

Study on the physiological characteristics of BAU-GPC released mango germplasm

R. Roy, M.A. Rahim and M.S. Alam

Department of Horticulture, Bangladesh Agricultural University, Mymensingh, Bangladesh

Abstract: The research work was conducted at the Germplasm Centre (GPC), Department of Horticulture, Bangladesh Agricultural University to study the physiological characteristics of some mango germplasm. Seven mango germplasm viz. BAU Aam-1, BAU Aam-2, BAU Aam-4, BAU Aam-7, BAU Aam-10, BAU AAM-13 and BAU Aam-14 were taken for this study. A wide range of variations were observed among the germplasm in different characters. The maximum weight of fruit (417.4 g), pulp (322.2 g), peel (48.01 g) and stone (48.52 g) were found the germplasm BAU Aam-10. The same germplasm also produced the longest thickness (6.72 cm) and peel to pulp ratio (7.13) of fruit. BAU Aam-4 formed the longest length of fruit (14.70 cm), breadth of fruit (7.13 cm), longest stone (11.69 cm), pulp to stone ratio (9.003), peel to stone ratio (1.620) and edible portion (81.56%). Germplasm BAU Aam-1 was the highest on stone size viz. longest breadth (4.163 cm) and longest thickness (2.163 cm). Non edible portion was the highest by the germplasm BAU Aam-14 where the same variety produced the lowest result on the other characteristics of mango germplasm.

Key words: Mango germplasm, physiological characters, BAU-GPC.

Introduction

Mango (*Mangifera indica* L.) is a tropical and sub-tropical fruit belonging to the family Anacardiaceae, originated in the southeast Asia, especially in India and being cultivated at least 4000 years ago (Litz, 1998). Bangladesh ranks top in area and third in production among the fruits grown in the country (BBS, 2010). Bangladesh produces 1047000 tons of mangoes every year in 79000 acres area under garden, which gives an average yield of 81 kg acres⁻¹ (BBS, 2010). The yield is very low compared to that in other countries, such as 8.95 t ha⁻¹ India (Ghosh, 1998) and 9.41 t ha⁻¹ in the Philippines (Espino and Javier, 1989). Mango is recognized as one of the choicest and is well accepted fruit all over the world and also acknowledged as the king of fruit (Shahjahan *et al.*, 1994). Mango cultivars also differ in flavour (Berardini *et al.*, 2005) and nutritional characteristics (Ahmad *et al.*, 2007). In Bangladesh mango is considered to be the best of all indigenous fruits because of its excellent flavour, attractive fragrance, beautiful shades of colour, delicious taste and nutritional value. Like many other fruits, mango is highly perishable in nature. In the circumstances, the present study has been designed to obtain information on some physiological characteristics of mango germplasm.

Materials and Methods

An experiment was conducted at the laboratory of BAU Germplasm Centre (GPC), Department of Horticulture, Bangladesh Agricultural University, Mymensingh during May to August 2011. Seven mango germplasm were selected for the study namely BAU Aam-1, BAU Aam-2, BAU Aam-4, BAU Aam-7, BAU Aam-10, BAU Aam-13 and BAU Aam-14 were collected from GPC, BAU, Mymensingh. Those 7 germplasm of mango were considered as the experimental treatments. The experiment was laid out in MSTATC program under ANOVA-4 function with 3 replications. Single plants of each germplasm about four years old were considered as a replication. For this study fifteen mature fruits were collected randomly from each selected plant. After collection, the fruits were put on the laboratory desk at a room temperature for recording their physical characteristics. Data were recorded on different qualitative characters viz. weight of fruit (g), weight of pulp (g), weight of peel (g), weight of stone (g), length of fruit (cm), breadth of fruit (cm) thickness of fruit (cm), length of stone (cm),

breadth of stone (cm) thickness of stone (cm), peel to pulp ratio, pulp to stone ratio, peel to stone ratio, edible portion (%) and non edible portion (%).

