Studies on Physico-chemical and Organoleptic Properties and Economic Analysis of Guava-sapota (Psidium guajava-Achrus zapota) Blended Cheese

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Authors’ contributions

This work was carried out in collaboration between both authors. Author SPR designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author SPR guided about my project work. Both authors read and approved the final manuscript.

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ABSTRACT

The present experiment was carried out during April 2019 to July 2019 in the Post Harvest Laboratory of the Department of Horticulture, SHUATS, Prayagraj (India). The experiment was conducted in Completely Randomized Design (CRD), with eleven treatments and three replications. The treatments were T_0 (Guava pulp 100% (Control)), T_1 (Guava pulp 90% + Sapota Pulp 10%), T_2 (Guava Pulp 80% + Sapota Pulp 20%), T_3 (Guava Pulp 70% + Sapota Pulp 30%), T_4 (Guava Pulp 60% + Sapota Pulp 40%), T_5 (Guava Pulp 50% + Sapota Pulp 50%), T_6 (Guava Pulp 40% + Sapota Pulp 60%), T_7 (Guava pulp 30% + Sapota Pulp 70%), T_8 (Guava pulp 20% + Sapota Pulp 80%), T_9 (Guava pulp 10% + Sapota Pulp 90%) and T_10 (Sapota Pulp 100%). The main objectives of the research is to standardize the proportion of guava and sapota pulp for Guava-Sapota blended cheese, in order to improve physico-chemical properties, organoleptic characteristics and shelf-life of the product, within an affordable economics. From the present investigation it is found that treatment T_5 (Guava Pulp 50% + Sapota pulp 50%) was superior in respect of the parameters Total Soluble Solids (74.75°Brix), Acidity (0.40%), pH (5.27%), Ascorbic acid (83.72 mg/100 g), Reducing Sugar (3.93%), Non-Reducing Sugar (5.75%) and Total Sugar (9.07%). In terms of organoleptic
properties like Colour and Appearance (8.52), Flavour and Taste (8.47), Texture (8.60) and Overall Acceptability (8.65) \( T_5 \) was found best. In terms of cost benefit ratio, the highest net return (325.50/) and Cost Benefit Ratio (1:2.08) were found in \( T_5 \) (Guava Pulp 50% + Sapota pulp 50%). Hence, \( T_5 \) was found superior based on above parameters.

Keywords: Guava; sapota and value addition.

1. INTRODUCTION

Guava (Psidium guajava Linn.) is an arborescent shrub or a small tree. It belongs to the family Myrtaceae and is one of the most gregarious of fruit trees. The place of origin of the guava is believed to be an area extending from the Southern part of Mexico up to the Central part of America. Guava is one of the most common and major fruits of India and is considered as the fifth most important fruit in respect of its area and production after mango, citrus, banana and apple. According to N.H.B. (National Horticulture Board) the total area under cultivation of guava in India is 2,76,000 ha and production is 42,36,000 MT recorded in the year 2018-19.

Guava is a good source of vitamin C, carbohydrates, proteins, minerals, pectin, calcium and phosphorus Garg et al., [1]. The fruit contains high concentration of vitamin A (200 to 400 IU), ascorbic acid (88.2 to 250.8 mg/100 g), lycopene (45.3 µg/g FW), total sugars (10 to 15.3%), reducing sugars (2.05 to 6.08%), acids (10 to 15.3%), pectins (0.62%) and phenols (170 to 345 GAE/g FW) Kaur et al., [2].

Sapota (Achrus zapota) belongs to family Sapotaceae and a popular tropical fruit commercially grown in India. Sapota is a native of tropical America and probably originated from southern Mexico or Central America USDA [3]. In south Mexico, Guatemala and other countries, it is commercially grown for the production of chuckle which is a gum like substance obtained from the latex and is mainly used for the preparation of chewing gum. However, in India, it is cultivated extensively for its fruit value. According to N.H.B. (National Horticulture Board) the total area under cultivation of sapota in India is 90,000 ha and production is 10,89,000 MT recorded in the year 2018-19.

