EFFECT OF MULCH TYPE ON SEEDLING GROWTH OF RUBBER *(Hevea brasiliensis* Muell. Arg.)

G. A. Sagay; K. O, Omokhafe and F. A. Akpobome

Abstract

Monoclonal seeds of *Hevea* clone 600 were collected and sown on beds measuring 1.0m x 1.5m at the spacing of 0.3m x 0.3m resulting in 15 seedlings per bed. Five mulching treatments viz., dry grass, wood shaving, unserviceable polythene sheets and no-mulch treatment were randomly assigned to the beds four weeks after the seeds were sown. Growth vigor of *Hevea* seedlings was determined 3 months and 9 months after planting using data collected on plant height (ht), stem diameter (d) and log (ht.d) as seedling vigor index. There was no significant treatment effect for ht, d or log (ht.d) for 3 months old seedlings. However, there was a highly significant treatment effect ($P < 0.01$) for ht, d and log (ht.d) for 9 months old seedlings and for pooled data. Unserviceable polythene sheets mulch (UPS) supported the most vigorous seedlings growth while wood shaving mulch (WS) supported the poorest growth for 9 months old seedlings. There was no significant difference in the growth of seedlings mulched with dry grass or dry leaves while unmulched seedlings were more vigorous in growth than seedlings mulched with wood shaving. The result of this study suggests that the use of unserviceable polythene sheets in *Hevea* seedlings nursery is a recommendable agronomic practice.

Introduction

Hevea cultivation often involves opening up new areas of land and near complete removal of vegetation before the crop is introduced. The exposure of the land brings about rapid decline in the organic matter content of the soil and a gradual decrease in total soil porosity and a corresponding increase in soil bulk density (Lai, 1987). The way land is cleared, cultivated and cropped has considerable influence on microclimate and soil temperatures. It has been reported that the better the soil is covered with vegetation or mulch and the shorter exposure it has been to the sun, the lower the temperatures and slower the deterioration of the soil tilth (Khatibu *et al*, 1984J.

Mulching is necessary in the early growth of *Hevea* in the nursery because of the problem of weeds shortly after the planting of the seeds. It serves physically to smother weeds by cutting them off from direct sunlight, reduction of run-off and erosion. It also slows down the movement of water over the soil surface and improves permeability of the soil. Other beneficial effects of mulching include the prevention of excessive heating of the soil by the sun as well as provision of organic matter as the mulch decays in the case of organic mulch. Studies indicate that mulching not only creates a better root environment, but also improves soil fertility and protects the soil from erosion. As a result, crop yields are increased and sustained (Lai, 1982; Wijewardene and Weerakoon, 1982).

The following types of mulch can be distinguished:

1) Imported mulch - material that has been taken from elsewhere. Examples are rice straw from another field or unserviceable polythene sheets.
2) In situ, dead mulch - dry crop residues from a previous crop such as maize stover; and
3) In situ, live mulch - living plants that grow between the crops. Normally live mulches are prostrate leguminous species.

Considering the scope and need of the techniques of mulching in rubber cultivation especially in the nursery, this study was conducted to evaluate the effect of mulching treatment on the juvenile growth of *Hevea* nursery seedlings at the Rubber Research Institute of Nigeria (RRIN) main station, lyanomo, Benin City.

Materials and Methods

In 2002, monoclonal seeds of RRIM 600 *Hevea* clone were collected at seed fall, cleaned, germinated and sown at a spacing of 0.3m x 0.3m on nursery beds measuring l.0 mx 1 .5m thus giving a plant population of 15 seedlings per bed. The experiment was a randomized complete block design with five mulching treatments replicated four times. The mulching treatments were:

(i) Dry grass (DO)
(ii) Wood shavings (WS)
(iii) Unserviceable polythene sheet (UPS)

(iv) Dry leaves (DL)
(v) No mulch as control (NM)

Mulching materials were applied four weeks after the sprouted seeds were sown on the beds. The beds were watered regularly every other day during the dry season. Data were collected on plant height (ht) and stem diameter (d) at 10cm from the bed level on 10 seedlings selected at random from the pool of 15 seedlings per bed. Data were collected at the age of 3 and 9 months. Analysis of variance was carried out to determine the effects of mulching treatment on plant height, stem diameter and vigor index [Iog_{10} (ht x d)] of *Hevea* nursery seedlings. LSD was calculated to determine significantly different mulch treatment means and hence their effect on the growth of *Hevea* seedlings.

