Journal of Agriculture and Agricultural Technology 7(1): 38-43, 2016

GROWTH PERFORMANCE AND NUTRIENT DIGESTIBILITY OF WILD GUINEA FOWLS (*Numidea meleagris galeata*) *FED* DIETS CONTAINING GRADED LEVELS OF FERMENTED CASSAVA (*Manihot palmata*) PEEL MEAL

Alabi, O.J., Ijaiya A.T., Wodi, D.A and Ayanwale, B.A.
Department of Animal Production, School of Agriculture and Agricultural Technology, Federal University of Technology, Minna, Nigeria.
Shola.alabi@futminna.edu.ng

ABSTRACT

The study was carried out to ascertain the growth performance and nutrient digestibility of wild guinea fowls fed diets containing graded levels of Fermented Cassava Peel Meal (FCPM). One hundred and twenty guinea fowls aged three weeks were used. Complete Randomized Design (CRD) was used as the experimental design. Four experimental diets were formulated such that FCPM replaced maize at 0, 25, 50 and 75 % levels. The guinea fowls were randomly allotted to these four experimental treatments, each dietary treatment had three replicates with ten (10) guinea fowls in each replicate. Feed and water were provided ad libitum. The fermented cassava and experimental diets were analysed to determine their proximate composition and energy value. Data on growth performance and digestibility were collected and analysed by one way analysis of variance. Where difference occurred at P<0.05, they were separated using Duncan Multiply Range Test Significant (P<0.05) differences were observed for the final body weights which were 853.33, 873.33, 820.00 and 693.33 g for diets with 0, 25, 50 and 75 % FCPM, respectively. Daily weight gain of 8.33, 8.65, 8.06 and 6.63 g were obtained for diets with 0, 25, 50 and 75 % FCPM respectively with value being significantly (P<0.05) lower for guinea fowl fed 75 % FCPM. The feed conversion ratio (FCR) showed no significant (P>0.05) differences in all the treatment diets. The highest (P<0.05) apparent nutrient digestibility of dry matter, crude protein and crude fibre were obtained at 50 % maize replacement with fermented cassava peel meal in the diet of guinea fowl. It was therefore, recommended that FCPM can be used to replace up to 50 % of maize in the diet of guinea fowls for optimum performance.

Key words: Ferment, cassava (*Manihot palmata*), peel, performance and digestibility

INTRODUCTION

Guinea fowl is a bird with a great potential for providing much needed animal protein in human diets in the developing countries (Adeyemo and Ojejola, 2004). This is because of their high productive potential, short generation interval and valuable nutrient contents (Ayanwale, 2006). They can be used to bridge the gap between demand and supply of animal protein. The potential of poultry in alleviating the problem of protein inadequacies in human nutrition in developing countries is, however, becoming less realizable (Ari, 2006). This is because of insufficient supply and high cost of certain conventional ingredients such as soybeans, groundnut, maize, and fish meal among others. Studies have shown that feeding account for over 60 % of the cost of poultry production. To lower this cost some operators of livestock feed industries compromised standards of the commercial feeds (Kudu *et al.*, 2010). The compromise in most cases leads to lower output, and in some cases total loss of poultry investment as a result of inadequate or nutrients imbalance. Effort has been made toward the reduction of feed cost; one of such is the use of non-conventional feedstuffs. Non-conventional feedstuffs have the potential to reduced cost of feeding if properly utilized. Various non-conventional feed ingredients have been tried on broiler chickens; Maize cob (Adeyemi and Familade, 2003), cassava peel (Dairo. 2011) and yam peel (Akinmutimi and Onen (2008). The uses of some of these non-conventional feedstuffs have some disadvantages such as high anti-nutritional content, high fibre and low protein content. Research works have shown that processing of some of these feedstuffs can reduce the anti-nutritional contents (Adeyemi and Familade, 2003, Dairo. 2011). However, the use of fermented cassava peel has not been tried on guinea fowls. Therefore, this study will determine the effect of graded level of fermented cassava peel meal diets on growth performance and nutrient digestibility of wild guinea fowl.

