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Utilization of Soybean Flour in the Production of Bread

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Abstract: The proximate and sensory analysis of the soy-supplemented wheat flour bread has been made. This was done to investigate the nutritional value and the general acceptability of the soy-supplemented bread. The proximate analysis indicate that the moisture content, ash and the protein increase with increasing soya bean flour concentration. The increase in protein concentration indicates that supplementation of wheat flour with soyabean flour would greatly improve the protein nutritional quantity of bread. It is observed from the organoleptic analysis that generally, whole wheat bread and soy-supplemented bread with soybean flour below 30% is preferred to bread with soybean flour beyond 30%.

Key words: Soybean flour, proximate analysis, sensory evaluation

INTRODUCTION

Bread is a major flour product which is normally consumed by majority of Ghanaians at breakfast, lunch and sometimes dinner (Tsatsu, 2009). It is an important stable food, the consumption of which is steady and increasing in Nigeria. It is however, relatively expensive, being made from imported wheat that is not cultivated in the tropics for climatic reasons (Edema *et al*., 2005; Olaoye *et al*., 2006). A lot of efforts has been made and still being made to promote the use of composite flours in which flour from locally grown crops and high protein seeds replace a portion of wheat flour for use in bread production, thereby decreasing the demand for imported wheat and producing protein-enriched bread (Giami *et al*., 2004; Olaoye *et al*., 2006).

Soybean (Glycine max) belongs to the family leguminosae and sub-family papillionnideae. It is a remarkable source of protein for both animals and human consumption and is also a leading source of edible oils and fats (Singh *et al*., 1999; Alabi *et al*., 2001). As an important component crop, soybean the legume richest in nutrients and the one from which the most dietary products are made is used in various traditional farming systems of various countries (Pamplona, 2005). It contains valuable phylochemicals and has extraordinary capacity to nourish and prevent diseases. Soya has the advantages of containing virtually no sodium, a mineral that cause fluid retention in the tissues; this makes it very suitable in cases of cardiovascular disease.

Soya is also known to be a good source of the trace elements copper, zinc and manganese and can be said to contain all the nutrients needed in food (Ampofo, 2009). It has been proved that daily consumption of soybean between 30 g and 50 g substitute for an equal amount of animal-base protein produces the following results:

- 9.3% reduction in total cholesterol
- 12.9% reduction in LDL cholesterol (harmful)
- 2.4% increase in HDL cholesterol (beneficial)
- 10.5% reduction in triglycerides (Pamplona, 2005)

Apart from the higher nutritional content of soybeans, it is also very cheap compared to wheat flour. According to a survey done by Ampofo (2009) at different markets in Ghana, a cup of soybeans cost GH¢0.50 whiles a cup of wheat flour cost GH¢0.80. This and the high nutrient content of the soybean have necessitated the need to formulate a soybean composite for the production of bread to make bread cheaper for the ordinary Ghanaian. In Ghana today, soybean is used in the dried and fresh forms and is available as soy protein in concentrated, isolated or texturized form, soy milk and cooked soybeans (Ampofo, 2009). Soybean is the only source that contains all the amino acids. Its use in the production of bread as composite flour has been reported (Kure *et al*., 1998; Dhingra and Jood, 2002; Basman *et al*., 2003; Olaoye *et al*., 2006).

MATERIALS AND METHODS

Soybeans and wheat flour were both purchased from the Kotokuraba market in Cape Coast, Central region of Ghana. They were sent to the laboratory of the Food Research Institute, Council for Scientific and Industrial Research, for processing. The soybeans were processed into flour, using the method of IITA (1990) (Fig. 1). The process ensures effective removal of most anti-nutritional factors.

