

GROWTH INDICES OF BROILER CHICKS FED DIFFERENTLY PROCESSED FULL FAT SOYABEAN

A. MAIDALA¹, U. D. DOMA², AND L. MEGBO²

¹Department of Animal Science, Federal University Gashua, Yobe State, Nigeria

²Animal Production Department, Abubakar Tafawa Balewa University, P.M.B. 248, Bauchi State, Nigeria

Abstract

An experiment was conducted to evaluate the performance and economics of broiler chickens production fed diets containing differently processed full fat soybean. Five diets were formulated in which differently processed full fat soybean containing sprouted, salt treated, cooked and roasted with raw soyabean as control. Two hundred and fifty (250) Anak 2000 broiler chicks were randomly allotted to five dietary treatments replicated five times in a completely randomized block design (CRBD). Results showed that daily feed intake (49.51-67.23g), daily weight gain (21.79-33.44g), feed conversion ratio (1.66-2.67), feed efficiency ratio (0.37-0.63g) and survivability (94.00-100)% were significantly ($P < 0.05$) affected by the different processing methods. It can be concluded that cooked soybean was more efficient in enhancing growth performance of broiler chicks.

Keywords: Soyabean, processing, broiler chickens, cost implication.

INTRODUCTION

Soybean (*Glycine max* (L.) Merrill) is a principal vegetable protein source in animal feed industry in Nigeria. The use of soybeans without oil extraction that is full fat soybean has great nutritional properties. It is high in protein with unique biological value, its fat content contribute to the energy required for protein synthesis. Full fat soybean contain between 38-40% CP, 18% fat and 5% crude fibre (Smith, 2001). Soybean can be used as a source of sole source of protein in poultry and swine diets. Soybean proteins have a high biological value and have a high content of fat and unsaturated fatty acids with about 50% linoleic acid (Leeson & Summers 2000). The quality of protein of soybean can be comparable to that of animal protein sources such as meat and milk (Fabiya and Hamidu, 2011). Metabolisable energy of 2800 – 3200k/cal/kg was reported in soybean. The use of full fat soyabean in poultry industry would eliminate the cost of oil extraction in monogastric diets (Lesson et al., 1987). Soya bean is also a good dietary source of amino acids, calcium and potassium (Iwe, 2003). It is also a good source of iron and contributes thiamine, riboflavin and niacin to the diet. Soybean is limiting in sulphur containing amino acids such as methionine and cysteine but contain sufficient lysine to overcome the lysine

deficiency of cereal (Potter and Hotchkiss, 1995). Raw full fat soyabean cannot be used in poultry nutrition, because it contains various anti-nutritional factors such as trypsin inhibitor, Lectins, saponins and goitrogenic factors that interfere with nutrient digestibility causing reduction of feed intake, growth rate and efficiency of feed utilization in broiler chickens (Maidala et al., 2011; Ari et al., 2013). Full fat soybean contain anti nutritional factors that reduce the digestibility, bioavailability of nutrients and utilization of amino acids in monogastric and immature ruminants (Anderson Heffernan, 1992; Maidala et al., 2011). Increasing the nutritional quality of soybean and other legumes can be accomplished by several processing methods such as toasting, cooking, extruding, salt treatment, fermentation, germination pressure cooking, cooking, soaking, urea treatment (Akande and Fabiyi, 2010; Maidala et al., 2013). The aim of the processing of seed legumes for poultry nutrition is to increase the nutritional value of feed and to maximize the bird performance. It is against this background that the research work attempted to evaluate processing methods of soybean seeds on growth performance and cost implication of differently processed soybean.

