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Development of post mix carbonated unripe mango RTS beverage

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Abstract

The mango (*Mangifera indica* L.), the king of tropical fruits, is loved by people all over the world for its sweetness, unusual flavour, and delectable taste. In addition to being delicious, it is a fruit with nutritional value because it is a good source of minerals, vitamins A, B, and C. It is reported that about 75% of the fruits are knocked off, right from the flowering stage till ripening. Mango, incidentally, is one of the few fruits that can be used at all stages of maturation. The aim of this experimental work was preparing post mix carbonated sugar-free unripe mango ready-to-serve beverage using different concentration of stevia sugar, cane sugar, water and soda water. Stevia (*Stevia rebaudiana*), a natural sweetener aqueous extract. The 10 % pulp, 14% of sugar and 0.3% citric acid was added in water to prepare control treatment of RTS beverage. The carbonated beverage prepared with 10% pulp, 14% sugar and 0.3% citric acid mixed with plain soda water found to have highest sensory score in sensory evaluation. The beverage prepared with sugar-free stevia powder found to have lower score due to bitter taste.

Keywords: Ready-to-serve beverage, stevia sugar, unripe mango, sugar-free

Introduction

Mango (*Mangifera indica* L.) is the king among tropical fruits and is greatly relished for its succulence, exotic flavour and delicious taste in most countries of the world (Bhatnagar and Subramanyam, 1973) [5]. Apart from its delicacy, it is a nutritionally important fruit being a good source of vitamin A, B and C and minerals. Nutritive value of mango fruits is shown in Table 1. Mango is considered to be a fruit with tremendous potential for future. Worldwide production of mango is 38.95 million tonnes (FAO, 2011). Mango has its origin in India and approximately a thousand different types of mango fruits are produced in the country. Annual production of mango in India is 15.19 million tonnes (FAO, 2011).

Mango is one of the few fruits which is utilized in all stages of its maturity i.e. from very young immature unripe stage to the fully mature and ripe stage. During fruiting, mango crop is very much exposed to the adverse weather conditions. It is reported by Roy and Singh (1952) that about 75% of the fruits are knocked off, right from the flowering stage till ripening. The losses however, can be minimized to a great extent by utilizing the dropped green fruits in the processing industry for making pickles, chutneys, candy, preserve, juice, dried powder (amchur), beverages, jam and other products (Bhatnagar and Subramanyam, 1973; Teotia *et al.*, 1987; Pruthi, 1992) [5, 44].

Raw mango fruits are valued for their tangy taste, nutritional content and as a therapeutic agent. Ready-to-serve (RTS) beverages made up of unripe mango fruit pulp have greater amount of water that is useful for body balancing by preventing dehydration which is also called as kairi panhe. This drinks contain high percentage of sugar and provide a few vitamins and minerals. The consumption of fruit-based beverages in the form of fruit blends and smoothies is increasing due to public awareness on the presence of various functional ingredients beneficial to health. The limited intake of free sugars below 10% of total energy intake constitutes a healthy diet and further reduction to < 5% of total energy intake will result in additional health benefits (WHO, 2015). The usage of various synthetic/natural sweeteners in lieu of sugar is increasing day by day due to health concerns. Studies on sensory quality of synthetic sweeteners such as saccharin, acesulfame K, aspartame, and neotame revealed that aspartame solution resembles the sweetness of sucrose solution (Sediva *et al.*, 2006) [40].

Stevia (*Stevia rebaudiana*), a natural sweetener aqueous extract was compared for sweetness with sugar and applied in eleven beverage recipes namely, milk, coffee, tea, gajar halwa, milkshake, kheer, curd, lemon water, custard, halwa, and lapsi.

The results indicated that 1.5% of stevia extract yielded sweetness comparable to 5% sugar in the products tested (Varsha D., 2009). The procedure for the extraction of sweetener ingredients (steviol glycoside) from stevia leaves includes pre-treatment of leaves, hot water extraction, concentration, recrystallization, and separation.

