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Research paper

Physico-Chemical Properties of Alphonso Mango Pulp

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ABSTRACT

In this paper the study was conducted to analysis the physico-chemical properties of Alphonso mango pulp. Pulp having moisture content (80.275±0.866%), Ash (0.607±0.034%), Total soluble solids (19.100±0.265 °B), Reducing sugar (4.317 ± 0.077 %), Total Sugars (10.067 ± 0.147 %), Acidity (0.329±0.077 %), Ascorbic acid (25.701± 0.391 %), Colour L, a, b values 60.885±0.395, 13.023±0.664, 48.678±0.509 respectively.

Keywords: Alphonso mango, pulp, physico-chemical properties

Mango (*Mangifera indica* L.) belongs to Anacardiaceae family and it is originated from South Asia. Mangoes are commercially cultivated in more than 103 countries worldwide and production is increasing each year due to increasing consumer demand. World production of Mango is 45.23 million tons, out of which India rank first in production which accounts 19.68 million tons in Maharashtra 5.14 million tonns. Mango mostly produced in Utter Pradesh, Andhra Pradesh, Telangana, Karnataka, Bihar, Gujarat and Maharashtra in India. In Maharashtra, Konkan region is one of the biggest mango growing belt in the country and also cultivated in Beed, Pune, Solapur district. Various varieties for mango are grown in our country are Kesar, Alphonso, Totapuri, Neelum, Dashehari, Rajapuri, Jamdar, Ratna, Sihdhu, Ambika 2000, Arunika 2008 (Horticulture Statistic at a Glance, 2017).

Konkan region is traditionally known for commercial cultivation of world famous, prime Indian export mango variety '*Alphonso*' which is locally called as '*Hapus*'. Alphonso mango (*Mangifera indica* L.) is the most delicious variety and having excellent fruit quality. It is known for its excellent texture, taste and aroma, accounts for nearly 60% of the mango export trade from India (Mallik *et al*. 2004). The taste is superb with an excellent sugar: acid blend and captivating flavour besides being a Table cultivar, much in demand it is a favoured fruits of the processing industry because it remains its characteristics flavour even during processing (Haldavnekar *et al*. 2018). Alphonso mango contain 62.1-63.7 kcal/100g pulp, Protein 0.36g-0.40g, Fat 0.30g-0.50g, Carbohydrates 16.20g-17.18g, Fiber 0.85g-1.06g, Ash 0.34–0.52 g, Calcium 6.1–12.8 mg, Phosphorus 5.5–17.9 mg, Iron 0.20–0.63 mg, Vitamin C 7.8mg-172.0mg, Vitamin A 0.135mg – 1.872mg.

Most of the Indian varieties possess strong aroma and intense peel coloration, characterized by attractive fragrance, delicious taste, and high nutritial value, containing high amounts of vitamin C, β-carotene,

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and minerals (Sagar *et al*. 1999). Hence there is a wide range of products derived from unripe mangos includes pickle, chutney, mango leather, concentrate, cereal flakes, fruit bars, and mango powder. Furthermore, a large number of products are based on ripe mango fruits such as puree, concentrate, juice, nectar, mango blends, and slices (Schieber *et al*. 2000). A continuously increasing demand for mango pulp and mango concentrate mostly used as a base material in the beverage industry, as a flavoring ingredient in the dairy industry, and in baby food formulations (Nanjundaswamy, 1997).

Ribeiro *et al*. (2007) reported that mangoes are good source of dietary antioxidants, such as ascorbic acid, carotenoids and phenolic compounds and also rich source of vitamin C and provitamin A. Mango is rich in a variety of phytochemicals and nutrients that qualify it as a model "superfruit", a term used to highlight potential health value of certain edible fruits. The fruit is high in prebiotic dietary fiber, vitamin C, polyphenols and carotenoids (Fowomola, 2010). Mango fruit contains compounds such as polyphenols, carotenoids that possess antioxidant activity (Berardini *et al*. 2004; Talcott *et al*. 2005; Mahattanatawee *et al*. 2006).

