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Effect of Dietary Enzyme (Maxigrain®) Supplementation on Carcass and Organ Characteristics of Broiler Finisher Chickens Fed Cassava Peel Meal Based Diet

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ABSTRACT

Two hundred and forty, 4 weeks old Arbor acre broiler birds were used to investigate the effect of enzyme (Maxigrain®) supplementation on carcass and organ characteristic of broiler chickens fed cassava peel meal (CPM) based diets. The birds were randomly allocated to four experimental diets tagged as T_1, T_2, T_3 and T_4, which were formulated to replace maize at 0, 25, 50, and 75% inclusion level respectively with supplementary enzyme (Maxigrain®). The birds were further subdivided into four replicates of ten birds each in a completely randomized design arrangement. At the end of the 4 weeks feeding trial, 2 birds per replicate were randomly selected according to average group weight and slaughtered for carcass and organ evaluation. The results showed that enzyme supplementation produced no significant ($p>0.05$) effect on live weight, carcass weight and dress weight across the treatments, however, birds on 50% dietary level had the highest mean values compared to other treatment groups. The cut weights of the wing, breast, thigh, back, liver, GIT and kidney were significantly ($P<0.05$) affected by the dietary treatment, due to enzyme supplementation. It was observed that birds fed 50% inclusion level of enzyme supplemented CPM elicited better cut part weights compared to other treatments. Therefore, enzyme supplementation improved carcass and organ characteristics of broiler finishers fed cassava peel meal based diet without any adverse effect and 50% inclusion gave an optimum performance on carcass and organ traits.

Keywords: cassava peel, Maxigrain, carcass, organ, broiler finisher.

INTRODUCTION

Broiler production is one of the most popular livestock enterprises adopted by small and medium scale farmers in both rural and urban areas as it offers the highest turnover rate and quicker returns on investment outlay (Idowu *et al.*, 2005, Afolayan *et al.*, 2014). The benefit of broiler production is eroded by the high cost of feed and it has been well established that feed alone account for about 70% of the total cost of poultry production (Iyayi and Tewe, 1998; Fasuyi, 2005). Maize, which is the predominantly used ingredient for energy in poultry feed in Nigeria, is very costly, because of higher demand for it by humans as food and industrial purposes (Bot *et al*., 2013, Etuk *et al*., 2013). Therefore, there is an urgent need for an alternative to maize in livestock feeds, to reduce the current pressure on maize as stable food for man (Uchegbu and Udedibe, 1998; Adeniyi and Balogun, 2002). One of such alternatives for replacement of maize in animal diets is the processed cassava peel meal (Iyayi, 1991, Abu and Onifade, 1996; Erurbefine *et al.* 1996, Salami and Odunsi, 2003, Agiang *et al*., 2004). Cassava peel in Nigeria is always discarded as waste and is usually allowed to rot, hence resulting to waste disposal problem. The relative availability and low cost of cassava peel make it an option in animal feeding (Oladunjoye *et al*., 2014). However, the use of cassava peel is limited by hydrocyanic acid and high fiber content which is harmful to the monogastrics. A preliminary findings indicated that processing of cassava peels by soaking possibly reduces more of the cyanide which, could be due to the twin processes of fermentation and leaching of cyanide (IITA, 1990) in the water-soaked peels prior to sun drying unlike other processing methods (Salami and Odunsi, 2003).

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Moreover, the use of multi-enzyme supplementation is one of the important techniques for enhancing the efficiency of feed utilization in monogastric nutrition (Duru and Dafwang, 2010, Midau *et al*., 2011, Shirmohammed and Mehhri, 2011). Thus, the digestibility of non-starch polysaccharide (NSP)-rich feed ingredients like cassava peels can be improved by treatment with enzymes (Iyayi and Yahaya, 1999, Udoyond *et al*., 2010, Midau *et al*., 2011). These enzyme complexes are formulated to complement the birds' digestive capacity by breaking down the NSPs in the high fibrous materials (Oldale and Hoffman, 1996). Supplementation of NSP degrading enzymes may not only reduce the anti-nutritive effects of NSP, but also releases some nutrients which could be utilized by the birds (Balamurugan and Chandrasekaran, 2009). The aim of this study was to evaluate the carcass and organ characteristics of broiler finisher birds fed cassava peel meal based diet with enzyme (Maxigrain) supplementation.

