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The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(7): 661-666

www.thepharmajournal.com
Received: 02-05-2023
Accepted: 06-06-2023

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Effect of different levels of sugar and citric acid on storage quality of guava fruit bar

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Abstract
An experiment entitled "Effect of different levels of sugar and citric acid on storage quality of guava fruit bar" was carried out during the year 2016-17 at Post Harvest Technology Laboratory, Section of Horticulture, College of Agriculture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola with the objectives to study the different recipes for preparation of guava fruit bar and to find out suitable recipe for guava fruit bar and to evaluate the chemical changes of guava fruit bar under ambient storage condition.

The experiment was conducted in RBD consisted of 10 treatments combinations. *viz*., T_1 (Guava pulp with 30% sugar + 1.5% citric acid), T_2 (Guava pulp with 30% sugar + 2% citric acid), T_3 (Guava pulp with 40% sugar + 1.5% citric acid), T_4 (Guava pulp with 40% sugar + 2% citric acid), T_5 (Guava pulp with 50% sugar + 1.5% citric acid), T_6 (Guava pulp with 50% sugar + 2% citric acid), T_7 (Guava pulp with 60% sugar + 1.5% citric acid), T_8 (Guava pulp with 60% sugar + 2% citric acid), T_9 (Guava pulp with 70% sugar + 1.5% citric acid) and T_{10} (Guava pulp with 70% sugar + 1.5% citric acid) which were replicated three times, to study the storability effect on guava fruit bar at ambient condition for 120 day of storage. The observations in respect of chemical analysis, microbial count and sensory evaluation were recorded periodically.

From the findings it was observed that, there was a gradual increase in TSS, acidity, TSS/acid ratio, reducing sugars, non-reducing sugars and total sugars content of guava fruit bar prepared with different recipes irrespective of storage period. However, ascorbic acid, phosphorus, calcium and p^H content of guava fruit bar decreased with the advancement of storage period of guava fruit bar prepared with different recipes. Minimum, change in p^H, TSS, acidity, TSS/acid ratio, reducing sugars, non-reducing sugars, total sugars, ascorbic acid, phosphorus and calcium in guava fruit bar were observed when bar prepared from guava pulp mixed with 50% sugar and 2% citric acid. The guava fruit bar prepared by using guava pulp with 50% sugar and 2% citric acid and stored at ambient storage condition remain better without spoilage at 120th day of storage.

Keywords: Guava, bar, citric acid, pulp, storage, sugar

Introduction
Guava, the poor man's fruit or "apple of tropics" is a popular tree fruit of the tropical and subtropical climate. The most important guava growing states in India are Madhya Pradesh, Maharashtra, Punjab, Karnataka, Uttar Pradesh and Bihar. Guava fruit consists of 20% peel, 50% flesh portion and seed core. The fruit has about 83% moisture and is an excellent source of ascorbic acid (228 mg/100 g) and pectin but has low energy (66 cal/100 g) and protein content (1%). The fruit is rich in minerals like phosphorous (23-37 mg/100 g), calcium (14-30 mg/100 g), iron (0.6-1.4 mg/100 g) as well as vitamins like niacin, panthotenic acid, thiamine, riboflavin, vitamin A (Bose *et al*. 1999) [3].

Guava are perishable fruit and are available as seasonal surpluses during certain parts of the year in different region and are wasted in large quantities due to absence of facilities and know-how for proper handling, distribution, marketing, and storage. Further more massive amounts of perishable fruits produced during a particular season results in glut in the market and become scarce during other seasons. Fruits for want of simple technologies of processing, preservation and transport to a various places of need, have a suffered post-harvest losses, estimated to nearly 35%. Only 1% of the total fruits and vegetables produced are processed in the 3000 food industries (Das, 1991) [5].

Dehydrated fruit processing is gaining importance now a-days due to long shelf life, light weight, better handling during export and providing variety to the consumers. The advantage is that during dehydration the moisture content is reduced greatly and the microorganisms like moulds and fungi do not thrive. This keeps the food for longer duration without spoilage.

Due to abundant availability of solar radiation, attention has been gradually diverting to utilize this renewable energy for a number of applications (Sarojini *et al.* 2009) [23].

