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Growth and yield performance of different exotic mango cultivars under South Gujarat

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Abstract
The present work growth and yield performance of different exotic mango cultivars under South Gujarat was conducted during the years 2021-22 and 2022-23 at Agriculture Experimental Station, Navsari Agricultural University, Paria, Gujarat. The experiment was laid out in Completely Randomized Design (CRD) with three repetitions, which includes six treatments (varieties) *viz.*, V_1: Maya, V_2: Osteen, V_3: Kent, V_4: Lily, V_5: Palmer and V_6: Keitt. Among all the varietal treatments, Palmer (V_5) variety was found superior with respect to plant height (6.50, 6.57 and 6.53 m), stem girth (87.67, 88.00 and 87.83 cm), plant spread in East-West direction (8.13, 8.27 and 8.20 m) as well as North-South direction (8.03, 8.13 and 8.08 m) and canopy spread (8.08, 8.20 and 8.14 m) during both the years and in pooled analysis, respectively. In case of yield parameters, the highest number of fruits per tree (246.00, 256.67 and 251.33) was observed in Maya (V_1). whereas, the highest average fruit weight (667.67, 691.00 and 679.33 g), fruit length (14.33, 14.74 and 14.53 cm), fruit diameter (10.00, 10.15 and 10.08 cm) and fruit yield (119. 08 kg/tree and 18.61 t/ha, 127.85 kg/tree and 19.98 t/ha and 123.46 kg/tree and 19.29 t/ha) were reported in Palmer (V_5) for both the years and in pooled, respectively.

Keywords: Mango, exotic, cultivars, growth and yield

Introduction
Mango (*Mangifera indica* L.) is the most popular and tropical fruit which belongs to the family Anacardiaceae order Sapindales and originated from the Indo-Burma region. Due to its high palatability, excellent taste, flavour and exemplary medicinal and nutritional values, it is said to be the "King of Tropical Fruits". India is the largest mango producer and contributes 40 percent of global mango production. The area and production of mango in India is 23.15 lakh ha and 208.99 lakh MT, respectively with productivity of 9.03 MT ha^{-1}. The main mango growing states in India are Uttar Pradesh, Andhra Pradesh, Bihar, Karnataka, Gujarat, Maharashtra and Tamil Nadu. Among the various states, Uttar Pradesh has the largest area followed by Andhra Pradesh and Karnataka. In Gujarat, the area under mango is 1.66 lakh ha with production of 12.19 lakh MT. The major mango growing districts in Gujarat are Valsad, Navsari, Gir Somnath, Kutch, Surat *etc*. India exports fresh mangoes to the countries like United Arab Emirates, United Kingdom, Saudi Arabia, Qatar, Kuwait and Bangladesh. The major exportable varieties of India are Alphonso and Kesar. The country has exported 21 thousand MT of fresh mangoes worth of ₹ 271.84 crores during the year 2018-19. Other market like USA, Canada and European Union are still underutilized because of the preference for specific mango varieties. The main varieties marketed in USA, Canada and European Union countries are Tommy Atkins, Kent, Osteen, Kiett, Maya and Lily. Currently they are imported from Brazil, Mexico, Peru, etc. Hence, to grab mango market of USA, Canada and European Union, we have to understand the varietal performance of different exotic mango cultivars under Indian condition (Anon., 2019) [1].

Materials and Methods
The experiment was carried out during two consecutive seasons 2021-22 and 2022-23 at Agriculture Experimental Station (AES), Navsari Agricultural University, Paria in Block-8. Fully grown healthy, free from diseases and pests, mature and bearing trees of six mango varieties of about 15 years old were selected from the orchards. These plants were maintained under uniform cultural practices to ensure yield of quality fruits. Observations were made on growth and fruiting characteristics among the different exotic mango cultivars. The experiment was laid out in Completely Randomized Design with six treatments *viz*. V_1: Maya, V_2: Osteen, V_3: Kent, V_4: Lily, V_5: Palmer and V_6: Keitt.

The standard method of analysis of variance technique appropriate to Completely Randomized Design was used for individual years as well as for pooled analysis over the year described by Panse and Sukhatme (1985) [12]. The means of all the treatment were compared using Duncan's Multiple Range Test (DMRT).

