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Original Article

Chemical characterisation of Tamarind plum squash

Muhammad Yasir Rafique[1], Misbah Arshad[1*], Zinab Sharmeen[1], Majida Umar Nasib[2], Shahid Bashir[1], Noor ul Huda[3]

[1]University Institute of Diet and Nutritional Sciences, Faculty of Allied Health Sciences, The University of Lahore, Lahore, Pakistan.
[2]Department of Human Nutrition & Dietetics, Knowledge Unit Health Sciences, University of Management & Technology, Sialkot, Pakistan.
[3]University of Agriculture, Sub campus Toba Tek Singh

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***Corresponding Author:**

Misbah Arshad
University Institute of Diet and Nutritional Sciences, Faculty of Allied Health Sciences, The University of Lahore, Lahore, Pakistan
fatimamisbah10@gmail.com

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ABSTRACT

Tamarind plum comprising of red flesh contains high-level of multiple bio-active compounds. These compounds showcasing extremely beneficial compositions, include anthocyanins and other additional polyphenolic compounds, having high anti-oxidant ability. These natural bio-active compounds have the tendency to avert major diseases, such as diabetes and even cancer. **Objective:** In this study squash was prepared with tamarind plum to evaluate the quality and shelf life extension of the fruit at different concentrations. **Methods:** The tamarind plum was used to prepare squash with different percentages of tamarind juice and plum juice but at same percentages of sugar, water, and sodium benzoic acid. Prepared squash was filled in polyethylene terephthalate bottles and analysed after 0, 15, 30, 45, 60, 75, and 90 days of storage. The tamarind plum squash was subjected to total phenolic compounds, pH, titrable acidity, TSS, sugar acid ratio, and non-reducing and reducing sugars. **Result:** Maximum TSS (49.54), ascorbic acid (33.46), pH (2.29), titratable acidity (2.11), reducing sugar (24.29), and non-reducing sugar (37.64) was observed in squash prepared using tamarind juice (350ml), plum juice (400), sodium benzoic acid, sugar and water (2g, 1kg and 250ml). Storage showed significant effect on reducing sugar and non-reducing sugar, ascorbic acid, pH and titratable acidity during nineteen-day storage. **Conclusion:** Based on the results concluded from this study that the sample TPS3 demonstrated exceptional storage quality. Thus, the conclusions on TPS3 basis of tamarind plum's blended squash makes it more recommendable for commercial utilization and for large-scale industrial manufacturing.

INTRODUCTION

Tamarind indica L. member of the Caesalpiniaceae family, grows mostly in the tropical African region but has been since subsequently found in South/North America pertaining to Florida and Brazil. Except from these parts of the world, it is also reported to be found in India, Thailand, Indonesia, subtropical China, Philippines, Spain, and Pakistan [1]. Based on multiple reported benefits, the tamarind fruit can be used for different reasons, which may include digestive, laxative, tonic blood, carminative, and expectorant purposes [2]. Till now, tamarind is being used in my different regions because of medicinal purposes, these regions involve African, Asian, and American parts of the world. The juice produced from the tamarind fruit has a little bit of disadvantages as well, such as loss of freshness, unappetising colour, and the capacity to get spoiled after hypoglycemic activities [3]. Based on the regions that it is being used in, the tamarind pulp is majorly utilized as a food souring entity for different food products, including sambar, sauces, chutneys, sauces, and curries. Other than that, it can also be used for the production of jams, ice-creams, jellies, beverages, syrups, canned juices, and other products [4]. By conducting thermal processing, the pulp of the tamarind can be used with original flavour in it. This fruit is regularly processes worldwide into nectars,

