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Evaluation of Tamarind Clones for Growth, Yeild and Quality Parameters

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ABSTRACT

Forty one different tamarind clones were evaluated at the Citrus Research Station, Petlur, during the year 2010 to 2013. The data pertaining to yield components and quality parameters were recorded and analysed. The study revealed that wide variation for fruit yield, pulp weight, shell weight, fiber weight, seed weight, titratable acidity and total soluble solids. The study indicated that clones like PKM-1, Urigam, PTS-4 and PTS-30 are very important with respect to excellent pulp recovery and higher acidity content and with reference to fruit yield per tree PTS-18, PTS-24 and PTS-6 are promising.

Key words: *Clones for growth, tamarind, Yield.*

Tamarind (*Tamarindus indica* L.) is a hardy evergreen monotypic tree which belongs to the family Leguminosae and sub family Caesalpinaceae and has a chromosome number 2n =24 (Anon., 1972 ; Purseglove, 1981). It is cultivated throughout the tropics and sub-tropics of the world and has become naturalized at many places. grown all over India mostly under rainfed conditions, particularly in Tamil Nadu, Maharashtra, Karnataka, Andhra Pradesh, Madhya Pradesh and Orissa. It is also one of the most popular avenue trees which yield useful fruits and timber besides providing shade. Tamarind is believed to be native of Tropical Africa but now cultivated throughout South East Asia, Australia, America. India is the only country to exploit tamarind grown extensively all over India mostly under rainfed conditions, particularly in Tamil Nadu, Maharashtra, Karnataka, Andhra Pradesh, Madhya Pradesh and Orissa. It is also one of the most popular avenue trees which yield useful fruits and timber besides providing shade. Tamarind is believed to be native of Tropical Africa but now cultivated throughout South East Asia, Australia, America Though tamarind is an economically important tree crop of India, so far, not much work has been done to understand and improve tamarind as a cash crop. Pulp powder and juice concentrates have a export potential in European countries. Tamarind pulp has an excellent keeping quality when dried properly in and cured with salt. Pulp is rich in glucose (47.7% of total sugar); D-manose (24.5%) and D-maltose (20.4%). The sour taste of the pulp is attributed to tartaric acid (8-18%) together with malic and citric acids (2%). The fruit is good source of phosphorus, calcium and iron. Tender leaves and flowers are also edible. Tender leaves and flowers are also edible. Tamarind seeds yield a cheap substitute for cereal starch which is in textile industry. (Dwivedi et.al, 1990).

Majority of tamarind grown in India are of seedling origin. High degree of variation and wide range of heterozygosity with respect to size and quality of fruit are existing. This heterozygous nature of plant gives scope for further selection and establishing desirable plus trees. Many plus trees have been identified which were of seedling origin. These were multiplied vegetatively and maintained in the gene bank. They need to be assessed for yield potential and quality parameters. Due to cross pollination and predomination practice of seed production there is immense opportunity to locate elite trees having desirable traits which needs to be conserved and exploited (Keskar et al, 1989) With this view, the present work was undertaken.

Systematic information on the germplasm is scanty particularly under harsh semi arid ecosystem for tamarind. There are very few well recognized tamarind varieties. However, in the recent past few seedling selections have been identified on the basis of fruit quality and yield. They are a) Prathisthan from Fruit Research station, Aurangabad, b) Tree No 38 located at college of Agriculture, Pune, (Maharashtra) c) PKM-1 a clonal selection from the gene bank is an early variety yielding 263 kg pods/tree with a pulp content

Table 1. Variability exhibited with respect to fruit yield, titratable acidity, TSS, shell, fiber, pulp and seed characters of 15 fruit bearing tamarind clones.

Sl.	Treatments clones)	Fruit yield	Titratable acidity (%)	TSS° Brix	Shell Content (%)	Fiber content (%)	Seed content (%)	Pulp content (%)
1	PTS-1	1.57	9.18	15.05	24.52	5.53	28.55	41.40
2	PTS-2	2.32	10.72	12.10	36.76	5.39	33.87	23.98
3	PTS-3	3.27	7.66	14.22	21.21	4.71	35.13	38.95
4	PTS-4	1.97	14.26	13.00	23.17	4.49	25.79	46.55
5	PTS-5	0.80	12.22	13.15	26.27	7.59	25.75	40.39
6	PTS-6	6.55	13.55	15.15	20.69	4.31	32.70	42.30
7	PTS-7	6.57	15.00	16.15	23.42	5.82	28.82	41.94
8	PTS-9	1.47	9.11	18.95	26.32	5.80	24.54	43.34
9	PTS-10	0.98	10.01	19.77	25.29	3.13	27.44	44.14
10	PTS-18	12.47	11.68	18.95	25.03	6.26	26.30	42.41
11	PTS-24	7.90	12.03	15.92	26.35	6.03	25.79	41.83
12	PTS-30	7.55	11.26	18.00	23.35	4.39	26.92	45.34
13	PTS-33	2.02	15.13	16.92	20.86	3.71	27.84	47.59
14	PKM-1	2.95	18.01	17.15	24.66	3.27	20.52	51.55
15	Urigam	2.57	15.26	16.00	18.77	5.56	11.42	64.25
	SEm +	1.41	0.0767	0.0955	0.0927	0.0982	0.1086	0.1791
	CD at 5 %	4.054	0.2185	0.2719	0.2649	0.2805	0.3105	0.5118
	Cv %	69.74	1.2428	1.1907	0.758	3.8836	0.8118	0.8188

