Utilization of Cowpea Seeds (*Vigna Unguiculata* (L) Walp) by Broiler Chickens: An Overview

[1]Maidala, Aminu & [2]Dass, Haruna Yusuf
[1]Department of Animal Science,
Federal University Gashua,
P.M.B.1005, Yobe State,
Nigeria
[2]Vocational and Technology Education,
Abubakar Tafawa Balewa University,
P.M.B. 248, Bauchi State,
Nigeria
Corresponding author: drmaidala@yahoo.com

Abstract
The high cost of poultry feeds is the major hindrance in the development poultry industry in Nigeria. This can be attributed to the high cost of soyabean which is the conventional protein source in the poultry industry in Nigeria. Cowpea is an available crop that provides a cheap source of plant protein for people and livestock in the third world countries. Cowpea dry seeds have high percentage of protein (20-30%) that is characterized as a complete protein compared with those of other vegetable. Cowpea is an important source of protein, carbohydrate, vitamins and minerals in the diet of many populations especially in developing countries. Cowpea protein shows a well-balanced amino acid content with a deficient of methionine. Field trials where cowpea replace soyabean (5-20%) in broilers diet showed that there were no significant difference ($P<0.05$) in the performance of broiler chickens. It can be concluded that broiler chickens can tolerate up to 20% level of inclusion of processed cowpea seeds without deleterious effect on performance, carcass characteristic and blood parameters with concomitant reduction of in cost of production.

Introduction

Poultry birds especially broilers play a significant role in the provision of animal protein required by man to meet his daily protein intake (Ogundipe, 2003; Igwebuike *et al*., 2009; 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 chicken meat is superior to that of other livestock species because it is associated with relatively lower calorie and sodium intake while containing high protein content than other sources of meat (Atteh, 2003). Poultry meat is nutritious, tender, juicy, tasty and generally appealing and accepted when processed (Omole *et al*., 2006). Nutrition is perhaps the most important consideration in livestock management. Inadequate supply of feeds, nutritionally unbalanced rations, adulterated ingredients or stale feeds are some of the factors responsible for low productivity of livestock in tropics (Ogundipe *et al*., 2003) Apart from nutrition, Poultry industry contributes significantly to family income (Ogundipe *et al.*, 2002). Feeding is the major constrain of poultry production which accounts for 70-85% of recurrent expenditure (Sanni and Ogundipe, 2005).). As a result of high cost of

ingredient used in poultry production, conventional poultry feeds continue to increase in price in Nigeria over several decades. The use of low price ingredient is encouraged to reduce the cost of production. The use of cheap alternative source of protein is to be encouraging hence soya bean and groundnut cake are the main source of protein which can be grown in all and semi arid areas.

