



**Food
Legume
Improvement
and
Development**

Proceedings
of a
workshop
held at The
University
of Aleppo,
Syria,
2-7 May
1978

Geoffrey C.
Hawtin
and
George J.
Chancellor,
Editors

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Food Legume Diseases in North Africa

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Food legumes have been important crops for some considerable time in the countries of North Africa, and recent increases in demand for dry pulses in Western Europe appear to be promoting a renewed interest in these crops. Food legumes provide a valuable source of dietary protein to the population and also play an important role in maintaining soil productivity in rotations by accumulating plant nutrients, such as nitrogen, and improving soil physical conditions.

The area occupied by grain legumes has fluctuated around 800 000 ha for the past 10 years, and the production from this area similarly around 600 000 metric tonnes. The low and variable yields obtained from these crops are to a large extent a result of the number and severity of the diseases that habitually affect them. These diseases affect both the yield and quality of the food legumes and constitute perhaps the most limiting factors to their production.

Diseases of Broad Bean (*Vicia faba*)

Broad beans are the dominant grain legume crop in North Africa, but yields are low and erratic as the commonly grown land varieties are poor yielders and susceptible to many pests and diseases. Fungal pathogens that affect the crop that may cause appreciable damage include *Botrytis fabae* (chocolate spot), *Uromyces fabae* (rust), *Cercospora fabae*, *Peronospora fabae* (downy mildew), *Fusarium culmorum* and *F. avenaceum* (root rot and wilt), and *Pleospora herbarum*. Of these, *Botrytis fabae* is by far the most important, becoming epidemic in hot and humid spring weather during flowering and fruit maturity and causing very great yield losses. Infection, for example, was so severe in 1970 and 1973 that farmers had no alternative but to plough in their crops. The disease is characterized by the appearance of circular brown spots on the leaves, from which it gets its common name, chocolate spot. These spots are usually from 1 to 3 mm in diameter, but can reach up to 15 mm and coalesce to form large necrotic areas in some cases. Diseased plants are also covered with necrotic lesions at their base and on their stems, and the flower parts and pods become covered in small black spots, which may result in a high percentage of flower sterility.

Although the other diseases are endemic to North Africa and appear regularly on the crop, they appear to have little economic importance in the region.

Diseases of Chick-pea (*Cicer arietinum*)

Chick-pea is the second-most important grain legume crop in North Africa and is grown on approximately half the acreage devoted to broad beans. Several pathogens affect the crop causing considerable yield losses. These include *Ascochyta rabiei* (blight) (also

recorded as *Mycosphaerella rabiei*), *Fusarium oxysporum* (wilt), and *Pleospora herbarum*.

Perhaps the most severe of these diseases in the region is *Ascochyta* blight, which causes elongated cankers on the stems, and circular/oval, brown to white spots with red margins about 8–10 mm in diameter on the young leaves. The pods are also infected and the pathogen enters the seed in which it is preserved to cause future infections. Mild attacks of this disease usually cause losses of the order of 40%, but plants infected early in the season, or in humid springs when the disease takes on epidemic proportions, may lose all their green tissues and have to be ploughed in.

All land varieties grown in Tunisia are susceptible to *A. rabiei*, and, as the fungus can be preserved in very hardy structures on plant parts left in the soil as well as in the seed, it recurs regularly every year in the chick-pea crops, becoming very severe only when environmental conditions are favourable. Seeds with coloured seed coats have been shown to be tolerant to the pathogen, but are unfortunately of no commercial value.

In contrast to *Ascochyta* blight, the yellowing and wilting of plants caused by species of the genus *Fusarium* (*F. oxysporum* and *F. lateritium*) are particularly serious in dry seasons. Losses resulting from these pathogens, which are also preserved both in the seed and in diseased plant parts in the field, have been recorded as between 20 and 40% in Tunisia during 1977.

Pleospora herbarum, which is predominantly seed transmitted, causes a decreased germination capacity in infected seeds. However, the economic impact of the pathogen is, at present, negligible.

Diseases of Dry Peas (*Pisum sativum*)

Although ranking third in importance after broad beans and chick-peas in the region as a whole, dry peas are more important in Morocco. The presence of several pathogenic agents, which include *Ascochyta* sp. (*A. pisi*, *A. pinodella*, and *A. pinodes*) and *F. oxysporum*, has been confirmed on this crop.

Of these, *Ascochyta* sp. are the group most frequently observed and most economically important. Variations in the size of the fruiting bodies (pycnidia), the spores, and in the symptoms caused allow an easy distinction between the three important species of the pathogen. *A. pisi* has spores measuring approximately 4.2×13.9 microns, and causes large pale-brown spots containing black pycnidia intermediate in size, on the leaves and pods. Some stem injury may also be apparent. Whereas the other two species cause darker leaf spots with purple margins, *A. pinodella* has small pycnidia and spores measuring 3.7×8.8 microns and mainly causes root rot, while *A. pinodes* attacks all the plant parts and has large fruiting bodies and spores measuring 4.5×12.3 microns. All three species can be seed transmitted as well as preserved on plant parts in the soil and yield losses from infection may be severe, especially in Morocco, which, as a result of the oceanic influence, has a higher April to June rainfall and humidity than the other two countries.

Wilting caused by *F. oxysporum* f. *pisi* and other *Fusarium* species is characterized by yellowing of the foliage and dwarfing and may result in severe plant injury and yield loss. The disease favours dry soil and high temperature conditions and generally appears in the field in isolated circular foci, which enlarge as the season progresses and may coalesce to cause extensive field infection in serious attacks.

Diseases of Dry Beans (*Phaseolus* spp.)

Dry beans are cultivated on only approximately 14 000 ha of land in North Africa and thus make little contribution to the agricultural economy of the region. Many pathogens have been reported as infecting this crop, among which *Colletotrichum lindemuthianum* f. sp. *phaseoli*, which causes anthracnose (characterized by yellowing and wilting symptoms), bean mosaic virus (BMV), and bacterial diseases are the most significant.

Diseases of Lentils (*Lens* sp.)

Few studies have been carried out on the disease problems of this crop to date; however, *Botrytis* sp. and *F. oxysporum* appear to be the most important pathogens.

Research Efforts

From the limited volume of work so far undertaken on legume diseases in the North African region, it appears that *Botrytis fabae* is the fungal pathogen of major importance in broad beans and *Ascochyta* spp. and *Fusarium* spp. cause the most problems in chick-pea and dry pea crops. Past research on diseases of grain legumes has been concentrated on studies of *A. rabiei*, and insufficient importance has been attached to these other disease problems. Present research aims to correct this imbalance by focusing on the estimation of losses caused by all three major legume diseases; the evolution of reliable inoculation techniques for these pathogens to promote good artificial infections for screening purposes; the identification of lines of broad bean and chick-pea resistant to the major diseases; the analysis of symptom expression for the evaluation of host reaction to diseases and the determination of tolerance as well as general field resistance; and the evaluation of cultural and chemical control methods as supplements to the main control program, which focuses on host plant resistance. In this way a greater understanding of the mechanisms involved in disease infection and development, leading to the establishment of integrated strategies for minimizing these severe constraints to production, can be achieved.