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ORIGINAL ARTICLE

Different Factors Affecting To Tamarind Beverage Production

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ABSTRACT
Tamarind fruit is usually consumed fresh and the seed discarded. Tamarind pulp has a unique sour taste due to the natural occurrence of sugars and plant acids together. There is an increase in the demand for juice and juice type beverages. In this study, we focus on investigation of favourable conditions for manufacturing tamarind beverage. Our results show that the blanching time 3 minutes in 85^{o}C by water with a formula composition as following water 66.78%, puree 22.26%, sugar 10.5%, salt 0.12%, citric acid 0.08%, vitamin C 0.1%, sodium benzoate 0.1%, agar 0.06%.
Keywords: *Tamarind, blanching, composition, beverage*

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INTRODUCTION

Tamarind (*Tamarindus indica* L.), a tropical fruit found in Africa and Asia, is highly valued for its pulp. The fruits contain fibre, sugars (namely, fructose, glucose, sucrose and maltose), acids, polysaccharides, small amounts of protein and lipid. Tamarind fruit pulp has a sweet acidic taste due to a combination of high contents of tartaric acid and reducing sugars. Tamarind fruit is most valued for its high ascorbic acid content, minerals and sugar. Ascorbic acid is one of the anti-scurvy vitamins and is one of the valued nutrients. . Inadequate intake of vitamin C has been reported as one of the major problems people encounter with regards to the health and nutrition of their children. The pulp is used for seasoning, in prepared foods, to flavor confections, curries, and sauces, and as a major ingredient in juices and other beverages [3]. Tamarind is commercially underexploited in Vietnam, where it is found growing wild on roadsides and uncultivated lands.

They prepared the ready-to-serve beverage, syrup and concentrate from tamarind [5]. They had previously developed a process for the production of an improved beverage from Nigeria's tamarind [2]. The process involved the removal of pulp from fruit, mixing with water, sieving, adding ginger, clove, and sugar, filling in bottles, and pasteurizing at 95°C for 8 min.

They produced tamarind powder specimens by drum-drying of mixture between juice squeezed from tamarind pulp and drying aid [8]. Two popular drying aids namely maltodextrin (MD) and Arabic gum (AG) were applied at the ratios of juice (20°Brix) and drying aids of 1:0.4, 1:0.8 and 1:1.4. A double drum dryer was employed in this work at the drying temperatures of 120 and 140°C, drum speed of 0.35 rpm, and the gap between drums of 0.4 mm. The results indicated that in order to obtain the tamarind powders, the ratio of tamarind juice and MD should be 1:0.8 if drying at 140°C or 1:1.4 if drying at 120-140°C. In case of using AG as a drying carrier the proportion should be 1:0.4 or 1:0.8 for drying temperatures between 120 and 140°C. Sensory evaluation indicated that the tamarind powders with MD were preferred in facet of appearance, color, and overall liking, while those with AG were favored in their aroma and taste. The energy costs of producing tamarind powders were between 7.27 and 21.00 Baht/kg powder whereas the drying aid costs were in the ranges of 208-228 Baht/kg powder and 640-768 Baht/kg powder if using MD and AG respectively.

They studied on standardization of enzyme concentration and process for extraction of tamarind pulp, variety Ajanta. The experiment was conducted to standardize the concentration of enzyme i.e. Biotropicase L and the process for extraction of tamarind pulp and evaluate their chemical qualities. Four methods of extraction i.e. hot enzymatic, cold enzymatic, hot and cold extraction were used for extraction of pulp. Hot enzymatic extraction method gave the highest recovery of pulp but for suitability and

availability of enzyme hot extraction method (flesh: water, 1:2, heating at 70°C for 10 minutes and soaking for 6 hours) was used for extraction of pulp from tamarind flesh. Among the different extraction methods the hot enzymatic extraction method yielded the highest pulp 92.4 per cent at 0.5 per cent concentration of enzyme in Ajanta while 1.5 per cent concentration of enzyme was given the highest recovery of pulp in case of Thailand and local market tamarind respectively than the cold enzymatic extraction method, Hot and cold extraction methods. Moreover the TSS of the extracted pulp was also higher in the hot enzymatic extraction method proved the Ajanta variety to be most promising sweet tamarind suitable for processing in to different commercial value added product [4].

They used velvet tamarind (Dialium guineese, wild) pulp flour to produce candies. Proximate composition, and vitamin composition of the pulp flour and candies were evaluated. The sensory properties and functional properties were also determined using chocolate candy as the control. The candies and the pulp flour had vitamin composition ranging from 0.7 mg/100 to 1.59mg/100 vitamin A and 38.71 mg/100 to 4.85 mg/100 vitamin C. The result of the functional properties of velvet tamarind pulp flour had emulsion capacity of 56%, bulk density of 0.44g/m, water absorption capacity of 2.5g/ml, oil absorption capacity of 1.76g/ml, foam capacity and stability of 30% and 111% respectively. The results of the sensory evaluation showed that the velvet tamarind chewable candy was most preferred by the panelists in terms of colour, flavour, taste and general acceptability. The control was most preferred in terms of mouth feel and appearance.

