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PERFORMANCE OF NEW ORTET SELECTIONS OF *HEVEA BRASILIENSIS* IN MEGHALAYA

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Eleven ortet selections from the states of Assam, Tripura and Meghalaya were evaluated for growth parameters and juvenile yield in a clonal nursery trial where RRIM 600 was used as a check clone. Observations on growth were recorded one year after planting onwards and continued up to five years of crop growth. Three years after planting, the young plants were subjected to test tapping and continued up to five years. The ortet selection RRST 37 attained the highest girth (30.3 cm) and juvenile yield (71.7 g t^{-1} 10t ap^{-1}) followed by RRSG 9 (66.0 g t^{-1}10 tap^{-1}) and RRSA 121 (57.2 g t^{-1}10 tap^{-1}). The check clone RRIM 600 recorded a juvenile yield only of 44.4 g t^{-1}10 tap^{-1}. The ortet selection RRST 24 attained the highest girth increment of 24 cm over five years followed by RRST 37 (22 cm) and RRST 39 (21.5 cm) whereas the check clone RRIM 600 recorded a girth increment of 21.2 cm indicating the superior performance of the new ortet selections. There is good prospect for preliminary selection of clones through clonal nursery evaluation of these orlets.

Key words: Clonal nursery evaluation, *Hevea brasiliensis*, Ortet selection, Potential clones

INTRODUCTION

Hevea brasiliensis is the most important source of natural rubber (NR) and its cultivation is expanding very fast in the state of Meghalaya compared to other plantation crops in the state. People of this region are now preferring to adopt NR over other crops available in this region, because of the suitability and profitability of the crop. Meghalaya is a non-traditional area characterized by low temparture and high altitude. On account of the gradual increase of the acreage under NR cultivation in Meghalaya, it has now become necessary to evolve new clones suited for the region.

Breeding of any crop aims at the evolution of the specific clones suitable for the particular region and to fulfill the objectives of the breeding techniques. Though there are several breeding methods in *Hevea viz.* hybridisation, ortet selection, poly-cross breeding, half-sib progeny evaluation, full-sib evaluation, *etc.* their evaluation in field trials are time consuming and very lengthy. The Rubber Research Institute of India is now emphasising on the

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modified breeding scheme to enable the release of clones within a short period and the early evaluation in the initial stage is aimed at reducing the size of the breeding populations to a manageable level. Like in Malaysia (Cramer, 1938; Tan and Subramaniam, 1976; Tan, 1987) and Indonesia (Meyer, 1950), *Hevea* breeders in India have also attempted various early evaluation procedures (Mydin, 2014).

Nair, (1965) and Marattukalam *et al.* (1980), realised the importance of indigenously developed planting materials in the early years of *Hevea* breeding in India and therefore, ortet selection and hybridisation programmes were initiated simultaneously in the year, 1954.

Varghese and Mydin, (2000), reported that clonal selection which includes preliminary evaluation in small scale trials followed by more elaborate large scale trials and the on-farm trials takes as many as 30 years for releasing a clone for cultivation in the farmers' field. Mydin *et al.* (2004), reported that regular small scale field evaluaton trials can be replaced successfully with close spaced clonal nursery evaluation programmes which helped in identifying the precocious high yielders at an early stage, with nursery test tap yield of clones exhibiting a high correlation with mature yield. Such types of breeding programmes have opened the possibilities to reduce the period of the breeding procedure by five years. Similar results for shortening the breeding cycle has also been reported by Chandrasekhar *et al.* (2007).

Screening and selection of potential clones suitable for the state of Meghalaya is much needed and hence, it is highly essential to evaluate the yield potentiality of the clones in a clonal nursery where more number of locally available clones can be tested at a very close spacing within a short period (about 5-6 years) of time. Therefore, a clonal nursery evaluation trial was conducted with the objective of the selection of potential clones suitable for the state of Meghalaya.