Post mix is also a blend of water (Soda or plain) and syrup, however it is manufactured right on site and is usually mixed directly into a cup or glass. The aim of this experimental work was preparing post mix carbonated sugarfree unripe mango RTS drink using different concentration of stevia sugar, cane sugar, water and soda water.

Materials and Methodology

The study entitled “Development of Post Mix Carbonated Unripe Mango RTS beverage” was carried out at the department of Agricultural Process Engineering, Dr. Annasaheb Shinde College of Engineering and Technology, Mahatma Phule Krishi Vidyapeeth, Rahuri. This chapter deals with materials and methods followed under the study. The methodologies on preparation of raw material, preparation of RTS beverages and evaluation of organoleptic properties are presented in this chapter.

The ingredients which were required for making RTS beverage was unripe mangoes, sugar, stevia sugar, soda Water, citric Acid, water. The equipment such as grinder was used for the preparing RTS beverage; the equipment’s used in this investigation were deep freezer, knife

Preparation of unripe mango pulp

Freshly harvested mango fruits were procured from the horticultural farm of the Dr. Annasaheb Shinde College of Engineering and Technology, Mahatma Phule Krishi Vidyapeeth, Rahuri. Mangoes were then cooked using different techniques namely; boiling in water at 100°C for 30 min. The cooked fruits were peeled manually and carefully to minimize pulp loss with the peels. The pulping was done using the domestic mixer grinder and the stone was collected separately. The flow chart for preparation of unripe mango pulp is given as follow:

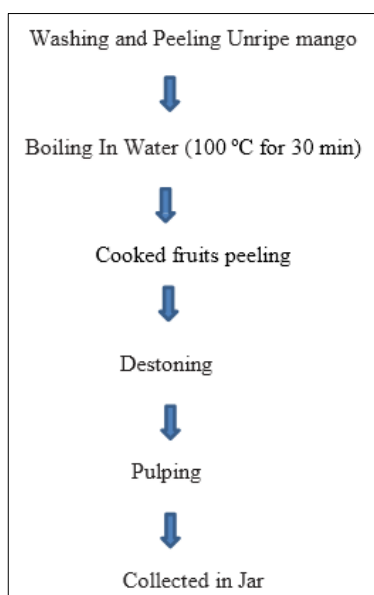


Fig 1: Flow Chart of Preparation of Unripe mango pulp preparation

Preparation of unripe mango pulp RTS beverage

The sugar or stevia sugar and citric acid was added at different proportions to the pulp and mixed with the help of blender. The pulp was then diluted with water and soda water. The beverage was then in sanitized PET bottles, followed by immediate cooling. The fresh as well as stored samples were analyzed for their sensory quality. Flow Chart for preparation of Unripe mango pulp RTS beverages is as follow:

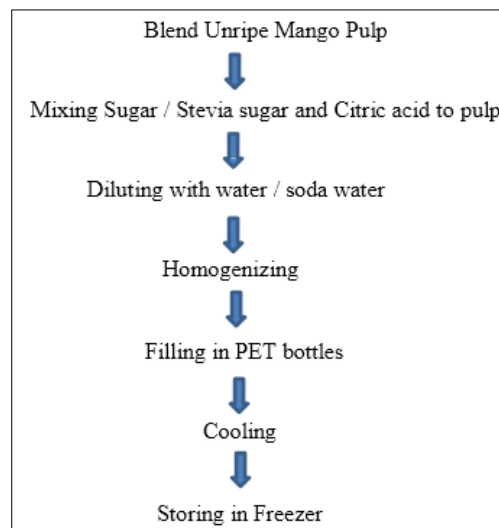


Fig 2: Flow Chart of Preparation of Unripe mango pulp RTS beverages

Treatment Details

The treatment details in research is as follow

Table 1: Treatment details

Treatments	Unripe Mango Pulp, g	Sugar , g	Stevia Sugar	Water, lit	Soda Water	Citric Acid
T ₁	100	144.3		753		2.7
T ₂	100		18.3	879		2.7
T ₃	100	144.3			753	2.7
T ₄	100		18.3		879	2.7

Sensory Evaluation

A subjective method of sensory analysis was employed for finding sensory characteristics of the prepared unripe mango RTS beverage. The 9 point Hedonic scale used for the sensory evaluation. The colour, appearance, consistency, taste and flavor were the quality attributes placed in the scale for RTS beverage. Sensory evaluation performed by a panel of 10 judges of various age groups consisting of students, staff and faculty members. The mean sensory scores for quality attributes obtained from individual sheet is reported.

