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Studies on value addition of guava and apple ber cheese

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Abstract

The present experiment was carried out during February, 2019 to May 2019 in Post Harvest Laboratory of Department of Horticulture, SHUATS, Prayagraj. The experiment was conducted in Completely Randomized Design (CRD), with five treatments, replicated thrice. The treatments were T₁ (100% Guava), T₂ (75% Apple Ber + 25% Guava), T₃ (50% Apple Ber + 50% Guava), T₄ (25% Apple Ber + 75% Guava) and T₅ (100% Apple Ber). From the present investigation it is found that treatment T₄ (75% Guava + 25% Apple ber) was found superior in respect of the parameters i.e., Total Soluble Solids, Acidity, pH, Ascorbic acid, Reducing Sugar, Non Reducing Sugar, Total Sugar, Colour and Appearance, Flavour and Taste, Texture, Aroma and Overall Acceptability etc. In terms of economics the highest Gross return was recorded in treatment T₃ with maximum Benefit Cost Ratio was found in T₃ (50% Guava + 50% Apple ber) and minimum was recorded in treatment T₅ in all the parameters.

Keywords: Guava, apple ber and value addition

Introduction

Guava (*Psidium guajava*) also called "Apple of Tropics", originated in tropical America perhaps from Mexico to Peru belongs to family Myrtaceae, Guava claims fourth most important fruit after mango, banana and citrus and has a high nutritive value that is why it is considered to be the poor man's apple.

The major guava producing areas in Uttar Pradesh are Allahabad, Varanasi, Lucknow, Kanpur, Aligarh and Agra. Cultivation of Guava is so naturalized in Uttar Pradesh that it is hard to believe it is not native to India.

Guava is a chief and rich source of vitamin "C" (300mg/100g pulp) and Pectin (2.33%). It is also contains fair amount of calcium, phosphorus and vitamin A (Phandnis, 1970; Rathore, 1976).

Guava is only a delicious and nutritious table fruit but may also be utilized to make products like jam, jelly, cheese, juice, ice-cream, canned segments, nectar, RTS beverage dehydrated slice, flakes, toffee, sauce guava lather, baby food puree, etc. However, the most commercially use of guava is for jelly preparation. Guava leaves are also used for curing Diarrhea and for Dying & Tanning.

Apple Ber is a Thailand variety fruit and it is also known as the Indian jujube or Chinese date. The taste of this Apple Ber is Sweet, Crispy & Juicy. The weight of each fruit is around 150-200 gm. It appears to be like green Apple. That is the reason it is named as Apple Plum or Apple Ber. Its farming is currently trending and it has lots of advantages over traditional Plum farming.

Fruit and vegetable are highly perishable commodities as they are living tissues that are subject to continuous changes after harvest, because of their peculiar characteristics, i.e. high moisture content and rapid rate of metabolism, they are prone to deteriorate rapidly after harvest and also due to lack of adequate post harvest losses due to spoilage are very high. An attempt is made to prepare cheese from Guava and Apple Ber, and to know the better combination between the proportion of Guava and Apple Ber.

The main objective of fruit processing is to supply wholesome safe, nutritious and acceptable fruit to consume throughout the year and the main objective of post harvest studies are reduction of fruit losses, import of produce and generation of Urban and Rural employments as well as sources of income to the farmers. It also helps in developing value added products so that they can be relished throughout the year. So there should be some ways that farmer can easily and rapidly save their produce. This can be only being done only if they have a processing industry nearby.

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Materials and Methods

The Experimental was conducted in Completely Randomized Design (CRD) with 5 treatments of Guava and Apple Ber Pulp with three replications in the Post Harvest Laboratory of Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj during February to May, 2019. Total number of treatments were five viz. T₁ (100% Guava), T₂ (75% Apple Ber + 25% Guava), T₃ (50% Apple Ber + 50% Guava), T₄ (25% Apple Ber + 75% Guava) and T₅ (100% Apple Ber).

Climatic condition in the experimental site

The area of Prayagraj district comes under subtropical belt in the south east of Uttar Pradesh, which experience extremely hot summer and fairly cold winter. The maximum temperature of the location reaches up to 46 °C- 48 °C and seldom falls as low as 4 °C- 5 °C. The relative humidity ranges between 20 to 94 %. The average rainfall in this area is around 1013.4 mm annually. However, occasional precipitation is also not uncommon during winter months.