MATERIALS AND METHODS

The experiment was conducted during the year 2010 at the research farm, of Rubber Research Institute of India, Regional Research Station, Ganolgre,Tura, Meghalaya situated at an altitude of about 410 m above mean sea level, corresponding latitudes and longitudes of 25°34.578' N and 90°14.141' E. The agro-met data recorded during the study period is presented in Table 1. The climate of this region is sub-humid with an average annual rainfall of 2524 mm (over 7 years) with 90 rainy days. The mean annual temperature of the location during the study period was recorded as 23.1°C, the maximum and minimum temperature being 28.9 °C and 17.1 °C, respectively. About 70 per cent of the annual rainfall is received between May and September. The mean annual relative humidity recorded during the study was 77.4 per cent and the morning and evening relative humidity being 87.4 and 68.0 per cent, respectively. The annual mean of bright sun shine hours (BSSH) was 5.02 during the study period.

The clones included in the study were ortet selections primarily selected from the poly-clonal seedling evluation trials from Assam, Tripura and Meghalaya states.The best performing local selections from the North-eastern region consisting of four selections each from the states of Assam (RRSG 1, RRSG 2, RRSG 3 and RRSG 9) and Tripura (RRSA 121, RRSA 315, RRSA 461 and RRSA 585), three selections from Meghalaya (RRST 24, RRST 37 and RRST 39) and the Malaysian clone RRIM 600 was used as

Table 1. **Agro-meteorological data of RRS, Ganolgre farm during the study period**

Year	Number of rainy days	Total rainfall (mm)	Temperature (°C) Max	Min	Relative humidity (%) 6.20 AM	1.20 PM	BSSH
2009	75	2434	30.0	16.4	87.1	70.9	4.96
2010	102	2771	29.2	17.5	86.8	66.4	5.12
2011	105	2905	28.3	17.4	89.0	68.7	5.10
2012	82	2286	28.9	17.3	87.5	67.0	5.23
2013	92	2144	28.9	17.0	87.5	66.2	4.84
2014	76	2413	28.7	16.9	86.0	66.0	5.9
2015	101	2717	28.5	17.7	88.0	71.0	5.6
Mean	90.4	2524.3	28.9	17.2	87.4	68.0	5.3
SD	13.03	278.35	0.56	0.44	0.94	2.19	0.16

check. These were raised in poly bags by bud grafting and at the 2-3 whorls stage were planted in the field during August, 2010. The experiment was conducted in the Randomised Block Design (RBD) with three replications. Each replications had six plants planted at a specing of 1.5 m x 3 m. The young rubber plants were maintained in the field following the standard agromanagement practices. Plants were test tapped from the third year onwards for getting the juvenile yield. Plants were test tapped at a height of 30 cm for ten consecutive tappings and the system of tapping followed was S/2d3. Growth parameters were recorded one year after planting and continued up tofive years.Girth was recorded at 30 cm above the collar region. Test tappings were done in November and December because of the continuous and heavy rains up to September and non-suitability of weather for tapping. The tapping was done in early morning hours to get the maximum quantity of latex. Immediately after two to three hours of each tapping, the proportionate quantity of the formic acid was added to individual cups to coagulate the latex.After finishing the 10 tappings in the year 2013 (first year of tapping), the individual cup lumps were collected and dried in the hot air oven for two to three days to dry them completely. Owing to the more latex volume during 2014 and 2015 (2nd and 3rd year of tapping), all these cup lumps were

Table 2. **Growth performance of different clones**

Clone	Girth (cm) Initial girth	3rd year	5th year	Girth increment over 5 years (cm)
RRSG 1	7.2	15.2	22.4	15.2
RRSG 2	7.6	18.5	28.0	20.4
RRSG 3	6.7	17.7	22.8	16.1
RRSG 9	7.8	20.6	26.5	18.7
RRST 24	5.5	18	29.5	24.0
RRST 37	8.3	19	30.3	22.0
RRST 39	5.0	16.7	26.4	21.4
RRSA 121	7.6	17.3	24.3	16.7
RRSA 315	8.6	16.4	24.5	15.9
RRSA 461	9.2	17.3	26.0	16.8
RRSA 585	7.8	20.5	25.1	17.3
RRIM 600	6.8	20.3	28.0	21.2
Mean	7.3	18.1	26.2	16.7
CD (P= 0.05)	0.73	0.209	0.43	0.17

Table 3. **Comparison of juvenile dry rubber yield pooled over three years**

Ortet selection	Yield ($gt^{-1}10tap^{-1}$)
RRSG 1	35.9
RRSG 2	43.2
RRSG 3	28.7
RRSG 9	66.0
RRST 24	42.6
RRST 37	71.7
RRST 39	38.6
RRSA 121	57.2
RRSA 315	10.1
RRSA 461	31.8
RRSA 585	42.0
RRIM 600 (check clone)	44.4
Mean	42.7
CD (P=0.05)	2.0

dried first in the open sunlight and then dried in the smokehouse. Weight of the individual cup lumps were recorded seperately for the years 2013, 2014 and 2015.

