



ACCEPTABILITY OF BREAD USING DIFFERENT WHEAT/SOYBEAN FLOUR RATIOS IN TERTIARY INSTITUTIONS OF DUTSINMA, KATSINA STATE, NIGERIA

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Abstract

Nigeria is facing food insecurity and various types of malnutrition due to ignorance, destitution and the limited food choices in the country. Soya bean is one of the promising food that holds a prospect in tackling the challenge. Therefore, incorporating soya into the diet, mixing with other food stuffs, of Nigerians is one strategy to implement new foods to enhance the nutrition standards of the citizens. It is at this backdrop that this research is undertaken to identify the viability of the soya, and acceptability of the soya-based product (soya bread) for marketing and consumption. The tests were conducted in two forms at different soya ratios. All with good acceptability and viability. The purpose of the research is to identify the extent to which soya bread could be accepted as substitute for conventional breads in the market; and to illustrate whether soya could be used in bread as composite flour. All the results show positive at varying degrees with respects to taste, colour, texture, and aroma.

Keywords:

Soya, flour, bread, and wheat.

INTRODUCTION

Soya beans is a popular legume utilized as food in culinary art. It is the only known plant protein to have possess all the essential amino acids required by the body. Its potential is enormous particularly in fighting hunger in children and women, used as the main ingredient as well as incorporated into other dishes (Hassan, 2024).

The acceptability of bread as food involves complex and interrelated factors such as sensory attributes, convenience, cost and cultural familiarity (Murray and Baxter, 2003). Bread acceptability is directly related to the interaction between bread and the consumer at a particular time. However, sensory characteristics of the bread (aroma, taste, appearance, texture) are of paramount importance in enhancing the general acceptability of bread (Maina, 2018).

In Nigeria, bread is frequently consumed by many people especially for breakfast and at night. There is widespread protein and mineral malnutrition among many individuals particularly children and women. This is due to low income status and the consumption of monotonous type of foods (rice, maize, wheat) that exclude a lot of quality packed ingredients found in legumes, nuts, vegetables and fruits (Welch, 2023). One way to alleviate the low nutrients content in human diets is to include high quality food ingredients that will provide the necessary amounts of proteins, minerals and vitamins. Therefore, this research seeks to determine an ideal wheat/soybean composite flour ratio that can be used to improve the nutritional quality of breads made for better health and wellbeing of Nigerians. Manufacturers, house-wives, caterers, who make soya products can have positive customer acceptability of the products; due to the good textures, aroma, taste and colour of the products. For instance, the Chinese soy sauce improves quality of meals, and has good aroma and good dark colour in cooking (Foskett and Paskins, 2012).

LITERATURE REVIEW

Hassan's (2017) experimental research reveals how soya was used to make soya bread, soya doughnut, and soya cake from soya composite flour. Soya bean has been a promising food commodity for centuries, particularly in Asia and in the Americas, a popular legume so far known with the highest protein value globally, as it contains all the essential amino acids needed by the body due to its high protein values, minerals, fibres, as well as vitamins. The world currently needs a promising crops to fight malnutrition and food insecurity at all levels (Hassan, 2024).

Bread is one of the major foods consumed in Nigeria, making it a significant contributor to our diet. The bread produced in Nigeria, particularly in the North (Katsina State), is of little nutritional value, low in weight, misbranding or adulteration due to high cost of living and poor monitoring by food agencies like the NAFDAC in the country (Hassan, 2024).

METHODOLOGY

Study Area

The study was conducted at Isa Kaita College of Education Dutsinma (12.455° N and 7.498° E; elevation: 605 m) in Katsina State. The area lies within the Sudan Savanna of Nigeria. The climate is that of 'tropical wet and dry' koppen system denoted as 'Aw'. Insolation is high due to low cloud cover. Average daily sunshine is about 8.5 hours per day. The long dry season is between November to May, while the short wet season is June to October (Aliyu, 2023). Dutsinma is a big town housing two large higher institutions of learning (Isa Kaita College of Education and Federal University), attracting various people from different parts of the country. These makes the town diverse, bringing together new settlers to the place.

Treatments and Experimental Procedure

To treat the soya bean for flour, first it was picked by hand and de-stoned. It was then washed and dried under the sun for grinding. After drying, the entire soya bean was treated under a hot temperature to destroy the anti-nutrient present in it, for safe consumption. After cooling down, the soya was taken for grinding. It was finely grounded and spread to dry again. Afterwards, the composite flour for the treatments were made by adding a ratio of wheat flour to the grounded soya flour of 65% - 35% for the treatment A; and 80% - 20% for the treatment B respectively as shown below:

The study consisted of two treatments (composite flours) in per centage proportions as follows:

- Treatment A = 65% wheat flour + 35% soybean flour
- Treatment B = 80% wheat flour + 20% soybean flour

