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# DRY ROT DISEASE MANAGEMENT IN *HEVEA BRASILIENSIS*

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Three years trials on screening of different fungicides indicated that methoxyethyl mercury chloride, thiram, oxycarboxin, carbendazim, thiophanate methyl and propiconazole were effective in checking dry rot disease of rubber and were superior to Bordeaux paste. Comparison of two carriers for fungicides viz., pidivyl compound and petroleum wound dressing compound indicated a significant superiority of the latter. The interaction between fungicide and carrier was also significant. Incorporating the fungicide in petroleum compound and applying to the affected area was as effective as applying fungicide solution followed by subsequent application of petroleum compound.

*Key words* - *Hevea brasiliensis*, Dry rot disease, Fungicides, Carriers, Application methods.

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## INTRODUCTION

Dry rot disease caused by the fungus *Ustulina deusta* (Hoffm. ex Fr.) Lind. was of less prominence in rubber plantations of South India. However, in recent years the occurrence of this disease had been on the increase and a large number of trees was lost due to the lack of timely detection (Fig. 1) and treatment. Varghese (1971) conducted inoculation studies and observed that deep wounds resulted in significantly more infections than medium or light wounds. He reported that infection occurred through lenticels and moribund root initials. Bordeaux paste was used by planters for controlling the disease. However, under moderate to high disease incidence and high rainfall conditions, this fungicide did not provide adequate control. In order to find out effective fungicides, suitable carriers and appropriate method of application, under South Indian conditions, trials were carried out from 1985-86 to 1987-88, in an estate where an out-break of this disease in a large area was reported. The results are presented in this paper.

## MATERIALS AND METHODS

### (a) Screening of fungicides

Five fungicides, viz., methoxyethyl mercury chloride (MEMC 0.015 per cent a.i.), Bordeaux paste, tridemorph (1 per cent a.i.), thiram (0.75 per cent a.i.), and oxycarboxin (0.5 per cent a.i.) were screened for their efficacy in checking the disease. Each fungicide was applied at the infected loci after removing the decayed bark and wood. On drying, a wound dressing petroleum compound (WDC) was applied over the cut surface. WDC, applied alone after washing the cut surface with water, served as the control. Each treatment was applied on 15 trees and the treatments were imposed during September each year.

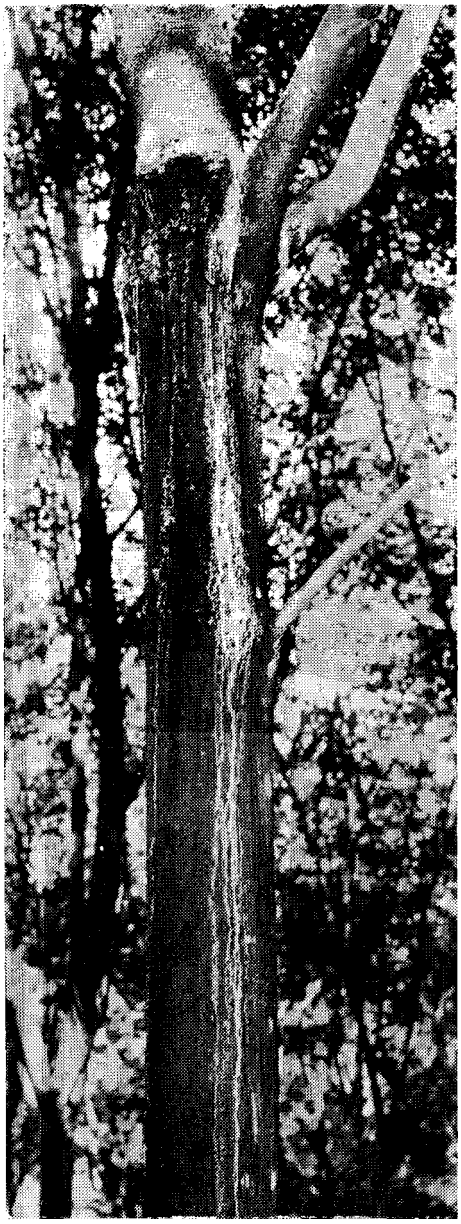

Fig. 1. A dry rot affected rubber tree.

