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Research Article

STANDARDIZATION OF RECIPES FOR PREPARATION OF WOOD APPLE FRUIT BAR

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Abstract: Wood-apple (*Feronia limonia* Swingle), an important dryland fruit crop with a lot of medicinal properties belongs to family Rutaceae. Fruits are being rich in minerals, vitamins and dietary fibre, so these are an essential ingredient of a healthy diet. It has high astringent properties and has beneficial role in cardio vascular system. Hence, efforts have been taken to study the recipes and storage for wood apple fruit bar, also find out best recipe and storage condition, so that the fruit bar would be readily available to the consumer throughout the year. The experiment was laid out in Randomized Block Design with Eight treatment which were replicated thrice, for standardization of recipes for preparation of wood apple fruit bar at refrigerated condition for 150 days storage. In the present investigation, it was observed that, there was gradual increase in the TSS, TSS/acidity ratio, reducing sugars, total sugars and non-reducing sugars content with storage period of wood apple fruit bar prepared with different recipes. However, acidity and ascorbic acid content were decreased continuously with the progressive of storage period of different recipes at refrigerated storage conditions.

Keywords: *Feronia limonia, TSS, Woodapple bar, Recipe*
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Introduction

Wood apple (*Feronia limonia* L.) is a rare and an endangered tree species but, equally a valued plant for its edible fruits and immense medicinal properties [1]. The pulp of the ripe fruit is eaten as much or with sugar and jaggery. The products such as jelly, chutney and beverage are prepared from pulp of this fruit. Excellent flavour, nutritive value and medicinal characteristics of fruit indicate its good potentiality for processing into value added products [2,3]. However, very little work has been carried out on the processing and storage aspects of wood apple. The research on preparation of consumer acceptable wood apple fruit bar needs to be explored by adopting the different recipes and storage conditions. Due to fast urbanization in the world, importance of off season and readymade healthy food is increasing at a faster rate. Wood apple fruit bar is readymade food products as it similar to fruit bar, whose importance will increase rapidly in recent future [4]. The main advantages of making fruit bar are to preserve fruit by drying and, hence, controlling postharvest spoilage. Making fruit bar, from ripe or slightly over-ripe fruits that are not suitable for fresh consumption will enable producers to satisfy market demand during off season periods [5].

Materials and Methods

The study on the processing of wood apple fruit bars was carried out at Post Harvest Technology, Laboratory, Horticulture Section, College of Agriculture, and Analytical Laboratory, Department of Horticulture, Dr P.D.K.V., Akola. The treatment for present investigation consider Fruit extract ,sugar and citric acid at different concentration.T1Fruit extract + 30% sugar + 0.3% citric acid, T2 Fruit extract + 40% sugar + 0.3% citric acid T3 Fruit extract + 30% sugar + 0.4% citric acid T4 Fruit extract + 40% sugar + 0.4% citric acid T5 Fruit extract + 50% sugar + 0.3% citric acid T6 Fruit extract + 50% sugar + o.4 % citric acid T7 Fruit extract + 60% sugar + 0.3% citric acid T8Fruit extract + 60% sugar + 0.4% citric acid. Chemical analysis of fruit and fruit bar was carried out as per the methods given by Ranganna, 1986 and AOAC, 1995 [6]. Sensory evaluation of prepared wood apple fruit bar was carried out by the procedure given by Amerine *et al*., (1965) [7] and Agarwal & Mangaraj, (2005) [8].

Results and Discussion

The results of investigation based on various observations viz., fruits chemical parameters of fruit pulp, chemical parameters and sensory attributes of wood apple fruit bar adopted during the course of investigation are presented and discussed below with the appropriate headings and sub headings.

TSS

From [Table-1] it is observed that, significantly maximum TSS (71.63◦B) at 30 days, (71.84◦B) at 90 days during storage and decreases subsequently after 120 days of storage, was recorded in treatment T8 which was significantly superior to rest of all treatments. It was followed by treatment T7, however, significantly minimum TSS was recorded in treatment. The result mention above is in conformity with the finding of various research workers. Shere *et al*. (2014) [9] reported slight increase in TSS of jamun-mango bar and by Khan *et al*. (2014) in guava bar during storage.

