FOOD LEGUME IMPROVEMENT PROGRAM

RESEARCH AND TRAINING PLANS 1985/86 SEASON

International Center for Agricultural Research in the Dry Areas
ICARDA
October 1985

Food Legume Improvement Program

Research and Training Plans

1985/86 Season

International Center for Agricultural Research in the Dry Areas
ICARDA

October 1985

CONTENTS

I. INTRODUCTION

The Food Legume Improvement Program (FLIP) conducted its program planning meetings for the 1985/86 season on 25 and 26 September 1985. The schedule for these meetings is given as Appendix I. All the Senior staff members, the graduate students and the research assistants of FLIP attended the meetings. Concerned senior scientists and support staff from other programs also participated in the meetings. This permitted good discussion also on those projects that are jointly conducted with other programs. Program of training in the food legumes was also discussed.

The program as finalised in these meetings is presented in this document. The details given here pertain to the projects that are to be conducted by the staff of FLIP and the collaborating Programs at the ICARDA headquarters, at ICARDA's principal station at Tel Hadya and at its sub-sites in Syria and Lebanon. Also a detailed listing of the International Trials and Nurseries, that were distributed to the collaborating scientists of various national programs as a part of International Testing Program, has been given. The program of research as finalised in the VI Coordination Meeting of the ICARDA/IFAD Nile Valley project held at Cairo from 9-13 September 1985 has been presented in a separate document - the Proceedings of the VI Annual Coordination Meeting of the Nile Valley Project. Similarly, the program of work in the ICARDA/INRAT Cooperative Project on Food Legume Improvement, as finalised in the Annual Coordination Meeting held in Tunis from 16-19 September 1985, has been included in a separate document.

II. FABA BEAN IMPROVEMENT

2.1. FABA BEAN BREEDING

OBJECTIVES

1. Supply lines for breeders through the international testing system and the supply of segregating populations and progenies for individual country selection.

2. To maintain a world germplasm collection of faba bean and develop a working pure line collection for evaluation from the heterogeneous lines received.

3. Introduction of chocolate spot, ascochyta blight, and rust resistance into well adapted, high yielding lines with good agronomic characteristics.

4. Screening for Orobanche resistance and introduction of such resistance into high yielding agronomically suitable lines.

5. Develop alternative plant types (determinate and Independent Vascular Supply) which take advantage of favorable environments to produce high yields by control of vegetatives growth and flower drop.

6. Study outcrossing in faba beans and develop methods for pollination control.

7. Study the use of synthetics, composites and F_1 hybrids in faba bean.

FABA BEAN BREEDING PROJECT 1

Title: Faba Bean Elite Yield Trials (Large and Small).

Objective: To test selections from advanced yield trials, international screening nurseries, and lines delayed to advance to international nurseries because of seed supply, in replicated trials.

Locations: FBEYT-L-1 at Tel Hadya, Syria; Terbol, Lebanon and Tunisia. All others at Tel Hadya, Syria and Terbol, Lebanon.

Treatments:

Trial	No. Entries	Design	Replicates
FBEYT-L-1	49	Triple Lattice[1]	3^1_1
FBEYT-L-2	34	RBD	3^1
FBEYT-L-3	30	RBD	2_1
FBEYT-S-1	49	Triple Lattice[1]	3^1_1
FBEYT-S-2	48	RBD	3^1
FBEYT-S-3	20	RBD	2

Large Trial Checks = ILB 1814, ILB 1817.
Small Trial Checks = ILB 1814, ILB 1816.

[1] Tel Hadya, other locations dependent on seed supply.

Scientist: Dr. Robertson.

FABA BEAN BREEDING PROJECT 2

Title: Faba Bean Advanced Yield Trials (Large and Small).

Objective: To test selections from preliminary yield trials in replicated yield trials at two locations.

Locations: Tel Hadya, Syria.
Terbol, Lebanon.
FBAYT-R - Tel Hadya only.

Treatments:

Trial	No. Entries
FBAYT-L-1	100
FBAYT-S-1	100
FBAYT-R	36

Large Trial Checks = ILB 1814, ILB 1817.
Small and Rainfed Trial Checks = ILB 1814, ILB 1816.

Design: Triple lattice (Simple lattice at Terbol if seed supply is deficient).

Scientist: Dr. Robertson.

FABA BEAN BREEDING PROJECT 3

Title: Faba Bean Advanced Yield Trials-Determinate.

Objectives:

a. To identify genotypes in the determinate background with high yielding ability.
b. To assess the effect of planting date on determinate lines.
c. To study the relation of yield and yield components in determinate lines.

Locations: Tel Hadya and Lattakia, Syria.

Treatments:
(a) FBAYT-Det-1. Sixteen entries, 15 determinate and ILB 1814 as check. Planted October 20 and November 20, 1985 at Tel Hadya and end of October at Lattakia.
(b) FBAYT-Det-2. Fourty-nine entries, 45 determinate and ILB 1814 and ILB 1817 as checks (double replicated).

Design:
(a) FBAYT-Det-1. Tel Hadya-Split Plot (3 reps); Lattakia-Triple lattice.
(b) FBAYT-Det-2. Tel Hadya - triple lattice.
Lattakia - simple lattice.

Scientists: Dr. Robertson, Dr. Silim.

FABA BEAN BREEDING PROJECT 4

Title: Faba Bean Preliminary Yield Trials (Large, Small, Determinate, and Disease Resistance).

Objective: To test selections from progeny rows in replicated testing at two locations.

Locations: Tel Hadya, Syria.
Terbol, Lebanon (Large and Small).
Lattakia, Syria (Determinate only).

Treatments:

Trial	No. Entries	Design
FBPYT-L-1	100	Triple lattice [1]
FBPYT-L-2	100	Triple lattice [1]
FBPYT-L-3	100	Triple lattice [1]
FBPYT-S-1	100	Triple lattice [1]
FBPYT-S-2	49	Triple lattice [2]
FBPYT-Det.-1	100	Triple lattice [2]
FBPYT-Det.-2	100	Triple lattice [2]
FBPYT-Det.-3	49	Triple lattice [2]
FBPYT-Dis.	49	Simple lattice

[1] At Terbol simple lattice if seed insufficient.
[2] At Lattakia simple lattice.

Large Trial Checks - ILB 1814, ILB 1817.
Small, Determinate, and Disease Trial Checks - ILB 1814, ILB 1816.

Scientist: Dr. Robertson.

FABA BEAN BREEDING PROJECT 5

Title: Faba Bean Preliminary Screening Nurseries (Large, Small, Determinate and Disease Resistance).

Objective: To test selections from progeny rows in an augmented design.

Locations: Tel Hadya, determinate also at Lattakia.

Treatments:

Trial	No. Test Entries
FBPSN-Large	900
FBPSN-Small	200
FBPSN-Determinate	800
FBPSN-Disease	400

Large Nursery checks - ILB 1814, ILB 1817.
Small, Determinate,and Disease Nursery Checks - ILB 1814, ILB 1816.

Design: Augmented Design with systematic check (ILB 1814).

Scientist: Dr. Robertson.

FABA BEAN BREEDING PROJECT 6

Title: Faba Bean Breeding Nurseries.

Objective: To develop lines for testing in screening nurseries and replicated trials.

Location: Tel Hadya, Syria.

Treatments:
(a) F_2 Populations - 500 crosses.
(b) F_3^2 Progeny Rows - 7000 lines.

Design: Systematic with checks.
(a) F_2 Populations - ILB 1814, ILB 1816.
(b) F_3^2 Progeny Rows - ILB 1814, ILB 1816, ILB 1817, ILB 1270.

Scientists: Dr. Robertson, Dr. Sherbeeny.

FABA BEAN BREEDING PROJECT 7

Title: Faba Bean Screenhouse Increase.

Objective:
(a) Pure line increase of germplasm collection.
(b) Advanced lines increase.

Location: Tel Hadya, Syria.

Treatments: (Same as given in objectives) 42 screenhouses = 8820 rows.

Design: Systematic.

Scientists: Dr. Sherbeeny, Dr. Robertson.

FABA BEAN BREEDING PROJECT 8

Title: Faba Bean Crossing Block.

Objectives:
(a) Development of high yielding genotypes with resistance to Ascochyta fabae, Botrytis fabae, Uromyces fabae, and Orobanche crenata.
(b) Develop lines with earliness.
(c) Develop well adapted, agronomically suitable lines with alternative plant types such as determinates and Independent Vascular Supply (IVS) types.

Location: Tel Hadya, Syria.

Treatments:
(a) 300 primary crosses.
(b) 200 secondary crosses.

Design: Systematic.

Scientist: Dr. Robertson.

FABA BEAN BREEDING PROJECT 9

Title: Faba Bean Increase Plots.

Objective: Increase of lines in International, Elite, and Advanced trials.

Location: Tel Hadya, Syria.

Treatments:

(a) All entries in the International Yield Trials, International Screening Nurseries, and Elite Yield Trials will be increased in Brassica isolation:
Use 12 x 18m for International Yield Trial entries.
12 x 12m International Screening Nurseries.
6 x 12m Elite Yield Trials.

(b) All advanced yield trial lines in Brassica Isolation Plots.
Large seeded 6 x 6m plot per entry.
Small seeded 4 x 6m plot per entry.
Approximately 6 ha land.

Design: Systematic

Scientist: Dr. Robertson

FABA BEAN BREEDING PROJECT 10

Title: Faba Bean Off-Season Nursery - Shawbak.

Objective: Increase of lines and generation advance.

Location: Shawbak, Jordan.

Treatments: Lines and single plant selections, approximately 1.2ha.

Design: Systematic.

Scientists: Dr. Robertson, Dr. Sherbeeny.

FABA BEAN BREEDING PROJECT 11

Title: Faba Bean Outcrossing Counts 1985.

Objectives/Introduction:

(a) To obtain outcrossing counts for experiments grown in the 1984/85 season by counting the number of plants with black hilum and the total number of plants.

(b) One experiment was designed to study the effect of plot size and Brassica napus isolation on outcrossing. Also, the amount of bare ground and Brassica used for isolation was studied.

(c) The second experiment was to study the amount of outcrossing on bare ground with varying row sizes and patterns of faba beans.

An additional part of this experiment was to determine the amount of outcrossing within progeny rows surounded by Brassica with one pattern of row placement.

Treatments: In 1984/85

(a) Experiment 1.
  (i) Brassica isolation - 4m, 2m and 1m isolation.
  Bare check - 4m, 2m, and 1m isolation.
  (ii) Brassica isolation (4m) - 6 x 12m plot.
  12 x 12m plot.
  12 x 18m plot.

(b) Experiment 2. (Factorial set of treatments)
  (i) 1m, 4m, and 9m row length.
  (ii) 1row/1row, 2row/2row, 4row/4row Black/White hilum marker.
  (iii) For 1m row 1/1 rows there is comparison with Brassica isolation from progeny rows.

Design: Completely Random Design.

Scientist: Dr. Robertson.

FABA BEAN BREEDING PROJECT 12

Title: Faba Bean Outcrossing 1986.

Objectives:

(a) To determine the effect of plot size on outcrossing with bare ground.

(b) To study the amount of outcrossing with different row lengths and patterns of black/white hilum lines. Additionally, one pattern will be grown with Brassica isolation to determine the amount of outcrossing within progeny rows surrounded by Brassica.

Treatments:

(a) Experiment 1.
On bare ground use 6 x 12m, 12 x 12m and 12 x 18m white hilum marker plots surrounded by black hilum marker plots to measure outcrossing.

(b) Experiment 2.
On bare ground use row lengths of 1m, 4m, and 8m. With each row length use 1/1, 2/2 and 4/4 patterns of Black/White hilum rows. This will be used to obtain outcrossing rates in 9 pattern and row length combinations. Additionally the 1m row length with 1/1 Black/White hilum pattern will be grown in Brassica isolation plots using the progeny rows to measure outcrossing within Brassica isolated plots.

Design: Completely Randomized Design.
(a) Experiment 1 - 4 replicates.
(b) Experiment 2 - 25-50 replicates.

Scientists: Dr. Robertson, Mr. Joubi and Senior Entomologist.

FABA BEAN BREEDING PROJECT 13

Title: Faba Bean Row Length Study for Screening Nurseries etc.

Objective: To study the efficiency of two replicates of 2m rows versus one replicate of 4m rows in an augmented design.

Location: Tel Hadya.

Treatments: Lines from FBIYT-S-86 and FBISN-S-86.

Design: Randomized Complete Block with 2 replicates.

Scientist: Dr. Robertson.

FABA BEAN BREEDING PROJECT 14

Title: Faba Bean Selection Experiment.

Objectives/Introduction:
(a) To continue a project following selection in Faba Beans from F_2 populations, through F_3 progeny rows and now a F_4 Preliminary Screening Nursery.
(b) To determine yield component(s) for selection for high yield.
(c) To study relationships of yield and yield components.
(d) To calculate heritabilities for yield and yield components.
(e) To determine efficency of various selection indices.

Location: Tel Hadya, Syria.

Treatments: 15 crosses (5 Large x Large, 5 Small x Large, 5 Small x Small seeded genotypes).
200 lines per cross.
Parents.

Design: Augmented Design.

Scientists: Dr. Robertson, Trainee, Dr. El-Sherbeeny.

FABA BEAN BREEDING PROJECT 15

Title: Faba Bean Heterosis Trial.

Objectives/Introduction:
(1) To study heterosis and inbreeding depression in faba beans.
(2) To study the effect of heterosis on yield components.
(3) To look at reciprocal effects on yields of F_1s.

Location: Tel Hadya; Syria, Terbol, Lebanon.

Treatments:
(a) Ten crosses; and reciprocals.
(b) 16 parents and checks.

Design: Triple Lattice.

Scientist: Dr. Robertson.

FABA BEAN PROJECT 16

Title: Faba Bean BPL Evaluation Trial.

Objectives/Introduction:
(1) To evaluation high cycle (6 or more) BPL accessions for the IBPGR/ICARDA descriptor list.
(2) To evaluate the same lines for Aphis fabae resistance (see Legume Entomology Experiment-Faba bean 3).
(3) To evaluate the same lines for quality characteristics. (see Faba Bean Quality Project 3).

Treatments: Approximately 1500 BPL accessions selfed 6 or more times. Four repeated systematic checks, ILB 1814, Reina Blanca, Leb.L.Large, Leb.L.Small

Design: A series of 75 Randomized Complete Block Experiments each having 20 test lines and four checks (common to all 75 trials). These will be analyzed and combined using the common checks.

Scientists: Dr. Sherbeeny, Dr. Robertson, Dr. Williams, Mr. Nakkoul, and Mr. Joubi.

FABA BEAN BREEDING PROJECT 17

Title: Faba Bean Disease Resistance Isozyme Analysis

Objective: To study relationships among disease resistance sources (Ascochyta fabae, Uromyces fabae, and Botrytis fabae) using isozyme banding patterns. Esterases, protein and peroxidases banding patterns will be studied.

Location: Tel Hadya

Treatments: Approximately 20 resistance sources for each disease, seeds and plant tissue.

Design: Systematic.

Scientists: Dr. Robertson, Dr. Yawooz, Dr. Hanounik.

FABA BEAN BREEDING PROJECT 18

Title: Faba Bean ILB passport information catalogue.

Objective: To catalogue passport information for the ILB collection data such as DON.ORG., DON.NO., COLL.ORG., COLLECTOR, D.COL. ORIGIN, D.RES., PROVINCE, Variety/Pedigree, Remarks, to be catalogued to make easier and more efficient use of the faba bean germplasm collection and for exchange of information with other institutes with faba bean germplasm collections.

Location: Tel Hadya

Treatments: 3200 ILB accessions

Scientists: Dr. Sherbeeny, Dr. Yawooz, Dr. Holly, Dr. Robertson.

FABA BEAN BREEDING PROJECT 19

Title: Testing Faba Bean Genotypes for Cold Tolerance.

Objectives: To test for cold tolerance in some promising diverse genotypes. These test genotypes showed high level of tolerance to cold during the 1984/85 season.

Location: Tel Hadya.

Treatments:
1. Date of sowing (2) October and December - main plot.
2. Genotypes (20-25) + 3 checks - sub plot.

Design: Split plot with 2 replicates.

Scientists: Dr. Sherbeeny, Dr. Silim, Dr. Saxena.

FABA BEAN BREEDING PROJECT 20

Title: Faba Bean Wide Crosses

Objective/Introduction: To attempt crosses within Vicia section Faba between Vicia faba and V.narbonensis, V.bithyrica, V.melanops, V.lutea, V.johannis, and V.serratifolia.

Location: Reading University, U.K.

Scientists: Drs. Pickersgill and Jones (University of Reading), Dr. Robertson (ICARDA).

FABA BEAN BREEDING PROJECT 21

Title: Faba Bean Wide Adaptability

Objective: To produce a faba bean germplasm pool with wide adaptability through crossing of diverse lines and multi-locational testing for selection for recombination.

Locations: Tel Hadya, Syria; Stuttgart, Germany; and Tunis, Tunisia.

Treatments: Composite of 25 crosses between 5 Mediterrean types and 5 N.European type faba beans. One cycle of composite crossing among F_2's of the original 25 crosses. 5000 seed per location.

Design: Systematic.

Scientists: Dr. von Kittlitz (Univ. Hohenheim), Dr. Robertson (ICARDA-Syria).

2.2. FABA BEAN PATHOLOGY

GENERAL OBJECTIVES

The pathology program is designed to:

1. Survey faba bean diseases
2. Develop integrated disease control strategies based on:
   - Host resistance and
   - Chemicals.
3. Conduct epidemiological studies to provide a better understanding of disease development.
4. Strengthen National Programs through training, and screening facilities.

FABA BEAN PATHOLOGY PROJECT 1

Title: Screening for Disease Resistance:

Location: Lattakia sub-site

Nurseries:

Nursery	No. of test entries	No. of spreader rows	Total (1m rows)
BPL-Bot. 86	150	80	230
F4 Prog. Bot. 86	68	36	104
F6 Prog. Bot. 86	63	34	97
F6 Prog. Bot. 86	42	22	64
BOT. Rest. Inb. 86	44	23	67
Seed Multip. Bot. x Bot. 86	100	-	100
F2 Prog. Bot. 86	15F2 populations	-	900
		Total Bot.	1562
BPL-Asco. 86	169	87	256
F3 Prog. Asco. 86	76	40	116
F5 Prog. Asco. 86	9	4	13
F6 Prog. Asco. 86	90	50	140
Asco. Rest. Inb. 86	25	12	37
Seed Multip. Asco. x Asco. 86	100	-	100
F2 Prog. Asco. 86	30F2 populations	-	3000
		Total Asco.	3662

BPL-Rust	100	50	150
Rust Rest. Inb. 86	35	18	53
		Total Rust	203
Seed Multip. Stem Nem.	13	-	13
		Grand Total	5440

Scientists: Drs S.B.Hanounik, L.D.Robertson & Mr. N.Maliha.

FABA BEAN PATHOLOGY PROJECT 2

Title: Screening of yield trials for disease resistance

Location: Lattakia sub-site

Nurseries:

Nursery	No. of entries	No.of rows per entry	Replicates	Total No. of rows (4m)
FBIYT-L-86	18	4	2	144
FBIYT-S-86	18	4	2	144
FBISN-L-86	40	1	1	40
FBISN-S-86	71	1	1	71
FBIF3N-86	52	4	1	208
			Total No. of rows	607

Scientists: Drs S.B.Hanounik & L.D.Robertson

FABA BEAN PATHOLOGY PROJECT 3

Title: Integrated Control

Objectives: To study the efficacy of combining genetic resistance and chemicals on development of Ascochyta blight.

Location: Jable Research Station-Lattakia

Lines:

1. L83135-3-42 (resistant)
2. ILB 1814 (moderately resistant)
3. Giza-4 (highly susceptible)

Chemicals:

1. Untreated control
2. Bravo-500 (chlorothalonil 40.4%), applied once using 2.5 ml product/L of water, one day before artificial inoculation, at 10% flowering.
3. Sonax C52 (20g etaconazol + 500g captan/kg), as a seed dressing treatment employing 5g per one kg of seeds.

Design: Split plot with chemicals in the main plot and faba bean lines in the sub-plot.

Replications: 3 replicates

Size of plot: 1 x 1 m^2

No. of rows/plot: 3 rows, 1 m long and 50 cm apart.

Spray volume: 600 L/ha

Time of artificial inoculation: at 10% flowering.

Inoculum density: 300,000 spores/ml.

Analysis of variance:

Source of variation	D.F.
Replications	2
Chemicals	2
Error (a)	4
Lines	2
Chemicals x Lines	4
Error (b)	12

Scientists: Dr. S.B.Hanounik & Mr. N.F.Maliha

FABA BEAN PATHOLOGY PROJECT 4

Title: Epidemiology of chocolate spot:

Objectives: To assess the effects of certain faba bean genotypes on the speed of the epidemic process of chocolate spot in the field.

Location: Lattakia sub-site

Genotypes: BPL 710, 1179, 110, 112, 1278, 1821, ILB 1814, and Rebaya-40.

