



**NIGERIAN SOCIETY FOR ANIMAL  
PRODUCTION (NSAP)**



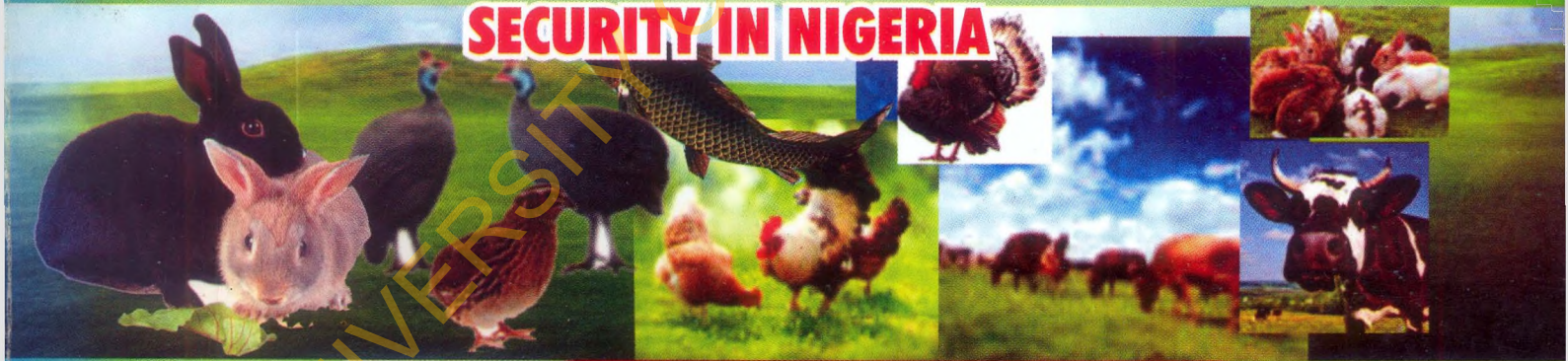
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**"ZARIA 2015"**

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**ENHANCED LIVESTOCK PRODUCTION: A TOOL  
FOR ECONOMIC EMPOWERMENT AND IMPROVED  
SECURITY IN NIGERIA**



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Edited by: I. A. Adeyinka, M. Kabir, S.B. Abdu, G. I. Erakpotobor,  
M.R. Hassan and A. O. Iyiola-Tunji

# **NIGERIAN SOCIETY FOR ANIMAL PRODUCTION**

## **PROCEEDINGS OF THE 40<sup>TH</sup> ANNUAL CONFERENCE**

**EDITED BY**

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MON36	Responses of weaned rabbits to diets containing sun-dried soyabean cheese residue meal	A.S. Muhammad, Y.U. Bappah, L. A. Saulawa, and M. S. Tamburawa	411-413
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MON38	Influence of <i>Moringa oleifera</i> seed meal on male japanese quails	Adedibu I.I, Jimoh M.A, Enesha V, Akinsola O.M	418-420
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MON43	Reproductive performance and husbandry practices of indigenous chickens in delta state, Nigeria	J. I Kperegbeyi and A.M. Orheruata	434-437
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MON47	Haematological indices, carcass and organ characteristics of crossbred weaner rabbits fed dehydrated bovine rumen digesta	Ani, A. O., Udeh, F. U., uzochukwu, and Onuora, S.I.	449-453
MON48	Evaluation of broiler chicks fed bitter leaf ( <i>Vernonia amygdalina</i> ) aqueous extract	V. U. Oleforuh-okoleh, S. O. Olurunleke, and L.C. Obi	454-456

