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SENSORY ACCEPTABILITY OF CORN (Zea mays L.) COB FLOUR-BASED MUFFINS

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ABSTRACT

The research employed a quantitative experimental method to analyze how corn cob flour affects the taste of muffins and its influence on customer product ratings. The research tested five different treatment groups, which included Treatment A with all-purpose flour at 100%, Treatment B with 75% all-purpose flour and 25% corn cob flour, Treatment C with equal parts all-purpose flour and corn cob flour at 50% each, Treatment D with 25% all-purpose flour and 75% corn cob flour, and Treatment E with pure corn cob flour at 100%. The 50 panelists conducted sensory evaluation through the 9-point Hedonic Scale developed by Peryam and Pilgrim to evaluate appearance, aroma, taste, texture, and general acceptability. The researchers applied descriptive statistics through mean and standard deviation together with the Kruskal-Wallis H test for data analysis. Results showed that Treatments A and B received the highest ratings across most sensory attributes, while Treatment E received the lowest. The results showed a statistically important variation between the treatments (H = 68.769, p = .000) which proved that corn cob flour substitution levels had a significant impact on how people liked the muffins. The research demonstrated corn cob flour's ability to function as an environmentally friendly baking ingredient which should motivate scientists to explore new food products that utilize agro-industrial waste materials.

KEYWORDS: *Corn Cob Flour, Zea Mays L., Muffins, Sensory Acceptability, Hedonic Scale, Sustainable Food Product, BSHM Students, Agro-Industrial Waste Utilization, Functional Ingredients, Product Development*

INTRODUCTION

1.1 Background of the study

Muffins exist under two other names which include quick bread muffins and American muffins. The basic components of muffins include flour and sugar and fat and a range of flavorings. The first recorded appearance of the term "muffin" occurred in the British publication London Labour during 1851 which started its rise in popularity. People from all generations enjoy muffins in different shapes and sizes and flavors as they serve both breakfast needs and snack cravings. The global muffin market shows ongoing growth because customers want to try new healthy food options.

Different physical and chemical testing methods help scientists understand corn cobs through measurements of particle size distribution and specific mass and density and ash content and protein and starch and fat and moisture levels. The main components of corn cobs include 34.7% hemicellulose and 31.7% cellulose and 20.3% lignin together with proteins and simple sugars and lipids and starch and water and various other substances. The agricultural waste from corn production includes corn cobs which contain high fiber content and low processing costs that make them suitable for creating nutritious affordable food items to improve access to healthy eating choices.

China uses corn by-products as cheap animal feed which wastes their nutritional value. The oils found in corn husks combine with dietary fiber content and corn pulp contains multiple minerals. The research shows these by-products contain antioxidant properties and anti-aging effects and anti-obesity benefits which makes them suitable for functional food ingredients after secondary processing. The South Korean study researchers examined corn cob phytosterol extraction for its liver health benefits and cholesterol reduction and diabetes prevention properties.

The Philippines considers corn their main cereal crop which people describe as "poor man's rice." The staple food serves approximately 20% of the Filipino population who mainly reside in southern areas including Visayas and Mindanao. Corn provides essential nutrients through its protein content and fat and fiber and vitamin composition. The product contains two essential amino acids which include lysine and tryptophan that deliver multiple health advantages. The natural sweetness of corn cobs makes them a perfect addition to soups according to traditional cooking methods. The research about corn cob applications mainly focuses on their use in corncob pipes and biomass fuel production yet they have restricted food manufacturing applications. The food sector fails to recognize the nutritional fiber content of corn cobs which could be highly valuable. Corn cob flour as a muffin

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ingredient results in higher fiber muffins while making a new fiber-rich food product through agricultural waste transformation.

The research conducted an assessment to determine if corn cob flour produces acceptable muffins through various treatment methods by evaluating their visual presentation and scent and flavor and texture and overall acceptance. The research establishes whether corn cob flour functions as a base component during muffin manufacturing.

