



Juxtaposition of morpho-qualitative traits of mango varieties grown in Mohanpur, West Bengal and Paria, Gujarat

*K. CHAKRABORTI, ¹N. I. SHAH, AND ²P. PATIL

ICAR-AICRP on Fruits, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur (BCKV), West Bengal; ¹Navsari Agriculture University, Paria, Gujarat; ²ICAR-Indian Institute of Horticultural Research, Bengaluru, Karnataka

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ABSTRACT

A comparative trial based on 15-year-old mango orchards consisting of 20 varieties, including five specific varieties from each zone in India, was conducted at Mohanpur, Nadia, in the Gangetic alluvial zone of West Bengal and at Paria in Valsad District, Gujarat, with each variety observed and evaluated in terms of the physico-chemical characters of its fruits and growth prospects of its plants. Significant variations were observed in almost all the varieties, with Mallika at the Mohanpur orchard found to be the best variety for its regularity in bearing, high yield (84.30Kg pl⁻¹), keeping quality (11 days), better fruit qualities (TSS 19.41^o Brix, acidity 0.31%) and precocity (four years), while the Bangalora variety at Paria recorded the significantly highest yield of 32.09Kg pl⁻¹.

Keywords: Juxtaposition, mango varieties, morpho-qualitative traits.

Mango (*Mangifera indica* L.), which belongs to the family Anacardiaceae, has immense adaptability and grows well in an extensive compass of climatic and soil conditions, making it the best of Indian table fruits. More than 200 varieties of mango are cultivated in West Bengal (Sarkar *et al.*, 2018). Apart from Murshidabad and Malda, Nadia district of West Bengal is famous for mango cultivation. New mango orchards are being set up in Nadia district. Lately, the district is producing high quality mangoes and creating huge employment opportunities in rural areas. According to the statistics, in 2013-14, mango was cultivated in 5.41 thousand hectares of land in Nadia and the yield was 35.5 thousand metric tons, which means productivity is 8.58 metric tons per hectare (www.wbfpih.gov.in).

Meanwhile, Valsad district of Gujarat is called the capital of mango. Valsad is one of the districts included in Agri Export Zone. In 2012-13, mango was cultivated in 29,000 hectares of land in this district. The production was 176 thousand metric tons. That means productivity per hectare is 6.08 metric tons (www.nabard.org). The research paper prepared in this context should be mentioned that Bidhan Chandra Krishi Viswavidyalaya is located at Mohanpur in Nadia and at Paria in Valsad there is an Agricultural Experiment Station which is a part of Navsari Agricultural University.

Chakraborti and Bauri (2006) conducted a comparative performance study of ten mango cultivars found between the Gangetic old alluvial zone of Ratua, Malda, in the eastern plain, characterized by a hot moist sub-humid ecosystem with alluvium-derived soils, and

the red lateritic zone of Jhargram, West Bengal, under the agro-ecological sub-region of the Eastern plateau, with a hot dry sub-humid ecosystem. An analysis of the plants, physico-chemical characteristics found that cultivar Himsagar produced the highest fruit yield and quality at Jhargram, whereas Langra gave the highest fruit yield and quality at Ratua, Malda.

Although there are comparative examples of production and excellence between a few mango cultivators in different agro-climatic zones in two different districts of the same state, there are no comparative examples of specific cultivars in different agro-climatic zones in two different states. If there is such a comparative example, the mango farmers of different states will be able to get an idea about the comparative quality and yield of the mangoes produced by them and the growth and development of the trees, which will take the commercial mango cultivation one step further.

