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EVALUATION OF ELITE TAMARIND GENOTYPES (*TAMARINDUS INDICA* L.) FOR YIELD AND QUALITY ATTRIBUTES FOR SOUTHERN DRY ZONE OF KARNATAKA

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ABSTRACT

Tamarind (*Tamarindus indica* L.) is one of the most important multipurpose tree species. It is considered one of the minor tree spice crops in India. In these views, ten Tamarind genotypes were evaluated at Horticulture Research and Extension centre in Arsikere, India. Among ten tamarind genotypes with respect to yield, quality parameters were studied. The analysis of variance of 5 year mean data indicated that there was a significant difference observed in vegetative and yield characters. Among the genotypes studied, the highest pod yield per plant was recorded in genotype-10 (110 kg/tree) followed by genotype-151 (105 kg/tree) compared to other genotypes. The lowest pod yield was recorded ingenotype-28 (70kg/tree). The maximum pulp yield was recorded in genotype-10 (50.95 kg/tree) followed by genotype-51 (36.24 kg/tree) genotype-14(33.98 kg/tree). The TSS was highest in genotype-10(18^0B) followed by genotype- 51(17.5^0B) compared to other genotypes. Hence, genotype-10 has been recommended as Krishna Prabha tamarind for commercial cultivation in southern dry zone of Karnataka, India under dry land conditions.

Key words : Tamarind, Genotypes, Yield, Pulp, TSS.

Introduction

Tamarind (*Tamarindus indica* L.) is one of the most important multipurpose tree spices. It belongs to the family Leguminacea and sub family ceasalpiniaceae (Kapur and Ahemed, 2014) and it has the chromosome number 2n=24 (Purseglove, 1987). The leaves have been used as vegetables and this is important in solving food security in semi-aridparts. The fruits are eaten fresh or the pulp is processed in to juice, jam, chewing gum, sauces and soups for a sweet and sour taste. Tamarind powder is also used in sizing material in leather and textile industry. India is the world's largest producer of tamarind products. Tamarind is abundantly available in the Indian states of Madhya Pradesh, Andhra Pradesh, Bihar, Karnataka, Tamil Nadu and West Bengal, Orissa and Kerala (Jambulingam and Fernandes, 1986). The annual production of pulp in India is over 3 lakh tones of which 4 tones are exported to Europe, North America and the rest are locally consumed (Swamy *et al*., 2014). The area of tamarind in India is 32000 hectares, of which 18,927 hectares area in Karnataka state.

Tamarind was recorded over a century ago as a variable species, especially for pulp colour and sweetness. Since there is such extensive variation in characters such as foliage, flower, pod production and timber quality. There is considerable scope to improve the species (Radhamani *et al*., 1998). A high degree of variation and wide range of hetrogygosity with respect to the size and quality of fruit are existing. This heterozygous nature of plants gives scope for further selection and establishing desirable plus trees. Considering the above facts, the present investigation was undertaken to study the variation in quantitative and qualitative characters in seedling originated tamarind genotypes.

Materials and methods

An investigation was conducted at the Horticulture Research and Extension Centre, Arsikere, under the University of Horticultural Sciences, Bagalkot, Karnataka, India from 2015-2022. The area is located at a longitude of 76.5^{0}E. latitude 13.15N Attitude, 800 mt MSL, a mean minimum temperature 13.84^0 C, the mean maximum temperature 34.62^0 C with an average rainfall 694mm peak in May-June and September-October. The soil type is medium black with PH of 7.5-8. The plant material consists of 10 genotypes collected from different locations like Hassan, Thumkur and Mysuru forest department were planted with a spacing of 10 X 10 metres. The recommended cultivation practices were followed in tamarind as per packages of practices. Growth parameters like plant height, girth, number of pods per tree and yield parameters like pod yield, pod length, pod width and single pod weight, quality parameters like Tartaric acid (%) and TSS were taken. The percentage of Tartaric acid was estimated as per the method suggested (AOAC, 1975).

Results and Discussion

The results of the quantitative and qualitative parameters of tamarind genotypes have been presented in Tables 1, 2 and 3, respectively. Among the different genotypes studied, the pod yield per tree varied from 70 to 110 kg/tree. The results of the present investigation revealed that pod yield per tree was highest in genotype- 10(110kg) followed by genotype-151(105 kg) and genotype-12 (100kg). The genotype-66 had the lowest pod yield/tree *i.e.* 70kg. Similarly, the higher pod yield per ha was observed in genotype-10(110 q/ha), followed by genotype-151(1050 q/ha) and the lowest was observed in genotype-28 and 66 (70 q/ha each). The genetic makeup of the plant plays a vital role in the productivity of plant. The yield is known to be a polygenic character besides care and management of the orchard, age of the plant and season are the important factor influence the yield was obtained (Patil, 2010). Similar trends were also observed in respect to yield as obtainedin different tamarind genotype S-18 (12.47 kg) and clone P-14 (0.80 kg) (Prabhushankar *et al*., 2004; Hanamashetti

Table 1 : Performance of elite Tamarind genotypes for growth and yield traits.

