

*Full Length Research Paper*

# A study on the performance of grain residues rations in ANAK 2000 chicks

Ajiboso, S. O. O.<sup>1\*</sup>, Gbate, M.<sup>2</sup>, Adejumo, O. I.<sup>3</sup> and Adeyemo, S. O.<sup>2</sup>

<sup>1</sup>Biochemistry Research Laboratory, Federal Polytechnic P. M. B. 55 Bida Niger State, Nigeria.

<sup>2</sup>Department of Science Laboratory Technology, Federal Polytechnic P. M. B. 55 Bida Niger State, Nigeria.

<sup>3</sup>Department of Agricultural Engineering, Federal Polytechnic P. M. B. 55 Bida Niger State, Nigeria.

Accepted 27 June, 2007

The study was conducted to determine the performance of grain residues as feed resources in chicks. Three different rations were formulated using grain residues and salted groundnut cake. The performance of these rations (F<sub>2</sub>, F<sub>3</sub>, and F<sub>4</sub>) and commercial feed (F<sub>1</sub>) were comparatively studied for a period of ten weeks in term of body weight gain, temperature and cytological implications in ANAK 2000 chicks. The results revealed that the chicks maintained on the commercial feed had comparative better performance in term of body weight gain than grain residues. Comparatively, the maize husk ration (F<sub>2</sub>) had better performance than rice husk (F<sub>3</sub>) and cowpea pod (F<sub>4</sub>) rations. This performance may be attributed to some factors such as its documented nutritive values and its colour, aroma and texture which compare favourably with the commercial feed. At P < 0.05, there was a significant difference between feeds effect and body weight gain, but no significant difference was observed between feeds effect and body temperature of chicks. No blood haemorrhage and ulceration was revealed in the result of cytological examinations of gastrointestinal lining, heart, lung and gizzard of the chicks. From the work carried out, maize husk which is otherwise wasted is hereby recommended for rural poultry farmers as a feed resource for formulation of a least cost ration, which will be economical, reduce space occupied by biomass and enhance the performance of the chicks.

**Key words:** Chick, ration, cytological, residue, temperature, weight.

## INTRODUCTION

Cassava residues for long had been part of foods of man and ruminants, with the foreign exchange value of cassava crop in Nigeria, interest has been shifted to other alternative sources of livestock feed resources. Crop residues have been estimated to account for about 25% of the total feed energy suitable for ruminant livestock in both developed and developing countries (Kossila, 1985). Crop residues from grains are the most utilized alternative sources of feed stuffs. The usages of crop residues at present are not at all systematic, regular or deliberate. In 1985, high international market in term of exportation and importation for cereal residues had been documented by APO (1990), Bearing in mind that some of these cereal crops like maize, beans and rice are staple foods

of Nigerian populace, the government of Nigeria has established various research institutes such as National Cereal Research Institute (NCRI) Badeggi-Niger State, International Institute of Tropical Agriculture (IITA) Ibadan-Oyo state, Institute of Agricultural Research and Training, Moor Plantation Ibadan Oyo State, Stored Product Research Institute (NSPRI) Ibadan, Oyo state with out-stations spread across the country etc. for crop processing, preservation, agronomy, research and development of new hybrids among others.

The estimated total grain yield amounts to 1.37 million tonnes per year, with an annual growth of 10.2% (FMA-WR, 1988). The cereal annual production status of Bida province reveals huge amount of crop residues like rice bran, rice husk, maize stover, maize cob, maize husk, millet stalk and cowpea pods which are either burned or ploughed into the soil because of the environmental hazard they constitute in form of pollution. Maize was considered the leading crop in providing crop residues that

\*Corresponding author. E-mail: [mideolabode@yahoo.com](mailto:mideolabode@yahoo.com). Tel: 2348035320215.

could be utilized as a livestock feed. A large proportion of the ruminant population that could utilize the residues is in northern part of the country (Adebowale, 1992). Maize residues may be relatively poor in nutritive value compared with some other locally available residues or roughages (Dzowela, 1987), but wide availability, large quantities, easy and cheap procurement and large cellulose and hemicellulose reserves enhance their utilization as energy sources in ruminant feed (Adebowale, 1992). However, the high lignocellulosic content of the residues requires a source of readily available carbohydrates and nitrogen to optimize their utilization (Kategile, 2006), particularly when treated (Adebowale, 1992).

