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EFFECT OF POWDERY MILDEW DISEASE ON YIELD OF RUBBER IN NORTHERN PART OF WEST BENGAL

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ABSTRACT

A field trial was conducted during 1999 to 2001 at Regional Experiment Station, Nagrakata for evaluation of economic efficacy of sulphur dust against the powdery mildew disease in 10-year-old trees of *Hevea* clone RRII 105. The impact of this disease on growth and yield of RRII 105 was also reported. Severity of powdery mildew disease was very high in undusted block (3.0) as compared to the dusted block (1.3) which resulted an annual crop loss of 28.52 per cent. The disease also adversely affected the growth of trees which reflected on poor girth increment in undusted block as compared to the dusted plot. The economic significance of sulphur dusting as a control measure against powdery mildew disease was evident.

ITRODUCTION

Powdery mildew disease of rubber (*Hevea brasiliensis* Muell. Arg.) caused by *Oidium heveae* Steinm. is known to be very severe in North East Region and Northern part of West Bengal (Mondal *et al.*, 1994). This disease was found to cause yield loss of 13.5 to 28.5 per cent in Kanyakumari district when the trees of RRIM 600 clone were not protected by dusting of sulphur (Jacob *et al.*, 1992). Among other rubber growing countries in South East Asia the control of powdery mildew disease is widely practised where economically beneficial effects of sulphur dusting have been demonstrated (Wastie and Mainstone, 1969; Liyanage *et al.*, 1971).

There is a wide variation in clonal susceptibility to the disease. Among the three popular clones (viz. RRIM 600, RRII 105 and GT 1) commended for large scale planting in India, RII 105 has above-average susceptibility to the disease (Mondal *et al.*, 1998), and commonly suffers extensive defoliation in areas where *O. heveae* infection is severe. Repeated defoliation followed by die-back of the branch tips occurs throughout February to May, resulting in a poor canopy for the remainder of the season (Mondal *et al.*, 1998). Moreover, the crop loss due to this disease in non-traditional region like Northern part of West Bengal has not been assessed. Therefore, this experiment has been undertaken to evaluate the impact of powdery mildew disease on yield and growth of RRII 105.

MATERIALS AND METHODS

This experiment was laid out at Regional Experiment Station in Northern part of West Bengal during 1999 to 2001 on ten-year-old trees of RRII 105 following paired-plot design (Wastie and Mainstone, 1969). Two blocks each of 250 mature trees were selected for this experiment. Sufficient guard rows were left in between the blocks. Girth was measured at an interval of three months from November, 1999 to December, 2001 on 195 trees of each block at a height of 150 cm from the bud union. Girth values of 157 trees were used to calculate the rate of girth increment before and after the treatment. Ninety trees of uniform girth were selected from each block for recording pre-and post-treatment yield (g/t/t) under 1/2s d/2 system by cup coagulation method throughout the tapping days from June to December in 2000 and 2001. Annual mean yield (g/t/t) in each block was calculated. Yield projection was made based on pre-treatment yield (g/t/t) and crop loss was calculated based on the projected yield (g/t/t) following the method described by Jacob *et al.*, (1992). For evaluation of economic efficacy of sulphur dusting as a control measure against powdery mildew disease, benefit-cost ratio (BCR) was also calculated and reported in this paper. Pre-treatment yield (g/t/t) was recorded in the first year (2000) and the treatment was imposed in the second year (2001).

The treatment was carried out in one block to protect powdery mildew disease by dusting of sulphur (85 per cent) using Aspee Bolo power duster carried in every fourth row, at the rate of 12kg per hectare, per round. Three rounds of dusting at 10 day-interval were carried out, the first round being done when bud break after wintering occurred in ten per cent of the trees. The other set

of block was kept unprotected. The incidence and severity of powdery mildew disease were assessed in 90 trees in each block by visual scoring and for classification of severity a scale of 1 to 5 was used where 1=healthy, 2=1 to 15 per cent, 3=16 to 30 per cent, 4= 31 to 50 per cent and 5= more than 50 per cent of the leaf area infected (Samaradeewa *et al.*, 1985). For the estimation of severity, the sum of infection grades of each sample was divided by total number observed which included both infected and non-infected leaves.