Guava fruit can be processed and preserved as various forms such as juice, pulp, squash, bar, leather, nectar and RTS. Deterioration of pulp and quality of process during storage is mostly due to microbial spoilage and biochemical changes and therefore, keeping quality intact during storage is a challenge. Preservatives are used to increase the shelf life of the pulp and bar (Kalra and Revanthi, 1983; Sagar and Maini, 1993) [8, 21]. Fruit leathers or bars are dehydrated fruit based products. The destruction of original fruit structure by pureeing and restructuring in dehydrated sugar-acid- pectin gels called "fruit bars" provide attractive, coloured products, on which research is enhanced now-a- days. Fruit bar also allow left over ripe fruits to be preserved (Natalia *et al.* 2011) [15]. Fruit leathers are dried sheets of fruit pulp that have a soft, rubbery texture and sweet taste. They are produced by dehydrating of fruit puree into a leathery sheet (Raab and Oehler, 1999) [18].

The edible portion of fruit (one or more types) is pureed, mixed with other ingredients to improve its physico-chemical and sensory characteristics, heated, formed (flattened and shaped) and then dried on a flat trays until a cohesive fruit bar is obtained (Moyls, 1981 and Phimpharian *et al*. 2011) [14, 16]. The main advantage of making fruit bar is to preserve fruit by drying and hence, controlling post-harvest losses.

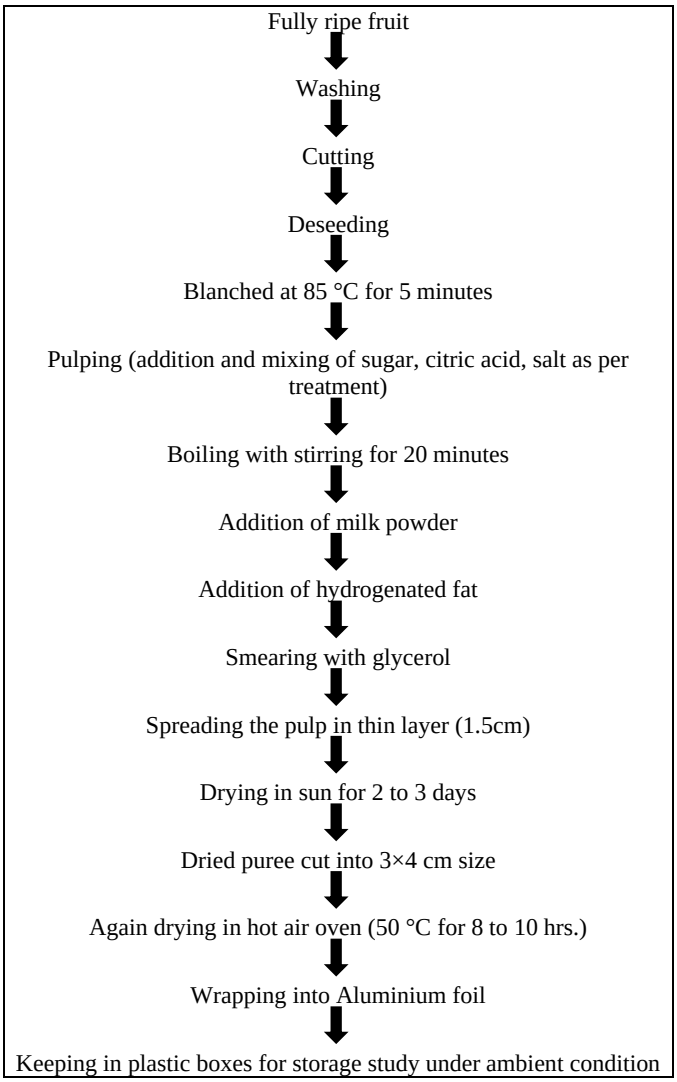
Guava fruit has considerable nutritional as well as medicinal properties. Fresh fruits are highly perishable and must be either marketed or processed immediately after harvesting, however, if they are gainfully utilized at the proper time it can become value added products. Thus, preparation guava pulp with simple technology and its utilization in preparation of fruit bar have a great scope.

Material and Method

The experiment entitled "Effect of different levels of sugar and citric acid on storage quality of guava fruit bar" was conducted at Post-harvest Technology Laboratory, Horticulture Section, College of Agriculture and Analytical Laboratory, Department of Horticulture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola during the year 2016-2017.The details of material used and methods adopted during the course of investigation are presented under the appropriate headings and sub headings.

