

Survey of Faba Bean (*Vicia faba* L.) Diseases in the Main Faba Bean-Growing Regions of Syria

C. Akem and M. Bellar

Germplasm Program, International Center for Agricultural Research
in the Dry Areas (ICARDA), P.O. Box 5466, Aleppo, Syria.

Abstract

Akem, C. and M. Bellar. 1999. Survey of Faba Bean (*Vicia faba* L.) Diseases in the Main Faba Bean-Growing Regions of Syria. Arab J. Pl. Prot. 17(2): 113-116.

During the 1995/96 cropping season, a quantitative disease survey was conducted in the main faba bean (*Vicia faba*) growing regions of Syria. The survey covered 108 fields within 45 faba bean growing areas in three of the five agro-ecological zones. The most important and widespread fungal diseases observed at all locations were: rust (*Uromyces fabae*), chocolate spot (*Botrytis fabae* and *B. cinerea*), ascochyta blight (*Ascochyta fabae*), leaf spots (*Alternaria alternata* and *Cercospora fabae*) and wilt/root rot complex (*Fusarium oxysporum* and *Macrophomina phaseolina* dominating the complex). Other diseases of apparent minor importance recorded at low incidence levels at most locations were: Sclerotinia blight (*Sclerotinia sclerotiorum*), downy mildew (*Peronospora viciae*) and stem nematode (*Ditylenchus dipsaci*). The distribution and severity of chocolate spot and rust was more concentrated in the coastal areas, while Ascochyta blight was more prevalent within the central regions. The disease survey confirmed earlier classifications of chocolate spot, rust and Ascochyta blight as the main fungal diseases of faba bean in Syria, and identified Sclerotinia stem blight and the wilt/root rot complex as potential threats to faba bean production in the coastal and central region production areas.

Keywords: Faba bean, *Vicia faba* L., Syria, Survey

Introduction

Faba bean (*Vicia faba* L.) is an annual cool-season food legume, widely cultivated in the countries of the Nile Valley, North Africa and West Asia, especially in areas with high annual rainfall or under irrigation (11). It is a source of cheap-quality protein, especially among the poor in these regions. In Syria, faba bean production is concentrated mainly along the coastal regions, and in Aleppo, Damascus, Hama, Homs, Idleb, and Quinetra Provinces. The approximate relative distribution of the crop in the coastal area and in these provinces is 34, 23, 19, 11, 7, 3.5 and 2.5% respectively (2). Most of these production areas are located in zones A and B, which are classified according to the average seasonal rainfall distribution (zone A, >350mm and zone B, 250-350 mm) (1) (Fig. 1). This represents, respectively, 46% and 31% of the total faba bean growing areas, in the five agro-ecological zones of Syria. The total area planted to faba bean in Syria has remained around 8000 ha in the last 10 years, and 60% of this area is irrigated (4). Even though acreage has remained fairly constant, average yields have been declining, due to effects of abiotic and biotic stresses, especially attacks from diseases.

Previous reports on the occurrence of faba bean fungal diseases in Syria relied mainly on observations of yield and on-farm multi-locational trials (6, 8, 9). Most of the diseases of faba bean mentioned in these reports were not quantitatively determined to take into account their regional distribution and intensities. Thus, there has been for a long time, a need to carry out a quantitative survey covering all the major faba bean growing areas of Syria, to document the prevalence and severities of the major diseases occurring on the crop in the main agro-ecological zones. An immediate secondary objective for the survey was to identify areas favorable for the development of major diseases which could be used as "hot spots" in screening faba bean germplasm and breeding lines for resistance to the most prevalent diseases in the different zones, under natural conditions of infection.

Materials and Methods

The survey was carried out during the months of March, April and May of the 1995/96 cropping season. It concentrated within the coastal region where the mean annual rainfall is above 600 mm, and in the zone A agro-ecology, with mean annual rainfall of 350-600 mm, where most of the faba bean in Syria is produced. It also extended to zone B in the central and northern regions, with mean annual rainfall between 250 and 350 mm, where about 10% of the crop is grown under irrigation (2). Fields surveyed in each zone were randomly selected, and the number of visits per zone was dependent on the approximate area of production in that zone.

In each field, 3-5 plants at 5 randomly-selected spots were closely examined. The prevalent diseases and their intensities were recorded based on visual symptoms. A disease index score (0-100%) based on the disease severity and incidence, was assigned to reflect the severity and spread of infection of each disease observed in the field. To confirm field diagnosis based on symptoms, infected plant samples were collected from different fields and taken back to the laboratory for isolation and confirmation of the causal agents after growth and sporulation on appropriate media, based on microscopic examination. The frequency of occurrence of different pathogens associated with the main diseases was recorded. Pathogenicity tests where needed, especially for apparently newly-observed diseases (Sclerotinia stem blight and Stemphylium blight) with no records of their previous occurrence in the country, were carried out under controlled conditions in pots in the plastic house.

