FOOD LEGUME PATHOLOGY PROGRESS REPORT

1980-81

Faba bean, Chickpea and Lentil Pathology Work at Lattakia

Food Legume Improvement Program

The International Centre of Agricultural Research in the Dry Areas

(ICARDA)

P.O.Box 5466, Aleppo, SYRIAN ARAB REPUBLIC

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Preface

This report contains the results of the food legume pathology studies conducted by Dr. Salim Hanounik, Pathologist, in collaboration with other colleagues of the Food Legume Improvement Program during the 1980-1981 season. Mr. Mohamad Ibrahim, Research Assistant and Mr. Ilias Zod were responsible for carrying out the field and laboratory work under the supervision of Dr. Hanounik.

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INTRODUCTION

This annual report covers results of research obtained from ICARDA's Pathology Program at Lattakia Disease Nursery Station during the 1980/81 season. The major long term objectives were to identify resistant genotypes for important diseases of faba beans, chickpeas and lentils. Screening techniques, developed previously, were employed to evaluate existing germplasm collections. This report presents some resistant genotypes which were identified for major diseases. Since these genetic materials will have to yet go further explorations, short term chemical control measures were developed for present gap periods. During the past two years certain resistant faba bean and chickpea genotypes developed some peculiar disease lesions. This phenomenon was considered immediately, and data indicating the occurrence of some variations in the pathogenicity of certain Ascochyta sp. populations are presented.

FABABEAN PATHOLOGY

1. SUMMARY

Chocolate Spot

1. Procedures for the production of chocolate spot, Ascochyta blight and rust epiphytotics in fababeans are described.

2. Among the 526 entries of the fababean pure line -Botrytis nursery, 14 were rated 1 and 148 were rated 3. Of these, 44 entries seemed very promissing. In general 332 plant selections were made.

3. Of the 27 entries of the fababean pure line-Bortytis- yield trial, one entry only (BPL 112) was rated 1 to 3. In this nursery 8 plant selections were made.

4. From the 6 entries included in the bulk-Botrytis nursery, BPL 112, ILB 938 and ILB 438 seemed very promising. In these entries, the best 10 plants were selected.

5. Of the progenies of 16 different crisses of faba bean F_2-Botrytis nursery, 214 single plant selections were made.

Ascochyta blight

6. Of the 34 entries of faba bean Ascochyta progeny nursery, 4 entries were rates 1-3.

7. Among the 15 entries of faba bean pure line-Ascochyta nursery, BPL 230, BPL 365, BPL 460, BPL 471 seemed most promising. Seeds from 11 selfed and 28 single plant selections were collected.

8. Of the 200 entries of F_3 progeny-Determinate-Ascochyta nursery, 37 promising sinlge plant selections were made, of which selections number 51024-16, 51027-2, and 51027-5 seemed resistant also to stem nematodes.

9. Among the progenies of 49 crosses included in F_2-Ascochyta nursery, 4 had very high yield and low disease rating (plots No. 43, 44, 45 and 46) and 5 had high yield and low disease rating (plots No. 2, 3, 6 , 16 and 21).

10. Five highly resistant plant selections from ILB 37 and two from F_6x 75TA 46 were made in moist chambers.

Rust

11. Among the 4 entries of faba bean-rust nursery, Sel.80-LAT No.15563-3 seemed very resistant. The remaining 3 entries seemed also promising. These 4 entries were resistant to Ascochyta blight as well.

Physiological Variations in A.fabae

12. A preliminary host differential set consisting of 9 genotypes was developed for A.fabae.

13. Employing the screening effects of certain faba bean genotypes, new virulences were detected in the local population of A. fabae.

Etiology of Root Diseases

14. The root-rot and wilt complex of faba bean was separated into faba bean wilt (Fusarium moniliforme var. anthophilum), and root-rot (Rhizoctonia solani).

Stem Nematode

15. An affective extraction procedure was developed to obtain enough inoculum of Ditylenchus dipsaci for screening ICARDA's germplasm collection.

16. Pathogenicity of D. dipsaci on the local large seeded faba bean cultivar was proved, and also the best type of inoculum was determined.

17. Yield reduction due to D.dipsaci was shown to range from about 20 % in 8 weeks-old to 85 % in one week old faba bean plants.

Chemical Control

18. The best fungicide for rust control is apparently Dithane-M_{45} followed by difolatan then trimiltox.

II. DISEASE RESISTANCE

Screening for disease resistance in faba beans included chocolate spot (Botrytis fabae), Ascochyta blight (Ascochyta fabae), and rust (Uromyces fabae). All these disease nurseries were inoculated artificailly to enhance the development of disease epiphytotics.

1. Chocolate Spot

The following procedure, developed previously at ICARDA, was adopted for producing epiphytotics of chocolate spot.

a. black sclerotia were separated from several faba bean - dextrase - agar (FDA) cultures of B.fabae. The pathogen was isolated the previous season from aggresive lesions obtained from different locations, and maintained on FDA medium in the refrigerator.

b. These sclerotia were surface sterilized in 0.5% sodium hypochlorite solution (10% clorox) for 2-3 minutes, plated on FDA medium then incubated at 22° C.

c. After 3-5 days of incubation, plates were exposed to 12hrs. darkness and 12 hrs. white fluorescent light, then left at room temperature until spores have formed.

d. Ten-day-old cultures were then homogenized in a waring blender for 60 seconds, and diluted with tap water until a spore suspension of 400,00 spores/ml was obtained.

e. The inoculum was then applied, by means of a knap-sack sprayer, on 10 weeks old nurseries, employing 10-15 ml of the spore suspension per plant.

f. Inoculated nurseries were then covered immediately with a polyethylene sheet supported by metal frames (2 x 6 x 1.2m) to provide adequate humidity and a water film on the leaf surface. Inoculated nurseries were sprayed on alternate evening with water to maintain high humidity.

g. After 4-5 days of incubation, plants were uncovered and disease severity was recorded 2-4 weeks after inoculation, employing the following 1-9 rating scale.

1 = No lesions visible
3 = Few small scattered lesions seen after carefull searching
5 = Lesions common with some coalesced
7 = Large coalesced reddish-brown lesions on most leaves with some defoliation.
9 = Large coalesced black, lesions on leaves, extensive defoliation, and sporulating lesions on stem.

The above procedure was employed on the following nurseries.

- Broadbean pure line - Botrytis (BPL - Bot.)
- Broadbean pure line - Botrytis yield trial (BPL Bot. Y.T.)
- Broadbean bulk - Botrytis (Bulk - Bot.)
- Broadbean F_2 - Botrytis (B.F_2-Bot.)

In all these nurseries a local large seeded faba bean cultivar was used as a check.

1.1. BPL - Bot.

Differences in disease reaction were observed among different accessions. Of the 526 entries included in this nursery, 14 were rated 1 (2.66%), 148 were rated 3 (27.9%) and 189 were rated 5 (35.9%). The remaining 176 accessions (33.4%) however, in addition to the local check, were rated 7 and 9. Selections rated 1 or 3 are listed in Table 1. In this nursery 5 plants were selfed, and 327 single plant selections were made. These selections seemed to represent the most resistant plants in this nursery. But since entries of this nursery were not replicated, all selections rated 1 or 3 require confirmation next season.

