Global Journal of Animal Scientific Research. 2(4):357-377. 2014

Global Journal of Animal Scientific Research

G.J.A.S.R

Journal homepage: www.gjasr.com

Print ISSN: 2345-4377 *Online ISSN: 2345-4385*

Original Article

Growth Performance of Indigenous Guinea Fowls Fed Varied Levels of Boiled Mango Kernel Meal

Anthony A. Agbolosu*, Francis Amoah and Herbert K. Dei

Department of Animal Science, University for Development Studies, P. O. Box TL 1882, Tamale, Ghana

ARTICLE INFO

Corresponding Author:
Anthony A. Agbolosu
aagbolosu@uds.edu.gh

How to cite this article:
Agbolosu, A.A., F. Amoah and H.K. Dei. 2014. Growth Performance of Indigenous Guinea Fowls Fed Varied Levels of Boiled Mango Kernel Meal. *Global Journal of Animal Scientific Research.* 2(4): 372-377.

Article History:
Received: 12 August 2014
Revised: 27 August 2014
Accepted: 28 August 2014

ABSTRACT

A study was conducted to determine effects of varied levels of boiled mango kernel meal (BMKM) as a replacement for maize on growth performance of local guinea fowls. The BMKM was obtained by cutting the seed open with knife and the mango kernel chopped into pieces, boiled at $100^{o}C$ for 30 minutes and sun-dried for 72 hours. One hundred and twenty, 28-day old local guinea keets of similar live weights (118g ± 2g/bird) were randomly allotted to 4 dietary treatments containing 3 replicates of 10 birds each. The BMKM replaced maize at inclusion levels of 0% (control), 10%, 15% and 20%, respectively. Clean water was provided *ad-libitum*. Data were collected on mean feed intake, final live weight, daily weight gain, feed conversion efficiency (FCE), feed cost per kg gain and analyzed using ANOVA by GENSTATS (3^{rd} Edition). There were no significant differences (P>0.05) in mean feed intake, final live-weight, daily weight gain, FCE, feed cost per kg and feed cost per gain between birds fed the control diets and diets containing BMKM. There was no significant differences (P>0.05) in mortality of birds on the various treatments. It was concluded that boiled mango kernel meal could replace maize up to 20% in the diet of local guinea fowls without any adverse effects on growth.

Keywords: Indigenous guinea fowl, growth performance, mango kernel meal, boiled, replacement.

INTRODUCTION

Poultry production is an important part of the daily life of man, especially of the rural farmers where poultry are raised for several purposes such as offering considerable dietary animal protein supply for human growth (Kondombo *et al.,* 2003). Some of these poultry species include turkey, domestic fowl, duck, peafowl, Japanese quill, pigeon, ostrich and guinea fowl (Payne, 1990). One of the greatest challenges facing the livestock industry in developing countries is the provision of nutritionally balanced and cost-effective rations, since feed constitutes about 65%-80% of the total cost of production (Durunna *et al.*, 2000). Hence it is necessary to look for locally available, cheap, safe and nutritionally adequate substitutes for maize in poultry feeding. Lots of feeding trials involving cheap locally available feed ingredients have been conducted with the aim of solving or reducing high feed costs. Such feeds include blood meal (Donkoh *et al.,* 1999), oilseed cakes (Kocher, 2002),mucuna beans (Sarfo, 2004), false yam tuber (Dei *et al., 2011)* and mango seed kernel (Diarra and Usman, 2008).

Mango kernel, a by-product of mango pulp is reported to be a good source of soluble carbohydrates (Diarra and Usman, 2008). The protein of the kernel (7.8 – 8.0%) is comparable to that of maize but it has higher fat (7.8 - 9.0%) than maize (Jadhav and Siddiqui, 2010). In India, mango kernel is consumed by human beings in the form of porridge (Saadany, 1980) but in Ghana, it is regarded as waste thus contributing to environmental pollution. The high carbohydrate content (Ravindran and Blair, 1991) and high-quality proteins of the seed kernels (Augustine and Ling, 1987) could therefore be exploited using poultry, which are the most efficient converters of raw ingredients such as starches, sugars and proteins into meat and egg products (Adegbola, 1990). There are few reports on the use of mango kernel in livestock feeding but the level of inclusion in poultry diets has been low because of the presence of tannins which exerts anti-nutritive effects that reduce chick growth (Teguia, 1995).

