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REPLACEMENT VALUE OF MAIZE WITH SWEET POTATO (*Ipomoea batatas*) WASTE MEAL SUPPLEMENTED WITH RONOXYZE ON THE PERFORMANCE AND CARCASS CHARACTERISTICS OF FINISHER BROILER CHICKS

By

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Abstract

This study was conducted to determine the growth performance and carcass characteristics of finisher broiler chickens fed sweet potato (Ipomoea batatas) *waste meal supplemented with Ronoxyme in their diets. One hundred and fifty (four weeks old) Agrited Ross broiler chickens were used for this experiment with each treatment consisting of 30 finisher broiler chickens. Each treatment group was replicated three times, consisting of 10 birds per replicate. Five experimental diets were formulated. The control diet (TMT1) contained basal diet, maize was quantitatively replaced with sun-dried sweet potato waste meal supplemented with Ronoxyme multi-grain enzyme at 10%. 20%, 30%, and 40% respectively in the other diets. The experiment was laid out in completely randomised design. The parameters measured include initial body weight, final body weight, body weight gain, feed intake, feed conversion ratio, carcass characteristics and cost of production. The initial body weight, final body weight, Body weight gain, average daily weight gain. Total teed intake, Average Daily feed intake and feed conversion ratio showed that there were no significant (P>0.05) differences across the treatment groups. The feed conversion ratio of the finisher broiler chickens in TMT4 compared favourably with those on control diet (TMT1) and recorded better feed conversion ratio than those in TMT2. T3 and T5. The finisher broiler chickens fed SPWM had a good cost of production. The least significant feed cost (₦398.39) per kg diet was obtained in finisher broiler chickens fed diet containing 40% SPWM (TMT5) as against the highest feed cost per kg feed of ₦438.43 obtained in finisher broiler chickens fed the control diet (TMT1). This is an indication of the economic benefit of SPWM when incorporated in the diet of finisher broiler chickens. The finisher broiler chickens in TMT4 recorded the highest dressing percentage of (88.93). The internal organs expressed as percent live weight were not affected by the treatments. Based on our findings, sun-dried sweet potato waste meal supplemented with ronozyme could be used in the diets of finisher broiler chickens up to 40% without affecting the body weight gain, feed intake and feed conversion ratio.*

Keywords*: Replacement, maize, sweet potato waste, Ronozyme, performance, finisher broiler chickens*

Introduction

The poultry industry has become the predominant source of protein in the diet of the population of most developed and developing countries, Maize is a major source of energy in the poultry and livestock feeds and can be used up to 60% in poultry diets. However, amongst other factor, inadequate supply, exorbitant prices and diversion towards using cereal grains for biofuel production, particularly maize, has led to a constant search for alternative energy source for poultry and other non-ruminant species (Tyner and Tpheripour, 2007), thus

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becoming unconventional to use them in poultry feeds (Esonu and Udedibie, 2003). Looking at alternative to maize are root and tubers which include cassava, sweet potatoes, cocoyam, yam and other tubers and their by-products. Sweet potato waste meal being one of the non-conventional feed stuffs can replace maize at 40% inclusion (fresh, sun dried).

Sweet potato is a staple food in Nigeria. The average yearly production of sweet potato root crop in Nigeria is estimated at 75,860 metric tons and the yield in Kg/ha is 12,245 (FAO, 1990). The substantial fractional part of the root constitutes the waste meal. Tewe (1997) projected that the crop residue from sweet potato waste meals will be 4.72 metric tons per hectare as of the year 2000. Osuagwu (2006) reported that 5% dietary level of inclusion of sweet potato meal gave good performance in weaner rabbits' diets. The sweet potato carbohydrate. Sweet potato waste contains about 5.36 percent crude protein and metabolizable energy of about 3,180 Kcal/Kg (Oyenuga, 1968; Jansen, 1989 and Osuagwu, 2006; Ameh, 2010). Considering the various attributes of sweet potato waste meal, it would appear that its proper utilization can be efficient to replace maize as energy source in the diets of finisher broiler chicken and can promote their performance.

