Effect of plant products on the management of basal stem rot (*Ganoderma*) of coconut

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Among the 29 plant products tried, 10 per cent leaf extracts of *Solanum nigrum* exhibited the maximum inhibitory effect of 76 per cent reduction of mycelial growth of *G. lucidum* over control. Leaf extracts of *Pungamia glabra, Azadirachta indica, Prosopis juliflora, Gleome viscose and Tephrosia purpurea* were also effective in suppressing the mycelial growth of *G. lucidum* over control.

Abstract

Basal stem rot *(Ganoderma)* disease which is posing a potential threat to coconut cultivation is wide spread in India. An integrated approach is essential to manage the disease in endemic areas. Twenty nine plant products were evaluated *in vitro* and *in vivo* on the management of BSR of coconut. Ten per cent leaf extracts of *Pungamia glabra, Azadirachta indica* and *Prospis juliflora* were effective in suppressing the mycelial growth of *Ganoderma lucidum in vitro.* In field, these plant products recorded lesser disease index of BSR compared to control. All the plant products increased the population of fungi and bacteria in soil.

Introduction

Coconut is an important oilseed as well as plantation crop in India. Basal stem rot (BSR) or *Ganoderma* wilt of coconut caused by *Ganoderma lucidum* is a lethal disease affecting coconut production in Tamil Nadu and other major coconut growing states in the country. This disease which was reported in Thanjavur district in 1952 was confined to the coastal districts of Tamil Nadu till 1966 (Bhaskaran *et al.,* 1984). Gradually the disease spread and in 1980, the disease was present in all the coconut growing areas. Role of biofertilizers, organic manures and fungicides in the management of BSR has been reported earlier (Bhaskaran and Ramanathan, 1983; Bhaskaran *et al.,* 1989 and 1990). Attempts made on the use of botanicals on the management of BSR is reported in this paper.

Materials and Methods

Leaf extracts of 29 plant species were tested for their effect on the mycelial growth of *G.lucidum* by poisoned food technique by incorporating these extracts in potato dextrose agar medium. Mycelial growth of *G. lucidum* was measured after 6 days of incubation at room temperature and the results are expressed as per cent inhibition of mycelial growth of *G.lucidum* over control. One hundred grams of plant tissues (leaf/rhizome) were extracted with 100 ml of distilled water and filtered through double layers of muslin cloth. This extract was added to give one litre of the medium and sterilized at 20 lb pressure for 15 min in an autoclave.

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To study the effect of plant products on the incidence of BSR of coconut, a field experiment was conducted during December, 2001 with the effective plant products identified under *in vitro*. The plant products (leaves) were incorporated thoroughly in the basin of 20 years old diseased palms (with a disease index of below 15) @ 50 kg/palm and irrigated regularly. For each treatment 10 palms were maintained. At monthly interval the disease index was recorded by using the following formula (Bhaskaran and Karthikeyan, 1994).

$$D.I = 23.6 + 17.7\,h + 3.6\,r - 0.61$$

Where

h = height in metres upto which bleeding has spread in the stem

r = reduction in leaf size in 0-4 scale

1 = no. of functional leaves in the palm

Population of fungi, bacteria and actinomycetes were assessed (one year after the application of plant products) using differential media by dilution plate technique (Warcup, 1950).

Table 1.Effect of plant products on G. lucidum in vitro

Treatments	Radial growth of *G.lucidum* in cm*	Percent reduction over control
Solanum nigrum	2.2	75.55
Pungamia glabra	2.9	67.77
Azardirachta indica	3.0	66.66
Prosophis juliflora	3.1	65.55
Cleome viscosa	3.5	61.11
Tephrosia purpurea	3.5	61.11
Solanum trilobatum	3.9	56.66
Ocimum sanctum	4.1	54.44
Cliricida lucida	4.3	52.22
Vitex negundo	4.3	52.22
Musa sp (Rhizome extract)	4.5	50.00
Calotropis gigantea	4.5	50.00
Eucalyptus globulus	4.6	48.88
Mahualongifolia	4.6	48.88
Phyllanthus niruri	4.9	45.55
Tridox procumbens	5.1	43.33
Acalypha indica	5.2	42.22
Corriandrum sativum	5.3	41.11
Mentha arvensis	5.5	38.88
Sesbania grandiflora	6.0	33.33
Alternanthera sessilis	6.5	27.77
Murraya koengii	6.8	24.44
Hemidesmus indicus	7.0	22.22
Solanum xanthocarpum	7.0	22.22
Hibiscus rosasinensis	7.2	20.00
Typhonium trilobatum	7.3	18.88
Leuceana leucocephala	7.5	16.66
Callpaconium sp	7.6	16.66
Cynodon dactylon	7.6	15.55
Control	9.0	
C D (p = 0.05)	0.4	

**Mean for 3 replications*

Results and Discussion

Among the 29 plant products tried, 10 per cent leaf extracts of *Solanum nigrum* exhibited the maximum inhibitory effect of 76 per cent reduction of mycelial growth of *G. lucidum* over control (Table. 1). Leaf extracts of *Pungamia glabra, Azadirachta indica, Prosopis juliflora, Gleome viscose* and *Tephrosia purpurea* were also effective in suppressing the mycelial growth of *G. lucidum* over control. Banana rhizome extract is reported to be highly inhibitory to the mycelial growth of *G.lucidum in vitro* (Bhaskaran *et al.,* 1988). In the present study it gave only 50 per cent inhibitiion of mycelial growth of *G. lucidum* over control. Since *Solanum nigrum* inhibited the mycelial growth of *Trichoderma* spp. *in vitro* it was not tried under field conditions (unpublished).

