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Assessment of small to medium sized mango varieties

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Abstract
A research experiment was conducted at the Fruit Research Station, Sakkarbag Farm, Junagadh Agricultural University, and Junagadh during the year 2013-2015 to study the evaluation of small to medium sized mango varieties under Saurashtra Agro Climatic Conditions. The experiment was laid out in 12 year mango trees with Randomized Block Design and three replications. Total eight varieties were under taken for the evaluation which falls under small to medium sized fruits *viz.,* Kesar, Nilphanso, Alphonso, Amrapali, Dashehari, Sindhu, Khodi and Dudhpendo. The maximum plant height in Alphonso and plant spread (E-W and N-S) in Kesar was recorded. The maximum fruit length, fruit width, average fruit weight and pulp weight were found in Kesar. Sindhu recorded minimum stone weight and peel weight. The maximum number of fruits per plant was registered in Khodi. The highest fruit yield per plant and hectare were recorded in Kesar variety. Quality parameters *viz.,* total soluble solid in Kesar, minimum acidity, reducing sugar and non-reducing sugar were reported in Dudhpendo. From different varietal evaluation of small to medium sized mango varieties, it concluded that the mango variety Kesar was found the best for commercial growing in South Saurashtra Agro Climatic Conditions for yield and quality.

Keywords: small to medium, sized mango varieties

Introduction
Mango (*Mangifera indica* L.) belongs to family Anacardiaceae is an important and the most popular fruit crop. It is commercially grown and popular in more than 80 countries worldwide. Mango market leaders in the world are India, Brazil, China, Thailand, Egypt, Indonesia, Mexico, Pakistan, Philippines and Vietnam. Among these countries, Asian countries are recognized as the top leaders in mango production. The production of the crop varies from small scale farming to large, highly organized orchards, where the best available technology is applied. Worldwide around 2000 mango varieties are found. Among these, majority varieties are cultivated in India. Its cultivation in India has been estimated to be 2.263 million ha with an annual production of 19.687 million MT with 8.7 t per ha productivity. Gujarat itself produces 13 lakh tons of mango which contributes around seven per cent in the country. Junagadh district produces 84120 tones mango produce from 21030 ha area (Anon., 2018) [1]. As an export fruit crop, mango earns the country foreign exchange while at the same time acts as a source of household income for the resources- poor farmer. The mango fruit is highly perishable, it's ripening hastened during hot summer months despite the importance of mango in India, 40-50 per cent of the fruit are lost during postharvest handling.
Out of these 2000 varieties worldwide more than two hundred varieties exist in different parts of the Gujarat. Of these hundred varieties only about five to ten varieties are being commercially grown. Collection, conservation and evaluation of different small to medium sized varieties of Mango is one of the most important aspect of any varietal improvement programme. The attempts was made to conserve and evaluate the small to medium sized varieties of Mango for early fruiting, high yielding with better quality under South Saurashtra Agro Climatic conditions.

Materials and Methods
The research experiment entitled, Assessment of small to medium sized mango varieties was initiated at South Saurashtra Agro-climatic conditions to evaluate varietal characteristics and performance in this region. The work was carried out at Fruit Research Station, Junagadh Agricultural University, and Junagadh falls under South Saurashtra Agro-climatic Zone during 2013 to 2015 in Randomized Block Design with three replications, and each treatment consist of eight trees.

The main objective was to distinguish the small to medium and medium to large sized mango fruits and to study fruit characteristics and quality parameters of mango fruit. For this research work 12 years old healthy trees of eight mango variety having small to medium sized fruit size were selected *viz.*, Kesar, Alphonso, Dashehari, Khodi, Dudhpendo, Nilphanso, Amrapali and Sindhu were selected.

Experimental material consisted of grafted mature and bearing trees of Kesar, Alphonso, Dashehari, Khodi, Dudhpendo, Nilphanso, Amrapali and Sindhu were selected. The trees were erect, medium in size; dome shaped and shoots medium to thick with spreading nature. These trees are spaced at 8 X 8 meter distance. Utmost care was taken while selecting the healthy and optimum productive trees of the uniform size, shape and age. Hand weeding was done as and when required in the orchard. Interculturing was done by power tiller as well as with the help of '*Kudali*' and then basin was prepared. Physical application of any material or chemical was not necessary for the execution of this experiment. But naturally fallen temperature and accumulated degree days were the naturally applied treatments for trees of all three mango varieties. Well rotten Farm Yard Manure was applied @ 100 kg/ tree. Chemical fertilizers were applied to the tree to the tune of 750: 160: 750: N-P-K g. The manures and fertilizer were applied by preparing ring around the main trunk of the tree. Nitrogen was applied in the form of ammonium sulphate, phosphorus in the form of single super phosphate and potash in the form of muriate of potash. Half dose of nitrogen was applied @ 400 g per plant when fruits attain mustard size (February). Remaining dose of nitrogen, full dose of phosphorus and potash were applied at the time of onset of monsoon by preparing a ring of one meter diameter as basal dose during July. First irrigation was applied to the mango plants when fruits attained mustard size. Before the first irrigation withholding of irrigation water was done since withdrawal of monsoon. After the first irrigation, trees were irrigated as and when required at 8-10 days interval. The mango fruits were harvested when the skin of fruit shows powdery shining with small white dots on it. Another maturity indices taken in to considerations was when 2-3 fruits fallen down on ground naturally (known as *sankh* in vernacular language and *'tapka'* in Hindi) or fruit show fullness of shoulder. The fruits don't mature and ripe at the same time. So, it requires frequent hand pickings. The final yield per tree in kilogram was obtained by sum up the yield of all the pickings.

