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Studies on potentiality of some mango varieties in West Bengal

S. KUNDU, N. SANYAL AND P. DATTA

Department of Fruits and Orchard Management, Faculty of Horticulture,
Bidhan Chandra Krishi Viswavidyalaya, Mohanpur- 741252, Nadia, West Bengal

ABSTRACT

Potentiality of twenty four less known mango varieties was studied for twenty three quantitative characters. Wide range of variations were observed in different characters among different varieties. High yields were recorded in varieties Nababhog (134.59 kg/plant), Mithua (98.64 kg/plant) and Khota lagga (95.95 kg/plant). Fruit weight, pulp weight and fruit size were found higher in Durgabhog, Gopibhog, Dhumma, Ashu Guti and Nababhog from nutritional point of view, ascorbic acid content was satisfactory in the varieties Nababhog, Mithua, Durlavbhog, Gopibhog, Gour and Subodh Guti but TSS/acid ratio was found higher (> 80) in Baro Langra Guti, Subodh Guti, Nababhog, Dudh Kumar, Khota Lagga, Ghia, Mithua, Gour and Durgabhog. The study suggests that some of the less known varieties have good potentiality for commercial exploitation

Key words : Acidity, ascorbic acid, sugar and TSS

India is leading mango producer in the world yet she occupies only third position in the context of increasing international trade of mango and mango products (Subramanyam, 1990). Inspite of its unique position in the horticultural economy of India, mango improvement has not received the importance it deserves. Most of our choice varieties of mango are biennial in their bearing habit, low in productivity, poor in keeping and processing qualities and prone to various biotic and abiotic stresses which need urgent attention. Efforts are being made to widen the varietal base for export and to develop export oriented varieties. About 1000 cultivars of mango are known to exist in India. Majority of these have originated as superior chance seedlings arising from natural crossing or gene mutation.

In West Bengal, mango is mainly grown in the districts of Malda, Murshidabad, Nadia and 24 Parganas (North) having a rich collection of varieties. Some of these varieties have already been described by several workers (Sadhu and Bose, 1982, Ghosh *et al.* 1985, Kundu and Ghosh, 1992). But a number of less known superior varieties still remain confined to the orchards of a few individuals only; as a result, these varieties are not gaining popularity. Twenty four such types of varieties of mango in Malda district were identified for this study. These varieties were vegetatively propagated and subsequently planted in the regional Research Station, Gayespur, Bidhan Chandra Krishi Viswavidyalaya for systematic studies for their commercial exploitation in mango industry and also for breeding work.

MATERIALS AND METHODS

The experimental area of Regional Research Station, Gayeshpur, Bidhan Chandra Krishi Viswavidyalaya is situated between $22^0$56` North latitude and $88^0$32` East latitude. The experiment was carried out during 2007-08. Each variety was replicated thrice and spaced at a distance of 10 × 10 m. Plants were of uniform in age (8 years) and received same cultural practices during the course of investigation. Twenty three quantitative observations were recorded for characterization and evaluation of these mango varieties following descriptor of mango (IBPGR, 1989). Ten matured green leaves, panicles and fruits free from any pest-disease attack were collected randomly from different directions from each plant for recording different observations. The total soluble solids (TSS) were recorded with the help of a hand refractometer. The sugars, acidity and ascorbic acid content of fruit were estimated by following the standard methods (AOAC, 1984). Hierarchical Cluster Analysis procedure was attempted to identify relatively homogeneous groups of varieties based on quantitative characteristics, using an algorithm that starts with each case (or variable) in a separate cluster and combines clusters until only one is left. Standardizing transformation like Z transformation was used before such clustering. Distance or similarity measures following Euclidian technique were generated by the Proximities procedure as input of this analysis. Dendrogram resulted by this analysis was taken into consideration for better understanding of homogeneous varieties (Dillon and Goldstein, 1984).

