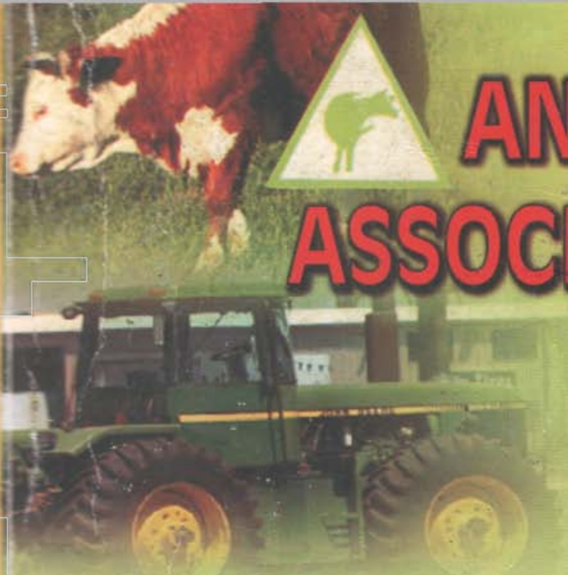

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NUTRIENT UTILIZATION AND CARCASS VALUE OF BROILERS FED PALM KERNEL CAKE AND CASSAVA RATIONS SUPPLEMENTED WITH Β-MANNANASE

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ABSTRACT
An 8-week feeding trial was conducted on one 144- day old Arbor acre strain of broiler birds to investigate the nutrient utilization and carcass value of broilers fed palm kernel cake and cassava rations supplemented with β -mannanase enzyme in a completely randomized design. The birds were subjected to six different dietary treatments with 24 birds per treatment each treatment had 3 replicates .Treatment I was the control with no test ingredients (no PKC, no Cassava grit). Treatments II, III, IV, V and VI were the test diets. In treatments II and III, maize were replaced in the diet with palm kernel cake + cassava Grit and Palm Kernel Cake +Dried Oil Cake respectively. Diet IV consisted of control + enzyme β mannanase and diet V and VI consisted of the addition of enzyme β mannanase to diets III & IV respectively. There was no significant difference ($p>0.05$) due to treatments on the weekly feed intake and body weight gain. There was no significant difference ($p<0.05$) on carcass value and nutrient utilization except dressed weight, eviscerated weight, neck weight expressed as percentage of dressed weight which showed significant ($p<0.05$) difference. Other carcass parameters evaluated did not differ significantly ($p>0.05$).There was no significant difference in eviscerated weight and dressed weight among treatment II, VI and the control but treatment V and IV differ significantly from other treatments. There was significant ($p<0.05$) difference in nutrient utilization among the treatments. Treatments IV, V, and VI differ significantly from the control in dry matter digestibility, crude protein, crude fibre, ash, ether extract and nitrogen free extract. There was no significant difference in feed conversion. With the noticeable trend in the result indicated that treatment V had improved performance therefore; it is more feasible to raise broilers on Cassava and palm kernel cake based diet supplemented with Enzyme mannanase for optimum performance and productivity.

INTRODUCTION

Availability of animal feed is one of the major constraints to a sustainable expansion of the livestock industry in developing countries. Apart from the high and fluctuating costs, some of the ingredients used in mixed feeds, notably cereal grains, are in high demand for human consumption. In view of the dwindling supply of the conventional feed resources and the shortage of foreign exchange for importation, alternative sources produced locally within are being investigated.

A lot of research works have been carried out on using these alternative feed ingredients (i.e. agro-industrial by-products) to supplement or replace conventional feed ingredients. All these are done in a bid to reduce the cost of feeding of birds without any deleterious effects while achieving maximum productivity. When cost of feeding is reduced, the production cost is also reduced and this leads to increased availability of poultry meat. Thereby the protein intake is increased and the nation becomes healthier. Among the many products which could be used to develop feed for poultry, cassava is of special importance. Cassava is the basis of many products, including food. It is also used commercially for the production of animal feed and starch-based products. Cassava as a substitute resource in livestock-feeds became fashionable first because of its relative cheapness compared with grains (especially maize) and later because of the increased demand of maize for human and other industrial uses such as in textiles, breweries and bakeries. Cassava has a high production potential and can adapt to different types of soil. It is an energy source which could take the place of maize or other cereals used for feeding poultry in tropical Africa. Cassava roots can be used to make flour with an energy value of more than 3000 kcal of metabolizable energy per kg (Cherry, 1982).

