

The replacement value of indomie waste meal for maize on performance, carcass traits, relative organ weight and cost and return analysis of broiler chickens

Omoikhoje, S. O., Eguaioje, S. A., Okoegwale, C., Ijeh, O. and Okpodi, Y.

Department of animal science, faculty of Agriculture, Ambrose Alli University, P.M.B 14, Ekpoma Edo State



Corresponding Author: +2347031677645, +2347035763568

eguaiojeabiodunstanley@gmail.com

Abstract

An eight week feeding trial was conducted to evaluate the replacement value of indomie waste meal with maize on the performance, carcass traits, relative organ weight and cost and return of 90 day old Anak 2000 broiler chickens. Three experimental starter and finisher diets were formulated with diet 1 as control containing 0% Indomie Waste Meal, while diets 2 and 3 contains IWM at 50 and 100% inclusion levels for maize. The chicks were assigned to the treatment diets (1, 2 and 3) in Completely Randomized Design and each treatment group contained three replicates with ten chickens per replicate. Result on performance revealed that daily and weekly weight gain at finisher phase was significantly highest ($P<0.05$) in birds fed 50% IWM (63.20g/bird). Feed conversion ratio was significantly lowest ($P<0.05$) in birds fed 50% IWM (2.14). Carcass traits revealed that relative weight of back, head, neck and shank were significantly ($P<0.05$) influenced by the treatment diets. Relative weight of gizzard was also significantly ($P<0.05$) influenced. Cost and return analysis at starter and finisher phases showed that cost of feed consumed (N137.16) and cost of feed per kilogram weight gain were (N15.96) lowest in birds fed 50% IWM. Income (N1579.50) and net profit (N881.17) were highest in birds on 50% IWM. From the overall results it could be concluded that the inclusion of indomie waste meal in the diet of broiler chickens up to 50% improved the growth performance, better carcass quality and economic returns.

Keywords: Broilers, Maize, Indomie waste meal, Growth performance, Carcass traits and cost

Introduction

The need to boost animal production to produce the much needed protein for the ever increasing human population in the developing countries cannot be over emphasized. Protein is a nutrient needed by the human body for growth and maintenance (FAO, 2007). One of the major developmental challenges facing most developing countries such as Nigeria is their inability to adequately feed their ever increasing population with the right proportion of carbohydrate and protein. Thus, an average Nigerian diet is characterized by low energy and protein (FAO, 1997). Energy feed sources like maize and sorghum are expensive feedstuff and constitute about 50-55% of the formulated poultry diet. Maize as a

conventional energy source for livestock feed is expensive, the productivity is low in Nigeria which means it does not meet national demand (Agbede *et al.*, 2002; Hamzat *et al.*, 2003; Okereke *et al.*, 2006). With respect to the present trend of rising price of animal feed stuffs all over the world and the geometric increase in human population, greater attention has to be paid to the search for safe and cheap local feed stuffs including the unexplored feed stuffs, by-products of agriculture and industry. Developing countries that cannot afford the expensive diet for livestock appeared most hit in this regard. Poultry production especially the production of broiler chickens offers the greatest scope for increasing the quality and quantity of protein intake in Nigeria because of the

The replacement value of indomie waste meal for maize

short generation interval and prolificacy (Apata and Ojo, 2000). Poultry production is regarded as a means of sustainable livelihood and a way of achieving a certain level of economic independence (Akinmutimi, 2006). Omoikhoje *et al.* (2010) reported that the replacement of maize with cornflakes waste meal up to 100% level had no adverse effect on blood profile of broiler chickens. Eniolorunda *et al.* (2007) reported that any effort made to substitute maize with 50% indomie waste in layers diet will significantly reduce cost of production and enhance performance. Against this backdrop, this study is focused on indomie waste which is of special importance among the non conventional feedstuffs because it is a fast food for human beings that are highly cherished by both children and adults. Indomie noodle is produce from wheat flour, refined palm oil, iodized salt, glutamate, chilli powder, onion flavor powder, garlic flavor spices (which give the noodles a good flavour) e.t.c. During the packaging process of the noodles, the waste obtained is sold to livestock industry as indomie waste, it has several advantages over other non-conventional feed ingredients since indomie noodle is meant for human consumption, they are hygienically packaged and this remove the fear of contamination. Indomie waste has no anti-nutritional factors and the high energy content of indomie waste makes it a good substitute for maize and other cereal grains. This experiment was therefore embarked upon to examine the replacement value of indomie waste meal for maize on the performance, carcass traits, organ weights and economic analysis of broiler chickens.

