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Research Article

EFFECTS OF PROCESSED SWEET POTATO MEAL AS A SOURCE OF ENERGY ON THE INTERNAL ORGAN WEIGHTS OF FINISHER BROILERS

E.O. Ahaotu[1,2], F.N. Madubuike[3], M.C. Edih[1,2] and E. A. Agiang[4]

[1]Department of Animal Production and Health Technology, Imo State Polytechnic, Umuagwo, P.M.B 1472 Owerri, Nigeria.

[2]Department of Animal Production and Health Technology, Imo State University of Agriculture and Environmental Sciences, Umuagwo, Nigeria

[3]Department of Animal Science and Fisheries, Imo State University, P.M.B 2000, Owerri, Nigeria

[4]Department of Animal Science, University of Calabar, Cross River State, Nigeria.

Abstract

A total of 120 Anak 2000 broiler finisher birds were used in a 56 days feeding trial in a deep litter house to assess the effect of processed sweet potato meal on the internal organ weights of broiler finisher birds. Five replacement levels of the formulated feed: 0%, 12.5%, 25%, 37.5% and 50% Processed Sweet Potato Meal (PSPM) was used for treatments 1, 2, 3, 4 and 5 respectively with 0% PSPM as control. Treatments were replicated thrice. The broiler birds were fed the experimental diets four weeks after a one-week stabilization period. Feed and water were given ad libitum, while medication and vaccination were appropriately applied. The deep litter house was provided with standard facilities. Measurements of internal organ weights of birds were taken with a sensitive weighing balance (Mettler Toledo B 90001 – S brand. Considering the results of the weights of intestine, heart, gizzard, liver and crop, it appeared that the 37.5% level of PSPM is the optimal replacement level for maize grain.

Keywords: Poultry feed, Processed Sweet Potato Meal, Maize Grain, Organ Weight, Broiler Finisher.

INTRODUCTION

Feed constitutes the greatest input in animal production not only for milk, meat or eggs but for growth and body maintenance (Ahaotu, 1991;2007). Thus, the cheaper the feed source without sacrificing its quality, the better the return to the farmer (Madubuike *et al.* 2003). Onu *et al*. (2008) stated that feeds and feeding have been shown to account for 65% to 85% of the total cost of commercial poultry production. The livestock producer appears most hit in terms of scarcity and high cost of livestock feed (Ahaotu *et al.* 2009).

Ahaotu (2007) reported that Nigeria, like most other developing countries suffer greatly from shortage and high cost of livestock feeds, especially those supplying protein. This situation is as a result of the competition between man and livestock for the available conventional energy feeds such as maize grain, spent grain, sorghum and wheat offal (Ihenetu, 2010, Abia and Akujobi,2008).

Consequently, some unconventional materials have been used to feed poultry with good results. For instance Ipomoea asarifolia leaf (Ekenyem, 2004); Moringa oleifera leaf (Ahaotu 1997); Rubber seed cake (Ahaotu, 1999); Rice mill waste (Amaefula *et al.* 2003); Citrus pulp (Faniyi, 2002) and Wild cocoyam meal (Onu *et al.* 2001) among others. Processed sweet potato meal could be a potential source of feed for poultry *Abia and Akujobi, 2008).* It has 3180 Kcal / Kg metabolisable energy and a good mineral profile although it has low lysine and methionine contents (Close and Menke, 1998).

It is therefore capable of reducing the cost of poultry production. This experiment was consequently conducted to evaluate the effects of PSPM as a source of energy on the internal organ weights of finisher broilers, since organ weights appear to positively significantly correlate with final body weight with a view to achieving high production at reduced cost and by making animal protein available and affordable to consumers.

MATERIALS AND METHODS

The experiment was carried out in the teaching and Research Farm of Imo State Polytechnic, Owerri, Imo State, Nigeria. The study area is situated at Longitude $7^{0}0^{1}06''$E (IMLS, 2009).