## SESSION SEVEN

### RUMINANT ANIMAL PRODUCTION, NUTRITION AND MANAGEMENT

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RUM03	<i>In-vitro</i> evaluation of 4, 6 and 8 week re-growths of vetiver grass ( <i>Chrysopogon zizanioides</i> L.roberty).	O.O.Falola., O.Y. Adedeji., A.A. Saka., A.O. Areegbe and A.F, Adisa	464-467
RUM04	Nutrients, anti-nutrients digestibility and nitrogen retention by west african dwarf rams fed <i>Panicum maximum</i> substituted with <i>Gliricidia sepium</i> and <i>Acacia nilotica tomentosa</i>	A.N. Fajemisin, O.B. Omotoso and T.A. Ayelotan	468-471
RUM05	Evaluation of forage resources of the zange grazing reserve	S.S. Mohammed, I.R. Muhammad, M. Baba	472-475
RUM06	Nutrient intake and digestibility in west african dwarf goats fed <i>Persea americana</i> leaves as supplement to <i>Panicum maximum</i>	Fadiyimu, A.A., Fajemisin, A.N. Folorunso, O.R., Adeyeye, S.A. and Sule K	476-479
RUM07	Macro-mineral compositions of panicum ( <i>Panicum maximum</i> ) intercropped with centro ( <i>Centrosema pascuorum</i> ) and <i>Clitoria ternatea</i>	T. O. Muraina., J. A. Alalade., I. A. Adebisi., C. B. Emiola., A. B. Oloko., T. B	480-482
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RUM09	Performance of west African dwarf (wad) goats fed gamba grass ( <i>Andropogon gayanus</i> ) supplemented with diet containing treated and untreated sweet orange ( <i>Citrus sinensis</i> ) peels	Oloche, J., Oluremi, O.I.A. And Shaapera, S.S	488-490
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RUM11	A survey of seasonal livestock population of zange grazing reserve in gombe state	S.S. Mohammed, I.R.Muhammad, M. Baba	495-497
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RUM13	Forest tree seeds as alternative feed source for livestock	N.J. Ogundun, A.A. Adeloje. M.B; Yousuf, and G.T. Imram	501-504
RUM14	Nutrient digestibility and intake of west African dwarf goats fed diet containing different levels of sweet orange peels and gamba grass	Oloche, J., Oluremi, O.I.A and Mnguachia, L.J	505-507
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RUM21	Effects of different processing methods of raw baobab ( <i>Adansonia digitata</i> ) seed meal on productive performance of broiler chickens	L. A .Saulawa, S. A. Muhammad , and M .I. Tamburawa	532-535
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RUM32	Effects of malted sorghum sprout with enzyme supplementation on performance characteristics, rumen fluid parameters and microbial counts of west African dwarf goats	A.O. Areegbe' C.F.I Onwuka F.T Ajayi, A.O. Oni, O.O. Falola, M.O Oladele-bukola and A.A Saka	569-572

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2	Phenotypic correlations between egg quality traits of the japanese quail in a semi-arid area of Nigeria	Abdulraheem, A.O., Raji, A.O. and Alade, N.K.	578-582
3	Occurrence of subclinical <i>Eimeria</i> infection in commercial poultry farms in Kaduna, state Nigeria	Jatau, I.D., Lawal, A.I., Kwaga, J.K.P. and Nok, A.J	583-585
4	Effect of season, sex, age and breed on the prevalence of bovine anaplasmosis in Sokoto metropolis	M. Abdullahi, M. Hussaini, M.D Salisu, M.A. Ibrahim, Z.M. Wunti, A.A. Mohammed	586-588
5	Performance of yankasa sheep fed <i>Panicum maximum</i> substituted with varying levels of <i>Gmelina arborea</i> forage	A.N Fajemisin, T. Adaramewa and M.K. Ogungbesan	589-592
6	Nutrients, anti-nutrients digestibility and nitrogen retention by west African dwarf rams fed <i>Panicum maximum</i> substituted with <i>Gliricidia sepium</i> and <i>Acacia nilotica tomentosa</i>	A.N. Fajemisin, O.B. Omotoso and T.A. Ayelotan	593-596
7	Correlation coefficient ( $r$ ) and dry Matter degradability of some <i>Ficus</i> Species using <i>in sacco</i> technique	A.A. Njidda, B Bello and I. K. Al-Habib	597-600
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9	Variation of haematological parameters in oestrus synchronization using fluorogestone acetate (FGA) intravaginal sponge in Sokoto red goat	F.U. Samuel, N.P Chiezey, J.O.O. Bale, T.K Bello, R. Hassan, F.S Maikaji M. Ibrahim, S.O Ereke, and H.J Magaji	605-608
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12	The effect of feeding different levels of tiger	D.N. Onunkwo and M.C. Ugwuene	616-620

	nut ( <i>Cyperus esculentus</i> L) seed meal on carcass and organ weights characteristics of japanese quails ( <i>Coturnix coturnix japonica</i> )		
13	Haematological and serological characteristics of cockerels fed different levels of tiger nut ( <i>Cyperus esculentus</i> ) seed meal	D.N. Onunkwo and M.C. Ugwuene	621-625
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16	Intake and nutrient digestibility in sheep fed some semi-arid browse plants	Ibrahim, H. and Abbator F.	633-636

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## ANTIOXIDANT AND ANTIMICROBIAL ACTIVITIES OF AFRICAN NUTMEG, PEPPER AND BLACK PEPPER EXTRACT ON THE QUALITY AND SHELF-LIFE OF CHICKEN NUGGETS

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### ABSTRACT

A study was conducted using five kilogrammes of manually deboned and comminuted broiler meat to determine the antimicrobial and antioxidant activities of Pepper, Black pepper and African nutmeg extracts on the quality and shelf-life of nuggets stored at 4°C for 12 days in a completely randomised design. The results for the antioxidant effect revealed that lipid oxidation of chicken nuggets were improved by the inclusion of the extracts compared to the control. Total plate count, coliform count and fungal count were significantly ( $P < 0.05$ ) reduced with the addition of African nutmeg extracts during storage. It is concluded that extracts of Pepper, Black pepper and African nutmeg led to retarded oxidative rancidity and microbial growth during refrigerated storage, thereby improving the quality and shelf-life of chicken nuggets.

