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ACTINOMYCETE POPULATION IN THE RHIZOSPHERE OF *HEVEA* AND ITS INHIBITORY EFFECT ON *PHELLINUS NOXIUS*

Brown root disease of rubber caused by the soil borne fungal pathogen *Phellinus noxius* (Corner) G. H. Cunn. has been reported from India and from other rubber growing countries (Sharples, 1936; Ramakrishnan and Radhakrishna Pillai, 1962). The pathogen multiplies on left-over stumps of felled rubber or other plants. The disease symptom could be normally noticed only at advanced stage of invasion of the pathogen and the recommended control measures such as removal of infected roots and drenching the base of the infected plants and healthy ones around with fungicides give limited success. This warrants effective control measures, preferably a prophylactic treatment. A modern approach of plant disease control is the use of antagonistic micro-organisms which is safe and economic. A number of reports are available on the inhibition of soil borne plant pathogens by actinomycets from soil (Baker and Cook, 1974; Kochuthresiamma *et al.*, 1988). A preliminary study was conducted on the occurrence of actinomycete population in the rhizosphere of five clones of rubber and their antagonistic activity towards *P. noxius* and the results are reported.

Budded stumps of clones (Table 1) were planted in earthen pots. After 24 months of growth, roots were collected at random and used for enumeration of actinomycetes population following the method of Timonin (1940) using Kenknights' agar medium. Population from soil collected away from root zone was also assayed. The actinomycete colonies were transferred to nutrient glucose agar slants after purification and tested for inhibitory activity against *P. noxius* using cross streak assay technique (Grove and Randall, 1955) in potato dextrose agar medium. Inhibition zone in each was measured after incubation at room temperature for seven days.

To study the antagonistic activity in sterile soil, four actinomycetes (PR 4, PR 10, 9/600 and 4/516) showing inhibition zones of 16 mm, 15 mm, 6 mm and 15 mm respectively were inoculated in sterilised soil in a 100 ml conical flask. Suitable control without inoculation was maintained. After one week all the flasks were inoculated with 5 mm discs of actively growing mycelia of *P. noxius* and the growth of the pathogen was monitored upto one month by visual observation.

In order to study the growth of the pathogen on sterile rubber wood in the presence and absence of actinomycetes, twigs of 2 cm diameter, cut into 7 cm pieces were taken, sterilised and inoculated with the four isolates. These were placed in conical flasks containing a mat of *P. noxius* on PDA medium. The wood pieces without any actinomycete served as control. All the twigs were examined periodically upto 30 days for growth of the pathogen.

The actinomycetes population in the rhizosphere of five clones of *Hevea* are given in Table 1. Total actinomycete population was 1.8–3.5 fold in the rhizosphere of *Hevea*, than in the soil away from the root zone. Percentage of actinomycetes showing inhibitory activity upto 0.9 cm against *P. noxius* was high in F 4542 and RRIM 701. Though the population of actino-

mycetes was low in non rhizosphere soil, 25 per cent of them were found to inhibit *P. noxius*. Percentage of actinomycetes showing higher degree of antibiosis (1–2 cm zone) was more in clones Fx 516 and PR 107. When the total percentage of antagonists was taken into account Fx 516 and F 4542 ranked first. The population of antagonists could not be correlated with clonal susceptibility as no information is available on susceptibility of these clones to brown root disease. All the selected actinomycetes inhibited the growth of *P. noxius* both in the soil and in rubber wood pieces under sterile condition.

Table 1. **Population of actinomycetes in *Hevea* rhizosphere**

Clone	Actinomycetes	Inhibition of antagonistic actinomycetes (%)		
	x 10^3 g^{-1}	Upto 0.9 cm	1–2 cm	Total
Fx 516	125	22.5	36.3	58.8
F 4542	180	36.4	18.2	54.6
RRIM 701	251	35.0	10.0	45.0
PR 107	148	10.0	30.0	40.0
RRIM 600	147	26.7	13.3	40.0
Soil	71	25.0	12.5	37.5

One of the benefits plants derive from rhizosphere microflora is protection from root pathogens. The enhanced population of antagonistic actinomycetes in the rhizosphere region of plants as seen in the present study is well documented (Agnihothrudu, 1955; Rangaswami and Vasantharajan, 1962). The phenomenon of increased antagonistic actinomycetes population was effectively utilised for the control of root disease of maize (Rangaswami and Vidyasekaran, 1966).The high percentage of antagonistic actinomycetes observed in the present study, confirms the findings of Broadbent *et al.* (1971) who examined 3500 isolates of actinomycetes and found 40 per cent of them to be effective against various plant pathogens. While investigating the reduced white root disease incidence in rubber under good ground cover, Fox (1965) suggested that the augmented population of antagonists under leguminous cover crops might be a reason. Garrett (1965) pointed out that biological control can be brought out by either introduction or augmentation of one or more species of controlling organisms or by change in the environmental conditions which favour the multiplication and activity of such organisms or a combination of both. It might therefore be possible to control brown root disease of *Hevea* by introduction of theses actinomycetes.

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