e-ISSN 3050-9602
p-ISSN 2795-4340

10.5281/zenodo.15429880 Vol. 08 Issue 05 May - 2025 Manuscript ID: #01904

Effect of diets supplemented with local concentrate as an alternative to the imported concentrate on the serum metabolites and enzymes of broiler chicks

[*]Mohmed Ismaiel Hamdan Malek[1], Mukhtar Ahmed Mulhtar[2] & Kamal Abd Elbagi Mohammed[2]

[1]PhD Student in Department of Animal Production, College of Agricultural Studies, Sudan University of Science and Technology, Sudan.
[2]Department of Animal Production, College of Agricultural Studies, Sudan University of Science and Technology, Sudan

Abstract:

A total of 63 chicks 7 days old unsexed broiler chicks strain (Arber Acer) purchased from a local commercial hatchery Company (mico) were randomly divided into three treatments (A, B, and C,). Each treatment group was sub divided into three replicates of 7 chicks per each. Group A fed on Local concentrate 5 %, group B fed on Local concentrate 7.5 %, and group C, fed on control diet with imported concentrate 5%. The inclusion of local concentrate by all levels improved significantly ($p \leq 0.05$) on chicks serum metabolites (total protein, albumin, creatinine, uric acid, glucose, urea, cholesterol (LDL) , serum enzymes (AST and ALPi) while the triglyceride and cholesterol (HDL), serum minerals (Ca and P) recorded no significant affect on means values.

Keywords:

Local concentrate, albumin, creatinine, serum enzymes (AST and ALPi).

How to cite: Malek, M. I., Mulhtar, M., & Mohammed, K. A. (2025). Effect of diets supplemented with local concentrate as an alternative to the imported concentrate on the serum metabolites and enzymes of broiler chicks. *GPH-International Journal of Agriculture and Research*, 8(05), 01-08. https://doi.org/10.5281/zenodo.15429880

Introduction

Sudan faced a feed crisis because of the high cost of production, which attributed to the raise of the cost of feed ingredients, mainly imported concentrates. Now there were many attempts from nutritionists to replace the imported concentrate with deferent locally available protein sources completely replaced imported concentrate by synthetic lysine, methionine and Fishmeal they recorded signifcantly improvement on the chick's performance (**Omer**, 2001). Fishmeal is a natural balanced feed ingredient that is high in protein, energy, minerals, and

vitamins. During the last decade, herbs and phytogenic compounds have attracted a lot of attention for their potential role as alternatives to Antibiotic Growth Promoters (AGPs) in monogastric animals (**Alloui** et al., 2014).The protein in fishmeal has a high biological value in diets for animals. It is rich in the essential amino acids, particularly lysine and the sulfur amino acids. The presence of fishmeal in a complete diet will supplement any deficiencies of the amino acids in vegetable protein, such as soybean meal (**Barlow** and **Windsor**, 1984; Miles and **Jacob**, 1997). Fishmeal is also fed to farm animals not only to improve productivity but also to protect health and welfare and reduce dependence on antibiotics and other drugs (**Pike**, 1999; **Anonymous**, 2002).This alternative represents a great potential for the use of capture and processing losses of fish processing (up to 60% of the total that is produced and/or caught). Among the animal production segments, poultry farming may be considered one of the most developed activities in recent times as a result of advances in genetics, nutrition, sanitation, and management. One of the main goals of poultry production is to efficiently and economically convert the relatively disposable, non-palatable, and unattractive raw materials into nutritious foods. The well-balanced diets that use alternative ingredients available at low cost are specifically formulated for countless ages and types of birds (**vCruz Pereira Filho**,and **Chaves**, 2006; **Loureiro, Rabello, Ludke Júnior, Guimarães**, and **Silva**, 2007; **Togashi** et al., 2008; **Pinheiro** et al., 2012).Therefore, the present study aimed to assess the comparison between local concentrate installation by fish meal and plant protein (sesame and ground nut cakes), imported synthetic essential amino acids (such as lysine and methionine) and vitamin premixes with imported concentrate on the broilers'serum constituents; total cholesterol, moisture, total protein, urea, enzyme activity forglutamic –oxaloacetic transaminase (GOT) and glutamic- pyruvictransaminase (GPT).