Details of experiment

The experiment comprises of 10 treatments of different recipes *viz*., T_1: Guava pulp with 30% sugar + 1.5% citric acid, T_2: Guava pulp with 30% sugar + 2.0% citric acid, T_3: Guava pulp with 40% sugar + 1.5% citric acid, T_4: Guava pulp with 40% sugar + 2.0% citric acid, T_5: Guava pulp with 50% sugar + 1.5% citric acid, T_6: Guava pulp with 50% sugar + 2.0% citric acid, T_7: Guava pulp with 60% sugar + 1.5% citric acid, T_8: Guava pulp with 60% sugar + 2.0% citric acid, T_9: Guava pulp with 70% sugar + 1.5% citric acid, T_{10}: Guava pulp with 70% sugar + 2.0% citric acid laid out in Randomized Block Design (RBD) with three replications. Lalit cultivar is recipe for preparation of guava fruit bar and were wrapped in aluminium foil and kept in plastic boxes. The packed boxes were stored at ambient temperature ($30+2^0$C). Evaluation of chemical changes and sensory qualities were done at 30 days interval during storage up to 120 days.



Flow chart for guava fruit bar

Results and Discussion

Total Soluble Solids (°Brix)

The data presented in Table 1 (a) shows significant differences in total soluble solids of guava fruit bar among the different treatments at initial, 30th, 60th, 90th and 120 days of observation. In general, the total soluble solids of guava fruit bar were gradually increased in all the recipes. Minimum increase (from 71.80 to 72.51°B) in total soluble solids at 120 day of storage was observed in treatment T_6 (Guava pulp with 50% sugar + 2% citric acid) which was significantly superior than rest of all the treatment. It was followed by treatment T_8 (Guava pulp with 60% sugar + 2.0% citric acid) (from 72.99 to 73.85°B) T_5 (Guava pulp with 50% sugar + 1.5% citric acid) (from 71.85 to 72.73). However, the change in total soluble solids was found to be more (from 68.18 to 69.90°B) in treatment T_1 (Guava pulp with 30% sugar + 1.5% citric acid) followed by treatment T_2 (Guava fruit pulp with 30% sugar + 2% citric acid) (from 68.10 to 69.66°B) and T_3 (Guava fruit pulp with 40% sugar + 1.5% citric acid) (from 70.02 to 71.35°B).

From the above result it is observed in general that, there was progressive increase in TSS of guava fruit bar during storage period, which might be due to the renovation of starch and other insoluble carbohydrates into sugars and also due to the

loss of moisture content that tends to increase total soluble solids. The results mentioned above are conformity with the findings of various research workers. Sandhu *et al*. (2001) [22] noticed that guava leather when stored for 3 months, the TSS of the leather increased with increase of storage period. Jain and Nema (2007) [7] observed that, the pulp with more sugar significantly increased the TSS in the guava leather. Phimpharian *et al*. (2011) [16] reported an increase in TSS of pineapple leather. Khadatar (2012) [9] prepared jackfruit bar are reported that the TSS content of bar increased numerically from 65.99° B at the time of preparation to 67.33°B after 60 days of storage. Kuchi *et al*. (2014) [11] reported that TSS, were increased in the jelly bar stored in ambient condition. Safdar *et al*. (2014) [20] also reported gradual increase in TSS during storage period in guava leather. Khan *et al*. (2015) [10] reported that the TSS of guava and apple blend leather was increased during the 90 days storage period. Shakoor *et al*. (2015) [24] reported increase in TSS during storage period. Kumar and Madhumathi (2017) [12] studied the different fortified guava and papaya fruit bars and noticed that, TSS was increased throughout the storage period.

Titratable acidity (%)

The data presented in Table 1 (a) shows significant differences in titratable acidity of guava fruit bar among the different treatments at initial, 30th, 60th, 90th and 120 days of observation. In general, the titratable acidity of guava fruit bar was gradually increased in all recipes. Significantly minimum increase (from 1.16 to 1.38%) in titratable acidity at 120 days of storage was observed in treatment T_6 (Guava pulp with 50% sugar + 2% citric acid) which was significantly superior than rest of all the treatment. It was followed by treatment T_8 (Guava pulp with 60% sugar + 2.0% citric acid) (from 1.18 to 1.45%) T_5 (Guava pulp with 50% sugar + 1.5% citric acid) (from 1.19 to 1.50%). However, the change in titratable acidity was found more (from 1.15 to 1.81%) in treatment T_1 (Guava pulp with 30% sugar + 1.5% citric acid) followed by treatment T_2 (Guava fruit pulp with 30% sugar + 2% citric acid) (from 1.13 to 1.73%) and T_3 (Guava fruit pulp with 40% sugar + 1.5% citric acid) (from 1.18 to 1.73%).

