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Antifungal activity of whole plant extract and plant latices on mycelial growth of some pathogenic fungi

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The present investigation deals with the antifungal activity of a whole plant extract of *Rauwolfia serpentina* and plant lattices of *Croton bonplandianum* of Euphorbiaceae and *Cryptostegia grandiflora* of Asclepiadaceae on mycelial growth of two pathogenic fungi i.e. *Collelotrichum capsici* and *Pyricularia oryzae*. Although these two plants belong to distant taxa, but still they are selected in the present study due to significant production of metabolites in the form of lattices. The lattices of both *Croton* and *Crytostegia* were found to be significantly fungitoxic and growth inhibitory also. On the other hand, the whole plant extract of *Rauvolfia* in different fractions showed differential toxicity on mycelial growth of the test-fungi. Even the maximum dilution of whole plant extract and latices showed a considerable level of toxicity.

Key words: Latices, whole plant extract, fungitoxicity, mycelial growth, *Rauwolfia serpentine. Croton bonplandianum*, *Crytostegia grandiflora,* growth inhibitory

INTRODUCTION

A good number of plants belonging to different angiospermic families like Apocynaceae, Euphorbiaceae, Caricaceae, Asclepiadaceae etc. produce latex which is composed of different alkaloids, glycosides, resins, terpenoids, organic nitrogenous matters, amino acids and few trace organic compounds, tannins, resins, balsum, proteins, vitamins, hormones etc. (Rizk, 1987; Kuchel and Ralston, 1988). Plant extracts as well as latices carry significant economic value and contain various pharmaceutical properties (Nielson et al., 1977). Even these two bioproducts have different degrees of antifungal activities. Mixon (1995) has reported that the plant products which directly go against pathogenic activities are of different skeletal structures but provide natural resistance to the plants.

MATERIALS AND METHODS

Different fractions of whole plant extract of *R.serpentina* and different dilutions of lattices of *C. bonplandianum* and *C. grandiflora* were used in the present investigation. To study the effect of plant extract and latces on the mycellial growth, a simple method was followed i.e. by mixing the extract/latices in PDA medium and sterilized at 121^{0}C for 20 minutes to avoid contamination. Now, such medium was poured in the sterilized Petriplates in

a laminar air-flow cabinet followed by aseptical inoculation of 7 days old mycelial block having 0.5-0.7 cm in diameter in the medium. Radial colony growth (in diameter) of each test fungus in all treatmernts was measured at an exposure of 72 hrs. and 120 hrs incubation at 28°C ± 1°C.

Extract fractions were prepared from dried whole plants of *R.serpentina* with petroleum ether in soxhlet apparatus. Now, the extract was poured into a silica gel chromatographic column and was allowed to elute successively with petroleum ether, petroleum ether: benzene (1:1), benzene, benzene:ethyl acetate (9:1) and benzene:ethyll acetate (1:1). Such fractions were designated as RS_1, RS_2, RS_3, RS_4 and RS_5 respectively. After removal of solvents, the gummy and oily concentrations were taken and desired concentrations were made by adding chloroform with the concentrates. A control set was considered using chloroform only. Actually 5 ml of concentrate is mixed with 95 ml of chloroform to make 5% (v/v) concentration and so on.

Now, the latices of *C. bonplandianum* and *C. grandiflora* were taken and 10% (v/v) aqueous solution of them were prepared as standard and designated as L from which further dilutions were made in the form of five-fold (L/5), ten-fold (L/10) and fifteen-fold (L/15) by adding requisite amount of sterile distilled water. Now, each set is sterilized by moist heat in an autoclave at 121°C for minutes only. The inoculated agar medium without any latex is treated as control.

RESULTS AND DISCUSSION

Different fractions of whole plant extract of *R. serpentina* tested on mycelial growth of *C.capsici* and *Pyricularia oryzae* showed differential growth (Table1). The data revealed that the fractions RS_1, RS_2 and RS_3 were significantly inhibitory to mycelial growth of *Pyricularia oryzae* at an exposure of 72 hrs. although a little mycellial growth of the said fungus was found to be resumed at an exposure of 120 hrs. (5 days). From bioassay results, it became also evident that major fractions exerted less inhibitory effect on mycelial growth at higher dilutions. Similarly, the mycellial growth of *Callototrichum capsici* was also found to be gently reduced by another two fractions RS_3 and RS_5.

