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COMPARISON OF DIFFERENT PLANTING TECHNIQUES OF *HEVEA* IN TRIPURA

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Conventional brown budded stumps, two year old brown budded stumps grafted at one year's stock growth and allowed to grow without cutting back, two year old budded stumps grafted at two years stock growth and green budded stumps raised in polybags for two months and 14 months were compared for field establishment and early growth at Tripura conditions. Fourteen months old green budded polybag plants performed better than the others with respect to plant height and number of flushes of leaves at nine months growth and girth throughout the period of study. The conventional budded stumps initially did not show good performance, but in subsequent years the difference in girth narrowed down and there was no significant difference between different treatments, except 14 month old green budded polybag plants. From the establishment point of view, the best performance was for the two months old polybag plants. Under conditions of best management, budded stumps could be used as successfully as small polybag plants.

Key words:- *Hevea brasiliensis*, Planting technique, Tripura.

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INTRODUCTION

One of the most important aspects in plantation management is shortening the unproductive phase so that early return from investment is ensured. Rubber being a crop with comparatively long gestation period, thrust should be on reducing the immature phase. This is particularly important in the non-traditional regions where the cultivation is extended against odds such as marginal situations, other agroclimatic features and unskilled management. Planting technique and early management practices count a lot in the establishment, early growth and uniformity of stand in the plantation from the beginning to the mature phase. Advanced planting material like polybag plants have been known to reduce immaturity period by six to nine months and choice of the right type of planting materials is thus important.

Sivanadyan *et al.* (1973) have reported that while budded stumps took 69 months to attain maturity, large polybag plants took only 60 months in Malaysia. Shepherd (1967) reported that polybag plants at two whorl stage had an immaturity period of 59 months only compared to field brown budded plants which had about 67 months of immaturity. Similar results were also reported by Pushparajah and Haridas (1977). In the traditional rubber growing region of India, Potty (1983) reported that at 78 months 73 per cent of polybag green budded plants of two to three whorl stage attained tappable girth, while it was only 39.5 per cent in the case of

brown budded stumps. However, in a well managed private estate the initial superiority of polybag plants narrowed down towards the end of immaturity (Abraham, 1983). One of the major constraints in the north-eastern region where extension of rubber is vigorously pursued is the difficulty in early establishment. Though budded stumps can be successfully used for establishing a reasonably uniform stand under conditions of best management, even in non-traditional localities, this is not so in most cases since majority of the growers are illiterate tribal *jhumias*. The agroclimatic conditions in the region are also quite different, which impart certain amount of stress to the young plants. Use of advanced planting materials like polybag plants is desirable since a well established plant with intact root system can tide over the stress period better during the initial years. Results of a comparative study on the establishment and early field performance of five kinds of planting materials under Tripura conditions are reported in this communication.

MATERIALS AND METHODS

The treatments were :

- T_1 conventional brown budded stumps
- T_2 two year old brown budded stumps (seedlings from 1979 nursery budded during June 1980 and allowed to grow in the nursery till June 1981)
- T_3 two year old brown budded stumps (1979 nursery, budded in 1981)
- T_4 two months old green budded polybag plants
- T_5 14 months old green budded polybag plants.

The field trial was laid out at the Regional Research Station in Taranagar (Tripura), about 22 km away from Agartala, of the Rubber Research Institute of India. Randomised block design with five replications and 25 plants per plot was adopted. The clone RRIM 600 was used and planting was done at a spacing of 5 m x 5 m, during the third week of June 1981.

For preparing 14 months old polybag plants (T_5), seedlings were green budded in March 1980 and successful grafts subsequently planted in polybags of lay flat size 33 x 65 cm. Green budded stumps were raised in polybags of size 23 x 55 cm during April 1981 for T_4. All cultural practices, including establishment of cover crop, were as per recommendations and were the same for all the treatments. Field establishment and growth performance till 1989 were recorded and the data analysed statistically (Panse and Sukhatme, 1985).

