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Performance of fruits of nine mango cultivars under South Gujarat conditions in relation to physical characters

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Abstract : The experiment entitled performance of fruits of nine mango cultivars under south Gujarat conditions in relation to physical characters was conducted at the Department of Fruit Science, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari (Gujarat). In this experiment six cultivars of mango viz., Alphonso, Dashehari, Kesar, Neelum, Rajapuri and Totapuri as well as three hybrids viz., Amrapalli, Mallika and Neelphonso were tested for their physical and chemical characteristics. The experiment was laid out in completely randomized design (CRD) with nine treatments and three repetitions. In the physical parameters, the fruits of cv. TOTAPURI recorded the maximum fruit length (cm) at marble and premature stages while, Mallika noted the maximum fruit length (cm) at mature and ripe stages. The maximum fruit diameter (cm) and fruit weight (g) was recorded in Rajapuri at all the stages of growth except Amrapalli at marble stage. The maximum average pulp weight (%) was recorded in Totapuri at marble stage and in Rajapuri at other stages. The minimum seed weight (%) was recorded in Rajapuri at all the stages but, at marble stage it was recorded minimum in Totapuri, Kesar at pre-mature stage, Amrapalli at mature stage and Mallika at ripe stage. The pulp:stone ratio was found higher in Totapuri at marble stage and in Rajapuri at pre-mature, mature and ripe stages.

Key words : Mango varieties, Physical characters, Stages of growth and development, Storage

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Mango (*Mangifera indica* L.) the King of fruits, belongs to the family Anacardiaceae. It is commercially cultivated over more than 111 countries around the world. India occupies the second position in the world with a production of 12,749.8 million tonnes of fruit grown on 2,309 Mt of area (Anonymous, 2009 a). The total area under cultivation of Gujarat is 115.7 hectares with 299.8 Mt productions. The climatic condition of south Gujarat is highly favourable for mango quality production. In terms of area, south Gujarat ranks first (50,602 ha) with the production of 4,70,069 Mt (Anonymous, 2009 b).

In the past, quality traits with regard to physico-chemical parameters were studied only at ripe stage. However, the characteristics of physical properties were not studied so far for the different varieties at marble, per-mature, mature and ripe stages of growth. To understand the physical changes in mango fruits at different stages of growth and development, the

investigation entitled performance of fruits of nine mango cultivars under south Gujarat conditions in relation to physical characters was conducted with nine varieties of mango viz., Alphonso, Kesar, Dashehari, Rajapuri, Totapuri, Neelum, Neelphonso, Amrapalli and Mallika.

RESEARCH METHODS

The experiment was carried out at the Laboratory of Fruit Science, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari. Mango fruits each of nine varieties were collected from the orchard of Instructional farm of the college, at different four stages of growth and development *i.e.*, marble, pre-mature, mature and ripe stage during the year of 2009. The experiment was laid out in a completely randomized design (CRD) with three repetitions. Fruits of total nine varieties including of six cultivars viz., Alphonso,

Dashehari, Kesar, Neelum, Rajapuri and Totapuri as well as three hybrids *viz.*, Amrapalli, Mallika and Neelphonso were tested for their physical characteristics. Simultaneously, more ten mature fruits were taken to the laboratory in CFB boxes for ripening process *i.e.* under storage condition. Observations on physical characters *viz.*, fruit length (cm), fruit diameter (cm), fruit weight (g), pulp weight (%), seed (stone) weight (%), peel weight (%) and pulp:stone ratio were recorded. The data recorded during the period of investigation were analysed statistically as per Panse and Sukhatme (1967).

RESEARCH FINDINGS AND DISCUSSION

The experimental results emerged from the investigation are discussed under following heads:

Physical characteristics:

Fruit length (cm):

Length of mango fruit of each variety showed an increase from marble stage to mature stage and it remained all most same at ripe stage. The fruit length was recorded maximum in Totapuri at marble (1.69 cm) and pre-mature (10.20 cm) stage and in Mallika at mature (13.14 cm) stage (Table 1). An increasing trend was observed in fruit length from marble to mature stage. This might be due to genetic and varietal characters. The results reported by Verma *et al.* (1986) and Kudachikar *et al.* (2003) are in accordance with the present study.