2. THEORETICAL FRAMEWORK

The research based its foundation on New Product Development theory which centers on creating new products through innovation to fulfill market requirements. According to Azanzedo (2022) New Product Development follows a structured approach which transforms market possibilities into business-ready products through planned goal-based stages that reach defined targets.

This framework was relevant for the research, which examined the sensory acceptability of muffins produced using corn (Zea mays L.) cob flour, thereby contributing to sustainable practices in the food industry.

The research by Gurbuz (2024) shows that sustainability in product development receives support through his demonstration of alternative food ingredients which help decrease waste while improving nutritional value. The research used corn cobs which farmers would normally throw away to achieve two sustainable development goals by turning agricultural waste into useful products and reducing food spoilage. The food production method met the rising demand for functional foods because it chose components which served both flavor enhancement and health improvement purposes.

The acceptability of corn cob as flour based muffins found support through the ongoing functional ingredient development trend. Research conducted by Perez (2022) indicated that corn cobs could provide dietary fiber, which was essential for digestive health, thereby enhancing the nutritional profile of baked goods. The market trend toward healthier food options matches what customers want according to Smith and Jones (2023).

3. METHODOLOGY

3.1 Research Design

The research study used a quantitative research design which required collecting numerical data in an organized way to solve scientific problems. According to Rana, Gutierrez, and Oldroyd (2022) the quantitative approach proved useful for detecting patterns and establishing causal relationships and outcome measurements and population-wide generalizations. The researchers used quantitative methods to study how corn cob flour affects the sensory properties of muffins which include texture and flavor and overall acceptance. The study used statistical methods to determine if corn cob-based muffins matched the quality standards of conventional recipes.

3.2 Participants

The research included 50 participants who consisted of 20 BSHM students together with 10 faculty members and staff and 10 bakers and 10 parents. The collected responses underwent a summarization process before researchers organized them into tables for further analysis.

3.3 Research Instrument

The research used an adapted sensory evaluation score sheet which was based on the 9-Point Hedonic Scale created by Peryam and Pilgrim. The instrument functions as a tool to assess the sensory appeal of muffin samples which contain different amounts of corn cob (Zea mays L.) flour in their formulation. The evaluation form exists to collect information about five sensory attributes which include appearance and aroma and texture and taste and overall acceptability. Each attribute was rated using a structured 9-point scale, where panelists indicated their degree of liking or disliking for each sample.

3.4 Data Analysis Procedure

Once the accomplished questionnaires were collected, the data were tabulated and analyzed using appropriate statistical tools.
The descriptive analysis of corn cob (Zea mays L.) as a main ingredient in muffin production used mean and standard deviation to evaluate participant responses which were collected through the adopted instrument.
The study investigates how acceptable five different corn cob flour treatments are to respondents through their evaluations of appearance, aroma, taste, texture and overall acceptance.

The second research question investigates the statistical difference between five different corn cob flour treatments based on respondent evaluations of appearance aroma taste texture and general acceptability.

3.5 Ethical Considerations

The researchers obtained authorization from the Campus Administrator to proceed with their data collection activities. The researchers gained approval before they could obtain informed consent from the respondents. The participants received information about their voluntary participation in the study and their right to stop participating at any time if they felt uncomfortable during the survey.

The researchers took steps to guarantee that the message content used language which remained both clear and understandable to readers.

The survey process maintained complete anonymity for all respondents who participated. The researchers maintained total confidentiality throughout the data collection process which involved gathering information from respondents.

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4. RESULTS AND DISCUSSIONS

Table 1. ***Level of Sensory Acceptability of Corn Cob Muffins in Terms of Appearance, Aroma, Taste, and Texture in the Five Treatment Groups as Assessed by the Respondents***

