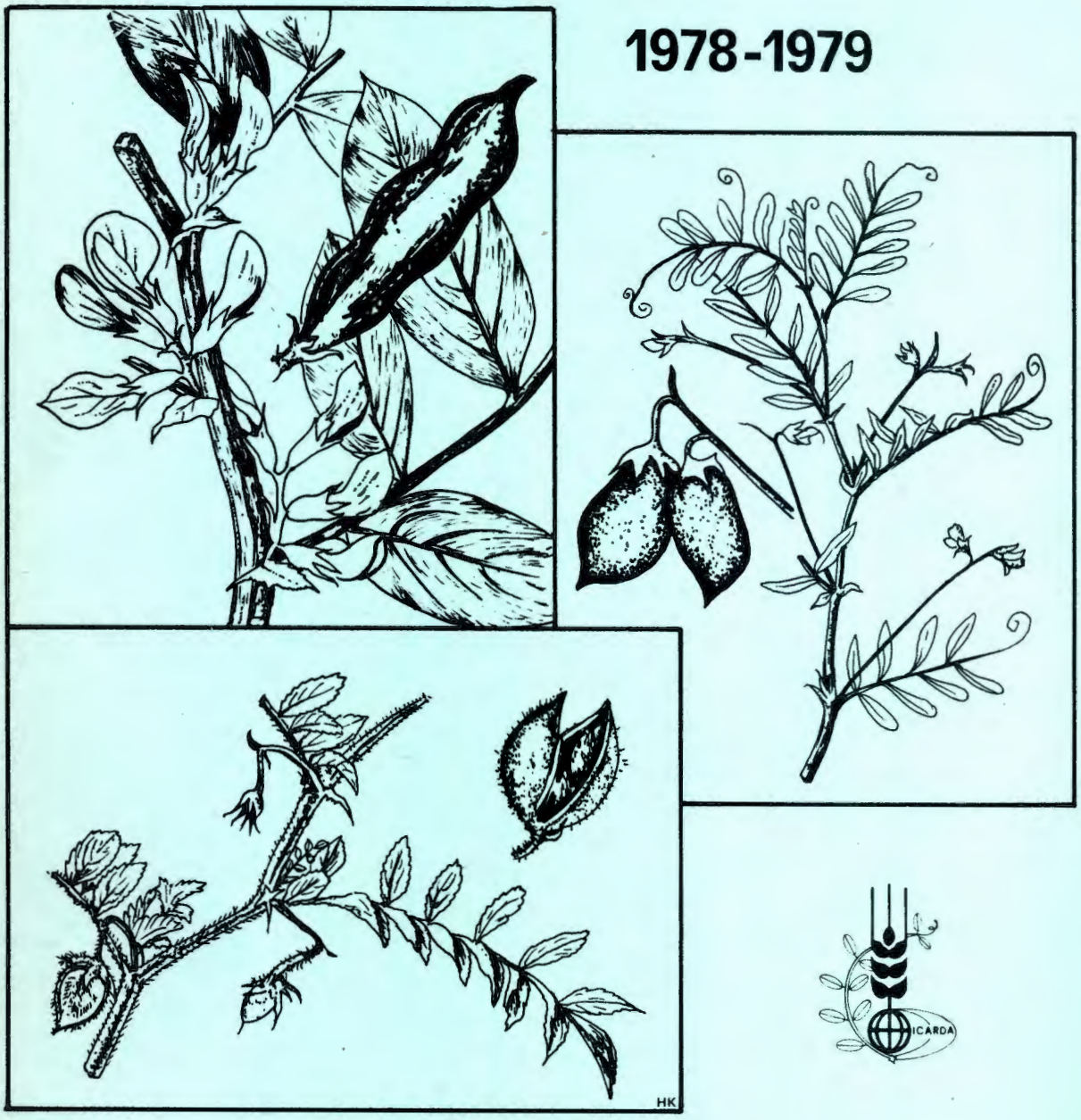
INTERNATIONAL NURSERY REPORT No.3

FOOD LEGUME NURSERIES



1978-1979

THE INTERNATIONAL CENTER FOR AGRICULTURAL RESEARCH IN THE DRY AREAS

March 1981

PREFACE

This report summarises the data received from scientists, who cooperate with the Food Legume Improvement Program (FLIP) at ICARDA, for the 1978/79 crop season, on replicated yield trials, non-replicated screening and disease nurseries and agronomic trials. The report has been prepared by FLIP staff at ICARDA, and it is hoped that the results and discussion will be of practical use and interest to legume scientists in the region. Any comments or suggestions arising from this report would be welcomed

CONTENTS

1. INTRODUCTION

The international cooperative program on food legume improvement is coordinated by the International Centre 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 originating from national and international programs. The testing aims at evaluating genotypic performance for both seed yield and reaction to pathogenic 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 multi-location testing permits the dissemination of elite segregating populations to interested scientists.

2. ICARDA INTERNATIONAL TRIALS AND NURSERIES FOR THE 1978/79 SEASON

2.1 DESCRIPTION

The following gives a brief account of the trials and nurseries that were distributed by ICARDA, in the three different crop improvement programs, during 1978/79.

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 this 1978/79 season. The results from this first set of trials are presented in this report.

2.1.2 International Yield Trials (IYT).

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

The IYTs are replicated trials which test advanced materials that have previously shown above average performance. The IYTs permit an assessment of yield performance (G) across a range of environments (E) and provide an estimate of the relative size of GxE interactions in that growing season. This should both allow national programs to identify genotypes best adapted to their local conditions, and provide ICARDA with information that will rationalise crossing programs for the different countries.

2.1.3 International Screening Nurseries (ISN).

The ISNs form an adjunct to the IYTs by providing an initial evaluation of a large number of advanced genotypes, 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.

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

2.1.5 International Disease Nurseries (I-N).

The development of cultivars resistant to pathogens 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 pathogenicity of legume diseases in the different areas. The International

Disease Nurseries were formulated to rectify this situation and aim to test a relatively large number of genotypes, in an unreplicated design, in a range of locations covering a number of countries. The nursery results will thus furnish information on the incidence and severity of the disease 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 disease resistance. The one nursery available for distribution in the 1978/79 season was a Faba bean and Chickpea International Ascochyta Blight Nursery (FBIABN, CIABN).

2.1.6 International Agronomy Trials.

In many countries the legume crops tend to be neglected in favour of the cereal crops, resulting in poorer management and fewer agronomic inputs. To combat this trend it is essential to develop suitable agronomic management practices for legumes that, if adopted, would increase both seed yields, a farmer's income, and hence enhance total the production in a country. Also the use of such practices should permit the full benefit to be gained from the cultivation of the potentially heavy seed yielding cultivars that emerge from plant breeding programs. The one trial available for distribution in the 1978/79 season was a fertility-cum-plant population trial (FPPT) for all three crops.

2.2 DISTRIBUTION AND LIST OF COOPERATORS

In table 2.1 is given a list of the trials and nurseries distributed from ICARDA to the different countries, in table 2.2 a list of the cooperators, and in table 2.3 details on some of the locations at which the trials were grown. Data were returned on 131 of the trials and nurseries, representing 51 % of the number distributed.

Table 2.1. Distribution of trials and nurseries during 1978/79.

	CHICKPEAS						FABA BEANS					LENTILS					
	CAT	CIYT	CISN	CIF3T	CIABN	CFPPT	FBAT	FBISN	FBIF3N	FBIABN	FBFPPT	LAT	LIYT	LISN	LIF3T	LFPPT	Total
ALGERIA	4	2	2	1	1	3	2	2	2	2	3	4	3	1	1	3	36
ARGENTINA														1			1
BANGLADESH														1			1
CHILE		1	1											1			3
CYPRUS		1	1	1			1	1					1				6
EGYPT	1	1	1				1	1	1	1		1	1	1			10
ETHIOPIA							1	1	1	1	1						5
INDIA			2		2			1				2	1	3			11
IRAN	1	1	1			1						1	1	1		1	8
IRAQ	3	1	1	1		3	1	2			2	1	2	1		3	21
JORDAN	1	1	1	1	1	2					2	1	1		1	2	14
LEBANON	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	16
LIBYA			1				1	1	1		1	1		1		1	8
MOROCCO	1	1	1					1	1								5
NEPAL		1	1				1					1	2	1			7
PAKISTAN	3	1	1	1	1	3	1	2	1		1	1	1	1	1	2	21
SUDAN	1						1		1			1					4
SYRIA	1	4	1		1	1		1	1		1	1	1			1	14
THAILAND							1							1			2
TUNISIA	1	1	1		1	1	1	1	1	1	1	1					11
TURKEY	3	2	2	2	3	4	1	1		1	1	4	2	3	1	1	31
ICARDA	1	1	1	1	2	2	1	2	2	2	2	1	1	1	1	1	22
Total	22	20	20	9	13	21	14	19	13	9	16	22	18	19	6	16	257

Table 2.2: Latitude, longitude, altitude and rainfall for some of the locations from which data was received for 1978/79 season.

Country	Location	Latitude	Longitude	Altitude (m)	Rainfall[2] (mm)
Algeria	Sidi-Bel-Abbes	35° 30' N	0° 40' E	490	215
Bangladesh	Mymensingh	24° 46' N	90° 24' E	18	52
Egypt	Sakha	30° 45' N	31° 00' E	6	NA
	Seds	31° 00' N	28° 30' E	NA[1]	NA
Iraq	Dihok	36° 50' N	43° 05' E	NA	NA
	Sulimania	35° 33' N	45° 25' E	825	664
Jordan	Jubeiha	32° 02' N	35° 52' E	980	345
	Rabba	32° 16' N	35° 45' E	920	277
Lebanon	Tel Amara	33° 55' N	35° 28' E	950	418
	Terbol	34° 00' N	36° 00' E	NA	NA
Libya	Janduba	32° 11' N	13° 00' E	700	370
	Tajoura	32° 53' N	13° 11' E	11	385
Morocco	Rabat	33° 59' N	6° 52' W	25	600
Nepal	Birgunj	27° 20' N	84° 35' E	100	48
	Kumal	27° 40' N	85° 20' E	1360	146
Sudan	Hudeiba	17° 34' N	33° 56' E	351	26
Syria	Hama	35° 08' N	36° 43' E	300	NA
	Homs	34° 50' N	36° 45' E	487	NA
	Izra'a	32° 51' N	36° 15' E	575	142
	Lattaqueh	35° 40' N	35° 40' E	7	NA
	Qarahta	36° 30' N	33° 30' E	NA	NA
	Tel Hadya	36° 40' N	37° 20' E	392	355
Turkey	Ankara	39° 50' N	32° 40' E	902	353
	Diyarbakir	37° 55' N	40° 12' E	660	351
	Erzurum	39° 55' N	41° 16' E	1869	467
	Eskisehir	39° 46' N	30° 31' E	792	338
	Izmir	38° 35' N	27° 04' E	10	195
W. Germany	Stottgart	49° 00' N	9° 00' E	420	282

(1) Not available.

(2) Total rainfall received during the crop growing season.

Table 2.3 : List of cooperators during 1978/79.

ALGERIA.

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I.D.G.C. B.P. 16,
El-Harrach,
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Dr. Noureddine Bouattoura,
Chef de Department de Genetique,
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AFGHANISTAN.

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CYPRUS.

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IRAQ.

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2.3 DESIGN, ANALYSIS AND MANAGEMENT

2.3.1 Design and Analysis

The designs used for the individual trials and nurseries are given in the crop reports. However, it will be noted that although the International Yield and F_3 Trials (IYTs and IF_3Ts) were designed as lattices, all the data presented from these trials were derived from analyses undertaken as randomised blocks. Without computer facilities this permitted a more rapid analysis of the results, which was necessitated by the need to make speedy selection decisions about the entries to be included in the next season's international trials. However, in the future it is hoped to undertake the lattice analyses and report on the comparative efficiency of the two different designs.

The International Screening Nurseries (ISNs) included both test and check entries, of which only the latter were replicated, being planted after every ten test entries. No form of statistical analysis is possible with this design, apart from calculating a coefficient of variation for the check entries. To rectify this the ISNs in the following seasons will use an augmented design, as proposed by Federer (1956)[1]. This design is again unreplicated but does permit 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 has been analysed statistically, and the term ' significant' has been used to denote a probability level (P) equal or less than 0.05. The coefficients of variation given in the different tables were calculated using an error mean square (EMS) from the relevant analysis of variance. The EMS was also used to calculate the appropriate least significant difference (LSD), which was used to test whether a genotype's performance differed significantly from that of the control (local check). The LSD is not appropriate for testing differences between any pair of genotypes in a trial.

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

2.3.2 Management

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

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

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. CHICKPEA INTERNATIONAL TRIALS AND NURSERIES

3.1 CHICKPEA ADAPTATION TRIAL (CAT)

Material

The eight test entries in the CAT were kabuli genotypes, originating from different countries, and were either local unselected cultivars or established varieties; in both cases the genotypes are widely cultivated commercially in their country of origin. It is hoped that such a choice of genotypes will provide the desired 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 randomised block with four replicates. The recommended plot size was four rows, each of 4 m, with an inter- and intra-row spacing of 0.30 m and 0.10 m respectively.

Twenty-two sets of the trial were dispatched to cooperators in 12 countries. Results were returned from 12 trials covering nine countries, although those from Pakistan have not been reported here, as the trial suffered a severe attack of Ascochyta blight. Available information supplied on the agronomic practices employed at the different locations is given in table 3.1.

Results and Discussion

The data for days to flowering are given in table 3.2. The location means varied from 111 days in Algeria, reflecting the early planting, to 53 days in the Sudan. In the Sudan ILC 1929 and ILC 1932 were relatively very early, but this differential was not maintained at other locations, which showed relatively little intra-location variation.

The seed yield of the genotypes is given in table 3.3.The location means varied by up to 552 % with the extremes represented by 326 and 1801 kg/ha in Sudan and Syria respectively. The coefficient of variation ranged from 7.6 % in Syria to 70.9 % in Sudan. 'F' tests indicated that genotypic differences were significant at the following locations; Egypt, Dihok and Sulimania in Iraq, Sudan and Syria. ILC 1922 had the heaviest mean seed yield across locations and ranked first at four locations. However, if the very variable trial in the Sudan is eliminated, ILC 1929 had the heaviest overall seed yield. This largely reflected its particularly heavy seed yield in Lebanon and not the consistancy associated with ILC 1922.

For the trials at two locations in a country, namely Iraq and Turkey, there was a similarity in the performance of the genotypes.This was not evident in other countries, however, indicating the presence of genotype X location interactions. As such these results have not allowed the classification of the countries into meaningful agro-ecological zones. Further, the interlocation differences in seed yield were not reflected in a similar pattern of differences for days to flower. Thus flowering time would appear to have been a poor indicator of the environmental factors that resulted in the large observed differences in seed yield. However, these results only represent the initial phase of a longer term study, which will involve a repetition of the CATs over as many years and locations as is practically possible. Only then may a detailed adaptation analysis permit some meaningful zoning of the countries.

Table 3.1. Agronomic data for different locations for the CAT during 1978/79.

Country	Location	Planting date	Crop[1] duration (days)	Fertilizer (kg/ha)			Irrigation	Insecticide
				N	P_2O_5	K_2O		
ALGERIA	Sidi-Bel-Abbes	27/12	172		90			
IRAQ	Dihok	2/3	93					Kalon
	Sulimania	18/3	102	45	42			
JORDAN	Raba	20/2		20	60			
LEBANON	Terbol	29/3	99	40	60		1	Dimecron, Malathion } X 1
SUDAN	Ed-Damer	21/11	114	43			8	Endosulphan x 3
SYRIA	Tel-Hadya	25/2	109	30	50		2	
TURKEY	Ankara	5/3	132	20	60			

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

Table 3.2 . Days to flower for entries in the CAT at different locations during 1978/79.

Entry	Varietal name	Origin	ALGERIA	EGYPT	IRAQ		JORDAN		LEBANON	SUDAN	SYRIA	TURKEY	
			Sidi-Bel-Abbes	Seds	Dihok	Sulimania	Raba	Jubeiha	Terbol	Ed-Damer	Tel-Hadya	Ankara	Eskishehir
ILC 519	Giza 1	Egypt	107	76	54	61	58	69	52	53	68	87	75
1919	C- 550	India	112	75	63	63	65	72	50	58	67	87	75
1922	Rabat	Morocco	111	76	65	62	65	74	58	62	70	87	76
1929	Syrian local	Syria	111	78	59	61	60	71	59	46	68	87	75
1930	Lebanese local	Lebanon	111	77	61	62	60	72	58	53	68	87	76
1931	Turkish local	Turkey	109	76	65	62	65	74	-	56	-	87	76
1932	Jordanian local	Jordan	111	76	61	61	60	70	52	45	68	87	76
1934	Iranian local	Iran	115	78	65	63	65	74	61	-	71	87	75
Location mean			111	77	62	62	62	72	56	53	69	87	76

Table 3.3. Seed yield (Y= kg/ha) and rank (R) of entries in the CAT at different locations during 1978/79.

Entry		ALGERIA		EGYPT		IRAQ				JORDAN				LEBANON		SUDAN		SYRIA		TURKEY				Mean	
		Sidi-Bel-Abbes		Sids		Dihok		Sulimania		Raba		Jubeiha		Terbol		Ed-Damer		Tel Hadya		Ankara		Eskishehir			
		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	1112	5	682	8	259	6	565	6	941	3	470	8	2709	2	171	5	1565	7	722	8	940	7	921	6
	1919	1246	2	1664	4	343	4	617	5	917	4	711	5	2378	3	786	1	1653	6	857	7	1000	5	1107	3
	1922	1250	1	1930	1	305	5	633	4	736	6	748	4	2153	4	780	2	1902	3	1000	1	1289	1	1157	1
	1929	1085	6	1237	6	351	3	745	3	1042	1	756	3	3229	1	178	4	1772	4	944	3	1203	3	1140	2
	1930	1022	7	1800	2	418	2	841	2	757	5	831	1	1642	6	96	6	2031	1	957	2	927	8	1029	5
	1931	1161	4	1240	5	219	7	513	8	590	8	636	6	-	-	54	7	-	-	911	4	1234	2	729	8
	1932	964	8	1732	3	457	1	849	1	962	2	810	2	2004	5	218	3	2007	2	877	6	1115	4	1090	4
	1934	1165	3	1130	7	128	8	547	7	604	7	521	7	1239	7	-	-	1679	5	911	4	956	6	888	7
Location mean		1126		1427		310		664		819		684		2193		326		1801		897		1083			
C.V. %		13.8		27.3		21.2		14.8		29.5		28.2		34.0		70.9		7.6		16.9		38.6			
S.E. entry		109.8		275.4		46.6		69.3		170.9		137.2		572.9		163.6		116.7		107.2		295.8			

3.2 CHICKPEA INTERNATIONAL YIELD TRIAL (CIYT).

Material

The twenty-four test entries in the CIYT originated from 10 countries and comprised 22 kabuli genotypes and two desi genotypes, namely, NEC 1096 and NEC 1813 (table 3.5). The remaining entry was to be supplied by the local cooperator. The former 24 genotypes were homozygous, derived from the germplasm collection, and had shown a superior seed yield either regionally of internationally in ICARDA's trials. Cooperators were free to use the genetic material in their own breeding programmes or for release as commercial cultivars.

Methods and Managements

The trial design was a 5 x 5 quadruple lattice (4 replications), although the results have been analysed as a randomised block. The suggested plot size was four rows, each of 4 m, with an inter-and intra-row spacing of 0.30 and 0.10 m respectively.

Twenty sets of the trial were distributed to cooperators in 14 countries. Results were returned from 13 trials covering nine countries, although those from Pakistan have not been reported, as the trial suffered a severe attack of Ascochyta blight. Information on the agronomic practices was supplied from a number of locations, and the details are given in table 3.4 .

Results and Discussion

At the locations where agronomic data were recorded, the data on flowering, maturity and plant height are given in tables 3.5 , 3.6 and 3.7 , respectively. For days to flower the location means ranged from 112 in Algeria, the earliest planted trial, to 56 in Lebanon. The relative differences between the locations showed a similar pattern for days to flowering and maturity. The location means for plant height varied from 26 cm at Qarahta in Syria to 52 cm in Egypt. Although the range for

genotypic means across locations was small for the three characters, the extreme genotypes were consistent in their performance. Further, the intercorrelations between the characters were positive and significant. The genotypic means for days to flower ranged from 74 for ILC 205 to 81 for ILC-812 and -1113, for days to maturity from 122 for ILC-52, -205 and -262 to 129 for ILC 610, and for plant height from 31 cm for ILC-52, -673, -1028, -1920 and -1921 to 40 cm for ILC 237.

For each location, the seed yield and rank of genotypes is given in table 3.8 , and the five heaviest yielding genotypes listed in table 3.9. Data on seed weight are included in the former table . In the latter table the local check was evident at five locations and among the other 22 genotypes, seven occurred at four or more locations. The seven were ILC-51, -237, -262, -263, -480, -1920 and NEC 1096. 'F' tests indicated that the genotypic differences were not significant at the following locations : Egypt, Iraq, Jordan, Homs in Syria and Eskishehir in Turkey. A least significant difference was calculated to indicate the genotypes which significantly exceeded the local check (table 3.8). But the apparent superiority of these genotypes over the local check, and those listed in table 3.9 , must be treated with caution at those locations where the ' F ' value was not significant. In Algeria all the genotypes exceeded the local check (AT 161/14) by a margin of between 466 % to 1047 %, as the latter genotype was very susceptible to Ascochyta blight, resulting in a severely depressed seed yield. At the other locations the local check was significantly exceeded by no genotype at five, by one or two at a further five and by seven at Eskishehir in Turkey. Excluding Algeria these genotypes exceeded the local check by a margin of between 22 % at Tel Hadya in Syria to 106 % in Egypt. Clearly such genotypes could be of practical value to the national programmes, although further testing will be required within a country to establish whether the heavy seed yield potential is maintained in future years. Also, although only one local check was included in each trial, there are likely to be other local cultivars in a country against which these genotypes should be tested.

In Turkey local check used at Ankara was ' Pedigree Number 830 ' and at Eskishehir ' Turkish Local ', and these genotypes ranked first and 24th respectively. This, together with the significant correlation (table 3.10) between the other 24 genotypes at the two locations, indicated that ' Number 830 ' could have potential as a commercial cultivar in the Eskishehir region.

The mean seed yield of the genotypes across the locations was not correlated with any of the three agronomic characters. Also the range of 332 kg/ha was small when compared to some of the ranges at individual locations. This, and the changes in the relative performance of the genotypes at the locations, indicated the presence of considerable genotype x location interactions. This was reflected in the relatively few positive and significant correlations between the seed yield of the genotypes at the different locations, and the occurrence of a number of negative and significant correlations (table 3.10). This would suggest that the selection of widely adapted genotypes may prove difficult. In this context it is relevant to examine the performance of the genotypes over the locations by calculating the stability parameters, used in the model proposed by Eberhart and Russel (1966)[1], for the individual genotypes. The three stability parameters, namely the mean, the regression coefficient (b) and the deviations from regression (S^2) are given in table 3.11. There was considerable variation for the last two parameters, but these will only be considered in some detail for the six heaviest yielding genotypes.