RESULTS AND DISCUSSION

The average diameter of budded stumps used in T_1, T_2 and T_3 were 1.29, 2.21 and 2.08 cm, respectively. The small plants in polybag had an average scion height of 0.25 m and two to three flushes of leaves. The average height of 14 months old plants was 3.11 m and number of whorls were 6–7. The results of observations on the height and number of flushes of leaves show that 14 months old polybag plants (T_5) was significantly superior to all others (Table 1). Among the other treatments, the small polybag plants (T_4) were significantly superior to all the budded stumps (T_1, T_2 and T_3). Among the three types of budded stumps, plants from conventional one year old stocks (T_1) recorded more whorls than those from two year old stocks (T_2 and T_3), eventhough the height values of scions from all the three were almost on par. It was generally observed that bud break of scion in the two year old stocks was delayed, and hence such plants had only fewer leaves than the one year old stocks. However, the scion heights were comparable because of the longer internodes of plants derived from two year old stocks which had plenty of food reserves. The girth of plants, at half yearly intervals, is summarised in Table 2 and the girth incre-

Table 1. **Height and number of flushes of leaves nine months after planting**

Treatments	Height (cm)	No. of whorls per plant
T_1 Conventional brown budded stumps	128	5.28
T_2 Two years old brown budded stumps grafted on to one year old stock	135	4.12
T_3 Two years old brown budded stumps grafted on to two years old stock	155	4.76
T_4 Small polybag plants	215	6.90
T_5 14 months old polybag plants	280	7.94
CD (P = 0.05)	26.36	0.16

ment in Table 3. It is noted that the girth increment, in general, was at par among all treatments except for three observations during 1983, 1984 and 1986–87 in which 14 months old polybag plants showed significantly higher girth increment. A reduction in rate of girthing is noticed for the six month period from 1985 November to 1986 May for all the treatments and is very conspicuous for T_5. The observation taken during May 1986 was immediately after a violent hailstorm which inflicted considerable bark injury. The maximum damage in this case occurred to treatment T_5 and there was also reduction in the rate of girth increment for the subsequent observations also. Considering the girth *per se* (Table 2), treatment T5 was significantly superior to the budded stumps (T_1, T_2 and T_3) as well as to two months old polybag plants (T_4) throughout. The difference between polybag plants with two to three flushes of leaves (T_4) and conventional budded stumps (T_1) was significant till the fifth year and the values were on par in subsequent stages. A similar trend upto third year was noted between T_2 and T_3. In both cases, two year old stock seedlings were used, but budding was carried out earlier in the former. Comparing the girth increments during winter (November to April) and summer (May to October) seasons, it is seen that out of the seven observations, the treatment T_5 registered the highest girth increment in the first two summer periods, which could be attributed to the well developed root system enabling the plants to grow faster.

By computing the total girth increment, it can be seen that there is not much difference in the rate of girth increment between the treatments from the 17th month of planting onwards. However, considering the girth at the time of last observation (November 1989), it is seen that treatment T_5 is significantly superior to all others. There was no significant difference between any of the other treatments. The higher girth recorded in T_5 has resulted from higher initial rate of girth increment during the first 17 months. In October 1982, treatment T_5 had about 80 per cent more girth and treatment T_4 21.3 per cent more than conventional budded stumps. This difference narrowed down to 10.8 and 3.5 per cent respectively by November 1989.

The results show that the main advantage of polybag plants is the high initial rate of girth increment and the consequent capacity to tide over stress periods during initial years and also reduction in immature period. But for the hailstorm damage, trees in treatments T_5 could have been opened one year earlier than trees in all other treatments (Table 2).