RESULTS AND DISCUSSION

The results obtained from the present studies on the performance of different less known varieties of mango in West Bengal revealed that there were wide variations in the leaf, flowering, yield and fruit characters. The results presented in table 1 clearly revealed that leaf length varied from 18.3 to 28.4 cm and leaf width ranged from 3.2 to 6.7 cm. Leaf size was larger in Ashu Guti (28.4 × 6.6 cm), Sinduria (26.6 × 6.3 cm) and Kuber Gaon Benka (23.7 × 6.5 cm). Inflorescence length varied from 21.8 to 32.3 cm. The length of inflorescence was found higher in Kuber Gaon Benka (32.2 cm), Sindhuria (32.0 cm), Kalithan (31.4 cm) and Hira Shahunia (30.8 cm). All the varieties had tiny flowers with a diameter of 3.2 mm to 6.1 mm. Among them, largest flower was observed in Ashu Guti (6.1 mm diameter) and smaller flower was noticed in Bhagwan Kelua (3.2 mm), Batasia (3.6 mm) and Hira Shahunia (3.9 mm). Wide variation of hermaphrodite flowers in a panicle (2.6 to 25%) with higher percentage of hermaphrodite flower was recorded in Subodh Guti (25%), Gopibhog (23%) and Durgabhog (22%). More or less similar observation on hermaphrodite flowers in a

E-mail: skundubckv@rediffmail.com

panicle (1.2 to 35.6%) was recorded by Mukherjee *et al.* (1949) in other varieties. According to Singh (1954), the variation was more wide (0.74-69.8%). The duration of flowering in the present study varied from 13 to 34 days whereas Kulkarni *et al.*(2003) recorded 25 to 36 days under Maharastra condition.

The present study showed a wide variation in fruit yield (7.7 - 134.5 kg/plant) and number of fruits per plant (37.6 – 684.4) (Table 1). High yield was recorded in varieties Nababhog (134.5 kg/plant) followed by Mithua (98.6 kg/plant) and Khota lagga (95.9 kg/plant). The maximum fruit yield in the variety Nababhog was due to large sized fruit (11.0 cm length × 7.4 cm breadth × 6.8 cm thickness) and heavy fruit weight (336.3g) although it did not produce maximum number of fruits in a plant. On the other hand, higher yield in the variety Khota Lagga was due to bearing of maximum number of fruits in a plant (684.4) although it has lesser fruit weight (140.2g) and fruit size (7.9 × 5.7 × 5.1 cm).The different varieties showed marked variation in fruit weight (132.2 – 476.7 g), pulp weight (80.5 – 401.7g), peel weight (17.8 - 51.1 g), stone weight (15.4 - 52.5 g), stone length (5.7 – 10.7 cm), fruit length (7.5-12.3 cm), fruit breadth (5.3-8.4 cm) and fruit thickness (5.0 – 7.6 cm). Fruit weight, pulp weight and fruit size were found higher in Durgabhog, Gopibhog, Dhumma, Ashu Guti and Nababhog (Table 2). Among these Durgabhog produced largest fruit (12.3 × 8.4 × 7.6 cm) with maximum fruit weight (476.7 g) and pulp weight (401.7 g). In India, heavier and larger sized fruits were found in Fazli (Shyamal and Mishra, 1989; Kundu and Ghosh, 1992), Banganpalli, Totapuri (Lodh *et al.,* 1974) and Mallika (Badyal and Bhutani, 1989).

