

## New Sunflower Disease Caused by *Fusarium tabacinum*

A. ZAZZERINI and L. TOSI, Institute for Plant Pathology, University of Perugia, Borgo XX Biugno, 74-06100 Perugia, Italy

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### ABSTRACT

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A new disease of sunflower (*Helianthus annuus*) caused by *Fusarium tabacinum* was reported from Italy for the first time. All cultivars tested were susceptible to the pathogen. The symptoms, occurring only on stems, consisted of external necrotic streaks and a pale pinkish red discoloration of the pith.

Additional key words: pith canker

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Sunflower (*Helianthus annuus* L.) is a widespread crop in central and southern Italy, with cultivations reaching 140,000 ha. It is usually grown as a spring crop and more rarely, and only experimentally, as a summer crop following cereals (especially wheat and barley). In this case, sunflower is cultivated under irrigated conditions, and it matures 1 mo later than the spring crop.

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The disease described here was detected in September 1984 on different sunflower cultivars summer-planted near Perugia (central Italy). Stems of infected plants showed a gray discoloration, and the stalks crushed easily. Longitudinal stem sections showed diffuse, pale pinkish red discoloration of the pith (Fig. 1) in the crown region and up to 30–40 cm above ground level. Microscopic observations revealed the presence of hyaline hyphae in the pith tissues that appeared disorganized. When field observations were carried out, sunflower leaves were

already physiologically wilted so that possible foliar symptoms induced by the disease were not discernible. An investigation was made to determine the cause of this disease.

### MATERIALS AND METHODS

Diseased plant samples were collected, and small tissue pieces taken from sunflower stems were soaked in 1% HgCl<sub>2</sub> solution for 30 sec, washed in sterile distilled water, and transferred to potato-dextrose agar (PDA) in petri dishes, then the plates were incubated at 25 C. Pieces of mycelium from the colonies that developed on PDA were transferred to fresh PDA for identification.

Pathogenicity of the isolated fungus was tested by inoculating 4-wk-old sunflower (cultivar Primasol) grown in 12-cm-diameter pots (two plants per pot) in a greenhouse. Four inoculation methods were compared. Test plants were inoculated with a 5-mm-diameter disk taken from the edge of an 8-day-old colony grown on PDA. The inoculum

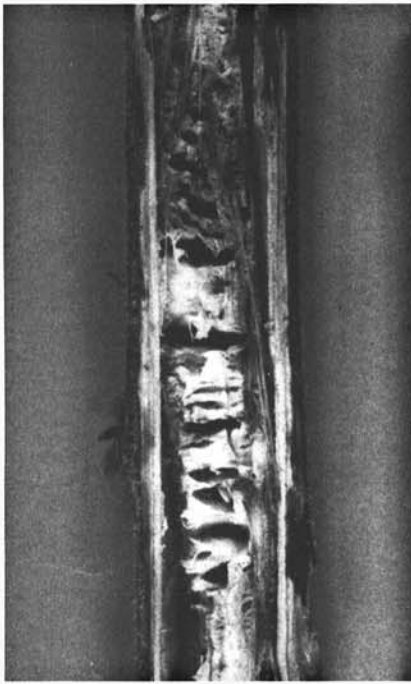


Fig. 1. Longitudinal section of sunflower stems showing the typical symptoms of the disease caused by *Fusarium tabacinum*. Note the decaying piths with pinkish red discolorations.



