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Squash from Tamarind Pulp by Blending with Mango Pulp

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Abstract

A study was conducted on development of squash with tamarind by blending with mango pulp at different levels (10%, 20% and 30%) and different sugar concentrates. all the treatments were kept for three months' storage period to evaluate their storage stability. During the storage period, all the treatments were evaluated for the physico-chemical, microbial and sensory quality. The results revealed that among all the treatments highest acceptability observed in squash prepared with 80% tamarind pulp and 20% mango pulp (T6) during the storage period. No microbial growth was observed in all the treatments. The products were stored without any deterioration in physico-chemical, sensory quality and microbial count up to 3 months of storage period.

Keywords: Tamarind; Mango; Squash; Overall acceptability; Storage

Introduction

Tamarind is native fruit of Africa. It belongs to Leguminosae family with botanical name *Tamarindus indica.* L. The tamarind is prized for its shade and shelter [1]. It is one of the important tropical fruit tree and is widely grows in India. There are only a few varieties of tamarind grown in India, some are sweet and some are sour. Fruit is the most important part of the tree and it is the most acidic of all fruits and contains an uncommon plant acid i.e., tartaric acid 8% to 18% [2]. India is the chief producer and consumer of tamarind in the world. It is estimated that India produces 3,00,000 MT of fruits and export tamarind products worth about Rs. 50.0 crores per annum. Tamarind pulp is the chief agent for souring food products like sauces, chutneys, sambar, rasam and beverages. The fruit pulp is the important raw material for the manufacture of tamarind pulp concentrate and soft drinks. The pulp of fruit is used extensively in the local confectionary industry in several developed countries [3]. Due to high acidity in the tamarind fruit, the utilization of these fruits for preparation of various processed products is limited. Tamarind also has hypoglycemic and hypocholestrolemic effect and it helps in reducing obesity. Blending of fruits like mango will be helpful to enhance the sensory quality characteristics such as color, flavor, taste and overall acceptability of the prepared products. Keeping the above facts in view, tamarind squash could be prepared by blending with mango pulp for better utilization of tamarind.

Materials and Methods

Tamarind was procured from local market and seeds were removed and cleaned properly. Then the tamarind was soaked in water in 1:1.5 ratios, heated up to 100°C, then cooled and crushed. After crushing it was passed through a siever to obtain pulp. The pulp so obtained was used for the preparation of squash. Simultaneously mangoes were procured and cleaned. Tamarind squash prepared by blending with mango pulp (10%, 20% and 30%) and different sugar concentrates (45°B, 46°B and 47°B) was used in different treatments. Sugar syrup was prepared; juice was added to the cooled syrup and mixed thoroughly. Potassium Meta bisulphate was added as a preservative. Filled in sterilized bottles and capped. Squash was diluted (juice 1: water 4) before serving. The flow diagram depicting preparation of squash was given in Figure 1.

The products so prepared were evaluated for physico-chemical parameters such as total soluble solids (TSS) [4], Acidity (%), Reducing sugars (%), Total sugars (%) [5]. Sensory evaluation was done by the sensory scoring by a panel of 10 members in the laboratory of PGRC, using a score card developed for the purpose. Descriptive terms were given to various quality attributes like appearance, color, flavor, consistency, taste and overall acceptability (Figure 2). Numerical scores were assigned to each attribute. A five-point scale was adopted to score each of the attributes, while scoring, highest score (5) was assigned to

