



RESEARCH PAPER

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Fruit characteristics of some locally important mango (*Mangifera indica* L.) cultivars at Chapai Nawabganj District, Bangladesh

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Article published on November 20, 2013

Key words: Mango, fruit characters, local cultivars, germplasms..

Abstract

The fruit characteristics of some important local mango cultivars grown at Chapai Nawabganj district were studied from 2008-2011 fruiting seasons. Seven locally cultivated important mango cultivars (*Alam shai*, *Champa*, *Danadar*, *Hayati*, *Lugnee*, *Mirabhog* and *Shantu*) were selected. Both qualitative and quantitative characteristics were considered in order to study the variations among the cultivars. The described cultivars were cross checked with the commercial varieties according to available literature but there were no resemblance between these two categories. The studied characters indicated that there remained considerable variations among those cultivars and these could be used for commercial basis as well as varietal development and needs to take action for sustainable conservation.

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Introduction

The mango belongs to *Anacardiaceae* family and has been cultivated for more than 4000 years (Candole, 1984). In Bangladesh, mango (*Mangifera indica* L.) is one of the most common and popular fruits and often mentioned as the “King of fruits” (Purseglowe, 1972) due to its excellent flavors, attractive color, delicious taste and high nutritive value. In Bangladesh it occupies an area of 32011 hectares of land with an annual production of 1047849 metric tons (BBS, 2011). The leading mango growing districts are Chapai Nawabganj, Rajshahi, and Dinajpur. A wide range of cultivars are observed in these regions. The present study keeps emphasis on the variations among the mango germplasms which exist at Chapai Nawabganj region, the Western most part of Bangladesh having more favorable conditions for mango cultivation.

The commercial varieties that grow in Bangladesh named *Fazli*, *Ashina*, *Khirshapat*, *Langra*, *Gopalbhog*, *Bombai* and *Lakhna* (*Lakhan bhog*) are not enough to meet the ever increasing demand of the large population of Bangladesh. Besides these a large number of mango cultivars are grown in different regions of Bangladesh. But the characteristics of most of the cultivars have not yet been studied systematically. Shirin (2013) documented 148 mango cultivars which were grown in the Chapa Nawabgonj district. Out of those 11 were commercial cultivars and 37 were local cultivars which seemed to have commercial importance. In this study, 7 from such cultivars, which may have more importance were taken into consideration. The information of some common cultivars had been reported by Kamaluddin (1967), Mollah and Siddique (1973), Hossain (1974), Samad and Faruque (1976), Bhuyaan and Islam (1989), Hossain and Ahmed (1994), Bhuyan *et al.* (2003). But the information on many other cultivars is still lacking and this study will add more information as a basis for future work.

Materials and methods

Mature mango trees of seven local cultivars were selected from the study area and the fruits were collected during the fruiting seasons of 2008-2011. For characterization of these cultivars three replications of trees were taken and for measurements and evaluations ten samples of fruits were chosen randomly from the each tree. Data were recorded to study their qualitative and quantitative characters. The qualitative fruit characters were fruit size, fruit shape, skin type, skin color, pulp color, flavor, texture, taste, fiber, beak, sinus, apex, basal cavity, fruit bearing type, time of fruit maturity, storage quality (in days) and productivity of fruits. Four quantitative fruit characters were fruit weight, fruit length, fruit width and fruit diameter. All the traits were recorded following the IBPGR Descriptor, 1989 and IPGRI Descriptor, 2006.

Fruit size, fruit shape, skin type, skin color, pulp color, flavor, texture, taste, fiber, beak, sinus, apex, basal cavity all these characters were tested by keeping mature fruits of each cultivar in the laboratory. The storage quality of fruits was measured in days by keeping fruits at room temperature. The data on time of fruit maturity, fruit bearing type and fruit productivity was recorded at the study sites. The measurements of quantitative characters were recorded in the metric system and averaged. The frequency of the quantitative characters grouped into different classes and presented in the figures.

