

ICARDA-303 En

**TUNISIA - ICARDA
COOPERATIVE PROGRAM ON
FOOD LEGUME IMPROVEMENT**

Progress Report 1985/86



NORTH AFRICAN REGIONAL PROJECT
ON FOOD LEGUME IMPROVEMENT

TUNISIA - ICARDA
COOPERATIVE PROGRAM
ON
FOOD LEGUME IMPROVEMENT

PROGRESS REPORT

1985/86

INRAT
2080 ARIANA
TUNISIA

ICARDA
P.O. Box 5466
ALEPPO, SYRIA

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P R E F A C E

This report contains the results of a collaborative research program on food legumes between the Tunisian Program and ICARDA. The program was carried out within the Institut National de la Recherche Agronomique de Tunisie (INRAT), and conducted by:

Mr. Habib Halila (Head, Food Legumes, INRAT)

Mr. Hamadi Ben Salah (Legume Breeder, INRAT)

With the technical help of:

Mr. Rhouma Sayari (El-Kef)

Mr. Taoufik Zarkouna (Beja)

Mr. M. El Mansouri (Sejnane - Ras Rajel)

Mr. Taoufik Oueslati (INRAT, Tunis)

Mr. Hedi Ghanmi (INRAT, Tunis)

Mr. Khaled Ben Hamida (INRAT, Tunis)

Mr. A. Ayadi (Oued Meliz)

Mr. Mokhtar Dridi (Beja)

Mr. Moncef Farhani (El-Kef)

Mr. Nourreddine Ben Abdallah (El-Kef)

Collaborative program with INAT: Dr. M. Harrabi and assistants.

Collaborative program with Office des Cereales: Mr. A. Haddad and assistants.

1. HIGHLIGHTS OF THE 1985/86 CROP SEASON

This report gives the results from the fifth year of a cooperative project on food legume improvement between INRAT (Institut National de la Recherche Agronomique de Tunisie) and ICARDA. The objective of this project is to identify superior genotypes and production techniques for faba beans, chickpeas and lentils, that together can ensure the farmer a more stable and improved economic return from the cultivation of these legume crops.

The highlights of 1985/86 season concern the breeding and the agronomy components.

1.1. Breeding

The highlights are the decision to release three chickpea lines and two lentil varieties.

a. Chickpea: three varieties are to be released:

Two for winter sowing and one for spring planting.

The first winter line is resistant/tolerant to Ascochyta blight under Beja conditions, has a reasonably good yielding capacity, reasonable seed size and a good height.

The second variety is a tall variety tolerant to Ascochyta blight and can be harvested mechanically. The seed size is however smaller than the other and is therefore recommended for pastry and coffee blending. Being a late variety, it is recommended strictly for

winter sowing and high rainfall areas.

The third variety is a spring variety; it is a selection from the local population Amdoun but yields 10 to 20% more. It is highly resistant to wilt; has an excellent seed size, but completely susceptible to Ascochyta blight, it is therefore recommended for spring sowing in wilt infested zones.

It must be stressed that the main objective of the chickpea breeding program is to produce varieties that combine resistance to wilt and ascochyta. The program has given priority to this and has made significant progress in this field. Resistant material to both diseases is being identified and should be available to farmers in the next few years.

- b. Lentils: Two varieties will be released for farmers. These two lines have been consistently good yielders during the last three years. One is of the large seeded type and the second is of the intermediate seed type.

1.2. Agronomy

The program has now completed four years of agronomic work and recommendations concerning some of the agronomic practices will be made available to farmers. These recommendations cover the date and the density of planting as

well as the manual weed control for the major food legume crops. They will be presented in a pamphlet and distributed to the extension people.

2. THE RESEARCH PROGRAM

2.1. Experiments and locations

The INRAT breeding trials and nurseries and agronomic experiments were grown at one or more of eight locations at Tunis, Beja, Kef, Mateur, Oued Meliz, Ras Rajel, Bou Salem and Krib. Most of these locations are situated in the principal crop growing areas in the North and West of the country and are complemented by the Office des Cereales experimental sites which are: Menzel Temime, Mateur bis and Bourouis (Figure 1).

In the breeding program the experiments called "International" came from ICARDA and contained breeding lines and segregating populations for evaluation in replicated trials and non-replicated screening and disease nurseries. The advanced (AYT) and preliminary (PYT) yield trials contained lines selected for a superior performance last season. Generally lines in an AYT have already been tested for one or more seasons in a replicated trial whilst those in a PYT have been previously evaluated only in a non-replicated screening nursery.

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2. THE RESEARCH PROGRAM

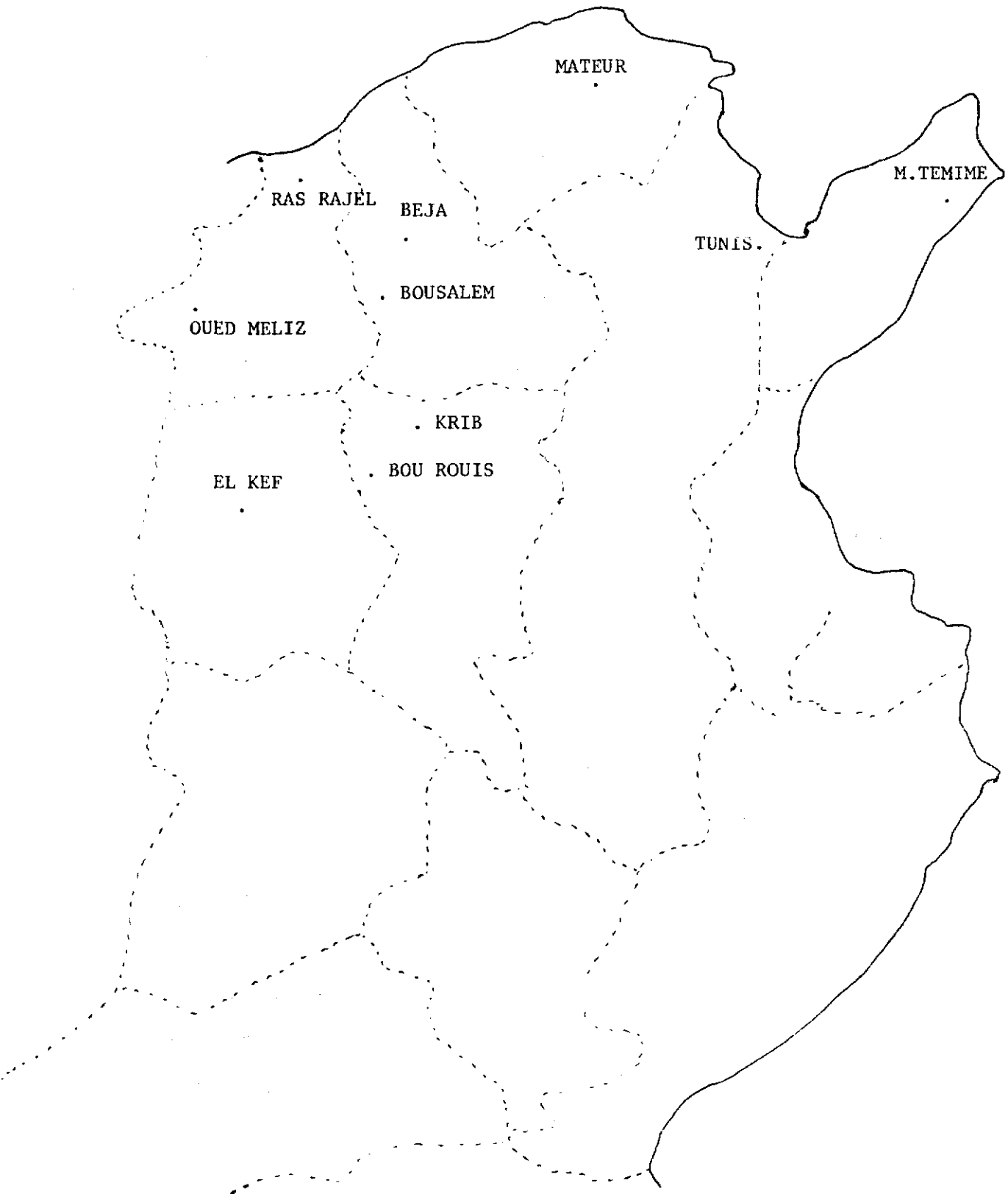
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Figure1 : Sites experimentaux utilises au cours de la
campagne 1985/86

Figure1 : Locations of experimental trials and nurseries
in Tunisia 1985/86.



In the following crop reports, however, the entries in the international, advanced and preliminary trials and screening nurseries are referred to simply as lines. The plot size in the majority of trials was 8m^2 and in the screening nurseries 2m^2 with 4m^2 and 2m^2 respectively harvested for yield evaluation.

The agronomic program covered all food legume crops including peas and continued to evaluate crop responses to different dates of sowing and differing levels of plant population, the effectiveness of a range of herbicides on natural weed populations, and crop/weed competition studies.

2.2. Analyses and Results

All the international trials were grown as randomised blocks and the advanced and preliminary trials as simple or triple lattices. The last two groups of trials have so far only been analysed as randomised blocks but lattice analyses will be undertaken once the new computer is operational. In discussing the results the term significant has been used to describe a probability level equal to or less than 0.05. Also only if the analysis of variance produced a significant ($P \leq 0.05$) 'F' value has a least significant difference been calculated, in order to assess whether the lines or populations had values that were significantly different from that of the checks.

The various abbreviations used in the report are defined in table 1.

2.3. Meteorological Data

Data on temperature and rainfall at all locations except Tunis, from which experimental data is given in the following report are given in figure 2 .

In general the growing season was characterized by a very dry autumn and by an important deficit in total rainfall at all locations except at Ras Rajel. The Kef station suffered the most from drought which has seriously affected the crops. Data from this station should consequently be used with caution.

Rainfall received during crop growth at Beja, Oued Meliz and Kef stations were 76%, 78% and 61% of the normal average rainfall, respectively.

Tableau.1: Abréviations utilisées dans le rapport

Table 1: Abbreviations used in the report

Locations/Sites

- B - Béja
- OM - Oued Meliz
- K - Kef
- RR - Ras Rajel
- BS - Bou Salem
- M - Mateur
- Kr - Krib
- T - Tunis

Data/Results

- Seed yield expressed in Kg/ha / Rendements en Kg/ha
- Data values - those underlined were significantly
($P \leq 0.05$) superior to the Tunisian local check.
Les soulignés sont statistiquement supérieurs à
celui du témoin.
- M= Data missing/Résultat manquant
- NA = Data not analysed/Resultats non analyses
- NT = Not tested/Non testé

Statistics/Statistiques

- CV % = Coefficient of variation expressed as a
percentage/Coefficient de variation de l'essai
- SE $\pm$ = Standard error/Erreur standard

Others/Autres

- D.P.P.T. = Date and Plant Population Trial/Date et

Densité de Semis

- W = Winter/Hiver

- Sp. = Spring/Printemps

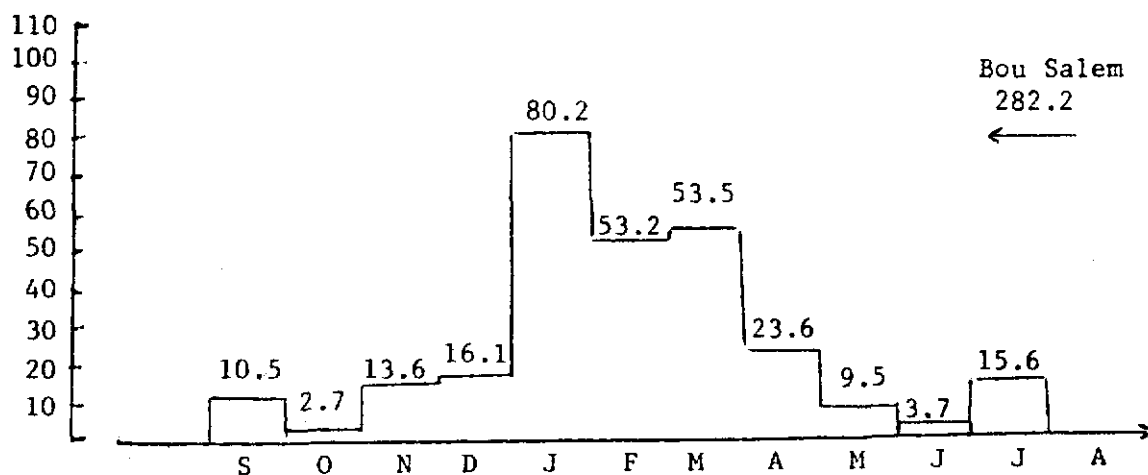
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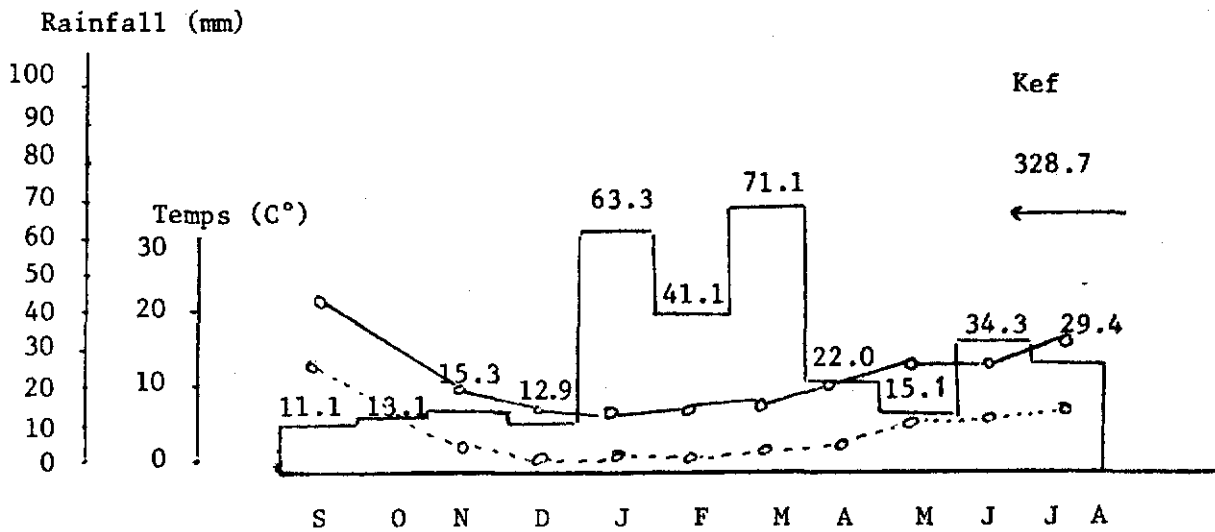
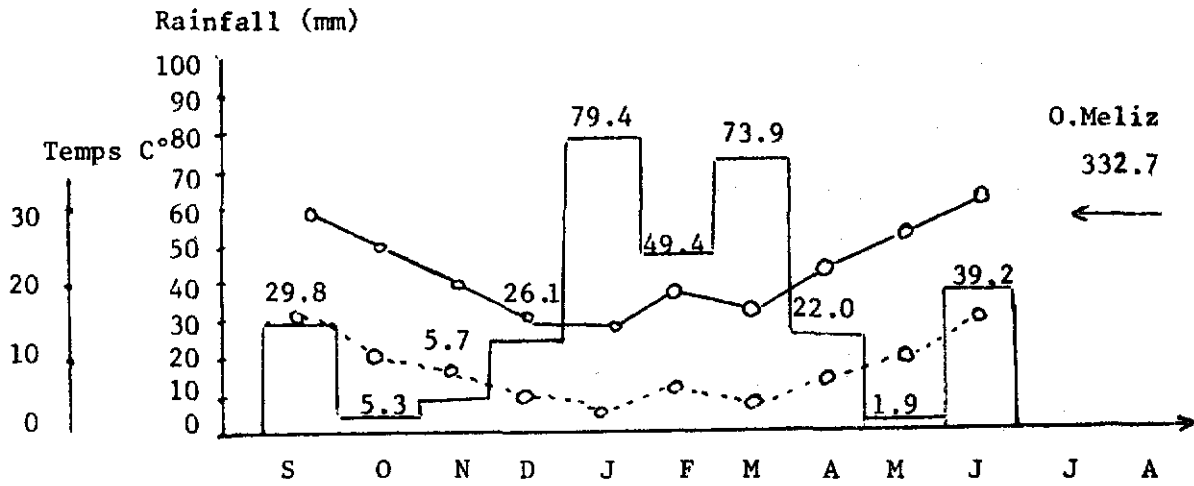
- N.P = Non protected

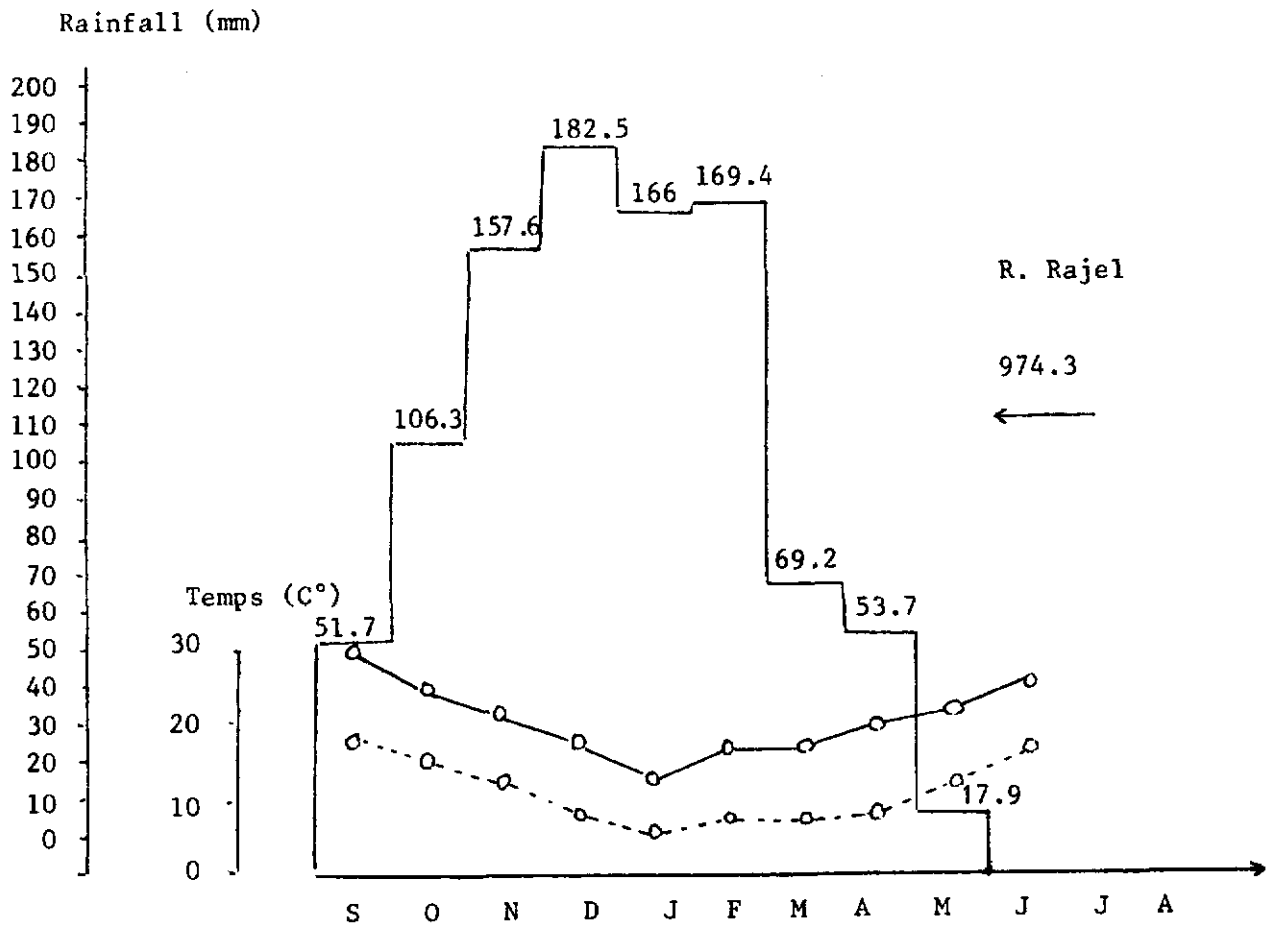
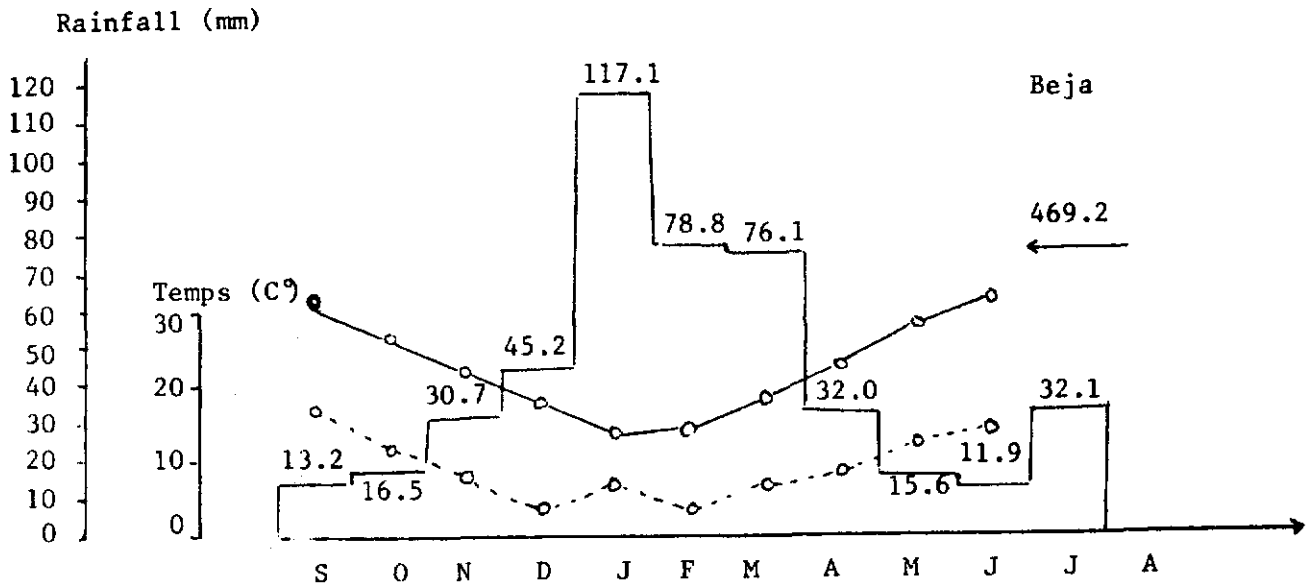
Fig 2 : Rainfall distribution (mm) and temperature
at all experimental sites in Tunisia in
1985/86.

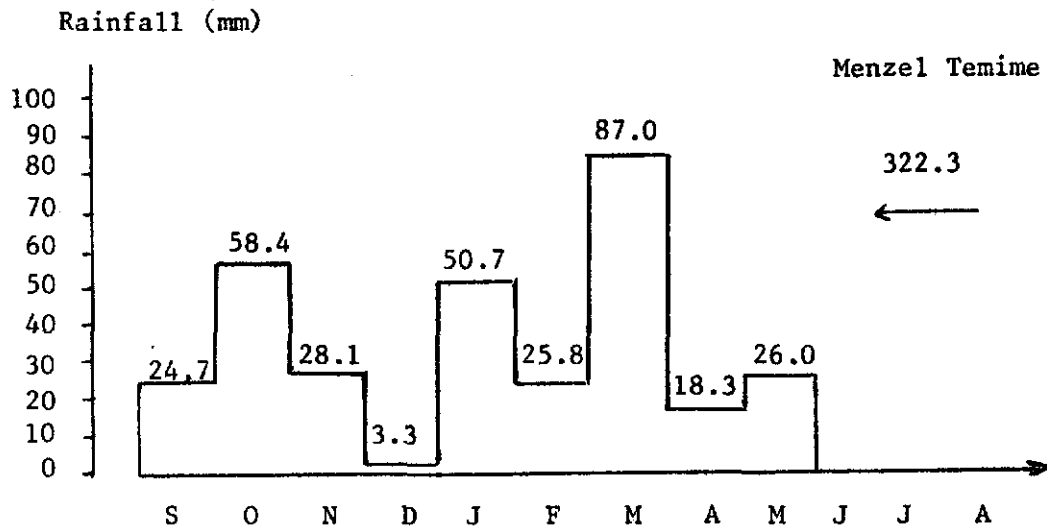
Fig 2 : Pluviométrie et température enregistrées
sur les stations expérimentales en
1985/86.

Rainfall(mm)









3. FABA BEAN IMPROVEMENT (H. Ben Salah)

3.1. Introduction

Both large and small seeded faba beans are cultivated in Tunisia and the program's objective is the improvement of both these types through the selection of heavier yielding lines and the identification of genetic sources of resistance to the prevalent diseases and pests. For diseases this season the aggressive stage of chocolate spot (Botrytis fabae) occurred in trials at the Ras Rajel location where an attack of rust (Uromyces fabae) was also observed. A high level of infestation of Orobanche spp. again occurred at the Beja location.

This season the farmer's crop was little affected by diseases but they are always a potential danger. Perhaps the most serious are chocolate spot, which can devastate the crop as occurred in the 1981/82 season, and soil infestation by the parasitic weed species of Orobanche which can make large areas impractical for faba bean cultivation for many growing seasons. Other diseases that have been noted are ascochyta blight (A. fabae), alternaria leaf spot (A. tenuis) and downy mildew (Peronospora spp.) and attacks of the stem nematode (Ditylenchus dipsaci) and the stem borer (Lixus algerus). The latter was also observed at Oued Meliz station.

Progress in achieving seed yield improvement over the local cultivars has so far been limited, and ideally any improvement should be stabilised by being combined with resistance/tolerance to the major diseases. Each season genetic material selected for resistance to chocolate spot, ascochyta blight, rust and orobanche by ICARDA is screened for resistance in Tunisia. With the irregularity of natural disease development, disease screening methods for developing epiphytotic conditions through artificial inoculation of ascochyta blight and chocolate spot nurseries took place this year in a plastic tunnel with irrigation facilities to ensure adequate levels of humidity and temperature for good disease development.

This crop report concentrates mainly on seed yield and table 2 provides a summary of the complete results from all trials and nurseries. The complete results are presented in tables 1 to 23 prefixed by the letter F.

In all the yield trials, screening and disease nurseries the local check was a large or small seeded local cultivar. This check was included as a single entry in the international yield trials but was repeated in the advanced and preliminary yield trials.

Preliminary	YT-S ₁	21	17	-	-	-	-	NS
	YT-S ₂	12	9	-	-	-	-	5
International	SN-L/S	1100	255*	-	-	-	-	
	SN-L	33	23	19	-	-	-	
	SN-F ₃	42	9	25	15	6	-	
	SN-SA	58	26	6	5	0	22	7

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(1) - L = Large, S = Small, F₁, F₄, F₅, = populations, SN = Screening nursery, EEC = European Economic Community

(2) NS = F Test of treatments not significant ($P > 0.05$)

* Greater than the local check : Faba bean large.