National interest on conversion of crop residues to feed resources was mainly for ruminants, the information on the use of crop residues as feed resources for poultry chicks was scanty and almost unavailable. Attempts have been made in India to feed rice husk to cattle (Chandra and Johri, 1953); maize stover and cobs have been used as feed resources for ruminants in Tanzania (Kategile, 1981). Optimum inclusion of rice husk in goat rations has also been studied in Nigeria (Okagbare and Aina, 1995). In Bida province of the North-Central geo-political zone of Nigeria, inputs into poultry business do not bring the commensurate market returns on the chicks because of improper feeding from management of feeds. Low body weight gains result in lower market weights (Brian, 2006). As commented by some of the rural poultry farmers of ANAK 2000 chicks in Bida province of the Nigeria North-Central zone 'the costs of commercial feeds are becoming unbearable and almost unaffordable to us'. 'However, concentrates (commercial feed) are expensive and this makes it difficult for the majority of farmers to use' this problem was also observed among farmers in Asia and the Pacific by APO (1990). ANAK 2000 variety is popularly reared in Bida province because of its comparative better adaptability to the rural areas than others. Bearing in mind, high crop residues status of Bida province, this experiment was designed to study the performance of grain residues in ANAK 2000 chicks' rations. It can help rural poultry farmers to utilize a feed resource which is otherwise wasted to formulate a least cost ration. The aims of this study also include formulation of rations using maize husk, rice husk, cowpea pods and groundnut cake. Preparation and hawking of groundnut cake is one of the major traditional occupations of Bida women.

## MATERIALS AND METHODS

### Chicks

40 (ANAK 2000) chicks from a week old were purchased from a local market in Bida town Niger State- Nigeria.

### Residues

The grain residues were obtained from a local mill, Research and Experimental Farm of Agricultural Engineering Department of The Federal Polytechnic, Bida, Niger State-Nigeria.

### Other materials

Commercial feed (Vital GCOML) was purchased from an agro-chemical store in Bida town Niger State-Nigeria.

### Preparation of groundnut cake

Groundnut cake was obtained as a by-product of extraction of oil from groundnut (*Arachis hypogaea* L.) through hydraulic pressing method described by Asiedu (1989).

The processing of groundnut into groundnut cake was carried out in the Crop Processing Laboratory of the Agricultural Engineering Department, The Federal Polytechnic Bida, Niger State.

### Salting of groundnut cake

The groundnut cake was salted through addition of 2.5 g table salt (NaCl) to 100 g of groundnut cake.

### Determination of nutritional composition of groundnut

The unsalted groundnut cake was evaluated for its nutritional composition using the methods described by AOAC (1990).

### Experimental procedure

The study was conducted on 40 (ANAK 2000) chicks from a week old. All the chicks were divided into four groups A, B, C and D. Four different experimental rations, F<sub>1</sub>, F<sub>2</sub>, F<sub>3</sub> and F<sub>4</sub> were based on commercial feed, maize husk, rice husk and cowpea pods respectively. The cereal residues were obtained from a local mill in Bida town and the formulation was carried out on 6:4 ratios for grain residue: salted groundnut cake, respectively, at Poultry Section of Zoological Garden of Science Laboratory Technology Department, the Federal Polytechnic Bida, Niger State Nigeria. Each ration F<sub>1</sub>, F<sub>2</sub>, F<sub>3</sub> and F<sub>4</sub> was applied to respective group A, B, C and D for ten weeks from the months of April to June 2006.

### Determination of body temperature and weight

Individual chick was monitored for weekly gain in body weight and weekly body temperature using Triple beam balance (HR 2713 Holland) and a clinical thermometer (0 - 100°C) respectively. Gain in weight was obtained from the relationship given below:

Weekly gain in weight = Final Week Weight – Initial Week Weight

### Cytological examination

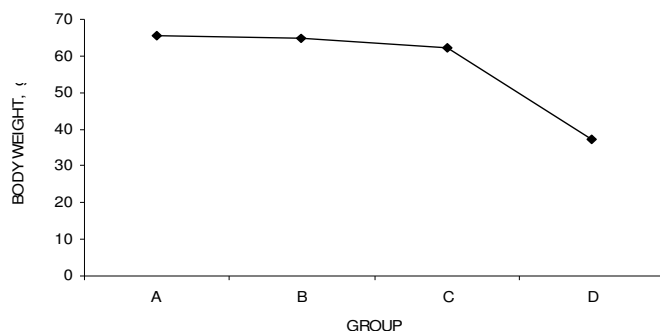
At the end of tenth week, the chicks were sacrificed and dissected for the presence of blood haemorrhage and ulceration in some organs like heart, gizzard, lung and gastrointestinal lining. The presence of blood clot or burst vein was used to determine haemorrhage while deep erosive perforation was used to determine ulceration.

