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Effect of Dietary Levels of Soya Bean Waste Meal on digestibility and haematological indices of Broiler Chickens in the Semi-Arid Region of Nigeria

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Abstract: *The effects of feeding graded levels of soya beans waste meal on digestibility and hematological parameters of broilers chickens were evaluated. The soya beans waste meal was included at 0, 2.5, 5, 7.5 and 10% levels into diets 1, 2, 3, 4 and 5 respectively as replacement for full fat soya beans meal. One three hundred (300) four week Amo breed broiler chickens were randomly assigned to five diets in a Completely Randomized Block Design (CRBD). Each treatment was replicated three times with 20 birds per replicate. At end of the experiment, 9 birds per treatment were selected for digestibility and hematological parameters. The nutrient digestibility of dry matter and ether extract digestibility were not significantly (P>0.05) different among the treatment groups while crude protein and crude fibre digestibility were affected (P<0.05) by the inclusion of soya beans waste meal. Broiler chickens fed T3 diet (5% soya beans waste meal) utilized better crude protein and crude fibre compared to those fed T5 (10% soya beans waste meal) diet, but similar (P>0.05) to other treatments. Most of the hematological parameters were not affected (P>0.05%) by the soya beans waste meal in the diets but only red blood cell count, mean corpuscular volume and mean corpuscular hemoglobin were affected (P<0.05) by the test material. The values obtained in this study were within the normal ranges of healthy broiler chickens. Therefore, the study indicating that up to 7.5% soya beans waste meal can replace with full fat soya bean meal without adverse effect on the digestibility and hematological parameters of broiler chickens.*

Keywords: *Broiler chickens, Soya bean waste meal, Digestibility and Haematological parameters*

INTRODUTION

The poultry industry in Nigeria has undergone significant transformation since the early fifties from a backyard, peasant and primitive household, oriented husbandry of breed of semi-wild chicken to the cash oriented modern large scale poultry. Broiler was introduced into Nigeria in the 1950s to supplement the fast declining rate of cattle production in a bird to supply much required protein in the diet of Nigerians (Oluyemi, 2000).

Feed supply is the major limiting factor in poultry production in developing countries such as Nigeria (Nwagu, 2005). Feed alone account for 65-80 of total cost of production (Yegany *et al.,* 2002).

The great source of dilemma in poultry industry is feed stuff like maize and soya bean (Adene, 2004). Another factor that affects the availability and affordability is the seasonality nature of the produce and therefore are scarce and very expensive when they are off season.

This result in animal nutritionist resorting to replacement of conventional ingredient with non-conventional alternative sources protein such as soya beans waste (Ezieshi *et al.,* 2004 Okeudo *et al.,* 2005, Okon and Ogunode, 2006). However, quantities of this product in the diet for optimum growth were not fully established.

MATERIALS AND METHODS

Experimental Animals and Management

The study was conducted at the Ramat Polytechnic Teaching and Research Farm, Maiduguri, Borno State of Nigeria. Maiduguri is located between latitude 11^0c and 12^0c longitude 13^0c and 14^0E and on an attitude of 354 above sea level (Alaku, 20005). It falls within the sub-arid zone of West Africa Characterize by short duration of rain fall (3.4 months), which varies from 580mm to 600mm with long dry season (7-8 months). Ambient temperatures are high during the month of April to June and fall within the range 40^0c and above well relative humidity at non-range from 5-45% (Alaku, 2005).

Three hundred (300) four week Amo breed broiler chickens were used for the experiment, the chicks were brooded together in a deep litter system using black charcoal with kerosene for heat production. A 200 watt electric bulb used at night to illuminate the house and lantern is provided in case of power failure in the night. A commercial broiler starter was provided and water *ad libitum* throughout brooding phase. Vaccination for Newcastle and Gumboru disease were strictly observed as scheduled.

At the end of the brooding phase, the birds were randomly assigned in to five treatment diets containing various level of soya beans waste replacing full fat soya bean for four weeks. Each treatment was replicated three times with 20 birds per replicate.

