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Research Article

Nutritional Composition and Acceptability of Biscuits Produced From a Blend of Wheat, Cinnamon and Desiccated Coconut Flour

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Abstract: The purpose of this paper was to produce composite biscuits from a blend of wheat, desiccated coconut and cinnamon flour. The coconut and cinnamon were used as composite with wheat flour at 30%, and 50%. The biscuits were analyzed for proximate and sensory attributes. The result of the proximate analysis of the biscuits showed increased percentage content of fat (25.81-46.16%), moisture (0.99 -6.41%) and ash (1.86 -2.46%). However, carbohydrate and proteins content decreased from (66.86 -49.98%) and (1.09-0.35%) respectively. The control sample was significantly ($p<0.05$) different from the other samples produced. The biscuit sample B comprising 80% wheat flour, 5% cinnamon powder and 15% coconut flour was highly accepted by consumers.

Keywords: Desiccated Coconut, Wheat Flour, Cinnamon Powder, Composite Biscuits, Product development.

INTRODUCTION

Biscuits are prepared to eat, helpful and modest delicacy that are consumed by individuals of all ages in different nations. Biscuits are one of the main flour products among the baked foods in Ghana (Boateng, 2012). Biscuits and other baked products are generally consumed and have moderately long lifespan and great eating characteristics. Biscuits are not staple nourishment like bread but have numerous alluring properties and properties heighten the worth of making biscuits from composite flours for economic and nutritional reasons. In places where delicate wheat flour is not accessible or excessively costly, it turns out to be monetarily important to prepare biscuits from composite flours. Healthfully, biscuits can be fortified with protein-rich flours to give an advantageous nourishment to enhance the nutritional value (Dragland, et al., 2013).

Okaka (2005) portrayed the preparation of biscuits as a blend of flour and water however may contain fat, sugar and different ingredients mixed into dough which is refreshed for a period and afterward rolled to make a sheet. Biscuits might be characterized either by the level of improvement and preparing or by the strategy embraced in cutting them. In light of the advancement standard, biscuits might be produced from delicate or resilient mixture (Fayemi, 2000). The nutritional content differs with the type of flour used in preparing the biscuit. Soft wheat flour is the appropriate flour for making biscuit. Soft wheat flour or flour with low gluten content is the best flour for biscuit making. This is because of its substance of gliadin and glutamine which experiences hydration in the presence of water, salt and sugar.

Cinnamon is a typical spice that is used by various societies around the globe for decades. It is acquired from the internal bark of trees from the class *Cinnamomum*, a tropical evergreen plant that has two fundamental assortments; *Cinnamomum zeylanicum* (CZ) and *Cinnamon cassia* (CC). Cinnamon is primarily utilized in the aroma and essence industries because of its flavour, which can be fused into various assortments of groceries, aromas, and medicinal items. The most significant constituents of cinnamon, which are available in the basic oil, along these lines adding to the aroma and to the various biological activities observed with cinnamon. The proximate analysis of cinnamon revealed that it contained ash (2.4%), crude protein (3.5%), crude fat (4.0%), crude fiber (33.0%);

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moisture (5.1%) and nitrogen free extract i.e. carbohydrate (52%) Khanum et al. (2001).

Northern Ghana being one of the tropical nations cannot is unable to cultivate wheat due its climatic condition. Consequently the baking industry can only live by application of this accessibility of indigenous grain which can either partially or completely substitute wheat in the product without harmfully affecting the quality of such product (Kent, 1984). Wheat production in Ghana is restricted because of climatic conditions and wheat is imported to meet nearby flour requirements for baking. Efforts have been made to advance the utilization of composite flour in which locally grown crops with high protein esteems replaces a part of wheat flour subsequently thereby lessening the interest for imported wheat (Giami and Bekebian 2000). It contains carbohydrate 68.5%, protein 12.6%, fat 2%, minerals 2.10% consisting of vitamin E, thiamine, riboflavin etc. Wheat is also a good source of minerals like selenium and magnesium, nutrients essential to good health (Topping 2007).