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concentrates, juices, glaze, and crystallized fruit forms [5]. Based on various studies, it has been reported that the tamarind fruit contains a bit of a low water content, which makes it difficult to extract fruit pulp. The pulp of tamarind fruit can easily be extracted by different conventional processes procedures, including soaking, straining, and maceration [6]. The tamarind pulp along with various beneficial properties contain reducing sugars, tartaric acid, fibre, pectin, and other cellulosic materials. Whereas, the sugar and acidic content can vary based on samples, for instance, reducing sugars are from 25% to 45%, the tartaric acid ranges between 8% to 18%, pectin ranges between 2% to 3.5%, and proteins between 2% to 3% [7]. Tamarind pulp does have a major odour with an enjoyable acidified flavour, and it is commonly used as a primary souring agent [8]. The pulp is also utilized as an unprocessed substance in the manufacturing of wine-like beverages. Prunus domestica L., commonly known as plum is a seasonal fruit with a shorter shelf life at optimum temperatures [6]. Fast ripening and mould growth can account for the plum fruit to decay during storage. Plum life span can be prolonged via adequate processing, transportation, and promotional chain, as well as keeping the fruit in low-temperature conditions to lengthen post-harvest quality. Plums have an elevated concentrations of bioactive components, such as anthocyanins as well as other polyphenols with an elevated antioxidant activity. Plum contains natural compounds that assist in avoiding diseases like diabetes and melanoma. They may serve as a low-cost cause of various materials that would be beneficial for food, cosmetics, and medical drugs [9]. Condensed soft drinks, which comprise of a specific proportion of juice, are utilized for refreshing and are very prevalent drinks [10]. Manufacturing, preservation, and sales of these products play a major role in commercial significance of countries. Fruit beverages are made up of pulp, juice, and water, in addition to added sugar, colouring, flavouring, and additives [11]. Even though fruit does have a dominant contribution to the flavour and general character in beverages, such product lines vary from fruit juices and are properly labelled [12].

METHODS

Tamarind fruits were bought from a local market. After that plum and tamarind squash was prepared in the lab of University of Lahore. The substances were added based on the 4:3:1 ratio of sugar, pulp, and water. TSS (°brix) was evaluated by the AOAC methodology 932.14 and 932.12. Hand refractometer was utilized to assess the TSS (°brix) of blended squash. A small quantity of blended squash was added to the calibrated instrument to take accurate and validated readings [13, 14]. 0.1 N NaOH standard solution was produced by taking 4.5g of NaOH and 6.30g of oxalic acid in a certain volumetric flask. This step was followed by taking 10ml 0.1N NaOH and titrating it against 0.1N oxalic acid. After that three phenolphthalein indicator drops were added and the experiment was repeated three times while taking readings after formulation of pink colour. The sample titration was done by taking 10ml squash sample and dissolving it in distilled water to allow the final volume to reach 100ml. Two drops of phenolphthalein were added to the 10ml sample solution and was titrated with 0.1N NaOH solution. The experiment was again repeated three times [13].

$$\text{Acidity}(\%) = \frac{CF \times N \times T \times D \times 100}{V \times S}$$

Correction Factor for acidity (CF), Normality (N), ml of sodium hydroxide (T), Dilution Factor (D), Sample for dilution (V), and Sample for titration (S). Calculation of sugar and acid ratio was done by:

$$\text{Sugar acid ratio} = \frac{\text{Total Soluble Solids (TSS)}}{\text{Titratable acidity\%}}$$

Standard method of AOAC 920.183 was used to evaluate reducing sugar of blended squash and tamarind plum [13]. Multiple reagents were used for different purposes, including a) Fehling A; by dissolving 500ml of distilled water with 34.65g of $CuSO4.5H2O$, and b) Fehling B; by taking 50gg of NaOH with 173g of potassium titrate in beaker which was further dissolved in 10ml of water. The solution thus produced was added into 500ml conical flask and the complete volume was achieved by adding distilled water. An indicator named Methylene blue was prepared by taking 0.2g of methylene blue in 100ml flask and was dissolved in 150ml of distilled water. For the complete process, 10ml of squash sample mixed with distilled water was added to for the achievement of 100ml total volume. 5ml each of Fehling solutions were taken with 10ml distilled water. The flask containing the solutions was heated up to the boiling point. To make the overall colour brick red, the solutions from the burette were drop by drop. In the boiled up solution, two drops of methylene blue were added, to comprehend the presence of enough quantity of plum solution. Fehling A amount is 5ml+%ml of Fehling B=Xml making the 10% of sample being equal to 0.05g of reducing sugar×100ml of 10% sample solution.

