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PROXIMATE COMPOSITION AND CONSUMER ACCEPTABILITY OF PANCAKES MADE WITH WHEAT AND SOYBEAN FLOUR BLENDS

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ABSTRACT

This study compared the quality of pancakes made with wheat and soybean flour blends in a varied proportion of 100:0, 90:10, 80:20, 70:30, and 60:40. The proximate composition and sensory characteristics of the various pancake samples were identified. The values of moisture, ash, fat, fibre, protein, and carbohydrate were; 10.55-12.16%, 3.00-3.64%, 11.56-15.40%, 1.00-3.34%, 9.45-21.37%, 42.40-63.00% respectively. Proximate composition of the various pancake samples was determined using the Pearson, 1973 technique. A 30 untrained market women evaluated the pancakes produced using a 9-point hedonic scale. Data obtained were subjected to the Analysis of Variance and the means were then separated using Duncan's multiple range tests with a 5% probability. The aroma, colour, texture, taste, and overall acceptability of the pancakes were assessed. Pancake produced from 100% wheat flour received the highest ratings, though did not differ ($p>0.05$) from the fortified pancake samples AA1 and AA2. It is observed that substituting wheat flour partially with soybean flour with up to 10% and 20% could be used to produce acceptable pancakes or pastry products without affecting the sensory quality.

Keywords: Composite flour, wheat flour, soybean flour, pancake, hedonic sale

INTRODUCTION

Wheat flour contains a significant amount of protein called gluten, which gives dough its ability to form in the baking process. It also influences elasticity of dough as well as the general appearance and crump structure of baked goods (Torbica et al., 2012). A pancake is a flat, usually circular cake that is thin and made from a batter that contains starch. Pancakes are baked on a heated surface like a griddle or frying pan. They can be offered as an appetizer, for breakfast, lunch, supper, or even dessert. A variety of toppings or fillings, such as jam, fruit, syrup, chocolate chips, or meat, may be used to serve them at any time (Dalby and Andrew,

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1996). Another widely consumed wheat-based product that can be modified to be gluten and wheat-free is pancakes. In order to improve the texture and flavour of traditional wheat pancakes, processing conditions have been widely explored (Seguchi, 1990).

Most baking products contain flour made from wheat (Triticum aestivum L.), which has been linked to several health issues in some people. Although wheat is a good natural source of proteins (8–12%), vitamins like Vitamin E, minerals like iron and zinc, and dietary fibers, a significant amount of these nutrients are lost during the milling and refining of the wheat grains to make flour. As a result of the removal of the outer layer of the wheat during excessive processing and milling, a considerable amount of fiber is lost (Anjum et al., 2006). In addition, wheat lacks crucial amino acids like lysine, just like many cereals (Khetarpaul and Goyal, 2009). Unfortunately, the climatic conditions in tropical nations like Ghana do not support wheat farming, making wheat-based products expensive. To replace wheat flour for the making of pancakes partially or entirely, researchers have been looking into the possibilities of employing flours generated from locally grown crops including maize, cassava, rice, and soybean among others (Okoye et al., 2020).

Glycine max (soybean), a grain legume, provides the most protein utilised as food by humans, making it one of the richest and most affordable sources of plant protein that can be used to improve the diets of millions of people, especially the poor and low-income earners in developing nations (LIU, 2000). Many different soy products can be made from soybean, including soymilk, soy sauce, tofu (soybean curd), soy-yogurt, soy sprouts, soy flour, and many others. Protein concentrations and isolates can be made using defatted soybean flour. Soybean protein is more similar to animal protein in terms of nutrition than other vegetable proteins. About 40% of the total solids are made up of soy protein, which is crucial for enhancing baked goods made with cereal (Fukushima, 1999). Additionally, it contains a lot of vitamins and minerals and has a low amount of crude fiber (Oyenuga, 1968). One such protein source is soybean, which, when used to supplement or replace wheat flour in the creation of bakery goods like bread, biscuits, and other confectionary, might significantly enhance the nutritional status of such goods.

