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A NEW FUNGICIDE TO CONTROL BLACK STRIPE DISEASE OF RUBBER (*HEVEA BRASILIENSIS*)

by

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SUMMARY

A new fungicide Code No. San 374 F4 PA09 significantly controlled the spread of black stripe disease on four Hevea *clones, artificially inoculated with* Phytophthora meadii. *The same fungicide caused a decrease in the number of depressions on the bark in naturally infected trees, although the length of depressions were not reduced. The number of lesions formed was less after the application of San 374 F4 PA09 compared with all other fungicides tested.*

INTRODUCTION

The application of fungicides as a preventive and curative measure for the control of bark rot caused by *Phytophthora* spp. started in 1916 in Sri Lanka (Petch, 1918) and the practice has been widely carried out since the mid 1940s. Today most estates use water miscible fungicides to protect the tapping panels from May to September each year when the disease is most severe. This Institute recommends the application of selected fungicides during this period on the tapping cut each day after latex is collected. To prevent the fungicides from being washed off by frequent rains, tapping cuts are treated with a waterproof panel dressing at fortnightly or monthly intervals (Perics, 1965; Liyanage *et al*, 1977).

The fungicides popularly used in Sri Lanka both as prophylactic and curative measures are Antimucin (Phenyl mercuric acetate), Brunolinum plantarium (Phenolic substance) and Difolatan (Captafol). Of the three, Antimucin is the most popular fungicide because it is effective at comparatively low concentrations and is cheaper. However, the need to apply fungicides daily is inconvenient and increases the cost. Also, the results under field conditions are often inconsistent, and unsatisfactory, particularly due to the fungicide being washed away by frequent rains. Antimucin is a mercury based fungicide and due to its toxicity attempts should be made to replace it with an effective and safe chemical.

MATERIALS AND METHODS

To achieve maximum information in a short period, this study was limited to two aspects.

(1) Antimucin, Difolatan and the systemic fungicides, Ridomil and Aliette, already recommended for control of *Phytophthora* diseases in many crops were compared with the fungicide code No. San 374 F4 PA09 (Paste

formulation), to determine its efficacy as a prophylactic fungicide for panel treatment for rubber. Eight year old rubber trees, in a budwood nursery were selected as test trees for this experiment.

(2) Infected mature rubber trees were also treated with the above named fungicides to determine the comparative efficacy in controlling *Phytophthora* panel disease, under field conditions.

Screening of fungicides on budwood nursery plants.

Four clones of rubber (PB 86, RRIC 45, RRIM 600 and RRIM 602) susceptible to bark rot with selected tree trunks of uniform size (15 - 25 cm circumference) were chosen for the experiment. On each, at approximately 1.5 m above ground level, an area of bark 30 cm long and encompassing half the circumference of the tree, was lightly scraped with a hard brush. Fungicides, at concentrations given below, were applied to these areas every week for 8 weeks using a paint brush.

Aliette (80% w.p.) at 1.6%
Ridomil (25% w.p.) at 0.4%
Difolatan (40% a.i.) at 1.6%
Antimucin (16.5% a.i.) at 0.8%
San 371 F4 PA09 (oxadixyl 4% a.i.)—applied as a paste.

Distilled water was used on control trees. Three trees per clone were used for each treatment. After eight applications were completed the trees were inoculated with a zoospore suspention (10^4 zoospores / ml) of *Phytophthora meadii*, using the method described by Satchuthananthavale *et al* (1974).

A plug of bark 2 cm diameter was removed with a cork borer at the centre of the scraped area. Exuding latex was allowed to coagulate and then removed with cotton wool. A plug (2 cm diameter) of sterilized absorbant cotton wool, previously soaked in the zoospore suspension, was inserted into each cavity and this was covered with adhesive tape to prevent drying. After 3 weeks the tape was removed and the bark pared off with a knife to expose the area infected. The lesion developed on the surface of the wood was immediately traced on to paper and the area infected was calculated using a planimeter.