Results and discussion

The qualitative characteristics of the studied mango cultivars are presented in Table 1. Fruit size and shape of mango varied depending on cultivars. Large fruit size was found in *Alam shahi* and *Hayati* while small fruit size was found only in *Champa*. The cultivars *Danadar*, *Lugnee*, *Mirabhog* and *Shantu* produced medium size fruits. Mollah and Siddique (1973) and Saha and Hossain (1988) also found different fruit sizes in different mango varieties. The fruit shape of *Alam shahi* was oblong (Fig. 1.A),

Champa was oblong elliptic (Fig. 2.A), *Danadar* (Fig. 3.A) and *Mirabhog* (Fig. 6.A) was oblong oblique, *Hayati* (Fig. 4.A) was roundish, *Lugnee* (Fig. 5.A) was ovate oblong and *Shantu* (Fig. 7.A) was oblong oval. Islam *et al.* (1992) observed the fruit shapes of mango varieties as oblong, ovate oblong and roundish. Anila and Radha (2003) worked on five mango cultivars under Kerala condition and found oblong fruit shape in most of the cultivars. The skin type was glossy only in *Alam shahi* and *Lugnee* whereas in the other five cultivars the skin type was non glossy. The color of skin is an important factor for mango trading as the attractive skin color easily attracts the consumers. Green with yellow skin color was found in *Alam shahi*, *Champa*, *Hayati*, *Lugnee* and *Mirabhog*. The skin color of fruit was green in *Danadar* and *Shantu*.

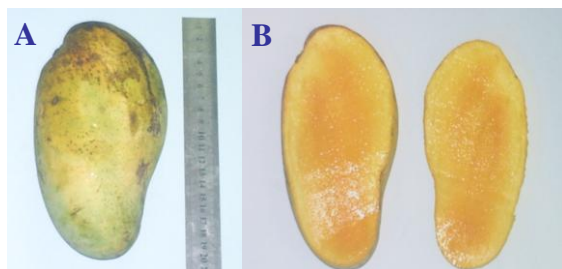


Fig. 1. Single fruit (A) and fruit showing pulp (B) of *Alam shahi*.

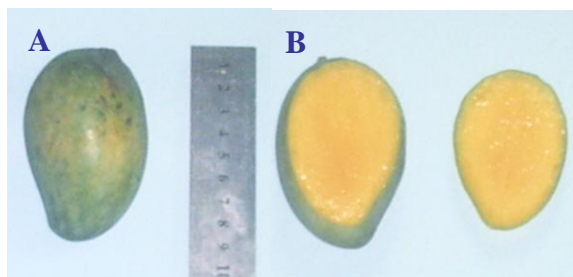


Fig. 2. Single fruit (A) and fruit showing pulp (B) of *Champa*.

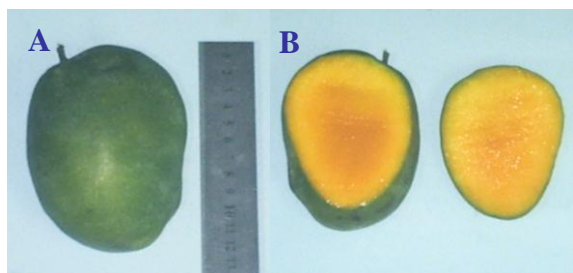


Fig. 3. Single fruit (A) and fruit showing pulp (B) of *Danadar*.

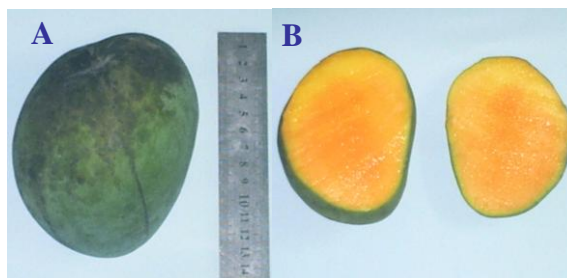


Fig. 4. Single fruit (A) and fruit showing pulp (B) of *Hayati*.

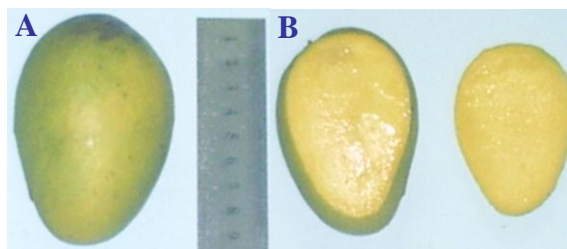


Fig. 5. Single fruit (A) and fruit showing pulp (B) of *Lugnee*.