$$\text{100ml of 10 \% solution will contain} = \frac{0.05 \times 100}{X\text{ ml}} = Y \text{ g of reducing sugar}$$

$$\text{Reducing sugar}(\%) = \frac{Y \times 100}{10}$$

To investigate non-reducing sugar of plum blended squash, AOAC 920.184 was applied [13]. 10ml of sample was subjected in a flask and 100ml volume was achieved with distilled water. Dilution of 10ml 1N HCl was conducted after taking 20ml solution. After that, the complete mixture was

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heated until boiled. 10ml of 1N NaOH was added after that and the volume was increased up to 250ml. 5ml each Fehling A and B solutions were diluted with 10ml water and the solution was heated until boiled. The plum was added to solution in drop by drop manner until it was brick red in colour. Two methylene blue drops were added to evaluate the reaction completion. Solution Xml=0.05g reducing sugars, 250ml of sample=259×0.05/ml=Y g reducing sugars. Sample solution comprises of Y×100/20=P g reducing sugar. 10ml of sample has=P g of reducing sugar. 100 ml of sample has=P×100/10=Q g of total reducing sugar. Q g of reducing sugar = free reducing sugar + inverted sugar. Non-reducing sugar can be calculated as; total reducing sugar – free reducing sugar.

RESULTS

The following tables demonstrate pH, titratable acidity, sugar acid ratio, reducing and non-reducing sugars, and total soluble solids, that were analysed during the entire study.

Treatment	Storage at different Concentration							Decrease (%)	Mean+SD
	00	15	30	45	60	75	90		
TPS1	1.07	1.04	1.02	0.97	0.96	0.95	0.93	11.431	2.27±0.03ab
TPS2	1.07	1.05	1.04	1.02	1.01	0.99	0.97	0.09	2.13±0.03aa
TPS3	1.08	1.07	1.07	1.05	1.01	1.02	1.00	9.84	2.11±0.04a
Mean	1.07	1.05	1.04	1.01	0.99	0.98	0.96	-	-

Table 1: The titratable acidity of the Juice ready by mixing the juice of plum and tamarind at various stages. a-g Values of alphabets demonstrate (P less than 0.05) difference.

Treatment	Storage at different Concentration							Increase (%)	Mean+SD
	00	15	30	45	60	75	90		
TPS1	47.41	47.53	47.64	47.73	47.85	47.94	48.05	1.34	47.73±0.02c
TPS2	48.32	48.43	8.55	48.63	48.74	48.83	48.93	1.26	48.63±0.03b
TPS3	49.22	49.31	49.43	49.54	49.63	49.74	49.82	1.21	49.54±0.01a
Mean	48.31	48.42	48.53	48.7	48.74	48.83	48.94	-	-

Table 2: Total soluble solids of juice ready by blending juice of plum and tamarind at various stages. a-g values of alphabets demonstrate (P less than 0.05) difference.

Treatment	Storage at different Concentration							Increase (%)	Mean+SD
	00	15	30	45	60	75	90		
TPS1	17.28	18.09	21.29	24.32	26.45	28.54	31.46	45.07%	24.03±0.06bac
TPS2	17.22	20.02	22.25	25.32	28.45	30.21	33.23	48.18%	25.27±0.05b
TPS3	17.24	19.25	22.87	24.54	26.93	28.54	30.65	43.75%	24.29±0.07a
Mean	17.24	19.12	22.13	24.72	27.27	29.09	31.78	-	-

Table 4: The reducing sugar of Juice ready from mix of fruit juice at various stages. a-g Values of alphabets demonstrate (P less than 0.05) difference.

Treatment	Storage at different Concentration							Increase (%)	Mean+SD
	00	15	30	45	60	75	90		
TPS1	44.95	42.01	38.65	34.21	30.24	23.46	20.25	54.95%	33.41±0.04c
TPS2	45.98	43.25	40.13	35.65	31.35	25.78	21.98	52.2%	34.87±0.06b
TPS3	47.01	45.24	41.21	39.19	34.99	30.01	25.65	45.54%	37.64±0.05a
Mean	45.98	43.5	39.99	36.35	32.19	26.41	22.62	-	-

Table 5: The non-reducing sugar of Juice ready by mixing of juice at various stages. a-g values of alphabets demonstrate (P less than 0.05) difference.