1.2. BPL - Bot. Y.T.

This nursery included 27 entries replicated 4 times. Disease readings of all these entries ranged between 5 and 7 except for BPL 112 which was rated 1 or 3 in all replications (Table 2).

Of the 27 entries of this nursery, 8 single plant selections were made. These will be added to the best selections obtained from BPL - Bot. nursery.

1.3. Bulk - Bot.

This nursery contained the best 6 entries selected during the previous season for their resistance to chocolate spot. These entries were inoculated 5 times with B.fabae following the same procedure mentioned earlier in this report. Of the six promising entries of this nursery 1 was rated 1 (BPL 112), and 2 were rated 3 (ILB 938 and ILB 438). The remaining entries were rated 5-7 (Table 3).

1.4. B.F2 - Bot.

This nursery consisted of F_2 progenies of 16 different crosses. Progenies of each cross were planted in one plot. Each plot consisted of 10 rows, each 10m long. Percent diseased plants, and number of single plant selections for each progeny are shown in Table 4. In all, 214 single plant selections were made. Segregation of F_3 progenies of these selections will be studied next season.

2. Ascochyta blight

The following procedure developed at ICARDA previously, was adopted for producing epiphytotics of Ascochyta blight.

a. Infected seeds of the resistant BPL 230, ILB 37 and the local large seeded faba bean genotypes were surface sterilized in 0.5% sodium hypochlorite solution (10% clorox) for 5 minutes, then plated on FDA medium and incubated at 22° C.

b. After 3 days of incubation, plates were exposed to an alternating cycle of 12hrs. darkness and 12hrs. white flourescent light for one week.

c. Portions of the growing tips of A. fabae were then transferred to FDA medium, propagated under the same light cycle at room temperature.

d. Two-weeks-old cultures were then homogenized in a waring blender for 60 seconds and diluted with tap water until a spore suspension of 500,000 spores/ml was obtained.

e. The inculum was then applied after 6PM by means of a knap-sack sprayer, on 10-12-weeks old nurseries, employing 15ml of the spore suspension per plant.

Disease readings were made 2-3 weeks after inoculation, using a 1-9 points rating scale. The above procedure was employed on the following nurseries.

- Faba bean Ascochyta Progeny, fababean pure line and the resistant selection 70015 (F.B.Asco. Prog. + BPL Asco. + 70015).
- Broadbean pure line - Ascochyta (BPL - Asco.)
- F_3 Progeny determinate Ascochyta (F_3 prog. Det. Asco.)
- F_2 - Ascochyta (F_2 - Asco.)

A susceptible check, Giza-4, was used in these nurseries as a spreader and was repeated every 2 rows.

2.1. F.B.Asco. Prog. + BPL Asco. + 70015.

This nursery included 34 entries, replicated 4 times Table 5. Ascochyta blight was first observed 5-6 days after inoculation. All local check rows were rated 9 and got killed 4-5 weeks after inoculation. Of the 34 entries of this nursery one (14435-3) was rated 2, and three (14986-3, 14998-1, and 14422-2) were rated 3. The remaining entries however, were rated 3.5 to 6. All test entries were significantly (1% and 5% levels) more resistant than the check.

2.2. BPL - Asco.

Among the 15 entries planted in this nursery, 6 were rated 3 and 9 were rated 5. Spreader rows (Giza - 4) were planted every other row and were rated 7 or 9. The four entries BPL 230, BPL 365 BPL 460 and BPL 471 seemed to be the most promising genotypes. Seeds from 11 selfed and 28 single plant selections were collected. Since disease readings were made from single rows, confermation is needed from a replicated test (Table 6).

2.3. F3 Prog. Deter.

This nursery consisted of 200 entries, and segregation of progenies for disease reaction was clearly evident (Table 7). Of the 200 entries, 36 entries listed in Table 7 seemed most promising. From these, 37 single plant selections were made, 34 of which were rated 1, and 3 were rated 3 for Ascochyta blight.

Selections number 51024-16, 51027-2 and 51027-5 seemed also resistant to stem nematode (Ditylenchus sp.) since most plants around these selections were infected heavily. All entries listed in Table 7 will be planted early next season and will be bagged.

2.4. F2 - Ascochyta

This nursery was consisted of F2 progenies of 49 different crosses. Progenies of each cross were planted in one plot with 10 rows, 10m each. Disaese reaction of these progenies are shown in Table 8.
Among the progenies of the 49 crosses, 4 had very high yield and low disease rating (Plots No. 43, 44, 45 and 46), and 5 had high yield and low rating (plots No. 2, 3, 6, 16, and 21). The remaining progenies however, had medium to low yield and higher disease rating.

3. Rust

Rust was probably the most widespread compared to other faba bean diseases during 1980/81 season. At Lattakia Disease Nursery Station, the following procedure however, was employed for producing rust epiphytotics.

a. Naturally rust-infected leaves were harvested from different faba bean genotypes grown at different locations.

b. Two kilograms of these leaves, placed in 12-liters-plastic-drum containing 5 liters of water, were shaken vigorously for 5 minutes.

c. Faba bean leaves were then separated by passing the contents of the drum through cheese cloth and collecting the leachates in a 10-liters plastic container.

d. The leachates were then diluted with enough tap water until a uredospore suspension containing 400,000 spores per ml. was obtained.

e. The inoculum was then applied after 6 p.m. by means of a knap-sack sprayer on 10-12 weeks-old nurseries, employing 15ml of the spore suspension per plant. Disease readings were made 3 weeks after using the following 1-9 rating scale.

1 = No pustules visible.
3 = Necrotic flecks with few pustules seen after careful searching.
5 = Pustules common on leaves but causing no damage.
7 = Pustules very common on leaves and stems with defoliation.
9 = Pustules very extensive on all plant parts with death of some leaves.

3.1. F.B.rust nursery.

In this nursery 4 entries, selected previously, were planted in 4 replications. A local large seeded faba bean cultivar was planted every 2 test entries. Selection - 80 - LAT. No. 15563-3 was rated 3 in all replications (Table 9), compared to 3.5 for the remaining 3 test entries and 7.5 for the check. Plants of 15563 - 3 failed to develop the telial stage of rust on the stem. If this break in the life cycle of the rust fungus, holds true. It could play a significant role in faba bean rust epidimiology. This phenomenom will be studied more closely next season.

The 4 test entries included in this nursery, were also rated 3 for Ascochyta blight comparedto 9 in the local check. In this nursery 27 resistant selections were made. These selections were rated 1-3 for rust and Ascochyta blight. All entries were significantly more resistant for rust and Ascochyta at the 1% level compared to the local check. Seeds from the 27 selections will have to be increased and used in joint projects with Khartoum and Canada cooperators.

III. PHYSIOLOGICAL VARIATIONS IN ASCOCHYTA FABAE

1. Developing a host differential set.

Studies concerning detection of pathogenic variations are based on the assumption that a pathogenic population always react in the same manner on a standarized set of host differentials. But when reactions are different, new virulences within the population being tested become evident. Therefore, an investigation was initiated in 1979 to start developing a host differential set for A.fabae. Several selfed faba bean genotypes, selected for diversity of disease reaction were artificially inoculated with a mixture of isolates of

A.fabae obtained from different locations in Syria. Artificial inoculation was made according to ICARDA's standard procedure mentioned previously in this report.

