Blood Profile and Serum Biochemical Parameters of Broiler Chickens Fed Three Local Sorghum Varieties Grown in Bauchi State

[1]Mahmud, M., [2]Maidala, A., [3]Dantata, I.J., & [1]Turaki, H.
[1]School of Undergraduate, College of Education Azare, Bauchi State. Nigeria
[2]Vocational and Technology Education, Abubakar Tafawa Balewa University Bauchi, Nigeria
[1]Department of Crop Production, Federal University Gashua Nigeria
Corresponding author: aminumaidala@yahoo.com

Abstract
An experiment was conducted to evaluate three local sorghum varieties as a replacement of maize on blood profile and serum biochemical indices of broiler chickens. Five hundred (500) Anak 2000 unsex broiler chicks were randomly allotted to four treatments in a randomized completely block design (RCBD). Results showed that packed cell volume (22.00-23.25), creatine (49.50-57.00) and aspertate amino transferase (8.25-10.00) were statistically similar (P>0.05). The hemoglobin (6.58-8.00), white blood cell (53.25-56.00), urea (0.65-4.05) and alanine amino transferase (52.25-74.25) were affected by the different varieties of sorghum. The three local sorghum varieties can be used to replace maize without detrimental effects on blood profile and serum biochemical parameters of blood

Keywords: *Maize, Sorghum varieties, Blood profile, Serum biochemical parameters*

Introduction

Heamatological parameters both in human and animal sciences are important indices in physiological state of individuals (Khan and Zapper, 2005: Animashahun 2009: Bhatti *et al.*, 2009: Maidala *et al*., 2014). Blood in animal's body serves as a medium of transporting nutrients absorbed from the digestive system or released from storage in adipose tissues or in liver. The blood picture changes with advancement of animal with age and with certain conditions such as nutrition. The heamatological parameters which are of significant diagnostic values include the packed cell volume (PCV), hemoglobin (Hb), total protein (TP) and Serum globulin (SG) are known to affect health, production and adaptability to environmental conditions in livestock (Medugu *et al* .,2010: Adenkola *et al.*, 2009: Adenkola *et al*., 2011). Benerjee, 2008 reported normal blood values for domestic fowl as PCV 25-45%, RBC 2-4 x 10^6, Hb 7-13g/dl, WBC 9-31x 10^3, and total serum protein 5-7%. Poultry birds especially broilers play a significant role in the provision of animal protein required by man to meet his daily protein intake (Maidala and Istifanus, 2012). They have high growth rate, high feed conversion ratio, short generation interval (5-6 months), short intestinal feed transit of 2-3 hours and traits that respond to feeding and nutritional manipulations within days (Atteh,2003). The energy level of the feed is the major factor influencing feed intake as birds will under normal circumstances eat to satisfy their energy needs. In poultry nutrition energy is used for the provision of body heat, maintenance, growth and production (Inaku *et al.*, 2011). The other dietary nutrients usually vary in relation to dietary energy content of the diet if they are not to become deficient with low feed intake or consumed more with low energy diet. Maize is the major source of energy in poultry feeds and constitutes

50-70% of broilers ration (Ojowola and Olugbemi, 2011). It constitutes 40-60% of the feed of monogastric animals (Ayenor 1985; Ogbanna, 1991). Maize also serves as staple food for good proportion of Nigerians. The ever growing demand for maize for human consumption, livestock feeds and some industrial uses has pushed its market price to an alarming height (Odukwe, 1994). This is because maize is high in energy and forms the standard (100) against which other cereals grains is compared (Atteh, 2002). Maize has a fat content of about 4% and this fat is high in linoleic acid (about 50%) making it excellent source of this essential fatty acid. The increasing competition between man and animals for available grains (Tegbe, *et al*., 1984: Egbunike and Achibang, 2002), the inadequate production of farm crop to meet the needs of man and his livestock and ever increasing cost of maize had made it necessary to critically re-evaluate some other grain like sorghum for alternative energy source in poultry production. *Sorghum bicolor* (L) Moench is widely grown in the semi-arid and arid savannah regions of Nigeria. Maunder (2002) reported that sorghum is a traditional crop of much of Africa and Asia and an introduced and hybridized crop in the western hemisphere. It benefits from an ability to tolerate drought, soil toxicities and temperature extremes effectively than other cereals. In terms of the nutritive value, cost and availability, sorghum grain is the next alternative to maize in poultry feed. From the foregoing, it is imperative that effort should be made to explore comparative and cheaper alternative to this scarce feed resource. This study aimed at feeding three sorghum local sorghum varieties grown in Bauchi state on hematological and serum biochemical parameters of broiler chickens.

