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Research Paper

Comparison of Total Carotenoid Content, Ascorbic Acid and Radical Scavenging Activity of Three Indian Mango Varieties

Food Science

KEYWORDS : Mango, Mango peel, Total Carotenoids, Ascorbic acid, Radical Scavenging Activity

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ABSTRACT

Mango is one of the most important tropical fruits and India ranks first in its world production. During the processing of mango, mainly for mango pulp, peel is a by-product. Peel forms about 15-20% of the whole fruit and at present it is a waste product and its disposal has become a great problem. With a view to exploit mango peel as a source of valuable components, in the present study, carotenoids, ascorbic acid content and radical scavenging activity of peels of three Indian mango varieties, namely, Deshehari, Chausa and Fazli were determined. The carotenoids contents in these peels ranged from 4.8 to 6.09 mg/g dry peel. Ascorbic acid content ranged from 20.21 to 42.07 mg/100g dry peel. Radical scavenging activity was not significantly different among these three varieties of mango.

INTRODUCTION

The mango is a very common tropical fruit usually found in Southern Asia, especially in Eastern India, China, Burma, Andaman Islands and Central America. Mangoes belong to the genus Angifera, consisting of numerous species of tropical fruiting trees in the flowering plant family Anacardiaceae. It is cultivated and grown vastly in many tropical regions and widely distributed in the world (Fowomola, 2010). It is one of the most extensively exploited fruits for food, juice, flavor, fragrance and color and a common ingredient in new functional foods often called superfruits. In 2008, India is the biggest mango producer, with a 13.6 millions of tons, followed by China (4.2 millions of tons) (http://faostst.fao.org). There are nearly 1,000 cultivars or varieties in India. However only about 30 cultivars are grown commercially (Anon., 2003). These include Dashehari, Langra, Chausa, Bombay Green and Fazli in north India (Negi, 2000).

During processing of mango, peel is a major by- product. Peel contributes about 15-20% of the fruit (Beerh, et al. 1976). As peel is not currently utilized for any commercial purpose, it is discarded as a waste and becoming a source of pollution. Peel has been found to be a good source of phytochemicals, such as polyphenols, carotenoids, vitamin E, dietary fibre and vitamin C and it also exhibited good antioxidant properties (Ajila et al. 2007). In this article, peel of Dashehari, Chausa and Fazli mango varieties are discussed.

MATERIALS AND METHODS

Chemicals - All chemicals and reagents used in the study were of analytical grade.

Sample collection and preparation- Three different varieties of mango are purchased from local market. Samples were placed in polyethylene bags and transported under refrigerated conditions. All measurements were conducted in triplicates.

Preparation of Mango Peel Powders (MPP): MPP was prepared according to method of Ashoush and Gadallah (2011). Mango peels were washed with tap water to remove any dirt particles. The peels were spread thin in trays and dried at 50°C for 18 h to moisture content around 10%. The dried peels were powdered using a grinder and sieved through a 150 mm sieve.

Determination of Total carotenoids - Total carotenoids (mg/100g) were determined by a modified method of Ranganna (1997) using acetone and petroleum ether as extracting solvents and measuring the absorbance at 450nm. Preparation of sample extract - Two grams of sample was mixed with10 ml of 80% ethanol. The extract was centrifuged at 10000×g for 15 min at 40C. The pellet following was centrifuged and the resulting supernatant was combined with initial extract. Triplicate supernatant extractions were made for each sample. The ethanolic extract volume was reduced in the evaporator to 20ml.

Determination of ascorbic acid - Ascorbic acid was quantitatively determined according to 2, 6-dichlorophenolindophenol dye method (Ranganna, 1997). The ascorbic acid of fresh samples 10g was extracted by grinding in a suitable medium with a small amount of sand and using 3% metaphosphoric acid (v/v) as a protective agent. The extract was made up to a volume of 100ml mixed and centrifuged at 3000g for 15 min at room temperature. Ten milliliters was titrated against standard 2, 6-dichlorophenolindophenol dye, which was already standardized against standard ascorbic acid. Results were expressed as (mg/100g) on fresh weight (fw) basis.

Radical Scavenging Activity: The antioxidant activity in the acetone extracts of MPP was determined by free radical scavenging activity according to the method described by Blois (1958) with slight modification described by Brand-Williams et al. (1995). MPP were extracted with 80% acetone and centrifuged at 8000×g. Each sample extract (200 µl) was mixed with 1 ml of DPPH solution (100 mM) and left in the darkness at room temperature for 20 min. The absorbance of the resulting solution was measured at 517 nm. The capacity to scavenge DPPH radical was calculated by the following equation.

Scavenging activity (%) = 1− (As / A0) × 100

Where A0 is the absorbance at 517 nm of the blank control and As is the absorbance of the sample. The percentage of free radical scavenging activity was plotted against the amount of the sample and IC50 was calculated.

