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EFFECT OF VARYING LEVELS OF IRISH POTATO (*Solanumtuberrosum*) ON SENSORY ATTRIBUTES OF CHICKEN NUGGETS

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ABSTRACT

This experiment was conducted to evaluate the effect of varying levels of Irish potato (*Solanumtuberrosum*) powder (Fillant) on composition and sensory attributes of chicken nuggets. Chicken nuggets were prepared from chicken with 0, 15 and 30% inclusion levels of irishpotato powder (IPP) in a Completely Randomized Design. The minced chicken meat was mixed with different levels of IPP, mixed spices before dipped into a bowl of beaten liquid egg, and coated with bread crumbs. It was then fried for about 5-10 minutes to golden brown color. Twenty six panelists evaluated the sensory quality attributes using five (5) point hedonic scale. Data collected from the experiment were analyzed for (ANOVA). The panelist rated the nugget for the overall acceptability of the chicken nugget with 15% PP higher (2.23), followed by the control (2.0) and least was the nugget with 30% PP (1.92). The study recommends inclusion of up to 15% PP in chicken nuggets as filler.

Key words: Chicken nugget, irish potato powder, bread crumbs, sensory evaluation.

INTRODUCTION

Livestock is commonly defined as domesticated animals raised in an agricultural setting to produce labor and commodities such as meat, eggs, milk, fur, leather and wool.Meat is the flesh of animal that is eaten as food (Lawrie*et al.,* 2006). The advent of civilization allowed the domestication of animals such as chicken, sheep, rabbits, goat, and cattle. This eventually led to their use in meat production on an industrial scale with the aid of slaughterhouses (Lawrie*et al.*, 2006). It is edible raw, but is normally eaten after it has been cooked and seasoned or processed in a variety of ways. Unprocessed meat will spoil or rot within a short period of time as a result of infection with and decomposition by bacteria and fungi. A chicken nugget is a meat product made from chicken meat that is breaded or battered, then deep-fried or baked. It was invented in the 1950s; it has become a popular fast food restaurant item, as well as commonly sold as a frozen product for home use (The National Chicken Council, 2016). It is made usually from chicken breast, especially in Korea where it is served at large-scale catering (The National Chicken Council, 2016). The surface appearance and texture of a nugget are the most significant factors for consumer acceptability. Most nuggets cook rapidly and develop a golden color, crisp texture, and good flavor at frying.

MATERIALS AND METHODS

Location of the Study

This study was conducted at the Department of Food Technology and Home Economics, National Agricultural Extension and Research Liaison Services, Ahmadu Bello University, Zaria, located between latitude 11^0 and 12^0 on an altitude of 640m above sea level, rainfall of 1100mm with temperature from

26^0c to 35^0c and relative humidity during the Harmattan period and wet season are 21% and 72% respectively (IAR, 2020).

Sample Preparation

Four whole dressed broiler chickens were sourced, washed and cut to separate the meat from the bones. The meat was then minced by the use of meat grinder. Ground Potato flakes were put into a bowl and mixed together with the minced chicken meat and spices were then added and thoroughly mixed to obtain a homogeneous mix. It was mauled into bite size shape of 2.5 cm X 2.0 cm. The spiced minced chicken meat was then dipped into a bowl of beaten liquid egg, and coated with bread crumbs. It was then fried for about 5-10 minutes to golden brown color.

The design of the experiment is a Completely Randomized Design (CRD). The treatments were inclusion levels of potatoes in a chicken meat nuggets, the levels of potatoes in the nuggets were nuggets prepared with 0 inclusion level of potato, nuggets prepared with 15 inclusion level of potato, nuggets prepared with 30 inclusion level of potato.

Sensory evaluation

The session was carried out to compare the samples of chicken nuggets. The panelist consists of men and women of about 20-40 years. They were made to sit on a back to back position or far apart there by not facing each other to avoid interaction. The score sheets were provided to them to test and describe or rate their perceived acceptability or preference of the samples.

Sensory score sheet and sample testing

A questionnaire was designed to evaluate the sensory characteristics of the various chicken nugget in terms of colour, juiciness, taste, texture and overall general acceptability using a five-point hedonic scale (5- Like very much, 4- Like moderately, 3- Neither like nor dislike, 2- Dislike moderately, 1- Dislike very much,). A panel of 26 judges, consisting of randomly selected students from various departments, members of the non-academic staff, lecturers and casual workers from outside the University Community, were used for the assessment. The meat samples were coded and served anonymously to the panelists. The panelists were given water which is odourless and tasteless to cleanse the palate between samples.

Laboratory Analysis

Samples of chicken meat nuggets samples were analysed for moisture content (MC), crude fibre (CF), crude protein (CP), ether extract (EE) and ash using the procedures outlined by AOAC (2005).