Materials and Methods

One hundred and seventy five (175) one day, unsexed broiler chicks were used. Chicks randomly divided into 3 groups (A, B and C) with 5 replicates and 7 chicks per each replicate. Chicks in group A fed on diet supplemented with broiler imported concentrate ,as control group chicks while groups B and C fed on diets supplemented with locally formulated concentrate at levels 5% and 7.5 % respectively. Experiment diets will be iso- nitrogenous and iso-caloric to meet the requirement of broiler chicks according to (N. R. C 1994). Experiment continued for 6 weeks. Feed and water will be provided ad libitum, chicks will be vaccinated against Newcastle and Gumboro diseases.

Table1: Chemical Analysis of diets:

Components	Dry matter%	Ash%	Crude protein%	Ether Extract%	Crude fiber%
C	93.67	10.6	21.9	3.4	21.6
A	92.87	10.87	22	4	20
B	93.65	11	2.23	4.5	21.2

(Koko research center lab)

The experiment parameters:

covered hot carcass and each evisceration have the liver, heart and gizzard were separately weighed. serum constituents, enzyme activities experiment repeated at summer season Data to be collected: - Non carcass components: liver, heart, spleen, gizzard and abdominal fat - Serum constituents total cholesterol, moisture, total protein, urea, enzyme activity forglutamic –oxaloacetic transaminase (GOT) and glutamic-pyruvictransaminase (GPT),

Statistical analysis:

The data obtained were statistically analyzed with the standard procedures of analyses of variance (ANOVA) using completely randomized design. Significant differences between treatment means were separated using the Duncan's multiple range tests with 5% probability (**Duncan**, 1995).

Results:

The effect of treatments on non- carcass components and dressing percentage of broiler chicks fed of local concentrate as alternative imported concentrate for 5 weeks was shown in table (2) The results recorded that, a significant differences ($p<0.05$) were observed between all tested groups local concentrate (5 % and 7.5%) compared to control group in dressing percentage and non- carcass components (gizzard, abdominal fat, liver, heart, intestine length, and intestine weight) compared to control group (imported concecntrate),. However, there was a significant ($p>0.05$) differences were observed between the two groups of local concentrate (5 and 7.5%) in (abdominal fat, intestine length , and intestine weight) and significant differences ($p \geq 0.05$) between two groups in dressing percentage .Although, all non-carcass components weight were in normal range of healthy broiler chicks.

Table2: Effect of local concentrate as alternative to imported concentrate on the non carcass characteristics and dressing percentage of experimental chicks during (5) weeks (per gram):

Treat	Carcass weight	Liver Weigh t	Abdominal fat weight	empty gizzard weight	Intestines Weight	Intestines Length	Dressing %
A	1677^{a}	55^{a}	24^{a}	33^{a}	114^{ab}	200^{ab}	76.03^{a}
B	1613^{a}	55^{a}	20^{b}	33^{a}	120^{a}	211^{a}	75.17^{a}
C	1189^{b}	43^{b}	16^{b}	27^{b}	94^{b}	188^{b}	72.06^{b}
SE±	60.89	4.2	3.6	2.51	9.20	9.96	0.89

***A**: local concentrate 5 % **B**: local concentrate 7.5 %

C: control diets with imported concentrate **S.E±**: standard error

Serum metabolites:

Effects of local concentrate alternative imported concentrate on serum metabolites of broiler chicks was shown in table (3). The results showed a significant ($p>0.05$) differences between control group and groups of local concentrate (5% and 7.5%) in serum total protein, albumin, creatinine, uric acid, urea, LDL cholesterol, and glucose. Also, there was no significant ($p>0.05$) treatment effect on cholesterol, HDL cholesterol, and triglycerides of broiler chicks. However, the chicks fed on local concentrate 5 % recorded numerically the higher values of total protein and glucose (4.75g/dl and 221.50mg/dl respectively) as compared to control group. simultaneously, the group of local concentrate 5, %, recorded the lowest values of albumin, creatinine, uric acid, LDL cholesterol, and urea (2.08g/dl, 2.05mg/dl, 3. 12mg/dl, 1.05 and 6.15mg/dl respectively), also, the same trend between control group and groups of local concentrate (5% and 7.5%) for HDL cholesterol, and triglycerides compared to control group. However, no significant ($p>0.05$) differences were observed between the two groups of local concentrate (5% and 7.5%). Although, all values of serum metabolites mentioned above were in normal range of serum profile of healthy broiler chick.

