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Development of papaya yeast bread

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Abstract

Bread is considered a basic food in the whole world which became more interesting due to its many innovations in terms of its appearance, form, and content which has resulted to consumers' increasing demands also with its freshness, sensory and nutritional contents. This research was conducted to know the acceptability of papaya yeast bread in terms of color, texture, sweetness, and flavor as well as to determine whether the overall attributes contributed significantly to the overall acceptability of the product. The profile of the respondents was also identified. Descriptive-quantitative tool was used in this study. Bread experts were randomly selected to answer the survey. Frequency counts, weighted mean, correlation analysis and ranking were utilized in analyzing the data. Results show that in terms of color, texture, sweetness, and overall acceptability, the papaya yeast bread was generally regarded favorably by participants in the study. Among the samples prepared, Sample C has the highest overall acceptability based on the hedonic evaluation. Statistical findings show significant and non-significant relationships when the samples' sensory characteristics, such as color, texture, sweetness, and taste, were correlated with their general acceptability. This suggests that even though taste, sweetness, color, and texture all have a significant impact on an item's overall acceptability, there might be still additional factors influencing consumer preferences.

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Introduction

Papaya (*Carica papaya*) is a tropical fruit with high medicinal and nutritive value and has huge commercial importance. It is considered an herbaceous perennial because though it resembles a tree, it is actually an herb. It is an herbaceous plant which originated from Central America but is now grown all over the world in tropical areas for its delicious, sweet, and large fruits (Saba & Patan, 2022). According to Koul, *et al.* (2022), the varieties of papaya are distinguished with their petiole color, leaf shape and structure, shape of stomatal, number of lobes in the leaf margins and number of leaves in central veins. Papayas are nutritious fruits considering the amount of nutrients present like vitamins A, B, C, E, K, folate, pantothenic acid, lutein, lycopene, zeaxanthin, magnesium, copper, potassium, and calcium. It is known to be rich in fiber, vitamin C and antioxidants. It is also known to prevent arthritis, lowers heart cholesterol, reduce aging, macular degradation, cancer and cardiovascular risks, a reason why many have cultivated papaya for millions of years.

Bread is considered a basic food in the whole world which has been awarded by World Heritage as model for healthy eating (Elia, 2011, UNESCO, 2010). Due to the many innovations of bread in its appearance, form, and content, it became more interesting (Pangesthi & Indrawati, 2021). Breads mixed with plant-based ingredients are called functional breads (Birch and Bonwick, 2018). The addition of plant-based ingredients in bread is a great way of enhancing the value of nutrients in bread (Martins, Z., *et al.*, 2017). This may also reduce food waste and enhance the status of nutrition of consumers (Amoah L., *et al.*, 2020). Consumers are increasingly demanding with the bread's freshness, sensory and nutritional properties in Europe (Heenan, 2008). Due to the wide consumption of bread products, it has become an alternative for the use of fruit processing end products which aims to enhance its nutritional contents (Santos, C., 2018)

In this research, sensory evaluation is utilized which will not just be essential for the assessment of the whole quality of the product but will also determine factors that could result in the development of the product. Sensory analysis technique application is an important tool for bakers because it offers quality assured products which are confirmed and defined in clear terms for the market. The precise sensory evaluation would help identify essential factors for the market and will be utilized in the formulation of new products (Elia, 2011). Given that the bakery business produces a quality-assured product that is confirmed and characterized in clear terms for the consumer, the implementation of sensory analysis techniques is a significant tool for the industry. The development of new items would be made easier with the use of a thorough sensory characterization that would pinpoint the crucial elements for regional markets. This research is conducted to determine the profile of the respondents in terms of age, sex and years in the service. Also, this study is conducted to identify the energy and nutritional facts present in the product as well as to determine whether the overall attributes (color, texture, sweetness, and flavor) contributed significantly to the overall acceptability of the product.

Materials and method

Sample procurement

All the baking ingredients (Milk, butter, sugar, wheat flour, all purpose, active dry yeast, salt, eggs) were brought from the mall grocery store while the ripe papaya fruit was freshly brought from the fruit vendors in Dagupan City.

Production of Papaya Puree

Fresh papayas were selected, cleaned, and peeled. The fruit was sliced into cubes and pureed using blender. Fig. 1 shows the flow chart to produce papaya puree.

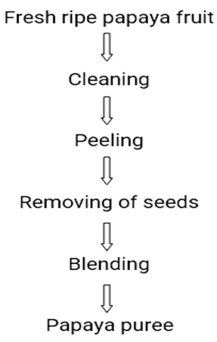

Fig. 1. Flowchart to produce papaya puree.