### Statistical analysis

The weekly values obtained for body temperature and gain in weights were subjected to statistical analysis using unpaired t-distribution for test of significance at 95% confidence level of Murray and Larry (1999).

**Table 1.** Composition of experimental rations (%) for ANAK 2000 chicks.

Ingredients/particulars	Groups (%)			
	A	B	C	D
Cereal residue	-	60	60	60
Salted groundnut cake	-	40	40	40
Net energy (kcal/kg)	-	>2530	>2530	>2530
Cost per kg (#)	-	8.00	8.00	8.00

**Figure 1.** Mean values of weekly gain in body weight of ANAK 2000 chicks fed experimental rations. A = Group fed with commercial feed, B = Group fed with maize husk ration, C = Group fed with rice husk ration, D=Group fed with cowpea pods ration.**Table 2.** Nutritional composition of unsalted groundnut cake (per 100 g).

Constituent	Unsalted groundnut cake
Water %	1.7
Energy (joules)	2530
Protein (g)	27.8
Fat (g)	50.2
Carbohydrate (g)	19.4
Fibre (g)	2.8
Ash (g)	4.2
Calcium (mg)	74
Phosphorus (mg)	510.0
Iron (mg)	1.8
Sodium (mg)	3.2
Potassium (mg)	634
Ascorbic acid (mg)	5.2
Thiamine (mg)	1.0
Riboflavin (mg)	0.1
Niacin (mg)	16.2
Vitamin A (mg)	23.4

## RESULTS AND DISCUSSION

The performance of rations comprising of commercial feed and grain residues in ANAK 2000 chicks was observed in forms of weekly body weight gain, body tempera-

ture and cytological implication on some organs. The findings of this study did not reflect poor performance of the rations, no weight loss but weekly weight gain was observed throughout the periods (10 weeks) of the experiment as shown in the mean values obtained from the weekly body weight gain, the mean weight gain of chicks fed with maize husk ration was close in value to the mean weight gain of the chicks that were maintained on commercial feed (Figure 1). No mortality was recorded; the results of the cytological examination of gastrointestinal lining, gizzard, lung and heart did not reveal haemorrhage and ulceration. This may imply that the rations neither possess hemolytic property nor cause loss of appetite in the chicks which may result to chicks' withdrawal from food.

The complete nutrient status of the formulation (Table 1) may be attributed to the salted groundnut cake which nutrition pack shown in Table 2 contains the six classes of food by chemical composition (water, fat, protein, carbohydrate, vitamin and minerals) that are essential in poultry diet as reported by Bolton (1967) with metabolizable energy above 2530 kcal/kg as composed in commercial feed (Table 3). The use of groundnut cake as an important feed component had been documented by Asiedu (1999) and APO (1990). The results revealed that the chicks maintained on the commercial feed had comparative better performance than the grain residues rations. The maize husk ration (F<sub>2</sub>) had better performance than rice husk (F<sub>3</sub>) and beans pod (F<sub>4</sub>) rations. The performance of maize husk ration may be attributed to its nutritive values as documented by Adebawale (1992), who rated the nutritive values of maize husk higher than maize stover and cob and also to the ash, crude protein, energy content and digestibility coefficient of maize residues (Urio, 1981; Biwi, 1986). The colour, aroma and texture of maize husk ration compared favourably with commercial feed, this may also account for high acceptability of maize husk ration by the chicks. The rating of the performance of residues rations in term of body weight gain in this study is in the order maize husk > rice husk > cowpea pods rations. This observation is in accordance with earlier studies on utilization of residues as feed resources. The use of maize husk as feed resource for ruminants in Nigeria was reported by Adebawale (1992). Inclusion of rice husk in goat rations was also reported by Okagbare and Aina (1995). The performance of cowpea pods ration in this study may be attributed solely to the salted groundnut cake in the formulation because the rat-

**Table 3.** Composition of commercial feed (%).

Ingredients/Particulars	Groups (A, %)
Crude protein	19.00
Fat	8.60
Crude fibre	5.40
Calcium	1.20
Phosphorus	0.41
ME (kcal/kg)	2900
Cereals/ grains	NI
Animal protein	NI
Vegetable protein	NI
Antioxidant	NI
Antibiotics	NI
Vitamin pre-mix	NI
Minerals	NI
Salt	NI
Cost per kg (#)	60.00

Key: NI= Not Indicated in the label.