Design: Complete randomized block

Replications: 5

No. of rows/plot: 5

Time of artificial inoculation: 8 weeks after planting

Inoculum density: 500,000 spores/ml.

Analysis of variance:

Source of variation	D.F.
Replications	4
Treatments	7
Error	28
Total	39

Scientists: Dr. S.B.Hanounik & Mr. N.F.Maliha

FABA BEAN PATHOLOGY PROJECT 5

Title: Epidemiology of Ascochyta Blight

Objectives: To asses the effects of certain faba bean genotypes on the speed of the epidemic process of Ascochyta blight in the field.

Location: Lattakia sub-site.

Genotypes: BPL 74, 465, A2, 2485, 818, 646, 471, 472, 230, 460, ILB 1814, and Giza-4.

Design: Complete randomized block.

Replications: 5

No. of rows/plot: 5

Time of artificial inoculation: at 10% flowering

Inoculum density: 300,000 spores/ml

Analysis of variance:

Source of variation	D.F.
Replications	4
Treatments	11
Error	44
Total	59

Scientists: Dr. S.B.Hanounik & Mr. N.F.Maliha

FABA BEAN PATHOLOGY PROJECT NO. 6

Title: Virus resistance screening in faba beans

Objective: Survey of virus diseases of faba bean carried out in the spring of 1985, as well as previous reports, indicated that the most common viruses of faba beans in Syria and the region are bean leaf roll virus (BLRV) and bean yellow mosaic virus (BYMV). Both viruses are transmitted by aphids in the persistent (BLRV) and non persistent (BYMV) manner. Hence chances of spread is high, when aphid population is large and the virus inoculum in present in the area. Screening for these two viruses will be initiated during the growing season of 1985/1986 in both Aleppo and Lattakia.

Experimental Details:

A. Screening for BYMV resistance in Tel Hadya, Aleppo.

Screening will be conducted in the plastic house. Faba bean plants will be inoculated mechanically in the seedling stage and will be observed for their reaction to the virus 4-8 weeks after inoculation. The following material will be included in this test:

Source of material	No. of lines
Sudan (selections from 1984/85)	602
ICARDA breeding lines	20
ICARDA BPL's	50
TOTAL	672

B. Screening for BLRV resistance in Lattakia.

Screening will be conducted in a screen house. Plants will be inoculated with BLRV by aphids, which will be reared in Lattakia for that purpose. Plants will be observed for their reaction to BLRV until harvest. Yield data will also be collected.
The following material will be included in this test:

Source of material	No. of lines
Sudan (Selections for 1984/85)	320
ICARDA breeding lines	20
ICARDA BPL's	100
TOTAL	440

Location: Tel Hadya and Lattakia

Scientists: K. Makkouk, Salim Hanounik, L.D. Robertson, M. El-Sherbeeny.

2.3. FABA BEAN ENTOMOLOGY

General Objectives:

1. Survey and identification of insect pests.
2. Determination of the economic importance of insect pests affecting faba beans in the region.
3. Screening for host plant resistance to key pests.
4. Development of alternate methods of control which can be integrated with host plant resistance.

FABA BEAN ENTOMOLOGY EXPERIMENT NO: 1

Title: Determination of Insect Control Recommendations for Faba Beans.

Objective: To further define the economic importance of Sitona and to develop precise information on the timing of applications for aphid control.

Location: Tel Hadya.

Treatments: The eight combinations of three factors(Sitona control; early aphid control, late aphid control) at two levels (control; no control).

Design: RCB, 4 repls. Plot size: 16 rows x 6m x 0.45m

Observations:
1. Sitona VDS, 10 plants/plot, 3 times/season.
2. Sitona % LD, 5 plants/plot, 3 times/season.
3. Sitona % ND, 5 plants/plot, 3 times/season.
4. Aphid vis and VDS every week.
5. Aphid % stems infested 2-3 times/season.
6. Thrips/flower, 10 flowers/plot, 2 times/season.
7. Bruchus, 10 pods/plot. once
8. Seed yield.

Scientist: Mr. A. Joubi and Senior Entomologist

FABA BEAN ENTOMOLOGY EXPERIMENT NO: 2

Title: Development of Aphid Control Recommendations based on Different Population and Damage Levels.

Objective: To determine critical damage and population levels for aphid control on faba beans.

Location: Tel Hadya.

Treatments:

1. Full protection
2. Sprayed once at grade 2 of damage.
3. Sprayed once at grade 3 of damage.
4. Sprayed once at grade 4 of damage.
5. Sprayed once when 5% of the stems be colonized.
6. Sprayed once when 10% of the stems be colonized.
7. Sprayed once when 20% of the stems be colonized.
8. Sprayed once when 30% of the stems be colonized.
9. Sprayed once when 50% of the stems be colonized.
10. Sprayed once when 70% of the stems be colonized.
11. Sprayed once when 70% of the stems be colonized.
12. Check.

Design: RCB, 4 reps. Plot size: 16 rows x 6m x0.45m.

Observations:

1. Aphid VDS and VIS every week.
2. % stems infested with aphids 2-3 times/season.
3. Thrips/flower, 10 flowers/plot, 2 times/season.
4. Pods/plant in 10 plants/plot at harvest.
5. Seeds/pod in 10 plants/plot at harvest.
6. B.Y. + S.Y./plant in 10 plants/plot at harvest.
7. Seed yield.

Scientists: Mr. A. Joubi and Senior Entomologist.

FABA BEAN ENTOMOLOGY EXPERIMENT NO 3

Title: Screening of Faba Bean Breeding Lines for Resistance to Aphids.

Objective: To measure the levels of resistance to aphids in new faba bean breeding lines.

Location:

Tel Hadya (plastic house) for Aphis fabae.
Cairo (laboratory) for Aphis craccivora.

Treatments:

Tel Hadya: 1500 genotypes.
In Cairo : approximately 2000 lines, precise number to be determined by Egypt and Sudan national programs.

Design: Unreplicated initial screening of ca. 1500 BPL accessions. 81 lines to be rescreened in three reps.

Observations:
1. VDS in unreplicated genotypes.
2. VDS and vis and No. of aphids/plant every week in 81 lines replicated 3 times for rescreening.

Scientists: Dr. L.D.Robertson, Mr. A.Joubi and Senior Entomologist.

FABA BEAN ENTMOLOGY EXPERIMENT NO 4

Title: Evaluation of the Economic Importance of the Faba Bean Stemborer.

Objective: To measure yield losses associated with increasing levels of infestation by Lixus algirus.

Location: Lattakia, Tel Hadya.

Treatments: Infestation with 0 pairs/m^2
3 pairs/m^2

Design: RCB, 3 reps. Plot size: 10 rows x 6m x 0.45m

Observations:
1. No. of holes/stem in 20 stems/plot every two weeks.
2. No. of infested stems in 20 stems/plot every two weeks.
3. No. of eggs, larvae, pupae and adults in 20 stems/plot every two weeks.
4. % lodging at harvest.
5. Seed yield.

Scientists: Mr. A. Joubi and Senior Entomologist.

FABA BEAN ENTOMOLOGY EXPERIMENT NO 5

Title: Pollination Studies.

Objective: To assess the efficiency of faba bean isolation mechanims.

Location: Tel Hadya.

Treatment: See Faba Bean Breeding Projects.

Scientists: Dr. L. Robertson, Mr. A. Joubi and Senior Entomologist.

2.4. FABA BEAN QUALITY

FABA BEAN QUALITY PROJECT 1

Title: Evaluation of advanced faba bean lines for protein content and seed size.

Objective: To monitor in relation to the local, the protein content, and 100 seed weight of advanced faba lines.

Location: Tel Hadya (Laboratory).

Trial:

BIYT-L		EYT-L-1
BIYT-S		AYT-S-1
	BRYT-Rain	AYT-L-1
	BRYT-Irr.	AYT-R
	EYT-S-1	

For protein content, and 100 seed weight. Seeds of 1985/86 season trial for 1 location will be used.

Variables: Protein content, NIR (Neotec 51A).
100 seed weight, Counting.

Scientists: Dr. Robertson, Dr. Williams, Mr. Nakkoul.

FABA BEAN QUALITY PROJECT 2

Title: Evaluation of seed and straw quality of entries in Faba Bean Protein Trial.

Objective:
(i) To study the change in protein content in some elite lines in different locations.
(ii) To evaluate the straw quaity of these lines.
(iii) To establish correlation between seed protein content and straw quality.

Trials: FBPIT 20 lines, 5 locations
T.H., Jindersi, Lattakia, Terbol, Edlib.

Treatments: 10 BPL high and 10 low protein lines + 1 check.

Variables: Protein content NIR, Neotec 51A.
Straw quality.

Scientists: Dr. Robertson, Dr. Williams, Mr. Nakkoul.

FABA BEAN QUALITY PROJECT 3

Title: BPL Screening for nutritional quality.

Objective: To fix some information about quality.

Location: T.H. Laboratory.

Treatments: Analysis of 1500 lines from BPL.

Variables: Protein content, methionine, vicine, convicine, Fatty acid. This is subject to the identification of appropriate wave length for Neotec for vicine, convicine and methionine determination.

Scientists: Drs. El-Sherbeeny, Robertson, Williams and Mr. Nakkoul.

FABA BEAN QUALITY PROJECT 4

Title: Effect of environmental conditions on the hard-seeded-ness and protein content of seeds faba bean genotypes and on the straw quality.

Objectives: Evaluation of environmental effects and agronomic variables on the seed and straw quality of 4 genotypes of faba bean.

Location: Tel Hadya Laboratory.

Treatments: As described in Faba Bean Agronomy Project No. 6.

Variables: Hard-seeded-ness, protein content of seed, straw quality.

Scientists: Drs. Silim, Williams, Saxena and Mr. Nakkoul.

2.5. FABA BEAN AGRONOMY/PHYSIOLOGY

GENERAL OBJECTIVES

One of the major objectives in faba bean improvement is to increase yield through improved total biological yield and increased partitioning of assimilates to reproductive parts. The main emphasis in Physiology and Agronomy research, therefore, is towards providing physiological understanding to achieve this objective (experiments 1-4). The remaining part of work (experiments 5-9) has diverse interest and the objectives indicated under individual topics.

FABA BEAN AGRONOMY/PHYSIOLOGY EXPERIMENT 1

Title: Reproductive growth and dry matter partitioning studies in faba bean genotypes of differing plant type.

Introduction: Yield potential of a crop under favourable environment is largely determined by its efficient utilization of light for dry matter production. But perhaps the next most important requirement is the favourable partitioning of the dry matter between the economic yield and the rest of the plant. In conventional faba bean the high per cent of flower and pod shed results in poor partitioning of the total dry matter to the seeds. To overcome this problem, a number of new lines with either independent vascular supply (IVS) to each flower or determinate growth habit have been developed.

Although a number of assimilate partitioning studies have been carried out on Vicia faba, only a limited number have been conducted on IVS and determinate materials. An investigation was therefore undertaken to resolve how the pattern of assimilate partitioning differed between the conventional indeterminate, IVS and determinate lines with a view to providing physiological guide lines for further breeding strategies.

Objective: Study the flowering and podding patterns and dry matter partitioning in the four genotypes of faba beans with contrasting growth habits.

Location: Tel Hadya (A 22).

Treatment : A combination of 4 genotypes and 2 population levels.

Four genotypes:
i) Independent vascular supply line (IVSFG),
ii) determinate mutant
iii) Syrian local large, and
iv) Giza-3

Two population: 22 and 44 plants/m^2
(45 x 5 cm; 45 x 10 cm)

Design: Single-split-plot with four replications.

Analysis of variance:

Source of variation:	DF
Replications	3
Genotype	3
Error (a)	9
Population	1
Genotype x population	3
Error (b)	12
	31

Note: The trial was started last year, but failed due to frost. Hence it is a new experiment. N^{15} technique will be used for assessing the symbiotic nitrogen fixation.

Scientists: Drs S.Silim and M.C.Saxena

FABA BEAN AGRONOMY/PHYSIOLOGY EXPERIMENT 2

Title: Mineral nutrient accumulation and distribution studies in faba bean grown under rainfed and assured moisture supply.

Introduction: Higher plants require 16 essential elements for growth (C, H, O, N, P, K, Ca, Mg, S, Fe, B, Mn, Cu, Zn, Mo and Cl). However, the mineral requirement of legumes is somewhat more complex than that of other plant species because of the special symbiotic relationship existing between the legume host and associated rhizobial bacteria.

Although a lot of research has been done on nutrient requirements and nitrogen fixation of faba bean in Europe and North America, little work has been carried out in the Mediterranean region where the crop is rainfed and grown in winter. A trial is therefore being initiated using faba beans cultivar ILB 1814 to:

(i) Study the uptake and distribution of nutrients at different growth stages.
(ii) Investigate nitrogen fixation
(iii) Compare different techniques used in measurement of N_2 fixation.

Objectives: Study the pattern of mineral nutrient uptake, distribution and mobilization of essential mineral nutrients as a function of

time. The nitrogen accumulation to be partitioned between that accumulated from soil + fertilizer and that from symbiosis using N 15 technique. Simultaneous assay for the nitrogenase enzyme will permit comparison of the two methods of quantification of symbiotic N_2 fixation. In site acetylene reduction technique will be used.

Location: Tel Hadya.

Treatments: Moisture supply:
a) Rainfed
b) Assured moisture supply through supplemental irrigation

Design: Randomised block design with six replications. Each plot will have six to eight well guarded microplots for sampling at 6 to 8 stages of growth to cover the entire crop duration.

Note:

1. The samples will be analysed for total N, P and K at Tel Hadya. N15 assay will be carried out at IAEA. Other macro- and micro-nutrients will be analysed through the collaborative arrangements with Dr El-Fouly of NRC, Dokki, Egypt. Acetylene reduction assay will be carried out in collaboration with microbiology group.

2. New study. This was started last year but failed due to frost.

Scientists: Drs S.Silim and M.C.Saxena

FABA BEAN AGRONOMY/PHYSIOLOGY EXPERIMENT 3

Title: Response to exogenous application of NAA growth regulator in faba bean.

Introduction: Faba bean is genetically capable of producing far greater yields than are generally obtained under field conditions. It is estimated that faba bean plant sheds as much as 70 to 80% of its reproductive bodies as flowers and young pods. If some of the flowers and pod shed presently are retained, it would be possible to increase yield. It is hypothesised that shortage of some endogenous growth substances may be responsible for the flower and young pod shed and there is a possibility to reduce this loss by application of growth regulators exogenously at an appropriate stage of growth. The growth regulator being evaluated is NAA which has been found to improve pod and seed set in some food and forage legumes.

Objective: To investigate the potential of plant growth regulator, NAA (planofix), as a means of increasing faba bean yield.

Treatment:

A. Time of application:
   (1) At the beginning of flowering
   (2) At the beginning of and 100% flowering
   (3) At beginning and 100% flowering and 100% pod set.

B. Growth regulator: (NAA)
   (1) Control
   (2) 10 ppm
   (3) 20 ppm
   (4) 30 ppm

Design: Split plot with A in main plot and B in subplot, 4 replications

Location: Tel Hadya

Analysis of variance:

Source of variation	DF
Replications	3
Time (T)	2
Error (a)	6
Hormone Conc. (H)	3
H x T	6
Error (b)	27
TOTAL	47

Scientists: Drs S.Silim and M.C.Saxena

FABA BEAN AGRONOMY/PHYSIOLOGY EXPERIMENT 4

Title: Evaluation of the productivity and water use efficiency of some promising genotypes for rainfed conditions at two plant populations and two row spacings.

Introduction: In regions with low rainfall, growth of faba beans is restricted resulting in inadequate ground cover and evaporative losses of moisture from the soil. At a given population, one way of cutting down moisture evaporation from the bare ground while increasing intercepted radiation and thus increase productivity and water use efficiency is to narrow inter-row spacing and increase intra-row distance. Starting in 1983/84, a trial was initiated and will be continued using selected faba bean genotypes that do well under low rainfall to investigate the performance and water use efficiency at 2 populations and 2 row spacings.

Objectives: To investigate the potential productivity of some promising genotypes for rainfed condition by optimising the plant

population and plant geometry. Also to identify attributes that lead to increased productivity under rainfed conditions.

Treatments:

A. Genotypes: 1) 80S 64214; 2) 80S 43856; 3) 80S 44358; 4) 80S 45057; 5) 80S 44815; 6) 80S 44367; 7) 80L 90121 and 8) ILB 1814.
B. Population: 22.0 and 44.0 plants/m^2
C. Row spacing: 22.5 and 45.0 cm

Design: Factorial with 3 treatment factors (G x P x R), 4 replications

Location: Tel Hadya

Analysis of variance:

Source of variation	DF
Replications	3
Genotypes G	7
Row spacing R	1
G x R	7
Population density P	1
G x P	7
R x P	1
G x R x P	7
Error	93
TOTAL	127

Note: This will be the third year of this study. Soil moisture study is carried out in few selected treatment combinations. Plant moisture status is also followed. Indirect parameters as canopy temperature will be used to investigate the genotypic differences in moisture extraction under rainfed conditions. Various parameters will be correlated.

Scientists: Drs S.Silim, M.C.Saxena and L.D.Robertson

FABA BEAN AGRONOMY/PHYSIOLOGY EXPERIMENT 5

Title: Root growth studies in faba bean

Introduction: Orobanche is a parasitic weed causing large losses in faba bean production in North Africa and the Mediterranean region. Its germination is triggered by exudates secreted from the roots of the host plant. Giza 402 has shown varying degrees of tolerance to this parasitic weed. Research has however shown that chemical composition of exudates produced by Giza 402 and susceptible cultivars are similar. It is possible that variation in

susceptibility is due to differences in the pattern of root growth.

A study initiated in 1984/85 and which is being continued will investigate the pattern of root development of Giza 402 and susceptible cultivar, Giza 3.

Objectives: Study the pattern of root development in Giza 3 and Giza 402 to attempt to relate the differential growth pattern to Orobanche susceptibility.

Location: Tel Hadya

Treatments: Two genotypes to be sown in root study chambers, and to be evaluated at 3 stages, early vegetative, early flowering and advanced podding stage. The effect of placement of Orobanche seeds at various depths will be studied, subject to the availability of the chambers.

Replications: Three for each stage of study.

Scientists: Drs S.Silim, J.Sauerborn and M.C.Saxena

FABA BEAN AGRONOMY/PHYSIOLOGY EXPERIMENT 6

Title: Growth and development of diverse faba bean genotypes in relation to specific environmental conditions.

Introduction: The differences in growth patterns and yields of Vicia faba between years at the same site, between sites in the same year and interaction between cultivars and sites is well documented. However, little is known about characters responsible for this variation in performance.

Edaphic factors such as water supply, nutrient status and soil physical condition as well as pests and diseases affect growth and development of faba beans. Aerial factors which also affect growth and development are temperature, radiation and photoperiod, and in the long term these three factors are comparatively stable, especially when compared to edaphic ones and are not readily modified by the grower.

Trial initiated in 1981/82 to investigate the effect of specific environment on growth and development of diverse genotypes of faba bean will be continued. Edaphic factor will be separated by providing soil physical conditions, water, nutrients and pest and disease control at 'luxury' levels.

Objectives: Study the interaction between specific environment, and diverse genotypes.

Location: 5 Mediterranean locations and 10 European locations. Tel Hadya is one of the Mediterranean location.

Treatment:

A. Four contrasting genotypes: Herz freya, Minica, Giza-3 and Aquadulce.

B. 15 locations: Dundee, Reading, Wye College, NOP, Wageningen, Dijon, Stuttgart, Gottingen, Vienna, Cordoba, Bari, Padua, Aleppo and Giza.

C. At each location, 3 nutritional/soil moisture treatments to be imposed: (i) assured moisture + luxuriant nutrition, (ii) assured moisture with normal nutrition and (iii) rainfed condition and normal nutrition.

Design: 3 large beds (12 m x 7 m) for each of the nutritional/soil moisture treatment. Data generated will be supplied to the Scotish Vegetable Institute for regression analysis using the crop performance and environmental parameters from different locations.

Note: This is the fifth year of this cooperative study. The second year data was not adequately collected because of difficulty in the establishment of stand in the artificial growing medium and the fourth year trial was all killed by frost. The study will be terminated after 1985/86 season. Tel Hadya result will be processed to examine relationship between the weather conditions and productivity of these four contrasting genotypes.

Scientists: Drs S.Silim and M.C.Saxena

FABA BEAN AGRONOMY/PHYSIOLOGY EXPERIMENT 7

Title: Photothermal period response in faba beans

Introduction: Selection of genotypes well adapted to the environment in which they are grown is a key to realising full yield potential of the genotypes. To aid breeders in selecting genotypes for different environments, a model is being developed at Reading (UK) under controlled conditions for predicting the time to flower under known photothermal regime. A trial will be initiated at Tel Hadya during the 1985/86 season to generate data under field conditions for testing this model.

Objectives: Generate data under field conditions to test the model being developed at Reading under controlled conditions.

Location: Tel Hadya (A 21)

Treatments:

A. Day length: Normal vs Artificially maintained at 16 hrs.
B. Five dates of planting: mid October, mid November, mid December, mid January, mid February
C. Six genotypes:

Design: Double split plot with lights treatment in main plot, dates in sub-plots and genotypes in sub sub-plots. 4 replications.