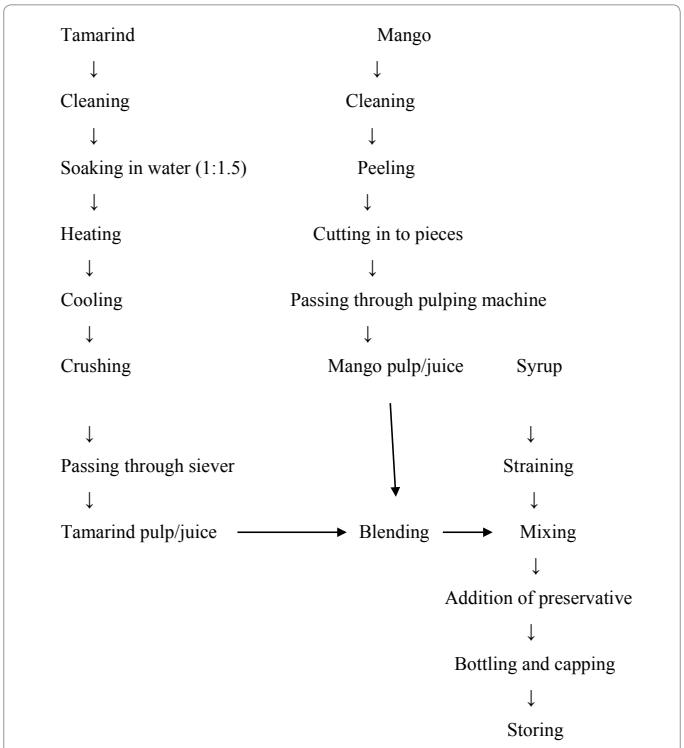

Figure 1: Flow chart for the preparation of tamarind squash by blending with mango.

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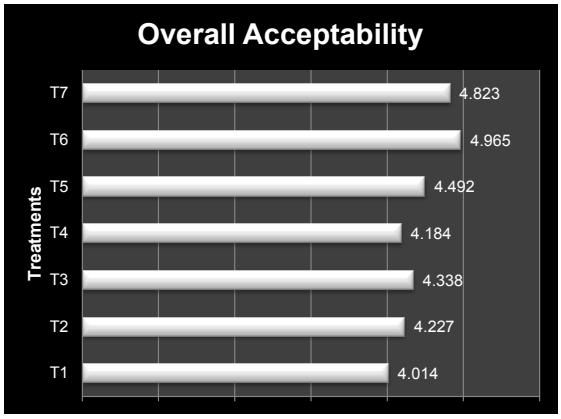
most preferred characteristic and least score (1) to the least designed characteristics. For estimating microbial count (bacteria, Yeast and moulds) population in different samples, dilution plate method was followed [6]. The data was subjected to statistical analysis as per the procedure described by Panse and Sukhatme [7]. The experimental design was complete randomized design with factorial concept.

Results and Discussion

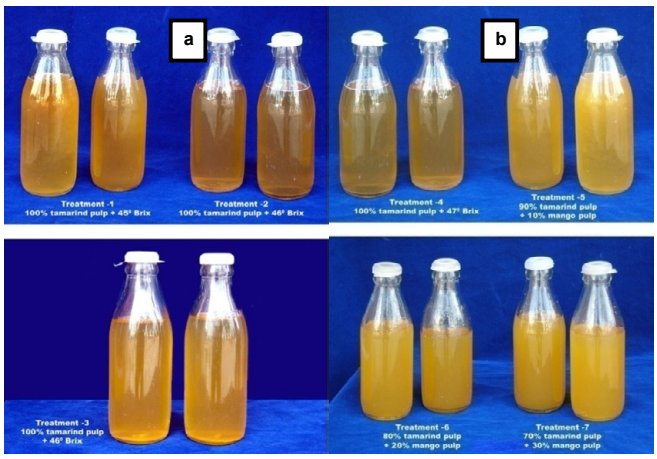
Total soluble solids (TSS) recorded in different treatments and days of storage were given in Table 1. No significant change in total soluble solids during the storage period was observed. Treatments recorded significant differences, where as interactions were found non-significant. Among the treatments employed for preparation of tamarind squash initially T4, T5, T6 and T7 47°B recorded highest TSS values in comparison with T1, T2 and T3. During storage, there was



T_1: tamarind pulp 100%+45°Brix; T_2: tamarind pulp 100%+46°Brix; T_3: tamarind pulp 100%+46°Brix;

T_4: tamarind pulp 100%+47°Brix; T_5: tamarind pulp 90%+ mango pulp 10%; T_6: tamarind pulp 80%+mango pulp 20%; T_7: tamarind pulp 70%+mango pulp 30%.

Figure 2: Mean values of overall acceptability of sorghum squash at room temperature during storage period.



a) T_1: tamarind pulp 100%+45°Brix; T_2: tamarind pulp 100%+46°Brix; T_3: tamarind pulp 100%+46°Brix

b) T_4: tamarind pulp 100%+47°Brix; T_5: tamarind pulp 90%+ mango pulp 10%; T_6: tamarind pulp 80%+mango pulp 20%; T_7: tamarind pulp 70%+mango pulp 30%.

Figure 3: Tamarind squash by blending with mango pulp using different treatments.

