Effect of Different Concentration of Guava Pulp, Apple Pulp and Sugar Solution on the Shelf Stability of Blend Leather Storage at Ambient Temperature

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Abstract

The aim of the study was to evaluate a suitable combination of guava pulp, Apple pulp and sucrose solution for the preparation of guava and apple blend leather, stored at ambient temperature. The treatments were T0, T1 and T2. The samples were wrapped in the aluminum foil and evaluation was carried out for total period of 90 days. Physiochemical analysis, acidity, pH, brix and sensory characteristics of color, taste, texture and overall acceptability (using Larmond scale) were evaluated at 15 days interval. The TSS of guava and apple blend pulp was 8 brix0 when sucrose solution was added in different ratio. Then TSS of guava and apple blend leather was increased from 56.53g to 58.37a during storage. Maximum increased was observed T1 (20%), while lowest value was observed in followed by T0 (13.93%). The pH of guava and apple blend pulp was 4, then the pH of guava and apple blend leather was decreased from 3.86g to 3.68a for the period of storage. Maximum reduced was perceived in T1 (5.03%), in compare minimum fall was observed in T0 (4.13%). The Titratable acidity of guava and apple blend leather was increased from 1.27g to 1.46a for the period of storage. Supreme increased was perceived in T0 (19.47%), while lowest raise was observed in T2 (15.38%). The storage intervals had effect on the mean scores for organolyptic assessment. Mean scores of juries for the color of guava and apple blend leather was reduced from 7.33g to 5.27a for the period of storage. Supreme decreased was perceived in T0 (41.67%), while lowest fall was observed in T2 (18.75%). Mean totals of juries for the taste of guava and apple blend leather was reduced from 6.83g to 4.80a for the period of storage. Maximum reduced was detected in T0 (44.4%), while lowest fall was observed in T2 (21.25%). Mean scores of judges for the texture of guava and apple blend leather was reduced from 700g to 5.07a for the period of storage. Maximum decreased was perceived in T0 (38%), while lowest fall was observed in T0 (18.75%). Mean scores of juries for the overall acceptability of guava and apple blend leather was reduced from 7.07g to 5.03a throughout the storage. Maximum decreased was perceived in T0 (42.31%), while lowest fall was observed in T2 (20%). Statistically result was showed that the treatment T2 was found most acceptable both Physiochemically and organoleptically.

Keywords: Apple pulp; Guava pulp; Storage; Physico-chemical analysis; Organolyptic analysis

Introduction

The main drawback of sugar (in sucrose) is its continuous degradation in to its fragments; glucose (dextrose) and fructose (levulose). This problem takes place in soft drinks which leads to changes in taste and flavor of fresh and aged beverages [1].

In 1915, the term stabilizer was consigned to a set of materials that were recognized as colloids, binders, holders, and fillers. They were also known by the name of improvers, a word used to denote enzymes or blends of enzymes and gums. Colloids, hydrocolloids, and gums are additional names of these materials, which specify that these ingredients are macromolecules, mostly polysaccharides, which have the capability to interact with water. In a mixture, the interaction with water also provides these substances, a pathway to interfere with lipids and proteins. Many substances have been used as stabilizers e.g. guar gum (E412), sodium carboxy methyl cellulose (CMC) (E466), gelatin (E441), xanthan (E415), carrageenan (Irish moss) (E407), locust bean gum (carob bean gum) (LBG) (E410), alginates and microcrystalline cellulose (Cellulose gel) (MCC) (E460) [2]. It has originated from Mexico to Peru. Guava is produced in all the tropics and subtropics of the world including Asia, Australia and America [3].

The fruit bars are possibly reflected a good food from health point of view as related to former confectionaries and candies usually in the form of thin leathery sheets, but they can take any form i.e. cubical or rectangular shape [4]. On the basis of water activity level, fruit leathers are classified into and softy texture. They contain acids and sugar naturally, while humectants are purposely added to minimize water activity and to provide softness even at lower moisture levels [5].

