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PROXIMATE EVALUATION OF SPENT LAYER CHICKEN NUGGETS INCORPORATED WITH POWDER AND EXTRACT OF WATERLEAF (*TALINUM TRIANGULARE*)

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Abstract

This study aimed at enhancing the proximate composition of spent layers chicken nugget (SLCN) using water leaf (*Talinum triangulare*). Twenty spent layer chickens were used in this experiment. The birds were humanely slaughtered, the thigh, drum stick and breast were deboned, minced and processed into chicken nugget incorporated with water leaf powder (WLP), ethanol extract of water leaf (WLE) and butylated hydroxyl toluene (BHT) in 4x4 factorial arrangements in a Complete Randomized Design. Processed SLCN were stored at 4ºC±1 in a refrigerator for 21days.The crude protein, crude fibre and ether extract values were significantly ($p<0.05$) higher in SLCN incorporated with water leaf powder and ethanol extract and they increased with storage days, with water leaf powder (WLP) having the highest significant ($p<0.05$) value for crude protein in the interaction between storage periods and the test ingredients. This implies that incorporation of WLP in chicken nuggets at 2% significantly improved its nutritive values up to 21 days. Waterleaf powder should be incorporated into SLCN at 2% for improved quality over the synthetic BHT as a means of nutritional value addition to spent layer chicken nugget and to help farmers reduce losses usually incurred from the problems of disposal of spent layer off festive periods and improve profits.

Keywords: *Talinum triangulare,* Chicken nugget, Butylated hydroxyl toluene, proximate composition

INTRODUCTION

In view of the growing rate of population in developing countries which includes Nigeria, there is need for increase in animal performance and protein intake. The drive for attainment of self-sufficiency in meat and animal products in Nigeria calls for total exploitation of the potential sources of animal protein to ensure a satisfactory level of human protein nutrition (Nworgu, 2016).

About 2.6 billion spent hens were used in the pet food industry globally and they were not much for human consumption (Navid *et al.,* 2011). There is the need to process and incorporate spent layer hens in meat to meet animal protein demand by consumers and also, to ameliorate the challenge of disposing layers culled before or after festive period at a minimum price that livestock farmers are facing.

Chicken nuggets are forms of meat product, an excellent source of protein, especially for growing kids, and are part of a healthy, balanced diet (National Chicken Council, 2019).

High consumer preference for natural foods has triggered the food industry to include natural antioxidants in various products in order to delay oxidative degradation of lipids, improve quality as well as nutritional value of foods and replace the use of synthetic antioxidants. As a vegetable,

water leaf has been said to contain high crude protein, omega -3-fatty acids, minerals (such as calcium, potassium and magnesium), soluble fibres (such as pectin) and vitamins (such as C, α and β tocopherols and β-carotene) that are needed for growth and development and essential oils which make it effective antioxidant (Swarna and Ravindhran, 2013).

MATERIALS AND METHODS

Preparation of waterleaf *(T. triangulare*) powder

Fresh leaves were purchased from Samaru Market, Zaria and were washed with distilled water to remove dirt. The leaves were air dried under shade until a constant weight was attained and then ground to a fine powder using a Q-Qlink grinder Bauhaus Design GmbH.Bockstr.168.

Extraction of waterleaf (*T. triangulare)*

Total of 200 g coarsely ground dried water leaves were mixed into 1600 ml of 95% (v/v) ethanol for 12 h in enclosed flasks with constant shaking (100 rpm) using a shaker. After filtration with a Whatman filter paper No.2, the residue was re-extracted with 800 ml of 95% ethanol for additional 12 h and then filtered. The filtrates were combined and concentrated on a rotary evaporator under reduced pressure at 50^{o}C with a vacuum pump. All the extracts were stored at 4 °C in glass vials before use (Zhang *et al.*, 2009).

Experimental design

The design of the experiment was 4x4 factorial arrangement in CRD which were used to check the effect of 4 treatments (powdered and ethanol extracts of waterleaf, positive (BHA) and negative (no addition) controls) and 4 storage periods on spent layers chicken nuggets, the samples were in triplicate.

Preparation of chicken nuggets

The nuggets were prepared using the procedure outlined by Olusola (2018). The frozen deboned chicken meats were reformed from the freezer and were cut into small cubes and then minced in a meat mincer (Tallers Ramon Model P-22, Barcelona, Spain). The minced meats were put in a bowl mixer, other ingredients were added along with ice flakes during chopping until uniform mixing of all ingredients was achieved. Meat nuggets composition consists of spent layer chicken (66.5%), vegetable oil (6.5%), ice flakes (2.0%), refined wheat flour (18%), whole egg liquid (6%) and table salt (1%).