Biochemical Properties Evaluation

A objective method of sensory analysis was employed for finding chemical characteristics i.e. total soluble solids and titrable acidity of the prepared unripe mango RTS beverage.

3.1.1 Total soluble solids

The total soluble solids (TSS) of unripe mango RTS beverage was be measured by digital Refracto meter of 0-90 Brix range.

Titration acidity

The titratable acidity of unripe mango RTS beverage was determined by titration with 0.1N Sodium Hydroxide (NaOH) using phenolphthalein as an indicator as per method advocated by A.O.A.C. (2005).

Results and Discussion

The experimental findings obtained from the present study have been discussed in following heads:

Sensory Evaluation

The sensory evaluation of prepared unripe mango RTS beverage was performed using nine point Hedonic scale. The quality attributes studied were appearance, colour, sponginess, consistency, taste, flavor and overall acceptability.

Table 2: Sensory Evaluation of unripe mango RTS beverage

Sample Code	Sensory Parameters			
	Appearance and Colour	Consistency	Taste and Flavour	Overall Acceptability
T ₁	7.2	8.3	8.6	8.1
T ₂	6.7	6.5	7.0	6.8
T ₃	7.0	8.2	7.5	7.8
T ₄	6.6	6.7	7.0	6.5

A panel of 10 people of different age group evaluated the prepared RTS beverages. The result of sensory scores is reported in the Table 4.1. The Table 4.1 shows that the appearance and colour of unripe mango RTS beverage prepared with treatment T₁ got 7.2 value followed by T₃ with 7.0 value. The consistency of unripe mango RTS beverage from treatment T₁ get 8.3 value which is followed by unripe mango RTS beverage with treatment T₃. Where as the taste and flavour get 8.6 value for treatment T₁ which is followed by T₃ with value 7.5. Similarly overall acceptability scores for unripe mango RTS beverage was found to be 8.1 for treatment T₁ which is followed by treatment T₃. The sensory scores for most of the attributes and overall acceptability score indicates that the unripe mango RTS beverage from treatment T₁ which is controlled followed by treatment T₃ are better compared to the other treatments.

Biochemical properties evaluation

The biochemical properties i.e TSS and titratable acidity was determined for different treatment of unripe mango RTS beverages. The table 4.2 shows total soluble solid and titratable acidity of different treatment of unripe mango RTS beverages.

Table 3: Biochemical properties of unripe mango RTS beverage.

Treatment	Total Soluble Solids (°Brix)	Titratable Acidity
T ₁	15	0.32
T ₂	2.7	0.30
T ₃	13.2	0.33
T ₄	2.3	0.32

The TSS and titratable acidity of unripe mango RTS beverage treatment T₁ is 15 °Brix and 0.32 which is control sample. The TSS of unripe mango RTS beverage treatment T₂ and T₄ is 2.7 and 2.3 which is low due to use of stevia sugar. The TSS of carbonated unripe mango RTS beverage is 13.2. The titratable acidity of all treatment was found between 0.30 to 0.33.

Conclusion

For the production of superior quality ready to-serve unripe mango beverage for longer shelf-life, the green but mature and unripe whole fruits of local variety should be cooked using hot water boiling at 100°C for 30 min; pulped; strained through 20 mesh stainless steel sieve. The pulp was added with 10 % pulp, 14% of sugar and 0.3% citric acid to prepare control treatment of RTS beverage. The carbonated beverage prepared with 10% pulp, 14% sugar mixed with plain soda water found to have highest sensory score in sensory evaluation. The beverage prepared with sugar-free stevia powder found to have lower score due to bitter taste.

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