Matured sapota pulp is a good source of carbohydrates (21.4 g/100 g), dietary fibers (10.9 g/100 g), tannin (3.16–3.45%), ascorbic acid and minerals like calcium (28 mg/100 g) and phosphorus (27 mg/100 g) Sulladmath & Reddy [4] Ramulu & Rao [5]. It is also rich in bio-iron, required for the formation of hemoglobin and vitamin A Gurusharansingh [6]. The amino acids present in the fruits are glutamic acid, glycine, alanine, methionine, phenylalanine, proline, hydroxy - proline, threonine, taurine, tyrosine, serine, valine and phosphoethanolamine along with urea Pervez et al., [7].

Fruit cheese has recently become very popular. It is a confection of the type of Karachi halwa and is prepared from fruits like Guava, Apple, Pear and Plum. Fruit cheeses have a long shelf life Srivastava and Kumar, [8]. Fruit cheese contains a minimum 68% T.S.S. and 45% prepared fruit in final product, (F.P.O Specification).

1.1 Objectives

1. To standardize the proportion of guava and sapota pulp for Guava-Sapota blended cheese.
2. To evaluate physico-chemical properties and organoleptic characteristics of Guava-Sapota cheese.
3. To work out the economics of the various treatments.

2. MATERIALS AND METHODS

2.1 Design and Site of Experiment

The Experimental was conducted in Completely Randomized Design (CRD) with 11 treatments of Guava and Sapota with three replications in the Post Harvest Laboratory of Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj during April 2019 to July 2019.

2.1.1 Treatment combinations

\( T_0 \) - Guava pulp 100%
\( T_1 \) - Guava pulp 90%+ sapota pulp 10%
\( T_2 \) - Guava pulp 80%+ sapota pulp 20%
\( T_3 \) - Guava pulp 70%+ sapota pulp 30%
\( T_4 \) - Guava pulp 60%+ sapota pulp 40%
\( T_5 \) - Guava pulp 50%+ sapota pulp 50%
\( T_6 \) - Guava pulp 40%+ sapota pulp 60%
T7 - Guava pulp 30%+ sapota pulp 70%
T8 - Guava pulp 20%+ sapota pulp 80%
T9 - Guava pulp 10%+ sapota pulp 90%
T10 - Sapota pulp 100%

2.1.2 Parameters studied

pH of guava-sapota cheese, TSS (°Brix), Acidity (%), Total sugar (%), Reducing sugars (%), Non-reducing sugars (%) and Ascorbic acid (mg/100 g) content were determined following the methods suggested by Association of Analytical chemists. Sensory evaluation was done by point hedonic scale in which 1 means dislike extremely, 2 means dislike very much, 3 means dislike moderately, 4 means dislike slightly, 5 means neither like nor dislike, 6 means likes slightly, 7 means like moderately, 8 means like very much and 9 means like extremely (Ranganna S). The total cost of production (INR) was recorded along with the selling price. The gross income is actually the selling price. The Net Income (INR) is determined by subtracting the selling price (INR) with the total cost of production.

2.2 Preparation of Guava-Sapota Cheese

Select firmly riped guava fruits wash with clean water and then cut into pieces. After that boil it with 300ml of water/kg of guava, till the pieces becomes soft then, either sieve in a muslin cloth or in a pulping machine to remove seeds and skin to make a fine pulp. Select fully riped sapota fruits, peel it and then remove the seeds after that cut into pieces and then grind the pieces to make the fine pulp. Mix the different proportions of guava and sapota pulp based on treatments and cook it for 5-10 min after that add sugar (400 g/kg of pulp), butter (45 g/kg of pulp) and citric acid (2 g/kg of pulp) to the pulp cooked till, until mixture become sufficiently thick, and then after removed from fire when mixture starts leaving side of the pan evenly distributed over butter coated tray and left for 3 hours to set cut into pieces, with a sharp knife prepackaged with butter paper and then packed in polythene. Stored at ambient temperature.