3.2. Yield trials and nurseries

In the large seeded program 89 advanced breeding lines, 22 preliminary breeding lines, and 33 preliminary breeding lines in a non-replicated screening nursery, and the corresponding figures in the small seeded program were 74, 33 and 42 respectively were tested (Table 2). The trials and nurseries were conducted at one or more locations. An additional 23 F5 and 36 F4 populations were tested in one replicated yield trial at two locations, 43 F3 populations and 19 F2 progenies were tested in a non-replicated yield trial at one location. Also this year a screening nursery of 1100 pure lines coming from the germplasm collection at ICARDA were tested at Beja station.

Although a number of lines in the trials outyielded the local check at the locations, significant increases were only evident for seven small seeded lines, four lines in the EEC trial and three lines in the advanced yield trial of faba bean small No. 2 at Beja and among them only one was significant at the Kef station but none at Jendouba station. Yield data of these lines are given in table 3. The large coefficients of variation for certain trials (especially at the Kef station) due to the effect of climatic conditions had markedly affected the accuracy of these trials. Within the screening nurseries a large number of lines and F3 populations exceeded the check at individual location but further testing in replicated

trials is needed to confirm such yield advantage.

Some of the yield increases over the local check recorded in table 3 might appear encouraging. However, yield data in table 4, on the heaviest yielding five large and three small seeded lines, tested over four seasons at two locations, clearly show the inadequacy of one season's testing in attempting to identify superior yielding genotypes, and although the value of statistical significance can be over estimated these results do indicate the poor progress so far achieved in identifying superior yielding lines

As a result of the above considerations increasing emphasis is being put on selection within and testing of early generation material from ICARDA's base program, and collection of and selection within Tunisian local landraces.

This season 255 lines were selected among 1100 pure lines from the base program at Aleppo. 52 single plant selections were selected among crosses made especially for North Africa regional program with selected parents from Morocco National program and ICARDA. Also, 19 crosses were made at ICARDA for our National program, with the objective of combining Botrytis and Ascochyta resistance with good yield. Next season this material will be evaluated for Botrytis and Ascochyta resistance at Ras Rajel under

Table 3 : Seed yield in Kg/ha of twelve superior yielding Faba bean lines at one and three locations respectively

Trial Entry		Location			
		Beja	Kef	Jendouba	Mean
EEC	Brocal	<u>3033</u> ^a			3033
	Palaelo	<u>3587</u>			3587
	Pam 1	<u>3483</u>			3483
	Vt 1	<u>3325</u>			3325
	Mean of Tunisian local check faba bean small and large	2783.5			2783.5
	Se ±	441.7			
	CV %	16.6			
PYT-S2	ILB 1813	<u>3625</u>			3625
	S 81 059	<u>3137</u>			3137
	X 75 TA 10	<u>3450</u>			3450
	X 77 TA 48 (80 S 43856)	<u>3412</u>			3412
	X 77 TA 48 (80 S 43859)	<u>3112</u>			3112
	ILB 3858	<u>3087</u>			3087
	Tunisian local check	2596.5			2596.5
	Se ±	324.7			
AYT-S2	CV %	11.2			
	X 77 TA 81	<u>3669</u>	537	2150	2119
	X 77 TA 81	<u>3763</u>	850	2122	2245
	X 77 TA 60	<u>3719</u>	869	<u>2675</u>	2421
	Tunisian local check	<u>3382</u>	673	<u>2540</u>	2198
	Se ±	419.1	159.1	351.4	
	CV %	14.2	26.3	16	

(a) Values underlined significantly ($P \leq 0.05$) outyielded the check

Table 4 : Seed yield expressed as a percentage of the local check cultivar of five large and three small seeded lines at two locations over four seasons

Location	Season	Large seeded lines				
		ILB 10 (78 S 49907)	ILB 398 (76 TA 56264)	ILB 1266 (Aquadulce)	ILB 1217 (Reina Blanca)	ILB 1269 (New mammoth)
Beja	1982/83	110	138	120	152 (a)	124
	1983/84	133	146	201	150	162
	1984/85	126	92	113	123	100
	1985/86	87	103	112	107	113
Kef	1982/83	93	101	82	135	94
	1983/84	107	131	96	102	95
	1984/85	78	81	80	86	68
	1985/86	98	127	88	110	116
	Mean	104	115	111.5	120.6	109
		Small seeded lines				
		X 77 Sa 11 (80 S 45676)	ILB 269 (74 TA 367)	ILB 269 (78 S 48821)		
Beja	1982/83	144	ND (b)	156		
	1983/84	110	124	91		
	1984/85	66	89	86		
	1985/86	99.6	ND	109		
Kef	1982/83	117	118	129		
	1983/84	100	99	92		
	1984/85	95	108	178		
	1985/86	103	ND	103		
	Mean	104	107.6	118		

(a) Value significantly ($P < 0.05$) outyielded the local cultivar

(b) ND: no data available

natural conditions and for yield at Beja. For yield purpose also 159 single plant selections from the local landraces were made. Except the 1100 pure lines and the crosses made for our national program, all the other selections were made this season under insect-proof conditions. Next season the same material will be grown under insect proof conditions with the hope that more space will be allocated to this work.

3.3. Disease and pest nurseries

The four international disease nurseries grown this season were a nematode nursery, an ascochyta blight nursery, a chocolate spot nursery and an orobanche nursery. Natural infection was only recorded for nematodes at Krib and orobanche at Beja, whereas both the ascochyta blight and chocolate spot nurseries were artificially inoculated at Tunis in a plastic tunnel with irrigation facilities to ensure adequate levels of humidity and temperature for good disease development. The ascochyta nursery was evaluated at the adult stage however the artificial inoculation did not work for unknown reasons. For the chocolate spot nursery, the local check had a score of 6.1 and most of the germplasm showed a resistant reaction. This could be attributed to either the virulence of the pathogen or the germplasm assembled in this nursery originated or came from resistant material. In the orobanche nursery, the level of infection was so variable between the repeated checks that little useful information about the resistance

of the test lines could be obtained, and the results have thus been omitted.

Next season inoculation of ascochyta blight and chocolate spot nurseries will continue under artificial facilities and more emphasis will be put for selection under insect proof conditions. Screening for nematode resistance will be conducted again this year at the Krib station for the 108 promising lines of this season.

Tableau 1 F : Essai avancé de rendement de Fève (FBIYT)

Table 1 F : Seed yield of lines in the IAYT - Faba bean large

Lignée/Line	Selection	Rendement/Yield
		B
1814	Syrian local large	1500
X 79 S 74	FLIP 82 - 25 FB	2800
X 79 S 131	FLIP 82 - 27 FB	3187
22	FLIP 83 - 5 FB	2237
X 75 TA 43	FLIP 83 - 8 FB	2850
9	75 TA 22	2962
398	76 TA 246	2637
1814	79 S 4	2750
1814	79 S 546	2612
1814	79 S 653	2587
10	79 S 49907	2200
X 79 S 72	80 S 80028	2537
3187	ILB 3187	2987
1815	Lattakia local	2837
1269	New Mammoth	2275
1270	Reina Blanca	2862
1821	Turkish local	2387
Local check		2275
SE ±		623.2
CV %		24.1

Tableau 2 F : Essai avancé de rendement de Fêve "Elite"

Table 2 F : Seed yield of lines in the Elite yield trial FB large

Lignée/Line	Selection	Rendement/Yield	
		B	
FLIP 84 - 1 FB	S 81 071 - 3		1925
FLIP 84 - 2 FB	S 82 004 - 16		2917
FLIP 84 - 3 FB	S 82 012 - 9		2225
FLIP 84 - 4 FB	S 82 013 - 1		2692
FLIP 84 - 5 FB	S 82 013 - 2		2483
FLIP 84 - 6 FB	S 82 013 - 5		1992
FLIP 84 - 7 FB	S 82 015 - 11		1808
FLIP 84 - 8 FB	S 82 019 - 35		3058
FLIP 84 - 9 FB	S 82 024 - 26		1892
FLIP 84 - 10 FB	S 82 026 - 22		2392
FLIP 84 - 11 FB	S 82 026 - 40		2515
FLIP 84 - 12 FB	S 82 033 - 3		2958
FLIP 84 - 13 FB	S 82 043 - 22		2408
FLIP 84 - 14 FB	S 82 049 - 2		2217
FLIP 84 - 15 FB	S 82 061 - 34		1908
FLIP 84 - 16 FB	S 82 063 - 4		1475
FLIP 84 - 17 FB	S 82 092 - 6		2117
FLIP 84 - 18 FB	S 82 095 - 6		2567
FLIP 84 - 19 FB	S 82 103 - 15		2250
FLIP 84 - 20 FB	S 82 105 - 8		2925
FLIP 84 - 21 FB	S 82 106 - 18		2283
FLIP 84 - 22 FB	S 82 107 - 14		2083
FLIP 84 - 23 FB	S 82 107 - 25		2083
FLIP 84 - 24 FB	S 82 110 - 13		1950
FLIP 84 - 25 FB	S 82 110 - 29		3383
FLIP 84 - 26 FB	S 82 112 - 14		2783
FLIP 84 - 27 FB	S 82 113 - 8		2742
FLIP 84 - 28 FB	S 82 147 - 19		2367
FLIP 84 - 29 FB	S 82 173 - 4		2575
FLIP 84 - 30 FB	S 82 178 - 11		2467
FLIP 84 - 31 FB	S 82 415 - 4		2492
FLIP 84 - 32 FB	S 82 418 - 4		2300
FLIP 84 - 33 FB	S 82 423 - 7		2958
FLIP 84 - 34 FB	S 82 486 - 5		2775
ILB 1814			2050
Local check			2800
SE ±			598.9
CV %			24.6

Tableau 3 F : Essai avancé de rendement de Fève

Table 3 F : Seed yield of lines in AYT - Faba bean large

Lignée/Line	Selection	Rendement/Yield		
		B	K	OM
ILB 10	78 S 492 017	2640	694	2775
29	75 TA 26 062	3081	762	2853
268	78 S 484 26	3413	794	2678
282	79 SL 48 590	2706	550	2837
398	76 TA 56 246	3131	900	2550
1217	Reina Blanca I	3256	781	2794
1266	Aquadulce	3381	625	3353
1269	New mammoth	3425	825	2303
1799	79 MB	3112	731	2559
1933	Seville Giant	3050	787	2678
26563		3400	737	2572
1813	Syrian local long pod	3226	819	2759
1815	Lattakia local	3069	775	2750
1814	79 S 4	3113	594	2831
1815	Lebanese local large	2681	800	2368
1821	Turkish local	3013	756	2516
31	74 TA 87	2725	781	3322
9	74 TA 22	2706	806	2687
1814	79 S 546	2475	756	2347
1814	79 S 653	2963	800	2756
X 79 S 155	80 S 80 123	3006	706	2725
Local check	-	3619	712	2812
Local check	-	2588	687	2294
Local Check	-	2819	694	2341
Local Check	-	3100	750	2537
SE ±		542.7	147.4	379.9
CV %		17.7	19.7	14.2

Tableau 4 F : Essai avancé de rendement de fève "Population Locale"

Table 4 F : Seed yield of lines in the AYT Faba bean large "local population"

Selection	Rendement/Yield		
	B	K	RR
Elite	3275	412	3412
Seville	3408	300	3281
FV - 83 - Kef	3667	350	2314
FV - 81 - Local	3850	387	3115
FV - 82 - Sahel 10	4100	287	2801
FV - 82 - Sahel 11	4267	350	3024
FV - 82 - Sahel 12	3800	425	3086
FV - 82 - Sahel 13	3900	319	2992
Local check large	3592	287	3346
Local check large	3533	406	2821
SE ±	639	153.9	224.6
CV %	17.1	43.6	18.6

Tableau 5 F : Essai avancé de rendement No. 1 de Fève population F4

Table 5 F : Seed yield of F4 population No. 1 in the AYT - F4
Faba bean large.

Population F4/F4 Population	Rendement/Yield	
	B	K
S 83 063	3250	617
S 83 075	3408	533
S 83 101	2958	483
S 83 103	4592	308
S 83 106	4367	267
S 83 112	3353	542
S 84 113	3817	412
S 83 115	3508	500
S 83 118	3883	442
S 83 162	3092	392
S 83 178	2733	-
S 83 195	3467	433
S 83 200	3008	508
S 83 201	3250	467
S 83 202	3200	400
S 83 205	4033	567
S 83 211	3558	450
S 83 214	3642	483
S 83 193	3567	408
S 83 196	3517	333
S 83 200	3692	650
S 83 208	3067	325
S 83 209	3333	433
Fève local	3517	383
Fève local	3617	500
SE ±	531.4	150.2
CV %	15.2	33

Tableau 6 F : Essai avancé de rendement No. 2 de Fève population F4

Table 6 F : Seed yield of F4 population No. 2 in the AYT - F4
Faba bean large

Population F4/F4 Population	Rendement/Yield	
	B	K
S 83 210	3175	325
S 83 170	2450	342
S 83 175	2100	308
S 83 176	2575	483
S 83 180	2450	342
S 83 119	2575	342
S 83 222	2492	450
S 83 224	2542	383
S 83 226	2800	291
S 83 227	2917	450
S 83 232	2542	433
S 83 233	2758	317
S 83 092	3133	342
Fève local	2967	317
Fève local	3133	375
Fève local	3183	442
SE ±	588.8	92.7
CV %	20.4	24.9

Tableau 7 F: Essai avancé de rendement de févérole (FBIYT-S)

Table 7 F: Seed yield of lines in the IAYT - Faba bean small

Lignée/Line	Selection	Rendement/Yield	
		B	
ILB 1812	Syrian local short pod	2272	
1819	Giza 3	1987	
X 77 Sd 100	FLIP 82 - 24 FB	2675	
22	FLIP 83 - 2 FB	2187	
32	74 TA 91	2812	
33	74 TA 95	3150	
285	78 S 48476	3000	
112	78 S 49288	2225	
X 77 Sd 70	80 S 46121	2725	
X 75 TA 150	80 S 50088	2837	
X 77 TA 60	80 S 43977	2937	
X 77 Sd 11	80 S 45676	2850	
X 77 TA 66	80 S 44056	3125	
X 75 TA 3	80 S 43064	1712	
X 77 Sd 13	80 S 45727	2812	
X 77 Sd 92	80 S 46593	2450	
3188	ILB 3188	600	
Local check		2362	
Local check		2300	
Local check		2625	
SE ±		811.4	
CV %		32.5	

Tableau 8 F : Essai avancé de rendement de Féverole No. 1

Table 8 F : Seed yield of lines in the AYT - Faba bean small No. 1

Lignée/Line	Selection	Rendement/Yield		
		B	K	OM
X 75 TA 3	80 S 4 3064	2475	481	1350
33	80 S 4 3651	3437	331	3071
X 77 TA 48	80 S 4 3856	2787	544	2759
82	80 S 4 4371	3312	593	2778
148	80 S 4 5579	2850	569	2694
X 77 Sd 13	80 S 4 5727	3075	337	2872
33	74 TA 95	3038	375	2447
269	78 S 4 8821	3100	637	2975
287	77 MS 88323	4087	750	2472
1555	Rostate	3212	625	2925
203154		3112	650	5884
PBI Cambridge 63		3525	612	2669
X 77 TA 88	80 S 4 4539	2612	581	2731
X 77 Sd 11	80 S 4 5676	2825	637	3112
382		3100	669	2362
470		3350	575	2994
X 77 TA 7	78 S 3 3011	3462	725	3131
X 75 TA 10	80 S 4 3238	3287	681	2700
X 75 TA 33	80 S 4 3651	2862	581	2606
X 77 TA 60	80 S 4 3971	3787	769	3078
X 77 TA 81	FLIP 82-20 FB	3625	675	2894
Local check		3175	619	3125
Local check		2650	756	2984
Local check		3075	562	3106
Local check		2437	537	2831
SE ±		504	175.2	450.6
CV %		18.8	29.4	16

Tableau 9 F : Essai avancé de rendement de Févérole No. 2

Table 9 F : Seed Yield of lines in the AYT - Faba bean small No. 2

Lignée/Line	Section	Rendement/Yield		
		B	K	OM
X 77 TA 81	FLIP 82 - 19 FB	<u>3669</u>	537	2150
X 77 Sd 11	80 S 45 676	3325	562	2245
X 77 TA 70	80 S 44 150	2863	681	2590
X 77 TA 81	80 S 44 358	<u>3763</u>	850	2122
ILB 112	78 S 49 288	3419	744	2490
ILB 285	78 S 48 476	3550	625	202
X 77 Sd 70	80 S 46 121	3613	825	2862
X 77 TA 60	80 S 43 977	<u>3719</u>	369	2675
Cagnotte		1088	200	1270
Alfied		938	287	1222
Pilote		806	187	629
Talo		2825	644	2117
Local check		3587	600	2302
Local check		3156	637	2822
Local check		3375	662	2230
Local check		3412	794	2805
SE ±		419.1	159.1	351.4
CV %		14.2	26.3	16.

Tableau 10 F : Essai avancé de rendement de fève et féverole
"Population Locale"

Table 10 F : Seed yield of lines in the AYT Faba bean large
and small "Local Population"

Selection	Rendement/Yield
	B
FVL CO 8 EM 83	2425
ST 81 - violet	3492
FVL 81 brune	3142
FVL 83 Béjà	2900
FVL 83 Kef	3292
FVL 81 blanc	2667
Elite	2367
Seville	3000
FV 83 - Kef	3608
FV 81 - Local	2975
FV PL - Sahel - 10	3450
FV PL - Sahel - 11	3183
FV PL - Sahel - 12	3533
FV PL - Sahel - 13	3131
Local check small	2642
Local check large	2233
SE ±	534.5
CV %	17.8

Tableau 11 F : Essai avancé de rendement de Fève et Féverole "CEE"

Table 11 F : Seed yield of lines in the Faba bean EEC Joint winter trial.

Lignée/Line	Rendement/Yield
	B
Alto	3033
Brocal	<u>3317</u>
Chiaro T.L.	1608
Gemini	3108
Palaelo	<u>3587</u>
Polycarpi	1225
Troy	1342
MS 125	3167
Pam 1	<u>3483</u>
R 29 T	1692
Vt 1	<u>3325</u>
ILB 1814	3100
Local feve	2575
Local feverole	2992
SE ±	441.7
CV %	16.6

Tableau 12 F : Essai avancé de rendement de févérole "population locale"

Table 12 F : Seed yield of lines in the AYT-Faba bean small
"local population"

Lignée/Line	Rendement/Yield	
	B	K
Févérole cosem 83	3737	494
ST - 81 violet	3962	569
Févérole - 81 brune	3762	544
Févérole - 83 Beja	3900	550
Févérole - 83 Kef	3825	519
Févérole - 81 blanc	3550	600
Févérole locale	4717	475
Févérole locale	4129	437
Févérole locale	4419	506
SE ±	540.7	94.5
CV %	13.6	18.1

Tableau 13 F: Essai avancé de rendement de Fève et Févérole
Population F5

Table 13 F: Seed yield of F5 Population in the AYT-F5
Faba bean large and small

Population F5/F5 Population	Rendement/Yield	
	B	K
S 82 098	2433	625
S 82 121	3767	641
S 82 368	3267	558
S 82 144	3417	325
S 82 106	3408	833
S 82 134	3300	558
S 82 170	2692	517
S 82 117	3458	383
S 82 415	3508	592
S 82 166	3025	600
S 82 375	2992	575
S 82 008	3625	492
S 82 015	3242	667
S 82 017	3400	708
S 82 018	3467	617
S 82 076	3492	583
S 82 027	4408	558
S 82 029	3433	650
S 82 077	3233	767
S 82 085	3075	625
S 82 088	3958	525
S 82 151	3225	500
S 82 054	3492	775
Fève Local	3442	733
Fève Local	3708	562
SE ±	514.9	160.9
CV %	15.2	26.1

Tableau 14 F : Essai préliminaire de rendement de fève

Table 14 F : Seed yield of lines in the P.Y.T. - Faba bean large

Lignée/Line	Selection	Rendement/Yield	
		B	K
X 79 S 178	FLIP 82 - 28 FB	2279	550
X 79 L 25	FLIP 82 - 29 FB	2817	608
ILB 41	FLIP 82 - 54 FB	2733	458
X 79 S 12	FLIP 83 - 3 FB	3075	658
ILB 22	FLIP 83 - 5 FB	2325	600
ILB 29	FLIP 83 - 6 FB	2700	508
S 81 079	FLIP 83 - 12 FB	2233	733
S 81 066	FLIP 83 - 17 FB	2817	325
S 81 055	FLIP 83 - 18 FB	3075	450
S 81 062	FLIP 83 - 20 FB	2583	383
S 81 060	FLIP 83 - 21 FB	2875	578
S 81 055	FLIP 83 - 32 FB	2417	567
S 81 062	FLIP 83 - 37 FB	2142	433
ILB 33	FLIP 83 - 41 FB	2733	608
ILB 24	74 TA 63	3125	417
ILB 41	76 TA 56 397	2517	700
282	76 TA 56 356	2633	683
X 75 TA 115	78 TA 33 200	2583	483
X 77 TA 31	80 S 43 587	2517	667
X 77 TA 64	80 S 44 027	1842	517
X 77 TA 72	80 S 44 178	2450	417
X 79 S 171	80 S 80 135	2533	558
Local large		2500	517
Local large		3737	625
Local large		3025	475
SE ±		501.0	174.4
CV %		18.9	32.4

Tableau 15F:Essai préliminaire de rendement de Févérole No. 1

Table 15F:Seed yield of lines in the PYT - small No. 1

Lignée/Line	Sélection	Rendement/Yield	
		B	
X 75 TA 105	FLIP 82 - 12 FB	2475	
X 75 Sd 48	FLIP 82 - 13 FB	3437	
X 77 TA 72	FLIP 82 - 17 FB	2787	
X 77 TA 81	FLIP 82 - 19 FB	3312	
X 77 TA 85	FLIP 82 - 21 FB	2850	
X 75 TA 8	FLIP 82 - 33 FB	3075	
X 75 TA 14	FLIP 82 - 34 FB	3038	
X 75 TA 14	FLIP 82 - 35 FB	3100	
X 75 TA 26062	FLIP 83 - 7 FB	4087	
79 S 33120	FLIP 82 - 9 FB	3212	
S 81 047	FLIP 83 - 50 FB	3112	
S 81 065	FLIP 83 - 68 FB	3525	
S 81 072	FLIP 83 - 75 FB	2612	
S 81 036	FLIP 83 - 78 FB	2825	
S 81 217	FLIP 83 - 85 FB	3100	
S 81 056	FLIP 83 - 89 FB	3350	
Sd 77 061	FLIP 83 - 95 FB	3462	
Sd 77 061	FLIP 83 - 96 FB	3287	
80 S 44 358	FLIP 81 - 100 FB	2862	
79 S 30 403	FLIP 83 - 102 FB	3787	
79 S 33 024	FLIP 83 - 105 FB	3625	
Févérole local		3175	
Févérole local		2650	
Févérole local		3075	
Févérole local		2437	
SE±		523.9	
CV%		16.7	

Tableau 16 F : Essai préliminaire de rendement de févérole No. 2

Table 16 F : Seed yield of lines in the PYT - small No. 2

Lignée/Line	Selection	Rendement/Yield
		B
ILB 1814	FLIP 83 - 106 FB	<u>3625</u>
10	FLIP 83 - 107 FB	2812
S 81 059	FLIP 83 - 114 FB	<u>3137</u>
1055	FLIP 83 - 128 FB	2362
1817	76 TA 56 267	2462
352	77 MS 88 158	2962
18	77 TA 800 23	2500
1816	78 S 48 561	2912
X 75 TA 10	80 S 43 238	<u>3450</u>
X 77 TA 48	80 S 43 856	<u>3412</u>
X 77 TA 48	80 S 43 859	<u>3112</u>
ILB 2858		<u>3087</u>
Févérole local		2825
Févérole local		2637
Févérole local		2387
Févérole local		2537
SE ±		324.7
CV %		11.2

Tableau 17 F: Pépinière de selection de fêves (FBISN-L)

Table 17 F: Seed yield of lines in the ISN-Faba bean large

Lignée/Line	Selection	Rendement/Yield	
		B	K
X 79 S 101 B	FLIP 82 - 26 FB	2750	300
X 79 S 178	FLIP 82 - 28 FB	3700	500
X 79 L 25	FLIP 82 - 29 FB	3450	500
X 79 L 130	FLIP 82 - 30 FB	4000	600
X 75 TA 209	FLIP 82 - 39 FB	2850	400
ILB 1817	FLIP 82 - 45 FB	3300	400
ILB 1817	FLIP 82 - 46 FB	2040	500
ILB 1817	FLIP 82 - 48 FB	4050	500
ILB 23	FLIP 82 - 53 FB	3850	500
ILB 41	FLIP 82 - 54 FB	4400	500
ILB 12	FLIP 83 - 4 FB	4350	200
ILB 29	FLIP 83 - 6 FB	3350	400
S 81 066	FLIP 82 - 17 FB	3850	500
S 81 055	FLIP 83 - 18 FB	2400	200
S 81 062	FLIP 83 - 37 FB	3550	500
80 L 90 222	FLIP 83 - 43 FB	2750	500
78 S 33 201	FLIP 83 - 44 FB	3300	600
78 S 33 202	FLIP 83 - 45 FB	3500	200
ILB 24	74 TA 63	2500	400
ILB 37	74 TA 109	4650	-
ILB 17	78 S 49 044	2700	600
X 77 TA 31	80 S 43 587	2800	400
X 77 TA 64	80 S 44 027	4000	500
X 77 TA 72	80 S 44 178	3050	300
X 79 S 70	80 S 80 026	4000	600
X 79 S 103	80 S 80 064	4900	300
X 79 S 155	80 S 80 123	2950	400
X 79 S 171	80 S 80 135	5300	600
X 79 L 153	80 S 81 054	3100	600
ILB 1266	Aquadulce	3650	300
ILB 1933	Seville Giant	3350	600
Syrian local large		3400	700
"		2350	450
"		3150	400
Reina Blanca		3400	600
"		3300	300
"		2400	700
Fêve local		2850	200
"		3750	600
"		2300	500