Analysis of variance: For some attributes the analysis could be carried out as per following details. However, the purpose of this trial is to generate information on the time to flower and relate it to the variables of temperature and photoperiod. It is aimed to isolate the effect of temperature from photoperiod in affecting flowering.

Source of variation	DF
Replications	3
Light (L)	1
Error (a)	3
Planting date (D)	4
D x L	4
Error (b)	24
Genotype (G)	5
G x L	5
G x D	20
G x D x L	20
Error (c)	150
TOTAL	239

Scientists: Drs. S.Silim and M.C.Saxena

2.6. FABA BEAN OROBANCHE CONTROL

FABA BEAN OROBANCHE PROJECT NO. 1

Title: Effect of Soil Solarization on Orobanche crenata Infestation in Faba Beans and Lentils.

Introduction/Objectives: Soil solarization involves covering wet soil during the hot season with transparent polyethylene (PE) to increase soil temperature to levels lethal to soilborne pests. Beside temperature effect, a shift in microbial population, change in chemical and gas composition level maintained by PE mulch are considered to be involved in disease control. Since 1974, experiments were carried out in naturally infested soils, in several countries, to evaluate the effectiveness of soil solarization in disease control under field conditions. Disease control through solar-heating the soil is reported in a range between 65-95% (KATAN, 1981). The work by JACOBSOHN et.al. (1980) demonstrated control of Orobanche aegyptiaca in carrots up to 100%. Orobanche seeds possibly are destroyed direct by heat or indirect by microbial activity after the seeds have been weakened by sublethal heating.

Location: Tel Hadya (A 22).

Plant material: Vicia faba (SLL), Lens culinaris. (SLL).

Field Preparation:
- Cultivate the field before mulching.
- Irrigate it by sprinkler to field capacity.

Treatments: Mulching periods (4): 0,10, 20, 40 days (Bury 0. seeds wrapped in muslin bags at depth of 2, 5, 10, 15 cm in each plot).

Design: Randomized block design.

Replications: 4.

Plot-size: 10 x 2m (= $20m^2$).

Row to row distance:
Faba beans - 50 cm (4 rows/plot).
Lentils - 30 cm (7 rows/plot).

Plant to plant distance:
Faba beans - 10 cm (100 plants/row).
Lentils - row seed.

Sowing depth:
Faba beans - 10 cm
Lentils - 5 cm

Total area of experimental layout: 27,9 X 21,7 m (= 605,43 m^2).

Measurements:
- Determine soil moisture before covering and after turning back, from 15 cm layer. Determine the water content gravimetrically, after heating to 105°C for 48 h.
- Determine temperature in the soil at depth of 5, 10, 15 cm with a thermograph.
- Determine air temperature at a height of 5 cm above ground.
- Record all weed species in the plots.
- Determine weed species controlled.
- Make a first evaluation of the effect of solarization after turning back the foil.
  - dig up the buried Orobanche seeds and make a survival test in TTC.
- Sow the plots with faba beans (SLL) and lentils (SLL) in the coming growing season and evaluate the Orobanche infestation:
  - count Orobanche shoots per plant (5 plants/plot).
  - determine crop yield ($4m_2$/plot).
    - whole plant (dry weight).
    - pods (dry weight)
    - seeds (dry weight).

Scientists: J. Sauerborn, H. Masri and M. C. Saxena

Note: The trial will be used to monitor nematode situation also.

References:

Egley, G. 1983. Weed Seed and Seedling Reductions by Soil Solarization with Transparent polyethylene sheets. Weed Science 31: 404-409.

Horowitz, M. et.al., 1983. Solarization for Weed Control. Weed Science 31: 170-179.

Jacobsohn, R. et. al., 1980. Control of Egyptian Broomrape and other Weeds by Means of Solar Heating of the Soil by Polyethylene Mulching. Weed Science 28:312-315.

Katan, J. 1981. Solar Heating of Soil for Control of Soilborne Pests. Ann. Rev. Phytopathol. 19:211-236.

La Mondia, J. A. 1984. Control of Globodera Rostochiensis by Solar Heat. Plant Disease 68:474-476.

Rubin, B. et.al., 1983. Solar Heating of the Soil: Effect on Weed Control and on Soil-Incorporated Herbicides. Weed Science 31:819-825.

Rubin, B. et al., 1984. Solar Heating of the Soil: Involvement of Environmental Factors in the Weed Control Process. Weed Science 32:138-142.

FABA BEAN OROBANCHE PROJECT NO. 2

Title: Influence of Temperature on the Time of Infestation of Orobanche crenata on Lentils and Faba Beans.

Introduction/Objectives: It is assumed that the course of infestation of Orobanche on lentils and faba beans is basically governed by the temperature. The purpose of this trial is to find out the optimal temperature, which induces early infestation. This information will facilitate quicker screening of genotypes for Orobanche resistance.

Location: Incubator.

Test vessel:
Lentil: plastic cups and petridishes.
Faba bean: poly bags.

Test medium: Sterilized soil and sand (3:1, weight proportion).

Inoculum load: 0.25g Orobanche seeds per kg medium.

Pre-conditioning: 10 days at 20°C.

Plant material:
Lens culinaris ILL 4400
Vicia faba SLL
O. crenata (harvested 1983 in Tel Hadya).

Treatments:
Temperature ranges (3) (day/night)
20/10°C
25/20°C
27/15°C

Day length: 12 h

Replications: 10

Measurements:
- Wash out the roots of one plant every 5 days start 20 days after sowing.

- Record first attachment of Orobanche to the host roots.
- Record growth stages of host plant.
- Accumulate the temperature from sowing to first attachment:
  tubercle stage
  bud stage
  emergent stage of Orobanche.

Scientists: J. Sauerborn, H. Masri and M. C. Saxena

FABA BEAN OROBANCHE PROJECT NO. 3

Title: Developing a Laboratory and a Green House Procedure for Single Plant Selection of Orobanche Resistant Faba Bean.

Introduction/Objectives: The faba bean variety Giza 402 is regarded as tolerant against Orobanche crenata. In the variety there is a big variability for susceptibility to Orobanche. It is therefore, suggested to purify this line. The single plant selection will help to find trew resistant source which can be used for future breeding. The seed can also be multiplied eventually for use in the area of the adaptation of this variety.

Location: Growth room, Plastic house.

Test vessel:
Polybags (8 x 8 x25) (growth room, 100).
Claypots (plastic house, 500).

Test medium: Mixture of soil and sand (3:1 weight proportion).

Plant material:
Orobanche crenata (harvested 1983 in Tel Hadya).
Vicia faba (402, and as a check SLL).
Orobanche seeds will be pre-treated for 10 days at 20°C in moist test medium.

Inoculum load: 0,25g/kg soil.

Test conditions: 26/21°C day/night
(growth room): 30-40% humidity.

Comment: The roots of faba beans grown in polybags will be washed out when the Orobanche has reached the tubercle stage, and a resistance evaluation will be done. Promising plants will be replanted in screen-house to get seeds. Faba bean plant grown in the claypots will again be evaluated for resistance when they are ready for harvest.

Scientists: J. Sauerborn, H. Masri, L. D. Robertson and M. C. Saxena.

Note: Once the pure selections showing resistance has been made, they will be compared with the original population for isozyme pattern differences.

FABA BEAN OROBANCHE PROJECT NO. 4

Title: Effect of Sowing Date on the Development of Orobanche crenata in a Susceptible and a Tolerant Genotype of Faba Beans.

Introduction/Objectives: It is known that delayed sowing of faba bean leads to a decrease in Orobanche infestation (MESA-GARCIA et.al., 1982, KUKULA et. al., 1985). This is because the Orobanche cycle becomes shorter with late sowing dates. In connection with herbicide control of Orobanche it is necessary to study the crop-parasite phenology and competition to find out the best application date.

Location: Tel Hadya (A 22).

Treatments:

- Dates of sowing (6) 1 Oct., 15 Oct., 1 Nov., 15 Nov., 1 Dec., 15 Dec.	Main plot
- Varieties (2) SLL (susceptible) Giza 402 (tolerant)	Sub-plot
- Glyphosate application (2 times) vs. no application	Sub-sub-plot

Design: Split split-plot.

Replications: 3.

Plot size: 5x3 m (= 15m^2).

Row to row distance: 50 cm (6 rows/plot)

Plant to plant distance: 20 cm (25 plants/row).

Fertilizer application: 20 kg N, 60 kg P_2O_5 per ha.

Herbicide application: 0,08 kg a.i./ha, 2 times at 15 days interval starting at tubercle stage of Orobanche.

Total area of the experimental layout: 36x37,5 m(=1350 m^2).

Measurements:

- Dig up two plants per plot every 8 days starting 30 days after sowing.
- Wash out the roots.
- Record the number of Orobanche per plant separated into the following growth stages:
  a) tubercle stage
  b) bud stage
  c) emergent stage
- Record growth stage of faba bean
- In the plots treated with glyphosate evaluate the condition of Orobanche:
  a) Orobanche normal developed (= no effect)
  b) Orobanche degenerated
  c) Orobanche decomposed.

Scientists:

1. Marja van Hezewijk and Arnold Pieterse from Royal Tropical Institute, Amsterdam.
2. J. Sauerborn, H. Masri and M. C. Saxena from ICARDA.

Note: EEC Project study.

References:

Mesa-Garcia J., L. Garcia-Torres, 1982. Effects of Bean (Vicia faba L.). Planting Dates on Broomrape Phenology and Competition. Proc. 1982 Brit. Crop. Protec., Weeds.

Kukula, S., A. Haddad, H. Masri, 1985. Weed Control in Lentils, Faba beans, and Chickpeas, Proc. 1985. Faba beans, Kabuli Chickpeas, and Lentils in the 1980's ICARDA.

FABA BEAN OROBANCHE PROJECT NO. 5

Title: On-Farm Trials with one Faba Bean Variety (SLL or farmers-own) and Glyphosate Application.

Introduction/Objectives: Orobanche crenata on faba bean can be controlled by glyphosate, a systemic herbicide (KASASIAN 1973; SCHMITT et.al. 1979; SCHLUTER et.al. 1979; JACOBSOHN et.al. 1980; MESA-GARCIA et.al. 1982; AMERICANOS 1983). Timing and the number of glyphosate applications necessary for Orobanche control, and the optimum herbicide dose, at which high efficiency is combined with low phytotoxicity depends on climatic conditions, Orobanche growth stage, infection level and vigour of faba bean plants.
In view of these facts, in the growing season 1985/86 an on-farm trial at 5 different locations in Syria will be carried out to

evaluate the practice under farmers' conditions.

Location: Al-Bab, Al-Mintar, Atareb, Homs, Jableh, (farmers field).

Treatments:
Variety (1)
- SLL or farmers-own

Glyphosate application (0,08kg a.i./ha, 2 times)
vs. no application.

Design: Randomized block .

Replication: 4

Plot size: 5x3m (= $15m^2$).

Row to row distance: 50 cm (6 rows/plot)

Plant to plant distance: 10 cm (50 plants/row)

Sowing depth: 10 cm

Fertilizer application: 30 kg N, 50 kg P_2O_5 per ha.

Herbicide application: 0,08 kg a.i./ha glyphosate in 500 l water: 2 times at 15 days interval starting at tubercle stage of Orobanche.

Total area of the experimental layout: 11,5 x 12m(= $138m^2$).

Measurements:
- Record growth stages of faba bean (using the key of BBA).
- Evaluate the effect of glyphosate 8 days after glyphosate application.
  - record the number of Orobanche per plant (2 plants/plot) devided into:
    a) tubercle stage
    b) bud stage
    c) emergent stage.
  - evaluate the condition of Orobanche.
    a) Orobanche normal developed (= no effect)
    b) Orobanche degenerated
    c) Orobanche decomposed
- Count the Orobanche shoots per plant (5 plants/plot) at the time of harvest.
- Determine crop yield (out of $8m^2$ per plot)
  a) whole plant (dry weight)
  b) pods "
  c) seeds "

Note : This trial will also be used for weed sampling

Additional Measurements:
- identify all the weed species in the control plots
- determine the weed infestation using the cover-abundance scale of Braun-Blanquet (1965)
- photograph characteristical details of the plant (flower, fruit, leaf etc.) for future species identification
- determine the population shift during crop growth.

Scientists: J. Sauerborn, H. Masri and M. C. Saxena

References:

Americanos, P.G., 1983. Control of Orobanche in Broad Beans. Tech. Bull. 50. Agric. Res. Inst. Ministry of Agric. and Nat. Resources, Cyprus.

Jacobsohn, R., Y. Clemens, 1980. Effectiveness of Glyphosate in Broomrape (Orobanche spp.). Control in Four Crops. Weed Science 28:692-699.

Kasasian, L., 1973. Control of Orobanche, PANS 19:368-371.

Mesa Garcia, J., L. Garcia Torres, 1982. Broomrape (Orobanche crenata Forsk) Control in Bean (Vicia faba L.) with Glyphosate as Affected by Infection Intensity. Proc. 1982 British Crop Protection Conf. Weeds 765-770.

Schluter, K., M. Aber, 1980. Chemical Control of Orobanche crenata in Commercial Culture of Broad Beans in Morocco, J. of Plant Diseases and Protection 87 (8): 433-38.

Schmitt, U., K. Schluter, P.A. Boorsma, 1979, Chemical Control of Orobanche crenata in Broad Beans. FAO Plant Prot. Bull. 27:88-91.

FABA BEAN OROBANCHE PROJECT NO. 6

Title: Testing New Herbicides for Orobanche Control in Faba Beans.

Introduction/Objectives: Two times glyphosate application at tubercle stage of Orobanche and 15 days later at a rate of 0,08 kg a.i./ha has been found an effective control measure for Orobanche in faba beans. Uptill now no chemical control measure for lentils has been developed although some herbicides like Ethylen-dibromide and Pronamide gave good results in Orobanche control. Ethylen-dibromide is not easy to apply and very poisonous to the user. Pronamide is very persistant in the soil with adverse residual effect in the

following crop. Chemical substances are needed which are easy to handle and which need only one time application instead of repeated spraying to control Orobanche. The purpose of the planned experiment is to evaluate the effectiveness of new substances for Orobanche control and determine the effective dosage and timing of their application for optimum activity compared to glyphosate as a standard herbicide.

Location: Tel Hadya (A 22)

Plant material: Vicia faba (SLL).

Treatment details:

Treatment No.	Herbicide & Dose	Time of Application
T_1	AC 252, 214, 0.08 kg a.i./ha	Once at bud stage of Orobanche
T_2	" "	Split in 2 times: Tubercle stage + 15 days thereafter
T_3	" 0.16 kg a.i./ha	Once at bud stage of Orobanche.
T_4	" "	Split in 2 times: Tubercle stage + 15 days therafter.
T_5	AC, 263,499, 0.08 kg a.i./ha	Once at bud stage of Orobanche
T_6	" "	Split in 2 times: tubercle stage + 15 days thereafter
T_7	" 0.16 kg/a.i./ha	Once at bud stage of Orobanche
T_8	" "	Split in 2 times: tubercle stage + 15 days thereafter.
T_9	Basta 0,08 kg a.i./ha	Once at bud stage
T_{10}	" "	Twice: tubercle stage + 15 days thereafter.
T_{11}	Round up , 0.08 kg a.i./ha	Twice: tubercle stage + 15 days thereafter.
T_{12}	Control	

Design: Randomized block design

Replications: 4

Plot size: 5X3 m (= $15m^2$).

Row to row distance: 50 cm (6 rows/plot)

Plant to plant distance: 10 cm (50 plants/row)

Seed depth: 10 cm

Total area of experimental layout: 36x24,5 m (=882 m^2).
Measurements:
- Record growth stages of faba bean (using the key of BBA)
- Report crop injury in percentage.
- Record growth stages of Orobanche by digging up the plants.
- Evaluate the effect of herbicides.
  - count the Orobanche shoots per plant (5 plants/plot) at the time of harvest.
  - determine crop yield ($8m^2$/plot):
    whole plant (dry weight)
    pods (dry weight)
    seeds (dry weight)

Scientists: J. Sauerborn, H. Masri and M. C. Saxena.

FABA BEAN OROBANCHE PROJECT NO. 7

Title : The Effect of Exogenous Growth Regulators on Orobanche Resistance of Faba Beans and Lentils.

Introduction/Objectives: There are some indications that growth hormones in the root system induce Orobanche to germinate and to grow towards the host roots. It is hypothesised that the application of exogenous growth regulators can influence the susceptibility of host plants through changing the chemical composition in the roots and root exudates.

Location: Tel Hadya, plastic house.

Plant material:
Vicia faba (SLL)
Lens culinaris (SLL)

Test vessel: Poly bag (8 x 8 x 25 cm)

Test medium: Sterilized soil and sand (3:1; weight proportion) 1,5 kg/poly bag.

Inoculum load: 0,25 g Orobanche seeds per kg medium

Pre-conditioning: 10 days at 20^{0}C.

Plant per bag: 1.

Test conditions: $25/20^{0}$C (day/night).

Replications: 6.

Total amount of poly bags: 120

Treatments:

Treatment No.	Growth Regulator	Concentration of Application	time of Application
1.	IAA	5×10^{-3}M	3 leaf stage
2.	"	"	6 " "
3.	"	10^{-3}M	3 " "
4.	"	"	6 leaf stage
5.	"	2×10^{-4}M	3 leaf stage
6.	"	"	6 " "
7.	GA3	3×10^{-4}M	3 " "
8.	"	"	6 " "
9.	"	10^{-4}M	3 " "
10.	"	"	6 " "
11.	"	3.3×10^{-5}M	3 " "
12.	"	"	6 " "
13.	Kinetin	5×10^{-3}M	3 " "
14.	"	"	6 " "
15.	"	10^{-3}M	3 " "
16.	"	"	6 " "
17.	"	2×10^{-4}M	3 " "
18.	"	"	6 " "
19.	Water spray	-	3 " "
20.	"	-	6 " "

Admixture: Wetting and spreading agent Tween 20, 0,2%.

Application rate: 3 ml per plant (run off application method).

Measurements:
- Determine phytotoxicity
- Wash out the roots of 3 plants at flowering stage and at pod

stage.
- Determine the Orobanche infestation per plant seperated into the following growth stages of Orobanche:
  - tubercle stage
  - bud stage
  - emergent stage.

Scientists: J. Sauerborn, H. Masri and M. C. Saxena

References:

Bellucci, S., 1980. - Einfluss von Wachstumsregulatoren insbesondere Giberellinsaure auf das Wachstum und den Ertragsaufbau der Ackerbohne (Vicia faba L.) - Dissertation ETH-Zurich.

Garas, N. A.; C.M. Karssen, J. Bruinsma, 1973. Effects of Growth Regulating Substances and Root Exudates on the Seed Germination of Orobanche crenata-Z. Pflanzenphysiol. 71:108-114.

2.7. FABA BEAN MICROBIOLOGY

FABA BEAN MICROBIOLOGY PROJECT NO. 1

Title: Collection, purification and evaluation of different strains of Rhizobium leguminosarum from different parts of ICARDA region.

Objective: To identify specific strains which are superior to the indegenous strains. The strains will be collected by survey of different production areas and collection of nodules and soil samples. The isolation will be done and their purification will be undertaken. Purified cultures will be evaluated for their performance using plant infection test technique, nitrogen yield and acetylene reduction assay.

Location: Growth Chamber/Microbiology Laboratory at ICARDA

Scientists: Mr. Fadel Afandi and Senior Microbiologist

FABA BEAN MICROBIOLOGY PROJECT NO. 2

Title: Field evaluation of some superior strains of Rhizobium for faba beans.

Objective: To identify superior strains of Rhizobium for faba beans for Tel Hadya condition.

Location: Tel Hadya

Treatment: Six promising strains will be evaluated agains one uninoculated and one uninoculated + fertilizer nitrogen check.

Design: RCB, 4 replications

Scientists: Mr. Fadel Afendi and Senior Microbiologist.

FABA BEAN MICROBIOLOGY PROJECT NO. 3

Title: Evaluation of some promising faba bean genotypes for their nodulation, actylene reduction pattern, nitrogen yield and productivity as affected by inoculation.

Objectives: The main aim is to confirm the differences observed earlier in the faba bean genotypes for nitrogen fixation in response to inoculation with the Rhizobium.

Location: Tel Hadya

Treatments:
A. Genotypes 15
B. Inoculation treatments 2

Design: Single split-plot design with 4 replications.
Inoculation in the main plots, genotypes in the sub-plots.

Scientists: Mr. Fadel Afendi, Senior Microbiologist, Dr. L.D.Robertson and Dr. M.El-Sherbeeny.

FABA BEAN WEED CONTROL

FABA BEAN WEED CONTROL EXPERIMENT 1

Title: International Faba bean Chemical Weed Control Trial.

Introduction: Weeds constitute one of the major constrains to faba bean production. Since labour is scarce and expensive, there is need to use chemicals to control weeds. A trial was initiated and will be continued to identify promising herbicides and determine the proper method of application.

