

FUNGI ASSOCIATED WITH WILT DISEASE OF CAPSICUM IN SINDH, PAKISTAN

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Abstract

Out of 16 genera and 28 species of fungi isolated from soil, at least 7 genera and 10 species of fungi were isolated from root, stem, leaves and seeds of infected plants of bell pepper (*Capsicum annuum*) as compared to 7 genera and 11 species from red pepper (*C. frutescens*). *Alternaria alternata*, *Cephalosporium acremonium*, *Fusarium anthophilum*, *F. moniliforme*, *F. oxysporum*, *F. proliferatum*, *F. solani*, *Macrophomina phaseolina*, *Pythium aphanidermatum* and *Rhizoctonia solani* were found predominant in plants showing symptoms of wilting in Mirpur Khas District, Sindh, Pakistan.

Introduction

Capsicum, an important vegetable crop of Pakistan is cultivated over an area of 61,600 ha., giving an yield of 110,500 tons annually (Anon., 1991). A number of diseases including root rot (*Phytophthora capsici*), anthracnose or die-back and fruit rot (*Colletotrichum* spp.), wilt and root rot (*Fusarium* spp.) have been found to adversely affect the crop productivity (Hussain *et al.*, 1990; Ahmed *et al.*, 1989; Sultana *et al.*, 1990; Hafiz, 1986; Kamal & Moghal, 1968; Khaleeqe & Khan, 1991). In the province of Sindh, capsicum is mainly grown in district Mirpur Khas over an area of 47,200 ha., giving an yield of 79,800 tons annually which is the largest capsicum market in Pakistan (Anon., 1991) Since the last several years, apart from leaf curl virus, the crop has been adversely affected by damping-off, wilt and die-back diseases causing 60-70% loss per acre amounting to Rs.30-40,000 in case of bell pepper (*Capsicum annuum*) and 70-100% yield loss per acre amounting to Rs.70-100,000 in case of red pepper (*C. frutescens*) [personal communication, Allah Buksh]. Experiments were therefore carried out to examine the mycoflora of the soil from infested fields and the association of disease causing agents with root, stem, leaf and seeds of diseased plants.

Materials and Methods

Soil samples, root, stem, leaf and seeds from diseased plants of bell pepper (*C. annuum*) and red pepper (*C. frutescens*) were collected from Mirpur Khas district and stored at 10°C. Soil dilution plate (Waksman & Fred, 1992) and baiting technique (Webster & Dennis, 1967) were used for the isolation of fungi from soil. Pieces of stem, leaves and roots of diseased plants were surface sterilized and transferred on PDA medium. Seed-borne mycoflora was examined by standard blotter method (Anon., 1966). Fungi were identified after reference to Booth (1971), Ellis (1971), Barnett & Hunter (1972), Nelson *et al.*, (1983), Plaats & Van Der (1981) and Singh *et al.*, (1991).

Table 1. Soil Borne Mycoflora of District Mirpur Khas.

Mycoflora	cfu/g soil	Occurrence %	Mean \pm SE
<i>Alternaria alternata</i>	3.3x10 ⁴	3.6	0.85 \pm 0.085
<i>Aspergillus candidus</i>	2.9x10 ⁴	25.5	0.45 \pm 0.35
<i>A. flavus</i>	3.2x10 ³	91.1	9.0 \pm 1.075
<i>A. fumigatus</i>	3.3x10 ⁴	15.2	0.125 \pm 0.1
<i>A. niger</i>	7.3x10 ⁵	91.1	8.75 \pm 2.725
<i>A. ochraceus</i>	8.3x10 ⁴	12.2	0.2 \pm 0.175
<i>A. parasiticus</i>	3.5x10 ⁵	25.5	0.5 \pm 0.325
<i>A. terreus</i>	2.7x10 ⁴	33.3	1.07 \pm 0.665
<i>A. versicolor</i>	4.8x10 ⁴	17.7	0.4 \pm 0.22
<i>Cephalosporium acremonium</i>	2.5x10 ⁴	22.2	2.07 \pm 1.27
<i>Drechslera hawaiiensis</i>	5.8x10 ⁴	18.9	0.3 \pm 0.2
<i>Emericella nidulans</i>	1.7x10 ⁴	3.3	0.35 \pm 0.35
<i>Emericella</i> spp.	1.6x10 ⁴	5.5	0.055 \pm 0.055
<i>Eurotium amstelodami</i>	1.7x10 ⁴	3.3	0.35 \pm 0.35
<i>Fusarium anthophilum</i>	6.5x10 ³	6.6	0.25 \pm 0.19
<i>F. oxysporum</i>	1.6x10 ⁴	5.5	0.055 \pm 0.055
<i>F. pallidoroseum</i>	1.7x10 ⁴	3.3	0.035 \pm 0.035
<i>F. solani</i>	1.7x10 ⁴	13.3	0.135 \pm 0.06
<i>Nigrospora oryzae</i>	1.7x10 ⁴	3.3	0.35 \pm 0.35
<i>Paecilomyces</i> spp.	4.2x10 ⁴	6.6	0.18 \pm 0.12
<i>Penicillium chrysogenum</i>	3.3x10 ⁴	5.5	0.1 \pm 0.1
<i>Penicillium</i> spp.	2.4x10 ⁴	20	0.37 \pm 0.37
<i>Pythium aphanidermatum</i>	6.5x10 ⁴	5.5	0.22 \pm 0.22
<i>Rhizopus</i> spp.	13.2x10 ⁴	61.1	5.85 \pm 2.175
<i>Mycelia sterilia</i>	0.5x10 ⁴	6.6	0.2 \pm 0.15
<i>Syncephalastrum</i> spp.	6.0x10 ⁵	46.1	2.7 \pm 1.4
<i>Verticillium</i> spp.	4.5x10 ⁴	3.3	0.065 \pm 0.065
Unidentified fungi	3.3x10 ⁴	3.3	0.07 \pm 0.07