Serum enzymes activity and serum electrolytes:

As shown in table (3), the results indicated, a significant ($p\leq0.05$) different between control group compared to groups of local concentrate (5% and 7.5%) on serum enzymes activities values (Aspartate amino-transferase AST and Alkaline phosphatase ALP) for 5 weeks. However, the chicks fed on different levels of local concentrate (5 % and 7.5%) had recorded numerically the lowest values of serum enzymes AST and ALP (30.75, 33iu/L and 175.13,178.22 respectively) as compared to control group that recorded highest value (34.82 and 181.22 iu/L). Data collected for serum minerals revealed that, no significant ($p>0.05$) differences were observed between the chicks fed on local concentrate (5% and 7.5 %) compared to control group (imported concentrate 5%) in serum electrolytes values (Calcium Ca and Phosphorus P). However, the chicks fed on all levels of local concentrate (5 and 7.5 %) recorded the highest values of minerals Ca and P (7.975, 8.10 mg/dl and 8.80, 7.20, 7.035mg/dl respectively) as compared to control group (imported concentrate 5 %) (7.650mg/dl and 5.40mg/dl respectively). While all values of serum enzyme activities and serum electrolytes values of all tested groups were in normal range of serum profile of healthy broiler chicks.

Table (3): Effect of local concentrate as alternative imported concentrate on blood serum metabolites and enzymes:

Treatments	Glucose (mg\dl)	Protein (g/dl)	Alb. (g/dl)	Cholest (mg/dl)	Chol. LDL (mg/dl)	Urea (mg/dl)	Uric acid (mg/dl)	Creatine (mg/dl)	AST (iu/l)	ALP (iu/l)
A	221.05^{a}	4.750^{a}	2.08^{ab}	123.0^{b}	21.05^{b}	6.150^{b}	3.125^{b}	2.055^{b}	30.75^{c}	175.13^{b}
B	216.55^{a}	4.25^{ab}	2.050^{b}	122.7^{b}	21.65^{ab}	6.350^{b}	3.275^{b}	2.150^{b}	33.00^{b}	178.22^{ab}
C	194.75^{b}	3.850^{b}	2.25^{a}	125.5^{a}	22.25^{a}	7.050^{a}	3.90^{a}	2.615^{a}	34.825^{a}	181.22^{a}
SE±	3.7919	0.1732	0.0627	0.6124	0.2415	0.1354	0.0500	0.1088	0.4383	1.2801

*A: local concentrate 5 % B: local concentrate 7.5 %

C: control diets with imported concentrate S.E±: standard error

Discussion:

Dressing percentage and non- carcass results recorded that, a significant differences ($p<0.05$) were observed between all tested groups local concentrate (5% and 7.5%) compared to control group components (gizzard, abdominal fat, liver,heart, intestine length , and intestine weight) compared to control group (imported concecntrate). However, there was a significant ($p>0.05$) differences observed between the two groups of local concentrate (5and 7.5%) in (abdominal fat, intestine length, and intestine weight), the result contrasting with results obtained by **Nour** (1985), who mentioned that carcass yield and dressing percentage were affected by dietary energy level, and in line with **Asrat** (2008) indicate that groups fed with rations containing fish meal were significantly superior ($p< 0.05$) to the control group in the carcass parameters, **Ahmed** and **Islam** (2018) who indicated that the abdominal fat, liver, gizzard, heart, spleen, and proventriculus weights were also slight increased under increased addition of SHR in feed, **Adesehinwa** et al. (2005) reported a change in gizzard weight and no change in liver weight in broilers fed different levels of local fish waste. The result, contrary with **Ponce** and **Gernat** (2002), observed no significant differences between treatments in mortality or carcass yield when broiler fed tilapia by product meal (**Maigualema** and **Gernet**, 2003). tilapia by product meal at various levels (up to 50% of soybean meal) in broiler diets resulted negatively affecting performance or carcass quality.