Objectives of the Study

The broad objective of this study is to evaluate the growth performance and carcass characteristics of finisher broiler chickens fed sun-dried sweet potato waste meal supplemented with ronoxyme multi-grain enzyme in their diets. The following specific objective are:

i. To determine the proximate composition and gross energy of fresh and dried sweet potato waste meal as well as the anti-nutrients content (tannin, saponin, alkaloid, phytate, oxalate and flavonoid)
ii. To determine the effects of dietary levels of inclusion of sun dried potato waste meal supplemented with ronoxyme multi-grain enzyme in the diets of finisher broiler chicken,
iii. To determine the carcass characteristics of broiler chickens fed graded levels of sweet potato waste meal supplemented with ronoxyme multi-grain enzyme in their diets
iv. To evaluate the cost benefits of finisher broilers chickens fed sun-dried sweet potato waste meal.

MATERIALS AND METHOD

Experimental Site

The experiment was carried out at the Poultry Unit of the Teaching and Research Farm of Michael Okpara University of Agriculture, Umudike, Abia State in Nigeria. The area is located on latitude 05° 29` North, longitude 07° 32` East, in the rain forest zone in Umuahia, Abia State of Nigeria. This site has an ambient temperature of between 22°C- 36°C with relative humidity between 50 and 90% and annual rainfall of 2177mm per annual and an altitude of 123m above sea level. It is therefore a humid tropical environment with temperature and relative humidity that are significant in agriculture production (NRCRI Umudike, 2017).

Procurement and Processing of Test Materials and Feed Ingredients

The sweet potato waste was collected from sweet potato dealers (traders) at Orieagu market in Imo State. They were dried under the harmattan sunshine for one week before it was milled to sweet potato waste meal and bagged for use. Other feed ingredients like palm kernel meal, maize, premix, salt, methionine, soyabean meal, lysine, fishmeal, bone meal were procured from Jocan Livestock Services, Umuahia.

Chemical Analysis of Fresh and Sun-dried Sweet potato waste meal

All the processed feed ingredients; sweet potato waste meal, palm kernel cake, soyabean meal, fishmeal were subjected to proximate analysis according to AOAC (1995) to determine their nutrient composition and gross energy. All analysis was based on 100% dry matter. This was done to use the value obtained to determine the nutrient composition of the experimental diets that were formulated from them. The components that were determined include: Dry Matter (DM), Crude Protein (CP), Ether Extract (EE), and Nitrogen Free Extract (NFE).

Anti-Nutrients Determination

The test materials, fresh and sundried sweet potato waste meal were analysed for the anti-nutrient contents such as oxalate, phytic acid, saponins, tannin, alkaloids and flavonoids. Total oxalate were determined according to Association of Official Analytical Chemist (AOAC, 2005). Phytic acid was determined according to Joslyn (1970), Saponin was determined according to Brunner (1984), Tannins was determined using the spectrometric method of AOAC (2005).

Experimental Finisher Broiler Diets

For the finisher broilers, control diet (Ti) did not contain sun-dried sweet potato waste meal but 60% of maize as the main source of energy, while diets 2,3,4,5 will contain 10%, 20%, 30% and 40% of sun-dried sweet potato waste meal. Other ingredient remains the same in the diets.

Table 1: Ingredient and nutrient composition of the experimental finisher broiler diet

Ingredient (%)	TMT 1	TMT 2	TMT 3	TMT 4	TMT 5 ^
	Control	10% SPYM	20% SPYM	30% SPYM	40% SPYM

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SCYM	-	6.00	12.00	18.00	24.00
Wheat offal	4.85	4.85	4.85	4.85	4.85
Soya bean meal	25.00	25.00	25.00	25.00	25.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Vitamin/Mineral	0.25	0.25	0.25	0.25	0.25
Premix					
Lysine	0.25	0.25	0.25	0.25	0.25
Methionine	0.10	0.10	0.10	0.10	. 0.10
Common salt	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00
Calculated Nutrient Composition of the Experimental Finisher Broiler Diet					
Crude Protein	21.00	20.78	20.52	20.26	20.00
ME/Kcal/Kg	3019.39	3009.68	2999.96	2990.24	2980.52

