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Antifungal property of some medicinal plants *in vitro*

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Studies were under taken to find out the *in vitro* effect of aqueous extracts (1.5%) of three medicinal plants parts namely, rhizome of *Zingiber officinale, Curcuma lo*nga, and bulb of *Allium sativum* on four plant pathogenic fungi-*Helminthosporium oryzae, Alternaria solani, Fusarium solani* and *Sclerotium rolfsii*. Result showed that there was a maximum inhibition of radial growth and biomass production in four test fungi at 15% aqueous extract of *Allium sativum* in comparison to other two plants extracts at the same concentration (15%).

Key words : *Helminthosporium oryzae, Alternaria solani, Fusarium solani, Sclerotium rolfsii,* medicinal plant, rhizome, bulb, extract

INTRODUCTION

The conventional method of control of fungal diseases of plants is by using fungicide chemicals, but these chemicals create health hazards to human beings and animals. Further the use of these chemicals is costly and cause air pollution. To overcome the problem, during recent years use of plant secondary metabolites for the control of plant diseases is gaining importance. Bio-products are non-hazardous, less costly, locally available, biodegradable, systemic in action as well as a potent source of therapeutants (Fowcett and Spencer, 1970 ; Beye, 1978 ; Bisht and Khuble, 1995). The present study was therefore undertaken to find out the effect of aqueous extracts of some medicinal plant parts such as rhizomes of *Zingiber officinale* R. and *Curcuma longa* L. and bulb of *Allium sativum* L. against some destructive plant pathogenic fungi namely *Helminthosporium oryzae* (Breda de Honn.), *Alternaria solani* (Ell and Mart.) Jones and grout, *Fusarium solani* (Mart) App. and *Sclerotium rolfsii* (Sace.) under *in vitro* condition.

MATERIALS AND METHODS

Freshly harvested rhizomes of *Zingiber officinale* and *Curcuma longa* and bulb of *Allium sativum* were collected from medicinal plant garden while the fungal cultures of *H. oryzae, A. solani, F. solani* and *S. rolfsii* were obtained from the stock culture of the Department of Plant Pathology, Bidhan Chandra Krishi Viswavidyalaya. Aqueous extracts were prepared out of each of 100 g of rhizomes and bulb, which was thoroughly washed with distilled water and then air dried at room temperature and finally crushed by using morter and pestle. During crushing 100 ml of sterile distilled water was added in each case separately. The crushed material was strained with the help of double-layered cheesecloth. The strained extracts were centrifuged at 5000 rpm for 30 minutes. The supernatant thus obtained was considered as 100% mother aqueous extracts and was stored in a refrigerator at 5°C for future use.

15 ml of the mother aqueous extract was added to 85 ml of PDA medium in 150 ml conical flask treated as 15% conc. of the aqueous extract following the process described by Bisht and Khuble (1995). The growth of the test fungi was measured following the poison food technique. The conical flasks containing medium and extract were then sterilized at 15 lbs psi for 15 minutes. Such medium

containing extracts were aseptically poured inside 10 cm sterillized petriplates using a laminar airflow table. A 5 mm disc of the 5 days old fungal culture was then aseptically placed on the middle of each plate. Such plates replicated thrice were incubated at 27° ± 1°C for 7 days in a B.O.D. incubator and after this period the radial growth was measured. For comparison, adequate control was kept by inoculating plates with PDA medium only. Percent inhibition of radial growth (PIRG) of the fungi were calculated as follows :

$$PIRG = \frac{\text{Radial growth of fungus in control (mm)-Radial growth of fungus in treatment (mm)}}{\text{Radial growth of fungus in control (mm)}} \times 100$$

For studying the biomass production (mycelial dry weight), the fungi were grown in 150 ml conical flasks containing PD broth following the usual poison food technique following Nene *et al.* (1968). For comparison, control was kept using flasks with PD broth only. For each treatment three replications were kept. After 7 days of incubation dry weight was estimated using dried and pre-weighed Whatman No. 42 filter paper.

The percent decrease in biomass production (PDBP) in test extracts was calculated following Pant and Mukhopadhyay (2001).

$$PDBP = \frac{\text{Biomass production in control (g)-Biomass production in treatment (g)}}{\text{Biomass production in control (g)}} \times 100$$

RESULTS AND DISCUSSION

Among the different plant extracts, the extracts from *A. sativum* exhibited highest fungitoxic effect on *F. solani* (92.40%), followed by *S. rolfsii* (77.03%), *A. solani* (53.15%) and *H. oryzae* (51.66%) than the other two plant extracts from *Z. officinale* and *C. longa* in respect of percent radial growth (Table 1).

In case of reduction in biomass production (Table 2) extract from *A. sativum* was highly toxic against *S. rolfsii* (100%) followed by *F. solani* (80.99%), *H. oryzae* (70.49%) and *A. solani* (47.91%). The present finding is in confirmation with what has been reported by Bisht and Khuble (1995). Although *C. longa* extract had some positive role in suppression of radial growth of *H.oryzae* (51.58%) as compared to other test fungi but inhibition of biomass production was higher in *A. solani* (38.35%) as compared to other test fungi. However, the extract from *Z. officinale* had no positive role on the suppression of radial and in biomass production of the test fungi.

Table 1 : Percent inhibition in radial growth of different fungi in test extracts (15%)

Fungi	Extracts			
	A.sativum	*C. longa*	*Z. officinale*	Mean
H. oryzae	51.663 (45.953)	51.587 (45.910)	30.183 (33.323)	44.478 (41.729)
A. solani	53.143 (46.803)	36.293 (37.047)	27.957 (31.920)	39.131 (38.590)
S. rolfsii	77.030 (61.363)	45.923 (42.663)	25.367 (30.240)	49.440 (44.756)
F. solani	92.403 (74.000)	41.660 (40.200)	14.997 (22.780)	49.687 (45.660)
Mean	68.560 (57.030)	43.866 (41.455)	24.626 (29.566)	

Figures in parenthesis are angular transformed values

	C.D. (P=0.05)	S.Em±
Fungi	0.259	0.089
Extract	0.224	0.077
Interaction	0.449	0.154

It may be concluded that the extracts of different plant sources as observed in the present study may be effectively utilized against plant pathogenic fungi as these are readily available, biodegradable and fungitoxic in nature.

Table 2 : Percent inhibition in biomass-production of different fungi in test extracts (15%)

Fungi	Extracts			
	A.sativum	*C. longa*	*Z. officinale*	Mean
H. oryzae	70.490 (57.100)	30.293 (30.390)	26.753 (31.147)	42.512 (40.546)
A. solani	47.910 (43.803)	38.353 (38.267)	27.123 (31.377)	37.796 (37.816)
S. rolfsii	100.00 (90.000)	27.483 (31.617)	30.607 (33.580)	52.697 (51.732)
F. solani	80.993 (64.157)	26.287 (30.847)	13.023 (21.153)	40.101 (38.719)
Mean	74.648 (63.765)	30.604 (33.530)	24.377 (29.314)	

Figures in parenthesis are angular transformed values

	C.D. (P=0.05)	S.Em±
Fungi	0.637	0.219
Extract	0.552	0.189
Interaction	0.105	0.378

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