Results and Discussion

Growth parameters

Plant height (m)

The perusal of data presented in Table 1 revealed that maximum plant height (6.50, 6.57 and 6.53 m) was recorded in Palmer (V_5) for both the years and in pooled data, respectively, which was statistically at par with Maya (V_1). The minimum plant height (5.07, 5.23 and 5.15 m) was found in Keitt (V_6) during both years and in pooled data, respectively, which was at par with Lily (V_4), Osteen (V_2) and Kent (V_3). The variation in plant height among the different varieties could be due to the variation in genetic make-up under the present set of environmental and edaphic conditions (Kumar *et al.*, 2017) [10]. Similar results have also been reported by Gunjate *et al.* (2004) [6], Kanpure *et al*. (2009) [8], Bakshi *et al*. (2012) [2], Barua *et al*. (2013) [3], Manav (2013) [11], Silva *et al.* (2014) [13], Bhalekar *et al.* (2016) [4] and Indian *et al.* (2020) [7].

Stem girth (cm)

The data depicted in Table 1 observed that, among the different treatments, Palmer (V_5) showed maximum stem girth (87.67, 88.00 and 87.83 cm) for both the years and in pooled data, respectively, which was at par with Maya (V_1), Kent (V_3) and Osteen (V_2). Whereas, the minimum stem girth (73.67, 74.67 and 74.17 cm) was reported in Keitt (V_6) for both the years and in pooled data, respectively, which was at par with Lily (V_4), Osteen (V_2) and Kent (V_3). The variation in vegetative growth characteristics concerning stem girth among mango cultivars might be due to genetic makeup variations. A Similar variation in stem girth of different mango cultivars has been reported by Gunjate *et al.* (2004) [6], Bakshi *et al*. (2012) [2], Barua *et al*. (2013) [3], Silva *et al.* (2014) [13], Bhalekar *et al.* (2016) [4] and Indian *et al.* (2020) [7].

Plant spread (m)

The data with respect to plant spread (Table 1) indicated that the average East-West spread (8.13, 8.27 and 8.20 m) was found to be maximum in Palmer (V_5), which was remained at par with Maya (V_1), Kent (V_3) and Keitt (V_6) during both the years and in pooled data, respectively. However, Osteen (V_2) observed the minimum East-West spread (6.27, 6.40, 6.33 m) during both the years and in pooled data, respectively, which was at par with Lily (V_4).

As far as the data pertaining to North-South spread, similar results were obtained as was recorded in East-West spread. The cultivar Palmer (V_5) (8.03, 8.13 and 8.08 m) had recorded maximum North-South spread, which was found to be statistically at par with Maya (V_1), Kent (V_3) and Keitt (V_6) during both the years and in pooled, respectively. Whereas, minimum North-South spread was recorded in Osteen (V_2) (6.00, 6.10 and 6.05 m) during both the years and in pooled data, respectively, which was at par with Lily (V_4).

The variation in plant spread may be due to genetic makeup of cultivars and also weather condition and nutrient status of soil. Similar variation in plant spread in mango varieties were also reported by Gunjate *et al.* (2004) [6], Kanpure *et al.* (2009) [8], Bakshi *et al*. (2012) [2], Manav (2013) [11], Bhalekar *et al.* (2016) [4], Kumar *et al.* (2017) [10] and Indian *et al.* (2020) [7].

Canopy spread (m)

The perusal of data presented in Table 1 revealed that significantly maximum canopy spread (8.08, 8.20 and 8.14 m) was recorded in Palmer (V_5) for both the years and in pooled data, respectively, which was statistically at par with Maya (V_1) and Kent (V_3). The minimum canopy spread (6.13, 6.25 and 6.19 m) was recorded in Osteen (V_2) during both the years and in pooled data, respectively, which was statistically at par with Lily (V_4).

It seems that mango variety Palmer is most vigorous in all the growth parameters. The variation in canopy spread may be due to genetic makeup of cultivars and weather condition where it is being grown. Similar results have also been reported by Gunjate *et al.* (2004) [6], Kanpure *et al*. (2009) [8], Bakshi *et al*. (2012) [2], Manav (2013) [11], Bhalekar *et al.* (2016) [4] and Indian *et al.* (2020) [7].

