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EFFECTS OF SOME ANGIOSPERMIC PLANT EXTRACTS ON *IN VITRO* VEGETATIVE GROWTH OF *FUSARIUM MONILIFORME*

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Abstract

Fifty five angiospermic plants were selected for evaluating the effect of their aqueous extracts on the *in vitro* vegetative growth of *Fusarium moniliforme* Sheldon. Extracts of 17 plants showed varied degrees of inhibitory effects on the test pathogen. For instance the leaf extract of *Lawsonia inermis* showed maximum inhibition (60.65 %) followed by roots of *Asparagus racemosus* (50.59 %). The possibility of using these plant extracts in seed treatment to control bakanae disease of rice is suggested. Antifungal property of leaves of *Andrographis paniculata* and *Lagerstroemia speciosa* against bakanae disease is reported here for the first time.

Bakanae is one of the major diseases of rice in Bangladesh and causes loss of yield up to 25% in susceptible varieties (Hossain *et al.* 2007). The disease is mainly seed borne and some seed dressing chemicals are usually used to control the disease. Because of growing awareness on the hazardous effects of chemical fungicides to human health and environment, use of plant extracts is becoming increasingly important to control plant diseases. Antifungal activity of different plant extracts has been reported earlier by several investigators against a number of plant pathogens (Hasan *et al.* 2005, Yang and Clausen 2007). However, a very few reports indicated the inhibitory effect of plant extracts against *Fusarium moniliforme* Sheldon (Miah *et al.* 1990). Thus, it is necessary to find out the plant parts which have antifungal principles against *F. moniliforme*.

A total of 55 angiospermic plants (Table 1) were selected for screening their effect on the vegetative growth of *Fusarium moniliforme*. The pathogen was isolated from the infected rice plants of BR-22 variety collected during T. aman season of 2005.

The selected parts of each plant were thoroughly washed in tap water, air dried and then used for the preparation of fresh extract. In case of leaves, bulbs, roots and rhizomes extracts were prepared by crushing fresh materials of known weight and added distilled water in the ratio of 1:1(w/v). However, in case of bark the ratio was 1:2 (w/v). The pulverized mass of a plant part was squeezed through four-folds of cheese cloth and the extracts were centrifuged at 3000 rpm for 20 minutes. The supernatant was filtered through Whatman filter paper No. 1 and the filtrate was collected in 250 ml Erlenmeyer flasks (Pyrex). A requisite amount of the filtrate of each plant was mixed with Potato Sucrose Agar (PSA) medium having 20% concentration and sterilized in an autoclave at 121°C under 10.35 K pascal (15 pounds) pressure for 15 minutes.

Effects of plant extract was tested following poison food technique and expressed as percentage of inhibition/stimulation of growth of the test pathogen. This was calculated by using the following formula:

Per cent growth inhibition/stimulation = $\frac{C \sim T}{C} \times 100$ where, C = growth in control,

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Table 1. Effect of 20% extracts of 55 angiospermic plant parts on the growth of *Fusarium moniliforme* Sheldon.

Sl. No.	Plant species	Plant parts	% growth inhibition/stimulation
1	*Lawsonia inermis* L. (Mendi)	Leaf	60.65
2	*Asparagus racemosus* L. (Shatamuli)	Root	50.59
3	*Solanum indicum* L. (Titbegun)	Leaf	38.82
4	*Andrographis paniculata* (Burm.f .) Wall. ex Nees (Kalomegh)	Leaf	33.53
5	*Eucalyptus citriodora* Hook. (Eucalyptus)	Bark, Leaf	29.41, 5.77
6	*Lagerstroemia speciosa* (L.) Pers. (Jarul)	Leaf	26.82
7	*Avicennia alba* Cl. (Bara baen)	Leaf	18.42
8	*Eupatorium odoratum* L. (Bara shialmuti)	Leaf	18.18
9	*Smilax macrophylla* Roxb. (Kumarilata)	Leaf	16.82
10	*Cuscuta reflexa* Roxb. (Swarnalata)	Whole plant	10.57
11	*Cinnamomum camphora* L. (Karpur)	Leaf	10.45
12	*Vangueria spinosa* Roxb. (Mainakata)	Leaf	10.18
13	*Mangifera indica* L. [Aam]	Leaf	5.77
14	*Eclipta prostrata* L. (Kalokeshi)	Leaf	4.61
15	*Leucas lavendulifolia* Sm. (Swetadron)	Leaf	3.29
16	*Boerhaavia repens* L. (Punarnava)	Leaf	2.44
17	*Cassia alata* L. (Dadmardan)	Leaf	0.66
18	*Datura innoxia* Mill. (Dhutura)	Leaf	+63.97
19	*Spilanthes acmella* L. (Marhatitiga)	Leaf	+55.48
20	*Wedelia chinensis* (Osb.) Merr. (Mahabhringaraj)	Leaf	+50.36
21	*Tagetes patula* L. (Ganda)	Leaf	+40.00
22	*Coccinea cordifolia* (L.) Cogn. (Telakucha)	Leaf	+39.82
23	*Centella asiatica* (L.) Urban (Thankuni)	Leaf	+34.29
24	*Catharenthus rosea* L. (Nayantara)	Leaf	+33.09
25	*Cinnamomum tamala* Nees (Tejpata)	Leaf	+31.65
26	*Lantana camara*L.var.*aculeata* (L.) Mold. (Lantana)	Leaf	+29.52
27	*Adhatoda vasica* Nees (Basak)	Leaf	+28.06
28	*Azadirachta indica* A. Juss. (Neam)	Leaf	+27.13
29	*Kalanchoe pinnata* (Lam.) Pers. (Pathorkuchi)	Leaf	+25.00
30	*Rauwolfia serpentina* Benth. (Sarpagandha)	Leaf	+20.00
31	*Zinnia elegans* L. (Zinnia)	Leaf	+20.00
32	*Syzygium cumini* (L.) Skeel (Jam)	Leaf	+18.71
33	*Allium cepa* L. (Piaz)	Bulb	+17.96
34	*Heliotropium indicum* L. (Hatishur)	Leaf	+17.33
35	*Euphorbia hirta* L. (Dudhiya)	Leaf	+16.37
36	*Curcuma longa* L. (Halud)	Rhizome	+14.97
37	*Dahlia hybrida* L. (Dalia)	Leaf	+14.67
38	*Vitex negundo* L. (Nishinda)	Leaf	+11.50
39	*Moringa oleifera* Lamk. (Sajna)	Leaf	+10.00
40	*Zingiber officinale* Rosc. (Ada)	Rhizome	+9.56
41	*Camellia chinensis* (L.) O.Kuntze (Cha)	Leaf	+9.33
42	*Phyllanthes niruri* L. (Bhui amla)	Whole plant	+9.33