Soil samples were collected with the help of augor. The collected soil samples were analyzed at the department of agriculture chemistry and soil science, JAU, Junagadh to know its chemical properties and soil nutrient status and depicted as follows.

Physio-chemical properties of soils of experimental site.

EC sm-1)	pH	O.C. (%)	Phosphorus (kg ha-1)	Potash (kg ha-1)
0.37	8.02	1.17	117.76	1226.00

Results and Discussion

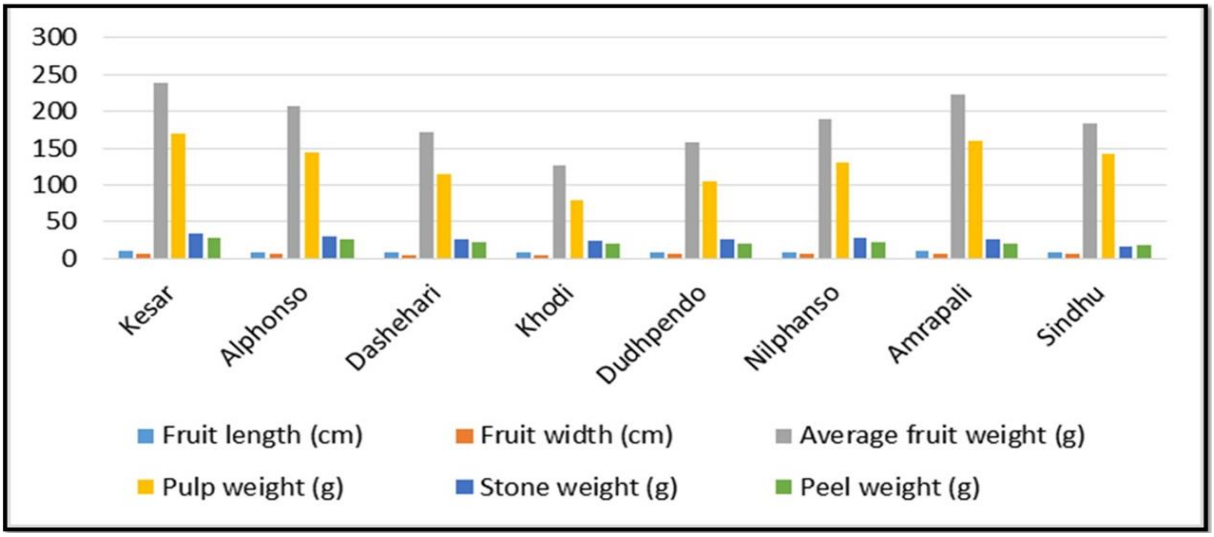
A variability in respect of various growth parameters, *viz.*, plant height and plant spread among mango varieties was reported. Variety Alphanso recorded maximum plant height (5.70 m) which was at par with Kesar and Sindhu in pooled data, whereas it was minimum in Khodi. Similar results were also reported by Barhate *et al.*, 2012 and Farheen *et al.*, 2017a) [2, 7]. Significantly the highest plant spread; N-S (5.68m) and E-W (5.52 m) was recorded for Kesar, it was found minimum in Dudhpendo and Khodi these results were in confirmation with the results achieved by Farheen *et al.*, 2019; Sharma *et al.*, 1999) [16, 18].

Significantly the maximum fruit length (10.42cm) was noted in Kesar and found at par with Amrapali. Though, it was minimum (7.63 cm) in Dudhpendo. The maximum fruit width (7.14 cm) was observed in Kesar and minimum (5.19 cm) in Dashehari. These results are also found in agreement with the findings observed by Gurmani, 1989 [9]; Kanzaria *et al.*, 2017 and Kumar, 2004) [3, 15]. This might be due to genetic makeup of individual genotypes. The maximum fruit weight (238.62 g) and pulp weight (168.90 g) was noted in Kesar, whereas it was minimum (125.41 g and 79.00 g) was recorded for fruit weight and pulp weight in Khodi (Bhad *et al.*, 2017; Disha *et al.*, 2018 [5]; Syed, 2009 and Uddini *et al.*, 2007) [21] these might be due to genetic behavior of genotype. As far as fruit quality is concern, the least weight of stone and peel is very important to finalize quality of any fruit crop. Variety Sindhu recorded minimum stone weight (15.89 g) and minimum peel weight (17.37 g) (Rajan *et al.* 2009; Kanzaria *et al.*, 2015a; Syed, 2009 and Zaied *et al.*, 2007) [10, 20, 22].

