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EFFECT OF PRUNING INTENSITIES ON LEAF NUTRIENT STATUS AND FRUIT YIELD IN TAMARIND PLANTAION AT DHARMAPURI DISTRICT OF TAMIL NADU, INDIA

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ABSTRACT
The field experiment on pruning treatment was carried out in 15 year old tamarind plantation at Harur taluk, Dharmapuri district, Tamil Nadu. The tamarind trees were imposed with three pruning intensities (15 % pruning, 30 % pruning and 50 % pruning) and control for enhancing the flowering and fruiting in Tamarind. The total nitrogen (2.25 %), total phosphorus (0.302 %), total potassium (0.207 %), chlorophyll 'b' (0.672 mg g^{-1}) and total chlorophyll (1.046 mg g^{-1}) were found superior in T_2 (30 % pruning) and the lowest leaf nutrient status (Total nitrogen - 1.45 %, Total phosphorus - 0.251 %, Total Potassium - 0.140 %, Chlorophyll 'a' – 0.263 mg $g^{-1}$and chlorophyll content, Chlorophyll 'b' - 0.403 mg g^{-1}, Total chlorophyll - 0.666 mg g^{-1}) in T_4 (Control-Unpruned trees). The maximum tamarind fruit yield was exhibited in 30 per cent pruning with the fruit yield of 39 kg. and the minimum was recorded in control (14 kg.). To conclude the study, the moderate pruning in tamarind tree enhanced the nutrient status in leaf and fruit yield.

INTRODUCTION

Pruning in trees is common and constructive technique for a variety of ornamental plants under natural exposed sunlight or greenhouse conditions (Sarkka and Erikson, 2003). Generally, the reason of pruning is to observe and control the plant growth to manipulate branching, flower and fruits production in different season or all year round. Many researcher and their studies have underlined the outcome of pruning on flowering and its effects on the subsequent fruit growth and quantity as well as its quality (Calatayud *et al*., 2007). Annual pruning of fruit trees always reduces yield, but enhances fruit quality. Pruning increases fruit size, because excess flower buds are removed and pruning encourages the growth of new shoots with high quality flower buds (Dhillon and Anirudh, 2014).

Although tamarind is being planted on large scale plantations, since long time as a species of wide adaptability and amplitude of uses, little has been done for its yield improvement (Reddy *et al*., 2010) and to reduce its reproductive age which would in turn make its cultivation economically feasible. Tamarind, a suitable species for wasteland and other afforestation programme planted extensively in Tamil Nadu by forest department, farmers and other agencies suffers from irregular bearing associated with shy bearing which results in poor fruit yield.

It is documented by earlier workers that due to profuse flowering in *Tamarindus indica*, the fruit set was very poor, resulting in large scale abscission of flowers as well as fruits during various stages of development. Normally in tamarind, large plantation have failed in flowering and fruiting and by keeping this in mind, the pruning intensities was carried out to study the nutrient status and fruit yield.

MATERIALS AND METHODS

The study was carried out during 2014-2016 in the Chinnakupam village, Harur Taluk, Dharmapuri district, Tamil Nadu, India (12º01'00''N 78º27'38.7'' E). The plant material consisted of tamarind trees, planted in 2000 with the spacing of 5 × 5 m were employed for productivity enhancement of tamarind fruit through the treatment of canopy management. The soil type of Harur taluk is red sandy loam, where the proportion of silt is very high. Soils at the location are slightly alkaline in nature and low in organic carbon status. Available nitrogen is low, whereas the available phosphorus was medium and highest available potassium content.

The experiment was initiated during April, 2014. The trees were selected on the basis of uniform vigor and development. The dormant pruning treatments were performed on the entire tree and consist of unpruned control and increasing levels of dormant pruning (removing 15 %, 30 % or 50 % of the fruiting wood). The leaf samples were taken for evaluation at different stages during new flush formation, peak flowering, pod maturation or fruiting and harvesting. The observations recorded are.

Nutritional status

The processed and ground leaf samples were analyzed for macronutrients using appropriate methodology as furnished in Table 1 and expressed in percentage.

Chlorophyll content

method of Yoshida *et al*. (1976) and expressed as mg per gram of fresh weight.

