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Raw Sword Bean Meal as A Substitute for Soya Bean Meal in Broiler Finisher Diets

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Abstract: Feeding trial was conducted using 150 birds of day-old Anak broiler chicks, to assess the effect of substituting raw sword bean meal for soybean meal in broiler finisher diets. 30 and 10 birds respectively constitutes a treatment and a replicate in a completely randomized design. Five experimental diets were used. Diet one was soybean based (control), while the test feedstuff quantitatively replaced 22.42, 44.84, 67.76 and 89.69% of soybean in diets 2, 3, 4 and 5, respectively. Feed intake of birds significantly ($p>0.05$) decreased as the quantity of raw sword bean increased in the diets. Weight gain followed the same pattern while feed-to-gain ratio significantly ($p<0.05$) increased as the quantity of raw sword meal increased in the diet. Mortality for birds fed diets 4 and 5 were 6.7 and 10%, respectively. The gross margin value favoured the control diet (N170.69) as opposed to the test diets with N169.69; N116.64; -N16.69 and -N61.88 for diets 2, 3, 4 and 5, respectively. Mean weight of organ showed significant ($p<0.05$) different for all the parameters measured with the exception of kidney and spleen. For the weight of cut-part, there were no significant ($p>0.05$) differences among treatment groups except for breast-cut and back-cut where diets 1 and 2 (24.03, 24.02) performed better than the others. The blood constituents showed significant difference ($p<0.05$) for all the parameters measured only with the exception of white blood cell. The PCV values fall within the normal range for all the treatment means. The RBC, MCH, MCHC, MCV values were abnormal starting from treatment 3 with the exception of MCHC starting from treatment 2. Serum albumin, creatinine, urea and alkaline phosphatase were higher in the test diets than in the control diet with the exception of treatment 2 where the value for alkaline phosphatase and albumin were lower than the control diet. The control diet had higher globulin value than the test diets. Liver, kidney and spleen were affected histopathologically. Raw sword bean meal cannot replace soybean meal quantitatively even at 5% dietary level of inclusion.

Key words: Raw sword bean meal, substitute, broiler finisher diets

INTRODUCTION

Poultry is the quickest source of meat and its production involves the least hazardous and arduous process in relation to other livestock enterprises[1]. This is much more important in developing countries where shortage of animal protein intake has generated a lot of concern[2]. Like other monogastric, feed accounts for over 70% of the total cost of production[3]. This has been attributed to inadequate production of conventional feeding stuffs, especially proteinous grains and unhealthy competition for them between human and animals with the animals being the looser[4]. Research interest has therefore been awakened in the area of alternative feed resources, which have comparative nutritive value but are cheaper than the conventional protein sources[5]. One of the potential alternatives feed stuff is sword bean (*Canavalia gladiata*)[6]. In Nigeria, it is commonly grown near houses for ornamental purposes but in some places it is believed to be yam-beetle expellant; hence it is called Apoje in Yoruba land. It is called 'Agidagba' in Nasarawa state where it is used for cultural dance and in some places it is believed to be a snake expellant[7,8].

Sword bean (*Canavalia gladiata,* Jacq D.C) is a widely available leguminous crop that thrives well on poor soils where most crops fail due to its excellent adaptability to extreme climatic conditions. It yields about 4600kg seed/ha with crude protein content of about 22-29 percent and is rarely edible by man[6,8,2].

Like other grain legumes, presence of anti-nutritional factors such as lectins, Canavanin, phytin, tannin, trypsin inhibitors, saponin etc. have been reported[6,9,7].

Okoro[2] reported that feeding of raw soybean to weaner rabbits did not produce deleterious effect at 15%

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dietary level of inclusion. The need then to determine the optimum level of inclusion of raw sword bean meal in place of soybean meal in finisher broiler diet. This forms the basis of this study. Since processing involves additional cost, time and energy.

