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Research Paper

Processing and Quality Evaluation of Banana Fig

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A B S T R A C T

The present investigation on the processing and quality evaluation of banana fig was carried out at Department of Horticulture, Faculty of Agriculture, Annamalai University, Annamalainagar during 2018-2020. The experiment was carried out in Completely Randomized Design with four formulations and five replications. Banana fig was prepared with four formulations viz., T_1 - Sugar, T_2 - Honey, T_3 - Country sugar, T_4 - Jaggery. The highest value of 59.22% for total sugar was recorded in figs treated with sugar (T_1). The highest values for vitamin C (7.65mg/100g), protein content (2.63%) was recorded in figs treated with honey (T_2). The lowest values for acidity (0.232%) and highest values for pH (4.92) were recorded in figs treated with country sugar (T_3). Though the physico-chemical characters vary among the formulations, the treatment T_1 (figs prepared with sugar) is regarded as the best with regard to the organoleptic scores. Banana fig had recorded four months of storage life at ambient temperature.

***Key words*:** Banana fig, Organoleptic scores, Formulation, Value addition

Banana (*Musa spp*.), is a fruit of tropics is one of the most important fruit crops of the world as well as India. Banana belongs to the family Musaceae. Banana after ripening is a soft and delicate fruit with a post-harvest shelf life of 5-10 days. It is a highly perishable fruit owing to its high moisture content and climacteric nature. This makes it prone to injury at the time of transport. Further, due to release of ethylene during bulk storage makes the fruit ripen faster and the fruits generally rot before reaching its destination [1]. Hence, it has always being considered a 'problem fruit' with respect to transportation. These phenomena contribute to a local market glut, resultant low price and subsequently the farming community show less interest to cultivate it on a large scale [2]. However, the post-harvest losses in banana can be reduced by applying appropriate processing technique and converting them into semi perishable products. Exploring possibilities of converting banana into products of commercial interest is one way of solving this problem [3]. In developed countries 40 - 50% of the yearly agricultural produce is converted into value added commodities [4]. However, in India it is less than 2% yearly. Such a situation further stresses the importance of development of value-added products. The processing of banana adds value to the produce where the farmers or traders can get a better price for the produce [5]. With this in view an investigation was carried out to process and evaluate the quality of banana fig.

MATERIALS AND METHODS

The present investigation on the quality evaluation of banana fig was carried out at Department of Horticulture, Faculty of Agriculture, Annamalai University, Annamalainagar during 2018-2020. The experiment was carried out in Completely Randomized Design with four formulations and five replications. Matured ripe banana were taken for the preparation of banana fig. Four formulations were prepared with different sources of sugar (50° Brix). Banana fig was prepared with four formulations viz. T_1 - Sugar, T_2 - Honey, T_3 - Country sugar, T_4 - Jaggery.

For preparation of banana fig, whole ripe banana fruits were selected. The fruits free from mechanical injury were used for preparation. Then the fruits were peeled. Then the whole fruits were dipped in uniform concentration of sugar solution (50° Brix) for 20 minutes. After soaking the fruits were taken out and dried in oven at 50°C for 48 hrs. After sufficient drying, then the figs were cooled to room temperature. Then packed in polythene bags of suitable size and they were stored in cool dry place. The organoleptic quality of banana processed products were evaluated by the panellists for sensory attributes such as colour, taste, flavour, and overall acceptability. All evaluation sessions were conducted in the Department of Horticulture, Annamalai University. A nine-point hedonic scale as described by [6] used ranging from like extremely (9) to dislike extremely (1). All samples were presented before the panellists at room temperature under normal lighting conditions. Spoons were provided to the panellists and drinking water was provided for oral rinsing. Proximate analysis such as pH, Titrable acidity (%), Vitamin C (mg/100g), Total sugar (%) and Protein (%) were analyzed.

RESULTS AND DISCUSSION

The highest values for vitamin C (7.65 mg/100g), protein content (2.63%) was recorded in figs treated with honey (T_2). The lowest values for acidity (0.232%) and

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highest values for pH (4.92) were recorded in figs treated with country sugar (T_3). Though the phsico-chemical characters vary among the formulations, the treatment T_1 (figs prepared with sugar) is regarded as the best with regard to the organoleptic scores, with 4 months of shelf life (Table 1). Titratable acidity of the banana fig varied according to the concentration of the sugar syrup used. The highest value of acidity percent was noticed in banana fig prepared with honey while the lowest value was recorded in banana fig prepared with country sugar. The increase in acidity might be due to the various level of solid uptake by the fruits as reported by [7]. The acidity of the sugar solution also plays a role in maintaining the acidity of the finished product as reported by [8].