The 'b' values for ILC-480, -262 and -1920 were equivalent to unity (b= 1) and the 'S^2' values were not significant. This indicated that the genotypes showed a linear response to an increase in location mean yield, and a predictable response at the different locations; in terms of the model these genotypes are considered to be stable. The 'S^2' value was smallest for ILC 480 and an examination of the seed yield data, expressed as a percentage of the location mean (figure 3.1), showed that this was reflected in a consistently above average performance in the majority of locations. The 'S^2' value for ILC 237 was significant, which

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(1) Eberhart, S.A. and Russel, W.L. (1966). Crop Science, 6, 36-40.

indicated an unpredictable response, and this was clearly shown by the genotypes large variation in seed yield at the different locations (figure 3.1). Both ILC 263 and ILC 51 had 'b' values that were respectively significantly larger and smaller than unity (table 3.11), and 's^2' values that were not significant. Thus both genotypes showed a predictable response, but the 'b' values denoted that the performance of ILC 263 and ILC 51 would generally only equal or exceed the mean at the heavier yielding and lighter yielding locations respectively. These trends can be seen from the data in figure 3.1. The previous three genotypes are of greater interest to the breeder, and with a stable and relatively heavy seed yield could be considered for cultivation in a wide range of environments. Whereas any proposed cultivation of the latter three genotypes would have to be restricted to environments to which they are well adapted.

So far seed yield has only been considered for a single year. However, there were eight genotypes in these CIYTs that were previously tested in 1977/78. The seed yield of the these genotypes, expressed as a percentage of the local check in both years, is given in table 3.12. In Algeria the susceptibility of the local check to Ascochyta blight resulted in all the genotypes maintaining a significantly superior seed yield in both years. At the other locations only ILC 480 and ILC 896 significantly exceeded the local check in one of the two years. But, it is clear that within an individual location a number of genotypes maintained a seed yield advantage over the local check in both years. Some of the better and more consistent genotypes were ILC-1920 and -1929 in Jordan, ILC-493 and -1921 in Lebanon, and ILC-480, -896 and -1920 at Tel Hadya in Syria. Thus a genotype's apparent failure to show a significant improvement over the local check in a single year of testing, at a limited number of locations within a country, should not necessarily preclude it from further testing.

Table 3.4. Agronomic details for different locations for the CIYT during 1978/79.

Country	Location	Planting date	Fertilizer (kg.ha.$^{-1}$)			Irrigation	Insecticide
			N	P_2O_5	K_2O		
ALGERIA	Sidi-Bel-Abbes	27/12		90			
IRAQ	Sulimania	17/3	45	42			
LEBANON	Terbol	29/3	40	60		1	Dimecron, Malathion } X 1
NEPAL	Birgunj	26/11		40			
SYRIA	Hama	4/2	22	65		3	
	Homs	3/3		46		1	Dimecron, Civeen } X 1
	Tel-Hadya	27/2	30	50		2	Endosulphan x 3
TURKEY	Ankara	2/3	20	60			
	Eskishehir	28/3	30	40			Lebaycid X 1

Table 3.5 . Days to flowering for entries in the CIYT at different locations during 1978/79

Entry		Origin	ALGERIA	EGYPT	IRAQ	JORDAN	LEBANON	NEPAL	SYRIA			TURKEY		Mean
			Sidi-Bel-Abbes	Seds	Sulimania	Jubeiha	Terbol	Birgunj	Hama	Qarahta	Tel Hadya	Ankara	Eskishehir	
ILC	4	Jordan	111	70	63	71	53	85	81	86	71	81	78	77
	51	Iraq	107	71	63	69	56	69	76	81	68	81	78	75
	52	Iraq	109	65	62	69	54	83	76	78	69	81	79	75
	205	Sudan	111	69	63	67	53	69	75	83	69	81	76	74
	237	U.S.A.	113	79	64	70	59	88	79	85	72	81	78	79
	262	"	113	73	62	69	56	88	80	87	70	81	78	78
	263	"	112	76	62	70	55	88	82	88	71	81	78	78
	432	Iran	112	76	63	74	60	88	83	90	73	81	79	80
	480	Turkey	113	74	63	71	56	88	82	86	71	81	79	78
	493	"	112	70	62	67	58	85	79	83	69	81	79	80
	571	Egypt	112	71	62	76	55	85	82	88	72	82	79	79
	610	Tunisia	111	75	62	68	54	85	77	82	70	81	79	77
	673	Iran	111	71	62	66	50	88	80	83	69	81	79	76
	812	"	115	85	64	72	61	93	85	88	74	81	79	81
	888	"	114	82	63	70	58	85	79	92	72	81	78	79
	896	"	114	77	63	73	58	88	82	85	72	81	79	80
	933	"	115	77	63	70	55	81	79	86	71	81	79	78
	1028	"	111	85	63	66	50	88	79	84	69	81	78	78
	1133	"	113	86	64	71	61	93	82	89	73	81	78	81
	1920	India	111	76	63	68	53	85	76	82	71	81	78	76
	1921	"	111	83	63	69	50	83	77	85	70	81	77	78
	1929	Syria	111	80	62	70	53	88	80	85	71	81	79	78
NEC	1096	Iran	111	80	61	66	63	83	78	86	71	81	79	79
NEC	1813	Iran	112	80	63	71	64	85	79	86	71	81	79	79
local	check		117	73	61	71	59	79	81	83	69	80	79	
Location mean			112	79	63	70	56	85	80	85	71	81	78	

Table 3.6. Days to maturity for entries in the CIYT at different locations during 1978/79

Entry		ALGERIA	EGYPT	IRAQ	LEBANON	NEPAL	SYRIA			TURKEY		
		Sidi-Bel-Abbes	Seds	Sulimania	Terbol	Birgunj	Hama	Qarahta	Tel Hadya	Ankara	Eskishehir	Mean
ILC	4	168	132	93	97	134	130	130	112	134	112	124
	51	167	132	92	92	130	128	128	111	132	112	123
	52	168	130	92	92	130	126	127	111	131	112	122
	205	167	131	92	91	136	124	126	112	130	113	122
	237	168	139	95	105	136	126	126	115	131	116	126
	262	167	135	93	92	134	122	122	111	131	112	122
	263	169	138	94	93	134	127	127	111	133	113	124
	432	167	137	94	93	134	127	127	111	130	112	123
	480	169	136	94	105	136	130	130	114	132	113	126
	493	167	133	93	99	134	127	128	112	130	113	124
	571	167	133	93	92	134	126	126	111	133	112	123
	610	167	135	94	102	136	128	128	111	134	114	129
	673	166	132	93	90	134	132	131	111	129	111	123
	812	169	142	97	110	136	129	130	117	134	114	128
	888	168	140	94	92	134	127	127	111	131	114	124
	896	169	140	93	106	136	131	130	112	135	114	126
	933	169	137	92	92	132	129	127	111	131	112	123
	1028	168	142	93	91	134	128	128	111	130	112	124
	1133	169	142	96	110	134	130	130	115	135	115	128
	1920	167	136	93	91	132	128	131	111	131	110	123
	1921	169	140	93	90	134	127	127	111	132	111	123
	1929	169	152	94	102	132	130	130	113	134	112	127
NEC	1096	169	136	92	103	128	127	127	112	130	112	124
NEC	1813	169	139	94	108	134	128	127	114	130	114	126
Local	check	172	135	93	109	128	130	131	112	130	116	
Location mean		168	137	93	98	133	128	128	112	132	113	

Table 3.7 . Plant height (cm) of entries in the CIYT at different locations during 1978/79.

Entry		ALGERIA	EGYPT	IRAQ	LEBANON	NEPAL	SYRIA			TURKEY	
		Sidi-Bel -Abbes	Seds	Sulimania	Terbol	Birgunj	Hama	Qarahta	Tel Hadya	Ankara	Mean
ILC	4	31	52	26	26	45	38	20	32	24	32
	51	33	53	26	28	41	36	25	31	22	33
	52	32	48	28	28	43	31	20	30	23	31
	205	39	48	33	31	44	36	25	33	26	35
	237	40	50	32	35	50	43	35	35	35	40
	262	37	43	26	29	47	32	25	33	27	33
	263	36	40	27	26	47	33	30	33	28	33
	432	38	47	32	28	40	28	20	32	25	32
	480	39	58	27	31	46	37	25	33	29	36
	493	40	57	30	30	43	39	30	35	29	37
	571	37	52	23	26	47	37	25	35	25	35
	610	37	55	27	30	48	40	25	33	28	36
	673	35	52	23	31	37	28	20	30	26	31
	812	45	60	32	36	54	39	35	37	33	41
	888	39	56	25	30	42	34	25	32	31	34
	896	36	51	26	31	50	43	23	30	34	36
	933	40	53	28	31	45	41	30	33	24	36
	1028	31	50	26	28	45	29	30	27	21	31
	1133	38	46	25	30	51	46	30	33	33	37
	1920	28	50	26	28	38	37	25	30	22	31
	1921	34	53	22	28	47	31	15	31	24	31
	1929	34	55	28	29	46	37	22	32	24	34
NEC	1096	40	59	25	31	44	41	28	34	32	37
NEC	1813	33	59	31	30	44	43	25	32	31	37
Local check		42	56	28	30	29	30	30	33	34	
Location mean		37	52	27	30	45	36	26	32	28	

Table 3.8. 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 1978/79.

Entry		ALGERIA Sidi-Bel-Abbes		EGYPT[3] Seds[2]		IRAQ[3] Sulimania		JORDAN[3] Jubeiha		LEBANON Terbol		NEPAL Birgunj	
		Y	R	Y	R	Y	R	Y	R	Y	R	Y	R
ILC	4	667[1]	24	1201	10	624	15	1139	9	1121	13	1335	2
	51	1052	12	1394	5	728	1	1316	3	1284	6	1100	7=
	52	772	23	1274	7	640	10=	1311	4	1137	11	970	15
	205	1327	2	733	22	637	12=	610	16	1470	1	1006	12
	237	1497	1	941	16	640	10=	944	14	1071	18	688	24
	262	956	16	931	17	666	8	1534	1	1117	14	1100	7=
	263	812	21	920	18	577	22=	1430	2	1091	15=	881	20
	432	985	14	1472	4	697	3=	822	21	1006	21	954	18
	480	925	18	1518	3	697	3=	1238	5	1091	15=	1058	10
	493	949	17	1014	14	713	2	991	13	1376	4	985	13
	571	1059	11	801	21	585	20	858	18	1043	20	959	17
	610	891	19	1763	1	637	12=	1209	6	1148	10	834	22
	673	1159	6	1524	2	681	5=	853	19	1178	8	1079	9
	812	1146	7	634	24	632	14	1155	8	1166	9	751	23
	888	1141	8	952	15	609	17	1180	7	1070	19	1126	5
	896	1003	13	666	23	681	5=	832	20	830	22	875	21
	933	1068	10	458	25	583	21	879	17	1132	12	965	16
	1028	971	15	905	19	577	22=	451	25	1417	2	1413	1
	1133	756	22	1118	11	577	22=	728	24	481	25	308	25
	1920	1271	4	1295	6	676	7	1099	10	1361	5	1230	4
	1921	1128	9	1232	8=	601	18=	1009	12	1379	3	975	14
	1929	844	20	1232	8=	601	18=	1089	11	1184	7	944	19
NEC	1096	1217	5	1102	12	614	16	759	23	807	23	1027	11
NEC	1813	1303	3	1050	13	663	9	915	15	608	24	1111	6
Local check		143	25	853	20	565	25	804	22	1076	17	1319	3
Location mean		1000		1081		636		1018		1106		1000	
C.V.%		29.8		32.1		16.8		42.9		21.2		21.9	
L.S.D.(5%)		418.9		734.3		151.5		629.7		331.4		307.7	
No. of entries significantly exceeding local check		24		1		1		1		2		0	

(1) Seed yield values underlined, significantly exceeded the local check.
(2) Based on two replicates.
(3) ' F ' test of genotypic differences not significant.

Table 3.8. (continued)

Entry		SYRIA								TURKEY				Mean		100 seed (4) weight(g.)
		Hama		Homs (3)		Qarahta		Tel-Hadya		Ankara		Eskishehir (3)				
		Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	
ILC	4	3159	11	1143	4	520	24	1547	21	730	11	2350	9=	1248	15	34.2
	51	2764	21	911	18	1059	5	1700	12	714	14	2391	7	1325	4	31.2
	52	3323	7	1009	14	892	9	1725	11	656	19	2300	11	1292	8	31.8
	205	2054	25	702	24	718	18	1219	25	633	20	1675	25	1062	23	14.7
	237	3013	13	986	15	1318	1	1356	5	734	10	2516	5	1319	5	36.7
	262	2870	17	1076	11	843	11=	1907	4	911	2	2772	1	1361	2	31.6
	263	3326	6	1278	1	713	19	1995	1	819	7	2603	3	1343	3	33.3
	432	2907	16	1081	10	687	20	1587	18	761	8	2200	14	1232	17	28.3
	480	3206	10	1247	2	952	7	1760	9	824	5	2425	6	1379	1	32.2
	492	2858	18	874	19	843	11=	1914	3	823	6	2222	12	1278	10	31.2
	571	2819	19	1235	3	1279	2	1853	6	711	15	2078	20	1259	13	24.2
	610	2624	24	1082	9	686	21	1579	19	691	17	1769	22	1202	19	31.4
	673	2720	22	1045	12	632	22	1821	7	722	12	2191	15	1250	14	21.3
	812	2626	23	836	22	1128	4	1634	14	859	3	2219	13	1217	18	42.0
	888	2803	20	1107	7	603	23	1624	16=	614	23	1757	23	1179	21	18.0
	896	2993	15	1087	8	900	8	1983	2	718	13	2350	9=	1225	17	32.6
	933	3058	12	974	16	744	17	1624	16=	552	24	2082	19	1162	22	21.1
	1028	3003	14	855	20	866	10	1427	24	687	18	2188	16	1201	20	20.1
	1133	3450	4	848	21	427	25	1575	20	626	21	2050	21	1047	24	26.9
	1920	3344	5	732	23	767	16	1687	13	622	22	2147	17	1311	6	25.2
	1921	3315	8	1043	13	837	13	1493	22	699	16	2116	18	1272	12	20.5
	1929	3279	9	1122	6	954	6	1815	8	537	25	2369	8	2384	9	32.5
NEC	1096	3513	3	930	17	832	14	1461	23	834	4	2688	2	1275	11	25.2
NEC	1813	3801	1	688	25	772	15	1726	10	738	9	2579	4	1295	7	24.3
Local check		3635	2	1142	5	1191	5	1628	15	917	1	1728	24			
Location mean		3058		1001		846		1686		725		2231				
C.V.%		17.9		26.8		37.1		14.0		19.9		20.5				
L.S.D.(5%)		774.4		379.7		438.2		335.0		203.5		647.3				
No. of entries significantly exceeding local check		0		0		0		2		0		7				

(4) Measured at Tel Hadya only.

Table 3.9 . The five heaviest seed yielding entries at the individual locations in the CIYT.

Rank	ALGERIA	EGYPT	IRAQ	JORDAN	LEBANON	NEPAL
	Sidi-Bel-Abbes	Seds	Sulimania	Jubeiha	Terbol	Birgunj
1	ILC 237	ILC 610	ILC 51	ILC 262	ILC 205	ILC 1028
2	205	673	493	263	1028	4
3	NEC 1813	480	480	51	1921	Local check
4	ILC 1920	432	432	52	493	ILC 1920
5	NEC 1096	51	673	480	1920	888

	SYRIA				TURKEY	
	Hama	Homs	Qarahta	Tel-Hadya	Ankara	Eskishehir
1	NEC 1813	ILC 263	ILC 237	ILC 263	Local check	ILC 262
2	Local check	480	591	896	ILC 262	1096
3	NEC 1096	571	Local check	493	812	263
4	ILC 1133	4	ILC 812	262	1096	1813
5	1920	Local check	ILC 51	237	480	237

Table 3.10. Correlations[1] (df=22) between the seed yield of entries in the CIYT at different locations during 1978/79 (local check excluded from the calculations).

		EGYPT	IRAQ	JORDAN	LEBANON	NEPAL	SYRIA				TURKEY	
		Seds	Sulimania	Jubeiha	Terbol	Birgunj	Hama	Homs	Qarahta	Tel-Hadya	Ankara	Eskishehir
ALGERIA	Sidi-Bel-Abbes	-0.25	0.16	-0.33	0.10	0.05	-0.18	-0.49*	0.38	-0.16	0.01	-0.05
EGYPT	Seds		0.41	0.26	0.04	0.10	0.13	0.19	-0.24	-0.04	0.03	-0.02
IRAQ	Sulimania			0.24	0.14	0.19	-0.20	-0.15	0.12	0.27	0.36	0.19
JORDAN	Jubeiha				0.10	0.03	0.08	0.43*	0.09	0.49*	0.32	0.33
LEBANON	Terbol					0.50*	-0.54**	-0.04	0.21	-0.20	-0.08	-0.30
NEPAL	Birgunj						-0.03	-0.01	-0.06	-0.16	0.04	0.10
SYRIA	Hama							0.02	-0.13	0.21	-0.02	0.56**
	Homs								0.09	0.46*	0.16	0.17
	Qarahta									0.34	0.23	0.29*
	Tel-Hadya										0.30	0.51**
TURKEY	Ankara											0.59**

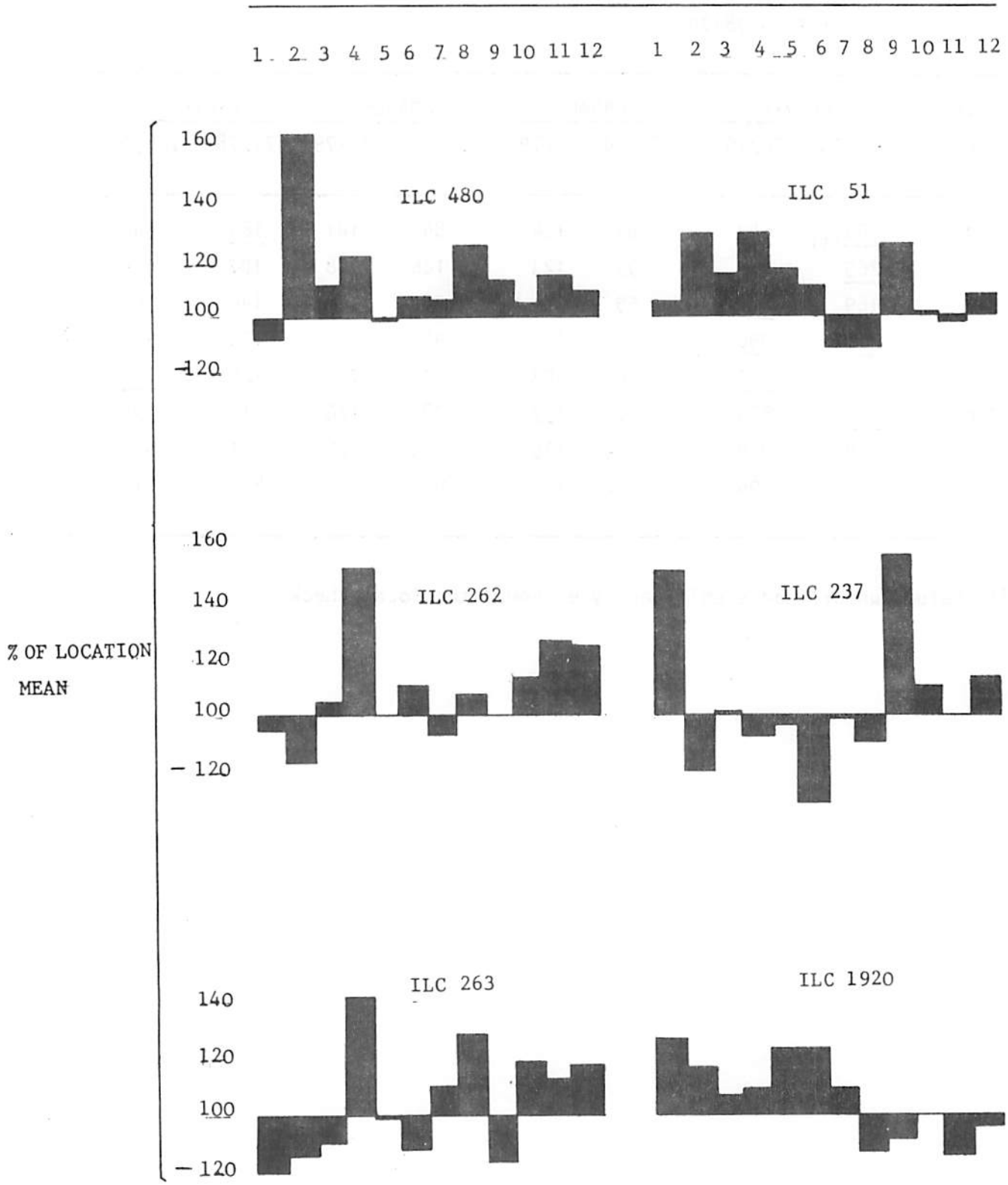
(1) * $P \leq 0.05$
** $P \leq 0.01$

Table 3.11. Stability parameters[1] for entries in the CIYT.

Entry	Mean seed yield	Regression coefficient	Residual mean square
ILC 480	1379	1.01	72576
262	1361	1.02	166390
263	1343	1.17	101408
51	1325	0.86	45446
237	1319	1.01	206588*
1920	1311	1.08	102323
NEC 1813	1295	1.31	165379
ILC 52	1292	1.09	43502
1929	1284	1.12	40682
493	1278	0.97	74080
NEC 1096	1275	1.23	132187
ILC 1921	1272	1.02	53941
571	1259	0.91	120430
673	1250	0.89	88801
4	1248	1.08	120312
432	1232	0.91	58358
896	1225	1.05	69968
812	1217	0.79	23802
610	1202	0.75	130871
1028	1201	0.98	204304*
888	1179	0.85	82883
933	1162	1.04	36647
205	1062	0.63	275180***
1133	1047	1.18	221629*

(1) The regression coefficient and residual mean square were calculated from 14 locations.

FIGURE. 3.1. SEED YIELD EXPRESSED AS A PERCENTAGE OF THE LOCATION MEAN OF THE SIX ENTRIES WITH THE HEAVIEST MEAN SEED YIELD ACROSS LOCATION IN THE CITY



(1) LOCATIONS 1 to 12 ARE IN THE SAME ORDER AS THESE IN TABLE

Table 3.12. Seed yield of entries, expressed as percentage of the local check, that were tested in the CRPYT in 1977/78 and in the CIYT in 78/79.

Entry	ALGERIA		JORDAN		LEBANON		SYRIA	
ILC	77/78	78/79	77/78	78/79	77/78	78/79	77/78	78/79
480	265(1)	647	87	154	84	101	180	108
493	265	664	95	123	106	128	107	118
812	169	801	59	144	38	108	145	100
888	216	798	71	147	90	99	135	98
896	208	701	66	103	92	77	126	122
1920	251	889	107	137	78	126	113	104
1921	218	789	104	125	103	128	111	92
1929	121	590	112	135	97	110	88	111

(1) Values underlined significantly exceeded the local check.