Blending wheat and soybean flour will help to cut down on the amount of money spent on importing wheat, supplement vital nutrients, make up for nutrients lost during processing and milling, and lower the risk of serious nutrition-related diseases like cancer, diabetes, and cardiovascular diseases. It will also help to reduce the product's gluten content, as its consumption typically leads to celiac disease in people with a genetic predisposition. The objective of the study was to determine the proximate composition and acceptability of pancakes made with wheat and soybean flours at different levels of substitution.

MATERIALS AND METHODS

Source of Materials

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Mature Soybean seeds (*Glycine max*) were purchased from a local market in Kumasi Central Market, Ghana while the wheat flour and other ingredients used for this study were acquired at Tafo Market, Kumasi, Ghana.

Preparation of Full-Fat Soybean Flour

The method outlined by Ihekoronye and Ngoddy (1985) was used to manufacture the full-fat soybean flour. Two kilograms of clean, dirt-free soybean seeds that were also devoid of other foreign objects like stones, twigs, and leaves were weighed, cleaned, and soaked in tap water for eight hours as part of the preparation process. The seeds were then drained, manually dehulled, and boiled for 30 minutes at 1000 degrees Celsius before being dried in a cabinet dryer (65^{o}C, 5hr). The dehulled seeds were swirled every 30 minutes to achieve even drying during the drying process. To make full-fat soybean flour, the dried seeds were ground (using an attrition mill) and sieved. In preparation for blending and analysis, the full-fat soybean flour was ultimately sealed in an airtight container.

Flour Blending

Different quantities of whole wheat and soybean flour were combined to make the blends including 100%, 90%, 80%, 70%, 60%, and 0%, 10%, 20%, 30%, and 40% of each. A Binatone food mixer was used to carefully combine the flours into a homogenous mixture. The flour mixtures were maintained at room temperature until employed for the production and analysis of pancake samples and were packaged and in sealed plastic bags.

Preparation of pancake

As shown in Table 1, defatted soybean flour and wheat flour were combined in the following ratios: 100:0, 90:10, 80:20, 70:30, and 60:40 for the manufacture of the pancake. The pancake made with wheat flour served as a control. The composite wheat and soybean flours have the designations AA2, AA3, AA4, and AA5, while the control wheat flour had the designation AA1. To make a homogeneous batter, other ingredients including sugar (20 g), salt (2 g), baking powder (5 g), Vanilla essence, and one raw egg were combined with the composite flour (100 g) and 250 ml of (water+milk). Pure vegetable oil was added to a frying pan after the batter had rested for 10 minutes using a 15 ml measuring spoon. The pancake was cooked for 1 minute until the top surface bubbled before being turned over to cook the other side, which took a further 1 minute to get golden. The oil temperature was then changed to 120°C. The finished pancakes were placed inside a plastic container for sensory analysis and proximate composition testing.

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Table 1 Recipe for pancake preparation

INGREDIENTS	AA1	AA2	AA3	AA4	AA5
Soft wheat flour (g)	100	90	80	70	60
Soybean flour (g)	0	10	20	30	40
Vegetable oil (mL)	15	15	15	15	15
Baking	powder(g)	5	5	5	5
5		20	20	20	20
Sugar	(g)	250	250	250	250
20		2	2	2	2
Water+ Milk (mL)	250	1	1	1	1
Vanilla essence (mL)	2				
Eggs (large size)	1				

Keys: AA1 (100% wheat flour), AA2 (90% wheat flour and 10% Soybean flour), AA3 (80% wheat flour and 20% Soybean flour), AA4 (70% wheat flour, 30% Soybean flour) and AA5 (60% wheat flour, 40% Soybean flour).

Proximate composition

Proximate analysis was done on each of the pancake sample. The Kjeldahl method was used for protein determination (Pearson, 1973). The procedures used to determine the fat; ash; fibre; and moisture content were those that Pearson described (1973). Difference was used to determine the carbohydrate (Bryant et al, 1988).

Sensory evaluation of pancakes

A survey was conducted to determine consumer preferences based on their desire, availability, motivation, and capacity to act as a member of a sensory panel. Thirty (30) untrained panelists from Tafo market women were chosen using a 9-point hedonic scale (9 = Extremely like, 1 = Extremely dislike). Five sensory qualities—aroma, taste, colour, hardness, and overall acceptability were examined (Iwe, 2002).