Observations reveal that the treatment T_1 recorded a vacancy of 7.2 per cent, treatment T_2 – 5.6 per cent and treatment T_3 – 8 per cent. The treatment T_4 with two months old polybag plants registered 100 per cent success in establishment. However, the treatment T_5 (14 months old polybag plants) resulted in a vacancy of 18.4 per cent which is very much on the higher side. This was due to the lack of practical experience in the

Table 2. **Girth (cm) at 125 cm**

Year	1982	1983		1984		1985		1986		1987		1988		1989	
Treatment	October	April	October	April	October	April	October	May	November	May	October	May	November	May	November
T_1	6.8	7.7	10.3	10.6	13.9	15.6	22.0	23.4	30.8	32.3	37.2	39.7	44.2	46.2	50.6
T_2	6.8	7.3	10.5	10.9	14.3	16.1	23.1	24.4	31.4	32.9	37.4	39.7	44.8	47.2	52.0
T_3	7.8	8.6	11.4	11.9	15.2	16.8	23.4	25.0	32.2	33.9	39.2	41.5	46.0	48.0	52.6
T_4	8.3	9.4	12.2	12.8	16.3	17.8	24.2	25.5	32.9	34.3	39.1	41.2	46.6	48.5	52.4
T_5	12.4	13.2	17.3	17.8	22.3	24.4	31.5	32.1	37.4	40.5	44.9	46.5	50.3	52.8	56.1
SE	0.261	—	0.380	0.231	0.280	0.573	0.670	0.744	1.129	—	1.039	1.015	1.110	0.859	0.874
CD (P = 0.05)	0.553	—	0.806	0.490	0.594	1.214	1.420	1.577	3.298	—	3.035	2.965	3.245	2.509	2.553

Table 3. **Girth increment (cm) at six months interval**

Treatment	1982 Oct to 1983 Apr	83 Apr to 83 Oct	83 Oct to 84 Apr	84 Apr to 84 Oct	84 Oct to 85 Apr	85 Apr to 85 Oct	85 Oct to 86 May	86 May to 86 Nov	86 Nov to 87 May	87 May to 87 Nov	87 Nov to 88 May	88 May to 88 Nov	88 Nov to 89 May	89 May to 89 Nov
T_1	0.87	2.60	0.36	3.23	1.68	6.38	1.48	7.34	1.56	4.88	2.44	4.55	1.99	4.40
T_2	0.54	3.19	0.40	3.33	1.87	6.94	1.31	6.98	1.52	5.03	1.77	5.09	2.35	4.82
T_3	0.84	2.83	0.61	3.29	1.54	6.64	1.56	7.25	1.70	5.24	2.33	4.51	1.97	4.57
T_4	1.05	2.81	0.59	3.53	1.54	6.37	1.26	7.45	1.37	4.81	2.08	5.40	1.95	3.81
T_5	0.84	4.03	0.54	4.54	2.59	7.07	0.65	5.33	3.11	4.34	1.56	3.78	2.54	3.28
S. E.	—	0.236	—	0.236	—	—	—	—	0.332	—	—	—	—	—
C D (P = 0.05)	—	0.501	—	0.500	—	—	—	—	0.703	—	—	—	—	—

beginning to handle comparatively large polybag plants which led to transplanting shock. Experience gained subsequently while planting in north-eastern region for other trials and commercial planting, shows that large polybag plants with five to six flushes of leaves have given nearly 100 per cent establishment. It is to be mentioned that treatment T_4 had no vacancy. However, these plants were too small to impart the full advantages of polybag plants. Large polybag plant was reported as the best polybag planting material (Sivanadyan *et al.*, 1976; Webster, 1989). It is thus felt that polybag plants would prove to be the best of the planting materials compared in Tripura. The budded stumps in general, however, had shown higher girth increment during the subsequent years of growth reducing the initial disparity in girth. Under best management conditions, budded stumps also could be used as successfully as small polybag plants. However, in general, using polybag plants would be the best planting technique for small holders of north-eastern region. The early growth of such materials already attained at the time of planting would help in tiding over stress periods as well.

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