Results and Discussion

Out of 16 genera and 28 species of fungi isolated from soil (Table 1), at least 7 genera and 10 species of fungi were isolated from root, stem, leaves and seeds of infected plants of bell pepper (*Capsicum annum*) as compared to 7 genera and 11 species from red pepper (*C. frutescens*). *Alternaria alternata*, *Cephalosporium acremonium*, *Fusarium anthophilum*, *F. moniliforme*, *F. oxysporum*, *F. proliferatum*, *F. solani*, *Macrophomina phaseolina*, *Pythium aphanidermatum* and *Rhizoctonia solani* were found predominant in plants showing symptoms of wilting in Mirpur Khas District, Sindh, Pakistan (Table 2).

Table 2. Percentage occurrence of fungi on root, stem, leaf and seeds of infected capsicum plants obtained from Mirpur Khas district, Sindh, Pakistan.

Fungi	<i>Capsicum annum</i>				<i>Capsicum frutescens</i>			
	Root	Stem	Leaf	Seed	Root	Stem	Leaf	Seed
<i>Alternaria alternata</i>	4.16 (0.33±0.23)	4.25 (0.22±0.22)	20 (0.55±0.55)	15.3 (61±46)	---	---	---	5.0 (20.6±9.0)
<i>A. solani</i>	---	---	---	---	---	---	---	0.25 (1.0±1.0)
<i>Aspergillus flavus</i>	---	---	---	32 (128±49)	---	---	---	56.3 (226±52)
<i>A. niger</i>	---	---	---	0.25 (1.0±1.0)	---	---	---	5.0 (12.0±9.0)
<i>Capthalosporium acremonium</i>	---	---	---	8.62 (34.5±32.5)	10.6 (0.7±0.7)	5.0 (0.3±0.21)	3.3 (0.7±0.7)	---
<i>Chaetomium globossum</i>	---	---	---	0.375 (1.5±1.5)	---	---	---	---
<i>Curvularia lunata</i>	---	---	---	1.5 (6.0±3.0)	---	---	---	2.0 (8.0±6.0)
<i>Drechslera australiensis</i>	---	---	---	0.125 (0.5±0.5)	---	---	---	0.25 (1.0±1.0)
<i>D. halodes</i>	---	---	---	---	---	---	---	0.38 (1.0±1.0)
<i>D. hawaiiensis</i>	---	---	---	0.375 (1.5±1.5)	---	---	---	0.25 (1.0±1.0)
<i>Fusarium anthrophilum</i>	8.3 (0.33±0.16)	6.4 (0.33±0.23)	---	0.125 (0.5±0.5)	---	1.6 (0.1±0.1)	---	---

It is interesting to note that *Phytophthora capsici* which has been reported by Ahmed *et al.*, (1989) could not be isolated in the present study. *F. oxysporum*, *F. solani*, *Rhizoctonia solani* (Ehteshamul-Haque & Ghaffar, 1994) and *Pythium aphanidermatum* (Shahzad & Ghaffar, 1993) have previously been reported from Sindh. In epigeal hosts the pathogen may spread from seed coat into cotyledonary leaves, stem and roots as is demonstrated by either surface contaminating *F. moniliforme* in capsicum (Hashmi, 1988) or the deep seated *F. oxysporum* f.sp. *matthiolae* (Neergaard, 1977). During germination, the fungus grows in seed tissues to build up inoculum sufficient to invade the seedling through the infection sites (Kuniyasu, 1980). In the present study capsicum seeds collected from wilted plants, surface sterilized and sown in sterile soil, gave rise to seedling wilt so demonstrating that *P. aphanidermatum* located deep in the seed, directly invades the plants. Presumably seed infection follows seed contamination in the field or even in storage and the pathogen penetrates the seed coat and becomes internally established. There is need to look into the control of wilt disease of capsicum to increase crop productivity.

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