International Journal of Advanced Biochemistry Research 2024; 8(1): 508-511

International Journal of Advanced Biochemistry Research

ISSN Print: 2617-4693
ISSN Online: 2617-4707
IJABR 2024; 8(1): 508-511
www.biochemjournal.com
Received: 14-11-2023
Accepted: 28-12-2023

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Effect of hydrocolloid on textural and sensorial quality of liquid jaggery based tamarind leather

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DOI: https://doi.org/10.33545/26174693.2024.v8.i1g.428

Abstract
The tamarind leather is confectionary accepted by all age groups, rich in minerals. The aim of the current study was to determine how hydrocolloid affected the textural and sensory qualities of tamarind leather made from liquid jaggery. Liquid jaggery in the tamarind leather gave product texture sticky. This stickiness could be removed by addition of hydrocolloid like guar gum and maltodextrin. Guar gum and maltodextrin in the leather was added in the proportion T_0 (0%), T_1(0.5%), T_2(1%), T_3(1.5%) and T_4(2%). The leather was prepared and well dried. The resultant leather was evaluated for its textural and sensory quality to decide the best quality leather, found that the leather with 1% guar gum and maltodextrin was found to be best for color and appearance, flavor, texture and overall acceptability.

Keywords: Tamarind leather, hydrocolloids, guar gum, maltodextrin, pectin

Introduction

The tropical fruit known as the tamarind (*Tamarindus indica* L.) is a member of the subfamily Caesalpinioideae and family Leguminosae (Fabaceae). Tropical Africa is home to the tamarind. (Vuyyala *et al*., 2019) [22]. Almost every part of this versatile tree can be used for something, whether it be medicinal or nutritional. (El Sidding *et al*., 2006) [7].

India is world's largest producer of tamarind (Deokar *et al*., 2019) [6]. The tree is occasionally farmed, but it primarily grows wild. The drier southern states of India are the main locations for tamarind cultivation, with the crop being gathered by the peasants and sold on the open market. It naturally regenerates on wastelands and forest lands in several regions of India. Since ancient times, India has been importing processed tamarind pulp to the United States of America and other western nations. Over 10,000 tonnes of tamarind are exported to the US every year, bringing in over 100 million Indian rupees. In India, tamarind production and area were 188 thousand MT and 59 thousand hectares, respectively, in 2014–2015. (Anon, 2014) [2]. The tamarind leather fruit's nutritional makeup varies greatly. The tamarind fruit is composed of roughly 55% pulp, 34% seeds, shell, and fiber. The fruit has a modest quantity of vitamins A and C, but it is an excellent source of calcium, thiamin, and niacin. Tamarind's most notable feature is how acidic it is, with a total acidity range of 12.2 to 23.8% in the form of tartaric acid. (Morton, 1987; Chapman, 1984 and Persueglove, 1987) [10, 4, 15]. The tamarind pulp of the Ajanta variety had the following chemical composition: TSS 27 0Brix, pH 2.6, acidity 1.5%, tartaric acid 1.8%, reducing sugar 17.7%, total sugar 38.8%, and ascorbic acid 3.9%. (Joshi *et al* 2013) [9].

Mango leathers are enhanced with sugar and pectin, and fruit pulps are combined with suitable amounts of acid, sugar, pectin, and coloring before being dried and formed into sheets. Pectin was added to thicken the pulp, change the flexible texture, and guarantee that the dried products' forms would hold after the sugar added sweetness and solids content.

When making jaggery from sugarcane juice, liquid jaggery is a crucial intermediate product that is obtained. Because liquid jaggery contains extra nutritional elements with a variety of therapeutic benefits, it's a good nutraceutical. Many traditional dishes and ayurvedic medicine formulas contain liquid jaggery (Rajendran *et al*., 2020) [16]. One adaptable substance that may be utilized in a variety of culinary compositions, similar to honey, is liquid jaggery.

(Nath *et al*., 2015) [11]. With over 70% of the world's supply, India is the world's largest producer of jaggery. (Rao *et al*. 2007) [17].

