

Abstract

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Twenty-seven lentil fields, in northwest Syria were surveyed for wilt damage. The proportion of wilted plants in all fields varied from 2 to 70% with a mean of 12%. Isolation of fungi from diseased samples showed a dominance of *Fusarium* spp. A pathogenicity test reproduced the disease and

showed that vascular wilt symptoms were associated with the growth of *Fusarium oxysporum* f. sp. *lentis* within infected tissues.

Additional key words: lentils, Fusarium wilt diseases, Syria.

Introduction

Lentil (*Lens culinaris* Med.) is the most important pulse crop in Syria covering an average area (1976 – 1982) of 106,000 ha (1). Production is concentrated in the northwest provinces of Aleppo, Idlib and Hama, which together represent about 68% of the lentil production in Syria. A survey of 115 lentil fields in 1980 revealed damping-off, root rot and wilt as being both widespread and damaging to yield (2). In the following years we observed wilt being the most damaging disease to farmers' lentils in northwest Syria. Wilt on lentils caused by *Fusarium oxysporum* f. sp. *lentis* is known as a major reducer of yields in India, particularly in Madhya Pradesh (3). The present survey was planned to assess the proportion of wilt-affected plants in farmers' fields and to determine the causal organism.

Materials and Methods

Field Survey: During the first week of May 1984 twenty-seven lentil fields were surveyed in the north Syrian provinces of Aleppo, Idlib, and Hama. Sample numbers per province were determined according to the crop's provincial distribution. Fields more than five kilometers apart were surveyed within each province to cover the main growing areas during the pod filling stage of growth. At each site, the crop area, the percentage of wilted plants, the symptoms expressed, and the growth stage of the crop were recorded. Diseased plants were collected at 27 locations for laboratory studies.

Isolation: In the laboratory 15 pieces of 0.5 cm length of the collar and primary roots from each field sample were sterilized for 3 minutes in mercuric chloride (1/1000), washed first in distilled water and secondly in sterilized water, and then dried in sterilized filter paper prior to planting. Two growth media, namely potato dextrose agar (PDA) and lentil seed extract agar (LSEA), were used. To prepare LSEA medium, 100 g of lentil grains were boiled to softness and filtered. The filtrate was adjusted to 1 litre volume, and then 20 g agar was added. The media was sterilized at 120°C for

20 minutes. For isolation, the fifteen tissue pieces from each lentil sample were cultured at 10°, 15° and 20°C with five randomly selected pieces at each temperature regime. After isolation the cultures were stored at 4°C.

Pathogenicity: A pathogenicity test was undertaken with pot-sown lentils in an incubator, illuminated with two fluorescent lights (10W) on a 16h light / 8h dark regime maintained at 20°C. Wet compost was sterilized at 120°C for an hour in an oven, and then put into plastic 8 cm pots, which were sown with three seeds of cultivar Precoz (ILL 4605) surface sterilized as above.

When the lentils were 12 cm high (15 – 18 days after sowing) the pots were inoculated with a pure culture of the fungus. The inoculum (a 10 cm Petri dish covered with fungal growth on LSEA medium) was mixed with 100 cc sterilized water and blended, then 10 ml irrigated into each pot.

Following the development of vascular wilt symptoms, re-isolation of *Fusarium* was done from 0.5 cm long shoot samples plated on LSEA media at 20°C. After 2 days identifiable fungal growth occurred. Microscopic examinations of the lentil vascular system were made using longitudinal sections of shoot tissue stained in lactophenol cotton blue.

Results

Field Observations: Plants with wilt symptoms were found in all 27 fields sampled. The proportion of wilted plants varied from 2%, which was insignificant in terms of final yield, to a maximum of 70% (Table 1). In general, 12% of the plants showed wilt symptoms, with Idlib province being higher (18%) than the corresponding values for the province of Aleppo (11%) or Hama (7%) (Table 1).