More number of fruits per plant is an important characteristic for the fruit crop to get more yield but at the same time it will reduce the average fruit weight. The maximum number of fruits per plant (332.78) was registered for Khodi whereas it was minimum for Alphonso (161.67). Significantly the highest fruit yield (47.80 kg/tree and 13.27 t/ha) was recorded in Kesar. The variation in number of fruits per plant and yield may vary within variety. Year to year variation within same plant may be due to climatic conditions prevailed during the year at specific location (Kanzaria *et al.*, 2015c and Singh and Singh, 2004). Significantly the maximum Total Soluble Solids (21.28 ^{0}B) was found in variety Kesar. The highest total sugars (17.46%), reducing sugars (4.90%), non-reducing sugar (12.56%) and minimum acidity (0.21%) contents were recorded in variety Dudhpendo (Bhuyan and Guha, 1995; Farheen *et al.*, 2017b; Kanzaria *et al.*, 2015a and 2015d and Uddini *et al.*, 2007) [21, 4]. The Fruit acidity might highly depends upon the genotype and prevailed micro climatic conditions. These results are also in confirmation with Kumar, 2004; Meera *et al.*, 2017; Rajan *et al.*, 2009 [17] and Uddini *et al.*, 2007) [8, 21].

Table 1: Evaluation of small to medium sized mango varieties for growth and fruit parameters.

Treatment	Plant height (m)	Plant spread		Fruit length (cm)	Fruit width (cm)	Average fruit weight (g)	Pulp weight (g)	Stone weight (g)	Peel weight (g)
		E-W (m)	N-S (m)						
Kesar	5.53	5.52	5.68	10.42	7.14	238.62	168.9	34.74	27.90
Alphonso	5.70	5.40	5.15	8.64	6.89	208.00	143.9	30.16	25.63
Dashehari	4.84	5.29	4.67	8.24	5.19	171.21	114.0	25.08	22.13
Khodi	4.37	5.09	4.14	8.46	4.61	125.41	79.0	23.18	19.47
Dudhpendo	4.86	4.61	4.65	7.63	5.30	158.29	103.9	26.45	19.03
Nilphanso	5.36	5.22	5.09	8.02	5.89	190.36	130.7	27.37	22.82
Amrapali	5.10	5.18	5.33	9.83	6.82	223.48	159.5	26.80	20.00
Sindhu	5.32	4.67	4.75	8.30	6.36	183.02	143.1	15.89	17.37
S.Em.±	0.152	0.180	0.133	0.249	0.213	6.286	4.931	0.926	1.355
CD at 5%	0.43	0.54	0.38	0.71	0.64	17.94	14.08	2.64	4.11
C.V.%	8.91	7.4	8.10	8.61	6.22	10.07	11.34	10.61	10.01



Graph 1: Evaluation of small to medium sized mango varieties for growth and fruit parameters.

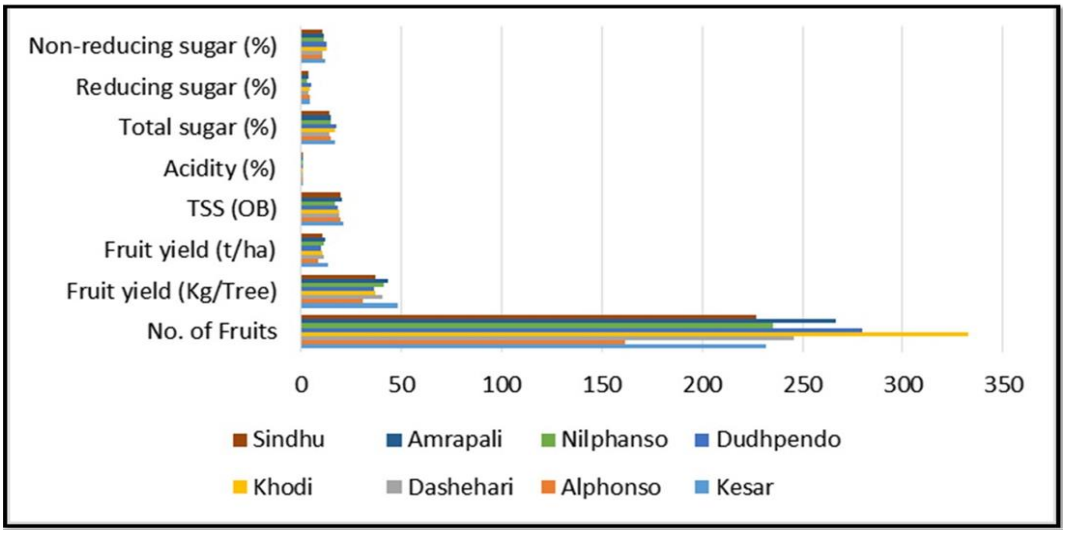
Table 2: Evaluation of small to medium sized mango varieties for yield and quality parameters.