Physical properties of food ingredients are some of the properties, which define their visual characteristics and basic functionality. The physico-chemical properties of fruits are important indicators of their external and internal characteristics and good quality of the fruit. Studies on fruit characterization can be helpful in selecting better quality fruits (Madalageri *et al*. 2017).

MATERIALS AND METHODS

The study was conducted in the Department of Post-Harvest Engineering Post Graduate Institute of Post-Harvest Management, Killa-Roha, Dr. Balasaheb Sawant Kokan Krishi Vidyapeeth Dapoli, during the year 2017-18. The Alphonso mango pulp was procured from the Mauli Agro Food Product, Kudal Tal. Kudal, District. Sindhudurg.

Physico-chemical properties of Alphonso mango pulp

1. Moisture content

The initial moisture content of the Alphonso pulp also was determined by using hot air oven method (AOAC, 2010). 10 g of Alphonso pulp was kept in the moisture boxes. The moisture boxes were kept in hot air oven at 105°C±5 for 24 h. Three replications were conducted for each experiment and the average value of moisture content was reported by following formula (1).

$$Moisture\ content\ (wb) = \frac{W_m}{W_d} \times 100 \ldots (1)$$

Where,

W_m = Weight of moisture, g.

W_d = Weight of dry material, g.

2. Ash (%)

The ash content of Alphonso mango pulp was determined as per procedure Rangana (1986). The tare weight of three silica dishes (7-8 cm diameter) was noted and 5 g sample of Alphonso pulp was weighed into each silica dish. The contents was ignited on a Bunsen burner and the material was ashed at not more than 525ºC for 4 to 6 hr in a muffle furnace. The dishes were cooled and weighed. The difference in weights represented the total ash content and was expressed as percentage. The ash content was represented by equation (2).

$$Ash\ (\%) = \frac{\text{Weight of crucible with ash} - \text{Weight of crucible}}{\text{Weight of sample in (g)}} \times 100 \quad \ldots(2)$$

3. Total soluble solids (TSS)

The total soluble solids were determined as per procedure AOAC, (1975). Total soluble solids was determined using Hand Refractometer (Atago Japan). A drop Alphonso mango pulp sample placed on prism plate to record the visible value on scale. The reading of sample as °Brix was obtained and digital reading of the Total soluble solids expressed

accordingly. Three observations were taken for replication.

4. Acidity

Take 10 g of Alphonso mango pulp was taken into the 100 ml volumetric flask, made up the volume and filtered. A 10ml of aliquot was titrated against 0.1N sodium hydroxide (NaOH) solution using phenolphthalein as an indicator (Ranganna, 1997). The acidity was calculated by the equation (3) and the results was expressed as per cent anhydrous citric acid.

$$\textit{Titrable acidity}\ (\%) = \frac{N \times T \times E}{W \times V \times 1000} \times 100 \ \ldots (3)$$

Where,

N = normality of alkali

T = titrate reading

E = equivalent mass of acid, g

W = weight of the sample, g

V = total volume of the sample, g

5. Reducing sugars

The reducing sugars was estimated by using Lane and Eynon Method (1923) with modifications suggested by Ranganna (1997). 25g of Alphonso mango pulp sample was blended with distilled water using lead acetate (45 %) for precipitation of extraneous material and potassium oxalate (22 %) to lead the solution.