Cowpea (Vigna unguiculata L. walp) is an herbaceous short term, annual legumes plant which is grown in many tropical and subtropical countries (Ameen *et al*., 2005). Cowpea originated in Africa and is widely grown in Africa Latin America, Southeast Asia and in the Southern United State (Davis *et al.*, 1991). Cowpea is the second most important food grain legume crop in tropical Africa in Nigeria, Niger, Burkina Faso, Uganda and Senegal in nearly all Africa countries south of the Sahara (Onwuene and Sinha, 1990). Cowpea is an available crop that provides a cheap source of plant protein for poor people in the third world countries (Walker, 1981). Cowpea dry seeds have high percentage of protein (20-30) that is characterized as a complete protein compared with those of other vegetable (Hafiz and Damarny, 2006). Cowpea is an important source of protein, carbohydrate, vitamins and minerals in the diet of many populations especially in developing countries (Udensi *et al*., 2007). Cowpea is a highly nutritious crop with a dry seed protein about 25% and protein digestibility higher than that of other legumes (Ologhobo and Fetuga, 1983). Cowpea protein shows a well balanced amino acid content with a deficient of methionine (Carnaval *et al*., 1990). The chemical composition of cowpea meals varies depending on the process used for their elaboration. In general cowpea meals can be considered as good source of available protein, carbohydrates, amino acid and energy (Laurena *et al*., 1991). Cowpea is an excellent and inexpensive source of protein, fatty acid, essential amino acid, vitamins and minerals (Fagreia *et al*., 1990). Cowpea and other grain legumes have been reported to contain anti-nutritional factors particularly haemaglglutinin and trypsin inhibitors (Amaefule *et al*., 2005; Teguia *et al*., 2008; Akande *et al*., 2010; Maidala *et al*., 2016) which limit their utilization in animal feeding. Teguia *et al*., 2003: Chakam *et al*., 2010 reported poor performance of birds when fed raw cowpea. Anti-nutritional factors are known to exert deleterious effect on protein metabolism, nutrient absorption, feed intake, poor growth rate, feed conversion efficiency in monogastric animals (Emiola *et al*. 2005: Maidala, 2015). These toxic compounds have been reported to cause poor growth, endogenous loss of essential amino acids, pancreatic hypertrophy in monogastric animals (Akanji *et al*., 2002: Maidala *et al*., 2016). Boiling, toasting, dehulling, salt treatment and soaking are some of the processing methods which are commonly used (Amaefule *et al*., 2008; Maidala, 015) to inactivate antinutritional factors (ANF). The most commonly found ANF in legumes is protease (trypsin and chymotrypsin) inhibitors, tannins, lectins, amylase inhibitors, glycosides, phytate and alkaloids. Most processing methods employed in improving the feed value of non-conventional or alternative feedstuffs only reduce their concentrations to tolerable levels in feedstuffs. However, recent studies agreed that the utilization of raw cowpea was limited by the presence of antinutritional factors (ANFs) (Chakam, *et al* ., 2010), which negatively affect broilers feed consumption, growth and utilization thus confirming previous reports on the necessity to detoxify grain legumes before they can be included in monogastric animals' diets (Maidala, 2015). The crop can be grown on a wide range of soil conditions even in marginal areas by poor resource farmers. The aim of this write up is to review the importance of cowpea as protein source in the diet of broilers.

Results and discussion

Cowpea is an excellent and inexpensive source of protein, fatty acid, essential amino acid,

vitamins and minerals (Fagreia *et al*., 1990). The proximate chemical composition of cowpea found that crude protein is 24.7% crude fiber is 2.7%, crude fat is1.30% and ash is 3.60% (Defang *et al*., 2008). All the parts of the plant that are used for food are nutritious and provide protein, vitamins and minerals. Cowpea plant can tolerate drought and poor soils hence it is an important crop in the savanna regions where these constraints restrict other crops (IITA, 2004). It also contains reasonable amount of other water-soluble vitamins such as riboflavin, pyridoxine and folacin, in addition to potassium, iron, zinc and phosphorus (Aykrayd *et al*., 1982). Field trial revealed that cowpea can be used to replace soyabean up to 20-30% without effect on performance. Defang et al., 2008 fed broilers with cowpea and common bean up to 11% and reported a significant difference in feed intake and daily weight gain at the starter phase ($P<0.05$) but feed conversion ratio was statistically similar ($P>0.05$), at the finisher phase the performance characteristics were statistically similar ($P>0.05$). Chakam *et al*., 2010 fed graded levels of cooked cowpea seeds to broilers at 0%, 15%, 20%, 25% and 30%. Results showed that total feed intake (3236.26-3348.43g), total weight gain (1094.93-1362.49g) and feed conversion ratio 92.48-3.02 were statistically similar ($P>0.05$) indicating that cowpea can replace soyabean. Similarly carcass characteristics showed that carcass yield (68.16-73.51%), liver weight (3.16-3.38%), gizzard (2.58-3.56%) and most of the internal organs were statistically similar ($P>0.05$). It was concluded that finishing broiler chickens can tolerate up to 20% cooked cowpea with no effect on performance and carcass yield.