Tableau 18 F : Pépinière de sélection de févérole

Table 18 F : Seed yield of lines in the I S N - Faba bean small

Lignée/Line		Selection	Rendement/Yield					
			B	K	OM	RR	Kr	M
X 75 TA 14		FLIP 82 - 1FB	1550	300	3700	935	800	1600
X 75 TA 43		- 9FB	2250	200	2650	1160	850	2550
X 77 TA 51		- 11FB	3550	350	270	1035	1250	2450
X 75 TA 105		- 12FB	3400	200	3200	1610	1050	2250
X 77 Sd 48		- 13FB	1400	50	2700	610	750	2250
X 75 TA 16		- 15FB	2500	150	2350	855	1050	2150
X 77 TA 72		- 17FB	2950	200	2200	1785	950	2600
X 77 TA 81		- 19FB	3300	150	1750	1185	1050	2050
X 77 TA 81		- 20FB	2000	200	3750	960	1400	2300
X 77 TA 85		- 21FB	2800	300	2150	1035	850	1700
X 75 TA 8		- 33FB	2500	300	4000	1060	950	2850
X 75 TA 14		- 34FB	1850	200	1100	1210	1000	1850
X 75 TA 14		- 35FB	2200	200	3050	985	1100	2100
X 75 TA 20		- 36FB	2550	150	1000	1510	1400	1500
5		- 1FB	2600	400	2200	2400	1250	3300
X 79 S 12		- 3FB	2900	250	2650	1310	1000	3050
S 81 054	FLIP 83	- 48FB	1800	250	2550	1435	1050	2350
S 81 047		- 50FB	3150	300	2500	1360	1300	2050
S 81 012		- 60FB	1650	-	800	1260	1150	1250
S 81 065		- 68FB	1850	100	1750	1860	1050	1900
S 81 072		- 75FB	1400	300	2450	1160	600	1650
S 81 211		- 84FB	2700	300	1900	835	1150	2100
S 81 217		- 85FB	2000	100	1750	1760	1500	2350
S 81 232		- 88FB	1850	350	2800	1125	900	1400
Sd 77 061		- 95FB	3200	-	1100	860	1450	3100
Sd 77 061		- 96FB	3150	300	2850	1060	1000	2200
Sd 77 061		- 97FB	3050	350	2350	2035	900	4100
80 S 44358		- 100FB	1900	400	2600	1735	1000	3050
79 S 30403		- 102FB	2600	300	2600	1385	1150	2100
79 S 33024		- 105FB	2900	400	2650	1935	1500	3900
1814		- 106FB	2950	250	2800	985	1400	3000
10		- 107FB	3600	300	3100	1160	1150	4400
1266		- 127FB	2900	300	2750	1285	1200	2450
1817	76 TA	56267	3190	400	2750	1710	1050	3050
407	78 S	49395	2150	250	3300	1235	1000	2850
X 75 TA 33	80 S	43651	2750	-	2700	1810	1150	2850
X 79 S 160	80 S	80128	2950	100	2750	2485	1600	2250
2858	ILB	2898	150	400	950	210	1050	1050
2864	73 RM	70	400	300	1500	485	1600	1350
2865	Outlook		150	250	350	410	100	1250
S 81 036	FLIP 83	- 78FB	2550	350	3100	760	950	2150
S 81 056		- 89FB	2400	200	2300	1185	1000	2500

	79 S 30424	- 101FB	2800	300	2300	1410	1050	550
S	81 059	- 114FB	1600	350	2850	1760	1200	4750
	1812	- 126FB	2750	300	3400	835	1050	1550
	1055	- 128FB	1800	300	3000	1335	1250	3000
S	82 002 FLIP 84	- 38FB	1700	350	2350	1635	1100	1900
S	82 018	- 41FB	2700	300	3050	2085	850	2500
S	82 061	- 43FB	3300	250	2950	1160	1100	1500
S	82 083	- 45FB	2300	300	3200	760	950	1600
S	82 097 FLIP 84	- 46FB	2750	350	3800	1385	1400	2950
S	82 099	- 48FB	4200	300	2900	2910	1560	4200
S	82 150	- 57FB	1800	400	2250	2035	1200	1400
S	82 154	- 58FB	3150	300	2850	2285	1500	3350
S	82 166	- 59FB	2250	250	2650	935	1250	3150
S	82 448	- 65FB	1800	250	2600	960	1250	1350
ILB	1814		2200	300	3250	1055	1500	2050
	1814		2500	400	3550	2560	1600	3000
	1814		3600	250	3500	2110	1450	3350
	1814		3700	350	4300	2150	2250	4200
	1814		4400	100	2850	2360	1950	3850
ILB	1270 Reina Blanca		1950	400	3300	1510	1000	2000
	1270 Reina Blanca		2750	350	3750	1685	1000	2450
	1270 Reina Blanca		4800	300	3800	885	1500	700
	1270 Reina Blanca		4200	300	2950	3110	1800	3050
	1270 Reina Blanca		3700	-	3950	3110	1700	1700
Févérole local			1850	400	3950	1710	1100	2250
"			2350	350	3050	1960	1200	3350
"			2300	350	3700	2285	1100	3750
"			3650	350	3100	2560	1250	4050
"			3050	400	3700	4035	1250	4350

Tableau 19 F : Pépinière d'observation de fève et féverole 86
"Rendement des lignées sélectionnées"

Table 19 F : Faba bean screening nursery 1986. "Seed yield of
selected lines"

Selection	Rendement/Yield	
	B	
S 82 004 - 33		3650
S 82 013 - 14		3150
S 82 015 - 8		3450
S 82 048 - 4		3750
S 82 050 - 66		3200
S 82 114 - 33		3250
S 82 138 - 3		2350
S 82 166 - 22		2450
S 82 087 - 6		3700
S 82 114 - 32		3700
S 82 166 - 20		4250
S 82 041 - 23		4500
S 82 165 - 19		2600
S 82 013 - 23		4050
S 82 018 - 33		3150
S 82 030 - 1		2850
S 82 030 - 18		3800
S 82 042 - 5		3100
S 82 044 - 11		2600
S 82 049 - 3		3300
S 82 085 - 42		3950
S 82 120 - 6		4650
S 82 148 - 31		3800
S 82 148 - 10		2950
S 82 425 - 19		3450
S 82 452 - 30		4400
S 82 471 - 7		2650
S 82 482 - 14		2600
S 82 382 - 10		3200
S 82 041 - 20		3200
S 82 041 - 53		2920
S 82 041 - 62		2100
S 82 381 - 8		3400
S 82 381 - 52		2800
S 82 381 - 90		3900
S 82 381 -114		2750
L 81 001 - 8		3800
L 81 004 - 6		3650
L 81 006 - 9		3000
L 81 023 - 12		2300
L 81 033 - 16		3650
L 81 034 - 7		4200

L 81 034 - 13	4200
5084 - 33	1600
5023 - 1 - 2	3600
5080 - 3 - 4	3150
5004 - 1 - 1	2350
5036 - 1 - 1	3255
5087 - 5	3850
30471 - 2 - 1	2150
S 82 011 - 5	4050
S 82 029 - 63	3100
S 82 482 - 9	2000
S 82 381 - 36	3800
S 82 019 - 35	3750
S 82 10 - 25	3000
S 82 113 - 8	3250
S 81 056 - 7	3300
S 82 009 - 6	3450
S 82 011 - 4	3400
S 82 037 - 23	3350
S 82 049 - 25	3400
S 82 061 - 21	1550
S 82 116 - 7	2250
S 82 118 - 5	3750
S 82 427 - 10	1750
S 82 431 - 7	3150
S 82 437 - 11	2800
S 82 439 - 6	1700
S 82 067 - 17	2450
S 82 348 - 6	3150
S 81 061 - 7	2450
S 82 154 - 11	3300

Tableau 20F: Pépinière de sélection de population F_3 (FBI F_3N)

Table 20F: Seed yield of F_3 populations in the IF_3N -Faba bean large and small

Population F_3/F_3 population	Rendement/Yield			
	B	K	OM	RR
S 84 053	3550	350	2570	3205
S 84 059	3200	150	1770	1122
S 84 062	3075	200	2040	992
S 84 063	4025	350	3280	817
S 84 064	2501	350	2330	2730
S 84 065	3750	250	1270	1092
S 84 066	3900	200	2190	967
S 84 070	3250	200	2210	1542
S 84 073	3375	300	1900	1142
S 84 075	4200	250	2600	1017
S 84 077	3625	200	1420	817
S 84 078	2875	150	2200	1917
S 84 081	2775	350	2100	2680
S 84 083	2550	200	2200	1917
S 84 101	2925	450	2760	1417
S 84 102	2550	450	2050	1905
S 84 104	3375	150	2290	1605
S 84 110	4000	275	3000	1355
S 84 113	3100	275	2110	2255
S 84 114	3350	250	2640	692
S 84 115	3450	275	1730	942
S 84 117	3750	150	3020	730
S 84 118	3550	200	1980	2737
S 84 122	3225	250	1610	957
S 84 127	3650	425	2190	3155
S 84 133	3800	350	2780	1760
S 84 145	4050	250	1740	2270
S 84 153	3350	275	2160	2030
S 84 158	3425	200	1880	995
S 84 170	4525	275	2260	2442
S 84 171	3175	200	2000	1930
S 84 174	3576	275	1780	1780
S 84 179	3325	250	1930	1880
S 84 181	3250	225	1840	2130
S 84 182	3400	150	2500	632
S 84 183	2950	150	2050	1295
S 84 187	2325	250	1780	1030
S 84 199	3100	300	1770	1192
S 84 205	3275	250	1770	1505
S 84 210	2900	200	1880	1367
Syrian local large	4300	190	1840	1192
"	4000	450	2000	1605
"	3475	100	2980	1730

Population F_3/F_3 Population	Rendement/Yield			
	B	K	OM	RR
Syrian local large	3450	350	2310	1405
Reina Blanca	3475	350	2610	1317
"	3800	450	1880	1880
"	4075	350	2830	3367
"	4500	350	2690	2442
Feve local	4600	150	910	1005
"	3700	325	3140	2217
"	3700	275	2150	2392
"	3175	150	2600	3442

Tableau 21 F : Lecture de l'ascochyta sur fève et févérole

Table 21 F : Ascochyta blight scores (ABS) for entries in the international ascochyta blight nursery.

Lignée/Line	Selection	ABS ⁽¹⁾	
		STEM	PODS
BPL 74	79 Lat. 70015 - 1	1	1
BPL 365	80 Lat. 14336	2	1
BPL 436	80 Lat. 14399	3	1
BPL 460	80 Lat. 14422 - 1	3	1
BPL 465	80 Lat. 14427	1	1
BPL 471	80 Lat. 14434 - 3	3	1
BPL 472	80 Lat. 14435 - 1	2	2
BPL 472	80 Lat. 14435 - 2	3	1
BPL 472	80 Lat. 14435 - 3	3	1
BPL 266	80 Lat. 14986 - 1	3	1
ILB 752	80 Lat. 15035 - 1	1	1
ILB 752	80 Lat. 15035 - 2	1	1
-	80 Lat. A2		1
-	IB 18 - 1/3	1	1
ILB 1820	Giza 4	4	1
ILB 1814	Syrian local large	3	2
Local check fève*		2.4	2.4
Local check févérole**		2	1

(1) Echelle 1 à 9 avec 1 = pas de lésions et 9 = lésions très étendues et beaucoup de plantes mortes.

(1) 1 to 9 scale where 1 = no lesions and 9 = lesions extensive and many plants killed.

* Répété cinq fois

* Repeated five times

** Répété quatre fois

** Repeated four times

Tableau 22 F : Lecture du botrytis sur fève et févérole

Table 22 F : Chocolate spot scores (CSS) for entries in the international chocolate spot nursery

Lignée/Line	Selection	CSS (1)
BPL 110	81 Lat. 24638 - 1	2.5
BPL 112	81 Lat. 24640 - 1	3
BPL 112	81 Lat. 24640 - 2 A	3
BPL 112	81 Lat. 24640 - 2 B	2
BPL 261	81 Lat. 24694 - 1 A	2
BPL 261	81 Lat. 24694 - 1 B	3
BPL 261	81 Lat. 24694 - 2 A	2
BPL 261	81 Lat. 24694 - 2 B	3
BPL 266	81 Lat. 24698 - 1	3
BPL 274	81 Lat. 24701 - 2	4
BPL 658	81 Lat. 24833	4
BPL 710	81 Lat. 24857 - 1	2
BPL 710	81 Lat. 24857 - 2	2
BPL 1056	81 Lat. 24901 - 2	1
BPL 1179	81 Lat. 24948 - 1 A	3
BPL 1179	81 Lat. 24948 - 1 B	2
BPL 1179	81 Lat. 24948 - 6	3
BPL 1278	81 Lat. 24957	2
BPL 1538	81 Lat. 24996	4
BPL 1546	81 Lat. 25003	4
BPL 1547	81 Lat. 25004	4
BPL 1548	81 Lat. 25005 - 2	4
-	S 81 077 - 1	3
BPL 1752	81 Lat. 25090	3
BPL 1764	81 Lat. 25100	1.5
BPL 1802	81 Lat. 25111	3
BPL 1821	81 Lat. 25114 - 1	4
BPL 1832	81 Lat. 25117	4
ILB 365	Rebaya 40	6
ILB 1814	Syrian local large	7
Local check fève (2)	-	6.1
local check févérole	-	6

(1) Echelle 1 à 9 avec 1 = pas de lésions et 9 = lésions très étendues et beaucoup de plantes mortes

(1) 1 to 9 scale where 1 = no lesions and 9 = lesions extensive and many plants killed

(2) Répété huit fois

(2) Repeated eight times

Tableau 23 F : Lecture de nématode (NS) sur fève "BPL"

Table 23 F : Nematode scores (NS) for the Faba bean "BPL" nematode trial

BPL	NS ⁽¹⁾	BPL	NS ⁽¹⁾
1	3	101	5
3	3	104	3
4	3	110	3
5	3	113	1
6	3	114	5
9	3	115	5
10	3	118	1
11	5	119	5
13	3	128	5
17	3	129	6
18	1	133	5
19	3	134	3
22	3	136	5
24	3	137	3
25	3	142	3
30	5	144	7
31	5	147	3
32	5	148	3
35	6	149	5
36	3	150	5
40	6	157	5
42	7	158	5
43	3	159	1
44	1	160	3
46	1	164	3
47	5	165	5
48	5	168	5
50	5	170	5
52	5	171	5
53	6	176	3
56	3	177	3
58	5	180	3
60	5	181	1
63	3	182	3
64	3	183	5
66	5	184	5
67	5	185	7
68	3	186	5
70	3	188	3
74	2	189	7
77	5	190	3
78	3	191	3
79	3	192	7
81	5	193	3
84	3	194	3
86	3	195	5
92	5	196	3
98	1	197	6

198	3	609	3
201	3	610	3
202	3	612	5
204	3	613	3
207	3	614	3
208	3	615	3
209	5	618	3
210	3	619	7
211	5	620	5
214	3	621	3
215	3	622	3
217	7	623	7
218	3	624	3
220	5	625	3
221	3	627	3
224	2	628	5
225	5	629	3
226	5	630	5
227	5	632	5
228	5	636	5
229	3	637	5
234	5	640	2
235	3	643	1
238	3	646	5
239	3	647	3
240	3	649	5
245	7	650	5
247	3	653	3
249	5	657	5
250	5	658	5
251	5	659	6
253	3	660	5
254	7	662	1
258	3	663	3
259	2	664	3
260	5	665	1
583	3	666	3
584	5	673	5
586	3	674	5
587	5	676	5
588	7	677	5
589	3	680	5
596	5	686	1
597	3	692	3
600	3	696	3
601	7	698	3
602	3	700	5
603	7	702	2
604	5	703	5
606	3	704	3
607	5	705	3
608	3	713	7
		Local check*	4.33

- (1) Echelle 1 à 9 avec 1 = pas d'infection et 9 = arrêt de croissance, nécrose et déformation des tiges, défoliation sévère avec mort des plantes (jusqu'à 50%)
- (1) 1 to 9 scale where 1 = no infection and 9 = severe stunting, giant necrotic stem swellings, severe defoliation and death of more than 50% of the plants.
- (*) Répété 51 fois
- (*) Repeated 51 times

4. CHICKPEA IMPROVEMENT (H. HALILA)

4.1. Variety release

At present the chickpea crop is only planted during spring in the farmers' fields. The chickpea breeding program is, however, oriented for both winter and spring sown crops.

Sowing date trials conducted this year by INRAT and the Office des Cereales (Cereals Office) again confirmed the yield advantage of winter versus spring sowing.

The research program conducted during the last five years has permitted the identification of genetic material suited for winter and for spring planting, and the program has decided to release three chickpea varieties, two of them for winter sowing and the third for spring planting. General informations on these varieties have already been given earlier in this report (1985/86 Highlights) and detailed informations are presented in table 5.

These varieties as well as the winter planting practices will be extensively tested and demonstrated in farmers' fields by the extension services of the D/PV (Production Vegetale) and the Office des Cereales, next season.

4.2. Introduction

This season the winter planted, and some early planted trials gave excellent yields at Beja and Oued Meliz stations. Winter sowing did not, however, give any substantial advantage over the spring at Kef because of the severe drought that

Table 5: Main Characteristics of the Chickpea lines to be released for farmers

Lines	Origin	Type of sowing	Diseases		Maturity	Habit		Seed		Utilisation	Yield A-W- A-W+
			AB (1)	Wilt		Type	Height (2) cm	Color	Type		
ILC 3279	RUSSIA	Winter	4.25	Susceptible	Late	Erect	77	Beige	Pea	Pastry-Coffee blending	Good Nil
FLIP 83-46 C	ICARDA	Winter	3.75	Susceptible	Semi-early	Semi-erect	61	Beige	Owl	Polyvalent	Good Nil
PL-Se-Be-81-48	TUNISIA	Spring	9.0	Resistant	Semi-early	Spreading	35 (3)	Cream	Susceptible	Polyvalent	Nil Good
Local "Amdoun"	Local check	Spring	9.0	Susceptible	Semi-early	Semi-Spreading	55	Cream	Susceptible	Polyvalent	Nil Nil

(1) Ascochyta rating on a 1-9 scale where: 1 = complete resistance and 9 = complete kill.

(2) Average of two stations - 1985/86

(3) Average of two stations. Spring sowing 1985/86

(4) Average of two/or three stations 1985/86

(5) A+ W- = Presence of Ascochyta and absence of Wilt.

A- W+ = Absence of Ascochyta and presence of Wilt.

had occurred at that station this year. The two main diseases of chickpea continued to be *Ascochyta* blight and wilt. *Ascochyta* blight resistance is a prerequisite for varieties to be winter planted and the spring planting can also be severely affected by the disease. Accordingly most of the genetic material received from ICARDA should have tolerance to blight. This season a natural infection of *Ascochyta* blight occurred sporadically at Beja and Ras Rajel experiment stations but it was not observed in farmers's fields. An excellent and uniform natural infection of AB was observed in our AB sick plot at Beja station and it was possible to make a very good screening in the advanced lines.

During the previous three seasons wilt symptoms have been observed at Beja experiment station and on farmer's fields. This year a survey conducted in the spring with the assistance of an ICRISAT chickpea pathologist, Dr. Haware, in the main chickpea growing areas have shown the rapid expansion of wilt diseases. New fields were getting infested and the incidence of the disease was assessed. Moreover, observations made in the ICRISAT ICWRR Nursery planted in the wilt sick plot (WSP) at Beja indicated that some of the varieties are showing a reaction to *Fusarium*/wilt different from that observed at Hyderabad, in India, implying the existence of a Tunisian race of F.O. different from the one prevailing

at ICRISAT Center.

It is now definitely felt that wilt disease in chickpea is potentially as important a constraint to production as Ascochyta blight.

From the foregoing it is clear that the objectives of the breeding program must be the development of lines adapted to the local environmental conditions and possessing resistance to ascochyta blight and wilt. At the present time lines have been selected with resistance to either blight or wilt and some progress made in developing lines with dual resistance. A further objective is that the resistant lines so developed should have a plant structure amenable to mechanical harvesting and a good seed size.

This crop report provides a summary of the complete results from all trials. These are in tables prefixed by the letter C. In all trials, screening and disease nurseries, the local check was the local Landrace/cultivar "Amdoun". This check was included three times in the IYT but was repeated at least four times in the advanced and preliminary yield trials.

4.3. Winter planted yield trials and nurseries

Seed yield results are available from testing 176 advanced breeding lines and 46 F4 populations in 11 replicated trials at one to four locations (Table 6). The relevant complete results are in tables 1C to 16C. It should be noted that in table 6 the 'International Yield Trial' - Sp (IYT-Sp) and - Nsp (IYN-Sp) were respectively the IYT for spring planting, although planted in winter as it contained ascochyta blight resistant lines, and the international screening nursery grown as a replicated trial. In the IYTs three local checks were included and not protected against ascochyta blight, whereas in the advanced (AYT) and preliminary (PYT) trials two of the check entries were protected through fungicide application and two were unprotected.

Statistically the yield of the test lines have been compared against the average yield of all checks, protected and unprotected. Because of the high coefficients of variation observed with the trials at Ras Rajel, due probably to the heterogeneity of the soil, and the severe drought which has prevailed in the season at Kef station, the data from these two stations are presented for information only and will not be discussed. Almost all the winter planted test lines and a large number of them at Beja and O. Meliz respectively, have outyielded the local check.

Table 6 : . Summary of the seed yield results of winter planted chickpea lines and populations tested in replicated yield trial (YT) at Beja (B), Kef (K), Oued Meliz (OM), Ras Rajel (RR) locations in 1985/86.

Trial designation (1)		Number of lines/populations										Coefficients of variation			
		Tested	Exceeding the local check at				Significantly exceeding the local check at (2)								
			B	K	OM	RR	B	K	OM	RR	B	K	OM	RR	
International	YT-MR	23	23	0	16	2	22	0	2	2	15.2	27.2	16.6	58.9	
	YT-STR	23	23	2	15	9	20	1	5	5	16.9	26.3	18.2	49.3	
	YT-Sp	23	21	8	18	13	7	NS	7	NS	21.8	30.0	11.0	41.5	
Advanced	YT-W-E	23	20	1	15	4	7	0	NS	3	18.1	21.2	19.9	66.6	
	YT-W ₁	21	12	2	10	19	4	0	0	14	22.2	32.1	16.0	30.3	
	YT-W ₂	21	10	1	4	12	2	0	0	8	18.8	30.1	14.0	41.0	
	YT-W ₃	21	18	1	20	13	3	0	NS	7	17.2	21.4	31.1	37.1	
	YT-W ₄	21	21	7	12	17	13	0	0	NS	18.4	20.1	25.5	39.5	
International	YT-F ₄ ,A	23	23	15	23	-	10	5	NS	-	18.3	25.3	35.9	-	
	YT-F ₄ ,B	23	8	-	-	-	NS	-	-	-	26.8	-	-	-	
International	SN.W	63	51	13	3	-									
	SN.Sp	50	38	18	4	-									

(1) MR = Mediterranean region; STR = Sub. tropical region; S = Spring; W = Winter; F₄ = F₄ population; SN = Screening nursery grown as replicated trial.

(2) NS = 'F' test of treatment not significant statistically.

At Beja where the local checks were seriously hit by Ascochyta Blight a relatively high number of lines, compared to last year, have significantly exceeded the check. A part from the IYT-F4.B, a minimum of two and as much as 22 lines have outyielded, significantly, the local check in all the replicated yield trials (Table 6). At Oued Meliz station, however, where Ascochyta blight was absent, the number of test entries exceeding significantly the check is much lower and was only noticed in the IYT-MR, IYT-STR and IYT-Sp.

The two lines in the IYT-MR, and the five lines in the IYT-STR which significantly outyielded the local at O. Meliz did also so at Beja. In the IYT-Sp, out of the seven there was only three that performed equally good at both stations. Yield data of all these lines across the two locations are given in table 7.

These lines should ~~theoretically~~ have Ascochyta blight resistance and used safely by the farmers for winter planting. They are however, all susceptible to wilt.

Wilt is a problem in both winter and spring planting and the objective of the program is still to identify material with dual resistance to Ascochyta and wilt.

Table 7 : Seed yield and wilt reaction of the lines exceeding significantly the local check at Beja and O. Meliz stations in 1985/86.

Tableau 7 : Rendements moyens des lignées dépassant significativement le local Amdoun.

Trial/ Essai	Line/Lignée	Locations		Wilt incidence% W. S.P. Beja	Mean/ Moyenne
		Beja	O. Meliz		
IYT-MR	FLIP 82-128C	2213	2461	93	2337
	FLIP 83- 47C	2188	2850	78	2519
	LOCAL CHECK	1204	2047	100	1625
	MEAN				
	SE ±	313.0	357.6		
	CV %	15.2	16.6		
IYT-STR	FLIP 82-150C	2612	3712	90	3162
	FLIP 82-239C	2363	3300	90	2831
	FLIP 83- 22C	2487	3328	100	2907
	FLIP 83- 50C	2087	3395	100	2741
	ILC 482	2668	3057	100	2862
	LOCAL CHECK	1357	2495	100	1926
	MEAN				
	SE ±	356.6	497.5		
IYT-Sp	FLIP 83- 26C	1800	2587	99	2193
	FLIP 83- 53C	1781	2737	64	2184
	ILC 482	1818	2737	100	2277
	LOCAL CHECK	1224	2124	100	1674
	MEAN				
	SE ±	338.3	255.0		
	CV %	21.8	11.0		

Tableau 8 : Résumé des résultats du triage des variétés de pois chiche pour la résistance au wilt à Béja.

Table 8 : Summary of wilt screening at Beja wilt sick plot (WSP) during 1985/86 season.

Trials/Essais	Total number of lines Nombre total des lignes	Number of lines/wilt incidence		
		0-20%	21-50%	51-100%
ICARDA Nurs.	512	76	58	378
ICRRWN	51	49	1	1
EARPC. E-W	27	0	2	25
EARPC 1-W	25	0	1	24
EARPC 2-W	25	0	6	19
EARPC 3-W	25	0	1	24
EARPC 4-W	25	0	0	25
CIYT-W-MR	24	0	0	24
CIYT-W-STR	24	0	1	23
CIYT-Sp	24	0	3	21
CISN-W	53	4	6	43
CISN-Sp	40	3	4	32
CISN-W 85	16	0	3	13
CISN-Sp 85	14	0	4	10
CIABN. A	41	1	0	39
CIABN-B	51	0	0	51
CILMN	26	10	4	22
EAR 1-Sp	23	12	5	6
EAR 2-Sp	23	0	3	20
EAR 3-Sp	21	2	6	13
EAR 4-Sp	22	18	3	1
CIYT-L	24	0	2	22
F6	44	12	0	32
F5	17	0	0	17
F4	21	1	5	15
PF/Hors prog.	33	0	1	32
Total	1231	178	119	932

The advanced lines of the AYT and IYT, screened in the Beja WSP using the wilt incidence (%) rating rather than the wilt score (1→9 scale) rating were susceptible to this disease. Only 4 lines in ISN-W, 3 in the ISN-Sp and 1 in the CIABN, did show a reasonable level of tolerance (0-20%) and those selected for good yielding and good seed size will be retested again for wilt reaction next year (Table 8).

4.4. Spring planted yield trials

Seed yield results are available from testing 92 advanced breeding lines in four replicated trials at four locations (Table 9). A summary of the yield data for each trial is also given in table 9. The relevant tables of complete results are presented in tables 17 C to 24 C. The same remarks made earlier on the winter trials at Ras Rajel and the Kef apply also for the spring trials at the same locations. At Kef there was in some trials, nothing to harvest and even those trials harvested have had a large number of missing plots.

At Beja, O. Meliz and Bou Salem and in all trials, a number of lines outyielded the local check but very few of them did so significantly.

However, in the AYT 1 and 4 there were 32 lines tested that stemmed from single plant selections made

Table 9 : Summary of the yield results of spring planted lines tested in replicated yield trials (YT) at Beja (B), Kef (K), Ras Rajel (RR), Oued Meliz (OM) and Bou Salem (BS) locations in 1985/86.

