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THE GROWTH PERFORMANCE AND NUTRIENT DIGESTIBILITY OF WILD INDIGENOUS GUINEA FOWL KEETS (*Numida meleagris galeata*) FED VARYING LEVELS OF ROASTED *Senna occidentalis* SEEDS UNDER INTENSIVE SYSTEM.

BY

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ABSTRACT

An experiment was conducted to evaluate the performance and nutrient digestibility of wild indigenous guinea fowls fed different inclusion levels of processed Negro coffee (*Senna occidentalis*) seed meal under intensive management. In the experiment, Roasted *Senna occidentalis* meal (RSOM) was included at 0.0, 6.50, 13.00 and 19.50 % levels to formulate isonitrogenous (26 % Crude Protein) and isocaloric (3000Kcal/KgME) diets fed to 180 day-old guinea fowl keets during the starter phase. The result revealed that roasting increased the nutritional value of senna seeds in terms of Dry Matter (DM) and CP.Similarly, some of anti-nutritional factors like cyanide and trypsin inhibitors were reduced by 41.89 and 61.76 % respectively. The result of the feed intake ,final weight,FCR,water intake, PER and cost/kg feed showed significant difference($P<0.05$).On the other hand, the values of Ether Extract were significantly affected by various inclusion levels of RSOM.The result of the nutrient digestibility revealed no significant difference ($P>0.05$) in DM,CP and Crude Fibre,however significant differences were recorded in EE, ash and Nitrogen Free Extract.From the result of this experiment, it can be concluded that roasted *Senna occidentalis* seed cannot be tolerated by guinea fowls keets even at 6.5% dietary level at the starter phase.

Key words: Wild indigenous guinea fowl, Growth performance, Roasted Senna occidentalis seed

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INTRODUCTION

The ever increasing demand for animal protein for the present and future population of people living in developing countries has been an issue of concern to governments, nutritionists, and individuals in recent years. Going by the current Nigerian population of over 140 million (NPC, 2006), to meet the recommended 35 g of animal protein- per person per day, an average meat supply of 4.9 million Kilograms per day will be required. Although a trend of increase of about 4.83 % has been observed in the livestock industry (Ojiako and Olayode, 2008), this level of increase is too low to meet up with the need for animal protein. In order to bridge the gap between demand and supply of animal protein, increased production of monogastric animals is essential because of their high productive potential and short generation intervals (Ayanwale, 2006). This problem of protein inadequacy can be attributed to insufficient supply and high cost of certain conventional ingredients such as soybean, groundnut, maize and wheat, in addition to animal protein sources, particularly fish meal. The search for novel high quality but cheap sources of protein and energy has continued to be a major source of concern to scientists and bodies charged with the responsibility for food in many parts of the developing world (Kudu,*et al.*,2010). Lack of adequate ingredients and high cost of poultry birds have created the need for research into alternative feed ingredients that have high nutritive value and are readily available.

However, most plant legumes such as Negro coffee (*Senna occidentalis*), contain anti nutritional factors (ANFs) like trypsin inhibitors, cyanides, phytic acid and tannins that greatly limit their use in monogastric diets. Presently, Negro coffee is not in use as a source of protein in poultry production.

The growth of the poultry industry in Nigeria today is a reflection of the level of importation of exotic chicken parent stocks that require special environmental alterations for their survival and success. This limits the overall development of the poultry sector and seriously limits poultry meat supply. The guinea fowl is widely distributed in the tropical guinea savanna area of Africa. The aim of this experiment was to determine whether *Senna occidentalis* seed could be an alternative protein source in feeding guinea fowls.

MATERIALS AND METHODS

Experimental site: This study was conducted at the poultry unit of the Department of Animal Production Farm situated at Bosso campus, Federal University of Technology, Minna, Niger State. Minna

Experimental ingredients and processing of *Senna occidentalis* seeds

The ingredients used for this experiment were purchased from Kure ultra-modern market, Minna ,Niger state

Seed collection and Processing: Senna coffee seeds were collected from the wild. The roasting method of Udunsi *et al.* (2008) was used. The method involved putting the seeds on a hot heated pot and turning continuously until more than 95 % of the seed coats cracked (Shiawoya *et al.*, 2008). The seeds were allowed to cool by spreading on a jute bag, and grinded to obtain roasted *Senna occidentalis* seed meal (RSOM).

