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Evaluation of copper fungicide dosage requirements against abnormal leaf fall disease of rubber for a high and a low susceptibility clone in two agroclimatic regions.

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ABSTRACT

Evaluation of copper fungicide dosage requirements against abnormal leaf fall disease for a high susceptibility clone (RRIM 600) and a low susceptibility clone (RRII 105) in two different agroclimatic conditions, viz low and high rainfall areas, from 1990-1992 was carried out to assess the necessity for the evolution of clonal and regional recommendations for rubber spraying. A minimum dose of 2 kg/ha was sufficient to protect clone RRII 105 in a low rainfall area whilst 4 kg/ha was required for clone RRIM 600. A higher dose of 10 kg/ha was necessary to protect the low susceptibility clone in a high rainfall area whereas even this dose was not effective on the highly susceptible clone.

Introduction

Abnormal leaf fall disease caused by *Phytophthora spp.* is the most serious disease of rubber (*Hevea brasiliensis* Muel. Arg.) in India. This is an annual recurring disease involving costly prophylactic control measures with copper fungicides every year. The cost of copper fungicide spraying has increased considerably in recent years. It was observed that certain *Hevea* rubber clones showed varied responses to the infection of *Phytophthora spp.*, which causes abnormal leaf fall disease of rubber, in low and high rainfall areas. Experiments were conducted in low and high rainfall areas using two different clones in four locations to elucidate this point. In addition, it was also hoped to reduce the cost of spraying by identification of the minimum required dose for different clones under different climatic conditions.

Materials and Methods

Experiments were laid out in an 8ha area using a Randomised Block Design with a 0.4ha plot size, with 4 replications each, to accommodate 5 treatments. Clones RRII 105 and RRIM 600 were selected at Kumarankudy and New Armbady estates, respectively, to represent low rainfall areas (Table 1). For high rainfall areas, Chemoni and Pudukad Estates were selected using the same clones. The age of the trees ranged from 8 to 12 years at the start of the experiment during 1990, 1991 and 1992. The treatments consisted of 30 litre quantities of spray oil containing 2, 4, 6, and 8kg copper oxychloride 56% (COC) oil dispersible powder (ODP) with an unsprayed control in the low rainfall areas and 4, 6, 8 and 10kg COC 56% ODP each in 30 litres of spray oil in the high rainfall areas but with an unsprayed control only for the low susceptibility clone RRII 105. No control plots were employed with the highly susceptible clone RRIM 600 in the high rainfall areas. The spraying was carried out with an airblast motorised micron sprayer from the ground as a single round pre-monsoon application during the months of April/May every year. Leaf retention was assessed in the experimental plots, by the method described by Idicula et al[1].

Table 1 *Rainfalll data from low and high rainfall areas.*

Period	Rainfall in mm	
	Low rainfall area (Punalur)	High rainfall area (Palapilly)
May 1990	118	436
June 1990	679	631
July 1990	741	870
August 1990	428	463
September 1990	179	136
Total	2145	2536
May 1991	85	61
June 1991	962	1107
July 1991	485	1139
August 1991	247	559
September 1991	217	429
Total	1996	3295

Results and discussion

Results in the low rainfall areas on the low susceptibility clone RRII 105[2] indicated that there were no differences in leaf retention between treatments during the 1990 and 1991 seasons. However, in 1992 there was a marked difference between the unsprayed control and sprayed plots even though there were no variation in results among the various dosages tried (Tables 2, 3 and 4). The lowest dose (2kg/ha) used on the high susceptibility clone RRIM 600[2] was not effective and on a par with the unsprayed control. However, 4kg/ha was enough to protect the plants (Table 4) and there was no difference between all effective treatments.

These results confirm that prophylactic spraying is also needed in low rainfall areas even though clone RRII 105 can be protected using the lowest dose (2kg/ha). A reduction in the cost of spraying is indicated in low rainfall areas with clone RRII 105. It has been reported that even if 25% of leaves are lost, this feature is not reflected in the yield[3]. Nevertheless, this limit was exceeded by the unsprayed RRII 105 control during the 1992 season (Table 4). Hence, spraying cannot be avoided with this clone in low rainfall areas.