			Number of lines/populations										Coefficients of					
Trial designation (1)			Tested	Exceeding the local check at					Significantly exceeding the local check at (2)					variation				
				B	K	OM	RR	BS	B	K	OM	RR	BS	B	K	OM	RR	BS
International	YT-L	23	20	6	16	18	-	4	NA	1	NS	-	32.8	NA	29.3	49.4	-	
	-CAT	16	1	-	-	-	-	0	-	-	-	-	33.7	-	-	-	-	
Advanced	YT-Sp1	23	18	18	23	7	16	3	NA	0	NS	2	20.1	NA		40.2	13.9	
	YT-Sp2	23	9	16	9	7	-	0	NA	NS	3	-	21.9	NA	45.8	41.0	-	
	YT-Sp3	23	16	0	12	11	-	2	NA	NS	6	-	36.1	NA	26.4	42.4	-	
	YT-Sp4	23	22	-	-	-	-	NA	NA	-	-	-	NA	NA	-	-	-	
	YT-Sp/W1	23	9	-	11	-	-	0	-	0	-	-	25.2	-	20.5	-	-	
	YT-Sp/W2	14	4	-	9	-	-	NS	-	NS	-	-	25.3	-	26.5	-	-	

(1) IYT-L = International large seeded yield trial

(2) NS = "F" test of treatments not significant (P>0.05)

ICAT = International adaptation yield trial

NA = Not analysed due to a large number of missing plots

Sp = Spring

W/Sp = Winter/spring

in the local cultivar/landrace 'Amdoun' for resistance to wilt. Out of these lines 27 have shown and kept a high level of resistance in the wilt sick plot (WSP) at Beja during this and the previous seasons, and in the last two seasons have significantly outyielded the local check by a large margin when grown in replicated trials in the WSP. The 32 lines were grown in wilt free land this season at Beja and 16 out of them at O. Meliz and Bou Salem. Five wilt resistant lines of the cultivars tested in the AYT 1 outyielded significantly the local check cultivar Amdoun at Beja and Bou Salem. Data on the six lines that have been tested over four seasons in both wilt infected and wilt free land are given in table 10. Since wilt is considered a major constraint to production, and as these lines have proved to be resistant and possess a seed yield and seed quality characters (particularly large seed size) similar to the local cultivar, one of them, PL-Se-Be-81-48, have been selected to be released to farmers for spring sowing in wilt infested areas.

4.5. Disease research work

The disease research work is conducted within a collaborative program with the Plant Breeding and Pathology Laboratory at INAT.

Tableau 10 : Rendement (kg/ha) de six variétés de pois chiche résistantes au wilt au cours des quatre dernières années.

Table 10 : Seed yield (kg/ha) of six wilt resistant chickpea lines selected out of the local cultivar "Amdoun" over four seasons.

Liné	82/83			83/84			84/85			85/86			Mean	
	B	K ⁽¹⁾		B	K		B	K		B	OM	BS	ST ⁽²⁾	% Lo
PL-Se-Be - 81 - 6	1193	1370		1391	1281		1775	690		1394	1375	800	1259	100
PL-Se-Be - 81 - 11	1243	1413		1635	1713		1775	706		1675	1573	1000	1414	112
PL-Se-Be - 81 - 48	1680	970		1737	1725		2000	784		1500	1921	987	1516	120
PL-Se-Be - 81 - 87	1360	1200		1875	1819		1975	865		1013	1984	962	1456	116
PL-Se-Be - 81 - 103	1490	950		1793	1600		1450	861		1325	1531	968	1336	106
PL-Se-Be - 81 - 120	520	1580		1653	1363		1700	657		1675	1593	931	1411	112
Local Amdoun	-	1275		-	1413		2062	657		1200	1314	871	1254	
CV %	14,4	30,2		22,6	20,5		10,8	21,5		20,1		13,9		

(1) B = Béja, K = Kef, OM = Oued Meliz, BS = Bou Salem

(2) ST = Seed yield.

Ascochyta rabiei

The work on Ascochyta disease consisted of creating an AB sick plot at Beja where the international ascochyta blight nurseries (CIABN) and a sample of the advanced lines tested in replicated yield trials were grown and artificially inoculated with a local isolate from Beja.

The second component of the work on this disease was done under laboratory controlled conditions and the same CIABN and the advanced lines were artificially inoculated at the seedling stage, with a mixture of three isolates collected from Beja, Mateur and Kef areas.

The CIABN was also grown at O. Meliz, Ras Rajel and Kef, no serious infection, however was observed. A good level of infection occurred at Beja and Ascochyta blight ratings were made using the 1 to 9 scale. Results of the CIABN-A and the CIABN-B are given in tables 14C and 15C. Ratings of the advanced lines will be detailed in a separate document but the distribution of the lines according to their reactions is presented in table 11.

Fusarium/Wilt

Starting last year, the program has made it a standard routine procedure the systematic screening for wilt resistance of all finished material, collected locally or introduced, which is tested in the nurseries and the replicated yield trials. The objective is to identify a maximum number of sources of resistance to this disease. The

Tableau 11 : Distribution des lignées avancées selon leur réaction à l'ascochyta blight (AR) à Béja en 1985/86.

Table 11 : Distribution of the advanced lines according to their ascochyta blight ratings (AR).

Trials/Essais	Lines/categories of AR Lignées/catégories d'AR			Total
	≤ 4	≥ 4.25-6.0	≥ 6.0-9.0	
AYT - E/EAR - E	6	14	7	27
AYT - W1/EAR - W1	2	16	7	25
AYT - W2/EAR - W2	2	13	10	25
AYT - W3/EAR - W3	6	12	7	25
AYT - W4/EAR - W4	5	8	12	25

screening is done at our wilt sick plot (WSP) at Beja station. In addition the program started, this year, to screen for resistance to wilt the chickpea germ-plasm collection maintained at Aleppo. For this 1989 "ILC" lines were sent and due to limited space in the WSP, only 500 lines were screened this year. The others will be tested in 1987 and 1988.

The detailed results of this screening will be presented in a separate document, only a summary is given in table 8.

Up to 1985 the wilt disease rating scale used is the one to nine (1 = no symptoms and 9 = complete kill), starting this year the scale has changed to the wilt incidence scale expressed as a percentage of killed plants over the total number of germinated plants. We then used the ICRISAT classification for wilt susceptibility and resistance.

An attempt was made during the last two years to survey the major areas grown to chickpeas in terms of wilt incidence. The results are being put together and will be published this year. In addition a survey of the wilt sick plot at Beja was done and showed that Fusarium oxysporium is the major pathogen with 37.4% of the plants tested, 1.8% of the plants tested showed Verticillium albo-atrum only and 2.8% of Fusarium solani

The remaining plants (58%) showed Fusarium and Verticillium simultaneously. This indicates that field screening at the Beja sick plot is done against these two pathogens simultaneously.

In addition four advanced chickpea yield trials were evaluated in terms of their resistance to Fusarium oxysporum and Verticillium sp separately. This test was done at the seedling stage under controlled environment conditions. The results of this work show that this technique is usefull in screening out early wilters but of little value in detecting germplasm with late wilting character. An attempt will be made next year to improve the technique and to circumvent this handicap.

Dual resistance to Ascochyta and wilt diseases

Work on dual resistance this season involved the screening of F4, F5 and F6 progenies, derived from ICARDA population trials and having theoretically resistance to A.B. in the the WSP in combination with artificial inoculation by a locally occurring strain of Ascochyta blight. The infection was not uniform and screening was made for wilt mainly and whenever possible for both wilt and ascochyta. Twelve F4 progenies from 22 crosses were selected for a good level of resistance to both diseases.

Four F6 progenies coming from the cross ILC 237 x ILC 191 which was an entry in the 1982/83 F3 populations have been keeping their resistance for wilt and will be retained for further tests although their seed size is rather small.

Crosses requested by our program, between ascochyta resistant lines with heaviest yield in Tunisia and wilt resistance Amdoun selections, with the aim of combining dual resistance with a large seed size in a locally well adapted background have been undertaken by the base program at Aleppo in 1983 and 1984. The resulted F1 and F2 populations were advanced in wilt free land at Terbol and Kef and the F3 progenies were screened this year for wilt and partly for ascochyta. Around 80 F3 progenies out of 1620 were selected based on their wilt reaction, earliness, erectness and seed size.

All the selected F4, F6 and F3's will be screened again for Ascochyta resistance in wilt free land and tested as bulks for yield. Furthermore 29 new crosses were undertaken this season at Aleppo for our program.

Tableau 1 C : Essai avancé de rendement de pois chiche d'hiver-E

Table 1 C : Seed yield of lines in the AYT-W-E of chickpea at four locations

Lignée/Line			Rendement/Yield			
			B	OM	K	RR
ILC	195		2062	2534	254	131
FLIP	81 -	079	2367	2803	308	131
FLIP	82 -	61 C	2169	2515	191	81
FLIP	82 -	117 C	1956	2818	387	175
FLIP	81 -	312 C	2650	3031	258	219
FLIP	81 -	71 C	2212	3103	320	125
FLIP	82 -	1 C	1794	2853	287	81
FLIP	83 -	13 C	2387	3137	362	32
FLIP	83 -	45 C	2037	2093	279	92
FLIP	83 -	46 C	2388	2709	350	417
FLIP	83 -	50 C	1962	3275	425	133
FLIP	83 -	60 C	2506	2621	250	50
FLIP	83 -	71 C	2150	2818	362	181
FLIP	83 -	76 C	2256	2678	208	206
FLIP	82 -	79 C	2106	2184	283	100
FLIP	82 -	98 C	1762	2746	300	124
FLIP	83 -	100 C	2425	2718	308	369
FLIP	82 -	121 C	1662	2471	354	225
FLIP	82 -	159 C	2025	2503	250	237
FLIP	82 -	180 C	2013	2375	266	131
FLIP	82 -	259 C	1812	2803	350	312
ILC	482		2593	2509	350	406
ILC	3279		1775	2681	275	237
Local	P		2418	2656	1170	362
Local	P		2343	2891	445	200
Local	N.P		1406	2337	366	241
Local	N.P		962	2471	395	287
SE ±			378.1	533.7	67.5	132.5
CV %			18.1	19.9	21.2	66.6

Tableau 2 C : Essai avancé de rendement de pois chiche
d'hiver No. 1

Table 2 C : Seed yield of lines in the AYT-W at four
locations

Lignee/Line	Rendement/Yield			
	B	OM	K	RR
ILC 484	2941	1025	162	1394
FLIP 81 - 004	2800	2158	150	1587
FLIP 81 - 003	2933	2020	106	1555
FLIP 81 - 0024	2291	1620	191	1200
FLIP 81 - 0026	2108	1800	208	1180
FLIP 81 - 0029	2341	1808	219	1242
FLIP 81 - 0068	2675	2208	170	1067
FLIP 81 - 0071	1958	2025	270	992
FLIP 81 - 00269	1800	2083	212	1175
FLIP 81 - 00293	1333	1708	225	1337
FLIP 81 - 0029 W	2233	2345	154	1075
FLIP 81 - 0059 W	1316	1991	112	875
FLIP 81 - 0010 C	2408	1791	187	1062
FLIP 81 - 0075 C	2008	1754	287	1257
FLIP 81 - 00293 C	1625	1820	166	1050
FLIP 82 - 40 C	2016	1725	120	1137
FLIP 82 - 85	1966	2166	112	1755
FLIP 82 - 86	2162	2050	233	887
FLIP 82 - 27	2225	2329	287	1212
ILC 482	1625	2170	175	1537
ILC 3279	1783	1745	183	1550
Local P	2116	1920	222	987
Local P	1875	1804	275	1417
Local N.P	1191	1870	304	762
Local N.P	1775	2354	293	480
SE ±	450.7	310.0	62.5	357.5
CV %	22.2	16.0	32.1	30.3

Tableau 3 C: Essai avancé de rendement de pois chiche d'hiver No. 2

Table 3 C: Seed yield of lines in the AYT - W2 at four locations

Lignée/Line	Rendement/Yield			
	B	OM	K	RR
FLIP 82 - 34 W	2587	1950	179	592
FLIP 82 - 57 W	2456	2687	225	123
FLIP 82 - 9 W	2306	2808	156	1137
FLIP 82 - 25 C	1625	2529	254	392
FLIP 82 - 26 C	1625	2325	133	M
FLIP 82 - 64 C	1918	2333	325	675
FLIP 82 - 73 C	2437	2279	141	1167
FLIP 82 - 87 C	2762	2904	187	1430
FLIP 82 - 91 C	2093	3004	179	1017
FLIP 82 - 96 C	1668	2595	220	812
FLIP 82 - 98 C	2156	2760	212	580
FLIP 82 - 100 C	1868	2429	206	817
FLIP 82 - 101 C	1537	2254	187	1375
FLIP 82 - 112 C	1993	2637	131	1262
FLIP 82 - 127 C	1793	3062	212	1080
FLIP 82 - 128 C	2212	2658	150	1117
FLIP 82 - 130 C	2075	2345	200	962
FLIP 82 - 133	1712	2762	191	675
FLIP 82 - 138 C	1600	2695	237	950
ILC 482	2162	2966	262	1087
ILC 3279	2025	2333	208	1000
Local P	1856	2716	262	1155
Local P	2068	2754	316	1157
Local N.P	1750	2908	304	300
Local N.P	2306	2862	295	725
SE ±	384.0	370.0	63.7	380.0
CV %	18.8	14.0	30.1	41.0

Tableau 4 C : Essai avancé de rendement de pois chiche d'hiver No.3

Table 4 C : Seed yield of lines in the AYT - W3 at four locations

Lignée/Line			Rendement/Yield			
			B	OM	K	RR
FLIP	82	- 144 C	2363	2493	316	403
FLIP	82	- 150 C	2213	3158	312	967
FLIP	82	- 152 C	2250	2856	250	1265
FLIP	82	- 165 C	1481	2321	216	1015
FLIP	82	- 43 C	1931	2440	200	1480
FLIP	82	- 175 C	2119	2877	262	605
FLIP	82	- 181 C	2288	3250	163	1075
FLIP	82	- 186 C	1788	3025	120	780
FLIP	81	- 56 W	1856	3452	279	930
FLIP	82	- 195 C	1906	2908	133	475
FLIP	82	- 196 C	1900	2656	176	850
FLIP	82	- 197 C	1604	2893	154	1075
FLIP	82	- 208 C	1881	3675	140	1365
FLIP	82	- 213 C	1744	3815	156	844
FLIP	82	- 228 C	1525	2687	325	637
FLIP	82	- 232	1875	3781	300	850
FLIP	82	- 234 C	1969	3346	166	1150
FLIP	82	- 239 C	2325	2537	262	1082
FLIP	82	- 243 C	1950	2675	225	1025
ILC	482		2319	3227	312	1137
ILC	3279		1838	2856	258	1437
Local	P		2181	2302	216	1175
Local	P		1931	1987	325	625
Local	N,P		1381	2581	350	875
Local	N,P		1712	2427	375	850
SE ±			335.7	902.5	52.5	176.1
CV %			17.2	31.2	21.4	37.1

Tableau 5 C : Essai avancé de rendement de pois chiche d'hiver No.4

Table 5 C : Seed yield of lines in the AYT - W4 at four locations

Lignée/Line	Rendement/Yield			
	B	OM	K	RR
FLIP 82 - 254 C	2188	878	283	450
FLIP 82 - 261 C	2394	2450	345	800
FLIP 83 - 1 C	1919	2321	175	725
FLIP 83 - 5 C	1944	2521	333	830
FLIP 83 - 12 C	1944	1828	350	525
FLIP 83 - 15 C	2713	2346	354	700
FLIP 83 - 16 C	1969	2703	358	637
FLIP 83 - 19 C	2513	2765	287	825
FLIP 83 - 22 C	2394	1990	175	930
FLIP 83 - 24 C	2288	1862	293	687
FLIP 83 - 73 C	2613	2475	250	767
FLIP 83 - 47 C	2356	2881	262	900
FLIP 83 - 48 C	2400	2806	316	955
82 TH 77	2363	2465	350	787
82 TH 78	2575	2040	216	1087
83 TH 5	2025	2709	281	630
83 TH 114	1975	2721	295	675
83 TH 136	1606	2625	275	700
83 TH 482	2356	2212	354	850
ILC 482	2538	2334	312	812
ILC 3279	2206	1975	341	780
Local P	1906	2431	237	600
Local P	1918	2265	295	792
Local N.P	975	2284	416	612
Local N.P	1200	2346	387	667
SE ±	394.2	607.5	60.0	290.0
CV %	18.4	25.5	20.1	39.1

Tableau 6 C: Essai de rendement de pois chiche d'hiver (CIYT-MR)

Table 6 C: Seed yield of lines in the IYT-MR at four locations

Lignée/Line			Rendement/Yield			
			B	OM	K	RR
FLIP	81 -	293 C	2094	1878	212	233
FLIP	82 -	101 C	2119	2378	183	230
FLIP	82 -	115 C	2194	2270	195	582
FLIP	82 -	121 C	1869	2075	193	200
FLIP	82 -	127 C	2413	1643	250	116
FLIP	82 -	128 C	2213	2461	275	190
FLIP	82 -	138	2225	2266	291	166
FLIP	82 -	154 C	1425	2112	158	131
FLIP	82 -	161 C	2131	2066	237	150
FLIP	82 -	169 C	2213	2237	200	129
FLIP	82 -	172 C	1938	1645	250	151
FLIP	82 -	186 C	2044	1691	254	91
FLIP	82 -	232 C	2350	2431	266	166
FLIP	83 -	7 C	1881	2153	250	216
FLIP	83 -	41 C	2281	1735	91	183
FLIP	83 -	47 C	2188	2850	150	166
FLIP	83 -	48 C	2669	2237	250	100
FLIP	83 -	49 C	2319	2332	208	400
FLIP	83 -	71 C	2050	2216	308	116
FLIP	83 -	97 C	2256	2303	240	100
FLIP	83 -	98 C	2531	2491	233	191
ILC	482		2900	2282	256	143
ILC	3279		1588	2125	150	163
Local			1194	2112	237	419
Local			1863	M	375	265
Local			556	1982	441	166
SE ±			313.0	357.6	63.7	115.0
CV %			15.2	16.6	27.2	58.9

Tableau 7 C : Essai de rendement de pois chiche d'hiver (CIYT-STR)

Table 7 C : Seed yield of lines in IYT-STR at four locations

Lignée/Line	Rendement/Yield			
	B	OM	K	RR
FLIP 81 - 26 W	<u>2231</u>	2378	250	292
FLIP 82 - 104 C	<u>2281</u>	2900	<u>512</u>	<u>657</u>
FLIP 82 - 130 C	<u>2206</u>	2075	<u>287</u>	<u>307</u>
FLIP 82 - 160 C	<u>2612</u>	3712	216	425
FLIP 82 - 162 C	<u>2212</u>	2362	250	717
FLIP 82 - 219 C	1675	3112	337	275
FLIP 82 - 228 C	<u>2150</u>	2891	162	113
FLIP 82 - 239 C	<u>2363</u>	<u>3300</u>	325	407
FLIP 82 - 258 C	<u>2012</u>	<u>1987</u>	258	307
FLIP 82 - 259 C	<u>1713</u>	2307	241	<u>767</u>
FLIP 82 - 266 C	1856	3041	212	<u>492</u>
FLIP 83 - 16 C	<u>1937</u>	2750	275	507
FLIP 83 - 22 C	<u>2487</u>	<u>3328</u>	275	467
FLIP 83 - 23 C	<u>2391</u>	<u>2470</u>	318	457
FLIP 83 - 24 C	<u>2300</u>	2812	262	400
FLIP 83 - 46 C	<u>2418</u>	3037	350	500
FLIP 83 - 60 C	<u>2087</u>	3395	308	167
FLIP 83 - 72 C	<u>2375</u>	2007	262	275
FLIP 83 - 73 C	<u>2268</u>	2928	250	132
FLIP 83 - 76 C	<u>1950</u>	2982	237	<u>807</u>
FLIP 83 - 77 C	<u>2318</u>	2970	179	<u>450</u>
ILC 482	<u>2668</u>	3457	325	792
ILC 3271	<u>2008</u>	<u>2275</u>	333	<u>157</u>
Local	<u>1243</u>	2520	316	550
Local	1462	M	354	532
Local	1351	2470	358	292
SE ±	356.6	497.5	73.7	255.0
CV %	16.9	18.2	26.3	49.3

Tableau 8 C : Essai de rendement de pois chiche d'hiver (CIYT-Sp)

Table 8 C : Seed yield of lines in the IYT-Sp at four locations

Lignée/Line			Rendement/Yield			
			B	OM	K	RR
FLIP	81	- 29 W	1231	2500	206	550
FLIP	81	- 40 W	1550	2630	179	917
FLIP	82	- 73 C	1456	2107	212	817
FLIP	82	- 79 C	1593	2056	216	557
FLIP	82	- 96 C	1687	2275	191	832
FLIP	82	- 112 C	1637	2175	229	757
FLIP	82	- 133 C	1718	2278	866	775
FLIP	82	- 180 C	1800	2395	276	592
FLIP	82	- 189 C	1275	2262	268	717
FLIP	82	- 195 C	1993	2012	393	557
FLIP	82	- 197 C	1318	2366	237	267
FLIP	82	- 236 C	1668	2350	287	757
FLIP	83	- 2 C	1612	2525	218	957
FLIP	83	- 10 C	1650	2078	220	632
FLIP	83	- 26 C	1800	2587	204	957
FLIP	83	- 27 C	1000	2141	187	492
FLIP	83	- 42 C	1850	2450	218	742
FLIP	83	- 53 C	1781	2737	287	832
FLIP	83	- 69 C	1812	2153	360	457
FLIP	83	- 99 C	1675	2412	196	417
FLIP	83	- 101 C	1675	1947	143	367
ILC	482		1818	2737	366	525
ILC	1929		606	2778	237	667
Local			2062	2120	195	717
Local			750	2075	281	400
Local			856	2178	241	707
SE ±			338.3	255.0	72.5	270.0
CV %			21.8	11.0	30.0	41.5

Tableau 9 C : Essai de rendement de populations F4 de pois chiche d'hiver (CIF4T-A)

Table 9 C : Seed yield of F4 populations in the IF4T-A at three locations

Population				Rendement/Yield		
				B	OM	K
X 83 TH	20			1708	2362	116
X 83 TH	21			2050	2443	225
X 83 TH	23			2300	2543	125
X 83 TH	25			2158	2518	258
X 83 TH	45			1858	2281	215
X 83 TH	47			2050	3481	112
X 83 TH	99			1808	1737	231
X 83 TH	105			1817	2681	125
X 83 TH	111			1858	2293	187
X 83 TH	115			1908	1262	154
X 83 TH	116			1800	2181	262
X 83 TH	135			1950	2731	175
X 83 TH	142			1583	2987	170
X 83 TH	164			1925	2231	220
X 83 TH	218			1700	3443	225
X 83 TH	267			2133	2781	225
X 83 TH	325			2175	2156	166
X 83 TH	331			1608	1687	204
X 83 TH	335			2192	1606	150
X 83 TH	336			2250	2156	156
X 83 TH	337			2000	1562	254
ILC	482			2283	3112	162
ILC	3279			1500	2387	287
Local				1275	1625	175
Local				1900	650	141
Local				900	1031	175
SE ±				343.1	812.5	47.5
CV %				18.3	35.8	25.3

Tableau 10 C : Essai de rendement de populations F4 de pois chiche d'hiver (CIF4T-B)

Table 10 C : Seed yield of F4 populations in the IF4T-B at one location

Populations				Rendement/Yield
				B
X	83	TH	1	1300
X	83	TH	2	1533
X	83	TH	3	1266
X	83	TH	4	1292
X	83	TH	5	1933
X	83	TH	7	1792
X	83	TH	24	1867
X	83	TH	26	1575
X	83	TH	58	1608
X	83	TH	64	1992
X	83	TH	82	1358
X	83	TH	89	1208
X	83	TH	97	1358
X	83	TH	117	1558
X	83	TH	120	1575
X	83	TH	121	2100
X	83	TH	123	1892
X	83	TH	136	1467
X	83	TH	338	1908
X	83	TH	341	2133
X	83	TH	366	1200
ILC		482		1542
ILC		3279		1942
Local				1783
Local				2108
Local				1633
SE ±				443.2
CV %				26.8

Tableau 11 C : Pépinière de sélection de pois chiche (CISN-W)

Table 11 C : Seed yield of lines in the ISN-W at three locations

Lignée/line	Rendement/Yield		
	B	OM	K
FLIP 84 - 20 C	2350	2950	300
FLIP 84 - 22 C	1850	2350	100
FLIP 84 - 32 C	1470	3150	200
FLIP 84 - 33 C	2075	600	175
FLIP 84 - 39 C	2300	2500	300
FLIP 84 - 41 C	1400	1950	250
FLIP 84 - 42 C	2100	2250	250
FLIP 84 - 43 C	3050	1750	300
FLIP 84 - 46 C	1700	2050	300
FLIP 84 - 48 C	2100	3150	250
FLIP 84 - 56 C	2150	1850	300
FLIP 84 - 60 C	2675	2350	350
FLIP 84 - 67 C	1675	1650	200
FLIP 84 - 68 C	2075	2250	300
FLIP 84 - 69 C	2225	2500	350
FLIP 84 - 70 C	2500	1000	200
FLIP 84 - 71 C	2325	2500	225
FLIP 84 - 73 C	1275	1950	200
FLIP 84 - 74 C	1300	2750	200
FLIP 84 - 79 C	1675	2050	200
FLIP 84 - 80 C	2525	2250	200
FLIP 84 - 81 C	2350	2050	200
FLIP 84 - 86 C	3050	800	350
FLIP 84 - 96 C	2525	2600	450
FLIP 84 - 104 C	2625	2550	200
FLIP 84 - 109 C	2300	1650	250
FLIP 84 - 111 C	1150	850	250
FLIP 84 - 112 C	2525	2800	350
FLIP 84 - 116 C	1775	3250	250
FLIP 84 - 117 C	2525	1200	250
FLIP 84 - 119 C	1675	3150	200
FLIP 84 - 120 C	1975	1200	200
FLIP 84 - 121 C	3000	1650	250
FLIP 84 - 122 C	2350	1650	350
FLIP 84 - 124 C	2075	1050	350
FLIP 84 - 133 C	1650	2900	200
FLIP 84 - 137 C	2075	2000	150
FLIP 84 - 138 C	2175	3200	200
FLIP 84 - 148 C	2325	2250	400
FLIP 84 - 152 C	2650	3050	350
FLIP 84 - 158 C	2500	3450	350

FLIP 84 -	159 C	2875	2400	225
FLIP 84 -	161 C	2325	750	250
FLIP 84 -	167 C	1675	2000	300
FLIP 84 -	168 C	2500	1000	250
FLIP 84 -	175 C	1200	2100	250
FLIP 84 -	176 C	1850	2850	350
FLIP 84 -	178 C	2275	2200	300
FLIP 84 -	181 C	1050	2400	400
FLIP 84 -	182 C	2350	800	300
FLIP 84 -	188 C	2350	1650	250
ILC	482	2065	1850	400
ILC	482	1300	2950	300
ILC	482	975	1800	400
ILC	482	1800	2500	350
ILC	3279	1675	1550	300
ILC	3279	1800	2050	150
ILC	3279	1575	2750	200
ILC	3279	1900	M	300
Local Amdoun		125	2550	350
Local Amdoun		625	2250	350
Local Amdoun		175	2750	450
Local Amdoun		1325	2550	350

Tableau 12 C : Pépinière de sélection de pois chiche (CISN-Sp)

