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Performance and haematology of broiler starter fed acha (*Digitaria exilis staph*) grains as replacement for maize

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Abstract

An experiment was conducted to investigate the replacement value of Acha (Digitaria exilis Staph) for maize in broilers diets. Five diets were formulated in which unprocessed Acha replaced maize at 0, 25, 50, 75, and 100% levels for the starter phase. Two hundred and twenty-five unsexed Marshall Broiler chicks were weighed and randomly allotted to the five dietary treatments with three replicates per diet in a complete randomized design (CRD). The highest (P<0.05) daily feed intake (71.,90g) and (P<0.05) daily weight gain (24.60g) were obtained in the birds fed diet 5 while the best feed conversion ratio was found in diet 2 as 2.55. Hematological evaluation was done at the end of the experiment and, the dietary treatments had no significant (P>0.5) effect on RBC (x10^{2}L, WBC (x10^{9}K Hbc (g/dl) MCH (pg) and MCHC (g/dl) and had significant (P<0.05) effect on PCV%, Lymphocytes (P<0.001) and Neutrophiles (%). Unprocessed Acha (Digitaria exilis Staph) could completely (100%) replace maize as energy source in the diets of broiler chicks at starter phase.

Keywords: Performance, hematological characteristics, unprocessed Acha (Digitaria exilis Staph), broiler chicks

Introduction

The poultry business in Nigeria is one of the popular and fast flourishing segment (Heise *et al*., 2015), gaining popularity amongst developing countries because of its function in bridging the protein malnutrition and economic empowerment of the producers (*Gebremedhn, 2015)*. Broiler chickens production is one of the most important and promising sector in poultry industry in Nigeria that has quick return on investment as this contribute to the economic growth of the nation.

Poultry feed composed of 60-65% energy, 30-35% protein and 2-8% minerals source as reported by Oladokun and Johnson (2012) to maximize live bird profitability and to minimize feed cost per kg live weight (NRC, 1994) is confronted by high cost of feeds, poor quality of day old chicks, poor transportation network, medications and labor (Mgbakor and Nzeadachie, 2013). However, maize which is the major source of energy in poultry feeds which constitutes about 60% in poultry diet (Obun and Abia, 2003) is affected by rapid increased in human population and mass migration from rural to urban areas that contributed low production of maize thereby build up competition between man and livestock for maize that resulted in high cost of feeds and consequently high prices of poultry products leading to very low levels of protein intake in most developing countries like Nigeria (Taiwo *et al.* 2005). But, Ukim and Obun (2015) reported Acha as a good source of protein and energy in poultry diet. "Acha"(*Digitaria exilis*) one of the oldest cereals and African lost crops tolerant to drought and poor soil (NAS, 1996), is rich in methionine and cysteine, the limiting amino acids of most cereals and has lower fibre content than the values for sorghum and maize (Chukwu and Abdul-kadir, 2008).

Blood helps in the transportation of nutrients, metabolic waste, gases and other materials to other parts of the body.

Evaluation of blood parameters served as pointer for nutritionist, pathologist and physiologist to determine animals well fare because of it dynamic nature. Blood acts as a reflector of the status of animals exposed to diseases and other conditions (Olafedehan, *et al*., 2010). Haematological profile both in human and in animal sciences is an important index of the physiological state of the individual. The blood of the domestic fowl contains erythrocytes, thrombocytes, non-granular leukocytes and granular leukocytes, suspended in plasma (Maxwell *et al*., 1979).

With the potential embedded in acha (*Digitaria exilis* Staph), this study was designed to evaluate the performance and hematological characteristics of diets containing graded levels of acha (*Digitaria exilis* Staph) as replacement for maize in broiler chickens at starter phase.

Materials and methods

Acha *(Digitaria exilis staph)* a stable crop was cultivated in Mushere chiefdom of Bokkos Local Government area of Plateau State. Sun dried raw acha grains after harvesting was milled and used to formulate five iso-nitrogenous broiler starter diets to replaced maize at 0, 25, 50, 75 and 100% levels designated as diet 1, 2, 3, 4, and 5 respectively. The dietary treatments are presented in Table 1.