Ayub et al. [6] investigate the individual and combine effect of caloric sweeteners (sucrose, glucose and fructose) non caloric sweeteners (saccharine, cyclamate and aspartame), antioxidants (citric acid and ascorbic acid), chemical preservatives (potassium metabisulphite and potassium sorbate) and water activity of dehydrated guava slices. They resulted that different dilutions of caloric and non-caloric sweeteners were used for osmotically dehydration of guava slices. The analysis showed that sucrose: potassium metabisulphite, citric acid and ascorbic acid formed top quality product, which have low water activity and best sensory attributes.

Wandi and Cheman [7] developed three formulae of durian...
leather and evaluated for its microbiological, physicochemical, sensory characteristics and storage constancy. They resulted that the vitamin C, water activity \( (a_w) \) and caloric content was increased. After storage of 12 weeks, all durian leather formulations were constant and revealed lower mold populations. Sensory evaluation of the study concluded that the three formulations showed acceptability in all attributes studied.

Uddin et al. [8] investigated ascorbic acid (vitamin C) retention and effects of different temperatures (30°C, 40°C, 50°C) and water activity \( (a_w) \) (0.43, 0.75, 0.84, 0.97) in dried guava during storage. They resulted that the degradation of ascorbic acid follows a pseudo-first-order reaction. As soon as storage circumstances were changed from \( a_w = 0.43–0.97 \), the ratio constant increased about four to six fold. The level constants and conforming water activity values are related by polynomial equation of second order. They also concluded that the initiation energy for ascorbic acid degradation is originated within the range of 3.4 to 11.0 kcal/mol. An empirical equation that is based on initiation energy for ascorbic acid degradation is originated within the range of 3.4 to 11.0 kcal/mol.
Statistical analyses: All the data regarding storage interval and treatments were statistically investigated by CRD 2 factorial as recommended by Gomez and Gomez and the means were separated by applying least significant difference (LSD) Test at 5% possibility level as defined by Steel and Torrie [10].

Results and Discussion

Guava and apple blend bar was prepared by different level of sucrose glucose mixture and guar gum. The samples were analyzed physicochemical for TSS, pH, acidity, ascorbic acid, reducing and non-reducing sugar, moisture, ash, water activity, TS and microbial count and sensory characteristics for color, texture, taste and overall acceptability. These parameters are discussed below.

TSS

The TSS of guava and apple pulp was 8%, while the initial TSS of guava and apple blend leather of T_0 to T_2 was 14.00, 77.10 and 78.50 which was gradually increased to 15.70, 79.00 and 80.40 correspondingly during storage. The mean values for intervals were significantly (P<0.05) intensified from 56.53g to 58.37a for the period of storage. Extreme mean values for treatments were perceived in T_1 (79.49a), but in contrast the lowest mean values were registered in T_0 (14.91f). During storage the highest raise in TSS was recorded in T_1 (79.49a), but in contrast the deepest mean values were registered in T_0 (13.93%), (Table 1).

The statistical study presented significantly (P<0.05) results which may be due to the effect of treatment and storage intervals on the acidity of guava leather during storage. The mean were separated by applying LSD test at 5% probability level (Table 2). Phimpharian et al. [11] reported an increased in TSS (from 82.42-86.9).

Titratable acidity

The acidity of guava pulp was 0.256, while the initial acidity of guava leather of T_0 to T_2 was 1.22, 1.24 and 1.32 which was gradually increased to 1.39, 1.46 and 1.56 similarly for the period of storage. The mean values for intervals were significantly (P<0.05) proliferated from 1.27g to 1.64a for the period of storage. Supreme mean values for treatments were perceived in T_1 (1.45a), but in contrast the lowest mean values were listed in T_0 (1.30f). For the period of storage the highest raise in acidity was recorded in T_0 (15.38%), while deepest raise was perceived in T_2 (19.47%) (Table 2).

The statistical study presented significantly (P<0.05) results which may be due to the effect of treatment and storage intervals on the acidity of guava leather during storage. The mean were separated by applying LSD test at 5% probability level (Table 2). Phimpharian et al. [11] reported an increased in acidity during storage of mango sheet (from 0.3-0.75).