Table 12 C : Seed yield of lines in the ISN-Sp at three locations

Lignée/Line			Rendement/Yield		
			B	OM	K
FLIP 84 - 26 C			1825	3450	100
FLIP 84 - 28 C			2600	1100	100
FLIP 84 - 53 C			2300	3050	200
FLIP 84 - 54 C			2400	1900	100
FLIP 84 - 55 C			2025	1750	200
FLIP 84 - 58 C			2125	1550	150
FLIP 84 - 62 C			2500	2960	100
FLIP 84 - 64 C			1575	2200	150
FLIP 84 - 66 C			1425	2150	200
FLIP 84 - 72 C			2475	2100	100
FLIP 84 - 75 C			1800	1750	175
FLIP 84 - 78 C			1975	1750	200
FLIP 84 - 82 C			2150	1350	100
FLIP 84 - 83 C			2375	3050	150
FLIP 84 - 85 C			1575	1750	150
FLIP 84 - 87 C			2300	2450	250
FLIP 84 - 91 C			1675	1450	400
FLIP 84 - 92 C			2925	2500	250
FLIP 84 - 93 C			1050	3100	150
FLIP 84 - 99 C			2025	1800	200
FLIP 84 - 102 C			1950	2650	200
FLIP 84 - 115 C			2750	2050	200
FLIP 84 - 116 C			2550	2350	175
FLIP 84 - 123 C			1925	2150	200
FLIP 84 - 126 C			1750	2350	100
FLIP 84 - 143 C			2900	2660	100
FLIP 84 - 144 C			2900	2900	100
FLIP 84 - 145 C			3325	2950	200
FLIP 84 - 146 C			2600	2700	275
FLIP 84 - 149 C			2400	2350	125
FLIP 84 - 153 C			1825	1900	150
FLIP 84 - 154 C			2675	2750	200
FLIP 84 - 155 C			2400	2300	200
FLIP 84 - 163 C			2075	2300	100
FLIP 84 - 164 C			2375	1050	200
FLIP 84 - 181 C			1550	1950	75
FLIP 84 - 182 C			2825	2050	200
FLIP 84 - 185 C			2450	1100	150
ILC 482			2250	4200	200
ILC 482			3150	2950	250
ILC 482			2525	1850	100

ILC	482	2175	2950	200
ILC	1929	1000	1750	250
ILC	1929	850	2550	250
ILC	1929	1200	2100	200
ILC	1929	1225	M	200
Local Amdoun		1625	3480	150
Local Amdoun		1025	1850	250
Local Amdoun		1775	1850	250
Local Amdoun		925	1600	300

Tableau 13 C : Pépinière de sélection pour la résistance à
A. blight (CIABN-A)

Table 13 C : Seed yield of lines in the CIABN-A at three locations

Lignée/Line	Rendement/Yield		
	OM	K	RR
ILC 72	1750	125	5.0
ILC 182	1500	400	10.0
ILC 200	1600	150	10.0
ILC 202	2075	50	10.0
ILC 215	1750	125	5.0
ILC 482	2550	150	7.5
ILC 3279	1900	100	12.5
ILC 3856	2100	50	10.0
ILC 3868	2300	125	7.5
ILC 3870	1425	325	15.0
ILC 4424	1825	125	10.0
FLIP 81 - 70	1700	125	27.5
FLIP 81 - 293	1850	125	12.5
FLIP 82 - 1 C	1925	125	12.5
FLIP 82 - 52 C	2050	100	10.0
FLIP 82 - 64 C	2225	100	7.5
FLIP 82 - 74 C	1675	250	7.5
FLIP 82 - 93 C	2025	200	25.0
FLIP 82 - 104 C	2550	175	20.0
FLIP 82 - 127 C	2350	150	10.0
FLIP 82 - 128 C	1950	150	20.0
FLIP 82 - 130 C	1950	125	15.0
FLIP 82 - 144 C	2100	125	17.5
FLIP 82 - 150 C	2200	250	5.0
FLIP 82 - 191 C	2500	125	5.0
FLIP 82 - 243 C	1700	125	10.0
FLIP 82 - 258 C	1350	100	17.5
FLIP 82 - 259 C	2175	75	7.5
FLIP 83 - 7 C	1725	175	7.5
FLIP 83 - 12 C	1825	75	22.5
FLIP 83 - 13 C	2050	125	5.0
FLIP 83 - 15 C	2100	175	12.5
FLIP 83 - 21 C	1750	50	10.0
FLIP 83 - 22 C	2050	150	20.5
FLIP 83 - 28 C	2525	125	25.0
FLIP 83 - 31 C	1700	125	10.0
FLIP 83 - 46 C	2125	100	12.5
FLIP 83 - 47 C	2000	175	5.0
FLIP 83 - 48 C	1725	150	5.0
FLIP 83 - 60 C	2450	50	

Local	2150	225	27.5
Local	2375	175	27.5
Local	2475	300	17.5
Local	2450	150	52.5
Local	2775	225	77.5
Local	3150	225	70.0
Local	2575	200	20.0
Local	2475	200	15.0
Local	2675	175	10.0
Local	2625	250	15.0
Local	2450	300	20.0
Local	2150	250	15.0
Local	2500	125	12.5
Local	2250	100	15.0
Local	2400	125	12.5
Local	1675	175	12.5
Local	1900	250	10.0
Local	1300	50	10.0
Local	1300	350	15.0
Local	950	250	12.5
Local	675	250	5.0

Tableau 14 C : Lecture de l'ascochyta (AR) et du wilt dans le CIABN-A

Table 14 C : Ascochyta ratings (AR) and wilt incidence in the CIABN-A at Beja

Lignée/Line		Wilt incidence %	AR
ILC	72	100	3.25
ILC	182	100	3.00
ILC	200	100	2.50
ILC	202	90	3.00
ILC	215	100	4.50
ILC	482	100	5.75
ILC	3279	100	2.75
ILC	3856	100	2.75
ILC	3868	100	4.00
ILC	3870	100	2.00
ILC	4421	100	3.25
FLIP	81 - 70	100	5.25
FLIP	81 - 293	100	6.75
FLIP	82 - 1 C	100	2.75
FLIP	82 - 52 C	100	3.25
FLIP	82 - 64 C	100	6.00
FLIP	82 - 74 C	60	7.25
FLIP	82 - 93 C	100	5.75
FLIP	82 - 104 C	100	2.25
FLIP	82 - 127 C	100	5.75
FLIP	82 - 128 C	100	8.00
FLIP	82 - 130 C	100	2.75
FLIP	82 - 144 C	100	1.25
FLIP	82 - 150 C	100	1.50
FLIP	82 - 191 C	100	6.50
FLIP	82 - 243 C	100	4.00
FLIP	82 - 258 C	100	5.50
FLIP	82 - 259 C	100	5.00
FLIP	83 - 7 C	100	7.00
FLIP	83 - 12 C	100	3.25
FLIP	83 - 13 C	75	3.25
FLIP	83 - 15 C	100	5.25
FLIP	83 - 21 C	100	3.75
FLIP	83 - 22 C	100	2.50
FLIP	83 - 28 C	100	1.25
FLIP	83 - 31 C	100	5.25
FLIP	83 - 46 C	65	4.50
FLIP	83 - 47 C	100	2.50
FLIP	83 - 48 C	100	5.75
FLIP	83 - 60 C	13	2.25
Local		100	8.75

Tableau 15 C : Lecture de l'Ascochyta (AR) et du wilt% dans le CIABN-B

Table 15 C : Ascochyta Ratings (AR) and wilt Incidence % in the CIABN-B at Beja in 1985-86.

Lignée/Line	Wilt incidence%	AR ⁽¹⁾
ILC 72	100	3.5
ILC 182	100	4.0
ILC 200	100	2.25
ILC 202	100	4.25
ILC 215	100	7.5
ILC 482	100	7.0
ILC 3279	100	5.0
ILC 3856	100	3.0
ILC 3868	100	3.0
ILC 3870	100	2.75
ILC 4421	100	4.25
FLIP 81 - 70	100	5.0
FLIP 81 - 293	100	5.0
FLIP 82 - 1 C	100	4.75
FLIP 82 - 52 C	100	7.0
FLIP 82 - 64 C	100	9.0
FLIP 82 - 74 C	100	5.5
FLIP 82 - 93 C	80	3.5
FLIP 82 - 104 C	100	2.5
FLIP 82 - 127 C	100	6.5
FLIP 82 - 128 C	100	6.0
FLIP 82 - 130 C	100	3.75
FLIP 82 - 144 C	100	1.5
FLIP 82 - 150 C	100	5.5
FLIP 82 - 191 C	60	4.25
FLIP 82 - 243 C	100	7.0
FLIP 82 - 258 C	100	5.5
FLIP 82 - 259 C	100	6.0
FLIP 83 - 7 C	100	3.75
FLIP 83 - 12 C	100	5.0
FLIP 83 - 13 C	100	3.5
FLIP 83 - 15 C	100	4.0
FLIP 83 - 21 C	100	3.5
FLIP 83 - 22 C	100	6.75
FLIP 83 - 28 C	100	2.25
FLIP 83 - 31 C	100	7.5
FLIP 83 - 46 C	100	3.5
FLIP 83 - 47 C	100	3.0
FLIP 83 - 48 C	100	2.5
FLIP 83 - 60 C	100	3.75

ILC	3932	100	1.0
ILC	5035	100	5.5
ILC	5127	100	2.25
ILC	5566	100	3.75
ILC	6304	100	7.25
ILC	6306	100	5.5
ILC	6373	100	1.5
ILC	6945	100	3.0
Pch	70	100	3.25
Pch	124	100	2.5
ILC	263	100	3.5
Local		100	7.7

(1) Ascochyta rating-1 to 9 scale

Tableau 16 C : Pépinière de selection pour la résistance à la larve mineuse

Table 16 C : Seed yield of lines in the CILMN at four locations

Lignée/Line		Rendement/Yield			
		B	OM	BS	K
ILC 5		850	1375	1800	250
ILC 316		600	3200	1700	125
ILC 333		175	2950	1900	250
ILC 334		250	2525	1800	100
ILC 402		100	2675	1500	125
ILC 655		475	775	1800	M
ILC 663		225	2105	1500	200
ILC 666		150	3400	2400	300
ILC 668		300	2950	2000	100
ILC 726		63	3025	1600	200
ILC 730		100	1050	1500	200
ILC 745		475	3475	1900	50
ILC 824		125	1825	1600	100
ILC 936		2425	2550	2300	225
ILC 1000		600	2550	1200	M
ILC 1003		375	3625	1700	100
ILC 1008		400	2300	2300	M
ILC 1048		200	2400	1900	100
ILC 1169		75	1850	1500	200
ILC 1216		525	3125	1600	200
ILC 1776		150	2200	1200	250
ILC 2226		575	2800	1800	200
ILC 2436		875	2175	900	300
ILC 2961		888	3325	1900	150
ILC 3805		675	1575	900	125
ILC 3397		650	2975	1300	200
ILC 3397		825	2975	1900	200
ILC 3397		1575	2925	2000	350
ILC 3397		1025	2525	1800	250
ILC 3397		1550	2700	1400	250
ILC 3397		613	3200	2400	250
ILC 3397		1400	3325	2200	200
ILC 3397		1350	3300	2500	200
ILC 3397		1250	2350	1800	400
ILC 3397		650	2825	2400	250
ILC 3397		550	2850	2400	200
ILC 3397		1175	1850	1900	150
ILC 3397		600	1575	2600	150
ILC 3397		825	1475	1900	150

Tableau 17 C : Essai avancé de rendement de pois chiche de printemps
No. 1

Table 17 C : Seed yield of lines in the AYT-Sp1 at five locations

Lignée/Line	Rendement/Yield				
	B	OM	K	RR	BS
PL-Se-Bej. 81 - 6	1394	1375	171	144	800
PL-Se-Bej. 81 - 11	1675	1578	168	256	1000
PL-Se-Bej. 81 - 34	1619	2125	183	244	1018
PL-Se-Bej. 81 - 36	1350	1578	175	262	906
PL-Se-Bej. 81 - 37	1450	1453	206	169	981
PL-Se-Bej. 81 - 40	1462	1562	218	194	862
PL-Se-Bej. 81 - 41	1266	1468	154	225	833
PL-Se-Bej. 81 - 46	1494	1312	200	231	1062
PL-Se-Bej. 81 - 48	1500	1921	231	219	987
PL-Se-Bej. 81 - 87	1013	1984	96	275	962
PL-Se-Bej. 81 - 103	1325	1531	118	137	968
PL-Se-Bej. 81 - 107	1458	1515	216	217	1083
PL-Se-Bej. 81 - 119	1738	1781	203	283	856
PL-Se-Bej. 81 - 120	1675	1593	175	256	931
PL-Se-Bej. 81 - 122	1306	1421	70	244	893
PL-Se-Bej. 81 - 111	1606	1781	140	206	1112
FLIP 81 00 4	687	1734	166	317	993
ILC 3279	675	1406	43	319	M
ILC 136	1275	1421	78	262	812
ILC 165	1316	1796	162	262	925
ILC 451	1608	1796	184	312	931
ILC 2587	1094	1203	134	331	862
ILC 482	612	1750	81	337	887
Local P	1075	1337	137	350	900
Local N.P	1325	1387	91	175	843
SE ±	266.1	362.5	NA	100.0	130.3
CV %	20.1	22.2	NA	40.2	13.9

Tableau 18 C : Essai avancé de rendement de pois chiche de printemps
No. 2

Table 18 C : Seed yield of lines in the AYT-Sp.2 at four locations

Lignée/Line		Rendement/Yield			
		B	OM	K	RR
ILC	76	1093	625	121	200
ILC	83	1056	1290	134	325
ILC	116	1131	1019	216	318
ILC	132	1006	906	262	343
ILC	134	850	412	200	312
ILC	135	968	550	158	293
FLIP	82 - 85	1012	884	95	456
FLIP	81 - 131	987	1118	280	331
FLIP	81 - 149	956	1287	200	293
FLIP	81 - 156	681	871	125	318
FLIP	81 - 180	918	890	150	250
FLIP	81 - 181	1025	781	133	437
FLIP	81 - 187	937	1425	200	268
FLIP	81 - 391	943	1402	200	212
28 II Fretissa		1081	884	M	412
ILC	484	768	1250	237	318
F 81 - 004		450	1659	81	200
ILC	3279	537	731	M	287
ILC	136	1081	759	175	306
ILC	165	1306	1081	175	301
ILC	451	1081	1265	175	318
ILC	2587	900	903	104	375
ILC	482	568	1256	150	737
Local P		1000	987	125	350
Local N.P		1062	1218	125	300
SE ±		206.2	467.0	NA	135.0
CV %		21.9	45.8	NA	41.0

Tableau 19 C : Essai avancé de rendement de pois chiche de
printemps No. 3

Table 19 C : Seed yield of lines in the AYT-Sp3 at four locations

Lignée/Line		Rendement/Yield			
		B	OM	K	RR
ILC	263	1438	1918	150	125
ILC	254	1288	1503	96	468
ILC	3396	1225	1418	153	300
ILC	3749	781	1578	100	675
ILC	35	763	1359	75	437
ILC	496	1244	1287	179	600
FLIP	81 - 158	1338	1432	137	312
FTA -	82 - 5	1250	1903	120	431
FTA -	82 - 9	1369	1671	137	668
FTA -	82 - 13	981	1403	112	556
FTA -	82 - 21	1250	1728	181	581
FTA -	82 - 23	1394	1881	145	468
FTA -	82 - 29	1563	1862	200	637
Local		1356	1665	231	856
28 II Fretissa		963	1418	112	368
ILC	484	1300	1668	203	950
F 81	004	656	1471	162	593
ILC	3279	566	1259	100	531
ILC	136	800	1303	137	643
ILC	165	1000	1400	175	637
ILC	451	1256	1385	206	687
ILC	2587	888	1465	175	512
ILC	482	756	1421	112	657
Local P		819	1231	M	518
Local N.P		1075	1659	225	400
SE ±		395.0	405.0	NA	230.0
CV %		36.1	26.4	NA	42.4

Tableau 20 C : Essai avancé de rendement de pois chiche de
printemps No.4
Table 20 C : Seed yield of lines in the AYT-Sp4 at one location

Lignée/Line	Rendement/Yield	
	B	
FTA - 85 - 1		1700
FTA - 85 - 2		1850
FTA - 85 - 10		1525
FTA - 85 - 11		1625
FTA - 85 - 15		1575
FTA - 85 - 17		1750
FTA - 85 - 18		1675
FTA - 85 - 22		1875
FTA - 85 - 23		1675
PL - Se - Bej. 81 - 10		1775
PL - Se - Bej. 81 - 22		1800
PL - Se - Bej. 81 - 25		1750
PL - Se - Bej. 81 - 26		1600
PL - Se - Bej. 81 - 75		1925
PL - Se - Bej. 81 - 92		1775
PL - Se - Bej. 81 - 95		2025
ILC 482		1525
ILC 3279		1475
ILC 263		1750
ILC 136		1375
ILC 165		1725
ILC 451		1850
ILC 2587		1850
Local P		1475
Local N.P		1450
SE ±		NA
CV %		NA

Tableau 21 C : Essai avancé de rendement de pois chiche de printemps
gros calibre (CIYT-L.)

Table 21 C : Seed yield of lines in the IYT-L at four locations

Lignée/Line		Rendement/Yield			
		B	OM	K	RR
ILC	35	875	1312	87	120
ILC	76	550	966	81	197
ILC	83	1119	1541	62	212
ILC	116	1269	925	87	167
ILC	132	819	1345	M	232
ILC	134	1163	562	91	227
ILC	135	1338	853	93	245
ILC	136	1013	1120	100	181
ILC	165	875	167	137	135
ILC	171	888	1200	93	137
ILC	254	1025	887	93	230
ILC	263	1200	1407	118	165
ILC	451	1219	1062	75	200
ILC	464	913	1307	56	145
ILC	496	942	1187	173	297
ILC	613	919	1328	75	280
ILC	620	1050	1112	118	262
ILC	629	1056	1866	50	267
ILC	2587	1413	945	100	197
ILC	3749	381	1141	37	182
FLIP - 81 -	180 C	1250	1537	106	247
ILC	482	450	1895	75	172
ILC	1929	944	1482	137	157
Local		788	1175	100	132
Local		856	703	M	250
Local		650	1262	M	107
SE ±		311.2	358.7	NA	97.5
CV %		32.8	29.3	NA	49.4

Tableau 22 C : Essai avancé de rendement de pois chiche hiver/
printemps No. 1

Table 22 C : Seed yield of lines in AYT-Sp/W1 at two locations

Lignée/Line	Rendement/Yield	
	B	OM
FLIP 81 - 068	975	1171
FLIP 81 - 71	1081	2031
FLIP 81 - 75	941	1596
FLIP 82 - 25 C	812	1256
FLIP 82 - 26 C	850	1334
FLIP 82 - 73 C	862	1703
FLIP 82 - 87 C	1041	2090
FLIP 82 - 91 C	900	2103
FLIP 82 - 96 C	825	1981
FLIP 82 - 101 C	843	1800
FLIP 82 - 127 C	1287	1862
FLIP 82 - 161 C	1100	1734
FLIP 82 - 228 C	950	1950
FLIP 82 - 254 C	758	2890
FLIP 82 - 12 C	575	1696
FLIP 82 - 48 C	950	1945
82 TH 77	656	1865
FLIP 82 - 180	508	2075
FLIP 82 - 121	750	1690
FLIP 82 - 312	566	1956
FLIP 82 - 45	1075	1934
ILC 482	975	1981
ILC 3279	415	1553
Local	956	1856
Local	843	1903
SE ±	212.4	365
CV %	25.2	20.5

Tableau 23 C : Essai avancé de rendement de pois chiche hiver/
printemps No. 2

Table 23 C : Seed yield of lines in the AYT-Sp/W2 at two locations

Lignée/Line	Rendement/Yield	
	B	OM
FLIP 82 - 1 C	1037	1718
FLIP 82 - 71 C	712	1831
FLIP 82 - 64 C	737	1006
FLIP 82 - 117 C	625	1393
FLIP 82 - 169 C	650	1818
FLIP 82 - 208 C	675	1950
FLIP 82 - 40 C	925	1625
FLIP 81 - 269 C	862	1612
83 TH 114	662	1481
83 TH 136	862	1612
ILC 482	725	1962
ILC 482	562	1918
ILC 3279	350	1350
ILC 3279	575	1768
Local	825	1593
SE ±	182.4	426.2
CV %	25.3	26.5

Tableau 24 C: Incidence du wilt sur pois chiche (pépinières ICRISAT-ICPRWN) WSP-Béja

Table 24 C: Wilt incidence on chickpea lines in the ICRISAT-Nursery (ICRRWN) at the WSP of Béja

Lignée/Line		No. total de plantes Total number of plants	Stand	Wilt inciden- ce % Incidence du wilt %
ICC	184	57	5	0
	594	45	5	0
	871	51	5	2
	1314	43	5	0
	1405	55	5	4
	1435	53	5	2
	1437	45	5	0
	1441	41	5	2
	1870	44	4	2
	2243	50	5	2
	2246	44	5	0
	2484	45	5	0
	2595	53	5	0
	2831	40	4	0
	3075	46	5	0
	3208	49	5	0
	3274	37	5	0
	3328	55	5	2
	3538	47	5	0
	4928	18	5	44
	4934	46	5	0
	4973	39	4	100
	5003	39	5	0
	9035	44	5	0
	11320	55	5	0
	11322	35	5	0
	11323	41	5	0
	11324	33	5	3
	12252	43	5	0
ICCL	82001	39	5	0
	82104	41	5	6
	83009	38	5	9
	83136	26	2	0
	83142	35	4	3
	85101	23	2	3
	85102	45	5	0
	85103	28	3	0
	85104	46	4	0
	85105	47	5	0
	85106	45	5	0
	85107	35	3	0
	85108	38	4	0

ICCL 85109	34	5	0
85111	36	5	0
85112	50	5	0
85113	41	5	0
85114	44	5	0
85115	16	2	5
85116	61	5	0
85117	45	5	0
ICC 4951	45	4,76	2,84
Local	29	-	99,57

5. LENTIL IMPROVEMENT (H. Halila)

5.1. Introduction

In 1972 lentil area in Tunisia was around 7000 hectares(ha) but has now declined to 914 ha and this represents less than 1% of the total legume area in 1985. This decline in lentil growing is due to the lack of high yielding cultivars and equally, if not more importantly, to harvest problems involving high labour costs and grain shattering. To make the crop more attractive to farmers the objectives must be to select heavier and stable yielding lines combined with better harvest characteristics or increased height and reduced shattering. As will be seen heavier yielding lines have been identified but taller material is still difficult to obtain although few semi-tall lines were observed in the ICARDA material. Yield results, however, seem to indicate a negative correlation between height and good yielding character.

Intensive work on local cultivars this season and previous years showed that none of the local cultivars tested outyielded significantly the one from Oueslatia and until further data are obtained the Oueslatia cultivar will continue to be used as the check in all trials.

Apart from an attack of Scelerotinia spp. on trials at Beja and a light attack of rust (Uromyces spp.) on the trials at Kef, observed in 1983 no serious pests or diseases

have been observed on the crop. This is thought to be probably due to the fact that lentil cultivation is still very limited. This crop report provides a summary of the complete results from all trials and nurseries contained in tables 1 to 15 prefixed by the letter L. As indicated earlier the program has decided to release two lentil varieties. The yield performance of these varieties compared to the local Oueslatia over the last three years is given in table 12.

5.2. Yield trials and Nurseries

Seed yield results are available from testing 200 advanced breeding lines, 20 F4/F5 populations, and 22 F3 populations in 13 replicated yield trials at two or three locations, and 252 preliminary breeding lines in four non-replicated screening nurseries at two or four locations, a summary of the yield data is given in table 13. .

Although a number of advanced lines, F4/F5 populations, and F3 populations outyielded the local check at the locations, only one line in the small seeded international yield trial, two lines in the advanced yield trial 2, and one in the preliminary yield trial 2 did so significantly at Beja and/or O. Meliz stations (Table 14). Unfortunately none of these lines showed good mechanical harvest characteristics in that none were particularly erect and all

Tableau 12 : Rendements moyens en kg/ha des variétés de lentille proposées à l'inscription.

Table 12 : Seed yield of two lentil lines and of the local Oueslatia over the last three years at Beja, Kef and Oued Meliz.

Line/Lignee	1983/84		1984/85			1985/86		Moyenne/Mean	
	B	K	B	K	OM	B	OM	Sy ⁽¹⁾	/ Local
ILL 4606 ⁽²⁾	1937	858	2183	1958	1475	2038	1846	1756	108
ILL 4400 ⁽³⁾	2000	1167	2300	1225	1500	1717	1844	1679	104
Local Oueslatia	1350	929	1918	1815	1591	1744	1991	1619	100

(1) Sy: Seed yield/Rendement - kg/ha

(2) ILL 4606 = Nablus

(3) ILL 4400 = Syrian local large

Table 13 : Summary of seed yield results of lentil lines and populations tested in replicated trials (YT) and screening nurseries (SN) in 1985/86 at Beja (B), Kef (K), Oued Meliz (OM) and Mateur(M).

Trial designation (1)			Number of lines/populations								Coefficients of variation			
			Tested	Exceeding the local check at				Significantly exceeding the local check at (2)						
				B	K	OM	M	B	K	OM	M	B	K	OM
International	YT-L	23	7	14	3	-	0	9	0	-	9.0	23.9	36.5	-
	YT-S	23	5	17	3	-	0	11	1	-	14.2	22.2	20.8	-
	YT-F ₃	23	3	5	-	-	0	NS	-	-	18.0	33.0	-	-
Advanced	YT-L ₁	22	6	6	1	-	NS	3	0	-	16.2	23.1	22.9	-
	YT-L ₂	22	7	11	3	-	0	8	0	-	16.4	18.8	28.3	-
	YT-L ₃	22	7	13	1	-	2	8	0	-	20.8	16.6	20.0	-
	YT-L/F ₄ -F ₅	22	11	9	6	-	0	6	NS	-	21.1	22.7	37.5	-
Preliminary	YT-L ₁	22	17	10	-	-	0	NS	-	-	17.1	23.5	-	-
	YT-L ₂	22	11	4	-	-	1	3	-	-	16.4	21.9	-	-
	YT-L ₃	22	5	2	-	-	0	1	-	-	17.9	26.3	-	-
	YT-L ₄	22	7	15	-	-	0	10	-	-	18.2	24.3	-	-
International	SN-L	51	7	12	1	-	-	-	-	-	-	-	-	-
	SN-TE	64	5	17	6	10	-	-	-	-	-	-	-	-
	SN-S	65	7	16	4	8	-	-	-	-	-	-	-	-
	SN-E	72	4	8	3	-	-	-	-	-	-	-	-	-

(1) L = Large, S = Small, E = Early, T = Tall. (2) NS = 'F' test of treatments not significant ($P > 0.05$)
Screening nurseries(SN) not analysed statistically

Tableau 14 : Rendements moyens des lignées de lentille dépassant significativement le local Oueslatia.

Table 14 : Seed yield of superior yielding lentil lines in two trials at Beja, O. Meliz and Kef in 1985/86

Trial	Line	B	OM	K	Mean
IYT-S	ILL 5728 - FLIP 84-58L	1794	<u>2268</u> ⁽¹⁾	433	1498
	Local Oueslatia	2316	<u>2168</u>	445	1643
	SE ±	288.4	361.2	107.5	
	CV %	14.2	20.8	22.2	
AYT-3	FLIP 84- 56 L	<u>2237</u>	2068	<u>665</u>	1656
	FLIP 84-114 L	<u>2156</u>	2240	<u>669</u>	1688
	Local Oueslatia	<u>1634</u>	2406	<u>597</u>	1545
	SE ±	360.9	403.7	102.5	
PYT-2	ILL 5716 - FLIP 84-45L	<u>2250</u>	-	512	1381
	Local Oueslatia	<u>1673</u>	-	618	1145
	SE ±	277.3		121.2	
	CV %	16.4		21.9	

(1) Underlined values significantly ($P \leq 0.05$) outyielded the check.

tended to lodge to a certain degree. It was disappointing that of the above lines only two advanced lines from the AYT 2 significantly outyielded the check last season, and that none of the lines in the AYT 1 and 2 showed a significant yield increase over the check although many of them has done so in the previous season. This may partly reflects the genotype x environment interaction factors.