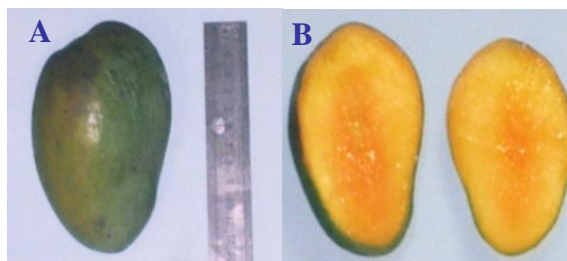


Fig. 6. Single fruit (A) and fruit showing pulp (B) of *Mirabhog*.

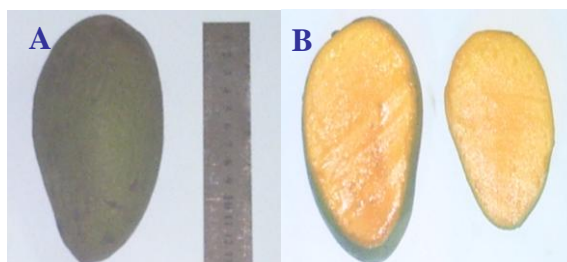


Fig. 7. Single fruit (A) and fruit showing pulp (B) of *Shantu*.

There also existed variations among the cultivars in pulp color like other qualitative traits. Light yellow pulp color was found in *Champa* (Fig. 2.B) and *Lugnee* (Fig. 5.B), yellow pulp color was found in *Shantu* (Fig. 7.B) and light orange pulp color was found in *Mirabhog* (Fig. 6.B). The pulp color of *Alam shahi* (Fig. 1.B), *Hayati* (Fig. 4.B) and *Danadar* (Fig. 3.B) was found deep yellow. Kamaluddin (1967) described the color of ripe fruits of *Brindaboni* and

Baromashi as mostly yellow and light yellow. The flavor of the ripe fruit was found pleasant in all the studied cultivars. Mannan *et al.* (2003) recorded pleasant flavor in most of the cultivars they studied in Khulna Region. The texture of the fruits varied from firm, moderate and soft. Firm texture of fruits was found in *Alam shahi* and *Lugnee* while soft texture of fruit was found in *Champa*, *Danadar* and *Hayati*. The fruit texture of *Mirabhog* and *Shantu* was moderate. Anila and Radha (2003) also recorded the fruit texture of mango varied from soft, medium and firm. The taste of ripe fruits was excellent in *Alam*

shahi, *Champa*, *Danadar*, *Lugnee* and *Mirabhog*, good in *Shantu* and fair in *Hayati*. Bhuyan and Kobra (2007) studied twenty-two mango cultivars under Joydebpur condition and found the taste of mango fruit varied from excellent, good, intermediate and poor. The mature fruits of *Alam shahi*, *Champa* and *Mirabhog* contain low fibre whereas *Danadar*, *Hayati*, *Lugnee* and *Shantu* contain medium fiber. Mannan *et al.* (2003) studied the mango varieties at Khulna region and observed the variation in fruit fiber varied from scanty, high, medium and very low.

Table 1. Qualitative characters of fruits of different local mango cultivars.