Treatment	Component	*N*	Mean	Verbal Description	*SD*
A - 100% APF	Appearance	50	8.56	Highly Acceptable	.64
	Aroma	50	8.44	Very Acceptable	.73
	Taste	50	8.52	Highly Acceptable	.68
	Texture	50	8.46	Very Acceptable	.73
	General	50	8.50	Very Acceptable	.62
B - 75% APF and 25% CCF	Appearance	50	8.56	Highly Acceptable	.76
	Aroma	50	8.40	Very Acceptable	.76
	Taste	50	8.28	Very Acceptable	.78
	Texture	50	8.14	Very Acceptable	.88
	General	50	8.35	Very Acceptable	.65
C - 50% APF and 50% CCF	Appearance	50	8.08	Very Acceptable	.83
	Aroma	50	8.26	Very Acceptable	.88
	Taste	50	8.00	Very Acceptable	.86
	Texture	50	7.90	Very Acceptable	.97
	General	50	8.06	Very Acceptable	.76
D -25% APF and 75% CCF	Appearance	50	7.92	Very Acceptable	1.14
	Aroma	50	7.88	Very Acceptable	1.15
	Taste	50	7.52	Very Acceptable	1.30
	Texture	50	7.42	Moderately Acceptable	1.39
	General	50	7.69	Very Acceptable	1.12
E - 100% CCF	Appearance	50	6.86	Moderately Acceptable	2.09
	Aroma	50	6.90	Moderately Acceptable	2.10
	Taste	50	6.14	Slightly Acceptable	2.17
	Texture	50	6.00	Slightly Acceptable	2.18
	General	50	6.48	Slightly Acceptable	1.97

Note: 8.51-9.00 Highly Acceptable; 7.51-8.50 Very Acceptable; 6.51-7.50 Moderately Acceptable; 5.51-6.50 Slightly Acceptable; 4.51-5.50 Neither Acceptable/Unacceptable; 3.51-4.50 Slightly Unacceptable; 2.51-3.50 Moderately Unacceptable; 1.51-2.50 Very Unacceptable; 1.00-1.50 Highly Unacceptable.

The findings in Table 1 showed that the level of sensory acceptability of corn cob muffins was influenced by the proportion of all-purpose flour (APF) and corn cob flour (CCF) used in the formulation. In general, the higher the percentage of corn cob flour, the lower the acceptability ratings across appearance, aroma, taste, texture, and overall quality.

The control sample (Treatment A: 100% APF) received the highest scores among all treatments. The appearance and taste received excellent acceptability ratings at 8.56 and 8.52 respectively. The aroma and texture and general acceptability received very acceptable ratings at 8.44 and 8.46 and 8.50 respectively. The results showed that the traditional muffin formulation received the highest preference from respondents.

The treatment B combination of 75% APF and 25% CCF produced the highest acceptability results because appearance received an excellent rating of 8.56 while all other attributes received very acceptable ratings. The overall mean score (M = 8.35) suggests that muffins with 25% corn cob flour were almost as acceptable as the control group.

Treatment C (50% APF and 50% CCF) showed a slight decrease in ratings but remained within the very acceptable range. The general acceptability score (M = 8.06) indicates that respondents preferred the 50–50 APF and CCF blend but their preference was lower than the control and 25% substitution level.

The treatment D (25% APF and 75% CCF) showed the most significant decrease in acceptability ratings especially for texture (M = 7.42) which received moderate acceptance. The general score (M = 7.69) was still very acceptable, but lower compared to the previous groups. The results indicate that elevated levels of CCF lead to decreased sensory quality through negative impacts on both mouth feel and crumb texture.

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Finally, Treatment E (100% CCF) obtained the lowest ratings in all attributes. The participants gave moderate acceptability ratings to appearance and aroma but the taste and texture and overall acceptability received slightly acceptable ratings. The data shows that respondents showed the least preference for muffins which contained only corn cob flour.

The research findings demonstrate that corn cob flour substitution works effectively until 50% without affecting consumer approval. The study revealed that 25% substitution rates produced the highest positive results. The sensory quality experiences a sharp decline after this point because of noticeable changes in both texture and taste.