Objective: To evaluate different herbicides for use in control of weeds in faba bean.

Treatments:

	Symbol
1. Weedy check	T_1
2. Weed free by repeated hand weeding	T_2
3. Hand weeding twice (30-40 & 70-80 DAE)	T_3
4. Pre-emergence application of chlorbromuron (Maloran) at 1.5 kg a.i./ha	T_4
5. Pre-emergence application of methabenzthiazuron (Tribunil) at 3.0 kg a.i./ha	T_5
6. Pre-emergence application of terbutryne (Igran) at 2.0 kg a.i./ha	T_6
7. Pre-emergence application of cyanazine (Bladex) at 0.5 kg a.i./ha	T_7
8. Pre-emergence application of cyanazine (Bladex) at 1.0 kg a.i./ha	T_8
9. Same as No. 4 above + 0.5 kg a.i./ha of pronamide (Kerb)	T_9
10. Same as No. 5 above + pronamide as No. 9	T_{10}
11. Same as No. 6 above + pronamide as No. 9	T_{11}
12. Same as No. 7 above + pronamide as No. 9	T_{12}

Design: Randomized complete block design with 4 replicates

Location: Jinderis, Terbol.

Analysis of variance:

Source of variation	DF
Replication	3
Treatments	11
Error	33

Note: This is part of international nurseries. This set of treatments being tested will be discontinued after 1985/86.

Scientists: Drs S.Silim, R.S.Malhotra, M.C.Saxena and Mr. Atef Haddad

FABA BEAN WEED CONTROL EXPERIMENT NO. 2

Title: Chemical weed control in faba bean.

Objectives: To evaluate the best herbicides which were identified in the preliminary study for weed control in faba bean. These treatments will also be used in the Interntional Weed Control Trial.

Location: Tel Hadya & Lattakia

Treatments: 12 herbicides + 2 checks.

Treatments	Timing	Rate kg a.i./ha Faba bean
Weedy check		-
Weed free		-
Cyanazine +		1.0
Pronamide	Pre-em	0.5
Terbutryne +		2.0
Pronamide	Pre-em	0.5
Bentazone +		1.0
Fluazifop butyl	post-em	0.5
Codal	Pre-em	2.0
Secbumetron	Pre-em	0.25
Napropamide	Pre-em	1.0
Carbetamide	Pre-em	1.5
Ac, 252, 214	Pre-em	0.2
Ac, 252, 214	At-em	0.2
Ac, 252, 214	E.post-em	0.15
Fomesafen	M.post-em	0.2
Fomesafen	L.post-em	0.2

Design: RCB, 4 replications.

ANOVA:

Source of Variance	df
Rep.	3
Treatment	13
Error	39

Related Measurements:
Crop phenology, crop injury and weed infestation levels.

Scientists: Mr. Atef Haddad, Dr. S.Silim and M.C.Saxena

III. LENTIL IMPROVEMENT

3.1. LENTIL BREEDING PROJECT

GENERAL OBJECTIVES

To develop improved cultivars and genetic stocks with high and stable seed yields adapted to the three main agro-ecological regions of lentil production with maintained, or wherever possible improved, seed quality and nitrogen-fixing ability, and with the additional specific characters for each region namely:

1. High altitude region (above 1000m elevation) - cold tolerance to allow a winter sowing and attributes for a mechanical harvest (tall, non-lodging growth habit and pod retention and indehiscence).

2. Middle to low elevation region around the Mediterranean Sea - attributes for a mechanical harvest, maintained straw quality and yield, tolerance to Orobanche and Heterodera sp., resistance to vascular wilt, and tolerance to drought stress during the reproductive period of growth.

3. Region of lower latitudes (Indian-sub continent Ethiopia, and Sudan) -phenological adaption to the warm, short-photoperiod environment and resistance to rust, vascular wilt and Ascochyta blight.

LENTIL BREEDING PROJECT 1

Title: Lentil Advanced Yield Trials (AYT)-Large and Small Seeded.

Objective: To test lentil selections promoted from preliminary yield trials in three contrasting locations.

Locations:
Tel Hadya, Syria (AYT-L, AYT-S-1 and AYT-S-2).
Brida, Syria (AYT-L, AYT-S-1 and AYT-S-2).
Terbol, Lebanon (AYT-L, AYT-S-1 and AYT-S-2).

Treatments:
2 small-seeded AYT(22 test entries/trial+2 checks (ILL 4400+ILL 4401).
1 Large-seeded AYT(30 test entries/trial+2 checks (ILL 4400+ILL 4401).

Scientist: Dr. Erskine.

LENTIL BREEDING PROJECT 2

Title: Lentil Preliminary Yield Trial (PYT) (Large Seeded, Small seeded, and Early).

Introduction/Objective: To test selections from a preliminary screening nursery in replicated trials in three contrasting locations.

Locations:
Tel Hadya, Syria
Brida, Syria
Terbol, Lebanon
Islamabad, Pakistan (PYT-Early only)

Treatments:

Trial Types	c.No. of of Trials	No. of entries/trial	Checks
Large-seeded PYT	6	24	ILL 4400
Small-seeded PYT	10	24	ILL 4401
Early PYT	1	34	ILL 4401

Design: Randomized complete block design with a maximum of three replicates.

Scientist: Dr. Erskine (Mr. Malik in Islamabad).

LENTIL BREEDING PROJECT 3

Title: Lentil Breeding Nurseries.

Objective: To select superior lentil lines.

Location: Tel Hadya.

Treatments:
Experiment 1: Progeny rows of 9000 single plants selected last season will be grown in 1m-long progeny rows arranged systematically with local checks, ILL 4400 and ILL 4401, repeated every 15 test entries.
Experiment 2: Lentil preliminary screening nurseries of selections made in 1985 progeny rows will be grown in augmented design with 3 checks with 4-row, 1m-long plots (approximately 1200 test entries).

Scientist: Dr. Erskine.

LENTIL BREEDING PROJECT 4

Title: Lentil Crossing Block and Segregating Populations.

Objectives:
1. To effect the recombinations in lentil necessary for breeding goals.
2. To advance populations from the above recombinations to the F_4 generation by the bulk method.
3. To make single plant selections in the F_4 generation.

Location: Tel Hadya.

Treatments:
1. Crossing block. Total of c.350 cross combinations with 250 crosses to be made in plastic house in winter and remaining crosses to be made in field.
2. F_1 Systematic design c. 50 crosses
   F_2 Systematic design c.300 crosses
   F_3 Systematic design c. 50 crosses
   F_4 Systematic design c.350 crosses

Scientist: Dr. Erskine

LENTIL BREEDING PROJECT 5

Title: On-Farm Lentil Variety Trial

Objective: To test on farmers' fields elite lines against local checks in the main lentil growing areas of Syria.

Locations: 12.

Treatments: 4 genotypes: 1. 78S 26013, 2. 76TA 66088, 3. Hurani 1, 4. Improved Hurani.

Design: RCB with 2 replications.

Scientists: Dr. Erskine (FLIP) and ARC, Douma.

LENTIL BREEDING PROJECT 6

Title: Pre-Release Multiplication

Objective: To increase the seed of 78S 26002 (ILL8) and to assess its performance in relation to local large-seeded genotypes.

Locations: 1 village each in Idlib and Aleppo Provinces.

Treatment: 0.5 ha block on farmer's fields of 78S 26002 (ILL8) to be planted and harvested mechanically. Local genotype in adjacent area will be sampled ($50m^2$)x 3.

Scientists: Dr. W. Erskine (FLIP) and ARC, Douma.

LENTIL BREEDING PROJECT 7

Title: Lentil Off-Season Summer Nursery.

Objective:
1. To advance the generation of segregating populations without selection.
2. To multiply seeds of breeding material.

Location: Shawbak Research Station, Jordan.

Treatments:

Populations	c.No. of crosses
F_0X86S	350
F_1X85S	50
F_2X85S	300
Increases	50

Design: Systematic

Area: 0.5 ha to be planted in mid-June, 1986.

Scientist: Dr. Erskine.

LENTIL BREEDING PROJECT 8

Title: Hybrid Vigour of Lentils.

Introduction and Objective: With the availability of effective gametocides the production of F_1 hybrid seed of autogamous cereals has become feasable and hybrid vigour can be exploited. In lentils little is known of the extent of hybrid vigour and this experiment aims to measure hybrid vigour on many diverse, simple crosses.

Location: Tel Hadya (the experiment is a repeat from 1984-1985 season).

Treatments: Parents, F_1 and F_2 of 50 lentil crosses.

Design: Randomized complete block in two replications.

Scientist: Dr. Erskine and a trainee.

LENTIL BREEDING PROJECT 9

Title: Genetic Variability in Response to Soil Moisture.

Objective: To characterize genotype x irrigation interaction in order to develop a methodology for selection for adaptation to irrigated conditions.

Locations: Tel Hadya (3 moisture regimes), Brida and Terbol (Repeat of 1984/85 season).

Design: Split-plot in Tel Hadya with irrigations as main plots; R.C.B. in Brida and Terbol.

Treatments: 35 genotypes.

Scientists: Mr. A. Hamdi (Ph.D. Student, University of Durham) and Dr. Erskine.

LENTIL BREEDING PROJECT 10

Title: Study of Lentil Growth Habit.

Introduction and Objective: Lentil harvest mechanization is easier with tall lentils, consequently breeding for increased height is an important goal of the lentil program. This experiment examines the morphology and plant architecture of a range of tall lentil lines.

Locations: Tel Hadya (Repeat of 1984/85 season).

Treatments: 24 genotypes

Design: Randomized complete block with 4 replications.

Scientists: Dr. Erskine, Dr. M.C. Saxena, Dr. Silim and Mr.Goodrich.

LENTIL BREEDING PROJECT 11

Title: Utilization of Wild Lentils in Breeding

Introduction/Objective: Several high yielding lines currently in lentil international trials originated from crosses made with a

Lens orientalis parent. Last year six crosses with their reciprocals were made between Lens orientalis and L. culinaris. The goal of the project is to assess the potential of Lens orientalis in lentil improvement. This year's experiment will assess the F_1 hybrids and reciprocal effects.

Location: Tel Hadya.

Treatments: Parents (7), F_1 hybrids and their reciprocals (12).

Design: Randomized block design with 3 replicates.

Scientists: Drs. Erskine, Holly and Adham.

LENTIL BREEDING PROJECT 12

Title: Screening of Lentils for Resistance to Cyst Nematode (Heterodera sp.).

Introduction and Objective: Cyst nematode (Heterodera sp.) is the most injurious nematode on lentils in Syria. We propose to screen advanced lines of lentils to this pest to ensure that they are no more susceptible than local checks.

Location: Tel Hadya plastic house.

Treatments: 100 advanced lines in pots.

Design: Randomized complete block with two replications.

Scientists: Drs Erskine, Greco and di Vito, Bari, Italy.

LENTIL BREEDING PROJECT 13

Title: Screening for Resistane to Lentil Vascular Wilt

Introduction/Objective: The most important fungal pathogen of lentils in Syria is vascular wilt (Fusarium oxysporum f.sp.lentis). We aim to screen advanced lines of lentils for resistance to vascular wilt.

Locations:
1. Plastic house, Tel Hadya.
2. Farmer's field, Souran.

Treatments: Parents from crossing block (c.100 lines).
Scientists: Drs. Erskine, Malhotra and B. Baya'a (Aleppo University).

3.2. LENTIL MECHANIZATION

LENTIL MECHANIZATION PROJECT 1

Title: On-Farm Trial of Lentil Harvest Mechanization.

Introduction/Objective: Lentil harvest mechanization is a major research goal of the FLIP Program. Last year two harvesting systems were tested on Tel Hadya farm in comparison with hand harvesting. The first was the angled blades system which worked best with traditional crop husbandary. The second was the double-knife cutter bar which performed best on land flattened with a bar during seed-covering of an erect cultivar. The aim is to test these systems on farmers' fields agronomically and economically.

Locations: Four villages (Aleppo province 2; Idlib province 2).

Treatments:

1.	Broadcast	Local seed	Hand harvest
2.	Broadcast	Local seed	Angled blades
3.	Broadcast + bar	Local seed	Hand harvest
4.	Broadcast + bar	Local seed	Cutter bar
5.	Broadcast + bar	Improved seed (ILL8)	Cutter bar
6.	Drilled	Local seed	Cutter bar
7.	Drilled	Improved seed (ILL8)	Cutter bar

Design: Randomized complete block with 2 replicates

Scientists: Drs. Erskine, Saxena, Diekmann, Salkini and Jegatheeswaran.

LENTIL MECHANIZATION PROJECT 2

Title: Evaluation of the effect of height of cut on the yield and straw quality of lentil.

Introduction: In Syria lentil harvest which is by hand pulling accounts for over 33% of the total production cost. It is projected that this cost will go even higher due to shortage of farm labour, a consequence of migration from rural to urban areas.

As part of efforts to mechanize lentil harvest, a trial initiated in 1984/85 to investigate the effect of height of cut on yield and straw quality will continue.

Objective: To establish the loss in quality and quantity of straw by cutting the straw at different plant heights in genotypes of differing plant stature.

Location: Tel Hadya (C 16)

Treatments:

A. Genotypes: SLL (ILL 4400), 78S 26002 (ILL 8) and ILL 554
B. Heights of mowing: M_1 = None, by pulling; M_2 = mow at ground level; M_3 = mow at 5 cm; M_4 = mow at 10cm above ground.

Design: Single split-plot with genotypes in the main plots and cutting height in subplots. 4 replications.

Analysis of variance:

Source of variation	DF
Replication	3
Genotype G	2
Error (a)	6
Mowing heights (m)	3
M x G	6
Error (b)	27
TOTAL	47

Note: This is a repetition of last season's work. Experiment in Tel Hadya having been killed by herbicide and flooding during the 1984/85 season. Seed development studies will be undertaken with the help of one of the trainees.

Scientists: Drs S.Silim, M.C.Saxena and W.Erskine

3.3. LENTIL AGRONOMY/PHYSIOLOGY

GENERAL OBJECTIVES

The lentil improvement research is concentrated on improving yield and its stability through the developement of genotypes with, wide adaptation, the plant type for mechanical harvesting and drought tolerance. The crop physiology research, therefore, has special emphasis in these areas to complement the work of the breeder. In addition, agronomy research is aimed at developing production practices for newer genotypes to develop best-bet technology which could then be evaluated in different agroecological conditions by the national programs.

LENTIL AGRONOMY/PHYSIOLOGY EXPERIMENT 1

Title: Photothermal period response in lentils

Introduction: Improved productivity of lentils requires selection of genotypes well adapted to the environment in which they are grown. In West Asia and South Europe growth coincides with progressively lengthening days and warmer temperatures. In contrast in Indian sub-continent, the crop experiences shortening day and cooling air temperatures at similar growth stage. When genotypes from West Asia are grown, therefore, in Indian sub-continent, they flower late and give very low yields. To aid breeders in selecting genotypes for different environments, a model is being developed at Reading (UK) under controlled conditions for predicting the time to flower under known photothermal regime. A trial was initiated at Tel Hadya during the 1984/85 season to generate data under field conditions for testing this model. It was partly damaged due to frost last season and it will be repeated in 1985/86.

Objectives: Generate data under field conditions to test the model being developed at Reading under controlled conditions.

Location: Tel Hadya (A 21)

Treatments:

A. Day length: Normal vs Artificially maintained at 16 hrs.
B. Five dates of planting: mid October, mid November, mid December, mid January, mid February
C. Six genotypes: Laird (ILL 4349), Precoz (ILL 4605), SLL (ILL 4400), ILL 1744, Pant-L-406 (ILL 2501) and 78S 26064 (ILL 9)

Design: Double split plot with light treatments in main plot, dates in sub-plots and genotypes in sub sub-plots. 4 replications.

Analysis of variance: For some attributes the analysis could be carried out as per following details. However, the purpose of this trial is to generate information on the time to flower and relate it to the variables of temperature and photoperiod. It is aimed to isolate the effect of temperature from photoperiod in affecting flowering:

Source of variation	DF
Replications	3
Light (L)	1
Error (a)	3
Planting date (D)	4
D x L	4
Error (b)	24
Genotype G	5
G x L	5
G x D	20
G x D x L	20
Error (c)	150
TOTAL	239

Scientists: Drs S.Silim, M.C.Saxena and W.Erskine

LENTIL AGRONOMY/PHYSIOLOGY EXPERIMENT 2

Title: Drought tolerance studies in lentils

Introduction: Productivity of lentils in Syria is limited by drought which occurs when the crop is at reproductive stage. Breeding for drought tolerance with special emphasis on drought avoidance has been going on for sometime in lentil breeding program. To complement the breeding work, a trial to evaluate field method for drought tolerance screening was initiated and will continue during 1985/86 season.

Objectives: Evaluation of field method for drought tolerance screening of lentil genotypes. The work will involve planting lentil genotypes in (a) different locations with differing precipitation during the crop season, (b) one location and vary moisture supply.

Location: Tel Hadya (A 22) and Breda

Treatments:

A. Moisture supply: 3 levels
   M_1 = Assured moisture supply with supplementary irrigation
   M_2^1 = Rainfed
   M_3^2 = Rain cut by 50 mm
   (NB at Breda only under rainfed conditions)

B. Genotypes: 12
V_1 = ILL 8; V_2 = ILL 9; V_3 = ILL 16; V_4 = ILL 101;
V_5 = ILL 223; V_6 = ILL 470; V_7 = ILL 793; V_8 = ILL 1801;
V_9 = ILL 4349; V_{10} = ILL 4354; V_{11} = ILL 4400;
V_{12} = ILL 4401; V_{13} = ILWL 7

Design: RCB with 4 replications for Breda. Single split plot with moisture in the main plots and genotypes in sub-plots, 4 replications.

Analysis of variance:

Source of Variance	Tel Hadya DF	Breda DF
Replications	3	3
Moisture (M)	2	
Error (a)	6	
Genotype (G)	12	12
Interaction (G x M)	24	
Error (b)	108	36
TOTAL	155	51

Scientists: Drs. S.Silim and M.C.Saxena

LENTIL AGRONOMY/PHYSIOLOGY EXPERIMENT 3

Title: Effect of exogenous application of a growth regulator in lentil

Introduction: Lentil is genetically capable of producing greater yields than are produced today. The number of pods at maturity is less than 50% of the total number of flowers produced. Generally the later formed flowers do not develop filled pods. It appears that there is a competition between the pods for the assimilates and possiblly also for some endogenous growth regulators. It is, therefore, proposed to see if exogenous application of NAA could improve the pod set and thus result in increased yield.

Objective: To investigate the potential of plant growth regulator planofix (NAA) as a tool for increasing yield in lentils.

Treatments:
A. Time of application:
(1) Beginning of flowering
(2) Beginning & 100% flowering (2 times)
(3) Beginning & 100% flowering and 100% pod set (3 times)

B. Growth regulator: (NAA)
(1) Control
(2) 10 ppm
(3) 20 ppm
(4) 30 ppm

Design: Split plot with A in the main plot and B in subplot

Location: Tel Hadya

Analysis of variance:

Source of variation	DF
Replications	3
Time (T)	2
Error (a)	6
Hormone rate (H)	3
H x T	6
Error (b)	27
TOTAL	47

Scientists: Drs. S.Silim and M.C.Saxena

LENTIL AGRONOMY/PHYSIOLOGY EXPERIMENT 4

Title: Row spacing and plant population studies in ILL 223.

Introduction: During 1983/84 cropping season, the response to four levels of plant population (100, 200, 300 and 400 plants/m^2) and four row spacings (20, 30, 40 and 50 cm) was studied at Tel Hadya and Terbol. There was significant increase in total biological yield with increase in population. Seed yield was not, however, affected. Row spacing did not influence yield.

The experiment was repeated in 1984/85 season but was killed by flooding at Tel Hadya.

Objective: To study the performance of improved lentil cultivar ILL 223 as influenced by plant population at different row spacing.

Location: Tel Hadya (C 16)

Treatments:
A. Row spacing: 20, 30, 40 and 50 cm
B. Plant population: 100, 200, 300 and 400 plants/m^2

Design: Single split-plot with row spacing in the main plots and population in sub-plots.

Analysis of variance:

Source of variation	DF
Replications	3
Row spacing	3
Error (a)	9
Plant population	3
Interaction	9
Error (b)	36
TOTAL	63

Note: One of the International Agronomy Trials initiated in 1983/84. Second and last year for this study. Results to be written up at the end of this season.

Scientists: Drs S.Silim and M.C.Saxena

LENTIL AGRONOMY/PHYSIOLOGY EXPERIMENT NO. 5

Title: Effect of some agronomic factors on farmers' lentil production.

Objective: To assess the main effect and interaction of date of sowing, weed control and Sitona control on lentil yields in farmers' fields.
To assess the yield losses due to weed infestation

Location: 10 farmers' fields throughout lentil growing area.

Treatments: 8 combinations of two dates of sowing (early vs normal), 2 weed control (zero, plus) and 2 Sitona control (zero, plus).

Design: Split-split plot with 2 replicatoins/location.