3. RESULTS AND DISCUSSION

The T.S.S. (Table 1) showed that there were significant differences among all the treatments during storage. There was subsequent increase in TSS content at different periods of storage. The highest score of TSS were found in T9 i.e 74.75, 74.94, 75.16 and 75.37, at initial, 30, 60, 90, days of storage respectively and minimum score was obtained in T0 i.e., 73.15, 73.24, 73.45 and 73.67. The total soluble solids content of value added Guava-Sapota blended cheese was showed increasing trend in all Guava-Sapota blended Cheese during storage. An increase in total soluble solids content of Guava-Sapota blended cheese may be possibly due to conversion of polysaccharides and starch etc, in to sugars. Chen and Zhang [9] Total Soluble Solids content of guava juice has also been reported to increase during storage. Shabi et al., [10] reported in Guava Cheese.

It is evident in Table 1 that in terms of Acidity (%) the lowest score of Acidity (0.40, 0.41, 0.44 and 0.46%) at Initial, 30, 60 and 90 days respectively after storage was observed in treatment T5 (Guava pulp 50% + Sapota pulp 50%), followed by treatment T8 (Guava pulp 20% + Sapota pulp 80%) with (0.41, 0.42, 0.45 and 0.47%) at Initial,30, 60 and 90 days after storage, whereas the maximum score was observed in treatment T0 (Guava pulp 100%) with (0.59, 0.61, 0.65 and 0.67%) during 90 days storage. The acidity (%) of Guava-Sapota cheese was showed increasing trend in all Guava-Sapota blended cheese during storage. An increase in acidity (%) of Guava-Sapota blended cheese during storage might be attributed to the chemical interaction between constituents of value added Guava-Sapota blended cheese induced by temperature and action of enzymes. Deka et al. [11], Nath and Yadav [12] and Jordana et al. [13] reported similar findings with lime-aonla blended RTS and with ginger-kinnow squash.

In terms of pH (Table 1) the maximum score of pH (5.27, 5.20, 5.16 and 5.07) at Initial, 30, 60 and 90 days respectively was observed in treatment T0, T3, T4, T5, T6, T7, T8, T9 and 73.67. The acidity (%)

90, days of storage respectively and minimum score was obtained in T0 i.e., 73.15, 73.24, 73.45 and 73.67. The total soluble solids content of value added Guava-Sapota blended cheese was showed increasing trend in all Guava-Sapota blended Cheese during storage. An increase in total soluble solids content of Guava-Sapota blended cheese may be possibly due to conversion of polysaccharides and starch etc, in to sugars. Chen and Zhang [9] Total Soluble Solids content of guava juice has also been reported to increase during storage. Shabi et al., [10] reported in Guava Cheese.

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In terms of pH (Table 1) the maximum score of pH (5.27, 5.20, 5.16 and 5.07) at Initial, 30, 60 and 90 days respectively was observed in treatment T5 (Guava pulp 50% + Sapota pulp 50%), followed by treatment T8 (Guava Pulp 20% + Sapota pulp 80%) with (5.18, 5.10, 5.06 and 5.03) during 90 days storage. The pH content of value added Guava-Sapota blended cheese was showed decreasing trend in all value added Guava-Sapota blended 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 Awad et al. [14] in guava, mango and banana cheese. Vinod et al. [15] in guava and cashew nut fruits.
In terms of Ascorbic acid (Table 2) the highest score of Ascorbic acid (118.82, 115.53, 110.22 and 107.96 mg/100 g) at Initial, 30, 60 and 90 days respectively was observed in treatment T0 (Guava pulp 100%), followed by treatment T1 (Guava pulp 90% + Sapota pulp 10%) with (115.71, 112.42, 107.84 and 101.76 mg/100 g) whereas the minimum score was observed in treatment T10 (Sapota pulp 100%) with (23.22, 19.55, 13.19 and 9.33 mg/100 g) during 90 days storage. The ascorbic acid content of Guava-Sapota blended cheese was showed decreasing trend in all Guava-Sapota blended cheese during 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 recorded the loss of ascorbic acid in fruit juice during storage Jakhar et al. [16] in guava and Barbados cherry RTS beverage, and Jawheer et al. [17] in guava jam.