They investigated the effect of sodium benzoate on the quality attributes of improved tamarind beverage during storage. Tamarind beverages were produced according to a previously reported improved method, with or without chemical preservatives (100 mg/100 mL sodium benzoate). Tamarind beverage produced according to traditional processing method served as the control. The tamarind beverages were stored for 4 months at room (29.2°C) and refrigerated (4– 10°C) temperatures. Samples were analyzed, at regular intervals, for chemical, sensory, and microbiological qualities. Appearance of coliforms or overall acceptability score of 5.9 was used as deterioration index. The control beverages deteriorated by 2nd and 10th days at room and refrigerated temperatures, respectively. Improved tamarind beverage produced without the inclusion of sodium benzoate was stable for 3 and 5 weeks at room and refrigerated temperatures, respectively. Sodium benzoate extended the shelf life of the improved tamarind beverage to 6 and 13 weeks, respectively, at room and refrigerated temperatures [6].

They prepared the spray dried tamarind pulp powder (TPP) by using three carrier agents maltodextrin (40, 50, 60%), gum arabic (40, 50, 60%) and whey protein concentrate (10, 20, 30%) and their total phenolic content and antioxidative properties (by DPPH, FRAP and ABTS assay). Total phenolic content of TPPs ranged from 59.45-131.33 mg of GAE / 100g. It was observed that phenolic content was protected at higher carrier agent addition rates. Values of Radical scavenging activity (% RSA), FRAP (mg of Ferrous sulphate equivalent / g) and total antioxidant activities (TAA) by ABTS assay of TPPs varied from 61.73 to 76.43, 56.81-311.63 and 0.071 - 0.15 mM of trolox equivalent / g of powder. FRAP values of TPPs ranged from and showed decrease in FRAP values with increase in the addition rate of the MD and GA. Antioxidant properties were positively correlated with total phenolic content of TPP [7].

The main purpose of this research is to investigate possible conditions for processing tamarind beverage such as raw material, mixing and formulating the finished product.

MATERIAL AND METHOD

Material

Tamarind fruit is collected in Mekong river delta. Various additives are supplied from Van Dai Phat Co. Ltd, Vietnam.

Research method

Raw material

We examine the puree recovery by weighing 5 samples, then separating pulp.

Processing

Blanching

a) Blanching time: Blanch at 85^{o}C in different intervals: 0.5 minutes; 1 minutes; 2 minutes; 3 minutes; 4 minutes; 5 minutes. Set these samples in 72 hours to observe sedimentation.

b) Blanching temperature: Fix the blanching time in water. Investigate in various blanching temperature 80^{o}C; 85^{o}C; 90^{o}C; 95^{o}C. Set these samples in 72 hours to observe sedimentation.

c) Blanching solution: Fix the blanching time and blanching duration. Investigate two blanching solutions: water and acid citric 0.1%.

2.2.2.2 Mixing formula

a) Dilution ratio: Examine various water additions into puree: 2/1; 2.5/1; 3/1; 3.5/1; 4/1. Select on viscosity, concentrated and color.

b) Additive supplementation: Vitamine C: 0.1%; NaCl: 0.12%; Sodium Sorbate: 0.1%. Fix the dilution ratio, Examine two sugars (9.5%, 10%, 10.5%, 11%) and acid citric (0.04%, 0.06%, 0.08%, and 1%,). Evaluate the pleasant taste between sweet and acidity to select the btest additive supplementation
c) Additive supplementation: Conduct two additive supplementation (pectin and agar)
- Step #1: pectine 0%; 0.04%; 0.06%; 0.08%; 0.1%
- Step#2: agar 0%; 0.02%; 0.04%; 0.06%; 0.08%
Determine the sendiment in 7 days together with product viscosity so that we get the best tamarind beverage.

Statistical analysis

All data are processeed by anh Excell.

RESULT AND DISCUSSION

Raw material

Puree recovery

Table 1. Puree recovery

Tamarind	Raw	Ripen
Puree recovery (%)	63.40	67.02

When ripening, protopectin will be changed into soluble pectin so we get more puree.

Physio-chemical characteristics of ripen tamarind

Table 2. Physio-chemical characteristics of raw and ripen tamarind

Composition	Unit	Raw tamarind	Ripen tamarind
Moisture	%	87.28	85.05
Ash	%	0.39	0.47
Dry matter	oBrix	12.59	14.80
pH	-	2.94	3.70
Acidity	% Citric acid	1.11	0.73
Vitamin C	mg%	38.43	37.92
Reduced sugar	%	4.5	4.73
Total sugar	%	7.7	8.33

From above table, we see clearly that the ripen tamarind is suitable for beverage production.