ANOVA: For each location:

Source of Variance	df
Total	15
Date	1
Rep	1
Error a	1
Sitona	1
Sitona x Date	1
Error b	2
Weed control	1
Date x weed control	1
Weed control x Sitona	1
Date x weed control x Sitona	1
Error c	4

Related Measurements:
Crop phenology, weed and Sitona infestation level and economic survey.

Principal Scientists Involved: Joint Project of FLIP & FSP

Scientists: Mr. Atef Haddad, Dr. S.Silim and Dr. M.C.Saxena

3.4. LENTIL HEED CONTROL

LENTIL WEED CONTROL PROJECT NO. 1

Title: International Lentil Weed Control Trial

Introduction: Weeds constitute one of the major constrains to lentil production. Since labour is scarce and expensive, there is need to control weeds by chemicals. A trial was initiated and will be continued to identify promising herbicides and determine the proper method of application.

Objective: To evaluate different herbicides for use in control of weeds in lentils.

Treatments:

	Symbol
1. Weedy check	T_1
2. Weed free by repeated hand weeding	T_2
3. Hand weeding twice (30-40 & 70-80 DAE)	T_3
4. Pre-emergence application of chlorbromuron (Maloran) at 1.5 kg a.i./ha	T_4
5. Pre-emergence application of prometryne (Gesagard) at 1.5 kg a.i./ha	T_5
6. Pre-emergence application of methabenzthiazuron (Tribunil) at 2.0 kg a.i./ha	T_6
7. Pre-emergence application of cyanazine (Bladex) at 0.5 a.i./ha	T_7
8. Pre-emergence application of cyanazine (Bladex) at 1.0 kg a.i./ha	T_8
9. Same as No. 4 above + 0.5 kg a.i./ha of pronamid (Kerb)	T_9
10. Same as No. 5 above + pronamide as No. 9	T_{10}
11. Same as No. 6 above + pronamide as No. 9	T_{11}
12. Same as No. 7 above + pronamide as No. 9	T_{12}

Design: Randomized complete block design

Replication: Four

Location: Breda, Terbol

Analysis of variance:

Source of variation	DF
Replication	3
Treatment	11
Error	33

Ndtote: One of the International Agronomy Trials. This set of treatment will be discontinued in 1986/87 season.

Scientists: Drs S.Silim, M.C.Saxena and Mr. Atef Haddad

LENTIL WEED CONTROL PROJECT NO. 2

Title: Chemical weed control in lentil.

Objectives: To evaluate the best herbicides which were identified in the preliminary study for weed control in lentil. These treatments will also be used in the Interntional Weed Control Trial.

Location: Tel Hadya

Treatments: 12 herbicides + 2 checks.

Treatments	Timing	Rate kg a.i./ha Lentil
Weedy check		-
Weed free		-
Cyanazine +		0.5
Pronamide	Pre-em	0.5
Terbutryne +		2.0
Pronamide	Pre-em	0.5
Dinoseb acetate +		1.0
Fluazifop butyl	Post-em	0.5
Codal	Pre-em	1.5
Secbumetron	Pre-em	0.2
Napropamide	Pre-em	1.0
Carbetamide	Pre-em	1.5
Ac, 252, 214	Pre-em	0.15
Ac, 252, 214	At-em	0.15
Ac, 252, 214	E.post-em	0.10
Fomesafen	M.post-em	0.2
Fomesafen	L.post-em	0.2

Design: RCB, 4 replications.

ANOVA:

Source of Variance	df
Rep.	3
Treatment	13
Error	39

Related Measurements:
Crop phenology, crop injury and weed infestation levels.

Scientists: Mr. Atef Haddad, Dr. S.Silim and Dr. M.C.Saxena

3.5. LENTIL OROBANCHE PROJECT

LENTIL OROBANCHE PROJECT NO. 1 - PART A

Title: Developing a Laboratory Test to Screen Lentils. Test with Petridishes.

Introduction/Objectives: For that it is necessary to find out the optimal conditioning period and-temperature for Orobanche seeds. To carry out resistance evaluation it is necessary to test several inoculum loads of Orobanche.

Location: Incubator, growth room.

Test vessel: Petridishes 9 cm.

Plant material:
Orobanche crenata (harvested 1983 in Tel Hadya)
Lens culinaris ILL 5582.

Treatments:
3 growth media (sand, natural soil, atapulgus clay)
3 conditioning periods for Orobanche seeds (5, 10, 15 days).
2 temperatures during conditioning period (20,25°C).
3 inoculum loads of Orobanche seeds (0,05; 0,1; 0,2 g/kg media).

Test conditions: 26/21°C day/night (+ 2°C).
(growth room): 30-40% humidity.

Replications: 10 per treatment.

Scientists: J. Sauerborn, H. Masri and M. C. Saxena

LENTIL OROBANCHE PROJECT NO. 1 - PART B

Title: Developing a Laboratory Test to Screen Lentils. Test with Behringer Vessels.

Location: Incubator, growth room.

Test vessel: Behringer vessel.

Test medium: Mixture of soil and sand (3: 1 weight proportion).

Plant material:
Orobanche crenata (harvested 1983 in Tel Hadya)
Lens culinaris ILL 5582.

Seeds of Orobanche are pre-conditioned at 20°C for 10 days in the mixed test medium.

Treatments:
2 inoculum loads of Orobanche seeds (0,1; 0,2g/kg soil).
3 seed rates of lentils (4, 8, 12 seeds per vessel).

Test conditions: 26/21°C (day/night) (+ 2°C).
(growth room): 30-40% humidity.

Replications: 4 per treatment.

Scientists: J. Sauerborn, H. Masri & M. C. Saxena

LENTIL OROBANCHE PROJECT NO. 2

Title: Effect of Sowing Date on the Development of Orobanche in a Susceptible and a Tolerant Genotype of Lentil.

Introduction/Objectives: A field experiment will be conducted at Tel Hadya to study the influence of sowing date of lentils on lentil and Orobanche phenology and competition intensity.

Location: Tel Hadya (A22).

Treatments:
- Dates of sowing (6) — Main-plot
  1 Oct., 15 Oct., 1 Nov., 15 Nov., 1 Dec., 15 Dec.
- Varieties — Sub-plot
  ILL 4400 (susceptible)
  (tolerant)

Design: Single split plot.

Replications: 3

Plot size: 5X3 m(= 15m^2)

Row to row distance: 30cm (10 rows/plot)

Plant to plant distance: 10 cm (50 plants/row)

Fertilizer application: 20kg N, 60kg P_2O_5 per ha.

Total area of the experimental layout: 37,5 x 18m (=671m^2).

Measurements:
- Dig up two plants per plot every 8 days starting 20 days after sowing.
- Wash out the roots.
- Record the number of Orobanche per plant seperated into the following growth stages:
  a) tubercle stage
  b) bud stage
  c) emergent stage.
- Record growth stage of lentils.

Scientists:
1. Marja van Hezewijk and Arnold Pieterse from Royal Tropical Institute, Amsterdam.
2. J. Sauerborn, H.Masri and M. C. Saxena from ICARDA.

Note: EEC - Project study.

LENTIL OROBANCHE PROJECT NO. 3

Title: Testing New Herbicides for Orobanche Control.

Introduction/Objectives: See Orobanche Project (6)

Location: Tel Hadya (A22)

Plant material: Lens culinaris (SLL)

Treatments:
Same treatments as in Orobanche Project 6

Design: Randomized block design.

Replication: 4

Plot size: 5x3 (= $15m^2$).

Row to row distance: 30 cm (10 rows/plot)

Plant to plant distance: Row-seed

Seed depth: 5cm

Total area of experimental layout: 36x2,5 m(=$882m^2$).

Measurements:
- Record growth stages of lentils
- Report crop injury in percentage

- Record growth stages of Orobanche by digging up some plants
- Evaluate the effect of herbicides;
  - count the Orobanche shoots per plant (5 plants/plot) at the time of harvest.
  - determine crop yield ($8m^2$/plot):
    whole plant (dry weight)
    pods (dry weight)
    seeds (dry weight)

Scientists: J. Sauerborn, H. Masri and M. C. Saxena

LENTIL OROBANCHE PROJECT NO. 4

Title: Effect of soil solarisation on Orobanche crenata infestation in Lentils.

Experimental details: Already described in FABA BEAN OROBANCHE PROJECT NO. 1.

LENTIL OROBANCHE PROJECT NO. 5

Title: Influence of Temperature on the Time to Infestation of Orobanche crenata on lentils.

Experimental details: Already described in FABA BEAN OROBANCHE PROJECT NO. 2.

LENTIL OROBANCHE PROJECT NO. 6

Title: The Effect of Exogenous Growth Regulators on Orobanche Resistance of Lentils.

Experimental details: Already discribed in FABA BEAN OROBANCHE PROJECT NO. 7.

3.6. LENTIL ENTOMOLOGY

General Objectives:

1. Survey and identification of insect pests.
2. Determination of the economic importance of insect pests affecting faba beans in the region.
3. Screening for host plant resistance to key pests.
4. Development of alternate methods of control which can be integrated with host plant resistance.

LENTIL ENTOMOLOGY EXPERIMENT NO. 1

Title: Determination of Insect Control Recommendations for Lentils.

Objective: To further refine control recommendations for Sitona and to measure the effect of aphid and thrips infestations on yields.

Location: Tel Hadya.

Treatments: The eight combinations of three factors (Sitona control, aphid control, thrip control) at two levels (control; no control).

Design: RCB, 4 reps. Plot size: 16 rows x 6m x 0.30m

Observations:

1. Sitona VDS, 10 plants/plot, 3 times/season.
2. Sitona % LD, 5 plants/plot, 3 times/season.
3. Sitona % ND, 5 plants/plot. 3 times/season.
4. Apion % LD, 5 plants/plot, 3 times/season.
5. Foliar insect counts, 2 boards/plot, every week.
6. No.of Neonate Sitona/1500 c.c. soil/plot at harvest.
7. % pod damage by pod borers at harvest.
8. Biological yield.
9. Seed yield.

Scientists: Mr. A. Joubi and Senior Entomologist.

LENTIL ENTOMOLOGY EXPERIMENT NO. 2

Title: Determination of an Economic Injury Level for Sitona macularius.

Objective: To establish the critical level of nodule damage that causes an economic loss.

Location: Tel Hadya.

Treatments:

Carbofuran	20 kg c.p./ha
"	15 kg c.p./ha
"	12 kg c.p./ha
"	10 kg c.p./ha
"	8 kg c.p./ha
"	5 kg c.p./ha
"	2 kg c.p./ha
Check	0 kg c.p./ha

Design: RCB, 4 reps. Plot size: 10 rows x 6m x 0.30m

Observations:

1. Sitona VDS, 10 plants/plot every two weeks.
2. Sitona % LD, 5 plants/plot every two weeks.
3. Sitona % ND, 5 plants/plot every two weeks.
4. % LD by Apion, 5 plant/plot every month.
5. No. of Neonate Sitona/1500 c.c. soil at harvest.
6. % pod damage by pod borers at harvest.
7. Biological yield.
8. Seed yield.

Scientists: Mr. A. Joubi and Senior Entomologist.

LENTIL ENTOMOLOGY EXPERIMENT NO. 3

Title: The Economics of Sitona Control in Lentils.

Objective: To evaluate the economic feasibility of Sitona control under farmers' conditions.

Location: Tel Hadya, Souran, Breda, Azzaz (2 sites), Idelib (2 sites), Kameshly, Jabal Sama'an.

Treatments:

1. Carbofuran 20 kg c.p./ha
2. Carbofuran 10 kg c.p./ha
3. Check

Design: RCB, 2 reps/site. Plot size: 16 rows x 6m x 0.3m

Observations:

1. Sitona VDS, 10 plants/plot, 3 times/season.
2. Sitona % LD, plants/plot, 3 times/season.
3. Sitona % ND, 10 plants/pllot, 3 times/season.
4. % LD by Apion , 10 plants/plot, 3 times/season.

5. Foliar insect counts, 2 boards/plot, 3 times/season.
6. Sitona Neonate in 1500/c.c. soil/plot at harvest.
7. % pods damaged by pod borers at harvest.
8. Biological yield.
9. Straw yield.

Scientists: Mr. A. Joubi and Senior Entomologist

3.7. LENTIL MICROBIOLOGY

LENTIL MICROBIOLOGY PROJECT NO. 1

Title: Collection, purification and evaluation of different strains of Rhizobium legumin s rum from different parts of ICARDA region.

Objective: To identify specific strains which are superior to the indegenous strains. The strains will be collected by survey of different production areas and collection of nodules and soil samples. The isolation will be done and their purification will be undertaken. Purified cultures will be evaluated for their performance using plant infection test technique, nitrogen yield and acetylene reduction assay.

Location: Growth Chamber/Microbiology Laboratory at ICARDA

Scientists: Mr. Fadel Afandi and Senior Microbiologist

LENTIL MICROBIOLOGY PROJECT NO. 2

Title: Field evaluation of some superior strains of Rhizobium for lentils.

Objective: To identify superior strains of Rhizobium for lentils for Tel Hadya condition.

Location: Tel Hadya

Treatment: Six promising strains will be evaluated agains one uninoculated and one uninoculated + fertilizer nitrogen check.

Design: RCB, 4 replications

Scientists: Mr. Fadel Afendi and Senior Microbiologist.

LENTIL MICROBIOLOGY PROJECT NO. 3

Title: Evaluation of some promising lentil genotypes for their nodulation, actylene reduction pattern, nitrogen yield and productivity as affected by inoculation.

Objectives: The main aim is to confirm the differences observed earlier in the faba bean genotypes for nitrogen fixation in response to inoculation with the Rhizobium.

Location: Tel Hadya

Treatments:
A. Genotypes 15
B. Inoculation treatments 2

Design: Single split-plot design with 4 replications.
Inoculation in the main plots, genotypes in the sub-plots.

Scientists: Mr. Fadel Afendi, Senior Microbiologist, Dr. W.Erskine

3.8. LENTIL QUALITY PROJECTS

LENTIL QUALITY PROJECT 1

Title: Screening of Advanced Lentil Lines for Seed Quality.

Objective: To monitor, in relation to the local check, the protein content, cooking time, 100 seed weight of advanced lentil lines from the breeding program.

Location: Tel Hadya.

Trial:
Lentil Regional Yield Trial-large seeded (24 entries, 3 Rep.,1 loc.)
Lentil Regional Yield Trial-small seeded (24 entries, 4 Rep.,1 loc.)
Lentil Inter. Yield Trial-large seeded (24 entries, 3 Rep., 1 loc.)
Lentil Inter. Yield Trial-small seeded (24 entries, 4 Rep., 1 loc.)

Variables:
Protein content %: NIR (Neotec 51A)
Cooking time: labconco crude fibre testing equipment.
100 seed weight: counting.

Design: R.C.B.

Scientists: Dr. Erskine, Dr. P. Williams and Mr. H. Nakkoul.

LENTIL QUALITY PROJECT 2

Title: Lentil Decortication (dehulling).

Objective:
1. To compare factory dehuller (Aleppo), TADD (Tangential Abrasive dehulling device) and Schule dehuller.
2. To study effect of location and genotype on decortication.

Trials:
1. LAYT-S-86 - 24 cultivars, 3 Reps., 3 locations
2. On-farm trial - 3 cultivars, 2 Reps., 8 locations.

Variables:
1. Decortication.
2. Seed size.
3. Protein content
4. Cooking time.

Scientists: Dr. Williams, Dr. Erskine and Mr.H. Nakkoul.

LENTIL QUALITY PROJECT 3

Title: Effect of moisture supply on protein content and cooking quality of lentil genotypes.

Objective: To study the effect of different moisture regimes on the cooking quality and protein content of seeds of different genotypes of lentils.

Trial: Lentil Agronomy/Crop Physiology Experiment No. 2.

Variables:
1. protein content
2. Cooking time
3. Seed size.

Scientists: Dr. Williams, Dr. Silim, Dr. Saxena, Mr. Nakkoul.

LENTIL QUALITY PROJECT 4

Title: Lentil Straw Quality.

Objective:
1. Test straw quality of elite lines.
2. Test quality of leaves, pod-walls, branches and roots.
3. Test straw quality of mechnaization trial (Lentil Mechanization Trial 7).
4. Test straw quality of height of mowing trial
5. Test straw quality of lentil fertility and inoculation trial.

Location: FLIP laboratory.

Treatments:
1. Analysis of 'on-farm trial' straw.
   6 varieties x 2 replicates x 8 locations.
2. Samples from a single location of on-farm trial.
3. Samples from Lentil Mechanization Expt. 1 (4 locations x 8 treat x 2 reps)
4. Samples from Lentil Mechanization Expt. 2.

Variables:
Protein content %.
Acid and Neutral detergent fibre (ADF + NDF)%.
Digestability (Pepsin - celllulase method)%.

Scientists: Dr. Erskine, Dr. S. Silim and Mr. H. Nakkoul.

IV. KABULI CHICKPEA IMPROVEMENT

4.1. CHICKPEA BREEDING PROJECT

GENERAL OBJECTIVES

High yield, ascochyta blight resistance, less photoperiod sensitivity, tolerance to iron deficiency, and maintenance of existing level of protein content.

Specific Objectives:

1. For spring sowing in the Mediterranean region: suitability of earlier sowing and heat tolerance.
2. For winter sowing in the Mediterranean region: cold tolerance, early flowering, and monitoring Orobanche susceptibility.
3. Large seeded (> 40g/100 seeds) for certain countries in the Mediterranean region and the Americas: avoidance of susceptibility to root rots and wilt.
4. For winter sowing in the Indian subcontinent and the Nile Valley: responsive to irrigation, early maturity, tolerance to wilt and root rots.

Chickpea Breeding Experiment No. 1

Title: Making crosses in chickpeas.

Objective To combine high yield; resistance to various stresses, such as ascochyta blight, cold, leaf miner, Orobanche, and nematode; and a range of seed sizes, growth habits, and maturities.

Location: Tel Hadya and Terbol.

Treatment: 400 crosses.

Design: Systematic

Analysis of Variance: Not applicable.

Scientist: K. B. Singh.

Chickpea Breeding Experiment No. 2

Title: F_1 generation in chickpea.

Objective: To grow F_1's under continuous light in the off-season to produce F_2 seeds. The material is grown under light because some

of the parents used in the hybridization program do not mature and also some of the their F_1's do not mature.

Location: Terbol/Sarghaya

Treatments: 422 F_1's

Design: Systematic.

Analysis of Variance: Not applicable.

Scientist K. B. Singh.

Chickpea Breeding Experiment No. 3

Title: Chickpea segregating generations.

Objective:

1. To grow F_2 and F_4 generations at Tel Hadya and screen for resistance to ascochyta blight, cold, and Orobanche sp., and iron chlorosis.
2. To grow F_3 generation in the off-season and screen for the less-photoperiod sensitivity.
3. To grow F_5 to F_7 generations during winter and spring at Tel Hadya and bulk uniform and promising lines.

Locations: Tel Hadya and the off-season site.

Treatments: 422 F_2 populations, 10,000-12,000 F_4 to F_7 progenies.

Design: Not applicable.

Analysis of Variance: Not applicable.

Scientist: K. B. Singh

Chickpea Breeding Experiment No. 4

Title: Chickpea off-season nursery.

Objective:

1. To advance generations.
2. To screen the breeding material for less-photoperiod sensitivity.

Locations: Terbol/Sarghaya.

Treatment: 422 F_1, 1700 F_3 and 314 bulked lines.

Design: Not applicable.

Analysis of Variance: Not applicable.

Scientist: K. B. Singh.

Chickpea Breeding Experiment No. 5

Title: Development of the leaf miner resistant genetic stocks of chickpea.

Objectives: To develop leaf miner resistance lines to minimize yield loss due to this important insect in the Mediterranean region.

Location: Tel Hadya.

Treatments:
1. To make 10 crosses between high yielding ascochtya blight resistant lines and leaf miner resistant sources.
2. To grow segregating populations (F_2-F_3) in ascochyta blight disease nursery and select plants/progenies resistance to ascochyta blight first and then for leaf miner resistance.

Design: Systematic.

Analysis of Variance: Not applicable.

Scientist: K. B. Singh and Food Legume Entomologist.

Chickpea Breeding Experiment No. 6

Title: Mass selection for cold tolerance in chickpea cultivars ILC 482 and ILC 3279.

Objective: Purification of ILC 482 and ILC 3279 for cold tolerance.

Location: Tel Hadya.

Treatments: 500 selected cold tolerant plants during 1984/85 from each of ILC 482 and ILC 3279 to be grown in the cold tolerance screening nursery.

Design: Systematic.

Analysis of Variance: Not applicable.

Scientist: K.B. Singh, R.S. Malhotra, M.C. Saxena

Chickpea Breeding Experiment No. 7

Title: Multilocation testing of newly bulked chickpea lines.

Objectives:
1. To identify lines suitable for winter sowing.
2. To identify lines suitable for spring sowing.
3. To identify lines with wide adaptation.

Locations: Tel Hadya and Jinderis in Syria and Terbol in Lebanon.

Treatments: 8 PYTs, each comprising 22 test and 2 check entries to be grown during both winter and spring seasons and at 3 sites. (Total of 48 trials).

