Performance of some introduced and indigenous rubber (*Hevea brasiliensis*) clones in a large estate in South India

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ABSTRACT

Performance of ortet and hybrid clones were evaluated in an on-farm trial at Shaliacary Estate (Punalur, Kerala). Based on data on mean yield of rubber in the A panel in the experimental clones, PR 255 exhibited a yield of 1301 kg/ha while PB 255 showed minimum yield of 1136 kg/ha as compared to check clone RRII 105 (1578 kg/ha). Mean girth of experimental clones at opening ranged from 44 cm in RRII 50 to 49 cm in PB 255 when compared to that of check clone RRII 105 (45 cm). Regarding tappability in opening year, clone PB 255 had maximum tappability (73%) while RRII 50 showed minimum tappability (40%). RRII 105 showed a tappability of 53%. Under Controlled Upward Tapping(CUT) system with stimulation, there was remarkable increase in rubber yield. While average yield of the clones in the lower virgin panel was 1248 kg/ha, average yield in the higher panel (under CUT system) was 2644 kg/ha. RRII 176 recorded a maximum mean yield of 3782 kg/ha followed by RRII 50 (3501 kg/ha). RRII 105 recorded a comparable yield of 3105 kg/ha. It is also worthwhile to note that RRII 176 (Mil 3/2 x PB 5/60), which yielded more than 3500 kg/ha of dry rubber on-farm as compared to PB, PR and SCATC clones, also has previous records of mild incidence of abnormal leaf fall and powdery mildew.

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Key words: clone evaluation, on-farm trial, exotic and indigenous rubber (*Hevea brasiliensis*) clones, traditional region, Kerala, India.

Introduction

Crop improvement programme in Para rubber (*Hevea brasiliensis*) in various rubber growing countries has resulted in profound increase in yield from 300 kg/ha using unselected seedling population to more than 2000 kg/ha using improved clones. Under clone exchange programme several superior clones were imported to India from China, Côte d'Ivoire, Indonesia, Malaysia, South America, Sri Lanka and Thailand. Although many of the imported clones had history of better performance in terms of growth, secondary characters and yield in their country of

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origin, these clones showed very high G x E interactions when introduced into new areas outside the country of origin. Hence, in India, the imported clones were evaluated in various clone evaluation trials before they were included in clonal recommendations. Over a period of time, several such clones were evaluated in small scale (SST), large scale trials (LST) and on-farm (OFT) block trials in various locations in traditional and non-traditional rubber growing regions of India and several promising clones were identified and recommended for planting. In the above lines of identifying more such clones, performance of selected imported clones from China, Indonesia and Malaysia, along with ortet and hybrid clones developed by RRII, was evaluated under block planting in Shaliacary Estate, Punalur (Kerala, India). The present paper reports findings of the above experimental trial.

Table 1. Details of experimental clones

Clone	Parentage	Country of origin
RRII 50	Ortet selection	India
RRII 176	Mil 3/2 x PB 5/60	India
PB 28/59	Ortet selection	Malaysia
PB 255	PB 5/51 x PB 32/36	Malaysia
PR 255	Tjir 1 x PR 107	Indonesia
SCATC 88/13	RRIM 600 x Pil B 84	China
RRII 105	Tjir 1 x Gl 1	India

Materials and methods

Planting material

During 1993, two-whorled plants (raised in polybags) of clones imported from Malaysia, Indonesia and China and clones developed in India were separately planted along with check clone RRII 105 in blocks of 300 trees each following normal spacing at Shaliacary Estate (West Division). Details of clones, parentage and country of origin are given in Table 1.

Tapping was started in 1999 (tapping system: S/2 d3 6d/7, ET2.5% Pa 1/y) and continued upto September 2009. From October 2009, the tapping system was changed to CUT (Controlled Upward Tapping) with Ethephon (3.3%) stimulation [tapping system: S/3 U d3 6d/7, ET3.3% La 8/y(m)]. Data was recorded on girth at opening of panel and data on yield from virgin panel