Based on disease readings and number of pycnidia in disease lesions, host status of faba bean genotypes included in this study were classified into 5 different categories (Table 10). These categories ranged from very resistant genotypes such as selection-80-Lattakia (14435-3) with 0-10 pycnidia per 10 mm^2 and disease rating of 1, to highly susceptible genotypes such as BPL 165 with 100 or more pycnidia per 10mm^2 and disease rating of 9. Seeds of this set will be increased next season for distribution on National and International programs.

2. Certain variations in pathogenicity of A.fabae

Variations in the pathogenicity of A.fabae could well be detected by the screening effects of resistant genotypes. After 4 years of screening, few Ascochyta blight-resistant faba bean genotypes were identified at Lattakia Disease Nursery Station. These genotypes had an initial disease rating of 1 or 3 when inoculated with a mixture of field collections of A.fabae.

Of these genotypes, Lattakia-1 (from ILB 37) and Lattakia-2 (from BPL 230) developed later few type-4 sporulating lesions, indicating the probable presence of certain undetected virulences in local population of A.fabae

The pathogen in these lesions was isolated and then inoculated back to Lattakia-1, Lattakia-2 and the local large seeded faba bean genotypes in the greenhouse. After 2 weeks, disease readings were made (Table 11). Isolates A and B seemed avirulent on Lattakia-1 and virulent on Lattakia-2 and local faba bean genotypes. Isolate C seemed avirulent on Lattakia-1, Lattakia-2 and virulent on the local large seeded faba bean genotype. Since isolates A and B incited the same low disease reaction on Lattakia-1 and high disease reaction of similar order on Lattakia-2, both isolates are apparently the same. The avirulent genes in isolates A and B for resistant genes in Lattakia-1, are apparently virulent for Lattakia-2. This new virulence should be considered in future screening programs.

IV. ETIOLOGY OF ROOT-ROT AND WILT COMPLEX OF FABA BEANS.

Root-rot and wilt complex is an important disease of faba bean in several parts of the world. It was present in 77% of the faba bean fields, on which our 1977 - survey was conducted in the coastal region of Syria. The disease is frequently encountered on plants in low moist spots of the field. It is favored by early as compared to late planting.

Several pathogens have been claimed responsible for the disease, but no specific symptoms have yet been related to specific causal agents. The objective of this study was to investigate the root-rot and wilt complex. Stunted faba bean plants, with yellow wilted leaves, and necrotic roots, were collected from several faba bean fields. When segments of infected lateral roots, were surface sterilized with 0.5% sodium hypochlorite for 2 minutes, plated on potato-dextrose-agar medium, then incubated at 24° C for one week, two genera of fungi; Fusarium sp. and Rhizoctonia sp. were encountered in more than 80% of the 50 root samples obtained from several locations.

Confirmation by CMI, indicated that these fungi were Fusarium moniliforme var. anthophilum (A.Br.) Wr. and Rhizoctonia solani kühn. Based on the results of this study, root-rot and wilt complex of faba beans could be separated into the following 2 major components.

1.1. Wilt (F.moniliforme var. anthophilum).

Followings are the most characteristic symptoms of wilt :

a. Stunting, wilting and yellowing of leaves.
b. The cortical tissue of the roots seems normal, except for few small black-colored segments. If the roots are split-open, however, necrosis of the xylem tissue become evident. Necrotic xylem can even be seen in the collar region when the stem is split. This is probably the most characteristic symptom of faba bean wilt.

1.2. Root-rot (Rhizoctonia solani).

a. Root-rot is frequently observed on young plants in low moist spots of faba bean fields.

b. Affected plants become stunted and yellow without any pathological wilting signs.

c. Cortical tissues of affected roots become dark and rotted, with no necrotic signs in the xylem tissue.

Pathogenicity tests were not conducted for these 2 diseases. Such tests will be carried out in the future.

V. STEM NEMATODE OF FABA BEAN.

The stem nematode Ditylenchus dipsaci, was first reported on faba beans from England, Syria and Jordan. It is a seed borne parasite which is very difficult to control. Infected plants are characterized by stunted shoots and swollen bases. Brittle elongated swellings are also found on the stems and leaves of faba bean plants. In advanced stages however, these swellings become necrotic under the unbroken skin. When opened, a brown decaying area with a granular appearance is revealed. In this area a great number of nematodes are seen. This investigation was started to standarize certain inoculation techniques for screening available germplasm collections.

1. Extraction of active nematode inoculum.

From the comparision of different extracting methods, the following procedure was adopted for the extraction of D.dipsaci.

a. Infected faba bean stems and leaves collected from the fields, were chopped in a waring blender into 5-10mm and placed on a 60-mesh sieve inside a funnel.

b. A continuous fine mist of water was sprayed over the infected materials and the leachates with active nematodes were collected on a 325-mesh sieve placed under the funnel in a shallow pan of water.

c. After 5hrs. of extraction, larvae collected on top of the 325-mesh sieve were washed and transferred immediately for inoculation. This procedure is believed

to yield more active nematodes because oxigenation is better and toxic decomposition products are washed away, by the continuous flow of water, as compared to other procedures.

2. Influence of different types of inoculum on disease development.

One week-old, local large-seeded faba bean plants grown in an autoclaved sandy soil in 22cm-plastic buckets, (5 plants per bucket) were inoculated with 2 forms of inocula of D.dipsaci as follows :

- One Kilogram of infected faba bean stems and leaves, blended into 5-10mm segments, was divided into 2 equal parts of 500gr. each.
- Nematode larvae extracted from the first part, were suspended in 500cc of water, distributed in equal amounts over 5 buckets, and then mixed into the top 2cm of soil. Nematode counting in larval suspension indicated that each plant recieved an average of 53,5 larvae.
- The second part of infected tissue was distributed equally over another set of 5-buckets and mixed also into the top 2cm of soil.
- A third set of 5-buckets served as a control.
- After inoculation, plants were irrigated, placed in a moist plastic chamber in the shade for one week, then removed and transferred to the field.

Disease readings (Table 12) were made 10 weeks after inoculation when disease symptoms were evident. These results indicated that infected plant tissue was much more efficient inoculum than larval suspension. Extraction procedures employed on infected plant tissues from this test yielded D.dipsaci, indicating that this parasite is the casual agent of the stem nematode disease of faba beans.

3. Susceptibility of plants of different ages to infection by Ditylenchus dipsaci.

Faba bean plants (local large-seeded) of 8, 4, 2 and 1-week-old, were grown in the field in 22-cm plastic buckets containing autoclaved sandy soil. Each bucket contained 5plants grown in 4 kg of soil. These plants were inoculatedwith 5-10mm - segments of D.dipsaci- infected faba bean stems and leaves,

employing 300gr of infected tissue per bucket. The inoculum was mixed immediately in the top 2-3cm of soil then plants irrigated with 500cc of water per bucket.

A randomized block design with 3 replications and 5 buckets per treatment was employed. This test was terminated on May the 1st (8 weeks after inoculation) when plants in the youngest age category ceased growing. The results of this test are shown in Table 13. As plant age increased from 1 to 8 weeks, there was a significant decrease (1%) in disease severity and damage. Younger plants are apparently more susceptible to infection by D. dipsaci.