Different varieties showed a wide range of TSS (13.6 - 22.3 ^{0}brix), total sugar (8.2-17.3 %), reducing sugar (2.1 – 4.1 %), non-reducing sugar (4.3-12.0 %), titratable acidity (0.13-0.53 %), ascorbic acid (16.3-85.6 mg/100 ml juice) and TSS/acid ratio (31.4 to 130) in fruits (Table 3). Ghosh *et al.* (1985) recorded more or less similar TSS value (10.4 – 21.6 ^{0}brix) in the mango fruits where as Kundu and Ghosh (1992) obtained higher values of ascorbic acid in fruits (26.13-154.73 mg/100mg pulp). In the present studies, the TSS content of fruit was recorded higher in fruits of Mithua, Baro Langra Guti, Subodh Guti, Gour, Nababhog, Dhumma and fruit acidity was found lesser in varieties Dudh Kumar, Baro Langra Guti, Ghia, Khota Lagga, Nababhog, Subodh Guti. However, TSS/acid ratio was found higher (> 80) in Baro Langra Guti, Subodh Guti, Nababhog, Dudh Kumar, Khota Lagga, Ghia, Mithua, Gour and Durgabhog. The varieties like Mithua, Baro Langra Guti, Kanchan Kosa and Bhagwan Kelua contained higher total sugar and non reducing content in the fruits. The nutritious value in respect to ascorbic acid content was satisfactory in the varieties Nababhog, Mithua, Durlavbhog, Gopibhog, Gour and Subodh Guti (Table 3). Hierarchical Cluster Analysis following complete linkage method on Euclidian proximity matrix on quantitative characters extracted 7 clusters allowing distance coefficient as 6.663 which is clear from dendrogram (Fig. 1). The varieties in each cluster were homogeneous in respect of different quantitative characters.

From the above investigation it may be concluded that lot of variation exist among these less known mango varieties. Considering yield and fruit quality Nababhog, Mithua and Khota Lagga have good potentiality for commercial exploitation. Other varieties like Baro Langra Guti, Subodh Guti, Dudh Kumar, Ghia, Gour and Durgabhog can also be exploited as table variety for good quality.

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Table 1: Leaf, flower and yield characters of different less known mango varieties

Variety	Leaf length (cm)	Leaf width (cm)	Inflores-cence length (cm)	Flower diameter (mm)	Herma-phrodite flowers (%)	Flowering dura-tion (days)	No. of fruits / plant	Yield (kg/plant)
Ashu Guti	28.4	6.6	30.4	6.1	5.0	22	92.3	34.3
Baro Langra Guti	26.9	5.9	22.6	5.5	4.6	25	52.7	10.5
Batasia	19.9	4.8	27.8	3.6	7.0	17	93.2	15.3
Bhagwan Kelua	18.3	3.2	23.8	3.2	4.6	18	107.3	17.4
Dagi	24.7	4.8	23.1	5.8	20.6	20	63.4	8.3
Dhumma	19.8	6.7	21.8	4.0	2.6	21	54.3	20.7
Dudh Kumar	18.4	4.8	27.1	5.0	11.3	28	247.1	48.2
Durgabhog	25.4	5.6	29.3	5.0	22.0	25	37.6	17.9
Durlavbhog	22.9	5.0	30.7	5.4	12.6	34	58.3	12.3
Ghia	19.8	4.7	26.5	5.0	7.3	18	45.9	9.4
Golapbas	21.3	4.5	25.9	5.2	5.3	15	90.2	20.3
Gopibhog	27.3	5.4	29.7	5.0	23.0	23	45.9	18.1
Gour	20.0	5.2	30.2	4.8	20.3	30	102.5	29.4
Hira Shahunia	25.0	6.0	30.8	3.9	2.6	16	200.1	52.0
Kalithan	22.4	5.1	31.4	5.8	8.0	21	108.4	16.6
Kanchan Kosa	19.2	4.6	27.3	4.8	19.3	27	41.7	10.5
Khota Lagga	24.6	3.7	23.0	5.6	15.0	15	684.4	95.9
Kishanbhog	22.5	5.4	30.2	5.4	6.0	28	118.3	30.3
Kuber Gaon Benka	23.7	6.5	32.3	5.5	2.6	17	110.5	25.3
Misrikhan	19.7	5.3	22.8	6.0	5.6	19	47.8	7.7
Mithua	19.6	3.4	29.4	4.0	3.3	24	393.6	98.6
Nababhog	23.2	5.4	22.9	4.8	8.0	20	400.2	134.5
Sinduria	26.6	6.3	32.0	4.0	11.3	15	207.4	66.3
Subodh Guti	24.5	4.5	25.3	5.0	25.0	14	91.5	21.3
CV (%)	**13.41**	**18.10**	**12.64**	**15.69**	**69.50**	**25.21**	**104.7**	**96.80**