From the above result it is seen that, there was progressive increase in titratable acidity of guava fruit bar during storage. The increase in titratable acidity of guava fruit bar during storage was probably due to addition of citric acid and which increased the level of acid in guava fruit bar. The increase in acidity was might be due to development of acidic substances by the degradation of pectic bodies or breakdown of sugars through utilization of acids for converting them to hexose sugar (Rao and Roy, 1980) [19]. Acidity of guava fruit bar increased while p^H decreased during storage as per the result of Gowda *et al*. (1995) [6].

Reducing sugars (%)

The data presented in Table 1 (a) shows significant differences in reducing sugars of guava fruit bar among the different treatments at initial, 30th, 60th, 90th and 120 days of observation. In general, reducing sugars of guava fruit bar was gradually increased in all recipes. Minimum increase (from 4.32 to 4.50%) in reducing sugars at 120 days of storage was observed in treatment T_6 (Guava pulp with 50% sugar + 2% citric acid) which was significantly superior than rest of all the treatment. It was followed by treatment T_8 (Guava pulp with 60% sugar + 2.0% citric acid) (from 4.46 to 4.66). However, the change in reducing sugars was found more (from 3.97 to 4.46%) in treatment T_1 (Guava pulp with 30% sugar + 1.5% citric acid) (from 3.97 to 4.46%) followed by treatment T_2 (Guava fruit pulp with 30% sugar + 2% citric acid) (from 4.09 to 4.53) and T_3 (Guava fruit pulp with 40% sugar + 1.5% citric acid) (from 4.16 to 4.56%).

From the above result it is observed in general that, there was gradual increase in reducing sugars of guava fruit bar during storage. Due to transposition of non-reducing sugars into reducing sugars and the modification of polysaccharides to monosaccharide's the reducing sugars increased. The increase in reducing sugars has also been observed during storage of mango leather by Rao and Roy (1980) [19]. Similar result have been record by Sreemathi *et al*. (2008) [25] in sapota-papaya bar. Vidya and Narain (2011) [27] observed that there was increase in reducing sugars of wood apple bar during storage. Shakoor *et al*. (2015) [24] reported increased reducing sugars during storage period of guava bar.

Total sugars (%)

The data presented in Table 1 (b) shows significant differences in total sugars of guava fruit bar among the different treatments at initial, 30th, 60th, 90th, and 120 days of observation. In general, the total sugars of guava fruit bar were gradually increased in all the recipes. Significantly minimum increase (from 42.53 to 42.76%) in total sugars at 120 days of storage was observed in treatment T_6 (Guava pulp with 50% sugar + 2% citric acid) which was significantly superior than rest of all the treatment. It was followed by treatment T_8 (Guava pulp with 60% sugar + 2.0% citric acid) (from 42.64 to 42.91%) and T_5 (Guava pulp with 50% sugar + 1.5% citric acid) (from 42.47 to 42.77%). However, the change in total sugars was found to be significantly more (from 42.23 to 42.90%) in treatment T_1 (Guava pulp with 30% sugar + 1.5% citric acid) followed by treatment T_2 (Guava fruit pulp with 30% sugar + 2% citric acid) (from 42.29 to 42.93%) and T_3 (Guava fruit pulp with 40% sugar + 1.5% citric acid) (from 42.35 to 42.94%).

From the above result it is observed in general that, there was gradual increase in total sugars of guava fruit bar during storage. The increase in total sugars of guava fruit bar during storage was probably due to the increase in TSS and sugars would attributed to the conversion of starch and other insoluble carbohydrates into sugars. The result mentioned above are in conformity with the findings of various research workers. The increase in sugar was also observed in storage life of pomegranate fruits by Pota *et al*. (1987) [17] where the increase would be attributed to the conversion of starch and other insoluble carbohydrates into sugars. Significant changes were observed in total sugars by Arun *et al*. (1998) [1] during storage of cereal based papaya powder. Sandhu *et al.* (2001) [22] noticed that total sugars of guava leather were increased with the increase of storage period. Vidya and Narain (2011) [27] reported that, there was gain in total sugar contents of jam and fruit bar of woodapple during the storage period. Kuchi *et al*. (2014) [11] reported that total sugars were increase the jelly bar stored in ambient condition. Safdar *et al*. (2014) [20] noticed gradual increase in total sugars in guava leather during storage period. Chavan and Shaik (2015) [4] reported that, continuous increase in total sugars of guava leather during storage. Kumar and Madhumathi (2017) [12] studied the different fortified guava and papaya fruit bars recorded total sugars from 61.15 to 74.45% was increased.