In terms of Reducing Sugar (Table 2) the highest score of Reducing Sugar (3.93, 4.00, 4.10 and 4.18 %) at Initial, 30, 60 and 90 days respectively was observed in treatment T5 (Guava pulp 50% + Sapota pulp 50%), followed by treatment T8 (Guava pulp 80% + Sapota pulp 20%) with (3.73, 3.84, 3.93 and 4.02%) whereas the minimum score was observed in treatment T9 (Guava pulp 100%) with (2.44, 2.54, 2.63 and 2.73%) during 90 days storage. The Reducing Sugar content of Guava-Sapota blended cheese was showed increasing trend in all Guava-Sapota blended Cheese during 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 et al. [11], Nath and Yadav, [12] and reported similar finding with lime-aonla blended RTS and with ginger-kinnow squash.

In terms of Non-reducing sugars (Table 2) the highest score of non-reducing sugar (5.75, 5.79, 5.86, and 5.89%) at Initial, 30, 60 and 90 days respectively was observed in treatment T5 (Guava pulp 50% + Sapota pulp 50%), followed by treatment T8 (Guava pulp 20% + Sapota pulp 80%) with (5.66, 5.69, 5.74 and 5.79 %) whereas the minimum score was observed in treatment T0 (Guava pulp 100%) with (4.75, 4.79, 4.83 and 4.87%) during 90 days storage. The non-reducing sugar content of Guava-Sapota blended Cheese was showed increasing trend in all Guava-Sapota blended Cheese during storage due to increase in time interval and temperature. Kumar et al., [18] and Shabi et al., [10] reported similar finding with Guava Cheese.

In terms of total sugars (Table 2) the maximum score of total sugar (9.07, 9.16, 9.23 and 9.28) at Initial, 30, 60 and 90 days respectively was observed in treatment T5 (Guava pulp 50% + Sapota pulp 50%), followed by treatment T8 (Guava Pulp 20% + Sapota pulp 80%) with (8.96, 9.05, 9.13 and 9.19) whereas the minimum score was observed in treatment T0 (Guava pulp 100%) with (7.84, 7.94, 8.01 and 8.06) during 90 days storage. The total sugar content of Guava-Sapota blended cheese was showed increasing trend in all different Guava-Sapota blended Cheese preserve and sugar levels concentration during storage. The result showed a progressive 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 their conversion into sample sugars. The similar findings reported by Deka et al. [11] and Ahmad et al. [19] for lime-aonla blended RTS and Bons et al. [20] for RTS beverages prepared from guava-papaya.

In terms of Score for colour and appearance (Table 3) the maximum score of colour and appearance (8.52, 8.40, 8.34 and 8.20) at Initial, 30, 60 and 90 days respectively was observed in treatment T5 (Guava 50% + Sapota 50%), followed by treatment T8 (Guava Pulp 20% + Sapota pulp 80%) with (8.46, 8.37, 8.32, and 8.19) whereas the minimum score was observed in treatment T0 (Guava pulp 100%) with (6.85, 6.59, 6.39 and 6.32) during 90 days storage. The colour and appearance of Value added Guava-Sapota blended Cheese was showed decreasing trend in all value added Guava-Sapota blended Cheese during storage due to increase in time interval, temperature and action of enzymes Sinha M and Mishra S [21].

