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# Comparative analysis on the quality characteristics of commercially important mango cultivars for canning

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***Abstract***

Fourteen important mango cultivars (Alphonso, Amarapalli, Banganapalli, Bombay green, Dushri, Kesar, Langra, Malgoba, Mallika, Neelam, Padari,Rumani,Sindhura and Totapuri) grown in Karnataka were selected and their physico-chemical properties were characterized and compared. Of all fourteen cultivars, Banganpalli mango exhibited significantly ($p< 0.05$) higher individual weight followed by Bombay Green and Totapuri mangoes respectively. Bombay Green mango presented significantly ($p< 0.05$) higher content of TSS, pH and total sugars. Alphonso mango had highest pulp content followed by Malgoba and Bombay Green mangoes. The study allowed the fourteen mango cultivars to be differentiated clearly based on all the physico-chemical properties and to use unexploited mango varieties for commercial purpose.

***Keywords*:** Canning, mango cultivars, physical, physico-chemical



## *1. Introduction*

Mango (*Mangifera indica.L*) belongs to Anacardiaceae family which is an important tropical and subtropical fruit, which is popular both in the fresh and the processed form worldwide. It is commercially grown in more than 80 countries. Mango is cultivated in more than 90 tropical and subtropical countries of continents viz. Asia, Africa, Australia, North America, and South America (Litz,1997). Mango is the most popular and choicest fruit of India, where mango cultivation is about 60% of the total fruit-growing area (Reddy & Reddy, 2005), India occupies 52% of the world's mango production which is about 12.75 million tones (Vijayanand, *et al*., 2013). India exports fresh mangoes to more than half countries (Shahir & Visvanathan, 2014), it is the most important fruit of India due to its wide range of adaptability, diversity, delicacy and rich nutritive value.

The mango has great economic importance, especially in the developing countries, where the annual yield is about 10,000 tons or more (Shahnawz *et al.*, 2012). There has been a growing demand for traditional varieties of mango in Western markets. However, mangoes are yet to realize their maximum potential as an export oriented commodity due to their localized production and potential markets located across the globe. There are more than thousand mango varieties in India. Post-harvest loss of mango in India has been estimated to be 25–40% from harvesting to consumption mainly because of lack of improved technology and instrumentation for getting right information for harvesting during ripening and transportation. (Jha *et al*., 2010).

Most of mango varieties are consumed raw as a dessert fruit, the rest of it being processed into diverse products, such as nectar, powder, canned mango slices in syrup, chutneys, pickles, etc. and among these products, juice has the higher consumption. Fruit juices market has increased considerably as consumers have become more concerned with healthier lifestyles, therefore consumption of mango juice represents an alternative strategy for attaining the dietary recommendations for fruit consumption. Being seasonal fruit, processing is increasingly needed to be considered, as an additional alternative to reduce postharvest losses and add the value

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of finished products (Liu et al., 2013).

Mango is considered as one of the rich sources of dietary antioxidants such as carotenoids, polyphenols and ascorbic acid, hence mango consumption is useful in preventing chronic diseases related to oxidative stress such as cardiovascular disease, cancer and neurodegenerative diseases (Londoño *et al*., 2017). It gains nutritional importance due to the presence of substantial quantity of appreciable β carotene, vitamin C, and dietary fiber as well as soluble sugars and minerals which are used as good sources of nutrition, and readily available and easily assumable in human body (Islam *et al.*, 2013).

Mei et al. (2006) have show that mango varieties grown in chain were found to be suitable for processing the mango pulp to various products. Vijayanand *et al*., (2015) in their investigation reported that Sindhura Mallika and Totapuri varieties are used for table purpose as well as commercial purposes, henceforth in our investigation, the others varieties such as Alphonso, Amarpalli, Baganapalli, Bombay green, Dushri, Kesar, Langra, Malgoba, Neelam, Padari, were examined for the physico-chemical characteristic and their suitability in canned product.