MATERIALS AND METHODS

Location of Study: The research work was carried out at the Teaching and Research Farm of the Department of Animal Production, Federal University of Technology, Bosso Campus, Minna, Niger State, Nigeria. Minna lies between latitude 28°N to 37°N and longitude 23°E to 33°E with annual rainfall of 1000- 1500 mm. Minna is located in the Southern Guinea Savanna Vegetation Zone (Niger State Agricultural Development Project, 2009).

Processing and Feed Formulation: Fresh cassava (*Manihot palmata*) peels were collected from a local cassava processing factory in Gwari Market, Minna. The cassava peels were washed and soaked in water inside a closed plastic drum for three days for fermentation. The fermented peels were air-

dried for seven days on spread polythene bags. The dried fermented peels were ground to pass through 2 mm disc using electrical grinding machine (6F-P150 Grinding Machine and Flour Mill (Tofu Making Machine).

Maize, groundnut cake (GNC) and other micro ingredients were purchased from Kure Modern Market, Minna. The four (4) experimental diets were formulated such that the control diet contained no fermented cassava peel meal while diets 2, 3 and 4 contained weight for weight 25, 50 and 75 % fermented cassava peel meal respectively as replacement for maize (Table 1)

Experimental Design and Animal Management

One hundred and twenty guinea fowls of three weeks of age were used for the experiment. They were hatched at the Department Farm. The birds were sorted and randomly allotted into the four dietary treatments in a Completely Randomized Design (CRD) layout. Each treatment had 30 guinea fowls that were divided into three replicate groups each. The dietary treatments were fed for 12 weeks.

The birds were raised on a deep litter. The birds were vaccinated against Gumboro disease at the first week of age and this was repeated at the second week of age. At fourth to eight week, Newcastle vaccine (NDV Lasota) was administered. All other management practices such as administration of anti-coccidial (coccidiostat), anti-stress and anti-biotic were strictly adhered to against outbreak of any poultry disease. Routine management operations were carried out on daily basis which include cleaning of drinkers, feeders, provision of clean water and feeds. The feed given and leftover were weighed and recorded daily.

Data collection: Feed intake was measured daily by subtracting the weight of feed leftovers from the feed offered, and the difference was divided by the total number of birds per pen per day. The initial live weights of the birds were taken when the birds were three weeks old and thereafter, mean live weight per pen was measured at weekly interval by weighing the birds in each pen and dividing the weight by the total number of birds in the pen. Feed conversion ratio was calculated by dividing the average feed intake by the average weight gain in each pen.

Table 1: Composition of the experimental guinea fowl diets

Ingredients	$FCPM_0$	$FCPM_{25}$	$FCPM_{50}$	$FCPM_{75}$
Maize	44.40	33.30	22.20	11.10
FCPM	0.00	11.10	22.20	33.30
Groundnut cake	38.90	38.90	38.90	38.90
Maize bran	10.00	10.00	10.00	10.00
Fish meal	2.00	2.00	2.00	2.00
Bone meal	2.50	2.50	2.50	2.50
Limestone	1.50	1.50	1.50	1.50
Premix	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25
Methionine	0.10	0.10	0.10	0.10
Lysine	0.10	0.10	0.10	0.10
Total	100.00	100.00	100.00	100.00
Calculated values ME (kcal/kg)	2565.62	2409.77	2255.70	2100.75
Crude protein%	23.91	23.48	23.05	22.62
Crude fibre%	3.76	4.51	5.27	6.02
Methionine	0.20	0.24	0.22	0.23
Lysine	0.88	0.85	0.82	0.79

Keys: FCPM – Fermented cassava peel meal; $FCPM_0$ - 100 % maize: 0 % FCPM; $FCPM_{25}$ – 75 % maize: 25 % FCPM; $FCPM_{50}$ – 50 % maize: 50 % FCPM; $FCPM_{75}$- 25 % maize: 75 % FCPM

Digestibility: Apparent nutrient digestibility was carried out when the birds were 12 weeks old; the total collection method was used. It was conducted in specially designed metabolic cages having separated watering and feeding troughs. Four birds were selected from each replicate and transferred to metabolic cages for the measurement of apparent nutrient digestibility. A three-day acclimatization period was allowed prior to a four-day collection period. Droppings voided by the bird were collected on a daily basis at 9.00 hours. Care was taken to avoid contamination from feathers, scales, debris and feeds. Apparent nutrient digestibility was calculated as nutrient in feed consumed minus nutrient in faeces voided divided by nutrients in feed consumed multiply by 100 (AOAC, 2005).

