

CHEMICAL AND SENSORY EVALUATION OF AVIAN BASED GRINDED MEAT

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ABSTRACT

This study was conducted to evaluate the sensory and chemical properties of grinded meat, locally called *Dambun Nama*, prepared from chickens, ducks, guinea fowls and quails. Fifteen (15) semi-trained panelists were used to determine the sensory properties of the Avian Based *Dambun Nama* (ABDN) using a 7 – point hedonic scale. The ash content, moisture, crude protein, ether extract and mineral concentrations of ABDN were evaluated using standard procedures. The result revealed that ABDN prepared from quails had significantly ($p < 0.05$) higher ash contents (2.67%), while that of ducks had significantly ($p < 0.05$) higher moisture (12.17%). Overall, ABDN prepared from quails had the highest acceptability (6.80 ± 0.41), although not significantly different ($p > 0.05$). However, the product prepared from ducks had significantly ($p < 0.05$) higher crude protein (23.70%) and ether extracts (53.73%), while that from chickens had higher concentrations of Ca (225.4 mg/kg), K (22.09 mg/kg), Mg (8.19 mg/kg) and Zn (0.09mg/kg). ABDN prepared from quails recorded higher value of Na (67.90mg/kg), whereas, that of ducks and guinea fowls had higher concentrations of Cu (0.06 mg/kg) and Fe (0.07mg/kg), respectively. Conclusively, the avian based *Dambun Nama* was highly nutritious, palatable and generally accepted. Thus, highly nutritious foods such as *Dambun Nama* are particularly required for malnourished people especially children and women.

Key words: Chemical, Sensory, Avian, *Dambun Nama*

INTRODUCTION

The provision of adequate food to the ever increasing teeming population of the world is one of the greatest challenge to mankind (Abubakar *et al.*, 2011). In 2010, the World Population Data Sheet (WPDS), estimated 6.892 billion people that may reach 7 billion in 2011 and 8 billion in 2024. Thus, the feeding of almost 7 billion people is an enormous task that must be taken seriously. According to the Food and Agricultural Organization, FAO (2010a), global per capita output of meat consumption, which at present averages 41.9 kg per year, varies greatly not only between developed countries (80.7 kg) and developing countries (31.6 kg) of the world, but even within communities in a country. Speedy (2003) had shown that while some countries consume more than 100 kg meat per annum, others consume less than 10 kg, which is insufficient and often leads to under-nourishment and malnutrition (FAO, 2010b). The high cost of meat is enough to make developing countries, including Nigeria, have limited access to meat and meat products. This is due to the fact that production and rearing of animals is far below demand and the preservative technology is grossly inadequate, resulting in high perishability of meat and meat products (Eke *et al.*, 2012). Fresh meat is highly perishable, and to prevent its spoilage, meat is usually processed into products using many techniques such as grounded meat, locally called *Dambun Nama* (Abubakar *et al.*, 2011).

Dambun Nama is a significant portion of the diet of a large active population in Northern Nigeria (Salihu *et al.*, 2010). In Kano State, it is usually sold as ready to eat meat products, which could be prepared locally for travelers and, especially during festivities. It is an indisputable fact that, reduction of protein malnutrition in the sub-Saharan African countries requires evaluation of simple, appropriate and affordable technologies applicable to local environment. As such, all avenues of meat preservation should be exploited so as to meet the animal protein requirement of the increasing world

population. Therefore, the purpose of this study is to evaluate the sensory and chemical properties of grinded meat, prepared under standard laboratory conditions, from some common avian species.

MATERIALS AND METHODS

Experimental Animals and Design: The avian species used for the experiment include; chickens, ducks, guinea fowls and quails. The birds were approximately of the same age and were purchased from Rimi market, located in Kano metropolis, Kano State, Nigeria. The ingredients (onions, ginger, salt, seasonings, sweet pepper, hot pepper, garlic and vegetable oil) were equally purchased from Rimi market. Completely randomized design (CRD) was employed where four treatments representing the four different avian species were used with each treatment replicated three times.

