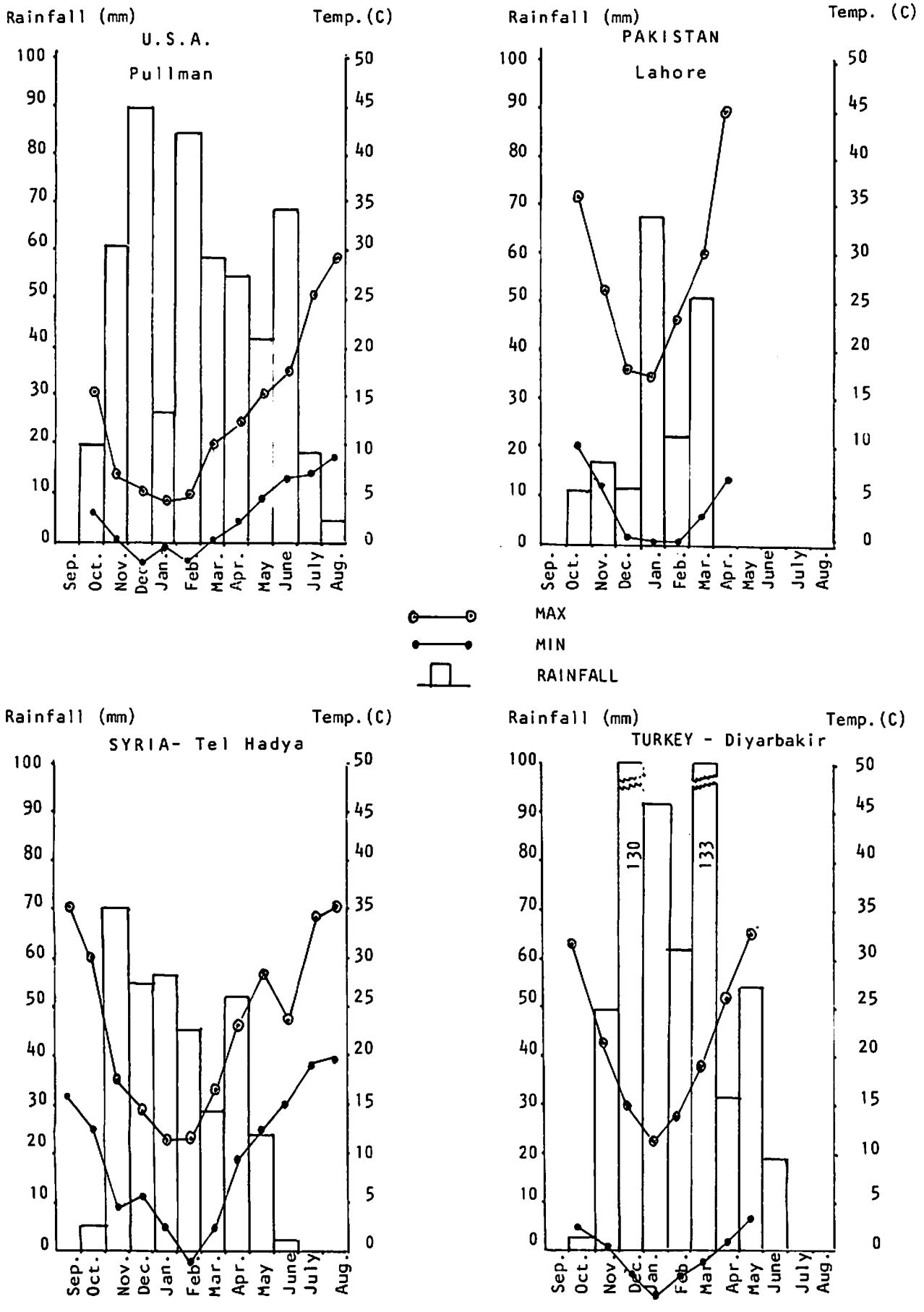
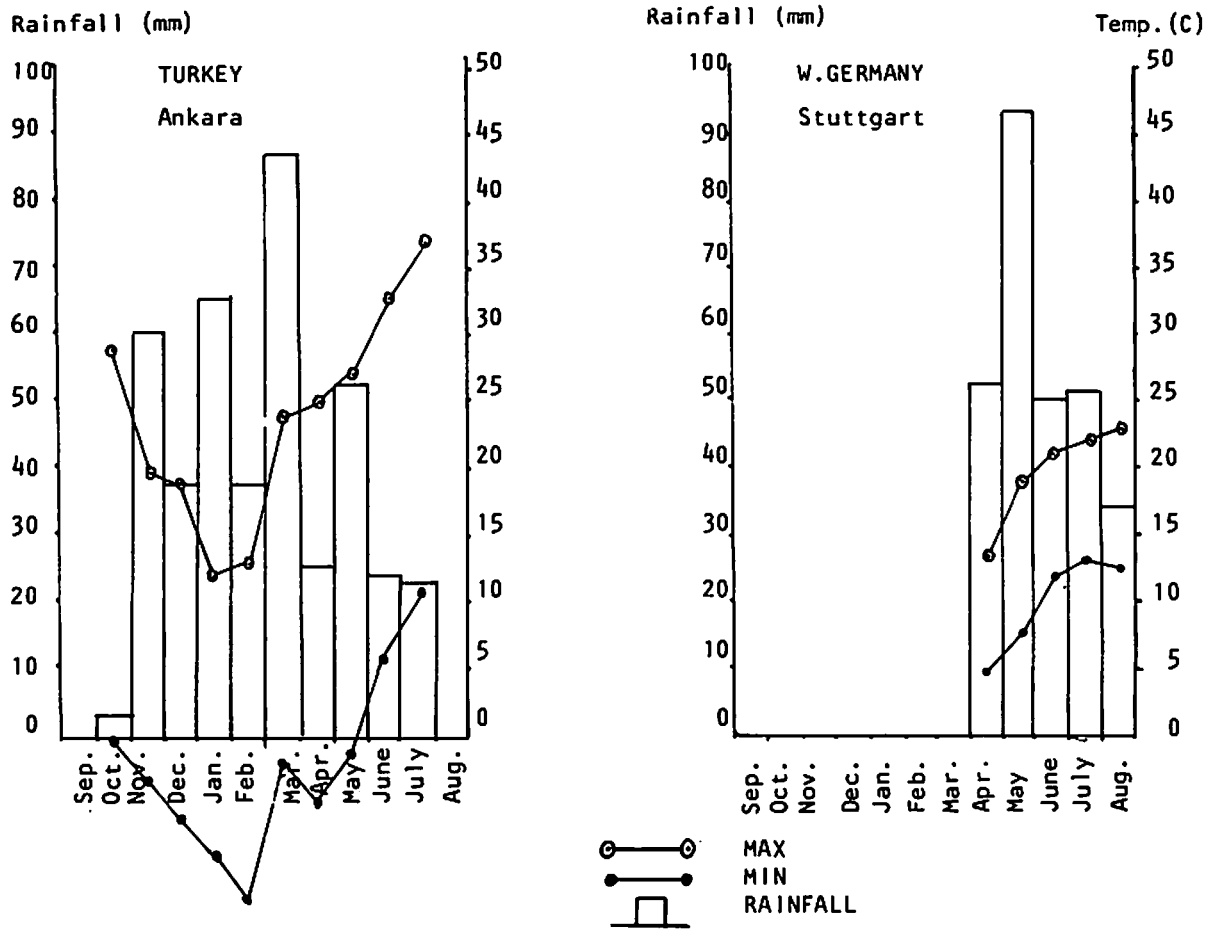

Rainfall (mm)
Temp.(C)
SPAIN
Madrid
103
SPAIN
Cordoba
Sep.
Oct.
Nov.
Dec.
Jan.
Feb.
Mar.
Apr.
May
June
July
Aug.

Fig. 1. cont'd.


Rainfall (mm)
Temp.(C)
U.S.A.
Pullman
Rainfall (mm)
Temp. (C)
PAKISTAN
Lahore
MAX
MIN
RAINFALL
Rainfall (mm)
Temp.(C)
SYRIA- Tel Hadya
Rainfall (mm)
Temp.(C)
TURKEY - Diyarbakir
130
133
Sep.
Oct.
Nov.
Dec.
Jan.
Feb.
Mar.
Apr.
May
June
July
Aug.


Rainfall (mm)
TURKEY
Ankara
Rainfall (mm)
Temp. (C)
W.GERMANY
Stuttgart
Sep. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug.
MAX
MIN
RAINFALL
Rainfall (mm)
Temp. (C)
NEPAL - Kathmandu
140
Rainfall (mm)
Temp. (C)
LEBANON - AUB
130
177