Palm kernel cake is an agro-industrial by-product that is a good source of protein and energy, but it is also rich source of fibre, which is not easily digestible by poultry. However, the high level of Non-Starch Polysaccharides (NSP) (mannan) reduces the digestibility of other dietary component like proteins and hence, reduces the performance of the chickens. Also the digestibility of the NSP rich feed can be improved by treatment with enzymes. In addition to increase in the digestibility of cell wall components, the digestibility of proteins and fats is also improved by adding feed graded enzymes. This will compensate for adequacy of fibre digesting enzymes in the poultry digestive system. There are many feed grade enzymes available that can be added to livestock rations to increase digestion but for the purpose of this study enzyme β-mannanase was used. There is considerable evidence of the benefit derived from inclusion of NSP degrading enzymes in poultry diet (Iyayi, 1991, Choct *et al*; 1994). NSP degrading enzymes are believed to raise the metabolizable energy of feed components especially cereals and legumes that contain NSP of varying levels. These enzymes are used to aid digestion in poultry because the enzyme spectrum of poultry is generally narrow. They are also of particular importance in young animals that do not produce enough of their own enzymes. β-mannanase is used to improve the digestibility of by-products containing mannans, which would have been depressed due to this variability. The improvement in the utilization of PKC based diet by birds will make the ultimate goal of replacing costly feed ingredients like maize with cheaper PKC available. The main difference between the dried oil cake and the expeller pressed type (PKC) is in the ether extract or oil content. The solvent-extracted and expeller pressed palm kernel cakes are of different quality depending upon the extent and efficiency of oil extraction (Nguyen and Bunchasak, 2005). Expeller-pressed palm kernel cake has higher oil content than solvent-extracted meals.These two processes thus make the percentage of other nutrients, such as crude protein and minerals, lower in expeller-pressed palm kernel cake. This work was designed to assess nutrient utilization of replacing maize with Cassava grit, PKC and DOC and the use of enzyme β-Manannase supplementation for optimal broiler production.

MATERIAL AND METHODS

A total of 144 day-old chicks of Arbor acre strain were allocated at random to the 6 experimental treatments. The experiment was carried out in the University Poultry Unit with 24 birds per treatment (3 replicate of 8 birds).The feeding trial lasted 42 days. Pre-experimental diet was formulated and fed to the birds for 2 weeks after arrival. Thereafter the experimental diets were fed to the birds. The diets were isonutritive and meet the nutrient requirements recommended by the NRC (1994) for broilers.Ingriedient composition and nutrient content of the basal diets are presented in Table 1. Treatment I was the control with no test ingredients (no PKC, no Cassava grit). Treatments II, III, IV, V and VI were the test diets. In treatment II and III of maize were replaced with palm kernel cake + cassava Grit and Palm Kernel Cake +Dried Oil Cake in experimental diets respectively. Diet IV consisted of control +enzyme β mannanase and diet V and VI consisted the addition of Enzyme β mannanase to diet III and IV.

Sampling, testing, observation and analysis

Weight gains, feed intakes, and feed conversion ratios were determined for each week. At the end of the 8th week, 2 birds were randomly selected from each replicate giving a total of 36 birds for slaughtering and carcass analysis.

Composite feed samples from each diet were analyzed for crude protein, fiber, fat and moisture content using (AOAC, 1990). Data were subjected to ANOVA and the SE of the differences of the means tested using SAS software1999. A $p< 0.05$ was considered statistically significant.

RESULTS AND DISCUSSION

Results revealed that the crude protein in the formulated diet to be approximately 22%. The dry matter was relatively high 88%, the crude fibre increased as maize was replaced. The highest value of crude protein recorded for diet IV could be attributed to the inclusion of maize with higher crude protein than the other test ingredients and the subsequent action of the β -mannanase The crude fibre range is 3.37 to 7.85% DM.The higher crude fibre in diet III could be attributed to the inclusion of highly fibrous feed ingredients (PKC and DOC) in the diet The ether extract is approximately between 3.20 to 5.80%DM while ash content is between 7.60 to 8.40%DM. The analysis of experimental diets is shown in Table 1.