In terms of flavor and taste (Table 3) the highest score of flavor and taste (8.47, 8.35, 8.20 and 8.11) at Initial, 30, 60 and 90 days respectively was observed in treatment T5 (Guava pulp 50% + Sapota pulp 50%), followed by treatment T8 (Guava pulp 20% + Sapota pulp 80%) with (8.46, 8.26, 8.13 and 8.04) whereas the minimum score was observed in treatment T0 (Guava pulp 100%) with (6.89, 6.68, 6.53 and 6.40) during 90 days storage. The taste and flavour of Value added Guava-Sapota blended Cheese was showed decreasing trend in all value added Guava-Sapota blended Cheese during storage.
| Treatment Symbol | Treatment Details | Total Soluble Solids (Brix) | Acidity (%) | pH (%) |
|------------------|-------------------|-----------------------------|-------------|--------|
|                  |                   | Initial          | 30 DAS   | 60 DAS | 90 DAS | Initial          | 30 DAS   | 60 DAS | 90 DAS | Initial          | 30 DAS   | 60 DAS | 90 DAS |
| T<sub>0</sub>    | Guava pulp 100%   | 73.15            | 73.24    | 73.45  | 73.67  | 0.59              | 0.61     | 0.65  | 0.67  | 4.16              | 4.10     | 4.03  | 3.96  |
| T<sub>1</sub>    | Guava pulp 90%+ Sapota pulp 10% | 73.33       | 73.53    | 73.74  | 73.96  | 0.58              | 0.60     | 0.63  | 0.66  | 4.23              | 4.20     | 4.14  | 4.08  |
| T<sub>2</sub>    | Guava pulp 80%+ Sapota pulp 20% | 73.54       | 73.76    | 73.96  | 74.16  | 0.56              | 0.58     | 0.60  | 0.64  | 4.54              | 4.50     | 4.44  | 4.37  |
| T<sub>3</sub>    | Guava pulp 70%+ Sapota pulp 30% | 73.76       | 73.95    | 74.14  | 74.36  | 0.53              | 0.55     | 0.57  | 0.59  | 4.41              | 4.37     | 4.30  | 4.24  |
| T<sub>4</sub>    | Guava pulp 60%+ Sapota pulp 40% | 73.82       | 74.02    | 74.24  | 74.46  | 0.51              | 0.53     | 0.55  | 0.58  | 4.37              | 4.30     | 4.24  | 4.17  |
| T<sub>5</sub>    | Guava pulp 50%+ Sapota pulp 50% | 74.75       | 74.94    | 75.16  | 75.37  | 0.40              | 0.41     | 0.44  | 0.46  | 5.27              | 5.20     | 5.16  | 5.07  |
| T<sub>6</sub>    | Guava pulp 40%+ Sapota pulp 60% | 74.26       | 74.44    | 74.66  | 74.87  | 0.49              | 0.51     | 0.54  | 0.57  | 4.97              | 4.90     | 4.83  | 4.76  |
| T<sub>7</sub>    | Guava pulp 30%+ Sapota pulp 70% | 74.56       | 74.73    | 74.95  | 75.14  | 0.42              | 0.44     | 0.46  | 0.48  | 4.86              | 4.80     | 4.75  | 4.67  |
| T<sub>8</sub>    | Guava pulp 20%+ Sapota pulp 80% | 74.65       | 74.86    | 75.07  | 75.26  | 0.41              | 0.42     | 0.45  | 0.47  | 5.18              | 5.10     | 5.06  | 4.98  |
| T<sub>9</sub>    | Guava pulp 10%+ Sapota pulp 90% | 73.95       | 74.13    | 74.35  | 74.56  | 0.44              | 0.46     | 0.48  | 0.50  | 4.75              | 4.71     | 4.65  | 4.60  |
| T<sub>10</sub>   | Sapota pulp 100% | 74.43        | 74.64    | 74.86  | 75.04  | 0.45              | 0.47     | 0.50  | 0.53  | 4.67              | 4.62     | 4.56  | 4.50  |
| **F-Test**       |                   |                 |          |        |        | **SE(d)**         |          |        |        | **C.V.**         |          |        |
|                  |                   |                 |          |        |        | **C.D. at 5%**    |          |        |        |                   |          |        |
| **SE(d)**        | S                 | S               | S       | S      | S      | S                 | S        | S     | S     | S                 | S        | S     | S     |
| **C.V.**         | 0.023             | 0.017           | 0.018   | 0.013  | 0.008  | 0.008             | 0.012    | 0.008 | 0.012 | 0.008             | 0.01     | 0.008 |
| **C.D. at 5%**   | 0.047             | 0.035           | 0.037   | 0.037  | 0.027  | 0.027             | 0.017    | 0.017 | 0.017 | 0.026             | 0.017    | 0.017 | 0.017 |
Table 2. Ascorbic acid and total different sugars of guava-sapota blended cheese