Table 1: Percentage Composition of Broiler Starter (1-5weeks) diets

	% level of Replacement of maize by Acha				
Ingredients	**0**	**25**	**50**	**75**	**100**
Yellow maize	45	33.75	22.5	11.25	0
Acha	0	11.25	22.5	33.75	45
Soya bean (full fat)	39	39	39	39	39
Wheat offal	5	5	5	5	5
Fish meal	7.8	7.8	7.9	7.8	7.8
Bone meal	2.5	2.5	2.5	2.5	2.5
Salt	0.25	0.25	0.25	0.25	0.25
Vit/premix	0.25	0.25	0.25	0.25	0.25
Lysine	0.10	0.10	0.10	0.10	0.10
Methionine	0.10	0.10	0.10	0.10	0.10
Total	**100**	**100**	**100**	**100**	**100**
Calculated analysis					
ME (Kcal/kg)	2776	2764	2758	2745	2738
Crude protein %	23.52	23.28	23.08	22.82	22.62
Crude fibre%	3.88	3.86	3.95	4.03	4.13
Calcium%	0.85	0.92	0.99	0.99	1.1
Total p%	0.55	0.55	0.56	0.56	0.56
Lysine %	1.44	1.41	1.42	1.35	1.32
Methtonine %	0.48	0.46	0.43	0.41	0.38
Cystene	0.34	0.32	0.30	0.29	0.27
Met + cys	0.82	0.78	0.73	0.70	0.65

Premix used biomix. Each kg of premix contained the following ingredients.

Vit A. I.U 5,000,000:00 Pantothenic acid (mg) 4,000; Vit. D3 I.U 1,000,000 Biotin (mg), 32 Vit E(mg) 20,000 Vit B12 (mg), 10Vit, k3 (mg) 1,000 folic acid (mg), 4,00 Vit. B1 (mg) 1,200 Choline Chloride (mg), 1,20,00 Vit B2 (mg) 2,400 manganese (mg), 40,00 Vit. B6 (mg2,4000 Iron, (mg), 20,000 Niacin (mg) 16,000 Copper (mg) 800 Cobalt (mg) 100 Iodine, (mg) 620 Selenium, (mg), 40.

Two hundred and fifty-five (255) Marshall Broiler chicks were obtained from Zartech Farm, Jos, Plateau State. The birds were brooded for one week to supports their health, survival and prevention from being exposed to draft which could result in wind chill. Thereafter, they were allocated on equal number basis and replicated three times in a completely randomized design. The birds were weighed weekly. Feed intake and weight gain were determined. Feed and water were provided *ad libitum.*

At the end of the starter phase (5 weeks) 5mls of blood samples were collected from two birds from each replicate into bijou bottles treated with EDTA to prevent blood clothing for the evaluation of the following hematological indices*:* red blood cells (RBC), total white blood cells (WBC), packed cell volume (PCV), haemoglobin concentration (Hb), mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC), neutrophil and lymphocyte. *The blood samples were analyzed at Central* Diagnostic Laboratory of National Veterinary Research institute Vom, Plateau state, Nigeria.

Experimental data collected were subjected to analysis of variance (ANOVA) using Statistical package for Social Science SPSS (2010). Where treatments means were significantly different, they were separated using Duncan's Multiple Range Test of SPSS (2010).

Results and discussion

The result of the performance of the chicks is summarized in Table 2. Though, treatment 2 to 4 are statistically similar, the feed intake increased with increasing level of Acha inclusion from 58.00g to 71.90g (100% Acha) the need for energy could be the cause for this trend, which is in line with the work of Osuji (1982) that broiler chickens tend to eat more to maintain their energy levels. The daily weight gain of the birds at the starter phase ranged from 21.8g to 24.60g. The highest value was observed in diet 5 (100% Acha) as 24.60g. The daily weight gain has the same trend of significant differences with daily feed intake. This agrees with the reports of Ukim *et al.* (2012). The result indicates that acha can be used to replace maize as an energy source without any deleterious effect on the birds. This result agrees with the findings of Jideani and Akingbola (1993) that the starch in maize is similar to that in acha and could be used interchangeably. Higher body weight in 100% acha replacement could be due to high amino acid profile such as methionine and cysteine that stimulate better growth response compare to maize-based diet. Another reason for higher body weight gain is low fibre content of acha compared to maize and sorghum (Chukwu and Abdul-kadir, 2008).