A wide variety of mangoes can be seen throughout India. But neither all cultivars grow well everywhere, nor they yield well. In some places it seems to be the most suitable subject to some cultivars of mango. That is why those cultivars are grown in different parts of India and its comparative results have to be analyzed. In order to propel a successful varietal improvement program, considerable efforts are to be made to collect a large number of important mango varieties from across the country as different regions have their particular commercial cultivars. Also, an individual cultivar does not grow equally well under different sets of climatic

Email: drkalyanchakraborti@rediffmail.com

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conditions prevailing in various parts of the country. Due to these reasons, it was considered worthwhile to study the performance of different varieties of mango in different regions based on their popularity; to select the elite varieties of mango based on their yield and quality in the respective zones; and to conserve the varietal bio-diversity of mango in those areas. Therefore, the objective of the present study is to identify the important popular and commercial mango varieties of India by cultivating them in two different states viz. West Bengal and Gujarat and to convey the results to the farmers.

MATERIALS AND METHODS

Experimental area: The experimental area of Mohanpur in West Bengal (located between 21° 31' and 27° 14' N latitude and 85° 51' and 89° E longitude) lies under the Gangetic flood plain region in Nadia district, with a tropical humid climate characterized by — rainfall of 1,350 – 1,650 mm, annual normal maximum temperature of 35.0 ° C and minimum temperature 15.6 ° C. Weather information has been collected from the ICAR-AICRP on Agro-meteorology unit of Bidhan Chandra Krishi Viswavidyalaya.

The area's soils are very deep, medium fine to medium in texture, and neutral to mildly alkaline in pH levels. Calcareousness is significant in a large section of the area, base saturation is moderately high, Nitrogen and Phosphate status is medium to low, potash status is medium to high, and external drainage is medium to low, while internal drainage is moderate.

The experimental area of Paria in southern Gujarat (located between 20° 1' and 24° 7' N latitude and 68° 4' and 74° 4' E longitude) falls under the Gujarat plains and hills region in Valsad district with semi arid to dry sub-humid climate. The annual precipitation of this region is 2879 mm in 2012-13 and 1957 mm in 2013-14. Soil is well drained with pH range neutral, organic carbon-low, nitrogen - low, potash - high and phosphorus - medium (www.nabard.org)

Experimental Materials: The trial was conducted in RBD pattern between 2000 to 2016 with a square planting system of 10m x 10m that was replicated three times with two plants per unit consisting of 20 treatments (varieties), including five specific varieties from each zone in India (North, West, South, Central and East). All the trees under investigation were subjected to cultural treatments and irrigation conditions recommended by their respective university production manual. The fertilizer dose was NPK @100:50:100 g plant⁻¹year⁻¹ of age. The trees were planted in 2000 at Paria and in 2001 at Mohanpur, which means in 2016 the age of the trees were 16 years for Paria and 15 years

for Mohanpur respectively. From the age of six, each plant was fully fertilized.

North	West	South	Central & East
Dashehari	Alphonso	Baneshan	Zardalu
Langra	Kesar	Bangalora	Bombai
Fazli	Mankurad	Mulgoa	Bombay Green
Chousa	Fernandin	Neelum	Himsagar
Mallika	Vanraj	Suvarnarekha	Kishan Bhog

The selected varieties were observed on the basis of the physico-chemical characters of fruits (number of fruits per tree, fruit yield, fruit weight, stone weight, stone percentage, peel weight, peel percentage, pulp weight, pulp percentage, TSS, acidity, TSS : Acid ratio, total sugar and shelf life) and growth characters of plants (viz. plant height, canopy spread, trunk girth). The growth and physico-chemical characters were compared and the center-wise average pooled data obtained after 15 years of fresh planting were analyzed using the analysis of variance method (Gomez and Gomez, 1984). The SPSS software (Ver. 10.0) was used to make the analysis.

20 mango cultivars have been selected for this research work. There were three replicated plots for each cultivar and there were two trees per plot unit. In other words, a total of six trees were planted for each cultivar. Three properly matured fruits from each of the six trees of each cultivar were taken at random for analysis.