Results and Discussion

Seedlings height and stem diameter are commonly used parameters for the evaluation of growth in immature rubber (Mydin *et. al*, 1990, Amma *et. al, 1990).* Omokhafe (2000) found that stem height and log (ht.d) produced significant variation in the second year of growth of *Hevea* seedlings and recommended evaluation of vigor parameters for more than one growth period to take advantage of relatively high precision of factorial analysis.

There was a highly significant treatment effect ($P < 0.01$) for plant height (ht), stem diameter (d) and log (ht.d) for 9 months old seedlings (Table 1). Similarly, very significant treatment differences ($P < 0.01$) were obtained for ht, d and log (ht.d) in combined analysis. The effect of year and its interaction with treatment were also significant (Table 2). The significant interaction effect suggests influence of weather factors on the effect of mulch on seedling vigor. This will be investigated in further studies.

The mean values obtained for seedlings vigor parameters (Table 3) indicates that unserviceable polythene sheet (UPS) supported the most vigorous seedling growth. This was followed by dry grass (DG) and dry leaves (DL) respectively. It is noteworthy that seedlings in control (without mulch) had better vigor than wood shavings. The relative advantage of polythene sheet could be due to its ability to smother weeds and conserve moisture. Conservation of moisture is important as seedling growth is in the dry season. The relative advantage of polythene sheet mulch is also reported in the production of field plantlets of yam and cassava (IITA, 3995). The use of unserviceable polythene mulch adds value to the polythene waste that fitters our environment. Such environmental hazard could be minimized through the use of the waste polythene sheet as mulching material.

In conclusion, unserviceable polythene sheet is a superior mulching material. Its use can enhance *Hevea* seedling vigor.

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Table 1. Mean Square of Three Seedling Vigor Parameters of *Hevea* At 3 and 9 Months Age

Source of variation	df	Seedling age (months)	Plant height (cm)	Stem diameter (cm)	Log (ht.d)
Replication	3	3	9.1425	0.00197	0.00123
		9	215.209*	0.0374**	0.01323**
Treatment	4	3	19.453	0.0020	0.0040
		9	333.566*	0.6262**	0.02324**
Error	12	3	9.8338	0.0014	0.0017
		9	58.011	0.0047	0.00126

*, **: Significant at P < 0.05 and P£ 0.01 respectively (F-test).

Table 2. Mean Square of Three Seedling Vigor Parameters of *Hevea* At 3 and 9 Months Combined Analysis

Source of variation	df	Plant height (cm)	Stem diameter (cm)	Log (ht.d)
Replication	3	135.287*	0.018	0,009*
Year	1	26884.225**	4.521**	3.552**
Mulch	4	213.670**	0.041**	0.019**
Year x mulch	4	139,320*	0.047**	0.008*
Error	27	40.049	0.007	0.002

: Significant at P < 0.05 and P < 0.01 respectively (F - test).

Table 3. Mean Values of Significant *Hevea* Seedling Vigor Parameters Under Five Mulching Treatments

Mulch treatment	9 months			Pooled data		
	hi (cm)	d (cm)	log (ht.d)	ht (cm)	d (cm)	log (ht.d)
1. Drygrass(DG)	115.93(2)	1.335(2)	2.19(2)	88.03(2)	0.966(2)	1.870(2)
2. Wood shavings (WS)	103.25(5)	1.123(5)	2.06(5)	80.53(5)	0.843(5)	1.786(5)
3. Unserviceable Polythene sheet (UPS)	125.75(1)	1.425(1)	2.25(1)	94.36(1)	1.024(1)	1.920(1)
4: Dry leaves (DL)	112.45(3)	1.33(3)	2.18(3)	85.99(3)	0.974(3)	1.863(3)
5. No mulch Control (NM)	104.93(4)	1.175(4)	2.09(4)	83.90(4)	0.893(4)	1.836(4)
Overall mean	112.49	1.278	2.15	88.56	0.940	1.855
LSDo.os 11-74	0.11	O.Q6	129.18	0.12	0.06	