In the field experiment all the plant products were effective in managing BSR disease compared to control. *Pungamia glabra* recorded the least disease index of 21.3 during April 2003, an increase of 11.3 disease index over the initial value (Table 2). This was followed by *Azadirachta indica* and *Prosopis juliflora* which recorded 23.6 and 28.1 disease index comapred to 47.5 in control. Bhaskaran *et al.,* (1988) observed lesser increase in disease index in the palms applied with neem cake compared to control. Incorporation of these plant products into soil has resulted in the increase of soil microbes especially fungi and bacteria (Table 3). However there was not much variation in the population of actinomycetes. Addition of leaf manures like neem and leuceansa performed well in reducing the

*Table 2.Effect of plant products on BSR of coconut in vivo**

Treatment	Disease index Initial (Dec. 2001)	During April, 2003	Increase over initial
Pungamia glabra	10.0	21.3	11.3
Azadirachta indica	10.4	23.6	12.2
Prosopis juliflora	9.9	28.1	18.2
Control	10.3	47.5	37.2
C D (p=0.05)			

**Mean of 10 palms*

*Table 3. Effect of plant products on microbial population in soil**

Treatment	Population of microorganisms in soil: Fungi 10^3 A	Fungi 10^3 B	Bacteria 10^5 A	Bacteria 10^5 B	Actinomycetes 10^2 A	Actinomycetes 10^2 B
Pungamia glabra	47	142	19	173	11	24
Azadirachta indica	45	126	22	146	14	26
Prosopis juliflora	41	94	20	102	16	22
Control	46	52	21	22	13	15
C D (p=0.05)	NS	13	NS	26	NS	8

**Population per g of dry soil*

A : Initial population

B : Population one year after treatment

incidence of black gram root rot, survival of *Macrophomina phaseolina* and increased the population of micro organisms (Samiyappan, 1988). Disease suppression may be due to the increase in the population of antagonistic microflora in soil or due to the direct effect of the plant products on the pathogen.

In the present study, soil application of plant products has resulted in slow progress of disease in BSR infected coconut palms and no complete control could be obtained. Hence for the management of BSR of coconut an integrated approach is needed and application of these green leaf manures holds promise to form an ideal partner in the system.

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References

Bhaskaran, R., Ramanathan, T. and Ramaiah, M. 91984). Thanjavur wilt of coconut, its occurrence, spread and management, Proc. *PLACROSYM VI* : 107-113.

Bhaskaran, R. and Ramanathan, T. (1983). Role of fertilizers and organic manures in Thanjavur wilt of coconut. *Indian Coconut Journal.* **14** (3) : 1-5.

Bhaskaran, R., Rethinam, P. and Nambiar, K.K.N. 91989). Thanjavur wilt of coconut. *Journal of Plantation Crops.* **17** (2) : 69-79.

Bhaskaran, R., Suriachandraselvan, M. and Ramachandran, T. K. (1990). *Ganoderma* wilt disease of coconut - A threat to coconut cultivation in India. *The Planter,* **66** : 467-471

Bhaskaran, R. and Karthikeyan, A. (1994) A method for assessing severity of basal stem rot disease of coconut. *Journal of Plantation Crops.* **22** (2) : 93-96.

Bhaskaran, R., Ramadoss, N. and Ramachandran, T. K. (1988). Biological control of Thanjavur wilt disease of coconut. *Indian Coconut Journal.* **19** (6) : 3-8.

Samiyappan, R. 91988). *Biological control of black gram root rot caused by Macrophomina phaseolina (Tassi) Goid.* Ph. D. thesis, TNAU, Coimbatore. 169. p.

Warcup, H.H. (1950). The soil plate method for isolation of fungi from soil. *Nature.* **175** : 953-954.

Semi automatic coconut scrapper

A semi automatic scrapper intended for scrapping coconut has been developed by Shri. Sajeev Singh, Vizhinjam, Thiruvanathapuram. In this machine there is no need to hold the coconut in hand so that the risk of accidents while scrapping coconut is avoided. Coconut is hold by jaws which moves to the centre of the machine and hold coconut from three sides. A whole coconut can be scrapped in two minutes. The handle has to be moved in different directions while scrapping. The machine is using a quarter power AC motor which is used in a table top grinder.

Entrepreneurs interested in the production of this scrapper on commercial scale may contact,

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