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# Effect of Pito Mash (Sorghum Brewers Waste) on the Growth Performance of Local Guinea Fowl (Numidameleagris)

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**Abstract**
A 10 – week on farm feeding trial was conducted to determine the effect of dry 'pito' mash on the growth performance of local guinea fowl when incorporated in their diet at 0% and 20%. Two treatment diets were formulated, control and 'pito' mash diets. The dry 'pito' mash was used at 0% in the control and 20% inclusion level in the 'pito' mash diet respectively. Two groups of 50 birds each were randomly assigned to the two treatment diets with no replication in a two sample test design on the farm. Feed and water were provided *ad libitum* throughout the experiment. The experiment lasted for 10 weeks (9 – 20 weeks of age). Data collected were feed intake, weight gain, final live weight, mortality and feed cost. The data was analyzed by student t-test using Genstat. The feed intake, weight gain, final live weight, mortality and feed cost were not significantly ($P>0.05$) affected. It was concluded that 'pito' mash can be incorporated in guinea fowl diet at 20% with favourable effects on their growth performance. Cost of feed was also reduced by 13.8% when 'pito' mash was fed to the guinea fowls.
**Keywords**: Pito mash, sorghum brewers' spent grain, growth performance, local guinea fowl

## INTRODUCTION

Poultry are species of birds that render economic service to man and reproduce freely under his care (Kekeocha, 1984). It mainly includes chickens (*Gallus gallus*), turkey (*Meleagrisgallopavo*), geese (*Anser anser*), Muscovy ducks (*Canna moschata*), and guinea fowls (*Numidameleagris*) (Taylor and Field, 1998). It offers considerable potential for meeting human needs as dietary animal protein supply (Folorunsho and Onibi, 2005). According to Payne (1990), possibilities of improving the productivity of guinea fowl, both as a meat and as an egg producer, are considerable and are being actively pursued in Ghana at the present time.

Guinea fowls are indigenous to Africa. Two species have been domesticated which are *Numidameleagris* indigenous to West Africa and *N. ptilorhyncha* from East Africa (Mongin and Plouzeau, 1984). Keeping of local guinea fowl (*Numida meleagris*) proves to be profitable as well as important in ensuring food security in Sub-Saharan Africa (Bleich *et al*., 2005). Payne (1990) reported that the meat of the guinea fowl tastes like that of the pheasant and it is relished by most African people. Work on the nutritional value has revealed that the meat and eggs of guinea fowls are tastier than those of chickens (Ikani and Dafwang, 2004). Hence the production of local guinea fowl.

Ademola and Farinu (2006) stated that guinea fowl production faces many problems which in some cases deter many farmers in the business. The major problem is the high cost of feeding the birds, which affect productivity and profitability (Koney, 1993). This is because feed cost alone can be as high as 75% of the total cost of commercial poultry production (Gopalakrishnan and Lal, 1985). Maize is the most important grain used in poultry rations, sorghum grain (milo) rank second, and wheat ranks third (Blakely and Bade, 1994). The high cost of maize as a feed ingredient has been increasing due to high demand and occasional scarcity of this ingredient. This situation has led to increase in production cost and added pressure on poultry producers (Oluyemi *et al*., 2007). Therefore an alternative and cheap materials should be searched for and used as poultry feed (Aderimi and Tewe, 2001).

Due to high cost and scarcity of maize as feed ingredient, Oluyemi and Roberts (1988) recommended that there should be a shift to ingredient for which there is less competition such as agricultural by-products or non-conventional feed resources that can help if they are sufficiently available. Brewers' spent grain ('pito' mash) is a by-product obtained after the brewing of beer (pito). It has sorghum grain as its raw material. Dry 'pito' mash is moderate source of energy and contains about 20% crude protein (Uchebu, 1995).

However, preliminary studies involving broiler chicken have shown that sorghum brewery waste (dry pito mash) can be used as a feed ingredient in their diet up to 15% without adverse effect on their performance (Quaicoo, 2011).

Therefore this study was undertaken to evaluate the usefulness of dry 'pito' mash as a dietary feed ingredient for local guinea fowl.