**(b) Comparison of carriers for fungicides**

Two carriers for fungicides, viz., pidivyl china clay compound and a wound dressing petroleum compound were compared for their efficacy. The pidivyl compound was prepared by mixing polyvinyl acetate, china clay and water in 1:2:4 proportion as described by Jacob and Edathil (1986). The fungicide was added to this compound to get the required concentration and stirred well for thorough mixing. In the case of WDC, a mechanical stirrer with 0.25 HP motor was used for 10 minutes for proper mixing of the fungicide. Both the compounds were applied directly on the cut surface. The fungicides included in this experiment were MEMC (0.015 per cent a.i.), mancozeb (0.75 per cent a.i.), thiophanate methyl (0.35 per cent a.i.), carbendazim (0.5 per cent a.i.), tridemorph (1 per cent a.i.) and propiconazole (0.2 per cent a.i.).

**(c) Comparison of methods of application**

Three fungicides, viz., MEMC, carbendazim and thiram which are commonly available and had given satisfactory control in earlier experiments were tested by two methods of application. In one method, the fungicide solution was prepared in water and used for washing the affected areas and after drying, the wound dressing petroleum compound was applied. In the other, the fungicide was directly incorporated with the petroleum compound with which the affected area was dressed.

In all the above cases the experimental trees were graded, based on symptoms, before fungicide application and kept under observation till the next rainy season. The final disease intensity was calculated and the percentage recovery from the disease was subjected to analysis. The various grades and the index numbers used in this study are given below:

a – Healthy, no disease (0)

b – Mild latex exudation (3)

c – Profuse latex exudation, discoloration on bark and wood (5)

d – Formation of fruiting bodies of the fungus and development of new shoot sprouts from below the affected area (7)

e – Trees blown over or dried (10)

Percentage disease intensity (PDI) was calculated using the formula:

$$PDI = \frac{NR \times 100}{NP \times MG}$$

where NR = Sum of numerical ratings

NP = No. of points observed, and

MG = Maximum grade

Percentage recovery was calculated as the difference between the initial PDI and the final PDI.

## RESULTS AND DISCUSSION

The percentage recovery from disease presented in Table 1 indicated that all treatments were significantly superior to Bordeaux paste. MEMC + WDC gave the maximum recovery and was on par with oxycarboxin+ WDC, thiram + WDC and tridemorph + WDC. The application of wound dressing petroleum compound alone recorded a better recovery than Bordeaux paste. Petroleum products, like tar, were recommended for control of some stem diseases of rubber and other tree crops (Petch, 1921; Hilton, 1958). The cut surfaces of trees applied with Bordeaux paste do not prevent moisture absorption and due to this, secondary infection occurred during heavy rains, whereas the petroleum compound kept moisture off and protected the wounds from invasion by fungus.

Table 1. **Effect of fungicides on recovery from dry rot**

| Treatments | % disease recovery | |
|---|---|---|
| MEMC + WDC | 81.0 | (90.0) |
| Bordeaux paste | 22.0 | (23.4) |
| Tridemorph + WDC | 58.7 | (66.1) |
| Thiram + WDC | 74.3 | (83.8) |
| Oxycarboxin + WDC | 78.0 | (86.7) |
| WDC alone | 47.2 | (50.5) |
| CD (P = 0.05) | 23.5 | |

Figures in parentheses indicate actual percentage disease recovery.

In the field evaluation of two carriers for fungicides, better recovery from disease was noticed with the petroleum compound than with pidivyl china clay compound (Table 2). The recovery in petroleum compound applied trees was more than 90 per cent, irrespective of the fungicides used. Edathil *et al.* (1988) also observed the superiority of the petroleum compound over the pidivyl compound in checking pink disease of rubber when used along with thiram and tridemorph. When pidivyl compound was used as carrier, propiconazole and thiophanate methyl were the most effective fungicides registering 95 and 90 per cent recovery respectively.