Materials and methods

Experimental site

An Experiment was conducted at Teaching and Research Poultry Unit of School of Undergraduate Studies College of Education Azare. Azare is located in Katagum Local Government Area of Bauchi State. It is located between latitudes $11^{o}30'$N and $11^{o}45^{o}$N and longitude $10^{o}10'$E and $10^{o}10'$E. It is 250km north of the capital. It covers an area of 915,045km with a population of 293,970.00 people (NPC, 2006). The mean monthly temperatures ranges from 20.10-22.50^{o}C in December and January to 30.0 – 32.5^{o}C in April and May. The temperature of the rainy season remains steady 25^{o}C – 27^{o}C for the month of June to October. The area is characterized by 5months of rainy season (April – September,) and seven months of dry season (October to March) (Bura, 2000).

Sources and processing of Ingredients

The three sorghum varieties are purchased in Azare Central Market. The collected seeds were cleaned by winnowing and hand picking of stones and debris. Cooking (boiling) of soybean seeds was done by bringing water in a half drum to boiling point and poured the ingredients in the boiling water for thirty minutes (30) to produced fullfat cooked soybean bean seeds they are then sun dried for 3-4 days. The different sorghum varieties and cooked soybean seeds were used to formulate four experimental diets which are isonitrogenous and isocaloric, the composition of the experimental diets are shown in Table 1.

Experimental diets and management

Five hundred (500) seven (7) days old unsexed broiler chickens were randomly allotted to four experimental diets, there were one hundred and twenty five (125) birds per treatment replicated five times (25 birds per replicate) in a randomized completely block design (RCBD). Each

replicate was housed in a floor pen measuring 2.4m^2 equipped with feeders and drinkers and the floor covered with litter materials. The birds were vaccinated as when due.

Blood profile analysis

Ten (10) birds per treatment (i.e. two birds per replicate) were randomly selected, fastened overnight and bled early in the morning to avoid temporary elevation of blood metabolites by feeding as observed by Bush (1975). Samples of blood were collected from the brachial vein using 2ml disposable syringe and needle, the blood were stored in a blood samples bottles with and without anticoagulant (EDTA). Blood samples were analyzed for heamatological parameters according to routine available clinical methods described by Baker *et al.* (1998). The biochemical parameters were determined by biuret reaction expanded by Bush, (1975). Data sets generated were subjected by analysis of variance ANOVA balance design Steel and Torrie 1980, LSD was used to separate the means.

Results and Discussion

The percentage composition of the experimental diets is shown in Table 1 and the crude protein and Metabolizable energy of the experimental diets are adequate for broiler production in the tropics (Aduku, 2004). The hematological and serum biochemical parameters are shown in Table 2 results showed the packed cell volume (22.00-23.25%) are statistically similar, this indicate the better utilization of all the energy sources, the values reported in this study are in agreement with (22.23-26.83%) reported by Afolayan *et al*. (2014), it is however fall below the normal range of (31-33.5%) reported by Mitruka and Rowley (1977). The white blood cell (53.25-56.00) are significantly affected by the different sorghum varieties ($P<0.05$) and the values reported in this work are slightly higher than (9.20-31.0x 10^6) reported by Afolabi *et al.* (2011) and lower than those reported by Ojediran *et al*., 2012 on healthy broiler birds. The difference can be attributed to variation in the environmental temperature in the two studies area, the lowest values (53.25) in jardawa indicate that there was adverse immune response in the diet due to presence of antinutritional factors in the sorghum varieties (Ozang *et al.*, 2014). The higher values of WBC in kaura sorghum an indication of better immune system than other diets ($P<0.05$). Blood platelets (1.60-1.75), creatine (49.50-57) and aspertate amino acid transferase (ALAT) are statistically similar ($P>0.05$) indicating that the liver and the kidney were physiologically normal. The alanine amino acid transferase (52.25-74.25) were affected by different varieties of sorghum ($P<0.05$), the values reported in this work are lower than (140.48-156.01) reported by Makanjoula *et al.* (2014). Results of this study indicated that the three local varieties of sorghum can be alternative to maize without adverse effect on heamatological and serum biochemical parameters of broiler chickens.

Acknowledgement

The support of management College of Education Azare and Financial support by TETFUND were acknowledged.

References

Adenkola, A.Y. and Ayo, J.O. (2009). Effect of ascorbic acid on rectal temperature fluctuations In indigenous turkeys during hot dry season. *International Journal of Poultry Science* **8** (5):457-461

Adenkola, A.Y., Idoga, E.S. and Tughgba, T. (2011).Comparative assessment of erythrocyte

Osmotic fragility and heamatological parameters of broiler and local chicken during the Hot –dry season in Makurdi, Nigeria. Proceedings of 36th Annual Conference of Nigerian Society of Animal production. University of Abuja, Nigeria. Pp 117-119

Aduku AO (2004). Animal Nutrition in the Tropics. Feeds and Feeding, Pasture Management, Monogastric and Ruminant Nutrition, Davcon Computers and Business Bureau, Zaria, pp. 17 -18.