RESULTS AND DISCUSSION

Girth and the dry rubber yield (g $t^{-1}10$ $taps^{-1}$) are given in Tables 2 and 3, respectively. Five years after planting, RRST 37 a local ortet selection from Tura attained the highest girth of 30.3 cm followed by RRST 24 (29.5 cm) and RRSG 2 (28 cm) respectively, whereas, the check clone RRIM 600 attained 28.0cm girth. High initial girth was recorded in RRSA 461 (9.2 cm) followed by RRSA 315 (8.6 cm) and RRST 37 (8.3 cm). Girth in the opening year was the highest in RRSG 9 (20.6 cm) followed by RRSA 585 (20.5 cm) and RRIM 600 (20.3 cm).

Girth increment over five years of plant growth was also recorded and found that the selection from Meghalaya region recorded the highest girth increment. RRST 24 recorded the highest girth increment of 24.0 cm over five years followed by RRST 37 (22.0cm) and RRST 39 (21.5 cm) whereas, the check clone RRIM 600 achieved the girth increment of 21.2 cm. Based on the mean plant girth of the individual clones five years after field planting, all the clones were ranked to a group and the rankings were given in the decreasing order of the mean plant girth. In this ranking, RRST 37, RRST 24 and RRST 39, which are the local selections, were ranked as top three performers whereas RRIM 600 was ranked as fourth. The girth increment of the selections from Assam and Tripura states was not satisfactory. But girth data can not be compared with the higher yields. Earlier studies on juvenile-mature correlations have established that nursery yield alone could be adopted as the early selection criterion and additional parameters could only marginally enhance the selection efficiency (Tan, 1998).

The mean dry rubber yield in the juvenile stage were analysed continuously for three years from the third year of plant growth up to the fifth year of planting. The dry rubber yields of the selection RRST 37, RRSG 9 and RRSA 121 were recorded significantly superior than the check clone, RRIM 600 whereas, the juvenile yields of the selections RRSG 2, RRST 24 and RRSA 585 was comparable to that of RRIM 600. The rest of the selections failed to produce good yield.The mean plant girth and dry rubber yield of the check clone RRIM 600, which is a popular clone of this region, were comparable with the performance from other North-east region. Comparison of growth and yield performance of the selections under study, RRST 37 performed the best in terms of the mean plant girth,

girth increment over five years of growth and the juvenile yields (g $t^{-1}10$ $taps^{-1}$) followed by RRSG 9 and RRSA 121. The initial mean yield recorded in the field trial at Agartala for the ortet selection RRSA 121 was 64.2 g t^{-1} t^{-1} (mean of 9 years) whereas the mean yield of 11 years continuous tapping of the mother ortet from Assam region RRSG 9 in the field trial showed 64.5 g $t^{-1}t^{-1}$ as reported by Mondal *et al.* (2016). Coefficient of variation (CV) of the individual clones was also worked out for the juvenile yields and found that the CV (%) values in the case of top three performers RRST 37, RRSG 9 and RRSA 121 was relatively high.However, the local selection RRST 37 performed consistently good over RRSG 9 and RRSA 121.The variation in the juvenile yield in the case of the check clone was very less. Mydin *et al.*(2004) also reported similar result. However, high positive correlations among yield in the first, second and third years of tapping in the clonal nursery evaluation trials have been reported by Alika (1980) and Licy *et al.* (1998).

CONCLUSION

Based on the mean plant girth and juvenile yield, it can be concluded that RRST 37, a selection from the Meghalaya, was the best performing one for the Garo Hills of Meghalaya. RRG 9 and RRSA 121 were the second best performers. All the three gave much better yield than RRIM 600. These selections will be multiplied and planted in the large scale trial for further evaluation.

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