### INTRODUCTION

The aims of preservation methods are to inhibit the microbial spoilage and to minimize the oxidation and enzymatic spoilage. Utilization of spices in various forms like powder, extract or essential oils has been well documented for its preservative ability by inhibiting lipid oxidation, growth of many spoilage bacteria and fungi in foods (Meena and Sethi, 1997; Subbulakshmi and Naik, 2002; Rajkumar and Berwal, 2003). Their addition also affects the taste, flavour, texture, water activity, pH and colour of some meat products (Zhang *et al.*, 2009; Ibrahim *et al.*, 2011). Examples of such spices include Pepper and Nutmeg. Pepper is a good source of antioxidant, contains vitamin c and beta carotene (Coon, 2003). In Nigeria and other African countries, the kernel obtained from the seeds of African Nutmeg is a popular spicing agent to improve flavor of food resembling that of nutmeg (*Myristica fragrans*) as well as an aromatic stimulating addition to medicine (Ekeanyanwu *et al.*, 2010). It is reported to possess valuable economic and medicinal value (Okafor, 1987). *Monodora myristica* is rich in glycosides, flavonoids, saponins and steroids but with very little cyanogenic glycosides, tannins, oxalates and phytates. Flavonoids, saponins and tannins are known to have antimicrobial activity, as well as other physiological activities (Ekeanyanwu *et al.*, 2010). Flavonoids possess anti-inflammatory, antioxidant, anti-allergic, hepatoprotective, anti-thrombic, antiviral and anticarcinogenic activities (Middleton *et al.*, 2000). This study was therefore

conducted to determine the antimicrobial and antioxidant activity of Pepper, Black pepper and African nutmeg extracts on the keeping quality of chicken nuggets. The objectives of these studies were to determine the antioxidant activities of Ginger, African nutmeg, Pepper, Black pepper and Cloves on the quality and shelf-life of chicken nugget, stored at 4°C for 12 days and to determine the antimicrobial activities of ginger, African nutmeg, pepper, black pepper and cloves on the quality and shelf-life of chicken nugget, stored at 4°C for 12 days.

### MATERIALS AND METHODS

#### Preparation of extracts

pepper (*Capsicum frutescens*), black pepper (*Piper guineense*) and African nutmeg (*Monodora myristica*) were purchased from Kurmi market in Kano State. The spices were washed with water, air dried overnight and ground into powder using a hammer mill. The spice extracts were prepared as follows: Aliquots (50 g each) of pulverized and dried spices were mixed into 400 ml of 95% (v/v) ethanol for 12 h in enclosed flasks with constant shaking (100 rpm) using a flask (Stuart: SF1). After filtration with a Whatman No. 2 filter paper, the residue was re-extracted with an additional 200 ml of 95% ethanol for an additional 12h and then filtered. The combined filtrates were concentrated on a rotary evaporator (RE- 100, Bibby Sterilin Co., Ltd., U.K.) at 50°C with a vacuum pump. The extracts were further evaporated on water bath using Petri dishes. Dried extracts were placed in

sealed bottles and stored at 4°C before use (Zhang *et al.*, 2009).

#### Chicken nugget preparation

Meat was deboned manually and cut into small pieces and minced in a meat mincer (Breville, UK) with a 3 mm plate. Emulsion of each formulation was prepared using bowl chopper (Breville®, UK). All the nugget formulations consisted of broiler meat, 60%; soy bean oil, 10%; ice flakes, 10%; refined wheat flour, 2.5%; skim milk powder, 2%; whole egg liquid, 5%; table salt, 2%; sugar, 1%; sodium tri-polyphosphate, 0.2%; condiments/spice mix, 2.5%; and spice extract, 4.8%. The formulation obtained was carefully cut in nugget size pieces (4×1.5×1.5 cm) and baked at 160°C for 15 minutes. The cooked product was cooled and weighed. The nuggets were packed in sterilized aluminum foil plates and stored at refrigerated temperature (4±1°C) for analysis (Kumar and Tanwar, 2011).

