IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)
e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 11, Issue 9 Ver. II (September 2018), PP 07-10
www.iosrjournals.org

Effect of Levels of Sand Grit in Diet on Nutrient Digestibility, Internal Organs Parameters and GIT Relative Length of Broiler Chicken

Agidi, C.N., Carew, S.N and Abang, F.B.
Department of Animal Production, University of Agrculture, Makurdi. Nigeria.
Corresponding Author: Agidi, C.N

Abstract: *The study was designed to evaluate the effect of sand grit inclusion on nutrient digestibility, internal organs parameters and GIT relative length of finisher broiler chicken fed high fiber diet. It was conducted on the backdrop of sourcing for alternative feed ingredient and that sand grit will aid the digestion of high fiber diet by finisher broiler chicken. Fiber level was deliberately boosted in the diet of broiler chicken by incorporating rice offal at 15% level. Sand grit of sizes 0.5mm to 1.00mm in diameter was added to the diet. There were five (5) dietary treatments in which sand grit was added at graded levels of 0%(T1), 0%(T2), 1.5%(T3), 2.0%(T4) and 2.5%(T5) and rice offal included at levels of 0%(T1) and 15% each for T2 to T5, in a completely randomized experiment. Two hundred brooded broiler chicks were used for the feeding trial which lasted for 35 days. Each treatment was replicated four (4) times and each replicate contain ten (10) birds. The birds on the control treatment had higher dry matter retained than those fed T2, while the experimental units that received sand grit in diet (T3 to T5) had higher dry matter retained than either T1 or T2 birds. This trend was maintained for the digestibility of individual nutrients such as crude protein, crude fiber, and most other nutrients considered, with the experimental unit that received 1.5% (T3) grit diet showing better digestibility for all the nutrients. The birds fed T4 and T5 diets recorded significantly ($p<0.05$) lower gall bladder weight than the rest treatment groups. The proventriculus, the GIT, small intestine and large intestine, all recorded higher relative weight at 2.0% sand grit level and above. Also the experimental units that received sand grit in diet (T3, T4, and T5), recorded significantly ($p<0.05$) higher relative length of large intestine than the rest treatment groups. It was concluded that adding sand grit in the diet of finisher broiler chicken aided in degrading fibrous materials in the diet, exerts extra demand for the content of the gall bladder and created digestive pressure on the proventriculus, water retention in the large intestine and heavier GIT at 2.0% inclusion level and above.*
Key words: *Grit, Rice offal, Fiber, Birds, GIT.*

Date of Submission: 02-09-2018 Date of acceptance: 18-09-2018

I. Introduction

The need to boost animal protein production to meet the demand of the ever growing human population of developing countries cannot be over-emphasized. The domestic fowl is a popular protein source supplying both chicken meat and egg and because of its short generation interval, has the potential to bridge the gap between the demand and supply of animal protein in developing countries. According to Oluyemi and Roberts (2000)[8], broiler chicken can attain a market weight of 1.6kg to 2kg at 6 to 8 weeks with a feed conversion ratio of 2:1.

The world is suffering from acute shortage of livestock feed ingredients, mostly cereals, because of rapid increase in human population and the competition for these feedstuffs between the livestock and the increased human population and industrial processors. Uko and Kamalu (2003)[11] reported that feed cost commands up to 80% of the total cost of production of farm animals and has been estimated to account for over 70% of the cost of raising commercial poultry. The rise in cost of these feedstuffs make poultry products expensive and beyond the reach of the masses, especially in developing countries of the world. This has greatly reduced the rate of expansion of poultry industry in some third world countries.

In other to arrest this trend, emphasis has been directed towards the use of economical and efficient feedstuffs such as agro-byproducts which include rice offal, palm kernel cake, brewer dry grain amongst others. This allow for savings in the feed cost without reducing the nutrient value of the ration. Agro-wastes such as rice offal are relatively cheap, it is waste constituting disposal problems at agro processing plants. Rice offal, like many other agro-byproducts is highly fibrous, containing about 30.39% crude fiber (Maikano, A. 2007)[6].This makes its use as feed ingredient very challenging especially for monogastric animals. Most simple stomach animals, such as chickens, unlike their ruminants counterparts, are not naturally equipped with the

ability to digest high fiber diets (Gallinga *et al.*,2004)[3]. Chickens ; being birds, have an organ in their digestive system called the gizzard, which is analogous to teeth in other animals. The gizzard makes use of grits to grind larger particles, reducing them to smaller particles: thereby increasing their surface area for the action of digestive juices (Solomon *et al.,* 2002)[9]. It was on this premise that sand grit is being proposed for incorporation in the feed of the boiler chicken to aid the grinding function the gizzard. The study was conducted with the assumption that the feeding of sand grits will help breakdown the crude fiber in rice offal and improve its utilization by broiler chicken.

