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ANTIFUNGAL ACTIVITY OF *POLYGONUM HYDROPIPER* AND *SOLANUM MELONGENA* AGAINST PLANT PATHOGENIC FUNGI

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Abstract

Antifungal activity of leaf extracts of *Polygonum hydropiper* and *Solanum melongena* were tested against *Colletotrichum capsici*, *Curvularia lunata*, *Rhizoctonia solani* and *Sclerotinia sclerotiorum*, causing severe losses in many economically important crop plants. The ethanolic leaf extracts were found to be effective against the pathogens, when compared with commercial fungicide *in-vitro*. The maximum zone of inhibition formed by the test extract at 2% concentration were 36.33 mm, 37.33 mm and 30.66 mm in *C. lunata*, *S. sclerotiorum* and *R. Solani*, respectively in *P. hydropiper* whereas 34.33 mm, 36.24 mm and 32.33 mm in *C. capsici*, *S. sclerotiorum* and *R. solani* respectively in case of *S. melongena* extracts. It was observed that the inhibitory effect of the commercial fungicide (Dithane M-45) was marginally higher.

Key words : Antifungal activity, Dithane M – 45, *Polygonum hydropiper*, *Solanum melongena*.

Introduction

The presence of naturally occurring substances in plants with antifungal properties have been recognized and tested against a wide range of fungi infecting many crops and commercially important plants. The antifungal activity of some isolated principles from plant extracts may be more effective than some commercial synthetic fungicides. Now-a-days some synthetic as well as semi-synthetic antimicrobial agents have been developing, among which very few have broad spectrum activity and most of them are environmentally hazardous in nature. The extensive use of agrochemicals especially fungicides, resulted more carcinogenic risk than other pesticides, which may give rise to undesirable biological effects on animals and human beings (Osman and Abdulrahman, 2003).

Polygonum hydropiper Linn. (Family-olygonaceae) is a herb with various ethnomedicinal uses. Whole plant is used as carminative and anthelmintic, as remedy for uterine disorder. Dried plant is in cloth to drive out moth and other insects, used to poison fish. *Solanum melongena* Linn (family - Solanaceae) is a shrub, which has also medicinal properties. Fruits are eaten as vegetable. Seeds are used as stimulant and leaves are nacrotics. An investigation was carried on to evaluate the antifungal activity of ethanolic extracts of dried leaves of *P. hydropiper* and *S. melongena* against some serious phytopathogens, *viz.*, *C. capsici*, *Curvularia lunata*, *S. sclerotiorum* and *R. solani.*

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Materials and Methods

Plant material and test pathogens

The leaves of *Polygonum hydropiper* and *Solanum melongena* were collected from different localities of Sonitpur and Nagaon districts (Assam), India. These were washed 2-3 times with tap water and air-dried at room temperature (25^0-30^0C). The microorganisms used in this study were *Colletotrichum capsici*, *Curvularia lunata*, *Sclerotinia sclerotiorum* and *Rhizoctonia solani* and were obtained from Defence Research Laboratory (DRDO), Tezpur (Assam), India.

Preparation of the extracts

The dried plant parts were ground into powder form, sieved and packaged into polyethylene bags until when needed. 50g sample of the powdered dried leaves of *Polygonum hydropiper* and *Solanum melongena* were weighed separately and extracted in Soxhlet extractor

Table 1 : Effect of ethanolic leaf extract of *P. hydropiper* on plant pathogenic fungi.

Treatment	Conc. (%)	Test fungi * Inhibition zone (Dia in mm)		
		Curvularia lunata	***Sclerotinia sclerotiorum***	***Rhizoctonia solani***
P. hydropiper	0.1	13.33±0.58 (63.97)	11.33±0.58 (69.37)	11.66±1.55 (67.78)
	0.5	19.66±0.57 (46.86)	18.66±1.15 (49.56)	16.33±1.53 (47.87)
	1.0	29.66±0.58 (19.83)	27.66±1.53 (25.27)	23.66±2.08 (24.48)
	2.0	36.33±1.54 (1.81)	37.33±1.15 (-0.89)	30.66±3.06 (2.13)
Dithane M-45	0.003	37.00±1.00	37.00±2.65	31.33±1.53
Control (DMSO)		0	0	0

* Mean of 3 replicates.
** Figure in parentheses indicates percent difference on growth of fungi with commercial fungicide.

Table 2: Effect of ethanolic leaf extract of *S. melongena* on plant pathogenic fungi.

Treatment	Conc. (%)	Test fungi * Inhibition zone (Dia in mm)		
		Colletotrichum capsici	***Sclerotinia sclerotiorum***	***Rhizoctonia solani***
S. melongena	0.1	14.33±0.58 (60.46)	12.31±0.52 (66.58)	11.62±1.05 (66.15)
	0.5	18.66±0.48 (48.50)	17.33±1.25 (52.96)	16.33±1.54 (52.43)
	1.0	30.23±1.08 (16.58)	28.66±1.12 (22.20)	24.66±1.48 (28.17)
	2.0	34.33±1.34 (5.27)	36.24±1.15 (1.63)	32.33±2.07 (5.83)
Dithane M-45	0.003	36.24±1.06	36.84±1.65	34.33±1.43
Control (DMSO)		0	0	0

* Mean of 3 replicates.
** Figure in parentheses indicates percent difference on growth of fungi with commercial fungicide.

with ethanol at 40^0-60^0C. The extracts obtained were evaporated to dryness using a rotary evaporator. The extracts were assayed against the test organisms to determine the antifungal properties.

