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Original Research Article

Biochemical Evaluation of Mineral Profile and Ascorbic Acid Content in Various Varieties of Ripened Mango (*Mangifera indica* L.) Fruits

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A B S T R A C T

The present investigation was conducted in four varieties of mango fruits namely Dashehari, Langra, Chausa and Safeda during 2008-09 and 2009-10. All the varieties of mango were collected from orchard of Devgaon, Faizabad (U.P.) to study the mineral profile and ascorbic acid content of mango fruits at 30 days, 60 days and 90 days after fruit setting. Mineral makeup was evaluated for important mineral content i.e. Ca, Mg, K, P, Fe and S. The result showed high variation among the mineral makeup and ascorbic acid content of ripened mango fruits. Highest amount of Ca, Mg, K, P, Fe and S content were noticed in Safeda (0.142%), Dashehari (0.254%), Dashehari (146.01 ppm), Safeda (0.022%), Safeda (0.673%) and Safeda (0.052%) respectively while lowest content were found in Chausa (0.138%), Chausa (0.189%), Chausa (108.66 ppm), Chausa (0.019%), Langra (0.622%) and Chausa (0.032%) respectively during ripened state in 2008-09. In 2009-10, the highest such mineral content were recorded in Langra (0.136%), Chausa (0.344%), Safeda (117.89 ppm), Dashehari (0.022%), Safeda (0.682%) and Safeda (0.038%) respectively, whereas lowest amount were observed in Safeda (0.128%), Dashehari (0.165%), Dashehari (78.96 ppm), Langra (0.017%), Dashehari (0.058%) and Dashehari (0.35%) in ripened fruits. Ascorbic acid content in mango fruits at different stages was observed between 13.37-26.33 mg/100g in 2008-09 and 14.67-27.33 mg/100g in 2009-10.

Keywords

Mango, Fruiting stage, Biochemical characteristics, Mineral profile, Ascorbic acid

Introduction

Mango (*Mangifera indica* L.) belongs to the family Anacardiaceae, is one of the most important tropical fruits commercialized and consumed worldwide fresh or processed, having an attractive colour and distinct taste and aroma. India is the largest producer of mango accounting for nearly 50% of the total world production, 34.9% of the area under fruit crops in India, and 20.7% of the total fruit production of the country (1). In Indian context, it is an important fruit crops ruling both domestic & export market. It is an excellent source of fibre and bioactive compounds such as carbohydrate, carotenoids, provitamins, vitamin C, protein, phenolics and other health promoting qualities (2). Mango is the main fruit of Asia and developed its own importance all over the world. Being an useful and delicious fruit, it was the part of culture and religion

since long time. Besides, fine taste and good quality it is called as "The king of fruits". All the parts of mango plant have various uses in India. Both ripe and unripe fruits are used extensively by food processing industry to prepare wide variety of products such as syrup, jam, squash, juice, cereal flakes and toffee etc from ripe mango. Pickles, chutney, slices, amchur, candy, jam, jelly, preserve and squash etc are prepared from unripe mango fruits (3).

The biochemical composition of mango fruits differs among the cultivars at the stage of maturity. Mango fruit is rich in carbohydrate as well as vitamin A and C. The composition after analysis of more than 25 varieties of mango are moisture (73.0-86.7%), carbohydrate (11.6-24.3%), protein (0.5-1.0%), fat (0.1-0.8%), fibre(1.1%), minerals (0.3-0.7%), vitamin A i.e.(6375-2650µg/100g) β-carotene and vitamin C (6.8-38.8 mg/100g) (4). The main sugar in mango fruits comprised of sucrose, glucose, fructose and maltose (5). Mango fruits are highly perishable due to enzymatic and non-enzymatic reaction that takes place during maturation, affecting nutritional, sensorial, physicochemical & biochemical properties. Besides riching carbohydrate (sucrose, glucose, fructose and maltose), there are about twelve amino acids have been identified including the essential ones like alanine, aspartic acid, lysine, leucine, cysteine, valine, arginine, phenylalanine and methionine. The highest concentrations of these amino acids are observed in fruits just after fruit set and concentrations decreased with fruit development (6). The aroma and flavor content were also varying widely among the mango cultivars and there is no one typical formulation of flavor component of mango fruits. In ripened mango fruits aroma and good flavor is released due to monoterpene hydrocarbons (7). Generally, mango is consumed at all stages of fruit development form the tiny imperfectly set fruits, that shed abundantly on to develop beyond the initial stage to fully mature ones and development stages of the fruits including mature and ripened stage. Little information about some varietal physicochemical characteristics has so far been recorded (8)(9).

Materials and Methods

Sample collection

The present investigation entitled "Biochemical evaluation of mineral profile and ascorbic acid content in various varieties of ripened mango (*Mangifera indica* L.) fruits" was carried out in the laboratory, Department of Biochemistry, N.D. University of Agriculture and Technology, Kumarganj, Faizabad during two consecutive year 2008-09 and 2009-10. All the varieties of mango i.e. (Dashehari, Langra, Chausa and Safeda) fruit samples used for this experiment were collected from two mango orchard of Devgaon, near Kumarganj, Faizabad (U.P.), India, to get a clear evaluation about the mineral profile and ascorbic acid each variety contained ten mango fruits. The cultivars of mangoes under experiment were analyzed at three different maturity stages viz. 30, 60 and 90 days after fruit settings.

Determination of nutritional properties

The mineral content (Ca, Mg, K, P, Fe, and S) were estimated on dry weight basis by ''Di-acid digestion, flame photometer and atomic absorption spectrophotometer'' method (10) at Indian Institute of Pulses Research (IIPR), Kanpur and result were expressed as percent basis and ascorbic acid content analyzed in fresh fruit pulp by AOAC method (11).