MATERIALS AND METHODS

Experimental location: The experiment was carried out at the poultry and live stock unit of the Michael Okpara University of Agriculture Umudike, Abia state, Nigeria. Umudike bears the coordinate of 5° 28[l] North and 7° 31[1] East and lies at an altitude of 122m above sea level. It is located within the tropical rainforest zone and the environment is characterized by an annual rainfall of about 2177 mm. The relative humidity during raining season is well above 72% and monthly ambient temperature ranges from 17°C-36 March is the warmest month with an average temperature range of 22- 30°C.

The raw sword bean seeds were bought from Agwantashi in Nassarawa state of Nigeria while other feeds tuffs and materials were purchased from Umuahia and Aba, all in Abia state. The raw sword bean seeds were sun-dried and then oven-dried at 60°C. They were later milled using a hammer mill and then used for analysis and animal trials.

Experimental diets and composition: Five diets were formulated (Table 1). Diet I was soya bean-based and served as control. Raw sword bean meal replaced soya bean meal (weight to weight) in diets 2, 3, 4 and 5 at 22.42% (5), 44.84% (10), 67.26% (15) and 89.69% (20), respectively.

Experimental birds and their management: One hundred and fifty (150) 4 week old Anak broiler birds, of average weight of 450-500 g per bird were randomly assigned to five (5) treatment diets given 30 birds per treatment group in a completely ramdomized design (C. R. D). Each treatment group was sub-divided into three replicates of ten birds each. Feed and water were provided to the birds *ad- libitum*.

Data collection: Initial average weight of the birds were taken on the first day of the experiment. Average weight and weight gain were subsequently taken on weekly basis. Feed-to gain ratio was calculated by dividing the average feed intake by the average weight again. Percentage mortality was calculated by dividing number of dead birds by the overall number of birds and multiplied by one hundred.

Table 1: Composition of treatment diets containing graded levels of raw sword bean meal fed at finisher phase

Ingredients	0%	5%	10%	15%	20%
Maize	49.8	49.8	49.8	49.8	49.8
Soyabean	27.5	22.5	17.5	12.5	7.5
Sword beans	-	5	10	15	20
Blood meal	5.0	5.0	5.0	5.0	5.0
Palm kernel cake	9.0	9.0	9.0	9.0	9.0
Fish meal	3.0	3.0	3.0	3.0	3.0
Bone meal	3.0	3.0	3.0	3.0	3.0
Oyster shell	2.0	2.0	2.0	2.0	2.0
Vitamin premix	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Methionine	0.10	0.10	0.10	0.10	0.10
Lysine	0.10	0.10	0.10	0.10	0.10
Total	100.00	100.00	100.00	100.00	100.00
Calculated composition					
Crude protein (%)	23.85	23.1	22.35	21.61	20.86
Metabolisable energy (kcal/kg)	2848.41	2807.91	2767.41	2726.91	2686.41

*1 kg of premix contains: Vitamins A (5,000.000 l.U), Vitamin D3 (1,000.000 I.u), Vitamin E (1200mg), Vitamin B2 (22,000mg), Niacin (22,000mg), Calcium pantothenate (4,600mg), Vitamin B6 (2,000mg), Vitamin B12 (10mg), Folic acid (400mg), Biotin (32mg), Choline chloride (200,000mg), Manganese 0mg)

Gross margin/profitability test was calculated according to Sonaiya[10].

Carcass quality and organ weight were evaluated as described by Akinmutimi[4]. For haematology and blood chemistry determination, one bird per replicate was randomly selected and bled at the end of the trial by severing the jugular vein. A set of blood samples was colleted into bottles containing EDTA for hematological evaluation while another set of blood sample was collected without any anticoagulant, for blood chemistry evaluation. Haematological parameters and blood chemistry were determined as described by Dacie and Lewis[11]. Histopathological examination was carried out as described by Durry and Wallington[12]. It involves collection of samples from various organs such as liver, kidney, heart, spleen, etc. The samples were fixed with 10% normal saline for a minimum of 24 h, after which they were processed and embedded in paraffin wax. This section of 5cm thick were cut, stained with haematoxylin and Eosin (H and E) and examined using the light microscope to observe the presence of necrosis, hyperplasia, etc.

