

DISEASE COMPLEX (*FUSARIUM OXYSPORUM* AND *MACROPHOMINA PHASEOLINA*) RESPONSIBLE FOR SUNFLOWER WILT IN PORTUGAL.

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SYNOPSIS

The most widespread and destructive sunflower disease recently observed in field surveys in Portugal was due to Fusarium spp., particularly F. oxysporum (1980-1982) and to Macrophomina phaseolina (1983) alone or intimately associated with F. oxysporum. Intensity of occurrence of this disease complex varied from medium to strong attack affecting up to 75 percent, or more, of the plants. Comparisons are made regarding symptoms of "Peste negra" described for Argentina and Uruguay. Differences in symptom expression in the fields, of sunflower attacked by Fusarium alone or by the two fungi of the wilt complex, were undiscernible.

UN COMPLEXE FONGIQUE (*FUSARIUM OXYSPORUM* ET *MACROPHOMINA PHASEOLINA*) RESPONSABLE POUR LE FLETRISSEMENT ET DESSECHEMENT PREMATURE DU TOURNESOL AU PORTUGAL.

RESUME

La plus répandue et destructive des maladies du tournesol récemment observées au Portugal est due au Fusarium spp., particulièrement au F. oxysporum (1980-1982) et au Macrophomina phaseolina (1983) agissant seul ou intimement associé au F. oxysporum. La fréquence d'apparition de ce complexe fongique a varié d'attaque moyenne à importante, affectant jusqu'à 75%, ou plus, des plantes. On fait des comparaisons entre la symptomatologie observée au Portugal et celle décrite pour la maladie nommée de "Peste negra" en Argentine et au Uruguay. On considère que des différences dans le cadre symptomatologique observé en plein champs entre les tournesols attaqués par le Fusarium seul ou par les deux champignons de ce complexe, sont indiscernables.

INTRODUCTION

Being in charge for the determination and evaluation of the occurrence of sunflower diseases in Portugal, some information on this crop fungi and on the intensity of their occurrence had already been reported (Barros, 1980a), 1980b), 1981a), 1981b), 1981c), 1983a), 1983b) and Lopes et al., 1982).

The present article aims at providing information on a soil borne fungal disease complex which has been the most widespread and destructive sunflower disease observed recently in field surveys in Portugal.

WILT COMPLEX

- Fusarium spp.
- Fusarium oxysporum Schlecht.
- Macrophomina phaseolina (Tassi) Goid. (= Macrophomina phaseoli (Maub.) Ashby).

In earlier field surveys (1980, 1981, 1982) and subsequent laboratory studies of the collected material we have observed and isolated Fusarium oxysporum from heavily infected roots with conspicuous mycelium even visible to the naked eye. Symptoms appear between budding and full flowering, specially at this last stage of the development of the plant.

Early attacked plants become "mummified" at the budding stage and dry quickly in an erect position and turning black (Barros, 1981<sub>a</sub>). If the pathogen's effects become evident later, we can see that sunflowers ripen prematurely — the so-called premature ripening in hot dry areas or seasons — with small heads, poorly filled seed and consequently much reduced yields. We have considered this symptom (Barros, 1981<sub>a</sub>), 1981<sub>b</sub>), 1981<sub>c</sub>), 1983<sub>a</sub>)) as possibly caused by F. oxysporum consistently isolated from well developed roots of the plants collected in every plot showing symptoms of wilt. Identification of our Fusarium sp. isolates as F. oxysporum had been made by Doctor Maria Teresa Lucas.

Notwithstanding, in 1983, from plants showing the same symptom expression in the fields we have isolated Fusarium spp. alone, Fusarium spp. and Macrophomina phaseolina and mostly M. phaseolina alone. In this case we noticed that the plants had a restrict root system and the tap root and the base of the stem were internally grayish, as described earlier in the Uruguay by Sackston (1957) for black root rot (Sclerotium bataticola Taub.). This grayish coloration is probably due to the presence of the microsclerotia of the fungus which are its form of resistance.

We have not obtained the pycnidial stage of the fungus — Macrophomina phaseolina — but only its sterile mycelial phase firstly named as S. bataticola Taub. in 1913 which is synonym of Rhizoctonia bataticola (Taub.) Butler, (Barros, 1983<sub>b</sub>)). Our isolates had been compared with isolates gently supplied by Dr. Aćimović (Yugoslavia) and we have observed typical anastomosis' ansae and the same type and dimensions of sclerotia in PDA medium in our isolates and in those received from Yugoslavia.