VI. CHEMICAL CONTROL.

1. Effects of certain chemical treatments on development of rust.

The efficacy of nine fungicides for rust control, was tested on a local large seeded faba bean cultivar. Fungicides were applied once every 15 days, employing 500L of water per hectar. Chemical treatments started on January 9, and were terminated May, 1981. In all, 9 applications were made. Plants in this test were artificially inoculated, on April 24, employing the same procedure mentioned previously in this report. A randomized block design with 6 replications per treatment was used. The results are presented in Table 14 . Dithane - M45, difolatan and trimiltox treatments provided the best control, followed by bravo-6F, topsin - M, calixin and bavistin. These chemicals provided significantly better rust control at the 1% level, than the rest of the treatments.

LENTILS PATHOLOGY

I. SUMMARY .

1. Of the 196 entries in the lentil rust nursery, 61 were rated 1 to 3.
2. No conclusions were drawn from the lentil Ascochyta blight nursery due to disease failure during the growth season .

II. DISEASE RESISTANCE

Screening for disease resistance in lentils involved rust (Uromyces fabae) and Ascochyta blight (Ascochyta lentis) .

1. Lentil rust nursery :

Of the 196 entries of this nursery, 14 were rated 1, and 47 were rated 3 for rust. Rating of the local, large and small seeded cultivars, ranged from 3 to 9. Lentil entries rated 3 or less, are listed in Table 15, and will be re-evaluated next season in replicated nursery with local suscpetible checks repeated every third row of the test entries.

2. Lentil Ascochyta blight nursery :

Ascochyta blight failed to develop into epyphytotic levels during 1980/81 season. Despite the artificial inoculation which was conducted using infected plant debris. Disease rating of most entries ranged between 1 and 5 including local checks. Since reliable conclusions are difficult to obtain under such conditions, it is suggested that this nursery be tested again next season with more efforts to produce high disease pressure. Local susceptible checks should be repeated every third row of test entries.

CHICKPEA PATHOLOGY.

I. SUMMARY

1. Disease readings of entries of Chickpea International Ascochyta Blight and Chickpea Adaptation nurseries are presented. Modifications in these nurseries are suggested.

2. Among the 19 entries of the Chickpea International Yield Trial-Winter Nursery, 3 (ILC 191, ILC 196, and ILC 200) were rated 1, 4 (ILC 182, ILC 72, ILC 3279, and ILC 202) were rated 2 to 3, and 5 (ILC 194, ILC 2548, ILC 195, ILC 482, and ILC 484) were rated 3.5 to 4.5.

Among these, only ILC 484 yielded more than 4000 kg/ha.

3. All entries of the Chickpea Preliminary Yield Trial-MV-Winter Nursery were rated between 1 and 3.5. Among these entries 2 (ILC 194 and MV_2) were rated 1, and 6 (ILC 3279, ILC 484, ILC 191, MV_3, ILC 201 and ILC 249) were rated 1.5 to 2.

4. In the evaluation of winter vrs. spring Planting Nursery, ILC 482 seemed better than ILC 195 and ILC 215. Other genotypes are suggested for comparision in winter planting nurseries also.

5. Strong indications for the presence of new virulences within local A.rabiei populations are presented. Resistant genes for these virulences are apparently present in ILC 202 and ILC 3279, and should be incorporated into other promising genotypes.

6. The combination of bravo-6F and dithane - M45 with certain resistant genotypes provided effective protection against A.rabiei, especially against the development of type 4 lesions. An approach combining one or two applications of bravo with a multiline cultivar is suggested for present gap periods.

II. DISEASE RESISTANCE

The objectives of the disease screening program at Lattakia were to identify and evaluate Ascochyta blight-resitant genotypes. During the 1980/81 season the following 6 different Ascochyta blight disease nurseries were tested.

1. Chickpea International Ascochyta Blight Nursery-Desi (CIABN-D)
2. " " " " " (CIABN)
3. Chickpea Adaptation Nursery (CAN)
4. Chickpea International Yield Trial-W (CIYT-W)
5. Preliminary Yield Trial-MV-W (PYT-MV-W)
6. Evaluation of Winter vs. Spring Chickpea Planting (EWSCP)

Artificial inoculation was not done because Ascochyta blight developed into epiphytotic levels, destroying completely the local chickpea cultivar from all nurseries. The following disease rating scale was adopted for Ascochyta blight.

1 = No lesions visible
3 = Few scattered lesions, seen after careful searching.
5 = Lesions common and easily observed with little stem girdling.
7 = Lesions very common with considerable damage.
9 = Lesions extensive, many plants killed.

1. CIABN-D

Among the 56 entries of this nursery, 5 were rated 3, and 15 were rated 5. The remaining 36 entries however, were rated 7 and 9. The local check was rated 9 (Table 16).

2. CIABN

This nursery consisted of 40 entries, replicated 2 times. Of these 40 entries 6 were rated 1 or 3 and 12 were rated 3 or 5 in both replications. The remaining 22 entries were rated 7 or 9. The local check however, was rated 9 due to high disease severity (Table 17).

Since new biotypes of Ascochyta rabiei are apparently present, and since entreis of these two nurseries are not standarized well enough to check such biotypes, it is suggested that entries of these nurseries be revised and characterized for diseased reaction to form a host differential set that is KNOWN well enough to meet the urgent needs of identifying new variations in populations of A.rabiei.

3. CAN.

Among the 69 entries of this nursery only 3 were rated 3, and 17 were rated 5. The remaining 49 entries were rated 7 to 9. The local check however, was rated 9 (Table 18). Since most entries of this nursery are highly susceptible to A.rabiei, some other more promising genotypes can be included for next season after dropping highly susceptible ones.

4. CIYT-W

This nursery consisted of 19 entries replicated 4 times. Of these, 3 highly resistant genotypes (ILC 191, ILC 196, and ILC 200) were rated 1, and 4 resistant genotypes (ILC 182, ILC 72, ILC 3279 and ILC 202) were rated 2 to 3. In addition 5 moderately resistant genotypes (ILC 194, ILC 2548, ILC 195, ILC 482 and ILC 484) were rated 3.5 to 4.5 and looked promising (Table 19).

From all these entries only ILC 484 yielded more than 4000 kg/ha. Entries yielded more than 3000 kg/ha however, were; ILC 191, ILC 200, ILC 182, ILC 72, ILC 3279, ILC 195, ILC 482 and ILC 249. The local check was rated 9 and gave no yield due to Ascochyta blight. Resistance to A.rabiei and yield of all entries of this nursery were significantly (1%) greater than the local check.

5. PYT-MV-W.

This nursery consisted of 12 entries replicated 4 times. Despite of the prevalence of high disease severity, as indicated by the complete destruction of the local check, all entries of this nursery were rated between 1 and 3.5 (Table 20).

Among these entries 2 were rated 1, and 6 were rated 1.5 to 2. The remaining 4 were rated 3 to 3.5 compared to 9 for the local check. In this nursery 9 entries yielded more than 4000 kg/ha of which ILC 3279 gave the highest yield (4855.2 kg/ha), followed by ILC 249 (4762.5 kg/ha), then MV_1, (4535.4 kg/ha). These high yielding entries were rated 1.5, 2 and 3 respectively. Resistance and yield of all entries of this nursery were significantly greater, at the 1% level, than the local check.