Production of papaya yeast bread

After mixing all the wet ingredients, papaya puree was added with varying proportions (75.6, 113.4, 151.2, 189, 226.8). After which, it was mixed with the solid ingredients and was set aside to rest before the next procedure. The papaya yeast bread was scaled, kneaded, molded, and was finally placed in greased baking pans. The dough was left to proof for 1 hour in a room temperature. The proofed dough was baked at 225 degrees Celsius for 15 minutes and cooled. Table 1 presents the formulation of papaya yeast bread with sample codes for each recipe.

Table 1. Formulation of papaya yeast bread.

Sample Code	Ripe papaya puree (g)	Milk (g)	Butter (g)	Sugar (g)	Wheat flour, All-purpose (g)	Active dry yeast (g)	Salt (g)	Eggs (pcs)	Water (tsp)
A	75.6	92	60	60	375	7	5.9	2	1
B	113.4	92	60	60	375	7	5.9	2	1
C	150	92	60	60	375	7	5.9	2	1
D	189	92	60	60	375	7	5.9	2	1
E	226.8	92	60	60	375	7	5.9	2	1

25 randomly chosen respondents coded and tested the papaya yeast bread samples. The samples' color, texture, sweetness, flavor, and overall acceptability were assessed by the respondents using a nine-point hedonic scale: 9 = extremely like, 8 = very much like, 7 = moderately like, 6 = slightly like, 5 = neither like nor dislike, 4 = slightly dislike, 3 = moderately dislike, 2 = very much dislike, and 1 = extremely dislike. For the purpose of assessing the coded products, a set of questionnaires was developed.

The collected data were summed up and analyzed. For the profile of the respondents, frequency counts were used. The indicators were computed using weighted means derived from the nine points hedonic scale. The perception of the respondents was correlated using correlation analysis.

Result and discussion

The tables and paragraphs below present the findings of the study. Table 2 shows the energy and nutrients per serving found in the papaya yeast bread (with 150g papaya puree content). Computations were based on The Philippine Food Composition Tables 2019 published by the Department of Science and Technology Food and Nutrition Research Institute (DOST-FNRI).

The table provides a comprehensive breakdown of the various nutrients present in papaya yeast bread. It highlights the essential vitamins, minerals, and other beneficial components that contribute to its overall nutritional value. Table 3 presents the profile of the bakers in terms of age, sex, and years in service.

Table 2. Energy and nutrient content of papaya yeast bread per serving.

Energy and Nutrient Content	
Nutrient	Total Nutrient Content
Water	34.9
Energy (kcal)	232.75
Protein (g)	6.7
Total fat (g)	6.81
Total CHO (g)	36.4
Ash (g)	1.09
Total Dietary fiber (g)	1.48
Total sugars (g)	7.88
Sodium (mg)	259.25
Calcium (mg)	54.99
Phosphorous (mg)	68.67
Iron (mg)	2.1
Retinol (ug)	45.83
B-carotene (ug)	90.44
Vitamin A, RAE (ug)	53.44
Thiamin (mg)	0.05
Riboflavin (mg)	0.13
Niacin (mg)	2.37
Vitamin C (mg)	11.37
Sat. Fatty Acids (g)	3.73
Monounsat. Fatty Acids (g)	1.75
Polyunsat. Fatty Acids (g)	0.42
Cholesterol (mg)	62.11

Findings revealed that most of the respondents (12 or 48%) are 21-30 years old, followed by 31-40 years old (7 or 28%), then 21 and below and 41 to 50 years old respondents garnered 3 each (12%). Further, most of them (15 or 60%) are male while the remaining (10 or 40%) are female. Lastly, in terms of their service as bakers, most of them have served for 6 to 10 years

already (12 or 48%) which is followed by 0 to 5 years (9 or 36%), 11-15 years in service and 16 and above have frequencies of 2 each or equivalent to 8% each. Table 4 presents the results from the evaluation of breads by different bread experts or bakers in terms of color, texture, sweetness, flavor, and overall acceptability.

Table 3. Profile of the bread expert respondents.

Age	Frequency	Percentage (%)
20 and below	3	12
21-30	12	48
31-40	7	28
41-50	3	12
51 and above	0	0
Total	25	
Sex		
Male	15	60
Female	10	40
Total	25	
Years in the service		
0-5	9	36
6-10	12	48
11-15	2	8
16 and above	2	8
Total	25	

Table 4. Computed mean from the respondents' evaluation on the different sensory attributes of papaya yeast bread.