3.3 CHICKPEA INTERNATIONAL SCREENING NURSERY (CISN).

Material

Sixty-two entries, originating from 13 countries, were tested in the CISN. They comprised 54 kabuli genotypes, five F_5 kabuli bulks and three check entries. The last group consisted of one kabuli (ILC 1929) and one desi (NEC 1163) genotype and a local check to be supplied by the cooperator. The 54 kabuli genotypes were homozygous selections from the germplasm collection and had shown a superior seed yield in ICARDA's regional trials. Cooperators were free to select the genetic material for use in their own breeding programs.

Methods and Management

Each of the 59 genotypes was to be planted in a single non-replicated row of 4 m, with the three check genotypes planted after every 10 test entries to allow some assessment of the environmental variation. The recommended inter- and intra-row spacing was 0.30 to 0.50 m and 0.10 m respectively. Twenty sets of the trial were distributed to cooperators in 16 countries. Results were returned from ten trials covering eight countries, although those from Pakistan have not been reported here, as the nursery suffered a severe attack of Ascochyta blight.

Results and Discussion

Genotypic values for days to flowering and to maturity and for plant height are given in table 3.13 , as a mean across six locations at which all three characters were measured. The data were derived, from all but three of the nine locations given in table 3.14 for seed yield; the excluded locations were : Algeria, Homs in Syria and Eskishehir in Turkey. Days to flowering varied from 73 for ILC-295 and 482 to 80 for ILC-413, -813, -917, and-953; days to maturity from 117 for ILC-18, -50, -266, -295, -405, -1352 and -1865 to 125 for ILC-413; and plant height from 33 cm for ILC-16, -32 and-266 to 43 cm for ILC 132. In spite of the relatively small ranges days to flowering was correlated with days to maturity ($r = 0.46$, $P \leq 0.001$) and plant height ($r = 0.34$, $P \leq 0.01$).

Seed weight was only determined at Tel Hadya in Syria, and the values have been included in table 3.13.

For each of nine locations the seed yield and rank of the genotypes is given in table 3.14, and the five heaviest yielding genotypes listed in table 3.15 . Among the latter the local check was evident at three locations, and of the remaining 30 genotypes only one, namely, ILC 231, occured more than twice. Only the mean seed yield for the seven replicates of the check genotypes has been given at each location, but some idea of the environmental variation can be gained from the coefficents of variation (CV) given for these genotypes (table 3.14). These CVs varied considerably within a location, but all were uniformly high in Egypt and Nepal.

At individual locations any selection of superior yielding genotypes, for use in national programs, should be based on their performance relative to that of the nearest local check. This would have particular relevance to locations with a high CV, especially to the above two, as at these locations the local check was ranked first and second respectively. At other locations with a lower CV, the superior performance of a number of the genotypes should allow the chance of more effective selection.

The seed yield of the six genotypes with the heaviest mean seed yield across locations, expressed as percentage of the location mean, is given in table 3.16. From this it is evident that the performance of all these genotypes, except ILC 268, was very variable at the individual locations. However, the lack of replication detracts from reaching any definite conclusions about the stability of these genotypes, but the above average seed yield of ILC 268 at the majority of locations is encouraging and merits further examination in the future. It is also noteworthy that the relatively heavy seed yield of ILC 237 was also evident in the CIYTs (table 3.8 and 3.9).

3.3 CHICKPEA INTERNATIONAL SCREENING NURSERY (CISN).

Material

Sixty-two entries, originating from 13 countries, were tested in the CISN. They comprised 54 kabuli genotypes, five F_5 kabuli bulks and three check entries. The last group consisted of one kabuli (ILC 1929) and one desi (NEC 1163) genotype and a local check to be supplied by the cooperator. The 54 kabuli genotypes were homozygous selections from the germplasm collection and had shown a superior seed yield in ICARDA's regional trials. Cooperators were free to select the genetic material for use in their own breeding programs.

Methods and Management

Each of the 59 genotypes was to be planted in a single non-replicated row of 4 m, with the three check genotypes planted after every 10 test entries to allow some assessment of the environmental variation. The recommended inter- and intra-row spacing was 0.30 to 0.50 m and 0.10 m respectively. Twenty sets of the trial were distributed to cooperators in 16 countries. Results were returned from ten trials covering eight countries, although those from Pakistan have not been reported here, as the nursery suffered a severe attack of Ascochyta blight.

Results and Discussion

Genotypic values for days to flowering and to maturity and for plant height are given in table 3.13 , as a mean across six locations at which all three characters were measured. The data werederived, from all but three of the nine locations given in table 3.14 for seed yield; the excluded locations were : Algeria, Homs in Syria and Eskishehir in Turkey. Days to flowering varied from 73 for ILC-295 and 482 to 80 for ILC-413, -813, -917, and-953; days to maturity from 117 for ILC-18, -50, -266, -295, -405, -1352 and -1865 to 125 for ILC-413; and plant height from 33 cm for ILC-16, -32 and-266 to 43 cm for ILC 132. In spite of the relatively small ranges days to flowering was correlated with days to maturity ($r = 0.46$, $P \leq 0.001$) and plant height ($r = 0.34$, $P \leq 0.01$).

Seed weight was only determined at Tel Hadya in Syria, and the values have been included in table 3.13.

For each of nine locations the seed yield and rank of the genotypes is given in table 3.14, and the five heaviest yielding genotypes listed in table 3.15 . Among the latter the local check was evident at three locations, and of the remaining 30 genotypes only one, namely, ILC 231, occured more than twice. Only the mean seed yield for the seven replicates of the check genotypes has been given at each location, but some idea of the environmental variation can be gained from the coefficents of variation (CV) given for these genotypes (table 3.14). These CVs varied considerably within a location, but all were uniformly high in Egypt and Nepal.

At individual locations any selection of superior yielding genotypes, for use in national programs, should be based on their performance relative to that of the nearest local check. This would have particular relevance to locations with a high CV, especially to the above two, as at these locations the local check was ranked first and second respectively. At other locations with a lower CV, the superior performance of a number of the genotypes should allow the chance of more effective selection.

The seed yield of the six genotypes with the heaviest mean seed yield across locations, expressed as percentage of the location mean, is given in table 3.16. From this it is evident that the performance of all these genotypes, except ILC 268, was very variable at the individual locations. However, the lack of replication detracts from reaching any definite conclusions about the stability of these genotypes, but the above average seed yield of ILC 268 at the majority of locations is encouraging and merits further examination in the future. It is also noteworthy that the relatively heavy seed yield of ILC 237 was also evident in the CIYTs (table 3.8 and 3.9).

Table 3.13. Values for three agronomic characters for entries in the CISN during 1978/79.

Entry	Origin	Days to flowering	Days to maturity	Plant height (cm)	100 seed weight (1)
ILC 7	Jordan	79	121	41	33.4
13	"	77	119	37	38.6
16	"	75	121	33	32.1
18	"	77	117	37	27.2
19	"	77	120	36	28.6
23	Iran	75	121	38	34.1
32	Syria	77	122	33	33.1
47	Iraq	74	119	36	33.8
50	"	75	117	36	30.3
132	Spain	75	122	43	45.4
176	Morocco	78	123	39	31.5
190	USSR	74	121	41	27.8
231	USA	75	120	38	33.2
237	"	78	122	42	32.8
266	Iran	74	117	33	25.2
268	"	78	121	35	25.3
295	"	73	117	36	31.7
349	"	77	121	37	17.7
405	"	74	117	34	15.5
413	"	80	125	44	43.8
482	Turkey	73	119	40	24.2
513	"	75	121	38	43.9
515	"	77	121	39	22.5
517	"	76	119	40	29.2
523	Egypt	76	121	40	42.8
567	Lebanon	75	118	35	33.0
576	Egypt	77	119	36	31.9
614	Tunisia	77	121	36	38.6
625	Iran	75	118	38	30.1
757	"	78	119	38	29.8
813	"	80	123	40	34.5
844	"	80	124	40	27.5
917	"	80	120	39	33.9

... cont'd .. ILC 918...

Table 3.13. (continued)

Entry		Origin	Days to flowering	Days to maturity	Plant height (cm)	100 seed weight[1]
ILC	918	Iran	77	121	39	29.8
	924	"	78	118	38	27.4
	926	"	76	119	40	27.2
	953	"	80	121	37	29.9
	998	"	76	120	37	27.1
	1018	"	79	120	37	26.6
	1022	"	79	121	37	24.9
	1039	"	74	118	37	25.4
	1043	"	78	118	37	16.9
	1096	"	77	122	37	26.3
	1123	"	79	124	39	26.4
	1164	"	76	119	37	35.2
	1178	"	78	120	37	38.2
	1298	USA	78	122	37	32.2
	1308	"	75	118	35	34.4
	1309	"	78	121	41	28.9
	1353	Afghanistan	78	117	39	20.0
	1552	"	77	117	41	21.6
	1573	"	78	120	42	29.5
	1865	(Unknown)	78	117	38	19.8
	1875	(Unknown)	74	121	36	25.5
78S	54233	(F_5 bulk)	77	118	38	26.8
	55294	"	76	119	38	25.8
	56097	"	78	123	39	23.7
	57579	"	77	119	42	25.8
	57590	"	77	118	40	26.1
ILC	1929	Syria	76	120	35	34.4
ILC	1163	Iran	76	120	39	23.5

(1) Measured at Tel Hadya only.

Table 3.14. Seed yield (Y=kg.ha^{-1}) and rank (R) of entries in the CISN at different locations during 1978/79.

Entry		ALGERIA Sidi-Bel-Abbes		EGYPT Seds		IRAQ Sulimania		LEBANON Terbol		NEPAL Birgunj		SYRIA Homs		SYRIA Tel-Hadya		TURKEY Ankara		TURKEY Eskishehir		Mean	
		Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R
ILC	7			625	18	1125	22	1067	8	344	38	2416	25	1946	13	1234	25	1833	36	1324	19
	13	500	25	250	48	1344	5	867	31	563	21	2391	28	1751	33	679	57	2374	13	1191	40
	16	417	31	625	18	969	36	1034	10	625	11	3199	2	1620	48	741	54	1791	39	1225	30
	18			333	36	1375	3	1134	6	500	22	-		1967	10	1111	34	1416	53	1119	59
	19			250	48	1125	22	1240	2	188	53	3015	4	1948	12	741	54	1291	56	1225	30
	23	1916	4	250	48	938	37	940	18	625	11	2932	7	1789	27	864	50	1666	44	1324	19
	32			267	47	1125	22	625	56	250	50	2891	10	1630	47	493	61	2416	11	1212	35
	47			208	52	1125	22	934	19	438	32	2049	44	1750	34	1790	8	2166	23	1308	24
	50			125	56	1188	15	1001	12	750	4	2416	25	2032	6	864	50	2207	21	1323	21
	132	1083	14	625	18	688	57	511	58	938	1	2016	46	1448	57	1543	10	875	61	1081	55
	176	1250	11	708	13	656	59	867	31	438	32	2182	38	1559	51	1234	25	1250	57	1127	47
	190	2332	3	750	12	1188	15	1040	9	500	22	2349	33	2087	4	1111	34	1166	59	1391	10
	231	1916	4	1041	5	1031	31	767	41	313	44	2249	35	1765	31	1481	12	3290	3	1539	1
	237	1083	14	791	10	844	47	768	40	375	37	4898	1	1874	19	1358	20	1250	57	1471	6
	266	1666	7	1208	3	1125	22	900	30	281	48	2599	15	1778	29	1234	25	1708	42	1389	11
	268			541	23	1313	7	1201	3	625	11	2382	29	1746	35	2099	2	2374	13	1535	2
	295	417	31	791	10	938	37	1201	3	750	4	2749	12	1689	41	988	43	1333	54	1206	36
	349			1125	4	469	62	800	38	63	62	2199	37	1896	17	1975	6	2166	23	1337	18
	405	500	25	83	60	1688	1	867	31	156	59	2532	18	1776	30	493	61	2416	11	1168	43
	413	500	25	333	36	750	51	440	61	500	22	1666	54	1917	14	925	48	1458	52	943	59
	482			417	31	844	47	914	28	438	32	2516	20	1844	21	1234	25	1624	48	1229	28
	513	583	23	417	31	906	45	667	49	625	11	2499	23	1913	15	1111	34	1874	35	1177	41
	515	1166	12	1250	2	813	44	1001	12	750	4	2899	9	1782	28	1481	12	2291	17	1493	4
	517	3249	1	250	48	1188	15	867	31	625	11	2399	27	2007	8	1234	25	1499	51	1480	5
	523	2666	2	417	31	1125	22	654	53	750	4	2766	11	1856	20	1358	20	2166	23	1529	3
	567	500	25	292	43	1188	15	984	17	344	38	1899	51	1802	24	1049	38	2124	27	1131	45
	576	666	22	858	9	688	57	1147	5	188	53	2682	14	1665	45	618	59	1666	44	1131	45

....cont'd.....ILC 614...

Table 3.14. (continued)

Entry		ALGERIA Sidi-Bel-Abbes		EGYPT Seds		IRAQ Sulimania		LEBANON Terbol		NEPAL Birgunj		SYRIA Homs		SYRIA Tel-Hadya		TURKEY Ankara		TURKEY Eskishehir		Mean	
		Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R
ILC	614	83	38	208	52	906	45	987	16	281	48	2982	5	1833	22	864	50	1999	32	1127	47
	625	1499	8	708	13	1156	20	934	19	500	22	2916	8	1961	11	1173	32	2166	23	1446	7
	757			625	18	938	37	467	59	344	38	1116	60	1746	35	1420	18	666	62	915	61
	813	1749	6	458	26	938	37	934	19	188	53	1999	47	2161	2	1173	32	2499	6	1344	16
	844	333	35	583	22	750	51	734	44	500	22	1399	58	1672	42	1111	34	2124	27	1023	57
	917	1416	9	666	15	938	37	667	49	250	50	2516	20	1897	16	987	47	1583	49	1213	34
	918			417	31	1188	15	1095	7	438	32	2249	35	1672	42	1420	18	2041	31	1315	23
	924			666	15	750	51	700	46	169	58	1000	61	1761	32	1729	9	1791	39	1071	56
	926	916	16	292	43	750	51	694	43	469	31	2116	42	1476	56	1049	38	2124	27	1098	52
	953			375	35	938	37	700	46	313	44	1816	53	2007	8	1234	25	1333	54	1090	54
	998			458	26	1125	22	714	45	750	4	2382	29	2094	3	1543	10	1958	33	1378	12
	1018			333	36	625	60	660	52	313	44	2066	43	1823	23	1481	12	3415	1	1340	17
	1022	333	35	541	23	1344	5	820	37	500	22	2182	38	1547	53	1358	20	2499	6	1236	27
	1039	447	31	292	43	1313	7	434	62	781	3	2382	29	1546	54	741	54	2291	17	1136	44
	1043	500	25	458	26	1313	7	740	43	625	11	2549	16	2043	5	988	43	1833	36	1228	29
	1096			42	61	1219	12	1001	12	500	22	2982	5	1799	25	1481	12	2332	15	1420	9
	1123			42	61	1250	10	467	60	344	33	2149	41	1554	52	1234	25	2582	5	1203	37
	1164	916	16	167	55	1375	3	934	19	156	59	3099	3	1322	60	679	57	2332	15	1220	32
	1178			666	15	1219	12	934	19	625	11	2549	16	1728	38	1049	38	2666	4	1430	8
	1298	833	19	950	7	1406	2	934	19	688	10	2332	34	1893	18	618	59	2499	6	1350	15
	1308			125	56	1031	31	867	31	625	11	2532	18	2180	1	925	48	1833	36	1265	25
	1309	1416	9	292	43	938	37	567	57	625	11	2049	44	1658	46	802	53	1666	44	1113	50
	1353			125	56	1156	20	927	27	313	44	2016	46	1328	59	1481	12	2249	20	1199	38
	1552	417	31	208	52	938	37	934	19	188	53	1999	47	1274	62	1481	12	1666	44	1012	58
	1573			333	36	1031	31	667	49	156	59	2516	20	1599	49	1358	20	1708	42	1171	42
	1865	750	21	333	36	625	60	1261	1	344	38	2382	29	1796	26	988	43	2291	17	1197	39
	1875	916	16	458	26	750	51	654	53	188	53	1933	50	1380	58	988	43	1125	60	932	60
78S	54233			916	8	750	51	767	41	475	30	1449	57	1565	50	3086	1	1916	34	1366	14

.... cont'd....78S 54233....

Table 3.14. (continued)

Entry	ALGERIA Sidi-Bel-Abbes		EGYPT Seds		IRAQ Sulimania		LEBANON Terbol		NEPAL Birgunj		SYRIA Homs		SYRIA Tel-Hadya		TURKEY Ankara		TURKEY Eskishehir		Mean	
	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R
78S 55294			458	26	1031	31	834	36	250	50	1883	52	2014	7	1975	6	2499	6	1368	13
56097			125	56	1125	22	634	55	500	22	1616	54	1696	40	1049	38	2083	30	1104	51
57579	1166	12	333	36	1031	31	934	19	438	32	1266	59	1296	61	2036	4	3374	2	1319	22
57590	333	35	1000	6	1125	22	800	38	344	38	2166	40	1543	55	2036	4	1583	49	1214	33
ILC 1929(1)	805	20	327	42	1192	14	1000	15	603	20	2476	24	1671	44	1022	42	2190	22	1254	28
NEC 1163(1)	521	24	469	25	808	50	906	29	697	9	1592	56	1729	37	1313	24	1791	39	1092	53
Local check(1)	500	25	2397	1	1232	11	1017	11	862	2	2694	13	1727	39	2044	3	2421	10	1655	
Location mean	1007		511		1032		851		456		2330		1755		1241		1981			
CV%: Local check	28.9		56.7		18.0		36.5		67.9		10.3		16.7		37.0		36.0			
ILC 1929	6.0		35.6		16.7		20.6		37.3		14.1		16.4		63.1		15.1			
NEC 1163	52.9		40.7		25.9		16.5		34.9		25.6		40.1		21.3		43.2			

(1) Seed yield values are the mean of seven replicates.

Table 3.15. The five heaviest seed yielding entries at the individual locations in the CISN.

Rank	ALGERIA	EGYPT	IRAQ	LEBANON	NEPAL	SYRIA		TURKEY	
	Sidi-Bel-Abbes	Seds	Sulimania	Terbol	Birgunj	Homs	Tel-Hadya	Ankara	Eskishehir
1	ILC 517	Local check	ILC 405	ILC 1865	ILC 132	ILC 237	ILC 1308	78S 54233	ILC 1018
2	523	ILC 515	1298	19	Local check	16	813	ILC 268	78S 57579
3	190	266	1164	268	1039	1164	998	Local check	ILC 231
4	23 (1)	349	18	295	50	19	190	78S 57579	1178
5	231	231	13	578	295	614	1043	78S 57590	1123
			1022		515	1096			
					523				
					998				

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

Table 3.16. Seed yield, expressed as a % of the location mean, of the six entries with the heaviest mean seed yield across locations (in descending order) in the CISN .

Entry		Location(1)								
		1	2	3	4	5	6	7	8	9
ILC	231	190	204	100	90	69	96	101	119	166
	268	-	106	127	141	137	102	99	169	120
	523	264	82	109	77	164	119	106	109	109
	515	116	245	79	118	164	124	102	119	116
	517	323	49	115	102	137	103	114	99	76
	237	108	155	82	90	82	210	107	109	63

(1) Locations 1 to 9 are in the same order as those in table 3.14.

3.4 CHICKPEA INTERNATIONAL F_3 TRIAL (CIF_3T)

Material

The CIF_3T comprised 23 F_3 populations, one ICARDA check (ILC 1929), and one check to be supplied by the local cooperator. The F_3 populations stemmed from crosses between germplasm entries originating from different countries. They thus provided a wide range of intra- and inter-population variation within which cooperators were free to practice their own selection. However, the trial was only furnished to those cooperators who have facilities to handle segregating material.

Methods and Management

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

Nine sets of the trial were distributed to cooperators in eight countries. Results were returned from eight trials covering seven countries, although those from Pakistan have not been reported, as the trial suffered a severe attack of Ascochyta blight.

The agronomic practices employed at the different locations are given in table 3.17 .

Results and Discussion

The mean performance of the populations across locations for days to flowering and to maturity and for plant height is given in table 3.18. The range for the first two characters was very small at four and five days respectively, with that for plant height varying from 27 cm for X77Sd 83 and X77Sd 116 to 39 cm for X77Sd 184.

The seed yield and rank of the populations at the locations is given in table 3.19. 'F' tests indicated that the populations differed

significantly at all locations except Jordan and Syria. A least significant difference was calculated and used to indicate those populations which significantly exceeded the local check.

In Algeria all the populations significantly exceeded the local check (AT 161/14), which was very susceptible to Ascochyta blight, resulting in a severely depressed seed yield. At the other locations the local check was only significantly exceeded by two F_3 populations in Lebanon and by six at Eskishehir in Turkey, but none of these populations was common to both locations. These populations exceeded the local check by a margin of between 23% to 50% in Lebanon and 20% to 29% at Eskishehir in Turkey. Clearly there should be prospects of producing further improvements in seed yield from selection within these variable populations. However, this strategy might be best implemented within individual countries in all those populations that did not yield significantly less than the local check, and not be restricted solely to those that significantly exceeded it. There are also likely to be other local cultivars within a country against which the populations should be tested. The occurrence of the large switch in rank position between the two local checks at the two locations in Turkey was again evident in these trials as in the CIYTs.

The correlations between the seed yield of the populations at the locations is given in table 3.20. The only two interlocation correlations significant were the negative association between Jordan and Syria and the positive association between the locations in Turkey. In the CIYTs both correlations were also significant, but that for the former association was positive. The reason for the switch is not clear, although it may be partly accounted for by the radical difference in the genetic architecture of the material tested in the two sets of trials.

Table 3.17. Agronomic data for different locations for the CIF_3T during 1978/79.

Country	Location	Planting date	Crop duration[1] (days)	Fertilizer ($kg.ha.^{-1}$) N	P_2O_5	K_2O	Irrigation	Insecticide
ALGERIA	Sidi-Bel-Abbes	27/12	168		90			
IRAQ	Sulimania	17/3	90	115	42			
JORDAN	Raba	20/2		10	30			
LEBANON	Terbol	29/3	100	40	60		1	Dimecron / Malathion X 1
SYRIA	Tel-Hadya	26/2	108	30	50		2	Endosulphan x 3
TURKEY	Ankara	6/3	118	20	60			
	Eskishehir	28/3	113	30	40			Lebaycide-X 2

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

Table 3.18. Mean values for three agronomic characters for entries in the CIF_3T during 1978/79.

Entry		Days to flowering	Days to maturity	Plant height cm.
X77Sd	7	83	124	34
	19	83	127	39
	22	81	125	34
	26	83	127	35
	27	83	126	36
	28	82	125	31
	36	81	125	30
	37	81	125	31
	41	81	126	31
	49	83	127	34
	69	83	125	30
	83	78	122	27
	113	79	123	34
	116	79	122	27
	172	83	125	37
	174	81	123	28
	175	82	124	31
	179	82	125	32
	184	82	125	39
	186	82	124	34
	192	82	126	37
	193	83	126	38
	204	79	122	32
ILC	1929	80	124	30

Table 3.19. Seed yield (Y= kg. ha.$^{-1}$) and rank (R) of entries in the CIF$_3$T at different locations during 1978/79.