Design: RBD; 2 replications.

Analysis of Variance

Source	D.F.
Replications	1
Entries	23
Error	23

Scientist: K. B. Singh

Chickpea Breeding Experiment No. 8

Title: Testing of newly bulked large seeded chickpea lines.

Objectives: To identify high yielding large seeded lines for winter and spring sowings.

Location: Tel Hadya and Terbol.

Treatment: 1 PYT comprising 22 test and 2 check entries (total of 2 trials).

Design: RBD; 2 replications.

Analysis of Variance

Source	D.F.
Replications	1
Entries	23
Error	23

Scientist: K. B. Singh.

Chickpea Breeding Experiment No. 9

Title: Testing of newly bulked tall chickpea lines.

Objectives: To identify high yielding tall lines for winter sowing.

Location: Tel Hadya, Terbol and Nicosia (Cyprus).

Treatment: 2 PYTs, each comprising 22 test and 2 check entries (total of 6 trials).

Design: RBD; 2 replications.

Analysis of Variance

Source	D.F.
Replications	1
Entries	23
Error	23

Scientists: K. B. Singh and a scientist from Cyprus.

Chickpea Breeding Experiment No. 10

Title: Testing of newly bulked desi chickpea lines.

Objective: To identify high yielding and early maturing desi lines for the Indian subcontinent.

Location: Tel Hadya (Syria), Islamabad (Pakistan) and ICRISAT Center (India), (total of 9 trials).

Treatments: 3 PYTs, each comprising 22 test and 2 check entries.

Design: RBD; 2 replications.

Analysis of Variance

Source	D.F.
Replications	1
Entries	23
Error	23

Scientists: K.B. Singh (Syria), B.A. Malik and Rahman (Pakistan) and H.A. van Rheenen (India).

Chickpea Breeding Experiment No. 11:

Title: Chickpea on-farm trial

Objective: To identify lines for release as commercial cultivars for winter sowing in Syria.

Location: 16 sites including 7 stations of the Ministry of Agriculture, Syria, 1 location at Tel Hadya, and 8 locations at farmers fields.

Treatment: Five cultivars (FLIP 81-293C, FLIP-82-150, FLIP 82-232 as test entries , ILC 482, ILC 3279 as check entries).

Design: RBD; 2 replications per location.

Analysis of Variance:

Source	D.F.
Replications	1
Entries	4
Error	4

Scientists: K. B. Singh and Scientists from the Ministry of Agriculture, Syria.

Chickpea Breeding Experiment No. 12

Title: Chickpea seed increases.

Objective: To multiply seed of the lines included in the preliminary yield trials, international nurseries, and on-farm trials.

Location: Tel Hadya.

Treatments:

1. Small scale multilocation: Approximately 500 lines.
2. Large scale multilocation: Approximately 10.

Design: Not applicable.

Analysis of Variance: Not applicable.

Scientist: K. B. Singh.

Chickpea Breeding Experiment No. 13:

Title: Screening for ascochyta blight resistance in chickpea.

Objective: To identify additional sources of resistance to ascochyta blight from the germplasm accessions and to reconfirm the resistance of the newly bulked lines.

Location: Tel Hadya, Lattakia, and Terbol.

Treatment: 800 genotypes.

Design: Systematic.

Analysis of Variance: Not applicable.
Scientists: Chickpea Pathologist and K. B. Singh.

Chickpea Breeding Experiment No. 14

Title: Screening for cold tolerance in chickpea.

Objectives: To identify winter hardy lines.

Location: Tel Hadya, Hymana, and Eskeshehir (Turkey).

Treatment:
i) Reconfirmation of 198 lines for cold tolerance at all the 3 sites.
ii) Evaluation of 1000 new germplasm lines at Tel Hadya and 2000 lines at Hymana.
iii) Evaluation of 502 lines included in the PYT_s and the international trials at Tel Hadya.

Design: Augmented in some of the trials.

Analysis of Variance: Not applicable

Scientists: R.S. Malhotra, K.B. Singh and M.C. Saxena.

Chickpea Breeding Experiment No. 15:

Title: Screening for leaf-miner resistance in chickpeas.

Objective: To identify additional sources of resistance to leaf miner.

Location: Tel Hadya.

Treatment: 500 approximately.

Design: Systematic.

Analysis of Variance: Not applicable.

Scientists: Food Legume Entomologist and K.B. Singh.

Chickpea Breeding Experiment No. 16

Title: Seasonal influence on yield of selected chickpea genotypes.

Objective: To evaluate genotypes during late autumn, late winter and early spring to examine the influence of season on selected genotypes.

Location: Tel Hadya and Terbol; 3 sowing dates: late autumn, late winter and early spring.

Treatments:
Main-plot: sowing dates
sub-plots: 24 genotypes
Design: Split spot.

Analysis of Variance

Source	D.F.
Replications	3
Main plot	2
Error (a)	6
Sub plot	23
Interaction	46
Error (b)	207

Scientist: K.B. Singh, M.C. Saxena and S.N. Silim.

Chickpea Breeding Experiment No 17

Title: To study correlation among genotypes sown during winter, spring, and summer at Terbol.

Objectives: Determination of selection response of chosen genotypes during different seasons.

Location: Terbol

Treatments: 25 genotypes.

Design: Partially balanced lattice, 4 replications.

Analysis of Variance:

Source	D.F.
Replications	3 = ($r_2$1)
Treatments	24 = (K^2-1)
Blocks with replications	16 = r(k-1)
Component (a)	8 = n(b-1)(k-1)
Component (b)	8 = n(k-1)
Intra block error	56 = (k-1)(rk-k-1)

Scientist: K.B. Singh.

Chickpea Breeding Experiment No. 18

Title: Screening chickpeas lines for resistance to cyst nematodes (Heterodera sp.)

Objective: To identify lines resistant/tolerant to cyst nematode.

Location: Tel Hadya (plastic house)

Treatments: Genotypes will be grown in pots with cyst nematode inoculum for evaluation of their resistance. The study will involve:
i) Reconfirmation of resistance in already screened sources.
ii) Preliminary screening of elite lines in different PYTs and international trials.

Design: Randomized Block Design.

Analysis of Variance.

Scientists: Chickpea Pathologist, K.B. Singh, M.C. Saxena and N.Greco.

4.2. CHICKPEA PATHOLOGY

Chickpea Pathology Experiment No. 1

Title: Relationship between population density of cyst nematode (*Heterodera* sp.) and root-knot nematode (*Meliodogyne artiellia*) with yield in chickpea.

Objective: To assess yield losses caused by *Heterodera* sp. and root-knot nematode and to find out the minimum population levels in soil to cause economic losses in chickpea.

Location: Tel Hadya and Bari; both in winter and spring.

Treatments:

1. Control
2. 0.125 eggs/cm^3 soil
3. 0.25 " " "
4. 0.5 " " "
5. 1 " " "
6. 2 " " "
7. 4 " " "
8. 8 " " "
9. 16 " " "
10. 32 " " "
11. 64 " " "
12. 128 " " "

Design: RBD with 9 reps.

Analysis of Variance:

Source	D.F.
Replications	3
Treatments	11
Error	33

Scientists: Chickpea Pathologist, K.B.Singh, M.C. Saxena and N. Greco.

Chickpea Pathology Experiment No. 2

Title: Chemical control of root-lesion nematode in chickpea.

Objective: To find out the suitable dose of nematicide for control of root-lesion nematode and estimate losses caused by nematode on lines of winter and spring chickpea.

Location: Tel Hadya - winter, spring.

Treatments:
Main plot: ILC 263, ILC 482, ILC 3279.
Sub plots: Nematicide treatments.
1. 5 kg/1000 m^2 Aldicarb before sowing +
   2.5 kg/1000 m^2 " after gremination +
   2.5 kg/1000 m^2 " preflowering stage
2. 5 kg/1000 m^2 " before sowing +
   5 kg/1000 m^2 " after germination
3. 10 kg/1000 m^2 " before sowing.
4. Seed treatment 3g Aldicarb per kg seed +
   2.5 kg/1000 m^2 " after germination +
   2.5 kg/1000 m^2 " preflowering stage
5. Seed treatment 3g Aldicarb per kg seed
6. Control.

Design: Split plot, 4 replications.

Analysis of Variance:

Source	D.F.
Replication	3
Genotypes (a)	2
Error (A)	6
Nematicide treatments (N)	5
Genotypes X N	10
Error B	45
Total	71

Scientists: Chickpea Pathologist, K.B. Singh, M.C. Saxena and N. Greco.

Chickpea Patholoogy Experiments No. 3

Title: Chickpea international blight nursery (CIABN-86).

Obectives: To identify additional sources of resistance to ascochyta blight in chickpea.

locations: Tel Hadya, Lattakia and Terbol.

Treatments: 50 + 1 (susceptible check, planted after every two test rows).

Design: RBD; 2 replications.

Analysis of Variance:

Source	D.F.
Replications	1
Entries	50
Error	50

Scientists: Chickpea Pathologist, K.B. Singh, R.S. Malhotra and Siham Kabbabeh.

Chickpea Pathology Experiment No. 4

Title: Ascochyta blight: Disease intensity and yield loss.

Objective: To study the effect of disease intensity on yield in chickpea.

Location: Tel Hadya.

Treatments:

Main plot Treatments:
1. Infected
2. Protected

Sub plot treatments: 20 genotypes

Design: Split plot.

Analysis of Variance:

Source	D.F.
Replications	2
Main plots	1
Error A	2
Sub-plot	19
Interaction	19
Error B	76

Scientist: Chickpea Pathologist, and K.B. Singh.

Chickpea Pathology Experiment No. 5

Title: Plant height and pod resistance to ascochyta blight in chickpea.

Objective: To find out association between plant height and pod infection in ascochyta blight of chickpea.

Location: Tel Hadya.

Treatments:

Main-plot treatments:
1. Normal plant height
2. Reduced plant height.

Sub-plot treatments: 10 genotypes.

Design: Split plot

Analysis of Variance

Source	D.F.
Replications	2
Main plots	1
Error A	2
Sub-plot	9
Interaction	9
Error B	36

Scientist: Chickpea Pathologist, and K.B. Singh.

Chickpea Pathology Experiment No. 6

Title: Epidemiology of ascochyta blight in chickpea.

Objective: To study the effect of temperature and relative humidity on disease development in susceptible, tolerant and resistant chickpea lines.

Location: Tel Hadya, (winter and spring).

Treatments: 3
ILC-263 (suscetible)
ILC-482 (tolerant)
ILC-3279 (resistant)

Design: RBD

Analysis of Variance:

Source	D.F.
Replications	2
Cultivars	2
Error	4

Scientists: Chickpea Pathologist, and K.B. Singh.

Chickpea Pathology Experiment No. 7

Title: Plant maturity and pod resistance to ascochyta blight in chickpea.

Objective: To study the association between the duration of crop maturity and pod resistance to ascochyta blight in chickpea.

Location: Tel Hadya.

Treatments

Main-plot treatments:
1. Normal day length.
2. Extended day length (artificial light).

Sub-plot Treatments: 10 genotypes.

Design: Split plot.

Analysis of Variance:

Source	D.F.
Replications	2
Main plot	1
Error A	2
Sub-plot	9
Interaction	9
Error B	36

Scientist: Chickpea Pathologist, and K.B. Singh.

Chickpea Pathology Experiment No. 8

Title: Multiple diseases resistance in chickpea.

Objective: To identify lines showing combined resistant to ascochyta blight, wilt, root-rots and stunt (PLRV), and to ascochyta blight and cyst nematode.

Location: Tel Hadya (winter)

Treatments: 20 genotypes

Design: Not applicable.

Analysis of Variance: Not applicable.

Scientists: Chickpea Pathologist, and K.B. Singh.

Chickpea Pathology Experiment No. 9

Title: Screening of chickpeas for resistance to different races of ascochyta blight.

Objective: To identify resistance to different races of A. rabiei in chickpea.

Location: Tel Hadya (plastic house).

Treatments: 1000 genotypes.

Design: Not applicable.

Analysis of Variance: Not applicable.

Scientists: Chickpea Pathologist and K.B. Singh.

Chickpea Pathology Experiment No. 10

Title: Seedling and adult plant resistance to ascochyta blight in chickpea.

Objective: To find out seedling and adult plant resistance to ascochyta blight in chickpea.

Location: Tel Hadya (plastic house).

Treatments:

Main-plot treatments:

1. Inoculation in seedling stage.
2. Inoculation in adult stage.

Sub-plot treatments: 10 genotypes.

Design: Single split plot with 3 replications.

Analysis of Variance:

Source	D.F.
Replications	3
Stage of inoculation	1
Error A	3
Genotypes	9
Stage x Genotypes	9
Error B	54
	79

Scientists: Chickpea Pathologist, and K.B. Singh.

4.3. CHICKPEA ENTOMOLOGY

General Objectives:

1. Survey and identification of insect pests.
2. Determination of the economic importance of insect pests affecting chickpea in the region.
3. Screening for host plant resistance to key pests.
4. Development of alternate methods of control which can be integrated with host plant resistance.

Chickpea Entomology Experiment No. 1

Title: Determination of Critical Periods of Control for Leafminer in Winter and Spring-Planted Chickpeas (Two Trials).

Objective: To further refine the information on critical periods of control for leafminer.

Location: Tel Hadya.

Treatments: The eight combinations of three factors (pre-flowering control, flowering control, post-flowering control) at two levels (control, no control).

Design: RCB, 4 reps. Plot size: 16 rows x 6m x 0.30m.

Observations:
1. D-vac every week.
2. VDS/plot every week.
3. No. of Heliothis larvae/2 boards/plot every week.
4. % pod damaged by pod borer at harvest.
5. Seed yield.

Scientists: Mr. A. Joubi and Senior Entomologist.

Chickpea Entomology Experiment No. 2

Title: Screening of Chickpea Genotypes for Resistance to the Leafminer.

Objective: To identify chickpea materials with resistance to leafminer.

Location: Tel Hadya.

Treatments: Details given in Chickpea Breeding Experiment No. 10
Variable: Approximately 250 germplasm,
Approximately 80 breeder's lines
Approximately 130 lines for reconfirmation of resistance
31 accessions in ILM nursery.

Design: Augmented Design
Variable: Unreplicated germplasm nursery
RCB, 3-4 replications in breeders' nurseries.
RCB, three replications for leafminer reconfirmation nurseries.

Observations: 1. VDS at least 4 times for best genotypes.

Scientists: Dr. K. B. Singh, M. A. Joubi and Senior Entomologist

Chickpea Entomology Experiment No. 3

Title: Yield Losses as Selection Criteria for Resistance to the Leafminer in Spring-Planted Chickpeas.

Objective: To measure the differential yield losses due to leafminer in susceptible and resistant chickpea genotypes.

Location: Tel Hadya.

Treatments:

Main plots	Sub-plots
Chemical protection	15 genotypes previously selected for
No chemical protection	varying degrees of resistance to LM

Design: Split-plot, 4 reps. Sub plot size: 4 rows x 6m x 0.30m.

Observations:
1. VDS.
2. Seed yield.

Scientists: Mr. A. Joubi and Senior Entomologist.

Chickpea Entomology Experiment No. 4

Title: Integrated Control of the Leafminer in Spring-Planted Chickpeas.

Objective: To assess the comparative risk-related aspects of the combination of resistance to the LM and the chemical control of this insect.

Location: Tel Hadya.

Treatments:
1.R Variety sprayed 3 times
2.R Variety sprayed 2 times
3.R Variety sprayed 1 time
4.R Variety never sprayed
5.S Variety sprayed 3 times
6.S Variety sprayed 2 times
7.S Variety sprayed 1 time
8.S Variety never sprayed.
R = Resistant, S = Susceptible

Design: RCB, 4 reps. Plot size: 12 rows x 6m x 0.30m.

Observations:
1. VDS every week.
2. D-vac every week.
3. % mining in 5 plants/plot twice a week.
4. % pods damaged by Heliothis at harvest.
5. Seed yield.

Scientists: Mr. A. Joubi and Senior Entomologist.

Chickpea Entomology Experiment No. 5

Title: Mechanisms of Resistance to the Leafminer in Spring-Planted Chickpeas.

Objective: To further refine the information on possible mechanisms of resistance to the chickpea leafminer.

Location: Tel Hadya.

Treatments: Four genotypes : ILC 1776 (R), ILC 2319 (R), ILC 2512 (S), ILC 3397 (very susceptible) under protected and unproctected conditions.

Design: Split-plot, 4 reps. Varieties as sub-plots. Sub-plot size: 12 rows x 6m x 0.30m.

Observations:
1. VDS every week.
2. D-vac every weeks up to flowering.
3. No. of Heliothis larvae/2 boards plot.
4. % leaflets dropped, in 2 boards/plot, twice a week.
5. % leaflets mind in 5 plants/plot every week.
6. % pods damaged by Heliothis at harvest.
7. Seed yield.

Scientists: Mr. A. Joubi and Senior Entomologist.

4.4. CHICKPEA AGRONOMY/PHYSIOLOGY

GENERAL OBJECTIVES

Chickpea research has emphasis on increasing yield through breeding for winter sowing (ascochyta resistance and cold tolerance) and drought tolerance. Emphasis in Agronomy/Physiology is, therefore, directed towards (a) Providing physiological understanding to the breeder of the plant ideotype suitable for winter sowing (b) Screening for drought tolerance. The remaining part of Agronomy/Physiology research has diverse objectives which is given under individual topics.

Chickpea Agronomy/Physiology Experiment No. 1

Title: Growth analysis and productivity of some new promising cultivars

Introduction: Chickpeas unlike faba beans and lentils are normally spring grown in West Asia and the Mediterranean region largely due to their susceptibility to ascochyta blight. The yields are, therefore, low because of exposure of the crop at reproductive stage to water deficit and high temperatures. Following the development of ascochyta blight resistant lines, it is now possible to sow in winter. The potential advantages of sowing in winter include completion of critical flowering and pod development before soil moisture becomes limiting and temperatures become high.

The purpose of the present investigation is to study the effect of a range of winter and spring sowing dates on growth and productivity of new lines of winter chickpea.

Objectives: Evaluate response of some new promising chickpea cultivars to varying dates of sowing starting from winter to spring. Particularly to examine the improvement that may occur in the productivity by advancing the sowing date in spring itself. Dry matter accumulation and distribution in different plant parts, branching and podding pattern will be evaluated by plant sampling at various stages of growth. Yield analysis will also be carried out. The data generated will help in proposing the ideotype suitable for winter and early spring sowing.

Location: Tel Hadya, Terbol

Treatments:

A. Date of sowing 6: Dec 1; Jan 1; Feb 1; Feb 15; March 3; March 18
B. Cultivars: ILC 482, ILC 3279, FLIP 82-236C and FLIP 82-39C.

Design: Single split-plot with dates in main plots and genotypes in sub-plots. 4 replications.

Analysis of variance:

Source of variation	DF
Replications	3
Dates	5
Error (a)	15
Cultivar	3
Interaction (D x C)	15
Error (b)	54
TOTAL	95

Note:

1. FLIP-82 236C and FLIP-82 39C are new promising entries. ILC 482 and ILC 3279 are standard checks.
2. At Terbol, a graduate student of Dr M.Solh will work on this project as a part of his M.Sc. thesis.

Scientists: S.Silim and M.C.Saxena

Chickpea Agronomy/Physiology Experiment No. 2

Title: Response to supplementary irrigation in chickpeas

Introduction: Low and erratic rainfall is a major limiting factor to yields of chickpea in the Mediterranean region. Studies have shown that sowing in early winter results in an extended growth period and high total dry matter production. If, however, drought occurs early in the season, this advantage is not fully reflected in seed yield because of early exhaustion of available soil moisture during the extended vagetative phase. The yield of spring sown crop on the other hand is inherently low due to reproductive stage coinciding with period of drought and increasing temperature.

There is, therefore, need to investigate the effect of supplemental irrigation on growth and yield of chickpea when sown in winter and spring. A trial was initiated in the 1984/85 season to study this aspect. The same will be repeated in 1985/86.

Objectives: Evaluate response of six genotypes to supplementary irrigation for both winter and spring sowing.

Location: Tel Hadya

Treatments: Sowing date 2 : winter and spring
Irrigation 2 : with and without
Genotypes 6 : ILC 482 and ILC 3279 will be used as checks; 4 new entries as recommended by breeder will be used.

Design: Double split-plot with date in main plots, irrigation in sub-plots and variety in sub-subplots. 4 replications.

Analysis of variance:

Source of variation	DF
Replications	3
Dates D	1
Error (a)	3
Irrigation I	1
I x D	1
Error (b)	6
Variety V	5
V x D	5
V x I	5
V x D x I	5
Error (c)	60
TOTAL	95

Scientists: S.Silim, M.C.Saxena and K.B.Singh

Chickpea Agronomy/Physiology Experiment No. 3

Title: Evaluation of the drought tolerance of some promising chickpea cultivars in receding soil moisture conditions (terminal stress) in spring sown chickpea.