Preparation of *Dambun Nama*: Preparation of *Dambun Nama* was conducted at the Department of Animal Science, Faculty of Agriculture, Bayero University, Kano. The meat was cut into pieces of approximately 4cm by 2.5 cm dimension, washed with water, mixed with spices, boiled and pounded into shreds. It was then shallow- fried using vegetable oil in a stainless steel pot to obtain a brownish product known as *Dambun Nama*. The product was cooled and packaged in low density plastic containers, from where samples was drawn for subsequent analysis.

Determination of Organoleptic Properties: The organoleptic quality assessment of *Dambun Nama* was undertaken using a 7-point hedonic scale (7 = Very much liked, 6 = Liked a lot, 5 = Liked, 4 = neither liked nor disliked, 3 = Disliked, 2 = Much disliked, 1 = Very much disliked) as reported by Beinner *et al.* (2010), where 15 semi-trained panelists were used. The evaluation was based on aroma, tenderness, color, flavor, texture, juiciness and general acceptability of the product.

Determination of Chemical Properties: The ash, moisture, crude protein, ether extract contents and some selected mineral constituents (Ca, Mg, K, Na, Fe, Cu, Zn) of the samples were determined according to the methods described by the Association of Analytical Chemists, AOAC (2007).

RESULTS AND DISCUSSION

Sensory Evaluation of Avian Based *Dambun Nama*

The mean sensory scores for the experimental *Dambun Nama* is presented in Table 1. All the parameters examined were not significantly ($p = 0.1645$) affected by meat type. The range of values (6.00 – 6.80) obtained are higher than those reported by Ogunsola and Omojola (2008) which ranges between 2.33 and 4.47 in their study on quantitative evaluation of *Dambun Nama* prepared from beef and pork. They are also higher than the values obtained by Onwuka and Nwosuagwu (2005) with a range between 1.90 and 6.00 in a study on the effect of four local vegetable leaves on the protein and microbial content of smoked and dried beef. In terms of flavor, the product prepared from quails was rated highest, also products prepared from chickens, ducks and guinea fowls were rated same. This may be due to the standardization of ingredient mix (Omojola, 2008). However, the contributions of each of the ingredients to the overall *Dambun Nama* flavor and quality was not clearly ascertained. A similar view had been reported by Eke *et al.* (2012) in their preliminary studies on the production and quality evaluation of *Dambun Nama*. Flavor, texture and appearance are perhaps the most important characteristics of food because they are the attribute the consumers can readily assessed. Consumers often base their meat purchasing decisions on appearance, but usually make rapid purchases based on product flavor and texture (Schilling *et al.*, 2009). Murano (2005) noted that two types of senses are involved in sensory perception: chemical (taste and odor) and physical (sight, sound and touch). Food flavor is an overall impression combining taste, odor, mouth-feel factors and trigeminal perception. Guinea fowl products are rated highest in aroma, texture and juiciness, but least preferred in terms of color, whereby panelists preferred the color of the product prepared from Chickens. Although *Dambun Nama* prepared from ducks had lower acceptability compared to other products, it was rated highest in terms of tenderness, which reflects consumers less familiarity and acceptability of the product in the study area. Miller *et al.* (1995) reported that mode of processing especially shredding and pounding had a significant effect on meat tenderness. Tenderness in meat is one of the important desires of the consumer, considering the amount of time and resources expended in an attempt to improve it (Farouk *et al.*, 1992). Eke *et al.* (2012) reasoned that, the traditionally processed *Dambun Nama* delicacy is highly acceptable to consumers because of its soft and tender taste compared to the hard, non-soft products.