Entry		ALGERIA Sidi-Bel-Abbes		IRAQ Sulimania		JORDAN(2) Rabba		LEBANON Terbol		SYRIA(2) Tel Hadya		TURKEY Ankara		TURKEY Eskishehir		Mean	
		Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R
X77Sd	7	1087	8	573	15	551	11=	959	8	1786	4	234	19	1979	24	1024	11
	19	1147(1)	7	635	9	384	23	647	24	1674	12=	276	5	2350	7	1016	13
	22	500	24	698	3	644	4	865	16=	1354	25	319	2	2478	4	980	21
	26	1210	4	607	13	519	15=	612	25	1543	18	263	11=	2347	8	1014	14
	27	951	16	555	16=	630	5	945	9	1457	21	253	14	2247	12=	1005	15=
	28	732	20	656	7=	690	2	865	16=	1674	12=	220	22	2038	20	982	20
	36	723	21	695	4	519	15=	795	21	1631	15	268	8	2597	1	1033	8=
	37	1083	9	500	22=	551	11=	862	18	1643	14	289	3	2303	10	1033	8=
	41	1031	11=	516	20=	546	13	925	12	1505	20	238	18	2025	22	969	22
	49	915	17	547	18=	667	3	989	6	1617	17	269	7	2028	21	1005	15=
	69	801	19	547	18=	426	21=	866	15	1676	11	197	24	2122	18	948	24
	83	1018	14	703	2	324	25	928	11	2029	1	262	13	2322	9	1084	4
	113	1031	11=	625	11	569	10	1089	2	1429	23	270	6	1963	25	997	17
	116	862	18	578	14	579	9	990	5	1702	8	196	25	2056	19	995	18
	172	1045	10	555	16=	792	1	860	19	1441	22	245	16	2247	12=	1026	10
	174	1152	6	656	7=	444	20	980	7	1541	19	252	15	2559	2	1083	5
	175	953	15	609	12	620	6	934	10	1688	9=	265	10	2406	6	1068	7
	179	1027	13	453	25	537	14	748	22	1360	24	230	20	2294	11	950	23
	184	1371	2	633	10	593	7	816	20	1688	9=	267	9	2166	17	1076	6
	186	703	22	492	24	482	19	1041	4	1724	7	240	17	2238	14	989	19
	192	1154	5	516	20=	426	21=	1061	3	1833	3	263	11=	2450	5	1100	3
	193	1393	1	500	22=	519	15=	741	23	1776	5	286	4	2522	3	1105	2
	204	1348	3	672	6	352	24	1322	1	1731	6	222	21	2194	16	1120	1
ILC	1929	694	23	688	5	583	8	886	13	1857	2	207	23	2222	15	1020	12
Local	check	424	25	721	1	509	18	884	14	1621	16	354	1	2009	23		
Location mean		974		597		538		904		1639		255		2246			
C.V.%		23.6		14.0		39.4		16.0		20.5		19.3		12.0			
L.S.D.(5%)		324.7		117.8		299.6		204.3		475.8		69.5		382.2			
No. of entries significantly exceeding local check.		19		0		0		2		0		0		6			

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

(2) "F" test of genotypic differences not significant.

Table 3.20. Correlations[1] (df = 22) between the seed yield of entries in the CIF_3T at different locations during 1978/79 (local check excluded from the calculations).

		IRAQ	JORDAN	LEBANON	SYRIA	TURKEY	
		Sulimania	Jubeiha	Terbol	Tel Hadya	Ankara	Eskishehir
ALGERIA	Sidi-Bel-Abbes	-0.21	-0.32	0.00	0.16	0.14	0.06
IRAQ	Sulimania		-0.13	0.07	0.20	0.09	0.17
JORDAN	Jubeiha			0.16	-0.50*	0.07	0.26
LEBANON	Terbol				0.17	-0.27	-0.32
SYRIA	Tel-Hadya					-0.22	0.12
TURKEY	Ankara						0.51*

(1) * P ≤ 0.05

3.5 CHICKPEA INTERNATIONAL ASCOCHYTA BLIGHT NURSERY (CIABN)

During the 1977/78 season, 1238 kabuli germplasm lines and 651 F_4 progeny rows were screened for resistance to Ascochyta blight by creating an artificial epidemic at Tel Hadya. The level of disease intensity was fairly high and uniform and sufficient seed of a few resistant/tolerant lines was harvested to initiate a Chickpea International Ascochyta Blight Nursery (CIABN) during 1978/79. The objectives of the nursery were to identify sources of resistance/tolerance to Ascochyta blight in various countries of the region, to recognize any stable sources of resistance across locations and to collect evidence on the possible existence of physiologic races.

Materials and Management

The CIABN comprised 40 resistant/tolerant entries and two susceptible checks, namely Syrian Local (ILC 1929) and a local check to be supplied by the cooperator. The entries originated from USSR, Spain, Turkey, Iran, Tunisia, USA, and ICARDA. Thirty seeds of each entry were furnished for sowing in 3 m rows spaced 0.30 to 0.40 m apart. After every two test entries a susceptible check was sown to serve as a spreader-cum-indicator row. The cooperators were advised to spray repeatedly with a spore suspension, prepared from infected plants, after the disease's appearance until the disease developed uniformly throughout the nursery.

A 1-9 scale, replacing 1-5 scale, was suggested for scoring the lines as follows : 1= no lesions visible (resistant); 3=few scattered lesions seen after careful searching (moderately resistant); 5=lesions common and easily observed, but defoliation occurring only in one or two patches in the plots (tolerant reaction); 7=lesions very common and damaging (moderately susceptible); and 9=lesions extensive and many or all of the plants killed (highly susceptible).

Thirteen sets of the nursery were distributed to cooperators in eight countries. Results were returned from 11 locations covering three countries. The nursery was planted in October at Lattaquieh (Syria); in November at Tel Hadya (Syria), Faisalabad(Pakistan), and Izmir (Turkey);

in December at Sidi-Bel -Abbes (Algeria), Terbol (Lebanon), Tel Saheb (Syria); in March at Eskishehir and in May at Ankara in Turkey. No information on the planting date was received from Rabba and Amman locations in Jordan.

Results and Discussion

The disease development was either poor or none at five locations including Terbol, Rabba and Amman, Tel Saheb and Ankara. The Faisalabad centre did not follow the scale suggested, as the cooperator simply classified the lines as tolerant, moderately susceptible and susceptible. Critical analysis of data also revealed that the disease development was not uniform. Therefore the results from these six locations were not considered. The results from the remaining five locations (table 3.21) are briefly discussed.

SYRIA

Thirteen lines were rated as resistant, 15 as resistant/tolerant, and 4 as susceptible at both sites (Tel Hadya & Lattaquieh). The remaining eight lines showed differential reactions, but the ratings were only markedly different for two lines (ILC-184 and -190). The 13 lines resistant at both the locations were ILC-182, -183, -191, -192, -194, -195, -200, -201, -202, -482, -484, NEC-138-2, and 77Ms 73022-2. Overall it appeared that the reaction of the lines to the pathogen was similar at both locations and any difference could be due to misclassification.

ALGERIA

In Sidi-Bell-Abbes site 28 lines were classified as resistant, 5 as tolerant, and 7 as susceptible.

TURKEY

Seven lines were evaluated as resistant, 5 as resistant/tolerant, and 20 as susceptible at both Eskishehir and Izmir. Only ILC 197 was rated resistant at Eskishehir and susceptible at Izmir, with the remaining seven

lines either tolerant or susceptible. As in Syria, the reaction of the lines to the pathogen was similar at both sites. Minor differences could be due to discrepencies in classification. The lines found resistant at both locations were ILC -191, -192, -195, -200, -201, -202, and NEC 138-2.

Considering all the results only seven lines, namely, ILC -191, -192, -195, -200, -201, -202 and NEC 138-2 were rated resistant at all the locations and all these lines originated in USSR. Other promising lines were ILC -182, -183, -194, -482, NEC 2388, and NEC 138-1. Only one line, ILC 618, showed a susceptible reaction across all the locations.

Many lines showed a differential reaction across the locations. For example : ILC 484 was rated resistant at both sites in Syria but was susceptible in Algeria and Turkey; ILC -611 and -616 were resistant in Algeria but susceptible in Syria and Turkey, and 77Ms 73022-2 was susceptible in Turkey but resistant in Syria and Algeria. The differential reaction of these lines strongly indicated the presence of physiologic races of the pathogen and these lines could be useful for future studies on the race situation.

Table 3.21. Reaction of entries in the Chickpea International Ascochyta Blight Blight Nursery (CIABN) to Ascochyta blight at four locations during the 1978/79.

Pedigree		Origin	Rating (1-9 scale)					Mean
			Syria		Algeria	Turkey		
			Tel Hadya	Latta-quieh	Sidi-Bel - Abbes	Eskishehir	Izmir	
ILC	105	Spain	9	5	5	7	7	6.6
	182	USSR	1	3	1	5	5	2.8
	183	USSR	1	3	1	5	3	2.6
	184	USSR	7	3	5	9	7	6.2
	189	USSR	5	3	5	7	5	5.0
	190	USSR	7	3	1	7	5	4.6
	191	USSR	1	3	3	3	4	2.8
	192	USSR	1	3	3	3	3	2.6
	193	USSR	7	7	3	5	5	4.6
	194	USSR	1	3	1	5	3	2.6
	195	USSR	3	3	3	3	3	3.0
	197	USSR	5	3	9	3	7	5.4
	200	USSR	3	3	1	3	3	2.6
	201	USSR	1	1	1	3	2	1.6
	202	USSR	3	3	1	3	3	2.6
	210	USSR	3	5	1	5	7	4.2
	212	USSR	5	5	3	7	7	5.4
	236	USSR	3	5	3	7	6	4.8
	244	USSR	3	5	3	9	7	5.8
	248	USSR	3	5	1	9	7	5.4
	249	USSR	5	3	7	7	7	5.8
	430	Iran	5	7	9	7	9	7.4
	482	Turkey	3	3	3	5	5	3.8
	484	Turkey	1	3	9	7	5	5.0
	611	Tunisia	9	7	3	7	9	7.0
	616	Tunisia	9	7	1	9	9	7.0
	618	Tunisia	9	9	9	9	9	9.0
	1255	U.S.A.	3	5	9	9	8	6.8
	1287	U.S.A.	3	5	9	9	6	6.4
	1276	U.S.A.	7	5	1	9	6	5.6
NEC	659	Iran	7	5	1	7	7	5.4
	2388	U.S.A.	3	5	5	5	5	4.6
	138-1	USSR	5	5	5	5	3	4.6
	138-2	USSR	3	3	3	3	3	3.0
	1256	Iran	3	5	3	7	6	4.8
77Ms	73022-2	ICARDA	3	3	1	7	6	4.0
77Ms	73131-11	ICARDA	5	5	3	9	9	6.2
77Ms	73131-12	ICARDA	7	5	3	7	9	6.2
77Ms	73131-13	ICARDA	7	5	3	7	5	5.2
77Ms	73132-18	ICARDA	5	3	3	9	9	5.8
Mean rating for susceptible			9	9	8.4	9	9	

4. FABA BEAN[1] INTERNATIONAL TRIALS AND NURSERIES

Introduction

Only four trials or nurseries of faba beans were available to cooperators in the 1978/79 season. These were the adaptation trial (FBAT), the international screening nursery (FBISN), the international F_3 trial (FBIF_3T) and the international Ascochyta Blight Nursery (FBIABN). Owing to the small quantities of seed available for distribution it was not possible to prepare any international yield trials. Large and small seeded entries were combined in the trials and nurseries, and a division into separate sets according to seed size has only been initiated for the 1979/80 season.

The results of the FBAT, FBISN and FBIF_3T only are presented here. The results from FBIABN of which nine sets were distributed to cooperators in seven countries are not included, as at most locations insufficient disease levels prevented any assessment of disease reaction of the test entries. The disease was severe only at Lattaquieh, where all the entries were rated 5 and 7 (on a 1-9 scale, where 1= resistant and 9= highly susceptible) except for selections from the germplasm accessions ILB 204 and ILB 286. The latter were rated 3 at the first scoring in January and 4 at the second in March.

4.1 FABA BEAN ADAPTATION TRIAL (FBAT)

Material

The nine test entries in the FBAT included both var. major and var. minor types. They originated in six countries, namely Syria, Turkey, Jordan, Lebanon, Spain and Egypt and were either local unselected (Syria, Turkey, Jordan and Lebanon) or commercially available cultivars (Aquadulce from Spain and Giza 3 and Giza 4 from Egypt). Although the range of variation was somewhat limited in this first year of the trial, it was hoped that it would be sufficient to attempt a classification of countries into agro-ecological zones (see 2.1.1).

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(1) The term "faba bean" has now replaced the original term broad bean.

Methods and Management

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

Fourteen sets of the trial were dispatched to cooperators in 12 countries. Results were returned from seven trials covering six countries. Available information supplied on practices employed at the different locations is given in table 4.1.

Results and Discussion

The data on days to flowering were supplied from four locations, namely, Egypt, Libya, and Tel Hadya and Lattaquieh in Syria and are given in table 4.2. Location means varied from 68 days in Egypt to 91 days at Tel Hadya. ILB 1818, from Jordan, was the earliest entry at all locations except at Lattaquieh,where it was three days later than Giza 3 and two days later than ILB 1921 from Turkey. ILB 1818 flowered on the same date as Giza 3 in Egypt and Libya and ILB 1814 (Syrian Local Large) was consistently late at all locations. Turkish local (ILB 1821) was the second earliest flowering entry at Lattakia (an environment similar to that of its origin in the coastal regions of southern Turkey) and the latest flowering entry in Egypt and Libya.

The seed yield of the entries is given in table 4.3. The heaviest mean yield was obtained in Egypt (4855 kg/ha) and the lightest in Sudan (182 kg/ha). The coefficients of variation for yield were very high in the Sudan (42%) and at Lattakia (48%), both of which locations were severely affected by diseases; powdery mildew and viruses at the former and Ascochyta blight, chocolate spot, and to some extent Orobanche at the latter. The cultivar Giza 3, originally released in Egypt for the northern Delta region, had the heaviest mean yield across all locations. It ranked first in Algeria, second in Egypt, Libya and Sudan and third both at Tel Hadya and at Izmir in Turkey. The other Egyptian cultivar, Giza 4, ranked second over all locations and was first in Libya and in Sudan and as expected at Seds in Middle Egypt, where the cultivar originated. The small-seeded Lebanese cultivar (ILB 1816) ranked first at both locations in Syria and was third overall. The large seeded Syrian cultivar (ILB 1814) ranked first at Izmir but was either eighth or ninth at all other locations.

The similarity in the ranks of entries at the locations in North Africa, Egypt and Sudan was emphasised by the significance of the respective inter-location correlations (table 4.4), except for that between Algeria and Sudan. This would suggest that these countries might be classified into a single agro-ecological zone, and the lack of correlation between the latter two countries may reflect their geographic position at the extremes of the zone. The only other significant correlation was that between Tel Hadya, in Syria, and Algeria. The season at Tel Hadya was unusually hot and dry and could be considered similar to a normal year in North Africa. It remains to be seen if this correlation will occur in a more normal year, and thus whether Algeria will be considered as part of an overall North african zone, or alternatively be included in the same zone as Tel Hadya.

All the other correlations were small, but even the conclusions reached about different zones must be tentative as this is the first year of the trial. However, it is hoped that the accumulation and analysis of data from this and future years of the trial will permit a more accurate zoning of the region.

Table 4.1. Agronomic date for different locations for the FBAT during 1978/79

Country	Location	Planting Date	Crop(1) Duration (days)	Fertilizer kg/ha N	P_2O_5	K_2O	Irrigation	Herbicide	Insecticide
ALGERIA	Sidi-Bel-Abbes	12/11	194	90				Trifluralin	
EGYPT	Sids	6/11	172	38	38		4		
LIBYA	Tajoura	29/10	170	120	60		7		
SUDAN	Hudeiba	26/10	111				11		
SYRIA	Lattaquieh	18/10	200						
	Tel Hadya	3/11	215	30	60		3		Malathion x2
TURKEY		8/11	242						Thiodan
									Metasystox

(1) Days from planting to harvest.

Table 4.2. Mean days to flowering of entries in the FBAT at different locations during 1978/79.

Entry		Varietal Name	Egypt Sids	Libya Tajoura	SYRIA Lattaquieh	SYRIA Tel Hadya
ILB	1814	Syrian Local Large	74	93	102	104
	1811	Syrian Local Small	68	64	62	32
	1821	Turkish Local Large	78	96	59	89
	1818	Jordanian Local Small	60	57	61	81
	1817	Lebanese Local Large	70	83	86	90
	1816	Lebanese Local Small	71	89	94	94
	1266	Aquadulce (Spain)	71	78	88	95
	1819	Giza 3 (Egypt)	60	57	58	96
	1820	Giza 4 (Egypt)	64	57	66	84
Mean			68	75	75	91

Table 4.3. Seed yield (Y= kg/ha) and rank (R) of entries in the FBAT at different locations during 1978/79.

ENTRY		ALGERIA Sidi-Bel-Abbes		EGYPT Sids		LIBYA Tajoura		SUDAN Hudeiba		SYRIA Lattaquieh		SYRIA Tel Hadya		TURKEY Izmir		MEAN	
		Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R
ILB	1814	1519	8	2799	8	276	9	20	8	348	9	3040	9	2548	1	1507	8
	1811	1560	7	5047	5	1591	5	339	3	1529	2	3258	8	1584	7	2129	6
	1821	1444	9	2221	9	432	8	9	9	436	7	3280	7	1246	9	1295	9
	1818	1765	6	4655	7	1638	4	194	4	1210	3	3845	4	1511	8	2117	7
	1817	1857	4	5750	3	1571	6	34	7	418	8	3683	5	2402	2	2245	4
	1816	1909	2	5004	6	1077	7	78	5	1586	1	4370	1	1794	5	2259	3
	1266	1880	3	5307	4	1706	3	61	6	542	6	4043	2	2130	4	2238	5
	1819	2002	1	5964	2	2002	2	412	2	1104	4	4000	3	2174	3	2523	1
	1820	1794	5	6954	1	2080	1	492	1	791	5	3680	6	1589	6	2483	2
Location mean		1748		4855		1375		182		885		3689		1886			
C.V. %		21.0		18.7		14.2		42.4		47.5		14.8		6.6			
S.E. entry.		183.1		445.9		97.9		57.8		210.1		401.9		250.9			

Table 4.4. Correlation[1] (df=7) betwenn the seed yield of entries in the FBAT at different locations during 1978/79

	EGYPT Seds	LIBYA Tajoura	SUDAN Hudeiba	SYRIA Lattaquieh	SYRIA Tel Hadya	TURKEY Izmir
Algeria	0.77*	0.71*	0.29	0.28	0.88**	0.33
Egypt		0.92*	0.68*	0.33	0.56	0.11
Libya			0.73*	0.36	0.51	-0.47
Sudan				0.45	0.10	-0.26
Syria (Lat)					0.44	-0.39
Syria (T-H)						0.11

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

4.2 FABA BEAN INTERNATIONAL SCREENING NURSERY (FBISN)

Material

The FBISN comprised 60 entries, originating from 23 countries, and three check entries, two of which were provided (one major and one minor type) with the third to be supplied by the local cooperator. The entries were reasonably, but not completely, homozygous genotypes from the germplasm collection and had been maintained with a partial control of cross-pollination. In data tables for this trial two descriptors have been given under the 'entry' heading. The 'ILB' 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.

Cooperators were free to select both between and within entries for genetic material that could be utilised in their own breeding programmes.

Methods and Management

The sixty genotypes were to be planted in a single non-replicated row of 4 m, with the three check genotypes planted after every 10 test entries to allow some assessment of the environmental variation. The recommended inter-and intra-row spacing was 0.40 m to 0.60 m and 0.12 m, respectively. Nineteen sets of the trial were distributed to cooperators in 14 countries. Results were returned from nine trials covering seven countries.

Results and Discussion

Data were only returned on ten test entries and two checks from Algeria, and on 33 test entries and two checks from Lattaquieh in Syria. The remaining entries at these locations were severely affected by cold and disease at the former, and by Ascochyta blight and chocolate spot at the latter.

Genotypic values for days to flowering and to maturity and for plant height are given in table 4.5, derived as a mean across seven, five and five locations respectively. Days to flowering varied from 83 for ILB 5 and ILB 359 to 105 for 77Ms 88293 (ILB 159); days to maturity from 161 for ILB 322 to 177 for ILB 438; and plant height from 70 cm for ILB 322 to 98 cm for 77Ms 88293 (ILB 159). The association of early flowering and maturity with short plant height for ILB 322, and the opposite for 77Ms 88293, was emphasised in significant and positive correlations between these characters for values from all genotypes recorded at three common sites

The seed yield and rank of the genotypes is given on table 4.6. Only the mean seed yield of the check genotypes has been given at each location, but some idea of the environmental variation can be gained from the coefficients of variation (CV) given for these genotypes (table 4.6). These CVs varied considerably within a location, but all were uniformly high in Egypt and Libya. At individual locations any selection of superior yielding genotypes, for use in national programs, should be based on their performance relative to that of the nearest local check, especially at locations with a high CV. Also the relatively small but significant correlations between seed yield and the three agronomic characters (table 4.7), indicated that the latter characters could assist in the identification of heavy yielding genotypes.

The five heaviest yielding genotypes at individual locations are listed in table 4.8, and of the 26 genotypes evident, only two, namely Aquadulce and ILB 5, occurred more than twice. These two genotypes were apparent four and three times, respectively, and as a result were the two heaviest seed yielders across the locations (table 4.6). The seed yield of these and the four next heaviest yielding genotypes expressed as a percentage of the location mean, are given in table 4.9. From this it is evident that the seed yield of Aquadulce and ILB 5 was relatively stable across the locations, when compared to that of the other four. This would suggest that the previous two genotypes have a wide adaptation with the remainder showing a more specific adaptation to individual locations. However, the lack of replication and small plot size of these trials detracts from reaching any definite conclusions about stability. But the apparent superior and stable performance of Aquadulce and ILB 5 merits further examination in the future.

Table 4.5. Values for three agronomic characters across several locations for entries in the FBISN during 1978/79.

Entry Selection		ILB	Country of Origin	Days to flowering (1)	Days to maturity (2)	Plant height (3)
77Ms	88755	1	Jordan	86	168	75
75TA	26003	3	Jordan	87	168	78
75TA	12	5	Cyprus	83	167	80
74TA	22	9	China	92	172	81
75TA	26022	9	"	88	171	81
77Ms	88252	16	Syria	95	171	81
74TA	51	19	"	96	173	81
74TA	59	22	"	91	171	80
75TA	26062	29	Hungary	86	169	84
74TA	84	30	Iraq	93	170	85
74TA	87	31	"	93	171	82
75TA	26083	32	"	92	170	85
77Ms	88711	53	U.K.	94	173	83
77Ms	88008	82	Iran	98	174	87
74TA	197	83	Jordan	89	163	78
75TA	26270	136	Morocco	90	169	79
74TA	253	142	"	94	171	81
75TA	26291	156	France	94	168	80
77Ms	88094	159	Greece	96	173	92
77Ms	88293	159	"	105	177	98
74TA	311	201	Turkey	91	166	80
75TA	26333	207	"	92	173	84
77Ms	88029	218	"	95	175	80
77Ms	88030	218	"	99	176	83
74TA	367	269	Spain	88	169	79
77Ms	88733	269	"	95	169	73
74TA	374	274	Lebanon	89	168	74
77Ms	88321	286	"	93	167	77
77Ms	88322	286	"	94	172	82
77Ms	88323	287	"	92	167	77
77Ms	88324	287	"	93	165	71
75TA	26467	295	Uruguay	92	169	80
77Ms	88218	298	Spain	98	172	80
77Ms	88335	311	Germany	88	167	84
77Ms	88338	317	U.K.	85	167	82
77Ms	88789	320	Japan	84	170	79
75TA	26501	322	"	89	161	70
77Ms	88138	328	China	85	164	75
77Ms	88158	352	Egypt	88	168	83
77Ms	88164	354	"	87	163	77

Cont'd....