## 2. Materials and methods

### 2.1 Raw Materials and chemicals

Fourteen mango cultivars (Alphonso, Amarapalli, Banganapalli, Bombay green, Dushri, Kesar, Langra, Malgoba, Mallika, Neelam, Padari,Rumani,Sindhura and Totapuri)were harvested at mature green from an IIHR Fields, Bengaluru, India. All the cultivars were authenticated by a botanist Dr. Ravi Shankar from IIHR Bengaluru. Potassium metabisulphate, glucose, dinitrosalicylic acid, sodium hydroxide, Rochelle salt, other chemicals and solvents of analytical grades were procured from Himedia, (Mumbai, India).

### 2.2. Extraction of pulp

After harvesting the mango cultivars, the fruits were sorted, washed and ripened naturally at room temperature for 5 days. The ripened fruits were washed, sliced, and passed through pulp extractor fitted with a stainless sieve having a pore diameter of 0.4 mm diameter, to extract pulp. The pulp was packed in sterile plastic bags and stored at -60 °C until further use.

### 2.3 Canning for mango pulp

The pulp was blended in an electric blender, and then screened through proper mosquito net cloth and pasteurized at a temperature of 75 °C for two minutes.10% citric acid was added to pasteurized pulp to adjust the pH to 4, followed by the addition of Potassium metabisulphate as preservative, stirred thoroughly and stored in sterilized bottles until further analysis.

### 2.4 Total Dissolved Solid (TTS)

TTS was estimated according to the method of Ellong *et al.,* 2015 using refractometer.

### 2.5 pH

pH was measured using digital pH meter (Model No. APX 175, Control Dynamics Ltd. Bengaluru, India).

### 2.6 Determination of Titration acidity (TA)

The TA was determined according to the procedure of Vijayanand *et al.*, 2013.

### 2.7 Determination of Total Sugar and Reducing Sugar

2.7.1 Preparation of the sample

20 mg of sample was taken into mortar, to that 10 ml of ethanol was added and homogenized well. The homogenate was then centrifuged and the 5ml supernatant was collected and to this 20 ml of double distilled water was added and the resulting solution was used as stock for the estimation of total and reducing sugars.

2.7.2 Estimation of Total Sugar by Anthrone method

Aliquot of 1ml of the flesh extract was taken sample into three test tubes. To that 4ml of the anthrone reagent was added and mixed well. The test tubes were then incubated in boiling water bath for 10 minutes. After cooling, the absorbance was read at 630 nm suing colorimeter against a blank reagent.

The total sugar present in the sample tubes was determined from the standard curve prepared using different concentrations of glucose. The total sugar present is expressed as g/100 g of mango flesh.

2.7.3 Estimation of Reducing Sugar by DNS (Dinitrosalicylic acid) method

Aliquot of 3ml of the flesh extract was taken in three test tubes, to that 3ml of DNS reagent was added and mixed well, test tubes were then kept in a boiling water bath for 5min. After the change of the yellowish red color, 1ml of 40% Rochelle salt solution was added (potassium sodium tartrate tetrahydrate) when the content of the tubes was still warm. Test tubes were cooled under running tap water. The absorbance of the solution was measured at 575 nm in a colorimeter against a blank reagent.

The amount of reducing sugar present in test tubes was calculated from the standard curve of glucose. Amount of reducing sugar is expressed as g/100 g of mango flesh.

All the chemical analysis was carried in triplicate.

### *2.8 Statistical analysis*

All experiments were run in triplicate, and data were expressed as mean ± SE for all the cultivars and analyzed with one way factor analysis of variance (ANOVA) followed by Tukey's test. The statistical analysis was performed used SPSS 20 software package for windows (version 22.0. Armonk, NY: IBM Corp.). $p<0.05$ was considered statistically significant.