The lowest dose was not effective on the high susceptibility clone RRIM 600 in low rainfall areas. However, a difference between effective dosages were not evident. Clonal susceptibility may be one of the reasons for this. The effectiveness of lower dosages (2kg/ha for RRII 105 and 4kg/ha for RRIM 600) in low rainfall areas may be considered as the effect of low rainfall and consequently a mild disease infection.

For the low susceptibility clone, the highest dose (10kg/ha) was effective and superior to all other treatments during 1990 and 1991 disease seasons in the high rainfall areas (Tables 2 and 3), but during the 1992 season the results were not significant (Table 4). Even though there were no differences between the lower dosages tried, the unsprayed controls had extremely poor leaf retention (Tables 2, 3 and 4). This indicates that a higher dosage of COC is required in high rainfall areas to protect even a low susceptibility clone. Heavy leaf fall will lead to considerable crop loss[4,5]. The performance of the high susceptibility clone in high rainfall areas was not satisfactory even with the highest dosage tried suggesting that this clone is unsuitable for planting in high rainfall areas.

Table 2 *Leaf retention (%) in the 1990 season*

Treatment	Low rainfall area Kumarankudy RRII 105	High rainfall area Chemoni RRII 105
COC 56% ODP 2 kg/ha	80	-
COC 56% ODP 4 kg/ha	76	42 (40.41)[b]
COC 56% ODP 6 kg/ha	79	57 (49.03)[b]
COC 56% ODP 8 kg/ha	80	51 (45.05)[b]
COC 56% ODP 10 kg/ha	-	77 (61.80)[a]
Unsprayed control	81	19 (24.79)[c]
	N.S.	CD 11.05

Figures in parenthesis denote the transformed values, C.D. for transformed values at P > 0.05.

Table 3 *Leaf retention (%) in the 1991 season.*

Treatment	Low rainfall area	High rainfall areas	
	Kumarankudy	Chemoni	Pudukad
	RRII 105	RRII 105	RRIM 600
COC 56% ODP 2 kg/ha	88	-	-
COC 56% ODP 4 kg/ha	77	27.75 (31.6)[c]	25.0
COC 56% ODP 6 kg/ha	86	32.9 (34.8)[c]	40.3
COC 56% ODP 8 kg/ha	76	54.4 (46.4)[b]	40.3
COC 56% ODP 10 kg/ha	-	83.1 (65.9)[a]	42.3
Unsprayed control	81	9.4 (17.3)[d]	-
	N.S.	C.D. -9.11	N.S.

Figures in parenthesis denote the transformed values, C.D. for transformed values at P > 0.05.

Table 4 *Leaf retention (%) in the 1994 season.*

Treatment	Low rainfall areas		High rainfall areas	
	Kumarankudy	Kulasekharam	Chemoni	Pudukad
	RRII 105	RRIM 600	RRII 105	RRIM 600
COC 56% ODP 2 kg/ha	71.94[a]	48.8 (44.25)[c]	-	-
COC 56% ODP 4 kg/ha	67.22[a]	70.15 (57.13)[a]	29.58 (32.91)	29.65 (32.94)[b]
COC 56% ODP 6 kg/ha	79.31[a]	69.65 (56.61)[a]	49.22 (44.82)	42.45 (40.56)[a]
COC 56% ODP 8 kg/ha	78.35[a]	81.90 (65.10)[a]	46.93 (43.50)	47.77 (43.67)[a]
COC 56% ODP 10 kg/ha	-	-	49.09 (44.44)	41.39 (39.98)[a]
Unsprayed control	56.24[b]	37.08 (37.46)[c]	21.21 (27.05)	-
	C.D. 15.96	C.D. 10.46	N.S.	C.D. 5.65

Figures in parenthesis denote the transformed values, C.D. for transformed values at P > 0.05.

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