Sample code	Color	Texture	Sweetness	Flavor	Overall acceptability
A	6.28	6	5.88	6.56	6.6
B	6.84	6.28	6.08	6.68	6.72
C	6.84	6.56	7	7.4	7.4
D	6.88	6.56	7.24	7	7
E	6.76	6.44	7.52	7.2	6.72

The table shows the result of the sensory evaluation in terms of color, texture, sweetness, and flavor. In terms of color, sample D has the highest weighted mean of 6.88 as compared to sample and B and C (6.84), sample E (6.76), and sample A (6.28). This indicates that sample D has the most appealing color among all the samples. In terms of texture, samples C and D garnered the highest mean (6.56), followed by sample E (6.44), sample B (6.28) and sample A (6). This means that the amount of papaya puree added has an effect to the texture of the bread considering that bread experts perceived that C and D samples have better texture compared to other samples with less papaya puree content (A and B) and E with the highest papaya puree content. In terms of sweetness, sample D has the highest weighted mean of 7.52, followed by D (7.24), C (7), B (6.08) and A (5.88). This indicates that as the amount of papaya puree rises, the sweeter the taste of the bread becomes. In terms of flavor, sample C is the most liked by respondents with 7.4 weighted mean, followed by sample E (7.2), sample D (7), sample B (6.68) and sample A (6.56). This means that sample C with an average amount of puree compared to the other samples was appreciated more by the respondents in terms of taste. Lastly, in terms of overall acceptability, sample C was perceived by the respondents to be the most acceptable. This is followed by samples B and E with 6.72 weighted mean, then sample D with 7 weighted mean and lastly, sample A with 6.6 weighted mean.

Results from the sensory evaluation revealed that the papaya yeast bread coded from A to E were rated almost alike in the various quality attributes evaluated which indicates the feasibility of adding papaya and yeast to bread. This result suggests the potential addition of papaya to bread as food flavoring apart from nutrition source.

Table 5 presents the respondents' perception for sample A on the relationship of the sensory attributes and overall acceptability.

Table 5. Perceptions of the respondents for Sample A on the relationship between the sensory attributes with their overall acceptability.

Sensory attributes	Overall Acceptability	
	r-value	Significance
Color	0.713**	0.000
Texture	0.606**	0.001
Sweetness	0.505**	0.010
Flavor	0.711**	0.000

Legend: ** highly significant at 0.01 level

The table indicates that all sensory attributes namely color, texture, sweetness, and flavor revealed highly significant relationship with the overall acceptability. This is indicated by their corresponding correlation coefficients and significance of .713 and 0.000 (color), 0.606 and 0.001 (texture), 0.505 and 0.010 (sweetness), and 0.711 and 0.000 (flavor). The result implies that based on respondents' evaluation, all the

sensory attributes contributed significantly to the overall acceptability of the product.

Table 6 presents the respondents' perception for sample B on the relationship of the sensory attributes and overall acceptability.

Table 6. Perceptions of the respondents for Sample B on the relationship between the sensory attributes with their overall acceptability.

Sensory attributes	Overall Acceptability	
	r-value	Significance
Color	0.864**	0.000
Texture	0.572**	0.003
Sweetness	0.418*	0.037
Flavor	0.749**	0.000

The table shows significant relationship between all sensory qualities, including color, texture, sweetness, and flavor, and their overall acceptability. This is indicated by their corresponding correlation coefficients and significance of .394 and 0.051 (color), 0.316 and 0.124 (texture), 0.492 and 0.012 (sweetness), and 0.452 and 0.023 (flavor). These correlation coefficients suggest that there is a strong positive relationship between sensory qualities and overall acceptability. The significance values indicate that these relationships are statistically significant, further supporting the idea that sensory qualities play a crucial role in determining overall acceptability.

Table 7 presents the respondents' perception for sample C on the relationship of the sensory attributes and overall acceptability.

Table 7. Perceptions of the respondents for Sample C on the relationship between the sensory attributes with their overall acceptability.

Sensory attributes	Overall Acceptability	
	r-value	Significance
Color	0.394	0.051
Texture	0.316	0.124
Sweetness	0.492*	0.012
Flavor	0.452*	0.023

The table shows significant relationship between sensory qualities, including sweetness, and flavor, however, in terms of color and texture findings revealed that they are not significant when correlated with their overall acceptability. This is indicated by their corresponding correlation coefficients and significance of 0.492 and 0.012 (sweetness), 0.452 and 0.023 (flavor) .394 and 0.051 (color), 0.316 and 0.124 (texture). These results suggest that sweetness and flavor play a stronger role in determining overall acceptability compared to color and texture. It is possible that consumers prioritize taste over visual appeal and texture when evaluating the acceptability of a product. Table 8 presents the respondents' perception for sample D on the relationship of the sensory attributes and overall acceptability.