CHEMICAL COMPOSITION OF AVIAN BASED *DAMBUN NAMA*

The result of the chemical composition of avian based *Dambun Nama* is presented in Table 2 and 3. *Dambun Nama* prepared from quails had the highest ash content while *Dambun Nama* prepared from ducks had the least ash content. The ash content had an inverse relation to the moisture content. The higher the ash content the lower the moisture content (Umar, 2015), and hence the higher the shelf life. This implies that, the product obtained from ducks may have shorter shelf life. High moisture content favors the growth of many spoilage and pathogenic microbes and this is one of the reasons why meat is considered as an excellent medium to support microbial growth (Adams and Moss, 1995). Therefore, the product obtained from ducks would be more prone to spoilage since it has the highest moisture content. However, the result shows that *Dambun Nama* prepared from ducks had the highest crude protein and ether extract, while that prepared from guinea fowls and chickens had the least crude protein and ether extract, respectively. Calcium (Ca), Magnesium (Mg), Sodium (Na), Potassium (K), Copper (Cu) and Zinc (Zn) were the predominant minerals found in Avian Based *Dambun Nama*. Ca is an important component of bones, thus if the ratio of Ca/P is above one, the food is considered good. K and Na are required for maintaining the osmotic balance of body fluids, pH of the body, regulation of muscle and nerve irritability, control glucose absorption and enhance normal retention of protein during growth (Fasasi *et al.*, 2010; NRC, 1989). Na/K ratio in the body is of great importance for prevention of high blood pressure. On the other hand, Zn keeps the immune system strong, promotes healthy skin, growth, development and reproductive health. Thus, the present study shows that the product could be incorporated in the daily balanced diet.

CONCLUSION AND RECOMMENDATIONS

It can be concluded that, the Avian Based *Dambun Nama* was highly nutritious, palatable and generally accepted, which could be useful for malnourished communities or especially among children and women. Further studies to determine the hazards associated with the products and also to evaluate all critical control points during processing and packaging of the product is recommended.

Table 1: Mean Sensory Scores for Avian Based *Dambun Nama*

Parameters	Samples (Mean $\pm$ Standard Deviation)				LSD
	Chickens	Ducks	Guinea fowls	Quails	
Aroma	5.73 $\pm$ 1.43	5.8 $\pm$ 1.082	6.200 $\pm$ 0.941	6.133 $\pm$ 1.125	1.64
Tenderness	5.46 $\pm$ 1.060	6.067 $\pm$ 1.279	5.933 $\pm$ 1.334	6.000 $\pm$ 1.000	0.499
Colour	6.200 $\pm$ 1.014	6.133 $\pm$ 1.356	5.667 $\pm$ 1.234	5.933 $\pm$ 1.032	1.07
Flavour	5.933 $\pm$ 0.884	5.933 $\pm$ 1.163	5.933 $\pm$ 1.099	6.467 $\pm$ 0.990	1.64
Texture	6.000 $\pm$ 0.845	5.600 $\pm$ 1.639	6.067 $\pm$ 1.033	6.000 $\pm$ 1.000	0.57
Juiciness	5.733 $\pm$ 1.335	5.533 $\pm$ 1.187	6.200 $\pm$ 1.082	5.733 $\pm$ 1.487	2.139
General Acceptability	6.467 $\pm$ 0.831	6.00 $\pm$ 1.309	6.533 $\pm$ 0.743	6.800 $\pm$ 0.414	1.569

Table 2: Chemical Composition (%) of Avian Based *Dambun Nama*

Parameters	Samples Mean $\pm$ Standard Deviation				LSD
	Chickens	Ducks	Guinea Fowls	Quails	
Ash	2.23 $\pm$ 0.104	2.17 $\pm$ 0.23	2.28 $\pm$ 0.32	2.67 $\pm$ 0.60	2.82
Moisture	10.95 $\pm$ 0.44	12.17 $\pm$ 0.68	10.95 $\pm$ 0.68	10.73 $\pm$ 0.61	3.31
Crude Protein	20.42 $\pm$ 0.63	23.69 $\pm$ 0.63	20.02 $\pm$ 0.66	22.24 $\pm$ 0.63	6.13
Ether extract	34.13 $\pm$ 0.25	53.73 $\pm$ 0.68	50.93 $\pm$ 0.49	47.93 $\pm$ 0.91	7.99

Table 3: Mineral Concentration (mg/kg) of Avian Based *Dambun Nama*

Parameters	Samples			
	Chickens Quails		Ducks	Guinea Fowls
	225.40	222.22	218.87	212.93
Mg	8.19	5.48	6.57	7.49
Na	51.51	48.94	37.69	67.90
K	22.09	8.70	17.90	14.23
Cu	0.02	0.06	0.04	0.04
Zn	0.09	0.08	0.08	0.05

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