Procurement of Experimental Birds and Brooding

A total of 130 – four weeks– old Anak broiler birds procured from Anthony and Patience Farms at Atta in Ikeduru Local Government Area, Imo State, Nigeria were used for this experiment. They experimental birds were fed commercial

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***Corresponding author:** E.O. Ahaotu, Department of Animal Production and Health Technology, Imo State Polytechnic, Umuagwo, P.M.B 1472 Owerri, Nigeria, E-mail: emmaocy@yahoo.com

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finisher feed for stabilization. After one week, 120 of the broiler birds were selected on the basis of apparent viability and good conformation and assigned to five dietary treatments of twenty four birds per treatment and each treatment replicated thrice of eight birds per replicate.

Processing of Sweet Potato (Ipomea batatas) Tubers

Sweet potato tubers used for this experiment were bought from Eke – Ukwu Market in Owerri, Imo State, Nigeria. Sweet potato tubers were sliced and sun dried to a moisture content of 10% and milled to produce processed sweet potato meal (PSPM). The processed sweet potato meal was subjected to proximate analysis (Table 1) at the Animal Science and Livestock Production Laboratory, University of Agriculture Abeokuta, Nigeria using standard methods (AOAC, 2001) which was the basis for experimental feed formulation. The mineral analysis was carried out by the method of Grueling (2000), while gross energy was determined with a Gallenkamp Oxygen Adiabatic Bomb Calorimeter.

Formulation of the experimental diets: Five experimental broiler finisher diets containing) 0%, 12.5%, 25%, 37.5% and 50% PSPM for treatments 1, 2, 3, 4 and 5 respectively were formulated in which 0% PSPM, (T1) was the control (Table 2). The ingredients were thoroughly mixed to ensure homogeneity and sent to hammer mill for grinding. The feed was fortified with vitamin premix and synthetic amino acids in line with National Research Council recommendation (NRC, 2004).

Table 1: Proximate Analysis of Processed Sweet Potato (*Ipomea batatas*) Meal.

	%
Ash	3.21
Ether Extract	0.54
Crude Fibre	0.33
Carbohydrate	17.1
Crude protein	5.36
Moisture	7
Elemental Analysis %	
Calcium	0.34
Phosphorus	0.49
Iron	0.006
Potassium	0.407
Sodium	0.03
Silica Free Ash	3.15
Essential Amino Acid %	
Lysine	0.07
Methionine	0.03
Vitamin Analysis %	
Thiamine	0.009
Riboflavin	0.004
Niacin	0.015
Ascorbic Acid	0.016

Table 2: Percentage Composition of Experimental Finisher Rations.

Ingredients	Treatments and % Inclusion				
	T_1	T_2	T_3	T_4	T_5
Maize	0.00	12.5	25	37.5	0
PSPM	50.00	37.5	25	12.5	50
Fish Meal	2	2	2	2	2
Soya Full Fat	14	14	14	14	14
Wheat Offal	10	10	10	10	10
Palm Kernel Cake	5	5	5	5	5
Spent Grain	6	6	6	6	6
Bone Meal	9.15	9.15	9.15	9.15	9.15
DL- Methionine	0.2	0.2	0.2	0.2	0.2
Common Salt	0.3	0.3	0.3	0.3	0.3
Premix (Broiler)	0.4	0.4	0.4	0.4	0.4
Total	100.00	100.00	100.00	100.00	100.00
Calculated Nutrient Composition (%)					
Crude					
Protein	17.90	17.62	17.04	16.52	14.50
Ether Extract	3.50	3.30	2.87	2.43	1.92
Crude Fibre	4.66	4.45	4.24	4.03	3.83
Calcium	3.77	3.84	3.95	3.99	4.06
Phosphorus	1.85	1.94	2.20	2.45	2.62
Methionine +					
Cystine	0.33	0.31	0.30	0.27	0.26
ME (Kcal/kg)	2652.55	2620.80	2589.05	2553.30	2525.50

Feeding and Brooding

The experimental birds were divided according to the five dietary treatments in a deep litter house made up of one hundred and twenty birds and replicated three times in a completely randomized design. Adequate number of feeders and drinkers were provided for the birds. They had *ad libitum* access to feed and water. Regular observation and manipulation of the brooder facilities regulated the room temperature.