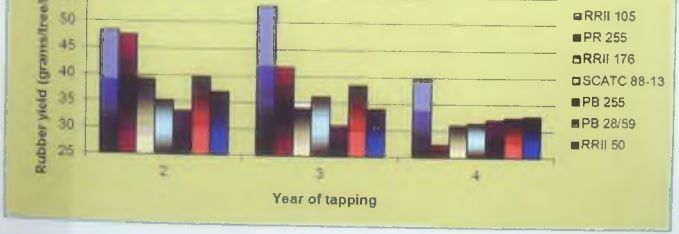

Fig 1. Yield performance of clones in BO-1 panel

Table 2. Performance of clones in the on-farm trial

Clone	Mean girth at opening (cm)	Mean yield*,#		Mean yield*,# #	
		kg/ha/yr	g/t/t	kg/ha/yr	g/t/t
SCATC 88/13	46	1150 (n 302)	34.3	1957 (n 292)	48.1
RRII 50	44	1171 (n 261)	34.6	3501 (n 243)	84.8
RRII 176	46	1171 (n 246)	34.8	3782 (n 183)	95.4
PB 28/59	47	1230 (n 291)	37.0	1905 (n 286)	46.3
PR 255	44	1301 (n 315)	38.9	2055 (n 301)	51.7
PB 255	49	1136 (n 305)	32.1	2206 (n 292)	53.5
RRII 105	45	1578 (n 306)	47.0	3105 (n 288)	78.2

*n- number of trees; #-virgin panel; ##-higher panel (CUT)

and higher panel were collected at fortnightly intervals. Rubber yield (g/t/t) of each clone was computed based on the fresh weight of latex, dry rubber content, weight of field coagulum, number of tapping days and number of trees per clone (Mydin and Saraswathyamma, 2005). Briefly, block-wise monthly yield, annual mean yield (AMY) and yield per hectare of dry rubber from each clone were computed based on equations [1], [2] and [3]:

Monthly yield (kg/block/day)

$$= \frac{\text{latex wet weight} \times \text{D.R.C}}{100} + \frac{\text{field coagulam weight} \times 50}{100} \quad \ldots\ldots [1]$$

(where D.R.C. is the dry rubber content)

Annual mean yield (kg block day)

$$= \frac{\text{Total of monthly yield}}{\text{No. of months tapped}} \quad \ldots [2]$$

Yield per hectare (kg ha year)

$$= \frac{(\text{AMY}) \times (\text{no. of trees/ha}) \times (\text{no. of tapping days})}{\text{Actual no. of trees per block of each clone}} \quad \ldots [3]$$

Results and discussion

Based on yield data from virgin panel (BO-I), the six experimental clones exhibited less yield compared to the check clone RRII 105 (Fig 1; Table 2). Overall mean yield of all the clones was 1248 kg/ha, while mean yield of RRII 105 was 1578 kg/ha (47 g/t/t).

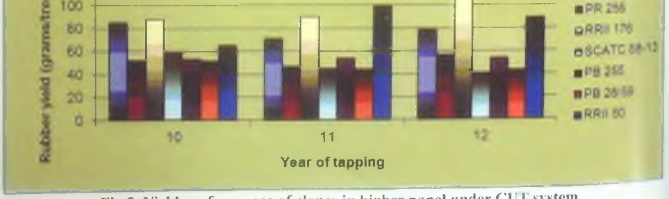

Fig 2. Yield performance of clones in higher panel under CUT system

Among the experimental clones, PR 255 exhibited maximum yield (1301 kg/ha; 38.9 g/t/t) followed by PB 28/59 (1230 kg/ha; 37 g/t/t), while PB 255 showed minimum yield (1136 kg/ha; 32.1 g/t/t). Clones SCATC 88/13, RRII 50, RRII 176 and PB 255 showed almost similar yield performance. However, in the higher panel, under CUT system of tapping with stimulation, there was remarkable increase in the yield of all the clones.

Overall mean yield of the clones in the higher panel was 2644 kg which is twice the yield in A panel. RRII 176 (3782 kg/ha; 95.4 g/t/t) followed by RRII 50 (3501 kg/ha; 84.8 g/t/t) recorded high yield compared to the check clone RRII 105 (3105 kg/ha; 78.2 g/t/t - Fig 3). All the remaining experimental clones showed comparable yield.

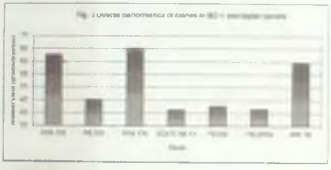

Fig 3. Overall performance of clones in BO - 1 and higher panels

Regarding growth of the clones, mean girth at opening ranged from 44 cm in RRII 50 to 49 cm in PB 255 (Table 2). Girth of check clone RRII 105 was 45 cm. With reference to tappability at opening, clone PB 255 had more tappability (73%) while RRII 50 showed minimum tappability (40%). RRII 105 showed a tappability of 53%.