The average fruit, peel, pulp and stone weight were determined with the aid of an electronic balance and were expressed in gram (g). The peel from the ripe fruits was completely removed with the help of a sharp knife and the percentage of peel was determined by dividing the peel weight by the fruit weight and then multiplied by 100 and their mean value was recorded and expressed in per cent (%). Similarly pulp weight, pulp percentage, stone weight and stone percentage were calculated accordingly. The fruit yield per tree was calculated by multiplying the fruit number with average weight of fruit and was expressed in kg.

The total soluble solids (TSS) of the fruit was estimated with the help of a hand refractometer and calibrated in degree brix. The fruit acidity percentage was estimated by titrating the aqueous extract of known quantity of fruit juice against N/10 NaOH using phenolphthalein as an indicator. The total sugar content of the fruit was determined by titrimetric procedures after completion of the conversion of the non-reducing sugar into reducing sugar by acid hydrolysis. The total sugar of the aqueous solution was determined by titrating against the freshly prepared mixture containing equal volume of Fehling's solution A and B by using methylene blue as an indicator. TSS:Acid ratio was calculated by dividing the total soluble solid content with total titratable acidity. The observation of the quality

parameters were estimated following the standard methods as described by A.O. A.C. (1984).

RESULTS AND DISCUSSION

Growth characters: At Mohanpur, the Bombay Green variety recorded a significantly highest plant height of 9.70 m (Table 1), which was at par with that of the Baneshan variety (9.40m). The Kishan Bhog variety recorded a significantly lowest plant height (4.50 m), which was at par with that of the Neelum variety (4.70 m). At Paria, a significantly highest plant height of 5.49 m was recorded in the Chousa variety, which was at par with that of the Fazli variety (5.20 m), whereas a significantly lowest plant height was observed in the Neelum variety (3.36 m), followed by the Vanraj (3.56 m), Kesar (3.58 m) and Fernandin (3.58 m) varieties.

At Mohanpur, a significantly highest plant girth of 126.00 cm was recorded in the Baneshan variety, which was on par with that of the Fazli, Bombay Green and Langra varieties (125.50 cm, 125.50 cm and 119.50 cm, respectively). At Paria, the Langra variety recorded a significantly highest plant girth of 80.4 cm, which was on par with that of the Chousa variety (80.2 cm). In contrast, significantly lowest plant girth was observed in the Neelum variety at 46.5 cm, which was at par with that of the Vanraj and Zardalu varieties (49.8 cm and 52.2 cm, respectively).

Number of fruits per plant: At Mohanpur, Dashehari registered significantly highest number of fruits (386.87), while Fazli recorded the lowest (89.35) (Table 3). At Paria, Bangalore registered significantly highest number of fruits (61.23), which was at par with that of Dashehari (56.89), Mankurad (52.33) and Zardalu (50.01) varieties. Bombai registered the lowest number of fruits (18.71), which was at par with that of Kishan Bhog (19.01).

Yield: At Mohanpur, significantly highest yield was recorded in the Mallika variety (84.30 kg tree⁻¹), which was at par with that of the Himsagar variety (83.60 kg tree⁻¹), while the lowest yield (23.20 kg tree⁻¹) was recorded in the Alphonso variety (Table 3). At Paria, significantly highest yield was recorded in variety Bangalore (32.09 kg tree⁻¹), while the lowest yield (6.06 kg tree⁻¹) was recorded in the Kishan Bhog variety. The average yield of Kisanbhog variety of mango at Paria Center is 81.11 per cent less than that of the highest yielding Bangalore variety and 50.04 per cent less than that of Himsagar, the famous mango variety of West Bengal and 58.46 per cent less than that of Mallika.

Physical characteristics of fruits: Significantly highest fruit weight was obtained in Fazli (519.67g) at Mohanpur and in Vanraj (682.82g) at Paria, while significantly lowest fruit weight was recorded in

Alphonso (168.54 g) at Mohanpur, which was at par with that of Mankurad (190.27g), Bombay Green (200.00g), Kesar (205.35g) and Dashehari (205.83g) (Table 2). At Paria significantly lowest fruit weight (209.05g) was recorded in Fernandin followed by Mankurad (255.71g), Neelum (268.30g) and Bombay Green (268.31g).