DISCUSSION

Highest mean value of titratable acidity was 2.27% having the concentration of tamarind juice 550 ml and plum juice 200 ml in the squash. The lowest titratable acidity (2.11%) was noted in squash of tamarind juice 350 ml and plum juice 400 ml. Range of titratable acidity was 0.93% to 1.00% during storage period of 90 days. Hydrolysis of polysaccharides is the main reason for change in acidity, conversion of non-reducing sugars into reducing sugars also responsible for this [15]. The loss of acidity might be attributed to the chemical interaction between the organic constituents of juice induced by temperature and the action of enzymes. A study observed the increase of titratable acidity at 90-days storage study in Tamarind Plum at ambient temperature. Highest mean value of TSS was 49.54% having the concentration of tamarind juice 350 ml and plum juice 400 ml in the squash. The lowest TSS (47.73) was noted in squash concentration of tamarind juice 550 ml and plum juice 200 ml. Range of TSS was 48.05% to 48.94% during storage period of 90 days. During storage study of drink, it is analysed that for better squash quality increase in a minimum quantity of TSS value is desirable for squash [16]. Proportion sugar corrosive of Juice tests was in the scope of 44.36 (TPS3) to 44.89 (TPS1) at beginning day, while demonstrated an expanding pattern of 51.72 (TPS1) to 49.75(TPS1) in three months stockpiling span. Beginning day stockpiling mean was 44.59, which increment to 50.66. Test TPS1 (48.11) show high mean worth, while the example TPS3 (47.11) with most reduced estimation of mean. Test TPS1 indicated % expansion of most extreme (13.02), while TPS3 (10.76) demonstrated the base increment in percent sugar corrosive proportion [17]. Diminishing sugar of fruit Juice was in the middle of 17.24 (TPS3) to 17.28 (TPS1) at beginning day. There demonstrates an expanding pattern of 30.65 (TPS3) to 33.23 (TPS1) in three months of capacity timespan. Beginning of the value of fruit was 17.24, which shows steady increment of 31.78 through the capacity timespan. Fruit test TPS2 (25.27) demonstrated the most extreme value worth, anyway test TPS1 (24.01) had least mean worth. Juice test TPS2 (48.18) found with greatest percent expansion, while the example TPS3 (43.75) with most minimal percent expansion in diminishing sugar [18]. The information of Juice tests was in the scope of 44.95 (TPS1) to 47.01 (TPS3) at starting. Through during capacity time, the non-diminishing sugar decline bit by bit from 20.25 (TPS1) to 25.65 (TPS3) at 90 days of stretch. Beginning mean information was 45.98, which shows a lessening pattern of 22.62. fruit mixed example TPS3 (37.64) with most extreme mean, while Juice test TPS1 (33.41) with least mean. High percent decline (54.95), for test TPS1. Be that as it may, TPS3 (45.54) demonstrated the base % decline [19, 20].

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CONCLUSION

Tamarind plum mixed juice was done with various extents. Concoction additives were utilised to hinder the development of microbial action in mixed juice. The tamarind juice drink has high content of vitamin C, antioxidant activity and total phenol. However, these compounds were lost during 3 months of storage at 28°C. As the supplementation level of tamarind plum squash increase from tamarind juice 350 ml and plum juice 400 ml pH, titratable acidity, ascorbic acid and TSS was increased. It is presumed that total soluble solids of fruit mixed juice expanded with perseverance and handling. The data had a critical impact on taste colour & overall acceptability through capacity and cure time spans. Mix juice is more suggested regarding business use and for huge scope mechanical creation.

