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NUTRITIONAL QUALITY ANALYZE OF BANANA PUREE PRODUCED BY MICROWAVE BALANCHING

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Abstract

Effect of microwave blanching on the nutritional characteristics of banana puree was investigated and compared with conventional water bath blanching method. Two lots of banana puree were prepared using electrical blender. Fully ripe, peeled bananas (cv. Dwarf Cavendish) were blanched in domestic microwave oven for 3 minutes and water bath at 100^{O}C for 8 minutes separately and blended. Banana puree prepared from the microwave blanched banana fruits had high ascorbic acid (6.3 mg/100 g), total soluble solids (18.3 ^{O} Brix), total sugars (14.7%), tannins (0.045%), acidity (0.29%) and organoleptic score (7.2) but had low pH (4.64) compared to banana puree prepared from the water bath blanched banana fruits. Enzymatic browning was completely retarded by both blanching treatments. However, non-enzymatic browning had non-significant difference among blanching treatments. Microwave and thermal inactivation of Polyphenol oxidase, Peroxidase and Pectin methyl esterase were also compared.

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1. Introduction

The banana fruit is not seasonal in nature like many other fruits and is available in fairly large quantity throughout the year. At present, India is the largest producer of banana in the world accounting 99.35 lakhs metric tons as compared to world banana production 440.51 lakhs metric tons (FAO, 1997). However, with an expansion of banana production in India, large quantity of fruits are expected to be surplus because of high standards imposed particularly on the appearance of fruits in banana export industry (Singh and Uma, 1996). The large quantity of unmarketable fruits available in all banana growing regions in India go as waste due to improper post-harvest handling and lack of processing technology for value addition (Wasker end Roy, 1993).
Banana puree (pulp) is most widely used as raw material for other value added products from banana. It contributes to the flavor of wide variety of food products and its functional properties are also of value (Jonas, 1994). The world banana puree market has a share of 120,000 metric tons. Large quantities of banana puree are used for the preparation of baby foods, ice cream and bakery foods (Singhal, 1999). The waste due to surplus banana production can be minimized by preparing banana puree {rem the excess banana fruits. Commercial banana varieties in India have not been exploited for product like banana puree and vast potentiality of banana for processing remained unexploited (Chadha, 1997). Non availability of quality puree from Indian bananas for export industry is an important missing link in post-harvest technology for export of banana. Also, very few process products from banana are marketed primarily due to difficulties in retaining the characteristics color, flavor and texture of banana pulp during processing (Palmer, 1963).

The microwave blanching procedure has recently gained some recognition as enzyme inactivation by microwave heating may offer the advantage that heat sensitive nutrients and flavor compounds are preserved due to its rapid heating potential and possible additive non-thermal effects on enzyme inactivation (Knutson et al., 1987 and Sahni et al., 1997). Several studies on blanching, using microwaves either independently or in combination with steam/ water heating were reported by Ramaswamy and Fakhouri (1998). In the present investigation, the effect of microwave blanching on nutritional qualities in comparison to the conventional blanching has been studied.

2. Materials & Methods

2.1. Fruit material

Bunches of matured, green fresh banana variety, Dwarf Cavendish (Basrai) were procured from Azadpur market, New Delhi and ripened in the post-harvest technology laboratory of Indian Agricultural Research Institute, New Delhi. Fully ripe fruits (yellow with brown flecks) were

washed with tap water, peeled and processed for puree by microwave blanching and water bath blanching. 2 kg lots of fully ripe and peeled banana fruits were used for each treatment.

2.2. Processing of Banana Puree

For water blanching treatments 6-7 peeled bananas were tied in muslin cloth at a time and immersed in l00"C water in a water bath for 8 minutes. For microwave blanching, 2-3 peeled bananas were placed in micro able glass bowl at a time and kept inside the microwave oven (1200 W,' 2450 MHz, BPL model) operated for 3 minutes at the higher power setting (unpublished data). Banana puree was prepared from the blanched banana fruits by blending them in an electrical blender (Sumeet model) and screening one after another through 16 mesh and 30 mesh stainless sieves to obtain homogeneous puree.

2.3. Enzyme assay

Polyphenol oxidase (PPO) was extracted and assayed by the method of Palmer (1963). Peroxidase (POD) was extracted and assayed by the method of Sadasivam and Manickam (1996). Pectin methyl esterase (PME) was extracted and assayed by the method of Hagerman and Austin (1986).

2.4. Physicochemical Analysis

Total soluble solids content of the puree was measured with hand Refractometer. Acidity was determined by titrating the pulp extract with 0.1 N NaOH using phenolphthalein as indicator and expressed as per cent malic acid. The pH of the blended pulp was measured by using a standard digital pH meter. Ascorbic acid, tannin content, total sugars and non-enzymatic browning were determined according to the methods described by Ranganna (1995).

2.5. Organoleptic quality Analysis

Organoleptic quality of pulp was evaluated by a taste panel members using 9 points hedonic rating system described by Amerine et a1. (1965).