Cultivar	Fruit size	Fruit shape	Skin type	Skin color	Pulp color	Flavor	Texture	Taste	Fiber	Beak	Sinus	Apex	Basal cavity	Fruit bearing type	Time of fruit maturity	Storage quality (in days)	Fruit productivity
<i>Alam shahi</i>	Large	Oblong	Glossy	Green with yellow slash	Deep yellow	Pleasant	Firm	Excellent	Low	Pointed	Absent	Obtuse	Present	Alternative	Late season	7	Low
<i>Champa</i>	Small	Oblong elliptic	Non glossy	Green with yellow slash	Light yellow	Pleasant	Soft	Excellent	Low	Absent	Absent	Obtuse	Absent	Regular	Mid season	10	High
<i>Danadar</i>	Medium	Oblong oblique	Non glossy	Green	Deep yellow	Pleasant	Soft	Excellent	Medium	Absent	Absent	Obtuse	Present	Alternative	Mid season	12	High
<i>Hayati</i>	Large	Roundish	Non glossy	Green with yellow slash	Deep yellow	Pleasant	Soft	Fair	Medium	Absent	Absent	Round	Present	Alternative	Mid season	13	High
<i>Lugnee</i>	Medium	Ovate oblong	Glossy	Green with yellow slash	Light yellow	Pleasant	Firm	Excellent	Medium	Prominent	Absent	Round	Present	Alternative	Mid season	15	Medium
<i>Mirabhog</i>	Medium	Oblong oblique	Non glossy	Green with yellow slash	Light orange	Pleasant	Moderate	Excellent	Low	Absent	Absent	Obtuse	Present	Alternative	Mid season	12	Low
<i>Shantu</i>	Medium	Oblong oval	Non glossy	Green	Yellow	Pleasant	Moderate	Good	Medium	Absent	Absent	Round	Present	Alternative	Late season	10	High

Table 2. Quantitative characters of fruits of different local mango cultivars.

Cultivar	Fruit weight (g)	Fruit length (cm)	Fruit width (cm)	Fruit diameter(cm)
<i>Alam shahi</i>	648±35.92	16.35±0.22	8.9±0.20	26.05±0.47
<i>Champa</i>	135.33±10.51	7.83±0.15	5.16±0.08	17.63±0.32
<i>Danadar</i>	285±8.57	11.46±0.15	8.06±0.10	21.04±0.23
<i>Hayati</i>	404±24.20	10.42±0.27	8.94±0.25	26.76±0.50
<i>Lugnee</i>	174±6.40	8.46±0.04	6.29±0.07	19.41±0.20
<i>Mirabhog</i>	292.33±14.69	10.80±0.19	7.39±0.16	21.97±0.51
<i>Shantu</i>	350±11.26	12.16±0.21	8.56±0.14	24.27±0.36

Beak was absent in most of the cultivars observed in the present study except *Alam shahi* and *Lugnee*. In *Alam shahi* beak was pointed while in *Lugnee* beak was prominent. In another study on mango cultivars, Anila and Radha (2003) found beak was absent in most of the cultivars. In the present study sinus was absent in all the cultivars while basal cavity was

present in all the cultivars except *Champa*. Apex of *Alam shahi*, *Champa*, *Danadar* and *Mirabhog* was obtuse while the apex of *Hayati*, *Lugnee* and *Shantu* was round. Bhuyan and Kobra (2007) recorded that fruit sinus of most of the varieties was shallow and basal cavity of most of the varieties was absent in their study on mango at Khulna Region. They also

observed the apex of fruit varied from round to obtuse as in the present study.

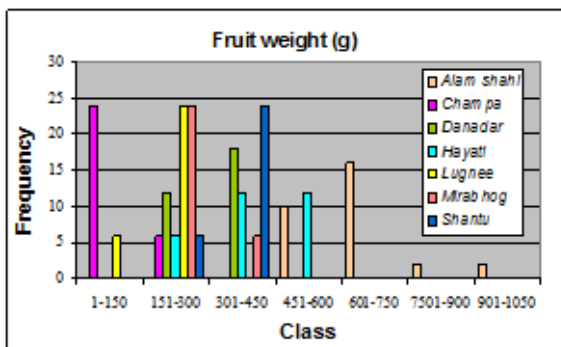


Fig. 8A. Fruit weight of seven mango.

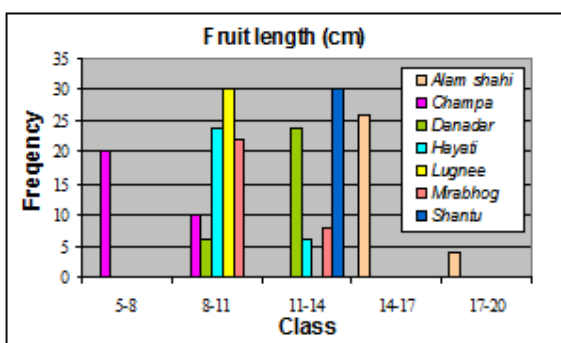


Fig. 8B. Fruit length of seven mango.