## *3. Results and discussion*

### *3.1 Physical characteristics*

Physical characteristics of mangoes from fourteen varieties are presented in figure 1. A random sample of 10 fruits of mango was examined for fruit color, average

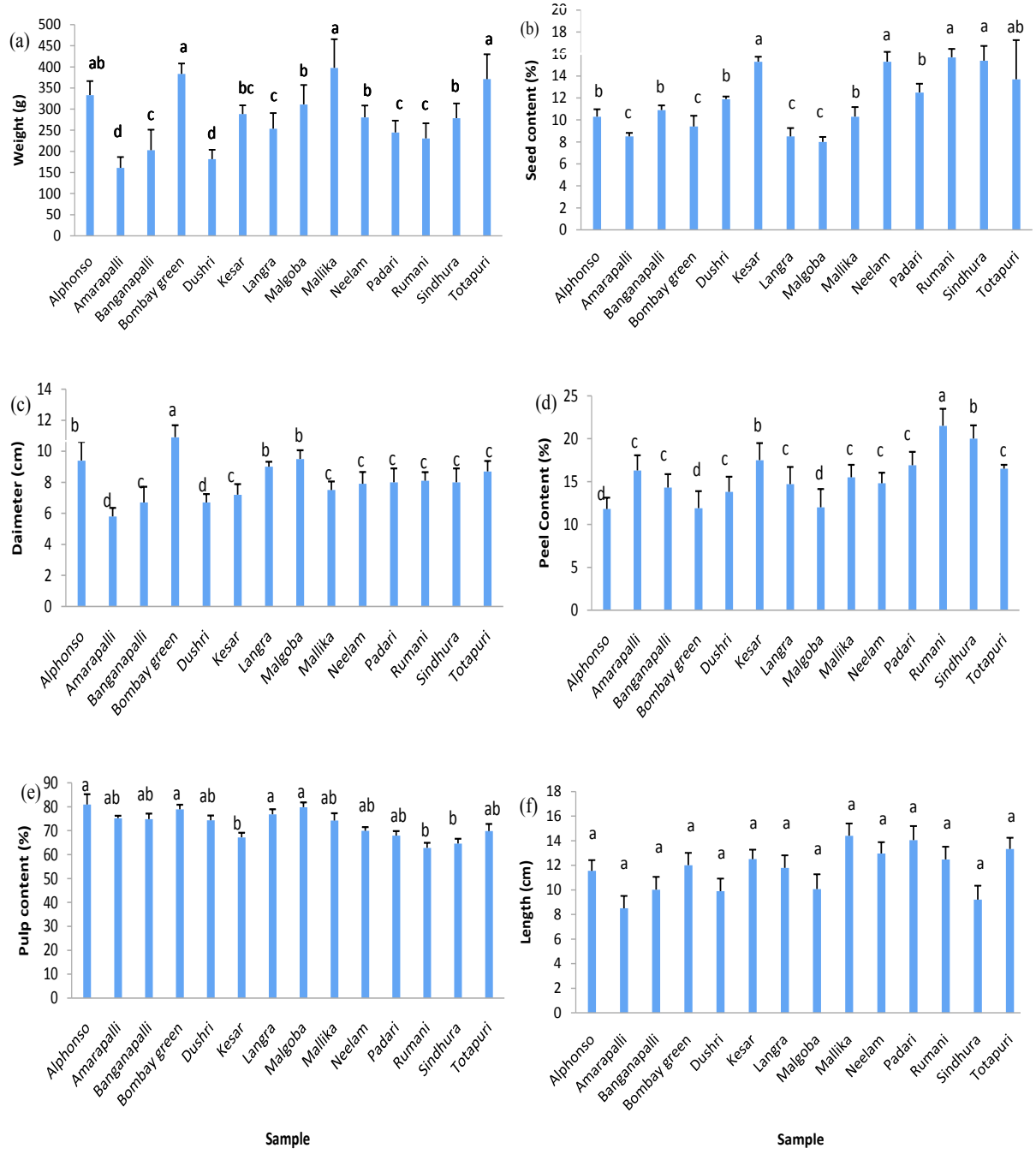


**Figure I:Physical characteristics of mango cultivars (a) weight (b) seed content (c) diameter (d) peel content (e) pulp content (f) length. The data are analyzed through one way – ANOVA followed by Tukey's test and is expressed as mean ± SE (n = 10). Statistical significance was set at $p<0.05$. Samples sharing same letters are statistically insignificant.**