Experimental diets: The roasted *Senna occidentalis* seed meal (RSOM) was used to prepare 4 different experimental diets at chick phase. Diet T_1 contained 0.0 % RSOM, while diets T_2, T_3 and T_4 contained 6.50, l3.0 and 19.50 % of roasted *Senna occidentalis* meal respectively. Each of the starter diets was formulated to contain 26% CP and 3,000 Kcal/kg ME. The diets were isocaloric and isonitrogenous (Table 1.).

Management of experimental birds: A total of one hundred and eighty (180) guinea fowl keets were used .The birds were randomly divided into 4 treatment groups in a Complete Randomized Design (CRD). Each treatment had 3 replicates with 15 guinea fowl keets, which were fed for a period of 10 weeks. Old news papers were used as litter material during the first two weeks of age ,instead of wood shavings to prevent the keets from peaking particles of wood shaving and to help check against crop compaction (Kudu, 1998). Routine health management practices were adopted.

Determination of anti nutritional factors :The anti-nutritional factors were determined using the methods outlined by Onwuka (2005). The ANFs include, Trypsin inhibitor activities. Tannin content, phytate (phytic acid) and cyanide content

Data collection: The following data were generated from daily and weekly records of : (1) Feed intake; (2) Body weight ;(3) Weight gain; (4) Feed Conversion Efficiency (feed / gain ratio) and (5) Digestibility

Digestibility The Proximate composition of the faecal samples was determined by the A.O.A.C. (2001) method. The percentage digestibility of the following nutrients: dry matter, crude protein, crude fibre, ether extract, total ash and Nitrogen Free Extractives (NFE) were computed using the formula of Iyayi and Davis (2005) stated thus:

Nutrient digestibility (%) =Nutrient intake-Nutrient in faeces /Nutrient intake x 100

Table .1:Chemical composition of raw and roasted *Senna occidentalis* seeds

Chemical composition (kg)	A Raw	B Roasted
Dry matter	91.17	95.62
Crude protein	16.04	18.15
Crude fiber	1.10	2.06
Ether extract	1.47	1.90
Ash	3.11	4.38
NFE	69.45	67.13
Moisture	8.83	4.38
Calculated energy (kcal/kg)	3550.00	3662.00

Anti-Nutritional Factors	**Raw**	**Roasted**	**% Reduction**
Phytic acid(mg/100g)	503.10	469.04	6.70
Tannin(g/kg)	25.64	23.44	8.58
Cyanide(mg/100g)	18.07	10.50	41.89
Trypsin inhibitor(g/kg)	36.85	14.09	61.76

NFE: Nitrogen Free Extract

Table:2 Composition of experimental diets containing roasted *Sienna occidentalis* seed meal at chick phase

Ingredients	Levels of roasted *Senna occidentalis* seed meal(%)			
(Kg) 19.50	0.00	6.50	13.00	
Maize	44.70	40.20	35.70	28.87
GNC	41.70	39.50	37.70	38.03
RSOM	0.00	6.50	13.00	19.50
Maize bran	5.00	5.00	5.00	5.00
Fish meal	4.00	4.00	4.00	4.00
Bone meal	2.50	2.50	2.50	2.50
Red oil	0.30	0.30	0.30	0.30
Lysine	1.10	1.10	1.10	1.10
Methionine	0.45	0.45	0.45	0.45
*Premix	0.25	0.25	0.25	0.25
TOTAL	100.00	100.00	100.00	100.00
Calculated values				
Energy K/cal/kg/ME				
B	2995	2990	2988	3000.30
Crude protein (%)	25.91	25.85	25.95	26.05
Crude fibre (%)	3.80	3.24	3.59	3.49
Ether extract (%)	5.98	5.73	5.50	5.31
Calcium (%)	1.46	1.47	1.53	1.58
Phosphorus (%)	0.92	1.05	0.99	1.03
Lysine (%)	2.11	2.27	2.41	2.58
Methionine (%)	0.82	1.76	2.17	2.62