Chemical and data analysis: Raw sword bean meal and the experimental diets were analyzed for proximate composition according to methods of A.O.A.C.[13]. All data were subjected to analysis of variance (ANOVA) while means with significant difference were separated using Duncan's multiple range test (DMRT)[14].

RESULTS AND DISCUSSION

There was slight difference in the composition of the diets. The slight difference in the composition of the diets is in order since the diets were not formulated to be iso-

Table 2: Growth performance and gross margin of broiler birds fed raw sword bean meal in broiler finisher diet

	Levels of raw sword beans in percentage					
	0	5	10	15	20	±SEM
Initial weight/bird (g)	551.67	550.00	558.33	557.33	549.67	20.402
Final weight/bird (kg)	1.8650[a]	1.49200[b]	1.01333[c]	0.52033[d]	0.41700[e]	0.025
Feed intake/bird/day (g	140.333a	126.6667[b]	78.9667[c]	47.33[d]	27.9333[e]	1.003
Weight gain/bird/day (g)	46.9033[a]	33.57[b]	16.2267[c]	-1.3900[d]	-5.1067[e]	0.492
Feed conversion ratio (g feed / g gain)	2.9900[b]	3.7600[a]	4.900[a]	-4.1[c]	-6.0367[c]	6.000
% Mortality	0.00	0.00	0.00	6.7[b]	10[a]	0.818
Gross margin (N)	170.69	163.69	116.64	-16.699	-61.88	

a-e treatment means in the same row with different superscript are significantly different ($p<0.05$)

Table 3: Cut-part of broiler chickens fed raw sword bean meal in broiler finisher diet (expressed as percentage of dressed weight)

	Levels of raw sword beans in percentage					
	0	5	10	15	20	±SEM
Live weight (kg)	2.06667[a]	1.783333a	1.06500b	0.72000c	0.518167	0.097
Dressing Percentage	71.5500	70.9900	67.9767	68.860	67.57	4.074
Drumstick	15.5033	159867	15.2667	15.5567	13.5867	1.112
Thigh	12.35667	12.6700	12.24667	12.5010	12.60167	0.572
Wing	9.11667	10.8033	9.66667	7.06333	9.07833	1.427
Breast cut	24.3033[a]	24.30333[a]	22.8667[ab]	20.71200[bc]	18.52833[c]	0.915
Back cut	24.02667[a]	24.02667[a]	22.3000[ab]	21.82000[b]	21.33233[b]	0.555

a-e treatment means in the same row with different superscript are significantly different ($p<0.05$)

Table 4: Organ weight of broiler birds fed raw sword bean meal in broiler finisher diet. (Expressed as percentage dressed weight)

	Levels of raw sword beans in percentage					
	0	5	10	15	20	±SEM
Kidney	0.74333	0.75000	0.82000	0.96000	0.81367	0.088
Liver	2.80333[c]	3.06333[c]	3.3500b[c]	3.9196[a]	4.226000[a]	0.230
Spleen	0.19000	0.16333	0.18667	0.10633	0.13550	0.033
Heart	0.70667[ab]	0.59667[b]	0.7500[ab]	0.76833[a]	0.65633[ab]	0.047
Intestine	5.4700[b]	5.42000[b]	8.65333[a]	8.46600[a]	9.57300[a]	0.301
Proventriculus	0.57333[b]	0.55667[b]	1.000[a]	1.01767[a]	1.03467[a]	0.084
Gizzard	4.15667[b]	4.31667[b]	4.67667[b]	8.16300[a]	7.91700[a]	0.635

a-e treatment means in the same row with different superscript are significantly different ($p<0.05$)