Results and Discussion

Severe pre-mature defoliation of trees was observed during March to May in undusted control block (3.0) due to attack of powdery mildew disease (Table 1). In dusted block, the severity of powdery mildew disease was in the infection grade of 1.3 which indicated that all the experimental plants had got a very good protection from the disease on dusting of sulphur. The impact of pre-mature defoliation on growth of the trees was observed more prominent in undusted block as indicated by the poor girth increment as compared to that of dusted block (Fig. 1). The girth increment during August was maximum in both dusted (1.38 cm) and undusted block (0.88 cm) as compared to other months. The rate of girth increment was found to be very high in dusted block as compared to that of undusted block. Lim (1974) reported that repeated massive pre-mature defoliation resulted in poor canopy with consequent adverse effect on girthing.

The influence of pre-mature defoliation on yield was more in undusted block as compared to that of dusted block (Fig. 2). In undusted block, a crop loss in the range of 19.0 per cent to 55.09 per cent over projected yield was observed in different months from June to December (Fig.3) with the highest in August (55.09 per cent). This might be due to the cumulative effect of repeated pre-mature defoliation in March to May which led to maximum decrease of the vitality of the tree during August. An annual crop loss of 28.52 per cent over projected yield was observed when the severity of powdery mildew disease was in the infection grade of 3.0 (Table 1). Yu Zhutong (1989) reported that in clone RRIM 600, 0,4.4, 11.3, 15.2 and 34.8 per cent yield loss were caused by disease rating of 2, 3, 4 and 5 respectively. This indicates that th_ more severe the disease, the more is the yield loss.

The result on the evaluation of economic efficacy of sulphur dusting against the control of powdery mildew disease is presented in Table 1. At the present cost of sulphur dust and labour, one round of dusting costs Rs.207.00 per hectare. If three rounds of dusting are required the cost would be Rs.621.00 which can be realized by an increase of 22kg of dry rubber at a mean cost of Rs.28.00 per kg of rubber. As the projected yield over control at RES, Nagrakata is well above 850 kg per hectare a crop gain of 2.58 per cent can compensate the cost of control measures. This observations also is in full conformity with the findings of Jayarathnam *et al.*, (1987). Moreover, the benefit-cost ratio was found to be very high (10.17:1) which

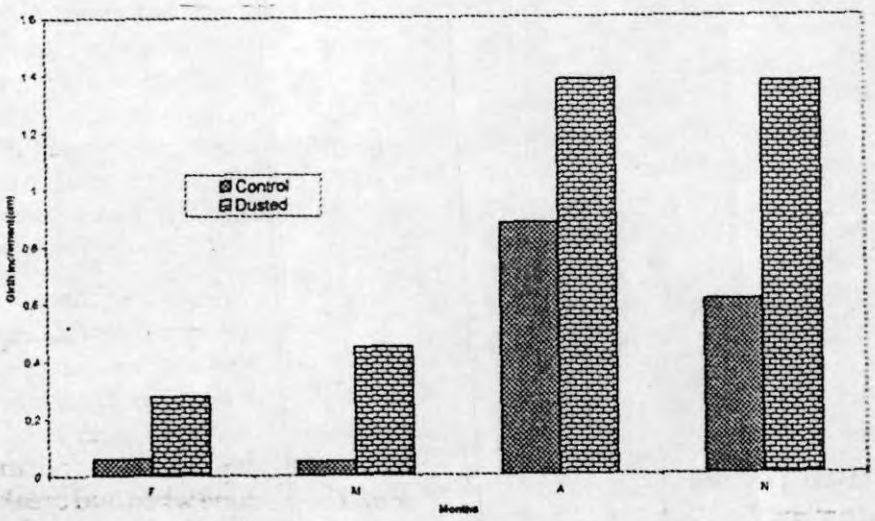

Fig. 1. Pattern of girth increment (cm) in undusted control (2000) and dusted blocks (2001)

indicates that the cost of dusting against the control of powdery mildew disease seems to be economic.

In conclusion, it can be stated that the severely affected areas where *Oidium* infection is known to recur every year sulphur dusting is not only a necessary measure if the health of the trees is to be maintained but also shows a quick return on the money spent towards the cost of control measures.