*To provide the following per 100kg of the diet: 440mg, riboflavin; 720mg calcium pantothenate; 2g, niacin; 2,2g chloride; 15mg folic acid; 1mg vitamin B12; 15mg retinol; 165g vitamin D2; 1000mg DL-tocopherol acetate; 1700mg copper; 200mg iodine; 3000mg manganese; 5000mg zinc; 10,000mg iron. KEY GNC- Groundnut Cake; RSOM- Roasted *Senna occidentalis* meal

Table .3:Proximate Composition and energy value of Guinea fowl keets diets containing Roasted *Senna occidentalis* seed meal

levels of roasted Senna occidentalis seed meal (%)				
Nutrients(%)	0.0	6.50	13.00	19.50
Starter				
Dry matter(%)	90.95	91.55	91.29	90.10
Crude protein(%)	26.21	25.95	26.01	26.35
Crude fibre(%)	10.21	11.85	11.75	11.82
Ether extract(%)	3.03	3.25	3.04	4.03
Ash(%)	7.50	6.25	5.74	6.29
NFE(%)	44.00	44.25	44.75	41.61
Moisture(%)	9.05	8.45	8.71	9.90
Calculated energy value (kcal/kg)	3081.10	3088.40	3104.00	3081.10

Table .4: Performance of guinea fowl keets fed graded levels of roasted *Senna occidentalis* meal at starter phase

levels of roasted Senna occidentalis seed meal (%)						
Parameters	0.0	6.50	13.00	19.50	SEM	LS
Initial wt.(g)	32.84	31.95	32.68	32.72	3.5	ns
Final wt.(g)	535.23^{a}	441.61^{b}	364.07^{c}	267.95^{d}	29.67	**
Feed intake(g)	2408.90^{a}	2242.80^{a}	2012.30^{c}	1849.50^{d}	64.51	**
Weight						

gain(g)	506.39[a]	409.66[b]	331.39[c]	235.24[d]	30.08	**
FCR	4.75[c]	5.17[c]	6.07[b]	7.86[a]	0.36S	**
Water intake(ml)	2864.40[a]	2489.20[b]	2193.5[c]	2017.80[c]	44.0	**
PER	0.86[a]	0.66[b]	0.62[c]	0.45[d]	0.04	**
EE	0.07	0.06	0.05	0.04	0.00	ns
Cost/kg of feed(₦/kg)	92.77[a]	91.12[b]	89.51[c]	88.75[d]	0.47	**

a,b,c,d : means in the same row with different letters are statistically different (P<0.05)

**: signifiant, LS : Level of signifiance. ns : non signifcant (P>0.05) ; SEM : Standard Error of the Mean

FCR: Feed Conversion ratio, PER : Protein Efficiency Ratio. EE : Energy Efficiency.

Table 5: Nutrient digestibility of guinea fowls fed roasted Senna *occidentalis* meal at starter and grower phases

	Levels of roasted *Senna occidentalis* meal (%)				
	0.00	6.50	13.00	19.50	SEM
LS					
Nutrients (%)					
Starter phase					
Dry matter	57.18	59.72	53.57	61.73	1.59	ns
Crude protein	77.95	78.74	78.07	80.70	0.73	ns
Crude fibre	26.49	41.50	26.25	34.84	2.73	ns
Ether extract	30.75[d]	38.02[c]	55.46[b]	24.28[a]	5.13	**
Ash	33.43[a]	39.47b[a]	38.60[b]	42.56[a]	1.02	**
NFE	57.47[bc]	62.82[ab]	56.5	65.13[a]	1.28	*

RESULTS AND DISCUSSION

Proximate composition and ANF in raw and roasted Senna *occidentalis* seeds

The Crude protein (CP) increasing from 16.04 to 18.15,this could be attributed to the improved nutritional quality of grain legumes ,Esterez *et al.*(1991) reported that heat treatment is based on the inactivation of proteineous inhibitors .The dry matter (DM), Ether extract (EE) ,Crude fibre (CF) and Nitrogen free extract (NFE) also showed improvement ,indicating the positive effect of roasting on physio-chemical properties of grain legumes (Khattab and Amffield,2009).Ragab *et al.*(2010) attributed increase in in CP in legumes on the decortification of the cotyledons. The result in this experiment was contrary to Kakati *et al.*(2010) who reported the negative effect of roasting of DM and CP respectively, and attributed the effect to uncontrolled temperature in the traditional heating method.(Table1)