Elfadil, 2004 fed soaked cowpea to broilers at 0%, 5%, 10% and 15% and reported no significant effect on total feed intake (2696.60-2851.90g), total weight gain (1411.94-1528.90g) and feed conversion ratio (1.81-1.91)($P>0.05$). Similarly live weight (1401.33-1551.33g), hot weight (900.98-1024.93) ($P<0.05$) and dressing percentage (64.29-65.93%). He concluded that soaked cowpea can be used in the diet of broiler chickens up to 15% without effect on performance and carcass yield. Maidala *et al*., fed graded level of cowpea seeds 0%, 20%, 30%, 40% and 50% and concluded that cowpea seeds can be incorporated into broiler diets up to 30% without deleterious effects on carcass yield and gut characteristics

Abdon *et al*., 2013 fed differently processed cowpea at 15% level of inclusion and evaluate the performance of broilers, results showed significant difference in feed conversion ratio for birds fed cowpea incorporated diet than those fed control diet (2.40 vs. 2.60 kg feed/kg weight). Abdelgani *et al*., 2013 fed graded levels of cowpea at 0%, 5%, 10% and 15% to broilers and evaluate their performance; results indicated that there was no significant difference in the performance and carcass characteristics. They reported better profit return in the control and 5% cowpea inclusion level. Gumaa Baliel, 2014 fed graded level of raw cowpea seeds at 0, 5, 10, and 15% and reported reduced performance at 15% level of inclusion ($p<0.05$). Similarly reduced blood parameters and high uric acid were reported in broilers fed 15% raw cowpea seeds. He concluded that 5-10% level of raw cowpea was satisfactory for enhanced performance of broiler chickens.

Maidala *et al*., 2016 fed higher levels of cowpea seeds at 0%, 20%, 30%, 40% and 50% and assessed the blood parameters of broilers. Results showed significant differences in heamoglobin (7.65-8.90), packed cell volume (26.50-41.00), neutrophiles (44.00-69.00), total protein (35.00-50.50), ASAT (72.00-119.00) and ALAT (17.50-19.50) were affected by the different levels of cowpea seeds. They recommended 30% level of inclusion for enhanced heamatological and serum biochemical parameters of broiler chickens to reduce toxicities. Akanji *et al* ., 2012 fed differently processed cowpea seeds at 20% level which include raw cowpea (control), dehulled cowpea, dehulled and cooked cowpea and dehulled and roasted

cowpea. Results showed that performance characteristics and blood parameters were better in differently processed cowpea than the control diet ($P<0.05$). It was concluded that combination of dehulling and cooking lead to better performance. This signified a better detoxification of the ant nutritional factors to other treatments.

Conclusion and recommendations

Based on the reviewed articles it can be concluded that broiler chickens can tolerate up to 20% level of inclusion of processed cowpea seeds without deleterious effect on performance, carcass characteristic and blood parameters. The inclusion of cowpea seeds to replace soyabean in broiler ration would reduce the cost of production, provide alternative protein feedstuff and make availability of animal protein.

References

Abdelgani A. A. , K. A . Abdel Atti , K .M. Elamin, K. Y . Dafalla and H .E. E. Malik and B. M. Dousa (2013). Effect of dietary cowpea (Vigna unguiculata) seeds on the performance of broiler chicks. *Wayamba Journal of Animal Science* 1367690653:678-684

Abdon T. Y. Kur , Khadig A. AbdelAtti , Bakheit M. Dousa , Hind A. A. Elagib , Huwaida E. E. Malik and Khalid M. Elamin,(2013). Effect of Treated Cowpea Seeds on Broiler Chicken. *Global Journal of Animal Scientific Research.* **1**(1): 58-65. 2013

Amaefule K.U. and Onwudike, O.C (2000). Foundation of Processing Methods of pigeon Pea Seed (Cajanus) as protein Source for Broiler Starter. J.Sust. agric. Enis ron **2**: 134-138

Amaefule FO, Obua BE, Ukweni IA, Oguike MA, Amaka RA (2008). Haematological and biochemical profile of weaner rabbits fed raw or processed pigeon pea seed meal based diets. Afr. J. Agri. Res., 3(4): 315-319.