The experimental diets and portable water was supplied *ad libitum* throughout the experimental period of four weeks.

Processing of Soya Bean Waste Meal

Soya bean waste (SBW) which is popularly called *Dusan awara* in Hausa were collected from local that produce *awara* in Maiduguri, Borno State. The SBW was then spread on clean concrete floor and sundried for a period of 2 days and obtained a 95% dry matter content. then it was ground to obtained fine and uniform particles in cooperated in the various treatment diets.

Experimental Diets

The ingredients composition of broiler finisher diets is presented in Table 1. The experimental diets were compounded using the following feed ingredients such as: Maize, soybean meal, groundnut cake, wheat offal, soya bean waste meal, fish meal, bone meal, limestone, methionine, lysine, common salt and premix. In each diet, the soya bean meal was replaced soya bean waste meal at graded levels of 0, 2.5, 5, 7.5 and 10% in treatments 1, 2, 3, 4 and 5, respectively. The proximate compositions of the experimental diets were analyse using AOAC (2000) method.

Table 1: Ingredients composition of broiler finisher diets

Ingredients	T1	T2	T3	T4	T5
Maize	65.36	65.36	65.36	65.36	65.36
Groundnut cake	6.64	6.64	6.64	6.64	6.64
Soya bean meal	10.00	7.50	5.00	2.50	0.00
Wheat offal	10.00	10.00	10.00	10.00	10.00
SBW meal	0.00	2.50	5.00	7.50	10.00
Fish meal	4.00	4.00	4.00	4.00	4.00
Bone meal	2.00	2.00	2.00	2.00	2.00
Limestone	1.00	1.00	1.00	1.00	1.00
Methionine	0.25	0.25	0.25	0.25	0.25
Lysine	0.20	0.20	0.20	0.20	0.20
Common salt	0.35	0.35	0.35	0.35	0.35
*Premix	0.20	0.20	0.20	0.20	0.20
Total	**100**	**100**	**100**	**100**	**100**

** Premix (grow fast) Manufactured by Animal Care Service Consult (Nig) Ltd. Lagos, Supplying the following per kg of premix: Vitamin A, 5000,000 IU; Vitamin D_3 800,000IU; Vitamin E, 12,000mg; Vitamin K, 1,5000mg; Vitamin B_1, 1,000mg; Vitamin B_2, 2,000mg, Vitamin B_6, 1,500mg; Niacin, 12,000mg; Pantothenic acid, 20.00mg; Biotin,10.00mg; Vitamin B_{12}, 300.00mg; Folic acid, 150,000mg; Choline, 60,000mg; Manganese, 10,000mg; Iron;15,000 mg, Zinc 800.00mg; Copper 400.00mg; Iodine 80.00mg; Cobalt 40mg; Selenium 8,00 mg*

Digestibility Study

The nutrient digestibility study was conducted at the end of the week of the experiment. Faecal samples were collected from nine chickens per treatment (i.e. 3 from each replicate) for a period of seven days using fine wire mesh trays placed under the cage cells. The amount of faeces voided daily was weighed and allowed to dry for 24 hours at 80^0C in an oven. The dried faecal samples were stored in air -tight bottles for chemical analysis. The proximate composition of the diets and faecal samples were determined according to AOAC (2000).

Hematological Parameters

At end of the experiment, blood samples were collected randomly from three (3) chickens per replicate (i.e nine chickens in each treatment) for the determination of the hematological indices. The blood samples were collected in sample bottles containing dipotassium salt of ethylene diamine–tetra acetic acid (EDTA–K^{2+}) which served as an anticoagulant. The hematological analysis of blood samples were carried out at the Department of Animal Science University of Maiduguri, Nigeria, using the routinely available clinical methods (Bush, 1975). The hematological indices determined were packed cell volume (PCV), hemoglobin concentration (Hb), red blood cell (RBC) counts and white blood cell (WBC) counts and differential counts. Mean corpuscular hemoglobin (MCH), mean corpuscular

volume (MCV) and mean corpuscular hemoglobin concentration (MCHC) were obtained from calculation according to standard formulae (Jain, 1986).