Materials and methods

Location and duration of the study

The experiment was carried out at the

poultry unit of the livestock section, Teaching and Research Farm, Ambrose Alli University, Ekpoma for a period of eight (8) weeks

Sources of ingredients

Instant noodle waste meal for the study was purchased from Dangote Flour mill, Illupeju Industrial Avenue, Lagos, while other feed ingredients were purchased in Benin City and Ekpoma, Edo State.

Design and management of experimental birds

A total of 90- day old Anak 2000 broiler chicks were used for the study. Thirty six birds each were selected based on their average initial weights and each group of birds was allotted to each of the three treatment diets (1, 2, and 3) in a completely randomised design (CRD). Each treatment group contained 3 replicates of 10 chicks each. All chicks were brooded for four weeks in a deep litter compartment. The house, feeders, and drinkers were properly washed and disinfected. The birds were fed commercial broiler starter diet for one week acclimatization period. The birds had access to experimental feeds and clean water *ad-libitum*. Routine medication, vaccination and other management practices were carried out throughout the duration of the experiment.

Experimental diets

A total of three treatment diets (1, 2, and 3) of broiler starter and finisher phases were formulated. Diet 1 was formulated to contain 42.94% maize (control diet), while diets 2, and 3 were formulated by replacing the percentage of maize in diet 1 with 50 and 100% levels of indomie waste meal (IWM) respectively. Both starter and finisher diets were of equal nitrogen (23 and 21%) and caloric values of (2800 and 3000kcal/ME/Kg).

Table 1: Proximate composition of maize and indomie waste meal

Component	Maize	Indomie waste meal
Dry matter	88.00	88.00
Crude protein	8.90	8.57
Crude fibre	2.70	2.80
Crude fat	4.20	17.14
Crude ash	1.90	0.90
NFE	74.90	58.59
Calcium	0.02	0.05
Phosphorus	0.29	0.32
ME (Kcal/kg)	3315.45	3799.07

Source: Lala, (2010), NFE: Nitrogen free extract

Table 2: Percentage compositions of broiler starter and finisher diets

Ingredients	Inclusion levels of IWM (%)			Inclusion levels of IWM (%)		
	0	50	100	0	50	100
	Starter diets			Finisher diets		
	1	2	3	1	2	3
Maize	42.94	21.47	0.00	44.13	22.07	0.00
IWM	0.00	21.50	42.97	0.00	22.07	44.80
SBM	21.86	21.86	21.86	16.04	16.04	16.04
GNC	15.00	15.00	15.00	15.00	15.00	15.00
Fish meal	1.00	1.00	1.00	1.77	1.77	1.77
Wheat offal	16.24	16.24	16.24	19.77	19.77	19.77
Oyster shell	2.36	2.36	2.36	2.28	2.28	2.28
Premix	0.25	0.25	0.25	0.25	0.25	0.25
Lysine	0.01	0.01	0.01	0.01	0.01	0.01
Methionine	0.01	0.01	0.01	0.01	0.01	0.01
Salt	0.30	0.01	0.01	0.27	0.01	0.01
Total	100.00	100.00	100.00	100.00	100.00	100.00
Cal. Analysis						
Crude protein	21.70	20.70	20.85	21.70	20.70	20.85
ME (Kcal/kg)	2800	2813	2825	2800	2813	2825

Performance study

During the feeding trial, daily feed intake, daily weight gain, feed conversion ratio, and protein efficiency ratio were assessed. The average weekly feed intake was divided by the number of birds and further divided by seven for average feed intake per bird per day. The weekly weight gain was determined by the difference in the weight at the beginning of the week and the weight at the end of the week. Feed conversion ratio was calculated as the ratio of feed intake in grams to weight gain, also in grams. This was estimated weekly and at the end of the experiment.