Table 1 Effect of variation in source of sugar on the nutritional quality of banana fig

Treatments	pH	Titratable acidity (%)	Vitamin C (mg/100g)	Total sugar (%)	Protein (%)
T_1 (Sugar)	4.44	0.356	6.12	59.22	2.02
T_2 (Honey)	4.21	0.401	7.65	56.31	2.63
T_3(Country sugar)	4.92	0.232	6.58	50.20	2.23
T_4 (Jaggery)	4.68	0.289	6.89	53.37	2.44
S. Ed.	0.10	0.009	0.15	1.17	0.05
C. D. (P=0.05)	0.22	0.02	0.31	2.49	0.11

Vitamin C content in fig was comparatively reduced when compared to the fresh fruits. The reduction in ascorbic acid content might be due to heat destruction. The ascorbic acid content of honey dipped banana was higher [9]. Honey contains a variety of phytochemicals (as well as other substances such as organic acids, vitamins and enzymes) that may serve as a source of dietary antioxidants [10]. The lowest value for ascorbic acid content was recorded in banana fig prepared with sugar. Total sugar of the four treatments increased when compared to fresh fruits in banana fig [11]. Due to the additional sucrose, the dried product showed higher total sugar. The higher sugar content might be due to infusion of sucrose, during immersion in different solution [12]. The highest value for total sugar content was recorded in banana fig prepared with sugar and lowest value for total sugar recorded in banana fig prepared with country sugar. The higher fructose content of sugar when compared to other sugar forms might have increased the total sugar content of banana fig prepared with sugar. The protein content of the fig increased when compared to that of fresh fruits. The increase in the protein content could be due to withdrawal of moisture from the dehydrated fruits in addition to chemical preservation and osmosis [13]. Among the four formulations, the treatment with honey recorded the highest protein content and lowest protein content recorded in sugar [14].

Table 2 Sensory scoring for banana fig at 1st month of evaluation (October 2019)

Taste panel (TP) S	T_1 (Sugar)				T_2 (Honey)				T_3 (Country sugar)				T_4 (jaggery)			
	Taste	Colour	Flavour	Overall acceptancy	Taste	Colour	Flavour	Overall acceptancy	Taste	Colour	Flavour	Overall acceptancy	Taste	Colour	Flavour	Overall acceptancy
TP1	7	8	9	8	9	8	8	8	9	7	7	8	7	6	6	7
TP2	9	8	9	8	9	8	8	8	9	8	9	8	9	8	9	8
TP3	8	8	8	8	7	8	7	8	7	6	8	7	6	7	7	7
TP4	8	8	8	8	7	7	7	7	6	7	8	7	5	5	5	5
TP5	9	9	9	9	8	7	7	7	7	7	7	7	8	8	8	8
TP6	9	9	9	9	7	7	7	7	6	6	6	6	8	8	8	7
TP7	7	7	9	8	7	7	6	7	6	6	5	6	7	7	8	7
TP8	8	8	7	7	8	8	8	8	6	5	8	6	8	8	7	8
TP9	8	9	8	9	8	8	6	8	7	6	7	6	7	6	7	7
TP10	9	7	7	8	9	7	7	8	7	5	7	6	7	6	8	7
Grand Total	81	81	83	82	79	67	71	76	70	63	72	67	71	68	75	71
Average	8.1	8.1	8.3	8.2	7.9	6.7	7.1	7.6	7.0	6.3	7.2	6.7	7.1	6.8	7.5	7.1

Sensory scoring of banana fig

Banana fig prepared with variation in sugar forms were subjected to sensory evaluation at monthly interval for a period of three months. A hedonic scale of 9 points was used to access the quality attributes viz., taste, colour, flavor and overall acceptability. The scores obtained were presented in (Table 2-4). The average score for taste (8.1), colour (8.1), flavor (8.3) and overall acceptability (8.2) were highest in the treatment T_1 in the initial stage of sensory evaluation. The treatment T_2 obtained the second-best score for sensory characters. The lowest sensory scores were given for treatment T_3 regarding taste (7.0), colour (6.3), flavor (7.2) and overall acceptability (6.7) during initial stage of organoleptic evaluation. During the second and third months of storage all the sensory characters of the banana fig decreased for all treatments. The treatment T_1 obtained the highest average score during third month of sensory analysis in taste (6.0), colour (6.4), flavor (6.3) and overall acceptability (63). The lowest score was recorded in T_3 in taste (5.2), colour (5.3), flavor (5.6) and overall acceptability (6.4). All the sensory characters gradually decreased during the third month of analysis. The organoleptic quality of banana fig gradually decreased during storage [15]. Among the treatments, the fig treated with sugar solution obtained the highest scores with regard to taste, colour, flavor and overall acceptability. The lowest scores were given for fig prepared with country sugar.

