JOURNAL OF CURRENT RESEARCH IN FOOD SCIENCE

E-ISSN: 2709-9385
P-ISSN: 2709-9377
Impact Factor (RJIF): 5.71
JCRFS 2025; 6(2): 107-110

www.foodresearchjournal.com
Received: 10-07-2025
Accepted: 15-08-2025

MS Ansari
Assistant Professor, Department of Food Engineering, K.K.Wagh College of Food Technology, Nashik, Maharashtra, India

VS Wadmare
Assistant Professor, Department of Food Engineering, K.K.Wagh College of Food Technology, Nashik, Maharashtra, India

CL Bedse
B.Tech. Food Tech, Department of Food Engineering, K.K.Wagh College of Food Technology, Nashik, Maharashtra, India

YR Kathe
B.Tech. Food Tech, Department of Food Engineering, K.K.Wagh College of Food Technology, Nashik, Maharashtra, India

SD Taskar
B.Tech. Food Tech, Department of Food Engineering, K.K.Wagh College of Food Technology, Nashik, Maharashtra, India

HR Pardeshi
B.Tech. Food Tech., Department of Food Engineering, K.K.Wagh College of Food Technology, Nashik, Maharashtra, India

Correspondence
MS Ansari
Assistant Professor, Department of Food Engineering, K.K.Wagh College of Food Technology, Nashik, Maharashtra, India

Standardisation and physicochemical properties of tamarind

MS Ansari, VS Wadmare, CL Bedse, YR Kathe, SD Taskar and HR Pardeshi

Abstract
Tamarind is a highly promising fruit crop in India, despite being under-utilized. It is nutritionally rich and offers significant health benefits. Tamarind-based products, such as tamarind candy, are widely enjoyed across age groups. Although tamarind candy has been a traditional product for a long time, there is limited literature on its recipe. Therefore, efforts have been made to standardize the recipe for tamarind candy production. Based on the results, the highest desirability was observed in candy. (T_1), which uses only sugar. (T_2), 3 (T_3), and 4 (T_4) differ in the amount of jaggery used: T_2 uses 150 g, T3 uses 250 g, and T4 uses 450 g of jaggery in addition to sugar. (T_1) with only sugar and (T_2) with 150 g of sugar replaced by jaggery showed similar levels of taste and overall acceptability. However, (T_2) was found to retain more Vitamin C compared to (T_1).The partial replacement of sugar with jaggery not only reduces direct sugar intake but also adds minerals and health benefits associated with jaggery consumption. Therefore, for preparing tamarind candy with added minerals, (T_2) which includes 850 g of sugar and 150 g of jaggery, is recommended.

Keywords: Tamarind candy, jaggery substitution, recipe standardization, nutritional quality

Introduction

Tamarind (*Tamarindus indica* L.) is a minor fruit crop originating from the dry savanna regions of tropical Africa, capable of thriving in varied climate conditions. In India, it holds the distinction of being the largest producer, exporter, and consumer of tamarind. Particularly in southern India, tamarind is a staple ingredient in various regional cuisines. The name "tamarind" derives from the Arabic term 'Tamar-u'l-Hind', reflecting its resemblance to dried dates and its association with India. Tamarind is prized for its high nutritional content, with its pulp constituting 75-80% of the fruit's weight, while the remaining 20-25% includes seeds, peel, and fiber. It is rich in carbohydrates, proteins, dietary fiber, minerals such as iron, phosphorus, potassium, and calcium, and vitamins like thiamin and niacin, though it contains lower amounts of Vitamins A and C. The fruit's pulp is particularly rich in potassium (62-570 mg/100g) and phosphorus (86-190 mg/100g). Tamarind is known for its organic acids like tartaric acid, citric acid, succinic acid, oxalic acid, and quinic acid, which contribute to its distinct tangy flavor and make it a popular acidulant in Indian culinary preparations. Additionally, tamarind plays a significant role in addressing sodium-potassium imbalances and combating iron deficiency due to its nutritional profile and bio-absorbable nutrients.

Tartaric acid in tamarind facilitates iron absorption in the bloodstream. Tamarind is prized for its delightful blend of sweet and sour flavors, making it useful as an antiseptic, carminative, and febrifuge, aiding in digestive issues. The pulp's Total Soluble Solids (TSS) range from 50 to 68.9° Brix. The red and brown types of tamarind pulp has anthocyanin pigments like chrysanthemin and leucocyanidin. Despite its benefits, many tamarind cultivars are too acidic to be consumed raw, necessitating processing into various products like jam, fruit bars, puree, sauce, pulp powder, pickle, and beverages. Among these, tamarind candy stands out due to its popular sweet-sour flavor combination. To achieve better quality and longer shelf life, there is a need to standardize the procedure for making tamarind candy, typically involving boiling tamarind pulp with sugar and minimal water.