Statistical analysis

The data was statistically analyzed using Randomized Block Design (RED) to asses and compare the biochemical properties of all the 4 mango cultivars.

Results and Discussion

Data revealed the maximum Ca, Mg, K, P, Fe and S content were noticed in Safeda (0.142%) Dashehari (0.254%), Dashehari (146.01ppm), Safeda (0.022%), Safeda (0.673%) and Safeda (0.052%) respectively while minimum content were found in Chausa (0.138%), Chausa (0.189%), Chausa (108.66ppm), Chausa (0.019%), Langra (0.622%) and Chausa (0.032%) respectively during ripen stage in 2008-09. On the contrary in 2009-10, the highest such mineral content were recorded in Langra (0.136%), Chausa (0.344%), Safeda (117.89ppm), Dashehari (0.022%), Safeda (0.682%) and Safeda (0.038%) respectively, whereas lowest amount were observed in Safeda (0.128%), Dashehari (0.165%), Dashehari (78.96ppm), Langra (0.017%), Dashehari (0.589%), and Dashehari (0.35%) at ripened stage. It was noticed from the data that all the varieties of mango were generally poor in mineral content and great variation among themselves. There was gradual increase in mineral content in all the varieties during the initial stage followed by rapid increase. Oxygen and carbon are the most abundant element on dry weight basis and hydrogen ranks third. There is approximately the same distribution of the elements as in carbohydrates, including cellulose the most abundant compound in wood. The low mineral content of aonla may probably be due to deficiency of macro and micro nutrients in soil it may be also due to improper distribution of nutrients (12). The result is in conformity with observation, the mineral content on the dry weight basis of all the fruits part of all cultivars was generally lower at harvesting stage than at half-maturity and the mineral content of peel was generally higher than that of other fruit parts at both stage of maturity. Plant growth depends on the presence of considerable number of elements. Some of them are required in large amounts, other in only very small quantities. Most soils contain adequate calcium which is absorbed as Ca^{2+}. It is essential for cell elongation and division and for maintenance of membrane permeability and of cell wall structure through cross linking of pectin. Magnesium is a component of chlorophyll and it is involved in the transfer of phosphate group as true substrate of many enzymes using ATP is a magnesium complex of ATP. Magnesium activates the activity of enzyme RUBISCO and may play a role in control of carbohydrate synthesis in chloroplast (13).

Table.1 Important minerals content in ripened mango fruits

Varieties	Mineral Content											
	2008-09						2009-10					
	Ca(%)	Mg(%)	Fe(ppm)	P(%)	K(%)	(S%)	Ca(%)	Mg(%)	Fe (ppm)	P (%)	K (%)	S (%)
Dashehari	0.135	0.254	146.01	0.020	0.645	0.036	0.133	0.165	78.96	0.022	0.589	0.035
Langra	0.130	0.222	112.79	0.021	0.622	0.034	0.136	0.227	93.56	0.017	0.616	0.037
Chausa	0.138	0.189	108.66	0.019	0.665	0.032	0.131	0.344	98.97	0.018	0.661	0.043
Safeda	0.142	0.206	105.04	0.022	0.673	0.052	0.128	0.220	117.89	0.019	0.682	0.038
C.D.at5% level	0.05	0.01	2.27	0.02	0.05	0.09	0.06	0.02	7.07	0.03	0.04	0.03

Table.2 Ascorbic acid content in mango fruits at different stages after fruit setting

Varieties	Ascorbic acid content (mg/100g)					
	2008-09			2009-10		
	30 days	60 days	90 days	30 days	60 days	90 days
Dashehari	26.33	23.00	19.33	27.33	22.67	19.67
Langra	25.33	22.67	17.67	26.67	22.33	18.00
Chausa	24.33	22.00	15.67	25.67	22.67	16.00
Safeda	23.33	20.00	13.67	24.00	19.67	14.67
C.D. at 5% level	1.91	1.91	2.08	1.97	1.99	1.33

Data pertaining to ascorbic acid content in (Table-2) revealed that the highest ascorbic acid content was obtained in Dashehari (26.33 mg/100g and 27.33 mg/100g) at 30days while lowest content was observed in Safeda (13.67 mg/100g and 14.67mg/100g) at 90days after fruit setting in both year 2008-09 and 2009-10. Similar results have also been reported (14). The highest concentration of ascorbic acid was observed in fruits just after fruits set and the concentration decreased with fruit development. Twelve weeks after fruit set, the cv. Langra contained the highest ascorbic acid, followed by Aswina and Fazli. The ascorbic acid content of fruit decreased with storage at room temperature (15). The ascorbic acid content in ripened mango fruits varies between (22-28mg/100g) of pulp (16). It is noticed that the ascorbic acid content was increased during the early growth stage but declined on attaining maturity (17). Several earlier workers have also reported significance reduction in the content of vitamin C in mango fruits. The active forms of vitamin C are the L-isomers of ascorbic acid and dehydroascorbic acid. The content of ascorbic acid in the present investigation increased initially in fruit while decreased during ripening stage. It is synthesized by hexose sugars (mainly glucose and galactose) to ascorbic acid and act as reducing agent and antioxidant (18)(19).

On the basis of general comparative characters and biochemical investigation of four cultivars of mango viz. ‘‘Dashehari, Langra, Chausa and Safeda’’, it may be concluded that cultivar ‘‘Safeda’’ was found most superior in case of mineral content and cultivar Dashehari was found much better in content of ascorbic acid among all cultivars in both the year of experiment.

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