Non-reducing sugars (%)

The data presented in Table 1 (b) shows significant differences in non-reducing sugars of guava fruit bar among the different treatments at initial, 30th, 60th, 90th and 120 days of observation. In general, non-reducing sugars of guava fruit bar was gradually increased in all recipes. Significantly minimum increase (from 38.21 to 38.26%) in non-reducing sugars at 120 days of storage was observed in treatment T_6 (Guava pulp with 50% sugar + 2% citric acid) which was significantly superior than rest of all the treatment. It was followed by treatment T_8 (Guava pulp with 60% sugar + 2.0% citric acid) (from 38.18 to 38.25%) and T_5 (Guava pulp with 50% sugar + 1.5% citric acid) (from 38.21 to 38.28%). However, the change in non-reducing sugars was found more (from 38.20 to 38.40%) in treatment T_2 (Guava pulp with 30% sugar + 2% citric acid) followed by treatment T_3 (Guava fruit pulp with 40% sugar + 1.5% citric acid) (from 38.19 to 38.38%) and T_1 (Guava fruit pulp with 30% sugar + 1.5% citric acid) (from 38.26 to 38.44%).

Ascorbic acid (mg/100 g)

The data presented in Table 1 (b) shows significant differences in ascorbic acid of guava fruit bar among the different treatments at initial, 30th, 60th, 90th and 120 days of observation. In general, the ascorbic acid of guava fruit bar was decreased in all the recipes. Significantly minimum decrease (from 118.67 to 101mg/100 g) in ascorbic acids at 120 days of storage was observed in treatment T_6 (Guava pulp with 50% sugar + 2% citric acid) which was significantly superior than rest of all the treatment. It was followed by treatment T_8 (Guava pulp with 60% sugar + 2.0% citric acid) (from 117.67 to 96.67mg/100 g) and T_5 (Guava pulp with 50% sugar + 1.5% citric acid) (from 122 to 98.33mg/100 g). However, the change in ascorbic acid was found to be more (from 127.67 to 83.67mg/100 g) in treatment T_1 (Guava pulp with 30% sugar + 1.5% citric acid) followed by treatment T_2 (Guava fruit pulp with 30% sugar + 2% citric acid) (from 125 to 83.33mg/100 g) and T_3 (Guava fruit pulp with 40% sugar + 1.5% citric acid) (from 124.33 to 84mg/100 g).

From the above result it is observed in general that, there was progressive decrease in ascorbic acid of guava fruit bar during storage. The decrease in ascorbic acid of guava fruit bar during storage was probably due to oxidation of ascorbic acid. Manimegalai *et al.* (2001) [13] reported a significant remarkable reduction in ascorbic acid content of sample during storage. Ashaye *et al*. (2005) [2] found a decrease in ascorbic acid during storage of pawpaw and guava leather respectively. Jain and Nema (2007) [7] reported that the ascorbic acid content of leather of all cultivars of guava showed decreasing trend with recipes when sugar content was increased during the storage period. Loss of ascorbic acid have been reported in sapota-papaya bar during 3 months storage (Sreemathi *et al*. 2008) [25]. Vagadia *et al.* (2016) [26] reported that, ascorbic acid content of fruit bar was decreased during storage period of six months.