Materials and Methods

Fresh tart tamarind was sourced from the local market, Nashik along with spices, oil, and salt. The experiment followed a Completely Randomized Block

Design (CRD) with 4 treatments and 5 replications. The candy preparation process was carried out as per the outlined procedure.

Tamarind fruit
↓
Peeling
↓
Extraction of pulp
↓
Separation of fibre and seeds from pulp
↓
Wetting with little water
↓
Mixing with ingredients (jaggery)
↓
Heating / cooking
↓
Mixing thoroughly
↓
Cooking till hardness is achieved
↓
Sanding sugar dust
↓
Shaping candy in proper shape
↓
Tamarind candy ready after mixing with sugar powder
↓
Cooling
↓
Packing in Cellophane paper

Results and Discussion

Table 1: Preparation of tamarind candy

Table 1: Physico-chemical composition of tamarind used for experiment

Attributes	Value / 100g
Vitamin C	0.641 mg/100g
TSS	42 ^{O}B
Titratable acidity	0.65%
Moisture percent	30.2%
Total sugar	16.4%
pH	2.98

Table 1 details the physio-chemical composition of fresh tamarind, showing Vitamin C content at 0.641 mg/100g, titratable acidity of 0.65%, moisture content of 30.2%, total sugar content of 16.4%, TSS (Total Soluble Solids) at 42°B, and pH of 2.98. In Table 3, variations in TSS (Total Soluble Solids) of tamarind candy during storage are highlighted. Initially, TSS levels were consistent among candies prepared with different recipes. However, after 4 months of storage, (T_1) exhibited the highest TSS at 85.38°B, followed closely by (T_2) at 85.30°B, (T_3) at 85.24°B, and (T_4) at 85.30°B. This trend continued at 4 months with the highest TSS observed in (T_1) at 85.38°B, followed by (T_2) at 85.30°B, (T_3) at 85.24°B, and (T_4) at 85.20°B.

The increase in TSS during storage is attributed to moisture loss, which is a continual process affecting the product. Candies made with higher proportions of jaggery exhibited lower increases in TSS compared to those made solely with sugar, due to jaggery's superior moisture retention capabilities.

Table 2: Effect of different Treatment on TSS (^{O}B) of tamarind candy during storage

Treatment details	Months of storage		
	0	2	4
T_1	85.25	85.25	85.38
T_2	85.22	85.21	85.30
T_3	85.16	85.16	85.24
T_4	85.13	85.13	85.20
S.Em. (±)	0.012	0.012	0.012
CD (0.05)	NS	0.035	0.035

Table 2 illustrates the variation in titratable acidity (%) of tamarind candy prepared using different recipes. Initially, at 0 days of storage, titratable acidity levels were similar across all candies prepared with different recipes. After 3 months of storage, titratable acidity remained consistent among candies from (T_1), (T_2), (T_3), and (T_4), with values of 0.531%, 0.532%, 0.532%, and 0.531% respectively. This consistency persisted even after 6 months of storage, with titratable acidity levels at 0.526%, 0.525%, 0.526%, and 0.525% for (T_1), (T_2), (T_3), and (T_4) respectively.The stable titratable acidity throughout storage indicates that variations in recipe, including the substitution of sugar with jaggery, do not significantly alter the acidic nature of the sweet-sour tamarind candy.

Table 3: Effect of different Treatment on titratable acidity (%) of tamarind candy during storage

Treatment details	Months of storage		
	0	3	6
T_1	0.534	0.531	0.526
T_2	0.534	0.532	0.525
T_3	0.533	0.532	0.526
T_4	0.535	0.531	0.525
S.Em. (±)	0.000	0.001	0.001
CD (0.05)	NS	NS	NS

Table 3 outlines the variation in pH of tamarind candy prepared using different recipes over the storage period. Initially, at 0 days of storage, (T_3) exhibited the highest pH value of 3.335, followed closely by (T_1) at 3.327, (T2) at 3.325, and (T_4) also at 3.325. No significant differences were observed among the treatments.

By the 3rd month of storage, (T_2), (T_3), and (T_4) all showed the highest pH value of 3.305, while (T_1) recorded a slightly lower pH of 3.301.

At the 6th month of storage, (T_1) exhibited the highest pH value of 3.273, followed by (T_2) at 3.266, and (T_3) and (T_4) both at the same pH of 3.267.

Overall, the variations in recipes did not significantly affect the pH values of the tamarind candy throughout the storage period.