Proximate Analysis: The fermented cassava peel meal, experimental diets and the faecal samples were analysed for crude protein, ether extract,

crude fibre, ash and nitrogen free extract contents using AO AC (2010) analytical methods.

Statistical analysis: Data on feed intake, growth rate, feed conversion ratio and apparent nutrient digestibility of the birds were analysed using the General Linear Model procedures for statistical analysis of variance (SAS, 2010). Duncan test for multiple comparisons was used to test the significance of differences between treatment means ($P<0.05$).

RESULTS

The results of the chemical composition of Fermented Cassava Peel Meal (FCPM) used in this research are shown in Table 2. The fermented cassava peel meal had dry matter content of 89.50 %, crude protein 5.70 %, crude fibre 14.83 %, ether extract 0.47 %, ash 9.47 % and nitrogen free extract 59.03 %. Fermentation reduced the Hydrogen cyanide (HCN) content by 59.88%. The fermented cassava peel had a calculated metabolizable energy (ME) value of 288.68 kcal/kg.

The results of the proximate and energy composition of the experimental diets fed to the guinea fowls are presented in Table 3. All parameters measured were influenced ($P<0.05$) by FCPM treatments. Dry matter of the diets ranged between 90.41 % and 91.28 %, the highest being that of diet with $FCPM_{25}$ (91.28 %) and diet with $FCPM_{50}$ had the lowest value. Crude protein contents was between 24.18% and 27.30 %, the highest been for diet $FCPM_{75}$ and control diet had the lowest crude protein (CP) value. Diet $FCPM_{75}$ had the highest crude fibre (CF) while diet $FCPM_{50}$ had the least. Ether extract results showed that diet $FCPM_{25}$ had the highest value while the least value was recorded for diet $FCPM_{50}$. The ash value result was between 9.70% ($FCPM_{50}$) and 13.35 ($FCPM_{25}$). Nitrogen free extract results in the diets ranged from 41.59 % ($FCPM_{25}$) to 45.10 % ($FCPM_0$). Diet $FCPM_{75}$ had the highest metabolizable energy while $FCPM_{50}$ had the lowest.

Feeding of graded levels of fermented cassava peel meals had no significant ($P>0.05$) difference on initial body weight and feed conversion ratio of the guinea fowls (Table 4) However, the final body weight, daily weight gain and feed intake were significantly ($P<0.05$) influenced by FCPM treatments. The final weight and daily weight gain results showed that birds on $FCPM_0$, $FCPM_{25}$ and $FCPM_{50}$ diets had similar ($P>0.05$) values. However, their values were higher ($P<0.05$) than birds on $FCPM_{75}$ diet. Results of daily feed intake showed that birds on $FCPM_0$, $FCPM_{25}$, and $FCPM_{50}$ diets had similar ($P>0.05$) values. Birds on $FCPM_{50}$ and $FCPM_{75}$ diets also had similar ($P>0.05$) feed intake. However, birds on $FCPM_0$ and $FCPM_{25}$ diets had higher ($P<0.05$) daily feed intake than those birds on $FCPM_{75}$ diet.

Apparent nutrient digestibility results showed that all parameters measured were influence ($P<0.05$) by FCPM treatments except the ether extract (Table 5). The dry matter digestibility results showed that birds on $FCPM_0$, $FCPM_{50}$, and $FCPM_{75}$ diets had similar ($P>0.05$) values. Birds on $FCPM_0$ and $FCPM_{25}$ diets also had similar ($P>0.05$) results. However, birds on $FCPM_{50}$, and $FCPM_{75}$ had higher dry matter digestibility than those birds on $FCPM_{25}$ diet. The crude protein and crude fibre digestibility results showed that birds on $FCPM_{50}$ had the highest value; their values were , however, only higher ($P<0.05$) than birds on $FCPM_0$ and $FCPM_{25}$ diets. Birds on $FCPM_{25}$ had the lowest ash and nitrogen free extract (NFE) digestibility and were significantly lower ($P<0.05$) than those birds on $FCPM_0$, $FCPM_{50}$ and $FCPM_{75}$ diets which had similar ($P>0.05$) values.