MATERIALS AND METHODS

The feed ingredients were purchased in Azare Central Market. The premix, lysine and methionine were purchased in Animal Care Kano, Kano State. The cleaned raw soyabean seeds were poured into a bed of alluvial sand in half drum and heating the sand to about 100°C. Sufficient quantities of the ingredients to cover two third of the area of sand was placed on the sand. Stirring of the ingredients was done constantly until they were roasted for the duration of 30 min (Cheva-Israkul and Tangtaweewipat, 1995). Grinding of the roasted beans produced full-fat soya bean meal. The raw soyabean seeds were sorted to ensure homogeneity of product and were cooked by bringing water in a half drum to boiling point and pouring the ingredients in the boiling water for thirty minutes (30) (Fanimo, 1996; Kaankuka *et al.*, 1996) to produced the cooked full-fat soya bean, they were then sun dried for 3-4 days and ground to produced the corresponding full fat soyabean meals. Salt solution is prepared by adding 3% salt of total weight of sample, dissolved in water and soaked the soyabean for 24 h (Ayanwale, 2006) they were sun dried for 3-4 days and stored in bags. Salt treated fullfat soya bean meals were produced by grinding the salt treated beans. Sprouts of soyabean were done by soaking the seeds in water for 24 h. The seeds were removed and germinated by spreading the seeds on jute bags and covered them with the same material and apply water on jute bags twice daily for 3 to 4 d (Echendu *et al.*, 2009) until the seeds begin to sprout. Sprouted seeds of soya bean, were sun-dried and ground to produce the meals. Two hundred and fifty Anak 2000 broiler chicks were obtained from Zartech Farm Jos. The birds were brooded for one week during which necessary routine husbandry management practices were duly observed. The birds were fed essential feed[®] broiler starter having 23 % CP. Thereafter, the birds were randomly assigned to isocaloric and isonitrogenous experimental diets containing differently processed soyabean (raw, roasted, cooked, salt treated and sprouted soyabean designated as 1,2,3,4, and 5, respectively). The ingredients and nutritional composition of the diets are presented in Table 1.

Feed intake, body weight gain and feed efficiency were measured.

Data generated were analyzed using Analysis of variance techniques (Steel and Torrie, 1980) using the Minitab software and means were separated using Duncan's multiple range test (Duncan, 1955)

RESULTS

The performance characteristics of broiler chicks fed differently processed soyabean in the starter phase is shown in Table 3. The initial weight of the broiler chicks varied between 98.07- 98.71 g and the difference between the values were similar. The final body weight varied between 618.80 g in raw soya bean to 1007.72 g in cooked soya bean and the values were affected by the different processing methods. The highest daily feed intake (67.23 g) ($P < 0.05$) was obtained in broiler birds fed diet 4 containing cooked soya bean which was similar to the values on diets 2, 3 and 5 containing sprouted, salted and roasted products, respectively. However the lowest value of 49.51 g/bird/day was found in broiler chicks fed raw soybean based-diet (diet 1). The highest daily weight gain (33.89 g) was observed on diet 5 (roasted soybean) which did not differ from the value of 33.44 g in birds fed cooked (diet 4) while the lowest value of 21.79 g was obtained on diet 1 (raw soybean) which was similar to the weight gain on diet 2 and 3. The feed conversion ratio and feed efficiency followed the same trend with best values on diets 4 and 5 (roasted soybean and cooked soybean) and were significantly ($P < 0.05$) better than the values of birds on diets 1, 2 and 3. Most of the chicks survived during the experiment with a survivability percentage of between 94 and 100 % observed on diets 1 and 2, respectively.

DISCUSSION

The reduced final weight (618.80 g) and the poorest feed intake was observed on raw soybean (49.51 g) and could be attributed to antinutritional factor present in raw soya bean (Liener, 1994; Anderson Hafermann *et al.*, 1992) which depressed feed intake and caused inhibition of intestinal digestion and absorption. The high feed intake ($P < 0.05$) in cooked soya bean (67.23 g) can be attributed to effective processing of cooked soya bean (Iheukwumere *et*

al., 2008; Abeke et al., 2011 and Ari et al., 2013). The low daily weight gain (21.79 g) of raw soya bean is a reflection of poor feed intake and utilization in raw soya bean. High daily weight gain in cooked soya bean (33.44 g) and roasted soya bean (33.89 g) is an indication of effective processing. The low feed conversion ratio in cooked soya bean (1.66) is an indication of effective processing and the values are better than 2.41 reported by Ayigun and Alphonsus (2014) on cooked and roasted soya bean. Poor feed conversion ratio in raw soya bean (2.27) and salt treated soya bean (2.50) is an indication of poor performance (Iheukwumere et al., 2008). The feed efficiency ratio is a reflection of feed intake and weight gain which is higher in cooked soya bean (0.63) and roasted soya bean (0.57) and lower in salt treated soya bean (0.37), sprouted soya bean (0.40) and raw soya bean (0.44). Chick's survivability is better in sprouted soya bean (100%) and worse in raw soya bean (94%). The antinutritional factors present in raw soya bean can cause mortality of broiler chicks. It can be concluded that cooked soybean was more efficient in enhancing growth performance of broiler chicks.