caloric and iso-nitrogenous. The result of the test ingredient shows the crude protein content of 27.04% and gross energy of 4.54 kcal/g. These values obtained for the test ingredient fall within the range of earlier workers[6,9]. It also emphasizes its potentiality as alternative vegetable protein source for livestock and poultry production.The result of the growth performance and gross margin of broiler birds fed raw sword bean meal is as presented in Table 2. There were significant ($p<0.05$) differences for all the parameters measured. The feed intake, weight gain and final live weight decreased as the quantity of the test ingredient increased in the diets. The feed-to-gain ratio increased and became negative values at 15 and 20% inclusion of the test ingredient. Birds placed on diets 4 and 5 had 6.7 and 10% mortality, respectively while diets 1, 2 and 3 had 0% mortality. The gross margin value decreased as the test ingredient increased in the diets. The significant ($p<0.05$) decrease in feed intake as the quantity of raw swords bean meal increased in the diets is not in line with the report of Okoro[2], who reported non significant ($p>0.05$) difference at 15% dietary level of inclusion of raw swords bean meal fed to grower rabbits. Also, it contradicts the report of Udedibie[9], who reported non significance ($p>0.05$) difference when jack bean a closely related legume was fed to laying hens at 20% dietary level of inclusion. This may be due to different tolerant in ability of animal specie[9]. This result is in line with Udediebie[9] who reported non tolerant by rats when 10% dietary level of jack bean (*Canavalia ensifornis*) a closely related grain legume was fed. Also, the result support the finding of Ologhobo[14] who reported significant decrease in feed intake when 12.5% dietary level of inclusion of some grain legumes (Jack bean and Lima bean) were fed to broiler finisher birds. The slight higher levels at which the significant decrease in feed intake occurred (10 and 12.5%) may be due to the iso-caloric and iso-nitrogeous nature of their experiments as opposed to non iso-caloric and non iso-nitrogenous in this study. The decrease in feed intake was attributed to the effect of toxic substances in the grain legumes such as haemaglutinin, canavanin, saponin, trypsin inhibitors etc. This probably

accounts for the decrease in feed intake observed in this study. Since above ant-nutrients have been reported in raw sword bean[6,15,2]. Canavanin for example, has been reported to inhibit nitric-oxide formation from Argenine[16]. Inhibition of nitric-oxide synthesis may result in reduced appetite[17]. Earlier on, D'mello[17] and Michelangeli and Vargas[18] reported that canavanin is a potent feed intake inhibitor for poultry. The observed significant decrease in weight gain even at 5% dietary level of inclusion of the test ingredient is not in line with the report of Okoro[2] who reported no significant ($p<0.05$) decline in weight gain when 15% dietary level of inclusion of raw sword bean was fed to grower rabbit. Also it contradicts the report of Esonu[19] who reported good weight gain when 20% dietary level of inclusion of raw jack bean (*canavalia ensiformis)* a closely related legume in rabbits diet.

This also may be due to animal specie difference[15]. The above result is in line with the observation of Ologhobo[14] who reported significant ($p<0.05$) decrease in weight gain when broiler birds were fed 12.5% dietary level of inclusion of raw Jack bean and Lima bean. The slight variation between the 5 and 12.5% when the decrease in weight gain occurred may also be due to associative effect of the iso-caloric and iso-nitrogeous nature of their experiments as opposed to the non iso-caloric and non iso-nitrogeous nature of this experiment. They attributed the result to poor feed intake and was as poor nutrient utilization as a result of toxic substances in the raw beans. This perhaps explains the above result.