Table 2: Physical characters of fruits of different less known mango varieties

Variety	Fruit weight (g)	Fruit length (cm)	Fruit breadth (cm)	Fruit thickness (cm)	Pulp weight (g)	Peel weight (g)	Stone weight (g)	Stone length (cm)
Ashu Guti	372.4	11.9	7.9	7.5	291.9	36.2	44.3	10.7
Baro Langra Guti	199.3	8.7	6.0	5.8	146.5	30.4	22.4	7.2
Batasia	164.2	8.8	5.8	5.2	118.6	17.8	27.8	8.4
Bhagwan Kelua	162.2	10.1	5.3	5.0	104.7	24.2	33.3	9.1
Dagi	132.2	7.5	5.5	5.2	80.5	24.2	27.5	6.3
Dhumma	382.5	11.3	8.0	7.5	293.9	43.2	45.4	8.3
Dudh Kumar	195.3	10.5	6.1	5.5	133.2	33.2	28.9	10.4
Durgabhog	476.7	12.3	8.4	7.6	401.7	29.7	45.3	8.3
Durlavbhog	211.2	9.8	5.9	5.8	142.4	31.3	37.5	8.6
Ghia	205.4	9.2	6.0	5.8	159.0	20.2	26.2	7.1
Golapbas	225.4	9.1	6.8	5.2	154.1	40.1	31.2	7.8
Gopibhog	396.3	12.0	7.8	7.4	311.8	50.1	34.4	9.6
Gour	287.4	10.7	7.0	6.7	210.8	35.4	41.2	8.6
Hira Shahunia	260.2	10.5	6.8	6.2	219.9	24.9	15.4	8.9
Kalithan	153.4	8.1	6.0	5.9	109.7	18.2	25.5	5.7
Kanchan Kosa	252.5	9.4	6.1	6.1	160.2	51.1	41.2	7.9
Khota Lagga	140.2	7.9	5.7	5.1	98.7	19.4	22.1	6.6
Kishanbhog	256.5	8.5	7.1	7.0	181.0	42.3	33.2	6.3
Kuber Gaon Benka	229.7	10.2	6.9	5.7	173.3	27.1	29.3	8.6
Misrikhan	162.4	8.0	6.0	5.7	112.5	28.6	21.3	7.2
Mithua	250.6	8.2	6.1	5.4	194.2	28.8	27.6	6.1
Nababhog	336.3	11.0	7.4	6.8	235.4	48.4	52.5	9.9
Sinduria	320.1	10.5	6.9	6.1	241.3	46.5	32.3	9.7
Subodh Guti	233.4	9.9	6.4	6.1	159.6	39.2	34.6	7.8
CV (%)	**36.09**	**14.20**	**12.70**	**13.46**	**42.70**	**31.31**	**27.71**	**16.98**

Table 3: Bio-chemical characters of fruits of different less known mango varieties

Variety	TSS (^{o} brix)	Total sugar (%)	RS (%)	NRS (%)	Acidity (%)	Ascorbic acid (mg/100 ml juice)	TSS /Acid ratio
Ashu Guti	17.4	10.1	2.1	7.5	0.29	78.7	60.0
Baro Langra Guti	20.8	14.5	3.5	10.4	0.16	36.7	130.0
Batasia	15.1	10.5	2.9	7.2	0.48	78.2	31.4
Bhagwan Kelua	18.5	13.7	4.6	8.6	0.42	16.4	44.0
Dagi	17.7	11.6	3.5	7.7	0.29	16.7	61.0
Dhumma	19.2	11.6	3.6	7.6	0.32	79.2	60.0
Dudh Kumar	15.3	9.1	4.0	4.8	0.13	60.3	117.6
Durgabhog	15.8	9.6	3.4	5.9	0.19	60.4	83.1
Durlavbhog	17.2	11.5	3.6	7.4	0.53	85.6	32.5
Ghia	17.2	11.5	3.9	7.1	0.16	42.4	107.5
Golapbas	16.9	12.0	4.2	7.3	0.26	32.4	65.0
Gopibhog	16.1	9.6	3.8	5.5	0.22	82.4	73.1
Gour	19.7	12.5	2.7	9.2	0.22	80.3	89.5
Hira Shahunia	16.4	9.6	4.0	5.3	0.42	18.9	39.0
Kalithan	16.6	12.3	3.3	8.5	0.32	24.8	51.8
Kanchan Kosa	19.2	15.0	4.6	9.7	0.38	48.8	50.5
Khota Lagga	17.7	12.3	3.5	8.4	0.16	42.2	110.6
Kishanbhog	17.4	11.0	4.7	6.0	0.32	16.3	54.3
Kuber Gaon Benka	13.6	8.2	3.6	4.3	0.19	32.5	71.5
Misrikhan	15.3	9.6	3.4	5.9	0.29	32.7	52.7
Mithua	22.3	17.3	4.6	12.0	0.24	82.2	92.9
Nababhog	19.4	12.5	4.0	8.0	0.16	85.6	121.2
Sinduria	18.6	10.4	3.0	6.9	0.35	32.7	53.1
Subodh Guti	19.7	11.4	2.4	8.5	0.16	80.4	123.1
CV (%)	**11.40**	**17.79**	**18.71**	**24.00**	**39.86**	**50.04**	**41.26**

