

PHYSICO-CHEMICAL ANALYSIS OF MANGO VARIETIES UNDER KERALA CONDITIONS

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Abstract: An evaluation of physical, morphological and biochemical characters of four varieties and two hybrids of mango were made under Kerala conditions. It was observed that Ratna fruits had the maximum length, breadth, weight, volume and circumference. The minimum contribution of stone to fruit weight was in Ratna and the maximum in Muvandan. Fruits of hybrids Ratna and H-151 recorded the highest values of TSS sugar and ascorbic acid contents. The overall perusal of the data revealed that hybrid variety Ratna had all the desirable characteristics in terms of length, breadth, weight, volume, circumference, minimum stone weight, TSS and sugar content.

Key words: Biochemical, *Mangifera indica* L., morphological, physical, varietal response.

INTRODUCTION

Kerala has mango cultivation over an area of 85.54 thousand hectares with an annual production of 247 thousand tonnes with a productivity of 2.89 t ha⁻¹ (FIB, 2000). Mangoes in Kerala can be classified mainly into seedling progenies and grafted plants. Progenies include the local types and the grafted plants comprise varieties like Alphonso, Bangalora, Banganapally, Neelum etc. and hybrids evolved from elsewhere. These varieties have been introduced from neighbouring states mainly and are grown here. Detailed and definite information on the performance of these varieties in terms of yield and yield attributes under Kerala conditions are lacking at present. Hence an attempt was made to evaluate the performance of important mango varieties in Kerala.

MATERIALS AND METHODS

The experimental material consisted of four varieties and two hybrids viz., Alphonso, Prior, Muvandan, Neelum and hybrids Ratna (Neelum x Alphonso) and H-151 (Kalapady x Neelum). The study was carried out at the College of Horticulture, Vellanikkara, Trichur utilizing the trees in the germplasm from June 2000 to June 2001. The plants were nine years old, grown under uniform conditions as per the package of practices recommendations of the Kerala Agricultural University. The experiment was laid out in randomized block design with three replications. Fully matured fruits were collected whensoever ready in each variety and were ripened under room temperature. The physical, morphological and biochemical characters of the fruits were recorded. TSS was measured with the help of a

hand refractometer. Reducing, non-reducing and total sugars were estimated. Titrable acidity and ascorbic acid content were estimated following the methods of AOAC (1984).

RESULTS AND DISCUSSION

Ratna had the superiority in terms of fruit measurements such as length, breadth, weight, volume and circumference (Table 1). In terms of length of fruits all the varieties were more or less equal. In the case of fruit breadth, Ratna was followed by Prior and Neelum and the lowest value was noticed in H-151 (5.6 cm). Salvi and Gunjate (1988) had reported the length and breadth of Ratna fruits as 10.69 and 8.36 cm respectively. In the present study Ratna fruits recorded almost the same size as given in the literature. Next to Ratna (398.01g), Neelum had the maximum fruit weight (267.3 g). The smallest fruits were produced by H-151, which recorded the minimum weight, volume, breadth and circumference. However, in terms of length, H-151 was on par with other varieties. No significant difference could be noticed between varieties in terms of specific gravity. Alphonso had a specific gravity of 1.02, H-151, 1.00 and the rest, 1.01. The stone weight ranged from 22.55 to 47.76 and was maximum in Ratna, but the percentage contribution to fruit weight by stone was the minimum in this variety (12%). With regard to these parameters Muvandan was at the other extreme with minimum pulp, maximum stone and peel percentage.

Fruits of Alphonso, Prior, Ratna and H-151 were oblong in shape whereas Neelum and Muvandan produced round fruits. The colour of skin was yellow in Alphonso, Ratna and H-151 and green

Table 1. Physical characters of mango varieties

| Variety | Length (cm) | Breadth (cm) | Circumference (cm) | Weight (g) | Volume (ml) | Specific gravity |
|-----------|-------------|--------------|--------------------|------------|-------------|------------------|
| Alphonso | 8.70 | 6.80 | 21.20 | 173.53 | 170.00 | 1.02 |
| Prior | 9.90 | 7.70 | 23.00 | 258.30 | 256.53 | 1.01 |
| Muvandan | 8.50 | 7.10 | 22.30 | 219.45 | 217.00 | 1.01 |
| Neelum | 8.60 | 7.30 | 23.50 | 267.29 | 265.00 | 1.01 |
| Ratna | 10.90 | 8.50 | 26.70 | 398.01 | 395.00 | 1.01 |
| H-151 | 8.80 | 5.60 | 19.30 | 155.66 | 155.00 | 1.00 |
| CD (0.05) | 0.83 | 0.58 | 1.57 | 42.12 | 7.45 | NS |

Table 1. Physical characters of mango varieties (continued)

| Variety | Stone weight (g) | Stone % | Pulp weight (g) | Pulp % | Peel weight (g) | Peel % |
|-----------|------------------|---------|-----------------|--------|-----------------|--------|
| Alphonso | 22.55 | 13.00 | 126.67 | 73.00 | 24.29 | 14.00 |
| Prior | 40.09 | 14.00 | 192.45 | 73.00 | 34.75 | 13.00 |
| Muvandan | 31.33 | 20.00 | 163.38 | 58.00 | 33.58 | 22.00 |
| Neelum | 35.12 | 15.00 | 101.84 | 72.00 | 48.28 | 13.00 |
| Ratna | 47.76 | 12.00 | 298.51 | 75.00 | 51.74 | 13.00 |
| H-151 | 25.57 | 16.00 | 112.17 | 72.00 | 20.23 | 13.00 |
| CD (0.05) | 10.67 | | 83.50 | | 14.33 | |

