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Growth performance of the tea clone TRF-1 under Nilgiri conditions

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The plant improvement programme initiated in UPASI Tea Research Institute during early 1960s, has resulted in the release of 28 UPASI series clones, 4 TRF series clones and five biclonal seed stocks with distinct morphological features, yield capacity and quality attributes (Venkataramani and Sharma, 1975; Sharma and Satyanarayana, 1989; Satyanarayana and Sharma, 1993). In 1984, 25 combinations of crosses were tested. Out of these, seeds obtained from five combinations *viz*., UPASI-10 x UPASI-9, UPASI-10 x ATK-1, UPASI-21 x UPASI-17, UPASI-15 x UPASI-21 and TRI-2025 x UPASI-21, were planted at Nedunkarna division of Arrapetta estate, Wyanad for evaluation. One of the hybrids from the above biclonal progenies, (UPASI-21 x UPASI-17 treated as a parental plants) TRF-1 (Selection-A) was found promising.

The commercial tea cultivars are recognized under three different taxon *viz*. *Camellia sinensis*, *C. assamica* and *C. assamica* ssp. *lasiocalyx*. The above three types were categorized based on their geographical distinction namely "China", "Assam" and "Cambod" type. TRF-1 is an 'Assam type' hybrid with vigorous semi-orthotropic robust branches forming a compact plucking table. The number of all branches of both TRF-1 and UPASI-9 was investigated (Radhakrishnan and Muthukannan, 2009). The leaves are permanently venated. The angle of inseration of the mother leaf to the stalk is high (Planophylly type), which will have added advantage in shearing and mechanical harvesting. The flush shoots are fairly large, moderately succulent, light green, highly pubescent and with prominent venation which are indications for good quality and yield. Considering these available information, a trial was conducted to evaluate the growth and yield of the clone TRF-1 under the agro-climatic conditions of Nilgiris.

The field performance of TRF-1 was evaluated in one acre block under Nilgiri conditions in Sutton estate, Nilgiri situated at an altitude of 6500 feet above MSL. The area was planted with the clone TRF-1 at a spacing of 135 x 90 x 90 cm. The cultural operations were followed as per UPASI recommendations. Yield data was monitored at each plucking round.

Bush architecture studies on TRF-1 were started in November, 2008 at UPASI Glysdale farm, Nilgiris. The popular clone, UPASI -9 was taken as a standard for comparison. For this purpose ten plants from each of the cultivars were selected randomly and monitored. The number of primary, secondary and tertiary branches, canopy cover and bush height were investigated in both TRF-1 and UPASI-9 at monthly interval.

Field performance of TRF 1 at different spacing

In this system of planting the bushes are spaced at a distance of 120 x 120 cm (4' x 4'), giving a population of 6800 per hectare. TRF-1 was planted at single (120 x 60 cm) and double hedge (135 x 75 x 75 cm) spacing in field no. RP 4 and field No. 9 of Sutton estate respectively. Observations on yield was recorded.

Optimization of nitrogen fertilizer input to the clone TRF - 1

The clone TRF-1 is a good spreader and has more biomass compared to other clones. As it is logical that more biomass is proportional to more inputs, a large block field trial was carried out in Field No. 9 of Sutton division of the estate in the Nilgiris to optimize the Nitrogen fertilizer. A field

planting at a spacing of 120 x 75 x 75 cm with young plants of TRF-1 was selected for this study. There were six treatments and each plot consisted of 60 plants. The treatments included T1- Control, T2- 180 kg N ha^{-1} yr^{-1}, T3- 240 kg N ha^{-1} yr^{-1}, T4- 300 kg N ha^{-1} yr^{-1}, T5- 360 kg N ha^{-1} yr^{-1} and T6- 420 kg N ha^{-1} yr^{-1}. Each treatment was replicated four times and fertilizer application was in 5 splits. The plants were centered as per the UPASI recommendations. They were brought under plucking following tipping. Bushes were plucked to a mother leaf during the low cropping months (January to March and June to August) and to the level during the rest of the months. Observation on yield was recorded from each plot at plucking intervals.

This study showed that the TRF-1 has the potential to yield consistently throughout the year. The survival of this particular clone in the field was found to be highly satisfactory. The performance of tea clones vary according to climatic conditions. If a clone performs well only under certain specific agro-climatic conditions then it should be considered as a region specific clone and recommended to that particular region. A clone which performs well under all weather conditions will be considered as a stable clone recommended for all regions (Babu, 2008). The yield performance of TRF-1 under Nilgiri agro-climatic condition is quite satisfactory. It had registered an yield of 3887 kg ha^{-1} yr^{-1} (Fig. 1).

Contour planting either in a single hedge at a spacing of 120 x 90 cm or in double hedge at a spacing of 120 x 75 x 75 cm was introduced in the late 1970s. This has helped to increase the planting density from 9500 to 13500 bushes per hectare. Contour style of planting has several advantages such as high yield, better soil conservation, less weed growth in the hedge and efficiency in cultural operations such as harvesting, manuring and spraying. Radhakrishnan and Muthukannan, (2011) made bush architecture studies on the Darjeeling clones. The primary, secondary and tertiary branches were more in TRF-1 when compared to UPASI-9. At the end of the pruning cycle, the canopy cover and bush height were also measured. The TRF-1 clone showed more canopy cover and lesser bush height than UPASI-9 (Table 1).

