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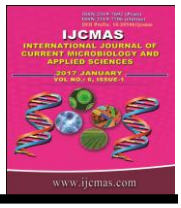

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Study of Antifungal Efficiency of *Curcuma zedoaria (christm.)* Roscoe against *Fusarium oxysporum F. Sp. Udum*

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A B S T R A C T

Nowadays wilt is a common disease caused by *Fusarium oxysporum* F. sp. *Udum* which causes great economic lose. Green plants are used as natural sources of treatment for several plant diseases, because they exhibit antimicrobial properties. They are also proved eco-friendly. In the present study fifteen plant extracts were tested for their antifungal potential against wilt causing fungus *Fusarium oxysporum*. The extract of *Curcuma zedoaria* (Christm.) Roscoe shows maximum inhibition.

Introduction

The wilt of pigeon pea (*Cajanus cajan* L.) caused by *Fusarium oxysporum* f.sp. *udum.* is one of the major limiting factor for the production of the pulse crop. It is the third most important pulse crop of world. 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 effects. 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 pigeon pea from wilting.

Materials and Methods

Fifteen locally available plants viz., *Allium sativum*Linn., *Azadirachta indica* A. Juss., *Achyranthus aspera* Linn., *Adhatoda vasica* Nees, *Citrus limon* (L.) Burm. f., *Cassia*

occidentalis Linn., *Euphorbia hirta*Linn., *Ricinus communis* Linn., *Allium cepa* Linn., *Curcuma domestica* Valet,*Curcuma zedoaria* (Christm.) Roscoe, *Oxalis curniculata* Linn., *Cannabis sativa* Linn., *Datura stramonium* Linn., *Vernonia cinerea* Schreb. were collected from Gorakhpur and adjacent districts and brought into the lab for the preparation of extract.

Preparation of Extracts

100gm of fresh disease free plants samples were taken and washed thoroughly with tap water to clean dust particles. After washing with tap water samples were washed with 4% sodium hypochlorite solution and finally with sterile distilled water three time, air dried and then ground with the help of sterile pestle and mortar. Extracts were filtered through double layered cheese cloth. Extracts were stored aseptically in airtight bottles and served as mother extract.

Test Fungus

The fungal strain of *Fusarium oxysporum*f. sp. *Udum* 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.

Antifungal Activity Assay of extract

The prepared plant extract was screened against test fungus by using poisoned food technique.PDA medium was prepared and antibiotic was added to the medium at the rate of 30mg/litre and mixed thoroughly (Gupta and Banerjee, 1970). The autoclaved PDA medium was poured in pre-sterilised Petri plates (17ml each).

In treatment sets the required amount of plant extracts were added and allow to solidify. Simultaneously in control sets same amount of sterile distilled water is added. After solidification of medium, five mm disc of seven day old culture were inoculated aseptically. Triplicate sets of petriplates were incubated at 28± 2°C for six days and observation were recorded on seventh day. The radial mycelial Growth of fungus is recorded on seventh day. The fungitoxicity of extracts was calculated in terms of percent inhibition of mycelia growth by using the formula: (Singh and Tripathi, 1999).

Percent inhibition of mycelial growth = $\frac{dc-dt}{dc} \times 100$

Where,
dc = Average increase in mycelia growth in control.
dt = Average increase in mycelia growth in treatment.

Determination of Minimum Inhibitory Concentration (MIC)

The MIC of the extract required for absolute inhibition of mycelial growth of the test fungus, *Fusarium oxysporum* f. sp. *udum*was determined by the Poisoned Food Technique. The extract of *Curcuma zedoaria*(Christm.) Roscoewas prepared as described previously. Requisite amounts of the prepared extract were added to pre-sterilized Petri plates containing 17 ml of molten PDA medium. Now 1, 0.9, 0.8, 0.7, 0.6, 0.5, 0.4, 0.3, 0.2, and 0.1 ml of the extract is added to the medium. The contents of the plates were agitated in a circular mode to mix the extract in the medium evenly. In control sets, the same amount of sterilized distilled water was used in place of the extract. The assay plates were incubated for six days at 28 ± 2°C. The observations were recorded on the seventh day in terms of the percent inhibition of mycelial growth and data presented in Table:

(2) are based on the averages of all the replications.