Table 4: Effect of different Treatment on pH of tamarind candy during storage

Treatment details	Months of storage		
	0	3	6
T_1	3.327	3.301	3.273
T_2	3.325	3.305	3.266
T_3	3.335	3.305	3.267
T_4	3.326	3.305	3.267
S.Em. (±)	0.003	0.003	0.003
CD (0.05)	NS	NS	NS

Table 4 presents the variation in total sugar (%) of tamarind candy prepared using different recipes over the storage period. Initially, at 0 days of storage, (T_4) had the highest total sugar content at 53.43%, followed by (T_3) at 53.18%, (T_2) at 53.03%, and (T_1) at 52.67%.

By the 3rd month of storage, (T_2) showed the highest total sugar content at 54.39%, followed closely by (T_4) at 54.29%, (T3) at 54.14%, and (T_1) at 53.58%.

At the 6th month of storage, (T_4) exhibited the highest total sugar content at 55.70%, followed by (T_3) at 55.29%, (T_2) at 55.12%, and (T_1) at 54.57%.

Overall, the total sugar content increased consistently throughout the storage period for all recipes. Recipes that included higher proportions of jaggery showed higher total sugar content due to jaggery's higher sugar concentration compared to refined crystal sugar.

Table 5: Effect of different Treatment on total sugar (%) of tamarind candy during storage

Treatment details	Months of storage		
	0	**3**	**6**
T_1	52.67	53.58	54.57
T_2	53.03	54.39	55.12
T_3	53.18	54.14	55.29
T_4	53.43	54.29	55.70
S.Em. (±)	0.017	0.122	0.026
CD (0.05)	0.051	0.369	0.079

Table 5 represents the variations in reducing sugar content (%) of tamarind candy across different recipes over different storage periods. Initially, at 0 days of storage, (T_1) had the highest reducing sugar content at 17.53%, followed by (T_2) at 13.81%, (T_3) at 13.32%, and (T_4) at 12.18%.

This trend persisted over time: at the 3rd month of storage, (T_1) still had the highest reducing sugar at 18.50%, followed by (T_2) at 14.80%, (T_3) at 14.08%, and (T4) at 13.29%. By the 6th month of storage, (T_1) maintained the highest reducing sugar content with 20.12%, followed by (T_2) at 16.18%, (T_3) at 15.34%, and (T_4) at 14.34%.

The lower reducing sugar content observed in recipes prepared with jaggery can be attributed to jaggery's high sucrose content and low levels of glucose and fructose, which are typical components of reducing sugars. Jaggery typically contains only about 6.8% to 14.2% reducing sugars, as opposed to higher levels found in recipes using other forms of sugar. Thus, recipes where sugar is partially substituted with jaggery show reduced levels of reducing sugars in the resulting candy.

Table 6: Effect of different Treatment on reducing sugar (%) of tamarind candy during storage

Treatment details	Months of storage		
	0	**3**	**6**
T_1	17.53	18.50	20.12
T_2	13.81	14.80	16.18
T_3	13.32	14.08	15.34
T_4	12.18	13.29	14.34
S.Em. (±)	0.068	0.057	0.039
CD (0.05)	0.207	0.172	0.119

Table 6 represents the variation in ascorbic acid content (mg/100 g) of tamarind candy across different recipes and storage periods. Initially, at 0 days of storage, the ascorbic acid content showed minor variation among the recipes.

By the 3rd month of storage, (T_2) exhibited the highest ascorbic acid content at 0.39 mg/100 g, followed closely by (T_4) at 0.39 mg/100 g, (T_3) at 0.38 mg/100 g, and (T_1) at 0.37 mg/100 g. At the 6th month of storage, (T_4) retained the highest ascorbic acid content with 0.32 mg/100 g, followed by (T_3) at 0.31 mg/100 g, (T_2) at 0.31 mg/100 g, and (T_1) at 0.22 mg/100 g. This period showed a decline in ascorbic acid content across all recipes, which is typical due to natural degradation during storage.

The addition of jaggery in (T_2) appeared to have a notable effect in reducing the rate of ascorbic acid loss during storage compared to recipes using plain sugar. Jaggery's natural properties seem to contribute to better preservation of vitamin C in the candy over time. Even a small amount of jaggery addition in significantly mitigated the loss of vitamin C during the storage period, highlighting its potential benefits in food preservation.

Table 7: Effect of different Treatment on ascorbic acid (mg/100 g) of tamarind candy during storage

Treatment details	Months of storage		
	0	**3**	**6**
T_1	0.42	0.37	0.22
T_2	0.42	0.39	0.31
T_3	0.43	0.38	0.31
T_4	0.43	0.39	0.32
S.Em. (±)	0.005	0.005	0.003
CD (0.05)	N/A	0.016	0.009

Table 7 details the variation in total plate count (10-5 log CFU) of tamarind candy across different recipes and storage periods. Initially, at 0 days of storage, the total plate count was relatively consistent among candies prepared from different recipes.

