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Non-chemical management strategy for leaf blight of dicoccum wheat

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ABSTRACT
Under laboratory conditions, biological agents viz., *Pseudomonas fluorescens, Trichoderma viride* and *T. harzianum* were found to be antagonistic to *E. hawaiiensis*. Among 16 plant extracts tested, leaf extracts of *Duranta repens*, *Mangifera indica, Azadirachta indica* and *Clerodendron inerme* have significantly inhibited the mycelial growth to the maximum extent.

Key words : Wheat, Leaf flight.

INTRODUCTION

Exserohilum hawaiiensis wheat crop and causes severe blighting of leaves resulting in destruction of foliage. Not much information is available on control of this disease using non-chemical methods particularly antagonistic microorganisms and plant extracts. The present investigation was therefore carried out to test the efficacy of certain known antagonists and plant extracts against the *E. hawaiiensis*.

MATERIALS AND METHODS

In-vitro assays of antagonists

The fungi viz., *Trichoderma harzianum* (Dharwad), *Trichoderma harzianum* (Bangalore), *Trichoderma koningii, Trichoderma viride, Gliocladium virens* and the bacterium *Pseudomonas fluorescens* were tested for their antagonistic effect against *E. hawaiiensis* under laboratory condition by using dual culture technique.

About 20 ml of potato dextrose agar was poured into sterile petri plates and allowed to solidify. In case of bacterium, mycelial discs of the fugus was kept at opposite ends. In the centre of the plate bacterium was inoculated. While in fungi, mycelial disc of test fungus was inoculated at one end and that of antagonistic fungi opposite to it simultaneously. Three replications were maintained in each treatment. The petriplates were inoculated at 26±1°C for 5 days and appropriate control was maintained. The zone of inhibition was recorded by measuring the clear distance between the margin of the test fungus and the antagonistic organism. The colony diameter of *E. hawaiiensis* in control plate was also recorded to work out the per cent inhibition of growth of *E. hawaiiensis*.

In vitro evaluation of plant extracts against *E. Hawaiiensis*

Plant based pesticides which are relatively cheaper, safe and non-hazardous can be used successfully against plant pathogenic fungi. Sixteen plant extracts were tested to know their efficacy against the pathogen. Hundred gram of fresh samples of each test plants were collected and washed first in tap water and then in distilled water. Then this sample was crushed in a surface sterilized mortar and pestle by adding 100-ml sterile distilled water (1:1 w/v). The extract was strained through two layers of muslin cloth. Finally filtrate thus obtained from leaves were used as the undiluted extract of cent per cent (Gerard *et al.*, 1994).

To study the anti-fungal mechanism of plant extracts, poisoned food technique was followed as suggested by Nene and Thapliyal (1982). For this, 5 and 10 ml of undiluted plant extract solution was mixed with 95 and 90 ml of sterilised molten potato dextrose agar medium respectively, so as to get 5 and 10 per cent concentrations. The medium was shaken thoroughly for uniform mixing of test extract.

About twenty-ml medium was poured into each of the 90 mm sterilised Petriplates. Each plate was seeded with 5-mm mycelial discs taken from the periphery of twelve-day-old fungal culture and incubated at 26±1°C till the growth of colony touches the periphery in control plate. The disc was placed upside down in the centre of the Petriplate, so that the mycelium was in direct contact with the medium poisoned with the requisite plant extract at required concentration. Three replications were maintained for each treatment. Suitable control plates were maintained, where in culture discs were inoculated into the centre of the PDA plates without plant extracts. Mean colony diameter in each case was recorded by taking the diameter of the colony in two directions. Radial growth of the fungus was measured and per cent inhibition of mycelial growth over control was calculated by using the formula as given by Vincent (1947).

$$I = \frac{100\ (C-T)}{C}$$

Where,

I	=	Per cent inhibition
C	=	Radial growth in control
T	=	Radial growth in treatment.

RESULTS AND DISCUSSION

The results pertaining to antagonistic effect on *E. hawaiiensis* is given in Table 1. It was found that both the fungal and bacterial agents retarded the growth of pathogens significantly. In the present study, bacterium *Pseudomonas fluorescens* recorded maximum inhibition of mycelial growth (76%) of *E. hawaiiensis* and superior over other fungal species tested. These results are in accordance with Ray *et al.* (1990) who found that rice plants treated with bacterial suspension of *P. fluorescens* effectively reduce the growth of *D. oryzae*. Next best antagonistic organism was *Trichoderma viride*, which was superior over to other antagonistic fungi, tested. Similar results were recorded by Kumar *et al.* (1993) against *Bipolaris sorokiniana*, Kumar and Misra (1994) against *D. oryzae*. *Trichoderma harzianum* was also found effective next to *T. viride*.