MATERIALS AND METHOD

Experimental Site

The experiment was conducted at the Poultry Unit of the Teaching and Research Farm of the Department of Animal Production Technology, Federal College of Wildlife Management, New Bussa, Niger State, Nigeria. The college is geographically located on latitude 7^{o} 3'N and longitude 4^{o} 33'W, which covers an area of 2.5km^2 with its vegetation described as Northern guinea savanna zone of Nigeria. The average temperature is 28^{o}C to 40^{o}C with a relative humidity of 60% and mean annual rainfall of 650mm-1300mm.

Preparation of Cassava Peel

Fresh cassava (*Manihot esculenta*) peels were collected from local cassava processing centers in New Bussa, Niger State. The cassava peels were soaked in water inside a metal drum for three (3) days, after which they were removed and drained with a basket and sun-dried for five (5) days before milling to fine particles of 2mm in diameter, using a hammer mill. The resultant product was incorporated into broiler's diet.

Management of Experimental Birds and Design

A total of two hundred and forty (240), 4-week old Anak birds were used for the experiment. They were randomly sub-divided into 4 dietary treatments of four replicates, with ten birds each in a completely randomized design. Feed and water were given to the birds' *ad-libitum.* Lighting source was provided using electricity bulbs during the night. The birds were administered anti-stress and vitamin/mineral premix orally at the recommended dosage after randomization before the commencement of the experiment. The birds were reared on deep litter in an open-sided wire mesh constructed poultry house to allow for adequate ventilation. Medications, vaccinations and other routine management practices were strictly followed. The birds were offered experimental diets and cool, clean water *ad-libitum* throughout the four weeks period of the experiment.

Experimental Diet and Treatment

Four experiment diets were formulated to contain Maxigrain enzyme supplemented cassava peel meal to replace maize at 0, 25, 50 and 75% as T_1, T_2, T_3 and T_4 respectively. Treatment 1 was the control diet with no cassava peel meal and enzyme inclusion. Maxigrain® enzyme was supplemented at the rate of 100mg/kg. The experimental diets composition is presented in Table 1.

Evaluation of Carcass Quality

At the end of the 28 days feeding trial, 2 birds per replicate were randomly selected with their live weights taken before carcass evaluation after fasting them for 16 hours. The birds were slaughtered by severing their jugular veins with sharp surgical knife. The birds were soaked in hot water, defeathered and washed. The internal contents were neatly removed and weighed (evisceration) followed by the cutting of the carcass into retail parts and weighed. Dressing weight was recorded after evisceration. The weights were expressed as percentages of dressed weight.

Chemical and Statistical Analysis

Proximate composition of the diet and CPM were analyzed by the method of AOAC (2000). All data obtained were subjected to analysis of variance procedure of SAS (2002). Significant differences between the treatment means were separated using Duncan`s multiple range test (Duncan 1995).

Table1. *Gross composition of experimental finisher broilers diets*

Ingredients %	$T_{1\ (0\%\ CPM)}$	$T_{2\ (25\%\ CPM)}$	$T_{3\ (50\%\ CPM)}$	$T_{4\ (75\%\ CPM)}$
Maize	59.00	45.70	30.40	15.10
CPM	_	15.30	30.60	45.90
Soy bean meal	28.00	28.00	28.00	28.00
Fish meal	3.00	3.00	3.00	3.00
Wheat offal	6.00	4.00	4.00	4.00
Bone meal	2.00	2.00	2.00	2.00
Limestone	1.00	1.00	1.00	1.00
Premix	0.30	0.30	0.30	0.30
Lysine	0.2	0.2	0.20	0.20
Methionine	0.30	0.30	0.30	0.30
Salt	0.20	0.20	0.20	0.20
Maxigrain®	0.00	0.01	0.01	0.01
Total	100	100	100	100
Calculated analysis				
CP %	21.24	20.73	19.33	18.63
ME kcal/kg	296.81	2985.18	30.3341	3058.28