The two proportions of the flours were thoroughly mixed together for making the bread *doughs*. The preparation of bread dough as well as baking were done according to the methods of American Institute of Baking as described by Sathivel et al. (2013). For each 100 g of flour, 80 ml of water was used while the other ingredients were also added (2 g of yeast, 2 g of salt, 3 g of margarine and 7 g of sugar). The two bread types were prepared by replacing wheat flour with 35% and 20% soybean flour respectively (Table 1)

Table 1: Bread Formulation

Ingredients	65:35 flour/soybean ratio (Treatment A)	80:20 flour/soybean ratio (Treatment B)
Commercial flour	65 g	80 g
Soybean flour	35 g	20 g
Water	80 ml	80 ml
Yeast	2 g	2 g
Sugar	7 g	7 g
Salt	2 g	2 g
Margarine	3 g	3 g

For each treatment, 400 loaves of bread were produced. The yeast was pre-fermented for 1 hour. Bread ingredients were then mixed homogenously. The mixing and kneading processes were continued to form the dough using a hydration of 80%. Dough was then allowed to rise again for 2 hours before second kneading. Thereafter, the dough was baked until the internal loaf temperature reached 98 °C. Bread was allowed to cool at 35 °C before slicing and wrapping (BIRT, 2021)

Consumer Taste Trial

A total of 400 students from Isa Kaita College of Education and Federal University, Dutsinma were randomly selected to taste bread. The participants comprised of 225 males and 175 females as recommended by Krejcie and Morgan (1970). The tasting trial was conducted during the breakfast period. Each participant was served 100 g of the bread types. Respondents completed a closed ended questionnaire as described by Adamu et al. (2006) and Kothari (2005)

Data Gathering and Analyses

Data were gathered on selected sensory characteristics of the bread (texture, taste, appearance, aroma and palatability). All data generated were analysed using Statistical tools such as bar charts and frequency tables as described by Kothari (2004). The entire test and data gathered were based on five areas (variables): 1) aroma; 2) appearance/presentation/colour; 3) texture; 4) taste; and 5) palatability

RESULTS AND DISCUSSIONS

Bread texture

The result in Table 2 shows the response of participants to the texture of bread. It can be seen that for both bread types, majority of respondents (64%) indicated the texture of the breads was good or very good. Few respondents (12%) mentioned that the texture was poor or very poor. Sullivan (2020) outlined the factors that determine bread texture to include: the type of flour used, fermentation temperature, fermentation time, kneading length and the ratio of water to flour (hydration). However, hydration is principally the most important factor that affects bread texture. A springy and open textured bread is obtained by using a hydration of 80% (i.e by adding 800 ml of water to 1,000 g of flour)

Table 2: Response to Bread Texture

	<u>65:35 ratio of Flour/Soybean</u>		<u>80:20 ratio of Flour/Soybean</u>	
Rating	Respondents	Percentage (%)	Respondents	Percentage (%)
<i>Very poor</i>	16	4	16	4
<i>Poor</i>	32	8	32	8
<i>Fair</i>	96	24	96	24
<i>Good</i>	144	36	128	32
<i>Very good</i>	112	28	128	32
Total	400	100	400	100

Flours that have high protein can produce a robust structure while, low protein flours lead to tender structures. It is important to mention that the two bread types were produced using the 80% hydration procedure. Also, the inclusion of soybean flour to replace 35% and 20% wheat flour did increase protein profile of the breads. These practices may have helped to give the breads high quality texture

Bread taste

Taste is an important parameter to determine food acceptability (Maina, 2018). The response to bread taste is presented in Table 3. The result revealed that majority of the respondents (64% to 84%) believed both breads have good/very good taste. According to Lessaffre (2016), bread needs to taste good and such good taste in bread depends mostly on the baker. Generally, bread taste varies on the basis of ingredients used and the method of preparation.

Table 3: Response to Bread Taste

	<u>65:35 ratio of Flour/Soybean</u>		<u>80:20 ratio of Flour/Soybean</u>	
Rating	Respondents	Percentage (%)	Respondents	Percentage (%)
<i>Very poor</i>	0	0	0	0
<i>Poor</i>	64	16	16	4
<i>Fair</i>	80	20	64	16
<i>Good</i>	160	40	96	24
<i>Very good</i>	96	24	224	56
Total	400	100	400	100

Adding certain ingredients such as honey, olive oil, small fat, banana, sugar or malt can improve the taste of bread by tenfold (Bob, 2026). Few respondents (4% to 16%) reported that the breads were of poor/very poor taste while, 16% to 20% were of the view that the taste of the breads was fair. By manipulating the above mentioned factors that determine the taste of bread, bakers can improve the taste to suit their people and environment

Bread color/appearance/presentation

The response to bread color is presented in Table 4. The result indicated that 56% to 100% of Respondents reported the breads have good/very good color. Essentially, all the respondents (100%) revealed that the bread made from 80:20 ratio of flour/soybean was of good/very good

colour while 56% of the respondents mentioned that the bread having 65:35 ratio of flour/soybean was good/very good in terms of color. The difference in color between the two bread types suggests that the inclusion of varying amounts of soybean may have been the reason for the color to appear differently from each other.