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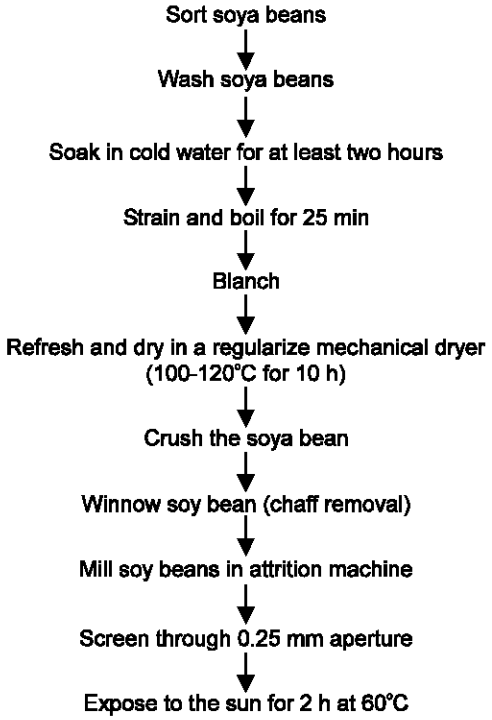

Fig. 1: Flow chart for the production of soy flour

Table 1: Composition of the samples used in this work

Sample	Soya flour (%)	Wheat flour (%)
A	0	100
B	10	90
C	20	80
D	30	70
E	40	60
F	50	50

Six samples were prepared by mixing soybean flour with wheat flour in the proportions indicated in Table 1, using a Kenwood food mixer KN 201, England. The mixing was done to ensure a homogeneous mixture of the samples.

The six sample formulations were baked using the straight dough method (Kinton and Ceserani, 2008) (Fig. 2). All ingredients were mixed in a Kenwood food mixer (Model A 907 D) for approximately 5 min. The dough were left in bowls to prove covered with damp clean muslin cloth for approximately 55 min at room temperature (29°C), the dough was then knocked back and moulded into a loaf, placed in a loaf tin and further proved in a proving cabinet for 90 min at 30°C, 85% relative humidity and baked at 250°C for 30 min (Giami *et al*., 2004). It was removed and placed on a cooling rack and packaged in zip lock polythene with label and stored in a refrigerator under temperature 32°C until needed.

The sensory attributes including crust, colour, taste, texture and general acceptance were evaluated by untrained 40 member panel, using a 5-point Hedonic

Fig. 2: Flow chart for the production of bread

scale according to Watts *et al*. (1989) with a scale ranging of 1 to 5 with 1 representing the least score (dislike extremely) and 5 the highest score (like extremely). Analysis of Variance (ANOVA) was performed on the data gathered to determine differences, while the least significant test according to Ihekoronye and Ngoddy (1985) was used to detect differences among the means.

Proximate analysis of samples was determined according to AOAC (1990, 2000). The samples were analyzed for moisture, ash, protein, fat, carbohydrate (by difference) energy (Atwater Factor).

RESULTS AND DISCUSSION

The results of the proximate analysis are presented in Table 2. The moisture content is found to increase as the soya flour content was increased. Soy flour, derived from ground soybeans, is found to bring moisture to baked goods (Soy foods Association of North America, 2010).

The ash content increased with the increase in proportion of soybean flour in the bread. This result agrees with results of other workers (Olaoye *et al*., 2006). The increase in ash content could be due to the higher ash content of the soya bean than in the wheat flour. The soybean seeds have been reported to contain an appreciable quantity of minerals and fat (Ariahu *et al*., 1999; Onyeka and Dibia, 2002; Plahar *et al*., 2003).

The protein content of the bread was observed to increase with increasing soybean flour concentration. This indicates that supplementation of wheat flour with soybean flour would greatly improve the protein nutritional quantity of bread. The increase in the protein

Table 2: Proximate analysis of the soyabean wheat flour composite bread

		Sample					
Parameter	Method	A	B	C	D	E	F
Moisture (%)	AOAC 925.10 (1990) 15th Edition	21.9	-	36.9	-	-	35.0
Ash (%)	AOAC 923.03 (2000) 17th Edition	1.1	-	1.7	-	-	1.7
Fat (%)	AOAC 920.03 (2000) 17th Edition	1.1	-	1.5	-	-	2.0
Protein (%)	AOAC 984.13 (1990) 15th Edition	7.5	-	13.2	-	-	13.2
Carbohydrate (%)	By difference	59.0	-	37.7	-	-	36.0

content of the bread could be due to the significant quantity of protein in the soybean seeds (Asiedu, 1989; Kure *et al*., 1998; Basman *et al*., 2003). The high protein content in the soybean supplemented breads studied in this work would be of nutritional importance in many developing countries like Ghana where many people are unable to afford foods with high protein because such foods are quite expensive.