Table 2: Chemical composition of fermented cassava peel meal (FCPM)

Parameter	Composition
Dry matter (%)	89.50
Crude protein (%)	5.70
Crude fibre (%)	14.83
Ether extracts (%)	0.47
Ash (%)	9.47
Nitrogen free extracts (%)	59.03
HCN of fresh cassava peel meal (Mg/kg)	17.20
HCN of fermented cassava peel meal (Mg/kg)	6.90
Reduction in HCN (%)	59.88
Energy in kcal/kg (ME)	288.64

DISCUSSION

The low protein (5.70 %) and high crude fibre (14.83) of fermented cassava peel meal obtained in this study is similar to the 6 % and less than the 30 % earlier reported by Aro *et al.* (2010) for crude protein and crude fibre levels of cassava peel meal respectively. Wood (1992) also recommended that levels of cassava usage should be lower than 50 % inclusion or less than 50 mg HCN per kg in feed of poultry birds.

The calculated energy values of between 316.61 and 364.22 kcal/kg for all experimental diets was higher than 2990 and 3200kcal/kg metabolizable energy recommended by Ayanwale and Kudu (2001) for growing guinea fowl. The range of crude protein content of the experimental diets was higher than the ranged (18-26 %) recommended by Ayanwale and Kudu (2001) and Hunton (2007).

Table 3: Proximate and energy composition of the experimental diets (%)

Component	$FCPM_0$	$FCPM_{25}$	$FCPM_{50}$	$FCPM_{75}$	SEM
Dry matter	90.82^b	91.28^a	90.41^d	90.83^c	0.092
Crude protein	24.18^d	24.92^c	26.25^b	27.30^a	0.371
Crude fibre	4.89^b	4.47^c	4.20^d	6.87^a	0.311
Ether extract	6.85^b	6.95^a	4.25^d	4.45^c	0.285
Ash	9.80^c	13.35^a	9.70^d	11.15^b	0.278
Nitrogen free extract	45.10^a	41.59^d	43.34^c	43.73^b	0.442
Energy in kcal/kg (ME)	338.77^b	328.59^c	316.61^d	364.22^a	5.301

$^{a, b, c, d}$ Means of the same row with different superscript are significantly ($P<0.05$) d different

Keys: FCPM – Fermented cassava peel meal; $FCPM_0$ - 100 % maize: 0 % FCPM; $FCPM_{25}$ – 75 % maize: 25 % FCPM; $FCPM_{50}$ – 50 % maize: 50 % FCPM; $FCPM_{75}$- 25 % maize: 75 % FCPM

Table 4: Performance of guinea fowl feed diets containing graded levels of fermented cassava peal meal

Parameters	$FCPM_0$	$FCPM_{25}$	$FCPM_{50}$	$FCPM_{75}$	SEM
Initial weight (g)	143.33	146.67	143.33	146.67	0.135
Final weight (g)	853.33^a	873.33^a	820.00^a	693.33^b	0.272
Daily weight gain (g)	8.33^a	8.65^a	8.06^a	6.63^b	0.306
Daily feed intake (g)	4.55^a	4.56^a	4.33^{ab}	3.96^b	0.280
FCR	1.83	1.91	1.86	1.68	0.183

$^{a, b}$ Means of the same row with different superscript are significantly ($P<0.05$) d different

Keys: FCR- Feed conversion ratio; SEM - Standard error mean ; FCPM – Fermented cassava peel meal; F FCPM – Fermented cassava peel meal; $FCPM_0$ - 100 % maize: 0 % FCPM; $FCPM_{25}$ – 75 % maize: 25 % FCPM; $FCPM_{50}$ – 50 % maize: 50 % FCPM; $FCPM_{75}$- 25 % maize: 75 % FCPM

Table 5: Apparent nutrient digestibility of guinea fowl fed diets containing graded level of fermented cassava peel diets

