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PARTIAL REPLACEMENT OF MAIZE WITH PROCESSED FALSE YAM (*Icacina oliviformis*) SEED MEALS IN GUINEA FOWL DIETS

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Abstract

Two feeding trials involving young guinea fowls were conducted to determine the effects of processed false yam seed meals on their growth performance. Crushed seeds were divided into 2 lots. One lot was boiled for 2 h and labeled BFYSM, whereas the other lot was soaked for 12 days and labeled SFYSM. Both lots were washed with water after boiling or soaking, sun-dried for 8 days and ground into gritty meals. In Experiment 1, BFYSM was fed to 96 ten-week-old pearl guinea fowls; while in Experiment 2, SFYSM was given to 96 five-week-old pearl guinea fowls. In each Experiment, 4 dietary treatments containing the seed meal sample at 0, 5, 10 and 15% as partial substitute for maize were tested using a Completely Randomized Design. Each treatment was replicated thrice with each replicate comprising 8 unsexed birds. In both experiments, mean feed intakes were similar (P>0.05) for all treatments. Mean live weight gain tended (P>0.05) to decrease slightly as the level of each seed meal increased in the diets. Gain/feed ratios were not significantly (P>0.05) different among the treatments in both experiments. Total feed cost was (P>0.05) similar for all treatments in both experiments. It is concluded that the processed false yam seed meals had no adverse effects on growth performance of guinea fowls when incorporated in their diets up to 15% was cost-effective.

Keywords: False yam Soaking, Boiling, Guinea fowls

Introduction

Guinea fowl (*Numida meleagris*) is an important poultry specie in northern Ghana. Its production plays significant roles in the rural economy in terms of food security and income generation. As a result, there has been gradual shift from free-range or traditional management system to semi-intensive and intensive systems in order to increase productivity.

Intensive rearing requires proper feeding using complete/balanced diets. Maize (*Zea mays*) is the main cereal grain used as dietary source of energy and constitutes high proportion (e.g. 40-70%) in poultry diets. However, there occurs occasional scarcity of maize due to competition with humans; since it is a staple food commodity. The scarcity or hike in price of maize has negative impact on productivity and profitability of poultry. Attempts to address this feed situation include the use of non-conventional feed ingredients including false yam (*Icacina oliviformis*) tuber and seed. Both products are high in starch (Fay, 1991), thus can serve as alternative dietary source of energy for poultry if properly processed to ameliorate adverse effects of

anti-nutritional factors such as gum resins (Dei, Bacho, Adeti & Rose, 2011a; Dei, *et al*, 2011b).
Presently, there is limited information on its usefulness for local guinea fowls. Therefore, this study was undertaken to determine dietary effects of processed false yam seed (soaked or boiled) meals as partial substitutes for maize on growth performance of local guinea fowl; as well as to assess the economics of feeding the false yam seed meals to guinea fowls.

Materials and methods

Two experiments involving growing local guinea fowls were conducted at the Poultry Unit of the University for Development Studies, Nyankpala Campus, Tamale. Experiment 1 was conducted from 9 to 19 weeks of age, and that of Experiment 2 was from 5 to 15 weeks of age.

Preparation of false yam seed meals

The false yam fruits were obtained from the wild at environs of Nyankpala by hand picking. The fruits were sun-dried and then cracked with stone to remove the seeds which were also later crushed with a stone to increase the surface area for leaching. The crushed seeds were divided into two lots. One lot was boiled for 2 h (i.e. 1 part seed to 1 part water) and labeled BFYSM, whereas the other lot was soaked for 12 days (i.e.1 part seed to 2 parts water) and water changed every 3 days, and labeled SFYSM. Both lots were washed with water after boiling or soaking, sun-dried for 8 days and ground into gritty meals using a grinding mill.
The BFYSM contained on "as fed" basis 87.3% dry matter, 13.5% crude protein, 2.1% crude fibre, 52.0% starch and 3722 Kcal/kg gross energy, whereas the SFYSM contained 85.9% dry matter, 6.9% crude protein, 1.7% crude fibre, 65.6% starch and 3652 Kcal/kg gross energy (Dei, unpublished data).

Experimental birds and design

In Experiment 1, BFYSM was fed to 96 ten-week-old pearl guinea fowls; while in Experiment 2, SFYSM was given to 96 five-week-old pearl guinea fowls. The birds were obtained from a small-scale guinea fowl producer in Tamale.

In each Experiment, 4 dietary treatments (Tables 1 &2) containing the seed meal sample at 0, 5, 10 and 15% as partial substitute for maize were tested using a Completely Randomized Design. Each treatment was replicated thrice with each replicate comprising 8 unsexed guinea fowls. In Experiment 1, the mean initial live weight per bird per replicate was 340g; whereas in Experiment 2, mean initial live weight per bird per replicate was 110g.

