



[Review Article]

Performance of Sapota cultivars under high rainfall conditions of Coorg

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ABSTRACT

Eleven varieties of Sapota (*Manilkaraachras* (Mill) Forb) were evaluated under humid tropical conditions at Central Horticultural Research Station (IIHR), Chettalli (Karnataka) during 2011 and 2012 for growth and yield. Higher plant height was recorded in CO-1 (9.02m) followed by cvs. CO-2 (8.22 m) and Gutti (8.15m) while it was lowest in cv. in Krithi Bharathi (5.79 m). The scion girth was also highest in cv. CO-1 (96.53 cm) while it was lowest (57 cm) in cv. Krithi Bharathi. The plant spread was higher in cvs. Kalipatti and CO-2. The number of fruits were highest in cv. Singapore (1521 fruits) closely followed by cvs. Kalipatti (1462 fruits) and Cricket Ball (1256 fruits) and lowest in CHES selection (232.5 fruits). The fruit weight was highest in CHES selection (158.8g) and lowest fruit weight in cv. Singapore (59.3g). The highest yield per tree was recorded in cv. Kalipatti (135.2 kg) closely followed by cv. Cricket Ball (133.7 kg). The lowest yield was recorded in cvs. CHES Selection (41.8 kg), PKM-1 (50.5 kg), CO-1 (53.71 kg) and CO-2 (62.6 kg). The total soluble Solids were highest in cvs. Kalipatti (20.4° Brix), PKM-1 (20.1520.4° Brix) and DHS-1 (19.2520.4° Brix). The fruit shape index varied from 0.84 in cv. CO-1 to 1.28 in cv. Singapore. The titrable acidity and ascorbic acid were found low in all the varieties. The result concludes that cvs. Kalipatti and Cricket Ball were found best in terms of yield and quality of fruits.

KEY WORDS :

Sapota (*Manilkaraachras* (Mill) Forb) is an evergreen tree. It is native to tropical America especially from South Mexico or Central America. It was introduced in India long back and became very popular. It grows like a native plant in South and Western Indian climatic conditions and produces crop almost round the year in some parts. The area under sapota in India is around 1.67 lakh hectare with a production of 14.95 lakh hectares and productivity of 9.1 tones (Anonymous 2014). It is mainly grown in Gujarat, Maharashtra, Karnataka, Tamil Nadu, and Andhra Pradesh. Most of the present day sapota cultivars are the result of seedling selection and its cultivation is based on a narrow genetic base. With increased emphasis on Sapota due to wide adaptability, ability to stand stress, high and continuous production and freedom from major pest and diseases, characterization, evaluation and documentation of Sapota germplasm has been receiving attention. Attempts have been made to evaluate the sapota germplasm for different agronomic traits so that recommendations for cultivation

could be made in different areas. Chundawat and Bhuva (1982) recommended cv 'Kalipatti' on the basis of higher quality and production for Gujarat conditions. Shirolet *et al.* (2006) reported CO-2, DHS-1, PKM-3 and DHS-2 were found promising with respect to yield and quality parameters in Northern Karnataka conditions. Sapota variety Viruthunagar was found better in Periyakulam areas of Tamilnadu (Saraswathy *et al.* 2010). The performance of the popular varieties varies in different climatic regions. Further the preference of sapota cultivars varies based on the fruit shape, size and yield characters. In some areas, consumers prefer oval or egg shaped fruit while in other parts of India round and bigger size fruits are preferred. The cultivation of sapota is gaining popularity in Coorg and adjoining regions of Western Ghats. The plant growth is comparatively slow and maturity of fruit also differs due to cool climate and higher humidity in this region. To assess the performance of some of the varieties of sapota in under these conditions, an experiment was laid out and planted to find the suitable cultivars

with higher production, better size and quality of fruits.