Statistical Analysis

Analysis of variance was done on the data obtained (ANOVA). Using the statistical package for social sciences, SPSS 16.0 software, the means were then separated using Duncan's multiple range tests with a 5% probability (Akinjayeju, 2002).

RESULTS AND DISCUSSION

Proximate composition of wheat and soybean flour pancakes

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Results of pancake samples for various proximate compositions, such as moisture content, ash content, crude lipid content, crude protein content, crude fiber content, and carbohydrate content, are shown in Table 2. The moisture content of the wheat and fortified pancake samples ranged from 10.55 -12.16% of which AA1 (100% wheat flour pancake) recorded high amount of moisture (12.6%) than the fortified pancake samples (10.55%, 10.95%, 11.35%, and 11.75%) respectively. When the ratio of soybean was increased, it was discovered that the moisture content decreased in all the fortified pancake samples. However, the water absorption values of fortified pancake samples were not comparable to those of the control pancake, hence bringing about a significant difference ($p<0.05$). The soybean flour inclusion may account for the unusually low moisture level in the pancake. As indicated by Shahzadi et al. (2005) to prevent microbiological growth and chemical changes during storage, the composite pancake's moisture content was within the safe storage recommendation of 14%. The importance of moisture content would improve product quality preservation and shelf life. The outcome of this study differs from that which Ogbemudia et al., (2017) stated. They noted that the product they produced had a moisture level of 8.07%.

The ash content ranged from (3.00-3.64%). The ash composition of the control sample and the samples of enhanced pancakes were statistically different ($p<0.05$). The fortified pancake samples recorded higher amount of ash content than the control. It is observed that increasing the soybean in the pancake samples resulted in a corresponding increase in the ash content. Wheat flour can be considered to be poor source of minerals as ash content provides insight into the mineral content of the food; hence, the relatively low-value recorded in the control sample pancake. Ogbemudia et al. (2017) reported an ash content of 4.29% which is higher than this finding, Lokuruka (2010) reported that soybean had an ash content of approximately 5%, which validates the finding of this research (3.64%). Additionally, the fat level ranged from 11.56 to 15.40%, which was incomparable to Van Hal's (2000) reports. The differences in fat content were significant ($p< 0.05$). AA1 (70:30) had the lowest values (11.56%), while fortified samples (AA5) had the highest values (15.40%). For all composite pancake samples, the fat content increased as soybean flour content increased. The high crude fat content of 15.40% in this study suggests that soybean may be a superior source of oil, and this report differed from the range of values (18.8 - 40.1%) obtained and published by Ogbemudia et al., (2017). The observed outcomes confirm the value of soya bean seed as a good source of edible oils that may be utilised in both the soap-making and cookery industries (Ogbemudia et al., 2017).

The fibre content ranged from 1.00-3.35%. The control sample had a crude fiber content of 1.0% whereas the enhanced pancake sample (AA5) had 3.35%. Due to the extensive removal of their fiber content during the unit operations of milling and screening, among others, required for the processing of wheat into flour, tiny particle flour samples were obtained. This implied that consuming wheat pancakes alone may impede peristalsis, the flow of food through the digestive tract, and prevent food digestion, and that the fortified pancake samples are good sources of fiber in our diet. The percentage fiber content of this study was inconsistent with the findings of Cole et al., 1999, who reported a fiber content of 6.5%. Even though the number can be minimal, fiber

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in diet is known to have positive effects. The gastrointestinal system is subject to several physiological effects of fiber. These effects include changes in fecal water, bulk, and transit time as well as the elimination of bile acids and neutral steroids, which lower the body's pool of cholesterol and may also reduce the risk of colon cancer (Ogbemudia et al., 2017).