Stone weight (%): At Paria, significantly lowest stone weight (6.88 %) was recorded in variety Vanraj, which was at par with that of Mallika, Bangalore, Bombai, Baneshan and Fazli (8.88%, 8.99%, 9.99%, 10.12% and 10.78%, respectively), while the highest stone weight was registered in variety Fernandin (19.08%) (Table 2). At Mohanpur, significantly lowest stone weight (9.99%) was recorded in Fazli, followed by Bangalore (12.1%), Neelum (12.17 %) and Mulgoa (12.63%), whereas, significantly highest stone weight (22.96%) was recorded in Alphonso, followed by Zardalu (21.44%), Fernandin (21.37 %) and Dashehari (19.72%).

Peel weight (%): Significantly lowest peel weight (9.65%) was recorded in variety Vanraj at Paria, which was at par with Zardalu, Fernandin, Baneshan, Mulgoa and Suvarnrekha (9.94%, 10.07 %, 13.04%, 13.20% and 13.53 %, respectively) (Table 2). Mankurad registered the highest peel weight (16.93%) in pooled analysis. At Mohanpur, significantly lowest peel weight (13.08%) was obtained in Neelum, followed by Langra (13.49%), Fazli (13.50%) and Mulgoa (13.99 %), whereas, significantly highest peel weight (19.85%) was observed in Dashehari followed by Alphonso (18.77%) and Zardalu (18.61%).

Pulp weight (%): It was observed that pulp per cent differed significantly with respect to variety during the period of experiment (Table 2). At Paria, significantly highest pulp weight (83.47%) was recorded in variety Vanraj, followed by Mallika (77.35%). At Mohanpur, significantly highest pulp weight (76.51%) was recorded in variety Fazli, followed by Neelum (74.75 %), Mulgoa (73.38 %), Langra (73.27%), Bangalore (72.95%) and Vanraj (70.27 %), whereas, significantly lowest pulp weight (58.27%) was recorded in Alphonso, which was at par with that of Zardalu (59.95%).

TSS (°Brix): At Paria, significantly highest TSS (19.06°Brix) was recorded in variety Alphonso in pooled data, which was at par with that of Himsagar, Dashehari, Langra, Bombai green, and Kesar varieties (19.03°Brix, 19.00° Brix, 18.94° Brix, 18.86° Brix and 18.73° Brix, respectively), whereas, at Mohanpur, significantly highest TSS content (19.43° Brix) was obtained in Mallika, followed by Himsagar (19.42° Brix), Langra (19.40°Brix), Kishan Bhog (19.22° Brix) and Dashehari

Table 1: Growth parameters of different varieties of mango

Variety	Plant height (m)		Plant girth (cm)	
	Mohanpur	Paria	Mohanpur	Paria
Dashehari	7.65	4.83	104.50	62.1
Langra	7.55	4.60	119.50	80.4
Fazli	9.25	5.20	125.50	75.6
Chousa	6.05	5.49	57.00	80.2
Mallika	8.40	4.28	98.50	63.6
Baneshan	9.40	4.43	126.00	62.9
Bangalora	6.25	4.39	92.50	61.0
Mulgoa	7.65	4.65	104.00	54.8
Neelum	4.70	3.36	49.00	46.5
Suvarnrekha	6.95	4.55	92.50	62.0
Alphonso	7.65	4.57	87.00	63.4
Kesar	8.35	3.58	107.50	53.6
Mankurad	4.97	4.01	55.50	52.9
Fernandin	7.74	3.58	81.00	54.6
Vanraj	7.80	3.56	109.50	49.8
Zardalu	7.45	4.44	99.00	52.2
Bombai	8.17	3.86	101.00	55.1
Bombay Green	9.70	4.04	125.50	63.6
Himsagar	7.80	4.39	96.00	62.7
Kishan Bhog	4.50	4.41	56.50	63.3
SEm (\pm)	0.36	0.42	5.14	6.09
LSD (0.05)	0.97	1.18	14.75	17.23