**Table 4.** Weekly gain in body weight of ANAK 2000 chicks fed experimental rations at 95% level of significance

Group	df	Mean	SE	T-calculated	T-tabulated
A-B	18	A=65.59 B=64.70	0.229	2.97	2.10
A-C		C=62.20	0.415	8.16	
A-D		D=37.2	0.312	90.99	
B-C			0.388	6.44	
B-D			0.275	100.00	
C-D			0.388	64.43	

A = Group fed with commercial feed, B = Group fed with maize husk ration, C = Group fed with rice husk ration, D = Group fed with cowpea pods ration, df = degree of freedom and SE = Standard error.

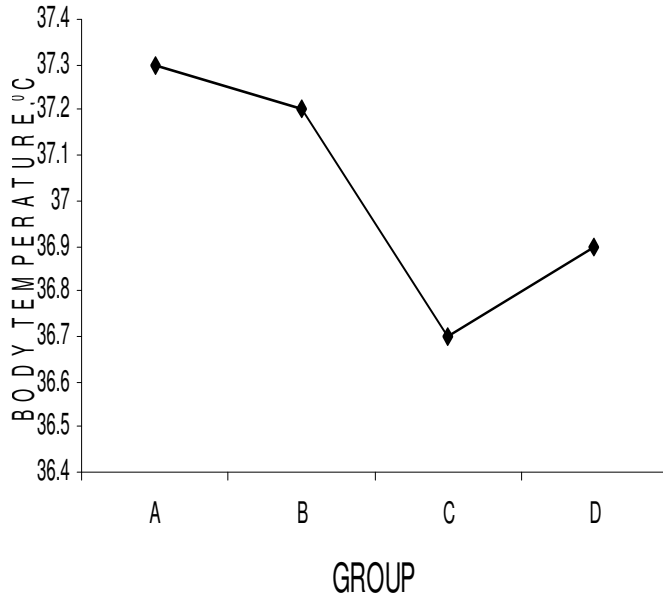
**Table 5.** Weekly body temperature of ANAK 2000 chicks fed experimental rations at 95% level of significance.

Group	df	Mean	SE	T-calculated	T-tabulated
A-B	18	A=37.3 B=37.2	0.367	0.367	2.10
A-C		C=36.7	0.329	1.82	
A-D		D=36.9	0.365	1.10	
B-C			0.246	2.03	
B-D			0.291	1.03	
C-D			0.242	0.83	

ion after formulation had a disgusting aroma that was not appealing and palatable. Major limitations in the use of cowpea residues as feed resources as documented by Tuah (1980) include low digestibilities, deficiency in vitamin A and low levels of crude protein, water and most likely some essential minerals. El-Naga (1986) suggested supplementation of minerals, vitamins and nitrogen as a way of improving feedstuff potential of cowpea residues. Low digestibilities may be due to the anti-nutritional pro-

perty of tannins, tannins precipitate nutritional protein and were found in high amount in cowpea pod (Ademoroti, 1996; Ajiboso and Adejumo, 2003). The high tannins containing property could serve as another major constraint in the use of cowpea pods as a feed resource.

From the results of the statistical analysis in Tables 4 and 5, significant difference was observed between rations effects and weekly weight gain since T-calculated values are greater than T-tabulated value (2.10). But, no



**Figure 2.** Mean values of weekly body temperature of ANAK 2000 chicks fed experimental rations. A = Group fed with commercial feed, B = Group fed with maize husk ration, C = Group fed with rice husk ration, D = Group fed with cowpea pods ration.

significant difference was observed between rations effects and mean temperature of chicks ( $T$ -calculated < 2.10). The findings of this study in term of mean values of weekly body temperatures shown in Figure 2, revealed a comparative high body temperature of 37.3°C in chicks maintained