The mean disease intensity score for each zone was calculated from the range of intensity scores recorded for the number of fields surveyed in that zone. The prevalence of each disease in each zone was also determined. In this study, disease prevalence is defined as the percentage of fields with a disease (12).

Results and Discussion

A total of 108 fields within the different faba bean growing areas in the 3 agro-ecological zones (Coastal, Zone A and Zone B) of Syria were surveyed (Fig 1). These represented 46 fields from the coastal areas (Lattakia and Tartous provinces), 43 from zone A (Idleb, Hama and Quinetra provinces) and 19 from zone B (Dara'a, Aleppo, Homs and Hama provinces). The faba bean crop in most of the fields, at the time of the survey (March-May), was mostly in the early flowering to pod-filling growth stages.

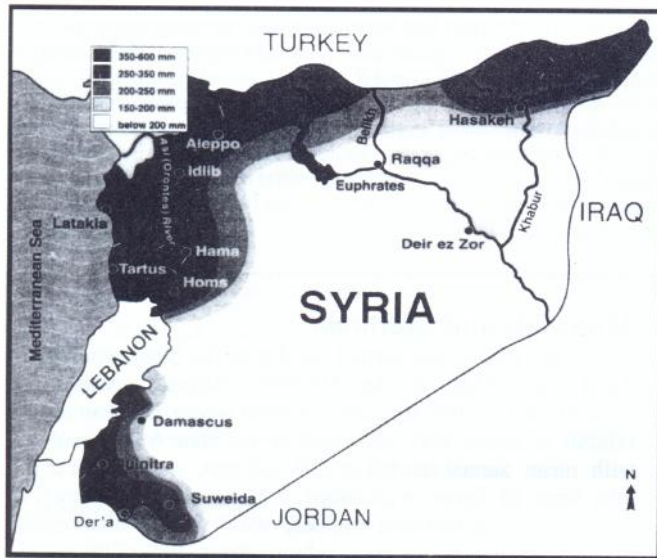


Figure 1. Map of Syria showing different agro-ecological zones and provinces surveyed for faba bean diseases during March-May 1996.

Table 1 summarizes the prevalence of the different faba bean diseases occurring in the three agro-ecological zones covered in the survey during the 1995/96 cropping season in Syria. Chocolate spot (*Botrytis fabae* Sard.) and rust (*Uromyces viciae-fabae* (Pers.) Schroet.) were the two predominant diseases observed in most fields surveyed in the coastal region. They occurred in 91 and 93%, respectively, of all fields surveyed in this region. They also occurred at a high proportion in zone A, but were not detected in any of the fields in zone B. Ascochyta blight (*Ascochyta fabae* Speg.), gray mold (*B. cinerea* Pers. ex Fr.), downy mildew (*Peronospora viciae* (Berk.) Casp. and the root rot complex (caused mostly by *Fusarium* spp., and *Rhizoctonia* spp.), were detected in some fields in all 3 agro-ecological zones. Other diseases detected in all the zones though at low prevalence levels were: Alternaria leaf spot (*Alternaria alternata* (Fr.) Kiessler), Stemphylium blight (*Pleospora herbarum* (Pres. ex Fr.), anamorph = *Stemphylium sarciniforme* (Cav.) Wilts.), Phoma blight (*Phoma medicaginis* Malbr. & Roum) var *pinodella* (James) Boerma and bacterial blight (*Xanthomonas phaseoli* J.J. and R). Most of them have not been considered as important constraints to faba bean production in these zones. Their widespread distribution, therefore, suggests that they could become major factors in yield reductions when seasonal conditions favor their development and spread.

Table 1. Prevalence of faba bean diseases occurring in different agro-ecological zones* of Syria, March-May 1996.

Disease	Percentage of fields infested			
	Coastal Regions 46 fields	Zone A 43 fields	Zone B 19 fields	All Zones 108 fields
Chocolate spot	91	44	0	57
Rust	93	60	0	64
Ascochyta blight	57	63	32	55
Gray mold	52	70	32	56
Sclerotinia stem blight	54	49	0	43
Downy mildew	52	58	47	54
Stem nematode	65	26	0	38
Root rots	59	53	32	52
Alternaria leaf spot	43	26	32	34
Stemphylium blight	52	30	11	35
Phoma blight	33	26	11	26
Bacterial blight	28	33	16	28

* Coastal Regions: >600 mm annual rainfall.

Zone A: 350-600 mm annual rainfall.

Zone B: 250-350 mm annual rainfall.

The severities of the major diseases observed reflected their relative importance in the different zones. Some fields in the coastal regions were almost wiped out by chocolate spot and rust (Table 2). However, some fields within this same zone had very low incidence levels of the diseases as reflected in the wide range of the disease intensities in the regions. The overall mean disease intensities and ranges in zone B were low for all the diseases recorded in this zone, while those for zone A were mostly intermediate (Table 2).