Afolabi ,K.D., Akinsoyinu , A.O., Abdullah,A.R.O,. Olajide ,R. and Akinleye, S.B. (2011). Haematological Parameters of the Nigerian Local Grower Chickens fed Varying Dietary Levels of Palm Kernel Cake. Pol JoPriveda 17: 2011 (1); pp 74 –78.

Afolayan, M. Bawa G.S., Sekoni A.A., Abeke F.O. Inekwe V.O. (2014). nutritional evaluation of locust bean (parkia biglobosa) fruit pulp. Nig. Soc. for Anim. Prod. 16 - 19 March, 2014. Babcock Univ. Ilishan-Remo, Ogun State, Nigeria.

Animashahun, R.A., Omoikhoje, S.O. and Bamgbose, A.M. (2006).Rabbits fed concentrates and syndrolla, nudiflora forage science Association of Nigeria. Institute of agricultural Research and raining. Ibadan, Nigeria. Pp.29-32

Atteh, J.O. (2002). Principles and practice of livestock feed manufacturing. Adlek Printers. Ilorin Kwara State Nigeria, Pp: 13-17.

Atteh, J.O. (2003).Romancing The Chickens. The sixty eight inaugural lectures series. University of Ilorin, Nigeria.

Ayenor, G. S. (1985). Effects of cassava product yield and cyanide detoxification. *Journal of Food Technology*.**20**. 89-96.

Baker, F.J., Silverton, R.E. and Pallister, C.J. (1998). Baker and Silverton's introduction To medical laboratory technology. 7th Edition. Butterworth –Heinemann, Linacre House, Jordan Hill Oxford.

Benerjee, G.C. (2008).Textbook of Animal Husbandry. Bidhan Chandra Krishi Viswadyala. Oxford and IBH publishing company. PVT. LTD

Bhatti, J.A., Younas, M.Abdullahi, M.E., Baber M.and Nawoz, H. (2009). Feed intake, Weight gain and hematology in Nili, Ravi, Buffalo heifers fed on Motgrass and Barseem fodder substituted with saltbush (Atriplex amnicola). *Pakistan Veterinary Journal* 29(3): 133-137.

Bura, A.B. (2000).The Role Small Scale Industries on Socio-economic Development of Azare Nigerian Certificate in Education Project College of Education, Azare, Bauchi State.

Bush, B.M. (1975).Veterinary Laboratory Manual. Williams Heinemann Medical book Limited. London, U.K., pp. 447.

Egbunike GN, and Achibong IO (2002). Performance and serum chemistry of growth: stimulated broiler finisher cassava peel based diet. Proc. of the 7th annual conference of the animal Sci. association of Nigeria (ASAN), Pp: 44-46.

Inaku, E.N., Bawa, G.S., Olugbemi, T.S. and Buba,W. (2011). Nutritive value of yam feel meal in broiler diet. In: Adeniji, A.A., Olatunji, E.A. and Gana, E.S .(Eds) **Value Re-orientation in Animal Production: A Key to National Food Security and sustainable Economy.** Pp 481-483. Proceedings of 36th Annual Conference of Nigerian Society of Animal Production. 13th-16th March,2011

khan, T.A. and Zafar, F. (2005). Heamatological study in response to varying doses of estrogen in broiler chicken. *International Journal of Poultry Production* **4**(10):748-751

Maidala, A. and Istifanus, J.A. (2012). The role of micro livestock in alleviating protein deficiency and poverty reduction in Nigeria. Proceedings of 2nd National conference of school of vocational and technical education, College of Education Azare. Bauchi state (Eds) Dantata, I.J., Maidala, A. and Garba, A.R.

Maidala, A., Doma, U.D. and Egbo, L.M.(2014). Heamatological and serum biochemical indices of broiler chickens fed differently processed African locust bean seeds (*Parkia biglobosa*). Nig. Soc. for Anim. Prod. 16 - 19 March, 2014. Babcock Univ. Ilishan-Remo, Ogun State, Nigeria.

Makanjuola, B. A., Obi, O. O., Olorungbohunmi, T. O., Morakinyo. O. A., Oladele-Bukola, M. O. and B.A.Boladuro (2014). Effect of *moringa oleifera* leaf meal as a substitute for antibiotics on the performance and blood parameters of broiler chickens. Proc. 39th Conf., Nig. Soc. for Anim. Prod. 16 - 19 March, 2014. Babcock Univ. Ilishan-Remo, Ogun State, Nigeria.

