Effect of Replacement of Soybean Residue for Groundnut Cake on the Performance and Nutrient Digestibility of Broiler Finisher

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Abstract
A 35-day feeding trial was conducted with two hundred (200) Arbor Acress strain broiler chicken to determine the effect of Soybean residue (SBR) on the growth response. The Iso-nitrogenous experimental diet were formulated which contain SBR. In the control diet (T¬¬1¬) groundnut cake was served as the only protein source. Four (4) test diets designate as T¬2, T3, T4 and T5 were formulated with SBR replacing 25, 50, 75 and 100% of groundnut cake respectively. The birds were randomly grouped into five (5) experimental treatment groups in (4) replicates of 40 birds per treatment in a completely randomized design. Significant increase (P<0.05) was observed in feed intake, body weight and protein intake as SBR inclusion level increased. Feed conversion ratio was significantly (P<0.05) better for birds fed 50% diet. The inclusion of SBR up to100% significantly (P<0.05) improved the digestion of crude protein and crude fibre. Ether extract and nitrogen free extract values obtained were not significant. Due to efficiency of utilization of feed and protein to produce meat, soybean residue can be used up to 100% to replace groundnut cake in diet of broiler chickens thus proving a productive use for this hitherto neglected agro-allied waste.

Key words: *Soybean residue, performance, digestibility, broiler finisher*

Introduction

The over dependence on the use of groundnut cake and soybean meal as a major sources of protein nutrient in poultry feed had led to both competition by man and thereby makes them uneconomic to be incorporated in monogastric nutritional managements (Agbale and Aleter, 2001). In the event of the global feed crisis therefore, the only better approach to solving this escalating princes of feed ingredients is the use of alterative feed ingredients to the conventional ingredients that can partly or wholly replace them without compromising on the health status and performance of the animals (poultry). The alternative to the high cost of convectional ingredients are discovery, processing harnessing of unconventional sources of poultry feedstuffs for which there is little or no competition from human (Ogunlipe *et al., 1992*).

Grain residue or wastes like soybean residue (SBR) is cheaper and represent unutilized protein sources. The important of soybean residue in monogastrics particularly poultry and

rabbit has been recognize by farmer because of its relatively high content of protein and energy (Ojebiyi *et al., 2013).* The SBR has higher lysine content (2.8%) than groundnut cake (1.6%) and is a good sources of protein which makes a good protein concentrate in poultry ration (Esonu, 2006). The utilization of SBR as a feed resource may help in reducing the pressure on conventional feedstuffs, control environmental pollution caused as a result of indiscriminate discarding of waste. This study was designed to investigate the effect of replacement of soybean residue for groundnut cake on the growth performance and nutrient digestibility of broiler chickens.

Materials and Methods

Experimental Site and Description

The feeding trial was carried out at the Livestock complex, College of Agriculture, Lafia in Nasarawa State of Nigeria. Lafia is located within the guinea Savanna zone of Central Nigeria. The area is between latitude 07^0 $52^/$N - 08^0 $56^/$N and longitude 07^0 $25^/$E - 90^0 $37^/$E. The mean monthly temperature is between 20^0C and 34^0C, with the hottest months being March and April, and the coolest months being December and January (Layam, 2000).

Soybean residue was obtained from soybean cake (Awara) producer in Lafia local government area of Nasarawa state. Soybean seeds were soaked in water for about six to eight hours depending on the temperature of water. The rehydrated beans then undergo milling and filtering to obtain soybean residue and paste for making soybean cake. The processing method used by the producers was presented in Fig 1. The wet (residue) material was collected and sun-dried to about 10% moisture. The dried soybean residue was crushed to smaller particles to obtain a suitable meal for broiler chicken diets. Five iso-nitrogenous diets containing 20% CP broiler finisher were formulated with inclusion varying levels (0%, 25%, 50%, 75%, and 100%) of soybean residue (Table 1). Two hundred (200), 28 days old Arbor Acres strain broiler chickens were randomly allotted to five dietary treatment groups replicated four times with ten (10) birds each to give randomized complete design. Feed and water were provided *ad libitum*. The feeding trial lasted for 35 days. Parameters measured include initial body weight, body weight gain, feed intake and feed conversion ratio. At the end of week 8, two bird / replicate were selected and placed at the metabolic cage for digestibility study. The collected fecal samples were analyzed for proximate composition accordingly to (AOAC, 2006). All data obtained were subjected to analysis of variance (ANOVA) using SPSS (2010).