* significant at 5 % level.

of 39 % yield is around 26 tonnes of pods/ha if transplanted at a spacing of 10 m x 10 m d) Urigam is another local type providing very long having sweet pulp.

Studies were also under taken to select high yielding cultivars based on their flowering pattern. In seedling populations, early, mid and late flowering tamarind types have been identified. Duration of flowering is longer in late flowering trees than in mid and early flowering trees. In mid and late flowering trees natural cross-pollination is greater than with early flowering trees which are mostly self-pollinated under natural conditions. Hence mid and late flowering trees can be selected and are most suitable for selection for improvement (Usha and Singh, 1994, Madhu 2001)

MATERIAL AND METHODS

A total of 41 tamarind accessions i.e. Petlur Tamarind Selections are maintained at Citrus Research Station, Petlur, Venkatagiri dist Nellore. The soil is red loamy type and the temperatures are very hot which reaches up to 47 degrees during summer months and dry weather persists for almost nine months in a year.

They were established in 2001 and were evaluated during the fruiting season (February - April, 2011, 2012, 2013).The plantation is twelve years old. Three plants in each clone at a distance of 8x8 mt were planted and maintained.. Nutritional requirement of tamarind recommendations on an adhoc basis for a ten year old tree received 50 kg FYM +1 kg N + 500 g P_2o_5 + 1 kg K_2o. During the period under study weeding, plant protection measures etc. were take care of. The data pertaining to yield components and quality parameters of fruits were recorded.

RESULTS AND DISCUSSION

Among the 41 clones in the study only 15 clones were fruit bearing. The fruit yield per tree significantly varied from 0.80 kg (PTS-5) to 12.47 kg (PTS-18) among the 15 different fruit bearing tamarind clones (Table 1). Maximum yield was recorded in PTS-18 (12.47 kg) and clone PTS-5 (0.80 kg) recorded lowest yield per tree. The research work done on vegetatively propagated tamarind is very meager and yield data of clonal progenies are not available . However, Murthy (1997) and Hanamashetti and Sulikeri (1997) reported tamarind fruit yield of less than 5 kg per tree from 6-7 year old vegetative propagated plants in the orchard.

The data revealed significant differences among the tamarind clones for Different components of the fruit

Table 2. Growth parameters of different Tamarind Clones.