However, boiling has been reported to be an effective method of tannin reduction. Boiling reduced up to 53% tannin in African oil bean (Ugherughe and Ekedolun, 1986) and about 55% tannin in mango kernel (Diarra and Usman, 2008). Because of the abundant accessibility and cheap cost of mango kernel, it would be interesting to investigate the effect of inclusion of mango kernel in poultry diets. This study was therefore undertaken to determine the effect of dietary boiled mango kernel meal (BMKM) on local guinea fowl growth performance and to assess the cost effectiveness of using BMKM as a feed ingredient.

MATERIALS AND METHODS

Location of experimental site

The trial was undertaken at the Poultry Section of the Department of Animal Science, University for Development Studies, Nyankpala Campus, and Tamale between August 2011 to November 2011. Nyankpala is located about 16km West of Tamale and lies on latitude 9^o 25 41 North and longitude 0^o 58 42'' West in the Guinea Savanna zone. It has an average annual rainfall of 1034.4mm. Mean annual daytime humidity is 54% with relative humidity usually high in the morning and low at night. Annual temperature is 28.3 ^{o}C (SARI, 2004). The study area is characterized by low, seasonal, uni-modal and poorly distributed rainfall. The dry season lasts for about six to seven months.

Sources and processing of Boiled Mango Kernel meal

Mango seeds were collected by both women and children during the month of May (peak of the mango season in Nyankpala). The kernel was obtained by cutting the seed open with knife. The fresh kernel was chopped to reduce the particle size andthen boiled in a metal pot with tap water at 100 ^{o}C for 30 minutes, followed by sun-drying on a clean cemented floorfor 72 hours. The dried kernel was ground in a grinding mill and labeled as BMKM (i.e. Boiled Mango Kernel meal).

Experimental diets

Four dietary treatments were formulated for the experiment (Table 1) with reference to Diarra *et al.* (2010). Diet 1 which was the control contained no BMKM (i.e. 0%). In diets 2, 3 and 4, BMKM replaced maize at 10, 15 and 20% respectively. The BMKM replaced maize on weight by weight basis on the assumption that they have similar nutrient composition, since the BMKM was not analyzed for its nutrient composition due to logistic constraints.

Table 1: Percentage composition of experimental diets

Ingredients	Replacement level of boiled mango meal for maize (%)			
	0.00	**10.00**	**15.00**	**20.00**
Maize	54.70	49.23	46.49	43.76
Boiled mango kernel meal	0.00	5.47	8.21	10.94
Broiler starter concentrate	11.00	11.00	11.00	11.00
Soybean meal	22.30	22.30	22.30	22.30
Wheat bran	10.00	10.00	10.00	10.00
Di-calcium PO_4	0.50	0.50	0.50	0.50
Oyster shell	1.00	1.00	1.00	1.00
Vitamin/ Trace mineral premix*	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25
Calculated Nutrients Analysis				
Crude protein %	19.63	19.56	19.52	19.48
Gross energy (MJ/kg)	11.19	11.22	11.23	11.25

*Composition of vitamin and trace mineral premix per kg diet; vitamin A,8000000IU; vitamin D3,1500000; vitamin E, 2500mg; K3, 1000mg; vitamin B2, 2000mg; vitamin B12, 5mg; Folic acid, 500mg; Nicotinic Acid, 8000mg; Calcium panthotenate, 2000mg; choline cloruro, 50000mg; Zn, 40000mg; Cu, 4500mg; Co, 100mg; I, 1100mg; Se, 100mg.