Statistical analysis

All the data collected were subjected to analysis of variance (ANOVA) using the randomized complete block design (Steel and Torrie, 1980). Means were separated where applicable using the Duncan's multiple range test (Duncan, 1955).

RESULTS AND DISCUSSIONS

Proximate Composition of Experimental Diets

The proximate composition of the experimental diets is shown in Table 2. The crude protein, crude fiber and ether extract values were numerically similar among the diets and values were adequate as recommended by Olomu (2011) for broiler finisher in Nigeria. The ash content of the diets were slightly increase as the levels of SBW meal increased in the diets while nitrogen-free extract decrease as the levels of SBW meal increased in the diets. The metabolizable energy of the diets were also similar and adequate as recommended by Olomu (2011).

Table 2: Proximate composition of experimental diets

Nutrients	T1 (0%)	T2 (2.5%)	T3 (5%)	T4 (7.5%)	T5 (10%)
Dry Matter (%)	83.90	93.95	93.70	93.25	94.05
Crude Protein (%)	19.25	19.39	19.53	19.67	20.80
Crude Fibre (%)	8.57	8.56	8.56	8.58	9.0
Ether Extract (%)	3.50	3.50	3.00	3.00	3.00
Ash (%)	3.50	3.80	4.50	5.50	6.00
NFE (%)	65.18	64.75	64.41	63.25	61.20
ME (kcal/kg)	3238.64	3274.71	3287.67	3287.17	3185.20

ME = Metabolizable energy calculated according to the formula of Pauzenga (1985): ME = 37x% CP+81x%EE+35.5 x %NFE NFE = Nitrogen-free extract

Nutrient Digestibility of Broiler Chickens Fed Different levels of SBW Meal

The nutrient digestibility of broiler chicken fed different levels of SBW meal is shown in Table 3. The result of nutrient digestibility showed that the dry matter and ether extract digestibility were not significantly ($P>0.05$) different among the treatment groups while crude protein and crude fibre digestibility were affected ($P<0.05$) by the inclusion of SBW meal in the diets. Broiler chickens fed T3 diet (5% SBW meal) utilized better crude protein and crude fibre compared to those fed T5 diet, but similar ($P>0.05$) to other treatments. The result shows that SBW meal can replace FFSB meal up to 7.5% level of inclusion without any effect on crude protein and crude fibre digestibility. The result can be compared favourably with the work of (Ajayi, 2014) who fed graded levels of hydrolyzed SBW meal in the diets of broiler chickens.

Table 3: Nutrient Digestibility of Broiler Chickens Fed Different Levels of SBW Meal

Parameters (%)	T1	T2	T3	T4	T5	SEM
Dry Matter	88.86	85.21	86.02	88.86	82.61	7.82 ^{NS}
Crude Protein	77.03^{ab}	79.25^{ab}	88.63^{a}	77.03^{ab}	67.18^{b}	7.96 *
Crude Fibre	67.60^{ab}	65.24^{ab}	84.70^{a}	67.60^{ab}	51.17^{b}	8.53 *
Ether Extract	82.76	82.78	82.01	82.76	81.32	6.04 ^{NS}

SEM = Standard error of mean; NS = Not significantly different (P>0.05); * = Significantly different (P<0.05) and Means in the same row with different superscripts are significantly different (P<0.05)

Hematological Parameters of broiler chickens fed graded levels of SBW meal

Hematological parameters of broiler chickens fed SBW meal are shown in Table 3. All the hematological parameters measured were not significantly (P>0.05) different expect red blood cell, mean corpuscular volume and mean corpuscular hemoglobin. The packed cell volume values (25.66-28.66%) were within the range from 25 to 45% as reported by Anon (1980). This means that protein of the diets was not affected by the inclusion of SBW meal in the diets. The hemoglobin concentration values (8.50-9.53g/100ml) obtained falls within the ranged (7-13g/100ml) as observed by Anon (1980).