Table 2. ***Significant differences in the level of Acceptability of Corn Cobs Muffins among five treatments as assessed by the respondents. Differences in the Sensory Acceptability of Corn Cob Muffins Among Five Treatment Groups***

Acceptability	N	Mean Rank	Kruskal Wallis H	df	p-value
Treatment Group A	50	170.12			
Treatment Group B	50	154.75			
Treatment Group C	50	130.96	68.769	4	.000
Treatment Group D	50	108.77			
Treatment Group E	50	62.90			

**p < .05, significant*

The Kruskal-Wallis H test results from Table 2 demonstrated that sensory acceptability of corn cob muffins showed a significant difference between the five treatment groups, H = 68.769, p = .000.

A study by Cabildo and Lizada (2020) examined the development and acceptability of cookies enriched with squash and malunggay, revealing that modifications in ingredient proportions significantly influenced the texture and taste preferences of panelists. The research by Mabunga, Cruz and Tolentino (2021) about banana peel and sweet potato flour muffins showed that different alternative flour types and amounts affected the product acceptance rates because some combinations produced undesirable textures and tastes which led to lower sensory scores.

The researchers Dizon and Reyes (2020) stated that developers should maintain ingredient proportions when using fruit and vegetable residues from agro-industrial waste to sustain sensory quality for sustainable product development. The current research demonstrates that corn cob flour concentration produces a major effect on sensory acceptability which mirrors the findings of previous studies.

The research of Gomez and Gomez (2019) demonstrates that non-parametric tests including Kruskal-Wallis serve essential roles in sensory evaluations when data fails to satisfy parametric analysis requirements. Field (2018) also supported the use of post-hoc procedures such as Dunn's test to identify specific group differences when significant results are observed in omnibus tests like Kruskal-Wallis. The research findings demonstrate that creating new baked goods requires correct recipe development and statistical analysis to produce consumer-accepted products.

Table 3. Post Hoc Test for the Sensory Acceptability of Corn Cob Muffins

Pairwise Comparisons of Treatment

Treatment Group	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.a
Group E and Group D	45.87	14.34	3.20	.001	.014
Group E and Group C	68.06	14.34	4.75	.000	.000
Group E and Group B	91.85	14.34	6.40	.000	.000
Group E and Group A	107.22	14.34	7.48	.000	.000
Group D and Group C	22.19	14.34	1.55	.122	1.000
Group D and Group B	45.98	14.34	3.21	.001	.013
Group D and Group A	61.35	14.34	4.28	.000	.000
Group C and Group B	23.79	14.34	1.66	.097	.972
Group C and Group A	39.16	14.34	2.73	.006	.063
Group B and Group A	15.37	14.34	1.07	.284	1.000

Note: Significant if p < .05. Significance values have been adjusted by the Bonferroni correction for multiple tests.

The analysis of Dunn's test requires using the adjusted p-value to determine which results are statistically significant. The adjustment method addresses multiple comparisons to lower the chance of Type I errors which occur because of testing many pairs of variables.

Dunn's test with Bonferroni adjustment showed that Group E differs statistically from Group C and Group B and Group A. The results also showed significant differences between Group D and Group B and Group A.

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The research results indicated that Group E members received lower acceptability ratings compared to Groups C, B and A. Moreover, the acceptability score of Group D was significantly lower than those of Groups B and A. The analysis showed that none of the other pairwise comparisons produced statistically significant results.

5. CONCLUSIONS

An experimental research design was used to study the sensory acceptability of corn (Zea mays L.) cob flour-based muffins through five distinct formulations. The The evaluation process examined five main sensory elements which included appearance and aroma and taste and texture and overall acceptability through feedback from students and faculty and staff and bakers and parents.

The evaluation of sensory properties included statistical analysis of mean and standard deviation to determine treatment acceptance levels. The results showed that most sensory characteristics received the highest acceptance ratings from Treatment A and Treatment B received very acceptable ratings. Treatments C and D were The evaluation results showed that Treatments C and D received very acceptable ratings but Treatment E obtained only slightly to moderately acceptable ratings. The Kruskal-Wallis H test results showed a significant difference in acceptability levels between the five treatments for all sensory attributes. The research findings demonstrated that corn cob flour functions as a suitable base component for muffin recipes although its acceptance level varies with different recipe formulations.