MATERIALS AND METHODS

The present investigation was carried out at the Central Horticultural Experiment station (IIHR), Chettalli, Kodagu, Karnataka during 2011 and 2012 with an aim to study the performance of Sapota varieties under high rainfall zone of Karnataka. Eleven Sapota cultivars namely Kalipatti, CO-1, Cricket Ball, CO-2, PKM-1, Krithi Bharathi, CHES Selection, Gutti, DHS-1, DHS-2 and Singapore planted at experimental farm were used for the study. Chettalli is situated in the Western Ghats of Peninsular India with an elevation of about 1000 m above MSL. The area is classified as hilly humid tropic region. The mean annual rainfall is about 1500 mm. The layered plants of sapota cultivars were planted during 1991-1992 in a square system at 10 x 10 m spacing. The experiment was layout in randomized block design. The orchard was maintained under recommended package of practices. Observations were recorded on plant height, plant girth, plant spread, fruit number, yield (kg/plant), fruit weight, fruit length, fruit diameter, fruit volume, number of seeds, total soluble solids, acidity and ascorbic acid. The fruit were harvested in the month of February in each year for analysis. Ten mature fruits from each tree were taken randomly for physico-chemical analysis. The samples were analysed as per standard AOAC (1980) methods with modifications. The data were analysed statistically.

RESULTS AND DISCUSSIONS

Vegetative growth

The phenological characters of sapota cultivars revealed that significant variation in growth was observed among the cultivars. Significantly higher plant height was recorded in cv. CO-1 (9.02 m) followed by cvs. CO-2 (8.22 m) and Gutti (8.15 m). The least plant height was observed in cv. Krithi Bharathi (5.79 m). The rootstock girth and scion girth was also higher in cv. CO-1 and it was 109.63 cm and 96.53 cm, respectively. The lowest stock girth was recorded in 57 cm in cv. Krithi Bharathi. The scion girth was also lowest in this cultivar. The plant height in CHES selection, a large fruit selection from CHES Chettalli was 7.63 m which was higher than cvs. DHS-1, DHS-2, PKM-1 and Krithi Bharathi. The rootstock girth of CHES selection was 91.95 cm which was higher than average rootstock girth of selected varieties. Similarly scion girth was also higher than average scion girth of selected varieties. The plant spread (E-W) was higher

in cvs. Kalipatti (9.91 m) and CO-2 (9.38 m) and it was lowest in CV. Krithi Bharathi (5.29 m). The plant

spread (N-S) was highest in CO-2 (9.6 m) followed by cv Kalipatti (9.54 m). The lowest plant spread (N-S) was recorded in cv. Krithi Bharathi (5.18 m). Tec vs. Kalipatti, CO-1, CO-2, were found vigorous than CHES selection while cv. Krithi Bharathi, Cricket Ball, PKM-1, DHS-1, DHS-2 were found less vigorous than CHES selection (Table 1). Significant variation among the cultivars was observed with respect to various growth parameters which may be attributed to the varietal character, which is mainly governed by genetic makeup of the plant. Chundawat and Bhuva (1982) and Shirol et al. (2006 & 2009) also reported variation in growth characters under different agro-climatic condition in sapota.

Yield

The number of fruits were highest in cv. Singapore (1521 fruits/plant) closely followed by cvs. Kalipatti (1462 fruits/plant) and Cricket Ball (1256 fruits/plant). These varieties were found far superior than other cultivars. The lowest numbers of fruits were recorded in CHES selection (232.5 fruits/plant). The highest yield was recorded in cv. Kalipatti (135.2 kg/plant) closely followed by cv. Cricket Ball (133.7 kg/plant). These two varieties produced in higher yield than all other varieties in both the year. The lowest yield was recorded in CHES Selection (41.8 kg), PKM-1 (50.5 kg), CO-1 (53.71 kg) and CO-2 (62.6 kg). The lowest yield in CHES selection may be because of the pollination and fruit setting problem. The fruit weight was highest in CHES selection (158.8 g) which was significantly higher than all the varieties. Higher fruit weight was recorded in cvs. Krithi Bharathi (127 g), Gutti (114 g) and DHS-2 (110 g). Lowest fruit weight was observed in cv. Singapore (59.3 g) and PKM-1 (71.4 g). The fruit volume showed similar trend (Table 2). Significant variation among the cultivars was observed with respect to various yield parameters. Chundawat and Bhuva (1982), Rokhade et al (1989) and Saraswathi et al (2010) also observed the variation in yield and yield contributing parameters under different agro-climatic conditions.

