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Development and Quality Evaluation of Papaya Malt

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ABSTRACT

The present investigation on the "Development and quality evaluation of Papaya malt" was carried out at Post Harvest Lab, Department of Horticulture, Faculty of Agriculture, Annamalai University, Annamalai Nagar during 2020-2022. The experiment was carried out in a completely randomized design with four formulations and five replications. Papaya was processed into malt and the effect of processing on the nutritional and sensory quality of malt was determined. The sensory evaluation was carried out at monthly intervals for three months during storage. Papaya malt was prepared in four formulations by incorporating millets into papaya pulp (T₁ – Pearl millets, T₂ – Ragi, T₃ – Varagu, T₄ – Thinai). Among the formulations, T₂ (40% of Ragi) was considered the best treatment with moisture (10.5%), ash (3.5%), reducing sugar (4.41%), and total sugar (8.45%), protein (9.3%). The maximum sensory scores for organoleptic evaluation were obtained by T₂ (40% of ragi) for taste, colour, flavour and overall acceptability followed by T₁ (40% of pearl millet). The cost economics for the production of papaya malt was 1.74.

1. INTRODUCTION

Papaya scientifically called *Carica papaya* L. is an important tropical and subtropical fruit crop native to the central and South American region. Papaya fruit is known for its nutrient content such as vitamin – A, C, and D, minerals viz., magnesium and potassium. Papaya fruit is consumed as raw fruit and also in value-added product. Papaya fruits are processed into different value-added products such as papaya candy, papaya pickles, Osmo dried papaya sweet, and papaya shake by involving different preservation methods such as drying, preservation, vacuum packing, freezing, pasteurization and canning. The shelf life of papaya fruits is enhanced by value addition technology. Hence an attempt was made to process papaya into papaya malt by incorporating different millets (Mezgebo, *et al.*, (2018), Agrahar

et al., (2016), Agrahar *et al.*, (2015), Chagas *et al.*, (2018).

Materials and Methods

This present investigation was carried out at Post Harvest Lab, Department of Horticulture, Faculty of Agriculture, Annamalai University, Annamalai Nagar during 2020-2022. The experiment was carried out in a Completely Randomized Design with four formulations and five replications. Papaya was processed into malt and the effect of processing on the nutritional quality and sensory quality of malt were determined. The sensory evaluation was carried out at monthly intervals for three months during storage. Papaya malt was prepared with four formulations viz., T₁ – Pearl millets, T₂ – Ragi, T₃ – Varagu, and T₄ – Thinai (Fig. 1). Prepared malt was stored up to three months.

Fully matured papaya fruit was selected and then peeled after washing. Seeds were removed and cut into small pieces then ground into pulp. Millets were Soaked for 8 hours and allowed to germinate at 37°C for 48 hrs and then dried

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at 180°C for 1 hour. Then millets, cashew, cardamom and country sugar were also ground to powder form. Papaya pulp was transferred to a pan and started cooking. After 10 minutes, according to the formulations, millets powder was added to it then cooking was continued. After 5 minutes, cooked malt was transferred to the vessels. Finally, cashew, cardamom and country sugar were added to it. The cooked malt was kept in a hot air oven till moisture was removed from it and then ground to a fine powder. The prepared malt was sieved (Sieve at 85 mesh) to get uniform size granules and kept in a plastic container.

The organoleptic quality of papaya processed products was evaluated by the panelists for sensory attributes such as color, taste, flavor, and also overall acceptability. As explained by (Wichchukit and Mahony, 2014) a nine-point hedonic scale was used ranging from like extremely (9) to dislike extremely (1). All samples were presented before the panelists at ambient temperature under normal lighting conditions. Nutritional quality such as pH, TSS (Brix), total sugars (%), protein (%) and moisture (%) were determined. Total sugars (%) and protein (%) were analyzed by the method of AOAC (2004).

RESULTS AND DISCUSSION

Among the different formulations of papaya malt, the minimum value for moisture content recorded in T₂ formulated with 40% ragi (10.5%) and the maximum moisture content recorded in T₃ formulated with 40% varagu (12.4%). The moisture content ranged from 10.50% to 12.40%, which is within the optimal range of humidity (6–15%) to ensure good storage (Taruvinga *et al.*, 2014). Lower moisture content might be due to the processing of malt at high temperatures for a long time leading to evaporation of water from malt.

Reducing sugars and total sugar content in raw papaya fruit are 2.8% and 5.5% (Attri, 2014). Reducing sugar content in prepared papaya malt ranged from 4.41% (T₂) to 3.46% (T₃) (Table 1) among the formulations and the highest value for total sugar content was recorded in treatment T₂ formulated with 40% Ragi (8.45%) and the lowest total sugar content recorded in T₃ formulated with 40% varagu (6.17%). Papaya contains a high amount of total and reducing sugars (Rai and

Chauhan, 2008). Thus, the incorporation of fruits could be the reason for an increase in total and reducing sugars of the malt mixes. The increase in reducing sugar and total sugar might be due to the degradation of starch to sugars by endogenous amylases on malting (Mittal *et al.*, 2004).