Maunder ,B. (2002). Sorghum - The global grain of the future. Retrieved November 30, 2004 from http://www.sorghumgrowers.com/maunder.htm.

Medugu, C.I., Kwari, I.D., Igwebuike, J., Nkama,, I., Mohammed, I.D. and Hamaker, B. (2010).Carcass and blood components of broiler chickens fed sorghum or millet as replacement for maize. *Agriculture and Biology Journal of north America.*1(3):326-329

Mitruka, B.M. and Rawnsley H.N. (1977). Clinical Biochemical and Haematological Reference values in normal experimental Animals. Masson, New York.

National Population Commission (2006).National Population Commission Bulletin.

Odukwe, C. A. (1994). The feeding value and composition of cassava root meal for broiler chicks. Ph.D Thesis, University of Nig. Nsukka, Nig. 20-27.

Ogbonna, J. U. (1991). Studies on the value of processed cassava peels in the nutrition of cockerel. Ph.D Thesis, University of Ibadan, Nigeria, 54-59.

Ojediran, T.K., Emiola, I.A.,Ogunwewimo,O. and Oluyeni, T.B. (2012). Effect of processed Jatropha carcass kernel cake on the blood profile and biochemical indices of of broiler Chickens. Proceedings of 17th Annual Conference of animal science association of nigeria. 9-12abuja pp. 509-512

Ojewola, G.S. and Olugbemi, F. (2011). Millet meal: a possible alternative dietary energy sources for broiler chickens. In: Adeniji, A.A., Olatunji, E.A. and Gana, E.S .(Eds) **Value Re-orientation in Animal Production: A Key to National Food Security and sustainable Economy.** Pp 481-483. Proceedings of 36th Annual Conference of Nigerian Society of Animal Production. 13th-16th March,2011

Ozung, P. O., Oko, O. O. Kennedy, Anya, M.I.and Ogunmakinde, A. T. (2014). Haematological and serum biochemical characteristics of broiler finishers fed diets containing *alchornea cordiforlia* leaf meal (aclm). Proc. 39th Conf., Nig. Soc. for Anim. Prod. 16 - 19 March, 2014. Babcock Univ. Ilishan-Remo, Ogun State, Nigeria.

Steel, R. G.D. and Torrie, J.H. (1980). Principles and Procedures of Statistics, 2nd Edition published by McGraw Hill books Co. New York, USA.

Tegbe, T.S, Atteh B, Jegede JO (1984). Utilization of agro-industrial by products (rice and wheat offal) in diet of pigs. Proc. of the Annual conference of the Nigeria society for animal production Nsukka, Nigeria

Table 1: Percentage composition of the experimental diets

Ingredients	Broiler starter		Broiler finisher	
	Maize based	Sorghum based	Maize based	Sorghum based
Maize	44.71	00.00	47.92	00.00
Sorghum	00.00	43.36	00.00	46.88
Full fat soybean	36.39	37.74	28.18	29.22
Wheat offal	10.00	10.00	10.00	10.00
Fishmeal	5.00	5.00	15.00	15.00
Bone meal	3.00	3.00	3.00	3.00
Sodium chloride	0.25	0.25	0.25	5.00
Lysine	0.20	0.20	0.20	0.20
Methionine	0.20	0.20	0.20	0.20
Premixes	0.25	0.25	0.25	0.25
Total	100	100	100	100
Calculated analysis				
Crude protein (%)	23	23	21	21
Metabolisable energy (kcal/kg)	2908	2865	2698	2627
Ether extract	5.37	5.63	5.10	5.16

Table 2: Hematological and serum biochemical indices of broilers fed three sorghum varieties

Parameters	Maize	Farfara	Kaura	Jardawa	SEM
Pack cell volume (%)	22.25	23.25	23.00	22.00	NS
Heamoglobin (g/dl)	6.58^{a}	6.98^{a}	7.18^{a}	8.00^{b}	1.42*
White blood cell (10^3/L)	55.25^{a}	54.25^{a}	56.00^{b}	53.25^{a}	2.75*
Platelets (x 10^3/µL)	1.75	1.60	1.68	1.60	NS
Urea (Mmol/l)	0.65^{a}	2.05^{a}	2.93^{a}	4.05^{b}	3.30
Creatine (Mg/dl)	57.00	57.00	49.50	56.50	NS
Sodium (Mmol/L)	136.25^{a}	136.75^{a}	138.75^{a}	138.25^{b}	*2.76
ASAT (µ/L)	70.00	74.25	62.50	52.25	20*
ALAT (µ/L)	10.00	8.75	8.25	9.25	NS

Means bearing superscripts within the same row are statistically significant