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EFFECTIVENESS OF PLANT EXTRACTS IN CONTROLLING WILT PATHOGEN OF CHRYSANTHEMUM

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ABSTRACT

Locally available 8 plant extracts obtained from leaves were screened for their capability to inhibit the mycelial growth of *Fusarium oxysporum* f. sp. *chrysanthemi* (*Foc*). Extracts of *Mentha arvensis, Tagetes patula, Eucalyptus sp, Dhatura stramonium, Calotropis procera, Lantana sp, Ricinus communis* and *Catharanthus roseus* were obatined through hot water extraction. Extract at the concentration of 1.0% and 3.0% were added to Potato Dextrose Agar and screened against *Foc,* using poison food technique. All the 8 botanicals extracts were used and results shows that they effectively checked the radial growth of the pathogen in the Petri plate medium. At 3.0% concentrations maximum growth inhibition was recorded with *M.arvensis* (61.8%) and minimum with *R.communis* (41.9%). Ability of plant extracts to inhibit the growth of fungal pathogens is due to presence of phyto-chemicals. The above extracts could be successfully employed to control the wilt pathogen of the *Chrysanthemum* plants.

Keywords: Botanicals, bio-control, *Fusarium oxysporum* f. sp. *chrysanthemi*

INTRODUCTION

Chrysanthemum is one of the most important flower crop and is commercially cultivated throughout the world. Demand of *Chrysanthemum* flowers are increasing day by day in the national and international floriculture market. Successful cultivation of *Chrysanthemum* is hindered by various diseases caused plant pathogens. *Fusarium* wilt of *Chrysanthemum* caused by *Fusarium oxysporum* f. sp. *chrysanthemi* (*Foc*) is one of the most wide spread and destructive disease, causing infection and losses to crop growers from nursery to flowering stage. Severe losses to the *Chrysanthemum* caused by *Foc* are reported from various part of the world (Garibaldi *et al.* 2009, Ghosh and Singh 1982, Armstrong *et al.* 1970, Emberger and Nelson 1981). Various agro-chemicals are being used for controlling the pathogen which is very harmful to the biotic and abiotic factors of the environment. Biological methods of controlling the plant pathogens are very important in reducing the adverse effects of fungicides. Use of chemical fungicides on a larger scale has also created a problem of developing resistance against fungicides, by plant pathogens.

The antimicrobial property of several plant extracts and essential oils are investigated by many workers. A single botanical plant extract shows variable degree of growth inhibition when applied against different isolates or species of pathogens. Essential oils and plant extract are known to reduce the growth of the pathogenic fungi when used at a desired concentration. Essential oil of *Trachyspermum ammi* and *Caryophyllus aromaticus* were found to be effective against *Fusarium oxysporum* and they completely inhibited the fungal growth (Guddewar *et al.* 1999).

The present study was undertaken to evaluate the inhibition effect of various locally available plant extracts against *Foc* under *invitro* conditions. The plants extract which were selected for the present study has not been previously screened for their ability to inhibit the mycelial growth of *Foc.*

MATERIALS AND METHODS

a) Preparation of Plant Extracts

Plant samples were collected, brought to laboratory and dried under shade conditions to remove the moisture and leaves were used for the process of extract preparation. Fifty gram of plant samples were taken in a Mortor pestle and 50 ml of hot water was added to it. The materiel was grinded properly to obtain the extract of the plant parts. After grinding the extracted samples were filtered through muslin cloth and used for the further studies.

b) Screening of Botanicals against Fusarium *oxysporum* f. sp. *chrysanthemi*

Plant extracts of *Mentha arvensis, Tagetes patula, Eucalyptus sp, Dhatura stramonium, Calotropis procera, Lantana sp, Ricinus communis* and *Catharanthus roseus* were tested for their anti-fungal potential against *Fusarium oxysporum* f. sp. *chrysanthemi* using poisoned food technique (Grover and Moore 1962). Two concentrations viz. 1.0% and 3.0% were prepared by adding requisite amount of extract. These extracts were added in Potato Dextrose Agar medium, sterilized and poured to Petri plates (diameter 90mm), aseptically. The

Petri plates were centrally inoculated with the mycelial disc (diameter 5 mm) of pathogen cut from the margin of 4 days old cultures of *Foc.* The plates were incubated at 25±2°C and data of radial growth was recorded periodically.

RESULTS AND DISCUSSION

All the 8 botanicals used for growth inhibition of *Fusarium oxysporum* isolates effectively checked growth in the Petri plate medium. Decrease in radial growth of the pathogen was observed with increasing concentrations of the botanicals (Table 1).

Table 1: Radial diameter of *Fusarium oxysporum* f. sp. *chrysanthemi* on PDA medium treated with botanicals.