The concentrations of chlorophyll 'a', chlorophyll 'b', total chlorophyll and chlorophyll a/b ratio were estimated by adopting the ,Fully matured young fresh leaf samples of 250 mg were collected, washed in distilled water and then ground with 10 ml of 80 per cent acetone using pestle and mortar. The homogenate solution was centrifuged at 500 rpm for 10 minutes. Thes The concentrations of chlorophyll 'a', chlorophyll 'b', total chlorophyll and chlorophyll a/b ratio were estimated by adopting the upernatant was collected and the volume was made up to 25 ml using 80 per cent acetone. The optical density of the content was measured at 663 and 645nm using double beam UV Spectrophotometer (Tanee and Albert, 2013).

Fruit yield

The pods harvested from each tree were weighed and expressed in kg tree^{-1}.

Statistical analysis

The data obtained were subjected for statistical analysis to evaluate the possible relationship between the different parameters and analysis of variance employing statistical methods described by Panse *et al*. (1985).

RESULTS AND DISCUSSION

Leaf Nutrient Status

The long term growing trees without proper management of pruning cannot improve its nutrient reserves in plants, moderately or totally and maintain their poor flower initiation (Sivakumar and Korsten, 2007 and Das *et al*., 2003). In the present investigation, T_2 treatment with 30 per cent intensity of pruning recorded highest total nitrogen, total phosphorus and total potassium with the value of 2.25 per cent, 0.207 per cent and 0.302 per cent respectively was represented in Table 2 and 3. Hossain and Fusao (2008) supported the present study and they observed that nitrogen, phosphorus and potassium in leaf were highest in pruned trees than unpruned peach trees. As growth progress, macro nutrients was increased from new flush formation to peak flowering stage and gradually declined from pod maturation to harvesting stage, with significant variation between each other. Potassium content was increased by frequent pruning, so frequent pruning could be one of the effective strategies to increase potassium in plant leaf (Hossain *et al*., 2007). On contrary, T_4-Control (Unpruned) was observed poor potassium content in different pruning intensities is represented in Fig. 1.

Chlorophyll content

Pruning is an effective method to increase yield, chlorophyll 'a', chlorophyll 'b' and relative content of leaf (Calatayud *et al*., 2002 and Medienen *et al*., 2002). In the current study, T_2-30 per cent pruning and T_3-50 per cent pruning obtained highest chlorophyll 'a', chlorophyll 'b', total chlorophyll and

Table 1: Standard procedures followed for leaf nutrient analysis

Sl.No.	Parameter	Method adopted	References
1	Nitrogen	Microkjeldahl method	Humphries (1973)
2	Phosphorus	Vanadomolybdate yellow colour method	Jackson (1973)
3	Potassium	Flame photometry	Piper (1973)

Table 2: Effect of different pruning intensities on total nitrogen content in tamarind leaves

Treatment		Total nitrogen (%)				Mean
		New flush formation	Peak flowering	Pod maturation	Harvesting	
T_1	15 % Pruning	1.62	1.91	1.89	1.83	1.81
T_2	30 % Pruning	1.97	2.43	2.35	2.26	2.25
T_3	50 % Pruning	1.43	1.8	1.54	1.56	1.58
T_4	Control	1.47	1.53	1.42	1.39	1.45
SEd		0.139	0.201	0.153	0.211	
CD (0.05)		0.303	0.438	0.334	0.461	

Table 3: Effect of different pruning intensities on total phosphorus content in tamarind leaves

Treatment		Total phosphorus (%)				Mean
		New flush formation	Peak flowering	Pod maturation	Harvesting	
T_1	15 % Pruning	0.264	0.302	0.326	0.269	0.29
T_2	30 % Pruning	0.227	0.361	0.303	0.315	0.302
T_3	50 % Pruning	0.196	0.31	0.252	0.308	0.267
T_4	Control	0.139	0.295	0.326	0.244	0.251
SEd		0.003	0.011	0.009	0.005	
CD (0.05)		0.007	0.024	0.021	0.012	

Table 4: Effect of different pruning intensities on chlorophyll 'a' content in tamarind leaves

Treatment		Chlorophyll 'a' (mg g^{-1})				Mean
		New flush formation	Peak flowering	Pod maturation	Harvesting	
T_1	15 % Pruning	0.167	0.455	0.568	0.31	0.375
T_2	30 % Pruning	0.193	0.459	0.46	0.382	0.374
T_3	50 % Pruning	0.177	0.474	0.481	0.435	0.392
T_4	Control	0.087	0.328	0.416	0.22	0.263
SEd		0.001	0.002	0.008	0.009	
CD (0.05)		0.002	0.005	0.017	0.02	