Results and Discussion

The present investigation entitled “Studies on value addition of Guava and Apple Ber Cheese” was carried out during February to May 2019 in Post Harvest Laboratory of Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P.) India. The results of the present investigation, regarding the value addition of Guava and Apple Ber Cheese, have been discussed and interpreted in the light of previous research work done in India and abroad. The experiment was conducted in Completely Randomized design with 5 treatments, and three replications.

The results of the experiment are summarized below.

In terms of Total soluble solids, the lowest score of (71.31, 71.76, 72.20 and 72.64 °Brix) was observed in treatment T₄ (75% Guava + 25% Apple ber), followed by treatment T₁ (100% Guava) with (72.66, 72.99, 73.45 and 73.99 °Brix), whereas the maximum score was observed in treatment T₅ (100% Apple ber) with (75.30, 75.78, 76.09 and 76.51 °Brix) during 90 days storage. An increase in total soluble solids content of Guava and Apple ber cheese during storage may possibly be due to conversion of polysaccharides starch etc, in to sugars. Total soluble solids content of guava, Singh, (1985) and Pandey, (1995) ^[13, 9], juice has also been reported to increase during storage. Shabi *et al.*, (2018) ^[11] reported in Guava Cheese.

In terms of Acidity %, the lowest score of Acidity (0.60, 0.64, 0.68 and 0.73 %) in treatment T₄ (75% Guava + 25% Apple ber), followed by treatment T₁ (100% Guava) with (0.66, 0.69, 0.73 and 0.78 %), whereas the maximum score was observed in treatment T₅ (100% Apple ber) with (0.91, 0.94, 0.96 and 0.98 %) during 90 days storage. An increase in acidity (%) of Guava and Apple ber Value added cheese during storage might be attributed to the chemical interaction between constituents of Value added Guava and Apple ber cheese induced by temperature and action of enzymes. Deka, (2000) and Deka *et al.*, (2004) ^[2, 3] reported similar finding with lime-aonla blended RTS and Nath and Yadav, (2005) ^[8] with ginger-kinnow squash. Shabi *et al.*, (2018) ^[11] in Guava Cheese.

In terms of pH, the lowest score of pH (3.24, 3.19, 3.15 and 3.07) was observed in treatment T₄ (75% Guava + 25% Apple ber), followed by treatment T₁ (100% Guava) with (3.32, 3.28, 3.23 and 3.17), whereas the maximum score was

observed in treatment T₅ (100% Apple ber) with (4.69, 4.56, 4.47 and 4.37) during 90 days storage. The pH content of Value added Guava and Apple ber cheese was showed decreasing trend in all Value added Guava and Apple ber cheese during storage. There was a negligible change in pH content decreased of the cheese during storage may possibly be due to increase in time interval, temperature and action of enzymes. Similar results were reported by Shanker *et al.*, (1967) ^[12] in case of guava juice. Shabi *et al.*, (2018) ^[11] in Guava Cheese.

In terms of Ascorbic acid, the highest score of Ascorbic acid (9.14, 8.83, 8.34 and 7.91 mg/100g) was observed in treatment T₄ (75% Guava + 25% Apple ber), followed by treatment T₁ (100% Guava) with (8.77, 7.39, 8.00 and 7.67 mg/100 g) whereas the minimum score was observed in treatment T₅ (100% Apple ber) with (7.26, 6.92, 6.56 and 6.21 mg/100 g) during 90 days storage. Results indicated that ascorbic acid content of cheese decreased continuously during entire period of storage. This reduction may be due to oxidation of ascorbic acid in to dehydro ascorbic acid by oxygen. Several authors have also recoded the loss of ascorbic acid in fruit juice during storage Ghosh *et al.*, (1982) ^[4] and Shabi *et al.*, (2018) ^[11] reported in Guava Cheese.

In terms of Reducing sugar, the highest score of Reducing Sugar (46.77, 47.97, 49.49 and 51.28 %) was observed in treatment T₄ (75% Guava + 25% Apple ber), followed by treatment T₁ (100% Guava) with (44.50, 45.92, 47.54 and 48.61 %) whereas the minimum score was observed in treatment T₅ (100% Apple ber) with (36.27, 37.56, 39.10 and 40.56 %) during 90 days storage. The increase in reducing sugar was slightly higher in storage condition that could be attributed to more rapid hydrolysis of polysaccharides and their subsequent conversion into sugars. Deka, (2000) and Deka *et al.*, (2004) ^[2, 3] reported similar finding with lime-aonla blended RTS and Nath and Yadav, (2005) ^[8] with ginger-kinnow squash. Shabi *et al.*, (2018) ^[11] in Guava Cheese.