Among the sixteen plant extracts tested, maximum inhibition of mycelial growth was recorded in *Duranta repens* followed by *Mangifera indica* both at 5 and 10 per cent concentrations (Table 2). The other effective extracts were *Azadirachta indica, Clerodendron inerme* and *Ocimum sanctum*. The least inhibition (9%) of mycelial growth was observed in *Tagetes erecta.* These results are in accordance with Singh *et al.* (1999) reported that *M. indica* and *A. indica* and *O. sanctum* inhibited (100, 91 and 78% respectively) the growth of *H. sativum*. Ahmed and Prasad (1995) reported that aqueous extract of *A. indica, C. roseus* and *O. sanctum* reduced the conidial germination of *H. oryzae*, upto 75 per cent. Similar results were observed by Ganguly (1994) also.

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Table 1: *In vitro* evaluation of antagonistic organisms on *E. hawaiiensis.*

Sl. No.	Biological agent	Per cent inhibition of mycelial growth (mm)
1.	Trichoderma harzianum (Dharwad)	56.00 (48.47)
2.	T. viride	68.77 (55.95)
3.	T. harzianum (Bangalore)	50.11 (45.07)
4.	T. konigii	42.11 (40.47)
5.	Gliocladium virens	38.44 (38.28)
6.	Pseudomonas fluorescens	76.00 (60.68)
	S.Em ±	0.783
	CD at 1%	3.507

Figures in the parentheses indicate arc sine transformed values.

Table 2 : *In vitro* evaluation of plant extracts (cold aqueous) against *E. hawaiiensis.*

Sl. No.	Name of botanicals	Concentration				Mean
		5 Per cent		10 Per cent		
		Average Mycelial growth (mm)	Inhibition over control	Average Mycelial growth (mm)	Inhibition over control	
1.	Polyalhia longifolia L.	60.40	32.80 (34.91)	55.2	33.86 (38.44)	35.7 (36.67)
2.	Parthenium hysterophorus L.	67.16	25.30 (30.21)	61.3	30.33 (33.40)	27.8 (31.81)
3.	Ocimum sanctum L.	48.80	45.70 (42.53)	41.8	53.55 (46.99)	49.6 (44.76)
4.	Vitex negundo L.	74.60	17.00 (24.31)	70.0	22.22 (28.08)	19.5 (26.27)
5.	Vinca rosea L.	56.80	35.10 (37.36)	54.6	39.22 (38.75)	38.0 (30.06)
6.	Nerium oleander L.	78.80	12.30 (20.57)	75.0	16.16 (24.02)	14.4 (22.29)
7.	Glyricidia maculata L.	83.50	07.10 (15.40)	81.5	9.33 (17.80)	8.2 (16.64)
8.	Eupatorium odoratum L.	70.50	21.60 (27.70)	65.0	27.77 (31.76)	23.1 (29.13)
9.	Bougainvillea glabra Chois	79.60	11.33 (19.66)	73.6	18.11 (25.16)	14.5 (22.41)
10.	Duranta repens L.	33.80	62.40 (52.16)	28.6	68.11 (55.62)	65.3 (53.89)
11.	Azadirachta indica Juss	38.50	57.20 (49.12)	35.3	60.77 (51.18)	59.0 (50.15)
12.	Mangifera indica L.	33.60	62.50 (52.26)	30.8	64.55 (53.47)	63.6 (52.86)
13.	Thuja occidentalis L.	74.50	16.80 (24.22)	69.6	21.11 (28.33)	19.6 (26.27)
14.	Tamarindus indica	87.20	03.44 (10.65)	78.5	12.33 (20.88)	7.1 (15.47)
15.	Tagetes erecta L.	86.80	03.11 (10.05)	81.8	9.00 (17.43)	5.9 (14.05)
16.	Clerodendron inerme Gaertn	44.00	51.11 (45.60)	39.5	56.51 (48.48)	53.6 (47.05)
	Mean		25.1 (31.05)		32.90 (34.99)	29.7 (33.02)

Figures in the parentheses indicate arc sine transformed values.

Source	S.EM ±	CD at 1%
Plant extracts (P)	0.488	1.830
Concentration (C)	0.173	0.648
P X C	0.691	2.590

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