**SPWM - Sun-dried Potato Waste Meal
*To provide per kg Diet: Vit A, 20000000iu; Vit D3, 4000iu, Vit E, 80g; Vit k, 049; Choline 48.00g; BHT, 32.00g; Manganese, 16.00g; Iron, 8.00mg; Zinc, 72gm; Copper, 0.32g; Iodine, 0.25g, Cobalt, 36.00g; Selenium, 16g.

Management of the experimental broilers

One hundred and fifty (150) day old Anak broiler chicks of 4 weeks of age were used for the experiment. They were distributed into five (5) treatment groups of 30 broilers chicks. Each treatment group was sub divided into 3 replicates of 10 broiler chicks. Each replicate was kept in a pen spread with wood shavings. Each treatment group was randomly assigned to an experimental finisher broiler diet in a Completely Randomized Design (CRD), was fed for four (4) weeks. Feeds were supplied in feeding trough built in such a way as to minimize wasting of feed. Feed and water was supplied *ad libitum.* Feeding was done once daily around 8am. The birds were weighed at the beginning of the feeding trial and weekly thereafter. Feed intake was recorded daily by weighing the quantity of feed given and the left over the following morning. The finisher phase of the feeding trial lasted for four weeks.

Carcass Evaluation

At the end of the feeding trial, two (2) broilers from each treatment were randomly selected, starved of feed but not water for 24 hours and then weighed, slaughtered by severing the jugular vein and left to bleed thoroughly. The carcass was scalded by dipping in warm water (50-60°C) before being de-feathered. The head, shank, neck and viscerals were separated from the carcass and then the dressed weight taken. Each dressed carcass was cut into parts for the purpose of cut parts evaluation. All the parts were weighed and expressed as percentage of the live weight.

Data collection

Data collection was done and the following parameters were determined: daily feed intake, body weight gain, final live weight, weekly body weight gain, fed conversion ratio, dressed weight, internal organ weight and cost of production.

Daily feed intake (FI)

The quality of feed given to broiler birds was weighed and the leftover of the feed at the following morning was also weighed and recorded in grams. Daily feed intake was determined as follows:
FI = Quantity of feed given - Left over feed.

Live Weight Gain (LWG)

This was calculated as the difference between the final body weight and the initial live weight.
QWG = Final body weight - initial body weight

Daily Weight Gain (DWG)

This was calculated by dividing the body weight changed by the number of days the feeding trial lasted.

Feed Conversion Ratio (FCR)

This was determined by dividing the average daily feed intake by average body weight gain. These values were used to determine the total feed intake per bird per day, total weight gain per bird per day and feed conversion ratio.

The following formula were used for calculation:

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❖ Feed intake/bird/day = Quantity of feed given - leftover
30 birds x 28 days

❖ Weight Gain/bird/day = Final live weight - Initial live weight
30 birds x 28 days

❖ Feed Conversion Ratio (FCR) = Daily feed intake (g)
Daily body weight gain (g)

At the end of the trail two birds per treatment was randomly selected, starved for approximately 12 hours of feed but was given water. The birds were weighed individually and then slaughtered by severing the jugular vein with sharp knife and blood allowed to drain. The carcass was defeathered after scalding in hot water and then eviscerated. The percentage of carcass cut parts and internal organs proportion were determined such as live weight, dressed weight. % dressed weight, heart, lungs, kidney, gizzard, etc.

