COLLAR AND ROOT ROT OF AIBIKA (*ABELMOSCHUS MANIHOT*) II. EFFECT OF PRE-PLANTING TREATMENT WITH FUNGICIDES

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ABSTRACT

*Pre-planting treatment in the field of aibika (*Abelmoschus manihot *(Linnaeus) Medicus) cuttings with protectant copper fungicides, Bordeaux paste and Cuprox (copper oxychloride) paste controlled the collar and root rot disease caused by* Phytophthora nicotianae *var* nicotianae *B. de Haan. There was a significant increase in shoot numbers and usable shoot weight. Ridomil 25 WP (metalaxyl), a systemic fungicide paste, controlled the disease but drastically affected the root formation, reduced vegetative growth and produced phytotoxic symptoms on the foliage at the rate used in this study. In Bordeaux paste treated plants root formation was profuse and the dry root weight was greater than for Cuprox paste or Ridomil 25 WP.*

INTRODUCTION

The effect of systemic fungicides on the control of *Phytophthora nicotianae* var. *nicotianae* B. de Haan, the causal organism of collar and root rot of aibika, has been discussed (Muthappa and Bull 1986). Further studies were conducted using fungicides in the form of paste for pre-planting treatment of aibika cuttings. The effects of one systemic and two protectant fungicides on the control of collar and root rot disease is described in this paper.

MATERIALS AND METHODS

The field trial was conducted at the Laloki Horticultural Research Station near Port Moresby. Two protectant fungicides, Bordeaux mixture and cuprox 50 WP (copper oxychloride, ICI), and a systemic fungicide Ridomil 25 WP (metalaxyl, Ciba-Geigy) were used. The fungicides were applied as pastes to the aibika cuttings before planting. The fungicidal pastes were prepared employing the following proportions.

1. **Bordeaux paste**: Copper sulphate, 1 kg; hydrated lime, 2 kg; and water 15 litres. Copper sulphate and hydrated lime were dissolved separately in equal quantities of water, then mixed together to obtain the paste.

2. **Cuprox paste**: Cuprox 50 WP, 1 kg in 5 litres of water.

3. **Ridomil paste**: Ridomil 25 WP, 1 kg in 5 litres of water.

The concentration of the fungicide was necessarily high in these pastes. The reason for using pastes was that they adhere well to the plant surface. Also it was intended to study the effect of fungicides in the field with a single application for prolonged protection.

The three fungicide treatments with an untreated control were compared in a randomized block design with seven

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replications. Trial design and plant spacing were the same as in an earlier trial (Muthappa and Bull 1986).

Aibika cuttings with eight vegetative buds were dipped in the desired fungicidal paste to cover the basal half of the cutting. Following treatment both treated and untreated cuttings were kept overnight before planting. Twenty four hours after planting they were inoculated with *P. nicotianae* var *nicotianae*. For inoculation *P. nicotianae* var. *nicotianae* was grown in pure culture on two percent V8 juice agar in 12 cm Petri plates. The inoculum was prepared from seven day old cultures, by mixing with sterile water in a Waring blender, at the rate 100 ml of water per Petri plate to obtain a heavy inoculum. One hundred ml of the inoculum was poured around the base of the stem after removing the soil to a depth of about 3 cm. The soil was replaced after the inoculum was absorbed into the soil. The control cuttings were inoculated but received no fungicide. Counts to record the diseased plants were made once a week up to 70 days. Three harvests were made of the leafy shoots 8, 10 and 12 weeks after transplanting. Five cuttings for each treatment were planted separately without inoculum to study the root system after 70 days.