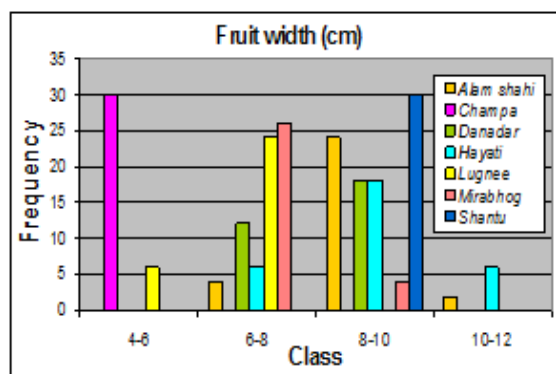


Fig. 8C. Fruit width of seven mango.

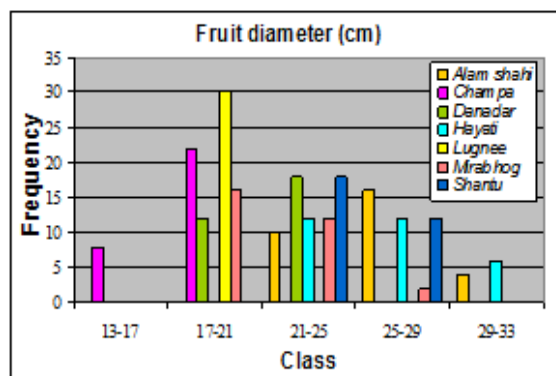


Fig. 8D. Fruit Diameter of seven mango cultivars.

Except *Champa* the fruit bearing type of all other cultivars were alternative. Among the seven studied cultivars only *Alam shahi* and *Shantu* was late season cultivar whereas the fruits of the other cultivars mature at mid season (Table 1). Bhuyan and Kobra (2007) found *Begumphuli* was the earliest and *Maldah* was the latest in respect of harvesting time. In the present study the maximum storage time at room temperature recorded in *Lugnee* (15 days) and the minimum was recorded in *Alam shahi* (7 days). Hossain *et al.* (2001) recorded maximum keeping quality in *Amrapali* (12.5 days) and lowest in *Bishawanath* (8.75 days). The fruit productivity of *Champa*, *Danadar*, *Hayati* and *Shantu* was high; *Lugnee* was medium while *Alam shahi* and *Mirabhog* was low (Table 1). The variation in qualitative characters among the seven cultivars observed in the present study was perceptible.

The quantitative characteristics of the studied mango cultivars are presented in Table 2. The heaviest fruit was obtained from *Alam shahi*. The average fresh weight of fruit of this cultivar was found 648 ± 35.92 g and the minimum fresh weight of fruit was recorded in *Champa* and it was 135.33 ± 10.51 g. The fruit weight of *Hayati* was 404 ± 24.20 g, next to *Alam shahi*. The average fruit weight of *Danadar*, *Lugnee*, *Mirabhog* and *Shantu* was 285 ± 8.57 g, 174 ± 6.40 g, 292.33 ± 14.69 g and 350 ± 11.26 g, respectively. The range of fruit weight was divided into seven classes. The most common range of fruit weight was 151-300 g and the next common range of fruit weight was 301-450 g (Figure 8A). The variation in fruit weight may be due to genetic differences among the cultivars, environmental influences and management practices.