6. EWSCP.

The best entry in this nursery was apparently ILC 482, followed by ILC 195 then ILC 215 in the winter planting (Table 21). In spring planting however, the Syrian local yielded more than ILC 263. In general entries in winter planting yielded more than those of the spring planting. Promising genotypes such as ILC 3279, MV2, ILC 194, ILC 484 or others should be tested for winter planting also.

III. PATHOGENIC VARIATIONS IN ASCOCHYTA RABIEI.

The use of resistant cultivars is the most practical method of combating plant diseases. But this is not as easy as it might look, simply because A.rabiei can apparently change to form new virulences much rapidly than expected so far. Waiting until a resistant cultivar, is no longer resistant, due to new virulences, yields no important bearing. It is the early detection of such pathogenic variations that helps avoidance of future gaps.

1. Disease reaction of resistant chickpea genotypes to certain isolates of A.rabiei:

During the past 3 years, some sources of Ascochyta blight - resistant chickpea genotypes were identified. When artificially inoculated with a mixture of field collections of A.rabiei, these genotypes had an initial disease rating of 1 or rarely 3. Of these genotypes ILC 184, 190, 195, 202, 215, 249, 482, and 3279, developed later few peculiar type 4 sporulating lesions, indicating the probable presence of certain virulences that might have not been detected previously. Isolates from these lesions were obtained and inoculated back to these genotypes and to the susceptible ILC 1929 chickpea genotype. After 3 weeks disease readings were made (Table 22).

Isolates A,B and C seem more virulent than D on all the genotypes in this study except on ILC 202 and 3279. Since isolates A,B and C induced the same high disease reaction on ILC 184, 215 and 249, and almost an equal low disease reaction on ILC 202 and 3279, these isolates are apparently the same. The avirulent genes in these isolates for resistant genes in ILC 202 and 3279, are apparently virulent for the rest of the genotypes included in this test.

2. Number of pycnidia induced by A.rabiei in certain resistant chickpea genotypes:

In an attempt to verify the presence of new virulences, an isolate of A.rabiei was obtained from type 4 sporulating lesion on ILC 249 and inoculated back to the same resistant genotypes included in the previous test. After 3 weeks, number of pycnidia per $10mm^2$ were counted in 10 different lesions per genotype (Table 23). Great increases in the number of pycnidia by isolate A over B in all these resistant genotypes except ILC 202 and 3279

where the increase was slight, supports findings of test 1 indicating that isolate A is a new virulence. An International survey of new virulences in A.rabiei is suggested. The work for the identification of new resistant genes for such virulences should be intensified, and genotypes having different genes for resistance ought to be developed. At present genes from ILC 202 and ILC3279 for example could be incorporated into other promising genotypes.

IV. CHEMICAL CONTROL.

1. Effects of certain chemical treatments and host genotypes on severity of Ascochyta blight and yield in chickpeas.

The combined effects of 7 chickpea genotypes and 3 fungicides on severity of Ascochyta blight and yield of chickpea were studied for winter planting in the field. Chemical treatments were started at emergence (15 days after planting) and continued at a frequency of one treatment per month employing 500L of water per hectar. A total of 5 applications were made during the entire season. A split-plot design with chickpea genotypes in the main plot and chemical treatments in the splits was employed. Each treatment was replicated 3 times. Bravo treatments decreased disease severity and increased yield of all genotypes significantly at the 1% and/or 5% levels. Dithane treatments decreased disease severity and increased yield of all genotypes significantly at the 1% and/or 5% levels except for the local check. (Table 24). Calixin treatments however, did not seem to have provided any sort of crop protection. Plots-treated with this fungicide developed chlorotic and slightly stunted stand compared to untreated plots. Chickpea yield was decreased in all calixin-treated compared to untreated genotypes, except for ILC 195. Apparently this fungicide had some phytotoxic effects on chickpea under the conditions of this test.

From an agronomical point of view, the best combination seemed to be in the ILC 190-bravo treatment, in which a yield of 6680kg/ha was obtained. This was followed in a decreasing order by ILC 249-bravo, ILC 249-dithane, ILC 3279-dithane, ILC 195-bravo, ILC 482-bravo, ILC 190-dithane, ILC 195-dithance, ILC 3279-bravo and ILC 482-dithane.

The local chickpea cultivar failed to produce any yield due to high disease severity in all treatments, except in plots treated with bravo.

From a pathological point of view, where disease severity and type-4 sporulating lesions on resistant genotypes are of prime importance, the best combination which completely suppressed Ascochyta blight and type-4 lesions were; bravo-treated ILC 202, 3279, 249 and dithane-treated ILC 3279 only. The failure of type-4 lesions to occur in such combined treatments, should help conserve and extend the life span of these valuable genetic materials.

Several reports indicated that resistance to Ascochyta blight in chickpeas is governed by a single dominant gene. If this is the case with existing promising genotypes, A.rabiei should be able then to overcome such resistance within a relatively short period of time. Therefore, the incorporation of different genes, with resistance to prevailing virulences, into a single cultivar, is a must. But until cultivars with such a balanced resistance are developed, a package of one or two chemical applications with a multiline cultivar might fill present gaps. This approach will be tested next season.

Table 1 : Chocolate spot resistant selections in BPL-Botrytis screening nursery.

BPL No.	Disease Rating	BPL No.	Disease Rating	BPL No.	Disease Rating
112*	1	207	3	388	3
261*	1	212	3	389	3
274*	1	215	3	310*	3
460*	1	258	3	410*	3
461*	1	259	3	467*	3
1538**	1	260	3	470**	3
1541**	1	262	3	471**	3
1543**	1	263	3	472**	3
1774*	1	265	3	657	3
1776*	1	266*	3	658*	3
1784*	1	268	3	1054*	3
1785*	1	276	3	1055	3
1786*	1	278	3	1056**	3
1787*	1	279	3	1058	3
4	3	284	3	1061	3
7*	3	285	3	1107**	3
18	3	331	3	1108	3
19	3	336	3	1109	3
93	3	338	3	1118	3
109	3	361	3	1154	3
110	3	362	3	1155	3
133	3	369	3	1156	3
1179	3	1552	3	1177	3
1189	3	1554	3	1648**	3
1196	3	1555	3	1651	3
1198	3	1556	3	1653	3
1199	3	1557	3	1654	3
1200	3	1558	3	1655	3
1278	3	1559	3	1656	3
1390*	3	1560	3	1657	3
1398	3	1561	3	1658	3

... Cont'd ...

(Cont'd) Table 1.

BPL No.	Disease Rating	BPL No.	Disease Rating	BPL No.	Disease Rating
1407	3	1667	3	1831	3
1409	3	1688	3	1832	3
1416	3	1689	3	1841	3
1423	3	1734**	3	1875	3
1517	3	1735	3	1876	3
1532	3	1736	3		
1535	3	1737	3		
1539	3	1738	3		
1540	3	1739	3		
1544	3	1745	3		
1545	3	1746	3		
1546	3	1747	3		
1547**	3	1748	3		
1548**	3	1749	3		
1549	3	1750	3		
1550	3	1751	3		
1562	3	1752	3		
1563	3	1753	3		
1564**	3	1754	3		
1565	3	1758	3		
1569	3	1759	3		
1570**	3	1762**	3		
1571**	3	1763**	3		
1573**	3	1764**	3		
1596**	3	1790*	3		
1579	3	1793**	3		
1598	3	1798	3		
1602**	3	1799	3		
1604	3	1802	3		
1607	3	1817*	3		
1608**	3	1821	3		
1609	3	1830	3		

* Very good resistance
** Excellent resistance

Table 2 . Reaction of different entries of BPL-Bot. Y.T.to chocolate spot.