Table 2: Physical characteristics of fruits of different mango varieties

Variety	Fruit weight (g)		Stone weight (%)		Peel weight (%)		Pulp weight (%)	
	Mohanpur	Paria	Mohanpur	Paria	Mohanpur	Paria	Mohanpur	Paria
Dashehari	205.83	357.66	19.72	12.75	19.85	15.47	60.43	71.78
Langra	247.15	364.75	13.24	12.49	13.49	11.99	73.27	75.52
Fazli	519.67	544.82	9.99	10.78	13.50	15.58	76.51	73.64
Chousa	227.35	542.56	18.63	11.68	14.22	13.88	67.15	74.43
Mallika	379.30	536.43	13.80	8.88	15.93	13.78	70.27	77.35
Baneshan	271.69	453.63	13.73	10.12	15.35	13.04	70.92	76.84
Bangalora	292.16	544.33	12.11	8.99	14.94	14.38	72.95	76.63
Mulgoa	242.68	326.49	12.63	11.78	13.99	13.20	73.38	75.02
Neelum	257.27	268.30	12.17	14.16	13.08	15.16	74.75	70.68
Suvarnrekha	244.74	395.85	14.53	11.96	16.61	13.53	68.86	74.51
Alphonso	168.54	341.03	22.96	10.79	18.77	14.76	58.27	74.45
Kesar	205.35	345.09	19.65	11.18	15.79	15.05	64.56	73.77
Mankurad	195.49	255.71	16.55	10.79	16.28	16.93	67.17	72.27
Fernandin	190.27	209.05	21.37	19.08	15.77	10.07	62.86	70.85
Vanraj	398.06	682.82	14.52	6.88	15.21	9.65	70.27	83.47
Zardalu	190.74	330.53	21.44	16.43	18.61	9.94	59.95	73.63
Bombai	205.70	433.61	19.47	9.99	16.04	16.40	64.49	73.62
Bombay Green	200.00	268.31	17.26	13.38	16.16	14.69	66.58	71.93
Himsagar	249.94	311.02	16.75	12.81	15.88	14.99	67.37	72.20
Kishan Bhog	285.07	325.94	17.30	12.33	15.70	14.88	67.00	72.79
SEm (\pm)	17.34	22.61	0.47	1.38	0.28	1.43	1.10	0.42
LSD (0.05)	48.46	63.97	1.29	3.90	0.79	4.02	2.97	1.18

Table 3: Yield parameters of different varieties of mango

Variety	Number of fruits tree ⁻¹		Fruit yield (Kg tree ⁻¹)	
	Mohanpur	Paria	Mohanpur	Paria
Dashehari	386.87	56.89	79.63	20.27
Langra	323.00	31.15	79.83	10.54
Fazli	89.35	31.23	46.43	16.44
Chousa	153.06	31.70	34.80	15.75
Mallika	222.25	30.48	84.30	14.59
Baneshan	202.92	30.69	55.13	13.50
Bangalora	195.65	61.23	57.16	32.09
Mulgoa	146.53	23.70	35.56	8.84
Neelum	124.50	46.64	32.03	11.92
Suvarnrekha	167.52	36.20	41.00	13.23
Alphonso	137.65	30.04	23.20	10.24
Kesar	215.53	39.35	44.26	13.94
Mankurad	142.87	52.33	27.93	10.48
Fernandin	214.75	36.23	40.86	6.42
Vanraj	197.28	27.87	78.53	14.90
Zardalu	337.11	50.01	64.30	14.37
Bombai	203.01	18.71	41.76	7.96
Bombay Green	169.80	26.84	33.96	6.84
Himsagar	334.48	42.59	83.60	12.13
Kishan Bhog	96.22	19.01	27.43	6.06
SEm (±)	14.21	4.90	3.21	1.55
LSD (0.05)	39.64	13.68	9.24	4.39

