COMPARATIVE EFFECTS OF DIFFERENT CEREAL GRAINS ON GROWTH PERFORMANCE OF BROILER STARTER CHICKENS

G. YISA, J. A. EDACHE, B. KAMSHIWE, B. YARO AND A. OKWECHIME
Federal College of Animal Health and Production Technology,
National Veterinary Research Institute, Vom, Plateau State, Nigeria
Correspondence: amosgyisa@gmail.com

ABSTRACT
This study was designed to compare the effects of different cereal grains on growth performance of broiler starter chickens. In a completely randomized design, 225 ten-day-old Marshall broiler chicks were allotted 5 dietary treatments containing Yellow maize (YM), White maize (WM), Guinea corn (GC), Millet (ML) and Cereal Processing Offal's (CPO) as the main energy contributors. Each treatment comprised of 45 birds made up of 3 replicates of 15 birds. The study lasted for 18 days. Results showed that average daily feed intake (83.54, 79.50, 81.35, 74.82, 62.03g/day), average daily weight gains (38.95, 34.84, 34.89, 27.06, 26.09g/day), feed conversion ratio (2.14, 2.28, 2.33, 2.77, and 2.38) and feed cost per kilogram gain (₦ 237.54, 243.23, 270.97, 241.46 and 183.12) in that order respectively differed significantly ($P<0.05$) between dietary treatments. Birds fed diets containing maize as major source of energy were better than the birds fed the other treatments in growth performance. However, the birds fed diets containing cereal processing offal's were significantly ($P<0.05$) cheaper to raise compared to the other treatments. Therefore, cereal processing offals may be used solely or in combination with maize as major energy source in broiler starter diets for cost effective feeding.

Key words: Comparative effects, cereal grains, broilers.

INTRODUCTION
Cereal grains, of the plant family poaceae, especially maize which form the bulk of energy in poultry feeds (Aduku, 2004; MacDonald *et al.*, 2010; Olomu, 2011) are in short supply as a result of industrial and human needs. This has resulted in competition between humans and animals for available feed resources, and hence high cost of animal production (Chiripasi *et al*, 2013). The most common cereal grains that have been in use for making livestock feed in Nigeria are maize, guinea corn and to a lesser extent millet. Others are rice and wheat which provides mostly bran's and offal's which are fibre sources for animal feeds. Nutritional composition of most cereal grains show that they contain between 55 – 70% Nitrogen Free Extract (NFE), 6 – 12% Crude protein (CP), and 3- 5% fat (Aduku, 2004). The performance of poultry to a large extent depends on the quality of nutritional materials made available to them (Fasanya and Yisa, 1999). One of the factors that have been reported to have significant effect on growth performance of poultry is the ratio of energy to protein in the diet which must be correct for optimum performance (Jagdish, 2005). This ratio, however, is determined by the nutritional composition of the ingredients that provide them. Different sources of energy have been used to feed poultry with satisfactory results (Agbede and Aletor, 1997; Amaefule and Obioha, 2001; Onu and Okongwu, 2006; Yisa, *et al.*, 2010). However, the cost of making animal feed has remained relatively high due to the market prices of these grains which differ from place to place due to geographical location and ecological factors that favour or do not favour production of certain crops. The nutritional composition of seeds is also determined by cultivar, geographical location soil type and manurial treatment the plant may have received (Bolton and Blair, 1986) and therefore, the effects of different species of seeds on performance of livestock may not be the same.

Cereal grains used in making poultry feed are processed mostly by grinding. The by-products which contain most of the outer covering and germ are normally swept away or gathered and given to scavenging poultry or pigs. Recently, local millers are beginning to have requests for these wastes which they gather and sell to interested persons for a token. The inclusion of such a product will help to reduce the cost of feed production, feeding and consequently, the

cost of raising the bird. This study was therefore, designed to compare the effects of different cereal grains and their by-products on growth performance of broiler starters

MATERIALS AND METHODS

Location

The study was conducted at the poultry unit of the Federal College of Animal Health and Production Technology, National Veterinary Research Institute, Vom, in Plateau State.

Source of Cereal Grains and Cereal processing Offals.

The cereal grains and cereal processing offals were obtained from a local market and a cereal grain miller in Bukuru, Jos south Local Government Area of plateau State., Nigeria.

Experimental design, birds and diets

Two hundred and twenty five (225) ten-day-old Marshal Broiler chickens were divided into five (5) groups of forty five (45) birds. Each group was further divided into 3 replicates of 15 birds in a completely randomized design. Each replicate of the birds were kept in deep litter pens measuring 1.2 × 2.5m equipped with feeders, drinkers and wood shavings as bedding material. All routine healthcare practices of sanitation and vaccination were observed. The 5 groups were then allotted to and fed 5 different diets containing Yellow Maize (YM), White Maize (WM), Guinea Corn (GC), Millet (ML) and Cereal Processing Offals (CPO) as the major sources of energy in the diets (Table 1). The diets were fed to the birds for duration of eighteen days. Growth performance parameters measured were average initial weights, final weights, feed intake, weight gain, feed conversion ratio (FCR) and feed cost per kilogram gained per bird.