Fruit quality

Number of seeds per fruit was significantly higher in cv. CO-1 (4.45) followed by cvs. PKM-1 (3.89) and Cricket Ball (3.3), whereas the least number of seeds were recorded in cvs. Kalipatti and CO-2 (1.65). Variation was also observed with respect of fruits shape. The fruit shape index (Fruit length / fruit girth) varied from 0.84 in cv. CO-1 to 1.28 in cv. Singapore. The fruit shape index was between 0.9 to 1.10 in cvs. Cricket Ball, Kalipatti, DHS-1, DHS-2, Gutti, CHES selection which are round in shape whereas oval to elliptic egg shaped fruits were noticed in cvs. Singapore, Krithi Bharathi and PKM-1 with fruit shape index more than 1.10 (Ta-

Table 1: Growth characteristics of Sapota cultivars

Cultivars	Plant height (m)			Root stock girth (cm)			scion girth (cm)			Plant Spread (m)						No. of main branches				
	2011		Av.	2011		Av.	2011		Av.	E-W			N-S			2011		Av.		
	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	Av.		
Kalipatti	6.6	6.7	6.65	68.13	68.13	68.13	89.67	89.67	89.67	89.67	89.67	9.9	9.92	9.91	9.5	9.58	9.54	5	5	5
CO-1	9	9.03	9.02	109.8	109.8	109.8	96.53	96.53	96.53	96.53	96.53	9.15	9.22	9.19	9.2	9.28	9.24	5	5	5
Cricket Ball	5.75	5.83	5.79	61.9	61.9	61.9	38.5	38.5	38.5	38.5	38.5	8.0	8.05	8.03	7.7	7.8	7.75	3	3	3
CO-2	8.15	8.28	8.22	88.08	88.08	88.08	76.05	76.05	76.05	76.05	76.05	9.45	9.58	9.52	9.5	9.7	9.6	3.5	3.5	3.5
PKM-1	5.2	5.3	5.25	68.5	68.5	68.5	50.5	50.5	50.5	50.5	50.5	5.6	5.75	5.68	6.1	6.2	6.15	3	3	3
Krithi Bharathi	4.5	4.57	4.54	57	57	57	80.65	80.65	80.65	80.65	80.65	7.4	7.55	7.48	8	8.15	8.075	4	4	4
CHES Selection	7.6	7.65	7.63	91.95	91.95	91.95	94.7	94.7	94.7	94.7	94.7	9.45	9.5	9.48	8.3	8.5	8.4	3	3	3
Gutti	8.1	8.2	8.15	99.1	99.1	99.1	80	80	80	80	80	7.9	8.1	8	7.35	7.55	7.45	5	5	5
DHS-1	5.5	5.5	5.5	99.9	99.9	99.9	96.1	96.1	96.1	96.1	96.1	6.55	6.65	6.6	7.15	7.25	7.2	6	6	6
DHS-2	5.75	5.85	5.8	81.63	81.63	81.63	60.43	60.43	60.43	60.43	60.43	7.2	7.33	7.27	6.8	6.92	6.86	3.33	3.33	3.33
Singapore	0.33	0.34	0.34	7.2	7.24	7.24	4.59	4.60	4.60	4.60	4.60	0.41	0.43	0.42	0.38	0.40	0.40	NS	NS	NS
CD(0.05)																				

Table 2: yield and yield contributing characters of Sapotacultivars

Cultivar	No of fruits/plants			Av. Fruit wt (g)			Yield (kg/plant)			Fruit Shape Index(Length/girth)		
	2011		Av.	2011		Av.	2011		Av.	2011		Av.
	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	
Kalipatti	1310	1615	1462.5	93.8	92.5	93.15	121.1	149.4	135.2	1.09	1.08	1.08
CO-1	510	615	562.5	114.8	115.2	115	54.4	70.8	62.6	0.82	0.82	0.82
Cricket Ball	1056	1456	1256.0	101.8	103.2	102.5	117.2	150.3	133.7	1.10	1.10	1.10
CO-2	452	651	551.5	103.4	102.5	102.95	40.1	66.7	53.4	1.16	1.12	1.14
PKM-1	584	745	664.5	69.4	71.4	70.4	47.8	53.2	50.5	1.27	1.29	1.28
KrithiBharathi	615	784	699.5	126.6	127.5	127.05	79.2	100.0	89.6	1.17	1.18	1.17
CHES Selection	216	249	232.5	157.4	160.2	158.8	43.7	39.9	41.8	1.10	1.08	1.09
Gutti	764	816	790.0	115	114	114.5	93.2	93.0	93.1	1.11	1.12	1.11
DHS-1	763	853	808.0	100.2	102.4	101.3	68.7	87.3	78.0	1.09	1.09	1.09
DHS-2	790	891	840.5	108	110	109	93.2	98.0	95.6	1.18	1.17	1.17
Singapore	1336	1707	1521.5	57.4	61.2	59.3	74	104.5	89.2	1.28	1.29	1.28
CD(0.05)	12.5	13.54	13.22	5.95	6.14	6.11	7.95	8.85	8.69	0.23	0.24	0.24