Data on carcass characteristics

Percentage dress weight = Dress weight x 100
Live weight 1

Percentage of the cuts part was determined by
Weight of each cut parts x 100 Live weight 1

Feed-cost benefit

The economics of the experimental diets was calculated using the following

Cost of feed= Total cost of production 100kg feed
100

Cost of feed consumed = cost/kg of feed x Total feed intake

Daily feed cost = Cost of feed/kg x Average daily feed intake/replicate

Total feed Cost = Cost of feed/kg x Total feed intake

Cost of feed/kg weight gain = Total feed cost/kg x feed conversion ratio

Data Analysis

The collected were subjected to one way Analysis of variance (ANOVA) according to Snedecor and Cochran (1989) where significant effects are detected from the ANOVA means was separated using Duncan's New Multiple Range Test (Steel arid Torrie, 1980).

Experimental Design

The design of this study was Completely Randomized (CRD). The statistical model is:

$$Y_{ij} = u + T_i + e_{ji}$$

Where:
Yij = Individual Observation
U = Population mean
Ti = Treatment effect
Eji = Error effect

RESULT AND DISCUSSION

ANTI-NUTRIENT AND PROXIMATE COMPOSITION OF FRESH (RAW) AND SUN-DRIED SWEET POTATO WASTE MEAL

The result of the Anti-nutrients of raw (fresh) and sun-dried sweet potato waste meal were shown in (Table 1a).

Table 1: Anti-nutrients of raw (fresh) and sun-dried sweet potato waste meal

Parameters	Fresh (Raw) Sweet Potato waste meal	Sundried Sweet Potato waste meal
Tannin (mg/g)	1.62	1.60
Saponin (mg/g)	0.05	0.05
Alkaloid (mg/g)	4.86	4.75
Oxalate (mg/g)	0.45	0.45
Phytate (mg/g)	0.07	0.47
Flavonoid (mg/g)	1.06	1.00

The values of tannin (1.62mg/g), Saponin (0.05mg/g), alkaloids (4.86 mg/g), oxalate (0.45 mg/g), phytate (0.07 mg/g), Flavonoid (1.06 mg/g) recorded in this study fall within range reported by (Akinmutimi and Anakebe, 2008; Ameh (2010).

Table 2: Proximate composition of fresh (raw) and sundried potato waste meal

Parameters	Fresh (Raw) potato waste meal	Sun-dried sweet potato waste meal
Dry matter (%)	37.18	92.23
Moisture (%)	62.82	7.77
Ash/mineral (%)	1.77	12.84
Crude protein (%)	3.00	5.65
Ether extract (%)	0.00	0.00
Crude fibre (%)	5.76	6.02
Nitrogen free extract (%)	26.65	67.72
Metabolizable Energy (Kcal/Kg)	1087.48	; 2412.04

The proximate composition of fresh (raw) and sundried sweet potato waste meal were presented in (Table 4.2). All values obtained for crude protein, crude fat, moisture content, ash, nitrogen free extract and metabolizable energy fall within the range reported by Aduku (1993),

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Oyenuga (1968), Osuagwu (2006), Akinmutimi and Anakebe (2008), Ameh (2010), AOAC (2005), Solomon *et al.,*(2015), Ola and Oba (2004).

Table 3Proximate composition of experimental diet containing sweet potato waste meal

The proximate composition (%) of Diet 1,2,3,4 and 5 is as shown below:

Parameters	Diet 1 (0% SPWM)	Diet 2 (10% SPWM)	Diet 3 : 20% SPWM)	Diet 4 (30% SPWM)	Diet 5 (40% SPWM)
Dry matter (%)	92.68	91.82	91.21	90.68	90.24
Moisture (%)	7.32	8.18	8.79	9.32	9.76
Ash/mineral (%)	8.90	9.86	10.56	11.30	12.18
Crude protein (%)	16.80	16.60	16.35	16.20	16.00
Ether extract (%)	3.10	3.07	5.02	2.96	2.92
Crude fibre (%)	5.02	5.86	5.17	6.28	6.41
Nitrogen free extract (%)	58.86	56.43	55.11	53.94	52.73
Metabolizable Energy (Kcal/Kg)	2750.18	2653.62	653.62	2612.76	2570.82

SPWM: Sweet potato waste meal

Table 4: Growth performance of the experimental finisher sweet potato waste meal supplemented with ronozyme multi-grain enzyme.