The protein content of the various pancake samples ranged from 9.45-21.37%. Wheat flour's protein content increased significantly ($p < 0.05$) as soybean flour increased. The blend with 60% wheat flour, 40% Soybean flour had the highest protein content (21.37%). Vegetable proteins have been incorporated into numerous food systems in the form of flour concentrates to provide products with superior nutritional advantages and functionality than those generated only from items made from wheat flour (Idowu, 2014). The high crude protein content of the wheat and soybean composite pancake samples suggest that the food can be used by Africans as a low-cost source of protein. Products made from flour could potentially address Africa's issue of protein-energy malnutrition (Bolarinwa et al., 2015). The outcomes of this study are inconsistent with those of Okoye, Nkwocha, and Ogbonnaya (2008). They found that when the percentage of soy flour in wheat-soy bean flour increased, the protein level decreased (9.45–21.37%). These findings corroborated those of Alabi and Anuonye (2000) and Shahzadi et al. (2005), who noted that high-protein legumes are frequently used as composite flour in the manufacture of bakery goods. They also suggested that replacing cereal with legumes as composite flour can increase the protein content and quality of flour products. One method to enhance the amount of protein in baked goods like biscuits, cookies, and cakes is to replace some of the wheat flour with legumes, particularly soybean flour, which is a higher source of protein (Masur et.al, 2009). Our findings concur with those of Eissa et al. (2007), who fortified Egyptian Balady bread with chickpea flour and discovered that adding raw chickpea flour increased protein content compared to control wheat bread. The noticeably greater protein content of chickpea flour (Eissa et al (2007).

Percentage of carbohydrates ranged from 42% to 63%. As can be seen from Table 2, the carbohydrate content of the supplemented pancake decreased as the quantity of soybean flour substitution increased. In comparison to the control (63%), fortified pancake samples exhibited lower carbohydrate contents at 42.40%, 47.55%, 52.70%, and 57.85% respectively. (Naseem et al., 2013) augmented HEB with various concentrations of chickpea flour and reported similar outcomes. With the addition of chickpea flour, Garg and Dahiya (2003) fortified papads and discovered that the amount of carbohydrates dropped with increasing fortification. When chickpea flour was added to wheat flour in toasted bread, Hefnawy et al. (2012) reported the same result. Dhinda et al. (2012) supplemented wheat flour bread with varying amounts of soy protein isolate, oat bran, and chickpea flour. Chickpea flour was discovered to contain fewer carbohydrates than wheat flour. Chickpea flour was added to bread by Yousseff et al. (2006) at percentages of 5, 10, 15, 20, and 25% wheat substitution. They discovered that the amount of carbohydrates in their finished products dropped as chickpea flour's fortification level increased.

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Table 2: Proximate composition of wheat-soybean pancake

Samples	Moisture (%)	Ash (%)	Fat (%)	Fiber (%)	Protein (%)	CHO (%)
AA1	12.16[a]	3.00e	11.56[e]	1.00[e]	9.45[e]	63.00[a]
AA2	11.75[b]	3.16[d]	12.14[d]	1.54[d]	13.38[d]	57.85[b]
AA3	11.36[c]	3.32[c]	13.28[c]	2.17[c]	15.37[c]	52.70[c]
AA4	10.95[d]	3.48[b]	14.42[b]	2.75[b]	14.61[b]	47.55[d]
AA5	10.55[e]	3.64[a]	15.40[a]	3.34[a]	21.37[a]	42.40[e]

Values in the same column with different superscripts are significantly different ($p>0.05$). Keys: AA1 (100% wheat flour), AA2 (90% wheat flour and 10% Soybean flour), AA3 (80% wheat flour and 20% Soybean flour), AA4 (70% wheat flour, 30% Soybean flour) and AA5 (60% wheat flour, 40% Soybean flour).