Acidity

The data presented in [Table-1] shows significant differences in titratable acidity of wood apple fruit bar among the different treatment in fresh as well as 30th (1.300%), 90th (1.190%) and 150th (1.033%) day of storage. In general, the titratable acidity of wood apple fruit bar was decreased during advancement of storage. From the above result, the decrease in titratable acidity of wood apple fruit bar was recorded due to acid base reaction [10].

TSS: Acidity ratio

There were significant differences in TSS/acidity ratio of wood apple fruit bar among the different treatment in fresh as well as 30th, 90th and 150th day of storage. In general, the TSS/acidity ratio of wood apple fruit bar was increased during advancement of storage. The increase in the TSS/acid ratio might be due to increase in TSS and decreased in acidity during storage by the conversion of oligosaccharides into sugars [11].

Table-1 *Effect of different recipes on TSS, Acidity and TSS/acidity ratio of wood apple fruit bar*

Treat.	TSS (° Brix)				Acidity (%)				TSS: Acidity Ratio			
	Storage Period (DAS)				Storage Period (DAS)				Storage Period (DAS)			
	Fresh	30th	90th	150th	Fresh	30th	90th	150th	Fresh	30th	90th	150th
T_1	71.09	71.22	71.56	72.13	1.887(1.37)	1.810(1.35)	1.630(1.28)	1.290(1.14)	37.68	39.35	43.91	55.95
T_2	71.15	71.26	71.58	72.12	1.780(1.33)	1.720(1.31)	1.570(1.25)	1.273(1.13)	39.98	41.43	45.60	56.67
T_3	71.22	71.32	71.62	72.17	1.687(1.30)	1.623(1.27)	1.510(1.23)	1.230(1.11)	42.22	43.93	47.44	58.68
T_4	71.27	71.38	71.67	72.17	1.637(1.28)	1.563(1.25)	1.451(1.20)	1.207(1.10)	43.48	45.66	49.44	60.31
T_5	71.36	71.46	71.73	72.23	1.580(1.28)	1.541(1.24)	1.4101.19)	1.150(1.07)	45.16	46.40	50.89	62.86
T_6	71.41	71.51	71.78	72.26	1.533(1.24)	1.470(1.21)	1.360(1.17)	1.140(1.07)	46.58	48.65	52.80	63.44
T_7	71.49	71.59	71.82	72.29	1.407(1.19)	1.350(1.16)	1.243(1.11)	1.050(1.02)	50.82	53.03	57.94	68.91
T_8	71.54	71.63	71.84	72.30	1.300(1.14)	1.277(1.13)	1.190(1.09)	1.033(1.01)	55.03	56.11	60.40	70.02
'F' Test	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig
SE(m)±	0.002	0.004	0.001	0.002	0.007	0.006	0.006	0.007	0.246	0.306	0.249	0.464
CD at 5%	0.007	0.013	0.004	0.007	0.021	0.017	0.019	0.023	0.746	0.927	0.754	1.408

Table-2 *Effect of different recipes on Ascorbic Acid, Phosphorus and Calcium of wood apple fruit bar*

Treat.	Ascorbic Acid (mg/100g)				Phosphorus (mg/100g)				Calcium (mg/100g)			
	Storage Period (DAS)				Storage Period (DAS)				Storage Period (DAS)			
	Fresh	30th	90th	150th	Fresh	30th	90th	150th	Fresh	30th	90th	150th
T_1	2.03	1.97	1.76	1.30	32.38	32.35	32.27	32.14	18.24	18.21	18.15	18.06
T_2	1.99	1.92	1.77	1.29	32.39	32.37	32.29	32.17	18.24	18.22	18.17	18.08
T_3	1.91	1.85	1.70	1.23	32.46	32.44	32.37	32.27	18.23	18.22	18.19	18.15
T_4	1.92	1.86	1.72	1.21	32.44	32.41	32.34	32.24	18.24	18.23	18.19	18.11
T_5	1.86	1.83	1.65	1.16	32.47	32.45	32.39	32.30	18.24	18.21	18.19	18.15
T_6	1.87	1.80	1.66	1.14	32.51	32.49	32.42	32.31	18.22	18.21	18.18	18.13
T_7	1.71	1.70	1.54	1.06	32.54	32.51	32.45	32.36	18.24	18.23	18.21	18.15
T_8	1.69	1.67	1.53	1.05	32.57	32.56	32.51	32.45	18.26	18.25	18.22	18.18
'F' Test	Sig	Sig	Sig	Sig	NS	NS	NS	NS	NS	NS	NS	NS
SE(m)±	0.007	0.018	0.005	0.008	0.04	0.04	0.06	0.06	0.010	0.008	0.015	0.028
CD at 5%	0.022	0.056	0.016	0.025	-	-	-	-	-	-	-	-