| Treatment symbol | Treatment details | Ascorbic acid (mg/100 g) | Reducing sugars (%) | Non-reducing sugars (%) | Total sugars (%) |
|------------------|-------------------|--------------------------|---------------------|-------------------------|-----------------|
|                  |                   | 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 |
| T0               | Guava pulp 100%   | 118.82 115.53           | 110.22 107.96       | 2.44 2.54 2.63           | 4.75 4.79 4.83 |
| T1               | Guava pulp 90%+ Sapota pulp 10% | 115.71 112.42           | 107.84 101.76       | 2.62 2.73 2.82           | 4.86 4.89 4.94 |
| T2               | Guava pulp 80%+ Sapota pulp 20% | 106.61 102.35           | 97.64 92.55         | 2.70 2.80 2.90           | 4.97 5.00 5.05 |
| T3               | Guava pulp 70%+ Sapota pulp 30% | 102.56 97.28            | 93.94 88.76         | 2.83 2.95 3.03           | 5.08 5.12 5.16 |
| T4               | Guava pulp 60%+ Sapota pulp 40% | 92.73 88.37            | 82.54 78.95         | 3.10 3.20 3.30           | 5.16 5.18 5.25 |
| T5               | Guava pulp 50%+ Sapota pulp 50% | 83.72 79.55            | 73.43 69.94         | 3.93 4.00 4.10           | 5.75 5.79 5.86 |
| T6               | Guava pulp 40%+ Sapota pulp 60% | 71.86 67.61            | 61.22 57.42         | 3.30 3.41 3.50           | 5.33 5.37 5.42 |
| T7               | Guava pulp 30%+ Sapota pulp 70% | 63.62 55.93            | 50.74 45.64         | 3.41 3.52 3.61           | 5.48 5.52 5.57 |
| T8               | Guava pulp 20%+ Sapota pulp 80% | 52.32 48.75            | 43.85 38.84         | 3.73 3.84 3.93           | 5.66 5.69 5.74 |
| T9               | Guava pulp 10%+ Sapota pulp 90% | 36.61 32.55            | 27.95 25.84         | 3.52 3.63 3.65           | 5.27 5.32 5.38 |
| T10              | Sapota pulp 100%  | 23.22 19.55            | 13.19 9.33          | 3.60 3.71 3.80           | 5.53 5.56 5.63 |

F-Test

|                  | S | S | S | S | S | S | S | S | S | S | S | S |
|------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| SE(d)            | 1.284 | 0.057 | 0.011 | 0.02 | 0.017 | 0.019 | 0.025 | 0.018 | 0.010 | 0.015 | 0.008 | 0.011 | 0.009 | 0.008 | 0.008 | 0.008 |
| C.V.             | 1.993 | 0.093 | 0.019 | 0.037 | 0.65 | 0.697 | 0.893 | 0.636 | 0.226 | 0.354 | 0.188 | 0.242 | 0.125 | 0.116 | 0.118 | 0.117 |
| C.D. at 5%       | 2.679 | 0.118 | 0.023 | 0.041 | 0.035 | 0.039 | 0.052 | 0.038 | 0.02 | 0.032 | 0.017 | 0.022 | 0.018 | 0.017 | 0.017 | 0.017 |
Table 3. Organoleptic score of value added Guava-Sapota blended cheese during storage