The addition of the water leaf powder and extracts and BHT were done by substituting for wheat flour such that 100 % composition was achieved. The prepared emulsion was cut into nugget sizes and packed in oil coated metallic mold and then baked in electric oven at 160^{o}C for 15 minutes. The cooked products were cooled, then removed carefully from the baking pan. The nuggets were packed in zip lock film bags and stored at 4±1 °C and analyses were carried out at days 0, 7, 14 and 21 post baking.

Proximate analysis

Samples of water leaf and the SLCN were subjected to proximate analyses to determine dry matter (DM), crude protein (CP), ether extract (EE), crude fibre (CF) and ash, using the AOAC. (2005) method. Nitrogen free extract (NFE) was determined by calculation. NFE = 100 - (CP, CF, EE, ash). All samples were done in triplicate.

Data analysis All data generated were subjected to analysis of variance using SAS (1999). Duncan Multiple Range Test (DMRT) was employed to show the level of significance between treatment means.

RESULTS AND DISCUSSION

Table 1 shows the proximate composition of nuggets produced from spent layer incorporated with water leaf powder or extracts. Significant ($p<0.05$) differences were observed across the treatments for CP, CF, ash and NFE. The CP was significantly higher ($p<0.05$) in nuggets incorporated with WLE over those with BHT and control but not significantly different ($p>0.05$) from the nuggets incorporated with WLP. The CF was significantly ($p<0.05$) low in the nuggets with BHT, followed by the control, WLE and WLP. The ash content of nuggets with BHT was significantly ($p<0.05$) higher than other treatments. The higher proximate composition recorded in this study is as a result of the high dietary value contributed by *T. triangulare* into the nuggets, hence, higher nutritional value. This was in support of the findings of Aja *et al* (2010) who reported higher levels of nutrients in dried water leaf which suggests that the nutrients are not volatile compounds. Similarly, increased CP was also reported for quail meat nuggets incorporated with *Ocimum gratissimum* extracts by Olusola (2018).

The main effect of storage days on proximate composition of SLCN incorporated with waterleaf is presented in Table 3. The results showed significant ($p<0.05$) differences in the proximate composition of the SLCN with regards to storage days. The CP was significantly higher ($p<0.05$) for nuggets at days 21 and 14 respectively and least for nuggets at days 0, which implies that CP of SLCN increases with storage days. The observed increase may be due to increased microbial activities on the nuggets as storage days increases. The EE was significantly higher ($p<0.05$) at day 0 and reduced significantly ($p<0.05$) as the storage days progressed. The CF decline ($p<0.05$) as the storage days progressed. The NFE was significantly higher ($p<0.05$) at day 21 and least at day 0. Ash content of the nuggets was significantly ($p<0.05$) high at day 7 above the other storage days. MC was ($p<0.05$) high at day 0 and 7 and least at day 21. The MC ranged between 21.39% - 35.94%, which falls within the range of commercial chicken nuggets reported by Ismed *et al* (2009).

Table 1: Proximate composition of waterleaf (Talinum triangulare) powder and extract

Parameters (%)	WLP	WLE
Crude protein	13.89	6.40
Moisture content	3.87	2.36
Crude fibre	7.94	0.02
Ether extract	1.88	1.28
Ash	8.12	0.00
NFE	68.17	92.3

WLP=Water leaf powder, WLE= Extracts of water leaf

Table 2: Main effect of treatments on proximate composition of chicken nuggets with waterleaf

Nutrients	Control	WLP	WLE	BHT	SEM
Crude protein	20.20^{b}	22.06^{ab}	25.52^{a}	21.78^{b}	1.78
Crude fibre	0.91^{b}	1.36^{d}	1.17^{c}	0.31^{a}	0.13
Ether extract	3.69	3.59	3.92	3.58	0.23
ASH	2.51^{b}	2.98^{b}	2.53^{b}	4.69^{a}	0.39
NFE	40.49^{a}	38.48^{ab}	35.98^{ab}	34.76^{ab}	2.05

Moisture	32.20	31.53	30.74	34.88	2.22

[abc] Means with different super scripts along same row differed significantly at 0.05%, SEM= Standard Error of Mean WLP = Waterleaf Powder, WLE= Waterleaf Extracts, BHT = Butylated Hydroxyl toluene

