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The Effect of Plant Extracts on the Growth of Wilt Causing Fungi *Fusarium oxysporum*

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Abstract: *Antifungal potential of aqueous extracts of forty plants of different families were tested against Fusarium oxysporum f.sp. ciceri causal agent of wilting of chick pea. Among forty plant species tested aqueous extract of Chenopodium ambrosioides has recorded significant antifungal activity against the test fungi. Solvent extracts viz. petroleum ether, benzene, chloroform, and methanol and ethanol extracts of Chenopodium ambrosioides was tested for the antifungal activity. Among the solvent extract tested methanol extract recorded maximum antifungal activity against the plant pathogen tested. Whereas, other plant extracts showed moderate to minimum antifungal activity.*
Key words: *Antifungal potential, Fusarium oxysporum, Chenopodium ambrosioides, plant extracts.*

I. Introduction

The wilt of Chick pea (Cicer arietinum L.) caused by *Fusarium oxysporum f.sp.ciceri.* is one of the major limiting production of the pulse crop. It is the world third most important pulse crop . At national level the yield loses encountered due to wilt may vary between five to ten percent (Vishwadhar and Gurha 1998). Synthetic fungicides are currently used as primary means for the control of plant diseases despite of their harmful effect. The demand of plant based therapeutics is increasing both in developing and developed countries as they are natural products, easily available and having no harmful effects. Keeping these facts in mind the present study deals with the study of such plant extracts which are ecofriendly and can play significant role in the protection of Chickpea from wilting.

II. Materials And Methods

2.1 Collection of Plant Material

Fresh disease free leaves of forty plant species were collected from Gorakhpur district, Uttar Pradesh (India). Selected plants were locally available in sufficient quantities.

2.2 Preparation of Extracts

Aqueous extract

Leaf samples of 100gm of all plants were washed thoroughly with sodium hypochlorite solution and finally with sterile distilled water, air dried and then ground with the help of sterile pestle and mortar. Extracts were filtered through double layered Whatman No. 1 filter paper and heat sterilized in an autoclave at 121 °C for 30 min. Extracts were stored aseptically in airtight bottles and served as mother extract.

Solvent extract

Twenty five gram of dried powder of each plant was filled in a thimble and extracted successively with petroleum ether, benzene, chloroform, methanol and ethanol. All extracts were preserved at 4°C in an air tight bottle for further use. All extracts were subjected to antifungal activity against the test fungi.

Test Fungi

The fungal strain of *Fusarium oxysporum* was obtained from the Microbial Type Culture (MTCC), Chandigarh (India Collection). The culture was maintained on PDA medium, which was served as the test fungi for antifungal activity.

2.3 Antifungal Activity Assay

Aqueous extract:

PDA medium with 50% aqueous extracts of the test plants were prepared and autoclaved and poured into pre sterilized petriplates (17ml each) and allowed to solidify. After complete solidification of the medium, five mm disc of seven day old culture of the test fungi were placed aseptically in the centre of the petriplates and incubated at 28± 2°C for six days and observation were recorded on seventh day. The colony diameter was

recorded in terms of millimeters. PDA medium devoid of extract served as control. For each treatment four replicates were maintained. The fungitoxicity of extracts was calculated in terms of percent inhibition of mycelia growth by using the formula: % inhibition = dc- dt / dc x 100
Where, dc= Average increase in mycelia growth in control.
dt = Average increase in mycelia growth in treatment. (Singh and Tripathi 1999).

Solvent extract:

One gram of each of the dried evaporated solvent extract of all the test plants was dissolved in 10 ml of methanol. 500µl of each of the solvent extract was amended with 15 ml of PDA medium before solidification of the medium. The medium amended only with 500 µl of methanol served as control. *Fusarium oxysporum* was inoculated and percent inhibition of the mycelia growth was determined as described earlier.

III. Result

Aqueous extract:

Antifungal activity was screened by agar dilution method (Perez et al; 1990). The result revealed that the extract of *Chenopodium ambrosioides* showed significant reduction in the growth of *Fusarium oxysporum.* The percent inhibition of aqueous extract of thirteen plants was more than 50% against the test fungus.