Fruit leather, sometimes referred to as a fruit bar or fruit slab, is a dehydrated fruit-based confection that is frequently consumed as a dessert or snack. It is created by using a cabinet drier to dry a very thin coating of fruit puree and other ingredients into sheets that resemble leather. (Andress and Harrison, 1999) [1]. Fruit leathers need hydrocolloids to retain their desired texture. They have been employed as thickening or gelling agents that have the ability to bind water molecules, improving the intended textural qualities of food products (Rascón-Díaz *et al*., 2012) [18]. When various forms of hydrocolloids are utilized, the instrumental textural qualities of fruit leather are measured to match with the desired features. Pear fruit leather's cohesiveness and springiness were both enhanced and lessened by a high water content, according to an instrumental texture profile analysis. (Huang and Hsieh, 2005; CheMan and Taufik, 1995) [8, 5]. Mango and guava leathers became less hard as the moisture level rose. (Vijayanand *et al*., 2000) [21]. Because of water absorption during storage, the piercing force of mango leather reduced as the water content increased (Azeredo *et al*., 2006) [3]. Pear fruit leather was found to be harder, more cohesive, springy, and chewier when it contained a higher pectin concentration; on the other hand, when corn syrup was added, the fruit leathers became softer (Huang and Hsieh, 2005) [8]. In the leather having both pectin and cellulose (0.5 and 1% concentration), cellulose enhanced hardness more than pectin did, while starch decreased hardness relative to cellulose in the leather containing either 1.0% concentration of cellulose or both pectin and cellulose. Rising pectin and rising glucose syrup concentrations in kiwi fruit leather both significantly enhanced tensile strength. (Vatthanakul *et al*., 2010) [20], and strawberry fruit leather (Ratphitagsanti, 2004) [19].

Hence present investigation, the efforts has been made to prepare liquid jaggery based tamarind leather from Ajanta variety with different levels of hydrocolloids.

Materials and Methods

Materials

An experiment entitled 'Effect of Hydrocolloid on Textural and Sensorial Quality of Liquid Jaggery Based Tamarind Leather' was carried out in the Department of Food Chemistry and Nutrition, College of Food Technology VNMKV Parbhani.

Ingredients used in the preparation of leather *viz.* tamarind, liquid jaggery, pectin, citric acid, guar gum and maltodextrin and packaging material HDPE bags were procured from local market.

Methods

Preparation of tamarind pulp

Tamarind pulp was developed as per the methods given by Joshi *et al.* (2013) [9].

Fresh sound quality ripe, mature tamarind fruit were selected. These fruits were cleaned by removing shell, rags and seeds. Once tamarind pods were washed with water to remove any foreign particle. Water in the ration with flesh 1:2 was added. This was heated to 70 ºC for 10 minutes and soaked for 6 hours. After soaking process maceration and straining process was carried out to obtain tamarind pulp. The pulp of tamarind was passed through a 1 mm filter mesh.

Preparation of tamarind leather

Tamarind leather was developed as per process standardized by Pavani *et al.* (2022) [14] with slight modification. The puree for drying was prepared by mixing 100 grams of tamarind pulp with 30 grams of liquid jaggery, 0.4 grams of citric acid, 1 grams of pectin and 2 grams of funnel seeds extract stirred continuously till all ingredients distributed uniformly. Quantity of guar gum and maltodextrin was varied according to treatment given in the Table 1.

Next, the puree was cooked for ten minutes to ninety-ºC. The puree was then transferred into aluminum trays that had been coated with glycerin. The sample was dried for 12 hours at 65±5 ºC in a cabinet tray dryer. Samples were taken out of the dryer, chopped, and then placed inside HDPE bags.

Table 1: Formulation of recipe of tamarind leather at different level of guar gum and maltodextrin

Ingredients	Control (T_0)	T_1	T_2	T_3	T_4
Tamarind pulp	100	100	100	100	100
Liquid Jaggery	30	30	30	30	30
Citric acid	0.4	0.4	0.4	0.4	0.4
Pectin	1	1	1	1	1
Guar gum	0	0.5	1	1.5	2
Maltodextrin	0	0.5	1	1.5	2
Funnel Seed Extracts	0	2	2	2	2

Sensorial evaluation of tamarind leather

Leather was evaluated for sensory characteristics like color, flavor, texture and overall acceptability by semi trained panel members on a 9-point Hedonic Scale with corresponding descriptive terms ranging from 9 'like extremely' to 1 'dislike extremely'.

TPA analysis of tamarind leather

When determining if a product is acceptable to consumers, there are some food-related factors that are very important. One of the most important characteristics of leather is its texture, which may be analyzed using criteria like cohesion, chewiness, stickiness, and hardness. these characteristics aid in calculating the force needed to bite or chew the fruit leather during mastication.

Using a load cell weighing two kilograms, texture analysis was carried out using a single arm texture analyzer (TA-XT Plus, Stable Micro Systems, Surrey, UK). A two-cycle compression force versus time curve was recorded using a disk probe with a 35 mm diameter moving at 10 mm/min. The data generated was analyzed using the texture analyzer's built-in software.