Ricardo[20] reported poor protein efficiency ratio and protein digestibility of raw sword bean in weaning rat diets due to the presence of anti-physiological substances such as trypsin inhibitors and lectins. Trypsin inhibitors has been reported to inhibit digestive enzymes by irreversibly binding themselves to the enzymes thus, making the enzymes unavailable for the break down of protein[21], leading to poor protein digestibility with the resultant effect of growth depression[22]. The chelating capacity of phytin with minerals also with result in poor availability of minerals for nutrient metabolism[23,24]. Belmer 1989 reported that saponin causes haemolysis, reduction of blood, enzyme inhibition and depressing of growth. The over all effect of the above anti-nutrient is poor weight gain. This perhaps explains the final live weight and mortality observed as the quantity of the test ingredient increased in the diets (diet 4 and 5). The negative values for weight gain and feed-to-gain ratio shows high effect of anti-nutritional factors on the birds placed on diets 4 and 5. This could have led the birds living on their body reserves. The resultant effect of this was loss of weight which invariably affected the final live weight and the feed-to-gain ratio. The gross margin for control diet is higher than the test diets. This implies better profitability of this diet than the test diets[5]. This may be due to good feed intake, weight gain, final live weight and good market price of the birds placed on diet 1 (control diet) over the bird placed on the test diets. In view of the above, raw sword bean meal could not replace soybean meal at 5% dietary level of inclusion (weight to weight). The result of cut-parts is as shown in Table 3.

The mean values were not significantly different ($p>0.05$) from one another with the exception of the mean values for breast-cut and back-cut. The breast-cut and back-cut values reduced as the dietary levels of raw sword bean meal increased but the reduction became significant ($p<0.05$) only at levels above 10% in the test diets. This implies that above 10% dietary level of inclusion of raw sword bean meal, the rate of tissue deposition in the breast and back-cut are reduced. The enhanced dressing percentage for all the diets suggest good edible portion of the live-weight (Oluyemi and Robert, 2000). Considering dressing percentage, breast-cut and back-cut 5% and 10% raw sword meal compared favourably with the control diet.

Table 4 shows the result of organ weights expressed as a percentage dressed weight. There were significant different ($p<0.05$) for parameters measured with the exception of kidney and spleen. The values obtained for heart do not follow specific pattern that could be attributed to test diets. The values for intestine, proventriculus and gizzard became significantly ($p<0.05$) different at levels above 5% for both intestine and proventriculus and at levels shown 10% for gizzard. The values of liver increased as the dietary levels of raw sword bean increased in the test diets and became significantly ($p<0.05$) different at levels above 5%. The significantly higher values observed for intestine is in agreement with Ologhobo[25] who reported increase in both weight and length of intestine in chicks fed raw lima beans. This they attributed to less digestible fibrous material and increased accumulation of anti-nutritional factors as the dietary level of test feed stuff increased. This also could account for the increase in the weights of proventriculus and gizzard of birds fed diet containing raw sword bean meal. Increase in weight of liver of birds fed test diets over the control diet is not in agreement with Ologhobo[26] who reported decreased in weight of liver when raw lima bean where fed to broiler chickens, but in line with Ukachukwu[27] reported that liver is a targeted organ, being a detoxification organ and hence increase in activity may result in enlargement and probably increase in weight.

Table 5 shows the haematology of birds placed on raw sword bean. There was significant ($p<0.05$) difference for all parameters examined with the exception of WBC.

Table 5: The result of haematology of birds fed raw sword bean meal in broiler finisher diet

	Levels of raw sword beans in percentage					
	0	5	10	15	20	±SEM
HB (g/100ml)	12.267^{a}	10.567^{b}	10.767^{b}	10.300^{b}	6.700^{c}	0.234
PCV (%)	37.00^{b}	34.67^{bc}	37.33^{a}	38.33^{a}	32.67^{c}	0.789
WBC (x106/cm3)	2.967	2.350	2.367	2.300	2.267	0.290
RBC (x106/cm3)	3.733^{c}	3.800^{c}	4.200^{b}	4.733^{a}	4.200^{b}	0.490
MCH (%)	32.1500^{a}	27.8067^{b}	25.6333^{c}	21.7867^{d}	15.9567^{e}	0.671
MCHC(pg)	33.1500^{a}	30.4767^{b}	28.8433^{c}	26.8867^{d}	20.5400^{e}	0.499
MCV (um3)	99.5133^{a}	91.2133^{b}	88.8867^{b}	81.0367^{c}	78.4167^{c}	2.183

a-d treatment means in the same row with different superscript are significantly different ($p<0.05$)

