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# Biological Control of Chilli Fusarium Wilt Caused By Fusarium Oxysporium

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## Abstract

Chilli *(Capsicum annuum L.)* is one of the important cash crop of India. This crop suffers with various fungal, bacterial and virual diseases, among *fusarium* wilt is a very destructive disease in Ujjain (M.P.) and its neibouring areas. Only a few aspects of chilli wilt caused by *fusarium oxysporum f. spp. capsici* have been investigated earlier. In the present study a comparative, study of rhizosphere and rhizoplane of diseased and healthy chilli varieties ('Malwa', 'Patna' and 'Simla') were made in control conditions. At seedling stage, peak of vegetative growth, flowering time and harvesting time the rhizosphere and rhizoplane was analysed for fungi, actinomycetes and bacteria. The pathogen (*fusarium oxysporum f.sp. capsici*) was 100% frequent and highly abundant in case of diseased plants rhizosphere and rhizoplane of all the three chilli cultivars. The infection were highest for 'Malwa' variety, where the percentage disease intensity was also maximum. Species of fungi, actinomycetes and bacteria isolated from rhizosphere and rhizoplane were tested for their antagonistic properties against the pathogen (*fusarium oxysporum f. sp. capsici*).

**Keywords:** biological control, rhizosphere & rhizoplane, trichoderma, antagonistic activity, fusarium *oxysporium.*

## Introduction

Chilli (*Capsicum annum L.*) is considered as one of the most important vegetable and spice crop belongs to the genus Capsicum, popularly known as "red pepper while belongs to nightshade family Solanaceae" (Sahi and Khalid, 2007). *Fusarium* wilt is the most important soil borne disease caused by *Fusarium spp.*

Biological control means antagonistic activity of micro-organism for another micro-organism. Antagonism is a term for micro-organism association which are harmful to one another and is often used for cases in which toxic metabolites are involved. It has been studied principally in relation to the rhizosphere, and competition. between micro-organism in the soil.

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Johanson and curl (1972) observed that biological control of soil borne plants pathogen (s), through the agency of other antagonistic soil micro-organism. Whose activity is encouraged by appropriate manipulation of environmental conditions, has been understood in recent past.

In the present investigation the microflora (fungi, actinomycetes and bacteria) isolated from rhizosphere and rhizoplane of different cultivars of chilli at different stages of growth were used to select antagonists in the laboratory experiments against the pathogen (*fusarium oxysporum f.sp. capsici*).

## Methodology

Pure culture of different rhizosphere and rhizoplane and fungi isolated (fungi actinomycetes and bacteria) were taken to observe their antagonistic ability.

Purified isolates were screened against test organism (*fusarium oxysporum f.sp. capsici)* by disc plating method as described by Jhonson and Curl (1972) the selected antagonists micro-organisms were retested against test organism (f.sp.capsici) for confirmation by streaking method described by Jhonson and Curl (1972) with slight modification.

To test the antagonistic activity 20ml of emersion'& agar medium was poured in sterilized petridishes of 10 cm size and poured petridishes were left for 24 hours to absorb water film present on the medium surface 4 days old single spore culture of test organism (pathogen) was prepared.

- Zone of inhibition develops between the colonies of antagonist and test organism. the antagonist may or may not continue to grow.
- After meeting, the hyphae of the fungal test organism dies back and disintegrate, while the antagonist may continue to grow.
- Actual parasitism of the fungal hyphae by the antagonist.
- Flattening of the colony of test organism on the sides mearest to the antagonist.
- Distinct general stunting or malformation of the test organism colony was compared with that on control plates in which the test organism has been grown alone.

In the present investigation the antagonistic activity of the micro-organism was recorded by measuring inhibition zone that developed between the test organism and antagonists colony.

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## Observation table

Zone of inhibition developed by interaction of test organism (*fusarium oxysporum f.sp.capsici)* and antagonistic micro-organisms.

| S. no. | Name of antagonist organisms | Test organism inhibition zone in mm | Remark |
|---|---|---|---|
| 1 | *Trichoderma viride* | Actually grew over test organism | A case of parasitism |
| 2 | *Aspergillus sydowi* | 11.0 mm +_ 2.51 | Inhibition zone clear |
| 3 | *Streptomyces ervthreus* | 6.5 mm +_ 3.2 | ------- do ------- |
| 4 | *Unidentified actinomycetes (2)* | 16.5 mm +_ 1.47 | " |
| 5 | *Bacillus sp. (1)* | 25.0 mm +_ 6.21 | Flating of the test organism colony |
| 6 | *Bacillus sp. (2)* | 21.5 mm +_ 5.11 | -------- do -------- |
| 7 | *Bacterial sp.(3)* | 5.0 mm +_ 1.12 | " |

The other tested micro-organisms did not show sufficient antagonistic activity against the test organism hence not given in the table.

Analysis of variance calculated for zone of inhibition developed by antagonistic micro-organisms and replications.

| Source of variation | Degree of freedom | Sum of squares | Mean of square | Variation ratio | 'f' value from table |
|---|---|---|---|---|---|
| Antagonists | 5 | 1036.88 | 207.37 | 183.00 | 5.64 |
| Replicates | 2 | 0.01 | 0.005 | 0.0043 | 7.56 |
| Error | 10 | 11.53 | 1.13 | - | - |

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## Result & Discussion

The results obtained during the course of present investigation have been elucidated, described and discussed. These studies indicate that there is an interaction between host, rhizosphere micro-organisms and the pathogen which forms a rhizospheric microbiological complex. The rhizosphere and rhizoplane study of different chilli cultivars at different ages gave certain clues for the biological control and other information in respect to chilli wilt.

The r: s ratio increased in diseased plants due to the pathogen activity and decaying of roots. Some saprophytic micro-organisms become more active and the rhizosphere microbial population of diseased plants increased. The root influencing area of diseased plants is less than that of healthy plants because pathogen attacked roots resulting in rotting of roots and their laterals. This affected the root exudation adversely.

In all, seven micro-organism which were isolated from rhizosphere and rhizoplane of different cultivars during the course of this investigation were antagonists to the pathogen *(fusarium oxysporum f.sp.capsici).* The *Trichoderma viride* was found highly antagonistic because its effect not only suppressed the growth of the test organism (*fusarium oxysporum f.sp.capsici*) but also grew over it which is nearing the case of actual parasitism. *Aspergillus sydowi* was also found to be as a good antagonistic against the test organism and formed marked inhibition zone due to the interaction. It is very interesting to note that both antagonistic fungi were isolated from the rhizosphere and rhizoplane of moderately resistant or less susceptible vrieties (‘patna and simla) of chilli.

*Trichoderma viride* showed the highest antagonistic property because it suppressed the growth of the test organism (*fusarium oxysporum f.sp.capsici)* and actually over grew it. jhonson isolated antagonists species of fungi,viz. saparcaria, pe’[nicillium, and aspergillus and seven species of actinomycetes while working on root of corn. Huber etal.(1966) and dhyani (1975) observed that a few aspergillus spp. And rhizoctonia sp. and onion wilt pathogen (*fusarium oxysporum f.sp.capsici)* respectively.

Dhyani (1975) observed that *trichoderma viride* inhibited the growth of root rotting and wilt pathogen (s) of different crops.

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