Coconut (*Cocos nucifera L*) has been depicted as the most significant and broadly developed palm tree which gives total nourishment to a large number of individuals particularly in the tropical and sub-tropical localities. The most significant coconut producing nations includes the Philippines, Ceylon, India, Malaysia, Oceania and parts of West Africa including Ghana and Nigeria (Prades et al., 2012). All aspects of the plant is valuable and from various perspectives support human life (Chan and Elevitch, 2006; Bourdeix et al., 2005). The organic product has diverse usefulness, the delicate coconut water is a sweet refreshing beverage taken straightforwardly from the internal pieces of coconut natural product (Sterner and Desser, 2008) and it contains a calorific estimation of 17.4/100 g, nutrient B gathering, nicotinic corrosive (B3), pantothenic corrosive (B5), biotin, riboflavin, folic corrosive, follow measure of thiamine (B1) and pyridoxine (B6) (USDA, 2009). Coconut is not known for providing meat, milk and oil yet it is likewise a decent wellspring of flour and it tends to be utilized as substitute to wheat flour. Coconut flour is a delicate flour-like item produced using the mash of coconut and it is really a by-product made during the coconut milk making process. Coconut flour can be utilized much like wheat flour to make a huge number of tasty breads, pies, cakes, bites and sweets. It contains more calorie free fiber than other wheat choices and furnishes a potential wellspring of protein with great dietary benefit (Trinidad et al., 2001; Fife, 2005). The purpose of this study was to assess consumer acceptability of biscuits produced from a blend of cinnamon, wheat and desiccated Coconut Flour

MATERIALS AND METHODS

Source of Raw Materials

The Cinnamon, Desiccated Coconut and Wheat flour were obtained from the Bolgatanga Market in the Upper East Region, Ghana. Alongside wheat flour, butter, baking powder, sugar, and milk was obtained from Sumbrungu market.

Sample Preparation

Coconuts were shelled and the meats were taken off. The brown elements of the coconut kernel were detached with the help of a kitchen knife and then the kernels were sliced (10 mm thickness), washed and divided into three (3) portions (1 kg for each sample). The first portion was kept as control (containing 100% wheat flour), while the second, and third portions were prepared using 80% wheat flour, 5% cinnamon powder and 15% coconut flour and 70% wheat flour, 10% cinnamon powder and 20% coconut flour respectively and then oven dried at 60°C for 24 h. The coconut was grated and juice squeezed to get the residue. The coconut residue was dried and blended using electric blender (Phillips blender at a low speed). The powder from the residues was sifted to get smooth.

Formulation of composite flour for biscuits production

Three major samples of biscuit were produced for this experiment to evaluate the sensory analysis of the biscuit using three major composite ingredients (Desiccated Coconut, Cinnamon and Wheat Flour). Sample A (Control sample), was kept under observation after factors were considered for its sensory analysis. It was conducted to understand whether further investigation needs to be carried out on the target samples (Sample B, C). Sample A was 100% wheat flour, sample B was 80%,: 5%:15% wheat, Cinnamon and desiccated Coconut flour and Sample C was made up of 70%: 10% and 20% Wheat Flour, Cinnamon, and Desiccated Coconut,). The table below shows the formulation of composition given on Desiccated Coconut and Cinnamon Composite Biscuit.

Table 1: Sample formulation

SAMPLES USED INGREDIENTS	A	B	C
Wheat Flour (%)	100	80	70
Cinnamon (%)	0	5	10
Desiccated coconut (%)	0	15	20
Sugar (g)	2tbs	2tbs	2tbs
Milk powder (g)	50g	50g	50g
Margarine (g)	40g	40g	40g
Water (ml)	150	150	150
Baking powder (g)	5g	5g	5g
Salt (g)	1g	1g	1g

Source: Field Survey, 2019

Method of Preparation

Coconut-cinnamon flour was combined to replace refined wheat flour at different ratios (100:0:0, 80:5:15 and 70:10:20) in making of biscuits. 100% wheat flour serves as the control. Biscuits were made from the three formulations using the method described by (Ihekoronye, 1999) and modified slightly. All the ingredients were weighed accurately. The pre-weighed flour, sugar, salt and baking powder were mixed thoroughly. Then fat was rubbed with the mixed flour to reassemble a fine bread crumbs before incorporating the water and mixed properly to make adequate dough and then the dough was rolled to a uniform sheet of thickness. The sheet was cut according to the desired shape and size of biscuits with a cutter and baked in the oven at a temperature of 220 oC for 15 mins. The biscuits were allowed to cool for 30 minutes and stored in polyethylene bags before further analysis on sensory and proximate were made.

Piloting of the Sampled Product

The biscuits were developed on two (2) different times. At the end of each process the product was analyzed by biscuit experts, and home economics students, their comments and suggestions were considered and used accordingly to effect the necessary modification prior to the final development of the product. The questions on the ballot sheet were set in a clear simple language. Scientific terms used in the ballot sheet were explained to respondents who needed further clarification. The processing procedure, flow chart and ballot sheet were given to biscuit the respondents at the catering department to verify the processes adopted.