Ash content in prepared papaya malt ranged from 3.5% (T₂) to 2.2% (T₃) among the formulations. Ash content of processed products was lower than the fresh fruit (4%). The lower amount of ash content might be due to the incorporation of mineral elements into cell constituents during the germination process in the malting of millet (Ogbonna *et al.*, 2012).

The minimum value for protein content recorded in treatment T₃ was formulated with 40% Varagu (7.6%) and the maximum protein content recorded in T₂ was formulated with 40% Ragi (9.3%). An increase in protein content was observed in prepared malt compared with raw fruit (0.6%). A significant increase in the protein content was observed on the malting of millet. The increase in protein content may be due to loss of carbohydrates through oxidation during germination and loss of low molecular weight nitrogen and rinsing of grains. Increased protein content might be attributed to the incorporation of millets which contain a good source of protein by 8% and also due to the formation of free amino acids and peptides during malting. This was also reported by Tanya *et al.* (2013).

The papaya malt produced with ragi (T₂) scored the best in the first month of sensory evaluation among the different formulations (Table 2), with scores of taste (8.1), color (7.9), flavor (8.0), and overall acceptability (7.7). T₁ with pearl millet obtained the second best score in the formulation, followed by T₄ with thinai.

The lowest score received in the formulation prepared with varagu (T₃) had scores for taste (5.9), color (6.2), flavor (6.1) and overall acceptability (6.5). Sensory evaluation was conducted for another two months, during this time sensory score of all treatment got decreased.

In the third month of evaluation, among the different formulations, the highest score was recorded in T₂ (ragi) with scores for taste (7.4), colour (7.4), flavor (7.5) and overall acceptability

Table 1: Effect of variation in millets on the nutritional quality of papaya malt

TREATMENTS	Moisture (%)	Ash (%)	Reducing sugar (%)	Total sugar (%)	Protein (%)
T ₁ - 40% Pearl millet	11.2	2.8	4.17	7.86	8.5
T ₂ – 40% Ragi	10.5	3.5	4.41	8.45	9.3
T ₃ – 40% Varagu	12.4	2.2	3.46	6.17	7.6
T ₄ – 40% Thinai	11.9	2.5	3.83	6.62	8.1
S. Ed.	0.228	0.134	0.109	0.178	0.153
C. D. (P=0.05)	0.46	0.27	0.22	0.36	0.31

Table 2: Mean sensory scoring for Papaya Malt

Treatment	1 st month				2 nd month				3 rd month			
	Taste	Colour	Flavour	Overall acceptancy	Taste	Colour	Flavour	Overall acceptancy	Taste	Colour	Flavour	Overall acceptancy
T ₁ (40% PEARL MILLET)	7.1	7.3	7.0	7.2	6.9	7.1	6.8	6.9	6.6	6.9	6.6	6.7
T ₂ (40% RAGI)	8.1	7.9	8.0	7.7	7.8	7.7	7.7	7.4	7.4	7.4	7.5	7.2
T ₃ (40% VARAGU)	5.9	6.2	6.1	6.5	5.7	5.9	5.8	6.3	5.4	5.6	5.6	6.1
T ₄ (40% THINAI)	6.6	6.7	6.5	6.9	6.3	6.5	6.3	6.6	6.1	6.2	6.0	6.4
S. Ed.	0.154	0.169	0.129	0.104	0.254	0.259	0.219	0.124	0.213	0.203	0.159	0.114
C. D.(P=0.05)	0.31	0.34	0.26	0.21	0.51	0.52	0.44	0.23	0.43	0.41	0.32	0.23

Table 3: Microbial analysis in papaya malt

S. No.	Organism	Medium	Dilution	Mean
01	Bacteria	NA	10 ⁻⁶	2.3
02	Fungi	RBA	10 ⁻⁴	0.3
03	Actinomy-cetes	KKA	10 ⁻⁵	Nil

(7.2) followed by T₁ and T₄. The lowest scores were recorded in the formulation T₃ (varagu) with a score for taste (5.4), colour (5.6), flavor (5.6) and overall acceptability (6.1).

The presence of bacterial count accounted to 2.3 × 10⁻⁶ cfu and a fungal count of 0.3 × 10⁻⁴ cfu in papaya malt (Table 3). The microbial count was

**Fig. 1:** Prepared Papaya Malt

slightly higher in malt. An increase in microbial count might be due to the incorporation of papaya fruit during the production of malt which contains nearly 90 % of moisture as reported by (Badau, 2006).

Conclusion

Finally, it is concluded that among the formulations, T₂ (40% of Ragi) was considered as the best treatment with moisture (10.5%), ash (3.5%), reducing sugar (4.41%), total sugar (8.45%), protein (9.3%). The maximum sensory scores for organoleptic evaluation were obtained by T₂ (40% of ragi) for taste, colour, flavour and overall acceptability followed by T₁ (40% of pearl millet). The cost economics for the production of papaya malt was 1.74. Hence processing of papaya into papaya malt can be commercialized.

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