Table 4: Bio-chemical compositions of fruits of different varieties of mango

Variety	TSS (°Brix)		Acidity (%)		TSS: Acid ratio	
	Mohanpur	Paria	Mohanpur	Paria	Mohanpur	Paria
Dashehari	19.03	19.00	0.26	0.21	73.19	86.54
Langra	19.40	18.94	0.34	0.25	57.05	98.09
Fazli	17.94	18.49	0.37	0.20	48.48	88.31
Chousa	17.70	16.39	0.37	0.23	47.83	74.00
Mallika	19.43	18.15	0.30	0.23	64.76	79.48
Baneshan	17.90	15.46	0.34	0.23	52.64	76.58
Bangalora	15.88	13.70	0.42	0.17	46.59	79.18
Mulgoa	16.46	17.34	0.41	0.23	40.14	83.91
Neelum	15.73	17.67	0.40	0.24	38.37	70.56
Suvarnrekha	16.05	16.60	0.43	0.23	37.32	69.57
Alphonso	18.37	19.06	0.32	0.22	57.40	91.15
Kesar	18.96	18.73	0.33	0.21	57.45	88.29
Mankurad	16.18	16.93	0.39	0.25	41.48	68.14
Fernandin	16.60	16.40	0.38	0.23	43.68	75.75
Vanraj	16.24	14.86	0.39	0.25	41.64	55.93
Zardalu	17.57	13.93	0.34	0.26	51.67	41.79
Bombai	18.55	14.46	0.32	0.25	57.96	59.36
Bombay Green	18.20	18.86	0.33	0.23	60.66	87.61
Himsagar	19.42	19.03	0.30	0.22	64.73	81.95
Kishan Bhog	19.22	16.71	0.33	0.22	58.24	78.98
SEm (±)	0.29	0.29	0.03	0.0035	—	—
LSD (0.05)	0.86	0.81	0.08	0.01	—	—

Table 5: Shelf life of fruits of different mango varieties

Variety	Shelf life (days)	
	Mohanpur	Paria
Dashehari	8.66	8.52
Langra	8.00	6.78
Fazli	9.66	9.95
Chousa	8.33	12.94
Mallika	11.00	10.15
Baneshan	8.33	12.89
Bangalora	10.66	15.88
Mulgoa	8.00	6.05
Neelum	7.66	8.82
Suvarnrekha	8.33	9.86
Alphonso	8.66	13.31
Kesar	8.33	13.41
Mankurad	5.33	8.51
Fernandin	4.66	8.25
Vanraj	6.33	8.42
Zardalu	7.33	12.79
Bombai	6.33	11.29
Bombay Green	6.00	10.39
Himsagar	5.66	9.95
Kishan Bhog	6.66	9.39
SEm (±)	0.20	0.89
LSD (0.05)	0.58	2.51

(19.03⁰Brix) (Table 4). Significantly lowest TSS content (15.73⁰Brix) was found in Neelum, which was at par with Bangalora (15.88⁰Brix).

Acidity (%): At Paria, significantly lowest acidity per cent was recorded in variety Bangalora (0.17%) in pooled analysis, while the highest acidity (0.25 %) was recorded in the Langra, Vanraj, Mankurad and Bombai varieties (Table 4). At Mohanpur, significantly lowest acidity was obtained in Dashehari (0.26%), followed by Mallika (0.33%) and Himsagar (0.33%).

Keeping quality (days): Fruit keeping quality (days) of different varieties differed significantly (Table 5). Fruit keeping quality was significantly more in variety Bangalora (15.88 days) at Paria and in Mallika (11.00 days) at Mohanpur, while it was the lowest in Mulgoa (6.05 days) at Paria and Fernandin (4.66 days) at Mohanpur. The extension of shelf life of mango has been one of the most important concerns of the researchers as mango is characterized by climacteric fruit with relatively high respiration and ripen quickly after harvest (Mitra and Baldwin, 1997). Therefore short post-harvest life is a limiting factor in case of mango and it restricts long-distance marketing. The shelf life may be affected by firmness of different mango germplasm or may be the activity of some enzymes acting differently

in different varieties leading to the faster or slower ripening or softening of fruits. Therefore, the shelf life of mango could be extended by selecting the suitable and potential cultivars in terms of storage, packaging and transport.