Akande, K.E. and Fabiyi, E.F. (2010). Effect of processing methods on some Antinutritional factors in Legumes seeds for poultry feeding. *International Journal of Poultry Science* **9** (10):996-1001

Akanji, A.M. (2002). Enhancing The Utilization of Some Tropical Legume Seeds In Diet of Exotic Meat Type and Egg Type Chickens. PhD Thesis, University of Ibadan.

Akanji, A., Fasina, O. and Ademola. D. (2012). Growth and Heamatological Profile Of Broiler Chickens Fed Raw And Processed Cowpea Based Diets. *Journal of Biology, Agriculture and Healthcare*. **6**:118-125

Ameen, O.M.; Fatope, O.M.; Usman, L.A. and Adebayo, S.A. (2005). Bioactive metabolites in improved cowpea seeds. African Journal of Biotechnology. **4**(6): 513-516.

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

Aykrayd, W.R., Douglas, J. and Walker (1982). Legumes in human nutrition. 2nd ed. Cited in Nugdallah, A.G. M.Sc.

Carnovale, E., Marletta, L., Marconi, E. and Brois, E. (1990). Nutritional and hydration properties in cowpea. Cowpea Genetic resource: 113 contributions in cowpea exploration evaluation and research from Italy and the International Institute of Tropical Agriculture.

Chakam, V.P. (2003) Essai d'utilisation de la farine des graines toastées de niébé (*Vigna unguiculata* (L)walp) et/ou de haricot commun noir (Phaseolus vulgaris) dans les rations démarrage et finition des poulets de chair. Mémoire de fin d'études du cycle des ingénieurs agronomes. Université de Dschang, FASA, 2003.

Chakam, V.P., Teguia, A. and Tchoumboue, J. (2010). Performance of finisher broiler chickens as affected by different proportions of cooked cowpeas (*Vigna unguiculata*) in the grower-finisher diet. AJPAND **10**(4):2427-2438

Davis, D.W., Oelke, E.A. and Hanson, C.V. (1991). Cowpea, Departemthn of of Horticultural Science, university of Minnesota, St. Paul. MN, 55108.

Defang, H.F., Teguia, A., Awah-ndukum, J., Kenfack, A., Ngoula, F. and Metuge, F. (2008). Performance and carcass characteristics of broiler fed boiled cow pea (*Vigna unguiculata* (L) walp) and or black common bean (*Phaseolus vulgaris*) meal diets. African Journal of Biotechnology, **9**:1351-1356.

Elfadil, E.K.E (2004). The use of soaked cowpea (Vigna unguiculata l. walp) seeds as protein source in broiler diets. Unpublished M.Sc. Thesis. University of Khartoum Sudan

Emiola, I.A., Ologhobo A.D, Adepeju T.A, Oladunjoye I.O and Akanji A.M (2003). Performance characteristic of broiler chicks fed kidney beans as replacement for two conventional legumes. Moor Journal of Agricultural research **4**:236-241.

Fageria, N.K.; Baligar, V.C. and Jones, C.A. (1990) Common bean and cowpea. In: Growth and minerals nutrition of field crops, eds. Fageria NK, Baliger V.C. and Jones C.A. 281-381.

Gumaa-Balaiel, N. (2014). Effect of dietary levels of cowpea (Vigna unguiculata) seeds on broiler performance and some serum biochemical factors. Online Journal of Animal and Feed Research Volume Online Journal of Animal and Feed Research. **4**(1):1-05

Hafiz, N.A. and Damarany, A.M. (2006). Variation in the susceptibility of some cowpea (Vigna unguiculata) genotypes to infestation with certain pests in upper Egypt.

