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Research Article

Quality Attributes of Bread Produced From Moringa Powder and Wheat Flour

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Abstract: The aim of the study was to prepare acceptable bread from composite flour blends of wheat flour and Moringa powder. Different flour proportions were obtained using design expert. The bread samples were evaluated for the proximate and sensory characteristics. The bread was prepared by blending the composite flours with dry yeast 5g salt 3g, sugar 20g, fat 20g, milk powder 25g and water 150 ml. Three different samples of bread were produced and coded as A, B, and C. Sample A contained 80% wheat flour and 20% Moringa Powder, samples B 50% wheat and 50% Moringa Powder and sample C 60% wheat flour and 40% Moringa Powder. Data were analyzed into frequencies, percentages and cross-tabulation tables using Statistical Package for Social Sciences (SPSS 16.0). The findings clearly highlighted that majority (50.0%) of the respondents opted for product A which contained 80% wheat flour and 20% Moringa powder. It was also revealed that the p-value is 0.000, which is less than the significance level of 0.05; the null hypothesis was rejected and concluded that some of the products have differences in means.

Keywords: composite flour, Bread, Moringa Powder, Baking, Ghana.

INTRODUCTION

Bread can be characterized as an aged confectionary item produced primarily from wheat flour, water, yeast and salt by arrangement of procedures including blending, working, sealing, forming and heating (Dewettinck *et al*., 2008). It is additionally a significant staple food consumed by numerous individuals in both developing and developed nations (Aider *et al*., 2012). Wheat has been the significant ingredients in the preparation of bread however is moderately low in all out protein particularly in lysine and other significant amino acids, which could be enhanced by the utilization of moringa powder and dark colored cheeseburger beans.

Composite flour can be categorized as a blend of at least two flours developed from roots, tubers, and vegetables with or without the expansion of wheat flour (Shittu *et al*., 2007). Specialists have likewise demonstrated that bread and other prepared items can be developed from various sorts of composite flours (Mignouna *et al*., 2011). Composite flours have likewise been accounted for to be more nutritious than wheat and flours from single yields (Ndife *et al*., 2011, Alozie *et al*., 2009). Indigenous materials substitution for wheat flour is expanding because of the developing business sector for candy stores and buyers developing awareness for nutritious foods (Noor *et al*., 2012) In Ghana, the utilization of composite flour would lessen the importation of wheat flour bringing about reserve funds from importation. The utilization of local harvests in flour arrangement would broaden its utilization, encourage production and increase farmer's income. In addition, occupations openings would likewise result from the utilization of local yields underway of flours for baked foods and dessert shops (Hugo *et al*., 2000).

Wheat (*Triticum spp*.) is an oat grain that has a place with the family *Poaceae gramineae (*Sramkova *et al*., 2009). All inclusive, it is one of the most significant human food grain used to make diverse baked item, for example, treats, cakes, pasta, and noodles, and for maturation to make lager (Ranhotra *et al*., 1998). By and large, it contains starch 78.10%, protein 14.70%, fat 2.10%, minerals 2.10% and extensive degrees of nutrients (thiamine and nutrient B) and minerals (Zinc, iron, selenium and magnesium) (Kumar *et al*., 2011).

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With the increasing consumption of bread and other baked products in many countries, the composite flour programme promises to save significant amount of foreign exchange, provide nutritious food to more people at lower cost and to utilize indigenous crops to a greater extent. Different levels of success have also been recorded with the use of flours from legumes, cereals, roots and tubers in baked goods (Dhingra and Jood 2002). Although there is now a substantial amount of available composite bread technology, such breads still require at least 70 percent wheat flour to be able to rise (Eggleston, and Omoaka2004) and are generally deficient in micronutrients.