An ideal carrier for fungicide should possess a favourable balance between tenacity and re-distribution. There was significant interaction between the fungicides and the carriers used. Better control with a particular carrier suggests that the fungicide is being well retained and released at the required time. The better efficacy of the petroleum compound can be attributed to these reasons. Jacob and Edathil (1986) reported the effectiveness of pidivyl compound as a good carrier for propiconazole against pink disease of rubber as well.

Table 2. **Effect of carriers of fungicides on percentage recovery from dry rot**

| Chemicals | Percentage disease recovery | | Mean |
|---|---|---|---|
| | Pidivyl compound | Petroleum compound | |
| Mancozeb | 49.5 (55.0) | 88.2 (99.0) | 68.8 (77.0) |
| Thiophanate methyl | 81.0 (90.0) | 85.5 (95.0) | 83.3 (92.5) |
| Carbendazim | 56.2 (58.7) | 90.0 (100.0) | 73.1 (79.4) |
| MEMC | 58.5 (65.0) | 90.0 (100.0) | 74.3 (82.5) |
| Propiconazole | 85.5 (95.0) | 84.0 (93.0) | 84.8 (94.0) |
| Tridemorph | 36.0 (40.0) | 90.0 (100.0) | 63.0 (70.0) |
| Mean | 61.1 (67.3) | 87.9 (97.8) | 74.5 (82.6) |

CD (P = 0.05) Fungicides = Not significant. Carriers = 9.3 Fungicide x Carrier = 22.7

Figures in parentheses indicate actual percentage disease recovery.

Table 3. **Effect of methods of fungicide application on percentage recovery from dry rot**

| Chemicals | Percentage disease recovery | | Mean |
|---|---|---|---|
| | Method I* | Method II** | |
| MEMC | 78.8 (87.5) | 81.0 (90.0) | 79.9 (88.8) |
| Carbendazim | 87.8 (97.5) | 80.4 (89.1) | 84.1 (93.3) |
| Thiram | 78.5 (87.0) | 70.3 (78.5) | 74.4 (82.8) |
| Mean | 81.7 (90.7) | 77.2 (85.9) | 79.5 (88.3) |

Not significant

* Fungicides incorporated with the petroleum compound directly applied to cut surfaces.

** Fungicide solution used for washing affected areas, over which petroleum compound applied after drying.

Results of the experiment in which two methods of application were compared (Table 3) revealed that both the methods did not significantly differ in efficacy. The incorporation of fungicides with the petroleum compound and its direct application on the affected regions has the advantage of quick operation. In the other method, the labourer needs to wait for drying of the fungicide solution before applying the wound dressing compound. Further, the petroleum compound appeared to be less sticky on a wet surface. Use of mechanical stirrer enables uniform and thorough mixing. Edathil *et al.* (1988) observed that mechanical stirring is superior to hand stirring where a powder formulation is used.

The comparative cost of commonly available and effective fungicides is given in

Table 4. Among the fungicides, MEMC is the cheapest followed by thiram. The systemic fungicides are comparatively costlier and amongst them oxycarboxin is less expensive.

Table 4. **Comparative cost of effective fungicides**

| Chemical | Cost (Rs.) of fungicide/litre solution |
|---|---|
| MEMC | 0.24 |
| Oxycarboxin | 3.50 |
| Thiram | 1.00 |
| Tridemorph | 4.00 |
| Carbendazim | 4.20 |

As in the case of other stem diseases of rubber early detection of this disease, when latex exudation appears, is necessary and the treatment at this stage itself ensures recovery. Removal and burning of any old stumps with fructifications, left in the field, are also essential as they provide inoculum for disease spread under favourable weather conditions.

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