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EVALUATION OF DUST FORMULATIONS OF TWO SYSTEMIC FUNGICIDES FOR THE CONTROL OF POWDERY MILDEW DISEASE OF *HEVEA BRASILIENSIS*

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ABSTRACT

The systemic dust formulations of the fungicides, tridemorph 1.5% a.i. and carbendazim 1.5% a.i. were evaluated for their effectiveness in controlling powdery mildew disease of rubber in disease prone areas for two seasons. Both the formulations were more effective than sulphur dust. Integrated schedule involving both systemic and non systemic fungicides was as effective as the systemic fungicides, but was superior to non systemic fungicide when either was used alone. The advantages of the integrated approach are discussed.

INTRODUCTION

Powdery mildew disease of rubber (*Hevea brasiliensis*) caused by *Oidium heveae* is known to be one of the most serious diseases in all rubber growing countries (Liyanage and Jacob, 1993). This disease causes crop loss of 13.5 to 32.0% in disease prone areas in India (Jacob et al., 1992). Four to six rounds of sulphur (70%) dusting with dust formulation was recommended for the control of this disease (Ramakrishnan and Radhakrishna Pillai, 1962). Thermal fogging of systemic fungicides was also reported to be effective (Edathil *et. al.* 1984; Radziah *et. al.* 1992). But thermal fogging did not gain popularity due to fire hazards. The use of dust formulation of tridemorph was observed to be effective when integrated with sulphur dusting (Edathil *et. al.* 1992). The present study was to evaluate two systemic fungicides tridemorph and carbendazim and to develop an integrated schedule for controlling the powdery mildew disease.

MATERIALS AND METHODS

Field experiments were laid out at Kulasekharam (Kanyakumari district) and at Panamaram (Wynad district) in the first season (1992). In the second season (1993) the experiment was conducted at Nadavayal (Wynad district) only. The clone included in the study was RRIM 600 at Kulasekharam and Nadavayal while it was muture Tjir 1 seedlings at Panamaram. Ten trees were selected in each one hectare plots when the trees had no leaves soon after winter. The schedules of dusting were fixed as per the table I to III at each location. Dusting was carried out at 15 days intervals, with the first round applied when nearly ten per cent of the trees had refoliated. Systemic dusts were applied at the rate of 7 kg./ha per round while sulphur (70%) was dusted at the rate of 12 kg/ ha. per round.

The disease intensity was evaluated by scoring five leaves in each of four twings collected from every sampling tree, taking care to collect twigs from different heights and

directions. The disease intensity was scored on a 0-10 scale, the percentage disease index calculated and analysed statistically.

RESULTS AND DISCUSSION

In the first season, higher powdery mildew disease intensity was observed at Kulasekharam. However, among the three trials, maximum disease intensity was recorded in the second season at Nadavayal (Table I, II and III).

In the trial at Kulasekharam, minimum disease intensity was recorded in plots which received initial two rounds of tridemorph followed by those which received initial two rounds of carbendazim. Plots which received one round of either of these systemic fungicides followed by two rounds of sulphur, although showed more disease, did not differ statistically from those which received two rounds of systemic fungicides. Sulphur dusted plots showed severe disease (Table I). Unprotected control treatment could not be maintained as the estate management did not permit it.

In the trial at Panamaram, the disease intensity in plots which received two rounds of systemic fungicides with one round of non-systemic in between was on par with the plots which received three rounds of systemic fungicide dusting. The plots which received three rounds of sulphur dusting recorded significantly higher disease intensity when compared to those which received systemic fungicide dusts, but was considerably lower when compared to undusted control (Table II).

In the second season trial at Nadavayal, the disease intensity was much higher. Even under such high disease incidence the systemic fungicides either alone or in integrated schedule with sulphur dust recorded lower disease intensity. These treatments were on par, while sulphur dusted plots recorded significantly

Table I. Percentage disease index under different schedules of dusting in clone RRIM 600 at Kulasekharam

Treatment rounds*			Disease index
1	2	3	
T	S	S	30.45
C	S	S	28.95
T	T	S	21.90
C	C	S	23.75
S	S	S	48.45
	CD (P = 0.05)		13.30

* Treatments

T - Tridemorph 1.5% D 7 kg/ha.
C - Carbendazim 1.5% D 7 kg/ha.
S - Sulphur 70% 12 kg/ha.

Table II. Percentage disease index under different schedules of dusting in clone Tjir 1 at Panamaram

Treatment rounds*			Disease index
1	2	3	
T	S	T	17.50
C	S	C	15.95
T	T	T	14.65
C	C	C	23.65
S	S	S	35.25
	CD (P = 0.05)		7.23

* Treatments

T - Tridemorph 1.5% D 7 kg/ha.
C - Carbendazim 1.5% D 7 kg/ha.
S - Sulphur 70% 12 kg/ha.

Table III. Percentage disease index under different schedules of dusting in clone RRIM at Nadavayal

Treatment rounds*			Disease index
1	2	3	
T	S	T	52.60
C	S	C	55.80
T	T	T	53.00
C	C	C	47.90
S	S	S	62.90
	Control		85.30
	CD (P = 0.05)		7.24

* Treatments

T - Tridemorph 1.5% D 7 kg/ha.
C - Carbendazim 1.5% D 7 kg/ha.
S - Sulphur 70% 12 kg/ha.

higher disease intensity. However, sulphur also afforded good protection when compared to undusted control (Table III).

Tridemorph is reported to reduce the infection by *O.heveae* and increase the density of rubber canopy (Radziah *et. al.* 1992). Edathil *et. al.* (1992) reported effectiveness of dust formulation of tridemorph and foliar spray of wettable formulation of carbendazim. To get comparable protection with sulphur dusting at closer intervals more rounds of dusting might be necessary.

Systemic fungicides have the advantages of quick uptake and rapid translocation which help in protection of plant parts not covered and those growing subsequently and nullifying the effect of exposure to adverse weather conditions (Vyas, 1993). The most serious limitation to the use of these fungicides is the development of resistance in some fungi. This can be overcome by use of fungicides with different mechanisms of action either as mixtures or alternatively (Delp, 1980; Staub, 1991). Sulphur, carbendazim and tridemorph have different modes of action and can therefore form components in an integrated dusting schedule.

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