3. Results and Discussion

The activities of Polyphenol oxidase, Peroxidase and Pectin methyl esterase in fresh banana pulp were 9.17, 2.0 and 0.95 units/ ml, respectively. Three minutes of microwave blanching and eight minutes of water blanching significantly reduced the activities of Polyphenol oxidase, Peroxidase

and Pectin-methyl esterase into zero activity in banana pulp. Cano et al. (1997) reported that microwave and steam blanching significantly reduced Polyphenol oxidase and Peroxidase activities in banana pulp. Peroxidase isoforms in corn kernels were efficiently inactivated by uniform microwave heating (Boyes et al., 1997). Sahni et al. (1998) concluded that microwave blanching takes lesser time for inactivation of Peroxidase and Lipoxygenase enzymes in French beans. Better inactivation of Peroxidase by microwave blanching was reported in carrot slices and sweet potatoes by Ramaswamy and Fakhouri (I998).

Table 01: Effects of blanching treatments on the nutritional qualities of banana puree

Treatments	Moisture (%)	TSS (O Brix)	Acidity (%)	pH	Tannins (%)	Ascorbic Acid (mg/100g)	Total Sugars (%)	Non enzymatic browning (OD value 0.085)
Fresh banana pulp (control)	78.2	20.13	0.35	4.48	0.051	15.35	8.4	0.085
Puree (microwave blanched,3 min)	77.3	18.30	0..29	4.64	0.045	14.70	6.3	0.079
Puree (water blanched,100oC, 8 min)	79.8	15.50	0.19	4.98	0.036	11.50	4.2	0.076
SEm±	0.069	0.034	0.006	0.08	0.062	0.039	0.027	0.004
CD at 5%	0.198	0.099	0.017	0.022	0.002	0.111	0.070	NS

Table l shows that moisture. TSS, acidity, pH and tannins were significantly influenced by the method of blanching. Moisture content of the fresh banana pulp was 78.2 which were reduced slightly by microwave blanching due to evaporation. Absorption of moisture by the pulp during water blanching resulted increase in the moisture content of water blanched pulp. 1l‘otal soluble solids content was 20.13 0Brix in fresh pulp and was least affected by microwave blanching but severely affected by water blanching due to leaching of nutrients. Microwave blanching and water blanching significantly influenced the acidity and pH of the pulp. Acidity of the pulp greatly affects the flavor of the banana pulp. Luh and Woodroof (1975) found that microwave blanched broccoli was lower in pH and higher in total acids than water blanched samples. Tannins value ranged from 0.045 per cent for microwave blanching to 0.036 per cent for water blanching, though microwave blanching yielded significantly higher tannins content.

Significant difference was found in total sugar content between microwave and water blanched treatments due to leaching of sugars during water blanching. Leaching of sugars during water blanching is observed by Quenzer and Burns (1981). Microwave blanching was superior to water blanching for conserving ascorbic acid and resulted in highest retention of ascorbic acid in banana pulp. Higher retention of ascorbic acid content by microwave blanching was reported by Kaur et al. (1999), Guines and Bayhindirh (1993), Knutson et al. (1987) and Mabesa and Baldwin (1978). Decreases in ascorbic acid during water/steam blanching resulted from leaching (Quenzer and Burns, 1981). Non-significant difference was found between microwave blanching and water blanching in non-enzymatic browning caused by Maillard reaction and ascorbic acid browning though fresh banana pulp showed little higher non-enzymatic browning.

Table 02: Effects of blanching treatment on the organoleptic quality of banana puree

Treatments	Colour	Flavor	Texture	Overall Score
Fresh banana pulp (control)	8.0	8.2	8.1	8.1
Puree (microwave blanched,3 min)	7.1	7.4	7.1	7.2
Puree (water blanched,100oC, 8 min)	7.1	6.5	6.9	6.8
SEm±	0.058	0.057	0.069	0.047
CD at 5%	0.166	0.165	0.199	0.135

Table 2 revealed that the banana puree prepared from the microwave blanched fruits received highest means hedonic score for flavor and texture than puree prepared from the water blanched fruits. Similar observation has been reported by Giami (1991) that after freezing and reheating, texture of the pulp obtained from microwave blanched plantains (Musa paradisiaca) was significantly better than pulps obtained from plantains blanched by conventional water or steam blanching. Mabesa and Baldwin (1978) also observed that mean sensory scores of flavor and colour of peas cooked in a consumer microwave oven were significantly higher. Quenzer and Burns (1981) found that microwave blanched spinach samples were rated as more desirable in textural characteristics as it induced coagulation of protoplasmic material surrounding the cell wall. The microwave blanching gave higher ratings for overall acceptability of puree. Sahni et al. (1998) also reported the same in French beans. Panelists were however, unable to distinguish the difference in colour between banana purees prepared from microwave blanched fruits and water blanched fruits.

4. Conclusion

In conclusion, results of the present investigation have shown that banana puree prepared from the microwave blanched fruits has higher nutritional and organoleptic quality as compared to conventional method of blanching.

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