Effect of fungicides on the control of *Phytophthora* panel disease

For this experiment, 258, rubber trees, each 8 years old were selected in July 1985, within a badly infected rubber plantation, showing typical symptoms of bark rot disease. An assessment of the damage shown superficially as sunken vertical depressions on the bark was made by counting these. The fungicides and the concentrations used were the same as for the budwood nursery plants except that a lower concentration of Difolatan (0.8%a.i.) was also included as a treatment. Forty trees were

used for each treatment and 18 trees were left untreated as controls. Fungicides were applied weekly for 12 weeks to unscraped bark covering the area infected, approximately 7.5 cm from the tapping cut upwards. The trees were tapped as usual. Two weeks after the final application each tree was examined carefully for the number of old depressions, new depressions and their lengths.

RESULTS AND DISCUSSION

The fungicide experiment on budwood nursery plants gave variable results with some of the fungicides. Nevertheless it was clear that San 374 F_4 PA09 controlled the spread of the disease significantly in all four clones tested (Table 1).

Table 1. *Effect of fungicides on nursery plants*

Fungicide	Mean lesion area (cm^2) in clone			
	RRIC 45	RRIM 600	RRIM 602	PB 86
Aliette	13.3	14.5	12.9	17.8
Ridomil	13.9	9.8	8.0	12.3
Difolatan	11.6	13.6	12.9	12.6
Antimucin	11.1	10.8	10.4	16.5
San 371 F_4 PA09	8.9	7.9	6.5	6.4
Untreated (control)	15.5	19.2	11.6	13.4

Variance ratio (F values) : Fungicides 7.67 $P \leq 0.001$) ;
clones 2.4 (n.s.) ; fungicides x clones 1.32 (n.s.)

Trees treated with the other fungicides Difolatan, Ridomil and Antimucin also had smaller lesions compared to the untreated trees although Antimucin did not give satisfactory control on clone PB 86. Aliette too did not give satisfactory results. With three of the four clones treated with this fungicide lesions were as large or larger than in the control. The fungicide San F_4 PA09 seems to have a greater fungitoxic activity against *Phytophthora meadii* than other fingicides tested, as it controlled the spread of the lesions significantly on all four clones.

The experiment on the effect of fungicides on the control of the disease in already infected trees showed that the number of depressions on the bark decreased after the application of the fungicides but increased on the untreated (control) trees (Table 2). However, the total length of the depression increased in all cases particularly so in the trees treated with Antimucin. This indicates that some depressions extended in length on the bark, even after treating with fungicides. New depressions developed

closer to the tapping cut in all treatments but the number and their length were much less in the trees treated with San 371 F_4 PA09 and Difolatan. In the untreated control in addition to producing a large number of new depressions, exudation of latex on the panel, through cracked bark was observed. The new fungicides San 371 F_4 PA09 and Difolatan proved to be effective in controlling *Phytophthora* panel disease, particularly both the preventive and curative action of San 371 F_4 PA09, were noteworthy. The fungicide San 371 F_4 PA09 has the added advantage of being retained on the panel for a longer time than the other fungicides tested and therefore, applications could be done weekly instead of daily. Though these are effective in short-term trials, their long term activity has to be assessed as some pathogens are known to have developed resistance to continuous use of the same fungicide. In this context, the use of mixtures of fungicides and/or alternative use of different effective fungicides particularly as prophylactic applications, could reduce the chances of natural selection of resistant strains of the fungus.

Table 2. *Lesion development on clone PB 86 in the fungicidal trial on infected mature trees*

	Mean No. depressions[a]		Mean length of depressions[a] (cm)		New depressions[a]	
Treatment	Before	After	Before	After	No.	Length(cm)
Antimucin	8.7	5.3	3.3	9.2	0.9	3.4
San 371 F_4	7.2	4.0	3.7	7.3	0.3	1.9
Ridomil	7.8	4.3	3.4	6.7	1.4	3.4
Aliette	7.4	4.7	3.9	7.8	0.9	3.8
Difolatan (0.8%a.i.)	8.7	5.5	3.4	6.9	1.3	3.9
Difolatan (1.6%a.i.)	10.2	4.7	3.1	6.6	0.2	4.1
Untreated (control)	7.7	8.1	3.8	6.8	11.7	3.4

[a]Each reading is a mean of 40 trees except in the untreated (control) where it is a mean of 18 trees.

As fungicides, have to be used regularly on the panels during the long disease period, the cost of any selected fungicide has to be assessed and its availability has to be assured.

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