

Antifungal activity of extract of *Clerodendron siphonanthus* against some plant pathogenic fungi

K. R. CHATTERJEE AND A. CHOWDHURY

Department of Plant Pathology and Agricultural Chemistry and Soil Science, Bidhan Chandra Krishi Viswavidyalaya, Kalyani, 741 235, West Bengal

Antifungal activity of different fractions of *Clerodendron siphonanthus* was assessed against different plant pathogenic fungi. Different fractions had differential effect on growth, sclerotial and conidial germination of different plant pathogenic fungi. Among the tested fractions, petrol-ether fraction inhibited sclerotial growth, sclerotial and conidial germination of some fungi.

Key Words : Plant extract, *Clerodendron siphonanthus*, antifungal activity

INTRODUCTION

Extracts from some plant species are known to have fungitoxic properties both *in vivo* and *in vitro* (Chowdhury *et al.*, 1976; Biswas and Mukherjee, 1981). Such plants contain certain chemicals which are toxic to the fungus and the chemicals often protect the plant from fungal infection. Antifungal plant chemicals may play an important role in plant disease control. Present investigation was carried out to see the effect of different fractions of the extract of *Clerodendron siphonanthus* on growth, sclerotial and spore germination of some plant pathogenic fungi.

MATERIALS AND METHODS

Sclerotium rolfsii, *S. oryzae-sativa*, *S. hydrophyllum*, *Macrophomina phaseolina*, *Aspergillus niger*, *Alternaria solani*, and *Helminthosporium oryzae* were used in the present study.

The dried whole plant of *C. siphonanthus* was extracted with petroleum ether in soxhlet apparatus for 30 h. Fractionation of the concentrated crude extracts were accomplished on a silica gel column using mixtures of petroleum ether, benzene and ethyl acetate. Petroleum ether solution of the extract was poured onto a silica gel chromatographic column and eluted successively with petroleum ether, petroleum ether:benzene (1:1), benzene, benzene:ethyl acetate (9:1) and benzene:ethyl acetate (1:1). Fractions, thus obtained, were designated as CS₁, CS₂, CS₃, CS₄ and CS₅. After removal of solvents, the gummy, oily concentrates were ready for testing. Desired concentrations of the extracts were made in chloroform and applied accordingly along with a control using only chloroform.

Effect of the extract from *C. siphonanthus* on sclerotial germination, was assayed by

following Mukherjee (1976) and on spore germination following Pan and Sen (1976). In each case germination was recorded after 24, 48 and 72 h of incubation at $28 \pm 1^\circ\text{C}$.

For testing the effect on growth of the fungi, mycelial block of 0.5 cm diameter of seven days old culture was dipped into plant extract for 2 minutes and then placed aseptically on PDA medium in petriplates. Colony diameter of each fungi in all the treatment was measured after 72 h incubation at $28 \pm 1^\circ\text{C}$.

One, five and ten percent solution of each fraction of the extract were used for the tests.

RESULTS AND DISCUSSION

Extract of *C. siphonanthus* delayed germination of sclerotia of all the three sclerotial fungi. Different fractions showed differential effect. Fraction CS₁ inhibited germination of *S. rolfii*, CS₃ and CS₅ inhibited sclerotial germination of *S. oryzae-sativa*, CS₂, and CS₄ failed to prevent germination of sclerotia. Inhibitory function of CS₁, CS₃, and CS₅ fractions were specific to only one of three test fungi and inhibition was noted also at lower concentration.

Effect of the fractions on spore germination of three sporulating fungi, *Alternaria solani*, *Aspergillus niger* and *Helminthosporium oryzae* was tested (Table 2). Fractions CS₂, CS₃ and CS₄ could not inhibit conidial germination but delayed it in some cases. Conidia of *A. niger* failed to germinate in fractions CS₁ and CS₅ even at one percent. Fraction CS₁ could delay conidial germination upto 24 h.