Table 5: Effect of different pruning intensities on chlorophyll 'b' content in tamarind leaves

Treatment		Chlorophyll 'b' (mg g^{-1})				Mean
		New flush formation	Peak flowering	Pod maturation	Harvesting	
T_1	15 % Pruning	0.573	0.588	0.711	0.635	0.627
T_2	30 % Pruning	0.558	0.65	0.782	0.699	0.672
T_3	50 % Pruning	0.481	0.504	0.726	0.63	0.585
T_4	Control	0.32	0.339	0.417	0.535	0.403
SEd		0.015	0.017	0.021	0.01	
CD (0.05)		0.034	0.042	0.048	0.022	

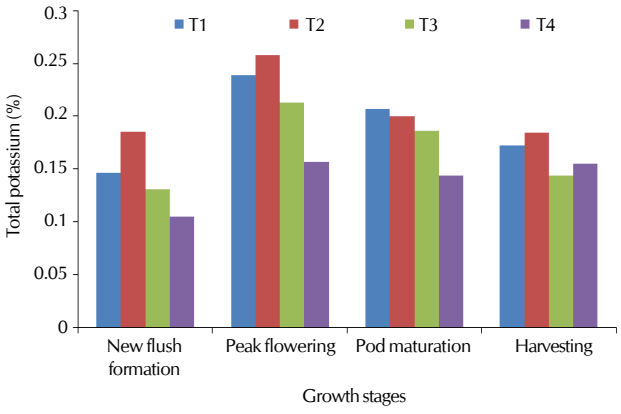

Figure 1: Effect of pruning intensities on total potassium content in tamarind leaves

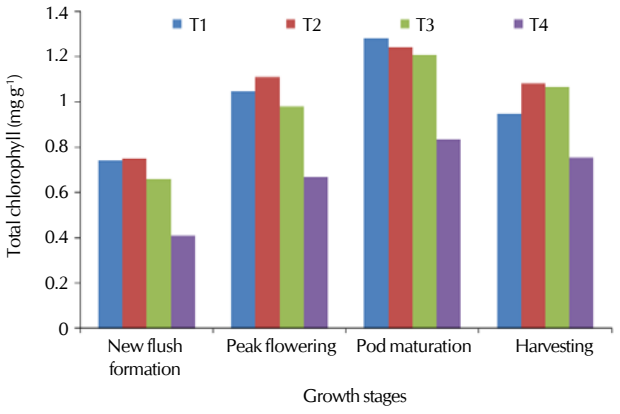

Figure 2: Effect of pruning intensities on total chlorophyll content in tamarind leaves

Table 6: Effect of different pruning intensities on fruit yield in tamarind tree

Treatment		Yield (kg.)
T_1	15 % Pruning	18
T_2	30 % Pruning	39
T_3	50 % Pruning	21
T_4	Control	14
	SEd	3.19
	CD (0.05)	6.95

chlorophyll a/b ratio in tamarind. On contrary, T_4-Control (Unpruned) was observed lowest physiological attributes in tamarind plantation was represented in Table 4 and 5.

Gradual increase in chlorophyll pigment content was observed from new flush formation to pod maturation stage with a reduction at harvesting stage in different treatments in Fig. 2. Hence, it can be referred that frequent pruning, once per month was the most favorable rate to keep the maximum stage of chlorophyll in bougainvillea (Saifuddin *et al*., 2010).

Fruit yield

Pruning is an important cultural operation for obtaining quality yield from the fruiting trees, which involves judicious removal of vegetative parts. An unpruned tree becomes very large, which inhibits light penetration inside the canopy and reduction in fruit production (Mishra *et al*., 2011). Pruning is an important tree management practice to regulate vegetative growth, flowering and yield in many fruit crops including mango (Srilatha *et al*., 2015). In present study, the highest fruit yield of 39 kg. was obtained in T_2 with 30 per cent pruning intensity followed by T_3 with 50 per cent pruning intensity with yield of 21 kg. and lowest of 14 kg. was recorded in T_4-Control (Unpruned) was represented in Table 6. On supporting the present study, pruning of cashew tree influenced the production of flowering laterals, number of bisexual flowers per panicle and the number of fruits per panicle (Murali *et al*., 2015).

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