S. no.	Tamarind genotypes	Plant height (m)	Plant girth (cm)	No. of pods/ tree	Pod yield/ tree(kg)	Pulp yield/ tree(kg)	Pod yield/ha (Quintal/ha)	Single pod weight (g)	Pod length (cm)	Pod width (cm)
1	Genotype-5	7.50	74	5462	80	25.09	80	14.65	9.50	2.26
2	Genotype-10	5.54	76	5021	110	50.95	110	21.91	14.42	2.48
3	Genotype-14	6.50	75	6317	108	33.98	108	17.10	12.66	2.42
4	Genotype-20	8.00	69	6760	92	26.67	92	13.61	14.72	2.16
5	Genotype-22	6.55	70	3587	90	32.62	90	25.09	16.26	3.00
6	Genotype-28	6.60	65	3711	70	24.16	70	18.86	15.26	2.28
7	Genotype-51	6.70	56	4345	80	36.24	80	18.41	11.86	2.32
8	Genotype-66	5.30	53	2843	70	25.68	70	24.62	15.44	2.74
9	Genotype-112	7.10	80	6535	100	31.73	100	15.30	14.42	2.24
10	Genotype-151	7.40	80	7387	105	33.00	105	14.21	10.88	2.18
	Mean	6.71	69.8	5196.8	90.5	32.01	90.50	18.4	13.5	2.41
	SD	0.84	9.35	1544.89	15.1	7.89	15.09	4.2	2.24	0.27
	CV%	12.51	13.4	29.71	16.7	24.64	16.68	23.1	16.31	11.19

Genotype-5, Genotype-10, Genotype-14, and Genotype-20- collected from Hassan district Genotype-22, Genotype-28, Genotype-51- collected from Thumkur district
Genotype-66, Genotype-112, Genotype-151- collected from Mysuru district

Table 2 : Performance of elite tamarind trees for yieldover years.

S. no.	Tamarind genotypes	Pulp yield (q/ha)					
		2015-16	2016-17	2017-18	2018-19	2019-20	Mean
1	Genotype-5	30.00	40.0	35.0	80.0	60.0	49.00
2	Genotype-10	43.50	65.0	60.0	110.0	78.0	71.30
3	Genotype-14	25.0	80.0	65.0	105.0	72.0	69.40
4	Genotype-20	63.0	70.0	55.0	92.0	65.0	69.00
5	Genotype-22	63.0	75.0	48.0	90.0	65.0	68.20
6	Genotype-28	35.0	57.0	43.0	70.0	53.0	51.60
7	Genotype-51	18.0	33.0	60.0	80.0	60.0	50.20
8	Genotype-66	20.0	30.0	38.0	70.0	50.0	41.60
9	Genotype-112	23.0	54.0	50.0	98.0	80.0	61.00
10	Genotype-151	39.0	62.0	45.0	105.0	70.0	64.20
Mean		35.95	56.60	49.90	90.00	65.30	59.65
SD		16.42	17.36	9.98	14.59	9.92	10.57
CV%		45.67	30.67	20.03	16.70	15.20	17.72

et al., 1996).

The plant height was maximum in genotype-20 (8m) followed by genotype-5 (7.50m) and the minimum plant height was observed in genotype-66 (5.30 m). However, plant girth of 80cm was observed in genotype-112 and 151 and genotype-66 had the lowest plant girth (53 cm). This is may be due to varietal difference among genotypes.

More number of pods per tree were recorded in genotype-151 *i.e.* 7387 (no.) followed by genotype-20(6760 no.) and less number of pods per tree was recorded at 2843 in genotypes-66. The Single pod weight ranged from 13.61 to 25.09 cm in genotype-20 & 22, respectively. The highest pod length and pod width were found in genotype-22 (16.26cm, 2.74 cm) followed by genotype-66 (15.44cm, 3cm) and lesser was found in genotype-5 (9.50cm, 2.26 cm) respectively. The pod width ranged between 2.16 cm to 3cm. The highest pod width was observed in genotype-22(3cm) followed by genotype-66 (2.74cm) and a minimum was observed in genotype-20 (2.16cm). The differences in the length of pod and width of pod may be attributed to the difference in genetic makeup of the different tamarind genotypes. A similar variation in pod length in tamarind genotypes was reported (Kokate, 1998; Jambulingam *et al*., 1997).