Yield parameters

Number of fruits per tree

The data with respect to number of fruits per tree (Table 2) recorded that, during both the years and in pooled data, maximum number of fruits per tree (246.00, 256.67 and 251.33, respectively) was observed in Maya (V_1). Osteen (V_2) variety recorded minimum number of fruits per tree (117.67, 125.00 and 121.33) during both the years and in pooled results, respectively, which was at par with Keitt (V_6).

Number of fruits per tree is directly depends on flowering pattern, sex ration in flowers, effective pollination; favourable weather conditions and the nature of the particular cultivar. These results are in agreement with findings obtained by Gunjate *et al.* (2004) [6], Kanpure *et al*. (2009) [8], Bakshi *et al*. (2012) [2], Manav (2013) [11], Kaur *et al*. (2014) [9] and Vidyashree *et al.* (2021) [14].

Average fruit weight (g)

The data presented in Table 2 revealed that, maximum average fruit weight was recorded in Palmer (V_5) (667.67, 691.00 and 679.33 g) during both the years and in pooled data, respectively, which was at par with Osteen (V_2). Minimum average fruit weight during both the years and in pooled data (316.50, 328.50 and 322.50 g, respectively) was recorded in Kent (V_3), which was at par with Maya (V_1).

This variation in fruit weight probably may be due to the absorption and translocation pattern of photosynthates, genetic composition and environmental factors. The rise in fruit weight is associated with increase in amylase activity, with simultaneous increase of amylase activity fruit weight was increased as reported by Fuchs *et al.* (1980) [5]. These results are in agreement with findings reported by Gunjate *et al.* (2004) [6], Kanpure *et al*. (2009), [8] Bakshi *et al*. (2012) [2], Manav (2013) [11], Kaur *et al*. (2014) [9] and Vidyashree *et al.* (2021) [14].

Fruit length (cm)

The data depicted in Table 2 found that, Significantly, Palmer (V_5) recorded maximum fruit length (14.33, 14.74 and 14.53 cm, respectively), which was at par with Osteen (V_2) and Lily (V_4) during both the years and in pooled data. Minimum fruit length (9.44, 9.78 and 9.61 cm) was recorded in Kent (V_3) during both the years and in pooled data, respectively, which

was at par with Maya (V_1) (10.52, 11.14 and 10.83 cm).
This might be due to genetic variability of different mango cultivar. Further the hormonal activity of seed plays a vital role in development of the fruit at mature stage. In the same line of work, Kaur *et al*. (2014) [9] recorded that the fruit length ranged from 6.35 to 11.70 cm in different mango cultivars. These results are also in harmony with findings obtained by Gunjate *et al.* (2004) [6], Kanpure *et al*. (2009) [8], Bakshi *et al*. (2012) [2], Manav (2013) [11] and Vidyashree *et al.* (2021) [14].

Fruit diameter (cm)
The results presented in Table 2 revealed that, the maximum fruit diameter was recorded in Palmer (V_5) (10.00, 10.15 and 10.08 cm) during both the years and in pooled data, respectively, which was at par with Osteen and Lily. Minimum fruit diameter (7.58, 7.74 and 7.66 cm, respectively) was recorded in Kent (V_3) during both the years and in pooled data. This might be due to genetic variability of different mango cultivar. Further the hormonal activity of seed plays a vital role in development of the fruit at mature stage. In the same line of work, Kaur *et al*. (2014) [9] recorded that the fruit diameter ranged from 5.80 to 7.70 cm in different mango cultivars. These results are also in harmony with findings obtained by Gunjate *et al.* (2004) [6], Kanpure *et al*. (2009) [8], Bakshi *et al*. (2012) [2], Manav (2013) [11] and Vidyashree *et al.* (2021) [14].

