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Management of purple root disease of *Hevea brasiliensis* seedlings in nursery

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In India, purple root disease of *Hevea brasiliensis* seedlings in nursery caused by *Helicobasidium compactum* Boedijn was first reported by Rajalakshmi and Joseph (1994) from Kerala State and in North East India by Mondal and Deka (2004). The disease caused a heavy loss of plants (above 45%) during 1998 in Meghalaya. In China, violet (purple) root disease was reported to be one of the major root diseases that destroys rubber plants of all age groups (Zhang and Chee, 1989a and 1989b; Zhang *et al*., 1990). Severe incidence of purple root disease on rubber caused heavy loss in plant stand in Java and Indonesia (De Fluiter, 1939). *H. compactum* is reported to infect wide range of host plants like *Eupatorium odoratum, Pueraria phaseoloides, Centrosema pubescens, Tectona grandis* (Rajalakshmi and Joseph, 1994; Mondal and Deka, 2004). Studies on the management of purple root disease of *H. brasiliensis* in India are scanty (Idicula *et al*., 2002). Thus, the study on identification of effective and economic control measures for the management of this disease assumes importance.

A field trial was conducted on eight-month-old *H. brasiliensis* seedlings in nursery during 2003-06 at District Development Centre, Rubber Board, Jenggitchakgre, Tura under West Garo Hills District of Meghalaya. The nursery for this experiment was raised in a susceptible pocket where the mortality of seedlings due to purple root disease was above 45 per cent. During the first year, twelve treatments were imposed on eight-month-old seedling plants in a RBD with three replications per treatment (40 plants per replication) in the nursery (Table 1). The fungicides were sprayed on the collar zone of seedlings for three rounds at an interval of one month (1.5 litre solution bed^{-1} $round^{-1}$). Disease incidence was estimated from one-year-old seedling plants in the experimental plots after the completion of treatments. To estimate disease incidence, the total number of seedling plants and total number of diseased seedlings per experimental plot (3.0 x 1.2 m with 40 seedlings) were recorded, irrespective of the grade of the disease and expressed as percentage. The reduction (%) in purple root disease over control was also calculated. The experiment was repeated in another susceptible pocket of the nursery for one more year after leaving the nursery beds fallow for two years, for confirmation of the results.

The incidence of purple root disease on the seedlings and reduction of disease over control in different experimental plots in nursery are presented in Table 1. In untreated control plots (T1), the incidence of purple root disease on the seedlings was very high (12%) after two years of study. Shrivelled appearance with sparse crown and profuse growth of adventitious roots from the collar zone of *Hevea* seedlings were found in the advanced stages of infection (Fig. 1). The presence of 10 to 15 cm long, resupinate, 6 to 10 mm thick purple coloured distinct fruiting body girdling the collar zone of the infected seedlings was also observed as typical symptom of the disease (Fig. 2). The infection led to yellowing of leaves and caused mortality of the affected plants. Significant reduction of purple root disease was observed in all the experimental plots except T8 and T9 compared to the control. Reduction in disease by 35 and 68.4 per cent were observed in T8 and T9 indicating that if

Table 1. Effect and cost of different treatments used for management of purple root disease of *Hevea* seedlings in nursery

Treatments	Incidence of purple root disease (Mean of two years)		Percentage reduction of disease over control	Cost (₹ per bed of 40 seedlings per round)
	Mean of affected plants per replication (nos.)	Disease incidence (%)		
T1 (Untreated control)	4.8	12.0	-	-
T2 (Propiconazole 0.1%)	0.15	0.4	96.7	5.10
T3 (Propiconazole 0.2%)	0	0	100	10.20
T4 (Propiconazole 0.1% alternate with tridemorph 0.15%)	0	0	100	-
T5 (Tridemorph 0.15%)	0	0	100	2.31
T6 (Tridemorph 0.3%)	0	0	100	4.62
T7 (Tridemorph 0.15% alternate with carbendazim 0.15%)	0	0	100	-
T8 (Carbendazim 0.15%)	3.1	7.8	35.0	3.46
T9 (Carbendazim 0.3%)	1.5	3.8	68.4	6.93
T10 (Carbendazim 0.15% alternate with propiconazole 0.1%)	0	0	100	-
T11 (Bioflora natural: 20g/bed)	0	0	100	4.80
T12 (Fallow bed for two years)	0	0	100	-

Fig. 1. Affected plant showing profuse growth of adventitious roots from the collar zone of *Hevea* seedling with damaged tap root

Fig. 2. Enlarged view of fruiting body (indicated by arrow) of the pathogen girdling the collar zone of the infected seedling

the dosage of the fungicides tested for control of the disease were increased, better control would have been possible. From this study, it is observed that tridemorph and propiconazole are effective fungicides for the management of purple root disease of rubber. Similar result was obtained from South India where the effective concentration of treidemorph and propiconazole against purple root disease were 0.25 per cent and 0.1 per cent, respectively (Idicula *et al*., 2002). The efficacy of tridemorph, propiconazole and hexaconazole against the management of root disease of rubber was also reported (Lam and Chiu, 1993; Idicula *et al*., 2002). Cleaning of land by removing most of the root fragments of the previous stands resulted in significant reduction in potential sources of root disease (Zhang and Chee, 1989b; Zhang *et al*., 1990).

Reduction in inoculum level while leaving beds fallow for two years (T12) which made the bed devoid of living host was also reported earlier from South India (Idicula *et al*., 2002). However, soil from disease affected plantation continues to spread the disease for a long time (Huang, 1990) if mixed with unaffected soil.

The high cost of fungicides used in root disease management restricts planters from spraying/drenching infected plants. It is observed that among the treatments tried, tridemorph (0.15%) was the cheapest systemic fungicide (₹ 2.31 bed^{-1} round^{-1}) followed by bioflora natural (₹ 4.80 bed^{-1} round^{-1}) for the management of purple root disease (Table 1). It was also observed that fallow bed (T12) was economically better suited than the other treatment for management of purple root disease of *H. brasiliensis* seedlings in nursery.

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