Fig. 2. Conidia of *Fusarium tabacinum* from a 10-day-old culture on potato-dextrose agar. Scale bar = 25  $\mu$ m.

was placed on the stem after removing the epidermis, then the inoculation site was wrapped with sterile, moistened cotton wool and covered with Parafilm. In the second and third inoculation methods, the fungus was grown in 500-ml flasks containing 200 ml of casein hydrolysate and incubated in a shaker at 25 C for 8 days. The resulting conidial suspension ( $10^6$ /ml) was sprayed onto sunflower leaves or distributed over the soil surface (80 ml/pot). The fourth inoculation method consisted of immersing the roots in the conidial suspension for 45 min, then transplanting plants in the pots. Controls consisted of plants inoculated with an agar disk or sterile distilled water. Inoculated plants were incubated in the greenhouse ( $22 \pm 2$  C) for 25 days, and development of symptoms was recorded. Pathogenicity tests on other plants, tobacco (*Nicotiana tabacum* L. cv. BC 60) and basil (*Ocimum basilicum* L.), reported as hosts of the fungus, were carried out.

Field observations in experimental trials on eight sunflower cultivars planted as a summer crop after wheat and barley were conducted to determine disease incidence. The percentage of infected plants was evaluated by observing the red pith discoloration on the longitudinal stem sections.

## RESULTS AND DISCUSSION

A fungus that produced yellowish or salmon-colored colonies, usually with little or no aerial mycelium on PDA, was consistently isolated from diseased sunflower stems. Conidia were variable in shape, according to the substrate composition and the age of the cultures; they were generally hyaline, cylindrical to ellipsoid or slightly curved, multiguttulate measuring 6.5–14  $\mu$ m long and 2–2.5  $\mu$ m wide and, more rarely, one-septate in the youngest cultures (Fig. 2). No chlamydospores were observed. The optimum temperature was 25–26 C for this isolate, and growth ceased at 32 C. Based on its morphological features, the fungus was identified as *Fusarium tabacinum* (Beyma) W. Gams (perfect stage *Plectosphaerella cucumerina* (Lindf.) W. Gams) (1–3). The identity of this fungus has been confirmed by Centraalbureau voor Schimmelcultures, Baarn, Netherlands.

A necrotic area developed after 15 days on sunflower stems inoculated by

wounding. The lesion that first appeared at the inoculation site was brown and spread to girdle the stem. Cross sections of the inoculated stem area showed that discoloration affected the cortical tissues and that hyphae invaded the vessels. The same symptoms were recorded in the two other hosts (tobacco and basil) inoculated by the same method. The other three inoculation techniques produced no infection in either sunflower, tobacco, or basil. *F. tabacinum* was subsequently reisolated from the lesion of inoculated sunflower, but no organisms were isolated from control plants.

All sunflower cultivars planted in the summer were susceptible to the fungus. Disease incidence ranged from 42–59% in the earlier planting (22 June) to 47–75% in the second (6 July). Significant differences were revealed in relationship to the sowing date and the behavior of different cultivars; the most frequently attacked was Gloriasol (65%) and the least affected was Primasol (45%) (Table 1).

Isolations of *F. tabacinum*, a common fungus both in arable soil and on decaying plant material, has often been reported in Europe, the United States, Australia, New Zealand, and other areas (2). Only in a few cases has it proven pathogenic (tobacco, pansies, tomato, basil, and other hosts [4,5]). Isolation of *F. tabacinum* from sunflower stems and confirmation of its pathogenicity increases the host range of this pathogen.

This disease was only observed in the summer crop when high relative humidity and low temperatures occurred.

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Table 1. Percentage of different sunflower cultivars infected by *Fusarium tabacinum* seeded on two dates<sup>a</sup>

Sowing dates	Cultivars								Mean percentage of infected plants
	Cerflor	Florom 305	Gloriasol	Luciole	Primasol	Romsun HS 90	Solaris	Stromboli	
22 June	59	56	55	48	42	54	47	55	52
6 July	65	63	75	64	47	62	64	55	62
Cultivar means	62	60	65	56	45	58	56	55	

<sup>a</sup>LSD ( $P \leq 0.05$ ) = 3 for cultivars, LSD ( $P \leq 0.05$ ) = 2 for sowing dates, and LSD ( $P \leq 0.05$ ) = 5 for sowing date  $\times$  cultivar interaction.