This lead free extract was used to estimate reducing sugars by titrating against standard Fehling' mixture (Fehling A and B in equal proportion) using methylene blue as an indicator to a brick red end point. The reducing sugar was calculated as below:

$$\frac{\text{Factor} \times \text{Dilution} \times 100}{\text{Titre rading} \times \text{Weight of sample}} \quad \ldots (4)$$

6. Total Sugars

Total sugars of Alphonso mango pulp was estimated adopting the Lane and Eynon method (Ranganna, 1978). Exactly 50 ml of lead free filtrate was taken to 100 ml volumetric flask. To it 10 ml of HCl (5 ml Conc HCl + 5 ml water) was added and allowed remain stand for 24 hours at ambient temperature in dark room. The invert solution was neutralized and the volume was made up to 100 ml with distilled water. This solution was taken in to burette and titrated against mixed Fehling's solutions as was done for reducing sugars. The aliquot was determined as invert sugars and the total sugars content was calculated below (Eq 5). The experiment was repeated three times to get the replication.

$$\text{Total Sugar} = \frac{\text{Factor} \times \text{DilutionTitre}}{\text{Reading} \times \text{Weight of Sample}} \quad \ldots (5)$$

7. Ascorbic acid (Vit. C)

Ascorbic acid was determined by 2, 6-dichlorophenol indophenol dye method of Johnson (1948) as described by Ranganna (1986). A sample of 10 g was mixed with 3 per cent metaphosphoric acid solution and volume was made to 100 ml. The extract was filtered through filter paper and 10 ml aliquot was titrated against standard dye solution at room temperature to pink end point. The ascorbic acid content of the sample was calculated taking into consideration the dye factor as given below.

$$\text{Ascorbic Acid} = \frac{\text{Titre} \times \text{dye factor} \times \text{volume made up}}{\text{Aliquot of extract taken for estimation} \times \text{weight or volume taken for estimation}} \times 100 \quad \ldots (6)$$

Colour

Colour (L*, a*, b* values) of the Alphonso pulp powder samples was determined by using (Make: M/S Konica minotta, Japan Model-Meter CR-400). L* is known as the lightness and extends from 0 (black) to 100 (white). The other two coordinates a* and b* represents redness (+ a) to greenness (- a) and yellowness (+ b) to blueness (-b), respectively. Three measurements was taken for each sample.

RESULTS AND DISCUSSION

Physico-chemical Properties of alphonso mango pulp

Table 1 shows the physico-chemical properties of alphonso mango pulp such as total soluble solids (°Brix), total sugar (%), reducing sugar (%), ascorbic acid (%), titrable acidity (%), moisture (%), ash (%), and non-reducing sugar (%).

Table 1: Physico-chemical properties of Alphonso mango pulp

Sl. No.	Parameter	Alphonso mango pulp	SD
(a)	Moisture Content (%wb)	80.275	±0.866
(b)	Ash (%)	0.608	±0.034
(c)	TSS(°Brix)	19.100	±0.265
(d)	Total sugar (%)	10.067	±0.147
(e)	Reducing sugar (%)	4.318	±0.559
(f)	Acidity (%)	0.329	±0.078
g)	Ascorbic acid (mg)	25.701	±0.391
(h)	Non-reducing sugar (%)	12.778	±0.759
(i)	Colour L	60.885	±0.396
	a	13.023	±0.665
	b	48.678	±0.510

1. Moisture

Table 1 shows moisture content of Alphonso mango pulp. Moisture content of Alphonso mango pulp was in the range 79.441% to 81.17% (wb) and average was 80.275±0.866% (wb). Nagaharshitha *et al*. (2014) reported that moisture content in Alphonso mongo 79.70% (wb); Madalageri *et al.* (2017) reported that the moisture content of mango was 83.19% (wb). Tharanathan *et al*. (2006) reported that the moisture content of the mango was 78.9% to 82.8% (wb).

2. Ash

Table 1 shows the ash content of Alphonso mango pulp. The ash content of Alphonso mango pulp was ranged from 0.579% to 0.645% and average was 0.607±0.034 %. Rasha *et al.* (2016), reported the ash content of mongo pulp 0.64%. Tharanathan *et al*. (2006) reported that the ash content of the mango was 0.34% to 0.52%. Kansic *et al*. (2008) reported that the ash content of mango was 0.49%.