| Treatment symbol | Treatment details | Colour and appearance | Flavour and taste | Texture | Overall acceptability |
|------------------|-------------------|------------------------|------------------|---------|-----------------------|
|                  |                   | 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 |
| T0               | Guava pulp 100%   | 6.85 6.59 6.39 6.32 6.89 6.68 6.53 6.40 6.94 6.75 6.56 6.36 6.91 6.76 6.54 6.45 |
| T1               | Guava pulp 90%+   | 6.91 6.73 6.49 6.41 7.36 7.27 7.05 6.95 7.40 7.24 7.14 7.03 7.39 7.33 7.22 7.09 |
|                  | Sapota pulp 10%   |                        |                  |         |                       |
| T2               | Guava pulp 80%+   | 7.14 7.06 6.88 6.71 7.55 7.43 7.29 7.23 7.51 7.33 7.23 7.08 7.61 7.44 7.32 7.24 |
|                  | Sapota pulp 20%   |                        |                  |         |                       |
| T3               | Guava pulp 70%+   | 7.34 7.22 7.01 6.95 7.60 7.49 7.36 7.26 7.63 7.45 7.34 7.23 7.72 7.62 7.43 7.36 |
|                  | Sapota pulp 30%   |                        |                  |         |                       |
| T4               | Guava pulp 60%+   | 7.45 7.34 7.15 7.05 7.82 7.61 7.55 7.46 8.34 8.23 8.09 8.04 7.84 7.73 7.53 7.40 |
|                  | Sapota pulp 40%   |                        |                  |         |                       |
| T5               | Guava pulp 50%+   | 8.52 8.40 8.34 8.20 8.47 8.35 8.20 8.11 8.60 8.43 8.36 8.17 8.65 8.43 8.25 8.14 |
|                  | Sapota pulp 50%   |                        |                  |         |                       |
| T6               | Guava pulp 40%+   | 8.01 7.96 7.85 7.75 8.22 8.14 8.04 7.95 8.26 8.05 7.95 7.71 8.40 8.34 8.14 8.00 |
|                  | Sapota pulp 60%   |                        |                  |         |                       |
| T7               | Guava pulp 30%+   | 7.74 7.54 7.30 7.89 8.09 7.98 7.93 7.82 7.89 7.71 7.63 7.47 8.26 8.15 8.04 7.93 |
|                  | Sapota pulp 70%   |                        |                  |         |                       |
| T8               | Guava pulp 20%+   | 8.46 8.37 8.32 8.19 8.46 8.26 8.13 8.04 8.39 8.33 8.26 8.06 8.53 8.38 8.19 8.08 |
|                  | Sapota pulp 80%   |                        |                  |         |                       |
| T9               | Guava pulp 10%+   | 8.41 8.29 8.21 8.13 7.93 7.75 7.54 7.45 7.81 7.67 7.43 7.31 8.04 7.95 7.91 7.79 |
|                  | Sapota pulp 90%   |                        |                  |         |                       |
| T10              | Guava pulp 10%+   | 8.33 8.24 8.15 8.05 8.29 8.13 8.01 7.90 7.71 7.54 7.30 7.23 7.93 7.80 7.71 7.49 |
|                  | Sapota pulp 100%  |                        |                  |         |                       |
| F-Test           |                   | S S S S S S S S S S S S S S S S |         |         |                       |
| SE(d)            |                   | 0.023 0.024 0.022 0.140 0.019 0.023 0.019 0.021 0.019 0.02 0.026 0.034 0.021 0.018 0.014 0.021 |
| C.V.             |                   | 0.359 0.389 0.366 2.313 0.292 0.357 0.311 0.341 0.301 0.317 0.422 0.555 0.319 0.280 0.228 0.337 |
| C.D. at 5%       |                   | 0.047 0.05 0.047 0.293 0.039 0.047 0.04 0.044 0.04 0.042 0.054 0.07 0.043 0.037 0.030 0.043 |
Table 4. Economic analysis of preparation of Guava-sapota blended cheese