Parameters	T1 (0% SPWM)	T2 (10% SPWM)	T3 (20% SPWM)	T4 (30% SPWM)	T5 (40% SPWM)	SEM
Initial body weight (g/b)	893.33	883.33	919.00	903.33	863.33	13.95
Final body weight (g/b)	2218.33	2186.67	2178.33	1510.00	2183.33	134.21
Weight gained g/b	1325.00	1306.67	1259 .33	1273.33	1320.00	23.57
Average daily weight gain (g/b)	47.32	46.67	44.9 1	45.47	47.14	0.84
Total feed intake (g/b)	5293.73	5433.11	5379 .80	5144.60	5491.60	70.93
Average daily feed intake (g/b)	189.06	194.04	192.13	183.74	196.13	2.53
Feed conversion ratio	4.04	4.21	4.25	4.05	4.17	0.12

SEM: Standard Error Mean

SPWM: Sweet potato waste meal

Table 4.4 showed the performance of finisher broiler fed diet containing 0%, 10%, 20%, 30%, 40% sweet potato waste meal supplemented with ronozyme multi-grain enzyme. The initial body weight, final body weight, body weight gain, average daily weight gain, total feed intake, average daily feed intake and feed conversion ratio showed that there were no significant (P>0.05) differences across the treatment groups.

Initial body weight

The average initial bodyweight of the finisher broiler chickens were 893.33g/b, 883.33g/b, 919.00g/b, 903.33g/b and 863.33g/b for the control diet (TMT1), Treatment 2, 3, 4 and 5 respectively. There were no significant (P > 0.05) differences among the treatment groups in their initial body weight.

Final body weight

The final body weights of the experimental finisher broiler, chickens fed with sundried potato waste meal supplemented with ronoxyme multi-grain enzyme were 2218.33g/b, 2186.67g/b, 2178.33g/b, 1510.00g/b and 2183,33g/b for treatments 1, *2* 3, 4 and 5 respectively. The final weight of the broiler chicken on different diets were recorded. The result revealed that there were no significant differences (P>0.05) in the final weights of the chickens across all diets. The enhanced performance of birds fed SPWM could possibly be attributed to the fact that their diet was supplemented with enzyme which helped to break down the unavailable polysaccharides for use by the birds as additional energy (Gidado *et al.* 2020). This result is not in agreement with those obtained by Adejinmi *et al.,* (2013) who attributed increasing levels

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of highly fibrous feedstuff in a ration.

Weight gained

The body weight gain of the experimental finisher broiler chickens fed with sweet potato waste meal supplemented with ronozyme multi-grain enzyme were 1325.00g/b, 1306.67g/b, 1259.33g/b, 1273.33g/b and 1320.00g/b for treatments 1, 2, 3, 4 and 5 respectively. There were no significant (P > 0.05) differences among the treatment groups. The weight gained (g/b) was highest for broilers on control diet which had a similar weight gained with those on diet 5 (40% SPWM). These differences may be attributed to variations availability, which can influence the growth of broilers. These observations is contrary to the findings of Afolayan et al. (2012) Who reported that there was a significant reduction in body weight gain when inclusion of SPWM in broiler diet exceeded 20%.

Average daily weight gain

The average daily weight gain (g/b) showed that broiler chickens control diet had the highest mean Value (47.32) followed by those fed diet containing 40% SPWM (47-14 g/b), while those fed diet containing 30% SPWM had the lowest (44.97 g/b). There were no significant (P > 0.05) differences among the treatment groups. This suggests that the inclusion of sweet potato waste meal, especially in diet 5, positively influenced the daily weight gain of the broiler chicken when compared to the control diet.