Results and Discussion

Collected fruit of different germplasm of BAU Aam showed different shape. Different shape and size of BAU Aam germplasm are shown in Table 1. The results are in conformity with the findings of Saha and Hossain (1988) and Ghose and Hossain (1988). Good appearance of BAU Aam germplasm was the maximum phenotypic acceptability for consumption. Among the seven BAU mango germplasm, the maximum germplasm showed medium appearance and few were good (Table 1). Skin colour of the selected mango germplasm are maximum yellowish green, where BAU Aam-4 was light yellow and BAU Aam-13 and 14 showed green colour which variance colour was presented in Table 1. The variability was found in the present study confirms the findings of Mukherjee (1997) who reported that fruit colour at maturity is dependent on genotype. Different mango germplasm showed different flesh colour whereas BAU Aam-1 and 2 was light yellow, ABU Aam-4 and 7 was yellow. Another variety BAU Aam 10, 13 and 14 showed different colour viz. orange, cream and yellowish orange, respectively. Peeling quality was also easy to whole selected germplasm except BAU Aam-13 and it was difficult to identify. Maximum germplasm's skin was also thin excluding BAU Aam-10 and 13 (Table 1).

Weight of fruit, pulp, peel and stone showed a highly significant variation due to the observation on different BAU Aam germplasm (Table 2). From the table 2, the highest weight of fruit (417.4 g), pulp (322.2 g), peel (48.01 g) and stone (48.52 g) were recorded from the germplasm of BAU Aam 10 whereas the lowest weight of fruit (137.5 g) and pulp (89.18 g) were observed from BAU Aam 14. On the other hand, the lowest weight of peel (24.17 g) and stone (20.33 g) were taken from BAU Aam 10 and 2, respectively. From the observation of the present investigation, the variation in fruit weight may be due to genetic or physiological factors which variation was similar to Lodh *et al.* (1974), Haque *et al.* (1993) and Iqbal *et al.* (1995). They reported that the variation in fruit weight among the different mango varieties. Haque *et al.* (1993) also reported that stone weight range was 14.0 to 70.0 g which was similar with my study.

Highly significant variation was also found on size of fruit. Fruit size also depend on the varietal or genetic differences. Fruit size viz. length, breadth and thickness were studied and the results are presented in table 2. A wide range of variation was observed among the germplasm in respect of fruit length, breadth and thickness. The maximum size of fruit viz. length (14.70 cm) and breadth (7.130 cm) were found from the germplasm BAU Aam-4 and maximum thickness (6.720

cm) was recorded in BAU Aam-10. The lowest length of fruit (7.190 cm), breadth (5.103 cm) and thickness (4.940 cm) were recorded from the BAU Aam-2, 14 and 13, respectively (Table 2). From an experiment, Sardar *et al.* (1998) reported that length, breadth and thickness of mango fruits varied from 7.6 to 15.5, 5.5 to 8.9 and 5.0 to 8.2 cm, respectively. Mollah and Siddique (1973), Prasad (1977) and Saha and Hossain (1988) also found different fruit size in different mango varieties.

Table 1. Qualitative characteristics of BAU-GPC released different mango germplasm

Germplasm	Shape of fruit	External appearance	Skin colour at ripe stage	Flesh colour	Peeling quality	Skin thickness
BAU Aam-1	Oblong oval	Good	Yellowish green	Light yellow	Easy	Thin
BAU Aam-2	Oblong oval	Medium	Yellowish green	Light yellow	Easy	Thin
BAU Aam-4	Ellipsoid	Good	Light yellow	Yellow	Easy	Thin
BAU Aam-7	Ellipsoid	Medium	Yellowish green	Yellow	Easy	Thin
BAU Aam-10	Oblong	Medium	Yellowish green	Orange	Easy	Thick
BAU Aam-13	Ellipsoid	Medium	Green	Cream	Difficult	Thick
BAU Aam-14	Oblong oval	Medium	Green	Yellowish orange	Easy	Thin

Table 2. Qualitative characteristics viz. weight, fruit and stone sizes of mango germplasm