S. No.	Name of the accession	Scion/stock ratio	Plant height (m)	Plant volume (cu.m)	Flowered plant (%)	Color flowering	Yield/ plant (kg)
1	PTS-1	1.24	10.4	60.6	15.6	Y	1.57
2	PTS-2	2.8	9.1	89.3	14	Y	2.32
3	PTS-3	2.3	9.6	60	16		3.27
4	PTS-4	2.2	7.5	47	12	R.Y	1.97
5	PTS-5	2.3	9.4	64.6	23.3	Y	0.80
6	PTS-6	2.2	9.3	37	52.6	Y	6.55
7	PTS-7	2.3	8.8	27	33.3	Y	6.57
8	PTS-8	2.4	9.1	47.3	5	Y	1.47
9	PTS-9	2.4	9.3	52.3	4	Y	0.98
10	PTS-10	2.3	10.7	43.3	20.6	Y	
11	PTS-11	2.4	11.3	52.6	20	RY	
12	PTS-12	2.3	11.1	92.3	26.6	Y	
13	PTS-13	2.2	11.7	33	26.6	Y	
14	PTS-14	2.3	11.2	37.3	26.6	Y	
15	PTS-15	2.3	11.4	89.6	30	Y	
16	PTS-16	2.3	11.6	54.0	60.6	Y	
17	PTS-17	2.4	11.5	64.6	61.3	Y	
18	PTS-18	2.3	11.1	63.3	57.3	**R.Y**	12.47
19	PTS-19	2.3	9.6	30.6	13.3	RY	
20	PTS-20	2.1	8.2	98	41.6	RY	
21	PTS-21	2.3	9.2	33.6	33.3	Y	
22	PTS-22	2.3	10.8	41.3	45	R.Y	
23	PTS-23	2.1	12.2	69.3	45	Y	
24	PTS-24	2.1	11.7	63.3	55	RY	7.9
25	PTS-25	2.2	11.8	63.3	50	Y	
26	PTS-26	2.3	11.7	60	23.3	Y	
27	PTS-27	2.2	10.1	40.3	18.3	Y	
28	PTS-28	2.2	10.9	73.3	16.6	Y	
29	PTS-29	2.2	9.4	25.6	15	Y	
30	PTS-30	2.2	10.7	71.3	10	Y	7.55
31	PTS-31	2.2	9.7	28	58	Y	
32	PTS-32	2.2	9.7	32	55	Y	
33	PTS-33	2.2	9.3	56.3	20	Y	2.02
34	PTS-34	2.3	11.0	56.6	13.3	Y	
35	PTS-35	2.2	9.6	36.6	18.3	Y	
36	PTS-36	2.1	9.7	35	18.3	Y	
37	PTS-37	2.16	10.6	77.6	15	Y	
38	PTS-38	2.2	9.0	47.6	25	Y	
39	PTS-39	2.3	11.2	60.3	10	Y	
40	PKM-1	2.1	8.3	21.3	10	Y	2.95
41	Urigam	2.2	8.4	20.1	10	Y	2.5
	SeD	0.346	66.9	16.3	3.09		
	CD	0.693	133.8	32.7	6.19		

characters. The highest shell content (36.76 %) was recorded for PTS-2 and lowest (18.77 %) was recorded for Urigam (Table 1). The fiber content was ranging from 3.13 to 7.59 per cent among the different clones (Table1). There were a significant differences among the clones with respect to fiber per cent. The highest fiber content (7.59 %) was recorded in PTS-5. PTS-10 clone recorded lowest rate (3.13 %). There was wide range of variation among the different clones for seed weight (11.42 to 35.13 %) (Table 1). Among 15 different tamarind clones, PTS-3 recorded highest seed content (35.13 %). The lowest seed weight (11.42 %) was recorded in Urigam. Maximum pulp content (64.25 %) was recorded in Urigam clone (Table 1). Similarly lowest pulp content (23.98 %) was recorded in PTS-2 clone. The variation in shell, fiber, seed and pulp content might be due to the distinct feature of different clones. Similar variation with respect to shell, fiber, seed and pulp content was observed in tamarind by Mastan *et al*. (1997), Shivanandam and Thimmaraju (1988) and Hanamashetti and Sulikeri (1997). The range of variation in titratable acidity was from 7.66 to 18.01 per cent (Table 1). There were significant differences among different tamarind clones with respect to percentage of tartaric acid content. The highest tartaric acid content was (18.01 %) found in the clone PKM-1 and the lowest acidity (7.66 %) was recorded in the clone PTS-3. The tamarind pulp contained 8 to 18 per cent tartaric acid (Hanamashetti and Sulikeri, 1997 and Mastan *et al*., 1997). Tamarind needs to be more acidic and higher the acid content better is the quality. The range of variation in total soluble solids was from 12.10 in PTS-2 to 19.77°Brix PTS-10 (Table 1). Significant differences were observed among the different tamarind clones with respect to total soluble solids. The highest total soluble solids content (19.77°B) of fruit pulp was recorded in PTS- 10 and least TSS (12.10°B) was recorded in PTS - 2 The difference in TSS content of pulp may be due to difference in sugar content of fruits. Similar outcome with respect to TSS was reported by Shivanandam and Thimmaraju (1988) and Keskar *et al*. (1989).

The data revealed significant differences among the tamarind clones for different components of growth characters. Highest plant height (11.8 mt) was recorded in PTS-25 followed by PTS-26 (11.7m) and minimum was recorded in PTS-4. The plant volume was highest (92.3 cu.m) in PTS-12 followed by PTS-15 (89.6 cu.m). Among the clones PTS-17,PTS-18 showed high percentage of flowering but the bearing habit was almost nil. In most of the varieties the fruiting was not observed due to biannual nature of tamarind. Among the clones PTS-18 recorded more yield, fruit length and pulp was found to be suitable variety for scarce rain fall zone in Nellore Dist.. There is also interest in India in using fruit tree genotypes for ameliorating marginal farmland wastelands in Tamilnadu (Madhu 2001). Knowledge of genetic diversity helps in efficient management of tamarind germplasm for further hybridization programme.

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