3. Total soluble solids (°Brix)

Table 1 shows total soluble solids of Alphonso mango pulp. Total soluble solids of Alphonso mango pulp was in the range 18.8°B to 19.3°B and average was 19.100±0.265. The total soluble solids of Ratnagiri and Devgad Alphonso mango pulp are reported in literature was 21.8°B by Government of India Geographical Indications Journal (2017). Madalageri *et al.* (2017) reported that total soluble solid of Alphonso 19.80 %. Rajkumar *et al*. (2007) reported the average total soluble solids of Alphonso mango pulp was 19.1°B. Liu *et al*. (2013) reported that total soluble solids of mango was 13.4°B to 17.9°B.

4. Total sugar

Table 1 shows total sugar of Alphonso mango pulp. Total sugar of Alphonso mango pulp was in the range 9.963 to 10.236% and average was 10.067 ± 0.147. The total sugar of Alphonso mango pulp are reported in literature was 10.37% by Burondkar *et al*. (2018); Rajkumar *et al*. (2007) reported the average total sugar Alphonso mango pulp was 13.2%. . Liu *et al*. (2013) reported that total sugar of mango was 844% to 15.35%.

5. Reducing sugar

Table 1 shows reducing sugar of Alphonso mango pulp. Reducing sugar of Alphonso mango pulp was in the range 3.987 to 4.963 % and average was 4.317 ± 0.077. Reducing sugar of Alphonso mango pulp are reported in literature was 3.21% by Burondkar (2018). Nagaharshitha *et al*. (2014) reported that the reducing sugar of Alphonso mango was 3.82% to 3.95%.

6. Acidity

Table 1 shows acidity of Alphonso mango pulp. Acidity of Alphonso mango pulp was in the range 0.245 to 0.398 % and average was 0.329±0.077. The acidity of Alphonso mango pulp are reported in literature was 0.35% by Sonune *et al*. (2015). Rajkumar

et al. (2007) reported the average acidity Alphonso mango pulp was 0.46%.

7. Ascorbic acid

Table 1 Ascorbic acid of Alphonso mango pulp. Ascorbic acid of Alphonso mango pulp was in the range 25.369mg to 26.123 and average was 25.701± 0.391. The Ascorbic acid of Alphonso mango pulp are reported in literature was 78.20% by Nagaharshitha (2014); Rajkumar *et al*. (2007) reported the average ascorbic acid Alphonso mango pulp was 25.12%. Tharanathan *et al*. (2006) reported that the ascorbic acid of the mango was 7.8% to 172%.

8. Non-reducing sugar

Table 1 shows non-reducing sugar of Alphonso mango pulp. Non reducing sugar of Alphonso mango pulp was in the range 12.312 to 13.654 % and average was 12.778 ± 0.758. Non reducing sugar of Alphonso mango pulp are reported in literature was 13.76% by Madalageri *et al*. (2017). Nagaharshitha *et al*. (2014) reported that the non-reducing sugar of Alphonso mango was 9.98% to 10.32%.

9. Colour

Table 1 shows the colour for Alphonso mango pulp. L value for Alphonso mango pulp was in range 60.456 to 61.236 and average was 60.885±0.395, a value for Alphonso mango pulp was in range 12.369 to 13.698 and average was 13.023±0.664 and b value for Alphonso mango pulp was in rage 48.236 to 49.239 and average was 48.678±0.509. Colour L, a, b for Alphonso mango pulp reported in literature was 61.3, 13.0, 48.3 by Ribeiro *et al*. (2007).

CONCLUSION

The physico-chemical properties of Alphonso mango pulp was moisture content 80.275 ± 0.864%, Ash 0.608 ± 0.034%, TSS 19.100 ± 0.265°B, total sugar 10.067 ± 0.147%, reducing sugar 4.318 ± 0.559%, acidity 0.329 ± 0.078%, ascorbic acid 77.685 ± 0.392%, non-reducing sugar 12.778 ± 0.759% and colour L 60.885 ± 0.396, a 13.023 ± 0.605, b 48.678 ± 0.510 respectively.

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