Table 1 a: Influence of sugar and citric acid levels on TSS, Acidity and reducing sugars content of guava fruit bar

	Total Soluble Solids (Brix)					Acidity (%)					Reducing sugars (%)				
	Storage days					Storage days					Storage days				
Treatment	**Initial**	**30**	**60**	**90**	**120**	**Initial**	**30**	**60**	**90**	**120**	**Initial**	**30**	**60**	**90**	**120**
T_1 - Guava pulp with 30% sugar + 1.5% citric acid	68.18	68.48	68.98	69.58	69.90	1.15 (1.07)	1.35 (1.16)	1.54 (1.24)	1.72 (1.31)	1.81 (1.35)	3.97 (1.99)	4.04 (2.01)	4.13 (2.03)	4.28 (2.07)	4.46 (2.11)
T_2 - Guava pulp with 30% sugar + 2.0% citric acid	68.10	68.39	68.84	69.38	69.66	1.13 (1.06)	1.29 (1.14)	1.47 (1.21)	1.62 (1.27)	1.73 (1.32)	4.09 (2.02)	4.15 (2.04)	4.24 (2.06)	4.37 (2.09)	4.53 (2.13)
T_3 - Guava pulp with 40% sugar + 1.5% citric acid	70.02	70.29	70.69	71.05	71.35	1.18 (1.09)	1.34 (1.16)	1.51 (1.23)	1.63 (1.28)	1.73 (1.32)	4.16 (2.04)	4.21 (2.05)	4.29 (2.07)	4.41 (2.1)	4.56 (2.14)
T_4 - Guava pulp with 40% sugar + 2.0% citric acid	70.00	70.22	70.50	70.75	71.10	1.14 (1.07)	1.22 (1.10)	1.34 (1.16)	1.41 (1.19)	1.49 (1.22)	4.19 (2.05)	4.23 (2.07)	4.28 (2.07)	4.35 (2.09)	4.45 (2.11)
T_5 - Guava pulp with 50% sugar + 1.5% citric acid	71.85	72.20	72.30	72.53	72.73	1.19 (1.09)	1.25 (1.12)	1.35 (1.16)	1.43 (1.20)	1.50 (1.22)	4.26 (2.06)	4.30 (2.07)	4.35 (2.09)	4.41 (2.1)	4.49 (2.12)
T_6 - Guava pulp with 50% sugar + 2.0% citric acid	71.80	71.95	72.15	72.39	72.51	1.16 (1.08)	1.20 (1.10)	1.25 (1.12)	1.31 (1.14)	1.38 (1.17)	4.32 (2.08)	4.35 (2.09)	4.39 (2.1)	4.43 (2.20)	4.50 (2.12)
T_7 - Guava pulp with 60% sugar + 1.5% citric acid	73.08	73.33	73.68	73.99	74.19	1.20 (1.10)	1.34 (1.16)	1.49 (1.22)	1.60 (1.26)	1.71 (1.31)	4.41 (2.1)	4.46 (2.11)	4.52 (2.13)	4.63 (2.15)	4.77 (2.18)
T_8 - Guava pulp with 60% sugar + 2.0% citric acid	72.99	73.16	73.41	73.73	73.85	1.18 (1.09)	1.22 (1.10)	1.29 (1.14)	1.37 (1.17)	1.45 (1.20)	4.46 (2.11)	4.49 (2.12)	4.53 (2.13)	4.58 (2.14)	4.66 (2.16)
T_9 - Guava pulp with 70% sugar + 1.5% citric acid	74.92	75.16	75.48	75.60	75.89	1.22 (1.10)	1.31 (1.14)	1.48 (1.22)	1.58 (1.26)	1.67 (1.29)	4.52 (2.13)	4.57 (2.14)	4.64 (4.15)	4.73 (2.17)	4.86 (2.20)
T_{10} - Guava pulp with 70% sugar + 2.0% citric acid	74.75	74.99	75.30	75.57	75.84	1.19 (1.09)	1.29 (1.14)	1.42 (1.19)	1.51 (1.23)	1.60 (1.26)	4.60 (2.14)	4.64 (4.15)	4.70 (2.17)	4.78 (2.19)	4.89 (2.21)
'F' test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
SE(m)±	0.012	0.026	0.031	0.023	0.002	0.003	0.001	0.003	0.002	0.003	0.001	0.002	0.002	0.003	0.003
CD at 5%	0.036	0.079	0.094	0.070	0.006	0.009	0.003	0.008	0.005	0.008	0.002	0.007	0.006	0.009	0.008

Table 1 b: Influence of sugar and citric acid levels on total sugars, non-reducing sugars and ascorbic acid content of guava fruit bar