Table 6: Blood chemistry values of broiler birds fed raw sword bean meal in broiler finisher diet

	Levels of raw sword beans in percentage					
	0	5	10	15	20	±SEM
Total protein (g/l)	38.1000	38.6667	38.1000	41.4333	38.6000	0.979
Albumin (g	11.3500^{c}	12.0333^{c}	13.3333^{bc}	18.0000^{a}	15.3500^{ab}	0.953
Globulin (g/l)	26.7333^{a}	26.6333^{a}	25.3933^{ab}	23.4333^{b}	23.2500^{b}	0.914
Creatinine (mg/dl)	1.0333^{b}	1.0900^{ab}	1.1067^{ab}	1.1267^{a}	1.1500^{a}	0.026
Alkaline Phosphatase(u/l)	180.00^{b}	176.00^{b}	197.00^{a}	182.00^{b}	223.33^{a}	10.946
Urea (mg/dl)	20.8000^{b}	22.5000^{b}	26.3333^{a}	26.6000^{a}	28.1667^{a}	1.114

a-d treatment means in the same row with different superscript are significantly different ($p<0.05$)

The haemoglobin value fall within the established standard range with the exception of diet 5 (20%). This implies that birds placed on this test diet could be prone to anemia[28]though the values for PCV for all the test diets were significantly difference ($p<0.05$) from the control diet but they all fall within the established standard range for broiler chickens[29,30]. The values obtained for RBC for diets containing 10, 15 and 20% of raw sword bean were abnormally higher than the established range. This situation is known as polycythemia where most probably resulted from diarrhea observed during the experiment. This is in agreement with the react of Levison and Macfate[31], who reported that polycythemia is caused by diarrhea. The above situation partly explain the observe weight loss, high feed-to-gain ratio and percentage mortality.

The MCH and MCV value for control diet and diet containing 5% raw sword bean meal fall within the established range while the other test diets were out of range as established by Mitrukka and Rawnsley[29,30]. This implies anemic condition particularly hypochromic anemia[32] which became more pronounced as the dietary level of raw sword bean meal increased. This probably explains the downward trend of the growth parameters. Although the HB MCH and MCV of diets 1 and 2 fall within the range established, they were significantly ($p<0.05$) different. This, coupled with poor value of MCHC for diet containing 5% raw sword bean meal makes it (5% replacement of soybean with sword been meal weight to weight) in capable of weight to weight replacement of the control diet.

Table 6 reveals the blood chemistry values of broiler birds fed raw sword bean meal. There were significant ($p<0.05$) differences for all the parameters measured with the exception of total protein. The values of albumin for test diets were higher and significantly ($p<0.05$) difference from the control diet at levels above 10%. This implies higher clotting ability of the blood and hence preventing of haemorrhage for birds fed the test diets[33]. The globulin values decreased as the dietary level of raw sword been meal increased, being significantly ($p<0.05$) different at levels above 10%. This implies that the control diet will be able to resist infection than the test diets since globulin is known for its ability to fight infection[34,28]. This probably explains the trend of percentage mortality observed. The alkaline phosphatase values did not follow specific pattern that could be attributed to the effect of test diets. The values for creatinine and urea increased as the dietary level of raw sword been meal in the diets increased and became significantly ($p<0.05$) different from the control diet at levels above 10% for creatinine and 5% for urea.

Since high values of creatinine and urea suggest kidney disease and renal failure due to damage to the glormerulus and hence poor glomerular filtration and excretion[35], it implies that the control diet with lower absolute values of creatinine and urea has better protein quality than all the test diets[34,36]. The higher values of creatinine and urea for birds placed on diets 4 and 5 show that the birds placed on them lived on body reserves and hence muscular wastage[34,37], which better explain the loss in weight and consequently poor feed conversion ratio and percent mortality observed.