Fruit diameter (g):

The diameter of mango fruit recorded an increasing trend from marble to mature stage and remained up to the ripe stage. The fruit diameters was the maximum in Rajapuri at all the stages of growth (1.04, 7.44, 9.22 and 9.22 cm), which was followed by Alphonso at marble stage, Kesar at pre-mature stage and Mallika at mature and ripe stages (Table 1). This might be due to genetic variability of the different mango cultivars. Further, the hormonal activity of seed (the greater source of hormone) also play a vital role in the development of fruit leading to length and breadth of the fruit at mature stage. An increase in fruit diameter from marble stage to ripe stage was reported by Verma *et al.* (1986) and Kudachikar *et al.* (2003) supported the present findings.

In general, increase in length and diameter periodically from marble stage to mature and ripe stages indicated the overall growth of fruit in certain cultivars as well as in the hybrids.

Fruit weight (g):

Fruit weight of mango showed an increasing trend

from marble to mature stage followed by a slight decline at ripe stage. The fruit weight was maximum (8.80 g) in Amrapalli at marble stage; in Rajapuri at pre-mature, mature and ripe stages (196.33, 556.00 and 454.67 g, respectively) and in Mallika at all the stages of growth (Table 1). Weight is one of the most important physical indices of maturity in fruits. The variability might be due to genotypic character of an individual cultivar corresponding the size of fruit *i.e.* length and diameter. Environment of particular location *vis-a-vis* orchard management practices may also influence on the size and weight of fruit. The results are in agreement with those of Mannan *et al.* (2003). An increasing trend in weight of mango fruit from fruit set to ripe stage was reported earlier by Tondon and Kalra (1983), Verma *et al.* (1986), Badyal and Bhutani (1989) and Kudachikar *et al.* (2003) confirmed the present findings.

Pulp weight (%):

The data on changes in pulp weight of different cultivars and hybrids of mango from marble stage to ripening showed that the pulp weight of mango fruit was increased from marble to mature stage and slightly decline at ripe stage. Pulp weight was maximum in Totapuri at marble stage (63.92 %), Rajapuri at pre-mature, (79.07 %) mature (84.24%) and ripe stages (80.35) (Table 1). Starch is the main carbohydrate present in green mature mango fruit. During ripening of mangoes, starch is being hydrolyzed, changes occurred in amylase activities at the same time. Similar trend was reported by Kudachikar *et al.* (2003). Pulp is the main edible portion of the fruit and increase in pulp weight indicated the higher recovery of mango pulp. Recovery of pulp is also associated with non edible portion (peel + stone) and the size of fruit. Small seed and thin skin influence on pulp weight (recovery).

Seed (Stone) weight (%):

The data of Table 1 indicated that an average seed weight of different cultivars and hybrids was increased from marble stage to mature stage by slight decline at ripe stage. Seed weight was equally minimum in Rajapuri and Totapuri at marble stage (1.60 %), Rajapuri at pre-mature (8.31 %), mature (8.58 %) and ripe stages (6.01 %) Massive increase in growth rate during this period is directly associated with the period of maximum activity of auxin and gibberallin like substances in the seed. An increase in seed weight from marble to mature stage as observed in mango fruits were also reported by Pandey *et al.* (1974). However, the seed weight drastically reduced at ripe stage which might be due to reduction in moisture during hardening of seed.

Table 1. Physical characters of fruits of nine mango varieties at different stages of growth in the Government (Average values)