Result and Discussion

Antifungal activity was evaluated by poisoned food technique (Grover and Moore, 1962; Mishra & Tiwari, 1992; Nene and Thapliyal, 2000).The results were recorded in Table No-1. The result revealed that out of 15 plants the extract of *Curcuma zedoaria*shows maximum inhibition (100%), followed by*Azadirachta indica* A. Juss. (81%), *Allium cepa* Linn (68%).The active plant extract of *Curcuma zedoaria* was subjected for MIC. The results were recorded in table 2. The 0.6ml of plant extract inhibits the mycelia growth of test fungus.

Table.1

Table 1			
Sl. No.	**Plant Species**	**Family**	**Mycelial inhibition (%)**
1	*Allium sativum* Linn.	Liliaceae	58
2	*Azadirachta indica* A. Juss.	Meliaceae	81
3	*Achyranthus aspera* Linn.	Amranthaceae	62
4	*Adhatoda vasica* Nees	Acanthaceae	57
5	*Citrus limon* (L.) Burm. f.	Rutaceae	26
6	*Cassia occidentalis* Linn.	Caesalpinaceae	51
7	*Euphorbia hirta* (L)Millsp.	Euphorbiaceae	58.86
8	*Riccinus communis* Linn.	Euphorbiaceae	62
9	*Allium cepa* Linn	Liliaceae	68.00
10	*Curcuma domestica* Valet	Zingiberaceae	41
11	*Curcuma zedoaria* (Christm.) Roscoe	Zingiberaceae	100
12	*Oxalis curniculata* Linn.	Oxalidaceae	50
13	*Cannabis sativa* Linn	Canabinaceae	46
14	*Datura stramonium* Linn	Solanaceae	53
15	*Vernonia cinerea* Schreb	Asteraceae	39

Table.2

Table 2	
Determination of Minimum Inhibitory Concentration (MIC)	
Concentration of extract (ml)	**Inhibition of Mycelial growth (%)**
0.1	12
0.2	23
0.3	36
0.4	46
0.5	93
0.6	100
0.7	100
0.8	100
0.9	100
1.0	100

Curcuma zedoaria

Rhizomes of *Curcuma zedoaria*

Control

Treatment(0.6ml)

In recent past to control plant disease several types of synthetic fungicides have been used. The uncontrolled use of synthetic fungicide develops several problems in host plant as well as on non-target organisms. Many agriculturally important pesticides have been banned by World Health Organization (WHO) due to their wide range of toxicity against non-target organisms including humans. Many of them are known to cause pollution problems (Barnard *et al.,* 1997). Due to adverse effect of synthetic fungicides on host and non-target organisms there is pressing need of development of alternative fungicides, which should be eco-friendly,less or no harmful and have no side effects on the host and other organisms.

The use of plant extracts in the treatment of diseases caused by various bacteria, viruses and fungi have been reported. Fungitoxic properties of plant extracts are widely recognized (Bylka *et al.,* 2004; Kosalec *et al.,* 2005; Natarajan *et al.,* 2003).

In present investigation the extracts of fifteen plants were evaluated for their antifungal activity and the result shows that extract of

Curcuma zedoaria (Christm.) Roscoeshows maximum inhibition (100%), followed by*Azadirachta indica*. A Juss. (81%) and *Allium cepa* Linn (68%).The extract of more than 10 plants shows 50% or above inhibition in mycelial growth. The present study can play important role in crop protection by developing plant based fungicides which are natural, biodegradable, non-toxic, non-pollutive and eco-friendly.

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