Although Kef station was not considered in the discussion, due to the severe drought observed in the area, results from Kef site show that while other crops such as Faba bean and Chickpea have completely failed, lentil gave a relatively good performance. This shows that lentils, which are grown mostly in wet areas, could possibly be extended to much dryer zones. The research program of next year will take into consideration this aspect and special trials will be developed for Kef based on this year results.

Tableau 1 L : Essai avancé de rendement de lentille No. 1

Table 1 L : Seed yield of lines in the AYT - L1 at three locations

Lignée/Line	Selection	Rendement/Yield		
		B	OM	K
ILL 8	78 S 26002	1869	1518	781
ILL 26	78 S 26032	1638	1584	587
ILL 346	-	1481	1139	606
ILL 707		1584	1568	425
ILL 842	Lebanon	1663	1543	650
ILL 857	Algeria	1733	1446	612
ILL 975	Chile	1544	1328	668
ILL 1939	Morocco	1788	1350	656
ILL 4606	Nablus	2038	1846	881
ILL 5562	76 TA 66005	2100	1662	643
ILL 5584	78 S 26004	1808	1212	716
ILL 5585	78 S 26009	1694	1246	866
ILL 5588	78 S 26013	1775	1318	525
ILL 5590	78 S 26018	1791	806	575
ILL 5700	FLIP 84 - 29 L	1783	1284	662
ILL 5732	FLIP 84 - 62 L	1483	1615	456
ILL 5746	FLIP 84 - 76 L	1916	1340	556
ILL 5753	FLIP 84 - 83 L	1581	1212	556
FLIP 84 - 1 L		1325	1378	562
76 TA 143		1691	1643	718
ILL 28		1666	1559	612
ILL 4400		1916	1521	743
Local Oueslatia		1844	1787	640
Local Oueslatia		1833	1306	762
Local Oueslatia		1658	2178	718
SE ±		281.3	336.2	70.1
CV %		16.2	22.9	23.1

Tableau 2 L : Essai avancé de rendement de lentille No. 2

Table 2 L : Seed yield of lines in the AYT - L2 at three locations

Lignée/Line	Rendement/Yield		
	B	OM	K
75 TA 23	2218	490	600
76 TA 2	1743	1965	<u>718</u>
76 TA 9	2137	1618	506
76 TA 10	1987	1221	519
76 TA 38	2008	1937	625
76 TA 169	2218	1690	612
76 TA 169	1512	1725	581
76 TA 182	1868	2081	607
FLIP 84 - 44 L	782	2012	<u>700</u>
FLIP 84 - 48 L	1950	1915	<u>658</u>
FLIP 84 - 51 L	1912	2062	<u>725</u>
FLIP 84 - 58 L	1693	2415	<u>681</u>
FLIP 84 - 68 L	2318	1950	<u>650</u>
FLIP 84 - 78 L	2081	2134	475
FLIP 84 - 84 L	2343	2290	<u>700</u>
FLIP 84 - 89 L	1831	1546	<u>669</u>
FLIP 84 - 100 L	2187	2175	<u>550</u>
FLIP 84 - 103 L	2068	2268	<u>775</u>
FLIP 84 - 125 L	887	1462	<u>475</u>
FLIP 84 - 129 L	2108	1881	575
ILL 28	2168	1959	550
ILL 4400	1950	1962	469
Local Oueslatia	2093	1878	600
Local Oueslatia	2131	2234	641
Local Oueslatia	2091	2390	569
SE ±	316.7	543.7	112.5
CV %	16.4	28.3	18.8

Tableau 3 L : Essai avancé de rendement de lentille No. 3

Table 3 L : Seed yield of lines in the AYT - L3 at three locations

Lignée/Line	Rendement/Yield		
	B	OM	K
ILL 358	1368	1812	475
ILL 1866	1291	1653	619
ILL 2149	1627	1625	562
ILL 2532	1862	1684	575
ILL 4062	2016	2396	506
FLIP 84 - 43 L	1712	2050	712
FLIP 84 - 50 L	1662	2015	656
FLIP 84 - 56 L	2237	2068	665
FLIP 84 - 75 L	1400	1950	832
FLIP 84 - 92 L	1856	2150	755
FLIP 84 - 108 L	1791	1918	657
FLIP 84 - 112 L	2037	2125	594
FLIP 84 - 114 L	2156	2240	669
FLIP 84 - 116 L	1768	2184	712
FLIP 84 - 117 L	1862	1400	675
FLIP 84 - 121 L	1787	1621	531
FLIP 84 - 123 L	1400	1871	862
FLIP 84 - 128 L	2012	2143	618
FLIP 84 - 131 L	1833	1643	400
FLIP 84 - 135 L	1400	2093	637
ILL 28	1806	2668	469
ILL 4400	1493	1978	519
Local Oueslatia	1725	2640	615
Local Oueslatia	1637	2534	600
Local Oueslatia	1541	2046	575
SE ±	360.9	403.7	102.5
CV %	20.8	20.0	16.6

Tableau 4 L : Essai avancé de rendement de lentille No. 4

Table 4 L : Seed yield of lines in the AYT - L4 at three locations

Lignée/Line	Rendement/Yield		
	B	OM	K
82 S 33	1331	415	381
82 S 40	1450	1581	506
82 S 49	1283	2053	481
82 S 55	1575	1762	612
82 S 89	1218	1881	600
82 S 168	387	728	407
82 S 61	1287	1678	475
82 S 177	1158	1568	431
82 S 186	1450	1890	675
82 S 243	1606	1562	519
82 S 220	1025	1437	594
82 S 57	1518	1540	562
82 S 349	1068	1371	383
82 S 245	1108	1246	419
82 S 230	1558	1371	675
83 S 2	1643	1403	575
83 S 163	1031	1384	531
83 S 311	1618	1690	531
83 S 321	1306	1571	419
83 S 15	1637	1512	612
ILL 28	1587	1459	512
ILL 4400	1512	1915	562
Local Oueslatia	1437	1696	550
Local Oueslatia	1318	1831	506
Local Oueslatia	1225	1496	531
SE ±	281.9	561.0	115.0
CV %	21.1	37.5	22.7

Tableau 5 L : Essai préliminaire de rendement de lentille No. 1

Table 5 L : Seed yield of lines in the PYT - L1 at two locations

Lignée/Line	Selection	Rendement/Yield	
		B	K
ILL 5667	80 Ter 52428	1341	375
ILL 5671	81 S 3832 C	1156	575
ILL 5751	FLIP 84 - 81 L	1550	450
ILL 5752	FLIP 84 - 82 L	1687	500
ILL 5754	FLIP 84 - 84 L	836	631
ILL 5755	FLIP 84 - 85 L	1250	287
ILL 5756	FLIP 84 - 86 L	1584	525
ILL 5760	FLIP 84 - 90 L	1556	487
ILL 5763	FLIP 84 - 93 L	1443	419
ILL 5766	FLIP 84 - 96 L	1608	494
ILL 5769	FLIP 84 - 99 L	1537	475
ILL 5770	FLIP 84 - 100 L	1758	537
ILL 5772	FLIP 84 - 102 L	1668	508
ILL 5773	FLIP 84 - 103 L	1756	583
ILL 5776	FLIP 84 - 106 L	1900	600
ILL 5814	FLIP 84 - 144 L	1568	544
ILL 5816	FLIP 84 - 147 L	1556	525
ILL 5821	FLIP 84 - 152 L	1612	475
ILL 5839	FLIP 85 - 1 L	1600	516
ILL 5840	FLIP 85 - 2 L	1641	400
ILL 28	74 TA 19	1737	562
ILL 4400		1600	506
Local Oueslatia		1441	550
Local Oueslatia		1587	446
Local Oueslatia		1375	512
SE ±		262.3	115.0
CV %		17.1	23.5

Tableau 6 L : Essai préliminaire de rendement de lentille No. 2

Table 6 L : Seed yield of lines in the PYT - L2 at two locations

Lignée/Line		Selection	Rendement/Yield	
			B	K
ILL	5841	FLIP 85 - 3 L	1400	475
ILL	5699	FLIP 84 - 27 L	1500	690
ILL	5713	FLIP 84 - 42 L	1725	431
ILL	5714	FLIP 84 - 43 L	1316	690
ILL	5716	FLIP 84 - 45 L	2250	512
ILL	5720	FLIP 84 - 49 L	1537	569
ILL	5722	FLIP 84 - 51 L	1881	675
ILL	5724	FLIP 84 - 54 L	1900	575
ILL	5729	FLIP 84 - 59 L	1681	444
ILL	5759	FLIP 84 - 89 L	1700	506
ILL	5774	FLIP 84 - 104 L	1587	482
ILL	5828	FLIP 84 - 159 L	1593	557
ILL	5832	FLIP 84 - 163 L	1781	602
ILL	5833	FLIP 84 - 164 L	1818	665
ILL	5854	FLIP 85 - 16 L	1781	550
ILL	5859	FLIP 85 - 21 L	1383	525
ILL	5860	FLIP 85 - 22 L	1525	525
ILL	5863	FLIP 85 - 25 L	1643	587
ILL	5866	FLIP 85 - 28 L	1783	525
ILL	5871	FLIP 85 - 33 L	1631	425
ILL	28	74 TA 19	1973	575
ILL	4400		1958	475
Local Queslatia			1513	556
Local Queslatia			1881	637
Local Queslatia			1625	662
SE ±			277.3	120.0
CV %			16.4	21.9

Tableau 7 L : Essai préliminaire de rendement de lentille No. 3

Table 7 L : Seed yield of lines in the PYT - L3 at two locations

Lignée/Line	Selection	Rendement/Yield	
		B	K
ILL 358	-	1166	544
ILL 2149	-	1588	531
ILL 2590	LWS 3	1129	475
ILL 3516	L 9 41	1563	437
ILL 5700	FLIP 84 - 29 L	1442	558
ILL 5726	FLIP 84 - 56 L	1600	512
ILL 5728	FLIP 84 - 58 L	1741	637
ILL 5748	FLIP 84 - 78 L	1600	640
ILL 5778	FLIP 84 - 108 L	1525	437
ILL 5779	FLIP 84 - 109 L	1100	219
ILL 5723	FLIP 84 - 113 L	1438	369
ILL 5784	FLIP 84 - 114 L	1316	469
ILL 5788	FLIP 84 - 118 L	1231	494
ILL 5791	FLIP 84 - 121 L	1475	425
ILL 5803	FLIP 84 - 133 L	1544	300
ILL 5806	FLIP 84 - 136 L	1858	537
ILL 5880	FLIP 85 - 42 L	1881	582
ILL 5874	FLIP 85 - 36 L	1706	219
ILL 5881	FLIP 85 - 43 L	1508	475
ILL 5882	FLIP 85 - 44 L	1550	525
ILL 28	74 TA 19	1638	369
ILL 4400		1488	412
Local Oueslatia		1750	507
Local Oueslatia		1588	425
Local Oueslatia		1444	737
SE ±		270.9	100.0
CV %		17.9	26.3

Tableau 8 L : Essai préliminaire de rendement de lentille No. 4

Table 8 L : Seed yield of lines in the PYT - L4 at two locations

Lignée/Line	Selection	Rendement/Yield	
		B	K
ILL 1939	-	1883	381
ILL 4711	Chilean	836	194
ILL 5582	78 S 26002	1587	358
ILL 5604	78 S 26052	1731	325
ILL 5669	81 S 31368	1375	342
ILL 5698	FLIP 84 - 26 L	1487	358
ILL 5714	FLIP 84 - 43 L	2016	494
ILL 5718	FLIP 84 - 47 L	1737	391
ILL 5737	FLIP 84 - 67 L	1762	525
ILL 5745	FLIP 84 - 75 L	1643	450
ILL 5753	FLIP 84 - 83 L	1483	456
ILL 5786	FLIP 84 - 116 L	1681	425
ILL 5799	FLIP 84 - 129 L	1612	415
ILL 5800	FLIP 84 - 130 L	1356	469
ILL 5805	FLIP 84 - 135 L	1775	469
ILL 5875	FLIP 85 - 37 L	1406	262
ILL 5876	FLIP 85 - 38 L	1550	383
ILL 5877	FLIP 85 - 39 L	1691	444
ILL 5878	FLIP 85 - 40 L	1331	250
ILL 5879	FLIP 85 - 41 L	1512	290
ILL 28	74 TA 19	1518	287
ILL 4400		1543	267
Local Oueslatia		1812	362
Local Oueslatia		1475	300
Local Oueslatia		1725	17
SE ±		288.4	90.0
CV %		18.2	24.3

Tableau 9 L : Essai de rendement de lentille - gros calibre (LIYT-L)

Table 9 L : Seed yield of lines in the IYT-L at three locations

Lignée/Line	Selection	Rendement/Yield		
		B	OM	K
ILL 20	-	2208	2105	325
ILL 707	-	2191	1872	492
ILL 842	-	2200	1977	325
ILL 857	-	2083	1561	637
ILL 4400	Local large	2225	2000	400
ILL 4605	Precoz	1400	900	525
ILL 4606	Nablus	2316	1738	542
ILL 5527	74 TA 276	1991	1463	650
ILL 5582	78 S 26002	2375	2300	582
ILL 5590	78 S 26018	2308	650	550
ILL 5668	81 S 30935	2525	1977	575
ILL 5672	81 S 38342	2225	2055	282
ILL 5743	FLIP 84 - 73 L	2016	1950	392
ILL 5745	FLIP 84 - 75 L	2116	2227	642
ILL 5746	FLIP 84 - 76 L	2183	1633	482
ILL 5747	FLIP 84 - 77 L	1925	1888	650
ILL 5748	FLIP 84 - 78 L	2266	1655	437
ILL 5750	FLIP 84 - 80 L	2187	1255	712
ILL 5722	FLIP 84 - 82 L	2158	1527	550
ILL 5753	FLIP 84 - 83 L	2166	1588	632
ILL 5769	FLIP 84 - 99 L	2200	2238	475
ILL 5770	FLIP 84 - 100 L	2300	1905	407
ILL 5772	FLIP 84 - 102 L	2266	2122	482
Local Oueslatia		2325	2044	417
Local Oueslatia		2341	2350	437
Local Oueslatia		1983	M	587
SE ±		197.3	478.7	122.5
CV %		9.0	36.5	23.9

Tableau 10 L : Essai de rendement de lentille - petit calibre (LIYT-S)

Table 10 L : Seed yield of lines in the IYT - S at three locations

Lignée/Line	Selection	Rendement/Yield		
		B	OM	K
ILL 975	-	1794	1746	519
ILL 1868	-	1531	1706	419
ILL 1939	-	2575	2246	487
ILL 2194	-	2200	1759	537
ILL 4401	Local small	1394	1250	456
ILL 5562	76 TA 66005	2313	1803	641
ILL 5584	78 S 26004	2316	2003	537
ILL 5676	FLIP 84 - 3 L	1663	1325	487
ILL 5677	FLIP 84 - 4 L	1375	1209	381
ILL 5684	FLIP 84 - 11 L	1856	1512	500
ILL 5687	FLIP 84 - 14 L	1563	1378	445
ILL 5690	FLIP 84 - 17 L	1519	1556	406
ILL 5698	FLIP 84 - 26 L	2050	1759	575
ILL 5699	FLIP 84 - 27 L	2413	2065	569
ILL 5700	FLIP 84 - 29 L	2400	1628	487
ILL 5715	FLIP 84 - 44 L	2366	2062	483
ILL 5720	FLIP 84 - 49 L	2200	1700	469
ILL 5728	FLIP 84 - 58 L	1794	2268	433
ILL 5729	FLIP 84 - 59 L	2469	2125	562
ILL 5730	FLIP 84 - 60 L	2038	2028	500
ILL 5731	FLIP 84 - 61 L	1863	1243	544
ILL 5732	FLIP 84 - 62 L	2191	1831	458
ILL 5737	FLIP 84 - 67 L	1769	1140	315
Local Oueslatia		2369	1834	400
Local Oueslatia		2481	2553	537
Local Oueslatia		2106	1815	400
SE ±		288.4	361.2	107.5
CV %		14.2	20.8	22.2

Tableau 11 L : Essai de rendement de population F3 de lentille

Table 11 L : Seed yield of F3 population in the IF3 T at two locations

Populations	Rendement/Yield	
	B	K
X 84 S 6	1750	362
X 84 S 9	1062	275
X 84 S 33	1925	387
X 84 S 40	1363	425
X 84 S 44	1512	375
X 84 S 45	1462	262
X 84 S 46	1862	262
X 84 S 47	2075	537
X 84 S 48	1512	462
X 84 S 76	1525	425
X 84 S 88	1662	400
X 84 S 90	1900	550
X 84 S 101	1562	527
X 84 S 126	1725	350
X 84 S 165	1162	437
X 84 S 178	1500	500
X 84 S 182	1150	650
X 84 S 232	787	412
X 84 S 260	1062	475
X 84 S 324	1050	300
X 84 S 327	737	300
X 84 S 352	1712	450
Syrian local	1812	325
Local Oueslatia	1587	550
Local Oueslatia	2050	500
Local Oueslatia	1925	437
SE ±	273.0	140.0
CV %	18.0	33.0

Tableau 12 L : Pépinière de sélection de lentille à petit calibre
(LISN-S)

Table 12 L : Seed yield of lines in the LISN-S at four locations

Lignée/Line	Selection	Rendement/Yield			
		B	OM	K	M
ILL 241		1250	1700	500	1750
ILL 5479	Trebisovska	850	550	150	1350
ILL 5480	Lenka	1200	1300	250	1000
ILL 5714	FLIP 84 - 43L	1550	2300	750	3450
ILL 5717	FLIP 84 - 46L	1250	1500	650	950
ILL 5725	FLIP 84 - 55L	1900	300	600	1350
ILL 5758	FLIP 84 - 88L	1850	1600	550	2600
ILL 5775	FLIP 84 - 105L	1900	1450	650	950
ILL 5827	FLIP 84 - 158L	2300	2000	500	850
ILL 5828	FLIP 84 - 159L	1000	1700	600	2575
ILL 5829	FLIP 84 - 160L	850	2300	400	1300
ILL 5830	FLIP 84 - 161L	950	1950	450	1950
ILL 5832	FLIP 84 - 163L	1800	2200	650	1600
ILL 5833	FLIP 84 - 164L	1550	2300	550	3150
ILL 5834	FLIP 84 - 165L	1800	1700	400	650
ILL 5835	FLIP 84 - 166L	1400	1700	650	1800
ILL 5836	FLIP 84 - 167L	2150	2100	500	2200
ILL 5837	FLIP 84 - 168L	1050	2050	800	1300
ILL 5838	FLIP 84 - 169L	600	1400	450	1600
ILL 5847	FLIP 84 - 9L	250	1000	500	1000
ILL 5849	FLIP 84 - 11L	260	1850	500	1550
ILL 5850	FLIP 84 - 12L	1200	1200	600	2000
ILL 5851	FLIP 84 - 13L	750	1650	M	1200
ILL 5852	FLIP 84 - 14L	400	1350	250	500
ILL 5853	FLIP 84 - 15L	1250	1650	500	650
ILL 5854	FLIP 84 - 16L	1350	2700	450	1600
ILL 5855	FLIP 84 - 17L	2700	1750	700	1425
ILL 5856	FLIP 84 - 18L	750	1300	400	1650
ILL 5857	FLIP 84 - 19L	1150	1550	400	1150
ILL 5858	FLIP 84 - 20L	2050	1400	M	1550
ILL 5859	FLIP 84 - 21L	1500	1350	300	1675
ILL 5860	FLIP 84 - 22L	900	2300	400	2550
ILL 5861	FLIP 85 - 23L	M	1100	500	1000
ILL 5862	FLIP 85 - 24L	2400	1850	550	1250
ILL 5863	FLIP 85 - 25L	900	1950	650	900
ILL 5864	FLIP 85 - 26L	900	1050	550	1325
ILL 5865	FLIP 85 - 27L	2000	2300	700	1500
ILL 5866	FLIP 85 - 28L	1600	1500	750	2000
ILL 5867	FLIP 85 - 29L	1400	1800	450	1100
ILL 5869	FLIP 85 - 31L	1450	1700	M	1650

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ILL 5870	FLIP 85 -	32L	650	1500	350	1250
ILL 5871	FLIP 85 -	33L	1450	1750	500	2800
ILL 6012	FLIP 86 -	26L	1300	1900	450	1150
ILL 6014	FLIP 86 -	28L	2200	1550	400	1925
ILL 6015	FLIP 86 -	29L	2950	2350	800	2750
ILL 6017	FLIP 86 -	31L	1150	2550	600	1250
ILL 6018	FLIP 86 -	32L	1100	2400	550	2750
ILL 6029	FLIP 86 -	43L	1150	1700	500	1000
ILL 6030	FLIP 86 -	44L	1300	1450	400	800
ILL 6031	FLIP 86 -	45L	1450	600	650	650
ILL 6047	FLIP 86 -	61L	1850	1700	850	1050
ILL 6048	FLIP 86 -	62L	1800	1400	450	1850
ILL 6049	FLIP 86 -	63L	350	1650	650	1750
ILL 6050	FLIP 86 -	64L	500	1700	650	1250
ILL 6051	FLIP 86 -	65L	750	1850	350	2050

Check genotypes

ILL 4401			250	1750	450	1250
ILL 4401			750	1900	750	1300
ILL 4401			1650	1500	550	1450
ILL 4401			800	1700	400	1700
ILL 4401			1700	350	650	2100
ILL 5588	78 S	26013	1700	2450	350	2700
ILL 5588	78 S	26013	1550	2550	750	1550
ILL 5588	78 S	26013	2500	2300	550	2700
ILL 5588	78 S	26013	2550	1700	450	2750
ILL 5588	78 S	26013	1600	1650	450	1600
Local Oueslatia			1000	2600	350	1050
Local Oueslatia			2050	1800	700	2100
Local Oueslatia			2500	2400	600	3000
Local Oueslatia			2400	2150	400	2750
Local Oueslatia			1650	2250	600	1075

Tableau 13 L : Pépinière de selection de lentille à gros calibre (LISN-L.)

Table 13 L : Seed yield of lines in the LISN-L at three locations

Lignée/Line	Selection	Rendement/Yield		
		B	OM	K
ILL 5426	UJL 176	800	2400	600
ILL 5481	OKUL 1	750	650	M
ILL 5593	78 S 26024	800	2300	600
ILL 5571	81 S 38326	1600	2450	500
ILL 5722	FLIP 84 - 51L	1300	2600	550
ILL 5741	FLIP 84 - 71L	1150	2700	500
ILL 5744	FLIP 84 - 74L	1800	2300	600
ILL 5751	FLIP 84 - 81L	2350	2350	450
ILL 5754	FLIP 84 - 84L	1600	1950	800
ILL 5761	FLIP 84 - 91L	1150	2000	700
ILL 5762	FLIP 84 - 92L	1300	1700	450
ILL 5814	FLIP 84 - 144L	2100	2450	350
ILL 5815	FLIP 84 - 145L	1250	2250	500
ILL 5816	FLIP 84 - 147L	1050	1800	750
ILL 5817	FLIP 84 - 148L	1250	2050	M
ILL 5818	FLIP 84 - 149L	1350	2150	650
ILL 5821	FLIP 84 - 152L	2000	2400	550
ILL 5824	FLIP 84 - 155L	1100	2100	650
ILL 5825	FLIP 84 - 156L	1550	2250	550
ILL 5839	FLIP 85 - 1L	2300	1650	650
ILL 5840	FLIP 85 - 2L	1550	1650	650
ILL 5841	FLIP 85 - 3L	1200	2500	650
ILL 5842	FLIP 85 - 4L	1450	2050	550
ILL 5987	FLIP 86 - 1L	1800	1900	750
ILL 5988	FLIP 86 - 2L	2050	2100	400
ILL 5989	FLIP 86 - 3L	2200	2050	950
ILL 5990	FLIP 86 - 4L	1700	2000	750
ILL 5991	FLIP 86 - 5L	1400	1850	800
ILL 5992	FLIP 86 - 6L	2000	2350	600
ILL 5993	FLIP 86 - 7L	2700	2000	550
ILL 5994	FLIP 86 - 8L	2050	2300	750
ILL 5995	FLIP 86 - 9L	1700	2000	950
ILL 5996	FLIP 86 - 10L	1550	1500	850
ILL 5997	FLIP 86 - 11L	2100	2200	750
ILL 5998	FLIP 86 - 12L	1300	1500	700
ILL 5999	FLIP 86 - 13L	2800	2000	450
ILL 6000	FLIP 86 - 14L	1400	1600	500
ILL 6001	FLIP 86 - 15L	950	140	450
ILL 6002	FLIP 86 - 16L	1850	2200	500
ILL 6003	FLIP 86 - 17L	1850	1250	500

ILL 6004	FLIP 86 - 18L	750	1250	500
ILL 6005	FLIP 86 - 10L	700	1600	500
ILL 6006	FLIP 86 - 20L	1750	2150	450
ILL 6007	FLIP 86 - 21L	1500	1450	500
ILL 6008	FLIP 86 - 22L	1200	2550	500

Check genotypes

ILL 4400		1800	2600	650
ILL 4400		1900	2200	500
ILL 4400		1800	2100	M
ILL 4605	Precoz	1950	1400	400
ILL 4605	Precoz	1300	1000	350
ILL 4605	Precoz	700	1050	600
Local Oueslatia		2050	2750	600
Local Oueslatia		1800	2750	700
Local Oueslatia		2400	2300	650

Tableau 14 L : Pépinière d'observation de lentille (LISN-E)

Table 14 L : Seed yield of lines in the LISN-E at three locations

Lignée/Line	Selection	Rendement/Yield		
		B	OM	K
ILL 241	-	2300	2400	500
ILL 358	-	1550	1250	400
ILL 784	-	1550	950	300
ILL 1712	EL 42	200	600	300
ILL 1983	L 528 (75)	150	1250	300
ILL 2022	L 1057	350	50	M
ILL 2069	L 1327	600	2350	950
ILL 2149	-	2550	1000	250
ILL 2500	Pant L 538	150	750	250
ILL 2501	Pant L 408	650	1050	850
ILL 2575	Pant L 639	300	700	300
ILL 2580	L 1278	100	1150	250
ILL 2581	L 1282	200	1100	350
ILL 2582	L L 1	400	275	M
ILL 3493	877	750	1150	200
ILL 3516	L G 41	1800	2250	550
ILL 3517	L G 46	400	1400	300
ILL 3601	-	450	950	300
ILL 3614	L L 57	3350	1250	M
ILL 4377	-	500	2000	M
ILL 4403	162	200	800	250
ILL 5248	UJL 81 ~ 173	2800	1800	750
ILL 5255	UJL 81 ~ 36	2000	2800	750
ILL 5486	Fam 370	800	1200	450
ILL 5673	81538084	1100	300	500
ILL 5699	FLIP 84 - 27L	1600	1650	600
ILL 5709	FLIP 84 - 38L	1300	2100	500
ILL 5748	FLIP 84 - 78L	2100	1900	500
ILL 5782	FLIP 84 - 112L	2550	2200	400
ILL 5803	FLIP 85 - 133L	1800	1400	650
ILL 5844	FLIP 85 - 6L	1800	2800	650
ILL 5991	FLIP 86 - 5L	1900	2700	900
ILL 6000	FLIP 86 - 14L	200	1500	650
ILL 6003	FLIP 86 - 17L	900	600	200
ILL 6007	FLIP 86 - 21L	1250	1500	M
ILL 6022	FLIP 86 - 36L	2250	2000	500
ILL 6023	FLIP 86 - 37L	1700	600	200
ILL 6024	FLIP 86 - 38L	1950	50	250
ILL 6025	FLIP 86 - 39L	1800	1250	300