BPL No.	Disease Rating I	II	III	IV	BPL No.	Disease Rating I	II	III	IV
18	7	7	5	7	357	5	5	7	7
43	7	5	5	7	444	5	7	7	7
85	7	9	7	7	666	5	7	5	7
112	3	1	3	3	890	5	7	7	7
200	5	7	7	5	1089	5	7	7	7
233	5	5	7	7	1109	7	5	5	5
237	7	5	7	7	1154	5	5	5	7
244	5	5	5	7	1159	5	5	5	7
249	7	7	7	5	1163	5	7	7	7
256	7	5	5	7	1394	7	5	5	7
262	7	5	5	7	1599	7	7	7	7
321	7	7	7	7	1873	7	7	7	7
325	7	5	5	7	1874	7	7	7	7
356	7	5	7	7	Loc.check	7	7	7	7

Table 3. Reaction of different entries of broadbean bulk-Botrytis to Chocolate spot.

BPL or* ILB	Disease Rating	Selfed	Single plants
BPL 112	1	2 Rated 1	3 Rated 1
ILB 938	3	4 Rated 3 to 1	1 Rated 1
ILB 438	3	-	2 Rated 1
BPL 356	5	1 Rated 1	-
ILB 368	5	-	1 Rated 3
Local check	7		-

* ILB 938 and ILB 368 were obtained from Egypt.

Table 4. Screening of F_2 - Botrytis.

Sl. No.	Plot No.	% Diseased Plants	Remarks	Number of single plant selections
1	143	50	Low yield	22
2	144	50	" "	14
4	146-1	50	" "	19
4	146-2	50	" "	16
7	149	Highly susceptible	" "	-
8	150	" "	" "	-
9	151	" "	" "	-
10	152	50	" "	6
11	159	Highly susceptible	" "	-
12	160	50	Medium yield	28
13	161	30	Good yield	23
14	162	30	" "	34
15	163	30	" "	28
20	168	40	Medium yield	24
21	169	Highly susceptible	Low yield	-
22	170	" "	" "	-

Table 5. Screening F.B.Asco. prog. + BPL Asco. + 70015.

Sel. 80 LAT	Disease Rating [1]	Sel. 80 LAT.	Disease Rating
14986-1	4.5	14013-1	4.5
14986-2	4.5	14200-1	5.0
14986-3**	3.0	14204-1	4.5
14986-4	4.5	14234-1	5.0
14989-1	4.5	14398-1	5.0
14989-2	5.5	14422-2**	3.0
14998-1**	3.0	14427-1	5.0
14998-3	5.0	14427-2	4.0
15025-2	5.0	14434-1	3.5
15035-1	4.5	14434-2	4.0
15035-2	4.0	14434-3	4.0
15035-3	3.5	14435-1	5.0
15035-4	5.0	14435-2	5.5
15041-2	4.0	14435-3**	2.0
15041-3	3.5	14588-1	6.0
15041-4	4.0	70015	4.0
15053-1	5.0	Local(Giza-4)	9.0
15067-1	3.5		

1. Disease reading on a 1-9 points scale, average 4 replications.

** Most resistant entries. (14435-3 is the best).

Table 6. Screening broadbean pure line - Ascochyta (BPL - Asco).

BPL	Disease reading	
18	3	No seeds
230*	3	Good (4 single and 1 selfed plant selections)
233	5	-
244	5	Good (2 single and 1 selfed plant selections)
265	5	Tolerant (2 single and 1 selfed plant selections)
365*	5	Good (1 single plant selection)
369	5	Good (1 " " ")
435	5	Good (2 " " ")
436	5	Good (1 single and 1 selfed plant selections)
460**	3	Very good (4 single and 1 selfed plant selections)
465	3	Good (1 single and 1 selfed plant selections)
471**	3	Very good (2 single and 4 selfed plant selections)
472	3	- (4 single and 1 selfed plant selections)
617	5	- (2 single plant selections)
618	5	- (3 single plant selections)
Local (Giza-4)	7-9	

* Tolerant = some lesions with good yield
  Good = small non-sporulating lesions on the stem with few or no lesions on the leaves.
  Very good= Very small specks on the stem with good yield.

Table 7. Screening F_3 progeny determinate for Ascochyta blight

Sel. 80 No.	Row Rating	Single plant sel. No.	Single plant sel. Rating	Sel. 80 No.	Row Rating	Single plant sel. No.	Single plant sel. Rating
51006-5	7	1	1	51021-9	5	1	1
51010-2	7	1	1	51021-12	5	1	3
51010-4	7	1	1	51021-16	7	1	1
51010-5	7	1	1	51021-20	5	1	3
51010-14	7	1	1	51021-28	5	1	1
51010-18	7	1	1	51021-35	7	1	1
51010-21	7	1	1	51021-36	7	1	1
51010-24	7	1	1	51024-8	5	1	1
51011-1	7	1	1	51024-16*	7	1	1
51011-4	3	1	1	51027-1	7	1	1
51013-13	9	1	1	51027-2*	7	1	1
51012-1	7	1	1	51027-5*	7	1	1
51012-3	7	1	1	51028-3	3	1	1
51012-7	7	1	1	51030-8	5	1	1
51012-8	7	1	1	51031-2	5	1	1
51012-13	5	1	1	51031-19	7	1	1
51015-14	9	1	1	51032-1	5	1	3
51018-2	3	2	1				
51021-7	7	1	1				

* Resistant to stem nematode also

Table 6. Screening F_2 - Ascochyta

Sel. No.	Plot No.	% Diseased plants	Remarks	Number of single plant selections
	1	50	Medium yield	69
	2**	30	High yield	179
	3**	30	High yield	166
	4	90	Low yield	-
	5	50	Medium yield	104
	6**	20	High yield	277
	7	50	Medium yield	290
	8	50	Medium yield	131
	9	90	Low yield	-
	10	90	Low yield	-
	11	90	Low yield	-
	12	50	Medium yield	19
	13	50	Medium yield	13
	14	50	Medium yield	15
	15	50	Medium yield	23
	16**	20	High yield	121
	17	90	Low yield	-
	18	90	Low yield	31
	19	90	Low yield	-
	20	50	Medium yield	25
	21**	30	High yield	185
	22	50	Medium yield	28
	23	50	Medium yield	23
	24	50	Medium yield	26
	25	50	Medium yield	42
	26	90	Low yield	-
	27	50	Low yield	31
	28	80	Low yield	12
	29	50	Medium yield	13
	30	80	Low yield	-
	31	80	Low yield	-
	32	50	Medium yield	10
	33	30	Medium yield	37

... Cont'd ... (Table 8)

Sel. No.	Plot No.	%Diseased plants	Remarks	Number of single plant selections
	34	50	Medium yield	15
	35	80	Low yield	-
	36	30	Medium yield	47
	37	50	Low yield	22
	38	70	Low yield	14
	39	50	Low yield	21
	40	80	Low yield	5
	41	80	Low yield	-
	42	50	Medium yield	27
	43***	20	Very high yield	76
	44***	20	Very high yield	94
	45***	20	Very high yield	89
	46***	25	Medium yield	35
	47	80	Low yield	-
	48	50	Medium yield	-
	49	80	Low yield	48

** Good resistance

*** Very good resistance

Table 9 . Reaction of certain faba bean genotypes for rust.