Sensory evaluation

The guava bar was analyzed for color, texture, taste and overall acceptability. All the data regarding storage interval and treatments were statistically investigated by CRD 2 factorial as recommended by Steel and Torrie [10].

| Treatments | Initial | 15 | 30 | 45 | 60 | 75 | 90 | % Increase | Mean |
|------------|--------|----|----|----|----|----|----|-----------|------|
| T_0        | 1.22   | 1.24 | 1.27 | 1.30 | 1.33 | 1.36 | 1.39 | 12.23 | 1.30f |
| T_1        | 1.24   | 1.29 | 1.33 | 1.36 | 1.39 | 1.43 | 1.46 | 15.07 | 1.36e |
| T_2        | 1.36   | 1.39 | 1.42 | 1.45 | 1.48 | 1.51 | 1.54 | 11.69 | 1.45a |
| Mean       | 1.27g  | 1.31f | 1.34e | 1.37d | 1.40c | 1.43b | 1.46a |       |      |

Values having different alphabetical letters are significantly (P<0.05) reported in Table 2: Effect of storage period and treatments on Titratable acidity (%) of guava and apple blend bar.

| Treatments | Storage Interval (Days) | Mean |
|------------|-------------------------|------|
| T_0        | 0 15 30 45 60 75 90 % Decrease | Mean |
| T_0        | 3.84 3.81 3.78 3.75 3.73 3.70 3.67 | 3.75d |
| T_1        | 3.86 3.82 3.79 3.77 3.74 3.70 3.67 | 3.76c |
| T_2        | 3.87 3.85 3.83 3.80 3.77 3.74 3.71 | 4.13 3.80a |
| Mean       | 3.86g 3.83f 3.80e 3.77d 3.75c 3.71b 3.68a |      |

Values having different alphabetical letters are significantly (P<0.05) reported in Table 3: Effect of storage period and treatments on pH of guava and apple blend bar.
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| Treatments | Storage Interval (Days) | Mean |
|------------|-------------------------|------|
| T<sub>0</sub> | 0 | 7.33g |
| T<sub>1</sub> | 15 | 7.00f |
| T<sub>2</sub> | 30 | 6.60e |
| T<sub>3</sub> | 45 | 6.27d |
| T<sub>4</sub> | 60 | 5.93c |
| T<sub>5</sub> | 75 | 5.63b |
| T<sub>6</sub> | 90 | 5.27a |

Values having different alphabetical letters are significantly (P<0.05) significant.

Table 4: Effect of storage period and treatments on color of guava and apple blend bar.

| Treatments | Storage Interval (Days) | Mean |
|------------|-------------------------|------|
| T<sub>0</sub> | 0 | 6.83g |
| T<sub>1</sub> | 15 | 6.40f |
| T<sub>2</sub> | 30 | 6.07e |
| T<sub>3</sub> | 45 | 5.77d |
| T<sub>4</sub> | 60 | 5.43c |
| T<sub>5</sub> | 75 | 5.10b |
| T<sub>6</sub> | 90 | 4.80a |

Values having different alphabetical letters are significantly (P<0.05) significant.

Table 5: Effect of storage period and treatments on texture of guava and apple blend bar.

| Treatments | Storage Interval (Days) | Mean |
|------------|-------------------------|------|
| T<sub>0</sub> | 0 | 4.50 |
| T<sub>1</sub> | 15 | 4.10 |
| T<sub>2</sub> | 30 | 3.70 |
| T<sub>3</sub> | 45 | 3.50 |
| T<sub>4</sub> | 60 | 3.30 |
| T<sub>5</sub> | 75 | 3.20 |
| T<sub>6</sub> | 90 | 3.00 |

Mean 7.20a

Values having different alphabetical letters are significantly (P<0.05) significant.

Table 6: Effect of storage period and treatments on texture of guava and apple blend bar.

acceptability at an interval of 15 days for a whole period of 90 days. The sensory analysis was approved through Larmond scale (hedonic 9 point) by 15 judge’s panel having knowledge about sensory evaluation. These evaluation are as under [14].