$$\text{Feed Conversion ratio} = \frac{\text{Feed intake (g)}}{\text{Weight gain (g)}}$$

Protein efficiency ratio was calculated as the ratio of weight gain to that of protein consumed as expressed in the formula.

$$\text{Protein efficiency ratio} = \frac{\text{Weight gain (g)}}{\text{Protein intake (g)}}$$

Carcass characteristics study

On the last day of the feeding trial, three (3) birds were selected randomly from each treatment group making a total of 29 birds. The birds were starved overnight of feed, but drinking water was provided. Each bird was tagged and weighed before and after slaughtering to determine the live and bled

The replacement value of indomie waste meal for maize

weight respectively. The slaughtered birds were dipped in hot water for about two minutes and the feathers were plucked. The plucked weight was also recorded. The plucked chickens were eviscerated and the dressed weights estimated. The dressed weight refers to the weight of the birds being partially butchered, removing all the internal organs. The carcass was thereafter cut into parts, such as head, neck, drumstick, shank, breast, back, wings and relative weights of organs like gizzard, kidney, liver, lungs, spleen, pancreas and bursa were estimated. The weights of the parts were recorded and measured relative to the eviscerated weight using the formula below.

The dressing percentage was calculated as:

Dressing percentage =

$\frac{\text{Dressed weight}}{\text{Live weight}} \times 100\%$

Live weight

Relative organ weight was calculated as:

Relative organ weight =

$\frac{\text{Weight of Organ} \times 100}{\text{Eviscerated weight}}$

1

Cost and return analysis

The cost of ingredients as at the time of purchase for the study was used to calculate the total cost of feed per 100kg of the diets. This was further used to estimate the cost of per kg diet, cost of feed consumed per bird, cost of feed per kilogram weight gained, cost of production, income per bird and the net profit.

Statistical analysis

All data collected were subjected to a one-way analysis of variance (ANOVA) and differences between treatment means were compared using Duncan's Multiple Range Test (Duncan, 1955). All statistical procedures were in accordance to Steel and Torrie (1990) using SAS (1999) package.

Results and discussions

Growth performance of broiler chickens at the starter phase (Table 3) revealed that

average live weight, daily and weekly feed intake, daily and weekly weight gain, feed conversion ratio and protein efficiency ratio were not significantly ($P > 0.05$) affected by the treatment diets. Birds maintained on 100% IWM had the highest daily and weekly feed intake value of 65.87 and 461.08g/bird/day and lowest value of 62.70 and 438.87g/bird in birds fed diet 2. However daily and weekly weight gain were similar, but the highest numerical values (32.06 and 224.44g/bird) were recorded in birds fed 50% IWM and least (29.30 and 205.12g/bird) in birds that were on the control diet. At the finisher phase, live weight, average daily and weekly feed intake and protein efficiency ratio were not significantly ($P > 0.05$) affected by the treatment diets but significant differences ($P < 0.05$) were observed for average daily and weekly weight gain as well as feed conversion ratio of birds fed the dietary treatments as shown in Table 4. Live weight was higher (2.28kg/bird) in birds placed on 50% IWM and lowest (2.07kg/bird) in birds that ate 100% IWM. Average daily and weekly feed intake though statistically similar ($P > 0.05$) were higher (144.73 and 993.15g/bird) in birds fed diet 3 and lowest (136.39 and 947.71g/bird) in birds placed on diet 2. Average daily and weekly weight gain showed a significant ($P < 0.05$) variation among birds fed the treatment diets with the highest values (63.20 and 442.40g/bird) recorded in birds fed 50% IWM, while comparable values of 55.58 and 393.07g/bird, 55.56 and 388.94g/bird were recorded in birds fed the control diet and diet 3, respectively. The significantly ($P < 0.05$) higher weight gain of birds placed on 50% IWM at the finisher phase compared to other treatments could be adduced to the nutrient availability and density which eventually translated to the improvement in growth rate. This takes credence from the report of Omoikhoje *et*

al. (2010) who reported a significant effect in the average weight gain of broilers fed roasted fluted pumpkin husk waste also Ajaja (2005) reported that feed intake of broiler were similar at both phases, though there is a numerical improvement in the feed intake at both phases this revealed that the inclusion of IWM at both phases did not affect the palatability of the diet (El-boshey and Vander Poel, 1994). The similar values recorded for birds placed on the treatment diets at both phases could be due to the quality and availability of nutrient in indomie waste (Ayanwale and Aya, 2006).