Solvent extract:

The present study revealed that the methanol and ethanol extracts had a higher fungitoxic activity against *Fusarium oxysporum* than the aqueous extracts. Methanol was tested more effective which was followed by ethanol, chloroform, benzene and petroleum ether. In case of *Chenopodium ambrosioides,Lippia alba and Carum carvi* the percent inhibition was more than 90%. Therefore this study suggests these plant extracts would be helpful in treating wilting disease in *Cicer arietinum* field.

IV. Discussion

Many agriculturally important pesticides has been banned by World Health Organization (WHO) due to their wide range of toxicity against non target organisms including humans, which are known to cause pollution problem (Barnard et al 1997).

The results are quite encouraging because most of the extracts screened showed antifungal efficacy of more than 90% for the test fungus. The screening revealed that *Chenopodium ambrosioides* plant was most effective, also thirteen plants showed moderate activity against the test fungi. The present study can play important role in crop protection by developing plant based pesticides which are ecofriendly.

TABLE (1). Antifungal Assay of Plant Extracts by Poisoined Foof Technique

S.No.	Plants	% Inhibition of Mycelial Growth
1	*Allium sativum*	58.0
2	*Artemisia nilagirica*	83.0
3	*Azadirachta indica*	82.0
4	*Capsicum annum*	78.0
5	*Carum carvi*	99.0
6	*Centella asiatica*	80.0
7	*Chenopodium ambrosioides*	100.0
8	*Cymbopogon citrates*	76.0
9	*Lippia alba*	99.0
10	*Mentha arvensis*	65.0
11	*Riccinus communis*	85.0
12	*Vitivera zizanoides*	68.0
13	*Zinziber officinale*	82.0

Data given are mean of four replicates

Chenopodium ambrosioides

Lippia alba

Carum carvi

Table (2). Antifungal Activity of Different Solvent Extracts Against Fusarium oxysporum

S.No.	Plant species	Petrolium ether	Benzene	Chloroform	Methanol	Ethanol
1	*Allium sativum*	40.45±1.45	47.80±1.52	56.15±0.56	82.26±6.50	78.45±2.10
2	*Artemisia nilangirica*	46.45±1.56	54.39±1.56	66.56±1.56	89.56±1.63	75.23±1.56
3	*Azadirachta indica*	41.25±0.56	49.23±2.35	56.45±0.56	83.48±1.27	74.29±3.15
4	*Capsicum annum*	41.25±1.49	47.05±3.56	55.40±1.56	84.23±0.36	72.81±2.80
5	*Carum carvi*	44.23±0.65	56.25±1.56	64.75±0.47	92.68±1.35	80.45±2.46
6	*Centella asiatica*	45.19±1.08	50.36±1.12	64.35±1.80	72.25±1.05	78.58±1.12
7	*Chenopodium ambrosioides*	46.28±1.78	55.52±0.58	65.29±2.50	97.65±1.55	82.20±2.45
8	*Cymbopogon citrates*	38.15±1.56	52.45±1.23	62.25±1.89	74.20±2.3	78.80±1.25
9	*Lippia Alba*	45.60±1.56	50.28±2.66	66.82±3.20	94.45±2.30	81.45±2.25
10	*Mentha arvensis*	36.15±1.56	56.28±1.12	66.38±1.90	74.40±1.20	76.25±1.23
11	*Riccinus communis*	42.85±0.45	52.12±1.23	65.75±1.05	72.94±1.51	75.73±1.45
12	*Vivera zizanoides*	40.24±0.65	50.23±3.54	66.05±8.50	86.35±1.26	74.46±2.36
13	*Zinziber officinale*	44.15±1.56	49.89±6.23	58.80±5.30	85.29±2.46	81.28±4.16

Data given are mean of four replicates ± Standard error

Control with treatment set of *Chenopodium ambrosioides*

Control with treatment set of *Lippie Alba*

Control and treatment set of Carum carvi

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