#### Microbial and Thiobarbituric acid assay

Nugget samples from each treatment were collected into sterilised plastic containers and transferred to the laboratory with the aid of ice bags, and analysed within an hour after collection (Nwachukwu *et al.*, 2008). The media used includes plate count agar, McConkey agar, potato dextrose agar, peptone water and nutrient agar which were prepared according to manufacturer's instructions (Oxoid, U.K.). The media were sterilized by autoclaving at 121°C for 15 minutes. Enumeration of TPC and TCC was carried out according to the method described by Cheesbrough, 2004 while the inoculated media for TFC was incubated at room temperature (28-32°C) for 7 days. The number of bacterial and fungal colonies were counted, recorded and expressed as colony-forming unit per gram (cfu/g).

$$Cfu/g = \frac{\text{Total Number of Colonies Counted} \times \text{Dilution factor}}{\text{Volume of inocula}}$$

Thiobarbituric acid (TBA) was determined according to the method proposed by Kirk and Sawyer (1991).

#### Statistical analysis

Data obtained were subjected to analysis of variance procedure of SAS (SAS, 2002) and significant means were separated using Duncan

Multiple Range Test (Duncan, 1995). The following model was used:

$$Y_{ij} = \mu + T_i + e_{ij}$$

Where;

$Y_{ij}$  = dependent variable;  $\mu$  = overall mean;  $T_i$  = effect of the  $i^{\text{th}}$  treatment;  $e_{ijk}$  = random error.

## RESULTS AND DISCUSSION

### Microbial count (Log cfu/g) and Thiobarbituric acid (malondialdehyde/kg) of chicken nuggets stored at 4°C for 12 days

The effect of spice extracts on the total plate count (TPC), total coliform count (TCC), total fungal counts (TFC) and thiobarbituric acid (TBA) of chicken nuggets stored at 4°C for 12 days are presented in Figures 1, 2, 3 and 4 respectively. Spice extracts inclusion in chicken nuggets decreased the TPC, TCC, TFC and TBA values. Extracts of pepper had exceptionally high activities against lipid oxidation and microbial growth as storage days increase.

#### Conclusion

The inclusion of spice extracts in chicken nuggets increased the shelf life and sensory attributes of the product.

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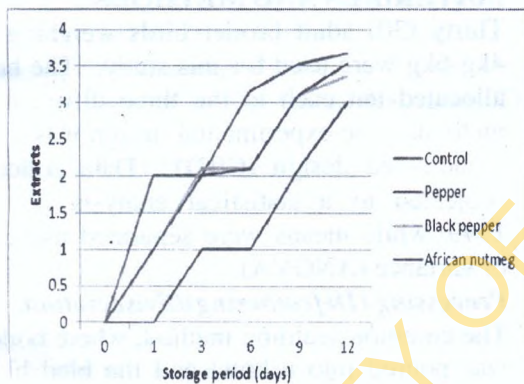


FIG 1: TPC

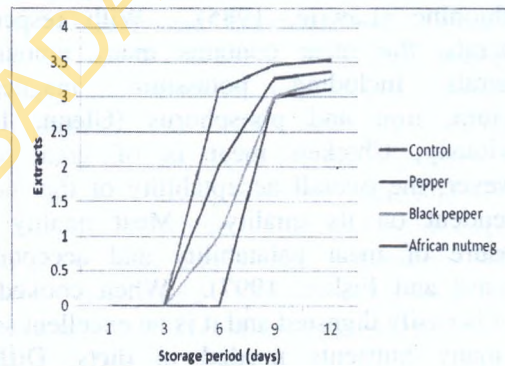


FIG 2: TCC

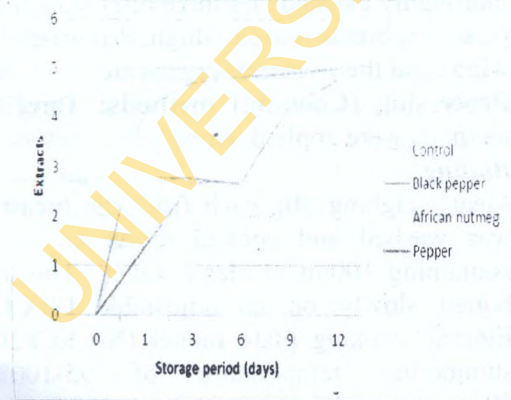


FIG 3: TFC

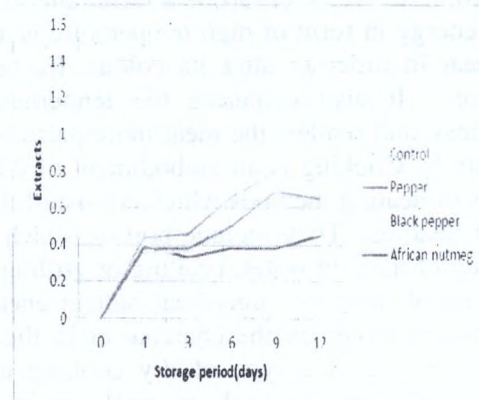


FIG 4: TBA