 

## MATERIALS AND METHODS

### Location and duration of the experiment

The experiment was carried out on a local guinea fowl farmer's farm in the Tamale Metropolis. According to Survey Department Tamale (2005), Tamale Metropolis is the capital of Northern Region of Ghana and covers a land area of about 930 $km^2$. Tamale Metropolis holds a population of 300, 931. It is located $9^0$ $24^1$ north of the equator, $0^0$ $50^1$ west of the Green meridian, and 170m above sea level (Survey Department Tamale, 2005). The region is tropical with temperatures ranging from as low as $14^oC$ at night during the hamattan season to a high of $38^oC$ during the hot dry season (Meteorology Department Tamale, 2004). Tamale is characterized by a unimodal rainfall pattern (April to October) with a mean rainfall of 1560mm and a minimum of 670mm. The rains begin lightly in April and rise steadily to a peak in August and September and gradually decline by the end of October. The dry hamattan winds engulf the whole region between December and February (Meteorology Department Tamale, 2004). The experiment started on the 16th July, 2012 and ended on 24th September, 2012.

### Chemical composition of brewers' spent grain (BSG)

The chemical composition of BSG varies according to grain variety, harvest time, malting and mashing conditions, and the quality and type of adjuncts added in the brewing process (Huige, 1994; Santos *et al*., 2003). In general, BSG is rich in protein and dietary fibre, which account for around 20 % and 70 % of its composition, respectively (Inge, 2008). It is also rich in water soluble vitamins (Kaur and Saxena, 2004). The main components of the dietary fibre fraction are cellulose, lignin and hemicellulose. Besides dietary fibre and protein, lipid and ash are present in BSG (Table 1). This makes this by-product a good material for feeding monogastrics.

### Procurement and preparation of experimental diets

The sorghum brewers' spent grain ('pito' mash) was obtained from a local brewer at Nyankpala in the Northern Region in a dry form.Two dietary treatments were formulated manually, control and test diet (pito mash diet). The control diet contained 60% maize. The 'pito' mash diet was formulated to replace 20% of the diet as substitute for maize (Table 2).

### Source of birds and experimental design

The local guinea fowls for the experiment were acquired from the farmer at the age of 9 weeks. One hundred birds were selected and divided into two groups of 50 birds each and were randomly assigned to two treatment diets with no replication in a two sample test design on the farm.

### Management of experimental birds

The birds were housed under intensive system in deep litter pens with a dimension of 3.81m × 3.81m. Light was not provided in the pens at night. Feed and water were provided *ad libitum* throughout the experiment in feeders and drinkers on the farm. Clean fresh water was supplied every morning. Recommended preventive measures (Table 3) were employed in the experiment to help prevent the occurrence of diseases such as coccidiosis, worm infestation, respiratory and urinary infection, and stress in the birds.

### Growth performance parameters

Feed consumption of birds was measured on weekly basis. The live weight was determined by weighing the 50 birds in each pen as a single batch at the beginning of the experiment and subsequently at the end of every week in a wooden cage on electronic scale. The final live weights of the birds were also determined at the end of the experiment. The feed conversion efficiency was calculated as feed consumed to weight gain ratio. Mortality was recorded as they occurred in this experiment. The cost of feed was determined by multiplying unit price of each ingredient by the quantity used in the diet and total divided by 100kg for cost per kg feed.

### Statistical analysis

The data obtained were analyzed by student t-test using Genstat. This method was used because only two treatments were used.

## RESULTS AND DISCUSSION

### Growth Performance

Results of the effects of the control diet and the 'pito' mash diet on growth performance of local guinea fowl (9 – 20 weeks of age) are presented in Table 4.

