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RESEARCH ARTICLE :

Squash from tamarind pulp by blending with mango pulp

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SUMMARY : 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 (T_6) 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 upto 3 months of storage period.

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KEY WORDS :
Tamarind, Mango, Squash, Overall Acceptability, Storage

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BACKGROUND AND OBJECTIVES

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 (Chaturvedi, 1956). 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 8-18% (Duke, 1981). 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 (Lewis and Neelkantan, 1964). 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 colour, flavour, 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.

RESOURCES AND METHODS

The study was conducted in the year of 2006 at Acharya N.G Ranga Agricultural University, PGRC Department, Hyderabad.

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 upto 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 (45^0B, 46^0B and 47^0B) 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 Fig A.

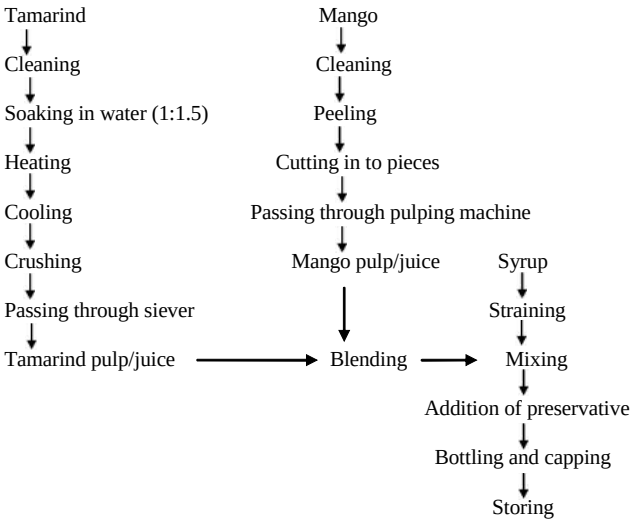


Fig A: Flow chart for the preparation of tamarind squash by blending with mango

The products so prepared were evaluated for physico-chemical parameters such as Total soluble solids (TSS) (Ranganna, 1986), Acidity (%), Reducing sugars (%), Total sugars (%) (AOAC, method, 1975).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. Numerical scores were assigned to each attribute (Peryam and Pilgrim, 1959). A five point scale was adopted to score each of the attributes, while scoring, highest score (5) was assigned to 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 (Cruikshank *et al.*, 1975). The data was subjected to statistical analysis as per the procedure described by Panse and Sukhatme (1985). The experimental design was Complete Randomized Block Design with factorial concept.

OBSERVATIONS AND ANALYSIS

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 T_4, T_5, T_6 and T_7 47°B recorded highest TSS values in comparison with T_1, T_2 and T_3. During storage there was 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. 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 and Saikia, 2002 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 T_6 (0.517%) recorded significantly higher acidity value and least recorded in T_1 (0.407%). During storage, there was no significant

change in acidity from 0 day (0.467%) to 90 days (0.467%) of storage. T_6 recorded Maximum acidity value (0.521%) and least acidity value was recorded in T_1 (0.404%) at 90 day of storage. Similar findings were reported in guava and papaya RTS beverage (Tiwari, 2000) and in blends of mango nectar (Kaur and Khurdiya, 1993). 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 T_6 recorded significantly highest reducing sugar content (15.56%) and least was recorded in T_1 (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. T_6 recorded the maximum reducing sugar content (19.77%) at 90 days of storage. Increase in reducing sugar content may be

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

Treatments	Storage period	TSS (^{0}B)	Acidity (%)	Reducing sugars (%)	Total sugars (%)
T_1	0 day	45	0.407	8.44	16.816
	90 days	45.03	0.404	15.68	16.516
T_2	0 day	46	0.423	9.56	17.24
	90 days	46.03	0.427	16.35	17.023
T_3	0 day	46	0.446	11.36	20.474
	90 days	46.06	0.451	16.98	20.133
T_4	0 day	47	0.475	12.95	22.22
	90 days	47.06	0.481	17.35	22.056
T_5	0 day	47	0.495	14.65	26.656
	90 days	47.09	0.497	17.35	26.333
T_6	0 day	47	0.517	15.56	27.97
	90 days	47.09	0.521	19.77	27.65
T_7	0 day	47	0.508	15.15	27.853
	90 days	47.09	0.489	19.55	27.533