Character	Amrapali	Chausaha	Kesar	Nandam	Rajapuri	Nandam	Ambapuri	Malda	S.S.	C.D. (P 0.05)	C.V. %
Fruit weight (gm)	Male	130	139	139	139	137	129	137	0.21	0.063	2.622
	Pre harvest	8.52	9.59	9.59	9.59	9.93	8.55	8.66	0.271	0.382	2.771
	Harvest	8.73	11.76	11.76	8.83	12.30	10.07	10.77	0.151	0.152	2.129
Fruit weight (kg)	Male	0.92	0.88	0.86	0.86	1.07	0.87	0.86	0.076	0.078	3.132
	Pre harvest	5.33	5.28	5.75	5.71	7.11	5.52	5.60	0.095	0.287	2.999
	Harvest	6.99	5.67	7.37	7.18	9.22	6.05	6.09	0.078	0.236	1.921
Fruit weight (g)	Male	6.77	7.63	7.70	6.73	7.73	7.22	8.80	0.195	0.58	1.59
	Pre harvest	26.70	27.00	33.00	28.70	35.33	27.07	28.33	1.816	5.39	2.37
	Harvest	27.00	28.67	28.60	27.67	35.00	27.33	27.67	1.233	1.730	3.18
Fruit weight (%)	Male	19.33	15.00	273.67	19.00	15.67	175.00	179.67	7.983	23.72	5.37
	Pre harvest	55.75	59.63	60.00	50.27	62.38	53.08	61.78	1.778	5.11	5.77
	Harvest	66.08	66.87	75.79	65.73	79.07	60.77	67.78	1.777	1.38	3.78
Seed weight (%)	Male	82.65	78.89	80.20	76.72	87.27	82.58	80.70	0.957	2.87	2.07
	Pre harvest	73.69	73.96	76.76	70.77	80.35	66.85	67.89	78.72	3.11	2.76
	Harvest	7.95	3.97	2.67	2.22	1.60	2.83	2.76	3.79	0.077	0.23
Fruit weight (%)	Male	17.86	16.80	16.03	16.88	13.70	17.00	16.67	1.178	1.37	5.76
	Pre harvest	9.95	8.60	8.78	10.70	6.07	12.37	11.69	1.358	1.073	22.95
	Harvest	12.60	36.70	37.93	17.57	36.02	11.09	35.76	1.653	5.27	7.66
Fruit weight (%)	Male	23.38	18.13	11.95	18.13	22.62	27.87	25.58	1.075	3.02	8.96
	Pre harvest	2.79	1.37	3.77	6.70	7.18	1.38	1.77	0.269	0.80	11.07
	Harvest	16.36	17.77	15.36	19.73	13.67	20.77	20.72	1.288	2.97	10.37
Fruit weight (%)	Male	28.60	15.02	29.07	22.67	38.97	18.77	17.38	1.067	3.16	7.13
	Pre harvest	6.32	1.77	5.86	7.07	9.52	7.27	3.86	0.180	0.57	5.60
	Harvest	5.58	7.70	5.07	7.57	9.86	7.79	5.16	7.07	0.273	0.87
Harvest	7.73	8.67	8.98	6.98	7.38	8.50	5.83	9.38	0.267	0.78	5.77

Cultivars	1 st day		3 rd day		6 th day		9 th day		12 th day		15 th day		S.E.	C.D. (P=0.05)	C.V. %
	Weight (g)	Loss (%)	Weight (g)	Loss (%)	Weight (g)	Loss (%)	Weight (g)	Loss (%)	Weight (g)	Loss (%)	Weight (g)	Loss (%)			
Rajapuri	556.00	1.61	556.00	1.61	556.00	1.61	556.00	1.61	556.00	1.61	556.00	1.61	5.82	17.30	3.18
Totapuri	400.04	1.61	400.04	1.61	400.04	1.61	400.04	1.61	400.04	1.61	400.04	1.61	5.82	17.30	3.18
Mallika	440.09	1.61	440.09	1.61	440.09	1.61	440.09	1.61	440.09	1.61	440.09	1.61	5.82	17.30	3.18
Alphonso	426.60	1.61	426.60	1.61	426.60	1.61	426.60	1.61	426.60	1.61	426.60	1.61	5.82	17.30	3.18
Neelphonso	475.51	1.61	475.51	1.61	475.51	1.61	475.51	1.61	475.51	1.61	475.51	1.61	5.82	17.30	3.18
Neelum	475.51	1.61	475.51	1.61	475.51	1.61	475.51	1.61	475.51	1.61	475.51	1.61	5.82	17.30	3.18
Kesar	556.00	1.61	556.00	1.61	556.00	1.61	556.00	1.61	556.00	1.61	556.00	1.61	5.82	17.30	3.18
Hybrid 1	450.00	1.61	450.00	1.61	450.00	1.61	450.00	1.61	450.00	1.61	450.00	1.61	5.82	17.30	3.18
Hybrid 2	450.00	1.61	450.00	1.61	450.00	1.61	450.00	1.61	450.00	1.61	450.00	1.61	5.82	17.30	3.18
Hybrid 3	450.00	1.61	450.00	1.61	450.00	1.61	450.00	1.61	450.00	1.61	450.00	1.61	5.82	17.30	3.18
Hybrid 4	450.00	1.61	450.00	1.61	450.00	1.61	450.00	1.61	450.00	1.61	450.00	1.61	5.82	17.30	3.18
Hybrid 5	450.00	1.61	450.00	1.61	450.00	1.61	450.00	1.61	450.00	1.61	450.00	1.61	5.82	17.30	3.18

Peel weight (%):

Peel weight (%) of mango indicated declining trend from marble to mature stage, while it was increased from mature to ripe stage. It was recorded significantly the highest in Neelum at marble stage (47.51 %) followed by Neelphonso (44.09%), Alphonso (42.60 %) and Mallika (41.63 %) (Table 1). An increase in peel weight from mature to ripe stage might be due to higher rate of cell division and enlargement in interior (mesocarp) and exocarp (skin/peel) simultaneously. However, the thinness or thickness of peel is a varietal feature which is reflected in the hybrids also. On the contrary, the reduction in peel weight at ripe stage might be due to the hardening of peel and softening of the pulp. The results of Rajput and Pandey (1997) and Mitra and Mitra (2001) are in accordance with the present study.