So, there was no harmony or parity in the mode of action of different fractions on the growth of the test fungi. Althrough the fraction RS_4 was found to be extremely less inhibitory to both fungi. Similar type of findings were observed by Chatterjee and Chowdhury (1995) working on some pathogenic and non-pathogenic fungi.The results (Table 1) further indicated that both test fungi were found to overcome the inhibitory effect of extract-fractions

Table 1 : Effect of different fractions of whole plant extracts of *R. serpentina* on the mycelial growth of two test fungi

Fractions	% of fractions/ concentrations	Mycelial growth in diameter (mm)			
		C.capsici		*P.oryzae*	
		Incubation (h)			
		72	120	72	120
RS_1	5	13.2	14.2	00	2.5
	10	13.9	14.7	00	3.1
	15	15.2	16.7	00	4.4
	5	11.8	12.9	00	00
RS_2	10	11.8	12.9	00	00
	15	12.2	13.1	00	1.2
	5	00	00	00	0.9
RS_3	10	0.9	0.9	00	1.2
	15	1.95	1.1	00	1.4
	5	14.1	14.9	13.3	14.9
RS_4	10	14.1	15.1	13.5	14.8
	15	14.3	15.2	13.4	14.8
	5	00	00	10.2	13.3
RS_5	10	00	00	10.3	13.4
	15	00	00	10.3	13.6
Control (chloroform)		18.6	19.7	15.9	17.3

*Average of 5 replicates, RS_1= Petroleum ether : benzene (1:1), RS_3 = Benzene, RS_4= Benzene : ethyl acetate (9:1), RS_5 = Benzene : ethyl acetate (1:1), and 0 = no growth.

Table 2 : Effect of lattices *C. bonplandianum* and *C. grandiflora* at 5 fold, 10 fold and 15 fold aqueous (v/v) dilutions on mycelial growth of two test fungi

Source of latex	**Dilutions of latex (v/v)	Mycelial growth in diameter (mm)			
		C.capsici		*P.orzae*	
		Incubation (h)			
		72	120	72	120
C.bonplandianum	L / 5	17.6	18.1	19.1	19.3
	L/10	21.3	22.2	20.5	20.9
	L/15	26.7	28.7	24.8	26.3
C. grandiflora	L/5	19.2	21.3	15.9	16.3
	L/10	24.9	26.2	19.1	19.9
	L/15	28.4	29.3	23.6	24.4
Control (dist. Water)		35.4	41.3	29.0	33.1

*Average of 5 replicates,** A 10% aqueous solution of latex was designated as 'L' and accordingly L/5, L/10 and L/15 denote 5 fold, 10 fold and 15 fold dilutions of standard 'L' (v/v).

at an exposure of 120 hrs (5 days) and to resume their growth to a little extent. Chatterjee *et al.*, (1996) provided almost same type of findings, when they tested the effect of a plant extract on three fungi.

Now, the effect of latices of *C. bonplandianum* and *C.grandiflora* on the mycellial growth of these test fungi were studied. Infact, plant latices contain a wide variety of plant metabolites and excretory products. According to Mitra *et al.* (1984) the latices which are to some extent fungitoxic belong to the classes of steroids, alkaloids, tarpenes, flavonoids, cyanogenic glycosides etc. The latices of the plants belonging to Euphorbiaceae, Asclepiadaceae and few families have been reported by Saxena and Saxena (1981) and also by Pandey *et al.* (1996). The present observations (Table 2) revealed that the latices of both *C. bonplandianum* and *C.grandiflora* caused extreme toxicity on the mycelial growth of these test fungi at L/5 dilution. Even, the antifungal activity of latices of these two plants was found to be considerably significant at both L/5 and L/10 dilutions at an exposure of 72 hrs (3 days) and 120 hrs (5 days). Results (Table 2) further indicated that the latex of *C.bonplandianum* was more inhibitory on *C. capsici* than *P. oryzae.* Similarly, the latex of *C. bonplandianum* was found to be more fungi toxic / fungistatic on *P. oryzae* than *C.capsici.* But in every case, the present findings suggested that higher dilutions of latex showed lesser inhibitory effect on mycelial growth. At higher dilutions, the fungi were possibly able to overcome or to detoxify the inhibitory compounds present in latex.

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