In terms of Non-reducing sugar, the highest score of non-reducing sugar (8.33, 8.51, 8.68 and 8.81 %) was observed in treatment T₄ (75% Guava + 25% Apple ber), followed by treatment T₁ (100% Guava) with (8.12, 8.34, 8.51 and 8.67 %) whereas the minimum was observed in treatment T₅ (100% Apple ber) with (6.77, 6.94, 7.13 and 7.28 %) during 90 days storage. The non-reducing sugar content of Value added Guava and Apple ber cheese was showed increasing trend in all Value added Guava and Apple ber cheese during storage due to increase in time interval and temperature. Kumar *et al.*, (2012) and Shabi *et al.*, (2018) ^[6, 11] reported similar finding with Guava Cheese.

In terms of Total sugar, the highest score of total sugar (55.10, 56.48, 58.17 and 60.09 %) was observed in treatment T₄ (75% Guava + 25% Apple ber), followed by treatment T₁ (100% Guava) with (52.62, 54.26, 56.05 and 57.28 %) whereas minimum was observed in treatment T₅ (100% Apple ber) with (43.04, 44.50, 46.23 and 47.84 %) during 90 days storage. The result showed a progressive and increase in total sugar content through the storage period increase in total sugar might be due to hydrolysis of polysaccharides like starch, pectin etc, and there conversion into sample sugars. The similar findings reported by Deka, (2000) and Deka *et al.*, (2004) ^[2, 3] for lime-aonla blended RTS and Tiwari, (2000) ^[15] for RTS beverages prepared from guava-papaya. Shabi *et al.*, (2018) ^[11] reported in Guava Cheese.

In terms of score for colour and appearance, the maximum score of colour (7.89, 8.00, 8.18 and 8.45) was observed in

treatment T₄ (75% Guava + 25% Apple ber), followed by treatment T₁ (100% Guava) with (7.70, 7.82, 7.93 and 8.11) whereas minimum score was observed in treatment T₅ (100% Apple ber) with (6.97, 7.11, 7.33 and 7.51) during 90 days storage. The colour and appearance of Value added Guava and Apple ber cheese was showed decreasing trend in all Value added Guava and Apple ber cheese during storage due to increase in time interval, temperature and action of enzymes. Similar findings previously also reported by Shabi *et al.*, (2018)^[11] in Guava Cheese.

In terms of flavor and taste, the highest score of flavor and taste (8.23, 8.43, 8.62 and 8.76) was observed in treatment T₄ (75% Guava + 25% Apple ber), followed by treatment T₁ (100% Guava) with (7.98, 8.21, 8.33 and 8.46) whereas minimum score was observed in treatment T₅ (100% Apple ber) with (7.09, 7.22, 7.35 and 7.55) during 90 days storage. The taste and flavour of Value added Guava and Apple ber cheese was showed decreasing trend in all Value added cheese during storage due to increase in time interval, temperature and action of enzymes. Similar results previously also reported by Shabi *et al.*, (2018)^[11] in Guava Cheese.

In terms of score for texture, the highest score of texture (8.14, 8.36, 8.51 and 8.62) was observed in treatment T₄ (75% Guava + 25% Apple ber), followed by treatment T₁ (100% Guava) with (7.97, 8.16, 8.34 and 8.53) whereas minimum score was observed in treatment T₅ (100% Apple ber) with (7.09, 7.32, 7.47 and 7.61) during 90 days storage. The texture is directly related to the setting of product and setting is a result of good pectin content 75% Guava + 25% Apple ber was judged best for consistency of Value added Guava and Apple ber cheese from it. There results coincide with the Studies conducted by Ishu *et al.*, (1989); Lal *et al.*, (1967), Vail *et al.*, (1978) and Shabi *et al.*, (2018)^[5, 7, 17, 11].