Sensory analysis of wheat- soybean pancake

The sensory evaluation of the wheat and fortified pancake samples were done by a panel of 30 untrained judges. On a scale of 1 to 9, scores were displayed (Table 3). Aroma, colour, texture, taste, and overall acceptance scores were reported by the sensory analysis. According to sensory data on aroma (Table 3), fortified pancake with soybean flour (60% wheat flour, 40% Soybean flour) received the lowest ratings; whereas control pancake sample made with entirely 100% wheat flour recorded highest ratings for aroma and differed significantly from the composite pancakes produced. Blending wheat flour with soybean flour affected aroma of all the composite pancake samples. Similar results were observed by Dodok et al. (1993) who supplemented wheat flour bread rolls with 10% and 20% chickpea flour. Both levels of bread fortification (10 and 20%) showed lower aroma ratings than the control. Again, this result disagrees with that of Fernandez and Beery (1989), they prepared chickpea-fortified bread and had higher score on aroma than control bread. The beany odour can be the cause of lower scores for all the composite pancakes produced. The bean-like odour of soybean is regarded as one of the crucial elements that may affect the quality and acceptance of any food product that contains soybean flour (Gonzales et al., 2014).

Findings on colour demonstrated that the control AA1 (100% wheat flour) differed significantly ($p<0.05$) than the supplemented pancakes. The assessors were able to distinguish the wheat flour pancake from the fortified pancakes. In comparison to the control, the colour scores for the 60% wheat flour, 40% Soybean flour pancake was much lower. It is observed that adding soybean flour resulted in a corresponding change in colour of the composite pancakes. When 10% chickpea flour was used to fortify bread, Fernandez and Beery (1989) discovered that the fortified bread scored better for colour than the unfortified bread. Scores for colour, scent, taste, texture, and general acceptance were reported by the sensory analysis. Our findings revealed no statistically significant variations between the control and fortified pancakes. On the other hand, the of the various pancake ranged from 6.65-8.30 with the control (100% wheat flour

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pancake) having the highest mean value (8.30) while the least mean value was for the fortified pancake sample AA5 (60% wheat flour, 40% Soybean flour). The texture score revealed that there were no noticeable changes in the control and fortified samples AA2 and AA3, but the control differed significantly ($p<0.05$) from AA4 and AA5. Yousseff et al. (2006) discovered that the texture scores dropped when chickpea flour (10% and 15%) was added to bread made with wheat flour in varied ratios. Hallab et al. (1974) evaluated the nutritional value and organoleptic qualities of white Arabic bread supplemented with soybean and chickpea, and their findings concur with those of Yousseff et al. (2006). They proved that higher fortification levels of chickpea flour in the finished product resulted in worse texture scores

The control pancake and fortified pancakes taste ratings are presented in Table 3. The findings of the sensory showed no statistically differences between the control AA1 (100% wheat flour) and fortified samples AA2 (90% wheat flour and 10% Soybean flour) and AA3 (80% wheat flour and 20% Soybean flour) in terms of taste ratings. Composite pancake samples AA4 and AA5 were rated low and these evaluations may have been low because of the pronounced bitter beany flavour that soybean flour has. When chickpea flour was fortified at higher levels in the finished product, taste ratings fell, according to research by Hallab et al. (1974) on the nutritional value and organoleptic qualities of white Arabic bread enriched with soybean and chickpea.

The range of sensory attributes of both products ranged from 6.10-8.40 with the control sample (AA1 100% wheat flour pancake) having the highest mean value (8.40) while the least rating is sample AA5 (60% wheat flour, 40% Soybean flour). The sensory assessments of the general acceptability of the control and fortified pancake samples showed no appreciable changes in the ratings. Due to the beany flavour and odour of soybean, liking at the 30% and 40% replacement levels were decreased. These were regarded as crucial variables that affect the quality and acceptability of any food products fortified with soybean or legume flour (Gonzales et.al., 2014). Pancake samples made with 10% and 20% soybean flour incorporation were accepted; this means that pancakes or pastry products could be supplemented with soybean flour up to 20% without any effect on the sensory attributes or product quality.

Table 3: Sensory analysis of wheat- soybean pancake

Samples	Aroma	Colour	Texture	Taste	Overall Acceptance
AA1	8. 41^{a}	8.36^{a}	8.30^{a}	8.41^{a}	8.40^{a}
AA2	7.35^{b}	7.24^{b}	8.28^{b}	7.39^{a}	8.37^{a}
AA3	7.30^{c}	6.85^{c}	8.26^{c}	8.37^{a}	7.38^{a}
AA4	6.35^{d}	6.05^{d}	7.45^{d}	6.28^{d}	6.24^{d}
AA5	5.15^{e}	5.11^{e}	6.65^{e}	5.50^{e}	6.10^{e}

Values in the same column with different superscripts are significantly different ($p>0.05$). Keys: AA1 (100% wheat flour), AA2 (90% wheat flour and 10% Soybean flour), AA3 (80% wheat flour and 20% Soybean flour), AA4 (70% wheat flour, 30% Soybean flour) and AA5 (60% wheat flour, 40% Soybean flour).