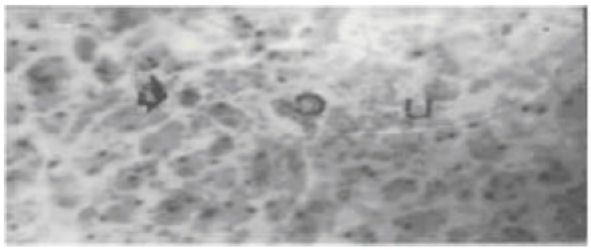

Plate 4: Liver section of birds fed finisher diet containing raw sword beans (20%) showing congestion of central vein © pyknosis of hepatocyte nuclear (closed arrow-head) and centulobular area of hepatocyte necrosis (n). H and E stain x 200

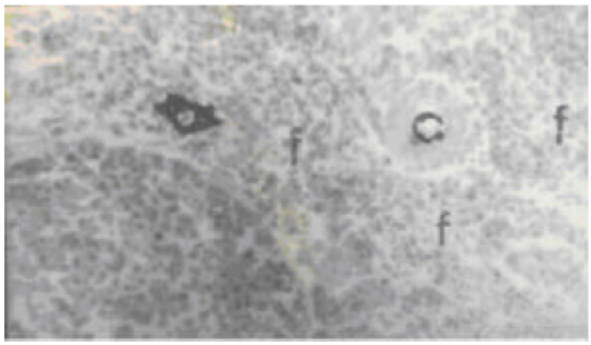

Plate 5: Spleen section of birds fed finisher diet containing raw sword bean (10%) showing splenic artery (a) surrounded by moderately depopulated follicle (f). the red pulp (arrow-head margin) is moderately depopulated. H and E stain x 100

Histopathological studies showed that three organs were affected. They are liver, kidney and spleen.

Liver: Feeding of raw sword bean meal showed pathological changes characterized by mild to moderate hyperaemia of the kupffer cells, which was directly related to the level of inclusion. Hepatocytes pyknosis was focal at 5% level of inclusion, but was moderately diffuse at 20% level of inclusion with mild to moderate focal mononuclear cells aggregation (Plate 4).

This result is in line with Ologhobo[26] who reported serious histopatological changes on broiler chicks fed raw lima bean. They attributed this to haemagglutinin, a toxic component of sword bean meal[15]. The increase in the weight of liver observed (Table 5) could be better explained by the liver damage as a result of an increase in metabolic activities of liver as a detoxification organ. Also since the liver is connected to blood formation[31] the liver damage may further explain the abnormal value for RBC, MCH, MCHC and MCV as observed with the test diets (Table 6).

Kidney: Feeding of raw sword bean meal to finisher broiler chickens produced histomorphologic changes characterize by mild to moderate haemorrhage and hyperemia, necrosis of epithelial lining cells of the tubules and focal areas of the highest dietary level of inclusion. This result probably explains the higher numerical values of kidney for the test diets in (Table 6). This has been attributed to increased metabolic activities of kidney being a detoxification organ and hence increase in weight) Ologhobo[6]. It also explains the high urea values for the diets. Partly because cyanide detoxification takes place in the kidney, leading to an increase in urea[38].

Spleen: The feeding of raw sword bean meal diets to finisher broiler chicks produced histopathological changes test diets containing raw sword beans produced mild to moderate congestion of the red pulp from the 10% level of inclusion. In addition, the splenic follicles were depopulated (Plate 5). This result probably explains the abnormal values of haematological parameters that have been associated with spleen problem[39]. Since spleen produces a humoral factor controlling erythropoiesis. In view of the above results, growth performance, gross margin, cut-parts, organ weight, haematology, blood chemistry and histopathological changes, raw sword bean meal cannot quantitatively replaces soy bean meal even at 5% dietary level of inclusion without being detrimental to health.

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