RESULT AND DISCUSSION

The result of the proximate composition of cassava peel and the experimental diets are presented in Table 2. The analysis showed that cassava peel contained 5.75% crude protein, 14.83% crude fiber, 1.47% ether extract, 5.68% ash and 70.1% NFE. The crude protein value was slightly higher while crude fiber value was however lower than the value reported by Udoyong *et al,* (2010) and Midau *et al* (2011). The differences observed could be due to differences in cassava varieties, peeling methods or soil types. The nutrient (proximate) compositions of the diets are adequate and within the recommended range for broiler finishers as reported by NRC (1994) and Oluyemi and Robert (2000). Table 2 shows the summary of the effect of Maxigrain enzyme supplementation on the carcass and organ characteristics of broiler chickens fed cassava peel based diets. The live weight, carcass weight and dress weight were not significantly varied ($P>0.05$) across the dietary treatment groups, except for dressing percentage, which was significantly ($P>0.05$) affected by the treatments. Cut parts weight that differs significantly ($P>0.05$) among the treatment groups were wings, breast, thigh and back, whereas leg, neck and head were compared ($P>0.05$) across the treatment groups. Assessment of visceral organ such as gizzard, liver and gastro intestinal tract were significantly ($p<0.05$) influenced by the enzyme supplementation except for heart, spleen and lung, that were not significantly ($p>0.05$) affected .The results revealed that birds fed enzyme supplemented cassava peel meal diets were heavier in weight than those on control diet in most parameters evaluated. The improvements in the parameters in the present study conform to the earlier assertion of Iyayi and Davis (2005) and Adeola and Olukosi (2008) that enzyme supplementation improves performance of animals. The breakdown of fibrous material in the cassava peel meal by the enzymes enables the birds acquires more nutrients from the feed thus depositing them as tissues in the body. These observations were consistent with the previous report of Iyayi and Okhankuele (2002), who observed a significant variation in percent weight of liver and breast, when they supplemented exogenous enzymes in the diets of broiler finisher chickens. Broilers reared on diets with mixed ingredients of plant origin, variation in the chemical structure of these ingredient (non-starch polysaccharides) and presence of anti-nutrients (Phytin, hydrocyanic acid and tannis), often leads to reduced performance of birds. Supplementation of diets with exogenous enzymes can reduce the adverse effects of some of these compounds (Bedford and Shulze 1998, Zyla *et al*, 1999b, Iyayi and Losel, 2000). The results showed that birds on cassava peel meal-enzyme supplemented diets were better than those on the control diets.

CONCLUSION AND RECOMMENDATION

Results of the present study therefore indicate that enzyme supplementation of diets containing 50% CPM in place of maize elicited an improved carcass performance and is hereby recommended for poultry farmers.

Table2. *Proximate composition of cassava peel meal*

Components	Composition
Dry mater %	92.66
Crude protein %	5.75
Crude fibre %	14.83
Ether Extract %	1.47
Ash %	5.68
NFE %	70.10
Energy (kcal/kg)	3720

Table3. *Proximate composition of experimental broiler finisher diet*

	T_1	T_2	T_3	T_4
Component	0% CPM	25% CPM	50%CPM	75% CPM
Dry matter (%)	89.72	90.01	90.31	90.06
Crude Protein (%)	20.60	19.95	19.84	19.20
Crude Fiber (%)	4.54	5.89	7.55	9.13
Ether Extract (%)	3.80	3.64	2.98	2.57
Ash (%)	4.85	5.20	5.93	6.36
NFE (%)	55.97	55.33	54.01	52.80

Table4. *Carcass and organ characteristics of broiler finisher fed cassava peel meal based diet supplemented with Maxigrain enzyme*

Parameter	$T_{1(0\% CPM)}$	$T_{2 (25\% CPM)}$	$T_{3 (50\% CPM)}$	$T_{4 (75\% CPM)}$	SEM
Live weight	2100.00	2233.30	2300.00	2050.00	54.60
Carcass weight	1983.0	2016.70	2183.30	1916.70	48.14
Dress weight	1620.57	1619.14	1883.37	1551.85	14.50
Dress %	77.70^{b}	72.50^{a}	81.90^{b}	75.70	1.12
Prime cuts					
Wing	9.20	9.23	9.51	9.99	0.08
Breast	18.03^{ab}	17.92^{ab}	20.09^{a}	15.43^{b}	0.47
Thigh	18.87^{b}	20.19^{b}	25.53^{a}	17.82^{b}	0.83
Drumstick	17.56^{b}	18.67^{b}	24.75^{a}	16.98^{b}	0.92
Back	13.73	14.28	15.68	12.63	0.17
Organ Weights					
Heart	0.40	0.44	0.48	0.35	0.04
Gizzard	1.71	1.40^{b}	1.51^{b}	1.90	0.04
Liver	1.68^{ab}	1.88	1.31^{b}	1.92^{a}	0.08
Spleen	0.40	0.60	0.6	0.24	0.04
GIT	4.13^{b}	3.20^{c}	3.53^{bc}	5.7^{a}	0.09
Lung	0.52	0.47	0.87	1.16	0.08
Kidney	0.66^{b}	0.88^{a}	0.59^{b}	0.80^{a}	0.05

^{abc} *Means in the same column without superscript in common are different at P<0.05.*

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