Table 3: Physico-chemical properties of Sapota cultivars

Cultivar	Fruit vol. (cc)			No. of Seeds/fruit			TSS (°B)			Titrable Acidity (%)			Ascorbic Acid (mg/100g pulp)		
	2011	2012	Av.	2011	2012	Av.	2011	2012	Av.	2011	2012	Av.	2011	2012	Av.
Kalipatti	94.2	92.9	93.55	1.8	1.5	1.65	20.3	20.5	20.40	0.021	0.023	0.022	2.0	2.2	2.10
CO-1	115.4	115.8	115.60	1.6	1.7	1.65	14.9	15.2	15.05	0.022	0.019	0.021	2.4	2.9	2.65
Cricket Ball	101.2	102.6	101.90	3.4	3.2	3.3	18.5	18.4	18.45	0.023	0.020	0.022	9.6	7.6	8.60
CO-2	104.2	103.3	103.75	4.4	4.5	4.45	17.8	17.9	17.85	0.021	0.022	0.022	10.4	7.6	9.00
PKM-1	69.4	71.4	70.40	3.8	3.9	3.85	20.2	20.1	20.15	0.022	0.019	0.021	6.4	8.2	7.30
Krithi Bharathi	126.4	127.3	126.85	2.0	2.1	2.05	19.4	19.2	19.30	0.021	0.019	0.020	4.0	4.2	4.10
CHES Selection	158	160.8	159.41	3.0	2.5	2.75	14.8	15.1	14.95	0.019	0.023	0.021	3.2	5.4	4.30
Gutti	115.4	114.4	114.90	2.1	2.4	2.25	14.1	14.5	14.30	0.021	0.023	0.022	4.5	6.2	5.35
DHS-1	100.2	102.4	101.30	1.8	2	1.9	19.1	19.4	19.25	0.023	0.022	0.023	2.4	3.6	3.00
DHS-2	108.4	110.4	109.40	2.6	2.5	2.55	16.4	16.2	16.30	0.025	0.020	0.023	4.0	5.2	4.60
Singapore	57.6	61.4	59.51	2.8	2.8	2.8	19.3	19.5	19.40	0.023	0.021	0.022	12.0	10.4	11.20
CD (0.05)	5.85	5.97	5.93	0.49	0.45	0.46	1.23	1.35	1.31	NS	NS	NS	NS	NS	NS

ble 3). Such variation size and shape of fruits indifferent cultivars was also reported under varied climatic conditions by Rokhadeet *al* (1989) and Saraswathiet *al* (2010). Highest total soluble solids were recorded in cv. Kalipatti (20.4°Brix), followed by PKM-1(20.15°Brix) Singapore (19.4°Brix), Krithi Bharathi (19.3°Brix) and DHS-1(19.25°Brix). Lower TSS was recorded in cvs. Gutti (14.3°Brix), CHES selection (14.95°Brix) and CO-1 (15.05°Brix). The titrable acidity was found low in all the cultivars and there was no significant difference among cultivars. The ascorbic acid content was also vary low in all varieties and there was no significant difference among these cultivars(Table 3). The Total soluble solid was lower than the earlier reports by Shirol et al. (2009) and Saraswathiet al.(2010) under Northern Karnataka and Tamilnadu conditions. The probable reason may be the low temperature of Coorg region during the maturity of the fruits. The results revealed that the performance of sapota varieties is different under humid and cool conditions of Coorg. The result concludes that cvs. Kalipatti and CricketBall were found superior under Cool and humid conditions of Coorg in terms of yield and quality than all the other cultivars.

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