Average yield
The perusal of data presented in Table 3 recorded that, significantly Palmer (V_5) recorded maximum yield (119.08 kg/tree; 18.61 t/ha, 127.85 kg/tree; 19.98 t/ha and 123.46 kg/tree; 19.29 t/ha, respectively) during both the years and in pooled data. During both the years and in pooled data, Kent (V_3) recorded minimum fruit yield (51.27 kg/tree; 8.01 t/ha, 56.49 kg/tree; 8.83 t/ha and 53.88 kg/tree; 8.42 t/ha, respectively). The findings of this study are supported by the idea that yield is highly variable factor depending upon the cultivars, climatic condition, age of plants and incidence of pest and diseases. Majority of the workers had the idea that yield potential is a varietal character. The increase in yield in terms of weight might be either due to the large sized fruits or due to a greater number of fruits per plant. The genetic makeup of the plant plays a vital role in the productivity of plant. Apart from this, the agro-climatic conditions which suited to particular genotype to give more yield. Similar variation in the yield was recorded by Gunjate *et al.* (2004) [6], Kanpure *et al*. (2009) [8], Bakshi *et al*. (2012) [2], Manav (2013) [11], Kaur *et al*. (2014) [9] and Vidyashree *et al.* (2021) [14].

Table 1: Variation in growth parameters of different exotic mango varieties

Treatments	Plant height (m)			Stem girth (cm)			Plant E-W spread (m)			Plant N-S spread (m)			Canopy spread (m)		
	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled
V_1: Maya	6.27^{a}	6.30^{ab}	6.28^{ab}	85.33^{a}	86.67^{a}	86.00^{a}	7.67^{a}	7.77^{a}	7.72^{a}	7.47^{a}	7.53^{a}	7.50^{ab}	7.57^{ab}	7.65^{a}	7.61^{ab}
V_2: Osteen	5.53^{b}	5.60^{c}	5.57^{c}	80.67^{ab}	81.67^{ab}	81.17^{ab}	6.27^{c}	6.40^{c}	6.33^{c}	6.00^{b}	6.10^{b}	6.05^{c}	6.13^{c}	6.25^{b}	6.19^{c}
V_3: Kent	5.63^{b}	5.70^{bc}	5.67^{bc}	82.00^{ab}	82.33^{ab}	82.17^{ab}	7.57^{a}	7.70^{a}	7.63^{a}	7.37^{a}	7.47^{a}	7.42^{ab}	7.47^{ab}	7.58^{a}	7.53^{ab}
V_4: Lily	5.27^{b}	5.33^{c}	5.30^{c}	75.00^{b}	75.67^{b}	75.33^{b}	6.60^{bc}	6.63^{bc}	6.62^{bc}	6.37^{b}	6.47^{b}	6.42^{c}	6.48^{c}	6.55^{b}	6.52^{c}
V_5: Palmer	6.50^{a}	6.57^{a}	6.53^{a}	87.67^{a}	88.00^{a}	87.83^{a}	8.13^{a}	8.27^{a}	8.20^{a}	8.03^{a}	8.13^{a}	8.08^{a}	8.08^{a}	8.20^{a}	8.14^{a}
V_6: Keitt	5.07^{b}	5.23^{c}	5.15^{c}	73.67^{b}	74.67^{b}	74.17^{b}	7.33^{ab}	7.40^{ab}	7.37^{ab}	7.23^{a}	7.33^{a}	7.28^{b}	7.28^{b}	7.37^{a}	7.33^{b}
Mean (Y)	5.71	5.79	5.75	80.72	81.50	81.11	7.26	7.36	7.31	7.08	7.17	7.13	7.17	7.27	7.22
S.Em ± (T)	0.21	0.21	0.16	2.98	3.07	1.90	0.25	0.28	0.19	0.26	0.28	0.18	0.24	0.26	0.17
CD at 5% (T)	0.64	0.66	0.47	9.20	9.46	5.61	0.78	0.86	0.56	0.81	0.86	0.52	0.73	0.79	0.49
CV %	6.26	6.42	6.78	6.40	6.52	5.74	6.07	6.54	6.31	6.41	6.70	6.11	5.69	6.13	5.67
S.Em ± (Y)			0.08	S.Em ± (Y)		1.16	S.Em ± (Y)		0.02	S.Em ± (Y)		0.01	S.Em ± (Y)		0.10
CD at 5% (Y)			NS	CD at 5% (Y)		NS	CD at 5% (Y)		NS	CD at 5% (Y)		NS	CD at 5% (Y)		NS
S.Em ± (TY)			0.23	S.Em ± (TY)		2.69	S.Em ± (TY)		0.27	S.Em ± (TY)		0.25	S.Em ± (TY)		0.24
CD at 5% (TY)			NS	CD at 5% (TY)		NS	CD at 5% (TY)		NS	CD at 5% (TY)		NS	CD at 5% (TY)		NS