Results and Discussion

Generally, the growth performance attributes of birds on SBR were significantly ($P<0.05$) better than those fed the control diet (Table 2). Birds fed the control diet (0% GNC level) had significantly ($P<0.05$) lower body weight final, body weight gain, feed intake and protein. The results agree with the finding of Odeyinke *et al.* (2007) who fed weaned rabbits with diets containing different percentage of soybean residue and cowpea as protein sources and obtained significantly ($P<0.05$) effect on their general performance. Feed intake of broiler finisher increased significantly ($P<0.05$) with increasing SBR levels (indicating slightly higher CP for SBR containing diets than control). Some workers (McDonal *et al., 2002*; Bregendalu *et al.*, 2002*)* reported that broiler chickens are generally known to eat and satisfy for energy and protein requirements. Feed conversion ratio (FCR) value for birds fed 50% (2.14) was lower and superior than FCR recorded for birds on the other diets. and this is in consistent with the finding of Ogbonna *et al.*, 2000) that the lower the conversion them as bird fed 50% SBR in this study had a slightly better final body weight compared to others. Protein intake increase significantly ($P<0.05$) with increased inclusion levels of SBR in the

diets. Result of nutrient digestibility is presented in Table 3. There were significantly ($P<0.05$) decreased in crude fiber (CF) digestibility percent with increase in substitution level of SBR based diets. Similar depressions in nutrient digestibility with increasing dietary levels of Baobab (*Adansonia digitata*) pulp based diet have been reported by Rafiu *et al.*, (2012). The CP digestibility decreased as the level of SBR increased. The increase in CP digestibility was probably due to higher (45.00%) level of CP found in GNC compared to 44.00% for SBR. The EE and NEE digestibility values were not significantly ($P>0.05$) influence by the inclusion levels of SBR. Digestibility of nutrients is affected by the nature of the feed in terms of crude fiber contain (McDonald *et al.*, 1995)