Sel. 80	Average disease readings		Single plant selections	
LAT	Rust	Ascochyta blight	Number	Rust Rating
15563-3	3.0**	3	8	1-3
15563-1	3.5	3	6	1
15563-2	3.5	3	9	1-3
15563-4	3.5	3	4	1-3
Local (large seeded)	3.7	9	-	-

** No telial stage was observed on the stem.

Table 10. Faba bean host differential set.

Pedigree	No. of pycnidia* per 10 mm^2	Disease Rating	Host status
Sel.80 - LAT (14435-3)	0 - 10	1	Very resistant
Sel.80 - LAT (F_6X75TA46)	0 - 10	1	" "
Sel.80 - LAT (ILB 37)	11- 25	3	Resistant
Sel.80 - LAT (Large Syr.Loc.)	26-50	5	Moderately resis.
Sel.80 - LAT (77MS 87002)	26-50	5	" "
Giza - 4	51-100	7	Susceptible
Sel.80 - LAT (77MS 87200)	51-100	7	"
BPL 161	101 or more	9	Highly susceptible
BPL 165	" "	9	" "

* Average 20 readings on randomly Ascochyta bligh-infected faba bean leaves.

Table 11. Pathogenicity of certain isolates of Ascochyta fabae on resistant and susceptible faba bean genotypes.

Isolates[1]			
	Lattakia-1	Lattakia-2	Local
A	2.0	7.0	8.5
B	2.0	6.5	8.0
C	1.5	2.5	8.0

1. Isolate A was obtained from ILB 37.
   Isolate B " " " BPL 230.
   Isolate C " " " Local large seeded faba bean cultivar in Lattakia.

Table 12. Influence of type of inoculum of Ditylenchus dipsaci on stem nematode - disease development in faba bean.

Type of inoculum	Average disease rating*	Reisolation from infected plants
Infected plant tissues	6.6	Positive
Larval water suspension	4.6	Positive
Control (No inoculum)	1.0	Negative

* Disease readings represent average rating of plants in 5 buckets employing the following scale :
1 = No infection, 3 = Slight swellings at the base of the stem,
5 = Moderate stem swellings (Two or less per stem), 7 = Severe elongated swellings on the stem (2-5 swellings per stem) and moderate leaf infections, 9 = Severe necrotic swellings on the stem (more than 5 per stem) with severe leaf infection and stunting.

Table 13. Susceptibility of plants of different ages to infection of Ditylenchus dipsaci.

Plant age (Weeks)	Disease severity* Control	Inoculated	Yield of green pods (Gr./25 plants) Healthy	Diseased**	Percent reduction in green pod wt. of diseased compared to healthy plants.
8	1.0	3.0 A	735.0	581.6 E	20.8
4	1.0	5.6 B	423.3	170.0 F	59.8
2	1.0	6.3 C	323.3	113.3 G	64.9
1	1.0	8.3 D	256.6	38.3 H	85.0

* Disease severity rated as in Table 13.

** Different letters next to disease and yield values indicate significant differences at the 1% level (F test).

Table 14. Effects of certain chemical treatments on rust in faba beans.

Fungicide and rate	Average disease rating*
DITHANE-M45(2.5g/L)	1.00
DIFOLATAN-WP80(2.5g/L)	2.00
TRIMILTOX (5g/L)	2.66
BRAVO-6F (3cc/L)	3.00
TOPSIN-M-WP 70(1g/L)	3.00
CALIXIN (0.5cc/L)	3.33
BAVISTIN-WP 50(0.7g/L)	3.66
RONILAN-WP 50(2g/L)	6.33
ALLISAN-DP 50% (2g/L)	7.00
UNTREATED	7.66

* Average 6 replications.

Table 15. Reaction of most promising lentil genotypes to rust.

Sel. 80 LAT	Rust Rating	Sel.80 LAT	Rust Rating	Sel.80 LAT	Rust Rating
Loc.large	5.7	27520**	1.0	50845	3.0
Loc.small	5.7	27521**	1.0	50848	3.0
27105	3.0	27523**	1.0	50851	3.0
27113	3.0	28111***	1.0	50891	3.0
27114	3.0	28116**	1.0	50892	3.0
27116	3.0	28119	3.0	50903	3.0
27117**	1.0	28122**	1.0	50910	3.0
27118	3.0	28124	3.0	50932	3.0
27122**	1.0	28126	3.0	50942	3.0
27131	3.0	28127	3.0	50952	3.0
27138	3.0	28134	3.0	11802	3.0
27160**	1.0	28143	3.0	11803	3.0
27163	3.0	28522	3.0	11805	3.0
27165**	1.0	28551	3.0	11806	3.0
27503	3.0	28559	3.0	11808	3.0
27508**	1.0	28563	3.0	11809	3.0
27509**	1.0	50195***	3.0	11811	3.0
27512	3.0	50456***	3.0	11812	3.0
27513	3.0	50839	3.0	11814	3.0
27516**	1.0	50843	3.0	11815	3.0
27519**	1.0	50844	3.0	11817	3.0

** Rated 1 under moderate disease levels.

*** Rated 3 under high disease levels.

Table 16 .Reaction of CIABN-D to Ascochyta rabiei.

Pedigree	Disease Rating	Pedigree	Disease Rating	Pedigree	Disease Rating
ICC 76	5	ICC 1525	5	ICC 3581	9
ICC 94	7	ICC 1591	5	ICC 3582	9
ICC 280	9	ICC 1754	3	ICC 3585	5
ICC 292	9	ICC 1762	5	ICC 3586	5
ICC 478	7	ICC 1772	3	ICC 3737	7
ICC 607	7	ICC 1809	5	ICC 3779	9
ICC 641	7	ICC 1854	5	ICC 3740	9
ICC 758	7	ICC 1871	5	ICC 4762	9
ICC 799	7	ICC 1881	3	ICC 4950	7
ICC 800	7	ICC 1963	5	ICC 5252	9
ICC 801	5	ICC 1973	7	ICC 6330	9
ICC 1062	5	ICC 1983	7	ICC 6843	9
ICC 1069	3	ICC 3377	9	ICC 6856	9
ICC 1121	7	ICC 3378	9	ICC 7563	9
ICC 1136	7	ICC 3432	9	ICC 7674	9
ICC 1168	7	ICC 3509	9	ICC 10829	9
ICC 1414	5	ICC 3573	5	ICC 1929	9
ICC 1416	7	ICC 3577	9	ICC	
ICC 1467	3	ICC 3578	7	ICC	
ICC 1468	5	ICC 3580	9	ICC	