Pulp : Stone ratio:

The data of Table 1 indicated that the pulp : stone ratio was maximum in Totapuri at marble stage (40.04) and in Rajapuri at premature (38.94), mature (9.86) and ripe stage (13.38). The edible and non-edible portion decreased from green to ripe stage and from ripe to over ripe stage. The edible and non-edible portion was also similar as studied by Rajput and Pandey (1997), Bains and Dhillon (1999) and Mannan *et al.* (2003) which is in accordance with the present study.

Changes in physical parameters during storage:

Fruit weight (g):

Fruit weight of different genotypes is a varietal feature. The maximum fruit weight was recorded on Ge first day of storage, which gradually declined up to 6th day in all the genotypes however it was highest in Rajapuri (556.00) over all varieties. All the varieties exhibited gradual reduction in weight up to 15th day of storage (Table 2) regarding different levels of weight loss during storage. Reduction in fruit weight might be due to physiological activities like loss of moisture and respiration.

Pulp weight (%):

The pulp weight of different cultivars and hybrids was decreased with increase in storage period. Pulp weight was significantly the highest in Rajapuri during storage followed by Totapuri at 1st, 3rd, 12th and 15th day of storage. Mallika at 6th day and Kesar at 9th day of storage showed higher pulp weight. Various reasons can be assigned namely genetic compositions of different mango cultivars and hybrids own genetically inherent that means phenotype of parental characters might have migrated in offspring and differences in management practices like

fertigation, irrigation etc. The above findings are in accordance with the report of Kudachikar *et al.* (2003).

REFERENCES

- Anonymous** (2009 a). An Indian Horticultural database, NHB, Ministry of Agriculture, GURGAON, HARYANA (India).
- Anonymous** (2009 b). Director of Horticulture, Krishi Bhavan, GANDHINAGAR, GUJARAT (India).
- Badyal, J.** and Bhutani, V. P. (1989). Physico-chemical characters of seven mango cvs. grown at Litchi and Mango Research Station, Nagrota Bagwan (H.P.). *Haryana J. Hort. Sci.*, **18** (1-2) : 51-55.
- Bains, K. S.** and Dhillon, M.S. (1999). Physico-chemical characters of 10 cvs. of mango at Fruit Research Station, Gangian (Hoshiarpur). *Haryana J. Hort. Sci.* **28** (3 & 4) : 172-173.
- Kudachikar, V. B.,** Kulkarni, S.G., Aradhya, S.M., Prasad, B.A. and Ramana, K.V.R. (2003). Physico-chemical changes in mango (*Mangifera indica* L.) varieties 'Alphonso' and 'Raspuri' during fruit development and maturation. *J. Food Sci. & Tech.*, Mysore, **40** (3) : 285-289.
- Mannan, M.A.,** Khan, S.A.K.U., Islam, M.R., Islam, M.S. and Siddiqua, A. (2003). Physico-chemical properties of mango varieties grown in Khulna region. *Pakistan J. Bio. Sci.*, **6** (24) : 2034-2039.
- Mitra, S.** and Mitra, S.K. (2001). Physico-chemical characteristics of 19 mango varieties grown in West Bengal. *Indian Agric.*, **45** (3-4) : 215-219.
- Pandey, R. M.,** Rao, M. M. and Singh, R. N. (1974). Biochemical changes in the developing mango fruit (*Mangifera indica* L.) cv. DASHEHARI. *Prog. Hort.*, **5** : 47-59.
- Pansee, V. G.** and Sukhatme, P.V. (1967). *Statistical methods for agricultural workers*, ICAR Publication Department, New Delhi.
- Rajput, S.S.** and Pandey, S. D. (1997). Physico-chemical characteristics of some mango cultivars under Chhatisgarh region of Madhya Pradesh. *Hort. J.*, **10** (1) : 9-14.
- Tondon, D.K.** and Kalra, S. K. (1983). Changes in sugars, starch and amylase activity during development of mango fruit cv. Dashehari. *J. Hort. Sci.*, **58** (3) : 449-453.
- Verma, R.A.,** Tripathi, M. P. and Srivastava, R. K. (1986). Studies on development of carotenoids ripening of mangoes (cv. DASHEHARI). *Prog. Hort.*, **18** (1-2) : 39-44.