Germplasm	Weight (g)				Fruit size (cm)			Stone size (cm)		
	Fruit	Pulp	Peel	Stone	Length	Breadth	Thickness	Length	Breadth	Thickness
BAU Aam-1	215.9 d	154.8 d	27.94 b	38.12 c	8.230 f	7.210 a	6.057 b	7.333 e	4.163 a	2.053 b
BAU Aam-2	172.6 e	124.6 e	27.13 b	20.33 g	7.190 g	6.270 b	6.017 b	6.233 f	3.413 d	1.507 d
BAU Aam-4	320.8 b	250.2 b	43.45 a	23.66 e	14.70 a	7.130 a	6.337 ab	11.69 a	3.253 e	1.133 e
BAU Aam-7	289.1 c	204.4 c	42.64 a	43.83 b	11.73 c	6.537 b	6.340 ab	10.71 c	3.547 c	2.163 a
BAU Aam-10	417.4 a	322.2 a	48.01 a	48.52 a	12.18 b	7.033 a	6.720 a	11.04 b	4.063 b	1.920 c
BAU Aam-13	162.1 f	109.2 f	24.17 b	21.68 f	9.073 d	5.250 c	4.940 c	8.440 d	3.037 f	1.453 d
BAU Aam-14	137.5 g	89.18 g	41.67 a	25.26 d	8.673 e	5.103 c	5.203 c	7.343 e	3.023 f	1.860 c
Sig. level	**	**	**	**	**	**	**	**	**	**
CV (%)	3.03	3.0	17.97	3.01	3.35	3.41	3.76	3.05	3.19	3.19

** = Significant at 1% level of probability

Table 3. Qualitative characteristics viz. ratio, edible and non edible portion of mango germplasm

Germplasm	Peel to pulp ratio	Pulp to stone ratio	Peel to stone ratio	Edible portion (%)	Non edible portion (%)		
					Peel	Stone	Total
BAU Aam-1	5.170 b	4.030 f	0.793 f	75.22 bc	12.63 f	17.45 b	30.08 c
BAU Aam-2	4.213 d	5.640 c	0.927 de	75.17 bc	15.34 b	12.03 e	27.38 e
BAU Aam-4	5.280 b	9.003 a	1.620 a	81.56 a	13.53 e	8.69 g	22.23 g
BAU Aam-7	4.403 c	5.240 d	1.057 c	72.80 c	14.33 d	14.12 d	28.45 d
BAU Aam-10	6.157 a	6.840 b	1.207 b	78.40 ab	11.62 g	11.44 f	23.06 f
BAU Aam-13	4.080 d	4.923 e	0.973 d	71.29 c	15.12 c	15.29 c	30.41 b
BAU Aam-14	2.693 e	3.240 g	0.857 ef	66.78 d	20.33 a	17.93 a	38.26 a
Sig. level	**	**	**	**	**	**	**
CV (%)	3.25	3.08	1.47	3.10	3.03	3.03	3.02

** = Significant at 1% level of probability

Stone size of BAU Aam germplasm showed significant difference among the different germplasm (Table 2). Among the BAU Aam germplasm, BAU Aam-4 produced the highest length of stone (11.69 cm) and BAU Aam-1 showed the highest breadth of stone (4.163 cm) where the

highest thickness (2.163 cm) was found in BAU Aam-7. The lowest length of stone (6.233 cm), breadth (3.023 cm) and thickness (1.133 cm) were also recorded from the germplasm of BAU Aam 2, 14 and 4, respectively.

Highly significant variation was also found on different ratio of peel, pulp and stone combination due to the effect of different germplasm (Table 3). The highest ratio of peel to pulp (6.157) was found from the germplasm of BAU Aam-10 where BAU Aam-4 also produced the highest on pulp to stone (9.003) and peel to stone (1.620). The germplasm BAU Aam-14 produced the lowest peel to pulp ratio (2.693) and pulp to stone ratio (3.240) whereas the BAU Aam-1 gave the lowest peel to stone ratio (0.793) (Table 3).

Percent edible portion of BAU Aam germplasm is an important character for selecting quality of fruits and it was found a significant difference among the germplasm which range was 66.78 to 81.56%. So, edible portion was significantly the highest (81.56%) and the lowest (66.78%) which were taken from the germplasm BAU Aam-4 and 14, respectively.