There were no significant differences in feed intake among the diets but varying numerical value. Treatment means for performance variables are given in Table2There were significant difference in weight gain between the birds fed diet III, V, VI and other treatments. The highest body weight gain was recorded in birds fed diet V which suggests that β -mannanase has beneficial effect on the body weight.

This supports Jackson *et al.* (2004) who reported an improvement in weight gain and feed conversion ratio when corn based diet with soyabean meal supplemented with β-mannanase were fed to broilers. Though there were no significant differences among the treatments for feed conversion ratio, Diets IV and V had the best value for feed conversion ratio. This is perhaps due to the mode of action of β -mannanase which increased the production of mucosal cells in the large and small intestine as well as increased crypt length and basal width of the villi (Johnson and Gee, 1986). Also it should be noted that the mode of action of β-mannanase is complex. β–mannans are highly viscous and may have adverse effects on digestive system that are overcome with the enzyme. Therefore, viscosity reduction has been suggested as a primary reason for improved performance with certain endolytic enzyme (Rotter *et al.*, 1990).

The carcass characteristics of broilers fed experimental diet are shown in Table 3. There was no significant difference ($p>0.05$) on carcass characteristics and nutrient utilization exception of dressed weight, eviscerated weight, neck weight expressed as percentage of dressed weight which showed significant difference ($p<0.05$). There was no significant difference in eviscerated weight and dressed weight among treatment II, VI and the control but treatment V and IV differ significantly ($p<0.05$) from other treatments and the control respectively. The digestibility result of broilers fed experimental diets is shown in Table 4. There was significant difference ($p<0.05$) in nutrient utilization among the treatments. Treatments IV, V, and VI differ significantly ($p<0.05$) from the control in dry matter digestibility, crude protein, crude fibre, Ash, Ether Extract and Nitrogen Free Extract. Treatment 4 has highest dry matter digestibility. Also treatment 4 has the highest crude protein digestibility which is significantly different ($p<0.05$) from other treatments. The enzyme supplementation has made the crude fibre more digestible for treatment 5 compared to other treatments values.

Table 1: Percentage composition of the Experimental diet

Ingredients (%)	Without Enzyme I	II	III	With enzyme IV	V	VI
Maize	50.0	-	-	50.0	-	-
Cassava Grit	-	25.0	25.0	-	25.0	25.0
PKC	-	25.0	-	-	25.0	-
DOC	-	-	25.0	-	-	25.0
Wheat offal	13.0	13.0	13.0	13.0	13.0	13.0
GNC	25.0	25.0	25.0	25.0	25.0	25.0
Palm Kernel Oil	1.0	1.0	1.0	1.0	1.0	1.0
Fish meal	2.5	2.5	2.5	2.5	2.5	2.5
DCP	2.0	2.0	2.0	2.0	2.0	2.0
Premix	0.25	0.25	0.25	0.25	0.25	0.25
Methionine	0.10	0.10	0.10	0.10	0.10	0.10
Lysine	0.25	0.25	0.25	0.25	0.25	0.25
Salt	0.20	0.20	0.20	0.20	0.20	0.20
Analyses						
Dry matter (%)	87.20	88.60	87.50	85.50	89.00	88.50
Crude protein (%)	21.88	21.65	21.48	22.95	22.45	21.35
Crude Fibre (%)	4.55	7.40	7.85	3.37	4.20	6.50
Ether Extract (%)	5.30	3.20	3.90	5.80	3.80	4.20
Ash (%)	8.10	7.60	8.40	7.80	8.20	8.00
MEKcal/g	3.35	3.23	3.20	3.43	3.34	3.25