II. Materials And Method

Rice offal was collected from local rice mills while sand grits on the other hand was collected from river banks. Sieve of 0.5 to 1.0mm in diameter was used to adjust sand grain sizes to 0.5 to 1.0mm diameter used for the finisher diet. On analysis the rice offal contain: Dry matter 94.42%, Crude protein 5.09%, Crude fiber 30.39%, Crude fat 3.40%, Ash 16.67% and 1184kcal/kg M. E.

A total of 200 birds were used for the study that lasted for 35 days (finisher phase only). Chicks were randomly allocated to 5 dietary treatments. Each treatment has 4 replicates of 10 experimental birds. The experimental birds were fed 4 levels of sand grits (0, 1.5%, 2.0%, 2.5%) and 2 levels of rice offal (0%, 15%). The experimental diets and water were given adilibitum throughout the experimental period. A completely randomized design was used. Anti-stress, vitamins and antibiotics were given as required. The common vaccines were given as required. At a week to the end of the feeding trial, nutrient retention (digestibility) trial was conducted using the total fecal collection method. All proximate analysis was conducted following the procedure designed by A. O. A. C (1990)[2]. Duncan's Multiple Range Test at 5% level of significance was used to separate the means where there were significant differences. Statistical Package for the Social Sciences (SPSS) version 16.0 computer soft ware (2006)[10] was used for the statistical analysis.

The proximate composition of experimental diet is presented in Table 1.

III. Result

Digestibility of feed and nutrients by finisher broiler chicken is presented in Table2. There was significant ($p<0.05$) difference in the digestibility of nutrients by the addition of sand grit in the diet of finisher broiler chicken. Only the digestibility of nitrogen free extract and ether extract did not show significant ($p>0.05$) difference among treatment groups. The digestibility of dry matter was higher among birds fed control (T1) diet than the ones fed T2 diet, the experimental units fed sand grit diet recorded higher dry mater digestibility than either T1 or T2 birds. This trend was maintained for the digestibility of specific nutrients such as crude protein and crude fiber. Most of the nutrients considered had their highest digestibility recorded among the experimental unit fed 1.5% sand grit level.

The internal organ parameters of finisher broiler chicken is presented in Table 3 while that of GIT relative length is presented in Table 4.

The relative weight of the gall bladder was lower among experimental units that received sand grit in diet. The proventriculus, GIT, small intestine and the large intestine, all recorded higher relative weight among experimental units that had sand grit 2.0% level and above in the diet. The relative length of the large intestine was higher among birds that received sand grit in the diet.

IV. Discussion:

The effect of the higher fiber level in T2 than T1 was the reason the birds fed T1 diet had higher dry matter digestibility than the ones that received T2 diet. Nwokolo *et al,* (1985)[7] and Isikwenu *et al,* (2005)[5] separately reported that fiber level has negative effect on protein and amino acid digestibility, that is , the higher the dietary fiber, the more its negative effect on nutrient digestibility. Also, Abeke *et al,* (2008)[1], reported that fibrous feed stuff speeds up the rate of movement of ingesta through the gut of simple stomach animals, thereby not allowing sufficient residence time for ingested feed to get digested and absorbed into the system. But the incorporation of sand grit in the test diets appear to reverse all these established trends, since dry matter digestibility was higher among experimental units that received sand grit in diet than those that received either T1 or T2 diets. This trend was maintained for the digestibility of crude protein, crude fiber and most other nutrients in the diet. This is in agreement with Idachaba *et al.*,(2013)[4], who reported that adding grit to the feed of poultry birds aids the breakdown of feed materials by the gizzard.