The results showed a significant ($p>0.05$) differences between control group and groups of local concentrate (5% and 7.5%) in serum total protein, albumin, creatinine, uric acid, urea, LDL cholesterol, and glucose. Also, there was no significant ($p>0.05$) effect on cholesterol, HDL cholesterol, and triglycerides of broiler chicks. However, the chicks fed on local concentrate 5 % recorded numerically the higher values of total protein and glucose (4.75g/dl

and 221.50mg/dl respectively) as compared to control group. At the same time, the group fed local concentrate 5, %, recorded the lowest values of albumin, creatinine, uric acid, LDL cholesterol and urea (2.08g/dl, 2.05mg/dl, 3. 12mg/dl, 1.05 and 6.15mg/dl respectively), also, the same trend between control group and groups of local concentrate (5% and 7.5%) for HDL cholesterol, and triglycerides compared to control group. However, no significant ($p>0.05$) differences were observed between the two groups of local concentrate (5% and 7.5%). Contrary to the findings of the present study, few researchers reported no significant difference in serum total protein, albumin and globulin concentration in commercial broilers fed acid treated fish waste silage (**Darsana** and **Sreekumar**, 2009; **Emadi** et al., 2007).

the results indicated that a significant ($p\leq0.05$) different between control group compared to groups of local concentrate (5% and 7.5%) on serum enzymes activities values (Aspartate amino-transferase AST and Alkaline phosphatase ALP) for 5 weeks. However, the chicks fed on different levels of local concentrate (5 % and 7.5%) had recorded numerically the lowest values of serum enzymes AST and ALP (30.75 , 33iu/L and 175.13 ,178.22 respectively) as compared to control group that recorded highest value (34.82 and 181.22 iu/L). these results are contrary to the findings reported by **Yohannan** et al. (2007) ,who indicated that the supplemented diet did not adversely affect the function of the liver and were not toxic. which serum minerals revealed that, no significant ($p>0.05$) differences were observed between the chicks fed on local concentrate (5% and 7.5 %) compared to control group (imported concentrate 5 %) in serum electrolytes values (Calcium,Ca and Phosphorus, P). However, the chicks fed on all levels of local concentrate (5and 7.5 %) recorded the highest values of minerals Ca and P as compared to control group (imported concentrate 5 %) (7.650mg/dl and 5.40mg/dl respectively). The result, contrasting with the study, founded a non-significant difference in the serum calcium and potassium concentration found in the present study due to the incorporation of fish silage (**Darsana** and **Sreekumar**, 2009). While all values of serum enzyme activities and serum electrolytes values of all tested groups were in normal range of serum profile of healthy broiler chicks. Similar results observed by **Bowes** et al. (1989), **Kollanoor** (2004) ,and **Francis** (2005) in broiler chicken were founded. The dietary replacement of fish meal with processed fish wastes was adequate enough to maintain the normal mineral metabolism in broiler chicken.

References:

Adesehinwa A.O.K., Omojola A.B. and Fadele O.K. (2005). Nutritive value of local fish industry waste as a replacement for imported fishmeal in broiler finisher diets in Nigeria.Tropical and Subtropical Agroecosystems 5:129-133.

Ahmed, S. and Islam M. A. (2018) Effect of Graded Levels of Slaughter House Residues on Growth Performance and Haematological Parameters in Broiler Chicken's Ration. Asian Research Journal of Agriculture. ARJA, 9(1): 1-8.

Alloui MN, Agabou A, Alloui N (2014). Application of herbs and phytogenic feed additives in poultry production-A Review. Glob J Anim Sci. 2: 234-243.

Anonymous, 2002. Fishmeal facts and figures. Fishmeal Information Network (FIN). International fishmeal and oil manufacturers association, 2College Yard, Lower Dagnall Street, St. Albans, Herts, AL3 4PA, U.K.

Asrat T., Tegene N., Aberra M. and Yosef T. (2008). The effect of inclusion of cooked and sun dried fish offal meal on feed intake, growth and feed efficiency of Rhode Island Red chicks. East African J. Sci. 2(2), 111-118.