Table 2. Intensity of faba bean diseases in different agro-ecological zones* of Syria, 1996.

Disease	Mean and range of disease intensities in		
	Coastal Regions (46 fields)	Zone A (43 fields)	Zone B (19 fields)
Chocolate spot	51 (5-100)	19 (8-53)	0
Rust	58 (4-100)	23 (5-70)	0
Ascochyta blight	20 (5-30)	25 (5-42)	17 (10-50)
Gray mold	25 (3-50)	18 (4-26)	6 (3-14)
Sclerotinia stem blight	16 (3-38)	15 (6-33)	0
Downy mildew	20 (5-35)	10 (3-23)	11 (3-18)
Stem nematode	19 (5-38)	6 (4-20)	0
Root rots	16 (4-50)	12 (5-30)	10 (5-25)
Alternaria blight	18 (8-40)	10 (5-15)	7 (5-10)
Stemphylium blight	13 (6-18)	7 (4-15)	5 (3-8)
Phoma blight	14 (5-35)	3 (1-7)	2 (1-4)
Bacterial blight	10 (4-18)	3 (1-5)	7 (2-18)

* Coastal Regions: >600 mm annual rainfall.

Zone A: 350-600 mm annual rainfall.

Zone B: 250-350 mm annual rainfall.

The frequency of isolation of the pathogens from diseased samples largely confirmed the field diagnosis based on visual symptoms (Table 3). *B. fabae* and *B. cinerea* were frequently isolated from infected samples showing typical chocolate spot symptoms. This suggested that both pathogens can be implicated in the cause of the disease on faba bean in Syria. This has also been established to be the case in other studies (3, 7). *Fusarium oxysporum* Schlecht. Emend. Snyder & Hans. f.sp *fabae* and *Macrophomina phaseolina* (Tassi.) Goid. were the predominant pathogens associated with root rot samples collected from drier and non-irrigated fields, while some *F. solani* (Mart.) Appel & Wr. and *R. solani* Kuhn were also isolated mostly from the irrigated areas (Table 3).

Table 3. Pathogens associated with some main diseases occurring on faba bean in Syria, 1996.

Disease	Causal agents	Frequency of isolation (%)*
Chocolate spot	<i>Botrytis fabae</i>	80
	<i>Botrytis cinerea</i>	45
Ascochyta blight	<i>Ascochyta fabae</i>	100
Sclerotinia stem blight	<i>Sclerotinia sclerotiorum</i>	85
Cercospora leaf spot	<i>Cercospora fabae</i>	100
Stemphylium blight	<i>Pleospora herbarum</i>	65
Bacteria blight	<i>Xanthomonas phaseoli</i>	75
Phoma blight	<i>Phoma medicaginis</i> var <i>pinodella</i>	65
Root rots	<i>Fusarium oxysporum</i>	65
	<i>Macrophomina phaseolina</i>	40
	<i>Fusarium solani</i>	15
	<i>Rhizoctonia solani</i>	15

* Isolated and cultured on potato dextrose agar and identified by microscopic spore morphology.

The occurrence and distribution of the diseases observed during the survey seem to have been greatly influenced by irrigation practices in the different fields. More than 70% of the fields surveyed were under sprinkler irrigation. Sclerotinia stem blight was detected at high incidence levels mostly in these irrigated fields, especially in zone A. Black root rots were also prevalent in the irrigated fields especially in the Al-Ghab area in Hama Province of zone A, while the dry root rots and wilts were associated mostly with non-irrigated fields in the zone B areas. Rust was observed mainly as a late-season disease in most of the fields surveyed. Its effect on grain yield was expected to be negligible because it occurred at high incidence levels mostly in fields with the crop already at the pod-filling stage.

Some of the diseases observed during this survey are new records on faba bean in Syria as previous surveys did not report their occurrence. These included sclerotinia stem blight observed in fields in the coastal region and in zone A, and stemphylium blight observed in all 3 zones.

The survey confirms earlier classifications (3, 10) of chocolate spot, rust and ascochyta blight as the major diseases of faba bean in Syria. It also indicates the potential importance of other diseases such as sclerotinia blight, root rots and downy mildew as biotic constraints to faba bean production in Syria. Screening for resistance to the major diseases observed in this survey has been intensified within the faba bean improvement program at the International Center for Agricultural Research in the Dry Areas (ICARDA). In this effort, some "hot-spots" identified during the survey will be useful to carry out initial germplasm screenings under natural field infection conditions. These include fields in Lattakia for chocolate spot and rust and fields in Aleppo for ascochyta blight.

الملخص

أكيم، كريس ومصطفى بلال. 1999. مسح للأمراض التي تصيب الفول (*Vicia faba* L.) في المناطق الرئيسية لزراعته في سورية. مجلة وقاية النبات العربية. 17(2): 113-116.