ILL 6026	FLIP 86 - 40L	1050	2000	250
ILL 6027	FLIP 86 - 41L	M	1000	600
ILL 6028	FLIP 86 - 42L	2100	1850	M
ILL 6029	FLIP 86 - 43L	1500	1800	M
ILL 6030	FLIP 86 - 44L	1250	1700	1050
ILL 6031	FLIP 86 - 45L	1500	1000	450
ILL 6032	FLIP 86 - 46L	650	800	600
ILL 6039	FLIP 86 - 47L	1900	2100	550
ILL 6034	FLIP 86 - 48L	1150	1400	650
ILL 6035	FLIP 86 - 49L	1250	1300	550
ILL 6036	FLIP 86 - 50L	1550	1500	550
ILL 6037	FLIP 86 - 51L	1050	1300	800
ILL 6038	FLIP 86 - 52L	1800	650	150
ILL 6039	FLIP 86 - 53L	1400	2100	600
ILL 6040	FLIP 86 - 54L	750	2650	900
ILL 6041	FLIP 86 - 55L	1600	1750	650
ILL 6042	FLIP 86 - 56L	2400	2850	500
ILL 6043	FLIP 86 - 57L	1050	2250	550
ILL 6044	FLIP 86 - 58L	3050	2450	700
ILL 6045	FLIP 86 - 59L	300	1050	M
ILL 6046	FLIP 86 - 60L	2650	1850	700
<u>Check genotypes</u>				
ILL 4354		2100	2350	200
ILL 4354		2350	3050	450
ILL 4354		2400	3150	450
ILL 4354		2350	2450	700
ILL 4354		2250	1550	300
ILL 4354		2900	400	M
ILL 4605	Precoz	1600	2050	650
ILL 4605	Precoz	1100	1050	550
ILL 4605	Precoz	650	1350	500
ILL 4605	Precoz	1150	1400	450
ILL 4605	Precoz	1100	1500	500
ILL 4605	Precoz	300	550	250
Local Oueslatia		2450	2700	650
Local Oueslatia		M	M	550
Local Oueslatia		2350	2400	650
Local Oueslatia		2300	3000	550
Local Oueslatia		2250	M	450
Local Oueslatia		M	1600	500

Tableau 15 L : Pépinière de sélection de lentille à port érigé
(LISN-T-E)

Table 15 L : Seed yield of lines in the LISN-T-E at four locations

Lignée/Line	Selection	Rendement/Yield			
		B	OM	K	M
ILL 20	-	2200	2350	600	2400
ILL 465	-	1200	1800	300	1575
ILL 468	-	1250	2200	200	1000
ILL 813	-	150	1800	200	1000
ILL 1939	-	1250	2250	700	1750
ILL 4349	LAIRD	1150	1150	400	400
ILL 4354		2650	1660	200	1750
ILL 4605	PRECOZ	1050	750	350	1550
ILL 4711	CHILEAN-78	1300	1100	450	550
ILL 5486	FAM 370	100	900	700	2250
ILL 5544	74 TA 550	100	1800	650	1450
ILL 5582	78 S 26002	2500	1850	450	1600
ILL 5604	78 S 26052	1350	2700	550	1350
ILL 5698	FLIP 84 26L	2500	1350	M	2100
ILL 5699	FLIP 84 27L	900	240	500	2300
ILL 5713	FLIP 84 42L	2500	1800	450	1500
ILL 5714	FLIP 84 43L	1850	1700	500	2150
ILL 5715	FLIP 84 44L	1100	1950	M	1700
ILL 5719	FLIP 84 48L	700	1000	650	2800
ILL 5722	FLIP 84 51L	1650	1850	750	1175
ILL 5728	FLIP 84 58L	500	2600	300	1050
ILL 5729	FLIP 84 59L	2900	2500	450	1200
ILL 5745	FLIP 84 75L	1550	2200	650	1250
ILL 5748	FLIP 84 78L	1050	2500	750	1200
ILL 5753	FLIP 84 83L	950	1925	750	1200
ILL 5799	FLIP 84 129L	2000	1850	150	1000
ILL 5803	FLIP 84 133L	2300	1650	750	600
ILL 5804	FLIP 84 134L	1900	1300	500	650
ILL 5806	FLIP 84 135L	2200	2150	M	2050
ILL 5811	FLIP 84 141L	400	2050	400	325
ILL 5823	FLIP 84 154	1350	1600	300	750
ILL 5873	FLIP 85 35L	450	2400	650	1250
ILL 5876	FLIP 85 38L	2300	2100	350	2100
ILL 5877	FLIP 85 39L	1850	1500	200	800
ILL 5878	FLIP 85 40L	1900	1650	350	1500
ILL 5879	FLIP 86 41L	1800	1850	500	1250
ILL 5988	FLIP 86 2L	1650	2550	M	300
ILL 5989	FLIP 86 3L	1850	2150	500	400
ILL 5990	FLIP 86 4L	1550	1300	500	1300
ILL 5998	FLIP 86 12L	950	1500	450	700
ILL 6002	FLIP 86 16L	1050	2250	450	450

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ILL	6004	FLIP 86	18L	400	1160	400	200
ILL	6005	FLIP 86	19L	1200	1800	200	425
ILL	6009	FLIP 86	29L	1050	1700	650	2100
ILL	6010	FLIP 86	24L	1600	1700	650	1400
ILL	6011	FLIP 86	25L	1950	1650	450	2050
ILL	6012	FLIP 86	26L	200	1950	350	1900
ILL	6013	FLIP 86	27L	700	2400	M	1500
ILL	6014	FLIP 86	28L	600	1350	150	2350
ILL	6015	FLIP 86	29L	1850	2200	650	1750
ILL	6016	FLIP 86	30L	950	1900	400	1000
ILL	6017	FLIP 86	31L	2050	1700	650	1750
ILL	6018	FLIP 86	32L	1350	2000	450	2460
ILL	6019	FLIP 86	33L	1450	1400	350	1800
ILL	6020	FLIP 86	34L	600	1000	500	M
ILL	6021	FLIP 86	35L	800	3300	600	1250
<u>Check genotypes</u>							
ILL	4401			800	1800	300	1250
ILL	4401			400	1750	400	900
ILL	4401			1400	1700	250	500
ILL	4401			1900	1600	600	1950
ILL	2130	Hurani 1		100	2650	600	1000
ILL	2130	Hurani 1		125	1600	450	425
ILL	2130	Hurani 1		1300	1750	350	1750
ILL	2130	Hurani 1		1300	1500	400	550
Local Oueslatia				650	2500	480	1150
Local Oueslatia				2700	2350	600	2250
Local Oueslatia				2650	2300	350	870
Local Oueslatia				3600	2300	400	2700

6. AGRONOMIC STUDIES (H. Halila and Ben Salah for F.B)

6.1. Introduction

Agronomic studies were conducted for the fifth year at various locations on all the three food legumes covering the aspects of date of sowing and plant population, chemical weed control and crop/weed competition. Multi-location evaluation of winter vs. spring sowing of chickpea was also undertaken. Many stations were added this year with the collaboration of the Agromony Laboratory of INRAT and the Office des Cereales and data from these additional stations will be presented in their respective progress reports.

6.2. Date of Sowing and Plant Population Studies

Effect of five sowing dates at 15 days interval, starting from 16 October 1985 for faba beans and lentils, at Kef station and starting from 17 October 1985 for faba beans and lentils, and 3 March 1986 for spring chickpea at Beja station, was studied in combination with four levels of plant population (Table 15). Local cultivars (Beja and Kef local faba beans and Oueslatia lentil and Amdoun chickpea) were used for these studies. The results of these trials are presented in tables 1A and 2A. As mentioned earlier, this year's climatic conditions have largely conditioned the results in general. Due to a

Tableau 15 : Niveau de peuplement utilises et dates de semis utilisees dans les essais de dates et densites de semis

Table 15 : Details of the treatments of plant population levels (plant/m²) and dates of planting used in the DPPT at Beja and El Kef in 1985/86.

Population levels/Peuplements	Plants/m ²			
	F.B.Large Feves	F.B.Small Feveroles	Lentil Lentille	Chickpea Pois chiche
P1	12.5	50.00	115.00	31.20
P2	8.30	25.00	82.50	20.80
P3	6.20	16.60	54.90	15.60
P4	5.00	12.50	41.20	12.50

Béjā

	F.B., Lentils/Fêves et Lentilles	Spring Chickpeas/Pois chiche-printemps
D1	16/10/1985	3/3/1986
D2	2/11/1985	18/3/1986
D3	18/11/1985	2/4/1986
D4	2/12/1985	21/4/1986
D5	20/12/1985	5/5/1986

Kef

F.B.small and large, lentil/Fêves, Févéroles et Lentille

D1	16/10/1985
D2	1/11/1985
D3	15/11/1985
D4	1/12/1985
D5	17/12/1985

dry autumn at both stations the effect of the early dates of sowing was not as pronounced as in the previous year except for the spring chickpea.

The relative effect of dates of sowing on all the crops is shown in table 16. Reduction was highest in faba bean large and in spring planted chickpea (c.v. Amdoun) at Beja when sowing was delayed till December and April respectively.

Conspicuous increase in yield was observed when the plant population was increased from lowest levels to the highest level. The population levels that proved optimum were 50, 12, 115 and 31 plants/m² for faba bean (small), faba bean (large), lentil and spring sown chickpeas, respectively.

6.3. Weed Control Studies

Yield losses due to weeds were very high again this year (Table 17). Hand weeding twice (at 45 days and 90 days after sowing) reduced the weed damage. The detailed effects are shown for faba bean, lentil and chickpeas in tables 3A to 6A. Data from the Chemical Weed Control Trials on these crops indicated that none of the herbicides tested proved very effective. Averaged over Beja and Kef locations.

Tableau 16 : Pertes de rendements occasionnées par les semis tardifs et augmentation du rendement due à l'utilisation des niveaux de peuplement élevés.

Table 16 : Percentage reduction due to delay in sowing and percentage increase due to increased plant populations in the yield of faba bean, lentil and chickpea at Beja and Kef during 1985/86.

	Lentils/ Lentilles		Faba bean small/Févérolles		Faba bean large/Fêves		Chickpea Spring/Pois chiche	
	BEJA	KEF	BEJA	KEF	BEJA	KEF	BEJA	KEF ⁽¹⁾
<u>Date of planting</u> <u>Date de semis</u>								
D1	100	100	100	100	100	100	100	-
D2	105	84	89	88	97	83	89	-
D3	111	100	97	87	91	105	27	-
D4	92	85	95	108	87	87	24	-
D5	74	79	98	95	50	87	02	-
<u>Populations/ Peuplement</u>								
P1	120	150	174	339	164	193	136	-
P2	90	121	115	173	129	139	131	-
P3	100	106	106	133	105	123	111	-
P4	100	100	100	100	100	100	100	-

(1) Not harvested/non récolté

Table 17 : Percentage yield loss due to weeds, as average of Beja and Kef stations in small seeded faba beans, chickpeas and lentils during 1985/86

Treatment	Faba bean	Chickpea	Lentil
Weed free	0	0	0
Weedy	8.5	88	89
Hand weeding, 2 times	39 ⁽²⁾	10	24 ⁽¹⁾

(1) Beja only

(2) Kef only

Igran (@ 3.5 kg a.i./ha) plus Kerb (@ 1.0 kg a.i./ha) as a pre-emergence application proved the most effective herbicide treatment for faba bean and chickpea while for lentil it was Maloran (@ 2.5 kg a.i./ha) plus Kerb (@ 0.5 kg a.i./ha). There is still a need for evaluating new herbicides at different rates and in different combinations for developing a satisfactory control schedule.

The crop weed competition studies at Kef (Table 7 A) and Beja (Table 8 A) showed that this year weeds did not pose any serious competition for the first eight weeks, but subsequent 10 to 12 weeks were very critical and any measure of control to ensure effective suppression of weeds in this period should result in increased yield. This also emphasizes the importance of late weeds in affecting the yield of food legumes at these locations.

In the orobanche chemical control trial, the best results were obtained with three applications of glyphosate at 0.08 kg a.i./ha starting at the beginning of flowering and twice at 15 days interval (Table 9A). For the date of sowing there is no big difference among the dates due to the lack of rain during the beginning of the growing season.

6.4. Comparison of Spring vs. Winter Sowing of Some Chickpea Genotypes

Four chickpea genotypes, ILC 482, ILC 3279, FLIP-81-56W and local (Amdoun) were evaluated for their performance when planted in winter (1st Dec. 1985), early spring (1st Feb. 1986) and late spring (1st Apr. 1986) at four different sites (Beja, Krib, O. Meliz and Menzel Temime)

Performance of all the genotypes at each location was affected by the date of sowing as shown in tables 10A and 11A. Average over all locations, the seed yield by winter sowing increased by a margin of 259% and by early spring sowing by a margin of 135% over late spring sowing (Tables 10A, 11A). The results of the previous seasons highlight the potential importance of winter sowing in areas where the rainfall is insufficient for growing a spring sown crop of chickpeas.

Tableau 1 A : Rendements moyens (kg/ha) pour les dates de semis

Table 1 A : Mean yield (kg/ha) of different food legumes as affected by dates of sowing in the DPPT at Beja and Kef in 1985/86.

Date ⁽²⁾	F.B.Large/ Fêves		F.B.Small/ Féveroles		Lentils/ Lentilles		Chickpea/ Pois chiche	
	B	K	B	K	B	K	B	K ⁽¹⁾
D1	3754	580	3534	962	1099	371	1376	-
D2	3648	486	3175	854	1162	313	1237	-
D3	3419	614	3447	839	1225	373	371	-
D4	3270	510	3383	1041	1014	318	330	-
D5	1902	507	3499	919	821	295	30	-

Tableau 2 A: Rendements moyens (kg/ha) des niveaux de peuplements.

Table 2 A: Mean yield (kg/ha) of different food legumes as affected by the PP levels in the DPPT at Beja and Kef in 1985/86.

Peuple- ment(2)	F.B.Large/ Fêves		F.B.Small/ Féveroles		Lentils/ Lentilles		Chickpea/ Pois chiche	
	B	K	B	K	B	K	B	K ⁽¹⁾
P1	4212	752	4788	1678	1248	420	771	-
P2	3315	542	3174	856	934	338	740	-
P3	2706	477	2924	662	1042	297	630	-
P4	2506	387	2744	495	1033	279	564	-

(1) Not harvested/Non récolté

(2) Details in table 15 /Détails au tableau No 15

Tableau 3 A : Essai de désherbage chimique sur févéroles.
Rendements en kg/ha.

Table 3 A : Weed control trial on faba bean small.
Seed yield in kg/ha in 1985/86.

Treatments/ Traitements		Beja		Kef	
		Rendt/Yield	% T2	Yield/Rendt	% T2
Temoin/Weedy check	T1	13	27	0	0
Propre/Weed Free	T2	50	100	613	100
2 binages/Hand					
Weedings	T3	70	140	379	61
Igran (3,0kg)	T4	0	0	39	6
Igran (3,5kg)	T5	13	27	73	11
Igran (3,0kg) +					
Kerb (1kg)	T6	77	153	326	53
Igran (3,5kg) +					
Kerb (1kg)	T7	60	120	366	59
Maloran (2,0kg) +					
Kerb (1kg)	T8	37	73	319	52
Maloran (2,5kg) +					
Kerb (1kg)	T9	60	120	313	51
Maloran (2,0kg) +					
Igran (3,0kg) +	T10	166	33	182	29
Kerb (1 kg)					
CV %		150.9		48.0	
SE ±		82.5		94.9	

Tableau 4 A : Essai de désherbage chimique sur lentille.
Rendements en kg/ha.

Table 4 A : Weed control trial on lentil. Seed yield
in kg/ha in 1985/86.

Treatments/ Traitements		Reja		Kef	
		Yield/Rendt	%T2	Yield/Rendt	%T2
Temoin/Weedy check	T1	259	22	0	0
Propre/Weed free	T2	1199	100	359	100
2 binages/Hand					
Weedings	T3	909	76	33	9
Tribunil (2,5kg)+					
Kerb (1kg)	T4	308	26	39	10
Tribunil (3kg) +					
Kerb (1kg)	T5	348	29	29	8
Gesagard (2,0kg)+					
Kerb (1kg)	T6	463	59	39	10
Gesagard (2,0kg)+					
Kerb (1kg)	T7	323	27	0	0
Maloran (2,0kg) +					
Kerb (1kg)	T8	595	50	33	9
Maloran (2,5kg) +					
Kerb (1kg)	T9	364	30	186	51
Maloran (2,0kg) +					
Tribunil (2,5kg)+	T10	356	30	119	33
Kerb (1kg)					
CV %		51.9		106.0	
SE ±		266.7		67.0	

Tableau 5 A : Essai de désherbage chimique sur pois chiche. Rendements en kg/ha.

Table 5 A : Weed control trial on chickpea. Seed yield in kg/ha in 1985/86.

Treatments/ Traitements		Beja		Kef ⁽¹⁾	
		Yield/Rendt	%T2	Yield/Rendt	%T2
Temoin/Weedy check	T1	196	12	-	-
Propre/Weed free	T2	1586	100	-	-
2 binages/Hand					
Weedings	T3	1423	90	-	-
Tribunil (3,0kg) +					
Kerb (1kg)	T4	163	10	-	-
Tribunil (3,5kg) +					
Kerb (1kg)	T5	129	8	-	-
Igran (3,5kg) +					
Kerb (1kg)	T6	269	17	-	-
Igran (4,0kg) +					
Kerb (1kg)	T7	573	36	-	-
Maloran (2,5kg) +					
Kerb (1kg)	T8	526	33	-	-
Maloran (3,0kg) +					
Kerb (1kg)	T9	416	26	-	-
Igran (3,5kg) +					
Maloran (3,0kg) +					
Tribunil (3kg) +					
Kerb (1kg)	T10	439	28	-	-
CV %		47.5		-	
SE ±		271.9		-	

(1) Not harvested/non récolté

Tableau 6 A : Essai de désherbage chimique sur petit pois. Rendements en kg/ha.

Table 6 A : Weed control trial on Peas. Seed yield in kg/ha in 1985/86.

Treatments/ Traitements	Beja		Kef	
	Yield/Rendt	%T2	Yield/Rendt	%T2
Temoin/Weedy check T1	586	25	19	7
propre/Weed free T2	2339	100	266	100
2 binages/Hand T3	1799	76	159	59
Weedings				
Tribunil (2,5kg)+ Kerb (1kg) T4	753	32	39	14
Tribunil (3,0kg)+ Kerb (1kg) T5	739	31	86	32
Gesagard (2,0kg)+ Kerb (1kg) T6	1373	58	49	18
Maloran (2,5kg)+ Kerb (1kg) T7	1253	53	86	32
Maloran (2,0Kg)+ Kerb (1kg) T8	939	40	142	53
Bladex (1,5kg) + Kerb (1kg) T9	699	29	115	43
Tribunil (2,5kg)+ Bladex (1,5kg) + Kerb (1kg) T10	799	34	46	17
CV %	44.1		76.5	
SE ±	498.5		58.9	

Tableau 7 A : Essai de désherbage manuel-station de Kef.
Rendements en kg/ha.

Table 7 A : Crop/weed competition trial at Kef in
1985/86. Seed yield in kg/ha.

Treatments/ Traitements	F.B.Small Févéroles	Lentils Lentilles	Chickpea ⁽¹⁾ Pois-chiche	Peas P.pois
Weedy for two weeks after emergence T1 2 semaines après levée puis propre	879	279	-	359
Weedy for 4 weeks after emergence T2 4 semaines après levée puis propre	626	213	-	319
Weedy for 6 weeks after emergence T3 6 semaines après levée puis propre	666	179	-	359
Weedy for 8 weeks after emergence T4 8 semaines après levée puis propre	593	226	-	466
Weedy for 10 weeks after emergence T5 10 semaines après levée puis propre	386	53	-	106
Weedy for 12 weeks after emergence T6 12 semaines après levée puis propre	66	13	-	13
Weed free for two weeks after emergence T7 Propre 2 semaines après levée puis abandonnée	0	0	-	13
Weed free for 4 weeks after emergence T8 Propre 4 semaines après levée puis abandonnée	13	13	-	0
Weed free for 6 weeks after emergence T9 Propre 6 semaines après levée puis abandonnée	266	66	-	26
Weed free for 8 weeks after emergence T10 Propre 8 semaines après levée puis abandonnée	153	66	-	199
Weed free for 10 weeks after emergence T11	599	213	-	333

Propre 10 semaines après levée puis abandonnée					
Weed free for 12 weeks after emergence T12	766	233	-	319	
Propre 12 semaines après levée puis abandonnée					
Weedy check/Temoin T13	26	0	-	0	
CV %	45.0	150.9		37.6	
SE ±	131.1	135.8		53.2	

(1) Not harvested/Non récolté

Tableau 8 A : Essai de désherbage manuel-station de Beja.
Rendements en kg/ha.

Table 8 A : Crop/weed competition trial at Beja station
in 1985/86. Seed yield in kg/ha.

Treatments/ Traitements	F.B.Small Févéroles	Lentils Lentilles	Chickpeas Pois-chiche	Peas P.pois
Weedy for two weeks after emergence T1	3389	1766	2006	2179
2 semaines après levée puis propre				
Weedy for 4 weeks after emergence T2	3286	1393	2256	2186
4 semaines après levée puis propre				
Weedy for 6 weeks after emergence T3	3446	1666	2293	2173
6 semaines après levée puis propre				
Weedy for 8 weeks after emergence T4	3486	1684	2233	2046
8 semaines après levée puis propre				
Weedy for 10 weeks after emergence T5	3239	1148	1660	1526
10 semaines après levée puis propre				
Weedy for 12 weeks after emergence T6	1799	529	379	699
12 semaines après levée puis propre				
Weed free for 2 weeks after emergence T7	2039	1359	2026	1799
Propre 2 semaines après levée puis abandonnée				
Weed free for 4 weeks after emergence T8	3239	1369	1333	2166
Propre 4 semaines après levée puis abandonnée				
Weed free for 6 weeks after emergence T9	3286	1246	1966	2406
Propre 6 semaines après levée puis abandonnée				
Weed free for 8 weeks after emergence T10	3453	1013	1566	2443
Propre 8 semaines après levée puis abandonnée				
Weed free for 10 weeks after emergence T11	3559	1033	1899	2246

Propre 10 semaines après levée puis abandonnée				
Weed free for 12 weeks after emergence T12	3273	1713	1719	2473
Propre 12 semaines après levée puis abandonnée				
Weedy check/Témoin T13	1219	519	946	1079
CV %	21.6	31.0	40.6	18.9
SE ±	641.0	394.5	713.5	371.3

Table 9 A : Faba bean orobanche chemical control

Treatments	Yield percent of the check
T 1 : Control - no glyphosate	100
T 2 : At the beginning of flowering apply 0.08 kg a.i./ha once	341
T 3 : At the beginning of flowering apply 0.08 kg a.i./ha twice at 15 days interval	433
T 4 : At the beginning of flowering apply 0.08 kg a.i./ha twice at 15 days interval	261
T 5 : At 15 days after flowering began, apply glyphosate at 0.08 kg a.i./ha once	270
T 6 : Starting 15 days after flowering began, apply glyphosate at 0.08 kg/ha twice at 15 days interval	239
T 7 : Starting 15 days after flowering began, apply glyphosate at 0.08 kg a.i./ha twice at 15 days interval	293
T 8 : At the beginning of flowering, apply glyphosate at 0.12 kg a.i./ha once	346
T 9 : Starting at the beginning of flowering, apply glyphosate at 0.12kg a.o./ha twice at 15 days interval	374
T10 : Starting at the beginning of flowering, apply glyphosate at 0.12kg a.i./ha twice at 15 days interval	266

Tableau 10 A: Essai de date de semis sur pois chiche
(hiver/printemps). Effet dates/sites.
Rendements moyens de toutes les variétés
(kg/ha)

Table 10 A: Dates of sowing comparison trials in
chickpea in 1985/86 at B, OM, Kr, M.T.
Average yield of all varieties. Kg/ha.

Locations/ Sites	D1 = 1/12/85	D2 = 15/2/86	D3 = 1/4/86
Beja	1836.2	873.1	531.8
M. Temime	1087.5	786.2	30.0
Krib	1122.5	1182.5	692.8
O. Meliz	2738.0	2012.0	634.8
Mean/Moyenne	1696.0	1213.4	472.3
% of D3	359	235	100

Tableau 11 A Essai de date de semis sur pois chiche
(hiver/printemps). Effet dates/variétés.
Rendements moyens de tous les sites (kg/ha).

Table 11 A Dates of sowing comparison trials in
chickpea in 1985/86 at B, OM, Kr, M.T.
Average yields of all locations. Kg/ha.

Variety/Variété	D1 = 1/12/85	D2 = 15/2/86	D3 = 1/4/86	Mean/Moyenne
FLIP 81-56W	1634.6	1260.0	484.4	1126.3
ILC 482	1867.5	1182.5	479.3	1176.4
ILC 3279	1536.8	1163.5	408.8	1036.3
Local	1745.2	1247.8	516.7	1169.9
Mean/Moyenne	1696.0	1213.4	472.3	

TOUR REPORT - TUNISIA

(11-18 May, 1986)

M.P. HAWARE

Itinerary

11-12 May	Hyderabad-Bombay-Tunis
13 May	Visit to Beja (Agric. Res. Station)
14 May	Visit to Farmers' fields
15 May	Visit to Farmers' fields
16 May	Visit to INRAT, INAT and departure to Zurich
17-18 May	Zurich-Bombay-Hyderabad

INRAT (Institut National de la Recherche Agronomique de Tunisie) and Dr. M.C. Saxena, Program Leader (FLIP) ICARDA wanted me to visit Tunisia to see chickpea wilt work and discuss with scientists about the ongoing research.

12 May

I reached Tunis Monday afternoon. Mr. Habib Halila, Head, Food Legumes, INRAT received me at the airport. He briefed me about my program for next 4 days in Tunis. I visited ICARDA office and met Dr. Ahmed H. Kamel, ICARDA representative for North Africa region. Due to Ramzan the offices and markets were closed at 2.30 p.m.

13 May

Visited Beja, Agricultural Research Station of INRAT along with Dr. Ahmed H. Kamel and Mr. Habib Halila.