Determination of antifungal activity

The retrieved extracts were tested for their antifungal activity using agar-well diffusion method. Broth culture of the test pathogens (400 ml) was spread evenly over the PDA plates separately. Well of 10 mm diameter was made in the centre of the media plate and each well was then aseptically filled with the test extract and allowed to diffuse at room temperature for 2 hrs and incubated at 28 ± 2^0C for suitable period. Another set of plates with DMSO was used as control. Comparison was also made with commercial fungicide Dithane M-45. Each treatment was replicated thrice. The efficacy of the extracts was determined by measuring the diameter of inhibition zone.

Results and Discussion

The present study tested the antifungal activity of ethanolic leaf extracts of *P. hydropiper* and *S. melongena* against *C. capsici*, *C. lunata*, *S. sclerotiorum* and *R. solani*. The results showed that the antifungal activity of *P. hydropiper* increased with increase in concentration of extract (table 1). The maximum zone of inhibition formed by the test extract at

2% concentration were 36.33 mm, 37.33mm and 30.66 mm in *C. lunata*, *S. sclerotiorum* and *R. solani*, respectively. It was observed that commercial fungicide (Dithane M-45) showed marginally higher zone of inhibition (31.33 mm) in case of *R. solani* than plant extract, however, *C. lunata* and *S. sclerotiorum* showed zone of inhibition at par with leaf extract. Ethanolic leaf extract of *S. melongena* also showed similar trend of antifungal activity. It was observed that the zone of inhibition in 2% concentration were 34.33 mm, 36.24 mm and 32.33 mm in *C. capsici, S. sclerotiorum* and *R. solani*, respectively (table 2).

In present investigation, *Polygonum hydropiper*, a common weed found in the post harvest crop field is also found to be effective against *S. sclerotiorum* and *Rhizoctonia solani.* The results obtained for ethanolic leaf extracts *Polygonum hydropiper* also show a similar trend, as in case leaf extracts of *Solanum melongena*. They too show increasing inhibitory effect on the fungal growth with higher concentration compared to control. Sood and Dohroo (2003), while studying the efficacy of 16 plant extracts in controlling the leaf spot in ginger caused by *Phyllostica zingiberis* found that growth inhibition of fungi increased with increasing concentration of extracts. These results are in similar line with the works of earlier workers. Pretorius *et al*. (2003) studied extracts of 26 plant species against *Colletotrichum* sp. and *Rizhoctonia solani* among other pathogenic fungi. In reference to *S. scelerotiorum* as specific pathogenic fungi, study was carried out by Das and Das (2006). They screened 12 angiospermic plants extracts in and around the same locality of Sonitpur district. Out of these six plants extracts *Mikania scandence*, *Eupatorium odoratum*, *Cassia sophera*, *Leucus plunketii*, *Occimum basilicum* and *Clitoria ternate* were found effective in total inhibition of mycelial growth of *S. scelerotiorum*.

Plants are important source of potentially useful structures for the development of new chemotherapeutic agents. It was revealed in this study, that increase in the antifungal activity of the extracts was enhanced by increase in the concentration of the extracts. This finding agrees with the report of Banso *et al.* (1999) that higher concentration of antimicrobial substance showed appreciation in growth inhibition. The results of this study showed that leaf extracts of *Polygonum hydropiper* and *Solanum melongena* exhibit antifungal properties justifies their traditional use as medicinal plants. This may be due to the presence of active principles in the plant materials. Plants generally produce many secondary metabolites which constitute an important source of microbicides, pesticides and many pharmaceutical drugs (Ogundipe *et al*., 1998 and Ibrahim *et al*., 1997). It may be concluded that keeping aside the environmentally hazardous commercial fungicides, these leaf extracts could be a suitable substitute for controlling the fungal pathogens. However, further evaluation in field conditions is needed.

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References

Osman, K. A. and H. T. Abdulrahman (2003). Risk assessment of pesticide to human and the environment. *Saudi J. Biol. Sci*., **10** : 81-106.

Banso, A., S. O. Adeyemo and P. Jeremiah (1999). Antimicrobial properties of *Vernonia amygdalina* extract. *Journal of Applied Science and Management*, **3** : 9-11.

Ibrahim, M. B. (1997). Anti-microbial effects of extract leaf, stem and root bark of *Anogeissus leiocarpus* on *Staphylococcus aureaus*, *Streptococcus pyogenes*, *Escherichia coli* and *Proteus vulgaris*. *Journal of Pharmaceutical and Development*, **2** : 20-30.

Ogundipe, O., O. Akinbiyi and J. O. Moody (1998). Antibacterial activities of essential ornamental plants. *Nigeria Journal of Natural Products and Medicine*, **2** : 46-47.

Das, J. and T. K. Das (2006). Botanicals to control phytopathogenic fungus *Sclerotinia scelerotiorum* (Lib) De-bary. *Geobios*, **33** : 203-205.

Pretorius, J. C., S. Magma and P. C. Zietsman (2003). Growth inhibition of plant pathogenic bacteria and Fungi by extracts from Selected South African plant species. *South African Journal of Botany*, **69(2)** : 186-192.

Sood, R. and N. P. Dohroo (2003). Efficacy of botanicals *in vitro* against *Phyllostictus zingiberis* causing leaf spot of Ginger. *Plant Disease Research (Ludhiana)*, **18(2)** : 174-175.