Table 4.5. (cont'd)

ENTRY Selection	ILB	COUNTRY OF Origin	MEAN (1) Days to flowering	MEAN (2) Days to maturity	MEAN (3) Height (cm)
77Ms 88165	356	Egypt	90	166	81
74TA 490	359	"	83	167	78
74TA 498	360	"	88	169	75
77Ms 88178	360	"	85	170	83
75TA 26639	369	Algeria	91	168	81
77Ms 88362	372	"	94	172	85
77Ms 88367	388	Tunisia	93	174	75
77Ms 88370	400	Tunisia	96	174	84
77Ms 88371	402	"	94	174	82
77Ms 88376	407	"	96	173	77
77Ms 88227	419	Iran	98	171	94
77Ms 88410	421	"	100	175	86
77Ms 88430	438	Colombia	100	177	81
77Ms 88679	692	Canada	92	174	81
77Ms 88683	697	"	89	173	85
77Ms 88266	1814	Syria	94	172	80
-	1816	Lebanon	94	167	70
Aquadulce		Spain	92	171	73
Giza 3		Egypt	88	167	79
Giza 4			85	167	79
Syr.Loc.Small	1811		86	165	71
Syr.Loc.Large	1814		95	172	82
Local check			86	167	85

Notes:
(1) Mean of data from Egypt, Lebanon, Libya, Hama, Lattaquieh and Tel Hadya-Syria.
(2) Mean of data from Egypt, Lebanon, Libya, Hama-Syria and Turkey and W. Germany.
(3) Mean of data from Lebanon, Libya, Hama-Syria and W. Germany.

Table 4.6. Yield (Y= kg/ha) and rank (R) of entries in the FBISN at different location during 1978/79.

ENTRY Selection		ILB	ALGERIA Sidi-Bel-Abbes		EGYPT Seds		LEBANON Terbol		LIBYA Tajoura		SYRIA Hama		SYRIA Lattaquieh		SYRIA Tel Hadya		MEAN	
			Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R
77Ms	88755	1			874	60	2304	38	1750	4	4175	41			3520	23	2525	40
75TA	26003	3			3203	5	2534	31	2063	2	4785	28			3260	38	3169	5
74TA	12	5			3453	4	3354	4	1563	11	6983	1			3120	43	3695	
74TA	22	9			1622	37	2509	35	1250	18	5301	13			3900	11	2916	16
75TA	26022	9			2642	10	2637	21	1250	18	4061	46			2860	52	2690	27
77Ms	88252	16			957	58	2765	15	1375	13	4988	22	768	32	2820	53	2581	36
74TA	51	19			1414	45	3840	2	563	44	4660	30	1056	26	3800	14	2855	22
74TA	59	22			1498	43	2970	8	375	51	5273	15			3220	40	2667	30
75TA	26062	29			1830	32	2970	8	2188	1	6327	3			3656	19	3394	
74TA	84	30			1622	37	2918	11	1625	8	5472	9	1306	20	3080	45	2943	14
74TA	87	31			1997	23	2995	7	1000	35	5538	8			3480	26	3002	11
75TA	26083	32			1165	53	2662	19	875	38	6470	2			3960	8	3026	
77Ms	88711	53			2621	11	1792	51	188	60	4295	38	1075	25	3928	9	2565	38
77Ms	88008	82			1102	55	1459	56	1063	32	4988	22	553	34	3468	27	2416	46
74TA	197	83			2746	8	2125	45	1188	22	4209	40	2112	8	2612	57	2576	37
75TA	26270	136			1914	28	2586	26	375	51	4167	42			3320	34	2472	43
74TA	253	142			1331	47	2662	19	688	42	4845	25			2760	54	2457	44
75TA	26291	156			1747	34	2150	43	438	48	4788	27			3020	48	2429	45
77Ms	88094	159			1872	29	2534	31	438	48	2964	60	1229	24	2220	61	2006	56
77Ms	88293	159	2188	4	790	62	1715	52	63	63	4133	43	1018	27	2740	55	1888	60
74TA	311	201			2330	15	2534	31	813	39	5287	14	2170	6	3440	28	2881	19
75TA	26333	207	2563	1	1414	45	2560	29	313	57	4318	36	1997	9	3280	37	2377	48
77Ms	88029	218			1206	51	2150	43	438	48	5102	17	1478	17	3500	24	2479	42
77Ms	88030	218	938	12	1331	47	2637	21	94	62	3805	51	1574	16	3300	36	2233	53
74TA	367	269			2080	21	2611	23	1125	28	4460	34	2208	5	3740	15	2803	24
77Ms	88733	269			2579	13	2560	29	1313	16	5030	20	1997	9	3140	42	2924	15
74TA	374	274	2063	7	1664	36	3379	3	1188	22	5087	18	1709	13	3728	16	3009	10
77Ms	88321	286			1789	33	2586	26	1188	22	5680	6	2266	4	3000	50	2849	23
77Ms	88322	286			998	57	1229	59	1125	28	4560	32	2285	3	2500	59	2082	54
77Ms	88323	287			1872	29	2505	35	1188	22	4332	35	3130	1	3032	47	2587	35

(Cont'd ...)

Table 4.6. (Cont'd)

ENTRY Selection	ILB	ALGERIA Sidi-Bel-Abbes		EGYPT Seds		LEBANON Terbol		LIBYA Tajoura		SYRIA Hama		SYRIA Lattaquieh		SYRIA Tel Hadya		MEAN	
				Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R
77Ms 88324	287			1747	34	2534	31	1375	13	3035	59	2342	2	3320	34	2402	47
	295			2621	11	2714	17	1188	22	4047	47	1613	15	3440	28	2802	25
77Ms 88218	298			1248	50	3251	5	1125	28	3654	56	1267	22	3120	43	2480	41
77Ms 88335	311			1872	29	2611	23	1313	16	3942	49			3340	33	2616	32
77Ms 88338	317	1781	10	2330	15	1997	46	1750	4	3491	57			4040	3	2722	26
77Ms 88789	320			1622	37	2458	37	563	44	3734	53	1440	19	3420	30	2359	49
75TA 26501	322	2094	5	2995	6	2867	13	1375	13	4076	45			3180	41	2893	18
77Ms 88138	328			2288	17	2893	12	1125	28	4532	33			3560	21	2880	20
77Ms 88158	352	2438	3	2371	14	1408	57	563	44	5059	19	1018	27	3560	21	2592	34
77Ms 88164	354			4410	1	2202	41	1063	32	4734	29	1459	18	3980	6	3278	
77Ms 88165	356			3536	3	2790	14	1000	35	3762	52	1805	12	4020	4	3022	9
74TA 490	359			2184	19	2253	40	1688	7	5127	16	1824	11	3980	6	3046	7
74TA 498	360			2163	20	2304	38	1188	22	5005	21	845	31	3900	11	2912	17
77Ms 88178	360			2933	7	2202	41	1563	11	4247	39			3860	13	2961	12
75TA 26639	369			1602	40	1971	47	813	39	5358	12			3680	18	2685	28
77Ms 88362	372	2563	1	1955	25	1229	59	375	51	4133	43			4080	2	2354	50
77Ms 88367	388			1206	51	1203	61	938	37	6016	4	998	29	3400	32	2553	39
77Ms 88370	400			790	62	1357	58	375	51	4617	31			2560	58	1940	59
77Ms 88371	402			1976	24	1843	50	813	39	3947	48	1267	22	3020	48	2320	51
77Ms 88376	407			1165	53	2611	23	625	43	5387	11			3260	38	2610	33
77Ms 88227	412			1040	56	1869	48	375	51	2964	60	538	35	3500	24	1950	58
77Ms 88410	421	1969	8	1498	43	1562	55	188	60	3221	58			3420	30	1978	57
77Ms 88430	438			832	61	1613	53	250	58	2095	62	768	32	2620	56	1482	61
77Ms 88679	692			957	58	512	63	250	58	1753	63	960	30	2060	62	1106	62
77Ms 88683	697	1875	9	1539	41	998	62	375	51	4304	37			3000	50	2043	55
77Ms 88266	1814			1955	25	2586	26	1250	18	4845	25			3708	17	2869	21
Local Lebanon	1816			1290	49	2688	18	1250	18	4876	24	2150	7	3040	46	2629	31
Aquadulce				2080	21	4429	1	2000	3	5700	5			4980	1	3839	
Giza 3				2267	18	1869	48	1750	4	3819	50			3640	20	2669	29
Giza 4				3827	2	2739	16	1625	8	3665	55			3928	9	3157	6

(Con't...)

Table 4.6. (Cont'd).

Selection	ALGERIA Sidi-Bel-Abbes		EGYPT Seds		LEBANON Terbol		LIBYA Tajowara		SYRIA Hama		SYRIA Lattaquieh		SYRIA Tel Hadya		MEAN	
	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R
Syria Local Small (2)			2704	9	1574	54	1009	34	3667	54	1661	14	2488	60	2288	52
Syria Local Large (2)	1732	11	1513	42	3178	6	518	47	5566	7	1306	20	3988	5	2953	13
Local check (2)	2094	5	1928	27	2954	10	1581	10	5415	10	-	-	-	-	3173	
Location Mean	2025		1906		2373		990		4538		1612		3363			
C.V. %																
Syria Local Small	-		26.7		27.6		47.5		12.6		-		9.0			
Syria Local Large	28.6		40.7		17.8		59.4		18.3		-		25.9			
Local check	19.8		33.8		23.3		20.3		17.1		-		-			

(1) Mean seed yield values exclude Algeria and Lattaquieh, Syria.

(2) Seed yield values are the mean of seven replicates for all locations except Tel Hadya where it is four.

Table 4.8. The five heaviest seed yielding entries at the individual locations in the FBISN.

Rank	ALGERIA Sidi-Bel-Abbes	EGYPT Seds	LEBANON Terbol	LIBYA Tajoura	SYRIA Hama	SYRIA Lattaquieh	SYRIA Tel Hadya
1	ILB 207 (1)	ILB 354	Aquadulce	ILB 29	ILB 5	ILB 287 (77Ms 88323)	Aquadulce
2	ILB 372	Giza 4	ILB 19	ILB 3	ILB 32	ILB 287 (77Ms 88324)	ILB 372
3	ILB 352	ILB 356	ILB 274	Aquadulce	ILB 29	ILB 286 (77Ms 88322)	ILB 317
4	ILB 159 (77Ms 88293)	ILB 5	ILB 5	Giza 3	ILB 388	ILB 826	ILB 356
5	ILB 322	ILB 3	ILB 298	ILB 1 ILB 317	Aquadulce	ILB 269 (74TA 367)	Syrian Large

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

Table 4.7. Correlations [1] between three agronomic characters and seed yield based on mean a cross values three locations (Libya,Lebanon and Hama, Syria) in the FBISN.

CHARACTERS	Days to maturity	Plant height	Seed yield
Days to 50% flowering	0.57 **	0.43 **	-0.35 **
Days to maturity		0.62 **	-0.36 **
Plant height			-0.25 *

(1) * P ≤ 0.05

** P ≤ 0.01

Table 4.9. Seed yield expressed as a % of location mean, of the six entries with the heaviest mean seed yield acrosslocations (in descending order) in the FBISN.

ENTRY	EGYPT	LEBANON	LIBYA	S Y R I A	
				Hama	Tel Hadya
Aquadulce	109	187	202	126	148
ILB 5	181	141	158	154	93
ILB 29	96	125	221	139	109
ILB 354	231	93	107	104	118
ILB 3	168	107	208	105	97
Giza 4	201	115	164	81	117

4.3 FABA BEAN INTERNATIONAL F_3 NURSERY ($FBIF_3N$).

Material

The $FBIF_3N$ comprised 30 F_3 populations, which stemmed from crosses between heavy yielding and widely adapted genotypes, originating from germplasm accessions, and a heavy yielding local genotypes. The material 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 was an unreplicated design with a local check planted after every five populations. The recommended plot size was 4 rows, each of 4 m, with an inter-and intra-row specing of 0.40 m and 0.16 m, respectively. Thirteen sets of the nursery were distributed to cooperators in ten countries. Data were returned from six locations, of which only four recorded seed yield.

The agronomic practices employed at the different locations are given in table 4.10.

Results and Siscussion

The data on seed yield at the four locations aregiven in table 4.11. However, the seed yield of the local check was only recorded in Algeria and Syria, and population yields were light in the Sudan, because of disease and the onset of hot and dry conditions during crop maturation.

Across the four locations the heaviest yielding population was X77TA 85; a cross between genotypes originating in the Sudan and Iraq. In Algeria the heaviest yielding plot of the local ranked tenth, and 19 of the populations were heavier yielding than the mean of the local check plots. X77Sd 129 was the heaviest yielding population at this location and originated from a three-way cross between genotypes from Ethiopia, Afghanistan and Iraq. In Syria five of the populations exceeded the mean of the local checks and the best, namely X77TA 3, stemmed from a cross between genotypes originating from China and Egypt.

The absence of data on local check seed yields and the lack of replication invalidates further analysis of the data. Future trials of early generation populations will be replicated, which will permit more meaningful analyses to be undertaken.

Table 4.10. Agronomic data for the different locations for the $FBIF_3N$

Country	Location	Planting Date	Crop[1] Duration (days)	Fertilizer N	P_2O_5	K_2O	Irrigation	Herbicide	Insecticide
ALGERIA	Sidi-Bel-Abbes	21/11	185		90			Trifluranin	
LEBANON	Terbol	23/11	217	40	60		2		Gusathion, Benylate Metasystox
SYRIA	Tel Hadya	3/11	215	30	60		3		
SUDAN	Hudeiba	2/11	111				10		

(1) Days for planting to harvest.

Table 4.11. Seed yield (Y= kg/ha) and rank (R) of entries on the FBIF$_3$N during 1978/79.

ENTRY		ALGERIA Sidi-Bel-Abbes		LEBANON Terbol		SUDAN Hudeiba		SYRIA Tel Hadya		MEAN	
		Y	R	Y	R	Y	R	Y	R	Y	R
X77TA	3	1019	27	3794	7	74	30	2452	1	1835	18
	5	998	28	3082	17	400	13	1790	16	1568	25
	41	2704	8	2691	24	233	20	2012	9	1910	15
	66	1643	23	3040	18	186	21	1799	15	1667	23
	70	1851	20	2624	25	818	1	2258	4	1888	16
	71	790	29	2695	23	744	4	1646	23	1469	26
	72	2350	11	3578	13	763	3	1731	18	2106	7
	85	3141	2	3630	12	530	8	2102	6	2351	1
	93	1290	25	1961	28	465	10	1281	24	1249	29
	94	728	30	1235	30	186	21	1097	30	816	30
X 77 Sd	11	2038	14=	3453	14	260	18	2332	2	2021	10
	13	2787	6	3875	4	140	29	2085	8	2222	4
	14	2850	4	3973	2	502	9	1803	14	2282	3
	22	1976	16=	3724	9	158	26	1518	26	1844	17
	25	1934	18	3813	5	186	21	1826	12	1940	13
	70	1976	16=	3754	8	260	18	1671	20	1915	14
	74	2912	3	3693	10	400	13	2260	3	2316	2
	79	2205	12	1879	29	437	11	1815	13	1584	24
	80	1082	26	3034	19	316	15	1358	28	1448	27
	81	1664	22	3960	3	298	16	2097	7	2005	11
	82	1560	24	2204	27	186	21	1767	17	1429	28
	90	2829	5	3677	11	149	28	2199	5	2214	6
	125	2662	9	2964	20	428	12	1519	25	1793	20
	126	1706	21	3299	16	577	7	1662	22	1811	19
	127	2475	10	3796	6	298	16	1663	21	2058	8
	128	2038	14=	4130	1	186	21	1834	10	2047	9
	129	3224	1	3316	15	667	6	1673	19	2220	5
	163	2766	7	2841	22	725	5	1608	24	1985	12
	164	1914	19	2885	21	158	26	1831	11	1693	22
	173	2101	13	2599	26	791	2	1479	27	1743	21
Location mean		1886		3173		384		2164			
C.V.% for the local check		20.3						3.8			

5. LENTIL INTERNATIONAL TRIALS AND NURSERIES

In the lentil international yield trial (LIYT) and in the lentil international screening nursery (LISN), 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 eight test entries in the LAT comprised a diverse set of genotypes which are cultivated commercially in their country of origin. It is hoped that such a choice of genotypes will provide the desired range of diversity required for the classification of countries into agro-ecological zones (see 2.1.1).

Methods and Management

The trial design was a randomised block with replications. The recommended plot size was four rows, each of 4 m, with an inter-and intra-row spacing of 0.25 m and 0.02 m respectively.

Twenty-two sets of the trial were dispatched to 14 countries,and results were returned from eight trials covering six countries. Available information supplied on the agronomic practices employed at the different locations is given in table 5.1.

Results and Discussion

Flowering was earliest in the Sudan and latest at Ankara in Turkey

(table 5.2). In the Sudan a local control was also included in the trial, and of the other four entries that flowered, only Giza 9 from Egypt (ILL 784) was as early as this genotype . Of the eight test genotypes, Giza 9 was earliest to flower in Egypt, Sudan and Libya suggesting that selections made in Egypt would show a phenology suited to conditions in the last two other southern locations. Also, the environment at the location in Egypt, because of its wide range in time to flower, should prove useful in selection for earliness.

In Algeria and the more northern locations Jordanian local (ILL 4354) was at least as early and sometimes earlier than Giza 9 (ILL 784). The Algerian location was noted to have had several nights with the temperature below 0^{o} C. Lebanese local (ILL 4399) and Winterlik red - 51 (ILL 1880) were consistently late to flower. The Syrian local entries (ILL 4400 and ILL 4401) had similar flowering responses.

The seed yield of the genotypes is given in table 5.3. The location means varied greatly with the extremes represented by 1437 kg/ha in Syria and 66 kg/ha at Ankara in Turkey; the low value for the latter reflected the occurrence of drought conditions during flowering. As only Giza 9 (ILL 784) produced any seed in the Sudan, this location has been ommitted from table 5.3.

The coefficients of variation ranged from 14% to 87% for Erzurum and Ankara in Turkey, respectively. ' F ' tests indicated that genotypic differences were significant at all sites except at Ankara in Turkey. Jordanian local (ILL 4354) had the heaviest mean seed yield across locations, and ranked first or second at five out of eight of the locations. Giza 9 (ILL 784) was the only genotype to produce seed in the Sudan, and was among the heaviest seed yielders in the four more southern locations (Algeria, Egypt, Jordan and Lebanon), but among the lightest in the more northern locations in Syria and Turkey. The two entries from Syria (ILL 4400 and ILL 4401) responded similarly at the different locations and the Turkish and Iranian entries, namely, ILL-1880, -4352, and -4351, respectively, performed best in the northern locations.

The data presented on flowering and seed yield have indicated considerable differences between the genotypes in their pattern of adaptation. The performance of Giza 9 for flowering and seed yield, and of the Iranian and Turkish genotypes for seed yield, suggested that adaptation was largely a reflection of differences in latitude. Whereas the consistent performance of Jordanian and Lebanese local for seed yield, and of the latter and Winterlik red-51 for flowering, indicated little or no effect of latitude. The two Syrian genotypes' performance for seed yield exhibited a more specific adaptation to the different environments.

In summary, the performance of some of the genotypes in the LAT strongly suggested a latitudional differentiation between their respective areas of adaptation. However, it may be hoped that such patterns of adaptation will be further elucidated by the results from LATs conducted over more sites and years, and so allow a meaningful classification of locations into agro-ecological zones.

Table 5.1. Agronomic data for different locations for the LAT during 1978-79.

Country	Location	Planting date	Crop duration (days) (1)	Fertilizer (kg/ha) N	P_2O_5	K_2O	Irrigation	Herbicide
ALGERIA	Sidi-Bel-Abbes	26/12	152		90			Trifluralin
EGYPT	Sids	13/12	140	18.5	75			
JORDAN	Jubeiha	6/2	120	20	60			
LEBANON	Terbol	27/11		40	60			
LIBYA	Tajoura	29/10	161	120	60		7	
SUDAN	Hudeiba	21/11	119	43			8	
SYRIA	Tel-Hadya	16/11	169	20	60			Tribunel-Eptam
TURKEY	Ankara	1/11	228	20	60			
	Diyarbakir	7/11	203	30	80			
	Erzurum	8/3	100	50	100			
	Eskishehir	27/3		30	40			

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

Table 5.2. Days to flower for entries in the LAT at different locations during 1978-79.

Entry	Varietal name	Origin	ALGERIA Sidi-Bel-Abbes	EGYPT Sids	JORDAN Jubeiha	LEBANON Terbol	LIBYA Tarjoura	SUDAN Hudeiba	SYRIA Tel-Hadya	TURKEY				Mean
										Ankara	Diyar-bakir	Erzurum	Eski-shehir	
ILL 784	Giza 9	Egypt	103	75	79	121	72	64	120		157	69	84	94
1880	Winterlik red-51	Turkey	123	109	94	136	141		130	185	158	70	89	124
4351	Iranian Local	Iran	126	105	94	145	127	71	143	185	164	66	85	119
4352	Turkish Local	Turkey	126	103	84	140	125	78	136	185	164	65	83	117
4354	Jordanian Local	Jordan	105	90	74	115	103	72	120	185	154	65	83	106
4399	Lebanese Local	Lebanon	125	109	78	140	134		131	185	164	70	86	122
4400	Syrian Local Large	Syria	115	98	78	124	132		125	185	158	66	84	117
4401	Syrian Local Small	Syria	115	98	78	125	129		129	185	159	68	84	117
Location mean			117	98	82	131	120	71	129	185	160	67	85	

Table 5.3 . Seed yield (Y=kg/ha) and rank (R) of entries in the LAT of different locations during 1978-79.