Treatments	Storage Period	TSS (°B)	Acidity (%)	Reducing Sugars (%)	Total Sugars (%)
T1	0 day	45	0.407	8.44	16.816
	90 days	45.03	0.404	15.68	16.516
T2	0 day	46	0.423	9.56	17.24
	90 days	46.03	0.427	16.35	17.023
T3	0 day	46	0.446	11.36	20.474
	90 days	46.06	0.451	16.98	20.133
T4	0 day	47	0.475	12.95	22.22
	90 days	47.06	0.481	17.35	22.056
T5	0 day	47	0.495	14.65	26.656
	90 days	47.09	0.497	17.35	26.333
T6	0 day	47	0.517	15.56	27.97
	90 days	47.09	0.521	19.77	27.65
T7	0 day	47	0.508	15.15	27.853
	90 days	47.09	0.489	19.55	27.533

T_1: tamarind pulp 100%+45°Brix; T_2: tamarind pulp 100%+46°Brix; T_3: tamarind pulp 100%+46°Brix; T_4: tamarind pulp 100%+47°Brix; T_5: tamarind pulp 90%+ mango pulp 10%; T_6: tamarind pulp 80%+mango pulp 20%; T_7: tamarind pulp 70%+mango pulp 30%.

Table 1: Effect of storage period on physico-chemical parameters in tamarind squash at room temperature.

no significant increase in mean TSS content of the tamarind squash from 0 day (46.42°B) to 90 days (46.48°B) of storage (Figure 3). The interaction effects between days of storage and treatments were also not significant. However, a slight increase in TSS was observed among all treatments during the storage period. This may be due to conversion of polysaccharides in to sugars. Similar observations were reported by Saikia et al. [8] in ou-tenga fruit squash. Acidity values recorded in different treatments and days of storage are given in Table 1. No significant change in acidity was observed during the storage period. Treatments recorded significant differences, where as interactions were found to be non-significant. Among the different treatments, initially T6 (0.517%) recorded significantly higher acidity value and least recorded in T1 (0.407%). During storage, there was no significant change in acidity from 0 day (0.467%) to 90 days (0.467%) of storage. T6 recorded Maximum acidity value (0.521%), and least acidity value was recorded in T1 (0.404%) at 90 day of storage. Similar findings were reported in guava and papaya RTS beverage [9] and in blends of mango nectar [10]. Among treatments, significant changes found in acidity might be due to initial differences maintained during processing in acidity. Reducing sugars of tamarind squash recorded in different treatments and days of storage is given in Table 1. There was significant change in reducing sugars during the storage period, among the different treatments and interactions. All treatments differed significantly from one another. Among the different treatments employed for tamarind squash, initially T6 recorded significantly highest reducing sugar content (15.56%) and least was recorded in T1 (8.44%). During storage, there was a significant increase in mean reducing sugar content of the samples from 0 days (12.52%) to 90 days (17.57%) of storage period. The interaction effects of treatments and days of storage were also found to be significant. T6 recorded the maximum reducing sugar content (19.77%) at 90 days of storage. Increase in reducing sugar content may be due to hydrolysis of total sugars by acid present in fruit, which might have resulted in degradation of disaccharides to monosaccharides [11]. Similar observations were made by Farheen [12] in guava-grape and guava-pineapple nectar blends and in watermelon nectar prepared from different blends of watermelon with other fruits.

	Overall acceptability			
Treatments (F1)	**0**	**45**	**90**	**Mean**
T_1	4.02	4.02	4.003	4.014
T_2	4.33	4.236	4.116	4.227
T_3	4.6	4.34	4.216	4.338
T_4	4.323	4.22	4.01	4.184
T_5	4.72	4.42	4.336	4.492
T_6	4.966	4.966	4.963	4.965
T_7	4.91	4.826	4.733	4.823
Mean	4.532	4.432	4.34	--
	F value	**Sed ±**	**CD at 5%**	--
Treatments (F_1)	* *	0.005	0.001	--
Periods (F_2)	NS	0.007	NS	--
F_1* F_2 interaction	NS	0.013	NS	--

T_1: tamarind pulp 100%+45°Brix; T_2: tamarind pulp 100%+46°Brix; T_3: tamarind pulp 100%+46°Brix; T_4: tamarind pulp 100%+47°Brix; T_5: tamarind pulp 90%+ mango pulp 10%; T_6: tamarind pulp 80%+mango pulp 20%; T_7: tamarind pulp 70%+mango pulp 30%.