Table 3: Main effect of storage days on proximate composition of chicken nuggets

	Storage periods/days				
Nutrients (%)	**0**	**7**	**14**	**21**	**SEM**
Crude protein	16.23^{b}	16.32^{b}	17.23^{ab}	18.78^{a}	0.99
Crude fibre	0.99^{b}	0.66^{a}	0.64^{a}	0.57^{a}	0.15
Ether extract	4.67^{a}	3.91^{b}	3.38^{c}	2.87^{d}	0.11
ASH	2.48^{b}	4.39^{a}	2.72^{b}	3.12^{b}	0.41
NFE	16.92^{d}	39.33^{c}	49.40^{b}	53.27^{a}	1.15
Moisture	35.94^{a}	35.39^{a}	26.63^{b}	21.39^{c}	2.04

[abcd] Means with different super scripts along same row differed significantly at 0.05%, SEM = Standard Error of Mean

Table 4 shows the effect of interaction of storage days and inclusion of WLP and WLE. The result showed significant ($p<0.05$) differences in MC, CP, CF, EE, ash and NFE contents. MC of nuggets were significantly ($p<0.05$) higher in the control and BHT treated groups. This study showed good proximate composition values which indicate that the SLCN treated with waterleaf is more nutritive than BHT treated and untreated SLCN. Aminzare *et al* (2019) stated meat and meat products to be an excellent source of essential nutrients with high-quality proteins, fat and mineral

CONCLUSION AND RECOMMENDATION

This study showed that waterleaf (*Talinum triangulare*) contain considerable amount of nutrients. SLCN incorporated with waterleaf powder or extracts at 2% had higher proximate composition values over the SLCN treated with BHT and the control group. Hence, waterleaf at 2% either in powder or extract form can be used to improve the nutritive value of spent layer chcken nuggets and some other meat products.

Table 4: Interactive effect of waterleaf powder (WLP) and water leaf extracts (WLE) and storage periods on proximate analysis of spent layer chicken nuggets

	Storage	Proximate compositions					
Treatments	**days**	**MC**	**CP**	**CF**	**EE**	**NFE**	**ASH**
Control	0	34.11^{b}	18.15^{g}	0.86^{c}	4.37^{b}	39.65^{c}	2.86^{g}
	7	40.95^{ab}	18.77^{f}	$0.92b^{c}$	4.32^{b}	32.11^{d}	2.93^{g}
	14	29.64^{b}	19.45^{ef}	$0.95b^{c}$	3.58^{c}	44.38^{bc}	2.08^{k}
	21	24.08^{bc}	18.41	$0.91b^{c}$	2.49^{d}	50.91^{b}	2.17^{j}
WLP	0	38.45^{ab}	19.96^{e}	1.00^{b}	4.95^{a}	34.31^{d}	1.33^{l}
	7	38.87^{ab}	20.84^{d}	0.82^{c}	4.05^{b}	31.48^{d}	3.94^{c}
	14	27.77^{b}	22.73^{b}	0.83^{c}	3.11^{d}	42.57^{c}	2.99^{g}
	21	21.03^{c}	24.72^{a}	0.81^{c}	2.45^{d}	47.33^{c}	3.66^{d}
WLE	0	26.67^{b}	19.93^{e}	1.00^{b}	5.00^{a}	46.61^{b}	0.79^{m}
	7	32.52^{b}	19.45^{ef}	0.82^{c}	4.12^{b}	40.34^{c}	2.75^{h}
	14	13.24^{d}	20.01^{e}	0.44^{d}	3.35^{c}	59.78^{a}	3.18^{f}
	21	10.54^{d}	21.68^{c}	0.43^{d}	3.21^{c}	60.73^{a}	3.41^{e}

BHT	0	44.54^{a}	16.88^{h}	1.09^{a}	4.35^{b}	28.2^{d}	4.94^{b}
	7	29.22^{b}	18.22^{f}	0.09^{e}	3.17^{c}	41.35^{c}	7.95^{a}
	14	35.88^{b}	18.73^{f}	0.06^{e}	3.48^{c}	39.21^{c}	2.64^{i}
	21	29.89^{b}	18.30^{g}	0.00^{f}	3.33^{c}	45.2^{b}	3.24^{f}
SEM		0.01	0.35	0.03	0.10	5.31	0.08

$^{a-g}$ Means with different super scripts along same columns differed significantly (P<0.05),

SEM = Standard Error of Mean, CP = Crude Protein, DM = Dry Matter, EE = Ether Extract, MC = Moisture Content, NFE = Nitrogen Free Extract, WLP = Waterleaf Powder, WLE= waterleaf extract, BHT = Butylated Hydroxyl Toluene.

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