Parameters	$FCPM_0$	$FCPM_{25}$	$FCPM_{50}$	$FCPM_{75}$	SEM
Dry matter	94.01^{ab}	93.09^b	95.84^a	95.49^a	0.082
Crude protein	$91,30^{bc}$	89.51^c	94.36^a	93.93^{ab}	0.722
Crude fibre	75.01^c	80.69^{bc}	92.14^a	86.34^{ab}	0.054
Ether extract	96.94	96.15	95.83	96.86	0.086
Ash	90.50^a	85.68^b	90.50^a	91.06^a	0.728
NFE	98.85^a	97.43^b	98.39^a	98.33^a	0.091

$^{a, b, c, d}$ Means of the same row with different superscript are significantly ($P<0.05$) d different

Keys: FCPM – Fermented cassava peel meal; $FCPM_0$ - 100 % maize: 0 % FCPM; $FCPM_{25}$ – 75 % maize: 25 % FCPM; $FCPM_{50}$ – 50 % maize: 50 % FCPM; $FCPM_{75}$- 25 % maize: 75 % FCPM

The high crude protein observed in diet containing 75 % FCPM could be attributed to higher FPCM inclusion level. The result showed that the CP content increased with inclusion level increment. The increase in crude fibre in the diet might be as a result of high fibre content of FCPM which is in agreement with the report of Adesehinwa (2008). The author reported that cassava peel meals are fibrous in nature. This implies that the higher content of fermented cassava peel meal in the diets have tendency to reduce nutrient utilization which in turn affects the final weight, daily weight gain and daily feed intake of the guinea fowl, as observed by Salami (2000) that the birds showed aversion to cassava peel meal especially at the higher inclusion levels in diets.

Weight gain decreased as maize is been replaced with fermented cassava peel meal at 25, 50 and 75 % though only significantly at 75 % replacement. The lowest feed intake observed in 75 % FCPM treatment group was similar to the findings of Eruvbetine *et al* (2003) who reported that birds cannot tolerate cassava peel meal at levels beyond 50 % replacement at the expense of dietary maize. Sogunle *et al.* (1994) also observed that the growing pullets performed poorly with increasing levels of cassava peel meal in the diets. Final and daily weight gains showed similar trend. Pido *et al.* (1997) reported that replacement of maize with cassava meal up to 50 % in broiler chickens' diets resulted in higher body weight gain.

The digestibility of the guinea fowls indicated differences in all the parameters measured except ether extract. The dry matter, crude protein and crude fibre were better digested by the guinea fowls fed diets containing fermented cassava peel meal at 50 %. From the growth performance result, birds on this treatment had better utilization. This result is in line with the findings of Sogunle *et al.* (1994) who reported that feeding cassava peel to poultry birds resulted in better nitrogen utilization and nutrient digestibility. The findings of this digestibility experiment which indicated significance differences ($P<0.05$) in most of the parameters measured is in agreement with the report of Urbano *et al.* (2005) who

reported that fermentation of cassava peel meal improved not only the nutritional quality of the cassava, but equally improves the nutrient bio-availability in livestock. The crude fibre digestibility values were lower in all the treatments; this is similar to the findings of Oduguwa *et al.* (2007) who reported that birds are less efficient at digesting of fibre. The lower digestibility could be due to the type of fibre in the diets, since fibre from different sources could vary in their digestibility depending on the proportions of cellulose, hemicelluloses and lignin. The low values of NFE digestibility observed in this study is not well understood; it might mean that the guinea fowl digestive system is not well developed enough to handle the high content of fermented cassava peel meal in the diets.

CONCLUSIONS

There were no differences in the weight gain, feed intake and feed conversion ratio of birds fed the control, 25 and 50 % FCPM diets. This suggests that this non-conventional feedstuff (fermented cassava peel meal) can be used to replace maize up till 50 % in the diets of guinea fowls without negative impact on the weight gain, feed intake and feed conversion ratio. However, at higher level of 75 % replacement of maize with FCPM, the weight gain and feed intake were impaired.. It could be, thus, recommended for improve weight gain, feed intake and feed conversion ratio maize can be replace up to 50 % with FCPM.

REFERENCES

Adesehinwa, A.O.K. (2008). Energy and protein requirements of pigs and the utilization of fibrous feedstuffs in Nigeria: A review. Afr J Biotech. 7:4798–4806.