Treatment	No. of Fruits	Fruit yield (Kg/Tree)	Fruit yield (t/ha)	TSS (^{O}B)	Acidity (%)	Total sugar (%)	Reducing sugar (%)	Non-reducing sugar (%)
Kesar	231.67	47.80	13.27	21.28	0.23	16.66	4.41	12.24
Alphonso	161.67	30.59	8.49	19.33	0.24	15.09	4.57	10.52
Dashehari	246.00	40.57	11.26	19.00	0.32	14.04	3.69	10.36
Khodi	332.78	37.21	10.33	18.72	0.26	16.93	4.61	12.32
Dudhpendo	279.78	36.56	10.15	18.56	0.21	17.46	4.90	12.56
Nilphanso	235.11	40.91	11.36	16.63	0.32	14.46	3.17	11.29
Amrapali	266.44	43.46	12.07	20.30	0.24	14.99	3.61	11.38
Sindhu	227.00	37.03	10.28	19.92	0.27	13.91	3.59	10.28
S.Em.±	19.336	1.942	0.539	0.415	0.017	0.328	0.349	0.270
CD at 5%	58.65	5.89	1.63	1.18	0.05	0.94	1.06	0.77
C.V.%	15.31	10.16	10.16	6.47	8.58	6.37	10.40	7.12

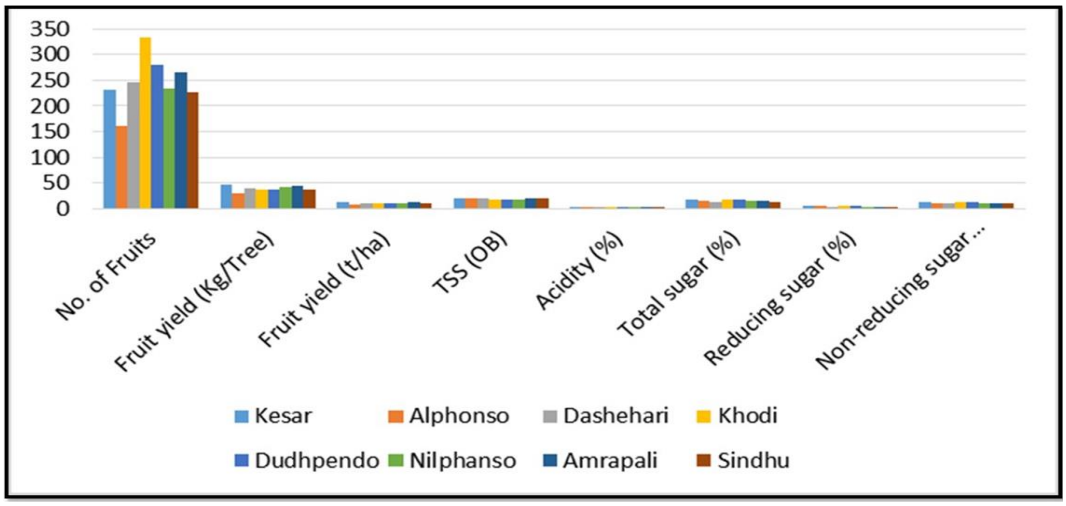
Conclusion

On the basis of the results obtained from the present experiment it may be revealed that maximum plant height in Alphonso and plant spread (E-W and N-S) in Kesar was recorded. The maximum fruit length, fruit width, average fruit weight and pulp weight were found in Kesar. Sindhu recorded minimum stone weight and peel weight. The maximum number of fruits per plant was registered in Khodi. The highest fruit yield per plant and hectare were recorded in Kesar variety. Quality parameters *viz.*, total soluble solid in Kesar, minimum acidity, reducing sugar and non-reducing sugar were reported in Dudhpendo.

From different varietal evaluation of small to medium sized mango varieties, it concluded that the mango variety Kesar was found the best for commercial growing in South Saurashtra Agro Climatic Conditions for yield and quality



Graph 2: Evaluation of small to medium sized mango varieties for yield and quality parameters



Graph 3: Evaluation of small to medium sized mango varieties for yield and quality parameters

Kesar	Alphonso	Dashehari
Khodi	Dudhpendo	Nilphanso

Sindhu

Amrapali

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