Table 2: Effect of storage period on overall acceptability in tamarind squash at room temperature.

Microbial load (Colony forming units/gm)								
Treatments	**0 Days**		**30 Days**		**60 Days**		**90 Days**	
	Bacteria	**Y & M**	**Bacteria**	**Y & M**	**Bacteria**	**Y & M**	**Bacteria**	**Y & M**
T_1	-	-	-	-	-	-	3×10^1	7×10^1
T_2	-	-	-	-	-	-	3×10^1	7×10^1
T_3	-	-	-	-	-	-	2×10^1	5×10^1
T_4	-	-	-	-	-	-	2×10^1	5×10^1
T_5	-	-	-	-	-	-	1×10^1	3×10^1
T_6	-	-	-	-	-	-	1×10^1	3×10^1
T_7							1×10^1	3×10^1

T_1: tamarind pulp 100%+45°Brix; T_2: tamarind pulp 100%+46°Brix; T_3: tamarind pulp 100%+46°Brix; T_4: tamarind pulp 100%+47°Brix; T_5: tamarind pulp 90%+ mango pulp 10%; T_6: tamarind pulp 80%+mango pulp 20%; T_7: tamarind pulp 70%+mango pulp 30%.

Table 3: Effect of storage period on microbial load (colony farming units/gm) of tamarind squash at room temperature.

Total sugars recorded in different treatments and days of storage are given in Table 1. No significant change in total sugar content was observed during the storage period. Treatments recorded significant differences, where as interactions were found non-significant. Among the treatments, initially T6 recorded highest (27.970%) total sugar content and least was in T1 (16.81%). During the storage, there was no significant decrease in the mean content of total sugars in squash from 0 day (22.74%) to 90 days (22.46%) of storage periods. The interaction effects of treatments and days of storage were also found to be non-significant during different storage period. Decrease in total sugars may be attributed to the increase in the bacterial count, which might have utilized for their survival. These findings were in conformity with the results reported by Sheeja and Prema [13] in papya squash, Chahal et al. [14] in watermelon juices and Krishnaveni et al. [15] in jack fruit RTS beverage. Of all the treatments, the overall acceptability score (Tables 2 and 3) was significantly highest for T6 (4.97) followed by T2 (4.33), T3 (4.6), T4 (4.32), T5 (4.72), T7 (4.91) and least overall acceptability score was observed in T1 (4.02). There was decrease in all sensory scores for the products during storage. Decrease in colour of the products may be due to browning of the products. Similar findings were reported by Ranganna [4] in phalsa and litchi squashes. Decrease in flavor and taste upon storage may be due to the loss of volatile aromatic substances responsible for flavor. Temperature also plays an important role on the biochemical changes in the products, which leads to the formation of flavor and discoloration, masking the original flavor of the products with the storage period [16]. Similar findings were reported by Kaur et al. [10] in plum nectars, Sogi et al. [17] in kinnow squash.

The microbial examination showed (Table 3) that no yeast and mold count was observed till 60 days of storage. T1, T2 recorded higher load (7×10^{-1}) followed by T3, T4 (5×10^{-1}), and T5, T6, T7 (3×10^{-1}) at the end of 90 days storage period. The bacterial growth was observed at 90 days only. T1 and T2 recorded higher bacterial count (3×10^{-1}), followed by T3 (2×10^{-1}), T4 (2×10^{-1}) and the least were observed for T5, T6, and T7 (1×10^{-1}) at the end of 90 days' storage. However, the increase in microbial growth was negligible and within the permissible limits of squash. Application of heat during processing reduced microbial load [18]. This has been reported in watermelon nectar and in mixed fruit RTS beverage by Bidyut et al. [19].

Conclusion

The overall acceptability was highest in squash prepared with 80% tamarind pulp and 20% mango pulp (T6). Negligible growth of microbes was observed in all the treatments. The products stored without any deterioration in physico-chemical, sensory quality and microbial count and are consumer acceptable up to 3 months of storage as per the study. Profit estimated for 1 litre of tamarind squash Rs. 25.00 when compared with locally available products. Hence it can be concluded that blending with mango pulp can bring value addition to tamarind and increase in appearance and taste.

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