	Total sugars (%)					Non-reducing sugars (%)					Ascorbic acid (mg/100 g)				
	Storage days					Storage days					Storage days				
Treatment	**Initial**	**30**	**60**	**90**	**120**	**Initial**	**30**	**60**	**90**	**120**	**Initial**	**30**	**60**	**90**	**120**
T_1 - Guava pulp with 30% sugar + 1.5% citric acid	42.23 (6.498)	42.37 (6.509)	42.52 (6.520)	42.70 (6.534)	42.90 (6.549)	38.26 (6.185)	38.33 (6.191)	38.39 (6.195)	38.42 (6.198)	38.44 (6.200)	127.67	118.67	102.33	88.33	83.67
T_2 - Guava pulp with 30% sugar + 2.0% citric acid	42.29 (6.503)	42.45 (6.515)	42.57 (6.524)	42.74 (6.537)	42.93 (6.552)	38.20 (6.180)	38.30 (6.188)	38.33 (6.191)	38.37 (6.194)	38.40 (6.196)	125	114	100.67	87.33	83.33
T_3 - Guava pulp with 40% sugar + 1.5% citric acid	42.35 (6.507)	42.49 (6.518)	42.62 (6.528)	42.77 (6.539)	42.94 (6.552)	38.19 (6.179)	38.28 (6.187)	38.33 (6.191)	38.36 (6.193)	38.38 (6.195)	124.33	114	100.33	88	84
T_4 - Guava pulp with 40% sugar + 2.0% citric acid	42.41 (6.512)	42.48 (6.517)	42.54 (6.522)	42.63 (6.529)	42.75 (6.538)	38.22 (6.182)	38.25 (6.184)	38.26 (6.185)	38.28 (6.187)	38.30 (6.188)	121.67	114	103.33	95.67	92.67
T_5 - Guava pulp with 50% sugar + 1.5% citric acid	42.47 (6.516)	42.53 (6.521)	42.58 (6.525)	42.66 (6.531)	42.77 (6.539)	38.21 (6.18)	38.23 (6.183)	38.23 (6.183)	38.25 (6.184)	38.28 (6.187)	122	116	108.667	101.33	98.33
T_6 - Guava pulp with 50% sugar + 2.0% citric acid	42.53 (6.521)	42.57 (6.524)	42.60 (6.526)	42.65 (6.530)	42.76 (6.539)	38.21 (6.18)	38.22 (6.182)	38.21 (6.18)	38.22 (6.182)	38.26 (6.185)	118.67	115	109.33	104	101
T_7 - Guava pulp with 60% sugar + 1.5% citric acid	42.58 (6.529)	42.71 (6.535)	42.81 (6.542)	42.95 (6.553)	43.12 (6.566)	38.17 (6.178)	38.25 (6.184)	38.29 (6.187)	38.32 (6.19)	38.35 (6.192)	118	110	98.33	86.67	83.33
T_8 - Guava pulp with 60% sugar + 2.0% citric acid	42.64 (6.529)	42.69 (6.533)	42.74 (6.537)	42.81 (6.542)	42.91 (6.550)	38.18 (6.178)	38.20 (6.18)	38.21 (6.18)	38.23 (6.183)	38.25 (6.184)	117.67	112	105.33	100.33	96.67
T_9 - Guava pulp with 70% sugar + 1.5% citric acid	42.70 (6.534)	42.81 (6.542)	42.91 (6.550)	43.03 (6.559)	43.15 (6.568)	38.18 (6.178)	38.24 (6.183)	38.27 (6.186)	38.30 (6.188)	38.29 (6.187)	114.67	108	97	87	82.33
T_{10} - Guava pulp with 70% sugar + 2.0% citric acid	42.72 (6.536)	42.79 (6.541)	42.87 (6.547)	42.98 (6.555)	43.09 (6.564)	38.12 (6.174)	38.15 (6.176)	38.17 (6.178)	38.20 (6.183)	38.20 (6.183)	112.23	105	94.67	84.67	82.33
'F' test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
SE(m)±	0.010	0.017	0.012	0.002	0.008	0.015	0.018	0.018	0.0028	0.0098	0.312	0.298	0.292	0.292	0.314
CD at 5%	0.030	0.05	0.036	0.005	0.023	0.044	0.054	0.054	0.0082	0.029	0.935	0.893	0.894	0.874	0.914

Conclusion

The guava fruit bar prepared by using guava pulp mixed with 50 per cent sugar and 2 per cent citric acid and stored at ambient storage was found significantly superior at 120 day of storage in p^H, TSS, acidity, reducing sugars, total sugars, non-reducing sugars, ascorbic acid, phosphorus, calcium, microbial count and sensory qualities.

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