Experimental birds, design and their management

A total of 120, 28 day-old guinea keets of similar weight (mean live weight was 116g per bird) were weighed and randomly allotted to 4 treatments containing 3 replicates each, with 10 birds per replicate. The birds were housedin a raised floor pen with wire mesh. Birds in each replicate were confined in a cage of size 2.3m×1.25m×1.8m with a floor space of 0.287m^2 per bird. Rice husk was used as a bedding material which was spread to a depth of about 0.6cm.Feed for birds were provided in wooden feeding troughs in the morning and evening. Clean fresh water was provided *ad-libitum* in plastic watering troughs throughout the experiment. Coccidiostat (Amprolin-300 ws powder) was administered orally at 5g/10L of water for 3 consecutive days as well as antibiotics (Aliserylws powder) at 5g/10L of water for 4-5 days respectively as and when necessary. Birds were also dewormed once every month with *Piperazine* at 5g/10L water. Biosecurity measures in the poultry house were ensured by using disinfectant (Izal) for cleaning and as footbath. Six (100w) white incandescent electric bulbs were provided as a source of light throughout the experiment to promote feeding particularly during the night. Data was taken every week from the 5th to 15th week of age.

Parameters measured

The parameters measured were feed intake, weight gain, final live weight, FCE (gain/feed), mortality and feed cost. Feed intake were measured weekly using an electronic weighing scale (Jadever JPS-1050). Feed consumption per replicate per week was obtained by subtracting feed left over at the end of every week from the total feed supplied for the week. Mean feed consumption per bird per day was obtained by dividing feed consumed by the number of birds in each replicate and number of days in a week. Weight gain was taken on weekly basis using an electronic weighing scale (Jadever JPS-1050). The calculation of mean weight gain per bird per day was done by dividing the weight gained by the number of birds in each replicate and number of days in a week. Final live-weight was measured at the end of the 11th week of age. The mean final live weight per bird was obtained by total weight of birds by the number of birds per replicate. Feed conversion efficiency (Gain/ Feed ratio) was calculated by dividing the weight gain in the week per bird per day, by the feed intake in the week per bird per day for each replicate. Deaths were recorded as they occurred. Dead birds were sent for post mortem examination by the veterinary technical officer of the school.
Feed cost was obtained as follows:

The quantity of each ingredient needed to formulate a 100 kg feed was multiplied by their unit prices to give the cost of a 100 kg feed. This was divided by 100 kg to give the unit cost of each diet. The unit cost of each diet was multiplied by the total feed consumed per bird to obtain feed cost per bird. Feed cost per kg gain was determined by dividing the feed consumed per bird by the total live weight gain. This total live weight gain was determined by subtracting the initial live weight of the bird from its final live weight.

RESULTS

Growth Performance

A summary of the performance data of local guinea fowls fed varied levels of BMKM is shown in Table 2.The average daily feed intake was not significantly different (P>0.05) for birds on the control diet (0%BMKM) and the other diets.

Table 2: Effect of varying levels of BMKM on feed intake, weight gain, gain/feed ratio, final live-weight and mortality of local guinea fowls during the growth phase (5-15weeks of age)

Parameters	Levels of BMKM				ANOVA	
	0%	10%	15%	20%	±S.E.D	P- value
Average daily feed intake (g/bird)	52.6	51.0	55.3	54.2	3.88	0.709
Average daily live- weight gain (g/bird)	9.47	9.00	8.41	7.52	0.685	0.081
Gain/Feed	0.180	0.177	0.147	0.140	0.0167	0.095
Final live-weight at 15 weeks (kg/bird)	0.870	0.830	0.777	0.713	0.049	0.059
Mortality	1.67	1.33	2.00	1.67	0.408	0.487

S.E.D = Standard Error of Difference; P = Probability

Numerically, mean feed intake increased for birds on BMKM-based diets increased from 10 to 20% as compared to birds fed with 0% BMKM. Mean weight gain did not vary significantly (P>0.05) between the control fed birds and the birds on test diets and within the treatment groups. Average weight gain of the birds on control diet was numerically similar to birds fed 10% BMKM test diet but slightly lower in birds fed 15% and 20% BMKM. There was no significant difference (P>0.05) in FCE, although less feed intake but better feed conversion efficiency were recorded for birds in fed 10%BMKM as compared to their counterparts fed the other diets. There was no significant difference (P>0.05) between control and the other treatments groups. Final live-weight of birds on control diet tended to be similar to that of birds fed 10% BMKM test diet but slightly lower in birds fed 15% and 20% BMKM.As shown in Table 3, feed cost per kg in all treatment diets was similar with slight increase in feed cost per bird of the BMKM-based diets except for those on 10% which was equivalent to those on 0% BMKM. From the experiments a total of 20 birds (5, 4, 6 and 5 birds in T0, T1, T2 and T3 respectively) died.