(Contd.)

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43	*Mikania cordata* (Burm.f.) Rob. (Assamlata)	Leaf	+9.21
44	*Ocimum sanctum* L. (Tulsi)	Leaf	+8.85
45	*Aegle marmelos* (L.) Correa (Bel)	Leaf	+8.33
46	*Polygonum hydropiper* L. (Bishkatali)	Leaf	+7.96
47	*Cynodon dactylon* Pers. (Durba)	Whole plant	+7.89
48	*Chrysanthemum coronarium* L. (Chandramallika)	Leaf	+7.60
49	*Nigella sativa* L. (Kalogira)	Seed	+7.33
50	*Allium sativum* L. (Rasun)	Bulb	+6.80
51	*Psidium guajava* (L.) Bat. (Peyara)	Leaf	+6.00
52	*Corchorus capsularis* L. (Pat)	Leaf	+6.00
53	*Oxalis corniculata* L. (Amrul)	Leaf	+4.67
54	*Paederia foetida* L. (Gandhabadhuli)	Leaf	+3.59
55	*Gloriosa superba* L. (Ulat chandol)	Leaf	+2.99

+ = Stimulation of growth. Local names are given in parenthesis.

Effects of extracts on the growth of test fungus are shown in Table 1. The extracts of 17 plants showed different level of inhibitory effects on the test pathogen. Among them leaf extract of *Lawsonia inermis* showed maximum inhibition (60.65 %) followed by roots of *Asparagus racemosus* (50.59 %), leaves of *Solanum indicum* (38.82%) and *Andrographis paniculata* (33.53%), bark of *Eucalyptus citriodora* (29.41%) and leaf of *Lagerstroemia speciosa* (26.82%). However, the leaf extracts of *Avicennia alba, Boerhaavia repens, Cassia alata, Cinnamomum camphora, Eclipta prostata, Eucalyptus citriodora, Eupatorium odoratum, Leucas lavendulifolia, Mangifera indica, Smilax macrophylla, Vangueria spinosa* and the whole plant of *Cuscuta reflexa* were found to show less than 25% growth inhibition of the test pathogen (Table 1).

Saha (1997) reported that, leaf extract of *Lawsonia inermis* completely controlled the growth of *Drechslera oryzae, Sclerotium oryzae, S. rolfsii* and *Rhizoctonia solani* at 20% (w/v) concentration. In the present study another pathogen (*F. moniliforme*) was added in the list of sensitivity to the extracts of said plant species. The presence of antifungal principle lawsone (2-hydroxyl-1,4, napthoquinine) in the leaf extract of *L. inermis* had been identified (Tripathi *et al*.1978) which might have been responsible for these inhibition.

The present study shows higher level of inhibitory effect of *Eucalyptus citriodora* bark extract (29.41%) than the leaf extract (5.77%) indicating that different plant parts of the same species may have different levels of antifungal principles (Table 1).

The present study also shows that, leaf extract of *Andrographis paniculata* and *Lagerstroemia speciosa* resulted 33.53 and 26.82% growth inhibition of *F. moniliforme*, respectively and probably the first report on antifungal properties of these two plant species against the test pathogen.

Out of 55 plant parts, extracts of 38 showed stimulatory effect on *F. moniliforme*. Among them maximum stimulatory effect was found with the leaf of *D. innoxia* (+63.97%) followed by *S. acmella* (+55.48%), *W. chinensis* (+50.36%) and *T. patula* (+40.00%) (Table 1). The stimulatory effect of the autoclaved extract observed in some cases indicating the availability of nutrients without active antifungal substances. The stimulatory effects of plant extracts on various pathogens are also reported (Agarwal 1978, Saha 1997 and Hossain 1993).

It appears that the *Lawsonia inermis* and *Asparagus racemosus* may serve as candidates of plant species for their exploitation as potent fungitoxicants for controlling bakanae disease of rice. They may also be proved to be a natural fungitoxicants with broad spectrum activity.

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