Introduction: In Indian sub-continent, West Asia and the Mediterranean region, chickpea is grown during seasons with little or no rainfall and without supplemental irrigation. The crop, therefore, depends on the moisture that is accumulated in the soil at the beginning of the cropping season and this soil moisture is progressively depleted during the growth of the crop. Efforts in improvement of the crop are being directed towards selection for drought tolerance. ICRISAT had started a program in this regard and sought ICARDA involvement. The entries selected at ICRISAT are those that have shown genotypic differences in drought tolerance in the initial screening.

Objective: To screen for drought tolerance in receding soil moisture conditions (terminal stress) in spring sown chickpea.

Location: Tel Hadya, full experiment; Jinderis only under rainfed condition.

Design: Split plot with 4 replications

Treatments:

A. Main plots: Irrigation levels
   1. Control = T_0 (unirrigated, unless needed to establish proper plant stand).
   2. Partially stressed = T_1 (one irrigation if needed to establish proper stand and one irrigation at flowering).
   3. Non-stressed = T_2 (one irrigation if needed to establish proper stand and 3 irrigations, one each at onset of flowering, pod set and pod fill).

B. Sub-plots: Genotypes (20)

ICRISAT		ICARDA	
V_1	= ANNIGERI	V_{11}	= ILC 262
V_2	= ICC 4958	V_{12}	= ILC 629
V_3	= K 850	V_{13}	= ILC 464
V_4	= ICC 10448	V_{14}	= ILC 1929
V_5	= ICC 10428	V_{15}	= ILC 1930
V_6	= ICC 11051	V_{16}	= TURKEY CODE 830
V_7	= ICC 10991		
V_8	= JG 74		
V_9	= P 1329		
V_{10}	= ICCL 82001		

Analysis of variance:

Source of variation	DF
Replications	3
Irrigation (I)	2
Error (a)	6
Genotypes (G)	15
I x G	30
Error (b)	135

Note: Collaboration between ICARDA and ICRISAT

Scientists: S.Silim, M.C.Saxena and N.P.Saxena (ICRISAT)

Chickpea Agronomy/Physiology Experiment No. 4

Title: Evaluation of line source sprinkler system for evaluating drought tolerance of spring chickpeas.

Introduction: The line source sprinkler allows researcher to apply a precise linear gradient of water across experimental area simulating the range of rainfall that might be encountered at that site over many years. It could, therefore, be used as a screening tool for drought tolerance. A trial will be initiated in 1985/86

to test the potential of line source sprinkler as a tool for screening for drought tolerance.

Objective: Evaluation of diverse chickpea genotypes under field conditions for moisture requirements using line source sprinkler.

Location: Tel Hadya

Treatments: Genotypes: (1) ICC 10491, (2) K 850, (3) ICC 11051, (4) JG 74, (5) P 1329, (6) ICC 10448, (7) ILC 16, (8) ILC 262, (9) ILC 482, (10) ILC 629, (11) ILC 1919, (12) ILC 1929, (13) ILC 1930, (14) ILC 3279, (15) FLIP 82-39, (16) FLIP 82-236

Design: (1) First regression on plot basis of yield vs. total moisture given will be done then the slope will be used for analysis as RCB.

Source of variation	DF
Total	63
Block	3
Genotype	15
Error	45

(2) Will try to carry out analysis as split plot design

Source of variation	DF
Block	3
Genotype	15
Error (a)	45
Moisture	13
Moisture x Genotype	195
Error (b)	625

Note: This is the first year for this trial.

Scientists: S.Silim and M.C.Saxena

Chickpea Agronomy/Physiology Experiment No. 5

Title: Pot culture study on nodulation of some segregating lines of chickpea

Introduction: Legumes, unlike other crops, have the unique ability of fixing atmospheric nitrogen through the symbiotic association with rhizobia. Scientists have been interested in quantifying the amount of nitrogen fixed by the crop. As a result different methods for the measurement of nitrogen fixation have been devised. One of the methods used in the estimation of fixed nitrogen is "Isotope dilution or ^{15}N-A value method" which involves the use of

non nodulating crop such as barley. One of the draw backs in the method is the physiological differences between a legume and a non-nodulating cereal crop. Recently, however, some lines of chickpea showed lack of nodulation and it promises therefore to over come the problem of using different crop species for estimating fixed N.

Objective: To evaluate the nodulating ability of chickpea cross. All the treatment will be inoculated with effective Rhizobium.

Location: Plastic house - Tel Hadya

Treatments:

A. Genotypes: V_1 = ILC 72; V_2 = ILC 482; V_3 = XTH ILC 72 x ILC 482 (Terbol summer increase row no 48277 of 1983/84 produce of TH)

B. Fertilization with nitrogen: N_1 = unfertilized; N_2 = fertilized with 120 kg N/ha in 3 splits of 40 kg N/ha each.

Design: RCB factorial (3 x 2) with 10 replications

Analysis of variance:

Source of variation	DF
Replication	9
Lines (V)	2
Fertilizer (F)	1
F x V	2
Error	45
TOTAL	59

Scientists: S.Silim, M.C.Saxena and K.B.Singh

Chickpea Agronomy/Physiology Experiment No. 6

Title: Planting method using ILC 482

Objectives: To evaluate the new precision seeder for chickpeas and quantify the yield differences between this and conventional planting methods for spring and winter sowing.

Location: Tel Hadya

Treatment: Planting techniques:

1. Hand planting, standard seed rate/ha, farmers method.
2. Cereal seed drill planted, standard seed rate/ha, 45 cm row spacing.
3. Precision seeder, standard seed rate/ha 45 cm row spcaing
4. Precision seeder 10 x 45 cm planting.

Design: RBD with the planting methods randomised in the block. 4 replications for each sowing date. (Spring and winter season).

Analysis of variance:

Source of variation	DF
Replications	3
Planting method	3
Experimental error	9

Scientists: S.Silim, M.C.Saxena and J.Diekmann

Chickpea Agronomy/Physiology Experiment No. 7

Title: Effect of some agronomic factors on farmers' chickpea production.

Objective: To assess the main effect and interaction of date of sowing, herbicide and inoculation on chickpea yields in farmers' fields.
To evaluate field losses due to weed infestation.

Location: 10 farmers' fields throughout chickpea growing area.

Treatments: 8 combinations of two dates of sowing (winter, spring).
2 weed control (with and without herbicides), and
2 inoculation levels (with and without inoculation).

Design: Split-split plot with 2 replications/location.
ANOVA: For each location

Source of Variance	df
Total	15
Date	1
Rep	1
Error a	1
Inoculation	1
Inoculation x Date	1
Error b	2
Weed	1
Date x weed	1
Weed x inoculation	1
Date x weed x inoculation	1
Error c	4

Related Measurements:
Crop phenology, weed infestaton level, root samples for acetylene reduction, and economic survey.

Principal Scientists Involved: Joint Project of FLIP and FSP
Scientists: Mr. Atef Haddad, Drs S.Silim and M.C.Saxena

4.5. WEED CONTROL IN CHICKPEAS

Title: Chemical weed control in chickpea.

Objectives: To evaluate the best herbicides which were identified in the preliminary study for weed control in chickpea. These treatments will also be used in the Interntional Weed Control Trial.

Location: Tel Hadya
Treatments: 12 herbicides + 2 checks.

Treatments	Timing	Rate kg a.i./ha chickpea
Weedy check		-
Weed free		-
Cyanazine +		1.0
Pronamide	Pre-em	0.5
Terbutryne +		2.0
Pronamide	Pre-em	0.5
Dinoseb acetate +		1.0
Fluazifop butyl	Post-em	0.5
Codal	Pre-em	2.0
Secbumetron	Pre-em	0.25
Napropamide	Pre-em	1.5
Carbetamide	Pre-em	1.5
Ac, 252, 214	Pre-em	0.2
Ac, 252, 214	At-em	0.2
Ac, 252, 214	E.post-em	0.10
Fomesafen	M.post-em	0.2
Fomesafen	L.post-em	0.2

Design: RCB, 4 replications.

ANOVA:

Source of Variance	df
Rep.	3
Treatment	13
Error	39

Related Measurements:
Crop phenology, crop injury and weed infestation levels.

Scientists: Mr. Atef Haddad, Dr. S.Silim and Dr. M.C.Saxena

4.6. CHICKPEA MICROBIOLOGY

CHICKPEA MICROBIOLOGY PROJECT NO. 1

Title: Collection, purification and evaluation of different strains of Rhizobium from different parts of ICARDA region.

Objective: To identify specific strains which are superior to the indegenous strains. The strains will be collected by survey of different production areas and collection of nodules and soil samples. The isolation will be done and their purification will be undertaken. Purified cultures will be evaluated for their performance using plant infection test technique, nitrogen yield and acetylene reduction assay.

Location: Growth Chamber/Microbiology Laboratory at ICARDA

Scientists: Mr. Fadel Afandi and Senior Microbiologist

CHICKPEA MICROBIOLOGY PROJECT NO. 2

Title: Field evaluation of some superior strains of Rhizobium for chickpeas.

Objective: To identify superior strains of Rhizobium for chickpeas for Tel Hadya condition.

Location: Tel Hadya

Treatment: Six promising strains will be evaluated agains one uninoculated and one uninoculated + fertilizer nitrogen check.

Design: RCB, 4 replications

Scientists: Mr. Fadel Afendi and Senior Microbiologist.

CHICKPEA MICROBIOLOGY PROJECT NO. 3

Title: Evaluation of some promising chickpea genotypes for their nodulation, actylene reduction pattern, nitrogen yield and productivity as affected by inoculation.

Objectives: The main aim is to confirm the differences observed earlier in the faba bean genotypes for nitrogen fixation in response to inoculation with the Rhizobium.

Location: Tel Hadya

Treatments:
A. Genotypes 15
B. Inoculation treatments 2

Design: Single split-plot design with 4 replications.
Inoculation in the main plots, genotypes in the sub-plots.

Scientists: Mr. Fadel Afendi, Senior Microbiologist, Dr. K.B.Singh

4.7. CHICKPEA QUALITY

Chickpea Quality Project No. 1

Title: Survey of the Use of Chickpea in Syria.

Object: To see most common use of chickpea in Syria with the collaboration of farming system program.

Location: Aleppo, Damascus.

Design: Prepare a questionnaire for housewives, shopkeepers, and factories using chickpea for different purposes.

Scientists: H.Nakkoul, P.Williams, A.B.Salkini and K.B.Singh

Chickpea Quality Project 2

Title: Evaluation of Elite lines of chickpea for protein content

Object: To monitor the protein content of elite lines of chickpea in relation to the local check.

Location: Tel Hadya

Trials: PYTs in W + S at Tel Hadya.

Variables:
Protein content : NIR (Neotec 51A)

Design: R.C.B.

Scientists: H.Nakkoul, P.Williams, A.B.Salikini and K.B.Singh

Chickpea Quality Project No. 3

Title: Evaluation of yield trials for protein content, cooking time, hydration capacity and Homos bitehineh.

Object: To monitor the protein content, cooking time, Hydration capacity, and Homos bitehineh in yield trials in relation to the local check.

Location: T.H. (Laboratory)

Trials:

CIYT-W-MR	24 entries	X_2 Rep
CIYT-Sp	24 "	X_2 Rep
CIYT-W-STR	24 "	X_2 Rep
CIYT-L	26 "	X_2 Rep

Variables:
Protein content%: NIR (Neotec 51A)
Cooking time: Labconco crude fibre testing equipment
Hydration: Water absorption
Homos-bitehineh: Test panel

Design: R.C.B.

Scientists: H.Nakkoul, P.Williams and K.B.Singh

Chickpea Quality Project No. 4

Title: Genotype - Environment interaction studies for quality parameters in chickpeas.

Object: To know the effect of location and year on protein content, cooking time, 100 seed weight in selected lines of chickpeas.

Location: Tel Hadya, Terbol, Jindersis.

Genotypes: 69

Variable:
Protein content : NIR (Neotec 51A)
Cooking time: Labconco and fibre testing equipment
100 seed weight: Counting

Design: R.C.B.

Scientists: H.Nakkoul, P.Williams, K.B.Singh

Chickpea Quality Project No. 5

Title: Evaluation of grain and straw quality of some improved genotypes of chickpeas grown in spring and winter with and without supplemental irrigation.

Object: To test grain and straw quality of elite lines planted in winter and spring with and without supplemental irrigation.

Location: Tel Hadya. Seed and straw samples from chickpea agronomy trial no. 2.

Variables:
Protein content : NIR (Neotec 51A); Seed Cooking Quality: Labconco.
Digestibility : Cellulose-pepsine method.

Design: R.C.B.

Scientists: H.Nakkoul, P.Williams, S.Silim, M.C.Saxena and K.B.Singh

V. INTERNATIONAL TESTING PROGRAM ON LENTILS, CHICKPEAS AND FABA BEANS - 1986

General Objectives:

1. To provide for widespread dissemination of:

   a) elite lines that could have potential as cultivars in West Asia,
   b) a range of genetic stocks to other regions for identification and utilization of the best adapted stocks by the national programs,
   c) early generation segregating populations for selection under local conditions,
   d) material exhibiting special characteristics for evaluation and testing under local conditions.

2. To conduct multi-location testing of elite material and thus examine genotypic performance across a range of environments and allow the identification of genotypes having wide adaptability.

3. To characterise the major environments in which food legumes are grown.

4. To obtain information on agronomic factors limiting crop growth in different regions.

5.1. EXPERIMENTS ON FABA BEANS

Experiment No. 1

Title: Faba Bean International Yield Trial-Large-1986 (FBIYT-L-86).

Objective:
a) Multilocational testing of elite lines which have already shown superiority in the initial evaluations and possess large seed size.
b) Identification of high yielding and widely adaptable lines for countries having preference for large seed size.

Locations: 25

Treatments: 18

Design: R.B.D.

Analysis of variance:

Source	DF
Replications	1
Entries	17
Error	17

Scientists: L.D.Robertson, R.S.Malhotra & M.C.Saxena

Experiment No. 2

Title: Faba Bean International Yield Trial-Small-1986 (FBIYT-S-86).

Objective:
a) Multilocational testing of small seeded elite lines which already have shown superiority in ISNs.
b) Identification of high yielding and widely adaptable lines.
c) Characterisation of environments.

Locations: 20
Treatments: 18
Design: R.B.D.

Analysis of variance:

Source	DF
Replications	1
Entries	17
Error	17

Scientists: L.D.Robertson, R.S.Malhotra and M.C.Saxena

Experiment No. 3

Title: Faba Bean International Screening Nursery - Large - 86 (FBISN-L-86).

Objective:

a) To furnish the advanced breeding lines (F_5/F_6) and elite germplasm with large seed size for initial evaluation by the national programs.

b) To identify superior performing genotypes for replicated multilocational testing in IYTS.

Locations: 40

Treatments: 34
Checks = 3
Blocks = 3
Block size = 14
Total Plots = 40

Design: Augmented

Analysis of variance:

Source	DF
Blocks	2
Checks	2
Error	4
Total	8

Scientists: L.D.Robertson, R.S.Malhotra and M.C.Saxena.

Experiment No. 4

Title: Faba Bean International Screening Nursery - Small - 1986 (FBISN-S-A-86) and Faba Bean International Screening Nursery - Small - B - 1986 (FBISN-S-B-86).

Objective:

a) To furnish the advanced breeding lines (F_5/F_6) and elite germplasm with small seed size for initial evaluation by the national programs.

b) To identify superior performing genotypes for replicated multilocational testing in IYTS.

Locations: FBISN-A 35
FBISN-B 15

Treatments: FBISN-A- 59
FBISN-B- 43

	FBISN-A	FBISN-B
Checks =	3	3
Blocks =	5	4
Block size =	15	13
Total plots =	71	52

Design: Augmented

Analysis of variance:

Source	DF	
	FBISN-A	FBISN-B
Blocks	4	3
Checks	2	2
Error	8	6
Total	14	11

Scientists: L.D.Robertson, R.S.Malhotra & M.C.Saxena

Experiment No. 5

Title: Faba Bean International F_3 Nursery-86 ($FBIF_3N$-86)

Objective:
a) To provide early generation segregating materials for selection under local conditions.
b) To evaluate the performance of the crosses in early generations in multilocations.

Locations: 40

Treatments: 43
Checks = 3
Blocks = 4
Block size = 13
Total plots = 52

Design: Augmented
Analysis of variance:

Source	DF
Blocks	3
Checks	2
Error	6
Total	11

Scientists: L.D.Robertson, R.S.Malhotra & M.C.Saxena.

Experiment No. 6

Title: Faba Bean International Orobanche Screening Nursery-1986 (FBION-86).

Objective:

a) To provide Orobanche tolerant materials to the national programs for identification of sources of resistance under local conditions.
b) To identify stable sources of resistance to Orobanche.

Locations: 17
Treatments: 11

Design: R.B.D.

Analysis of variance:

Source	DF
Replications	2
Entries	10
Error	20

Scientists: R.S.Malhotra, J.Sauerborn, L.D.Robertson & M.C.Saxena

Experiment No. 7

Title: Faba Bean International Ascochyta Blight Nursery-86 (FBIABN-86).

Objective:

a) To provide ascochyta blight resistant materials to the national programs for identification of sources of resistance under local conditions.
b) To identify stable sources of resistant to Ascochyta blight.

Locations: 10

Treatments: 17 (16 cultivars + 1 Susceptible check repeated after every two test entries, Total plots = 25)
Design: RBD with repeated spreader row susceptible check.

Analysis of variance:

Source	DF
Replications	1
Entries	16
Error	16

Scientists: S.Hanounik, R.S.Malhotra, L.D.Robertson & M.C.Saxena

Experiment No. 8

Title: Faba Bean International Chocolate Spot Nursery-1986 (FBICSN-86).

Objective:
a) To provide chocolate spot resistant materials to the national programs for identification of sources of resistance under local conditions.
b) To identify stable sources of resistances to chocolate spot disease.

Locations: 10

Treatments: 31 (30 cultivars + 1 Susceptible check repeated after two test entries, Total plots = 46).

Design: RBD with repeated spreader row and susceptible check.

Analysis of variance:

Source	DF
Replications	1
Entries	30
Error	30

Scientists: S.Hanounik, R.S.Malhotra, L.D.Robertson & M.C.Saxena

Experiment No. 9

Title: Faba Bean International Rust Nursery-1986 (FBIRN-86).

Objective:
a) To provide rust resistant materials to the national programs for identification of sources of resistance under local conditions.
b) To identify stabel sources of resistance to rust.

Locations: 10

Treatments: 23 (22 cultivars + 1 Susceptible check repeated after every two test entries, total plots = 34).

Design: RBD with repeated spreader row and susceptible check.

Analysis of variance:

Source	DF
Replications	1
Entries	22
Error	22

Scientists: S.Hanounik, R.S.Malhotra, L.D.Robertson & M.C.Saxena

Experiment No. 10

Title: Faba Bean Fertiliy-cum-Inoculation Trial - 1986 (FBFIT-86)

Objective: To study the effect of inoculation with Rhizobium, and fertilizer application with phosphorus and nitrogen

Locations: 3
Treatments: 8
Design: Randomised Block Design

Analysis of variance:

Source	DF
Replications	3
Entries	7
Error	21

Scientists: R.S.Malhotra & M.C.Saxena

Experiment No. 11

Title: Faba Bean Plant Population Trial - 1986 (FBPPT-86)

Objective: To study the performance of local improved cultivar as influenced by plant population at different row spacings.

Locations: 9

Treatments: 12
Main plot: Row spacing (4): 1. 30 cm
2. 40 cm
3. 50 cm
4. 60 cm
Sub plot: Plant Population (3) 1. 30 plants/m^2
2. 45 plants/m^2
3. 60 plants/m^2

Design: Split plot

Analysis of variance:

Source		DF
Replications	(r-1)	3
Main plot	(p-1)	3
Error (a)	(r-1)(p-1)	9
Sub plot	(q-1)	2
Interaction	(p-1)(q-1)	6
Error (b)	p(q-1)(r-1)	24

Scientists: R.S.Malhotra & M.C.Saxena

Experiment No. 12

Title: Faba Bean Weed Control Trial - 1986 (FBWCT-86)

Objective:

a) To evaluate the yield losses caused by weeds in different locations.
b) To evaluate and identify different herbicides which can control weeds in different areas.

Locations: 11

Treatments: 12

Design: RBD

Analysis of variance:

Source	DF
Replications	3
Entries	11
Error	33

Scientists: R.S.Malhotra, M.C.Saxena & Weed Control Specialist

Experiment No. 13

Title: Faba Bean Orobanche Chemical Control Trial - 1986 (FBOCCT-86)

Objective:

a) To evaluate the yield losses caused by Orobanche
b) To identify the suitable time and dose of Glyphosate application for the control of Orobanche.

Locations: 4

Treatments: 10

Design: RBD

Analysis of variance:

Source	DF
Replications	3
Entries	9
Error	27

Scientists: R.S.Malhotra, M.C.Saxena & J.Sauerborn

5.2. EXPERIMENTS ON LENTILS

Experiment No. 1

Title: Lentil International Yield Trial - Large Seeded (LIYT-L-86)

Objective:

i) multilocation testing of large seeded elite materials, which have already proven their superiority in small scale trials
ii) identification of high yielding and widely adaptable lines with large seed size
iii) characterization of environments.