Table 3: Cost-benefit analysis of BMKM-based and control diets on guinea fowls performance

Parameters	Levels of BMKM				ANOVA	
	0%	10%	15%	20%	±S.E.D	P- value
Feed cost per kg (GH/kg)	0.99	0.98	0.97	0.96	-	-
Total feed consumed (kg/bird)	4.05	3.9	4.26	4.17	0.299	0.709
Total feed cost (GH/bird)	4.03	3.84	4.14	4.02	0.293	0.796
Feed cost per kg weight gain (GH)	4.63	4.63	5.35	5.70	0.511	0.162

S.E.D = Standard Error of Difference; P = Probability

DISCUSSION

Feed intake

The present report on feed intake, agrees with the observation of Diarra *et al.* (2010) who observed no significant differences (P>0.05) in daily feed intake in broiler chickens fed graded levels of boiled mango kernel meal as a replacement for maize. This suggests that the combination of boiling and sun drying could be suitably employed to prepare mango kernel meal for inclusion in diets for guinea fowls. The similarity in the consumption of the feed between birds fed control diet and the BMKM indicated that, boiling might have reduced the anti-nutritional factors in the kernel thereby making the feed palatable.

Growth Performance

Weight gain

Although the birds on the different dietary treatments consumed similar amounts of feed, live-weight gains of guinea fowls fed 0% and 10% BMKM in absolute term were slightly higher than those fed the diets containing 15% and20% BMKM. It was expected that consumption of similar amount of feed by the birds would have yielded similar live-weight gains. The lower live-weight gain of birds on the 15% and 20% replacement diets could be due to the fact that, the tannin content in the mango kernel of these diets may be above the threshold of 0.30% that can be tolerated by chicks as reported by Jansman *et al.* (1989). This might be associated with the residual tannins present in the BMKM since boiling did not completely remove the tannins. The findings of this experiment on weight gain agrees with Douglas *et al.*, (1993) who reported that, increasing dietary tannins significantly reduced weight gain in young turkeys while there were no adverse of tannins on performance once the turkeys were 57 days old or older. Jansman (1993) reported that addition of tannins to the diet can lead to a lower apparent digestibility of crude protein and to a lesser extent, energy. Thus the lower growth rate, though insignificant, observed for birds on 15% and 20% BMKM diets might be caused by a reduced amount of protein and other nutrients available for growth.

Feed conversion efficiency and mortality

In numerical terms, feed conversion efficiency value obtained for birds fed the control diet was higher compared to those obtained for birds on the BMKM diets. This was expected as the BMKM diets contain some tannin as reported earlier on (Jansman, 1993) impairs feed conversion efficiency. Mortalities were not traceable to any dietary effect but were reported to be internal hemorrhage in the skull of the birds due to an electric shock that occurred during repair of some electrical fittings in the pen.

Economic evaluation

The costs per kilogram of feed for the formulated diets are shown in Table 3. Even though the Mango Seed Kernels were (MSK) obtained free of charge from the market grounds of Nyankpala, it was assigned a value of GH 0.30 (i.e. $0.078) per kg being the cost incurred in collecting the mango seed kernel plus cost incurred in producing the meal. The reduction in the cost of the feed with the increase in the level of mango kernel was due to the relatively cheaper price of MSK compared to maize (GH 0.70 per kg) (i. e. $ 0.182) at the time of the experiment. However, the cost of feed to produce a kg of bird on the 10% was equivalent to those on 0% BMKM and lower than those on 15% and 20% BMKM. Hence the use of the BMKM was economical.

CONCLUSION AND RECOMMENDATION

Based on the results of the present study, BMKM could be included in the diets of local guinea fowls up to 20% during the growth phase without any adverse effects on performance. The use of the BMKM-based diet was economical in guinea fowl production. Further study should be conducted to determine the effect of soaking the mango kernel prior to boiling since soaking has been shown to reduce concentrations of tannins.