Table-3 *Effect of different recipes on Sensory score of wood apple fruit bar*

Treat.	Colour Score				Taste Score				Overall Acceptability			
	Storage Period (DAS)				Storage Period (DAS)				Storage Period (DAS)			
	Fresh	30th	90th	150th	Fresh	30th	90th	150th	Fresh	30th	90th	150th
T_1	7.50	7.17	6.33	5.33	7.17	6.67	6.00	5.67	7.00	6.61	6.11	5.22
T_2	7.67	7.33	6.67	6.00	7.33	6.83	6.33	5.67	7.17	6.83	6.44	5.61
T_3	8.17	8.00	7.50	6.83	8.00	7.67	6.33	6.33	7.61	7.33	6.94	6.28
T_4	8.33	8.17	7.83	7.17	8.17	8.00	7.33	6.67	7.72	7.50	7.33	6.39
T_5	8.50	8.33	8.00	7.50	8.33	8.33	8.00	6.67	8.00	7.89	7.67	6.83
T_6	8.67	8.50	8.17	7.83	8.50	8.50	8.00	7.33	8.28	8.11	7.72	7.28
T_7	8.83	8.67	8.33	8.00	8.83	8.67	8.33	7.67	8.78	8.56	8.39	7.67
T_8	9.00	9.00	8.83	8.50	9.00	8.83	8.67	8.33	8.94	8.83	8.72	8.28
'F' Test	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig
SE(m)±	0.256	0.200	0.237	0.245	0.356	0.306	0.445	0.330	0.203	0.204	0.145	0.135
CD at 5%	0.776	0.608	0.718	0.743	1.079	1.929	1.351	1.002	0.617	0.618	0.441	0.408

Ascorbic Acid

After 30, 90 and 150 days of storage, significantly minimum ascorbic acid (1.67 mg/100g, 1.53 mg/100g and 1.05 mg/100g, respectively) was recorded in treatment T8 which was significantly superior to rest of all treatments and this was followed by treatment T7. However, significantly maximum ascorbic acid was recorded in treatment T1. The ascorbic acid content decreased during storage due to oxidation of ascorbic acid to dehydro ascorbic acid. Similar result of decreased in ascorbic acid was also reported in papaya fruit bar during storage by Aruna *et al.* (1999) [12]and Khusbu and Singh (2015) in wood apple leather.

Phosphorus and Calcium Content

The data presented in [Table-2]. shows non-significant difference in phosphorous and calcium content in wood apple fruit bar amongst the various treatments.

Overall acceptability

In wood apple fruit bar, significantly maximum (like very much) score for overall acceptability was recorded in treatment T8 (Fruit extract + 60% sugar + 0.4% citric acid) which was significantly superior to rest of all the treatments. This treatment was at par with treatment T7 (Fruit extract + 60% sugar + 0.3% citric acid). However, significantly minimum (like moderately) score for overall acceptability was recorded in treatment T1 (Fruit extract + 30% sugar + 0.3% citric acid) data presented in [Table-3].

Conclusion

The best quality wood apple fruit bar prepared by using fruit extract with 60% sugar and 0.4% citric acid in respect of chemical properties and sensory attributes and stored for a period of five months.

Application of research: Study of standardization of recipes for preparation of wood apple fruit bar

Research Category: Fruit Science

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Study area / Sample Collection: Post Harvest Technology, Laboratory, Horticulture Section, Akola

Cultivar / Variety / Breed name: Wood-apple (*Feronia limonia* Swingle)

Conflict of Interest: None declared

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