6. RECOMMENDATIONS

Recommendations were made based on the findings of the study, which showed that corn (Zea mays L.) cob flour was used to successfully substitute some of the flour in the manufacture of muffins

Department of Agriculture (DA). It is recommended that the DA strengthen programs to promote the conversion of agricultural waste to value-added products, such as converting corn cobs to flour. The study revealed that muffins made with flour substituted from 25 to 50% corn cob flour were, in fact, rated as very acceptable, which supports the DA's goals of sustainability and waste reduction.

Corn Farmers and Producers. Farmers should partner with local food processors and cooperatives to supply corn cobs for production of flour. Since consumer testing indicated that muffins made with varying percentage of corn cob flour were acceptable to consumers, farmers can produce additional income from corn farming while reducing waste.

Local Entrepreneurs. Small-scale bakery owners or food businesses should consider extending their product lines to include muffins made with corn cob flour. Consumer treatments A – C were all rated to be high in appearance, taste, and texture and were considered acceptable food. This entrepreneurial activity fosters entrepreneurship as well as responds to consumer demand for functional foods.

Housewives. Housewives are encouraged to try and implement muffin production in their home using partial substitution with corn cob flour. The 25 to 50% recipe trials used herein can be viable for livelihood programs and provide an inexpensive avenue for home-based enterprise and supplemental income for the family.

Potential Consumers. Consumers are encouraged to try corn cob flour muffins as a nutritious and sustainable food alternative. Since the sensory evaluation showed that they are acceptable in terms of coloration, aroma, flavor, and texture, they could be sold as healthy snacks in schools, bakeries, and food fairs.

Future Researchers. While it was beyond the scope of this investigation, it is suggested that future studies could work towards optimizing the formulations of corn cob flour muffins addressing the texture challenges observed in the 100% substitution trial. In addition, testing across a broader consumer audience consists of different age groups and locations, would improve the generalizability of the study.

REFERENCES

1. *Adriana Mejía-Terán, Carla María Blanco-Lizarazo, Eduardo Leiva Mateus, Indira Sotelo-Díaz Techno-functional and physicochemical properties of corn cobs flours as potential food ingredients, Applied Food Research, Volume 4, Issue 1, 2024, 100427, ISSN 2772-5022, https://doi.org/10.1016/j.afres.2024.100427.(https://www.sciencedirect.com/science/article/pii/S2772502224000398)*
2. *Azanedo, L., Garcia-Garcia, G., Stone, J., & Rahimifard, S. (2020). An Overview of Current Challenges in New Food Product Development. Sustainability, 12(8) 3364. https://doi.org/10.3390/su12083364*
3. *Bon Appétit. (2018, November 26). Everything you need to know about flour. Condé Nast. https://www.bonappetit.com/story/everything-you-need-to-knowabout-flour*
4. *Blanco-Canqui, H. (2018). Corn residue removal: Effects on soil and crop. *Agronomy Journal, 110*(4), 1504–1521. https://doi.org/10.2134/agronj2017.12.0750*
5. *Cabildo, R. M., & Lizada, R. L. (2020). Development and acceptability of squash and malunggay-based cookies. Asian Journal of Culinary Research, 6(1), 55–63.*
6. *Castillo, S., Rodríguez, A., Bautista-Villarreal, M., García-Solano, N., Gallardo-Rivera, C. T., Báez-González, J. G., Sánchez-García, E., & García-Alanis, K. G. (2021). Rheological and nutritional characterization of sweet corn by-product (cob) to develop a functional ingredient applied in dressings. Frontiers in Nutrition, 8, 666654. https://doi.org/10.3389/fnut.2021.666654*
7. *Chao, A. M., Roy, A., Franks, A. T., & Joseph, P. V. (2020). A systematic review of taste differences among people with eating disorders. Biological Research for Nursing, 22(1), 82–91. https://doi.org/10.1177/1099800419872824*

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Volume: 11| Issue: 10| October 2025|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2025: 8.691 || ISI Value: 1.188