Husbandry

In both Experiments, the birds were housed in deep litter pens (1m x 1m x 1m) with floor space of 0.15 m^2 per bird. Feed and water were given *ad libitum* and light was provided 24 h from 10 to 19 weeks of age.

Data collection and analysis

Feed intake was measured weekly by subtracting the left-over feed from the amount of feed provided. Live weight of birds in each replicate were measured weekly by weighing them using a digital electronic scale (Jadever JPS-1050). Live weight gain was determined by subtracting initial live weight from final live weight. Feed conversion ratio was defined as unit live weight gained per feed consumed. Final live weight was determined either at 15 or 19 weeks of age.
Feed cost per bird was obtained by multiplying the unit cost of feed by the total feed consumed per bird; while feed cost per kilogram live weight gain was computed as feed cost per bird divided by weight gained.
Data collected were analyzed for Analysis of Variance (ANOVA) using GenStat (8^{th} edition, Lawes Agricultural Trust, 2005).

Table 1: Composition (%) of Experiment 1 dietary treatments

Ingredients	Treatments			
	Control (0% BFYSM)	5% BFYSM	10% BFYSM	15% BFYSM
Maize	58	53	48	43
Boiled false yam seed meal (BFYSM)	0	5	10	15
Fishmeal	10	10	11	10
Soybean meal	15.5	15.2	17.3	17.4
Wheat bran	11.4	11	2.1	3.1
Palm oil	1.5	2.2	8	8
Oyster shell	3	3	3	3
Vitamin/Trace mineral premix[1]	3	3	3	3
Common salt	0.3	0.3	0.3	0.3
Calculated composition				
Crude protein (%)	19.8	19.8	20.2	20.0
Metabolisable energy (Kcal/kg)[2]	2,922	2,913	2,705	2,784

[1]Composition of vitamin/trace mineral premix per kg diet: vitamin A 8000 IU, vitamin D3 1500 IU, vitamin E 2.5 mg, vitamin K3 1.0 mg, vitamin B2 2.0 mg, vitamin B12 00.5 mg, Folic acid 0.5 mg, nicotinic acid 8.0 mg, Calcium pantholenate 2.0 mg, choline chloride 50 mg, magnesium 50 mg, Zinc 40 mg, copper 4.5 mg, Cobalt 0.1 mg, Iodine 1.0 mg and Selenium 0.1 mg. Antioxidant: Butylated hyroxytoluene (BHT) 1.0 mg. [2]Metabolizable energy content of 2,300 Kcal/kg DM of untreated false yam seed meal (Dei, unpublished data) was used for diet formulation.

Table 2: Composition (%) of the Experiment 2 dietary treatments

Ingredients	Treatments[1] (starter phase)				Treatments[2] (grower phase)			
	Control (0% SFYSM)	5% SFYSM	10% SFYSM	15% SFYSM	Control (0% SFYSM)	5% SFYSM	10% SFYSM	15% SFYSM
Maize	58	53	48	43	58	53	48	43
SFYSM	0	5	10	15	0	5	10	15
Fishmeal	10	10	12	11.8	10	10	11	10
Soybean meal	15.5	16.4	17.3	17.4	15.5	15.2	17.3	17.4
Wheat bran	12.9	11	1.1	2.2	11.4	11	2.1	3.1
Palm oil	0	1	8	7.1	1.5	2.2	8	8
Oyster shell	3	3	3	3	3	3	3	3
Premix[3]	0.3	0.3	0.3	0.3	3	3	3	3
Common salt	0.3	0.3	0.3	0.2	0.3	0.3	0.3	0.3
Calculated composition								
Crude protein (%)	20.0	20.0	20.0	20.0	19.8	19.8	20.2	20.0
ME (Kcal/kg)[4]	2819	2823	2705	2707	2922	2913	2705	2784

SFYSM-Soaked false yam seed meal, [1]Starter phase (5-8 weeks of age), [2]Grower phase (9-15 weeks of age), [3]Composition of vitamin/trace mineral premix per kg diet: vitamin A 8000 IU, vitamin D3 1500 IU, vitamin E 2.5 mg, vitamin K3 1.0 mg, vitamin B2 2.0 mg, vitamin B12 00.5 mg, Folic acid 0.5 mg, nicotinic acid 8.0 mg, Calcium pantholenate 2.0 mg, choline chloride 50 mg, magnesium 50 mg, Zinc 40 mg, copper

4.5 mg, Cobalt 0.1 mg, Iodine 1.0 mg and Selenium 0.1 mg. Antioxidant: Butylated hyroxytoluene (BHT) 1.0 mg. [4]Metabolizable energy content of 2,300 Kcal/kg DM of untreated false yam seed meal (Dei, unpublished data) was used for diet formulation.