Up to three months the storage of fig was found acceptable. Among the various treatments of the fig, the treatment with sugar and honey recorded the highest shelf life up to 4 months. The product was prepared without the addition of any preservatives. The greater shelf life might be due to the higher sugar content of the treatments. Sugar (glucose, sucrose, lactose, dextrose) acts as a preservative when used at a higher concentration. The natural and added sugar reduces the available moisture for microbial growth thus extending the shelf life of the product. The lower shelf life was recorded in country sugar and jaggery.

CONCLUSIONS

Thus, it is concluded that banana figs prepared with sugar is adjudged as the best with regard to the organoleptic scores, and shelf life. Hence this value-added product may be commercialized for income generation.

Table 3 Sensory scoring for banana fig at 2nd month of evaluation (November 2019)

Taste panel (TP) S	T_1 (Sugar)				T_2 (Honey)				T_3 (Country sugar)				T_4 (jaggery)			
	Taste	Colour	Flavour	Overall acceptancy	Taste	Colour	Flavour	Overall acceptancy	Taste	Colour	Flavour	Overall acceptancy	Taste	Colour	Flavour	Overall acceptancy
TP1	7	8	8	8	8	7	6	8	6	7	7	7	7	6	5	6
TP2	8	7	8	7	7	7	8	7	7	8	7	7	7	6	8	7
TP3	8	8	6	7	7	8	7	7	7	6	8	7	6	7	7	7
TP4	8	8	7	8	7	7	7	7	6	7	8	7	5	5	5	5
TP5	8	8	8	9	6	6	6	6	7	6	5	7	8	8	7	8
TP6	8	8	7	8	7	7	7	7	5	6	6	6	6	8	7	7
TP7	6	7	8	8	7	6	6	6	6	6	5	6	7	7	8	7
TP8	7	7	7	7	8	8	7	8	5	5	5	5	8	5	5	6
TP9	8	8	5	7	7	7	6	7	7	6	6	6	5	6	7	6
TP10	8	5	7	7	7	7	5	6	6	5	7	6	7	6	6	7
Grand Total	75	74	73	77	72	62	66	69	62	62	65	64	66	64	65	66
Average	7.5	7.4	7.3	7.7	7.2	6.2	6.6	6.9	6.2	6.2	6.5	6.4	6.6	6.4	6.5	6.6

Table 4 Sensory scoring for fig at 3rd month of evaluation (December 2019)

Taste panel (TP) S	T_1 (Sugar)				T_2 (Honey)				T_3 (Country sugar)				T_4 (jaggery)			
	Taste	Colour	Flavour	Overall acceptancy	Taste	Colour	Flavour	Overall acceptancy	Taste	Colour	Flavour	Overall acceptancy	Taste	Colour	Flavour	Overall acceptancy
TP1	6	7	5	6	6	6	6	6	6	6	6	6	5	6	5	5
TP2	6	7	7	7	5	6	6	6	4	6	5	5	6	5	5	5
TP3	5	6	6	6	4	5	6	5	4	6	6	5	4	7	6	6
TP4	6	5	7	6	5	7	5	6	6	4	6	5	5	5	5	5
TP5	7	6	6	6	5	6	6	6	5	5	5	5	5	5	4	5
TP6	5	7	7	7	7	5	7	7	5	4	6	5	6	6	7	6
TP7	6	7	6	6	5	6	6	6	6	6	5	6	7	6	6	6
TP8	6	7	7	7	5	6	7	6	5	5	5	5	6	5	5	5
TP9	7	6	6	6	7	7	6	7	5	6	6	6	5	4	7	5
TP10	6	6	6	6	7	5	5	6	6	5	6	6	5	6	6	6
Grand Total	60	64	63	63	56	59	60	61	52	53	56	54	5.4	5.5	56	54
Average	6	7	5	6	6	6	6	6	6	6	6	6	5	6	5	5

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