Table 2 :Performances of broilers on experimental diets

Variables	Treatments I	II	III	IV	V	VI	SEM
Initial weight (g/wk)	185.00	185.00	185.00	185.00	183.00	187.50	-
Final weight (g/wk)	2006.25[a]	2031.25[ab]	1918.75[b]	2012.50[ab]	2135.00[a]	1902.08	45.89
Weight gain (g)	43.36[ab]	43.94[ab]	42.27[b]	43.50[ab]	48.23[a]	40.82[c]	1.11
Feed Intake (g)	124.91	123.21	126.78	125.03	128.41	123.51	3.72
FCR	2.88	2.81	2.91	2.87	2.56	3.03	0.13

abc- means with different superscripts on horizontal rows are significantly different ($p \leq 0.05$)
FCR: feed conversion ratio, DOC: Dried Oil Cake, GNC: Groundnut Cake, DCP: Dicalcium Phosphate

Table 3: Carcass characteristics of Broilers fed Experimental diets

Parameters (%)	Treatments I	II	III	IV	V	VI	SEM
Live wt.	95.34	94.71	96.47	95.84	95.49	97.17	0.81
Plucked wt.	93.22	92.53	91.63	94.20	92.53	90.57	1.73
Eviscerated	80.71[ab]	81.50[ab]	82.20[ab]	75.60[b]	84.43[a]	79.53[ab]	2.39
Dressed wt.	73.47[ab]	72.03[ab]	70.60[ab]	69.13[b]	75.28[a]	70.78[ab]	1.72
Drum sticks	11.06	11.10	10.43	12.30	12.44	10.66	0.39
Thigh	12.17	12.48	12.01	12.26	12.50	11.29	0.40
Back	19.02	16.93	16.82	18.77	18.18	18.51	0.91
Breast	13.77[b]	17.56[a]	17.74[a]	18.15[a]	18.70[a]	17.32[a]	0.47
Head	3.27	3.42	3.35	3.48	3.39	3.40	0.12
Shank	4.87	5.37	5.49	5.10	5.72	4.91	0.29
Wing	8.52[ab]	9.18[a]	8.47[ab]	18.12[b]	9.16[a]	8.47[ab]	0.26
Neck	4.33[ab]	4.40[ab]	3.80[c]	4.44[ab]	4.75[a]	3.97b[c]	0.17

Table 4 Digestibility Results of Broiler on Experiment

	Treatments						
Variables	I	II	III	IV	V	VI	SEM
Dry matter	67.67^{bc}	58.00^{d}	60.00^{cd}	77.00^{a}	65.67b^{cd}	69.67^{ab}	2.79
Crude protein	69.00^{b}	67.67^{b}	65.33^{b}	78.33^{b}	72.67^{ab}	70.00^{b}	2.55
Crude fiber	24.33^{b}	15.67^{c}	22.00^{b}	33.00^{a}	34.67^{a}	25.00^{b}	1.05
Ether extract	78.00b	72.67^{d}	73.33^{d}	83.67^{a}	77.33^{bc}	66.00^{c}	1.29
Ash	33.67^{b}	21.33^{c}	31.33^{b}	49.67^{a}	28.33^{b}	32.67^{b}	1.76
NFE	71.36^{ab}	59.71^{c}	60.80^{c}	74.59^{ab}	78.62^{a}	65.38^{bc}	3.07

Over the course of the experiment, mortality rate was very low.

This support the findings of Preston *et al* (2000), that the digestibility of non- starch polysaccharides is improved by addition of enzyme in the diet. Treatments 2 and 3 had the least crude fibre digestibility. This is perhaps due to non-inclusion of enzyme to the highly fibrous PKC and DOC present in the diet respectively. Hence, there was no breakdown of the cell wall (non-soluble polysaccharide). Treatment 4 exhibited the highest value for digestibility of fat (ether extract). There were significant difference between the treatments and the control. The increased fat in treatment 4 shows that the use of enzyme to supplement diet has led to increase in digestibility of fat. Also treatment 4 has the highest value for ash digestibility and differs significantly from the control and other treatments.

CONCLUSION

In support of reports from researchers who had used enzyme to supplement Non Soluble Polysaccharide rich feeds, animals fed PKC + DOC supplemented with β-mannanase exhibited an improved growth performance for broilers. The positive effects of dietary manipulation and nutrient utilization of broilers fed Cassava, PKC based diet with enzyme were observed and those animals performed better than other treatments in the overall assessments.

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