### Feed Intake

There was no significant difference ($P>0.05$) in mean feed intake between the birds fed with the control diet and the pito mash diet (Table 5). However, it was seen that birds on the pito mash diet tended to consume slightly more feed than their counterpart on the control diet (Fig. 1). Weekly mean feed intake of the birds is shown in figure 1. Feed consumed on week 10 differed between the control birds and the pito mash birds with a difference of 77g. This could be due to the sudden feed change to the birds fed the pito mash diet, as pito mash is not a familiar feed ingredient to the birds. In week 11 and 12, it was observed that feed intake of the pito mash group was increasing with a difference between the two groups being 31g and 16g. This could be that the birds were now becoming used to the pito mash diet. There was a wide change in feed intake during week 13 and 14, with pito mash birds increasing (62g and 63g) more than the control. It may be due to the palatability of the pito mash

 

in their diet. During week 15 the increment of feed intake of the pito mash birds was more than expected. This was attributed to the fact that, there was a driven rain inside their pen which got some of their feed in the feeding troughs wet. The wet feed might have favored their feed intake. Feed intake of the pito mash birds fell below that of the control birds on week 17. It may be that the birds had a better taste for the wet feed which did not continue resulting in their decline in feed intake. On week 18 feed intake of both group of birds appeared to be similar and on the last 19 week the pito mash birds increased the intake of feed with a difference of 15g and 30g. This could be due to the fact that the pito mash birds were beginning to have the taste of the dry feed they knew from the start of the experiment.

**Weight Gain and Final Live Weight**

The weight gain and final live weight of the birds did not show any significant difference (P>0.05). It was almost the same in both control birds and their counterpart fed the pito mash diet (Table 5). However, the birds fed the test diet had a higher numerical weight gain than the control birds. It has been observed that inclusion level at 15% pito mash has favorable effect on weight gain, feed intake and carcass yield of broiler chicken without adverse effect (Quaicoo, 2011). Adama *et al.* (2007) also reported that, up to 20% inclusion level of sorghum dried brewer's grain (SDBG) in the diet of broiler had no significant effect on the digestibility of dry matter and various components in the diet because of it high nutrient content which can meet the energy requirement of broiler chicks, and therefore can replace conventional grains in situations of acute shortage.

**Gain/Feed**

The utilization of both diets showed no significant difference (P>0.05). The gain/feed was similar in both control and pito mash birds groups (Table 5). However, birds on the pito mash diet converted much of the feed to body weight gain than birds on the control diet.

**Mortality**

Mortality was recorded in both control and pito mash birds groups, but there was no significant difference (P>0.05) in death as shown in Table 5. Thirteen birds died in the course of the experiment. Their death was not attributed to any disease condition even though post mortem was not done.

**Feeding Cost**

All the parameters measured for economic benefits showed no significant difference (P>0.05). However, the pito mash containing diet was having slightly higher total feed intake and recording the least cost of feed per kilogram gain (Table 5).

The cost of feed was reduced in the pito mash diet by 13.8% from table 6. The pito mash was obtained at a cheaper cost and it was already processed. This resulted in the reduction in cost of feed with the pito mash. This corresponds to Quaicoo (2011) who reported that diet containing pito mash reduces cost of producing broiler chicken.

## CONCLUSION

The results of this study have indicated that, dry 'pito' mash can be incorporated in guinea fowl diet at 20% with favourable effects on their growth performance. Cost of feed can also be reduced by 13.8% when pito mash is fed to guinea fowl.

## RECOMMENDATION

Farmers into guinea fowl production should use pito mash in diet for guinea fowls.

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**Table 1: Chemical composition of brewers' spent grain (BSG) (% DM basis)**

| Components (% dry weight) | Mussatto and Roberto (2006) | Serena and Knudsen (2007) | Mussatto *et al*. (2008a) | Adeniran *et al*. (2008) | Khidzir *et al*. (2010) |
|---|---|---|---|---|---|
| Cellulose | 16.8 | 15 | 16.8 ± 0.8 | - | - |
| Hemicellulose | 28.4 | - | 28.4 ± 2.0 | - | - |
| Lignin | 27.8 | 13 | 27.8 ± 0.3 | - | - |
| Protein | 15.3 | 22 | - | 2.4 ± 0.2 | 6.4 ± 0.3 |
| Ashes | 4.6 | 5 | 4.6 ± 0.2 | 7.9 ± 0.1 | 2.3 ± 0.8 |
| Extractives | 5.8 | - | - | - | - |
| Others | - | - | 22.4 ± 1.2* | - | - |
| Carbohydrates | - | 53 | - | 79.9 ± 0.6 | - |
| Crude fibre | - | - | - | 3.3 ± 0.1 | - |
| Moisture content | - | - | - | 6.4 ± 0.2 | - |
| Lipid | - | - | - | - | 2.5 ± 0.1 |
| Acid detergent fibre | - | - | - | - | 23.3 |
| Total carbon (%) | - | - | - | - | 35.6 ± 0.3 |
| Total nitrogen (%) | - | - | - | - | 1.025 ± 0.05 |