Entry	Varietal name	ALGERIA Sidi-Bel-Abbes		EGYPT Sids		JORDAN Jubeiha		LEBANON Terbol		SYRIA Tel Hadya		TURKEY						Mean	
												Ankara		Diyarbakir		Erzurum			
		Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R
ILL 784	Giza 9	1232	4	1881	1	764	2	1017	3	694	7	-		580	8	519	7	955	3
1880	Winterlik red-51	1134	5	450	6	514	7	958	5	1260	1	125	1	1885	2	741	6	883	5
4351	Iranian Local	576	7	625	5	514	7	642	6	783	6	70	3	1038	6	1050	1	662	6
4352	Turkish Local	268	8	319	7	701	3	250	8	510	8	57	4	865	7	984	2	494	8
4354	Jordanian Local	1594	1	1663	2	792	1	1293	2	1016	4	35	6	1945	1	828	5	1146	1
4399	Lebanese Local	679	6	244	8	681	4	367	7	1018	3	32	7	1670	5	834	8	634	7
4400	Syrian Local Large	1353	2	1169	3	611	6	1512	1	907	5	95	2	1752	4	966	3	1046	2
4401	Syrian Local Small	1263	3	831	4	618	5	1017	3	1056	2	47	5	1760	3	838	4	929	4
Location mean		1012		898		649		882		906		66		1436		845			
C.V.%		18.2		26.1		15.1		19.9		14.0		86.7		19.7		27.5			
S.E.entry ±		125.4		159.2		119.4		66.7		193.0		38.4		146.8		88.9			

5.2 LENTIL INTERNATIONAL YIELD TRIAL (LIYT).

Material

The LIYT comprised 24 test entries which had performed well in the Lentil International Screening Nursery (LISN) in 1977/78; there was also provision for a local check at each location.

Methods and Management

The trial design was a 5 x 5 lattice with four replications, although the results have been analysed as a randomised block. The recommended plot size was four rows, each of 4 m, with an inter- and intra-row spacing of 0.25 m and 0.02 m respectively.

Eighteen sets of the trial were distributed to cooperators in 12 countries. Results were returned from eight trials covering seven countries. Information on the agronomic practices was supplied from a number of locations, and the details are given in table 5.4.

Results and Discussion

At the locations where agronomic data was recorded, the data on flowering, maturity and plant height are given in tables 5.5, 5.6, and 5.7, respectively. Flowering was earliest in Egypt and latest in Turkey. There were genotypes as early as the local check at all locations and Giza 9 (ILL 784), ILL 813, and ILL 1744 were consistently early. The first two originated in Egypt and the last in Ethiopia. The genotypic differences for days to maturity were similar to those for flowering. The location means for plant height varied from 22 cm in Turkey to 33 cm in Lebanon, and at every location there were some genotypes taller than the local check.

For each location, the seed yield and rank of the genotypes is given in table 5.8, and the five heaviest yielding genotypes listed in table 5.9..

In the latter table the local check occurred twice, and of the remaining 22 genotypes, six occurred at three or more locations; these were 74TA-19, -260, -276, ILL-1744, -4400 and -1880. '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 5.8). In Egypt the local check was taken to be Giza 9 (ILL 784).

Both the heaviest and lightest yielding trials were in Turkey; the very light seed yield of the latter at Anakra reflected the onset of drought conditions during the reproductive period of growth. In Algeria and Jordan the local checks surpassed all the other genotypes tested. At other locations there were genotypes that exceeded the local check, but only in Nepal and Syria, and at Diyarbakir in Turkey were the differences significant. However, in Syria, Syrian local large (ILL 4400) and small (ILL 4401) can also considered as local checks, and only the latter was significantly exceeded by a genotype, namely, ILL 1880.

74TA 276 had the heaviest mean seed yield across locations. This is a large seeded genotype and its occurrence in the top nine genotypes at every location except Ankara in Turkey, where yields were low, indicated that it is adapted to a very wide range of conditions. Both 74TA 260 and 74TA 572 also showed a wide adaptation. The second and third heaviest yielding genotypes were 74TA 19 and Syrian local large (ILL 4400). These two large seeded genotypes showed a similar response at the different locations by producing very heavy yields in Lebanon, Syria and Turkey but relatively lighter yields in Algeria and Egypt. Thus, in contrast to 74TA 276,both these genotypes have a more specific adaptation which does not extend south of the Mediterranean.

Another interesting pattern of response across locations was well illustrated by the small seeded genotype 74TA 441 from Mexico. This genotype performed well in Algeria, Egypt, Nepal and Syria, but less well in Jordan and both Turkish locations. The adaptation of this genotype was thus to more southern than northern locations.

Table 5.4. Agronomic data for different locations for the LIYT during 1978/79.

Country	Location	Planting date	Crop duration (days) [1]	Fertilizer (kg/ha) N	P_2O_5	K_2O	Herbicide
ALGERIA	Sidi-Bel-Abbes	26/12	152		90		Trifluralin
EGYPT	Sids	3/12	138	18.5	75		
JORDAN	Jubeiha	24/12					
LEBANON	Terbol	26/11	175	40	60		
MOROCCO	Rabat	9/1					
NEPAL	Kumaltar	28/11	172	20	40		
SYRIA	Tel-Hadya	7/11	168	20	60		Eptam-Tribunel
TURKEY	Ankara	31/10	230	20	60		
	Diyarbakir	7/11	204	30	80		

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

Table 5.5. Days to flowering for entries in the LIYT at the different locations during 1978/79.

Entry		Origin	ALGERIA	EGYPT	JORDAN	LEBANON	NEPAL	SYRIA	TURKEY		Mean
Selection	ILL		Sidi-Bel Abbes	Sids	Jubeiha	Terbol	Kumaltar	Tel-Hadya	Ankara	Diyarbakir	
74TA 19	28	Syria	115	101	107	121	123	126	186	160	130
75Kf 36075	97	Morocco	121	103	113	136	132	136	186	162	136
74TA 138	101	"	119	104	113	136	125	136	186	166	136
74TA 260	253	Australia	112	99	105	120	124	124	186	160	129
-	254	Greece	116	101	108	127	123	130	186	160	131
74TA 276	262	Hungary	110	95	104	119	120	123	186	160	127
-	346	Mexico	121	103	114	131	123	133	186	160	134
74TA 434	350	"	123	105	114	135	128	130	186	-	132
74TA 441	353	"	112	99	104	129	121	125	186	158	129
-	467	Chile	121	109	115	137	132	135	186	165	138
74TA 550	470	Syria	117	96	108	121	130	125	186	157	130
74TA 565	495	Mexico	121	104	115	130	128	136	186	162	135
74TA 572	498	"	118	98	106	123	124	126	186	160	130
74TA 577	500	"	115	96	109	123	119	124	186	160	129
74TA 580	501	"	113	103	108	124	123	120	186	158	129
Giza 9	784	Egypt	99	79	104	119	113	114	-	158	112
-	813		108	78	102	116	110	111	186	157	121
-	924	Iran	125	106	119	144	127	138	186	160	138
75Kf 36627	1169	"	119	98	112	128	120	130	186	-	128
-	1744	Ethiopia	101	78	101	110	110	115	-	154	110
Winterlik Pub 11	1877	Turkey	123	105	115	139	126	138	186	160	137
Winterlik 51	1880	"	122	100	111	136	129	130	186	160	134
Syrian local large	4400	Syria	117	100	106	121	123	123	186	158	129
Syrian local small	4401	"	113	98	105	116	123	123	186	157	128
Local check			104		103	137	110	140	186	156	134
Location mean			115	98	109	127	123	128	186	159	

Table 5.6 . Days to maturity for entries in the LIYT at different location during 1978/79.

ENTRY			ALGERIA	EGYPT	LEBANON	NEPAL	SYRIA	TURKEY		
Selection		ILL	Sidi-Bel -Abbes	Sids	Terbol	Kumaltar	Tel Hadya	Ankara	Diyarbakir	Mean
74TA	19	28	154	141	175	173	169	229	206	178
75Kf	36075	97	155	141	178	175	169	231	206	179
74TA	138	101	153	143	183	169	170	230	206	179
74TA	260	253	151	136	179	175	174	229	205	178
-		254	152	141	180	174	171	230	205	179
74TA	276	262	150	135	169	175	160	231	205	175
-		346	153	141	178	172	170	231	202	178
74TA	434	350	156	143	175	175	168	231	206	179
74TA	441	353	148	138	164	175	167	227	199	174
-		467	155	148	189	165	172	231	206	181
74TA	550	470	149	136	161	173	159	228	201	172
74TA	565	495	152	143	183	171	165	230	206	179
74TA	572	498	150	136	165	172	164	232	201	174
74TA	577	500	153	135	176	173	167	232	205	177
74TA	580	501	149	143	168	172	166	229	203	176
Giza	9	784	147	126	170	173	169	-	205	165
-		813	146	124	170	175	162	232	202	173
-		924	158	146	193	167	175	232	205	182
75Kf	36627	1169	154	138	184	175	167	232	206	179
-		1744	144	124	155	172	160	-	199	159
Wint.Pull-11		1877	157	144	190	170	180	230	206	182
Wint.red -51		1880	153	140	169	174	165	225	201	175
Syr.Loc.Large		4400	154	139	175	173	168	230	206	178
Syr.Loc.Small		4401	148	138	165	175	163	227	202	174
Local check			147	-	193	163	175	229	202	185
Location mean			152	138	176	172	168	230	204	177

Table 5.7. Plant height (cm) of entries in the LIYT at different locations during 1978/79.

ENTRY			ALGERIA	JORDAN	LEBANON	NEPAL	SYRIA	TURKEY	
Selection		ILL	Sidi-Bel-Abbes	Jubeiha	Terbol	Kumaltar	Tel Hadya	Ankara	Mean
74TA	19	28	31	33	36	35	31	21	31
75Kf	36075	97	30	25	35	36	23	20	28
74TA	138	101	31	30	39	36	26	23	31
74TA	260	253	28	35	44	37	33	23	33
-		254	31	35	40	34	29	22	32
74TA	276	262	29	31	36	32	28	17	29
-		346	31	25	38	28	25	19	28
74TA	434	350	32	26	39	31	25	20	29
74TA	441	353	29	29	34	33	24	17	28
-		467	37	33	44	37	30	28	35
74TA	550	470	31	30	35	21	26	19	27
74TA	565	495	32	31	36	36	31	22	31
74TA	572	498	29	26	36	33	28	19	29
74TA	577	500	31	29	38	32	27	20	30
74TA	580	501	28	28	34	34	24	15	27
Giza	9	784	33	30	35	34	33	-	33
-		813	32	35	35	32	32	27	32
-		924	34	29	43	41	30	32	35
75Kf	36627	1169	28	30	34	37	28	24	30
-		1744	27	28	30	25	24	-	27
Wint.Pull-11		1877	32	30	39	40	29	26	33
Wint.Red -51		1880	29	30	35	30	28	20	29
Syr.Loc.Large		4400	31	35	39	33	33	23	32
Syr.Loc.Small		4401	32	30	35	25	24	19	28
Local check			31	34	40	23	23	28	30
Location mean			31	30	37	33	28	22	30

able 5.8. Seed yield (Y=kg/ha) and rank (R) of entries in the LIYT at different locations during 1978/79.

ENTRY			ALGERIA		EGYPT		JORDAN		LEBANON[1]		NEPAL		SYRIA		TURKEY				Mean	
election		ILL	Sidi-Bel-Abbes		Sids		Jubeiha		Terbol		Kumaltar		Tel Hadya		Ankara		Diyar-bakir			
			Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R
'4TA	19	28	1250	19	669	12	700	13	1534	6	1264[2]	1	1148	3	169	3	1858	3	1074	2
'5Kf	36075	97	1308	13	484	19	650	16	1334	12	986	3	-	-	52	13	1770	6	941	10
'4TA	138	101	1103	22	856	4	550	19	-	-	966	4	811	19	108	7	1752	8	878	14
'4TA	260	253	1444	7	1169	1	1091	4	1289	13	653	12	806	20	189	2	1688	11	1041	5
-		254	1259	18	625	14	928	9	-	-	421	18	764	22	132	6	1822	5	850	17
'4TA	276	262	1397	9	950	3	1088	5	1469	7	1089	2	1018	8	38	21	1745	9	1099	1
-		346	1277	16	725	9	525	21	1468	8	570	14	1006	9	41	20	1548	14	895	13
'4TA	434	350	1036	23	469	20	516	22	1601	5	530	16	896	16	47	16	1418	18	814	20
'4TA	441	353	1683	2	826	5	625	17	1468	8	748	6	1056	6	44	18	1263	22	964	7
-		467	1304	14	631	13	212	23	867	20	393	19	909	13	151	5	1292	21	720	22
'4TA	550	470	1319	11	344	22	680	14	1134	17	218	24	1152	2	97	9	1477	16	803	21
'4TA	565	495	1150	21	688	11	563	18	-	-	695	9	1129	4	50	14	1565	13	834	19
'4TA	572	498	1469	6	731	8	866	10	1651	3	660	11	1039	7	17	23	1737	10	1021	6
'4TA	577	500	1438	8	625	14	531	20	1784	1	576	13	956	12	46	17	1603	12	945	9
'4TA	580	501	1527	4	463	21	675	15	1412	10	390	20	884	17	32	22	1527	15	864	16
Giza	9	784	1386	10	1050	2	763	11	1226	16	269	22	908	14	-	-	948	25	936	11
-		813	1587	3	694	10	1103	3	1242	15	278	21	901	15	84	11	1133	23	878	14
-		924	603	25	734	7	116	24	958	18	554	15	792	21	198	1	1322	20	660	23
'5Kf	36627	1169	1201	20	550	16	713	12	950	19	688	10	844	18	90	10	1762	7	850	17
-		1744	1482	5	738	6	1338	2	1676	2	85	25	979	11	-	-	1060	24	1051	4
Wint.Pull-11		1877	781	24	206	23	70	25	703	21	799	5	740	23	108	7	1410	19	602	24
Wint.Red -51		1880	1299	15	169	24	943	8	1367	11	233	23	1239	1	152	4	1847	4	906	12
Syr.Loc.Large		4400	1310	12	538	18	1047	6	1623	4	733	7	1116	5	67	12	2050	1	1061	3
Syr.Loc.Small		4401	1277	16	544	17	1013	7	1284	14	433	17	1004	10	43	19	1977	2	847	8
Local check			1759	1	-	-	1591	1	467	22	731	8	452	24	48	15	1473	17		
Location mean			1288		645		721		1335		593		961		89		1566			
C.V. %			14.5		42.0		40.8				44.2		13.0		117.1		18.2			
L.S.D.			268.9		383.2		436.2				374.1		178.0		144.4		402.4			
No. entries Significantly exceeding local check			0		0		0				1		23		1		2			

(1) Analysis of variance not under taken owing to a large number of missing plots.
(2) Values underlined significantly exceeded the local check.

Table 5.9 . The five heaviest seed yielding entries at the individual locations in the LIYT during 1978/79.

Rank	ALGERIA Sidi-Bel-Abbes			EGYPT Sids			JORDAN Jubelha			LEBANON Terbol			NEPAL Kumaltar			SYRIA Tel Hadya			TURKEY					
																			Ankara			Diyarbakir		
	Selection		ILL	Selection		ILL	Selection		ILL	Selection		ILL	Selection		ILL	Selection		ILL	Selection		ILL	Selection		ILL
1	Local check			74TA	260	253	Local check			74TA	577	500	74TA	19	28	Wint-red-51		1880	-		924	Syr.Loc.L.		4400
2	74TA	441	353	Giza	9	784	-		1744	-		1744	74TA	276	262	74TA	550	470	74TA	260	253	Syr.Loc.S		4401
3	-		813	74TA	276	262	-		813	74TA	572	498	75Kf	36075	97	74TA	19	28	74TA	19	28	74TA	19	28
4	74TA	580	501	74TA	138	101	74TA	260	253	Syr.Loc.L		4400	74TA	138	101	74TA	565	495	Wint.red-51		1880	Wint.red-51		1880
5	-		1744	74TA	441	353	74TA	276	262	74TA	434	350	Wint.red-11		1877	Syr.Loc.L.		4400			467	-		254

5.3 LENTIL INTERNATIONAL SCREENING NURSERY (LISN)

Material

Eighty entries, originating from fifteen countries, were tested in the LISN, together with three check entries. The latter comprised Syrian local large and small, and a local genotype to be supplied by the cooperator. The entries were homozygous genotypes, stemming from germplasm accessions or selections made from within the latter, which had shown a superior seed yield in ICARDA's regional trials. Cooperators were free to select the genetic material for use in their own beeding programs.

Methods and Management

A non-replicated experimental design was utilised for the 80 test entries, with the three checks (ILL 4400, ILL 4401 and the local check) planted after every 10 test entries. The recommended inter-and intra-row spacing was 0.25 m and 0.02 m respectively. Nineteen sets of the nursery were distributed to 15 countries and results were returned from eight nurseries covering seven countries.

Results and Discussions

Genotypic values for days to flower and to maturity and for plant height are given in table 5.10 as a mean across eight locations at which all three characters were measured. For days to flowering the two extreme location means were evident at Eskishehir and Ankara in Turkey, the values being 84 and 191 respectively. In Bangladesh only the local check flowered, whereas at other locations there were genotypes as early as the local check, except in Morocco where a comparison was not possible in the absence of such a genotype. In Egypt three entries, namely, ILL-791, -826, and -1756 were as early as the local check; the first two genotypes originated in Egypt, whereas the latter is from Afghanistan. Over all locations ILL 791 and ILL 826 from Egypt were the earliest genotypes and ILL 371 from Chile the latest.

The relative values of the genotypes for mean days to maturity across locations was similar to that for flowering (table 5.10), with ILL 826 from Egypt the earliest at 155 days and 74TA 260 (ILL 253) the latest at 184 days. However, the period of pod set and filling was shortest in Syria (34 days) and Algeria (36 days) and longest in Morocco (53 days).

Mean plant height was lowest in Banghladesh (20 cm) and greatest in Lebanon (34 cm). In Iraq and Algeria only ILL 33 was taller than the local check. In Syria 69 genotypes were taller than the local check, whereas in Lebanon the latter was tallest. The tallest genotype averaged over all locations was 76TA 66059 (ILL 119) (table 5.10).

For each of eight locations the seed yield and rank of the genotypes is given in table 5.11, and the five heaviest yielding genotypes listed in table 5.12. The latter table contained 32 genotypes of which five appeared at two locations but only one, namely, 75 kf 36009, at three locations. Only the mean of the nine replicates of the check entries has been given at each location, but some idea of the environmental variation can be gained from the coefficients of variation (CV) given for these entries (table 5.11). These CVs were relatively consistent at a location, but all were uniformly high in Egypt, Morocco and at Ankara in Turkey.

At individual locations any selection of superior yielding genotypes, for use in national programmes, should be based on their performance relative to that of the nearest local check. This would have particular relevance to locations with a high CV, but at locations with a lower CV the superior performance of a number of the genotypes should allow the chance of more effective selection.

The lack of replication detracts from reaching any definite conclusions about the stability of the genotypes tested. However, the superior performance of 75kf 36009 at three locations, and the occurrence of 74TA 452 in the top fifteen at five locations suggested that these genotypes are widely adapted.

Table 5.10. Values for three agronomic characters for entries in the LISN during 1978/79

Entry Selection	ILL	Country of origin	Days to flowering	Days to maturity	Plant height(cm)
74TA 14	16	Jordan	129	179	28
19	28	Syria	127	171	26
76TA 66026	29	"	121	165	25
74TA 20	30	"	123	174	27
25	32	"	126	167	26
75Kf 36009	33	"	127	172	27
74TA 72	54	Iraq	129	171	28
75Kf 36075	97	Morocco	130	169	25
76TA 66054	99	"	121	166	27
75Kf 36083	118	Turkey	129	174	26
74TA 152	119	"	131	175	27
76TA 66059	119	"	130	175	30
74TA 158	149	"	131	180	28
161	151	"	131	180	26
212	211	Greece	133	184	27
76TA 66088	223	Iran	123	165	25
74TA 260	253	Greece	124	168	25
262	253	"	124	169	27
264	254	"	126	168	24
266	254	"	126	172	24
268	255	Turkey	128	171	24
276	262	Hungary	125	158	24
76TA 66116	264	"	124	159	23
74TA 290	272	Greece	131	182	26
302	285	"	125	175	27
307	287	"	128	175	25
309	289	"	131	180	29
310	290	"	132	181	27
76TA 66127	305	"	133	170	24
74TA 387	331	Turkey	131	179	25
75Kf 36209	348	Mexico	128	161	26
76TA 66150	349	"	125	157	26
74TA 434	350	"	129	161	27
75Kf 36212	351	"	125	156	26
36213	351	"	126	160	28
36215	351	"	125	161	26
74TA 452	363	Chile	133	182	27
470	371	"	134	176	28
533	445	"	133	180	27
539	451	"	132	181	27
548	470	Syria	124	167	23
549	470	"	125	170	23
559	492	"	130	172	24
560	493	"	129	170	23

Cont'd...2

Table 5.10. (cont.)

Entry Selection	ILL	Country of origin	Days to flowering	Days to maturity	Plant height (cm)
74TA 569	497	Mexico	133	178	24
572	498	"	127	163	27
573	499	"	128	177	26
577	500	"	125	160	28
580	501	"	125	162	25
581	501	"	128	173	26
75Kf 36241	501	"	125	167	25
74TA 583	502	"	126	158	25
587	504	USSR	124	170	26
615	538	Turkey	132	175	26
618	540	"	131	175	27
75Kf 36261	553	"	130	174	25
75Kf 37356	752	Lebanon	129	177	27
-	791	Egypt	117	156	26
-	826	"	118	155	28
74TA 877	901	Iran	132	175	25
75Kf 36346	915	Spain	128	173	26
76TA 66182	915	Spain	130	163	25
75Kf 36384	947	Iran	125	161	25
36421	983	Chile	127	161	25
36423	983	"	130	164	26
36442	998	"	131	164	27
36466	1026	Iran	126	161	28
36468	1027	"	127	160	28
36488	1036	"	127	162	26
36600	1147	"	128	163	26
36627	1169	Lebanon	126	164	27
36712	1255	Iran	128	177	25
36822	1397	"	129	177	29
36824	1400	"	129	172	27
36844	1415	"	130	173	29
36931	1522	"	129	174	29
-	1756	Afghanistan	128	172	25
-	2124	Syria	131	179	25
-	2130	"	123	168	24
75Kf 36082	4399	Lebanon	131	175	29
Syria Local Large	4400	Syria	125	169	26
Syria Local Small	4401	Syria	124	165	24

Table 5.11. Seed yield (Y=kg/ha.) and rank (R) of entries in the LISN at different location during 1978/79.