Faba beans and chickpea are the two most important food legumes grown in Tunisia. Chickpea is grown on about 30,000 ha, but the yields are poor (500 kg/ha). Traditionally chickpea is planted in Spring (March) and harvested in June-July. Their preference is for white seed and 45-50 gm/100 seed wt. It is sown mostly in Mateur, Beja and El-Kef in North West and in south of Tunis along the sea coast. Annual rainfall in these areas is around 600 to 1000 mm, mostly in December-February.

Most of the field experiments on food legumes are conducted at Beja. The soil is black and annual rainfall is 600 mm. The day was spent in looking for chickpea diseases in winter and spring plantings. I have listed the diseases in order of their intensity at Beja Farm.

Winter Planting		Spring Planting	
1	Wilt	1	Wilt
2	Ascochyta blight	2	Root rots
3	Root rots	3	Stunt
4	Stunt		

Wilt: Wilt was almost in all the fields of chickpea planted in winter and spring. The symptoms were typical of vascular disease. Two pathogens, Fusarium oxysporum and Verticillium albo-atrum were reported to cause wilt. According to Mr. Habib, there was no difference in initial and late symptoms due to these two pathogens. In Beja soils both wilt pathogens are present and it makes the screening work difficult.

Wilt sick plot was developed by adding infected plant debris in the same field year after year. The plot is quite uniform (1 ha). All the chickpea material received from ICARDA including F₃ progenies was planted for screening. One replication of ICRRWN (50 test lines) along with check ICC 4951 after every 2 test rows, was also planted. Local check was planted after every 10 rows. It was highly susceptible and showed 100% wilt. ICC-4951 (JG-62) did not show any wilting and was healthy. ICC-4934 and -5003 were also resistant. However, C-104 and L-550 were highly susceptible. These reactions indicated the possibility of new race of Fusarium in Tunisia. Natural occurrence of AB (Ascochyta blight) was sporadic.

In addition, 500 germplasm lines received from ICARDA were being evaluated in wilt sick plot. ILC-3279 was tolerant to wilt. Wilt resistant selections, made from local 'Amdoun' were resistant with 45-50g/100 seed wt. Crosses for Tunisia are undertaken at Aleppo, between Ascochyta resistant lines with high yield in Tunisia and wilt resistant selections from Beja. F₃ progenies are simultaneously screened for wilt and Ascochyta blight resistance at Beja. There were several lines in FLIP material and local Amdoun selections which were wilt resistant. Some of these were field resistant to Ascochyta blight. ILC-480 was susceptible to wilt and Ascochyta blight in Tunisia.

Root Rots: Several dried seedlings were examined closely. The mortality was mainly due to early wilting and collar rot (Sclerotium rolfsii). Late mortality due to dry root rot was possible. Mr. Habib described the symptoms of the disease, which he told, were common at maturity when day temperatures were above 30°C.

Ascochyta blight: Due to long dry spell, Ascochyta blight did not appear. However the disease was present in AB-nursery (winter planting) where humidity was created with sprinklers. Local check was showing 5-9 rating. ILC-3279 showed 3 to 5 rating.

Orobanche: In winter chickpea orobanche was a problem. Spring planted chickpea was free from infestation.

14 May

Surveyed chickpea fields in Beja Governorate. Chickpea cultivation was mostly concentrated around Mateur and Beja. The fields were sown in spring and soils were black. Wilt was most common and destructive. Stunt was observed in some of the fields. Iron chlorosis was also observed. Salinity symptoms were observed in low

lying fields. Most of the crop was in pre-flowering stage. Plant population was less than normal and fields were free from weeds. Mr. Habib told that the fields which had wilt problem last year were sown with cereals this year by farmers. Local seeds were used.

15 May

In the south of Tunis we travelled along the coast towards Nabeul. In this part chickpea is a new introduction. Cultivation practices in terms of planting (March to April), row to row distance (50 to 150 cm) and cultivation (monocrop to garden crop: Olive) varied. Chickpea did not have any problem except very low plant population. The soils were deep-red mediterranean type.

Incidence of wilt and other diseases of chickpea in the farmers' fields in Tunisia during May 1986

Location	Approximate area (ha)	% Disease Incidence				Remarks
		Wilt	Stunt	RR	AB	
A <u>MATEUR-BEJA-TUNIS</u>						
Sitinsir 1	10	10	-	-	-	
2	5	60	-	-	-	
3	10	50	-	-	-	
Frietissa	10	50-100	5	-	-	
Mateur 1	5	1	5	-	-	
2	15	50	1	-	-	
Guoumine 1	10	20	2	1	-	Iron chlorosis
2	5	1	-	1	-	Salinity
Beja 1	10	10	-	1	-	Salinity
2	10	10	1	-	-	
B <u>Tunis-Nabeul</u>						
Hemam Chatt	2	1	-	-	-	In olive orchard
Korbous-1	5	-	-	0.5	-	Leaf miner
2	5	-	-	-	-	
3	5	-	-	-	-	Late sowing
Nabeul	4	-	-	-	-	Late sowing

RR - Root Rot, AE - Ascochyta blight

Visit to INAT (Institut National Agronomique de Tunisie)

INAT is a teaching institute. I met Dr. M.M. Harrabi, Head of Plant Pathology. Two students were working with him for their M.Sc. degree on chickpea diseases. One of his students worked on variability in Ascochyta rabiei and found out 4 races in Tunisia. Dr. Harrabi was hesitant to call them races because of the reactions on host were not well differentiated. Regarding chickpea wilt, he was very much sure about the role of Verticillium and Fusarium in causing wilt. He used water culture technique to screen chickpea lines against both pathogens. Fortunately, the lines which were resistant to Fusarium were also resistant to Verticillium. Local 'Amdoun' was susceptible to both. Mr. Habib in cooperation with Dr. Harrabi are planning to work on inheritance of wilt resistance in chickpea. We discussed on the possible screening techniques which could be used in confirming the field resistant lines. Dr. Harrabi showed me the laboratory facilities which were adequate (except glasshouse) for pathology work. Detailed discussion was held with Mr. Habib Halila on chickpea pathology work to be carried out in future.

16 May

At the end of my trip I had a meeting with Dr. Mustapha Lasram, Director INRAT and Vice-Chairman, Board of Trustees, ICARDA. Mr. Habib and I briefed him about the disease situation in chickpea. He appreciated my visit. He was of the opinion that surveys with the help of ICARISAT scientists should be conducted in North Africa Region (Morocco, Algeria and Tunisia) to understand the disease situation in chickpea. He also wished that ICARISAT should help Tunisia in training the persons in legume pathology.

SUMMARY

1. Wilt is a major problem in spring and winter chickpea. Therefore resistance to wilt is a must in released cultivars.
2. Under favourable condition Ascochyta blight can be a problem in winter chickpea. Resistance to blight and wilt has to be incorporated in local high yielding materials.
3. Facilities have to be created to strengthen the work on disease resistance. Uniform disease nurseries and screen houses are essential.
4. There is a need for Legume Pathologist who can work on chickpea, faba beans and lentil.
5. There is a need to understand the distribution of Fusarium and Verticillium pathogens in farmers fields in Tunisia and other North African regions.
6. Identification of Fusarium races based on host differentials is possible and should be carried out.
7. Since Ascochyta and Fusarium are seed-borne, effective fungicidal seed treatment is essential, which may be recommended to farmers.

8. The material generated at ICARDA involving Tunisian lines may be tested in F_3 in Tunisia so that selections for resistance are made against local isolates. Introduction of advanced material have the problem of local adaptation.
9. ICRISAT may offer the training facilities to scientists from Tunisia.
10. Stunt can be a problem. Highly susceptible material should be discarded.

My sincere thanks to Dr. M.C. Saxena ICARDA and Dr. Y.L. Nene ICRISAT for giving me the opportunity to visit Tunisia.

Mr. Habib Halla and Dr. Ahmed H. Kamel helped me to make my visit productive.

Report on Food Legume Seed Production

P.K. Agrawal

Head, Seed Technology Division, IARI, New Delhi-12

I visited Tunisia on the request of the Leader, FLIP, ICARDA, Aleppo (Syria) from March 30, 1986 to April 2, 1986 with the following objectives:

1. To review and assess briefly the present system of seed multiplication and production for main food legumes in the country through discussion with National Staff and field visits.
2. To elaborate and submit a proposal for a sound seed multiplication program for faba bean, lentil, chickpea, pea and Phaseolus taking into account international and local regulations on the matter.

During the visits, meetings with the officials of all the 3 seed companies were held, fields, processing plants and Seed Testing Laboratory were visited to get the first hand information on the status of seed production in Tunisia.

The report is based on the field visits and discussions with the officials of seed companies. Although the stay in Tunisia was brief but the author got the feeling of the present situation of seed production in food legumes.

Actually in true sense of the term no seed production program in food legumes exists in Tunisia. However, throughout in this report in the section 'Present Status' the term Seed Production has been used loosely. In addition to review the present situation, a method of seed production including field and seed standards have been suggested for faba beans, lentil, chickpea, pea and Phaseolus.

It is hoped that the report will be found to be useful in starting a scientific and methodical seed production program of food legumes in Tunisia.

It should be emphasized that for starting the program much investment is not required. A system already exists for the production and distribution of improved varieties of cereals, therefore all the necessary infrastructure like field staff for inspection, seed processing facilities and seed testing laboratory etc. exist. With very little effort in training the existing staff the seed production program for food legumes can be initiated which I am confident will go a long way in increasing the yield. It has been proved beyond doubt that even in self pollinated cultivars use of certified seed of known quality yields significantly more than the seeds which have been saved by farmers for sowing.

Present Status

1. Food Legumes in Tunisia

Food Legumes have long been important crops in Tunisia. 82,828 hectares are under cultivation in faba bean, chickpea, lentil, pea and Phaseolus. The crop wise area under cultivation are: faba bean 40,728, chickpea 32,947, lentil 857, pea 6,947 and Phaseolus 1,349 hectares (Average of 5 years: 1981 to 1985 Table 1). Faba beans are most important representing around 50% of the total area under cultivation in food legumes. But yield of these food legumes are very low. The last 14 years average being 8.3 Q/ha in faba beans, 7.9 Q/ha in chickpea, 7.4 Q/ha in lentil, 6/7 Q/ha in pea and 7.5 Q/ha in Phaseolus. One of the reasons for low yield in food legumes is perhaps the cultivation of age old cultivars as no new cultivars have been released (Anonymous, 1981-82). However, the experimental yield in faba beans (large and small), lentil and pea have been reported to be higher than that of the local checks (Anonymus, 1983/84, and Table 1). Therefore, there is a clear case of release of improved cultivars of some of the food legumes. If new improved cultivars are to be released, a systematic method of seed production and multiplication should be evolved so that identity of the new released cultivars may not be lost.

2. Method of release of new cultivars:

1. INRA has 4 major research stations for food legume breeding work as well as for conducting trials.
2. Promising lines are tested in microplots for their superiority over the local cultivars by breeder himself, under the control of INRAT, for 3 years during the normal growing seasons. The testing on larger plots may be conducted by "Office des Cereales".
3. The best line thus obtained is presented for release to the National Varietal Release Committee.
4. Amount of breeder seed which should be available with the breeder for the release of food legume cultivars is not specified but in cereals it is fixed to be 150 kg, to be given equally to the three seed companies (50 kg each) for multiplication.

3. Popularization of new cultivars:

Large scale demonstrations are conducted on farmers field by extension services of the Directorate of Agricultural Production. Open house or information days (field days) are also organised by the "Office des Cereales" during which farmers are invited to visit these demonstrations to know about the new cultivars. INRAT publishes bulletins on New Cultivars etc. for the use by extension officials. Radio and T.V. talks/announcements are also arranged about the "New Cultivars".

However, no improved cultivars have been released in food legumes.

4. Seed Production in Food Legumes:

There are 3 seed companies in Tunisia namely (i) COSEM, (ii) CCSPS and (iii) GRAFOUPAST. The first two companies are in cooperative sector. The GRAFOUPAST was established in 1977 in private sector with 67% State share primarily to produce and market forage seeds, but it also produces seeds of faba bean (small and large), pea and chickpea. Detailed discussions were held with the officials of COSEM (Mr. Abdelhamid Abdeljelil, Technical Director and Mr. Mohamed Makki Chouchane, Administrative Director) and GRAFOUPAST (Mr. Jabeur Ammar, President Directeur General).

COSEM: It is engaged in producing seeds of cereals, vegetables and food legumes. About 1000 Q of faba beans and 2,000 Q of pea seeds are produced and marketed every year. Small quantity of vetch and chickpea seeds are also produced and marketed.

Seeds of food legumes are produced without providing any isolation distance which is important to check "out-crossing" in a crop like faba beans where the extent of out crossing could be as high as 70% (cf. Hawtin and Omar, 1980). Although no such studies have been conducted in Tunisia, in Syria a maximum of 15% out crossing have been observed (Hawtin and Omar, 1980). No field inspection and rouging are done but seeds are cleaned at the processing plant. The seeds are also tested for germination in the seed testing laboratory (Laboratoire de Controle de Semences et Plantes, D.P.V. Ministere de l'Agriculture) although it is not specified on the tag which is attached with the bag. The genetic purity is not guaranteed. For marketing 50 kg of small faba beans, pea and vetch and 40 kg of large faba beans are packed in a bag.

The so called "seed" is sold at the grain price to the farmers which was about 80 dinar/Q for pea, 25 dinar/Q for small faba beans, 50 dinar/Q for large faba beans and 100 dinar/Q for chickpea in 1984-85, (1 Dinar = 0.72 US\$) whereas price of cereal seeds is 1.5 times higher than the grain price which is subsidized by the Government.

GRAFOUPAST: I had the most stimulating discussion with Mr. Jabeur Ammar, President Directeur General of the company. Mr. Ammar was very optimistic and enthusiastic for evolving a systematic system for the production and distribution of seeds of improved cultivars of food legumes. Food legume seeds are produced through contract growers. It has its own processing plant where about 2,000 tons seeds of food legumes can be processed every year. The company is planning to establish a new processing plant which would have a capacity of about 10,000 tons per year out of which 4,000 tons per year would be for seeds of the food legumes only.

The cost of the food legumes seeds marketed by the company is 20-30% higher than the grain price and the company does not face much difficulty in marketing. It is in contrast to COSEM which sells the so called seeds at the price of grain. Seeds are bagged either in jute bag, multiwall paper bag or polyvinyl bag.

CCSPS: Due to the pre-occupation of the company official, it was not possible to have a meeting. But the processing plant at Beja was visited which is modern and automatic. It has a capacity of 2 tons/hour/shift (8 hour shift).

5. Seed Testing and Quality Control:

The Laboratoire de Controle de Semences et Plantes has excellent facilities, which was established with the help of the Federal Republic of Germany (ISTA News Bulletin, No. 38, October 1972, Page 1. "Seed Testing Station in Tunis - A Tunisian German Applied Project"), for testing the quality attributes of seeds including seed health. Seeds may be tested for physical purity, germination, vigour, moisture, tetrazolium and seed health. About 3,000 samples were tested in 1985 but the laboraotry has the capacity for testing about 5,000 samples per year. 30 technical persons are working in the laboratory. All the three seed companies send their sample for testing and a nominal fee is charged for the services rendered by the laboratory.

Seeds are tested as per the procedure prescribed by the International Seed Testing Association (1985). The laboratory is authorised to issue the International Seed Analysis certificate.

Synthesis of the present status:

1. No improved cultivars of food legumes have so far been released.
2. The country does not have a systematic seed production program for food legumes and yet the so called seeds are produced and marketed every year at the price of grain.
3. Genetic purity of the marketed food legume seed is neither guaranteed nor any attempt is made to maintain it.

4. No legislation or law is available in the country to regulate the production and marketing of food legume seeds.
5. Neither field standard nor seed standard have been prescribed for seed production in food legumes.
6. Very good seed processing facilities are available in the country.
7. A modern seed testing laboratory with sufficient staff and good equipment is available with a capacity to test about 5,000 seed samples per year.
8. The International rules for seed testing are followed in Tunisia.

Table 1. Some vital statistics about food legumes in Tunisia.

Crop	Area *	Seed rate**	Seed requirement/Yr. (Minimum, tons)	Yield***	Approx. **** multiplication ratio
1. Faba bean	40728 ¹	Large 182 Small 242	3706 4928	1775 2275	10 9
2. Chickpea	32947	88	2899	676	8
3. Lentil	857	107	92	1657	15
4. Pea	6947	194	1348	2780	14
5. <u>Phaseolus</u>	1349	103	139	600	6
Total	<u>82828</u>		<u>13112</u> tons		

* Average of the last 5 years (1981 to 1985).

** Based on experimental results (Source: Mr. Habib Halila).

*** Experimental yield (Source: Mr. Habib Halila).

**** Multiplication ratio = Yield divided by seed rate.

1/ Assuming 50% of the area (20364 ha) under large faba bean and 50% of the area under small faba beans.

Scientific Seed Production of improved cultivars of food legumes:

Seed production is a highly specialized job. The use of certified seeds of improved cultivars is a most effective and economical way for obtaining higher yields. Seeds of improved varieties should be:

- True to type
- high in germination and vigour
- physically pure
- free from seed borne diseases &
- chemically treated

To achieve the above quality attributes in seeds to the extent of 100% is difficult but realistic quality attributes may be obtained by evolving a systematic method for certified seed production.

Method of Seed Production:

Generation system of seed production is suggested which consists of using the "Breeders Seed" (pre-basic seed) for production of the "Foundation Seed" (basic seed), which in turn should be used to produce the "Certified Seed".

In a highly self pollinated crops like chickpea, lentil etc. where extent of out-crossing is very little foundation and certified seeds of these crops may be utilized for one more generation (beyond foundation or certified seed stage) to produce certified seeds. However, to stop further multiplication of such seeds beyond second generation the tag should carry the inscription like "Not fit for multiplication for further certification".

Requirements for seed production

1. Seeds should be produced on good soil with adequate irrigation facility or adequate rainfall. The area which is selected for seed production should be suitable for growing the crop. Field requirement which is specified for all the five food legumes crops (see later) should be met.
2. Generation system of seed production should be followed.
3. Adequate isolation should be provided to prevent outcrossing, disease spread and mixture of varieties by accident or by mechanical means.
4. Field inspection should be done (as suggested in the standard) to check whether requirements outlined (see later) have been maintained and to suggest roguing of other varieties, diseased and weed plants etc.
5. Sufficient precaution should be taken during harvesting and threshing to avoid mixing seeds of different varieties.
6. Seeds should be processed (cleaning, size grading etc.)
7. Seeds should be analyzed for quality attributes (Germination, physical purity, seed moisture and seed health).

The above requirements of seed production may be met by adopting the procedure of certified seed production.

Seed Certification:

1. Purpose:

The purpose of seed certification should be to maintain and make available to the public, through certification, high quality seeds of food legumes so grown and distributed as to ensure genetic identity and genetic purity. Only released varieties should be eligible for certification.

2. Classes and source of seed:

A. Breeder Seed (pre-basic seed):

It should be controlled directly by the originating plant breeder of the breeding program or institution (e.g. INRAT) and which should be the source for the initial and recurring increase of foundation seed.

B. Foundation Seed (Basic Seed):

It should be the progeny of breeder seed or in case of highly self pollinated crops like chickpea be produced from foundation seed which can be clearly traced to breeder seed. Production should be supervised and approved by the certification authority. It should be so handled as to maintain specific genetic identity and purity and should be required to conform to certification standards specified for the crop being certified. The three seed companies may be responsible for the production of foundation seeds either at their own farm or through contract growers.

C. Certified Seed:

It should be the progeny of foundation seed and its production should be so handled as to maintain genetic identity and purity as per standards specified for each crop.

In case of highly self pollinated crops certified seed may be produced from certified seed for two more generations beyond foundation seed.

Certified seed may be produced through contract growers by seed companies.

Standards:

A set of standards are fixed for certified seed production which are of two types viz:

1. Field standards
2. Seed standards

Field standards are checked during field inspection during various stages of seed crop growth by qualified and trained staff and if found to meet pre-set field standards the crop is certified. The seed crop is then harvested, threshed, cleaned and delivered at the seed processing plant for further cleaning, size grading, treating with insecticides and fungicides (optional). The seed is then tested for pre-set seed standards which are normally for analytical purity, germination, seed health and moisture content, in the seed control laboratories.

Certification standard should be realistic and should be such as to attract farmers to have deep faith in the high quality of seed and to assure them of the soundness of their investment in the purchase of seed.

Seed certification standard for faba bean, pea, Phaseolus, chickpea and lentil are suggested.

Minimum Seed Certification Standard for faba bean (Vicia faba)

1. Field Requirements:

A crop of faba bean shall not be eligible for certification if planted on land in which a crop of the same kind was grown in the previous season unless the crop in the previous season was of the same variety and was certified.

2. Field Inspection (Minimum)

Three

First: Preferably 15-25 days after sowing

Second: At flowering

Third: At maturity but before harvest.

3. Field Standard

a. Isolation distance (Minimum)

A minimum isolation distance of 200 metres for foundation seed class and 100 metres for certified seed class shall be provided from fields of other varieties and fields of the same variety not conforming to varietal purity requirements for certification .

b. Off Types (Maximum permitted at flowering)

Foundation: 0.10%

Certified: 0.20%

c. Plants affected by seed borne disease maximum permitted at the final inspection: 0.5%.

4. Seed Standard

Factor	Standard %	
	Foundation	Certified
1. Pure seed (Minimum)	98.0	98.0
2. Inert matter (Maximum)	2.0	2.0
3. Other crop seed (Maximum)	0.25	0.50
4. Germination including hard seed (Minimum)	80.0	80.0
5. Moisture content (Maximum)	11.0	11.0

Minimum Seed Certification Standard for Pea (Pisum sativum)

1. Field Requirements:

A pea crop shall not be eligible for certification if planted on land on which the same kind of crop was grown in the previous season unless the crop in the previous season was of the same variety and was certified.

2. Field Inspection (Minimum)

Three

First: Preferably 15-25 days after sowing

Second: At flowering

Third: At the pod stage

3. Field Standards:

a. Isolation distance

An isolation distance for 20 metres for foundation seed class and 10 metres for certified seed class shall be provided all around a seed field to separate it from fields of other varieties and fields of the same variety not conforming to varietal purity requirements for certification.

b. Off Types (Maximum permitted at the final inspection)

Foundation: 0.10%

Certified : 0.50%

c. Plants affected by seed borne disease, maximum permitted at the final inspection: 0.5%.

4. Seed Standard:

Factor	Standard %	
	Foundation	Certified
1. Pure seed (Minimum)	98.0	98.0
2. Inert matter (Maximum)	2.0	2.0
3. Other seeds (Maximum)	0.25	0.50
4. Germination including hard seed (Minimum)	80.0	80.0
5. Moisture content (Maximum)	11.0	11.0

Minimum Seed Certification Standard for Phaseolus vulgaris

1. Field Requirements:

A crop of Phaseolus shall not be eligible for certification if planted on land on which the same kind of crop was grown in the previous season unless the crop in the previous season was of the same variety and was certified.

2. Field Inspection (Minimum)

Three

First: Preferably 15-25 days after sowing

Second: At flowering

Third: At maturity but before harvest

3. Field Standards:

a. Isolation (Minimum)

An isolation distance shall be provided all around a seed field to separate it from fields of other varieties and fields of the same variety not conforming to the varietal purity requirements for certification.

The minimum isolation distances are as follows:

Foundation: 50 metres

Certified: 25 metres

b. Off Types

Maximum permitted (%) at the final inspection.

Foundation seed plots: 0.10%

Certified seed plots : 0.20%

c. Plants affected by seed borne disease maximum permitted at the final inspection: 0.5%.

4. Seed Standard:

Factor	Standard %	
	Foundation	Certified
1. Pure seed (Minimum)	98.0	98.0
2. Inert matter (Maximum)	2.0	2.0
3. Other seeds (Maximum)	0.25	0.50
4. Germination including hard seed (Minimum)	80.0	80.0
5. Moisture content (Maximum)	11.0	11.0

Minimum Seed Certification Standard for Lentil (Lens culinaris) and Chickpea (Cicer arietinum).

1. Field Requirements:

A crop of lentil and chickpea shall not be eligible for certification if planted on land on which the same crop was grown in the previous season, unless the crop in the previous season was of the same variety and was certified.

2. Isolation distance (Minimum)

An isolation distance of at least ten and five metres should be provided all around a foundation and certified seed crop respectively to separate it from fields of other varieties and fields of the same variety not conforming to the varietal purity requirements for certification. In addition the seed crop should be adequately isolated from disease susceptible varieties.

3. Field Inspection (Minimum):

Three

First: 15-25 days after sowing

Second: At flowering

Third: At maturity but before harvest

4. Off Types:

Maximum permitted at the final inspection:

Foundation seed plots: 0.1%

Certified seed plots : 0.5%

5. Plants affected by seed borne disease, maximum permitted at the final inspection: 0.5%.

6. Seed Standard:

Factor	Standard %	
	Foundation	Certified
1. Pure seed (Minimum)	98.0	98.0
2. Inert matter (Maximum)	2.0	2.0
3. Other seeds (Maximum)	0.25	0.50
4. Germination including hard seeds (Minimum)	80.0	80.0
5. Moisture content (Maximum)	11.0	11.0

If a seed lot meets the minimum certification standard (field as well as seed standard) the processed seed should be bagged. The seed bag must bear a tag and a seal.

The colour of the tag may be the same as prescribed for cerealseeds.

Tags, Labels and Seal

All certified seed when sold should have an official tag which will be supplied by the certification agency properly fixed to each container. The tag should contain the following information:

1. Crop and variety
2. Lot no. or Batch no.
3. Genetic purity (Minimum) in %
4. Germination (Minimum) in %
5. Physical purity (Minimum) in %
6. Other seed (Maximum)
7. Date of test, date of issue of the certificate and its validity.
8. Name and address of the certified seed producer
9. Name and address of the certification agency.

The container of the certified seed shall carry a seal of an appropriate material and no container carrying a certification tag shall be sold as certified seed if the tag or seal has either been tampered with or removed.

Seed Price

There was considerable discussion on pricing of food legumes seeds. The cost of production of seeds would be more than the cost of production of grain because of additional requirements of seed production. Therefore, cost of seed may be 50-100% more than that of grain price.

Seed Requirement:

In table 1 the requirement of seeds has been calculated to be about 13,112 tons per year. It may be subject to questioning because the seed rate for this calculation has been taken from the experimental data. Similarly, for calculation of the multiplication ratio, the experimental yield has been used. These calculations have been given as a guideline for planning the seed production to cover the sowing of the entire area (82,828 ha) with the quality seeds of improved variety in a phased manner.

It is not necessary to plant certified seeds of highly self pollinated food legumes crops every year. Farmers may be advised to purchase certified seed every 4 years. Therefore, planning for seed production may be done on the basis of 25% of the requirement i.e. about 3279 tons every year. For this amount of certified seed 38.58 and 351.4 tons of breeder and foundation seed respectively are required (Table 2).

Table 2. Seed requirements (Tons), calculated from Table 1.
25% of the total requirement.

S. No.	Certified	Foundation	Certified
1. Faba bean (large)	927	92.7	9.27
(small)	1232	136.8	15.20
2. Chickpea	725	90.6	11.32
3. Lentil	23	1.5	0.10
4. Pea	337	24.0	1.72
5. <u>Phaseolus</u>	<u>35</u>	<u>5.8</u>	<u>0.97</u>
Total	<u>3279</u>	<u>351.4</u>	<u>38.58</u>

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