However, by the 3rd month and 6th month of storage, there was a noticeable increase in the total plate count across all recipes. This increase is attributed to the natural proliferation of bacterial populations in the candy over time, which is a typical occurrence in food products.

The observed increase in total plate count reflects the growth and multiplication of bacteria within the candy as storage duration extends. This phenomenon is expected in food products unless specific preservation methods or conditions are employed to inhibit microbial growth.

While the initial total plate count was similar across recipes, the subsequent increase over the storage period indicates natural bacterial growth in the tamarind candy, a common consideration in food safety and shelf-life management.

Table 8: Treatment details and months of storage

Treatment details	Months of storage		
	0	**3**	**6**
T_1	13.7	32.7	62.5
T_2	14.3	33.1	61.3
T_3	14	32.5	62.5
T_4	15	32.7	62.1
S.Em. (±)	0.57	0.74	1.51
CD (0.05)	NS	NS	NS

Table 9 represents the sensory evaluation of tamarind candy prepared from different recipes at the 6th month of storage, focusing on flavour, texture, sourness, sweetness, and overall acceptability.

- **Flavour:** (T_1) and (T_2) received the highest score of 7.8 for flavour. (T_3) followed closely with a score of 7.3. (T_4) had a lower score of 6.8, possibly due to a higher addition of jaggery which could have affected the flavour negatively.
- **Texture:** (T_1) had the highest texture score of 9, indicating excellent texture. (T_2) followed with 8.8, (T_3) scored 7.6, and (T_4) had the lowest score of 6.6. The increasing softness observed with higher jaggery content in (T_4) might not be preferred by consumers.
- **Sourness:** (T_1) and (T_2) were rated highest in sourness with a score of 8 each. (T_3) had a sourness score of 7.8, and (T_4) scored 7.6, indicating a slight decrease in perceived sourness with higher jaggery content.
- **Sweetness:** (T_4) was noted for its high sweetness with a score of 8, likely due to the increased jaggery content. (T_3) also had a sweetness that masked some sourness, scoring lower in sourness. (T_1) and (T_2) had lower sweetness scores compared to (T_3) and (T_4).
- **Overall acceptability:** (T_1), which used complete sugar, and (T_2), with partial jaggery substitution, were the most preferred in terms of overall acceptability. (T_3) and (T_4) were also acceptable but had lower overall scores compared to and 2. The higher jaggery content in and likely impacted their overall acceptability negatively.

Table 9: Effect of different recipe on organoleptic property (9 point hedonic scale) of tamarind candy during storage

Treatment details	At 6th month of storage				
	Flavour	Texture	Sourness	Sweetness	Overall acceptability
T_1	7.8	9	8	7.8	8.8
T_2	7.8	8.8	8	7.6	8.8
T_3	7.3	7.6	7.8	7.2	7.6
T_4	6.8	6.6	7.6	8	7.4
S.Em. (±)	0.17	0.50	0.24	0.44	0.29
CD (0.05)	0.55	NS	0.78	NS	NS

Conclusion

From the findings, it can be concluded that (T_1), made with complete sugar, and (T_2), where 150g of sugar is replaced with jaggery, demonstrate the highest desirability. Both recipes are closely competitive in terms of taste and overall acceptability. However, (T_2) shows an advantage in retaining Vitamin C compared to (T_1).

The partial substitution of sugar with jaggery not only reduces direct sugar intake but also enriches the candy with minerals and health benefits associated with jaggery consumption. Therefore, for preparing tamarind candy with enhanced mineral content, (T_2), comprising 850g sugar and 150g jaggery, is recommended.

References

1. Coates-Palgrave K. Trees of Southern Africa. 10. *Tamarindus indica* L. Cape Town: C. S. Striuk Publishers; 1988. p. 278-279.
2. Mani A, Suresh CP. Climate resilient fruit crops - possible solution to ensure nutritional security in changing climate scenario. Climate Smart Agriculture. [No year cited].
3. Narina SS, Catanzaro CJ. Tamarind (*Tamarindus indica* L.), underutilized fruit crop with potential nutritional value for cultivation in the United States of America. [No source/journal details cited].
4. Mani A, Prasanna VSSV, Praveena J, Yadav A. Importance, cultivation and value-added products of tamarind: a wondrous tree legume. International Journal of Agriculture Sciences. 2020.
5. Gandhi YS, Bankar VH, Vishwakarma RP, Satpute SR, Upkare MM. Reducing sugar determination of jaggery. Imperial Journal of Interdisciplinary Research. 2017.