Processing protocol

Effect of blanching

Blanching time

Table 3. Effect of blanching time

Sample	#1	#2	#3	#4	#5	#6	#7
Time (minutes)	0.5	1	2	3	4	5	0
Temperature (oC)	85	85	85	85	85	85	-
Solution	Water	Water	Water	Water	Water	Water	-
Puree recovery (%)	67.02	67.34	68.56	69.86	70.02	69.21	67

From above table, we choose 3 minutes for blanching.

Effect blanching temperature

Table 4. Effect blanching temperature

Temperature (^oC)	80	85	90	95	Control
Apperance	Separated	Not separated	Not separated	Not separated	Not separated
Sediment	0.035	0	0	0	0.124
Color	Bright yellow	Bright yellow	Yellow	Dark yellow	Light yellow
Flavor	Specific	Specific	Cooked	Cooked	Specific

Blanching at 85^{o}C is adequated. So we choose this value for further experiments.

Effect of blanching solution

Table 5. Effect of blanching solution

Blanching solution	Water	Citric acid 0.1%
Color	Yellow	Yellow
Flavor	Specific	Not specific

From the above table, we decide to choose water as medium for blanching.

Mixing step

Effect of dilution ratio

Table 6. Effect of the dilution ratio

Water/puree	2/1	2.5/1	3/1	3.5/1	4/1
Concentration	Very concentrated	Quite concentrated	Rather concentrated	Rather loose	Loose
Viscosity (Cp)	2.789	1.67	1.25	1.19	1.13
Color	Brown yellow	Dark yellow	Bright yellow	Bright yellow	Light yellow

In comparison among these samples, we choose the dilution ratio of water/puree 3/1 for further research.

Effect of the additive mixture.

We decide to supplement vitamin C (0.1%); NaCl (0.12%); sodium sorbate 0.1%; water/puree 3/1 to please the sour and sweet taste in mixing acid citric and sugar.

Table 7. Effect of the additive mixture

Water/ puree	Vitamin C %	NaCl %	Sodium sorbat %	Sugar/citric acid %	9.5	10	10.5	11
3/1	0.1	0.12	0.1	0.04	B1	B2	B3	B4
3/1	0.1	0.12	0.1	0.06	B5	B6	B7	B8
3/1	0.1	0.12	0.1	0.08	B9	B10	B11	B12
3/1	0.1	0.12	0.1	0.10	B13	B14	B15	B16

We choose the ratio of sugar/ citric acid of sample M11=10.5/0.08 with the pleasant taste to produce tamarind beverage.

Effect of additive mixture to condensate

a) Effect of pectin ratio

Table 8. Effect of pectin ratio

Pectin %		0	0.04	0.06	0.08	0.10
Viscosity		1.25	1.27	1.30	1.32	1.51
Sediment	0 day	0	0	0	0	0
	1 day	0.087	0.065	0.063	0.035	0.032
	2 days	0.197	0.152	0.130	0.064	0.060
	3 days	0.275	0.230	0.223	0.091	0.087
	4 days	0.288	0.245	0.240	0.143	0.136
	5 days	0.320	0.255	0.255	0.157	0.145
	6 days	0.325	0.260	0.255	0.160	0.149
	7 days	0.325	0.260	0.257	0.160	0.150

After 7 days of observation, we notice the sendiment reduced dramatically when comparing the control sample and treated samples. So we don't need to supplement pectin into tamarind beverage.

b) Effect of agar supplementation

Table 9. Effect of agar supplementation

Agar %		0	0.02	0.04	0.06	0.08
Viscosity		1.25	1.26	1.28	1.29	1.40
Sediment	0 day	0	0	0	0	0
	1 day	0.087	0.031	0.018	0	0
	2 days	0.197	0.058	0.057	0.005	0
	3 days	0.275	0.135	0.084	0.005	0
	4 days	0.288	0.179	0.125	0.007	0.005
	5 days	0.320	0.236	0.130	0.007	0.005
	6 days	0.325	0.236	0.130	0.007	0.005
	7 days	0.325	0.310	0.132	0.008	0.005

When adding 0.06% agar, the sendiment removal is not accessed 100% and acceptable. So we choose this ratio for further research.

Quality of tamarind beverage characteristics

Table 10. Chemical characteristics of tamarind beverage

Criteria	Unit	Quantity
pH		3.1
Dry matter	oBrix	14.5
Acid	% Citric acid	0.27
Total sugar	%	12.82
Vitamin C	mg%	51

Table 11. Sensory score of tamarind beverage

Criteria	Total	Average score without the emphasized ratio	The emphasized ratio	Average score with the emphasized ratio
Color	68	4.53	1.2	5.44
Appearance	62	4.13	0.8	3.30
Flavor	54	3.60	1.0	3.60
Taste	62	4.13	1.0	4.13
Total score				16.47

With the total score 16.47, the tamarind is in average according to TCVN 3215-79.

CONCLUSION

Tamarind (*Tamarindus indica* L.), an indigenous underutilised tree fruit, has many valuable properties and almost every part of the tree is utilised by rural and urban dwellers. Upgrading the quality attributes of tamarind beverage, using an improved processing method may be able to diversify the beverage market and provide a totally new experience for consumers.

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