Sensory Analysis

Fifty (50) consumers were selected randomly for sensory analysis of the biscuits. Each respondent was provided with sensory ballot sheet and coded samples A (100% wheat flour) (standard), B (80%wheat flour, 5% cinnamon and 15% coconut flour), Sample C (70% wheat flour 10% cinnamon powder and 20% coconut flour). Each respondent was provided with drinking water to rinse their mouth, before and after tasting each sample. They were requested to complete the questions on the ballot sheet independently without any bias.

Proximate composition

The functionality of flours of cereals grains, which depends to a great extent upon starch and protein content of flours, contribute a lot to the formulation and properties of the final product Therefore, flours were analyzed for their physicochemical. Moisture, ash, Protein, fat, and carbohydrate were determined by the methods (AOAC, 2010). The carbohydrate content was calculated by subtraction method.

Statistical Analysis

All analytical determinations were conducted in duplicates. Means and standard deviations were calculated. Data obtained was subjected to analysis of variance (ANOVA) where significant differences exist; Fishers LSD (Least significant difference) test was used in separating the means. Microsoft Excel and Statistical Package for Social Science (SPSS) were used to analyze the data.

RESULTS AND DISCUSSIONS

Gender Distribution of the Respondents

Table 2: Gender Distribution of the Respondents

GENDER	FREQUENCY	PERCENTAGE
Male	20	40
Female	30	60
TOTAL	50	100

Source: Field Survey, 2019

According to the table below, twenty (20) of the respondents, representing 40% were males while

thirty (30) of the respondents were females, representing 60%. This observation probably indicates that the study area is dominated by female.

Table 3: Age Distribution of the Respondents

AGE	FREQUENCY	PERCENTAGE
18-24years 26	52	
25-30years 20	40	
31-36years	3	6
37years and above	1	2
TOTAL	50	100

Source: Field Survey, 2019

Table 2 represents the age distribution of the respondents. According to the table, fifty-two percent (52%) of the respondents were in the age range of 18-24years, 40% were between 25-30 years, 6% of the respondents were between 31 – 36 years, and only 1% was up to 37 years. This clearly shows that majority of the respondents from the study were in the age range of 18-24 years.

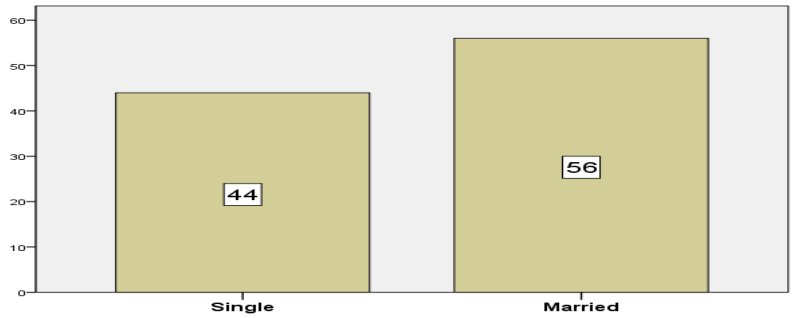

Figure 1: Marital Status of Respondents (Source: Field Survey, 2019)

This study involved 50 respondents and out of the total respondents, 44% of the respondents were single. The remaining portion (56%) was married at the time of the survey. This observation clearly states that, the study area is dominated by married people.

Table 4: Occupation of the respondents

OCCUPATION	FREQUENCY	PERCENTAGE
		96
Student	48	
Teacher	1	2
Trader	1	2
TOTAL	50	100

Source: Field Survey, 2019

Table 4 represents the occupation of the respondents. The research seeks to find out the occupation of the respondents and out of the total number of the respondents, 96% were students, 2% were teachers and the remaining portion 2% were traders. This study clearly indicates that majority of the respondents were students.