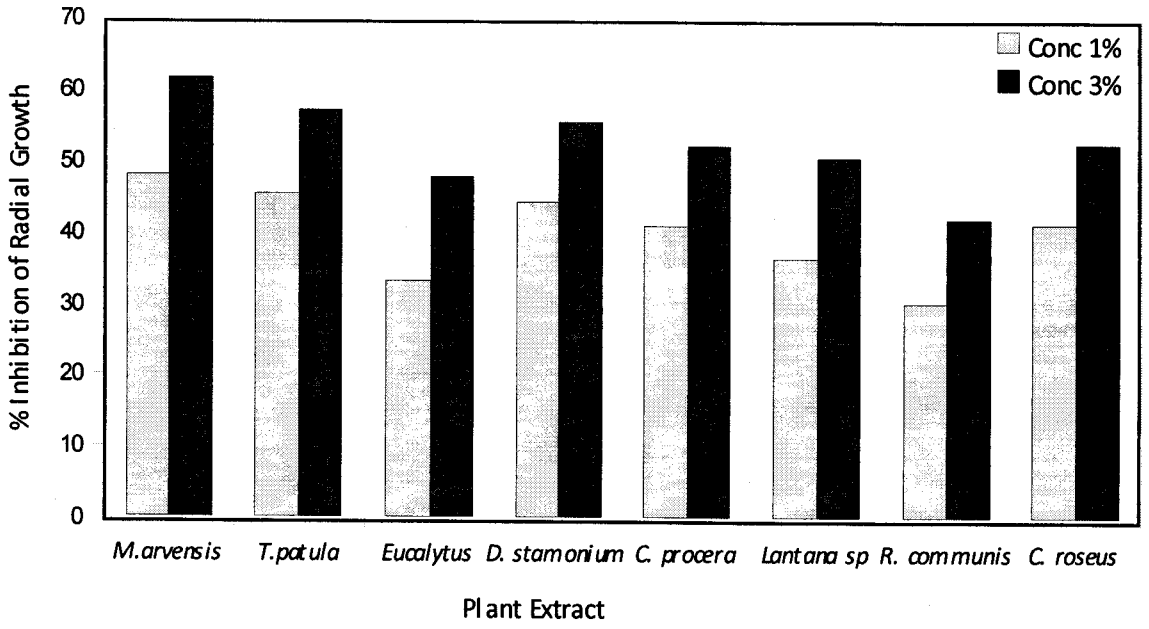
Botanical Extracts	Concentration (%)	Radial Diameter (mm) of *Fusarium oxysporum* Isolates*
Mentha arvensis	1.00	40.6 ± 0.88
	3.00	30.0 ± 0.00
Tagetes patula	1.00	43.0 ± 0.58
	3.00	33.6 ± 0.33
Eucalyptus sp	1.00	52.6 ± 0.33
	3.00	41.0 ± 0.58
Datura stramonium	1.00	44.0 ± 0.58
	3.00	35.0 ± 0.00
Calotropis procera	1.00	46.6 ± 0.33
	3.00	37.6 ± 0.33
Lantana sp	1.00	50.0 ± 0.58
	3.00	39.0 ± 0.58
Ricinus communis	1.00	55.0 ± 0.58
	3.00	45.6 ± 0.33
Catharanthus roreus	1.00	46.3 ± 0.33
	3.00	37.3 ± 0.33
Control	0.00	78.6 ± 0.33

*Values represent the means with standard error (±).

Among all treatments maximum inhibition in the radial growth was reported at the concentration of 3.0% and minimum with 1.0%. At 3.0% concentrations maximum growth inhibition was recorded with *M.arvensis* (61.8%) followed by *T.patula* (57.2%), *D.stramonium* (55.5%) *C.roseus* (52.5%) and minimum with *R.communis* (41.1%) (Graph 1). Similar were the findings of Riaz *et al* (2008). They reported 54.0 to 79.0% growth inhibition of *Fusarium oxysporum* f sp. *gladioli* using the extract of *Tagetus erecta* @ 2.0 to 8.0% concentrations. *Tagetus* sp. has fungicidal properties due to presence of thiophenes in its tissues (Gomez-Rodriguez *et al.* 2003). Bowers and Locke (2000) reported that population of *Foc* was reduced drastically by 97.5% when the soil was treated with 10% aqueous extract of clove.

Extracts of *M.arvensis* showed maximum mycelial growth inhibition at all the concentration compared to other botanicals used in the study. At 1% concentration maximum inhibition was registered with *Mentha arvensis* (48.0%) and minimum with *R.communis* (30.0%). Ghorbany *et al* (2010) reported *Mentha* sp extract to cause growth inhibition of *Fusarium oxysporum* f. sp. *cumini,* supports our findings. Irum (2007) reported growth inhibition of pathogenic fungi using the extract of *Datura metel* and *Azadirachta indica.* Reducing the concentrations of the botanicals resulted in reduced mycelial growth inhibition of the pathogen. *T.patula, D.stramonium* and *C.roseus* were the three best botanicals after *M.arvensis* in growth reduction of the pathogenic fungi. Against the wilt pathogen all the botanicals showed variations in growth inhibition percentage. It is generally assumed that the active constituents which are contributing to these anti-fungal properties of the extracts are phyto-chemicals (Okwu 2004). Woody plants and herbs are known to synthesize and accumulate a great variety of phyto-chemicals in their cells and tissues. These phyto-chemicals include low molecular weight phenolics such as hydroxybenzoic acid,

Graph 1: Percent Inhibition in Mycelial Growth of *Fusarium oxysporum* f. sp. *chrysanthemi* by different Plant extracts.



hydroxycinamic acid, acetophenone, flavanoids, stilbenes and lignans) as well as oligo or polymeric forms such as hydrolysable and condensed tannins and lignins (Close and McArthur 2002, Okwu 2004, Okwu and Omodamiro 2005). Ability of any plants extract to inhibit the growth of various fungal pathogens is due to presence of the above phyto-chemicals. Variations in the growth inhibition percentage are due to presence of different types of phyto-chemicals in different plant parts, genera and species.

CONCLUSIONS

Eight botanicals obtained from leaves were used in the present study successfully inhibited growth of *Fusarium oxysporum* f. sp. *chrysanthemi*. Percent inhibition of the pathogen mycelial growth, increased with the increasing concentration of botanicals. Maximum percent inhibition was recorded with *M.arvensis* and minimum with extracts of *R.communis*. Ability of any plants extract to inhibit the growth of fungal pathogens is due to presence of the phyto-chemicals. The above extracts could be successfully employed to control the wilt pathogen of the *Chrysanthemum* plants.

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