1443

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PRELIMINARY EVALUATION OF WEED CONTROL METHODS IN PLANTING STRIPS OF RUBBER

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Various weed control methods in planting strips of rubber were evaluated in an immature rubber plantation from the time of planting. Cultural, chemical and a combination of these methods were tried in planting strips and in plant basins. Scrapping the entire platform recorded better weed control than slashing. Herbicide sprays of glyphosate in the entire planting strips also showed low weed infestation. The integrated approach of herbicide spray in the plant basin and slash weeding in the inter basin area showed comparable weed control as that of herbicide application in the entire strips. Cost evaluation of the various methods is also discussed.

INTRODUCTION

Weed control operations in the immature phase of rubber plantations take up nearly 34 per cent of the total cost of cultivation and a herbicide based integrated weed management system was found to reduce cost by 28 per cent (Mani and Pothen, 1987). With the introduction of fast growing leguminous ground cover species in plantations, weed flora in the interrow spaces are controlled by the profuse growth of these cover crops. Weed domination in the initial years of a plantation, therefore, is mainly in the planting strips. Weed management operations in the immature stage commonly resorted to are slashing and scrapping of the plant basin. Herbicidal control in plant basins is not common. Weed control around the plant basin assumes importance since nutrients are applied in this area during the initial years. The degree and method of weed control required in the planting strips are questions often raised by growers. If a proper weed management regime is not followed, growth of rubber plants is likely to be affected.

The main objective of the study is to evaluate different weed management methods on weed control in planting strips and to study their effect on the growth of rubber.

MATERIALS AND METHODS

A field experiment was initiated at Shaliacary Estate, Punalur during September, 1995 to evaluate various weed management methods. Rubber planting in this area was done during August, 1995 on contour terraces having a width of 1.2 m. The treatments were:

1. Scarpping the entire strip,
2. Slashing the entire strip,
3. Spraying Gramoxone (2.25 l/ha) + Fernoxone (1.25 kg) in the entire strip,
4. Spraying glyphosate (2 l/ha) in the entire strip,
5. Scrapping plant basin and slashing interplant area in the strip,
6. Spraying Gramoxone (2.25 l/ha) + Fernoxone (1.25 kg/ha) in plant basin and slashing remaining area in the strips, and

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7. Spraying glyphosate (2 l/ha) in plant basin and slashing remaining area in the strips.

The trial was laid out in a randomized block design with four replications. Each plot consisted of ten consecutive plants on the same contour terrace. Weed flora in the area included *Mimosa pudica.* L, *Mimosa invisa, Borreria sp, Paspalum conjugatum.* Berg, *Axonopus compressus (SW) and Cyanadon dactylon.* The first treatment imposition was done after one month of planting. Weed regeneration in the different plots was examined subsequently on a monthly basis and whenever the weed canopy coverage was above 50 per cent in a visual rating (where 0 = total absence of weeds and 100 = complete weed coverage) in at least three replications of a treatment, such treatments were repeated. Herbicide application was done with a knapsack sprayer with a WFN-40, floodjet nozzle. Slashing and scrapping were done with sickle and spade respectively.

Observations on weed infestation (visual rating) was taken at monthly intervals. Weight of weeds from three spots of 0.05 m^2 area each was taken during October , November, January and July from each plot to represent the weed density. These were then expressed as mean dry weight in 1 m^2 area. Girth of rubber at 10 cm from bud union was taken. Cost of weed control operations was also worked out.

RESULTS AND DISCUSSION

Treatment effects on weed infestation was evident from the first recording in October onwards (Table 1). During this month scraping and glyphosate spraying of the entire platform showed significantly higher weed control than other methods. Mean overall weed coverage was the lowest in scraping of the entire platform. Slashing of weeds did not bring in the desired degree of control with the plots showing more than 50 per cent weed coverage during most months. All treatments, except the treatment of scrapping the entire platform (T1), were repeated in October irrespective of the degree of regrowth.

Percentage weed infestation during November i.e., one month after the repetition of the treatment showed that the glyphosate sprays were most effective in reducing the weeds in the planting strips. Spraying of Gramoxone + Fernoxone in the entire planting strips also showed comparable control. Due to high weed reinfestation, slashing the entire platform (T2) had to be repeated. Percentage of weeds in slashweeded plots remained high throughout the period of observation. Eight rounds of slashings had to be done in the entire planting strips from September to July. This was the least effective control measure and was found to be double the recomended weeding rounds (Potty *et al.*, 1980). Glyphosate application in the entire planting strips (T4) significantly lowered weed infesta-

Table 1. Percentage weed infestation (angularly transformed) in various weed control treatments (1995-96)