Table 5: Results for proximate analysis

Samples	**Moisture %**	**Ash%**	**Fat%**	**Protein%**	**Carbohydrate%**
A	3.43±0.16	1.86±0.14	27.67±0.15	1.09±0.03	66.06±0.45
B	0.99±0.04	2.46±0.01	46.19±0.51	0.35±0.01	49.98±0.55
C	6.41±0.06	1.73±0.07	25.18±0.48	0.73±0.06	65.99±0.23

Sample A-(100% wheat flour); Sample B-(80% wheat flour, 5% cinnamon and 15% desiccated coconut); Sample C-(70% wheat flour and 10% cinnamon and 20% desiccated coconut)

The moisture contents of the composite biscuit increased with coconut and cinnamon as composite by a range of 0.99 to 6.41%. The control had a moisture content of 3.43. Samples (B and C) had a moisture

content of 0.99% to 6.41% respectively. The increased in moisture content has been associated with the increase in the desiccated coconut which may contain some amount of moisture. The high moisture content has been associated with short shelf life of composite biscuit as they encourage microbial proliferation that leads to spoilage (Ezeama, 2007). The ash content of the cookies increased from 1.7 to 2.46% with increase in the substitution of the grated coconut. The increase in the ash content can be as a result of coconut blends. The increase in the ash content could make the product a good source of minerals as observed by other researchers (De Lumen et al., 2003; Elleuch et al., 2007).

The fat content also increased from 25.18% to 46.19% in the composite biscuit produced from the cinnamon and desiccated coconut as composite. Coconut fruit from which the grated coconut flour was produced has high amount of fat. Sample (B) had the highest fat (46.19%) content due to the 15% increase in the desiccated coconut. The control sample (A) had fat content of 27.67% while sample (C) had the lowest fat. The high fat content of the composite biscuits can affect the shelf stability of the product (Weiss, 2000; Potter and Hotchkiss, 2006). The protein content of the control is 1.09% and for that sample B and C is 0.35 and 0.73 respectively. The decrease is as a result of substitution of wheat flour (80%) with the desiccated coconut of (15%). The protein level could be improved by increasing the content of the wheat flour. Studies also revealed that, coconut fruit have a low level of protein (Mashayekh et al, 2008). The carbohydrate content were high in sample A (66.06%) and sample C (65.99). Sample B had the lowest content of 49.98%. The low carbohydrate was as a result of incorporating the desiccated coconut of 15% and wheat flour of 80%.

Table 6: Sensory Properties of the Biscuits Produced

Samples	Colour	Aroma	Texture	Taste	Level of acceptability
A	4.18±1.04	3.80±1.21	3.68±1.32	3.82±1.24	4.8±o.40
B	3.02±1.40	3.32±1.50	3.38±1.37	3.54.84±1.53	3.08±1.07
C	3.70±1.19	3.10±1.22	2.84±1.24	3.54±1.37	2.96±1.14
LSD	1.138	0.80	0.924	0.859	0.875

Sample A-(100% wheat flour); Sample B-(80% wheat flour, 5% cinnamon and 15% desiccated coconut); Sample C-(70% wheat flour and 10% cinnamon and 20% desiccated coconut)

Colour

Results of sensory evaluation of biscuits samples containing different level of desiccated coconut and cinnamon composite as compared to the control is shown in table above. The results of biscuit color did not show a consistent pattern for all the biscuit samples, and there was no significant difference ($P<0.05$) in the biscuit produced in sample(C) and the control sample (A). The observation agreed that majority of the respondents like the color of product (C) very much, which is approximately 4.0. The respondents also indicates that, they neither like nor dislike the colour of sample (B) which is 3.02.The brownish colour of the biscuit could be as result of high baking temperature or the sample of the coconut blends.

Aroma

The incorporation of desiccated coconut and cinnamon into wheat flour resulted in poor aroma scores. The results showed a decrease in the scores as the cinnamon and desiccated coconut was used as composite with wheat flour. Samples (B and C) with 10% and 20% coconut blends recorded low mean score of 3.32 and 3.10 respectively, that is "neither like nor dislike". The control sample (A) had the highest mean score of approximately 4.0, which is liked slightly. The control was significantly ($p<0.05$) different from the other products.

Texture

The scores for texture (mastication ability) of the composite biscuit samples decreased with increase in composite of cinnamon and coconut when compared to whole wheat biscuit (control sample A). The biscuit with 15% coconut and 5% cinnamon (sample B), had the best texture when compare to that of sample (C) with the mean score of 3.38 which means "neither like nor dislike". The hard texture is caused by increased in fiber from wheat bran substitution was reported by Eiman et al. (2008).

Taste

The control sample (A) and sample (B) had the highest taste score of 4.0 which is "Liked slightly" and sample (C) was neither liked nor disliked with a mean score of approximately 3.0. This result proves that both samples (A and C) were equally accepted in terms of taste. However, the control sample (A) and sample (B) were significantly ($p<0.05$) different from sample (C). From the results, it could be observed that up to 15% composite of coconut and 5% cinnamon could be accepted by the consumers (that is, "slightly liked" with mean score of 4.0).