Total feed intake

The total feed intake of the experimental finisher broiler chickens fed with sweet potato waste meal supplemented with ronozyme multi-grain enzyme were 5293.73g/b, 5433.1lg/b, 537980g/b, 5144.60g/b and 5191.60g/b for treatments 1,2, 3, 4 and 5 respectively. There were no significant (P > 0.05) differences among the treatment groups. The total feed intake (g/b) was the highest for broilers fed diet containing 40% SPWM and lowest for broiler chicken fed 30% SPWM. This could be due to differences in palatability and digestibility of the diets, affecting the total feed intake of the chickens. According to (Leeson, 2008), broiler chickens are known to eat more when diets are palatable and coarse when compare d to finely grinded and unpalatable diets. (Gillette *et al.*, 1983) reported that birds are more responsive to weakly flavoured diets than highly flavoured diets.

Average daily feed intake

The total feed intake of the experimental finisher broiler chickens fed with sweet potato waste meal supplemented with ronozyme multi-grain enzyme were 189.06g/b, 194.04g/b, 192.13g/b, 183.74g/b and 196.13g/b for treatments 1, 2, 3, 4 and 5 respectively. There were no significant differences (P > 0.05) among- the treatment groups. The average daily feed intake (g/b) was highest for broilers fed diet containing 40% SPWM and lowest for those fed diet containing 30% SPWM. These differences might be attributed to the variations in nutrient content and taste preferences of the diets.

Feed conversion ratio

The fed conversation ratio of the experimental finisher broiler chickens fed with sundried potato waste meal supplemented with ronoxyme multi-grain enzyme were 4.04g/b, 4.21 g/b, 4.25g/b, 4.05g/b and 4.17g/b for treatments 1, 2, 3, 4 and 5 respectively. The fed conversation ratio showed that broiler chicken fed control diet 1 (0% SPWM' (4.04). ^t was observed that broiler chicken fed 30% SPWM diet. It was also observed that the feed conversion ratio did had the best feed conversion ratio competed favorably with the control not follow any particular pattern as diet 4 with the fed conversion ratio of (4.05) were significantly (P <0.05) lower than birds fed diet T2, T3 and T5.

Table 5: Carcass Analysis

Parameters	T1 0% SPWM	T2 10% SPWM	T3 20% SPWM	T4 30% SPWM	T5 40% SPWM	SEM
Live weight g/b	1910.00	1850.00	1690.00	1700.00	1950.00	64.70
Dressed weight g/b	1250.00	1250.00	1450.00	1500.00	1600.00	56.67
Dressing percentage %	65.44°	67.69^{bc}	86.56^{a}	88.93^{a}	82.1 l^{ab}	3.54
Breast %	33,65^{a}	31.98^{ab}	21.47°	24.83^{b}°	25.66^{abc}	1.69
Wings %	11,69^{a}	11,99^{a}	9.12^{b}	9.25^{b}	9.41^{b}	0.44
Thigh %	17.43^{a}	12.86^{ab}	12.40^{b}	11.26*?	13.57^{ab}	0.83
Drumstick %	15.44^{3}	15.54^{a}	12.07^{b}	; n.44^{b}	12.72^{b}	0.61
Backcut %	19.95^{3}	20.54^{3}	14.73^{b}	14.98^{b}	17.63^{ab}	0.86

^{abc} means within the same row with different superscripts are significantly (P <0.05) different.
SEM= Standard Error Mean

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SPWM = Sundried potato waste meal

Table 5 showed the carcass analysis of finisher broiler fed diet containing SPWM supplemented with ronozyme multi-grain enzyme. The result of the live weight and dressed weight showed that there were no significant (P>0.05) differences across the treatment groups. The dressing percentage showed that broiler chicken fed diet higher than those fed diet 1 and diet 2 but were not significantly fed diet 5 while the result of wings and drumstick followed the same level of significance where broiler chicken fed diet 1 and diet 2 were significantly (P<0.05) higher than the remaining treatment group (T3, T4 and T5). The result of the thigh showed that broiler chicken fed diet 1 were significantly (P<0.05) higher than those fed diet 3 and diet 4, while the result of the backcut showed that broiler chicken fed control diet and diet 2 were significantly (P< 0.05) higher than those fed diet 3 and diet 4. It was observed that the dressed weight tended to increase with increasing levels of SPWM and was significantly greater in the birds fed 40% replacement diet compared with those of other treatment