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CONCLUSION

This study demonstrated that blends of wheat and soybean flour can be used to make pancakes that are both sensory acceptable and have a desirable proximate composition. The proximate composition of fortified pancakes differed significantly ($p < 0.05$) from the whole wheat flour pancake, which increased their potential for use. The moisture contents of the fortified pancakes improved the storability and keeping quality. The ratings of the control and fortified pancakes did not differ from each other in terms of texture, taste, and overall acceptance when wheat flour was supplemented with 10% and 20% soybean flour. The study concludes that soybean flour could be used to prepare pancakes for up to 20% since they have sensory characteristics that are similar to those of whole wheat pancakes.

REFERENCES

[1]. Torbica A., Hadnadev, M. and Hadnadev, T.D. (2012). Rice and buckwheat flour characterisation and its relation to cookie quality. *Food Research International*, 48: 277–283.

[2]. Dalby L. and Andrew D. (1996). Siren feasts: a history of food and gastronomy in Greece, Routledge p.91.

[3]. Seguchi, M. **(**1990). Effect of heat-treatment of wheat flour on pancake springiness. *Journal of Food Science*, 55: 784- 785.

[4]. Anjum F.M., Khan M.I., Butt M.S., Hussain S., Abrar M. (2006). Functional properties of soy hulls supplemented wheat flour. Nutrition and Food Science; 36:82-89.

[5]. Khetarpaul, N., Goyal, R. (2009. Effect of composite flour fortification to wheat flour on the quality characteristics of unleavened bread. British Food Journal 6: 554-564.

[6]. Okoye, E. C., . Ani, J. C ., Ugwuanyi G. R., and Oyeoku O. C.. (2020). Quality assessment of crackers from the flour blends of wheat, maize – African yam bean seed and cassava cortex. *Journal of Clinical Nutrition and Food Chemistry*. 1:002 JCNFC – 002. 000002.

[7]. LIU, K. (2000). Expanding soybean food utilization. J. Food Technol. 54(7): 46-47.

[8]. Fukushima, D. (1999). Recent progress of soybean protein foods: Chemistry, Technology and Nutrition. *Food Review Int. 7(B): 323-352.*

[9]. Oyenuga, V.A. (1968|). Nigeria's food and feeding stuffs, their chemistry and nutritive value 3rd edition, Reprinted, Ibadan University Press, pp 20-26.

[10]. Ihekoronye, A.I and Ngoddy, P.O (1985). Integrated Food Science and Technology for the Tropics. Macmillian Publishers Ltd, London and Oxford. Pp 283-292

ISSN- 2394-5125 VOL 9, ISSUE 04, 2022

[11]. Pearson, D. (1973). Laboratory Techniques in Food Analysis. Butterworth and Company Publishers Ltd, London, pp 27-72.

[12]. Byrant, L.A; Montecalvo, J.J.R; Morey, K.S. and Lay, B. (1988). Processing, functional and nutritional properties of okro seed products. *Journal of Food Science* 53: 810-816.

[13]. Iwe, M.O. and Onuh, J.O. (1992). Functional properties of soybean and sweet potato flour mixtures. *Lebensin – Wiss. U-Technol*. 25: 569-573

[14]. Akinjayeju, O., Organoleptic Assessment of Foods. In Statistical Quality Control. Concept Publications Limited Lagos. Nigeria. (2002): 151 – 188.

[15]. Shahzadi, N., Butt, M.S., Rehman, S.U. and Sharif, K. (2005). Chemical characteristics of various composite flours. *International Journal of Agriculture and Biology*, 7(1): 105-108.