Feed conversion ratio was significantly highest ($P<0.05$) in diet 3 (2.55) comparable to 2.44 in the control diet and least mean value in diet 2. The significantly ($P<0.05$) higher feed conversion ratio value recorded in birds fed 50% IWM at the finisher phase could be ascribed to the better feed intake and the quality of protein present in the test diets. This observation lend support from the report of Nworgu *et al.* (2000) and Oduguwa *et al.* (2004) on significant($P<0.05$) improvement in the average weight gain of broilers fed sorghum dust.

Table 3: Performance characteristics of broiler starters fed the treatment diets

Parameters	Inclusion levels of Indomie waste meal (%)			SEM±
	0	50	100	
	Diets			
	1	2	3	
Ave. Initial weight (g/bird)	533.33	536.67	473.33	26.03
Ave. Daily feed intake (g/bird/day)	63.01	62.70	65.87	2.87
Ave. Weekly feed intake (g/bird/wk)	441.11	438.87	641.08	19.45
Ave. Daily weight gain (g/bird/day)	29.30	32.06	29.81	0.72
Ave Weekly weight gain (g/bird/wk)	205.12	224.44	208.67	14.13
Feed conversion ratio	2.16	1.96	2.21	0.18
Protein efficiency ratio	1.46	1.62	1.55	0.18

SEM±: standard error of mean

Table 4: Performance characteristics of broiler finishers fed the treatment diets

	Inclusion levels of Indomie waste meal (%)			
	0	50	100	
	Diets			
Parameters	1	2	3	SEM±
Ave. Live weight (Kg/bird)	2.13	2.28	2.07	3.05
Ave. Daily feed intake (g/bird)	136.03	135.39	141.73	5.56
Ave. weekly feed intake (g/bird)	952.19	947.71	992.15	38.39
Ave. Daily weight gain (g/bird)	55.80 ^b	63.20 ^a	55.56 ^b	0.51
Ave. Weekly weight gain (g/bird)	393.07 ^b	442.40 ^a	388.94 ^b	3.35
Protein efficiency ratio	1.77	1.86	1.74	0.10
Feed conversion ratio	2.44 ^a	2.14 ^b	2.55 ^a	0.08

ab: means in the same row with varying super script differ significantly ($P<0.05$),

SEM±: standard error of mean

The carcass characteristics of broiler chickens as influenced by the treatment diets, (Table 5) indicated that average live weight, plucked weight, eviscerated weight, dressing percentage, breast, drumstick, thigh and wings were not

significantly varied ($P>0.05$) from one another. However, relative weights of back, head, neck and shanks were significantly influenced ($P<0.05$) by the treatment diets. The highest ($P<0.05$) back weights (9.15) was recorded in birds fed 50% IWM,

The replacement value of indomie waste meal for maize

followed by (7.8)1 in birds fed the control diet and least in diet 3. The relative weights of the head were significantly different ($P<0.05$) among the birds fed the dietary treatment with highest mean value (2.58) in birds fed the control diet, followed by (2.56) in birds on diet 2 and least in diet 3 (2.33). The relative weights of neck were significantly influenced ($P<0.05$) by the treatment diets with highest numerical value of 5.67 in diet 3, followed by (3.87) in diet 1 and least (2.91) in diet 2. The values obtained for relative weight of shanks differ significantly ($P<0.05$) amongst birds fed the dietary treatments with highest numerical value of 4.23 recorded in birds maintained on the control diet followed by (3.64) in birds fed 100% IWM and least (2.84) in bird fed 50% IWM based diet. The weights of the back, head, neck and shanks which showed significantly ($P<0.05$) increase amongst broilers fed dietary treatments may have resulted from the increasing level of metabolizable energy in the broiler starter and finisher diets. This is because reduced metabolizable energy content of feed have been reported (Iyayi and Yahaga, 1997) to have caused reduction in the weight of carcass and intestine of the experimental birds. However, the eviscerated weight which was expressed as