Moringa oleifera belongs to the Moringacaea family and it is indigenous in Northern India and Pakistan but has been introduced throughout the tropics and sub-tropics and has become naturalised in many African countries (Grubben and Denton, 2004). Moringa is highly patronized by people in the tropics and sub-tropics for it numerous medicinal properties (Fuglie, 2001). As a source of nutrition, Moringa leaves probably rank as the best of all tropical vegetables. They contain very strong concentrations of vitamins A and C, B-complex vitamins, iron, calcium, protein, zinc, selenium, and, unusual for a plant source, all the essential amino acids. Leaves of Moringa can be an extremely valuable source of nutrition for people of all ages. One (1) table spoonful of powdered leaves will satisfy about 14% of the protein, 40% of the calcium, and 23% of the iron and all the vitamin A needs for a child aged one to three. Six (6) table spoonful of powdered leaves will satisfy nearly all of a woman‘s daily iron and calcium needs during times of pregnancy and breast feeding (Fuglie, 2001). Ounce-for-ounce, Moringa leaves contain more vitamin A than carrots, more calcium than milk, more iron than spinach, more vitamin C than oranges, and more potassium than bananas, and that the protein quality of Moringa leaves rivals that of milk and eggs (Fahey, 2005). The leaves can be dried and stored but powdering the leaves before storage is locally common (Grubben and Denton, 2004). If more moisture is removed the produce loses colour, flavour, nutrients and textural quality (Meshas and Rodgers, 1994). Significant loses of vitamin A can occur if leaves are exposed to sunlight during the drying process. Therefore, this study was undertaken to produce acceptable Bread from Moringa Powder and Wheat Flour

MATERIALS AND METHODS

Source of Raw Material

All the ingredients (refined wheat flour, eggs, castor sugar, butter, milk, baking powder, vanilla essence) for preparation of *moringa* bread were purchased from local market. Fresh *Moringa oleifera* leaves were procured from the trees in Sumbrungu, Bolgatanga

Preparation of Dried Moringa Leaves Powder

Drying of fresh *Moringa oleifera* leaves was carried out, with slight modifications, following the method reported by Joshi and Mehta (Joshi and Mehta 2010). Fresh, unspoiled leaves were sorted and washed with clean water methodically to remove all dirt. The water was drained and leaves were air dried for some time. The washed and air-dried leaves were then dried in a tray drier at 60^{o}C for seven days. The dried leaves were ground, sieved (80 mesh size), packaged in zip lock bags and stored (-18°C).

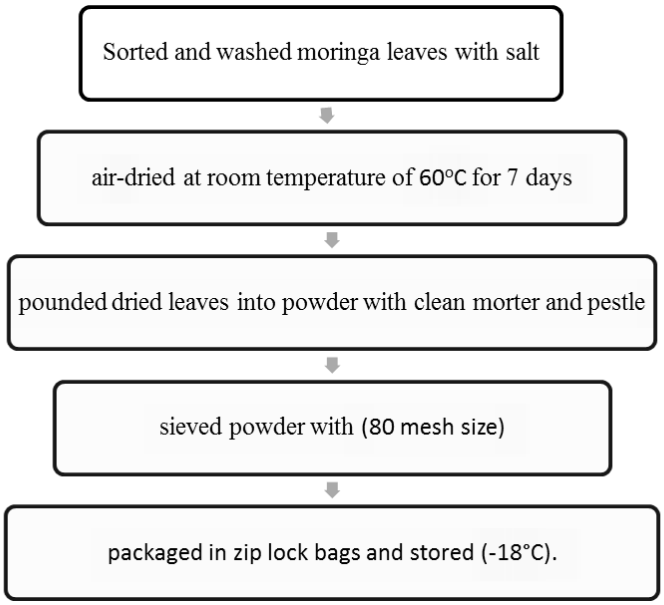

Figure 1: Flow chart for preparing Moringa leaves powder

Formulation of Composite Flour and Other Ingredients for Bread Production

Three different samples of bread were produced and coded as A, B, and C. Sample A contained 80% wheat flour and 20% Moringa Powder. Samples B, 50% wheat and 50% Moringa Powder and C 60% wheat flour and 40% Moringa Powder as presented in Table 1.

Table 1: Formulation of Composite Flour and other Ingredients for Bread Production

INGREDIENTS	SAMPLE A=80% wheat flour and 20% Moringa Powder	SAMPLE B = 50% wheat and 50% Moringa Powder	SAMPLE C= 60% wheat flour and 40% Moringa Powder
Wheat flour	160g	100g	120g
Moringa Powder	40g	100g	80g
Yeast	5g	5g	5g
Salt	3g	3g	3g
Margarine	20g	20g	20g
Sugar	20g	20g	20g
Milk powder	25g	25g	25g
Water	150 ml	150 ml	150 ml

Bread Making Procedure

The method used by (Okafor *et al*., 2012) was followed with minor modification. Various ratios of the bread flour and Moringa leaf powder were blended together to prepare formulated bread. Dough was prepared by blending the composite flours with dry yeast 5g, salt 3g, sugar 20g, fat 20g, milk powder 25g and water 150 ml. Dry ingredients were mixed together by placing in a mixing bowl and then the dough were developed according to the various formulations.

