

Animal Product and Processing Technology

SENSORY CHARACTERISTICS OF BROILER CHICKEN NUGGETS AS INFLUENCED BY DIFFERENT LEGUME EXTENDERS

*R. Yaqoob¹, S.B. Abdu², D. Zahraddeen², S. I. Karkarna, A.A, Muhammad, Y. Ahmad¹, A. E. Talabi¹, F.N. Shehu¹, A. Shittu¹ and E. A. Salihu²

¹National Agricultural Extension and Research Liaison Service

²Department of Animal Science, Faculty of Agriculture, Ahmadu Bello University Zaria

*Email address: ummnusaybah29gmail.com, ryaqoob@abu.edu.ng, Phone no: +2347033587008.

Abstract

The study evaluated the sensory characteristics of broiler chicken nuggets as influenced by 20% inclusion of legume extenders; Soya Bean Flour (SBF), Bambara nut flour (BNF) and Black Eyed Bean Flour (BBF). The study was laid in a Completely Randomized Design. Four chicken nugget formulations were produced; control treatment was the commercial formulation with 0% extender while the remaining 3 treatments had 20% meat replacement of the extenders. Sensory evaluation of the samples were done subjectively using the 7 point hedonic scale (with the score of 1 representing liked extremely while the lowest score 7 represented dislike extremely). The result from this study showed significant differences ($P < 0.05$) in texture, crunchiness and juiciness while colour, aroma, taste, beany flavor and overall acceptability were not significantly ($P > 0.05$) affected by the inclusion of the legume extenders. The chicken nuggets containing SBF, BNF extenders with the control group had the most preferred texture properties. From the findings of this study, control had the best score among all the parameters studied, however it can be concluded that partial replacement of meat (aiming at cost reductions) in chicken nuggets with 20% soya bean, Bambara and black-eyed bean legume flours as extenders has good potential with no much impact on consumers acceptability as all the parameters monitored scored above average on the 7 point hedonic scale.

Keyword: Chicken nuggets, Sensory characteristics, Extenders, Legume flours, value addition.

Description of Problem

Chicken nuggets is a tasty comminuted emulsified meat product commonly prepared from spiced chicken meat and other ingredients (1). Consumers demand for a less expensive quality nugget has led to the development of “value added” nuggets, which replaces chicken meat with binders and extenders to decrease the cost of production (2), while maintaining the nutritional profile of chicken nuggets. Extenders are additives usually from plant origin used in chicken nuggets formulation, they include; hydrocolloids, gums, starches, or textured vegetable proteins (3). They are used to enhance the water binding and textural properties of meat (4). Soy protein is widely used as extenders, however, its use at high concentrations can result to “beany” flavor which is not acceptable in chicken nuggets (5). Due to the negative flavor aspects of using soy proteins in meat products,

researchers have focused on developing new, non-soy protein, that can function similarly to soy in a food system. The ideal replacement would not impart any off flavors and can be used at a higher concentration in chicken formulation than soy in order to lower the production costs associated with using higher concentrations of meat (2). Thus, along with soyabean, it is important to screen other extenders like Bambara nut and Black-eyed bean as extenders in chicken nuggets formulation. This study therefore postulates that, apart from soya bean flour, other legume based flour extenders could enhance quality of chicken nuggets. In order to ascertain this postulation, Bambara nut and Black-eyed bean flour were used as extenders in the development of high quality chicken nuggets.

Materials and Methods

Location of the experiment

The experiment was conducted at the Animal Product Laboratory of the Department of Animal Science, Ahmadu Bello University, Samaru, Zaria. Samaru is Located in the Northern Guinea Savanna zone on the longitude 7° 38' E and 11° 10' at an altitude 671m above the sea level with an annual rainfall of 1100mm and ambient temperature ranging from 26-32°C (6).

Design of experiment and Preparation of the chicken nuggets

Table 1: Chicken nuggets formulation/ 1000g

Ingredients	Extenders at 20% inclusion			
	0	SBF	BNF	BBF
Whole deboned chicken meat	960.0	730.0	730.0	730.0
Water	30.0	60.0	60.0	60.0
SBF	-	200.0	-	-
BNF	-	-	200	-
BBF	-	-	-	200
Refined salt	10.0	10.0	10.0	10.0

SBF= Soya beans flour, BNF= Bambara nut Flour, BBF= black-eyed bean Flour

The chicken breast meat was minced, emulsified with spices and seasoning. The emulsion of chicken nuggets (with or without extenders) was spread in a thin layer (20 mm thickness), frozen (2h) and was cut into a rectangle of 3 x 6cm² dimension. The chicken nuggets were breaded using the following three steps: first they were coated with thin layer of wheat flour. Secondly, immersed in mixture of whole liquid eggs, and lastly, was coated with thin layer of fine ground bread crumbs. The breaded chicken nuggets were kept at 4°C for at least 45 minutes before frying. The breaded chicken nuggets were fried for approximately 4-5 minutes, until an internal temperature of 80°C is reached.