Adeyemi, O.A. and Familade F.O. (2003). Replacement of Maize by Rumen Filtrate Fermented Corn-Cob in Layer Diet. *Bioresource Tech.* 90: 221- 224.

Adeyemo, A.I and Ojejola, O. (2004). Performance of guinea fowl fed varying levels of poultry droppings. *International Journal of poultry science* 3 (5): 357 - 360.

Akinmutimi, A.H. and Onen, G.E. (2008). The response of broiler finisher birds fed graded levels of yam peel meal in place of maize-based diets. Int. J. Poult. Sci., 7: 474-479.

AOAC. (2005). Official Method of Analysis of Association of Official Analytical Chemists, International (18th ed.), Washington D.C.

Ari, M.M (2006). An evaluation of the effect of various processing methods on the utilization of soybeans (Glycine maximum) by broiler Ph.D thesis submitted to Postgraduate School. Federal University of Technology, Minna.

Aro, S.O., Aletor, V.A., Tewe, O.O. and Agbede, J.O. (2010). Nutritional potentials of cassava tuber waste: a case study of cassava starch processing factory in South- Western Nigeria. *Livestock Research and Rural Development.* 24(3).

Ayanwale, B.A. (2006). Growth and carcass characteristics of broiler fed alkali Processed soybeans. *Nigeria Journal of Animal Production* 33(1): 40 - 44.

Ayanwale, B.A. and Kudu, Y.S. (2001). The response of Wild West Africa guinea fowl to varying levels of dietary protein under intensive management. *Tropical Journal for Animal Science* 4(2): 13-19

Dairo F.A.S.(2011). Utilization of ensiled metabolizable mixture of cassava peel and caged layers' manure as energy source in broiler diets. Afr J Food Agric Nutr Dev, 11 (5) (2011).

Eruvbetine, D., Tajudeen, I.J., Adeosun, A.I and Olejede A.A (2003). Cassava *(manihot esculenta)* leaf and tuber concentrate in diets for broiler chickens. *Bio resources Technology.* 86 :277–281.

Hunton, P. (2007). Poultry production world Animal Science Series C9.Elsevier. ISBN- 13-978-0-444 - 88965-2, ISBN-100 444 - 88965 – 5

Kudu, Y.S., Ayanwale, B.A.,. Shiawoya, S.L., Aremu, A., Jiya E.Z and Masodomi, V. (2010). Growth performance of wild indigenous guinea fowls (Numidea meleagris galeata) fed graded levels roasted negro coffee (*Senna occidantalis*) seed meal. Proceeding of 35th Annual Conference of the Society for Animal Production. (NSAP) University of Ibadan, Nigeria. 14th-17th March, 2010.315-318

Niger State Agricultural Development project. (2009). Quarterly Farmers' magazine. 27 series.

Oduguwa, B.O., Jolaosho, A.O. and Ayakoso, M.O (2007). Effect of ensiling on the physical properties, chemical composition and mineral contents of guinea grass and cassava tops silage. *Nigeria Journal of Animal Production,* 34(1): 100-106.

Pido, P.P., Adeyanju, S.A and Adegbola, A.A (1997). The effect of graded levels of fermented cassava meal on broilers. Poult. Sci. 58: 427-431.

Salami, R.I (2000).Preliminary studies on the use of parboiled cassava peel meal as a substitute for maize in layer diets. *Tropical Agriculture (Trinidad) 11:199* -204

SAS, 2010. Statistical Analysis System. SAS User Guide: Release 9.2. SAS Institute Inc, Cary NC, USA

Sogunle, O.M., Fanimo, A.O., Abiola, S.S. Bamgbose, N.K Tewe, O.O. (1994). Indices of cassava safety for livestock feeding. *Act Horticulture.* 375:241-249.

Urbano, G., Arada, P., Vilchez, A. and Arada, C. (2005). Effect of germination on the composition and nutritive value of proteins in pisum sativum, L. *Food Chemistry,*

93(2005)671-679
Wood, J.F. (1992). Quality aspects of tradable cassava products including problems of in Proceeding of the FAO Expert Consultation, on Roots, Tubers Plantation and Bananas in Animal Feeding CI AT Cali Colombia 67-80.