In terms of score for aroma, the highest score for aroma (8.12, 8.26, 8.42 and 8.58) was observed in treatment T₄ (75%

Guava + 25% Apple ber), followed by treatment T₁ (100% Guava) with (7.93, 8.04, 8.20 and 8.35), minimum score was observed in treatment T₅ (100% Apple ber) with (7.16, 7.35, 7.50 and 7.69) during 90 days storage. However, the organoleptic characters showed a gradual decreasing during storage due to increase in time interval, temperature and action of enzymes at room temperature. This finding was in conformity with Singh *et al.*, (1983), Vinod *et al.*, (2007) and Shabi *et al.*, (2018)^[14, 11] in guava cheese storage and decrease there after Ranganna (2001)^[10] in food selection Ahmad *et al.*, (2004)^[1] in Apple cheese.

In terms of score for overall acceptability, the highest score of overall acceptability (8.33, 8.49, 8.67 and 8.74) was observed in treatment T₄ (75% Guava + 25% Apple ber), followed by treatment T₁ (100% Guava) with (8.08, 8.20, 8.42 and 8.59) minimum score was observed in treatment T₅ (100% Apple ber) with (7.10, 7.26, 7.52 and 7.67) during 90 days storage. However, the organoleptic characters showed a gradual decreasing during storage due to increase in time interval, temperature and action of enzymes at room temperature. This finding was in conformity with Singh *et al.*, (1983), Vinod *et al.*, (2007) and Shabi *et al.*, (2018)^[14, 11] in guava cheese storage and decrease there after Ranganna (2001)^[10] in food selection Ahmad *et al.*, (2004)^[1] in Apple cheese.

In terms of economics, the maximum Gross return of Rs. 520 is recorded in treatments T₂ and T₃ but Highest Net Return Rs. 272.50, was recorded in T₃ (50% Guava + 50% Apple ber) followed by T₂ with Rs. 266.50, and highest Cost Benefit Ratio 1:2.10 was recorded in treatment T₃ followed by Treatment T₄ (75% Guava + 25% Apple ber) with 1:2.07, lowest Gross Return Rs. 480.00 was recorded in treatment T₁ (100% Guava) and lowest Net Return Rs. 240.50 and Cost Benefit Ratio 1:1.92 was recorded in treatment T₅ (100% Apple ber).

Table 1: Effects of Value addition of Guava and Apple Ber Cheese on Total Soluble Solids (°Brix), Acidity (%), pH, Ascorbic Acid (mg/100 g), Reducing Sugar (%) and Non Reducing Sugar (%).

Treatment Symbol	Treatment Details	Total Soluble Solids (°Brix)				Acidity (%)				pH (%)				Ascorbic Acid (mg/100 g)				Reducing Sugar (%)				Non - Reducing Sugar (%)			
		Initial	30 DAS	60 DAS	90 DAS	Initial	30 DAS	60 DAS	90 DAS	Initial	30 DAS	60 DAS	90 DAS	Initial	30 DAS	60 DAS	90 DAS	Initial	30 DAS	60 DAS	90 DAS	Initial	30 DAS	60 DAS	90 DAS
T ₁	100% Guava	72.66	72.99	73.45	73.99	0.66	0.69	0.73	0.78	3.32	3.28	3.23	3.17	8.77	8.39	8.00	7.67	44.50	45.92	47.54	48.61	8.12	8.34	8.51	8.67
T ₂	25% Guava + 75% Apple Ber	74.20	74.68	75.22	75.70	0.75	0.79	0.83	0.87	3.52	3.49	3.45	3.35	8.32	8.24	7.81	7.41	39.84	41.44	42.68	44.26	7.43	7.56	7.71	7.86
T ₃	50% Guava + 50% Apple Ber	73.45	73.88	74.45	74.97	0.70	0.74	0.77	0.81	3.36	3.32	3.27	3.19	8.67	8.33	7.90	7.55	42.24	43.77	45.02	46.47	7.97	8.11	8.30	8.51
T ₄	75% Guava + 25% Apple Ber	71.31	71.76	72.20	72.64	0.60	0.64	0.68	0.73	3.24	3.19	3.15	3.07	9.14	8.83	8.34	7.91	46.77	47.97	49.49	51.28	8.33	8.51	8.68	8.81
T ₅	100% Apple Ber	75.30	75.78	76.09	76.51	0.91	0.94	0.96	0.98	3.88	3.86	3.81	3.73	7.26	6.92	6.56	6.21	36.27	37.56	39.10	40.56	6.77	6.94	7.13	7.28
F-test		S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
SE(d)		1.036	0.997	0.999	1.000	0.058	0.062	0.067	0.066	0.118	0.111	0.101	0.093	0.209	0.301	0.288	0.297	1.451	1.430	1.392	1.346	0.168	0.200	0.197	0.232
C.V.		1.730	1.654	1.647	1.638	9.767	9.917	10.294	9.726	4.161	3.963	3.672	3.461	3.041	4.522	4.565	4.944	4.237	4.042	3.809	3.564	2.661	3.105	2.991	3.458
C.D. at 5%		2.339	2.251	2.254	2.256	0.130	0.139	0.151	0.149	0.266	0.250	0.229	0.211	0.473	0.678	0.650	0.670	3.274	3.228	3.142	3.037	0.379	0.452	0.445	0.524