The Mohanpur trial confirms the study of Chakraborti *et al.* (2010), in which Mallika was determined to be the best variety among thirteen commercial varieties grown in young orchards in the new alluvial zone of West Bengal. Khara *et al.* (2016) mentioned that the fruits of Mallika were superior to some other cultivars with regard to fruit weight and size. They also noticed that maximum per cent of total soluble solids was in cultivar Mallika of 23.60⁰Brix along with highest total sugar, reducing sugar as well as non-reducing sugar contents. The highest TSS:Acid ratio was also recorded in cultivar Mallika at Malda condition.

CONCLUSION

The 15-year-old varietal trial at BCKV in Mohanpur, West Bengal, based on observation of physico-chemical parameters, showed that the performance of Mallika is the best compared to Himsagar, the State's most important commercial variety, because of its regularity in bearing, high yielding behaviour, higher keeping quality of fruits, and better table type fruit qualities. Although the yield and quality of mangoes of Mallika variety is not much different from that of Himsagar variety, the storage period and freshness of Mallika variety is much higher than that of Himsagar (48.55 per cent), resulting in long-term market opportunities at Mohanpur as Mallika decays late (from 11 days) whereas Himsagar starts decomposing earlier in the season (from 5.66 days). The pulp content of Mallika is also slightly higher than that of Himsagar (4.13%). Mallika also has a slightly higher growth rate in terms of height (7.14%).

Mallika also exhibited precocity in bearing and gave good fruits even at four years of age. Eastern Indian varieties Bombay Green and Fazli and South Indian variety Baneshan at Mohanpur and the north Indian varieties of Langra, Fazli and Chousa at Paria were found to be better with respect to growth parameters. The Bangalora variety emerged superior with respect to yield. The Alphonso, Himsagar, Dashehari, Langra and Kesar varieties were found to be better with respect to TSS, while acidity was the lowest in Bangalora. Fruit keeping quality was highest in variety Bangalora at room temperature. We recommend variety Mallika for Gangetic West Bengal and variety Bangalora for South Gujarat.

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REFERENCES

- A.O.A.C. 1984. Official methods of analysis. 14th Edition. Association of Official Agricultural Chemists. Washington D.C, U.S.A., p16.
- Chakraborti, K. and Bauri, F. K. 2006. Juxtaposition of qualitative traits of mango cultivars in Gangetic old alluvial and red lateritic zones of West Bengal. *Environ. Ecol.*, **24**: 502-504.
- Chakraborti, K., Sen, T. and Samanta, S.K. 2010. Morpho-qualitative traits of different Indian mango cultivars in new alluvial zone of West Bengal. *Proc. Nat. Acad. Sci. India, Sect. B* 80(1): 81-97.
- Gomez, A.A. and Gomez, A.A. 1984. Statistical Procedures for Agricultural Research, 2nd Edition, John Wiley & Sons, Inc.
<https://www.nabard.org> <https://www.wbfpib.gov.in>
- Khara, S. N., Thakur, P. K., Acharya, P. and Dhua, R. S. 2016. Characterization of different cultivars of mango commercially grown in Malda, India. *J. Postharvest Technol.*, **4**(4):50-55.
- Mitra, S.K. and Baldwin, E.A.1997. Post-harvest physiology, storage of tropical sub-tropical fruits, CABI International, New York, p. 85-122.
- Sarkar, B., Mondal, S. and Basu, D. 2018. Problems and prospects of mango growers of Nadia district, West Bengal. *J. Agric. Engg. Food Technol.*, **5**(2): 97-103.