.Table 6 Internal Organs Characteristics

Parameters	TI 0% SPWM	T2 10% SPWM	T 3 20% SPWM	T4 30% SPWM	T5 40% SPWM	SEM
Liver %	1.94	1.70	2.04	1.88	2.31	0.10
Lungs %	0.61	0.50	0.67	0.53	0.77	0.05
Kidney %	0.74	0.68	0.60	0.74	0.72	0.02
Proventiculus %	0.55	0.57	0.48	0.51	0.44	0.02
Pancreas %	0.16^{C}	$0.3\ 5^{a}$	0.35^{a}	0.30^{ab}	0.28^{b}	0.02
Heart %	0.42	0.49	0.48	0.44	0.49	0.01
Gizzard %	1.73	1.59	0.67	0.61	2.22	0.12

^{abc} means within the same row with different superscripts are significantly (P <0.05) different.
SEM= Standard Error Mean SPWMS = Sundried potato waste meal

Table 6 showed the internal organ characteristics of finisher broiler fed diet containing SPWM supplemented with ronozyme multi-grain enzyme. The result of the liver, lungs, kidney, Proventriculus, heart, gizzard, showed that there were no significant (P>0.05) differences across the treatment groups. The result of the pancreas showed that broiler chicken fed diet 2 and diet 3 were significantly (P< 0.05) higher than those fed diet 5 and diet 1. The result of the heart showed that broiler chicken fed diet 5 were significantly higher (P<0.05) than the other treatment groups but the high values obtained for diet 5 in terms of heart, liver, and gizzard could be attributed to the cumulative residual effect of anti-nutritional factors. This report is in agreement with the findings of Ukachulcwu and Akimutimi (2004) who reported that liver is a major detoxification organ and hence increase in its activities may result in enlargement and probably increase in weight.

Table 7 Offals Characteristics

Parameters	T1 0% SPWM	T2 10% SPWM	T3 20% SPWM	T4 30% SPWM	T5 40% SPWM	SEM
Head %	3.58^{ab}	3.82^{a}	3.07^{ab}	2.83^{b}	2.94^{ab}	0.15
Shank %	5.39	5.95	4.32	4.75	4.91	0.23
Neck %	7.30^{a}	7.44^{a}	5.55^{b}	4.95^{b}	5.75^{b}	0.34
Crop %	0.53	0.52	0.67	0.51	0.69	0.05
Abdominal fat %	1.49 j	1.56	0.64	0.91	1.09	0.21

^{abc} means within the same row with different superscripts are Significantly (P <0.05) different. SEM= Standard Error Mean SPWMS = Sundried potato waste meal

Table 7 showed the offals characteristics of finisher broiler fed diet containing SPWM supplemented with ronozyme multi-

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grain enzyme. The result of the shank, crop, abdominal fat showed that there were no significant (P>0.05) difference across the treatment groups. The result of the head showed that the broiler chicken fed diet 2 were significantly (P<0.05) higher than birds fed diet 4 while the result of the neck showed that the .broiler chicken fed control diet and diet 2 were significantly (P< 0.05) higher than those fed diet 3 , diet 4 and diet 5 respectively. It was observed that the carcass quality was significantly (P < 0.05) reduction of abdominal fat in the birds fed 20%, 30% and 40% SPWM in their diets. This report is in agreement with the findings of Agwunobi *el al.*, (1999) who reported that birds on sweet potato diet continually passed wet droppings, resulting in a significant (P<0.05) reduction in body weight.