تم، في الموسم الزراعي 96/1995 القيام بمسح كمي للأمراض التي تصيب الفول في المناطق الرئيسية لزراعته في سورية. وقد شمل المسح 108 حقول في 45 منطقة زراعة موزعة في ثلاثة من مناطق الاستقرار الخمسة. وكانت أكثر الأمراض الفطرية أهمية وانتشار في كافة المواقع: الصدا (*Uromyces fabae*)، التبقع الشولاتي (*Botrytis fabae* و *B. cinerea*)، لفحة أسكوكيتا (*Ascochyta fabae*)، تبقع أوراق (*Alternaria alternata* و *Cercospora fabae*) ومعدن الذبول/تعفن الجذور (حيث كان الفطران *Fusarium oxysporum* و *Macrophomina phaseolina* الأكثر سيادة في المعدن). ومن بين الأمراض الأخرى ذات الأهمية القليلة، والمسجلة بمستويات حدوث منخفضة في كافة المواقع نذكر: لفحة سكليروتتيا (*Sclerotinia sclerotiorum*)، البياض الزغبى (*Peronospora viciae*)، ونيماتودا الساق (*Ditylenchus dipsaci*). وكان مرض التبقع الشوكولاتي والصدا متركزين في المناطق الساحلية، في حين كانت لفحة الأسكوكيتا أكثر سيادة في المناطق الداخلية. وقد سمح المسح الحالي بتأكيد التصنيف السابق من أن أمراض التبقع الشوكولاتي، والصدا ولفحة الأسكوكيتا هي الأمراض الفطرية الرئيسية التي تصيب الفول في سوريا، وإظهار لفحة سكليروتتيا ومعدن الذبول/تعفن الجذور كخطر محقق لانتاج الفول في المناطق الساحلية والوسطى لزراعته.

كلمات مفتاحية: الفول، *Vicia faba*، سورية، حصر.

References

1. **Anonymous.** 1997 . The Annual Agricultural Statistical Abstracts 1997, Ministry of Agriculture and Agrarian Reform, Syria. 188 pp.
2. **Anonymous.** 1996 . The Annual Agricultural Statistical Abstracts 1996, Ministry of Agriculture and Agrarian Reform, Syria. 172 pp.
3. **Diekmann, M.** 1994. Seedborne pests and diseases of faba beans (*Vicia faba*). ICARDA/Danish Government Institute of Seed Pathology for Developing Countries. ICARDA, Aleppo, Syria. 56 pp.
4. **FAO.** 1996. Production Yearbook 1995. Food and Agricultural Organization, Rome, Italy.
5. **Hanounik, S.B.** 1979. Diseases of major food legume crops in Syria. Pages 98-102 In: Food Legume Improvement and Development. G.C. Hawtin and G.J. Chancellor (eds.). Proceedings of a Workshop held at the University of Aleppo. Aleppo, Syria, 2-7 May 1978. IDRC, Ontario, Canada. 216 pp.
6. **Hanounik, S.B., G.J. Jellis and M.M. Hussein.** 1993. Screening for disease resistance in faba bean. Pages 97-106. In: Breeding for Stress Tolerance in Cool-Season Food Legumes. K.B. Singh and M.C. Saxena (eds.). John Wiley & Sons, Chichester, UK.
7. **Harrison, J.G.** 1988. The biology of *Botrytis* spp. on *Vicia* beans and chocolate spot disease – a review. Plant Pathology 37:168-201.
8. **ICARDA.** 1989. Pathology of food legumes. Pages 143-153. In: Collaborative Research and Training Program: Annual Report for the 1987/88 season. Ministry of Agriculture and Agrarian Reform, Damascus, Syria and ICARDA, Aleppo, Syria.
9. **ICARDA.** 1990. Pathology of food legumes. Pages 97-99. In: Collaborative Research and Training Program: Annual Report for the 1988/89 season. Ministry of Agriculture and Agrarian Reform, Damascus, Syria and ICARDA, Aleppo, Syria.
10. **Khoury, F., M. Bellar, L. El-Roh and N. Riad.** 1974. List of plant diseases in Syria. Agricultural Extension Bulletin No. 55; Ministry of Agriculture and Agrarian Reform. Damascus, Syria. 29 pp.
11. **Saxena, M.C.** 1991. Status and scope of production of faba bean in the Mediterranean countries. In: Proceedings of a Conference on Present Status and Future Prospectives of Faba Bean Production and Improvement in the Mediterranean Countries. J. Cubero and M.C. Saxena (eds.). CIHEAM No. 10, 186 pp.
12. **Zadoks, J.C. and R.D. Schein.** 1979. Epidemiology and plant disease management. Oxford University Press, New York, 427 pp.