Results and discussion

The results of the effects of processed false yam seed meals on growth performance of guinea fowls are shown in Tables 3 and4. In both experiments, mean feed intakes were similar (P>0.05) for all treatments. This is suggests a reduction in the concentration of the bitter compounds (mainly gum resins) in the seeds which made the products palatable. It is known that soaking seeds in water over time improves extraction of some anti-nutritional factors (Moneam, 1990). Both soaking and boiling of false yam seeds have been shown to increase feed consumption by broiler chickens (Dei *et al*., 2011b). Nutritionally, starch and crude protein contents of false yam seed and maize are similar (Fay, 1991; Dei *et al.*, 2011b). Thus the major nutritional concern in replacing maize with the seed meal would be its concentration of anti-nutritional factors such as gum resins (Fay, 1991).

The mean live weight gain tended (P>0.05) to decrease slightly as the level of each seed meal increased in the diets (Tables 3 &4). Gain/feed ratios were not significantly (P>0.05) different among the treatments in both experiments (Tables 3 &4). Although the seed meals had no significant adverse effects on growth of the birds, the observed numerical reduction in weight gains (Tables 3 &4) suggests there could be residual concentration of the anti-nutritional factors as has been noted in studies with broiler chickens (Dei *et al*, 2011b). However, the maximum dietary level (15%) of the seed meal utilized by the guinea fowls in this study is higher than the levels (5-10%) reported for broiler chickens (Dei *et al*, 2011b). Judging from the performance data, it appears the soaked seed meal should be preferred to the boiled seed meal.

In Experiment 1, mortality was generally low, but occurred more (P<0.05) in the groups fed the 10 and 15% BFYSM diets than the rest of the treatments (Table3). On the contrary, there was no significant (P>0.05) differences in mortalities recorded in Experiment 2, which were quite low (Table4). However, post-mortem examinations of all dead birds showed symptoms of coccidiosis. Previous studies involving broiler chickens did not show any ill-health associated with the seed meal (Dei *et al*., 2011b).

The total feed cost was relatively (P>0.05) similar for all treatments in both experiments (Tables 3&4). This was expected because of small disparities in the unit cost of maize and the processed seed meals, as well as amounts of feed consumed. Also, the protein quality of the false yam seed is poorer than that of maize because of its very low content of methionine (Dei, Wallah &Mohammed, 2012). Thus slightly more fishmeal and soybean meal (Tables 1&2) were added to the diets containing the seed meals. Besides, the metabolisable energy content of false yam seed is about 50% less than that of maize (Dei, unpublished data); hence palm oil was added to increase dietary energy. Nevertheless, the use of the processed seed meals appeared to be cost-effective and should be used as feed ingredients during periods of maize shortage in the market as their use in poultry diets could spare maize for human consumption. For instance, for every ten tonnes of poultry feed produced using the seed meal, one and half tonnes of maize would be spared for human use.

Table 3: Effect of boiled false yam seed meal on growth performance of guinea fowl (10-19 weeks of age)

Parameters	Control	5%BFYSM	10%BFYSM	15%BFYSM	SED	P. value
Feed intake (g/bird/day)	65.2	66.4	62.0	65.1	2.79	0.489
Weight gain (g/bird/day)	9.0	7.8	6.4	5.9	1.15	0.097
Gain/feed ratio	0.14	0.12	0.11	0.09	0.015	0.062
Final weight@ 19wk (g/bird)	910	830	740	690	80.0	0.102
Mortality (%)	0.33^{a}	1.00^{ab}	2.50^{b}	2.00^{b}	0.549	0.021
Total feed cost (GHS/bird)	3.74	3.77	4.06	4.10	10.173	0.151

Means bearing the same letter are not significantly different (P>0.05)

Table 4: Effect of soaked false yam seed meal on growth performance of local guinea fowl (5-15 weeks of age)

Parameters	Control	5%BFYSM	10%BFYSM	15%BFYSM	SED	P. value
Feed intake (g/bird/day)	44.8	41.6	40.2	39.2	4.52	0.642
Weight gain (g/bird/day)	8.7	8.3	8.3	6.3	0.99	0.155
Gain/feed ratio	0.19	0.20	0.21	0.16	0.022	0.171
Final weight@ 15wk (g/bird)	720	690	690	550	69.0	0.154
Mortality (%)	0.0	0.3	2.3	1.3	1.16	0.250
Total feed cost (GHS/bird)	2.85	2.61	2.93	2.74	0.325	0.785

Conclusion

Processing of false yam seed either by boiling or soaking improved its nutritional value and can be fed up to 15% in diets for growing guinea fowls without adverse effects on their growth performance. Also, the use of the processed seed meals was cost-effective.

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