Entry Selection	ILL	ALGERIA Sidi-Bel-Abbes		EGYPT Sids		IRAQ Dihok		LEBANON Terbol		MOROCCO		SYRIA Tel Hadya		TURKEY Ankara		TURKEY Diyarbakir		Mean	
		Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R
74TA 14	16	786	68	200	64	710	17	564	31	170	20	266	31	106	17	1507	43	539	60
19	28	1357	14	950	8	620	30	564	31	70	48	280	27	44	38	1400	49	661	23
76TA 66026	29	1286	20	500	32	650	26	487	39	50	55	266	31	-	-	1800	18	720	15
74TA 20	30	1214	28	700	22	1280	1	693	13	150	21	326	15	30	45	1507	43	738	8
25	32	1143	35	400	42	1030	3	-	-	150	21	463	2	6	62	1307	59	643	29
75Kf 36009	33	1214	28	650	26	1210	2	219	70	100	35	396	4	11	58	2000	3	725	12
74TA 72	54	929	57	700	22	1010	4	225	69	100	35	333	14	8	60	1733	21	630	35
75Kf 36075	97	1000	51	400	42	910	7	450	42	80	43	173	72	17	52	1600	32	579	48
76TA 66054	99	1786	3	1400	1	420	55	693	13	30	61	343	12	7	61	1333	53	752	4
75Kf 36083	118	1143	35	800	14	970	5	534	37	220	12	266	31	46	36	1947	6	741	7
74TA 152	119	1214	28	900	10	520	45	513	38	120	29	256	41	56	34	1333	53	614	37
76TA 66059	119	1071	41	400	42	430	54	731	12	130	26	266	31	31	44	1533	41	574	53
74TA 158	149	643	76	400	42	590	34	410	48	400	4	283	23	98	21	933	74	470	71
161	151	429	82	300	56	690	22	103	78	150	21	300	21	310	3	973	70	407	79
212	211	500	79	400	42	630	29	125	77	60	53	233	53	26	47	1333	53	413	78
76TA 66088	223	1786	3	200	64	650	26	436	45	50	55	266	31	156	10	1720	24	658	24
74TA 260	253	1143	35	1100	5	700	20	282	64	20	68	213	63	192	7	1400	49	631	34
262	253	1286	20	1000	6	690	22	436	45	10	75	266	31	18	51	1560	38	658	24
264	254	1214	28	950	8	610	31	385	51	150	21	250	44	16	55	1200	61	597	42
266	254	1214	28	750	20	720	16	564	31	-	-	270	30	24	49	1333	53	696	18
268	255	714	72	100	75	320	70	590	28	100	35	243	49	97	22	1400	49	446	76
276	262	1071	41	200	64	410	57	884	9	260	6	150	77	-	-	1827	15	686	20
76TA 66116	264	1857	1	600	27	450	52	667	20	260	6	233	53	-	-	1133	65	743	6
74TA 290	272	1214	28	800	14	340	67	450	42	220	12	260	39	340	2	800	79	553	58
302	285	1286	20	100	75	210	78	205	71	700	1	180	70	56	34	840	78	447	75
307	287	1000	51	550	31	420	55	539	36	550	2	220	59	102	20	1080	67	558	55
309	289	1071	41	300	56	250	75	410	48	500	3	433	3	178	9	333	83	734	77

Cont'd...

Table 5.11. (cont'd)

Selection	Entry	ILL	ALGERIA Sidi-Bel-Abbes Y	R	EGYPT Sids Y	R	IRAQ Dihok Y	R	LEBANON Terbol Y	R	MOROCCO Y	R	SYRIA Tel Hadya Y	R	TURKEY Ankara Y	R	TURKEY Diyarbakir Y	R	Mean Y	R
74TA	310	290	1071	41	100	75	360	63	385	51	100	35	220	59	12	57	1600	32	481	67
76TA	66127	305	1000	51	100	75	660	25	308	58	100	35	163	74	-	-	933	74	466	73
74TA	387	331	786	68	200	64	560	38	308	58	50	55	316	18	200	6	800	79	403	80
75Kf	36209	348	1286	20	200	64	340	67	898	7	190	18	240	51	87	26	1347	52	574	53
76TA	66150	349	1643	9	200	64	400	58	641	22	80	43	133	80	25	48	1507	43	579	48
74TA	434	350	1143	35	600	27	510	48	616	27	270	5	260	39	113	16	1613	30	641	30
75Kf	36212	351	1357	14	500	32	830	10	667	20	80	43	243	49	57	33	1600	32	667	22
	36213	351	1357	14	800	14	650	26	693	13	200	16	213	63	121	15	1707	25	718	16
	36215	351	1000	51	750	20	600	33	641	22	70	48	167	73	41	41	1187	64	557	56
74TA	452	363	1429	11	450	40	760	15	564	31	5	78	356	8	366	1	1867	11	725	12
	470	371	786	68	200	64	710	17	180	72	110	32	150	77	182	8	1733	21	506	65
	533	445	1071	41	300	56	350	65	282	64	230	11	226	56	35	43	1733	21	528	62
	539	451	1286	20	400	42	220	76	436	45	200	16	340	13	17	52	1560	38	557	56
	548	470	1786	3	400	42	330	69	1129	1	130	26	253	43	6	63	1773	19	726	11
	549	470	1357	14	400	42	400	58	1026	3	80	43	466	1	11	58	1827	15	696	18
	559	492	857	65	300	56	550	42	308	58	250	8	393	6	61	30	2000	3	590	44
	560	493	714	72	100	75	380	60	693	13	110	32	350	9	15	56	800	79	395	81
	569	497	893	64	-	-	270	74	688	17	250	8	250	44	44	38	1133	65	504	66
	572	498	1064	50	300	56	380	60	795	11	150	21	266	31	-	-	1467	46	632	33
	573	499	750	71	400	42	530	44	563	35	130	26	280	27	72	29	1533	41	532	61
	577	500	1286	20	100	75	170	81	1052	2	100	35	276	29	-	-	1067	68	579	48
	580	501	1821	2	500	32	190	80	961	5	250	8	320	16	-	-	1253	60	756	3
	581	501	1679	7	300	56	300	72	846	10	210	15	240	51	17	52	1640	29	654	27
75Kf	36241	501	1179	34	700	22	580	35	949	6	5	78	346	10	20	50	947	73	591	43
74TA	583	502	1071	41	900	10	210	78	975	4	20	68	346	10	-	-	1453	47	711	17
	587	504	1000	51	1000	6	60	82	898	7	100	35	223	58	30	45	1333	53	581	47
	615	538	500	79	900	10	460	50	625	25	30	61	310	20	39	42	1760	20	578	51

Cont'd...

Table 5.11. (cont.)

Entry Selection	ILL	ALGERIA Sidi-Bel-Abbes Y	R	EGYPT Sids Y	R	IRAQ Dihok Y	R	LEBANON Terbol Y	R	MOROCCO Y	R	SYRIA Tel Hadya Y	R	TURKEY Ankara Y	R	TURKEY Diyarbakir Y	R	Mean Y	R
74TA 618	540	429	82	200	64	570	37	385	51	70	48	250	44	46	36	1893	9	480	69
75Kf 36261	553	571	77	350	54	320	70	154	73	20	68	196	69	148	11	1333	53	387	83
37356	752	1000	51	500	32	-	-	282	64	30	61	256	41	210	5	2280	1	651	28
-	791	929	57	850	13	560	38	688	17	5	78	220	59	-	-	960	72	602	40
-	826	1429	11	1150	3	810	13	590	28	40	59	200	67	-	-	867	76	727	10
74TA 877	901	1500	10	1400	1	710	17	359	56	60	53	366	7	105	18	1560	38	758	2
75Kf 36346	915	929	57	500	32	820	12	385	51	120	29	226	56	44	38	1853	14	610	38
76TA 66182	915	1071	41	800	14	960	6	308	58	100	35	200	67	-	-	1827	15	752	4
75Kf 36384	947	1071	41	500	32	890	9	103	78	20	68	230	55	-	-	1907	8	674	21
36421	983	714	72	700	22	800	14	-	-	120	29	143	79	-	-	1867	11	724	14
36423	983	929	57	400	42	910	7	-	-	220	12	206	65	-	-	1933	7	766	1
36442	998	857	65	300	56	350	65	359	56	110	32	220	59	-	-	2267	2	638	31
36466	1026	929	57	200	64	670	24	128	74	180	19	250	44	-	-	1200	61	508	64
36468	1027	821	67	600	27	360	63	308	58	70	48	180	70	-	-	1867	11	601	41
36488	1036	929	57	800	14	560	38	257	67	30	61	157	75	-	-	867	76	514	63
36600	1147	929	57	400	42	520	45	462	40	50	55	203	66	-	-	800	79	481	67
36627	1169	1143	35	400	42	220	76	462	40	5	78	283	23	-	-	1613	30	589	45
36712	1255	1357	14	200	64	370	62	410	48	20	68	133	80	94	24	1200	61	473	70
36822	1397	1714	6	600	27	460	50	308	58	20	68	283	23	124	13	1573	37	635	32
36824	1400	1071	41	500	32	580	35	385	51	40	59	266	31	83	27	1693	26	577	52
36844	1415	1143	35	500	32	560	38	641	22	-	-	283	23	58	32	1413	48	657	26
36931	1522	1357	14	100	75	700	20	128	74	30	61	247	48	124	13	2000	3	586	46
-	1756	500	79	800	14	550	42	438	44	30	61	157	75	274	4	987	69	467	72
-	2124	571	77	250	63	500	49	625	25	20	68	100	82	105	18	973	70	393	82
-	2130	1429	11	200	64	450	52	128	74	30	61	396	4	59	31	1667	27	545	59
75Kf 36082	4399	714	72	100	75	300	72	-	-	10	75	320	16	142	12	1667	27	465	74
Syr.Loc.Large	4400(1)	1230	27	1111	14	607	32	576	30	74	47	313	19	94	24	1868	10	734	9
Syr.Loc.Small	4401(1)	1286	20	350	54	517	47	678	19	61	52	285	22	73	28	1576	36	603	39
Local check.		1663	8	422	41	821	11	242	68	10	75	99	83	96	23	1598	35	619	36
Location mean		1108		513		557		507		122		258		86		1460			
C.V%:Local check		4.7		30.0		0		25.2		-		9.3		23.1		7.7			
Syrian local large		14.7		25.6		14.8		39.1		30.0		7.0		33.7		3.2			
Syrian local small		8.3		13.9		15.3		29.6		34.5		7.0		68.6		6.0			

(1) Seed yield values are the mean of 9 replicates.

Table 5.12. The five heaviest seed yielding entries at the individual locations in the LISN during 1978/79.

Rank	ALGERIA Sidi-Bel-Abbes	EGYPT Sids	IRAQ Dihok	LEBANON Terbol	MOROCCO	SYRIA Tel Hadya	TURKEY Ankara	TURKEY Diyarbakir
1	76TA 66116	76TA 66054	74TA 20	74TA 548	74TA 302	74TA 549	74TA 452	75Kf 37356
2	74TA 580	74TA 877	75Kf 36009	74TA 577	74TA 307	74TA 25	74TA 290	75Kf 36442
3	76TA 66054 (1)	ILL 826	74TA 25	74TA 549	74TA 309	74TA 309	74TA 161	75Kf 36009
4	76TA 66088	Syr.loc.large	74TA 72	74TA 583	74TA 158	75Kf36009	ILL 1756	74TA 559
5	74TA 548	74TA 260	75Kf 36083	74TA 580	74TA 434	Hurani-1	75Kf37356	75Kf 36931

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

5.4 LENTIL INTERNATIONAL F_3 TRIAL (LIF_3T).

Material

The LIF_3T was composed of 16 entries, of which 14 were F_3 populations originating from single crosses made in 1976 between selections from germplasm originating from different countries (table 5.13). The other two entries were an ICARDA check (Syrian local large, ILL 400) and a local check to be supplied by the cooperators. The F_3 populations were selected on the basis of their performance as F_2 populations and 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 a 4 x 4 triple lattice (3 replications), although the results have been analysed as a randomised block. The suggested plot size was four rows of 4 m with inter- and intra-row spacing of 0.25 m and 0.02 m respectively.

Six sets of the trial were distributed to six countries, with results returned from four locations in four countries. The agronomic practices employed at the different locations are given in table 5.14.

Results and Discussion

The mean performance of the populations across locations for days to flowering and to maturity and for plant height is given in table 5.15. Days to flowering varied from 115 for X76TA 101 to 129 days for X76TA-77 and -90, and days to maturity from 153 for X76TA 101 to 161 for X76TA-23, -77, -90 and -181. Plant height varied from 32 cm for X76TA-74 to 38 cm for X76TA-23 and -124. Only the correlation between days to flowering and to maturity was significant ($r = 0.92$, $P \leq 0.001$).

The seed yield and rank of the populations at the locations is given in table 5.16. 'F' tests indicated that the population differences were significant at the three locations for which an analysis of variance was conducted. A least significant difference was calculated and used to

indicate those populations which significantly exceeded the local check.

In Algeria, which had the heaviest mean seed yield, the local check exceeded all the populations. Whereas in Jordan and Lebanon the local check was significantly exceeded by one and five populations respectively. Further improvements in seed yield should be possible from selection within these variable populations, and this could also be practiced within individual countries in those populations which did not yield significantly less than the local check. The latter would be particularly applicable in Algeria where the local check ranked first.

Outstanding amongst the populations were X76TA 254 and X76TA 259, which both produced heavy seed yields in all locations, except the former in Jordan. The parents of the former population originated in Guatemala (ILL 495) and Mexico (ILL 500) (table 5.13). Interestingly the same Mexican genotype was a parent in the latter population; the other parent being a selection from a Greek accession (ILL 254) (table 5.13). The parents of these crosses were all chosen for their adaptability to give a cross combination of wide adaptation x wide adaptation.

Table 5.13. Pedigree and origin of crosses in the LIF_3T.

Cross		Pedigree and Origin						
X76TA	1	74TA 138	(ILL 101)	Morocco	X	74TA 216	(ILL 212)	Afghanistan
	2	74TA 138	(ILL 101)	Morocco	X	74TA 276	(ILL 262)	Hungary
	3	74TA 138	(ILL 101)	Morocco	X	74TA 434	(ILL 350)	Mexico
	23	74TA 550	(ILL 470)	Syria	X	74TA 216	(ILL 212)	Afghanistan
	25	74TA 550	(ILL 470)	Syria	X	75Kf 36770	(ILL 1334)	Iran
	74	74TA 138	(ILL 101)	Morocco	X	74TA 374	(ILL 321)	Hungary
	77	74TA 138	(ILL 101)	Morocco	X	74TA 804	(ILL 866)	Iran
	90	74TA 855	(ILL 885)	Lebanon	X	75Kf 36249	(ILL 516)	USSR
	96	74TA 577	(ILL 500)	Mexico	X	74TA 219	(ILL 213)	Afghanistan
	101	74TA 577	(ILL 500)	Mexico	X	ILL 719		Ethiopia
	124	74Ta 533	(ILL 445)	Chile	X	Giza 9	(ILL 784)	Egypt
	181	ILL 861		Iran	X	74TA 268	(ILL 255)	Turkey
	254	74TA 565	(ILL 495)	Mexico	X	74TA 577	(ILL 500)	Mexico
	259	74TA 577	(ILL 500)	Mexico	X	74TA 265	(ILL 254)	Greece

Table 5.14. Agronomic data for different locations for the LIF_3T during 1978-79.

Country	Location	Planting date	Crop duration (days) (1)	Fertilizer (kg/ha) N	P_2O_5	K_2O	Herbicide
ALGERIA	Sidi-Bel-Abbes	26/12	154		90		Trifluralin
JORDAN	Jubeiha	6/2	121	20	60		
LEBANON	Terbol	27/11	186	40	60		
SYRIA	Tel-Hadya	6/11	172	20	60		Eptam-Tribonel
TURKEY	Diyarbakir	7/11		30	80		

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

Table 5.15. Mean values for three agronomic characters for entries in the LIF_3T during 1978-79

Entry		Days to flowering	Days to maturity	Plant height (cm)
X76TA	1	126	159	35
	2	119	154	34
	3	125	159	35
	23	126	161	38
	25	126	159	35
	74	126	160	32
	77	129	161	36
	90	129	161	37
	96	123	158	35
	101	115	153	33
	124	118	156	38
	181	126	161	33
	254	122	158	36
	259	119	158	35
	4400	121	157	34

Table 5.16. Seed yield (Y=kg/ha) and rank (R) of entries in the LIF_3T at different locations during 1978-79.

Entry		ALGERIA Sidi-Bel-Abbes		JORDAN Jubeiha		LEBANON Terbol		SYRIA Tel Hadya[1]		Mean	
		Y	R	Y	R	Y	R	Y	R	Y	R
X76TA	1	643	14	569	12	356	16	564	13	533	16
	2	889	8	625	8	689	8	650	9	713	7
	3	833	9	806	2	711	6	813	5	791	5
	23	595	15	542	13	689	8	657	8	621	12
	25	802	10	472	15	889	3	613	10	694	8
	74	937	5	681	7	422	14	578	12	655	10
	77	714	12	431	16	444	13	700	6	572	15
	90	905	7	597	9	467	12	433	15	601	14
	96	675	13	778	3	578	11	432	16	616	13
	101	1079	4	722	6	889	3	456	14	787	6
	124	722	11	736	5	711	6	583	11	688	9
	181	556	16	750	4	622	10	688	7	654	11
	254	1143	3	514	14	911	2	876	2	861	2
	259	1214	2	994	1	1111	1	888	1	1052	1
ILL	4400	937	3	597[2]	9	867	5	822	4	806	4
Local check		1564	1	597	9	400	15	869	3	860	3
Location mean		887		651		672		664			
C.V.%		20.4		34.0		28.8		-			
L.S.D. 5%		301.4		369.5		322.9		-			
No.of entries significantly exceeding local check		0		1		5					

(1) Herbicide damage, with consequent missing plots, made an analysis of variance inappropriate.
(2) Values underlined significantly exceeded the local check.

6. INTERNATIONAL AGRONOMY TRIALS

6.1 INTRODUCTION TO THE FERTILITY AND PLANT POPULATION TRIALS (FPPT)

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

(i) whether the naturalised Rhizobia present in the soil are effective or there was a need for artificial inoculation;

(ii) whether the symbiotic nitrogen fixation as reflected in terms of crop performance can be improved with a starter nitrogen dressing;

(iii) whether there is a need for application of phosphate (and potash in case of faba bean);

(iv) whether the symbiotic nitrogen fixation is adequate in meeting the nitrogen need of the crop;

(v) what is the optimum plant population level for different conditions, and whether there is any interaction between levels and soil fertility treatments.

Methods and Materials.

The basic set of fertility and inoculation treatments was same for all the three legumes. They consisted of (i) an unfertilised uninoculated control; (ii) inoculation (1) with peat based multi-strained Rhizobial inoculant produced at ICARDA; (iii) inoculation + 20 kg N/ha as starter nitrogen; (iv) inoculation + 50 kg P_2O_5/ha, and (v) 120 kg N/ha (applied in three splits, 40 kg at planting, 40 kg at the start of flowering and 40 kg at the podding stage) and 50 kg P_2O_5/ha.

For faba beans an additional treatment of inoculation plus 60 kg K_2O/ha was included and 60 kg K_2O/ha was also added for the treatment involving the application of 120 kg N/ha. Phosphate, potash and basal nitrogen were hand placed.

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

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

The size of the sub-plots was 21.6 m^2 (3.6 X 6 m) for chickpeas and faba beans and 16.2 m^2 (2.7 X 6.0 m) for lentils. The two outside rows and 0.5 m at either end of the central rows were discarded. Thus the net plot harvested, and the seed yields reported, are derived from the central rows of 5 m.

The details of the soil analysis, annual seasonal rainfall, irrigation, dates of planting and harvesting, cultivars, any special problem associated with the trials for chickpeas (CFPPT), faba beans (BFPPT) and lentils (LFPPT) are given in table 6.1. Some cooperators provided data on monthly maximum and minimum temperatures and total rainfall for the duration of the crop. These are diagrammatically represented in figure 1. Unfortunately some data are missing in the table as soil samples were not received in time for analysis from some locations.

Table 6.1. Some details of the material and general conditions under which the fertility and plant popualtion trials were conducted at various location.

Country		IRAQ				JORDAN		LEBANON	
Location		Baghdad	Sulimania		Dihok	Amman		Terbol	
Trial		CFPPT	BFPPT	CFPPT	CFPPT	CFPPT	LFPPT	BFPPT	LFPPT
Soil analysis									
Characteristic	Soil layer (m)								
PH	0 - 0.15	8.3	8.3	8.3	8.0			8.1	
	0.15 - 0.30	8.6	8.3	8.2	8.3				
Olsen's available P(ppm)	0 - 0.15	20	20	12	16			37	
	0.15 - 0.30	10	18	10	6				
Exchangeable K (meq/100g soil)	0 - 0.15	1.42	1.51	1.08	1.76		NA(1)	1.51	
	0.15 - 0.30	1.33	1.46	1.08	2.41				
Organic matter (%)	0 - 0.15	1.98	2.15	2.55	3.31			2.03	
	0.15 - 0.30	2.58	2.46	2.55	2.46				
Total N (%)	0 - 0.15	0.07	0.10	0.13	0.06			0.09	
	0.15 - 0.30	0.07	0.11	0.10	0.06				
Annual rainfall		125	664	664	NA	345	345	283	
Number of irrigations		7	0	0	0	0	0	2	0
Planting date		27/11	21/11	22/3	19/3	NA	3/1	1/12	1/12
Harvest date		10/5	12/7	7/7	13/6	7/7	17/5	9/7	27/6
Special Problem								Drought during podding	
Variety		Local large	Local large	Local	Local	Local	Local	Local large	Local small

(1) NA - Not available.

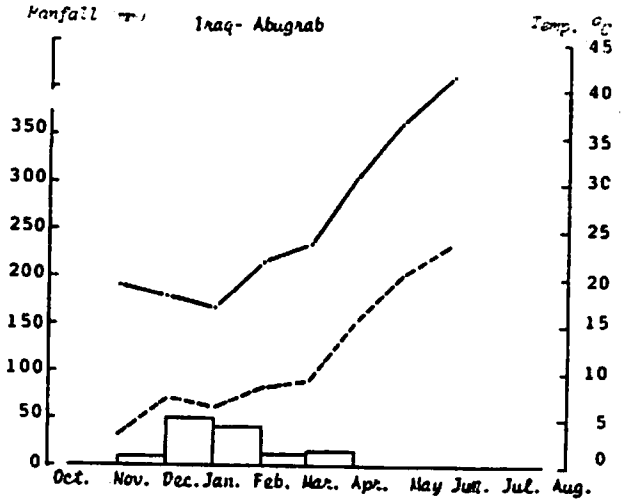
(Cont'd ....)