Barlow, S.M. and M.L. Windsor, 1984. Fishery by-product.International Association of Fishmeal Manufactures. International fishmeal and oil manufacturers association, 2 College Yard, Lower Dagnall Street, St. Albans, Herts, AL3 4PA, U.K. Technical Bulletin No:1.

Bowes, VA; Julian, RJ and Stritzinger, T (1989). Comparison of serum biochemical profiles of male broilers with female broilers and white leghorn chicken. Can. J. Vet. Res., 53: 7-11.

Cruz, F. G. G., Pereira Filho, M., & Chaves, F. A. L.(2006). Efeito da substituição do milho pela farinha da apara de mandioca em rações para poedeiras comerciais.Revista Brasileira de Zootecnia, 35(6), 2303-2308.

Darsana, MG; Sreekumar, KP and Jalaludheen, A (2009). Effect of feeding processed fish wastes on the growth and haematology of broilers. Indian J. Poult. Sci., 44: 213-217.

Duncan, D. B. (1955).Multiple range and multiple F tests: Biometrics, 11:1- 42.

Emadi, M; Kermanshahi, H and Maroufyan, E (2007). Effect of varying levels of turmeric rhizome powder on some blood parameters of broiler chickens fed corn- soya bean meal based diets. Int. J. Poult. Sci., 6: 345-348.

Francis, MJ (2005). Effect of dietary cationanion balance on growth performance of broiler chicken. MVSc. Thesis, Kerala Agricultural University, India, P: 58.

Kollanoor, JA (2004). Effect of dietary and supplementation of phytase on growth and mineral availability in broiler chicken. MVSc. Thesis, Kerala Agricultural University, India. P: 96.

Loureiro, R. R. S., Rabello, C. B. V., Ludke Júnior, W. M.D., Guimarães, A. A. S., & Silva, J. H. V. (2007).Farelo de tomate (Lycopersicum esculentum Mill.) naalimentação de poedeiras comerciais. ActaScientiarum. Animal Sciences, 29(4), 387-394.

Maigualema M.A and A. G. Gerant (2003).Department of poultry Science, North Carolina State University, Raleigh, North Carolina 27695-7608,USA(Asian Network for Scientific Information.

Miles, R.D. and J.P. Jacob, 1997. Fishmeal: understanding why this feed ingredient is so valuable in poultry diets. University of Florida Cooperative and Extension Service. Institute of Food and Agricultural Sciences.

Nour, A.I. (1985). Effect of energy level and stocking density during the finishing period on performance and carcass quality of broiler. MSc. Thesis, University of Khartoum.

NRC. 1994. Nutrient Requirements of Poultry. 9th rev. ed. Natl. Acad. Press, Washington, DC.

Omer MA (2001). Replacement of Super-Concentrate by L-lysine and DL- methionine at Different Levels in Broiler Rations (Doctoral dissertation, MSc. Thesis, Sudan University of Science and Technology, Sudan).

Pike, I.H., 1999. Health benefits from feeding fish oil and fish meal: The role of long chain omega-3polyunsaturated fatty acids in animal feeding. International fishmeal and oil manufacturers association, 2 College Yard, Lower Dagnall Street, St. Albans, Herts, AL3 4PA, U.K. Technical BulletinNo:28.

Pinheiro, J. W., Fonseca, N. A. N., Bridi, A. M., Silva, C. A.,Oba, A., Medeiros,
L. G., & Oliveira, M. L. L. (2012).Desempenho e qualidade dos ovos de poedeiras comerciais leves submetidas a dietas contendo torta denabo forrageiro. Ciências Agrárias, 33(4), 1555-1564.

Ponce, L.E. and A.G. Gernat, 2002. The effect of using different levels of tilapia by product meal in broiler diets. Poult. Sci., 81: 1045-1049.

Togashi, C. K., Fonseca, J. B., Soares, R. T. R. N., Costa,A. P. D., Silveira, K. F., & Detmann, E. (2008).

Yohannan, CV (2007). Physiological evaluation of dietary supplementation of steroid hormone and alpha tocopherol in broiler chicken. MVSc. Thesis, Kerala Agricultural University. P: 143.