Table 2: Set parameters of TAX-T2 plus texture analyzer

Test mode	Compression
Pre-test speed	1 mm/sec
Test speed	5 mm/sec
Post-test speed	5 mm/sec
Target mode	Distance
Distance	10 mm
Time	5 sec

Statistical analysis: A statistical analysis was performed on the data that was collected for this investigation. The data was analyzed according to a completely randomized design (CRD) The analysis of variance. When necessary, the analysis of variance demonstrated that S.E. and C.D. at the 5% level were significant at the $p<0.05$ level.

Results and Discussion

Effect of hydrocolloids on sensorial quality of tamarind leather

The hydrocolloids at different quantity *viz*. 0, 0.5, 1, 1.5 percent were used in preparation of tamarind leather and results were found are presented in Table 3.

Table 3: Effect of hydrocolloids on sensorial quality of tamarind leather

Treatment	Color and Appearance	Texture	Taste	Flavor	Overall Acceptability
Tg_0	8.3	7.1	8.3	8.3	7.9
Tg_1	8.2	7.5	8.2	8.3	8.0
Tg_2	8.2	8.3	8.2	8.2	8.2
Tg_3	8.1	8.1	8.2	8.2	8.0
Tg_4	8.1	8.0	8.0	8.0	8.0

*Each value is average of three determinations

Color and appearance

When evaluating a product's quality and consumer acceptability, color is a crucial factor. Table 3 shows that the leather's color and appearance were essentially the same for every treatment. Samples Tg_0, Tg_3, and Tg_4 have hedonic ratings of 8.3, 8.1, and 8.2, respectively, on the scale, while samples Tg_1 and Tg_2 have hedonic ratings of 8.2, which is considerably higher than the other treatments. It is important to remember that a greater hydrocolloid content is undesirable for color, as the sensory rating drops from 8.3 to 8.1.

Texture

The addition of maltodextrin and guar gum to the product affected its textural qualities, resulting in why sample Tg_2 (8.3) received the highest hedonic score. Texture scores of Tg0 (7.1), Tg_1 (7.5), Tg_3 (8.1), and Tg_4 (8.0) are hedonic. Because the T1 sample combines the benefits of maltodextrin and guar gum, it received the highest score. The hard texture of the leather caused the texture to drop from Tg_3 to Tg_4.

Taste

Owing to a lower concentration of guar gum and maltodextrin, Tg_0 was found to have the best taste score, followed by Tg_1, Tg_2, Tg_3, and Tg_4. A maximum of 1% of maltodextrin and guar gum was permitted; any amount above that was not because it would adversely affect the flavor characteristics.

Flavor

Up to 1 percent, it was discovered that the average flavor score for leather treated with guar gum and maltodextrin at various levels-0, 0.5, 1, 1.5, and 2 was relatively similar. The treatment with the highest percent of maltodextrin and guar gum received the lowest score (8.0).

Overall Acceptability

Furthermore, it was possible to see that the sample Tg_2 (8.2) performed exceptionally well when compared to the control and all other samples. This suggests that the total acceptability of leather may be raised by adding up to 1 percent more guar gum and maltodextrin, whereas the total acceptability may be lowered by adding more than 1 percent. These outcomes were similar to those of Patil *et al*. (2017) [23] in terms of the quality characteristics of fruit leather derived from date and mango.

Texture Profile Analysis of Tamarind Leather

Texture is a major factor in deciding whether or not customers are ready to accept the developed product. Using a Texture Analyzer, the textural characteristics of the tamarind leather were measured in relation to hardness, cohesiveness, springiness and gumminess.

Table 4: Texture profile analysis of tamarind leather

Sample	Parameters			
	Hardness(kg)	Cohesiveness(g/sec)	Springiness(mm)	Gumminess
Tg_0	52.1	1.023	0.874	78.8
Tg_1	54.6	1.032	0.877	80.3
Tg_2	57.3	1.244	0.910	82.4
Tg_3	60.2	1.346	0.987	85.5
Tg_4	62.2	1.508	0.998	87.1

The data presented in Table 4 demonstrated that adding hydrocolloids, such as maltodextrin and guar gum, to tamarind leather could make it harder. Sample Tg_4 (62.2 kg) had the highest hardness, whereas sample Tg_0 had the lowest hardness due to the complete absence of hydrocolloids.

According to data revealed in Table 4, the springiness test results for tamarind leather ranged from 0.874 to 0.998 mm. The extremely low springiness value indicates that once force is applied to the tamarind leather, it does not return to its original state. The outcomes closely matched the findings of Parn *et al*. (2015) [12], who noted that both varieties of date bars had low springiness values, with values falling below 1. This suggests that because of their low cohesiveness, leather can be chewed on easily.

With respect to gumminess, guar gum and maltodextrin affects the gumminess of tamarind leather with value Tg_0 (78.8) to Tg_4 (87.1).