Fungal Growth: Three incubation temperatures (10, 15 and 20°C) were used for culture studies. At 10°C fungal growth was slowest, at 15°C *Fusarium* growth was discernible in relation to other fungi; while at 20°C *Fusarium* colonies were overgrown by other fungi. Lentil plant extract medium (LSEA) resulted in more fungal growth than potato

dextrose agar (PDA), and, in particular, more growth of *Fusarium* spp.

Table 1. Summary of field observations of wilt of lentils (*Lens culinaris*) in northwest Syria.

جدول 1 . ملخص للملاحظات الحقلية عن ذبول العدس في شمال غرب سورية .

Province	Number of fields	Average field area (ha)	Wilted plants %	Range of wilted plants %
Aleppo	17	1.1	10.8	2 - 30
Idlib	6	1.6	18.2	2 - 70
Hama	4	2.5	7.0	3 - 12

Fungi Isolated: The fungi isolated from wilted lentil plants were *Fusarium* spp. (*F. oxysporum*, *F. moniliforme*, and *F. roseum*), *Penicillium*, *Ascochyta*, *Rhizopus*, *Alternaria*, *Peyronellaea*, *Heterosporium*, and *Cladosporium*, as well as bacteria and unidentified Basidiomycetes. The number of fields (out of 27 examined) yielding positively-identified fungi, is shown in Table 2. From each location five lengths of collar and primary root were plated and incubated at each of the three temperatures. From all these isolations, the percentages of specific fungi in relation to the total fungi isolated is given in Table 2. The results show a predominance of *Fusarium* spp.

A pathogenicity test resulted in vascular wilt symptoms with a progressive drying of leaves and shoots from the apex downward. The lentil vascular system under microscopic examination was found to contain fungal hyphae and isolation from these shoots yielded growth of *Fusarium oxysporum*.

Discussion

Characteristic symptoms of wilt were observed in lentil fields during the reproductive period of growth. This allows insufficient time for compensatory growth of the adjacent, unaffected plants. Wilted plants usually produce no seeds. Consequently, the proportion of wilted plants in a field gives an approximation of the actual yield loss from the disease. We may deduce an overall yield loss from wilt in northwest Syria of about 12 percent.

Table 2. Identity and frequency of fungi isolated from diseased lentil plants collected from 27 fields in northwest Syria.

جدول 2 . هوية وتردد الفطور المعزولة من نباتات العدس المريضة والمجموعة من 27 حقلاً في شمال غرب سورية .

Fungi	Number of fields	% of isolates
<i>Fusarium</i>	16	46.0
<i>Penicillium</i>	20	32.2
<i>Ascochyta</i>	5	5.4
<i>Rhizopus</i>	5	3.7
<i>Alternaria</i>	4	1.7
<i>Peyronellaea</i>	1	0.8
<i>Heterosporium</i>	1	0.5
<i>Cladosporium</i>	1	0.5
Bacteria and unidentified Basidiomycetes	2	2.0

The two most commonly occurring fungi were *Fusarium* and *Penicillium*. The latter is known to be a saprophyte and a secondary pathogen. *Fusarium* spp. were the most widely found organisms, and the pathogenicity test showed vascular wilt symptoms caused by *Fusarium oxysporum* f. sp. *lentis*.

الملخص

بيّاعة، ب.، و. ارسكين ول. خوري. 1986. دراسة أضرار الذبول على العدس في شمال غرب سوريا. مجلة وقاية النبات العربية 4 : 118 - 119

اختبار القدرة المرضية للفطر المعزول على البيئة الاصطناعية ظهرت أعراض الذبول الوعائي كما ظهرت نموات للفطر *Fusarium oxysporum* f. sp. *lentis* على العدس.

كلمات مفتاحية: عدس، أمراض الذبول الفيوزاري، سوريا.

لدراسة مدى الأضرار التي يحدثها الذبول على العدس، تم مسح 27 حقلاً في شمال غرب سوريا. تراوحت النسبة المئوية للنباتات المصابة بالذبول في الحقل الواحد ما بين 2% - 70% وكان معدلها الوسطي 11.5%. بعد عزل الفطر من النباتات المصابة تبين أن *Fusarium* spp. كان هو الفطر السائد. عند

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