Table 1. Effect of various fractions of *C. siphonanthus* on sclerotial germination of three test fungi

Fraction	Fractions %	Germination* of sclerotia (%)								
		<i>S. rolfisil</i>			<i>S. oryzae-sativa</i>			<i>S. hydrophyllum</i>		
		Incubation (h)								
		24	48	72	24	48	72	24	48	72
CS ₁	1	0	0	0	0	100	100	0	100	100
	5	0	0	0	0	100	100	0	100	100
	10	0	0	0	0	100	100	0	100	100
CS ₂	1	0	0	100	0	0	100	0	100	100
	5	0	0	100	0	0	100	0	100	100
	10	0	0	100	0	0	100	0	100	100
CS ₃	1	0	100	100	0	0	0	0	100	100
	5	0	100	100	0	0	0	0	100	100
	10	0	100	100	0	0	0	0	100	100
CS ₄	1	0	100	100	0	0	100	0	100	100
	5	0	100	100	0	0	100	0	100	100
	10	0	100	100	0	0	100	0	100	100
CS ₅	1	0	100	100	0	0	0	0	100	100
	5	0	100	100	0	0	0	0	100	100
	10	0	100	100	0	0	0	0	100	100
Control		100			100			100		

*Average of six replicates; CS₁ = Petroleum ether; CS₂ = Petroleum ether:benzene(1:1); CS₃ = Benzene; CS₄ = Benzene : ethyl acetate (9:1); CS₅ = Benzene:ethyl acetate (1:1).

Table 2. Effect of various fractions of *C. siphonenthus* on spore germination of three test fungi

Fraction	Fractions %	Germination* of conidia (%)					
		<i>A. solani</i>		<i>A. niger</i>		<i>H. oryzae</i>	
		Incubation (h)					
		24	48	24	48	24	48
CS ₁	1	0	100	0	0	0	100
	3	0	100	0	0	0	100
	5	0	100	0	0	0	100
CS ₂	1	0	100	0	100	0	100
	3	0	100	0	100	0	100
	5	0	100	0	100	0	100
CS ₃	1	100		0	100	100	
	3	100		0	100	100	
	5	100		0	100	100	
CS ₄	1	100		0	100	100	
	3	100		0	100	100	
	5	100		0	100	100	
CS ₅	1	100		0	0	100	
	3	100		0	0	100	
	5	100		0	0	100	
Control		100		100		100	

* Average of six replicates

Table 3. Effect of different concentrations of various fraction of *C. siphonenthus* on growth of four fungi

Fraction	Fractions (%)	Diameter* of colony (mm)			
		<i>A. niger</i>	<i>A. solani</i>	<i>H. oryzae</i>	<i>M. phaseolina</i>
		72	72	72	72
CS ₁	1	20.5	0	13.2	10.5
	5	20.1	0	8.5	8.5
	10	20.5	0	6.0	6.1
CS ₂	1	0	0	15.3	16.5
	5	0	0	0	16.5
	10	0	0	0	16.1
CS ₃	1	20.1	0	15.5	16.5
	5	26.5	0	0	16.5
	10	26.3	0	0	16.1
CS ₄	1	26.1	20.5	20.1	16.5
	5	26.1	15.5	20.1	16.5
	10	26.0	0	18.0	16.3
CS ₅	1	24.2	18.5	23.5	6.5
	5	20.3	13.5	19.5	4.5
	10	20.2	12.1	14.5	3.5
Control	-	26.5	20.5	23.3	16.5

* Average of five replicates, 0 = No growth.

These fractions, when tested on mycelial growth of *A. niger*, *A. solani*, *H. oryzae* and *Macrophomina phaseolina* showed differential growth (Table 3). Fraction CS₂ was highly inhibitory against *A. niger*, *A. solani* and *H. oryzae*. CS₁ on *A. solani* and *H. oryzae*, CS₃ on *A. solani* and *H. oryzae*. Growth of *M. phaseolina* was greatly reduced by fractions CS₅ and CS₁ and to some extent by other fractions.

Among the fractions, CS₁ showed wide range of activity showing inhibition of sclerotial germination of *Sclerotium rolfsii*, conidial germination of *A. niger* and growth of *A. solani* and *H. oryzae*. Fraction CS₂ showed its effect on growth of sporulating fungi. CS₃ inhibited sclerotial germination of *S. oryzae-sativa*. Fraction CS₄ did not show any antifungal activity. CS₅ inhibited the sclerotial growth of *S. oryzae-sativa* and conidial growth of *A. niger*. Screening of the fractions of extract of *C. siphonanthus* thus showed antifungal property against a large number of fungi and its possible use in disease control in future.

ACKNOWLEDGEMENT

The authors are thankful to Director, ICAR, Research Complex, Delhi, for providing the financial support.

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(Accepted for publication 20 February 1995)