Statistical Analysis

Data collected on proximate composition, sensory quality, microbiological properties were analyzed for variance (ANOVA) using (SAS, 2009) version 9.4. Means with significant differences would be separated using Tukey HSD at 5% level of probability.

The models for the experiments would be; $\mathbf{Y_{ij}= \mu + P_i + e_{ij}}$

where, μ = overall mean, Y_{iji}effect of i^{th} test ingredients (Potato powder), P_I = effect of i^{th}ingridient (days 0, 7, 14, 21, 28), e_{ij}= Random error.

Table 1 Gross composition of Mixed Spices

Spices	Inclusion level (g)	Percentage
Ginger powder	5	22.72
Seasoning cube	2	9.09
Black pepper	5	22.72
Garlic powder	5	22.73
Salt	5	22.72
Total	22	100.0

RESULTS AND DISCUSSION

Proximate composition (%) of raw meat samples and the processed chicken nugget

The result of the proximate composition of the raw meat samples and processed chicken nugget is presented in Table 2. The control nugget had lower carbohydrate content while the PP15 had higher and the PP30 had highest, from 2.1%, 6.3% to 9.1%. The control had highest CP of 37% and the lowest CP (17.8%) was recorded in nugget with 30% potato inclusion level. Also the result of the lipid (Ether extract) followed similar pattern. The control had 1.0%, fibre followed by 15 and 30% potato inclusion levels with 3.2 and 5.3% respectively. The reduction in the CP value of the nuggets with inclusion of the potato powder may be attributed to the dilution effect of the potato powder that was added to the nugget and also the bread crumb used in the coating of the nuggets. The potato powder is not a protein rich material, hence the reduction in the CP level. This is in agreement with Sen*et al.* (2012) who also observed similar finding in chicken nuggets containing grape fiber. According to Black *et al.* (2006), grape seed oil is used as an ingredient for oil infusion of garlic, rosemary and other herbs and spices. Also the increase in fiber fraction in the nugget may be attributed to the other materials that are included in the nugget.

Table 2 Proximate Composition of Chicken Nuggets Fortified with Different Potatoes Powder Inclusion Levels

Parameters (%)	Potatoes powder inclusion levels			
	PP0	PP15	PP30	SEM
Ash	1.3	1.9	2.8	1.60
Carbohydrate	2.1^{c}	6.3^{b}	9.1^{a}	2.17
Lipid	43.4^{a}	37.7^{b}	36.3^{b}	1.95
Protein	37.4^{a}	23.80^{b}	17.8^{c}	2.11
Moisture	13.3^{a}	14.0^{b}	14.92^{a}	0.127
Fiber	1.0^{a}	3.2^{b}	5.3^{a}	0.22

^{abc}Means across rows with different superscript are significantly ($p<0.05$) different, SEM= standard error of means, *= Significantly different

Effect of potato powder inclusion levels on sensory attributes of broiler chicken nugget

The panelists rated the nugget with 15% potato powder high (2.0), followed by the control with (1.77) and the least was recorded in the 30% potato powder (1.38) as shown in Table 3. The panelists rated the nugget with 0% potato powder high for taste, which was followed by 15 and 30% potato powder inclusion levels, which were rated similar and lower (2.15). The overall acceptability of the chicken meat nugget with 15% potato powder was rated higher (2.23), followed by control nugget (2.0) and least was the nugget with 30% potato powder (1.92). The results obtained in this study agree with those reported by Choe*et al*. (2013), who noted significantly higher scores in frankfurter sausage on the addition of pork

skin and wheat fiber mixture. Also the lower score for the 30% potato powder on the aroma (flavor) due to the reduction in the level of fat with the inclusion of the potato powder in the nugget.

Table 4. Sensory Evaluation of Chicken Nuggets Fortified with Different Potatoes Powder Inclusion Levels

Parameters(%)	Potatoes powder inclusion levels			SEM
	PP0	PP15	PP30	
Colour	1.77[b]	2.00[a]	1.38[c]	0.13*
Juiciness	2.23[a]	2.15[b]	1.92[c]	0.13*
Taste	2.30[a]	2.15[b]	2.15[b]	0.05*
Aroma	2.15[a]	2.00[b]	1.85[c]	0.10*
Flavor	2.15	2.15	2.15	0.43
Tenderness	2.07	1.62	1.77	0.14*
Texture	1.92	1.85	2.00	0.12*
Acceptability	2.00	2.23	1.92	0.09*

[abc]Means across rows with different superscript are significantly ($p<0.05$) different, SEM= standard error of means, *= Significantly different

Conclusion and Recommendation

Potato powder can be used in preparation of chicken nuggets. Increasing the concentrations of potato powder in the nugget at 30% inclusion level lowered (diluted) the protein content of the nugget. It is recommended that, up to 15% filler could be used and other fillers should be evaluated.

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