Table 2: Effects of Value addition of Guava and Apple Ber Cheese on Total Sugar (%), Score for Colour and Appearance, Score for Flavour and Taste, Score for Texture, Score for Aroma, Score for Overall acceptability and Benefit Cost Ratio.

Treatment Symbol	Treatment Details	Total Sugar (%)				Score for Colour and Appearance				Score for Flavour and Taste				Score for Texture				Score for Aroma				Score for Overall Acceptability				Benefit cost ratio
		Initial	30 DAS	60 DAS	90 DAS	Initial	30 DAS	60 DAS	90 DAS	Initial	30 DAS	60 DAS	90 DAS	Initial	30 DAS	60 DAS	90 DAS	Initial	30 DAS	60 DAS	90 DAS	Initial	30 DAS	60 DAS	90 DAS	
T ₁	100% Guava	52.62	54.26	56.05	57.28	7.70	7.82	7.93	8.11	7.98	8.21	8.33	8.46	7.97	8.16	8.34	8.53	7.93	8.04	8.20	8.35	8.08	8.20	8.42	8.59	1:2.04
T ₂	25% Guava + 75% Apple Ber	47.27	49.00	50.39	52.12	7.17	7.34	7.53	7.68	7.21	7.44	7.59	7.76	7.14	7.34	7.50	7.79	7.12	7.19	7.40	7.63	7.32	7.50	7.72	7.86	1:2.05
T ₃	50% Guava + 50% Apple Ber	50.21	51.88	53.32	54.98	7.53	7.68	7.83	8.03	7.81	8.01	8.20	8.33	7.76	7.89	8.02	8.22	7.53	7.71	7.83	7.98	7.81	7.94	8.15	8.31	1:2.10
T ₄	75% Guava + 25% Apple Ber	55.10	56.48	58.17	60.09	7.89	8.00	8.18	8.45	8.23	8.43	8.62	8.76	8.14	8.36	8.51	8.62	8.12	8.26	8.42	8.58	8.33	8.49	8.67	8.74	1:2.07
T ₅	100% Apple Ber	43.04	44.50	46.23	47.84	6.97	7.11	7.33	7.51	7.09	7.22	7.35	7.55	7.09	7.32	7.47	7.61	7.16	7.35	7.50	7.69	7.10	7.26	7.52	7.67	1:1.92
F-test		S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	
SE(d)		1.539	1.533	1.482	1.448	0.187	0.188	0.206	0.179	0.218	0.214	0.195	0.193	0.101	0.085	0.080	0.110	0.219	0.225	0.239	0.238	0.259	0.248	0.229	0.214	
C.V.		3.796	3.666	3.437	3.257	3.067	3.030	3.244	2.763	3.477	3.330	2.975	2.896	1.623	1.325	1.226	1.657	3.535	3.581	3.717	3.619	4.105	3.851	3.471	3.188	
C.D. at 5%		3.473	3.461	3.346	3.268	0.421	0.424	0.464	0.405	0.491	0.482	0.440	0.436	0.228	0.191	0.180	0.249	0.493	0.509	0.539	0.537	0.585	0.559	0.518	0.484	

Conclusion

Based on findings of the present experiment it is concluded that treatment T₄ (75% Guava + 25% Apple ber) was found superior in respect of the parameters Total Soluble Solids, Acidity, pH, Ascorbic acid, Reducing Sugar, Non Reducing Sugar, Total Sugar, Colour and Appearance, Flavour and Taste, Texture, Aroma and Overall Acceptability. In terms of economics the highest Gross return was recorded in treatment T₂ and T₃ but highest net return and Cost Benefit Ratio was found in T₃ (50% Guava + 50% Apple ber) and minimum was recorded in treatment T₅ in all the parameters.

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