REFERENCES

- Abeke, F.O., Amodu, J.T., Ogundipe, S.O., Sekoni, A.A. and Adeyinka, I.A. (2011). Effect of processing methods on the proximate composition of Lablab purpureus (Rongai) beans. In: 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 734-736. Proceedings of 36th Annual Conference of the Nigerian Society for Animal Production. 13th-16th March, 2011. Abuja
- Akande, K.E. and Fabiyi, E.F. (2010). Effect of processing methods on some antinutritional factors in 1 Legumes seeds for poultry feeding. *International Journal of Poultry Science*, 9 (10):996-1001.
- Anderson Hafermann, J.C., Zhong, T. and Parsons, S. (1992). Effect of heating on nutritional quality of conventional and kunitz trypsin inhibitor-free soya beans. *Poultry Science*, 71:1700-1709
- Ari, M.M., Ayanwale, B.A., Adama, T.Z. and Olatunji, E.A. (2013). Performance traits, nutrient utilization and cost implication of feeding different thermally treated soya beans to broiler chickens. *Nigerian Journal of Animal Science*, 15:71-82
- Ayanwale, B.A. (2006). Growth and carcass characteristics of broilers fed alkali processed Soya bean. *Nigerian Journal of Animal Production*, 33 (1):40-44
- Ayigun, A.E. and Alphonsus, C. (2014). Performance of broiler chicks fed diets containing boiled and toasted full-fat soya bean. In: Abdullahi, A.R., Tayo, G.A., Akubanjio, A. O. and Akinsoyinu, Q.A. (Eds) Positioning Animal Production in the Agricultural Transformation Agenda. Proceedings of 39th Annual Conference of the Nigerian Society for Animal Production Pp 258-261. Ilesha-remon, Ogun state, Nigeria.
- Cheva- Israkul, B. and Tangtaweewipat, S.(1995). Utilization of full-fat soya bean in poultry diets-Broilers. *African Journal of Food Science*, 8(7)89-95
- Duncan, D.B., (1955). Multiple range and multiple F-tests. *Biometrics*, 11: 1-42.
- Echendu, C.A., Obizoba, I.C. and Anyika, J.U. (2009). Effects of germination on chemical composition of groundbean (*Kerstingiella geocarpa* harm) seeds. *Pakistan Journal of Nutrition*, 8: 1849-1854.
- Fabiyi, E.F. and Hamidu, B.M. (2011). Adoption of improved technologies in soya bean processing utilization in Tafawa Balewa Local Government Area of Bauchi State, Nigeria. *African Journal of Food Agriculture, Nutrition and Development*, 11 (1):4527-4537.
- Fanimo, A.O. (1996). Nutritional evaluation of full-fat soya bean boiled for three times periods. *Pertanica Journal of Tropical Agriculture*, 19(2/3):175-182.
- Iheukwumere, F.C., Ndubisi, E.C., Mazi, F.A. and Etusim, P.E. (2008). Growth, carcass and gut Morphology of broiler chickens fed raw and processed soya bean seed meal. *Research Journal of Poultry Science*, 2 (3):49-52
- Iwe, M.O. (2003). The Science and Technology of Soya bean, Chemistry Nutrition,