Clone PB 255, the hybrid clone developed in Malaysia, is classified under Category II of planting recommendations for traditional regions of India (Rubber Board India, 2012). The vigorous growth nature of the clone is further confirmed by its maximum girth and tappability in the present study. The clone exhibited mean yield of 61 g/t/t rubber yield in on-farm trials across five locations in traditional and non-traditional areas (Varghese *et al.*, 2009). However this clone exhibited high intensity of abnormal leaf fall and powdery mildew diseases. While incidence of pink disease was high, intensity of *Corynespora* leaf spot was low (Varghese *et al.*, 2009). Clone PB 28/59, the Prang Besar clone developed in Malaysia, is classified under Category II of planting recommendations for traditional regions of India (Rubber Board India, 2012). Under large scale evaluation in Kanyakumari (Tamil Nadu, India), the clone showed 60 g/t/t based on six year data (Varghese *et al.*, 2009). However, the clone is susceptible to stem and leaf diseases.

Clone PR 255, the hybrid clone of Indonesian origin, is classified under Category III of planting recommendations for traditional regions of India (Rubber Board India, 2012). This clone exhibited 58 g/t/t mean rubber yield (based on ten year data) in LST (Saraswathyamma *et al.*, 2000). SCATC 88-13, the hybrid clone (RRIM 600 and Pil B 84) developed in China as a cold tolerant clone, recorded 41.35 g/t/t in LST at Agartala (Tripura, India; mean of six years) and 44.75 g/t/t rubber in LST in traditional region (Rubber Board India, 2012). This clone, presently classified under Category III of planting recommendations for traditional and non-traditional regions of India (Rubber Board India, 2012), showed adaptation to cold conditions as indicated by its high winter yield contribution (>59 per cent) and significant yield in both panels (Das *et al.*, 2010). It has cylindrical trunk and dense canopy and possesses average girth at opening and it is highly susceptible to powdery mildew disease (Saraswathyamma *et al.*, 2000). The clone exhibited tolerance to *Corynespora* leaf fall disease (Manju *et al.*, 2010).

Clone RRII 50, the primary clone developed by Rubber Research Institute of India presently included under Category III of planting recommendation (Rubber Board India, 2012). The clone exhibited 71 g/t/t rubber yield based on ten year data under small scale evaluation

(Saraswathyamma *et al*., 2000). This clone appears to be highly responsive to stimulation as indicated by three times increase in yield under stimulation in the present study. Clone RRII 176, developed by Rubber Research Institute of India, is presently included under Category III of planting recommendations (Rubber Board India, 2012). RRII 176 exhibited 62.4 g/t/t rubber yield based on 15 years data from SST and 50 g/t/t yield based on five year data in LST from traditional rubber growing region (Saraswathyamma *et. al*., 2000). The clone exhibited a comparable yield of 47 g/t/t/ in Kanyakumari (Tamil Nadu, India) as compared to RRII 105 (60 g/t/t) and RRII 430 (54 g/t/t). Under cold conditions also this clone exhibited encouraging yield with 32 g/t/t rubber yield in Agartala (Tripura, India; RRII 105 - 36 g/t/t; RRIM 600 - 37 g/t/t) and 34 g/t/t in Nagrakata (West Bengal, India) (Meenakumari *et al*., 2010). This clone showed remarkable response to stimulation with more than 3700 kg yield in the present study.

Earlier studies using RRII 200 series clones have shown better response to stimulation in low yielding clones when compared to high yielding clones (Gireesh *et al*., 2005). The recent study corroborate the findings of the above study based on similar response in the clones like RRII 176 and RRII 50 as indicated by enhanced yield under stimulation as compared to RRII 105.

Conclusion

The present study showed high yield and appreciable level of response of the experimental clones to stimulation under CUT system. Clone RRII 176, which recorded maximum yield in higher panel under stimulation, has been reported to have only mild incidences of abnormal leaf fall and powdery mildew. The clone can be further tested for consistency in disease tolerance under laboratory as well as in hotspot areas following which it can be considered for recommendation for planting in areas with high incidences of the above diseases, since the yield is also encouraging. Clone RRII 50 also gave comparatively higher yield in the higher panel under stimulation following CUT system.

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