Color

Initially the mean score of judges for color of guava bar of T<sub>0</sub> to T<sub>2</sub> was, 6.8 and 8 which was gradually decreased to 3.5, 6.1 and 6.5 similarly for the period of storage. The mean values for intervals were significantly (P<0.05) intensified from 7.33g to 5.27a for the period of storage. Supreme mean values for treatments were perceived in T<sub>2</sub> (7.2571a), but in contrast the lowest mean values were listed in T<sub>0</sub> (4.7000f). For the period of storage the highest fall in color was recorded in T<sub>0</sub> (41.67%), while lowest fall was observed in T<sub>2</sub> (18.75%) (Table 5).

The statistical study presented significantly (P<0.05) results which may be due to the effect of treatment and storage intervals on the texture of guava leather for the period of storage. The mean were separated by applying LSD test at 5% probability level (Table 4). The texture of fruit leathers is mostly affected by their moisture content and drying temperatures by Che-man et al. [17].

Taste

Initially the mean score of judges for taste of guava bar of T<sub>0</sub> to T<sub>2</sub> was 4.5, 8 and 8 which was gradually decreased to 2.50, 5.60 and 6.30 similarly for the period of storage. The mean values for intervals were significantly (P<0.05) intensified from 6.83g to 4.80a for the period of storage. Supreme mean values for treatments were perceived in T<sub>2</sub> (7.1143a), but in contrast the deepest mean values were registered in T<sub>0</sub> (3.4857d). During storage the highest fall in taste was recorded in T<sub>0</sub> (44.44%), while lowest fall was observed in T<sub>2</sub> (21.25%) (Table 5).

The statistical study presented significantly (P<0.05) results which may be due to the effect of treatment and storage intervals on the taste of guava leather for the period of storage. The mean were separated by applying LSD test at 5% probability level (Table 4). The texture of fruit leathers is mostly affected by their moisture content and drying temperatures by Che-man et al. [17].

Overall acceptability

Primarily the mean score of juries for overall acceptability of guava bar of T<sub>0</sub> to T<sub>2</sub> was 5.2, 8 and 8 which was gradually decreased to 3, 5.7 and 6.4 similarly for the period of storage. The mean values for intervals were significantly (P<0.05) intensified from 7.07g to 5.03a for the period of storage. Supreme mean values for treatments were perceived in T<sub>2</sub> (7.20a), but in contrast the deepest mean values were listed in T<sub>0</sub> (4.06d). During storage the highest fall in overall acceptability was recorded in T<sub>0</sub> (42.31%), while lowest fall was observed in T<sub>2</sub> (20.00%) (Table 6).
The statistical study presented significantly (P<0.05) results which may be due to the effect of treatment and storage intervals on the overall acceptability of guava leather for the period of storage. The mean were separated by applying LSD test at 5% probability level (Tables 6 and 7). Overall acceptability generally related to all sensory attributes in all food products. It is stated that the suitability of fruits and vegetables is influenced by their aroma by Karmas and Harris. Sharma et al. [19] noticed a decreased in overall acceptability during storage of apricot fruit bar (from 7.8-7.2).

**Table 7**: Effect of storage period and treatments on overall acceptability of guava and apple blend bar.

| Treatments | Storage Interval (Days) | Mean |
|------------|-------------------------|------|
| T3         | 0 15 30 45 60 75 90    |      |
| T1         | 5.2 4.8 4.3 4 3.7 3.4 3 | 42.31 | 4.06 d |
| T2         | 8 7.5 7.1 6.7 6.4 6 5.7 | 28.75 | 6.77 c |
| Mean       | 7.07g 6.7f 6.30e 5.97d 5.67c 5.37b 5.03a |      |

Values having different alphabetical letters are significantly (P<0.05) not same

**Conclusion and Recommendations**

In present study guava bar was prepared by using different level of sucrose glucose mixture with guar gum. The samples were analyzed for physicochemical, microbiologically and sensory. From this study physicochemically the samples GL2 prepared by sucrose: glucose (7:3) followed by GL1 prepared by sucrose (10:0) showed best result, while GL1 prepared by guava pulp and followed by GL2 prepared by sucrose: glucose (50:50) showed lowest result. Sensory and microbiologically GL1 followed by GL2 showed good result, while GL2 followed by GL1 showed lowest result.

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