8. *Dizon, E. I., & Reyes, K. J. (2020). Utilization of agro-industrial waste in baked products: A sensory evaluation study. Philippine Journal of Agricultural Science and Technology, 25(2), 135–142.*
9. *Dong, X., & Huang, Y. (2022). Microbial valorization of corncob: A sustainable approach for biotechnological applications. Current Research in Microbial Sciences,3, 100135. https://doi.org/10.1016/j.crmicr.2021.100135*
10. *Field, A. (2018). Discovering statistics using IBM SPSS Statistics (5th ed.). SAGE Publications. Girona-Ruíz, D., Cano-Lamadrid, M., Carbonell-Barrachina, Á. A., López-Lluch, D., & Sendra, E. (2021). Aromachology related to foods: Scientific lines of evidence – a review. Applied Sciences, 11(13), 6095. https://doi.org/10.3390/app11136095*
11. *Girona-Ruíz, D., Cano-Lamadrid, M., Carbonell-Barrachina, Á. A., López-Lluch, D., & Sendra, E. (2021). Aromachology related to foods: Scientific lines of evidence – a review. Applied Sciences, 11(13), 6095. https://doi.org/10.3390/app11136095*
12. *Gomez, K. A., & Gomez, A. A. (2019). Statistical procedures for agricultural research (2nd ed.). Wiley-Blackwell. Guiné, R. P. F. (2022). Textural properties of bakery products: A review of instrumental and sensory evaluation studies. *Applied Sciences, 12*(17), 8628.https://doi.org/10.3390/app12178628*
13. *Greis, M., Kukkonen, H., Lampi, A.-M., Seppä, L., Partanen, R., & Sandell, M. (2022). Discriminative sensory analysis and consumer acceptability of plant-based yogurt alternatives with different fat and protein contents. Foods, 11(3), 364.*
14. *https://doi.org/10.3390/foods1103036*
15. *Gurbuz, B., Cayir, M., Akdeniz, E., Öztürk, S. A., Karaman, S., Karimidastjerdi, A., Toker, O. S., Palabiyik, I., & Konar, N. (2024). Optimization of citrus fiber-enriched vegan cream cheese alternative and its influence on chemical, physical, and sensory properties. Food Science & Nutrition, 12(8), 5872–5881. https://doi.org/10.1002/fsn3.4220*
16. *Harastani, R., James, L. J., Ghosh, S., Rosenthal, A. J., & Woolley, E. (2021). Reformulation of muffins using inulin and green banana flour: Physical, sensory, nutritional and shelf-life properties. Foods, 10(8), 1883. https://doi.org/10.3390/foods10081883*
17. *Hashem, K. M., He, F. J., Alderton, S. A., & MacGregor, G. A. (2018).*
18. *Cross- sectional survey of the amount of sugar and energy in cakes and biscuits on sale in the UK for the evaluation of the sugar- reduction programme. BMJ Open,8(e019075). https://doi.org/10.1136/bmjopen-2017-019075*
19. *Jesus, M., Mata, F., Batista, R. A., Ruzene, D. S., Albuquerque-Júnior, R., Cardoso, J. C., Vaz- Velho, M., Pires, P., Padilha, F. F., & Silva, D. P. (2023). Corncob as carbon source in the production of xanthan gum in different strains Xanthomonas sp. Sustainability, 15(3), 2287. https://doi.org/10.3390/su15032287*
20. *Jiao, Y., Chen, H.-D., Han, H., & Chang, Y. (2022). Development and utilization of corn processing by-products: A review.Foods, 11(22), Article 3709. https://doi.org/10.3390/foods11223709*
21. *Lau T, Clayton T, Harbourne N, Rodriguez-Garcia J, Oruna-Concha MJ8. Sweet corn cob as a functional ingredient inbakery products. Food Chem X. 2021 Dec 4;13:100180. doi: 10.1016/j.fochx.2021.100180. PMID: 34950866; PMCID: PMC8671855.*
22. *Mabunga, M. A., Cruz, J. R., & Tolentino, S. V. (2021). Sensory acceptability of muffins with banana peel and sweet potato flour substitution. Asian Journal of Food Research and Innovation, 4(1), 45–51.*