diameter and average weight. Mean weight showed significant difference ($p$<0.05) among the cultivars. Baganapalli showed the highest mean weight of 472.27 g which is significantly higher as compared to the rest of the cultivars and least weight of 160.88 g was observed in Amarpalli. Peel content and seed content of Rumani and Sindhura were found to be significantly higher when compared to other varieties, however there was no significant changes among these two varieties. Our results were in agreement with the studies of Vijayanand *et.al., (*2015). The pulp recovery was highest in Alphonso (81%) followed by Malgoba (80%) and Bombay Green (79%). Ara *et. al.,* (2014) have reported highest pulp content in Mallika (73%) and our study is in accordance with report with recover of 74% of pulp content in this variety.

### *3.2 Compositional characteristic*

The Total Soluble Solids was maximum in Bombay Green (21.97%) and minimum in Neelam (15.83%) variety (table II). There was decrease in the acidity level with an increase in the TSS level signifying that, increase in TSS results in the decrease in acidity in fruits (Sajb*et. al;* 2014). After canning the TSS content and pH of all the varieties was found to be lowered. However the Titrable acidity in all the varieties increased, the variation in pH value and Titrable acidity of mango product due to the storage (Prusky *et al.,* 1993). Total and reducing sugars decreased irrespective of all the varieties due to storage, Vijayanada *et al.* (2013) have also reported decrease in total sugars and reducing sugar after storage.

## *4. Conclusion*

In the present study validated that, there was significant variation in different mango cultivars, which plays very important role in the assessing these mango cultivars for possible use for different processed products. All fourteen mango cultivars presented well distinct characteristics which can be significant in differencing the cultivars for pulping and canning industries. Thus, it will be more interesting to study their phytochemical characteristic to draw more substantial results for addition of more mango cultivars in processing

**Table I: Chemical characteristics of mango pulp from different cultivars before canning. The data are analyzed through one way – ANOVA followed by Tukey's test and is expressed as mean ± SE (n = 3). Statistical significance was set at $p$<0.05. Samples sharing same letters are statistically insignificant.**

| Sample/Parameter | Total Sugar (%) | Reducing sugar (%) | Titrable acidity (%) | pH | TSS |
|---|---|---|---|---|---|
| Alphonso | $16.3^{bc}$ | $4.41^{bc}$ | $0.11^{f}$ | $4.01^{c}$ | $16.90^{cd}$ |
| Amarpalli | $12.7^{e}$ | $4.06^{bc}$ | $0.29^{de}$ | $4.57^{b}$ | $20.04^{ab}$ |
| Baganapalli | $14.0^{cd}$ | $3.95^{bc}$ | $1.02^{a}$ | $4.45^{bc}$ | $19.03^{b}$ |
| Bombay green | $20.8^{a}$ | $3.99^{b}$ | $0.32^{d}$ | $5.57^{a}$ | $21.97^{a}$ |
| Dushri | $16.7^{bc}$ | $3.09^{c}$ | $0.25^{de}$ | $5.50^{a}$ | $17.73^{c}$ |
| Kesar | $15.1^{c}$ | $2.13^{d}$ | $0.51^{c}$ | $4.61^{b}$ | $16.01^{cd}$ |
| Langra | $19.9^{ab}$ | $4.99^{b}$ | $0.29^{a}$ | $4.40^{bc}$ | $21.23^{a}$ |
| Malgoba | $20.6^{a}$ | $3.32^{c}$ | $0.99^{b}$ | $4.75^{b}$ | $20.00^{ab}$ |
| Mallika | $17.5^{bc}$ | $3.81^{c}$ | $0.32^{f}$ | $4.30^{bc}$ | $20.69^{ab}$ |
| Neelam | $17.1^{bc}$ | $7.1^{a}$ | $0.52^{c}$ | $3.80^{c}$ | $15.87^{d}$ |
| Padari | $18.2^{b}$ | $2.91^{cd}$ | $0.19^{e}$ | $4.70^{b}$ | $20.83^{ab}$ |
| Rumani | $13.1^{d}$ | $5.5^{b}$ | $0.43^{cd}$ | $4.8^{b}$ | $16.53^{cd}$ |
| Sindhura | $15.0^{c}$ | $4.25^{bc}$ | $0.19^{e}$ | $4.17^{bc}$ | $19.43^{b}$ |
| Totapuri | $12.1^{e}$ | $4.6^{bc}$ | $0.20^{e}$ | $4.87^{b}$ | $15.83^{d}$ |