| Treatment No. | Treatment                                      | Total cost (Rs.) | Guava and Sapota cheese output (kg) | Selling rate (Rs./kg) | Gross return (Rs.) | Net return (Rs.) | Benefit cost ratio |
|---------------|-----------------------------------------------|------------------|------------------------------------|-----------------------|--------------------|------------------|-------------------|
| T0            | Guava pulp 100%                               | 279.50           | 1.250                              | 380.00                | 475.00             | 195.50           | 1:1.69            |
| T1            | Guava pulp 90%+ sapota pulp 10%               | 283.50           | 1.250                              | 430.00                | 537.50             | 254.00           | 1:1.89            |
| T2            | Guava pulp 80%+ sapota pulp 20%               | 287.50           | 1.250                              | 430.00                | 537.50             | 250.00           | 1:1.86            |
| T3            | Guava pulp 70%+ sapota pulp 30%               | 291.50           | 1.250                              | 430.00                | 537.50             | 246.00           | 1:1.84            |
| T4            | Guava pulp 60%+ sapota pulp 40%               | 295.50           | 1.250                              | 450.00                | 562.50             | 267.00           | 1:1.90            |
| T5            | Guava pulp 50%+ sapota pulp 50%               | 299.50           | 1.250                              | 500.00                | 625.00             | 325.50           | 1:2.08            |
| T6            | Guava pulp 40%+ sapota pulp 60%               | 303.50           | 1.250                              | 450.00                | 562.50             | 259.00           | 1:1.85            |
| T7            | Guava pulp 30%+ sapota pulp 70%               | 307.50           | 1.250                              | 450.00                | 562.50             | 255.00           | 1:1.82            |
| T8            | Guava pulp 20%+ sapota pulp 80%               | 311.50           | 1.250                              | 480.00                | 600.00             | 288.50           | 1:1.92            |
| T9            | Guava pulp 10%+ sapota pulp 90%               | 315.50           | 1.250                              | 450.00                | 562.50             | 247.00           | 1:1.78            |
| T10           | Sapota pulp 100%                              | 319.50           | 1.250                              | 450.00                | 562.50             | 243.00           | 1:1.76            |
due to increase in time interval, temperature and action of enzymes. Similar results previously also reported by Pereir et al., [22] in case of guava jam.

In terms of texture (Table 3) the highest score of texture (8.60, 8.43, 8.36 and 8.17) at Initial, 30 60 and 90 days respectively was observed in treatment T5 (Guava pulp 50% + Sapota pulp 50%), followed by treatment T8 (Guava pulp 20% + Sapota pulp 80%) with (8.39, 8.33, 8.26 and 8.06) whereas the minimum score was observed in treatment T0 (Guava pulp 100%) with (6.94, 6.75, 6.56 and 6.36) during 90 days storage. The texture is directly related to the setting of product and setting is a result of good pectin content Guava pulp 50% + Sapota pulp 50% was judged best for consistency of value added Guava-Sapota cheese from it. Similar results were reported by Kumar and Sagar, [23] in case of guava jam.

In terms of overall acceptability (Table 3) the highest score of overall acceptability (8.65, 8.43, 8.25 and 8.14) at Initial, 30, 60 and 90 days respectively was observed in treatment T5 (Guava pulp 50% + Sapota pulp 50%), followed by treatment T8 (Guava pulp 20% + Sapota pulp 80%) with (8.53, 8.38, 8.19 and 8.08) whereas the minimum score was observed in treatment T0 (Guava pulp 100%) with (6.91, 6.76, 6.54 and 6.45) 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 Manivas sagan et al., [24] in guava cheese storage and Ahmad et al., [19] in Apple Cheese.

It was very clear in Table 4 that in terms of Economics the Cost Benefit Ratio showed that there were significant differences among the all the treatments in Cost Net Return, Gross Return and Cost Benefit Ratio of different treatments. The highest profit was recorded in treatment T5 (Guava pulp 50% + Sapota pulp 50%) with a Gross Return of Rs. 625.00/-, Net Return of Rs.325.50/- and Cost Benefit ratio of 1: 2.08. The highest benefit was followed by treatment T8 (Guava pulp 20% + Sapota pulp 80%) with a Gross Return of Rs.600.00/-, Net Return of Rs.288.50/- and a Cost Benefit ratio of 1:1.92. The lowest profit was recorded in treatment T0 (Guava pulp 100%) with a Gross Return of Rs.475.00/-, Net Return of Rs.195.50/- and a Cost Benefit ratio of 1:1.69.

4. CONCLUSION

Based on research of the present experiment it is concluded that treatment T5 (Guava pulp 50% + Sapota pulp 50%) was found superior with respect to physico-chemical parameters (AOAC,1995) like Total Soluble Solids, Acidity, pH, Ascorbic acid, Reducing Sugar, Non Reducing Sugar, Total Sugar and organoleptic properties (Rangana S. 2001) like Colour and Appearance, Flavour and Taste, Texture and Overall Acceptability and also in terms of cost benefit ratio the highest net return, Cost Benefit Ratio was found in T5 (Guava pulp 50% + Sapota pulp 50%).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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