REFERENCE

Adegbola, A.A. 1990. Indigenizing the poultry industry in Africa. *Proceeding of an International Workshop on Rural Poultry Development in Africa (Africa Network on Rural Poultry Development)*, Ile-Ife, Nigeria. pp: 19-23.

Augustine, M.A. and D.P. Ling. 1987.Composition of mango seed kernel. *Pertanika.* 10(1): 53-59.

Dei, H. K, A. Bacho, J. Adeti, and S.P. Rose. 2011. Nutritive value of false yam (*Icacina oliviformis*) tuber meal for broiler chickens. *Poultry Science.* 90:1239–1244.

Diarra, S.S. and B.A. Usman. 2008. Growth performance and some blood parameters of broiler chickens fed raw or cooked mango kernel meal. *International Journal of Poultry Science.* 7(4): 315-318.

Diarra, S. S., B. A. Usman and J.U. Igwebuike. 2010. Replacement value of Boiled Mango Kernel Meal for maize in broiler finisher diets. *ARPN Journal of Agricultural and Biological Science.* 5(1): 47 – 52.

Donkoh, A., C.C. Atuahene, D.M. Anang, and S.K. Ofori. 1999. Chemical composition of solar-dried blood meal and its effect on performance of broiler chickens. *Animal Feed Science and Technology Journal.* 81: 299-307.

Douglas, J.H., T.W. Sullivan, N.J. Gonzalez, and M.M. Beck. 1993.Differential age response of turkeys to protein and sorghum tannin levels. *Poultry Science.*72: 1944-1951.

Durunna, C.S., A.B.I. Udebibie, and G.A. Anyanwu. 2000. Combination of maize/sorghum and cassava tuber meal as a substitute for maize in diet of laying hens. *Proceedings of the 25th Annual Conference of the Nigerian Society for Animal Production (NSAP),Umudike.* p: 13.

Jadhav, N.V. and M.F. Siddiqui. 2010. Handbook of Poultry Production and Management. 2nd Edition. Jaypee Brothers Medical Publishers Ltd. New Delhi. India. 383p.

Jansman, A.J. 1993. Tannins in Feed Feedstuffs for Simple Stomached Animals. *Nutrition Res. Rev.* 6:209

Jansman, A.J.M., J. Huisman, and A.F.B. Van der Poel. 1989. Faba beans with different tannin contents; Heal and fecal digestibility in piglets and growth in chickens. Recent Advances in Research in Anti-nutritional Factors in Legume seeds , J. Huisman , A. F. B. Vander Poel, and I.E. Liener, Eds. Washington, Netherlands, Purdue. pp: 176-180.

Kocher, A. 2002. Use of oilseed meals in broiler diets: Effects of feed enzymes. *Proceedings of the Australian Poultry Science Symposium.* 14. 96p.

Kondombo, S.R., A.J. Nianogo, R.P. Kwakkel, H.M.Y. Udo, and M. Slingerland. 2003. Comparative analysis of village chicken production in two farming system in Burkina Faso. *Tropical Animal Health and Production.* 35: 563-574.

Payne, W.S.A. 1990. An Introduction to Animal Husbandry in the Tropics.4th Edition. pp: 739-740.

Ravindran, V. and R. Blair. 1991. Feed resources for poultry production in Asia and the Pacific. 1. Energy Sources. *World's Poultry Science Journal.* 47: 213-231.

Saadany, R.M.A., Y.H. Roda, and F.M. Saadany. 1980. Studies on starch extraction from mango seed (*Mangifera indica*) as a new source of starch. *Starch/Starke.* 32: 113-116.

Sarfo, K.G. 2004. The Nutritive Value of Processed Mucuna Beans (*Mucuna pruriens var cochinchinnensis*) in Broiler Finisher Diets. B.Sc. Dissertation, University for Development Studies, Tamale.

SARI (Savannah Agricultural Research Institute). 2004. Meteorology Department. Council for Scientific and Industrial Research, Nyankpala, Tamale, Ghana.

Teguia, A. 1995. Substituting Mango Kernels (*Mangifera indica L.*) for maize in broiler diets. *Animal Feed Science Technology.*56: 155-158.

Ugherughe, P.O. and P.A. Ekedolun. 1986. Pasture and Range Potential of Borno State. *Annals of Borno.* 31: 179-192.