Uddin *et al.* (2006) also reported variable fruit weight in different mango varieties. Under Joydebpur condition, Bhuyan and Kobra (2007) found maximum fruit weight in *Maldah* (407.00 g) and lowest fruit weight in *Lalbhog* (85 g) among the 22

varieties of mango those they studied. The variation in fruit length, fruit width and fruit diameter among the seven cultivars were also recorded. The longest fruit (16.35 ± 0.22 cm) was obtained from *Alam shahi* and the shortest fruit (7.83 ± 0.15 cm) was obtained from *Champa*. Next to *Alam shahi*, *Shantu* had the maximum fruit length (12.16 ± 0.21 cm). The fruit length of *Danadar*, *Hayati*, *Lugnee* and *Mirabhog* was 11.46 ± 0.15 cm, 10.42 ± 0.27 cm, 8.46 ± 0.04 cm and 10.80 ± 0.19 cm, respectively. Figure 8B shows that the most common range of fruit length was 8-11 cm and the next common range of fruit length was 11-14 cm. Mannan *et al.* (2003) recorded maximum fruit length in *Madrazi Tota* which was 15.53 cm and lowest fruit length in *Indian Lota* (6.33 cm). Bhuyan and Islam (1986) recorded the range of fruit length 8-18 cm which was much similar to the present study. Among the seven local cultivars the maximum fruit width was observed in *Hayati* and the minimum fruit width was observed in *Champa*. The mean fruit width of these two cultivars was 8.94 ± 0.25 cm and 5.16 ± 0.08 cm, respectively. Next to *Hayati* the mean fruit width of *Alam shahi* was 8.9 ± 0.20 cm. The mean fruit width of *Danadar*, *Lugnee*, *Mirabhog* and *Shantu* was 8.06 ± 0.10 cm, 6.29 ± 0.07 cm, 7.39 ± 0.16 cm and 8.56 ± 0.14 cm, respectively (Table 2). The maximum number of fruits had 8-10 cm range for fruit width whereas the minimum number of fruits had 10-12 cm range for fruit width which was found only in a few number of fruits of *Alam shahi* and *Hayati* (Figure 8C). Several researchers worked on fruit quantitative characters. Saha and Hossain (1988) recorded the fruit width varied from 5.9-7.3 cm while Ghose and Hossain (1988) recorded the range of fruit width was 5.8-8.6 cm. The diameter of fruits recorded in the present study varied from 17-27 cm. The maximum fruit diameter was recorded in *Hayati*. The mean fruit diameter of *Hayati* was 26.76 ± 0.50 cm and mean fruit diameter of *Alam shahi* was 26.05 ± 0.47 cm which was next to *Hayati*. The cultivar *Champa* had the lowest fruit diameter (17.63 ± 0.32 cm). The mean fruit diameter of *Danadar*, *Lugnee*, *Mirabhog* and *Shantu* was 21.04 ± 0.23 cm, 19.41 ± 0.20 cm, 21.97 ± 0.51 cm and

24.27 ± 0.36 cm, respectively. The range of fruit diameter was divided into five classes and the highest frequency was recorded 17-21 cm followed by 21-25 cm (Figure 8D). Chaudhuri *et al.* (1997) evaluated the South Indian mango varieties and found fruit diameter varied from 5.5-10.2 cm. Anila and Radha (2003) found highest fruit diameter in *Ratna* (26.70 cm). They found the range of fruit diameter 19-27 cm which showed much similarity with the findings of the present study.

Conclusion

The cultivars studied in the present research might help in selecting mango cultivars for fresh consumption, processing of food and varietals development programmes. Some qualitative or quantitative characters of the described cultivars may have more or less similar characteristics as those of the famous standard varieties. But there was no specific resemblance between the commercial cultivars and those of local cultivars which had been described. The study also revealed that the local cultivars of this region were found as promising in terms of fruit traits. This could be used in the promotion of marketing by popularizing them as happened in case of commercial cultivars. Several workers described likewise the varieties collected as the germplasm in various centers (Yadav and Rajan 1993; Yadav, 1997).

Considering the overall quantitative and qualitative characteristics of the fruits of the studied cultivars, *Alam shahi*, *Mirabhog*, *Shantu* and *Danadar* were found to be superior in respect of fruit weight, skin type and colour, pulp colour, flavour, texture, fibre, taste and storage quality. Although the fruit weight of *Champa* and *Lugnee* were not so high but considering other desirable characters, especially the taste of fruits, these two cultivars could also be considered as good cultivars. So these cultivars deserve a place in any mango varietal trail for selecting superior varieties for different agro-climatic region of the country. The exhibited diversity could also be used in

breeding programme to produce desirable quality of mango.

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