There was extra demand for the content of the gall bladder through negative feedback mechanism initiated by the presence of sand grit in the diet of finisher boiler chicken. This is the reason the relative weight of gall bladder was lower among experimental units that had sand grits in the diet. The presence of sand grit at 2.0% level and above in diet exerted digestive pressure on the proventriculus and this is the reason the relative weight of the proventriculus is higher among T4 and T5 birds. Feed materials are stored temporarily in the proventriculus before getting to the gizzard and during the process of churning by the gizzard to bring the feed

materials to an easily digestible mass, the feed materials can be passed from the gizzard to the prventriculus and back to the gizzard before moving unto the small intestine when properly churned. This movement of the feed materials caused extra digestive pressure on the proventriculus among experimental units that received sand grit up to 2.0% and above. There was heavier GIT among experimental units that received sand grit up to 2.0% and above in diet, and that was the reason the eviscerated weight was lower among experimental units fed T4 and T5 diets because the relative weight of the GIT, small intestine and large intestine were all higher among T4 and T5 birds (Table 3). The heavier GIT was caused by the presence of some quantities of sand on the verge of being excreted. Solomon *et al,* (2002)[9], reported that grits become smaller and roundish after some time in the gizzard and when they could no longer perform their function are usually excreted. This therefore caused higher weight of these organs among birds that received higher percentage of sand in diet.

Water retention occurred in the large intestine; the site for water re-absorption in the body, among birds that were fed sand grit in diet. This was why there was elongation of the large intestine of birds fed T3, T4 and T5 diets. The elongation occurred to free the water molecules for re-absorption process.

Conflict: No conflict of interest.

References

[1]. Abeke, F.O., Ogundipe, S.O., Sekoni, A.A., Dafwang, I.I., and Adeyinka, I.A (2008). Effect of dietary levels of cooked lab purpurues beans on the performance of broiler chickens. *American Journal of Food Technology.* 3(1):42-49.

[2]. AOAC (1990). Association of Official Analytical Chemists. Official method of analysis (15th edition). Vol.1, Arlington, Virginia, USA.

[3]. Gallinger, C.I., Suarez D.M., and Irazusta, A. (2004). Effects of rice bran inclusion on performance and bone mineralization in broiler chicks. *Journal of Applied Poultry Research*. 13: 183-19.

[4]. Idachaba, C., Abeke,F., Olugbemi, T. and Ademu, A. (2013b). Influence of granite grit on nutrient digestibility and homological parameters of broiler chicken fed rice offal based diets. *Pakistan Journal of Biological Sciences.* 16:106-1064.

[5]. Isikwenu, J.O., Omeje, S.I., and Okagbare, G.O. (2005). Improving the nutritive value of brewer's dried grain by urea treatment and fermentation. Proceedings: *1st Nigeria International Poultry Summit*. 20-25 Feb, 2005. Ogun state. Nigeria.

[6]. Maikano, A. (2007). Utilization of rice offal in practical ration of broilers. *The Zoologist*. 5;Pp 1-7.

[7]. Nwokolo, E.N., Akapunani, A. and Ogunjimi, J (1985). Effects of varying levels of dietary fibre on mineral availability in poultry diets. *Nigerian Journal of Animal Production*. 12:1-2.

[8]. Oluyemi, J.A and Roberts, F.A. (2000). "Nutrient requirement of fowl". In: *Poultry production in warm weather climates* (3rd Ed). MacMillan Press Lond. Pp.1-140.

[9]. Solomon, E.P., Berg L.P., and Martin, D. W. (2002). *Biology Sixth Edition.* Thomson Learning Inc., Austria, Canada,Mexico, Singapore, Spain, United Kingdom, United States. Pp.664

[10]. SPSS (1999). Statistical package for social sciences. Procedures and facilities for release. 6.0 User's Manual. McGraw-Hill Book Co.NY.

[11]. Uko,J. O. and kamalu, T.N (2003).Studies on feeding value of Neem seed kernel (Azadirachtaindica) in poultry meat production. Ph.*D, Thesis Department of Veterinary Physiology/ Pharmacology.* University of Nigeria. Nigeri

Table 1: Proximate composition of finisher broiler diet (%)

Parameter	Diets/Treatments				
	T1 (0/0%)	T2(0/15%)	T3 (1.5/15%)	T4 (2.0/15%)	T5 (2.5/15%)
Crude Protein(%)	21.49	20.14	21.75	20.42	20.35
Crude Fiber(%)	3.50	9.90	8.96	8.95	8.93
Crude Fat(%)	7.72	7.25	7.12	7.02	7.00
NFE(%)	42.66	41.18	39.61	39.13	38.75
Ash(%)	9.18	7.20	7.39	9.40	9.90
Moisture(%)	15.45	15.25	15.18	15.08	15.07
M.E (kcal/kg)	2894.61	2880.12	2853.32	2828.89	2810.18

M.E= Metabolizable energy, NFE= Nitrogen free extract. (X/Y%) X%sand grit/Y%rice offal,
Metabolizabe energy calculated from the determined proximate composition using the formular:
*M.E = 37 (% CP) + 81.8 (% EE) + 35.5 (% NFE) (Pauzenga, 1985).