RS – Reducing sugar, NRS – Non reducing sugar

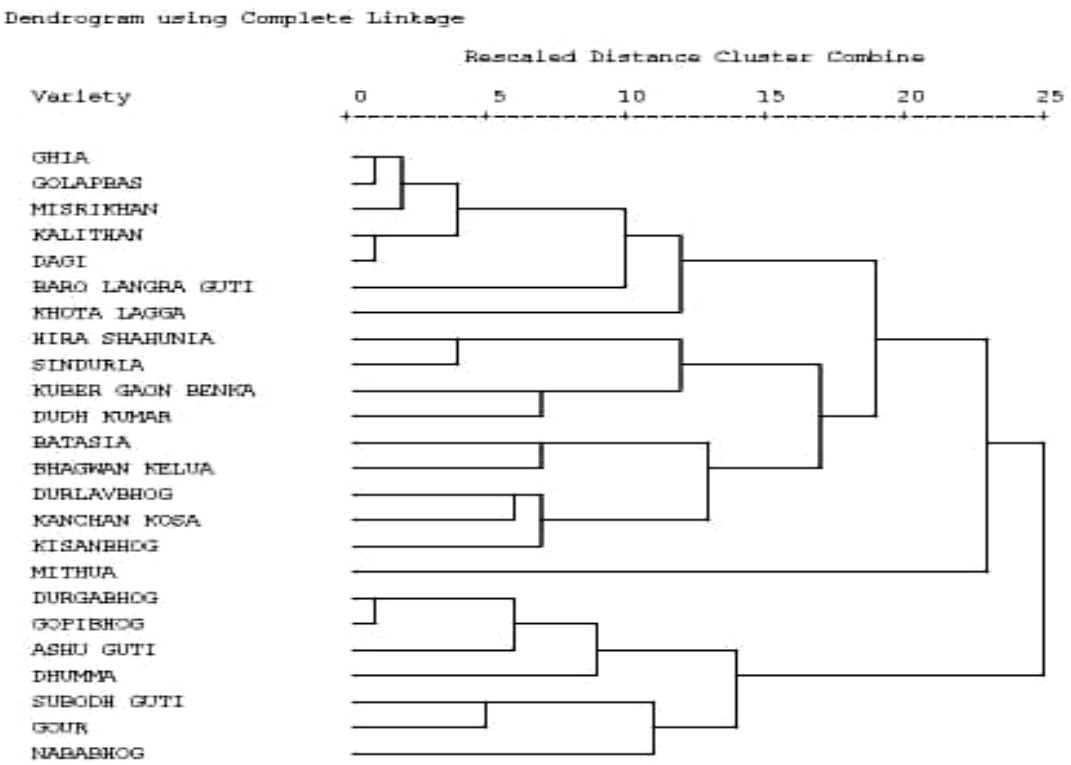

Fig 1: Hierarchical cluster analysis of different less known mango varieties using quantitative variables