Statistical analysis - Three replicates of each sample were used for statistical analysis. Analysis of the data was performed on the original data by one-way analysis of variance (ANOVA) or regression analysis. Differences at $P < 0.05$ were considered significant. The data was also analyzed with the help of SPSS 16.0 Software package.

RESULTS

Total Carotenoids Content - Total carotenoids content of MPP was highest for the Chausa (6.09 mg/100g), followed by Deshehari (5.12 mg/100g) and then Fazli (4.80 mg/100g). but these are much lower than the carotenoids content observed by Ajila et al. (2007) in Raspuri amd Badami mango peels (also indian mango varieties). A continuous increase in carotenoid content was observed by Ajila et al. (2008 & 2010), with the continuous increase in incorporation amount of MPP in biscuits and macroni.

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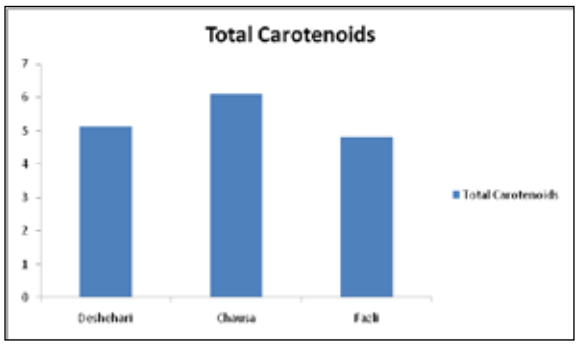


Figure1. Total Carotenoids Content of three Indian varieties (Deshehari, Chausa and Fazli), in mg/100g.

Ascorbic acid Content - Ascorbic content of MPP was observed highest for Fazli (42.07mg/100g) followed by Chausa (35.17 mg/100g), while Deshehari (20.21mg/100g) have lowest ascorbic content among these three varieties. While ascorbic acid content (vitamin C) of peels of Raspuri and Badami were 30.8-34.9mg/100g and 39.2-50.9mg/100g, observed by Ajila et al., (2007). Jilani et al. (2010) observed ascorbic content of whole mango fruit of various varieties. They observed whole fruit of Deshehari and Fazli mango have 141mg/100g and 169mg/100g respectively. Ascorbic acid content (vitamin C) of mango seed was 0.56mg/100g reported by Fowomola (2010), which is much lower than peel.

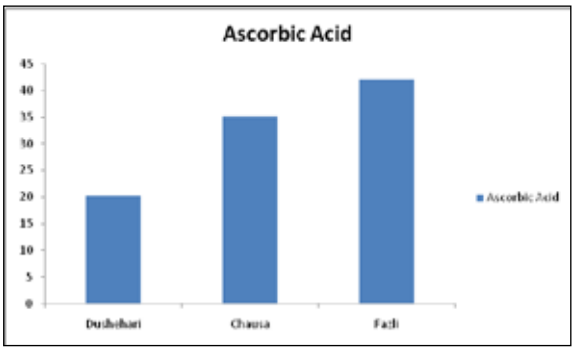
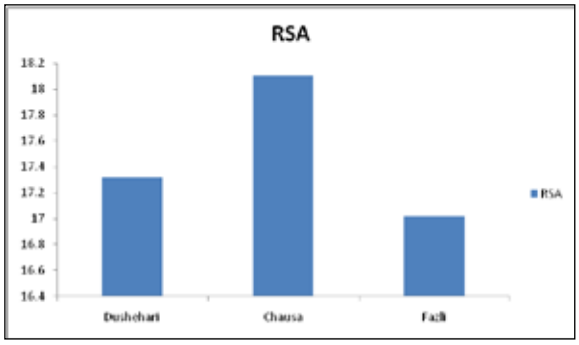


Figure2. Ascorbic Acid Content of three Indian varieties (Deshehari, Chausa and Fazli), in mg/100g.

Radical Scavenging Activity (RSA) - RSA was observed highest for Chausa (18.10%) followed by Deshehari (17.32%) and Fazli (17.02%). Also an increase in RSA was observed by Ajila et al. (2010), with incorporation of MPP.



CONCLUSION

This study showed that MPP of Dushehari, Chausa and Fazli mango varietiea are rich source of ascorbic acid (vitamin C), carotenoids etc. Mango peel, by-product of mango processing industry, could be a rich source of bioactive compounds. This new source will be potential as a functional food or value added ingredients in future in our dietary system. Mango peel if conveniently processed, could furnish useful products that may balance out waste treatment costs and also decrease the cost of main product. Therefore, there is a scope for the isolation of these active ingredients and also use of mango peel as an ingredient in processed food products such as bakery products, breakfast cereals, pasta products, bars and beverages.

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