Overall Acceptability

The sensory evaluation also revealed that the biscuit with composite cinnamon and coconut of up to 20% and 10% (sample C) was neither liked nor disliked with overall acceptability of 2.96. The control had the

highest overall acceptability with mean score of approximately 5.0, which is "liked very much". There is significant ($p<0.05$) different between the control from the other samples.

CONCLUSION

Results obtained from this work shows that desiccated coconut and cinnamon could be used to partially replace wheat flour in biscuit production. Coconut and cinnamon could be used as composite with wheat flour of up to 80% level in making of biscuits without any adversely effects on the sensory characteristics of the products. Biscuit made from 70% wheat flour and 10% cinnamon powder and 20% coconut flour as composite had average mean scores of 2.96 and most of the attributes were disliked slightly by the consumers.

REFERENCES

1. AOAC. (2010). Official methods of analysis: Association of OfficialAnalytical Chemistry; Arlington, USA, 781.
2. Boateng, A. (2012). Quality Protein Maize Infant Feeding Trials in Ghana. *Ghana Health Services*; Ashanti Region, Ghana.
3. Bourdeix, R., Konan, J.L., & N'Cho, Y.P. (2005). Coconut: a guide to traditional and improved varieties, Ed. Diversiflora, Montpellier, France
4. Chan, E., & Elevitch, C.R. (2006). Cocos nucifera (coconut) (version 2.1). In C.R. Elevitch (Ed.). Species profiles for pacific island agroforestry. Holualoa, Hawai'i: Permanent Agriculture Resources (PAR).
5. De lumen, B.O., Thompson, S., & Odegaard, J.W. (1993). Sulphur amino-Acid rich proteins in 464 Acha (Digitana extihs) a promising underutilized African cereal. *Journal of 465 Agriculture and Food Chemistry.:41*:1045 – 47.
6. Dragland, S., Senoo, H., Wake, K., Holte, K., & Blomhoff, R. (2003). Several culinary and medicinal herbs are important sources of dietary antioxidants. *The Journal of nutrition*, *133*(5), 1286-1290.
7. Elleuch, M., Besbes, S., Roiseux, O., Blecker, C., & Attia, H. (2007). Quality characteristics of sesame seeds and by-products. *Food chemistry*, *103*(2), 641-650.
8. Fayemi, P.O. (2000). Home Economics Teacher Guide. Ibadan Macmillian Nigeria Publisher Ltd. p 201.
9. Fife, B. (2005). Eat fat, look thin: A safe and natural way to lose weight permanently. 2nd ed. Piccadily Books, Colorado Springs, Co, USA.
10. Giami, S.Y., & Bekebian D.A. (2000). Proximate composition and. Functional properties of raw and processed full fat soya bean flour. *J. Sci. Food. Agric.*, *59*: 321-325
11. Ihekoronye A. (1999). Manual on small scale food processing. (1st ed), *Academic Publishers Nsukka*, *32*.
12. Khanum, F., Sudarshanakrishna, K. R., Semwal, A. D., & Vishwanathan, K. R. (2001). Proximate composition and mineral contents of spices. *Indian J. Nutr. Diet*, *38*(3), 93-97.
13. Mashayekh, M., Mahmoodi, M. R., & Entezari, M. H. (2008). Effect of fortification of defatted soy flour on sensory and rheological properties of wheat bread. *International journal of food science & technology*, *43*(9), 1693-1698.
14. Okaka, J. C. (2005). Handling, storage and processing food plant. *OCJ Academic Publishers Enugu, Nigeria*, P. 266
15. Prades, A., Dornier, M., Diop, N., & Pain, J. P. (2012). Coconut water uses, composition and properties: a review. *Fruits*, *67*(2), 87-107.
16. Steiner, I., & Desser, A. (2008). Coconut water – composition, properties and processing, Ernahr., 32, 513-516.
17. Topping D. (2007). Cereal complex carbohydrates and their contribution to human health. *J Cereal Sci 46:* 220-9.
18. Trinidad, T. P., Ph, J., Askali, F. C., Maglaya, A. S., Chua, M. T., Castillo, J. C., ... & Masa, D. B. (2001). Coconut flour from residue: a good source of dietary fiber. 366 Indian Coconut J 7.;7:45–50.
19. USDA. (2009). National nutrient database for standard reference, nuts, coconut water. (online). Available from: http://www.nal.usda.gov/fnic/food/cgi-bin/list_nut_edit.pl/. (Accessed on December 8, 2019).