The reduction in most of the anti - nutritional factors could be attributed to the effect of heating as an effective means of inactivating the thermo – labile anti - nutritional factors of legume grains (Akande and Fabiyi 2010). The value of phytic acid reduction reported in this experiment (6.70%) was similar to that reported by Jeanne *et al.* (2005) who reported a reduction in phytic acid of 8.30% in kidney beans as a result of roasting and attributed the reduction to partially destroyed molecules of inositol, hexaphosphate (phytic acid) to penta,tetra and triphosphates (Cyclohexanehexol).The percentage reduction in the cyanide, tannin and phytic acid contents in the roasted *Senna occidentalis* seed was in agreement with the findings of Gahlawat and Sehgal (1992) and Mubarak (2005) who reported that roasting of legumes and some cereal grains inactivates most of the anti-nutritional factors to tolerable levels, by unfolding their protein structures, thus making them susceptible to attack by digestive enzymes.

The result of the proximate analysis of the feed intake is presented in Table 2. The dry matter values in this experiment was higher than the values reported by Yildrin (2012), who reported a range of 87.0 to 87.8 % for starting guinea fowls. The CP and energy levels reported in this experiment were in agreement with recommendations of Ayanwale and Kudu (2001), Nahashon (2006) and Yildrin (2012) who recommended that guinea fowls keets could be started on CP and energy levels of 24 – 26 % with an energy level of 3100 kcal/kg. Similarly the values of CF (8.65 -10.50) in this experiment were higher than that recommended by Yildrin (2012),this higher values might be attributed to the various inclusion of the roasted *Senna occidentalis* seeds in the diets of the guinea fowls. (Table2)

The guinea fowls keets fed diets containing 13.0 and 19.50 % RSOM had significantly ($P<0.05$) lower feed intake compared to those fed the control diet and 6.50 % RSOM respectively. The reduced feed intake might be attributed to percentage of tannin content, Midala*et al.* (2013) attributed low growth rate and feed intake in monogastics to the residual effect of ANFs resulting from different processing methods (Table 3).Akinmutimi and Okun (2006) had reported similar result, and attributed low feed intake and growth rate to the astringent nature of tannin when poorly reduced in roasted mucuna, as a result of its ability to bind with protein of saliva and mucosa membranes. Fajemilehin (2010) attributed slow growth rate in guinea fowls to the problem of nutritional quality and feed selection. The FCR reduced as the levels of RSOM increased in the diets.This might be attributed to the residual effects of ANFs.The PER decreased as the RSOM increased, this was in agreement with Seabo *et al* (2011)

who reported that when birds consumed below their protein requirement they do not improve protein utilization.(Guptal *et al*., 2005 and Vadievel*et a*l., 2008).(Table 3)

The non-significant difference reported in DM, CP and CF digestibility might be attributed to the ability of the guinea fowls keets to digest RSOM containing diets, although this was not translated to higher weights, this was in agreement with Ragab*et al*.(2010) who reported that nutrient digestibility in poultry is usually reduced due to some effects of ANFs, particularly phytic acid, that reduces the bio-availability of nutrients, in this experiment phytic acid was only reduced by 6.50 %. A significant difference ($P<0.05$) was reported in EE and NFE ,thus indicating that guinea fowls keets were able to digest the components of the feed better than those keets fed the control diet (0 % RSOM) this was in contrast to Dahauda *et al.* (2009) who reported that roasting improved nutrient digestibility in guinea fowls. In this experiment, the lower level of nutrient digestibility might be attributed to the inability of the guinea fowl to digest this component probably due to an ill –developed gastro intestinal system.

CONCLUSION AND RECOMMENDATION (S)

The result of this experiment indicated that the performance parameters and nutrient digestibility decreased as the level of roasted *Senna occidentalis* increased in the diets. The best results in level of feed intake, weight gain, FCR and PER ratio were obtained in the guinea fowl keets fed diets containing0% RSOM. It can therefore be concluded that roasted *Senna occidentalis* seed meal cannot be included in the diets of the guinea fowls at starter phase.

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