Treatments	Weed infestation (%)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Mean
T1	18.4d	35.9bc	0.0d	0.0d	0.0e	0.0d	13.6b	37.6bc	15.7	32.1	34.7	17.1
T2	50.8a	55.5a	58.61a	62.3a	61.8a	24.2bc	33.1a	52.3a	34.6	43.5	40.4	47.7
T3	34.5c	27.1cd	57.48a	57.7a	34.0cd	25.7b	9.6b	31.4c	17.6	28.6	39.9	32.2
T4	22.5d	18.4d	45.00b	46.4b	28.2d	9.2cd	17.7b	39.1bc	31.7	34.3	41.3	29.2
T5	47.9ab	50.9a	42.12b	42.1bc	40.7bc	40.7a	12.9b	47.9ab	42.1	34.3	35.4	40.1
T6	42.1bc	41.8ab	29.89c	31.6c	32.9cd	17.5bc	17.7b	37.5bc	31.3	33.9	39.8	31.6
T7	42.1bc	32.9bc	42.05b	42.1bc	46.4b	13.3bcd	21.6ab	40.6bc	31.9	36.1	45.0	34.9
SE	2.69	4.43	3.1	3.52	2.80	4.95	4.05	3.40	6.07	6.39	4.86	
LSD (P = 0.05)	7.9	13.2	9.2	10.5	8.31	14.7	12.0	10.0	ns	ns	ns	

Means followed by the same alphabet are not significantly different at 5% level.

tion throughout the period and during the initial months this was on par with scraping (T1). Glyphosate applied plots showed lower weed infestation during the period coinciding with the North East monsoon. This being a systemic herbicide regrowth during favorable period was curtailed. Glyphosate spray in the entire planting strip was second in terms of low weed infestation. Manual weeding and its combination with herbicides could not match the efficiency of Glyphosate during this period. Gramoxone application also effectively controlled weeds in the entire planting strips. The effect of this contact herbicide was also seen during the N.E. monsoon period as Gramoxone is rain fast (Watson, 1989).

Scrapping plant basin and slashing the remaining space (T5) was not found to control weed growth throughout the period. Gramoxone spray in plant basin and slashing the remaining area (T6) was third in overall terms of low weed infestation. This being an integrated approach may prove to be beneficial for soil ecosystem in the long run. However, combination of glyphosate spray in plant basin and slashing the remaining area (T7) did not perform well in terms of weed control.

Dry weed weight representing density of weed in 1 m^{-2} area is given in Table 2. Weighings done in October, one month after first treatment imposition showed the lowest weed dry weight in scrapping the entire platform treatment (T1). Spraying Gramoxone + Fernoxone in the entire strips (T3) was second and spraying glyphosate in the entire strips (T4) was third lowest in overall weed dry weight. Slashing the entire platform (T2) recorded the highest weed weight up to January. The next density measurement was done only in July when the various treatments did not significantly influence weed weight.

Table 2. Dry weed weight (g/m^2) in various weed control treatments

Treatments	Oct	Nov	Jan	Jul	Mean
T1	195.5	15.8	0	211.5	105.7
T2	860.0	187.0	315.0	379.5	435.4
T3	245.0	53.3	133.0	242.0	168.3
T4	294.5	64.0	118.0	265.0	185.4
T5	453.0	98.5	222.5	225.0	249.8
T6	537.5	116.8	147.3	257.5	264.8
T7	490.0	106.5	146.5	259.5	250.6
SE	126.0	25.5	38.2	48.1	
LSD (P = 0.05)	374.3	75.8	113.6	ns	

Scrapping the entire platform required the least rounds of operation but since the man power engagement is high, total cost is also very high (Table 3). Slashing the entire platform required maximum weeding rounds incurring the highest cost of operation. The most cost effective treatment was found to be glyphosate spraying in the entire planting strip both in terms of manpower requirement and number of rounds and cost was lower by 25 per cent compared to manual weed control by slashing. The cost of operation in the integrated approach of spraying Gramoxone + Fernoxone in plant basin (T7) and slashing the ramaining area was only marginally higher than spraying the entire strips with glyphosate.

Table 3. Annual weed control rounds, man days engaged and cost of operation under different treatments (per ha)

Treatments	Rounds	Man days engaged	Labour cost* (Rs)	Cost of herbicides (Rs)	Total cost (Rs)
T1	3	10	1426.50	nil	1426.00
T2	8	4	1521.60	nil	1521.00
T3	5	3	713.25	573.75	1287.00
T4	4	3	570.60	576.00	1146.00
T5	4	7	1331.00	nil	1331.00
T6	5	4	951.00	207.00	1158.00
T7	5	4	951.00	260.00	1211.00

* at Rs. 47.55/labour

The results show that the most cost effective weed management on planting strips of rubber is glyphosate spray in the entire planting strips, followed by the integrated approach of spraying Gramoxone + Fernoxone in plant basin and slashing the interbasin area. The integrated approach offers scope for reducing the quantity of herbicides needed for weed control thereby minimizing possible environmental damage when long-term applications are attempted.

Table 4. Girth of rubber (cm) in various weed control treatments

Treatments	Girth (cm)	
	Dec 95 4 MAP*	Aug 96 12 MAP
T1	3.72	8.70
T2	3.36	8.89
T3	3.32	8.96
T4	3.41	9.55
T5	3.60	9.15
T6	3.51	9.83
T7	3.28	9.84
	ns	ns

* MAP : Months after planting

The different weed control methods did not significantly influence girth of rubber at these early stages of four and 12 months after planting (Table 4).

The long - term effects of these methods on various aspects of nutritions and plant growth are to be studied to substantiate the relative advantages of different weed managemente practices on performance of rubber.

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