Data Collection and Analysis

At the end of the 9 weeks, 3 birds per treatment (one from each replicate) were randomly selected and slaughtered by neck dislocation. Thereafter, the carcasses were scaled and eviscerated, Internal organs namely: heart, gizzard, liver, crop and intestine were measured and the average of these organs per treatment (3) were subjected to one way analysis of variance (Steel and Torrie 1980), while differences in means were separated by the Duncan's multiple Range Test as outline by Gordon and Gordon (2004).

2.5kg of premix/tone contain; vitamin A 10,000 I.U; Vitamin D_3 20,000 I.U; Vitamin E 12,000 I.U; Vitamin K 2.5g; Thiamine

TABLE 3: ORGAN WEIGHTS OF ANAK BROILER FINISHER BIRDS (G).

Parameters	T_1	T_2	T_3	T_4	T_5	SEM
Heart (g)	6.1^{c}	7.35^{a}	8.33^{b}	9.11^{b}	11.1^{e}	0.43*
Gizzard (g)	40.1^{a}	45.2^{b}	45.1^{b}	60.3^{c}	65.4^{d}	1.01*
Liver (g)	35.4^{a}	1.3^{b}	30.1^{b}	28.9^{c}	20.3^{d}	0.39*
Crop (g)	8.5^{a}	9.3^{ab}	9.3^{ab}	9.9^{b}	12.8^{c}	1.65*
Intestine (g)	180^{a}	165^{b}	150^{c}	135^{d}	90^{e}	2.96*

a, b, c, d, e means within the same row with different superscripts are significantly different (P<0.05).

1.5g; Riboflavin 5g; Pyriboflavin (B6) 1.5g; Vitamin B_{12} 10mg; Biotin 2mg, Niacin 15g, Panthotenic acid 5g, Zinc 50g, Iron 15g, Copper 5g, Iodine 1.4g, Selenium 100mg, Cobalt 300g, BHT 125G.

RESULTS AND DISCUSSION

The internal organ characteristics of the broiler finisher (Table 3) showed significant difference (P<0.05) between birds in treatments the internal organs. Birds on the control diet (T_1) were significantly (P<0.05) heavier than birds on T_2 and T_3 which were also significantly (P<0.05) heavier than birds on T_4 and T_5 only in weights of intestine and liver.

Tewe (1996) and *Horton (1998)* had reported anti-nutritional effects of PSPM arising from glycoalkaloids, which reduced availability, absorption and utilization of nutrients for productive purposes. Consequently, birds fed 50% PSPM (T_5) consumed more feed than those on other treatments in an attempt to satisfy their body requirements *(Oboh, 1996)*.

The trend was that increasing level of PSPM reduced nutrient availability and thus reduced weights of organs, which was traceable to higher dietary fiber of feeds with increasing PSPM. This result agrees with *Ofukwu* and Okwor, (2001) who observed that higher dietary fiber depressed organ weights in poultry birds.

CONCLUSION

The use of PSPM to replace Maize Grain was achieved without any deleterious effect on the broiler finisher birds. Considering the results on the weights of the crop, heart and gizzard, it appears that the optimum replacement value of PSPM for Maize Grain is 37.5% level. It is therefore recommended that 37.5% level of processed sweet potato meal for maize grain is adopted considering the cost effectiveness and final weights potentials of broiler finisher. However, higher levels such as 50% could be adopted if fortified with yeast or exogenous enzyme to improve fiber digestion.

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