Proofing was under taken for 1h in the sun. The dough was divided, knocked back and shaped. The dough was divided into the required size pieces; the pieces were shaped into long strips and was covered and allowed to rest for final proofing. It was left to rise in the sun for 30 minutes. The bread was baked in a hot oven set at a temperature of 240 °C for 45 min until the crust turns golden and well baked.

SAMPLE A: 80% WHEAT FLOUR AND 20% MORINGA POWDER

SAMPLE B: 50% Wheat Flour and 50% Moringa Powder

SAMPLE D: 60% Wheat Flour and 40% Moringa Powder

Sensory Evaluation (5 Point Hedonic Score Card)

Sensory evaluation of the formulated products were done using experienced bakers of 50 members. The panelists scored on the basis of colour, appearance, aroma, flavour, texture and overall acceptability on a 5-point hedonic scale as described by FAO (Food and Agriculture Organization). Sensory evaluation was performed 24 hours after baking to evaluate colour, taste, texture, flavour and overall acceptability of the bread samples as described by Meilgaard (2007).

Validation of the Procedure

The bread was developed on three (3) pilot basis. At the end of each process the products were analyzed by bread bakers, their comments and suggestion were used to modify the procedure before the final product was develop. The questions on the ballot sheet were set in simple easy to understand language. Terminologies used in the ballot sheet were explained to respondents who needed assistance.

Statistical Analysis

The data generated with triplicate readings were studied using one-way analysis of variance (ANOVA). Mean values were tested for significant difference using Duncan Post Hoc test (SPSS Software). Values with $p < 0.05$ were considered statistically significant.

RESULTS AND DISCUSSION

Analysis of Demographic Data about Respondents

Table 2: Shows the cross-tabulation between gender and age of the respondents

		Age of the respondent			Total
		18-24	25-30	31-36	
gender of the respondent	**male**	2	3	3	8
	female	34	8	0	42
Total		36	11	3	50

Source: field work, (2019)

On demographic data, questions were asked on gender and age of the respondents.

The population size of 50 respondents was gathered from Bolgatanga Township. In dealing with gender and their ages, the respondents were 42 females and 8 males. The majority of female respondents were in the aged range of 18-24 and their counterparts males were in the ages between 18-24.

Analysis of Sensory Evaluation Test

This is where the recipe developed was served to taste and fill in the ranking scale provided to them. The data obtained from respondents were analyzed using one-way anova to compare three products in other to find out whether which of the three products are preferred by customers. The descriptive table provides some very useful descriptive statistics, including the mean, standard deviation and 95% confidence intervals for the dependent variable (Time) for each separate group (product A, product B and product C), as well as when all groups are combined (Total).

Table 3: Shows summary descriptive statistics of three products

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
product A	200	4.0950	1.15440	.08163	3.9340	4.2560	1.00	5.00
product B	200	3.0400	1.29878	.09184	2.8589	3.2211	1.00	5.00
product C	200	3.7100	1.17593	.08315	3.5460	3.8740	1.00	5.00
Total	600	3.6150	1.28564	.05249	3.5119	3.7181	1.00	5.00

The first three groups are equal in size (n=200) and means of the three products are 4.0950, 3.0400 and 3.7100 with standard deviations are 1.15440, 1.29878 and 1.17593. Because the pooled standard deviation uses a weighted average, its value (1.28564) is closer to the standard deviation of the largest group.

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Table 4: Shows Test of Homogeneity of Variances

Levene Statistic	df1	df2	Sig.
4.611	2	597	.010

From table 4, it is clear that the variance across three products groups are statistically significant and this implies that the three products differ in terms of their means and variances across the three products groups.

Table 5: Shows Analysis of variance (ANOVA)

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	114.010	2	57.005	38.847	.000
Within Groups	876.055	597	1.467		
Total	990.065	599			

In this results, the null hypothesis states that the mean values of 3 different products are equal. Because the p-value is 0.000, which is less than the significance level of 0.05, you can reject the null hypothesis and conclude that some of the products have different means. This is great to know, but we do not know which of the specific groups differed. Luckily, we can find this out in the Multiple Comparisons table which contains the results of the Tukey post hoc test.

Table 6: Shows Robust Tests of Equality of Means

	Statistic[a]	df1	df2	Sig.
Brown-Forsythe	38.847	2	590.287	.000

a. Asymptotically F distributed.

From table 6 it is clear that the means are statistically difference since the p-value=0.000 is less than 0.05.