Data analysis: Data collected were subjected to analysis of variance (ANOVA) using SPSS statistical package version 16 (SPSS, 2007). Where applicable, differences between the means were separated using Least Significant Difference (LSD) in the same package.

RESULTS AND DISCUSSION

Considering the performance of the birds in this study (Table 2), the average initial weights of the birds were not significantly different ($P>0.05$), However, their weights at four (4) weeks of age differed significantly ($P<0.05$) between treatments. The average final weights of these birds at 4 weeks of age compare favourably with the weights of between 800 to 920g for broilers of the same age reported by Akinmoladun *et al* (2015) when they fed broilers varying energy levels using maize as the main energy source. The birds fed diets containing yellow maize performed significantly better than the other treatments in terms of weight gain. The yellow maize which is being preferred over other cereal grains for poultry feeding is said to be rich in protein and beta carotene; a precursor of vitamin A (Dakare *et al*., 2014)The feed conversion ratio values and feed cost per kg gain were also better in birds fed diets containing maize compared to the others. These FCR values do not favourably compare with optimum levels of between 1.8 to 2.0 for broilers stated by Mandal *et al* (2004) or Afolayan *et al* (2014). The birds that were fed diets having cereal processing offal as the main energy source were the least expensive to raise. This was because the price of the offal's (less than ₦ 30 per kg) is less than those of the grains Maize (₦ 68), Guinea corn and Millet (₦ 100/kg). The feed cost per kilogram gain of the birds in this study, also compare well with the ₦ 341.55 for optimum energy levels for starter broilers reported by Akinmoladun *et al* (2015). These values are however, higher than the range of 57.91 to 87.71 Naira reported by Afolayan *et al* (2014) who fed graded levels of sweet potato meal to broiler starters in comparison to maize.

CONCLUSION AND RECOMMENDATION

The results obtained from this study showed that broiler chickens fed diets having yellow maize as their main energy source produced the best results on terms of rate of body weight gain compared to white maize, guinea corn, millet and cereal processing offal's. Those fed diets with white maize also performed better compared to the other energy sources. Thus maize in general produced the best results. However, since the cereal processing offal's were obtained at a much lower cost and it costs less to obtain a unit of weight gain with the offal, we recommend that cereal processing offal's may be used as a source of energy for broiler chickens for cost effective feeding .

REFERENCES

Aduku, A. O. (2004). Animal Nutrition in the Tropics. Feeds and Feeding, Pasture Management, Monogastric and Ruminant Nutrition. Typeset by Davcon Computers and Business Bureau. 11 Baptist Church Road, Samaru, Zaria, Kaduna State.

Afolayan, S. B., Dafwang, I. I., Tegbe, T. S. B., Sekoni, A. and Jegede, J. O. (2014). Performance of broiler chickens fed maize-based diets substituted with graded levels of sweet potato meal. *Nigerian Journal of Animal Production.* 41 (1): 50 - 59

Agbede, J.O. and Aletor, V.A. (1997). The performance, nutrient utilization and cost implications of feeding broiler finishers conventional or under-utilized feed resources. *Applied Tropical Agriculture* **12**(2) 57-62.

Akinmoladun, O. F., Onibi, G. E. and Lomuwagun, A. T. (2015). Performance and economics of production of broiler chicks fed diets of varying energy levels. Proceedings of 40th Conference of Nigerian Society for Animal Production, 15th – 19th March, NAPRI/ABU Zaria. Pp 399 - 402

Amaefule, K. U. and Obioha, F. C. (2001). "Performance and nutrient utilization of broiler starters fed diets containing raw, boiled or dehulled pigeon pea seeds. *Nigerian Journal of Animal Production.* **28** (1): 31 – 39.

Bolton, W. and Blair, R. (1986). **Poultry Nutrition.** Ministry of Agriculture, Fisheries and Food. Reference Book 147. London, UK.

Chiripasi, S.C., Moreki, J.C., Nsoso, S.J. and Letso, M. (2013). Effect of Feeding Yellow Maize, White Sorghum and Pearl Millet as Energy Sources on Mineral Intake, Retention and Utilisation by Guinea Fowl Under Intensive Management System. *ARPN Journal of Science and Technology,* **3**(1):124-137.