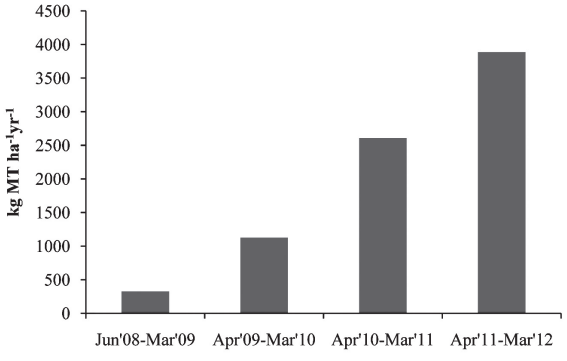

Fig. 1. Field performance of TRF-1 (upto formative pruning)

Table 1. Bush architecture studies on TRF-1

Clones	No. of branches			Canopy cover (m^2)	Bush height (inch)
	Primary	Secondary	Tertiary		
TRF-1	6.07±0.01	64.83±0.37	192.90±1.18	1.42	40
UPASI-9	5.90±0.01	52.71±0.27	172.55±1.03	1.02	45

± Standard Error

The performance of TRF-1 planted in double hedge at a spacing of 120 x 75 x 75 cm showed quite good yield levels up to 3792 kg ha-^{1} yr^{-1}, which is 31.71 percent more than that of TRF-1 planted in single hedge at a spacing of 120 x 90 cm during 2011 (Fig. 2). This finding is in agreement with those reported by Radhakrishnan and Durairaj, (2008). A greater number of plants can be accommodated in a unit area that gives rise to high yield.

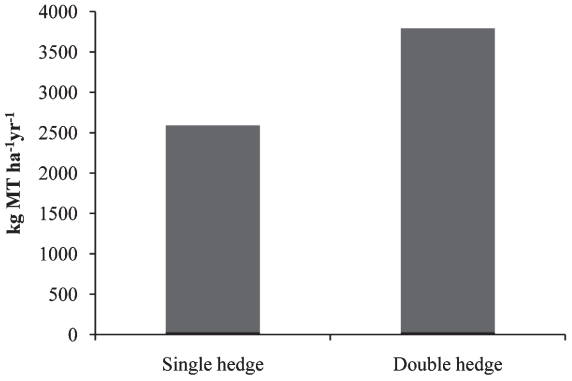

Fig. 2. Field performance of TRF-1 at different spacing

The nutrient management has played a key role in increasing tea productivity in South India. The significance of fertilizer use can be judged from the fact that growth in fertilizer consumption and tea productivity has gone up almost together. Higher fertilizer not only keeps the bush healthy and with vigour, but also translates to more yield. These findings are in agreement with those reported by

Verma (1996; 1998). For higher efficiency, the rate should be optimum. For increasing the efficiency of N and K, these fertilizers should be applied in four to six splits, maintaining a minimum interval of about three weeks during peak growth period. All the nutrients must be applied in a balanced proportion.

The normal recommendation *i.e*. 240 kg of nitrogen is optimum for normal growth of the TRF-1. Observation made over a period of four years clearly indicated that the 240 kg N ha^{-1} yr^{-1} in 5 splits gave more yield followed by other treatments. The yield level up to 4007 kg MT ha^{-1} and 9430 kg MT ha^{-1} has been achieved in 2011-12 and up to formative pruning respectively. The yield when 240 kg N is applied is 7.02 per cent more than the control till formative pruning (Table 2). There was no significant yield increase when increased rate of N:K fertilizer was applied. Before fertilizer application, soil (0-9 inch) and leaves (3 leaf and a bud and matured leaf) were collected and analyzed for nutrient status. There was only marginal difference in the nutrient levels between the treatments. The study further showed that the drought was severe in the every first quarter of the year (January to March). During this period, signs of drooping and defoliation were more pronounced in TRF 1 than other clones. However, recovery was faster after drought.

Table 2. Yield of TRF-1 under different N levels kg MT ha^{-1}

Treatment (kg MT ha^{-1}) in 5 splits	2008-09 (Sep'08-Mar'09)	2009-10 (Apl'09-Mar'10)	2010-11 (Apl'10-Mar'11)	2011-12 (Apl'11-Mar'12)	Total Kg MT/ha (Sep 08 - Mar 12)
T1 - Control	282	1462	3281	3786	8811 a
T2 - 180	351	1606	3052	4062	9071 (3.96) a
T3 - 240	328	1644	3450	4007	9430 (7.02) a
T4 - 300	303	1654	3076	4009	9043 (4.28) a
T5 - 360	308	1660	3157	4126	9251 (1.93) a
T6 - 420	340	1652	3321	4016	9328 (1.09) a
CD (0.05)					19.27

Figures followed by the same alphabets in a vertical column are not significantly different at five per cent level. Figures in parenthesis indicate percentage increase over control

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