a percentage of the live weight is a more reliable measure of the quantity of raw edible meat in finished broiler chicken (Isikwenu *et al.*, 2010). The similarity in the values recorded for live weight, plucked weight and eviscerated weight is a pointer to the fact that all the diets are capable of tissue synthesis in finisher broiler chicken under the same environmental condition. The dressing percentage of broiler chicken was similar for all treatment groups and the values obtained are consistent with the range of values reported by Lamidi *et al.* (2008) and Isikwenu *et al.* (2010) for broiler chickens. The cut parts such as drumstick, breast thigh and wings were not significantly different ($P>0.05$) amongst the treatment group while some cut parts such as back, head, neck and shanks weight expressed as percentage of eviscerated weights of broiler chickens significantly varied ($P<0.05$) amongst the treatment group. However, the values fell within the range of those reported by (Atuahere *et al.*, 1987; Lamidi *et al.*, 2008; Etuk and Udedibie, 2006). The similarities in the breast weight amongst the treatment group conform to the performance of other cut parts. This report was similar to the observation of Akpodiete *et al.* (1997). This may indicate that nutrient for tissue synthesis of breast muscles was adequate.

Table 5: Relative Carcass Traits of broiler chickens fed treatment diets

Parameters	Inclusion levels of Indomie waste meal (%)			SEM±
	0	50	100	
	Diets			
	1	2	3	
Average live weight (kg/bird)	2.13	2.10	2.30	0.09
Plucked weight (g/bird)	2.03	2.01	2.20	0.09
Eviscerated Weight (g/bird)	1.87	1.70	1.98	0.17
Dressing percentage (%)	85.91	82.20	80.86	0.78
Cut Parts				
Back	7.81 ^b	9.15 ^a	5.07 ^c	0.38
Breast muscles	17.78	16.83	16.13	0.51
Drumsticks	13.25	13.90	13.88	0.66
Head	2.58 ^a	2.56 ^b	2.33 ^c	0.33
Neck	3.87 ^b	2.91 ^c	5.67 ^a	0.11
Shanks	4.23 ^a	2.84 ^c	3.64 ^b	0.09
Thigh muscles	16.91	15.59	16.33	0.77
Wings	12.87	12.02	12.13	0.27

abc: means in the same row with varying super script differ significantly ($P<0.05$)

SEM±: standard error of mean

The relative organ weights of broiler chickens as shown in Table 6 indicated that, the relative weight of liver, kidney, heart and lungs were not significantly influenced ($P>0.05$) by the treatment diets. However, the weights of the bursa and gizzard were influenced significantly ($P>0.05$) by the test diets. Broiler chickens fed with 0% IWM diet had the highest bursar weight of 0.83%, followed by those fed on 50% IWM (0.72%) and the least in those fed 100% IWM (0.50%). Gizzard weight was highest in those fed the control with the value of (2.26%), followed by (2.05%) in those fed

50% IWM and lowest value of (1.37%) was recorded in birds fed 100% IWM based diet. This observation shows that the incorporation of IWM in place of maize did not cause any toxicity or abnormal metabolic activity in the organs or system of the birds and was supported by Tanimowo *et al.* (2005); Tanuti *et al.* (2005) and Isikwenu *et al.* (2010) that feeding broilers dried brewer grains had no adverse effect on their carcass quality or organ weights and no gross morphological changes or histopathological manifestation in the organ of birds fed diets containing various ingredients.