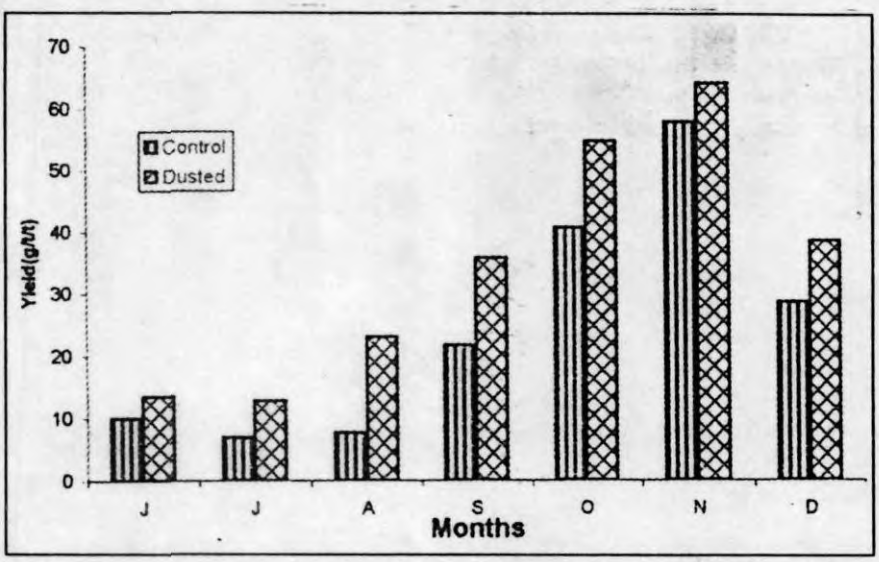

Fig. 2. Yield (g/t/t) pattern of control (2000) and dusted blocks (2001) in different months

Table 1. Efficacy of sulphur dusting on the control powdery mildew disease, growth and yield of rubber (RRII 105)

	Parameter	Year	Control block	Dusted block	Projected yield (g/t/t) over control	Annual Crop loss (%) over projected yield	Benefit cost ratio
Pre-treatment	Girth (cm)	Feb, 2001	50.4	51.5			
	Annual mean of girth increment (cm)	2000-01	1.0	1.8			
	Disease incidence (%)	April 2000	100.0	100.0			
	Severity	April 2000	3.0	2.4			
	Annual mean of dry rubber yield (g/t/t/)	2000	19.8	20.3			
Post-treatment	Disease incidence (%)	April 2001	100.0	50.5	30.88	28.52	10.1:1
	Severity	April 2001	3.0	1.3			
	Girth (cm)	Dec, 2001	52.2	54.63			
	Annual mean girth increment (cm)	2001	1.76	3.16			
	Annual dry rubber yield (g/t/t)	2001	22.07	31.66			

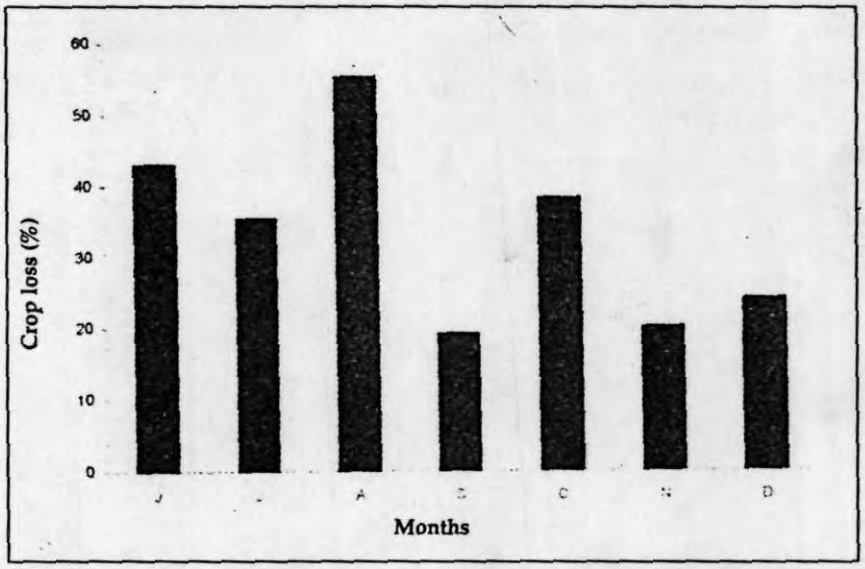

Fig. 3. Variability in crop loss (Per cent) over projected yield in different months

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