Table 7: Shows Multiple Comparisons

	(I) test	(J) test	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Tukey HSD	product A	product B	1.05500*	.12114	.000	.7704	1.3396
		product C	.38500*	.12114	.004	.1004	.6696
	product B	product A	-1.05500*	.12114	.000	-1.3396	-.7704
		product C	-.67000*	.12114	.000	-.9546	-.3854
	product C	product A	-.38500*	.12114	.004	-.6696	-.1004
		product B	.67000*	.12114	.000	.3854	.9546
LSD	product A	product B	1.05500*	.12114	.000	.8171	1.2929
		product C	.38500*	.12114	.002	.1471	.6229
	product B	product A	-1.05500*	.12114	.000	-1.2929	-.8171
		product C	-.67000*	.12114	.000	-.9079	-.4321
	product C	product A	-.38500*	.12114	.002	-.6229	-.1471
		product B	.67000*	.12114	.000	.4321	.9079

A one –way anova between groups analysis of variance was conducted to explore the impact of age on criminal thinking style scores. post-hoc comparisons using the Turkey HSD test and LSD indicated that the mean score for three products was significantly different among three products. This implies that the three products have difference variances across three products groups.

Table 8: Grouping Information Using the Turkey Method and 95% Confidence

	test	N	Subset for alpha = 0.05		
			1	2	3
Tukey HSD[a]	product B	200	3.0400		
	product C	200		3.7100	
	product A	200			4.0950
	Sig.		1.000	1.000	1.000

Means for groups in homogeneous subsets are displayed.
a. Uses Harmonic Mean Sample Size = 200.000.

Table 8 shows that group B contains product 1 and group C contains product 2. Group A contains product C. The Difference between means that is all statistically significant. The p-values reported on various products are statistically not significant and this implies that the three products are same.

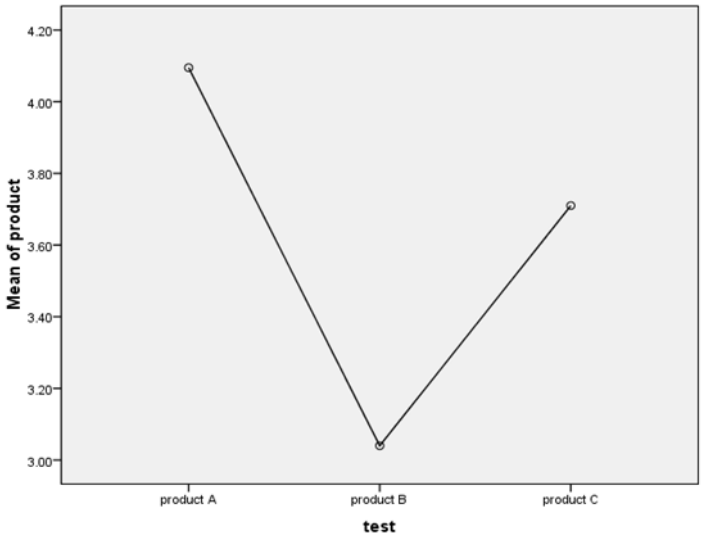

Figure 2: Mean plot

In the interval plot, product B has the lowest mean and product A has the highest. You cannot determine from this graph whether any differences are statistically significant. To determine statistical significance, assess the confidence intervals for the differences of means.

Table 9: Assessment based on preferred and overall acceptability product A, B and C

Product	Frequency	Percentage (%)
A	25	50
B	15	30
C	10	20
Total	50	100

There were three separate products that were used in the study to determine the acceptability level. This is clear from the table 9 that majority (50.0%) of the respondents opted for product A which contained 80% white flour and 20% Moringa powder; 30% opted for product B which contained 50% white flour and 50% Moringa powder and the few(20%) opted for product C which contained 60% wheat flour and 40% Moringa powder . The results revealed that, Moringa powder are mostly accepted on Ghanaian market because of its both health and nutritional component of human life. The reason is that respondents perceived that Moringa production serves as food nutrient security as well as played vital role in health related problems and others features such as colour, appearance, taste, and flavour.

CONCLUSION

From the findings it can be concluded that acceptable bread could be produced by using a blend of wheat flour and moringa powder. It can also be said that respondents were satisfied with product A which contained 80% white flour and 20% Moringa powder. Nevertheless, the research also conclude that post-hoc comparisons using the Tukey HSD test and LSD which indicated that the means score for three products were significantly different among three products.