Table 6: relative organ weight of broiler chickens fed treatment diets

Inclusion levels of Indomie waste meal (%)				
	0	50	100	
	Diets			
Organs (%)	1	2	3	SEM±
Bursar	0.83 ^a	0.72 ^b	0.50 ^c	0.02
Lungs	0.96	0.68	0.74	0.03
Heart	0.68	0.68	0.56	0.03
Liver	2.46	2.29	2.21	0.04
Kidney	0.45	0.31	0.27	0.01
Gizzard	2.26 ^a	2.05 ^b	1.37	0.07

abc: means in the same row with varying super script differ significantly ($P<0.05$)

Cost benefit analysis of broilers fed treatment diets (Table 7) at starter phase revealed that cost of feed consumed was highest (₦142.50) in birds fed the control diet and least (₦137.16) in birds fed 50% IWM. Cost of feed/kg weight gain was also least (₦15.96) in birds that ate 50% IWM and highest (₦17.50) in birds that ate 100% IWM based diet. At finisher phase, cost of feed consumed was least (₦267.50) in birds that ate diet 3, followed by (₦281.17) in diet 2 and highest (₦290.87) in the control diet. Cost of feed/kg weight gain was least (₦25.13) in birds fed 50%IWM and highest (₦27.03) in diet 3. Total cost of production was least (₦668.60) in diet 3, followed by (₦698.33) in diet 2 and highest (₦713.37) in the control diet. Income was

highest (₦1,579.50) in birds fed on 50%IWM, followed by (₦1,384.31) in birds fed the control diet and least income (₦1,346.15) was observed from birds that ate diet 3. Net profit was highest (₦881.17) in birds maintained on 50% IWM and least (₦670.94) in birds fed the control diet. This indicated that the inclusion of indomie waste meal in broiler diet up to 50% reduce cost and gave good returns. This lend support from the report of McNab and Shannon (1994); Nworgu *et al.* (1999) who reported that there is the need for a dietary formulation that can be used as alternative, non competitive, readily available and cheap ingredient that can partly replace the conventional energy and protein feed stuffs in poultry diets.

The replacement value of indomie waste meal for maize

Table 7: Cost benefit analysis of broiler chickens fed treatment diets

Parameters	Inclusion levels of Indomie waste meal (%)		
	0	50	100
	Diets		
	1	2	3
Starter phase			
Cost of feed consumed (₦/bird)	142.50	137.16	141.03
Cost of feed/Kg weight gain (₦)	16.57	15.96	17.50
Finisher phase			
Cost of feed consumed (₦/bird)	290.87	281.17	267.50
Cost of feed/Kg weight gain (₦)	26.64	25.13	27.03
Total cost of production (₦/bird)	713.37	698.33	668.60
Income (₦/bird)	1384.31	1579.50	1346.15
Net profit (₦/bird)	670.94	881.17	677.53

Conclusion

The overall result in this study indicated that indomie waste meal can successfully be included in broiler ration up to 50% level without any adverse effect on the performance, carcass quality and good economic return of broiler chickens.

References

- Agbede, J. O., Ajaja, K. and Aletor, V. A. 2002.** Influence of Roxazyme G. supplementation on the utilization of sorghum dust-based diet for broiler chick. *Proceedings of 27th Annual conference of NASP. Akure, 105-108.*
- Ajaja, K. 2005.** Effect of replacing maize with Sorghum dust in diet for broiler finishers. *Proceedings of 10th Annual Conference (ASAN) Animal Science Association of Nigeria, Pp, 179-181*
- Akinmutimi, A. H. 2006.** Nutritive value of raw and processed jack fruit seeds (*Articarpus heterophilus*). Chemical analysis agricultural section meeting. 4:266-271
- Akpodiete, J. O., Ologhobo, A. D. and Ayoade, O. G. 1997.** Replacement Value of Maggot Meal for Fish meal in Broiler Chickens Diets. In: *Livestock Products Proceedings of 2nd Annual Conference of Animal Science Association of Nigeria. September 16th-19th, 1997 Ikaja-Lagos. Pp 64-76.*
- Apata, D. F. and Ojo, V. 2000.** Efficacy of Tricdnoderma viride Enzyme complex in broiler starter fed cowpea testa-based Diets Animal production in New Millenium Challenges and options. *Proceedings of 25th NASP Annual Conference of NASP, Ibadan Pp 271-273*
- Ayanwale, B. A. and Aya, A. E. 2006.** Nutritional evaluation of con flakes waste in diets for broilers. *Pakistan Journal of Nutrition* 5(5): 485-488.
- Duncan, D. E. 1955.** Multiple Range and Multiple F-tests. *Biometrics* 11: 1-42
- El Boushy, A. R. and Vander Poel, A. F. B. 1994.** *Poultry feed from wastes, processing and uses.* 1st ed. (Chapman and Hall) pp 377.
- Eniolorunda, B. B. A., Taino, O. O., Oyewumi, B. V. and Adeyemi, O. A. 2007.** Performance of laying hen fed graded levels of Indomie waste as replacement for maize in humid tropical environment. *proceeding of 32nd Annual conference of Nigeria society for Animal production Pp 264-207*
- Etuk, E. B. and Udedibie A. B. 2006.**