Values in a column bearing different superscripts are significantly different at 0.05 level

Table 2: Variation fruiting parameters of different exotic mango varieties

Treatments	Number of fruits per tree			Average fruit weight (g)			Fruit length (cm)			Fruit diameter (cm)		
	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled
V_1: Maya	246.00^{a}	256.67^{a}	251.33^{a}	364.83^{d}	375.17^{d}	370.00^{c}	10.52^{bc}	11.14^{bc}	10.83^{bc}	9.06^{b}	9.16^{b}	9.11^{b}
V_2: Osteen	117.67^{d}	125.00^{e}	121.33^{e}	634.50^{ab}	647.50^{ab}	641.00^{a}	13.54^{a}	14.11^{a}	13.83^{a}	9.77^{ab}	9.93^{ab}	9.85^{a}
V_3: Kent	162.00^{bc}	172.00^{bc}	167.00^{bc}	316.50^{d}	328.50^{d}	322.50^{c}	9.44^{c}	9.78^{c}	9.61^{c}	7.58^{c}	7.74^{c}	7.66^{c}
V_4: Lily	158.67^{c}	163.33^{c}	161.00^{c}	580.67^{bc}	590.00^{bc}	585.33^{b}	13.32^{a}	13.72^{a}	13.52^{a}	9.62^{ab}	9.75^{ab}	9.69^{ab}
V_5: Palmer	178.33^{b}	185.00^{b}	181.67^{b}	667.67^{a}	691.00^{a}	679.33^{a}	14.33^{a}	14.74^{a}	14.53^{a}	10.00^{a}	10.15^{a}	10.08^{a}
V_6: Keitt	132.00^{d}	146.67^{d}	139.33^{d}	532.17^{c}	543.50^{c}	537.83^{b}	10.79^{b}	11.58^{b}	11.18^{b}	9.09^{b}	9.22^{ab}	9.15^{b}
Mean (Y)	165.78	174.78	170.28	516.06	529.28	522.67	11.99	12.51	12.25	9.19	9.33	9.25
S.Em ± (T)	5.40	5.37	3.79	17.86	19.15	11.48	0.36	0.42	0.27	0.27	0.29	0.16
CD at 5% (T)	16.64	16.56	11.18	55.04	59.01	33.88	1.12	1.28	0.79	0.82	0.90	0.47
CV %	5.64	5.33	5.45	6.00	6.27	5.38	5.24	5.76	5.33	5.00	5.45	4.18
S.Em ± (Y)			3.52	S.Em ± (Y)		7.56	S.Em ± (Y)		0.16	S.Em ± (Y)		0.12
CD at 5% (Y)			NS	CD at 5% (Y)		NS	CD at 5% (Y)		0.46	CD at 5% (Y)		NS
S.Em ± (TY)			5.36	S.Em ± (TY)		16.24	S.Em ± (TY)		0.38	S.Em ± (TY)		0.22
CD at 5% (TY)			NS	CD at 5% (TY)		NS	CD at 5% (TY)		NS	CD at 5% (TY)		NS

Values in a column bearing different superscripts are significantly different at 0.05 level