Igwebuike, J.U., Kwari. I.D., Ubosi, C.O., Alade, N.K. (2009). Replacement Value of Spent Sorghum Grains for Maize in Broiler Finisher Diets. *Journal of Sustainable Agricultural Environment* **3**:224-33.

International Institute tropical agriculture (IITA) (2004). Information available at http://www.iita.org/crop/cowpea.htm.

Laurena, A.F.M., Rodriguez, N.G., Sabino, A.F., Zomora and Mendoza, E.M.T. (1991). Amino acid composition relative, nutritive value and in vitro protein digestibility of several Philippine indigenous legumes. *Plant Foods for Human Nutrition*. **41**: 59-68.

Maidala A. and Istifanus, J.A (2012). The roles of micro-livestocks in Alleviating protein deficiency and poverty reduction in Nigeria. Being A paper presented at second school of vocational and technical Education conference held at College of Education Azare 4th -8th June, 2012.

Maidala, A. (2015). Nutritional evaluation of selected plant protein sources in the diets of broiler chickens. Unpublished Ph.D thesis. Animal production department. Abubakar Tafawa Balewa University, Bauchi

Maidala, A., Mahmud, M. and Ibrahim, M. (2016). Carcass yield and gut characteristics of broiler chickens fed graded levels of cooked cowpea . Proceedings of 42nd Annual Conference of Nigerian Society of Animal Production Landmark university Omu-Aran. Pp 895-901

Maidala, A., Mahmud, M. and Adamu, M. (2017). The effect of feeding graded levels of cowpea seed meal on heamatology and serum biochemical parameters of broiler chickens.Proceedings of NSAP Abeokuta, Nigeria

Ogundipe, S.O., Abeke., F.O, Sekoni, A.A., Dafwang, I.I. and Adeyinka, A.I.(2003). Effect of duration of cooking on the utilization of lab lab purpureus by pullet chicks. In: Proceedings of the 28th Annual conference of the Nigerian Society for Animal

Production held at Ibadan, Nigeria. p. 233-5.

Ogundipe, .SO., and Sanni, .SA. (2002). Economics of poultry production in Nigeria. Training workshop manual (2002). National Animal Production Research Institute, A.B.U. Shiva, Zaria. 2002. p. 27-45.

Ologhobo, A.D. and Fetuga, B.L. (1983). Varietal difference in fatty acid composition of oils from cowpea and lima bean. Food Chem. **10**: 267-274.

Omole, A.J., Adejimi, O.O., Adejurigbe, A.D., Tiamiyu, A.K. and Raji, A.M. (2006). **Small and medium scale broiler chicken farming**. Green choice Agric Publications 55pp

Onwuem, I.C. and Sinna, T.D. (1990). Field crop production in tropical Africa principles and practice. 292-298.

Sanni, S.A. and Ogundipe, S.O. (2005). Economics of some modules of poultry production in Kaduna state. *Nigerian Journal of Animal Production* **32** (1):102- 107.

Teguia A and Beynen A (2005). Alternative feed stuffs for broilers in Cameroon. *Livestock Research for Rural Development*, 17: (3), 2005.

Teguia A, Japou IB and Kamsu EC (2003). Response of broiler chickens to Vigna unguiculata (L.) walp (cowpea) Phaseolus vulgaris (black bean) and Voanzeia subterranean (Bambara groundnut) as feed ingredients in replacement of meat meals. Submitted for Publication to Journal of Animal and Feed Sciences.

Udensi, E.A.; Edwu, F.C. and Isinguzo, J.N. (2007). Antu-nutritional factor of vegetable cowpea (Sesquipedalis) seeds during thermal processing. Pakistan Journal of Nutrition 6 (2): 194-197.

Walker, A.F. (1981). Pulses: neglected part of diet. Br. Nutr. Found Bull No. 31 6(1): 36-42 Cited by Nugdallah, A.G. M.Sc. Thesis, University of Khartoum, Sudan. W