- processing and utilization. Rejoint Communication Services Ltd. Pp.1-31
- Kaankuka, F.G., Balogun, T.T. and Tegbe, T.S.B. (1996). Effect of duration of cooking of fullfat soya bean on proximate analysis, levels of antinutritional factors and digestibility by weaning pigs. *Animal Feed Science and Technology*, 62:229-237
- Lesson, S. J., Atteh, J. O and Summers, J.D. (1987). Effect of increasing dietary levels of Commercially heated soya beans on performance nutrient retentions and carcass Quality of broiler chickens. *Canadian Journal of Animal Science*. 67:821-828
- Lesson, S. and Summers, J.D. (2000). Commercial poultry nutrition. Second edition, University Books. Guelph, Ontario.
- Liener, I.E. (1994). Implication of anti-nutritional component sin soya bean foods. *Critical Review of Food Science and Nutrition*, 34: 31-67
- Maidala, A. Doma, U.D. and Ajighjigh, D.T. (2011) .Growth performance of weaner rabbits fed diets containing different processed soybean (Glycine max (L) Merrill) product. *Proceedings of 36th of Nigerian society of Animal production 13-16th March 2011, University Abuja.*
- Maidala, A., Egbo. M.L. and Doma, U.D. (2013). Effects of different processing methods on the chemical composition and antinutritional factors of soybean (Glycine max (l.) Merrill). *Pakistan Journal of Nutrition* 12(12):1057-1060
- Smith (2001). *The tropical Agriculturalist*. Revised Edition. Published by Macmillan Education Ltd. London and Oxford.
- Potter, W. N. and Hotchkiss, J. H. (1995). *Food sciences 5th Edition*. Chapman and Hall book International. Thompson publishing pp.28-30.
- 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.

Table 1: Ingredients and nutrient composition (%) of the differently processed soyabeam diets fed to broiler starter at the starter phase (1-5weeks)

Ingredients	Diets				
	1 Raw	2 Sprouted	3 Salt Treated	4 Roasted	5 Cooked
Maize	45.06	45.06	45.06	45.06	45.06
Soybean (Full-fat)	36.04	36.04	36.04	36.04	36.04
Wheat offal	10.00	10.00	10.00	10.00	10.00
Fishmeal	5.00	5.00	5.00	5.00	5.00
Limestone	1.00	1.00	1.00	1.00	1.00
Bone meal	2.00	2.00	2.00	2.00	2.00
Sodium chloride	0.25	0.25	0.25	0.25	0.25
lysine	0.20	0.20	0.20	0.20	0.20
Methionine	0.20	0.20	0.20	0.20	0.20
Vitamin/mineral premix*	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00
Calculated analysis					
Crude protein	23.00	23.00	23.00	23.00	23.00
Metabolisable energy(kcal/kg)	2800.00	2800.00	2800.00	2800.00	2800.00
Crude fibre	6.08	6.08	6.08	6.08	6.08
Ether extract	6.08	6.08	6.08	6.08	6.08
Calcium	1.42	1.42	1.42	1.42	1.42
Available phosphorus	0.95	0.95	0.95	0.95	0.95

Each kilogram contains; vit. A, 10,000,000 IU, vit. D₃ 2,000,000 IU, Vit. E 23,000mg, Vit. K₃ 2,000mg, Vit. B₁ 1,800mg, Panthothenic Acid 7,500mg, Vit. B₆ 3,000mg, Vit. B₁₂ 15mg, Folic acid 750mg, Biotin 11260mg, Choline Chloride 300,000mg, Cobalt 200mg, Copper 3,000mg, Iodine 1,000mg, iron 20,000mg, Manganese 40,000mg, Selenium 200mg, Zinc 30,000mg, Antioxidant 1,250mg

Table 3: Performance of broiler chickens fed diets containing differently processed Soya bean at the starter phase (1-5 weeks of age)

Parameters	Diets					SEM
	1 Raw	2 Sprout	3 Salt Treated	4 Cooked	5 Roasted	
Initial weight (g/b)	98.45	98.71	98.07	99.08	98.25	0.20 ^{NS}
Final weight (g/b)	618.80 ^b	792.12 ^a	761.60 ^a	1007.72 ^a	969.08 ^a	368.92 [*]
Daily feed intake (g)	49.51 ^b	59.50 ^a	59.37 ^a	67.23 ^a	59.19 ^a	10.01 [*]
Daily weight gain (g)	21.79 ^b	23.71 ^b	21.94 ^b	33.44 ^a	33.89 ^a	11.04 [*]
Feed conversion ratio	2.27 ^a	2.50 ^a	2.98 ^a	1.66 ^b	1.76 ^b	0.84 [*]
Feed efficiency	0.44 ^b	0.40 ^b	0.37 ^b	0.63 ^a	0.57 ^a	0.12 [*]
Survivability (%)	94	100	98	98	98	-

SEM: Standard error of means, abc: means bearing different superscripts within the same row are statistically different (P<0.05)