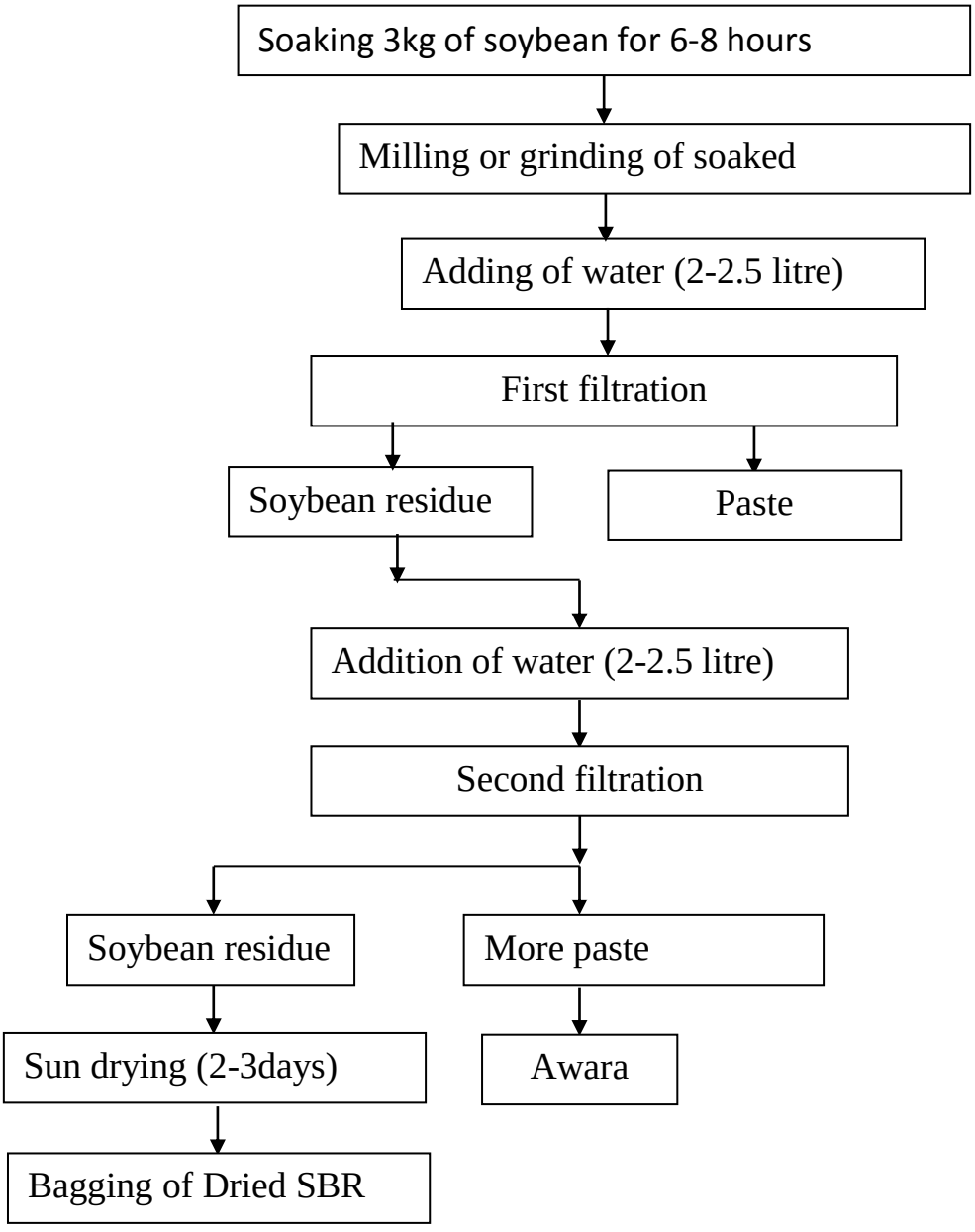

Fig 1: A flow chart showing the production of soybean residue.

References

Agbede, J. O. and Aletor, V.A. (2001). Characterization and role in quality evaluation of differently processed Mucana seed flow. In Proc. Ann. Conf. of the Nig. Soc. For Anim. Prod. PP 210-213.

AOAC (2006). Association of official Analytical Chemists official methods of Analysis. 8th ed. (W. Horwit ed.). Washsington D.C.

Bregendalu, K., Shell, J.H. and Zimmerman, D.R. (2002). Effect of low protein diet on performance and body composition on broiler chicks. World. Poul. Sci. 81 (11): 56-67.

Esonu, B. (2006). Animal Nutrition and Feeding. A Functional Approach. Rukzcal and Ruksons Associate Memory press, Oweri, Imo state, Nigeria. PP 40,118

Layam, A. (2000). Nasarawa State. In A.B., Mamman, J.O., Oyebanji and S.W. Peter, (eds). Nigeria: A people united, a future assured. Survey of state, Abuja, Federal Ministry of Information.

McDonald, P., Edwards, R.A., Greenhalgh, J.F.N. and Morgan, C.A. (1995). Animal Nutrition. 5thEd. Longman, London, U.K. PP 444-510.

McDonald, P., Edward, R.A., Greehalgh, J.D. and Morgan, C.A. (2002). Animal Nutrition (6th edition) Wesley Longman Ltd. Edinburgh. PP 66.

Ogbonna, I.U., Oredein, A.O. and Adesheinwa, A.O.K. (2000). Effect of replacing groundnut cake with raw soybean residue in diet on performance and nutrient digestibility of cockerel chicks. A preliminary study, Nigeria *Poultry Science Journal.* 1: 23 – 31.

Ogundipe, S.O., Sa'adu ,G., Bale, J.O., Aduku, A.O. and Balogun, T.F. (1992). Utilization of Animal Manure in Poultry Diets. Seminar Paper Presented at NAPRI, Shika Zaria. Nigeria.

Ojebiyi, O.O.,Oladunjoye, I.O.,Aboderin, O.J. and Okelade, A.A. (2013). Synergetic effect of Cassava Sievate/Soybean Milk Residue Mixtures as Replacement for Maize in Growing Rabbits diet. *Journal of Natural Science*. 3 (2): 129-131.

Odeyinka, S.M., Olosunde, A.S. and Oyedele, O.J. (2007). Utilization of soybean milk residue, cowpea testsa and corn starch residue by weaner rabbits. Livestock Research for Rural Development 19 (9) Dept. of Anim. Sci. Faculty of Agric. Obafemi Awolowo Uni. Ile-Ife, Nigeria.

Pauzenga, U. (1985). Feeding parentstock. Zcotechnica International PP 22-24.

Rafiu, T.A., Okuntola, D.O., Shittu, M.D., Ookanola, G. and Falodun, T.T. (2012) Diegestibilty and growth performance of broiler Chickens fed Varying Dietary level of Baobab (Adansonia Digitate) Pulp and based diets. Proc. 17th Ann. Conf. ASAN Abuja. PP 442-445.