No mortality was observed in the starter phase, indicating that even at younger age, the broiler chickens had no problem with the feed.

Table 2: Performance of broiler chicks fed diets containing Acha grain

	Levels of replacement of maize by acha (%)					
Parameters	0	25	50	75	100	SEM
Daily feed intake (g)	60.06^{b}	58.00^{b}	61.00^{b}	62.00^{b}	71.90^{a}	1.94**
Daily Weight gain (g)	22.02^{b}	22.71^{b}	21.81^{b}	22.44^{b}	24.60^{a}	0.65*
Feed conversion ratio	2.72	2.55	2.80	2.77	2.93	0.08^{NS}
Mortality (Number)	0	0	0	0	0	-

a,b = Means bearing different superscripts within the same row differ significantly. SEM=Standard error of the mean, NS=Not Significant (P>0.05)
**significant (P< 0.01).

The hematological parameters of birds fed the test diet are shown in Table 3. The red blood cells, white blood cell, hemoglobin concentration, mean cell hemoglobulim and mean cell haemoglobin concentration were not affected by the dietary treatments. The non significant parameters in this study such as red blood cell, white blood cell, hemoglobin concentration and mean cell haemoglobin concentration agreed with the investigation of Ukim and Obon (2015). Haemoglobin concentration within the normal range for healthy chickens has indicated improved oxygen carrying capacity (Guluwa *et al.,* 2017). The packed cell volume, neutrophiles and lymphocytes were affected by dietary treatments (P <0.05) but disagreed with the reports of Ukim and Obon (2015) for pack cell volume. However, the packed cell volume for treatment 1 and 2 fall below the normal value for adult birds reported by (Chauhan and Roy, 1996) as 31 to 36%. Significances in neutrophil and lymphocyte could be due to stress condition.

Table 3: Haematology of broiler chickens fed Acha-based diets

	Levels of replacement by Acha (%)					
Parameters	0	25	50	75	100	SEM
RBC($x10^{12}$L)	2.04	2.04	2.177	3.32	2.45	0.38^{NS}
WBC ($x10^{9}$/L)	106.57	79.83	84.54	83.44	88.50	9.59^{NS}
PVC %	28.73^{b}	29.10^{b}	34.03^{ab}	33.53^{ab}	37.97^{a}	5.85*
HB (g/dl)	9.23	9.53	10.43	11.67	11.70	0.75^{NS}
MCH (pg)	45.37	47.47	46.47	46.53	11.70	0.75^{NS}
MCHC(g/dl)	32.27	34.20	34.13	31.80	32.26	2.9^{NS}
NEU (%)	37.33^{c}	40.00^{c}	53.07^{b}	65.00^{a}	66.00^{a}	2.29**
LYM (%)	50.00^{a}	42.00^{ab}	35.67^{b}	36.00^{bc}	30.70^{c}	2.81**

a, b =Means bearing different superscripts within the same row differ Signi ficantly, SEM =Standard error of mean, NS =Not significa nt, * =P< 0.05, **=P<0.01, RBC =Red blood cell, WBC=white blood cell, PVC=packed cell volume HB=haemoglobin, MCH=mean cell haemoglobin, MCHC =Mean cell haemoglobin concentration.

Conclusion and recommendation

Acha (*Digitaria exilis* Staph) could completely (100%) replace maize as energy source in the diets of starter broiler chicks without affecting the performance and haematological indices of the birds.

References

Chauhan, H. V. S. and Roy, S. 1996. *Poultry Diseases, Diagnosis and Treatment*. 2nd ed. *New Age International Limited Publishers.* Pp 429.