#### EXPERIMENTAL PROCEDURES AND RESULTS

The method employed for checking the intensity of occurrence of this disease complex was the same employed before for other diseases: observation on 100 plants in five spots (total 500 plants) checked along the diagonal for plots with areas from 10 to 100 ha or, 20 plants in five spots (total 100 plants) for smaller areas (< 10 ha) employing the scale of evaluation from 0 to 4 adopted by the FAO Research Subnetwork On Sunflower Diseases — (0) = healthy plants; (1) = weak attack (damages ranging to 25%); (2) = medium attack (from 26% to 50%); (3) = strong attack (51% to 75%) and (4) = very strong attack (76% to 100%) — according to Aćimović (1979). Intensity of wilt occurrence varied as follows (Table I):

Table I - Sunflower wilt in Portugal and its intensity of occurrence.

Disease (common name)	Causal agent	Intensity of occurrence	Year
W	probably due to <u>Fusarium oxysporum</u> .....	medium .....	1980
		(2)	
I	<u>F. oxysporum</u> .....	medium to strong .....	1981
		(2) - (3)	
L	<u>F. oxysporum</u> .....	weak to medium .....	1982
		(1) - (2)	
T	Fungi complex: <u>Macrophomina phaseolina</u> <u>Fusarium</u> spp. <u>F. oxysporum</u> .....	medium to strong .....	1983
		(2) - (3)	

Fusarium spp. particularly F. oxysporum had been consistently isolated from sunflower plots at Vila Franca de Xira (Ribatejo), Herdade da Revilheira (Évora, Alentejo), Beja (Alentejo) and Campo Maior (Portalegre, Alentejo) in 1980 according to Barros (1981<sub>a</sub>). In almost all sunflower areas of Ribatejo and Alentejo the fungus was observed inducing strong attack particularly observed at Beringel (Beja) and Elvas in 1981 (Barros, 1981<sub>b</sub>) and in 1982 in almost all areas of sunflower in the Alentejo but presenting a decrease in its intensity of occurrence (Barros, 1983<sub>a</sub>).

Isolates of Macrophomina phaseolina (in its sterile mycelial phase) alone or associated to Fusarium spp. have been obtained from sunflower roots collected at Alentejo: Elvas (Portalegre), H. da Revilheira (Évora) and Vendinha (Évora) and at Lisbon (Institute of Agronomy experimental fields), in 1983 (Barros, 1983<sub>b</sub>).

The plots showed damaged plants from 30% to 75% — medium (2) to strong attack (3) — but differences in symptom expression in the fields due to Fusarium alone or to Fusarium associated with M. phaseolina were undiscernible.

#### DISCUSSION AND CONCLUSIONS

According to Sackston (1981), charcoal rot (M. phaseolina) is the major component of the complex known as "Peste negra" in Argentina and Uruguay, which is considered as a disease complex extremely destructive for sunflower in those regions.

According to Sobrino Vesperinas et al. (1980) referring to Sackston (1978), M. phaseolina is also considered as important for several countries like France, Spain, Tunisia, Iran, Hungary and Yugoslavia.

In Spain which interests us particularly because of its geographical position, the disease was first detected in the province of Andalucía and nowadays it is considered more important than mildew for this country, as the latter has been satisfactorily controlled by the use of resistant hybrids (Sobrino Vesperinas et al., 1980).

According to these authors the disease in Spain, inducing premature ripening can inflict to the plants losses higher than 90%.

Though M. phaseolina is a soil borne fungus present in most warm countries of the world it need some particular climate requirements for infection development, growing best and attacking its very wide host range at high temperatures and dry weather.

In fact, in Portugal, sunflower wilt expression in the fields began in 1981 probably due to the lack of rain observed during winter and spring associated with a 10 days heat wave that occurred in June in the same year and with temperatures going up to 43° C (Barros, 1981<sub>b</sub>). Better climate conditions were observed in 1982 and so it was observed less intensity of wilt.

In 1983 an increase in sunflower wilt symptoms was detected, probably due to the outbreak of the other component — M. phaseolina — of the wilt - inciting disease complex under appreciation.

The present article supports the conclusion that sunflower wilt in Portugal is due to a soil borne fungal disease complex with at least two main components (Fusarium spp., particularly F. oxysporum and M. phaseolina). Also, according to

environmental and soil conditions and the degree of susceptibility of the sunflower cultivars employed, one of these components can become prevalent over the other.

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