On commercial feed and least body temperature with mean value 36.7°C in chicks fed on cowpea pods. The mean values of weekly body temperatures of the chicks are above the acceptable temperature range (70 - 90°F) equivalent of 21.1- 32.2°C for brooding chicks as reported by Brian (2006). Reduction in body temperature below this temperature range has negative impact on body weight gain, feed conversion ratio and lower market weights. Birds at cooler brooding temperatures had double the mortality and more than 3 times the amount of ascites (Brian, 2006). The obtained mean temperature values in this study (36.7-37.3°C) are above room temperature (32°C) and are within the region of human body temperature of 36.9°C. This confirms the warm-blooded nature of chicks and also suggests a peculiarity between chicks and man. This peculiarity may be a resemblance in a pre-disposed factor that is genetical. For example, the *Avian influenza* (Bird flu) that recently invaded chicks market in Nigeria was global news. High prevalence of bird flu in epidemiological and demographical wise resulted to mortality and economic depression in northern Nigeria.

Generally, the performance of the formulated rations mostly the maize husk ration was good, the maize husk which is otherwise wasted is hereby recommended for rural poultry farmers as a feed resource for formulation of a least cost ration. Maize husk can also be utilized in the

formulation of feed of viable commercial standard through its rationing with commercial feed.

## REFERENCES

- Adebowale EA (2006). Maize residues as ruminant feed resources in Nigeria. *Word Animal Review*. 73.
- Ademoroti CMA (1996). Tannins. *Environ. Chem. Toxicol.* 1st edn. Foludex, Ibadan. p. 214.
- Ajiboso SOO, Adejumo OI (2003). Investigation and identification of active components in Roselle (*H. sabdariffa* var *sabdariffa*) calyces extracts. *Nig. J. Res. Prod.* 3(2): 202 - 207.
- AOAC (1990). *Official Methods of Analysis 11<sup>th</sup> edn.* Association of Official Analytical Chemists. Washington D.C.
- Asian Productivity Organization (1990). *Animal Feed Resources in Asia and the Pacific.* Report of APO Symposium on Animal Feed Resources pp. 24-29.
- Asiedu JJ (1989). Traditional West African Method of Obtaining Groundnut Oil. *Processing Tropical Crops.* Macmillan Education Ltd, London. pp. 137-138.
- Biwi KM (1986). The Effect of Feeding Sodium Hydroxide 'dip' Treated and Untreated Maize Stover To Lactating Dairy Cattle. M.Sc. Thesis, Sokoine University of Agriculture, Morogoro.
- Bolton JR (1967). Protein Feedstuffs. *Poultry Nutrition.* NAFF / AMSO. London. p. 174.
- Brian D (2006). Effects of Cool Temperatures on Broiler Performance. *Poultry Times*, Monday, October 9.
- Chandra K , Johri PN (1953). Rice Husk As Cattle Feed. *Proc. Indian Sci. Cong. Abstr.* 40: 252.
- Dzowela BH (1987). Efforts to enhance maize stover utilization for small-holder livestock producers in Malawi. In *Proceedings of ARNAB workshop on the Utilization of Agricultural By-Products as Livestock Feeds in Africa.* pp. 27-36.
- Ei-Naga MA (1986). Improvement in nutritional values of straws with supplementation of mineral, vitamins and nitrogen. *ARNAB Newsletter* 6, (1&2). p. 8.
- FMAWR (1988). *Agricultural policy for Nigeria: strategies for implementation.* Lagos, Federal Ministry of Agriculture, Water Resources and Rural Development. pp.18-21.
- Kategile JA (1981). Digestibility of low quality roughages supplemented with concentrates, in the utilization of low quality roughages in Africa, proceedings of workshop held in Arusha, Tanzania. *AUN Agricultural Development Report No. 1 Aas NLH-Norway.*
- Kossila VL (1985). Global review of the potential use of crop residues as animal feed. In *FAO Animal Production and Health* FAO Rome. Paper. 50: 1-13.
- Murray RS, SJ Larry (1999). *Schaum's Outlines Statistics, 3<sup>rd</sup> edn.* Tata McGraw- Hill Publishing Company Ltd. New Delhi. pp. 242-244.
- Okagbare GO, Aina ABJ (1995). Optimum level of inclusion of rice husk in goat rations. *J. Agric. Technol.* 3 (2): 60-64.
- Tuah AK (1980). *FAO corporate document repository on better feeding for improved production.* ILCA Monograph-2 1980 X5536/E.
- Urio NA (1981). Alkali treatment of roughages and energy utilization of treated roughages fed to sheep and goats. Ph.D Thesis, University of Dar es Salaam.