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

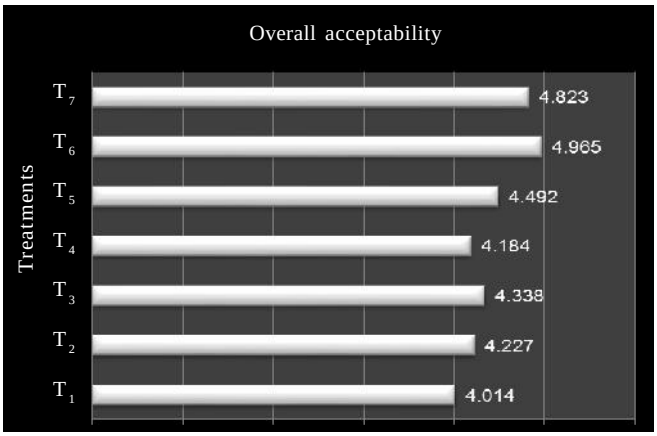
Treatments	Overall acceptability			
	0	45	90	Mean
T_1	4.020	4.020	4.003	4.014
T_2	4.330	4.236	4.116	4.227
T_3	4.600	4.340	4.216	4.338
T_4	4.323	4.220	4.010	4.184
T_5	4.720	4.420	4.336	4.492
T_6	4.966	4.966	4.963	4.965
T_7	4.910	4.826	4.733	4.823
Mean	4.532	4.432	4.340	
	F value	S.E.±	C.D. (P=0.05)	
Treatments (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^{0}Brix, T_2: tamarind pulp 100%+46^{0}Brix, T_3: tamarind pulp 100%+46^{0}Brix, T_4: tamarind pulp 100%+47^{0}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% NS= Non-significant

due to hydrolysis of total sugars by acid present in fruit, which might have resulted in degradation of disaccharides to monosaccharides (Aruna *et al.*, 1977). Similar observations were made by Prasanna (1997) in guava – grape and guava – pineapple nectar blends and in watermelon nectar prepared from different blends of watermelon with other fruits (Farheen, 2004).

Total sugars recorded in different treatments and days of storage are given 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 T_6 recorded highest (27.970%) total sugar content and least was in T_1 (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 (1995) in papya squash, Chahal and Sain (1999) in watermelon juices and Krishnaveni *et al*. (2001) in jack fruit RTS beverage.

Of all the treatments, the overall acceptability score (Table 2 and Fig 1) was significantly highest for T_6 (4.97) followed by T_2 (4.33), T_3 (4.6), T_4 (4.32), T_5 (4.72), T_7 (4.91) and least overall acceptability score was observed in T_1 (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 Jain *et al*. (1986) in phalsa and litchi squashes. Decrease in flavour and taste upon storage may be due to the loss of volatile aromatic substances responsible for flavour. Temperature also plays an important role on the biochemical changes in the products, which leads to the formation of flavour and discolouration, masking the original flavour of the products with the storage period. (Doodnath and Badriel, 2000). Similar findings were reported by Joshi *et al.* (1993) in plum nectars, Sogi and Singh (2001) in kinnow squash.



T_1: tamarind pulp 100%+45^{0}Brix, T_2: tamarind pulp 100%+46^{0}Brix, T_3: tamarind pulp 100%+46^{0}Brix, T_4: tamarind pulp 100%+47^{0}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%.

Fig. 1: **Mean values of overall acceptability of sorghum squash at room temperature during storage period**

The microbial examination showed (Table 3) that no yeast and mold count was observed till 60 days of storage. T_1, T_2 recorded higher load ($7x10^1$) followed by T_3, T_4 ($5x10^1$) and T_5, T_6, T_7 ($3x10^1$) at the end of 90 days storage period. The bacterial growth was observed at 90 days only. T_1 and T_2 recorded higher bacterial count ($3x10^1$), followed by T_3 ($2x10^1$), T_4 ($2x10^1$) and the least were observed for T_5, T_6, and T_7 ($1x10^1$) at the end of 90 days storage. However, the increase in microbial growth was negligible and within the permissible limits

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

Treatments	Microbial load(colony farming units/g)							
	0 Days		30 Days		60 Days		90 Days	
	Bacteria	Y and M	Bacteria	Y and M	Bacteria	Y and M	Bacteria	Y and M
T_1	-	-	-	-	-	-	$3x10^1$	$7x10^1$
T_2	-	-	-	-	-	-	$3x10^1$	$7x10^1$
T_3	-	-	-	-	-	-	$2x10^1$	$5x10^1$
T_4	-	-	-	-	-	-	$2x10^1$	$5x10^1$
T_5	-	-	-	-	-	-	$1x10^1$	$3x10^1$
T_6	-	-	-	-	-	-	$1x10^1$	$3x10^1$
T_7							$1x10^1$	$3x10^1$

(a) T_1: tamarind pulp 100%+45^{0}Brix, T_2: tamarind pulp 100%+46^{0}Brix, T_3: tamarind pulp 100%+46^{0}Brix,

(b) T_4: tamarind pulp 100%+47^{0}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%.

Fig 2: Tamarind squash by blending with mango pulp using different treatments

of squash. Application of heat during processing reduced microbial load (Srivastava and Sanjeev, 2002). This has been reported in watermelon nectar and in mixed fruit RTS beverage by Bidyut and Sethi (2000).

Conclusion:

The overall acceptability was highest in squash prepared with 80% tamarind pulp and 20% mango pulp (T_6). 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 upto 3 months of storage as per the study. Profit estimated for 1 lt 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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