Table 3: Variation fruit yield of different exotic mango varieties

Treatments	Fruit yield					
	2021-22		2022-23		Pooled	
	Kg/tree	t/ha	Kg/tree	t/ha	Kg/tree	t/ha
V_1: Maya	89.76[b]	14.02[b]	96.31[b]	15.05[b]	93.03[b]	14.54[b]
V_2: Osteen	74.11[c]	11.58[c]	80.44[c]	12.57[c]	77.27[c]	12.07[c]
V_3: Kent	51.27[d]	8.01[d]	56.49[d]	8.83[d]	53.88[d]	8.42[d]
V_4: Lily	92.13[b]	14.40[b]	96.39[b]	15.06[b]	94.26[b]	14.73[b]
V_5: Palmer	119.08[a]	18.61[a]	127.85[a]	19.98[a]	123.46[a]	19.29[a]
V_6: Keitt	70.53[c]	11.02[c]	79.86[c]	12.48[c]	75.19[c]	11.75[c]
Mean (Y)	82.81	12.94	89.56	13.99	86.18	13.47
S.Em ± (T)	3.44	0.54	3.57	0.56	2.39	0.37
CD at 5% (T)	10.60	1.66	11.01	1.72	7.04	1.10
CV %	7.20	7.20	6.91	6.91	6.79	6.79
S.Em ± (Y)					1.44	0.23
CD at 5% (Y)					NS	NS
S.Em ± (TY)					3.38	0.53
CD at 5% (TY)					NS	NS

Values in a column bearing different superscripts are significantly different at 0.05 level

Conclusion

From the present study, it can be concluded that out of all the six exotic mango cultivars grown under South Gujarat condition, cv. Palmer showed better performance as it resulted in the highest growth and yield parameters, while maximum number of fruits per tree was observed in Maya.

References

1. Anonymous. Agricultural statistics at a glance 2019. Horticulture statistics division. Department of Agriculture, Cooperation & Farmers Welfare. Ministry of Agriculture & Farmers Welfare, Gov. of India; c2019.
2. Bakshi P, Kumar R, Jasrotia A, Wali VK. Growth and yield performance of mango varieties under rainfed areas of Jammu. Indian J Agric. Res. 2012;46(3):281-285.
3. Barua H, Patwary MMA, Rahman MH. Performance of Bari mango (*Mangifera indica* L.) varieties in Chittagong region. Bangladesh J Agric. Res. 2013;38(2):203-209.
4. Bhalekar SG, Chalak SU, Badguar CD. Performance of exotic mango cultivars under Pune conditions. J Krishi Vigyan. 2016;5(1):88-91.
5. Fuchs V, Edna P, Zauberman G. Changes in amylase activity, starch and sugar contents in mango fruit pulp. Sci. Hortic. 1980;13:155-160.
6. Gunjate RT, Kumbhar AR, Thimaiah IM, Amin SM. Performance of some Indian and Exotic mango cultivars under high density planting in Arid conditions of Gujarat (India). Acta Horticulturae. 2004;645:347-351.
7. Indian G, Naik E, Deenavarman M, Jagathesan K, Janani T. Studies on the growth and flowering behaviour of different mango (*Mangifera indica* L.) genotypes. Int. J Curr. Microbiol. App. Sci. 2020;9(6):1981-1989.
8. Kanpure RN, Singh HP, Reja RK. Evaluation of mango hybrids for Kymore Plateau of Madhya Pradesh. J Community Mobilization Sustain. Dev. 2009;4:1-3.
9. Kaur M, Bal JS, Sharma LK, Bali SK. Evaluation of mango (*Mangifera indica* L.) germplasm for future breeding programme. African J Agric. Res. 2014;9(20):1530-1538.
10. Kumar A, Malik S, Chaudhary P, Kumar N. Studies on the growth and flowering of different mango (*Mangifera indica* L.) cultivars under Western Uttar Pradesh conditions. J Pharmacogn. Phytochem. 2017;9(21):439-442.
11. Manav MK. Study on flowering and fruiting behaviour of mango cultivars in relation to weather parameters. Thesis M.Sc. (Agri.), Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, India; c2013.
12. Panse VG, Sukhatme PV. Statistical Method for Agricultural Workers. ICAR, New Delhi, India; c1985. p. 152-161.
13. Silva AC, Souza AP, Leonel S, Souza ME, Ramos DP, Tanaka AA. Growth and flowering of five mango cultivars under Subtropic conditions of Brazil. American J Plant Sci. 2014;5:393-402.
14. Vidyashree K, Sabarad AI, Nataraja KH, Naik N, Bhat AS, Gorabal K, Lakshmidevamma TN. Performance of mango (*Mangifera indica* L.) varieties for flowering and yield under high density planting. J Pharmacogn. Phytochem. 2021;10(1):2331-2333.