The broiler chickens fed T4 diet recorded the highest value compared to other treatments but similar to those fed T3 diet. The red blood cell (RBC) values obtained were within the range 21.00-27.00x10^6mm^3 which were similar to the ranged of 25-32 10^6/mm^3 reported by Anon (1980). The function of the RBC is to transport hemoglobin, which in turn carries oxygen from the lungs to the tissues (Bush, 1991). As a result of the higher value of RBC in T4 is a clear indication that the chickens were free from blood related disease like anemia. The white blood cell values (16.00-17.00x10^3/mm^3) were within the normal ranged (9-31x 10^3/mm^3) for healthy chicken as reflected by Anon (1980). Bush, (1991) reported that high level of white blood cell (WBC) indicates that the body is fighting infection while lower value shows problems with the bone marrow production which was not occur in this study.

. The broiler chickens fed T4 recorded lowest value of mean corpuscular volume (MCV) compared to other treatments with similar values. The MCV ranged between 12.12 and 12.57fl were within the ranged as reported by Anon (1980) for normal healthy chickens. Bush (1991) explained that the MCV values aid in assessing the anemia conditions of an animal and the capacity of the bone marrow to produce red blood cells of normal size and metabolic capacity as earlier stated. This observation was supported by Anon (1980) who reported that hemoglobin reflects the responsiveness of the animal to its internal and external environment which includes nutritional status. The mean corpuscular hemoglobin values ranged from 3.15 to 4.47pg were also tallies with the values reported by Anon (1980). The chickens fed T1 had the highest value when compared to those fed other diets, but similar to chickens fed T2 diet. However, lowest value was obtained in those chickens fed T4 diet. The values were within the range recommended by Anon (1980). The mean corpuscular hemoglobin concentration values ranged from 33.13 to 35.85% were within the ranged 32 to 42% as recommended by Anon (1980). The differential counts (%) parameters are associated with body defense mechanism. All the parameters were not significantly (P>0.05) different among the treatment groups. The values are within the reference values for healthy chicken as recommended by Anon (1980). This is an indication that the diets are adequate in nutrient to support the healthy condition of broiler chickens.

Table 3: Hematological parameters of broiler chicken fed graded levels SBW meal

Parameters	TI	T2	T3	T4	T5	SEM
Packed cell volume (%)	26.33	28.66	28.66	25.66	25.66	1.51^{NS}
Hemoglobin concentration (g/100ml)	9.33	9.50	9.53	8.50	8.53	0.37^{NS}
Red blood cell count ($x10^6mm^3$)	21.00^b	23.00^b	23.66^{ab}	27.00^a	22.00^b	1.05^*
White blood cell($x10^6mm^3$)	16.00	16.00	16.00	16.66	17.00	1.39^{NS}
Mean corpuscular volume (fl)	12.57^a	12.51^a	12.12^a	9.50^b	11.69^a	0.53^*
Mean corpuscular hemoglobin (pg)	4.47^a	4.14^{ab}	4.03^b	3.15^c	3.89^b	0.13*
Mean corpuscular hemoglobin concentration (%)	35.85	33.13	33.25	33.12	33.24	1.12^{NS}
Differential count (%)						
Monocytes	8.33	2.78	0.33	0.33	0.08	0.19^{NS}
Neutrophils	44.00	38.33	40.00	38.33	45.41	9.36^{NS}
Eosinophils	3.33	1.66	1.66	1.66	0.16	1.15^{NS}
Lymphocytes	52.66	60.00	59.66	58.00	54.83	9.46^{NS}

SEM**:** Standard Error of Mean, NS= Not significant (P > 0.05) difference; *= Significant (P<0.05) difference, a b c= Means in the same row with different superscripts are significantly different (P<0.05)

CONCLUSION

Based on the digestibility and hematological indices results indicated that inclusion level of up to 7.5% SBW in the diets of broiler chickens shown no any adverse effect on the health status of the broiler chickens. However, there is need to conduct studies on the growth performance parameters of broiler chickens fed SBW.

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