23. *Mishra, M., Sushma, ., & Sharma, R. (2021, December 3). Corn (Zea mays) as a nutrient source and diet: A review. *Journalof Pharmaceutical Research International, 33*(52B), 299–303. https://doi.org/10.9734/jpri/2021/v33i52B33629*
24. *Mueller, N. D., & Gerber, J. S. (2021). Maize (corn). In Encyclopedia of Food Security and Sustainability (Vol. 2, pp. 435–440). Elsevier. https://doi.org/10.1016/B978-0-12-812687-2.00079-1*
25. *Oxford University Press. (n.d.). Acceptability. In Oxford Learner's Dictionaries. Retrieved from https://www.oxfordlearnersdictionaries.com/definition/english/acceptability*
26. *Pleñago, J. A. (2024, May 27). Formulation, analysis and acceptability of sweet corn cob flour in baked products. Pantao International Journal of the Humanities and Social Sciences, 3(2), 232–239. Retrieved from https://pantaojournal.com/wpcontent/uploads/2024/05/20-Plenago.pdf*
27. *Polovnikova, D., Evlash, V., Aksonova, O., & Gubsky, S. (2022). Muffin enriched with bioactive compounds from milk thistle by-product: Baking and physico– chemical properties and sensory characteristics. Biol. Life Sci. Forum, 18(1), Article49. https://doi.org/10.3390/Foods2022-12930*
28. *Rana, J., Gutierrez, P. L., & Oldroyd, J. C. (2022). Quantitative methods. In A. Farazmand (Ed.), Global encyclopedia of public administration, public policy, and governance (pp. 11202–11207). Springer. https://doi.org/10.1007/978-3-030662523_460*
29. *Rustagi, S. (2020). Food texture and its perception, acceptance and evaluation.Biosciences Biotechnology Research Asia, 17(3), 651–658. https://doi.org/10.13005/bbra/2869*
30. *Santos, T. M. dos, Andressa, I., Nascimento, G. K. S., Neves, N. de A., & Schmiele, M.(2025). Corncob flour as an alternative ingredient for muffins: Technological and nutritional perspectives. Research, Society and Development, 14(5), e8695148563. https://doi.org/10.18265/244-9187a2025id8695*
31. *Shukla, D., Tewari, B. N., Trivedi, S. P., Dwivedi, S., Kumar, V., & Tiwari, V. (2024). Quality and functional attributes of muffins with incorporation of fruit, vegetable, and grain substitutes: A review. Journal of Applied and Natural Science, 16(1), 344–355. https://doi.org/10.31018/jans.v16i1.5330*
32. *Silva, F. O. da, Santos, L. M. dos, & Pereira, C. G. (2021). An overview of research designs relevant to nursing: Part 1 – Quantitative research designs. Revista LatinoAmericana de Enfermagem, 29, e3453. https://doi.org/10.1590/15188345.4605.3453*
33. *Vermeir, I., & Roose, G. (2020). Visual design cues impacting food choice: A review and future research agenda. Foods, 9(10), 1495. https://doi.org/10.3390/foods9101495*
34. *Wang, H., Wang, P., Kasapis, S., & Truong, T. (2024). Optimising corn (Zea mays) cob powder as an effective sorbent*

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
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for diverse gel matrices: Exploring particle size and powder concentration effects. International Journal of Food Science &
35. *Technology, 59(9), 6628–6641. https://doi.org/10.1111/ijfs.17419*
36. *Yang, J., & Lee, J. (2019). Application of sensory descriptive analysis and consumer studies to investigate traditional and authentic foods: A review. Foods, 8(2), 54. https://doi.org/10.3390/foods8020054*
37. *Yundle.(n.d.).Appearance definition. Yundle.com. Retrieved June 2025, from https://www.yundle.com/terms-definitions/a/appearance*