In the present investigation, it was found that, maximum seed weight per pod was observed in genotype-22(9.58 g), followed by genotype-66 (8.96) and minimum was noticed in genotype-20(4.72g) .The pulp weight per pod was higher in genotype-10(10.15g) followed by genotype-22 (9.09g) and the lowest was observed in genotype-20(3.95g). The difference in seed weight is due to varietal character due to the difference in size of the seed among genotypes. These results are confirmed by finding reasons (Divakara, 2008; Singh *et al*., 2014).

The vein weight per pod varied from 0.60 to 1.42g. The maximum vein weight was noticed in genotype-22(1.42g) followed by genotype-14(1.12g), genotype-28 (1.08g) and the minimum vein weight was noticed in genotype-10(0.60g). The genotype 112 and 151 contained more seed to pulp ratio that is 1:3 and genotype-10 has less seed to pulp ratio. The similar results obtained by Hanamashetti and Sulkeri (1997), Divakara (2008) in tamarind genotypes. This may be due to differences in vein weight per pod may be due to the differences in the rate of development of vascular tissue in fruits.

The pod ridges ranged from 0 to 2 and genotypes 5, 10, 14, 22, 66, 112, 151 contained two ridges and genotype-28 has only one ridge, further genotype-20 and genotype-51 have no ridges on it. Among the 10 tamarind genotypes tartaric acid content was higher in genotype-51(10.05%) followed by genotype-66(9.75%) and lesser tartaric acid content was recorded in genotype-14(5.40%). The TSS ranged from 9.5 to 17.50 ^{0}B in ten tamarind genotypes. The differences in tartaric acid content of different tamarind genotypes may be due to different tamarind genotypes and vary from season to season. A similar study was conducted by Hanamashetti *et al.*, (1996), Prabhushankar *et al.* (2004) on PKM-1 tamarind.

The genotype-10 has recorded more TSS *i.e.* 18^{0}B and genotype-66 has less TSS(9.50^{0}B). Similar results were obtained by Mayavel *et al*. (2018). The differences in TSS content of tamarind pulp may be due to difference in sugar content of tamarind fruits of different genotypes.

Table 3 : Performance of elite Tamarind genotypes for Quality traits.

S. no.	Tamarind genotypes	Seed weight/pod (g)	Pulp weight/pod (g)	Vein weight/pod (g)	Seed to pulp ratio	Pod ridges	Tartaric acid(%)	TSS (^{0}B)	Taste	Pod shape
1	Genotype-5	5.24	4.59	0.96	1.1	2	8.70	11.00	Sour	C
2	Genotype-10	6.39	10.15	0.60	0.6	2	6.00	18.00	Medium Sour	SK
3	Genotype-14	6.33	5.38	1.12	1.2	2	5.40	11.50	Sour	SK
4	Genotype-20	4.72	3.95	0.89	1.2	0	6.30	13.00	Mixed	C
5	Genotype-22	9.58	9.09	1.42	1.1	2	9.60	14.00	Mixed	C
6	Genotype-28	7.20	6.51	1.08	1.1	1	9.30	14.00	Sour	C
7	Genotype-51	5.71	8.34	1.02	0.7	0	10.05	17.50	Highly Sour	St
8	Genotype-66	8.96	9.03	0.89	1.0	2	9.75	9.50	Medium Sour	SK
9	Genotype-112	6.49	4.86	0.64	1.3	2	7.20	12.00	Sour with sweet tinge	SK
10	Genotype-151	5.66	4.47	0.90	1.3	2	7.80	10.00	Mixed	SK
	Mean	6.63	6.64	0.95	1.10	1.5	8.01	11.05		
	SD	1.56	2.31	0.30	0.24	0.85	1.71	2.90		
	CV%	23.6	34.8	24.76	22.32	56.7	21.36	22.23		

C –C shaped SK- Sickle shaped St-Straight

Tamarind growing an arid region with limited water tended to more accumulation of dry matter and lower moisture may results in higher TSS in tamarind fruits (Meghwal and Azam, 2004).

The observations recorded on qualitative traits from each of the 10 tamarind genotypes indicated a considerable amount of variation in all the traits. The pod shape were categorized as straight, sickle shaped, C shaped were recorded in 10 genotypes, whereas C shaped pod were recorded in 4 genotypes namely genotype-5, 20, 22, 28. The sickle shaped pods were noticed in 5 genotypes namely genotype- 10, 14, 66, 112, 151 and straight pod shape was observed only in one genotype which is genotype-51.

Conclusion

Significant variation was observed among the genotypes with respect to yield, podcharacters, and tartaric acid content. Among the tamarind genotypes, genotype-10 has recorded the highest pod yield per plant (110kg), pulp yield per tree (50.948kg), pulp weight per pod (10.15g) and TSS (18^{0}B). Hence, it was recommended to release as variety Krishna Prabha tamarind for the southern dry zone of Karnataka, India and these attributes could be effectively used in the tamarind improvement programme for selecting genotypes.

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