Table 2. Morphological characters of mango varieties

| Variety | Fruit shape | Colour of skin | Thickness of fruit skin | Skin texture | Flesh texture | Adherence of skin to pulp |
|-----------|-------------|----------------|-------------------------|--------------|---------------|---------------------------|
| Alphonso | Oblong | Yellow | Med. thick | Smooth | Soft | Present |
| Prior | Oblong | Green yellow | Very thick | Rough | Firm | Present |
| Muvandan | Roundish | Green yellow | Med. thick | Smooth | Juicy | Present |
| Neelum | Roundish | Green yellow | Med. thick | Smooth | Firm | Present |
| Ratna | Oblong | Yellow | Med. thick | Smooth | Soft | Absent |
| H-151 | Oblong | Yellow | Med. thick | Smooth | Firm | Present |
| CD (0.05) | | | | | | |

Table 2. Morphological characters of mango varieties (continued)

| Variety | Fibre content | Stalk insertion | Beak type | Sinus type | Slope of shoulders | Fruit apex |
|-----------|---------------|-----------------|-----------|------------|------------------------|------------|
| Alphonso | Scarce | Vertical | Absent | Absent | Ending in a long curve | Obtuse |
| Prior | Abundant | Vertical | Point | Shallow | Rising & then rounded | Obtuse |
| Muvandan | Abundant | Vertical | Absent | Absent | Ending in a long curve | Obtuse |
| Neelum | Scarce | Vertical | Absent | Absent | Rising & then rounded | Rounded |
| Ratna | Scarce | Vertical | Absent | Shallow | Rising & then rounded | Obtuse |
| H-151 | Scarce | Oblique | Point | Shallow | Sloping abruptly | Obtuse |
| CD (0.05) | | | | | | |

Table 3. Biochemical characters of mango varieties

| Variety | TSS (°brix) | Total sugar (%) | Reducing sugar (%) | Acidity (%) | Ascorbic acid (mg 100g ⁻¹) | Sugar/acid ratio |
|-----------|-------------|-----------------|--------------------|-------------|--|------------------|
| Alphonso | 19.60 | 17.00 | 2.43 | 0.41 | 14.01 | 42.50 |
| Prior | 14.00 | 12.50 | 2.23 | 0.20 | 1.23 | 62.50 |
| Muvandan | 10.00 | 6.00 | 2.35 | 0.23 | 1.50 | 26.08 |
| Neelum | 16.00 | 12.80 | 2.29 | 0.46 | 18.70 | 27.83 |
| Ratna | 24.00 | 20.66 | 2.97 | 0.28 | 31.30 | 73.78 |
| H-151 | 23.00 | 18.66 | 2.66 | 0.21 | 53.00 | 88.86 |
| CD (0.05) | 1.44 | 1.14 | 0.31 | 0.18 | 2.18 | |

yellow in Prior, Muvandan and Neelum (Table 2). In all the varieties except Prior the skin was medium thick, in Prior the skin was very thick. Skin texture was smooth in all the varieties. Soft flesh texture was seen in Alphonso and Ratna, whereas Prior, H-151 and Neelum had a firm texture. Muvandan had a juicy flesh texture. The skin was found adhering to the pulp in the case of all varieties except Ratna. Fruit fibre was found to be abundant in Prior and Muvandan while in all other varieties fibre was found to be scarce. The stalk insertion in all the varieties was vertical except in H-151 in which it was oblique. Prior and H-151 had point type beak for the fruit while in all others it was absent. Shallow sinus was present in Prior, Ratna and H-151, whereas it was absent in Alphonso, Muvandan and Neelum. The slope of shoulder was rising and then rounded in the case of Prior, Ratna and Neelum. The slope was ending in a long curve in the case of Alphonso and Muvandan. The slope ended abruptly in the case of H-151. In all the varieties except Neelum the apex was obtuse and in Neelum the fruits were with round apex.

Results of the qualitative analysis of the fruits indicated the superiority of Ratna in terms of TSS and sugar contents (Table 3). In the case of TSS, H-151 was almost equal with Ratna, followed by Neelum and Alphonso. The minimum value for TSS (100° brix) was recorded in Muvandan. Satyavati *et al.* (1972) reported that TSS of ripe fruits of local varieties of Kerala varied from 10 to 24° brix. Salvi and Gunjate (1988) have reported the TSS of Ratna fruits as

230, Neelum 17.50 and Alphonso 190° brix. The results of the present study also indicate conformity with the earlier reports. The total and reducing sugars were found to be high in H-151 and Alphonso next to Ratna. Alphonso and Neelum fruits recorded higher acidity values whereas all other varieties were on par with respect to this parameter. Ascorbic acid was maximum in H-151 (53) followed by Ratna. The sugar to acid ratio ranged from 26.08 to 88.86. H-151, followed by Ratna had the maximum sugar to acid ratio. The sugar to acid ratio in Alphonso was 42.50. Muvandan and Neelum recorded the minimum values.

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REFERENCES

- A.O.A.C. 1984. *Official Methods of Analysis*, 14th ed. Association of Official Agricultural Chemists, Washington D.C., U.S.A. pp.160-186
- FIB. 2000. *Farm Guide*. Farm Information Bureau, Thiruvananthapuram, Kerala. p.92
- Salvi, M.J. and R.J. Gunjate. 1988. Mango breeding work in the Konkan region of Maharashtra state. *Acta Hort.* 231:100-102
- Satyavati, V.K., A.V. Bhal, G.A. Varkey, and K.K. Mookherjee. 1972. Studies on sustainability of different mango varieties of Kerala for processing. *Indian Food Pack.* 26:8-12