- Effect of cooked pigeons pea seed meal on the Performance dressed and organ weight characteristics of broilers *Nigeria Journal Animal Production* 33(1): 16–22.
- F. A. O. 2007.** The State of Food Insecurity in the world 2007: High Food Prices and Food Security-threats and Opportunities. Food and Agricultural Organization of the United Nations, Rome Pp: 8
- FAO 1997.** Food and Agricultural organization production year book volume 50: 12-118
- Hamzat, R. A., Timaiyu, A. K., Raji, A. M. 2003.** Effect of dietary inclusion of cocoa pod Husk (KPH) on growth performance of West African Dwarf (WAD) Goats. *Proceedings of 28th Annual conference of NASP, Ibadan Pp* 271-273
- Isikwenu, J. O., Akpodiete, O. J., Omeje, S. I. and Okagbare, G. O. 2010.** Effect of replacing groundnut cake with urea treated and fermented brewer dried grain on nutrient digestibility, retention and carcass characteristics of broiler finisher. *Nigeria Journal of Animal Production.* 37(1):1-12
- Lamidi, A., Famino, W., Eruvbetine, D. and Biobaku, W. O. 2008.** Effects levels of graded level of pineapple (*Ananas comosus L. Meer*) Crush waste on the performance, carcass yield and blood parameters of broiler chicken. *Nigeria Journal of Animal Production.* 35(2): 168-170
- McNab, R. N. and Shannon, D. W. F. 1994.** The nutritive values of barley, maize and oats. *British Poultry Science* 15: 516-657
- Nworgu, F. C. and Egbunike, G. W. 1999.** Effect of plant protein sources on feed utilization and nitrogen utilization in broilers. *Tropical Animal Production and Investigations.* 3(1):47-54
- Nworgu, F. C., Egbunike, G. W. and Ogundola, F. I. 2000.** performance and nutrient utilization of broiler chickens fed full fat extruded soya bean meal and full fat soya bean. *Tropical Animal Production and Investigations.* 3(1):47-54
- Oduguwa, D. O., Fanimu, A. O. and Jegede, V. A. 2004.** Effect of Enzyme, supplementation on the utilization of shrimp waste meal based diet by broiler chickens. *Nigeria journal of Animal production* 31(2), 167-173.
- Okereke, C. O., Ukachukwu, S. N. and Nsa, E. E. 2006.** Potentials of cassava leaves and/or foliage in poultry. *Proceeding of the 40th annual conference of the Agricultural society of Nigeria, Umudike,* 25:515-517.
- Omoikhoje, S. O., Oboh, S. O., Bangbose, A. M., Obasoyo, D. O., Ehebha, E. T. E. and Isidahome, C. O. 2010.** Growth response of broiler chickens to dietary levels of roasted fluted pumpkin pod husk waste meal. *Proceeding 35th annual conference of Nigeria society for Animal production (NSAP).* PP.353-355
- S.A.S/STAT 1999.** SAS User's Guide: Statistic released version 8.0. Statistical Analysis System Institute Incorporation Cary, NC
- Steel, R. G. D. and Torrie, J. H. 1990.** Principles of Statistics. A Biometric Approach. 2nd Ed. McGraw Hill Book Co. Inc. New York, USA.

Received: 10th November, 2017

Accepted: 21st February, 2018