Conclusion

It can be concluded that hydrocolloids guar gum and maltodextrin addition in the tamarind leather was accepted up to 1 percent by sensory attributes. This might lead to the creation of premium tamarind leather with less sticking issues and better-quality goods in terms of acceptance overall, color, flavor, and texture.

References

1. Andress EL, Harrison JA. So easy to preserve (4th edition). Athens: University of Georgia Cooperative Extension Service; c1999.
2. Anonymous. A report of Indian horticulture database published by National Horticulture Board (NHB), Gurgaon; c2014.
3. Azeredo HMC, Brito ES, Moreira GEG, Farias VL, Bruno LM. Effect of drying and storage time on the physico-chemical properties of mango leathers. International Journal of Food Science and Technology. 2006;41:635-638.
4. Chapman KR. Tamarind in tropical tree fruit for Australia. Compiled by PE page. Information series q 183018, Brisbane, 1984, 83-86.
5. Che Man YB, Taufik YC. Development and stability of jackfruit leather. Tropical Science. 1995;35:245-250.
6. Deokar VT, Walunj AA, Deokar V, Shinde PD, Dighe PK. Evaluation of chemical parameters of tamarind (*Tamarindus indica* Linn). International Journal of Food Science and Nutrition. 2019;4(6):117-119.
7. El Sidding K, *et al*. Tamarind-*Tamarindus indica* L. Fruits for future. Southampton, UK, 2006, 188.
8. Huang X, Hsieh FH. Physical properties, sensory attributes, and consumer preference of pear fruit leather. Journal of Food Science. 2005;70:177-186.
9. Joshi AA, Kshirsagar RB, Chilkawar PM. Comparative Evaluation of Physico-chemical Characteristics of Three Different Varieties of Tamarind (Ajanta, Thailand and Local). International Journal of Current Research. 2013;5(08):2140-2142.
10. Morton J. Tamarind. In: Fruits of warm climates, Morton JF (ed.). Miami, USA, 1987, 115-121.
11. Nath A, Dutta D, Kumar P, Singh JP. Review on Recent Advances in Value Addition of Jaggery based Products. Journal Food Process Technology ISSN: 2157-7110 JFPT, an open access journal. 2015.
12. Parn PJ, Bhat R, Yeoh TK, Al-Hassan AA. Development of novel fruit bars by utilizing date paste. Food Bioscience. 2015;9:20-27.
13. Piyadasa RUK, Bandara SJS. Surface Water Pollution due To Hazardous Waste from Leather Tanning Industry in Colombo District-Sri Lanka. Int. J Geogr Geol. Environ 2021;3(1):31-33.
14. Pavani S, Swarajya Lakshmi K, Srinivasulu B, Padmaja VV, Sireesha. Standardization of process development for fortified tamarind fruit leather with pulp of red tamarind variety Anantha Rudhira. The Pharma Innovarion Journal. 2022;11(8):1701-1707.
15. Purseglove JW. Tropical crops, Dicotyledons, Longman Science and Technology, 1987, 204-206.
16. Rajendran I, Palaniswami C, Vennila A. Improved method of liquid jaggery preparation Journal of Sugarcane Research. 2020;10:107-112.
17. Rao PVK, Das M, Das SK. Jaggery- a traditional Indian sweetener. Indian Journal of Traditional Knowledge. 2007;6:95-102.
18. Rascón-Díaz MP, Tejero JM, Mendoza-Garcia PG, García HS, Salgado-Cervantes MA. Spray Drying Yogurt Incorporating Hydrocolloids: Structural Analysis, Acetaldehyde Content, Viable Bacteria, and Rheological Properties. Food Bioprocess Technology. 2012;5:560-567.
19. Ratphitagsanti W. Processing and properties of strawberry leather. M.Sc. Thesis, University of Missouri, Columbia; 2004.
20. Vatthanakul S, Jangchud A, Jangchud K, Therdthai N, Wilkinson B. Gold kiwifruit leather product development using Quality function deployment approach. Food Quality Prefer. 2010;21:339-345.
21. Vijayanand P, Yadav AR, Balasubramanyam N, Narasimham P. Storage stability of guava fruit bar prepared using a new process. LWT-Food Science and Technology. 2000;33:132-137.
22. Vuyyala B, D Kumar S, Thakkalapally Lakshmi. *Tamarindus indica* (Fabaceae): extent of explored use in traditional medicine. Asian Journal of Pharmaceutical and Clinical Research. 2019.
23. Patil SH, Shere PD, Sawate AR, Mete BS. Effect of hydrocolloids on textural and sensory quality of date-mango leather. Journal of Pharmacognosy and Phytochemistry. 2017;6(5):399-402.