Table 8: Economics of production of experimental diet

Parameters	Diet 1 0% SPWM	Diet 2 10% SPWM	Diet 3 20% SPWM	Diet 4 30% SPWM	Diet 5 40% SPWM	SEM
Cost/ kg feed (₦)	438.43[a]	422.51[b]	414.47[b]	402.43[c]	398.39[c]	3.85
Daily Fed cost (₦)	82.89[a]	81.98[ab]	79.63[ab]	73.94[b]	78.14[ab]	35.68
Total feed cost (₦)	2320.92[a]	2295.54[ab]	2229.7b[a]	[b] 2070.61[b]	2187.80[ab]	50.68
Cost/kg weight gain (₦)	1769.78	1781.59	1761.50	1660.69	1662.61	50.68

[abc] means within the same row with different superscripts are Significantly (P <0.05) different.
SEM= Standard Error Mean
SPWMS = Sundried potato waste meal

Table 4.8 showed the Economic of production of experimental broiler finisher diet. The result of the cost per kg feed showed that broiler chicken fed diet containing 30% SPWM (₦402.45) and 40% SPWM (₦398.39) were significantly (P<0.05) lower than those fed diet containing 10% SPWM (₦ 422.51), 20% SPWM (₦414.47) and 10% SPWM (₦438.43) but not significantly (P>0.05) different from each other. The daily feed cost showed that broiler chicken fed diet containing 30% SPWM (73.94) were significantly (P<0.05) owed that broiler chicken fed diet lower than those fed control diet but not significantly (P>0.05) different from those fed 20% SPWM, and 40% SPWM. The Total feed cost showed that broiler chicken fed diet containing 30% SPWM were significantly (P<0.05) lower than those fed control diet but not significantly (P>0.05) different from those fed 20% SPWM, and 40% SPWM. The cost per kg weight gain showed that there were no significant difference across the treatment. The cost tier kg weight gain showed that broiler chicken fed diet containing 10% SPWM had the highest mean value (₦1781.59) followed by those fed diet containing, 20% SPWM, 30% SPWM and 40% SPWM respectively.

The least significantly feed cost (₦398.39) per kg diet was obtained in birds fed diet containing 40% SPWM as against the highest feed cost per kg diet of ₦438.43 in birds fed the control diet. This is -an indication of the economic benefits of SPWM when incorporated in the diet of finisher broiler chickens. Variation observed in the feed cost per kg diet is adduced to differences between the price per kg of ₦400.00 and ₦266.66 for maize and sun-dried potato waste meal (SPWM). This observation was contrary to the findings of Muhammad *et al.* (2012). Also the broiler chicken fed 30% SPWM had the least significant total feed cost per bird (₦2070.61) well as the least daily feed cost per bird (₦73.94) when compared to the control (₦2320.92; ₦82.89) and those fed 20% SPWM (₦2229.77; ₦79.63) and 10% SPWM (₦2295.54; ₦81.98).

Conclusion

The findings of this study demonstrated the potential of replacing maize with sweet potato waste meal supplemented with ronozyme in poultry diet. Our findings suggest that such substitution can be a viable and cost-effective option for enhancing broiler performance and reducing feed costs. The nutritional value of sweet potato waste meal, when combined with ronozyme, improves digestibility and supports optimal growth. This approach promotes sustainability by utilizing food waste, thereby contributing to environmental preservation.

Additionally, Sun-dried sweet potato waste meal supplemented with ronozyme could be used in the diets of finisher broiler chickens up to 40% without affecting the body gain, feed intake and feed conversion ratio.

Recommendation

- Based on the result of the study, it was therefore recommended that sundried sweet potato waste meal supplemented with ronozyme could be used up to 40% to replace maize in the diets of broiler finisher chicks for optimum performance.
- It is also recommended that additional studies should be conducted to explore the optimal inclusion levels of sweet potato waste meal and ronozyme for different stages of broiler production (starter, grower, finisher), as well as for different poultry species. This will help establish precise feeding recommendations.

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- It is also recommended that detailed economic be performed to determine the cost-effectiveness of using sweet potato waste meal in poultry feed compared to traditional feed ingredients like maize. Consider feed conversion rates, growth rates, and overall production costs.

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