REFERENCES

[1] Khan I, Rehman AU, Khan SH, Qazi IM, Arsalan Khan SF, Rehman TU. Development and Quality Evaluation of Tamarind Plum Blended Squash During Storage. J Food Process Technol. 2017; 8(662):2. DOI: 10.4172/2157-7110.1000662

[2] Hassan SM. Production and quality evaluation of vinegar from tamarind (Tamarindus indica L.) fruit pulp (Doctoral dissertation, University of Gezira). 2014.

[3] Aengwanich W, Suttajit M. Effect of polyphenols extracted from Tamarind (Tamarindus indica L.) seed coat on physiological changes, heterophil/lymphocyte ratio, oxidative stress and body weight of broilers (Gallus domesticus) under chronic heat stress. Animal science journal. 2010 Apr; 81(2):264-70. doi.org/10.1111/j.1740-0929.2009.00736.x

[4] Silva FM, Leite MF, Spadaro AC, Uyemura SA, Maistro EL. Assessment of the potential genotoxic risk of medicinal Tamarindus indica fruit pulp extract using in vivo assays. Genetics and Molecular Research. 2009 Sep; 8(3):1085-1092. doi: 10.4238/vol8-3gmr630.

[5] El-Siddig K. Tamarind: Tamarindus Indica L. Crops for the Future; 2006.

[6] Obulesu M, Bhattacharya S. Color changes of tamarind (Tamarindus indica L.) pulp during fruit development, ripening, and storage. International Journal of Food Properties. 2011 Mar; 14(3):538-49. doi.org/10.1080/10942910903262129

[7] Muzaffar K, Kumar P. Parameter optimization for spray drying of tamarind pulp using response surface methodology. Powder Technology. 2015 Jul 1;279:179-84. doi.org/10.1016/j.powtec.2015.04.010

[8] Pattar AS. Studies on Extraction of Tamarind Pulp and Value Addition. Doctoral Dissertation, University of horticulture Sciences, Bagalkot. 2012 Feb.

[9] Cantin CM, Moreno MA, Gogorcena Y. Evaluation of the antioxidant capacity, phenolic compounds, and vitamin C content of different peach and nectarine [Prunus persica (L.) Batsch] breeding progenies. Journal of agricultural and food chemistry. 2009 Jun; 57(11):4586-92. https://doi.org/10.1021/jf900385a

[10] Rajauria G, editor. Fruit juices: Extraction, composition, quality and analysis. Academic press; 2017 Nov.

11. Kregiel D. Health safety of soft drinks: contents, containers, and microorganisms. BioMed research international. 2015 Jan; 2015. doi.org/10.1155/2015/128697

[12] Snowden AL. Post-harvest diseases and disorders of fruits and vegetables: Volume 1: general introduction and fruits. CRC Press; 2008 Feb. Doi: 10.1201/b18214.

[13] Anurag S, Pragati K, Ashutosh U. Bael (Aegle marmelos Correa) products processing: A review. African journal of food science. 2014 May; 8(5):204-15. Doi: 10.5897/AJFS2013.1119.

[14] Larmond E. Laboratory methods for sensory evaluation of food. Publication 1637. Canada Department of Agriculture, Ottawa. 1977.

[15] Harborne JB. Methods in plant biochemistry. Volume 1. Plant phenolics. Academic Press Ltd.; 1989.

[16] Horwitz W, Latimer G. AOAC-Association of official analytical chemists. Official Methods of Analysis of AOAC International 18th edition, Gaithersburg, Maryland, USA. 2005; 45:75-6.

[17] Barbosa-Cánovas GV. Handling and preservation of fruits and vegetables by combined methods for rural areas: technical manual. Food & Agriculture Org.; 2003.

[18] Chang TS, Siddiq M, Sinha NK, Cash JN. Plum juice quality affected by enzyme treatment and fining. Journal of Food Science. 1994 Sep; 59(5):1065-9. Doi: 10.1111/j.1365-2621.1994.tb08191.x.

[19] Omer HA. The Potential of Tamarind (Tamarindusindica L.) Kernels as a Substitute Source of Pectic Substances. Doctoral dissertation, UOFK.

[20] Davis RH. Aloe vera: A scientific approach. Vantage Press; 1997.