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PREPARATION OF EGG-MEAT LOAVES AND ASSESSMENT FOR SAFETY AND QUALITY AS A FUNCTIONAL FOOD

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INTRODUCTION

Meat as a core component of diets owing to its high quality protein, vitamins and minerals Eggs on the other hand are universally acknowledged for their excellent source of high quality protein vitamins especially A, D, E and K as well as minerals, lutein and Zeaxanthin [1, 2]. The differential characteristics between meat and eggs lie primarily on their nutritional components, both are excellent sources of protein, the type of fat they contain differs, as meat contains saturated fats, whereas eggs have unsaturated fats and provide choline which is essential for brain health, that is less prevalent in meat [3]. The differences in meat and eggs composition create a compelling need for incorporating meat and eggs into a whole diet leveraging on their complementary nutritional benefits to consumer [4]. Previous studies examined meat and eggs based products separately, but research that focuses on their combination as synergy in the form of an egg-meat loaf is limited in literature. Thus, this study was conducted to fill the existing gap and to provide necessary information on the preparation and assessment of egg-meat loaf for safety and quality as a functional food.

MATERIALS AND METHODS

Beef from thigh cut of a healthy White Fulani spent cow weighing 1.75kg and eggs of Nicholas Brown birds weighing 1.35kg were procured and used for this study. The eggs were mixed with minced meat and chilled for 24hrs at 4^{o}C before further processing [5].

Table 1: Ingredient composition of Egg-meat loaves

	Treatment			
Ingredients (g)	T1	T2	T3	T4
Beef	400.0	425.0	450.0	475.0
Egg	375.0	350.0	325.0	300.0
Bread crumbs	200.0	200.0	200.0	200.0
Salt	15.0	15.0	15.0	15.0
Pepper	10.0	10.0	10.0	10.0
Total	1000.0	1000.0	1000.0	1000.0

The egg-meat batter was partitioned into four groups; T1 = 400g beef + 375g egg; T2 = 425g beef + 350g egg; T3 = 450g beef + 325g egg; T4 = 475g beef + 300g egg. Other ingredients in the batter included bread crumbs and pepper, therefore, the reason for crude fibre analysis. The egg-meat loaves totaling 160 (4x40) were fed into previously cleansed, sterilized and oven dried 40 baking pans, greased with vegetable oil [6] and baked in a pre-heated oven (Scanfrost CK9476 NE Electric, Nigeria) for 30 min at 180^{o}C turned at 10 min intervals for 71^{o}C doneness, removed from the oven and cooled to room temperature (27^{o}C) in a food desicator/dehydrator. (Cuisant DHR-20, UK) overnight before analysing the egg-meat loves [4]. WHC was measured with filter paper press method. Thermal shortening was measured by raw length of loaf minus Cooked length of loaf divided by raw loaf multiplied by 100. Data were collected on physico-chemical and microbial parameters of the egg-meat and were subjected to analysis of variance (ANOVA) and the means were separated at $p < 0.05$ using [7].

RESULTS AND DISCUSSIONS

Significant ($p<0.05$) variations were observed in the physical characteristics of egg-meat loaves values across the groups with T3 having the lowest cooking loss (11.25%) and highest cooking yield (88.75%), lowest thermal shortening (8.50%) and highest water holding capacity (WHC) (62.10%) compared with other groups, suggesting that the ratio of beef-to-egg with higher protein structure perhaps with nutrients synergy enhanced the quality of the product [4]. The moisture content (32.10%) was lower ($p<0.05$), crude protein (29.05%) was higher, ether extract (fat) (5.13%) and TBARS (0.008mg MA/100g) were lower, while ash (0.28%) and crude fibre (3.45%) were higher in T3. This implies that the proportionate ratio of beef-to-egg, coupled with ingredients and nutrients synergy highly enhanced chemical attributes of egg-meat in T3 than other groups in this study as reported by [3]. T3 was considered better of the 4 treatments because the loaves were preserved for one week (7 days) under an epileptic supply of electricity in Nigeria, hence, the significance observed.

Table 2 - Physico-chemical characteristics of egg-meat loaves

	Treatments					
Variable (%)	T1	T2	T3	T4	SEM	P-Value
Cooking loss	12.55^{b}	13.80^{a}	11.25^{c}	12.65^{b}	0.15	0.002
Cooking yield	87.45^{b}	86.20^{c}	88.75^{a}	87.35^{b}	0.14	0.000
Thermal shortening	9.65^{a}	9.85^{a}	8.50^{b}	9.70^{a}	0.04	0.014
Water holding capacity	60.25^{b}	58.70^{c}	62.10^{a}	59.90^{b}	0.01	0.000
Moisture	35.80^{a}	34.62^{b}	32.10^{d}	33.50^{c}	0.32	0.000
Crude Protein	28.00^{b}	26.50^{c}	29.05^{a}	26.20^{c}	1.96	0.005
Ether Extract	10.03^{a}	8.65^{b}	5.13^{d}	6.80^{c}	3.18	0.012
Ash	0.19^{c}	0.23^{b}	0.28^{a}	0.15^{d}	0.02	0.001
NFE	25.48^{c}	30.00^{b}	33.44^{a}	33.35^{a}	5.13	0.000
Crude fibre	1.02^{c}	2.30^{b}	3.45^{a}	2.23^{b}	0.49	0.024
TBARS(mg MA/100g)	0.011^{a}	0.010^{b}	0.008^{d}	0.009^{c}	0.00	0.067
pH	5.95	5.94	5.52	5.76	0.05	0.001

*abcd: means on the same row with different superscripts are statistically significant ($p<0.05$).

SEM = Standard error of the means.

T1 = 400g beef + 375g egg; T2 = 425g beef + 350g egg; T3 = 450g beef + 325g egg; T4 = 475g beef + 300g egg.

NFE = Nitrogen free extract.

TBARS = 2-thiobarbituric acid reactive substances.

The results on microbial loads of egg-meat loaves indicated that T3 exhibited the lowest ($p<0.05$) bacterial ($5.0x10^3$ cfus/g) and fungal ($7.4x10^2$ cfus/g) counts which suggests a tolerable microbial stability of the samples of the product in T3, than other groups [8]. This might be due to lower moisture and normal pH of the egg-meat loaves in this group which are crucial factors that impact quality and safety on meat product [4].

Table 3 - Microbial loads of egg-meat loaves

	Treatments			
Variable	T1	T2	T3	T4
TVC (cfus/g)	$8.3x10^{3a}$	$6.9x10^{3b}$	$5.0\ x10^{3c}$	$6.2\ x10^{3b}$
TFC (cfus/g)	$9.8x10^{2a}$	$7.7x10^{2b}$	$7.4x10^{2b}$	$9.1x10^{2a}$

abc: means on the same row with different superscripts are statistically significant ($p<0.05$).

T1 = 400g beef + 375g egg; T2 = 425g beef + 350g egg; T3 = 450g beef + 325g egg; T4 = 475g beef + 300g egg.

VC = Total viable count; TFC = Total fungal count.

CONCLUSION

It can be concluded from the results obtained in this study that egg-meat loaves can be prepared using the proportion of beef (450g) to egg (325g) in group 3 for enhanced quality and safety of the product better physicochemical and microbial characteristics and it is, recommended for egg-neat loaves processors for wholesome product.

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