Table2: Effect of dietary levels of sand grit on the digestibility of feed and nutrients by broiler Chickens.

Parameter	Diets						
	T1 (0/0%)	T2(0/15%)	T3 (1.5/15%)	T4 (2.0/15%)	T5 (2.5/15%)	SEM	P
Dry matter	67.50^{b}	65.42^{c}	73.30^{a}	67.15^{b}	70.50^{ab}	0.74	0.02
Crude protein	71.07^{b}	63.82^{c}	76.84^{a}	74.51^{ab}	75.17^{ab}	0.69	0.00
Crude fiber	65.37^{bc}	60.76^{c}	72.43^{a}	66.31^{bc}	68.04^{b}	0.84	0.00
Ether extract	76.70	67.74	77.92	68.94	76.54	0.99	1.00
Ash	62.99^{bc}	63.56^{b}	75.47^{a}	60.55^{c}	69.83^{ab}	1.00	0.03
Nitrogen free extract	60.94	63.21	69.99	65.05	65.78	0.94	1.00

(X/Y%) X% sand grit / Y% rice offal, ^{a,b,c} means on the same row with different superscripts are significantly different ($p<0.05$).

Table3: Effects of dietary levels of sand grit on internal organs parameter of finisher broiler chicken

Parameter	Diets						
	T1 (0/0%)	T2(0/15%)	T3 (1.5/15%)	T4 (2.0/15%)	T5 (2.5/15%)	SEM	P
Heart	1.07	1.11	1.16	1.00	1.10	0.05	0.80
Lungs	0.87^{ab}	1.07^{a}	0.88^{ab}	0.95^{a}	0.67^{b}	0.05	0.03
Gall bladder	0.88^{a}	0.88^{a}	0.60^{c}	0.72^{b}	0.67^{bc}	0.04	0.03
Liver	2.92	2.48	2.59	2.61	2.75	0.09	0.40
Full gizzard	5.41	5.40	4.78	5.31	5.38	0.31	0.44
Empty gizzard	3.08	3.00	2.63	2.80	2.77	0.11	0.21
Proventriculus	1.62^{b}	1.56^{b}	1.36^{b}	2.08^{a}	2.36^{a}	0.13	0.00
GIT	8.07^{ab}	7.36^{b}	7.36^{b}	9.36^{a}	9.19^{a}	0.32	0.01
Small intestine	5.76^{b}	5.74^{b}	5.64^{b}	7.38^{a}	6.79^{ab}	0.27	0.02
Large intestine	0.87^{b}	0.72^{bc}	0.59^{c}	0.88^{ab}	1.10^{a}	0.73	0.00
Caeca	1.38	1.19	1.33	1.09	1.10	0.90	0.68

(X/Y%) X% sand grit / Y% rice offal, ^{a,b,c} means on the same row with different superscripts are significantly different ($p<0.05$).

Table4: Effect of dietary levels of sand grit on the GIT relative length of broiler chicken

Parameter	Diets						
	T1 (0/0%)	T2(0/15%)	T3 (1.5/15%)	T4 (2.0/15%)	T5 (2.5/15%)	SEM	P
GIT(cm)	172.75	171.00	180.00	190.00	183.50	0.30	0.30
Small Intestine	82.89	81.12	81.68	78.98	81.78	0.06	0.06
Large Intestine	4.89^{b}	4.96^{b}	5.69^{ab}	8.35^{a}	5.31^{ab}	0.01	0.01
Caeca	12.34	13.91	12.61	13.65	12.59	0.48	0.48

(X/Y%) X% sand grit / Y% rice offal, ^{a,b,c} means on the same row with different superscripts are significantly different ($p<0.05$).

Agidi, C.N". Effect of Levels of Sand Grit in Diet on Nutrient Digestibility, Internal Organs Parameters and GIT Relative Length of Broiler Chicken." IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS) 11.9 (2018): 07-10.