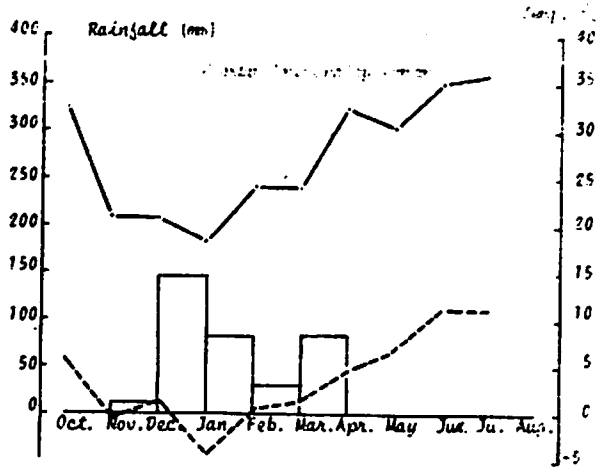
Table 6.1.(Cont'd)

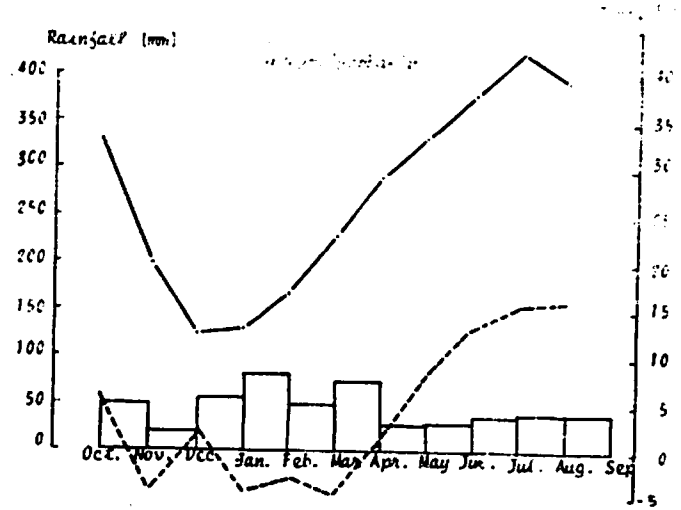
Country	LIBYA		SYRIA							TURKEY	
Location	Tajoura		Qarahta		Lattakia	Tel Hadya				Diyar-bakir	Izmir
Trial	BFPPT	LFPPT	CFPPT	LFPPT	BFPPT	BFPPT	CFPPT(W)	CFPPT(S)[2]	LFPPT	LFPPT	BFPPT
Soil analysis Charcteristic											
PH	7.4					8.5 8.5	8.4 8.5	8.5 8.5	8.4 8.4	8.2 8.2	
Olsen's available P (ppm)	NA					6.0 6.0	7.0 5.0	7.0 6.0	5.0 5.0	20 18	
Exchangeable K (meq/100g soil)	NA		NA		NA	2.37 2.04	2.45 2.15	2.28 2.15	2.37 2.11	2.11 2.11	NA
Organic	0.66					1.70 1.81	1.36 1.36	1.81 1.05	1.05 1.63	1.75 2.20	
Total N (%)	NA					0.06 0.05	0.06 0.04	0.05 0.05	0.05 0.04	0.07 0.07	
Annual rainfall	251		NA		NA	246	246	246	246	301	407
Number of irrigations	7	7	5	4	0	4	0	0	0	0	0
Planting date	6/11	2/11	28/11	16/11	23/10	2/11	6/11	13/2	6/11	10/11	18/12
Harvest date	26/4	8/4	25/6	20/5	13/5	20/5	23/5	16/6	8/5	30/5	2/7
Special Problem	Salinity in Patches		Salinity & Strong winds		Foliar diseases & Orobanche	Orobanche	Ascochyta blight		Oro-banche	Avena	Aphid
Variety	Local large	Local	Syrian local	Syrian local	Lattakia local	Syrian local large	Syrian local	Syrian local	Syrian local large	Turkish local	Sakiz

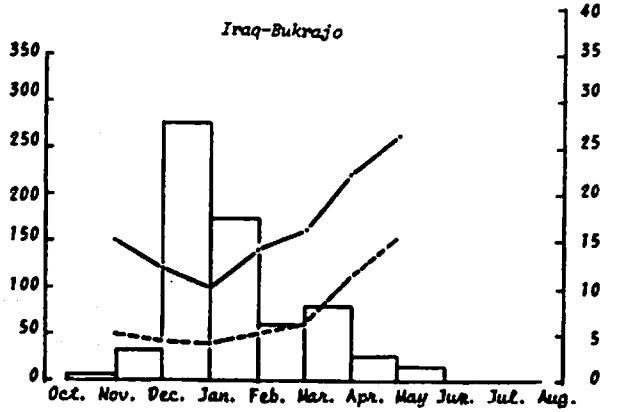
(2) W - Winter; S - Spring.

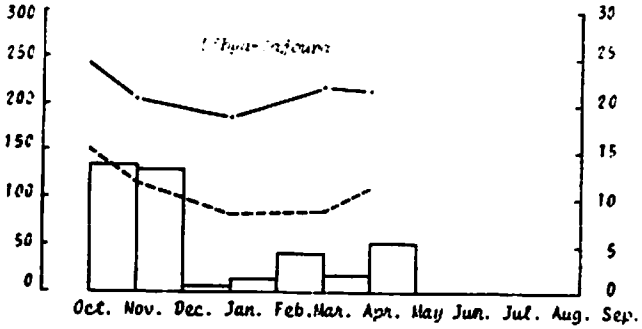
Fig. 1 : Monthly maximum and minimum temperature and monthly total rainfall during the cropping season at different locations.

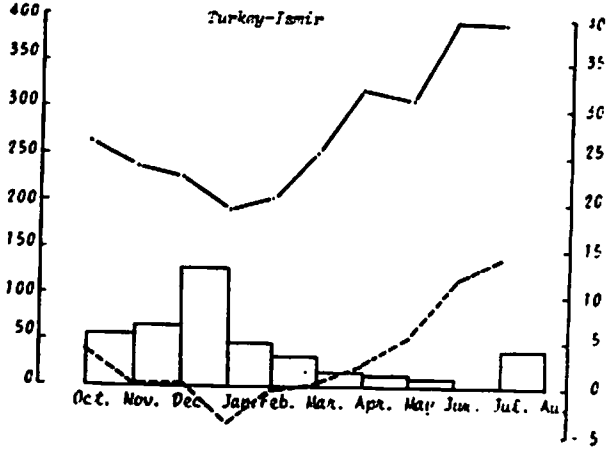








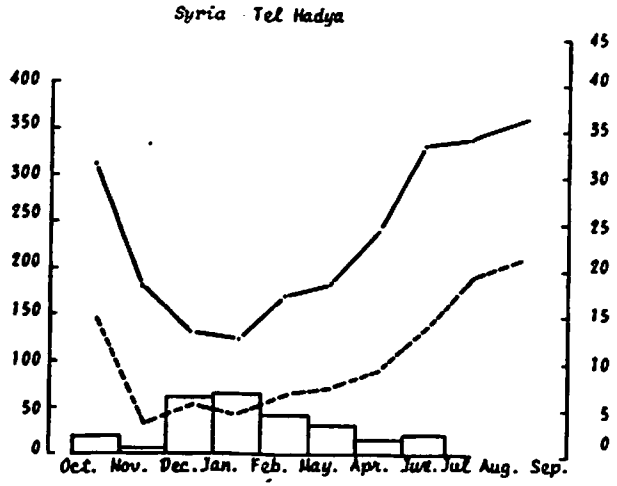




Legend. Rainfall

Temp Max

Temp Min



6.2 CHICKPEA FERTILITY AND PLANT POPULATION TRIAL (CFPPT).

Results and Discussion.

Data were received from the five locations listed in table 6.2. One additional winter sown trial conducted at Tel Hadya was badly damaged by Ascochyta blight and has not therefore been reported. In Jordan the seed yield was lightest and the coefficient of variation (CV) the highest. The CV was also high at Qarahta in Syria.

(i) Fertility-cum-Inoculation treatments.

There was no significant difference between the treatments at any location (table 6.2). Thus the crop yield at these locations was not restricted by a shortage of soil nitrogen and available phosphorous. As the lowest available soil phosphorous was 7 ppm at Tel Hadya in Syria it would appear that the critical level for chickpeas is well below this level. Also the lack of response to nitrogen application and introduced Rhizobia would suggest that the naturilised Rhizobia were sufficiently effective to meet the nitrogen demand of the crop.

(ii) Population levels.

The treatments comprised five population levels covering a range from 16.7 to 50 plants/m^2 and were obtained by varying the inter-row spacing from 0.60 to 0.20 m, while retaining a fixed intra-row spacing of 0.10 m. Treatment differences were significant at three locations, namely, Dihok and Sulimania in Iraq and Qarahta in Syria. The treatment differences in Jordan although relatively large did not differ significantly owing to a high CV, and they were small at Tel Hadya in Syria (tab.6.2).

Seed yields tended to increase at all the locations as the plant population level was raised; the heaviest yields were generally obtained at 33.3 to 50 plants/m^2 and the lightest at 16.7 plants/m^2. The largest increase in yield from raising the plant population level was obtained at Qarahta, where a late winter planted crop was grown with five irrigations. Here the yield increased by 14, 35, 51 and 52% respectively with 20, 25, 33.3 and 50 plants/m^2 over the population level of 16.7 plants/m^2.

Large increases in yield were also associated with higher plant populations at the rainfed locations at Sulimania in Iraq and in Jordan, where the rainfall was above 340 mm. At Dihok in Iraq, where the treatment effects were similar to those at Sulimania, the crop was grown under rainfed conditions, although the rainfall data for the season were not received. In contrast to all these locations, the spring planted crop at Tel Hadya was grown in a season with a total precipitation of only 246 mm and here, the higher plant populations were not associated with an increase in yield. This probably stemmed from an accentuated inter-plant competition for soil moisture. However, averaged over the five locations, yield increases of 6, 20, 23 and 25% were associated with raising the plant populations to 20, 25, 33.3 & 50 plants/m^2 respectively, from the population level of 16.7 plants/m^2.

The interaction between the fertility-cum-inoculation treatments and plant population levels was not significant.

In conclusion seed yield increases can be obtained by raising the plant population of chickpeas to about 33 plants/m^2 from the normal level of less than 20 plants/m^2 commonly found on farmers' fields. The increase was particularly conspicuous in conditions of a good moisture supply from either natural precipitation or irrigation. Planting earlier than the traditional spring planting should also improve moisture supply to the crop, and may thus result in a positive response to higher populations, as has been evident from some other studies conducted at Tel Hadya.

Table 6.2. Seed yield (kg/ha) of chickpeas as affected by the fertility-cum-inoculation treatments and levels of plant population at various locations during 1978/79.

TREATMENTS	JORDAN	IRAQ		SYRIA	
	Amman	Dihok	Sulimania	Qarahta	Tel Hadya
A. Fertility and inoculation					
T_1 - Control	919	942	1224	1613	1533
T_2 - Inoculation (I)	868	995	1225	1677	1633
T_3 - I + 20 kg N/ha	798	989	1244	1471	1577
T_4 - I + 50 kg P_2O_5/ha	633	977	1311	1580	1408
T_5 - 120 kg N + 50 kg P_2O_5/ha	875	1008	1249	1754	1650
S.E. ±	147.0	29.6	34.5	138.5	74.8
L.S.D. (5%)	N.S(1)	N.S	N.S	N.S	N.S
C.V. %	69.5	13.5	12.3	38.2	21
B. Population levels:					
50 Plants/m^2 (0.20 X 0.10 m)	896	1076	1364	1882	1597
33.3 " (0.30 X 0.10 m)	862	1058	1315	1877	1605
25 " (0.40 X 0.10 m)	899	984	1250	1676	1608
20 " (0.50 X 0.10 m)	781	910	1198	1419	1462
16.7 " (0.60 X 0.10 m)	656	883	1127	1241	1529
S.E. ±	71.4	18.9	24.5	90.9	54.2
L.S.D. (5%)	N.S	53.6	69.3	257.1	N.S
C.V. %	33.8	8.6	8.8	25.1	15.5

(1) 'F' test of treatment differences not significant.

6.3 FABA BEAN FERTILITY AND PLANT POPULATION TRIAL (FBFPPT).

Results and Discussion.

Data were received from the seven locations listed in table 6.3. At Tajoura in Libya, where the available potassium (K) content in the soil was known to be high, the cooperator replaced the treatment of 'Inoculation (I) + 60 kg K_2O/ha' with 'Inoculation (I) + 25 kg P_2O_5/ha' (treatment T7 in table 6.3). Also K was deleted from T6 to make a new treatment of '120 kg N + 50 kg P_2O_5/ha (treatment T8 in table 6.3).

Seed yields were heaviest at the irrigated location of Baghdad in Iraq and lightest at Lattakia in Syria, where although the crop received the high rainfall of the Mediterranean coast it was severely affected by foliar diseases, as well as by the parasitic weed Orobanche. The crop at Tel Hadya was also infested with Orobanche and the coefficient of variation (CV) was high at both these last two locations.

(i) Fertility-cum-inoculation treatments.

A significant difference between the treatments was only evident at Tel Hadya in Syria, in spite of a relativaly high CV (table 6.3). At this location although the treatments, T4 (I + 50kg P_2O_5/ha) and T6 (120 kg N+P+K/ha) did not differ significantly, they both significantly exceeded the control by 52 and 62% respectively; the latter also significantly exceeded all the other treatments and the former all but T3. As the two treatments T4 and T6 were the only ones that contained phosphorous (P), the results indicated a high level of response to phosphate application at Tel Hadya where the availble P in the top 0.30 m of soil was 6 ppm (table 6.1). At the other locations for which soil analysis data are available, namely, Baghdad and Sulimania in Iraq and Terbol in Lebanon (table 6.1), the available P status appeared to be quite high, which would explain the lack of response to phosphate application. At Tajoura in Libya there was a positive although non-significant response to phosphate application, and although no data are available on P status of the soil, the cooperator indicated that it varied from low to medium. The only positive

although non-significant response to potassium application occured at Baghdad in Iraq, where the exchangeable potassium content in the 0-0.15 m soil layer was 1.42 meq/100 g soil (table 6.1), the lowest value evident among the locations.

It can be concluded that at the locations used the application of nitrogen had no beneficial effect on seed yield indicating that the crop was obtaining an adequate supply of nitrogen from the soil and symbiotic association with Rhizobia. However, the application of P and K was beneficial at those locations for which the soil analysis indicated a low values for these elements.

(ii) Population levels.

In contrast to the previous treatments the effect of differing plant populations was significant at all locations except at the two in Syria (table 6.3). However, the interaction between the fertility and population treatments was not significant.

At all locations, except the two in Syria, raising the population from 16.7 plants/m^2 to 22.2 and 33.2 plants/m^2 produced an increase in seed yield (table 6.3). At Baghdad and Sulimania and at Terbol in Lebanon the optimum population was 22.2 plants/m^2, as there was no significant yield increase beyond this level. At Tajoura in Libya and at Izmir in Turkey, the heaviest yield was obtained with 33 plants/m^2, which was significantly heavier than the yields at the two lower population levels, which showed no significant difference. At Lattakia in Syria the seed yield was lightest at the highest population level, but visual observations revealed that the intensity of foliar diseases and lodging were severest at this level. At Tel Hadya in Syria where the rainfall was relatively low, there was little difference in yield at the three population levels.

As a mean across all locations except Lattakia, the increase in yield from raising the plant population from 16.7 to 22.2 and 33.3 plants /m^2 was 7.3 and 12.0% respectively. There is, therefore, a need to test higher plant populations in the future.

Table 6.3. Seed yield (kg/ha) of faba beans as affected by the fertility-cum-inoculation treatment and level of plant population at various locations during 1978/79.

TREATMENTS	IRAQ		LIBYA	LEBANON	SYRIA		TURKEY
	Baghdad	Sulimania	Tajoura	Terbol	Tel Hadya	Lattaquieh	Izmir
A. Ferility & inoculation							
T_1 - Control	5013	3737	1989	4678	1929	869	3449
T_2 - Inoculation (I)	5131	3640	2009	4061	2136	914	3385
T_3 - I + 20 kg N/ha	5435	3478	2147	4087	2417	1040	3828
T_4 - I + 50 kg P_2O_5/ha (P)	5151	3476	2368	4072	2934	1111	3986
T_5 - I + 60 kg K_2O/ha (K)	5629	3410	-	3935	1967	806	3344
T_6 - 120 kg N+P+K	5709	3780	-	3993	3204	1414	3714
T_7 - I + 25 kg P_2O_5/ha	-	-	2174	-	-	-	-
T_8 - 120 kg N+P	-	-	2155	-	-	-	-
S.E. ±	242.1	126.5	129.1	311.3	232.2	210.3	168.9
L.S.D. (5%)	N.S(1)	N.S	N.S	N.S	699.9	N.S	N.S
C.V. %	16.7	12.2	20.9	26.1	33.1	61.5	14.0
B. Population levels							
33.3 Plants/m^2 (0.30 X 0.10 m)	5651	3708	2361	4295	2415	909	3910
22.2 " (0.45 X 0.10 m)	5505	3654	2038	4275	2452	1090	3527
16.7 " (0.60 X 0.10 m)	4878	3398	2021	3843	2429	1078	3417
S.E. ±	183.9	48.7	51.9	126.7	94.0	62.7	131.2
L.S.D. (5%)	525.8	139.2	149.1	363.8	N.S	N.S	383.1
C.V. %	16.9	6.7	11.9	15.0	18.9	25.9	15.4

(1) 'F' test of treatment differences not significant.

6.4 LENTIL FERTILITY AND POPULATION TRIAL (LFPPT)

Results and Discussion.

Data were received from the six locations listed in table 6.4. The crop was rainfed at all locations except at Tajoura in Libya and at Qarahta in Syria, where it was raised with irrigation. Planting was done in November at all locations except at Amman in Jordan and at Qarahta, where the crop was planted in January. The crop suffered from extremely desiccating winds during the reproductive growth at Terbol in Lebanon and at Qarahta, and from salinity at Tajoura; this resulted in high coefficents of variation and relatively low seed yields. The heaviest seed yields were obtained at Diyarbakir in Turkey.

(i) Fertility-cum-inoculation treatments.

There were five treatments (T_1 to T_5, table 6.4) and the differences between the treatments were significant for seed and straw yield at Tel Hadya in Syria and for seed yield at Terbol in Lebanon (table 6.4). The application of 50 kg P_2O_5/ha gave a significant increase in seed and straw yield at the former location, the increases being 12 and 30% respectively. But the starter nitrogen, inoculation and a high rate of nitrogen application had no significant effect at this location. Phosphate application also tended to increase seed yields at Amman, Tajoura and Diyarbakir although the effect was not significant. Averaged over all locations except Terbol, the seed yield was increased by 9.4% from phosphate application, with the major contribution to this increase stemming from that occurring at Tel Hadya, where the available phosphorous in the soil was low (table 6.1).

Although the seed yields at Terbol were extremely low there was interesting effect from phosphate application. Seed yield was significantly increased by phosphate application, whereas when this was combined with a high rate of nitrogen (treatment T5) there was a significant depression in the seed yield. It would appear that in spite of the high available

phosphorous in the soil at this location (table 6.1), the application of phosphate hastened reproductive growth which resulted in an earlier seed set and thus a heavier seed yield, before the crop was desiccated from depletion of soil moisture. In all the other treatments the majority of pods were desiccated before any seed was set. This data indicated that excessive vegetative growth can result in an early depletion of limited soil moisture in rainfed areas at the expense of reproductive growth.

(ii) Population levels.

The seed yield response to differing population levels was significant at all locations except Diyarbakir (table 6.4). Although there was no significant interaction between these levels and the fertility-cum-inoculation treatments, the responses varied according to the moisture supply at the different locations.

At Tajoura and at Qarahta, where the crop was irrigated, raising the population level up to 444 plants/m^2 produced an increase in seed yield. At Amman, where the seasonal rainfall was 345 mm, seed yields only increased up to 296 plants/m^2, and there was no significant difference between this and the next lower population of 222 plants/m^2. At the rainfed locations of Tel Hadya and Terbol, where the rainfall was low (table 6.1) and sub-normal, the heaviest seed yield occured at the lowest population level. However, the trend in straw yields was opposite with yields increasing from a raising of the population level. Excluding the very low values recorded at Terbol, the seed yield was increased by an average 15, 23 and 28% respectively at the remaining locations as the population level was raised from 148 to 222, 296 and 444 plants/m^2.

Table 6.4: Yield (kg/ha) of lentils as affected by fertility cum-inoculation treatments and plant population levels at various locations during 1978/79.

TREATMENT	JORDAN	LEBANON		LIBYA	SYRIA				TURKEY
	Amman	Terbol		Tajoura	Qarahta	Tel Hadya			Diyarbakier
	Seed	Seed	Total	Seed	Seed	Seed	Straw	Total	Seed
A. Fertility & inoculation:									
T_1 - Control	1187	91.7	5013	919	260	1192	2559	3751	1562
T_2 - Inoculation (I)	1174	70.6	4083	931	359	1191	2394	3535	1595
T_3 - I + 20 kg N/ha	1160	110.7	4981	1098	327	1089	2268	3357	1553
T_4 - I + 50 kg P_2O_5/ha	1209	134.2	4271	1117	252	1341	3317	4658	1682
T_5 - 120 kg N + 50 kg P_2O_5/ha	1065	51.1	4115	993	228	1386	3203	4589	1481
S.E. ±	97.4	15.0	320.3	121.2	37.1	53.5	165.2		88.2
L.S.D. (5%)	N.S(1)	44.9	N.S	N.S	N.S	164.8	509.0		N.S
C.V. (%)	29.1	64.0	28.5	47.9	52.0	17.3	24.1		22.4
B. Population level:									
444 Plants/m^2 (0.150 X 0.015 m)	1110	52	4756	1463	499	1141	2808	3949	1543
296 " (0.225 X 0.015 m)	1268	76	4433	1203	247	1255	2772	4027	1664
222 " (0.300 X 0.015 m)	1240	99	4562	888	222	1244	2760	4004	1597
148 " (0.450 X 0.015 m)	1019	138	4220	494	173	1319	2613	3932	1495
S.E. ±	62.4	11.0	126.7	97.1	24.8	34.1	98.7		48.6
L.S.D. (5%)	180.3	32.0	360.9	277.2	70.7	97.4	N.S		N.S
C.V. (%)	20.9	55.0	12.6	42.9	38.9	12.3	16.1		13.8

(1) 'F' test of treatment differences not significant.

7. CONCLUSIONS.

ICARDA is mandated to both stimulate and assist in the improvement of the three major grain legumes that are cultivated in North Africa and West Asia; a region that is geographycally very diverse. The problems posed by such diversity have been high-lighted by both the general lack of correlation between the seed yield of genotypes, and the variation in yield response to the agronomic treatments, at the different locations. Indeed such data have indicated that ICARDA's site at Tel Hadya cannot necessarily be considered as an ideal environment in which selection of superior genotypes can be effectively practised for other locations. In these circumstances the network of international cooperative trials is absolutely vital if ICARDA is to profitably assist countries in the development of new and superior cultivars, which are adapted to the many and varied agro-ecological situations in which the crops are grown. Thus the importance of these trials cannot be overemphasised.

In spite of the above constraints, the data presented on the breeding trials and nurseries indicated that there were genotypes which yielded more than the local check cultivars at many locations. However, only relatively few of these genotypes did so by a significant margin. The results from the first set of Chickpeas Ascochyta Blight Nurseries provided information on the variation in the pathenogenicity of the disease. And there can be little doubt that such nurseries will be essential to the future development of stable forms of resistance, which in turn may greatly assist in increasing the productivity of the crop.

Although progress can be made through the development of improved cultivars, few breakthroughs in crop yield are ever achieved without an additional and complimentary adaptation of new and improved agronomic practices. The results from the first set of international agronomy trials have clearly highlighted some of the constraints to crop production that, if not rectified, would nullify any improvements achieved from breeding. Thus these trials must form part of an integrated approach in

the attempt to improve legume production in the region, and it is hoped that such trials will be a regular feature of crop improvement programmes.

Several locations failed to return data to ICARDA, and thus have not been included in this report. Incomplete data were also received from several locations, and it is hoped to be able to include data from a greater proportion of cooperators in the future. Cooperators are also urged both to submit genetic material for inclusion in future trials, and in order to allow a detailed analysis of environmental effects, to supply details of managerial and environmental factors.

It is strongly believed that international cooperation is essential for the efficient utilisation of the talents of the relatively few and scattered food legume scientists throughout the world. Also, it is only by receiving all the relevant data on the international trials, that ICARDA can fully and most efficiently utilise its resources in attempting to assist countries in developing and improving their legume crops.

8. ACKNOWLEDGEMENTS.

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