REFERENCES

1. Alozie, Y. E., Iyam, M. A., Lawal, O., Udofia, U., & Ani, I. F. (2009). Utilization of Bambara Groundnut Flour blends in bread production. *Journal of Food technology*, *7*(4), 111-114.
2. Dhingra, S., & Jood, S. (2002). Physico-chemical and nutritional properties of cereal-pulse blends for bread making. *Nutrition and health*, *16*(3), 183-194.
3. Eggleston, G., Omoaka, P. E., & Ihedioha, D. O. (1992). Development and evaluation of products from cassava flour as new alternatives to wheaten breads. *Journal of the Science of Food and Agriculture*, *59*(3), 377-385.
4. Fahey, J. W. (2005). Moringa oleifera: A review of the medical evidence for its nutritional, therapeutic, and prophylactic properties. Part 1. *Trees for life Journal*, *1*(5), 21205-2185.
5. FAO. **(**1979). Food Outlook. Food and Agriculture Organisation of the United Nations, May, Rome.
6. Fuglie, L.J., & Sreeja, K.V. (2001). Cultivation of Moringa. Pp 123-128. In: The Miracle tree. *Moringa oleifera*: Natural nutrition for the tropics. (*Ed. Fuglie, L.J.). CWS, Darkar, Senegal.*
7. Grubben, G. J. H., & Denton, O. A. (2004). Plant Resources of Tropical Africa 2. Vegetables. PROTA Foundation, Wageningen, Netherlands. *backhuys Publishers, Leiden, Netherlands/CTA, Wgeningen Netherlands. Http://www/hort. purdue/edu/newcrop. duke_energy/moringa, htm. Accessed on*, *4*(05), 2008.
8. Hugo, C.K., Loretan, P.A., Hill, W.A., & Mortley, D.G. (2000). Response of sweet potato to continuous light. *HortScience. 27(5), 471-475.*
9. Kumar, P., Yadava, R. K., Gollen, B., Kumar, S., Verma, R. K., & Yadav, S. (2011). Nutritional contents and medicinal properties of wheat: a review. *Life Sciences and Medicine Research*, *22*, 1-10.
10. Mignouna, D. B., Mutabazi, K. D. S., Senkondo, E. M., & Manyong, V. M. (2011). Imazapyr-resistant maize technology adoption for witch weed control in western Kenya. *African crop science journal*, *19*(3), 173-182.
11. Ndife, J., Abdulraheem, L. O., & Zakari, U. M. (2011). Evaluation of the nutritional and sensory quality of functional breads produced from whole wheat and soya bean flour blends. *African Journal of Food Science*, *5*(8), 466-472.
12. Noor Aziah, A. A., Mohamad Noor, A. Y., & Ho, L. H. (2012). Physicochemical and organoleptic properties of cookies incorporated with legume flour.
13. Joshi, P., & Mehta, D. (2010). Effect of dehydration on the nutritive value of drumstick leaves. *Journal of Metabolomics and Systems Biology*, *1*(1), 5-9.
14. Okafor, J. N. C., Okafor, G. I., Ozumba, A. U., & Elemo, G. N. (2012). Quality characteristics of bread made from wheat and Nigerian oyster mushroom (Pleurotus plumonarius) powder. *Pakistan Journal of Nutrition*, *11*(1), 5-10.
15. Olaoye, O. A., Onilude, A. A., & Idowu, O. A. (2006). Quality characteristics of bread produced from composite flours of wheat, plantain and soybeans. *African Journal of Biotechnology*, *5*(11).
16. Meilgaard, M.C. (2007). "Sensory Evaluation Techniques," *4th Edition, CRC Press L.L.C., New York.*
17. Meshas, K.Y., & Rodgers, S.L. (1994). Food Science and You, 2nd editon. *Glencoe, McGraw-Hill. Pp 399*
18. Ranhotra, G. S., Gelroth, J. A., Leinen, S. D., Vinas, M. A., & Lorenz, K. J. (1998). Nutritional profile of some edible plants from Mexico. *Journal of Food Composition and Analysis*, *11*(4), 298-304.
19. Shittu, T. A., Raji, A. O., & Sanni, L. O. (2007). Bread from composite cassava-wheat flour: I. Effect of baking time and temperature on some physical properties of bread loaf. *Food Research International*, *40*(2), 280-290.
20. Šramková, Z., Gregová, E., & Šturdík, E. (2009). Chemical composition and nutritional quality of wheat grain. *Acta Chimica Slovaca*, *2*(1), 115-138.