Percent non edible portion varied significantly among the germplasm, where the non edible portion range was 22.23 to 38.26%. The highest percentage of non edible portion was 38.26% which was obtained from the germplasm BAU Aam-14 where the percentage of peel was 20.33% and stone 19.93%. On the other hand, the lowest edible portion was 22.23% and it was recorded from the germplasm BAU Aam-2 where the minimum percentage of peel was 11.62% and stone was 8.69. The present observation was similar with the findings of Bhuyan and Islam (1986) who recorded 18.51 to 35.06% non edible portion.

Acknowledgement: The authors thankfully acknowledge the financial assistance of BAU GPC of the Department of Horticulture, Bangladesh Agricultural Univ., Mymensingh for their guidance at the research period.

References

- Ahmad, I., Malik, A.U., Aman, M.A. and Anwar, R. 2007. Comparative studies on the performance to two commercial mango cultivars under ambient ripening conditions. *Life Sci. Intl. J.*, 4: 463-467.
- BBS (Bangladesh Bureau of Statistics). 2010. *Statistics Pocket Book of Bangladesh*. Bangladesh Bureau of Statistics Division, Govt. of the People's Republic of Bangladesh. pp.40.
- Berardini, N., Fezer, R., Conrad, J., Beifuss, U., Carle, R. and Schieber, A. 2005. Screening of mango (*Mangifera indica* L.) cultivars for their contents of flavonol O- and xanthone C-Glycosides, anthocyanin, and pectin. *J. Agric. Food Chem.*, 53: 1563-1570.
- Bhuyan, M.A.J. and Islam, M.S. 1986. Physio-morphological characters of some popular mango cultivars. *Bangladesh J. Agric.*, 14(3): 181-187.
- Espino, R.R.C. and Javier, F.B. 1989. Present status of the mango industry in the Philippines. *Acta Hort.*, 231(1): 57-67.
- Ghose, G.H. and Hossain, A.K.M.A. 1988. Studies on physico-chemical composition of some mango varieties of Bangladesh. *Bangladesh Hort.* 16(2): 7-11.
- Ghosh, S.P. 1998. Fruit Wealth of India. In: *Tropical Fruits in Asia*. Ed. R.K. Arora and V. Ramanatha Rao, IPGRI., pp. 3-15.
- Haque, A.M.M.M., Ali, M.R., Uddin, M.R. and Hossain, A.K.M.A. 1993. Evaluation of elite mango cultivars at Southern region of Bangladesh. *Bangladesh J. Plant Breed. Genet.*, 6(2): 21-28.
- Iqbal, S.M., Uddin, M.S., and Shakur, M.A. 1995. Performance of exotic mango germplasm under Bangladesh condition. Annual Report on Mango Improvement. Regional Horticultural Research Station, BARI, Nawabganj-6300, pp. 28-34.
- Litz, R.E. 1998. *The Mango, Botany, Production and Uses*. CAB Intl., New York. USA. P. 7.
- Lodh, S.B., Subramanyam, M.D. and Divakar, N.G. 1974. Physico-chemical studies of some important mango varieties. *Indian J. Hort.*, 31(2): 160-162.
- Mollah, S. and Siddique, M.A. 1973. Studies on some mango varieties of Bangladesh. *Bangladesh Hort.* 1(2): 16-24.
- Mukherjee, K.U. 1997. Induction: Botany and Importance. In: *The Mango: Botany, Production and Uses*. 1st Edition (R. E. Litz. Ed.), CAB International, Wallingford, UK, pp. 1-19.
- Prasad, A. 1977. Bearing behaviour and fruit quality of South Indian varieties of mango in Northern Indian. *Indian J. Hort.*, 34(2): 372-376.
- Saha, S.K. and Hossain, A.K.M.A. 1988. Studies on fruit characteristics of some grafted mango cultivars. *Bangladesh J. Agril. Res.*, 13(2): 47-52.
- Sarder, P.K., Hossain, M.A., Islam, M.S. and Khandaker, S.M.A.T. 1998. Studies on the physico-morphological characters of some popular mango cultivars. *Bangladesh J. Agril. Sci.*, 25(1): 1-4.
- Shahjahan, M., Shell, S., Zaman, M.A. and Sakur, M.A. 1994. Optimization of harvesting maturities for major mango cultivars in Bangladesh. *Bangladesh J. Sci. Res.*, 12(2): 209-215.