Locations: 59
Treatments: 29
Design: RBD

Analysis of variance:

Source	DF
Replication	2
Entries	23
Error	46

Scientists: W.Erskine, R.S.Malhotra & M.C.Saxena

Experiment No. 2

Title: Lentil International Yield Trial - Small Seed - 86 (LIYT-S-86)

Objective:

i) multilocational testing of small seeded elite materials which have already proven their superiority in small scale trials
ii) identification of high yielding and widely adaptable lines with small seed size
iii) characterisation of environments.

Locations: 44
Treatments: 24
Design: RBD

Analysis of variance:

Source	DF
Replication	3
Entries	23
Error	69

Scientists: W.Erskine, R.S.Malhotra & M.C.Saxena

Experiment No. 3

Title: Lentil International Screening Nursery - Large Seeded - 1986 (LISN-L-86)

Objective:
a) to furnish advanced lines (F_5/F_6) and elite germplasm with large seed size for initial evaluation by the national programs
b) to identify superior performing genotypes for replicated multi-location testing (IYTs).

Locations: 58

Treatments: 48 Total plots = 54
Block = 3
Block size = 18
Checks in each block = 3

Design: Augmented

Analysis of variance:

Source		DF
Blocks	b-1 =	2
Checks	c-1 =	2
Error	(b-1)(c-1)=	4
Total	bc-1 =	8

Scientists: W.Erskine, R.S.Malhotra & M.C.Saxena

Experiment No. 4

Title: Lentil International Screening Nursery - Small Seeded - 1986 (LISN-S-86)

Objective:
a) to furnish advanced lines (F_5/F_6) and elite germplasm with small seed size for initial evaluation by the national programs
b) to identify superior performing genotypes for replicated multilocational trials (IYTs).

Locations: 42

Treatments: 58 Total plots = 70
Blocks = 5
Block size = 14
Checks = 3

Design: Augmented

Analysis of variance:

Source		DF
Blocks	(b-1)	4
Checks	(c-1)	2
Error	(b-1)(c-1)	8
Total	(bc-1)	14

Scientists: W.Erskine, R.S.Malhotra & M.C.Saxena

Experiment No. 5

Title: Lentil International Screening Nursery - Tall (Mechanical Harvest) - 1986 (LISN-T-86)

Objective:

a) to furnish advanced lines (F_5/F_6) and elite germplasm suitable for mechanical harvesting for initial evaluation by the national programs

b) to identify superior performing genotypes for replicated multilocational testing (IYTs)

Locations: 52

Treatments: 59 Total plots = 68
Blocks = 4 (one incomplete + 3 complete)
Block size = 19
Checks in each block = 3

Design: Augmented

Analysis of variance:

Source		DF
Blocks	(b-1)	3
Checks	(c-1)	2
Error	(b-1)(c-1)	6
Total	(bc-1)	11

Scientists: W.Erskine, R.S.Malhotra & M.C.saxena

Experiment No. 6

Title: Lentil International Screening Nursery - Early - 1986 (LISN-E-86)

Objective:

a) to furnish advanced lines (F_5/F_6) and elite germplasm for countries in southernly regions including Egypt, Sudan,

Ethiopia, India, Pakistan, etc.
b) to identify superior performing genotypes for replicated multilocational testing (IYTs)

Locations: 49

Treatments: 63 Total plots = 78
Blocks = 6
Block size = 13
Checks in each block = 3

Design: Augmented

Analysis of variance:

Source		DF
Blocks	(b-1)	5
Checks	(c-1)	2
Error	(b-1)(c-1)	10
total	(bc-1)	17

Scientists: W.Erskine, R.S.Malhotra & M.C.Saxena

Experiment No. 7

Title: Lentil International F_3 Trial - 86 (LIF_3T-86)

Objective:
a) to provide early generation segregating materials/populations for selection under local conditions
b) to evaluate the performance of the crosses in early segregating generations on multilocation.

Locations: 19

Treatments: 24

Design: RBD

Analysis of variance:

Source	DF
Replication	2
Entries	23
Error	46

Scientists: W.Erskine, R.S.Malhotra & M.C.Saxena

Experiment No. 8:

Title: Lentil International F_3 Trial - Early - 1986 (LIF_3T-E-86)

Objective:
a) to provide early segregating materials for selection in the southernly countries like North Africa, India, Pakistan, etc. for selection for earliness under local conditions
b) to evaluate the performance of the crosses in early generations (F_3/F_4) on multilocations

Locations: 19

Treatments: 24

Design: RBD

Analysis of variance:

Source	DF
Replications	1
Entries	23
Error	23

Scientists: W.Erskine, R.S.Malhotra & M.C.Saxena

Experiment No. 9:

Title: Lentil Plant Population Trial - 1986 (LPPT-86)

Objective: To study the performance of local improved cultivar as influenced by plant population at different row spacings.

Locations: 12

Treatments: Main plots: row spacings: (4)
i) 20 cm
ii) 30 cm
iii) 40 cm
iv) 50 cm

Sub plots: Plant Populations (4):
i) 100 plants/m^2
ii) 200 plants/m^2
iii) 300 plants/m^2
iv) 400 plants/m^2

Design: Split plot

Analysis of variance:

Source	DF
Replications	3
Main plot	3
Error (a)	9
Sub plot	3
Interaction	9
Error (b)	36

Scientists: R.S.Malhotra & M.C.Saxena

Experiment No. 10:

Title: Lentil Fertility-cum-Inoculation Trial - 1986 (LFIT-86)

Objective: To study the effect of inoculation with Rhizobium, fertilizer application with phosphorus and nitrogen, and control of sitona sp. with carbofuron.

Locations: 10

Treatments: Eight:

1. Control
2. Phosphate at 50 kg P_2O_5/ha
3. Carbofuron at 1.0 kg ai/ha
4. Inoculation with Rhizobium
5. Inoculation + Phosphate
6. Inoculation + Carbofuron
7. Inoculation + Phosphate + Carbofuron
8. 100 kg N/ha + Phosphate + Carbofuron

Design: R.B.D.

Analysis of variance:

Source	DF
Replications	3
Treatment	7
Error	21

Scientists: R.S.Malhotra & M.C.Saxena

Experiment No. 11:

Title: Lentil Weed Control Trial - 1986 (LWCT-86)

Objective:

a) To evaluate the yield losses caused by the weeds in different locations
b) To evaluate and identify different herbicides which can control weeds in different areas.

Locations: 24

Treatments: 12

Design: Randomized Block Design

Analysis of variance:

Source	DF
Replication	3
Treatments	11
Error	33

Scientists: R.S.Malhotra, M.C.Saxena & Weed Control Specialist

5.3. EXPERIMENTS ON CHICKPEAS

Experiment No. 1

Title: Chickpea International Yield Trial-Spring-86 (CIYT-Sp-86)

Objective:
a) Multilocation testing of elite materials which have already shown superiority in initial evaluations in spring.
b) Identification of high yielding and widely adaptable lines for spring sowing.

Locations: 55

Treatments: 24

Design: RBD

Analysis of variance:

Source	DF
Replications	3
Entries	23
Error	69

Scientists: K.B.Singh, R.S.Malhotra & M.C.Saxena

Experiment No. 2

Title: Chickpea International Yield Trial - Winter - Mediterranean Region-86 (CIYT-W-MR-86).

Objective:
a) Multilocatoinal testing of elite materials which have already shown superiority in initial evaluations during winter in the Mediterranean region.
b) Identification of high yielding and widely adaptable lines for winter sowing in the Mediterranean region.
c) Characterisation of environments.

Locations: 55

Treatments: 24 treatments

Design: RBD

Analysis of variance:

Source	DF
Replication	3
Entries	23
Error	69

Scientists: K.B.Singh, R.S.Malhotra & M.C.Saxena.

Experiment No. 3

Title: Chickpea Interntational Yield Trial - Winter - Sub Tropical Region-86 (CIYT-W-STR-86).

Objective:

a) Multilocational testing of elite materials which have already shown superiority in the initial evaluations during winter in the sub-tropical countries.
b) Identification of high yielding and widely adaptable lines for winter sowing in the sub-tropical countries.
c) Characterisation of environments.

Locations: 22

Treatments: 24

Design: RBD

Analysis of variance:

Source	DF
Replications	3
Entries	23
Error	69

Scientists: R.S.Malhotra, K.B.Singh & M.C.Saxena

Experiment No. 4

Title: Chickpea International Yield Trial-Large Seed-86 (CIYT-L-86).

Objective:

a) Multilocational testing of elite materials which have already shown superiority in the initial evaluations and possess large seed size.
b) Identification of high yielding and widely adaptable lines for the countries having preferance for large seed size.
c) Characterisation of environments.

Locations: 70

Treatments: 24

Design: RBD

Analysis of variance:

Source	DF
Replications	3
Entries	23
Error	69

Scientists: K.B.Singh, R.S.Malhotra & M.C.Saxena

Experiment No. 5

Title: Chickpea International Screening Nursery - Spring - 1986 (CISN-SP-86).

Objective:

a) To furnish the advanced lines (F5/F6) and elite germplasm suitable for spring season for initial evaluation by the national program.

b) To identify superior performing genotypes for replicated multilocational testing in spring (IYTs).

Locations: 40

Treatments: 41
Checks = 3
Blocks = 4
Block size = 13
Total plots = 50

Design: Augmented

Analysis of variance:

Source	DF
Blocks	b-1 = 3
Checks	c-1 = 2
Error	(b-1)(c-1) = 6
Total	bc-1 = 11

Scientists: K.B.Singh, R.S.Malhotra & M.C.Saxena

Experiment No. 6

Title: Chickpea International Screening Nursery-W-86 (CISN-W-86)

Objectives:

a) To furnish the advanced lines (F_5/F_6) and elite germplasm suitable for winter season for initial evaluation by the national programs.

b) To identify superior performing genotypes for replicated multilocations testing in winter (IYTs).

Locations: 60

Treatments: 54
Checks = 3
Blocks = 4 (incomplete)
Block size = 16
Total plots = 63

Design: Augmented

Analysis of variance:

Source	DF
Block	3
Checks	2
Error	6
Total	11

Scientists: K.B.Singh, R.S.Malhotra & M.C.Saxena

Experiment No. 7

Title: Chickpea International F_4 Trial-A - 1986 (CIF_4T-A-86)

Objective:

a) To provide early generation segregating materials for selection under local conditions during winter in the Mediterranean Region.

b) To evaluate the performance of crosses in early generations on multilocations.

Locations: 30

Treatments: 24

Design: R.B.D.

Analysis of variance:

Source	DF
Replications	3
Entries	23
Error	69

Scientists: K.B.Singh, R.S.Malhotra & M.C.Saxena

Experiment No. 8

Title: Chickpea International F_4 Trial-B - 1986 (CIF_4T-B-86)

Objective:

a) To provide early generation segregating materials to the national programs for selection under local conditions in the Sub-tropical Region.
b) To evaluate the performance of crosses in early generations on multilocations.

Locations: 19

Treatments: 24

Design: R.B.D.

Analysis of variance:

Source	DF
Replications	3
Entries	23
Error	69

Scientists: K.B.Singh, R.S.Malhotra & M.C.Saxena

Experiment No. 9

Title: Chickpea International Ascochyta Blight Nursery-A (Kabuli)-1986 (CIABN-A-Kabuli-86)

Objective:

a) To provide ascochyta light resistant materials of Kabulies (A), and Kabulies and Desis (B) to the national programs for identification of sources of resistance under local conditions.
b) To identify the stable sources of resistance to ascochyta blight.

Locations:
CIABN-A-86 = 47
CIABN-B-86 = 19
TOTAL = 66

Treatments:
A. 41 (Susceptible check repeated after every two test entries)
Total plots = 61
B. 51 (Susceptible check repeated after every two test entries)
Total plots = 76

Design: R.B.D. with repeated susceptible check

Analysis of variance:

Source	DF CIABN-A	CIABN-B
	1	1
Replications	40	50
Entries	40	50
Error		

Scientists: K.B.Singh, R.S.Malhotra, Chickpea Pathologist & M.C.Saxena

Experiment No. 10

Title: Chickpea International Leaf Miner Nursery - 1986 (CILMN-86)

Objective:
a) To provide leaf miner resistant materials to the national programs for identification of sources of resistance under local conditions.
b) To identify stable sources of resistance to leaf miner from multilocation testing over a range of environments.

Locations: 29

Treatments: 26 (one susceptible check repeated after every two test entries) Total plots = 39

Design: RBD with repeated susceptible check

Analysis of variance:

Source	DF
Replications	1
Entries	25
Error	25

Scientists: K.B.Singh, R.S.Malhotra, FLIP Entomologist & M.C.Saxena

Experiment No. 11

Title: Chickpea Date of Planting-cum-Plant Population Trial - 1986 (CDPPT-86)

Objective:
a) To find the suitable date of planting of chickpeas which gives maximum seed yield.
b) To find the suitable plant population giving maximum yield in different dates of sowings.

Locations: 9

Treatments: 18
Main plot : Dates of Planting (2)
Sub plot : Row Spacings (3)
Sub-sub plot: Plant Population (3)

Design: Double Split Plot Design with 4 replications

Analysis of variance:

Source	DF
Replications	3
Dates of sowing-A	1
DatesxReplicate Error (a)	3
Row spacings-B	2
A x B	2
Error (b)	12
Plant population-C	2
A x C	2
B x C	4
A x B x C	4
Error (c)	36
	71

Scientists: R.S.Malhotra & M.C.Saxena

Experiment No. 12

Title: Chickpea Fertility-cum-Inoculation Trial - 1986 (CFIT-86)

Objective: To study the effect of inoculation with Rhizobium, and fertilization with nitrogen and phosphorus in different locations.

Locations: 7

Treatments: 8
1. Control
2. Phosphate @ 50 kg P_2O_5/ha

3. Potash @ 60 kg K_2O/ha
4. Inoculation with Rhizobium
5. Inoculation + Phosphate
6. Inoculation + Potash
7. Inoculation + Phosphate + Potash
8. 100 kg N/ha

Design: Randomised Block Design

Analysis of variance:

Source	DF
Replications	3
Entries	7
Error	21

Scientists: R.S.Malhotra & M.C.Saxena

Experiment No. 13

Title: Chickpea Weed Control Trial - 1986 (CWCT-86)

Objective:

a) To evaluate the yield losses caused by the weeds in the different locations.
b) To evaluate and identify different herbicides which can control weeds in different areas.

Locations: 21

Treatments: 12

Design: Randomised Block Design

Analysis of variance:

Source	DF
Replications	3
Entries	11
Error	33

Scientists: R.S.Malhotra & M.C.Saxena

VI. TRAINING PROGRAM 1986
FOOD LEGUME IMPROVEMENT PROGRAM

Subject: Plan and Budget

Training Activity	No. of Candidates	Duration	Countries	Source of Funds
1. Residential Course	a. 4	3 months (1 Mar-2 June)	Egypt, Sudan, Ethiopia	NVP
	b. 2		Pakistan	ADB
	c. 14		Iran, Pakistan, Turkey, Peru, Algeria, Tunisia, Syria, YAR, Iraq, Chile, Bangladesh, Nepal, Mexico	UNDP/ICARDA
	d. 5		Arab Countries	AOAD
	c. 2		Sudan	IDRC
2. Short Courses				
a) Food Legume Improvement in-country course-Tunisia	15	2 weeks (10-25 Feb)	Tunisia,Algeria Morocco	IDRC/NAR
b) Hybridization Tech. Inservice Training	6	One week (7-14 Jan)	Hudeiba, Sudan	NVP
c) Development of Artificial Epiphytotics for Food Legumes-Lattakia	4	2 weeks (25 Mar-10 Apr)	Syria, Tunisia	UNDP/ICARDA
d) In-Country Breeding Strategies, Workshop	5	5 days (10-12 Mar)	Syria	UNDP/ICARDA
e) Mechanical Harvesting of Lentil Course	8	2 weeks (11-22 May)	Syria, Morocco Tunisia, Turkey Algeria, Jordan, Egypt. (4 Syria =2 ARC + 1 Machinery Dept. + Agric. Production)	IDRC/
f) Seed Production In-Country Course-Egypt	15	2 weeks (15-30 Mar)	Egypt, Sudan, Ethiopia	NVP

3. Individual

a) Non-degree — Training Associate

1. Legume Germplasm	1	6 months	Ethiopia	GTZ/DSE
2. Faba Bean Breeding	1	3 months (Mar-June)	Ecuador	ICARDA
3. Orobanche	1	9 months (Sept-Feb)	Netherlands	Netherlands
4. Entomology	1	One month (Apr-May)	Syria	ICARDA
5. Pathology & Orobanche	1	One month (Mar-Apr)	Syria	ICARDA
6. Data Collection	3	One month (Apr-May)	Sudan	NVP
7. Entomology	1	One month (Apr-May)	Sudan	NVP
8. Pathology	1	One month (Apr-May)	Sudan	NVP
9. Food Legume Quality	1	2 months (June-Aug)	Egypt	NVP
10. Agronomy/Physiology	1	9 months (Feb-Oct)	Morocco	UNDP
11. Crossing Techniques	1	One month (Mar-Apr)	Algeria	ICARDA Core
12. Grain Quality	1	2 weeks (April)	Turkey	ICARDA Core
13. Pathology	1	2 weeks (April)	Turkey	ICARDA Core
14. Breeding & Agronomy	1	2 weeks (April)	Turkey	ICARDA Core
15. Field Experiment & Crossing	1	2 months (Mar-Apr)	N.Yemen	ICARDA Core

16. Agronomy	1	One month (March)	Tunisia	IDRC/NAR
17. Entomology	1	3 months (Mar-June)	Ethiopia	NVP
18. Pathology	1	4 months (Mar-July)	Ethiopia	NVP
19. Water relations	1	2 months (Mar-May)	Ethiopia	NVP

b) Non-degree — Senior Research Fellow

1. Breeding/Agronomy	1	4 months	Sudan	NVP
2. Breeding	1	9 months	China	UNDP
3. Breeding	1	18 months	China	UNDP

c) Degree — 1. Research Scholar (M.Sc.)

1. Breeding/Physiology (Nottingham Univ.)	1	1 & 1/2 years	Sudan	NVP
2. Agronomy/Physiology U.K.	1	1 & 1/2 years	Egypt	NVP
3. Weed Science U.K.	1	1 & 1/2 years	Ethiopia	NVP
4. Entomology U.K.	1	1 & 1/2 years		Ethiopia NVP

2. Research Scholar (Ph.D.)

1. Weed Control	1	3 years	Sudan	NVP
2. Faba Bean Breeding	1	3 months	Egypt	NVP
3. Breeding	1	3 years	Tunisia	UNDP/ICARDA
4. Breeding	1	3 years	Pakistan	UNDP/ICARDA
5. Breeding/Pathology	2	4 months	Egypt	NVP
6. Breeding	1	3 years	Ethiopia	NVP

ANNEXURE I

Program of FLIP Planning Meeting for 1985/86 Season

September 25, 1985

08.30 - 08.40	Introduction	M.C.Saxena
	Lentils	
08.40 - 09.40	Breeding and Mechanization	W.Erskine
09.40 - 10.00	Agronomy and Physiology	S.Silim
10.00 - 10.10	Weed Control	A.Haddad
10.10 - 10.25	Tea Break	
10.25 - 10.40	Orobanche Control	J.Sauerborn
10.40 - 10.55	Quality	H.Nakkoul
10.55 - 11.10	Entomology	C.Cardona
11.10 - 11.25	Microbiology	F.Afendi
	Faba Beans	
11.25 - 12.25	Breeding	L.Robertson
12.25 - 13.00	Lunch Break	
13.00 - 13.20	Pre-breeding & Evaluation of Germplasm	M.Sherbeeny
13.20 - 14.20	Pathology	S.Hanounik & K.Makkouk
14.20 - 14.40	Agronomy and Physiology	S.Silim

September 26, 1985

	Faba Beans	
08.30 - 08.40	Weed Control	A.Haddad
08.40 - 09.00	Orobanche Control	J.Sauerborn
09.00 - 09.15	Quality	H.Nakkoul
09.15 - 09.40	Entomology	C.Cardona & O.Tahhan
09.40 - 09.55	Microbiology	F.Afendi
	Chickpeas	
09.55 - 10.55	Breeding	R.S.Malhotra
10.55 - 11.10	Tea Break	
11.10 - 12.10	Pathology	R.S.Malhotra
12.10 - 12.30	Agronomy and Physiology	S.Silim
12.30 - 13.00	Lunch Break	
13.00 - 13.10	Weed Control	A.Haddad
13.10 - 13.25	Quality	H.Nakkoul
13.25 - 13.40	Entomology	C.Cardona
13.40 - 13.55	Microbiology	F.Afendi
13.55 - 14.25	FLIP International Nurseries	R.S.Malhotra
14.25 - 14.40	FLIP Collaborative Projects	M.C.Saxena
14.40 - 14.55	Training in FLIP	H.Ibrahim
14.55 - 15.05	Future Projections	M.C.Saxena