Table 4: Response to Bread Color

	<u>65:35 ratio of Flour/Soybean</u>		<u>80:20 ratio of Flour/Soybean</u>	
Rating	Respondents	Percentage (%)	Respondents	Percentage (%)
<i>Very poor</i>	0	0	0	0
<i>Poor</i>	32	8	0	0
<i>Fair</i>	144	36	0	0
<i>Good</i>	176	44	208	52
<i>Very good</i>	48	12	192	48
Total	400	100	400	100

Color is the first quality indicator consumers look for in bread (Dubat and Lena, 2026). Very light colored breads suggest under baking, while too dark breads indicate over baking or burning. Therefore, the ideal colour for acceptability is brown. In fact, any deviation in bread color may suggest problem with baking temperature, baking time or the ingredient ratios. Moreover, Dubat and Lena (2026) stated that bread color is affected by amount of starch in flour, the ash/protein content (lower ash or protein leads to lighter color) and sugars (they intensify browning). Also, lipids ensure uniform browning in bread.

Bread Aroma

The aroma of bread forms part of the sensory attributes of its acceptability (Maina, 2016). Result in Table 5 revealed that for both bread types, majority of the respondents (64% to 72%) reported the aroma was good/very good. However, 28% to 36% of the respondents indicated that the breads were poor or fair in terms of aroma.

Table 3: Response to Bread Aroma

	<u>65:35 ratio of Flour/Soybean</u>		<u>80:20 ratio of Flour/Soybean</u>	
Rating	Respondents	Percentage (%)	Respondents	Percentage (%)
<i>Very poor</i>	0	0	0	0
<i>Poor</i>	80	20	0	0
<i>Fair</i>	32	8	144	36
<i>Good</i>	176	44	32	8
<i>Very good</i>	112	28	224	56
Total	400	100	400	100

Since aroma influences the zeal to consume food products, there is need to improve the aroma by manipulating the factors that influence it. Bread aroma is well known to be influenced by yeast and lactic bacteria to generate aroma during baking. Thus, aroma in bread depends on the type of flour, fermentation process and baking techniques (Sanja and Nermia, 2024)

Findings:

The results from the research is on four main areas; aroma, colour/appearance/presentation, taste, and texture. The result is as follows:

1. Aroma – the acceptability for aroma of the entire respondents was; A) Flour ratio % of 65:35 is >288 of No. of entire respondents (400), = >72%. Therefore, its total acceptability in % = >72%. B) While flour ratio of % 80:20 is >368 of the No. of respondents is >90%.
2. Colour - acceptability for colour of the Bread by the entire respondents (400) was; A) Flour ratio % 65:35 is 244 of the entire respondents; = >56%. B) Flour ratio of % 80:20 is 400 of the entire respondents (400), = 100%.
3. Taste – the acceptability for taste for the entire respondents was; A) Flour ratio of % 65:35 is >256 for the entire No. of respondents; = >64%. B) Flour ratio of % 80:20 is > 320 for the entire No. of respondents (400); = >80%.
4. Texture – the acceptability for texture of the entire respondents (400) was: A) Flour ratio of % 65:35 is >256 for the entire respondents (400), = >64%. B) Flour ratio of % 80:20 is 356 for the entire No. of respondents (400) is >64%.

Discussion:

Generally, the research reveals the acceptability of the soya composite flour bread with some significant degrees across the areas tested (aroma, taste, texture, and colour) in the two proportions of the composite flours. The Ratio with 20% soya flour is highly more acceptable than the one with 35% soya flour. This shows that the bread incorporated with 20% soya flour is more acceptable in terms of **colour** and aroma than the one with 35% of soya flour. While in terms of **taste**, the **Treatment B** (one with 20% soya flour) shows to be more *tasty* than the **Treatment A** (one with 35% of soya flour).

Meanwhile, in terms of texture, both the one with 35% and 20% of soya (Treatment A) prove to be the same; 64% acceptability each. The research positively proves the main objective of the experiment – to ascertain the acceptability of a soya flour bread as a new product for public consumption.

Summarily, all the two tests (for the two variables) have good acceptability. However, the one with ratio of wheat and soya flour of 80:20% (Treatment B) have the highest acceptability. This means that all the new products will sell to the public and eventually accepted. In addition, people in the area would want new product (soya bread product) that has high nutritional value than the conventional bread. The implication is that introducing soya bread to the market will be a welcome move, therefore bakers can venture into it with a good hope. The product will enhance the diet of the people, moving from conventional refine flour products that has negative impacts to health to a more safe and nutritive bread.

Conflict of Interests:

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