Chukwu, O. and Abdul-kadir, A. J. 2008. Proximate Chemical Composition of Hungry rice rice (*Digitaria exilis* and *Digitaria iburua*) Grains. J Food Tech 6: 214-216.

Gebremedhn, B. A. A. 2015. Review of Mango (*Mangifera indica*) seed kernel waste as diet for poultry. College of Dry land Agriculture and Natural Resources, Department of Animal, Range land and Wildlife Sciences, Mekelle University.Mekelle, Ethiopia, *Journal of Biology, Agriculture and Healthcare, 5 No.11*

Guluwa, L.Y., Oluremi, O.I.A.., Ashom, S.A. and Wumnokol, P.D. 2017. Effect of unsoaked and water soaked sweet orange peels on haematology and serum biochemistry of finisher broiler chickens. *Proceedings of 6th ASAN-NIAS Joint Annual Meeting. September 10-14, 2017. Abuja*

Heise, H., Crisan, A., and Theuvsen, L.

2015. The poultry market in Nigeria: Market structures and potential for investment in the market. *International Food and Agribusiness Management Review,* 18, 197-214.

Jideani, A.I. *and* ***Akingbala, J.O****. 1993. Some physic-chemical properties of acha (Digitaria exilis) and Iburu (Digitaria Iburua.Stapt) grains (Journal of the Science of Food and Agriculture) 63* ***(3):*** *369-373.*

Maxwell, M. H., Siller, W. G. and McKenzie, G. M. 1979. Eosinophiles associated with facial edema in fowls. *Vet. Res.* 105: 232.

Mgbakor M. N and Nzeadachie E. C 2013. "Economic Analysis of Broiler Production: A Case Study of Orumba South L. G. A of Anambra State, Nigeria". AmericanEurasian. *Journal of Agronomy* 6 (2): 25-31.

National Academy of Sciences (NAS) 1996. Lost Crops of Africa: Volume I: Grains. Washington, D.C.: National Academy Press.

National Research Council (NRC) 1994. *Nutrient requirements of poultry*. 9th rev. ed. National Academy Press, Washington, DC.

Obun, C.O. and Abia. E. E. 2003. Performance and hematological changes of broiler chicks fed. Agro- chemical treated maize. *Journal of Sustainable Agric and the Environment*, Umudike, Abia State Vol. 5 (2), 2003,313-318pp

Oladokun V.O and Johnson A. 2012. Feed formulation problem in Nigeria Poultry farms: A mathematical programming approach. *American Journal of Scientific and Industrial Research.*

Olafedehan, C.O., Obun, A.M., Yusuf, M.K., Adewumi, O.O., Oladefedehan, A.O., Awofolaji, A.O. and Adeniji, A.A. 2010. Effects of residual cyanide in processed cassava peal meals on haematological and biochemical indices of growing rabbits. *Proceeding of the 35th Annual Conference of Nigerian Society for Animal Production.* pp 427-433

Osuji, P.O. 1982. Agro Industrial By-Products and Animal Feeding in the Carribean Region *World Rev Animal. 18:43-46*

Taiwo, A.A, Adejujabe, A.D, Adebowale, E.A, Oshotan, J.S, and David O.O. 2005. Performance and nutrient Digestibility of weaned Rabbits fed forages supplemented with concentrate*, Nigerian Journal of Animals production* ***32****(1) 74-78*

Ukim C.I. and Obun, C.O. 2015. Haematology and Blood Chemistry of finisher broiler chicks fed Hungry rice (*Digitaria exilis*) grains as replacement for maize. *Res. Opin. Anim. Vet. Sci*., 5(4): 205-209.

Ukim, C.I., Ojewola, G S. and Obun, C. O., Ndelekwute, E. N 2012. Performance and carcass and organ weights of broiler chicks fed graded levels of Acha grains (Digitaria exilis). *Journal of Agriculture and Veterinary Science (IOSR-JAVS). Volume 1(2): 28-33*.

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