[16]. Lokuruka, M. N. I. (2010). Soybean nutritional properties: The good and the bad about soy foods consumption-a review. *African Journal of Food Agriculture, Nutrition and Development., 10*(4), 2439.

[17]. Van Hal, M. **(**2000). Quality of sweetpotato flour during processing and storage. *Food Review International*, 16: 1-37.

[18]. Ogbemudia RE., Nnadozie BC. and Anuge B. (2017) Mineral and Proximate Composition of Soya Bean *Asian Journal of Physical and Chemical Sciences* 4(3):1-6

[19]. Cole, J.T., Fahey, G.C., Merchen, R., Patil, A.R., Murray, S.M., Hussein, H.S., and Brent, J.L. (1999). Soybean Hulls as a Dietary Fiber Source for Dogs. *Journal of Animal Science*, 77:917-924.

[20]. Idowu, A. O. (2014). Development, nutrient composition and sensory properties of biscuits produced from composite flour of wheat and African yam bean. *British Journal of Applied Science and Technology*, *4*, 1925–1933. https://doi.org/10.9734/BJAST

[21]. Bolarinwa, I. F, Olaniyan S.A, Adebayo, L.O., & Ademola, A. A, (2015). Malted Sorghum Soy Composite Flour: Preparation, Chemical and Physico-Chemical Properties Food Proc ess T e c h n o l o g y 6:8

[22]. Okoye J. I., Nkwocha A. C. & Ogbonnaya A. E. (2008). Production, proximate composition and consumer acceptability of biscuits from wheat/soybean flour blends. *Continental Journal of Food Science and Technology*, 2, 6–13.

[23]. Alabi, M.O. and Anuonye, J.C. (2000). Nutritional and sensory attributes of soy-supplemented cereal meals. Nigerian Food J., 25(1): 100-110

[24]. Masur SB, Tarachand KC and Kulkarni UN. (2009). Development of high protein biscuits from bengal gram flour. Karnataka J. Agric. Sci. 22: 862-864.

[25]. Eissa HA, Hussein AS and Mostafa BE. (2007) Rheological properties and quality evaluation on Egyptian balady bread and biscuits supplemented with flours of ungerminated and germinated legume seeds or mushroom. Polish Journal of Food and Nutrition Sciences 57: 487-496.

ISSN- 2394-5125 VOL 9, ISSUE 04, 2022

[26]. Naseem K, Bibi N, Raza S, et al. (2013). Development, characterization and evaluation of high energy biscuits for combating malnourishment among children in pakistan. Pakistan Journal of Agricultural Research 26: 230-236.

[27]. Garg R and Dahiya S. (2003) Nutritional Evaluation and Shelf Life Studies of Papads Prepared from Wheat–Legume Composite Flours. Plant Foods for Human Nutrition 58: 299-307.

[28]. Yousseff SAM, Salem ALI and Abdel-Rahman AHY. (2006). Supplementation of bread with soybean and chickpea flours. International Journal of Food Science &Technology 11: 599-605.

[29]. Hefnawy T.M.H., El-Shourbagy G.A., Ramadan M.F. (2012) Impact of adding chickpea (*Cicer arietinum* L.) flour to wheat flour on the rheological properties of toast bread. *International Food Research Journal*, Vol. 19(2), p. 521–525.

[30]. Dhinda F, A JL, Prakash J, et al. (2011) Effect of Ingredients on Rheological, Nutritional and Quality Characteristics of High Protein, High Fibre and Low Carbohydrate Bread. Food and Bioprocess Technology 5: 2998-3006.

[31]. Dodok L, Modhir A, Hozova B, et al. (1993) Importance and utilization of chickpea in cereal technology. Acta Alimentaria 22: 119-129.

[32]. Fernandez ML, Berry JW (1989) Rhedogical properties of flour and sensory characteristics of bread made from germinated chickpea. Internal J Food Sci Technol 24: 103

[33]. Hallab AH, Khatchadourian HA and Jabr I. (1974). Nutritive value and organoleptic properties of white Arabic bread supplemented with soybean and chickpea. Cereal Chem 51: 106-112.