**Table II: Chemical characteristics of mango pulp from different cultivars after canning. The data are analyzed through one way – ANOVA followed by Tukey's test and is expressed as mean ± SE (n = 3). Statistical significance was set at $p<0.05$. Samples sharing same letters are statistically insignificant.**

| Sample/Parameter | Total Sugar (%) | Reducing sugar (%) | Titrable acid-ity (%) | pH | TSS |
|---|---|---|---|---|---|
| Alphonso | $15.3^{bc}$ | $3.97^{b}$ | $0.24^{e}$ | $3.8^{c}$ | $14.9^{d}$ |
| Amarpalli | $11.7^{c}$ | $3.76^{b}$ | $0.31^{d}$ | $4.4^{ab}$ | $18.4^{ab}$ |
| Baganapalli | $13.0^{c}$ | $3.65^{bc}$ | $0.97^{a}$ | $4.1^{b}$ | $16.1^{c}$ |
| Bombay green | $18.8^{a}$ | $3.73^{b}$ | $0.45^{c}$ | $5.2^{a}$ | $19.2^{a}$ |
| Dushri | $15.7^{bc}$ | $2.89^{cd}$ | $0.34^{d}$ | $4.9^{a}$ | $15.0^{cd}$ |
| Kesar | $12.1^{c}$ | $2.63^{d}$ | $0.62^{b}$ | $4.2^{ab}$ | $16.6^{c}$ |
| Langra | $17.9^{ab}$ | $4.59^{a}$ | $0.39^{d}$ | $3.9^{c}$ | $19.8^{a}$ |
| Malgoba | 19.6a | $3.01^{c}$ | $0.97^{a}$ | $4.6^{ab}$ | $18.0^{ab}$ |
| Mallika | $16.5^{b}$ | $3.10^{c}$ | $0.52^{c}$ | $3.7^{cd}$ | $18.7^{ab}$ |
| Neelam | $15.1^{bc}$ | $3.10^{c}$ | $0.61^{b}$ | $3.1^{d}$ | $13.9^{d}$ |
| Padari | $17.2^{b}$ | $3.9^{b}$ | $0.21^{e}$ | $4.4^{ab}$ | $17.8^{b}$ |
| Rumani | $10.1^{d}$ | $4.0^{b}$ | $0.32^{d}$ | $4.2^{b}$ | $13.9^{d}$ |
| Sindhura | $15.0^{bc}$ | $3.6^{bc}$ | $0.25^{e}$ | $3.9^{c}$ | $15.8^{cd}$ |
| Totapuri | $9.3^{e}$ | $3.0^{cd}$ | $0.29^{e}$ | $4.3^{ab}$ | $13.1^{d}$ |

industries.

***Conflict of interest***

Authors declare none

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