Table 8. Perceptions of the respondents for Sample D on the relationship between the sensory attributes with their overall acceptability.

Sensory attributes	Overall Acceptability	
	r-value	Significance
Color	0.433*	0.030
Texture	0.292	0.157
Sweetness	0.075	0.720
Flavor	0.570**	0.003

The 8 table shows a significant relationship between sensory qualities, including color and flavor, however, in terms of texture and sweetness, findings revealed they are not significant when correlated with their overall acceptability. This is indicated by their corresponding correlation coefficients and significance of .433 and 0.030 (color), 0.570 and 0.003 (flavor), 0.292 and 0.157 (texture), and 0.075 and 0.720 (sweetness). These correlation coefficients suggest that color and flavor have a stronger impact on the overall acceptability of the sensory qualities compared to texture and sweetness. The weaker correlation coefficients for texture and sweetness suggest that these factors may be less influential in shaping their perception of the product's acceptability. Table 9 presents the respondents' perception for sample E on the relationship of the sensory attributes and overall acceptability.

Table 9. Perceptions of the respondents for Sample E on the relationship between the sensory attributes with their overall acceptability.

Sensory attributes	Overall Acceptability	
	r-value	Significance
Color	0.678**	0.000
Texture	0.559**	0.004
Sweetness	-0.047	0.823
Flavor	0.304	0.140

The table shows a highly significant relationship between sensory qualities, including color and texture, however, in terms of sweetness and flavor, findings revealed they are not significant when correlated with overall acceptability. This is indicated by their corresponding correlation coefficients and significance of .678 and 0.000 (color), 0.559 and 0.004 (texture), -0.047 and 0.823 (sweetness), and 0.304 and 0.140 (flavor). These correlation coefficients suggest that there is a strong positive relationship between color and overall acceptability, as well as between texture and overall acceptability. However, there is no significant relationship between sweetness and overall acceptability, while the relationship between flavor and overall acceptability is moderately positive but not statistically significant.

Conclusion

This study provided conclusions on the acceptability of the development of papaya yeast bread. The study found that participants generally found the papaya yeast bread to be acceptable in terms of color, texture, sweetness, and overall acceptability. Among the samples prepared, results from the hedonic evaluation show that Sample C has the highest overall acceptability. Statistical findings show significant and non-significant relationships when the samples' sensory characteristics, such as color, texture, sweetness, and taste, were correlated with their general acceptability. This suggests that while color, texture, sweetness, and taste play a crucial role in determining overall acceptability, there may be still other factors influencing consumers' preferences.

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References

Amoah I, Taarji N, Johnson PNT, Barrett J, Cairncross C, Rush E. 2020. Plant-based food by-products: Prospects for valorisation in functional bread development. Sustainability **12(18),** 7785.

Birch CS, Bonwick GA. 2019. Ensuring the future of functional foods. International Journal of Food Science & Technology **54(5),** 1467-1485.

DOST-FNRI. 2019. The Philippine Food Composition Tables. ISBN 978-971-8769-44-7

ELÍA M. 2011. A Procedure for Sensory Evaluation of Bread: Protocol Developed by A Trained Panel. Journal of Sensory Studies **26(4),** 269-277.

Heenan SP, Dufour JP, Hamid N, Harvey W, Delahunty CM. 2008. The sensory quality of fresh bread: Descriptive attributes and consumer perceptions. Food research international **41(10),** 989-997.

Martins ZE, Pinho O, Ferreira IMPLVO. 2017. Food industry by-products used as functional ingredients of bakery products. Trends in Food Science & Technology **67,** 106-128.

Pangesthi, Indrawati V. 2021. Development Ability of Sweet Bread Made from Liquid and Dry Raisin Yeast. IOP Conference Series: Earth and Environmental Science **709(1),** 012056.

Saba S, Pattan N. 2022. The Potential Health Benefits of Papaya Seeds. Int. J. Res. Appl. Sci. Eng. Technol **10,** 44-50.

Santos CMD, Rocha DA, Madeira RAV, Queiroz EDR, Mendonça MM, Pereira J, Abreu CMPD. 2018. Preparation, characterization and sensory analysis of whole bread enriched with papaya byproducts flour. Brazilian Journal of Food Technology 21.