Sensory analysis

The sensory evaluation was carried out subjectively using the 7 point hedonic scale with the score of 1 representing liked extremely while the lowest score 7 represented dislike extremely. warmed nugget samples were served in a random coded manner to semi-trained panel of assessors consisting of male and female. The meat samples were judged for their colour, aroma, taste, texture, crunchiness, juiciness and overall

Deboned broiler chicken breast obtained from birds slaughtered at 8 weeks of age were used for this formulation. The design of this study is in a Completely Randomized design. Different formulations of the chicken nuggets representing the treatments were prepared as follows: T1: Control - containing 0% extender; T2: SBF- Soya Bean Four 20% inclusion; T3: BNF-Bambara Nut Four 20% inclusion; T4: BBF- Black-eye Bean Four 20% inclusion as shown in Table 1.

acceptability. Water and cracker biscuits were served along with the samples for pallet cleansing.

Data analysis

Data collected were subjected to analysis of variance (ANOVA) using the general linear model of SAS software (7). Significant differences among treatment means were separated using the Duncan Multiple Range Test.

Result and discussion

Table 2 shows the sensory characteristics of chicken nuggets as influenced by inclusion of different extenders. Sensory characteristics of meat products depends greatly on aroma, flavour, colour, appearance, tenderness and juiciness. However, Studies on consumers have proven that flavour and texture are more important among the meat quality attributes (8). The result showed significant difference (P<0.05) in texture, crunchiness and juiciness while colour, aroma, taste, beany flavor and overall acceptability were not significant (P>0.05). Across the treatments,

the control group, those with SBF and BNF had the best score for while the least was chicken nuggets with BBF. Crunchiness was ranked best in the control group, BNF and BBF had similar ranking for crunchiness while the least ranking was recorded for SBF. Juiciness ranked higher in the control group, followed by SBN and the least similar ranking recorded for BNF and BBF. The observed variations in rankings could be attributed to the difference in the physicochemical properties of the extenders used in this study.

In reference to the 7-point hedonic scale used for this study, one can conclude that 20% addition of the different legume extenders to the chicken nugget formulation did not impact negatively on the sensory properties of the nuggets especially on the beany flavour as all the parameters

monitored scored above average on the hedonic scale which indicated general acceptability of the chicken nuggets irrespective of the extenders used in this study. By the consumers.

Similar results were reported by Polizer *et al.* (9). From their study, the partial replacement of meat and fat with 2% pea fibre did not impact negatively on consumers' acceptance of the chicken nugget. These authors found no significant differences ($p>0.05$) in sensory acceptance amongst the treatments when considering the attributes of appearance, colour, flavour, and overall acceptability. Verma *et al.* (10) on the other hand found lower values for flavour, texture and overall acceptability when apple pulp (at levels of 8 to 12%) was used to partially replace the meat fraction (8.46 to 12.45%) in chicken nuggets.

Table 2: Sensory evaluation of chicken nuggets as influenced by different legume extenders at 20%

Parameters	Control	CN+SBF	CN+BNF	CN+BBF	SEM
Colour	2.36	2.07	2.07	2.07	0.30
Aroma	2.40	2.60	2.67	2.60	0.33
Texture	2.53 ^{ab}	2.27 ^a	2.67 ^{ab}	3.00 ^b	0.34
Taste	2.33	2.47	2.47	2.87	0.34
Crunchiness	2.20 ^a	2.93 ^b	2.47 ^{ab}	2.60 ^{ab}	0.25
Juiciness	2.40 ^a	3.07 ^{ab}	3.20 ^b	3.20 ^b	0.38
Beany Flavour	3.15	3.08	3.08	3.15	0.37
Overall Acceptability	2.27	2.29	2.43	2.21	0.35

CN+SBF= chicken nuggets with soya bean flour, CN+BNF= chicken nuggets with bambara nut flour, CN+BBF= chicken nuggets with Black eyed bean flour, SEM= standard error of mean

Conclusion and Application

From the findings of this study, one can conclude that it is possible to partially replace meat (aiming at cost reductions) in chicken nuggets with soya bean, Bambara and black-eyed bean legume flours as extenders at 20% with no much impact on consumers' acceptability.

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