*stands for the combination of proteins and extractives.

 

**Table 2: Percentage composition of experimental diets**

| Ingredients | Control Diet (%) | Pito Mash Diet (%) |
|---|---|---|
| Maize | 60.0 | 40.0 |
| Wheat bran | 16.0 | 16.0 |
| Pito Mash | 0.0 | 20.0 |
| Soyabean meal | 15.7 | 15.7 |
| Fish meal | 6.0 | 5.7 |
| Oyster shell | 1.8 | 1.8 |
| Vitamin / trace mineral premix * | 0.25 | 0.25 |
| Salt | 0.25 | 0.25 |
| Palm oil | 0.0 | 0.3 |
| Calculated Nutrient Analysis | | |
| Crude Protein (%) | 18.0 | 18.0 |
| Metabolizable Energy (MJ/Kg) | 12.3 | 12.3 |

*Composition of vitamin/trace mineral premix per kg diet: vitamin A=20000 IU, vitamin D=4000 IU, vitamin E=30 IU, vitamin B1=2mg, vitamin B2=9mg, vitamin B12=24mg, Niacin=50mg and Mineral Fe=90mg, Cu=5mg, Mn=120mg, Co=1mg, Zn=100mg, I=4mg, Se=0.4mg.

**Table 3: Health management schedule during the experiment.**

| Age (Days) | Medication |
|---|---|
| 70-73 | Antibiotic (CLORDATONA) |
| 74-75 | Vitamin (VMD Spervitamins) |
| 76 | Dewormer (Laprovet) |
| 77-84 | Vitamin (VMD Spervitamins) |
| 85-87 | Coccidiostat ( Amprocox) |
| 88-91 | Antibiotic (Aliseryl) |
| 92-98 | Vitamin (VMD Spervitamins) |
| 99-102 | Coccidiostat ( Amprocox) |
| 103-107 | Vitamin (Introvite A+) |
| 108-110 | Antibiotic (Aliseryl) |
| 117-120 | Coccidiostat ( Amprocox) |
| 121-125 | Vitamin (Introvite A+) |
| 132-133 | Coccidiostat ( Amprocox) |

**Table 4: Effect of control diet and pito mash diet on feed intake, weight gain, gain/feed, final live weight and mortality of guinea fowl (9 – 20 weeks of age).**

| Parameter | Control (mean ± s.d) | Pito mash (mean ± s.d) | Probabilty |
|---|---|---|---|
| Feed intake (g/bird/day) | 53.11 ± 2.78 | 56.73 ± 7.21 | 0.385 |
| Weight gain (g/bird/day) | 5.86 ± 2.49 | 5.71 ± 0.82 | 0.916 |
| Gain/feed (g/g) | 0.11 ± 0.04 | 0.10 ± 0.01 | 0.673 |
| Final live weight (g/bird/day) | 1.01 ± 00 | 1.08 ± 00 | - |
| Mortality (%) | 1.50 ± 1.29 | 1.75 ± 0.96 | 0.766 |

s.d-standard deviation

**Table 5: Effect of control diet and pito mash diet on feed cost per kilogram diet, total feed intake, total feed cost and feed cost per kilogram gain of local guinea fowl (9 – 20 weeks of age).**

| Parameter | Control (mean ± s.d) | Pito mash (mean ± s.d) | Probability |
|---|---|---|---|
| Feed cost/kg diet (GH¢) | 0.82 ± 00 | 0.73 ± 00 | - |
| Total feed intake (kg/bird) | 4.02 ± 0.27 | 4.16 ± 0.54 | 0.66 |
| Total feed cost (GH¢/bird) | 3.29 ± 0.22 | 3.03 ± 0.39 | 0.294 |
| Feed cost/kg gain (GH¢) | 3.26 ± 0.22 | 2.81 ± 0.36 | 0.076 |

s.d-standard deviation

 