SPSS (2010). Statistical package for social sciences. (SPSS Version 19 of (2010)

Table 1: Composition of experimental diets for finisher broiler chickens (5 –9 weeks)

	Dietary levels of soybean residue				
Ingredients	T_1 (0%)	T_2 (25%)	T_3 (50%)	T_4 (75%)	T_5 (100%)
Maize	42.92	42.92	42.92	42.92	42.92
Maize offal	14.30	14.30	14.40	14.30	14.30
GNC	31.78	23.84	17.89	7.94	0.00
SBR	0.00	7.94	17.89	23.84	31.78
Rice offal	5.00	5.00	5.00	5.00	5.00
Bone meal	2.00	2.00	2.00	2.00	2.00
Limestone	1.00	1.00	1.00	1.00	1.00
Palm oil	2.10	2.10	2.10	2.10	2.10
Premix'	0.25	0.25	0.25	0.25	0.25
Salt	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
Total	100	100	100	100	100
Calculated Nutrient					
ME (Kcal/Kg)	2908	2942	2979	3014	2908
CP (%)	20.00	19.92	19.84	19.80	19.70
CF (%)	4.02	4.19	4.35	4.52	4.68
Ca (%)	1.16	1.17	1.17	1.19	1.19
P (%)	0.90	0.64	0.64	0.64	0.64
Lysine (%)	1.34	1.35	1.55	1.76	1.96
Methionine (%)	0.74	0.58	0.61	0.64	0.67
Feed cost Kg N/kg)	78.66	71.55	67.72	57.31	50.21

T_1 (0%) control diet, T_2 Diet contained 25% SBR, T_3 = Diet contained 50% SBR T_4 = Diet contained 75% SBR and T_5 = Diet contained 100% SBR GNC = Groundnut cake, SBR = Soybean residue, ME = Metabolizable energy. 'Vitamin – mineral premix (Biomix®) will supply per Kg diet, vit. A 500iU, vit. $D_3$888iU, vit. E12, 000mg, vit. K_3 (500mg) niacin 12000mg, pantothenic acid 2000mg, Biotin 1000mg, vit. B_{12} 300mg, folic acid 1,500kg, chlorine, chloride 600mg, manganese 1000mg, vit. iron 1,500mg, zinc 800mg, copper 400mg, Iodine 80mg, cobalt 400mg and selenium 800mg.

ME(kcal/ kg) = 35 x CP% + 81.8 x EE % + 35.5 x NFE % (Pauzenga, 1985).

Table 2: Effect of experimental diets on growth performance of finisher broiler chickens

Performance indices	Experimental diets					SEM
	$T_{1\ (0\%)}$	$T_{2\ (25\%)}$	$T_{3\ (50\%)}$	$T_{4\ (75\%)}$	$T_{5\ (100\%)}$	
Initial body weight (g)	540.00	540.00	540.00	540.00	530.00	-
Average final body weight (g)	2050.00^{b}	2160.00^{ab}	2370.00^{a}	2210.00^{ab}	2190.00^{ab}	0.04*
Daily body weight gain (g)	43.14^{c}	46.29^{bc}	52.29^{a}	47.71^{b}	47.43^{b}	0.27*
Daily feed intake (g)	104.50^{c}	109.25^{bc}	111.75^{ab}	113.25^{ab}	115.25^{a}	1.00*
Feed conversion ratio	2.42^{c}	2.36^{b}	2.14^{a}	2.37^{b}	2.43^{c}	0.06*
Protein conversion ratio	0.98^{b}	0.97^{b}	0.42^{b}	0.47^{a}	0.48^{ab}	0.07*
Protein intake (g)	20.90^{c}	21.76^{bc}	22.17^{a}	22.42^{a}	22.70^{a}	0.26*

* ($p<0.05$), a, b, c Means on the same row with different superscripts are significantly different ($P<0.05$), SEM = Standard error of mean, T_1 = Control diet, T_2= Diet containing 25% of soybean residue, T_3 = Diet containing 50% of soybean residue, T_4 = Diet containing 75% of soybean residue, T_5 = Diet containing 100% of soybean residue.

Table 3: Effect of experimental diets on nutrient digestibility of finisher broiler chicken

Nutrient	Experimental diets					SEM
	$T_{1\ (0\%)}$	$T_{2\ (25\%)}$	$T_{3\ (50\%)}$	$T_{4\ (75\%)}$	$T_{5\ (100\%)}$	
Crude protein (%)	96.07^{a}	95.62^{b}	94.45^{ab}	94.96^{c}	92.17^{b}	0.38*
Ether extract (%)	83.37	80.11	82.60	85.25	81.53	0.83^{ns}
Crude fibre (%)	90.48^{a}	88.23^{a}	87.30^{a}	86.60^{a}	80.93^{b}	1.00*
Nitrogen free extract (%)	74.60	72.09	71.56	77.58	73.70	1.14^{ns}

* ($p<0.05$), a, b, c Means on the same row with different superscripts are significantly different ($P<0.05$), ns = ($P>0.05$), SEM = Standard error of mean, T_1 = Control diet, T_2= Diet containing 25% of soybean residue, T_3 = Diet containing 50% of soybean residue, T_4 = Diet containing 75% of soybean residue, T_5 = Diet containing 100% of soybean residue.