The carbohydrate contents decreased with increase in the proportion of the soy flour in the soybean flour supplemented bread. This trend supports the claim of Akpapunam and co-workers (1997).

Table 3 gives the percentage score of the comparative sensory evaluation of the soya bean bread. The crust as applied here is the outside layer of the bread. It should be smooth and golden brown. 100 percent of the panellists prefer the crust of samples B and D while 95 percent prefer sample A. Thus, the panellists seem to slightly prefer the crust of the soya-supplemented bread to the whole wheat bread. However, the crusts of the samples with beyond 30% soya bean flour do not appeal to the panellists. It can be seen from Table 4 that there is insignificant difference between samples A, B and D at 5% level.

The colour of bread talks about the appearance of the bread, how it looks like, if it is appealing to the eyes, inviting and bright. 100 percent of the panellists prefer the colour of the whole wheat bread to that of the soy-supplemented bread. However, the mean of the whole wheat bread and the soy-supplemented bread up to 30% soybean flour is insignificantly different at 5% significant level. Like the crust, the colour of the bread with soyabean flour beyond 30% does not seem to appeal to the panellists.

The taste of the bread refers to the sweet sensation caused in the mouth by contact with the bread due to the sweetening agent. 100 percent of the panellists prefer the taste of samples A and B while 95% and 85% prefer the tastes of sample C and D, respectively. There seems, however, to be no significant difference between the tastes of the whole wheat bread and the soy-supplemented bread up to 30% of soybean flour.

Texture is the quality of the bread that can be decided by touch, the degree to which it is rough or smooth, hard or soft. The panellists prefer sample A and B equally, as confirmed by the organoleptic evaluation. However, the

Table 3: Percentage score on comparative sensory evaluation of soya bean bread

Sample	Crust	Colour	Taste	Texture	Overall acceptance
A	95	100	100	70	80
B	100	95	100	70	100
C	85	85	95	61	53
D	100	90	85	50	50
E	70	62	43	55	35
F	43	38	40	55	12

Table 4: Organoleptic evaluation of soya bean bread

Scale	Crust	Colour	Taste	Texture	Overall acceptance
A	2.2000	2.3250	1.8750	1.7500	2.0000
B	2.3750	2.2500	1.5000	1.7500	2.5000
C	1.1250	1.9250	0.9750	1.5250	1.3250
D	2.3000	2.1625	0.7500	1.2500	0.8750
E	1.2000	1.8500	0.7350	1.3750	0.3000
F	0.6200	1.8500	0.07350	1.3750	0.3000

mean indicates that there is insignificant difference between the colours of the samples at 5% significant level.

The overall acceptance expresses how the consumers or panellists accept the product generally. It is observed that 80% of the panellists accept the whole wheat flour while 100 of the panellists accept the bread with 10% soybean flour. The analysis of variance indicates that there is a significant difference between the samples with soybean flour below 10% and those beyond 10% at 5% significance level.

It is observed from the organoleptic analysis that generally, whole wheat bread and soy-supplemented bread with soybean flour below 30% is preferred to bread with soybean flour beyond 30%. The preference of the panellists for the sensory attributes of the wheat flour bread may be due to the familiarization of consumers to the normal whole wheat flour.

Conclusion: The proximate analysis of the soy-supplemented wheat bread shows that the nutritional content of the bread increased with the soybean content. The organoleptic analysis also indicate that generally, whole bread and soy-supplemented bread with soybean flour below 30% is preferred to bread with soybean flour beyond 30%. The preference of the wheat flour bread may be due to the familiarization of consumers to the

normal whole wheat flour. Public enlightenment on the nutritional importance of the soy-supplemented foods would help enhance the acceptability of the soy-supplemented bread.

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