Dakare, M. A., Ameh, D. A., Agbaji, A. S. and Atawodi, S. E. (2014). Chemical Composition and Antinutrient Contents of Yellow Maize, Raw and Processed Composite Mango (*Mangifera indica*) Seed Kernel from Zaria, Kaduna State Nigeria. *International Journal of Advanced Research,* 2 (7): 90-97. ISSN 2320-5407

Fasanya, O. O. A. and Yisa, A. G. (1999). Carcass evaluation of rabbits fed a mixture of concentrate and *Ipomea batatas* during a 12 - week study period. Proceedings of 36th Annual Conference of the Nigerian Veterinary Medical Association, Arewa House, Kaduna. 25th-29th October.

Jagdish, P. (2005). Poultry Production and Management. Second Revised Edition. Kilyani Publishers, New Delhi. 110 002.

MacDonald, P., Edwards, R. A., Greenhalgh, J. F. D., Morgan, C. A., Sinclair, L. A. and Wilkinson, R. G. (2010). Animal Nutrition. Seventh Edition. Prentice Hall, Imprint of Pearson. London.

Mandal, A.B., Yadav, A.S., Johri, T.S. and Pathak, N.N. (2004). Nutrition and Disease Management of Poultry. First Edition. International Book Distributing Company. Charbagh, Lucknow 226004 u.p. (INDIA).

Olomu, J. M. (2011). Monogastric Animal Nutrition. Principles and Practice. Jachem Publication. Nigeria.

Onu, P. N. and Okongwu, S. N. (2006). Performance characteristics and nutrient utilization of starter boilers fed raw and processed pigeon pea (*Cajanus cajan*) seed meal. *International Journal of Poultry Science* **5** (7): 693-697. Asian Network for Scientic Information.

SPSS (2007). Statistical Package for Social Sciences. Pc Version 16. SPSS Inc. 444 N. Michigan Avenue Chicago, United States of America.

Yisa, A. G., Diarra, S. S., Edache, J. A. and Bogoro, S. E. (2010). Utilization of Differently Processed Pigeon Pea (*Cajanus cajan* L. Millsp) Seed Meal by Broilers. *Nigerian Journal of Experimental and Applied Biology* **11** (1): 69 – 78.

Table 1. Percent ingredient composition of broiler starter diets containing different cereal grains

Ingredients	Cereal energy sources and offals				
	YM	WM	GC	ML	CPO
Yellow Maize	51.45	0.00	0.00	0.00	0.00
White Maize	0.00	51.45	0.00	0.00	0.00
Guinea Corn	0.00	0.00	54.67	0.00	0.00
Millet	0.00	0.00	0.00	54.00	0.00
C P O	0.00	0.00	0.00	0.00	53.15
Wheat offal	7.72	7.72	0.00	0.00	0.00
Rice bran	5.15	5.15	0.00	0.00	0.00
Soya bean cake	30.88	30.88	26.86	27.70	28.77
Fish meal	1.50	1.50	1.50	1.50	1.50
Bone meal	1.50	1.50	1.50	1.50	1.50
Limestone	1.00	1.00	1.00	1.00	1.00
Salt	0.25	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25	0.25
Lysine	0.10	0.10	0.10	0.10	0.10
Methionine	0.20	0.20	0.20	0.20	0.20
Total	100.00	100.00	100.00	100.00	100.00
Calculated composition					
Crude protein	21.01	21.01	21.01	21.01	21.01
M E (kcal/kg)	2898.15	2898.15	2882.89	2879.54	2778.03

C P O = Cereal Processing Offals M E = Metabolizable Energy

Table 2. Performance parameters of broiler starter chickens fed different energy sources

Parameter	Cereal energy sources and offals					
	YM	WM	GC	ML	CPO	SEM
Av initial weight (g)	113.33	107.78	112.22	111.35	113.10	1.81NS
Av final weight (g)	814.44^{a}	735.56^{b}	740.21^{b}	598.73^{c}	582.78^{c}	24.69*
Av Daily feed intake (g)	83.54^{a}	79.50^{b}	81.35^{b}	74.82^{c}	62.03^{d}	2.10*
Av Daily Weight gain (g)	38.95^{a}	34.84^{b}	34.89^{b}	27.06^{c}	26.09^{c}	1.38*
Feed Conversion Ratio	2.14^{a}	2.28^{ab}	2.33^{b}	2.77^{c}	2.38^{b}	0.60*
Feed Cost/Kg gain (₦)	237.59^{a}	243.23^{a}	270.97^{a}	241.46^{a}	183.12^{b}	10.51*

^{a,b,c,d} Means in the same row bearing different superscripts are significantly different ($p<0.05$).

NS = Not Significant ($p>0.05$) *= Significant ($p<0.05$)

WM = White Maize, YM = Yellow Maize, GC = Guinea corn, ML = Millet, CPO = Cereal Processing Offals