Table 17 . Reaction of CIABN to Ascochyta rabiei

Pedigree	Disease Rating Rep I	Repll	Pedigree	Disease Rating Rep I	Repll
ILC 72	3	1	ICC 280	5	7
ILC 182	5	5	ICC 1903	3	5
ILC 183	5	5	ICC 2160	5	5
ILC 191	5	5	ICC 2232	7	5
ILC 194	7	7	ICC 4131	5	5
ILC 195	5	5	ICC 4935	5	5
ILC 196	5	7	ICC 5127	5	5
ILC 200	3	3	ICC 6067	7	9
ILC 201	5	5	ICC 7513	5	9
ILC 202	1	3	ICC 7514	5	7
ILC 215	7	7	ICC 7520	7	5
ILC 482	3	5	G 543	7	7
ILC 484	5	7	G 549	5	7
ILC 1695	5	7	AUG 480	9	7
ILC 1757	7	5	PCU 15	3	5
ILC 2380	5	5	PCU 128	3	5
ILC 2548	5	5	ILC 1929	9	9
ILC 2555	7	7			
ILC 2956	3	1			
ILC 3257	9	7			
ILC 3279	3	1			
77MS-73022-2	7	7			
NEC 138-2	3	1			
NEC 1256	7	5			

Table 18. Reaction of CAN to Ascochyta rabiei

Pedigree	Disease Rating	Pedigree	Disease Rating	Pedigree	Disease Rating
ILC 187	5	ILC 2919	5	ICC 1087	5
ILC 210	5	ILC 2965	9	ICC 1091	9
ILC 236	7	ILC 3153	5	ICC 1093	7
ILC 244	7	ILC 73034-3-1	7	ICC 1102	7
ILC 249	7	ILC 73132-18-2	3	ICC 1106	9
ILC 1276	7	NEC 1431	5	ICC 1117	5
ILC 1287	9	NEC 2388	7	ICC 1177	5
ILC 1305	7	ICC 12	7	ICC 1234	5
ILC 1331	7	ICC 124	3	ICC 1301	5
ILC 1407	9	ICC 369	3	ICC 1400	5
ILC 1617	7	ICC 529	5	ICC 1472	7
ILC 1619	7	ICC 601	5	ICC 1532	7
ILC 1675	9	ICC 623	9	ICC 1654	7
ILC 1695	5	ICC 643	7	ICC 1711	7
ILC 1723	9	ICC 652	7	ICC 1757	5
ILC 1728	9	ICC 665	9	ICC 1877	7
ILC 1781	7	ICC 697	9	ICC 1883	5
ILC 2441	7	ICC 712	9	ICC 1905	7
ILC 2459	9	ICC 716	9	ICC 1947	7
ILC 2496	7	ICC 740	9	ICC 4111	7
ILC 2506	5	ICC 743	5	ICC 4112	7
ILC 2906	7	ICC 986	7	ILC 1929	9
ILC 2912	7	ICC 1084	9		
ILC 2916	9	ICC 1085	7		

Table 19. Severity of Ascochyta blight and yield of certain chickpea genotypes grown in winter (CIYT-W).

Pedigree	Mean disease severity	Mean yield (kg/ha)
ILC 191	1.0	3554
ILC 196	1.0	2354
ILC 200	1.0	3183
ILC 182	2.0	3157
ILC 72	2.5	3268
ILC 3279	3.0	3706
ILC 202	3.0	2889
ILC 194	3.5	2118
ILC 2548	3.5	2723
ILC 195	4.0	3710
ILC 482	4.0	3406
ILC 484	4.5	4257
ILC 249	5.5	3452
ILC 2912	5.5	2029
ILC 2555	6.0	2758
ILC 236	6.0	1559
ILC 1407	6.5	2283
ILC 1276	7.0	1582
ILC 2906	7.5	1696
Local check	9.0	0.0

Table 20. Severity of Ascochyta blight and yield of certain promising chickpea genotypes grown in winter (PYT-W).

Pedigree ILC	Mean disease severity	Mean yield (kg/ha)
194	1.0	3433.30
MV_2	1.0	4186.40
3279	1.5	4855.20
484	1.5	4408.30
191	1.5	4287.50
MV_3	1.5	3933.30
201	1.5	3531.20
249	2.0	4762.50
MV_1	3.0	4535.40
482	3.0	4312.50
202	3.0	4287.50
72	3.5	4021.80
1929	9.0	000.0

Table 21. Evaluation of winter vs. spring chickpea planting.

Plot No.	Time of Planting	Pedigree	Yield kg/ha	Severity of Ascochyta blight
1	Winter	Syr. local	0.0	9
2	"	ILC 195	3874.0	3
3	"	ILC 215	2497.5	5
4	"	ILC 482	4306.8	3
5	Spring	Syr. local	1509.6	3
6	"	ILC 263	1176.6	3

Table 22. Pathogenicity of certain isolates of Ascochyta rabiei on certain resistant and susceptible chickpea genotypes.

Isolate[1]	Genotypes rating								
	184	190	195	202	215	249	482	3279	1929
A	7	5	5	1	7	7	5	3	9
B	7	7	5	3	7	7	5	3	9
C	7	5	5	1	7	7	5	3	9
D	4	3	3	2.5	4	3	2.5	2	9

1- Isolate A was obtained from ILC 249
" B " " " ILC 482
" C " " " ILC 195
" D is a mixture of field collection of A. rabiei

Table 23. Number of pycnidia induced by Ascochyta rabiei in certain resistant chickpea genotypes.

Isolate[1]	Number of pycnidia per 10 mm^2 in different genotypes								
	184	190	195	202	215	249	482	3279	1929
A	54.0	54.0	38.6	14.0	32.8	30.0	68.5	5.0	147.7
D	6.8	11.5	9.5	2.8	2.8	1.5	20.5	1.7	135.7

1- Isolate A was obtained from ILC 249
" D is a mixture of field collection of A. rabiei.

Table 24. Effects of certain chemical treatments on severity of Ascochyta blight (DS) and yield (Y=kg/ha) of different chickpea genotypes.

Fungicides and rates	Severity of Ascochyta blight and yield of different genotypes[1]													
	ILC 202		ILC 3279		ILC 482		ILC 249		ILC 195		ILC 190		ILC 1929	
	DS	Y	DS	Y	DS	Y	DS	Y	DS	Y	DS	Y	DS	Y
Bravo-6F(3cc/l)	1.0*	4651*	1.0**	5179**	1.6*	5306**	1.0**	6113**	2.3*	5324**	3.0**	6680**	7.0**	2419**
" " (0cc/l)	1.6	4471	3.0	4895	2.3	4870	2.3	5738	3.0	4847	5.0	4773	7.0	0.0
Dithane-M_{45}(2.5g/l)	1.6*	4941*	1.0**	5569**	1.6**	5040*	2.3**	5581**	1.6**	5275**	3.0**	5284**	9.0	0.0
" " (0 g/l)	2.3	4766	3.0	5312	3.0	4811	4.3	5169	3.0	4911	5.0	4900	9.0	0.0
Calixin(0.5cc/l)	3.0	3751	3.0	2830	3.0	3013	3.0	5509	3.0	4580	3.6**	4705	9.0	0.0
" (0 cc/l)	3.0	4290	3.0	3950	3.0	4627	3.0	6369	3.0	3849	5.0	5576	9.0	0.0

1- Significant differences

*- 5 % level

**- 1 % level employing Duncan's multiple