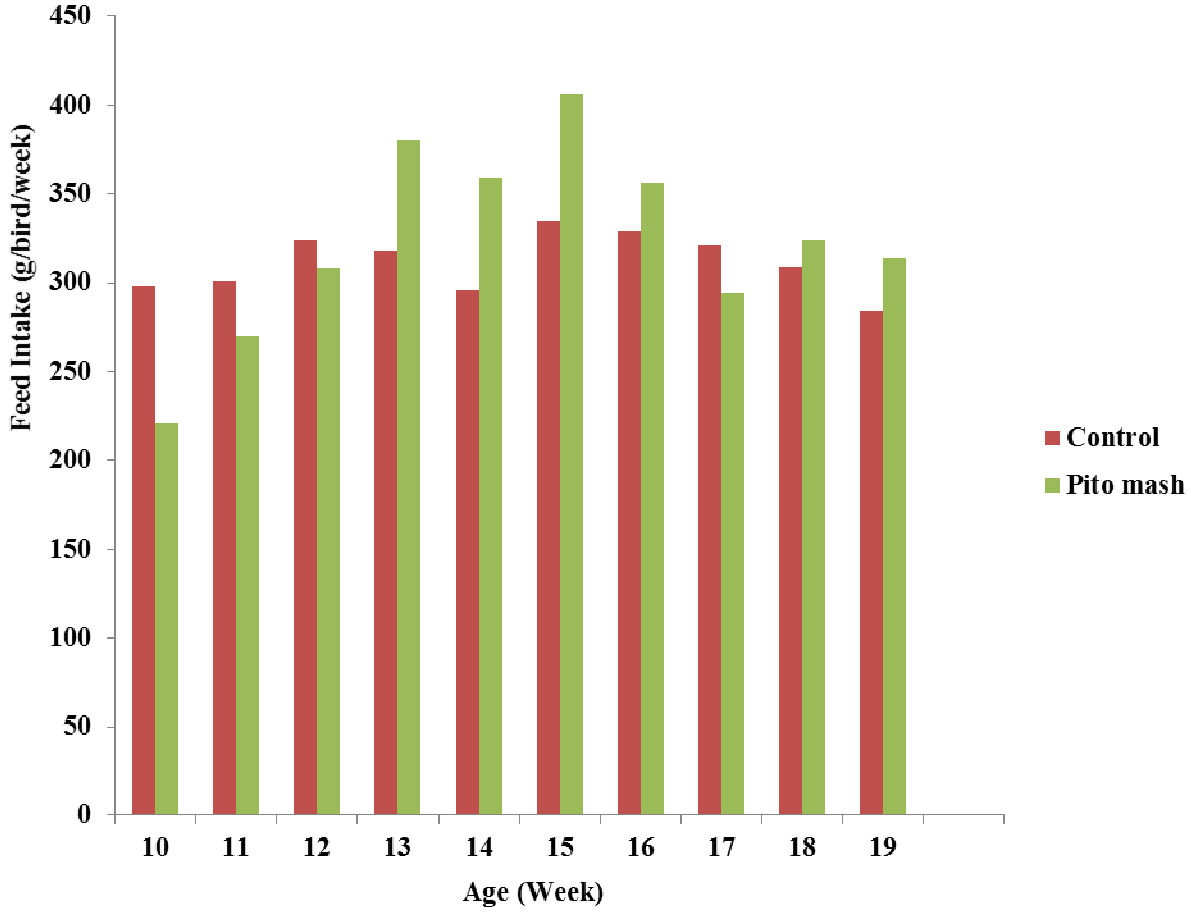


**Figure 1: Effect of control diet and pito mash diet on mean feed intake of guinea fowl (9 – 20 weeks of age).**

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