RESULTS

The percentage of diseased plants 70 days after planting is given in *Table 1*. The three fungicides were significantly effective ($p<0.05$) in controlling the collar and root rot disease of aibika. Whilst there was no significant difference between the fungicides in their effects, Ridomil paste was toxic to aibika cuttings. Root formation was poor, leaves were reduced in size and were yellowish green with necrotic spots on the lamina. Vegetative growth was slow up to about 50 days. However, leaves formed after 50 days were broad, dark green and seemed healthy. Bordeaux paste and Cuprox were not phytotoxic. Plants grew up with broad, dark green coloured, healthy foliage. Death of plants was sporadic during the period of observation. Profuse root formation was observed when examined after 70 days. Roots produced by Bordeaux paste treated cuttings were unusually thick with profuse feeder roots. The mean dry weight of roots of each treatment is given in *Table 2*.

The plots treated with Cuprox and Bordeaux paste gave significantly higher yields ($p<0.05$) than those treated with Ridomil and the untreated control. The total usable yields, mean shoot number and the mean weight of leafy shoots over the three harvests are given in *Table 1*.

DISCUSSION

P. nicotianae var. *nicotianae* infected the untreated aibika cuttings and the disease was severe as 80% of the plants were killed. The protectant fungicides, Cuprox and Bordeaux pastes, were significantly effective in controlling the collar and root rot disease of aibika.

Mean shoot number and total yield were significantly higher with these treatments. These two fungicides were not phytotoxic when applied as paste. Copper fungicides appeared to give prolonged protection since the death rate of plants did not increase even after 60 days towards the end of the trial. The same trend of protection can be expected in naturally infected soil if aibika cuttings are subjected to a pre-planting dip in copper fungicidal paste.

Ridomil, in spite of its phytotoxicity, was effective in protecting the plants against *P. nicotianae* var. *nicotianae*, however yields were less than in the copper fungicide treated plots. Dark green, healthy leaves formed 50 days

Table 1.–**Effect of pre-planting treatment with fungicides on collar and root rot of aibika**

Fungicide	Percent diseased plants* (angular transformation)	Total shoot weight ($t \cdot ha^{-1}$)	Total shoot number ($'000 \cdot ha^{-1}$)
Bordeaux paste	11.7(4.1)	3.95	22.1
Cuprox paste	15.4(7.1)	4.11	21.7
Ridomil paste	23.5(15.9)	2.33	14.1
Control (no fungicide)	63.5(80.1)	1.75	9.0
Mean	28.5	3.03	16.7
s.e.d. (d.f 18)	7.81	0.513	3.03
C.V. (%)	51.2	31.6	33.9
Significant effect ($p < 0.05$)	16.41	1.078	6.37

Notes: * Back transformed values are shown in brackets.

Table 2.–**Effect of pre-planting treatment of aibika cuttings with fungicides on root growth (70 days after planting)**

Fungicide	Total of five plants Fresh root wt(g)	Total of five plants oven dry root wt(g)	Mean root weight/plant (g) (oven dry)
Bordeaux paste	105	93	18.6
Cuprox paste	68	57	11.4
Ridomil paste	33	27	5.4
Control (no fungicide)	40	32	6.4

after the pre-planting treatment showing that phytotoxicity lasted for about seven weeks. At the rate used, Ridomil 25 WP was not lethal to the plants but drastically reduced root formation. Using Ridomil as a paste for pre-planting treatment of aibika at this rate of application seems inadvisable. Copper fungicide treated cuttings produced profuse root systems and vigorous vegetative growth besides effectively controlling the disease. Pre-planting treatment of aibika cuttings with a copper fungicidal paste would be useful where aibika is grown in *P. nicotianae* var. *nicotianae* infected soil.

One litre paste of Bordeaux or Cuprox can be used to treat 100 cuttings of aibika. The price quoted by the supplier (ICI, PNG. Ltd) was Cuprox K2.82, copper sulphate K1.40 and hydrated lime K0.52 per kilogram. Using this price the cost in 1983 of fungicides for 1000 cuttings worked out to Bordeaux paste K1.64 and Cuprox paste K5.64. Cuprox paste was easier to prepare than Bordeaux paste.

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