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STUDIES ON PERFORMANCE OF BROILER CHICKENS FED OIL PALM SLURRY

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ABSTRACT

A ten-week feeding trial was conducted using 72 Cobb commercial broiler chickens to study the inclusion of oil palm slurry (OPS) in broiler diets. The 1-day-old chickens were randomly allocated in groups of 24 birds to each of the three dietary treatments. The chickens were given conventional feed containing 75 and 150 g kg^{-1} levels of OPS. The control diet did not contain OPS. Feed and water were supplied *ad libitum*. Broilers fed on diets with 75 g kg^{-1} OPS inclusion recorded the highest feed intake, body weight gain, feed conversion efficiency and dressing percentage. The abdominal fat content of carcass showed a significant ($P<0.05$) difference among the treatment means. The control group had the highest proportion of lean meat and therefore recorded the best carcass quality. This was followed by birds fed on diet with 75 g kg^{-1} OPS inclusion. Birds fed on diet with 150 g kg^{-1} OPS inclusion recorded the highest abdominal fat content and hence the poorest carcass quality. Therefore, the inclusion of 75 g kg^{-1} OPS in the diet of broiler chickens from 1-day-old to finishing could minimize the high cost of feeding broilers.

KEYWORDS: Oil palm slurry, broiler chickens, growth performance.

INTRODUCTION

The incidence of animal protein malnutrition is unacceptably high in most developing countries south of the Sahara, and Ghana in particular. The level of animal protein intake is very low. Protein malnutrition among women and children is a serious problem in the rural areas of Ghana. According to Nutrition Facts for Ghanaian Families (2003), about 2 out of every 10 babies born have a low birth weight, about 3 out of every 10 young children are malnourished, nearly 2 out of every 10 babies born die before their fifth birth-day and about 4 out of every 10 school age children are stunted, thin, learn slowly, often tired, ill and anaemic. Some young children even develop 'kwashiorkor' and in extreme cases die. In many communities men get the biggest share of fish, poultry and meat. These problems have arisen because our level of animal protein intake is very low as compared to the developed countries. Poultry production provides a means by which rapid transformation in animal protein consumption can be achieved in developing countries. This has necessitated the increasing number of poultry farms in many developing countries and Ghana in particular.

Feed costs constitute about 60-65 percent of the total poultry production cost in Ghana (Koney, 1993). In spite of the foregoing, there has not been any appreciable increase in the prices of poultry products resulting in reduced profit margin. There is the need to search for cheaper and good quality feed ingredients that will make poultry production cost effective and help farmers to maximize profit.

According to Church (1991), energy is the most important item in the diet of animals, and all feeding standards and ration formulations. Kesse (1988) reported that the commonest energy yielding feed ingredient available to poultry farmers in Ghana is maize. However, the great competition between man and poultry birds for maize usually results in acute shortage and high cost of the energy yielding feed ingredient.

In the search for substitutes for the maize portion of poultry diets, various agricultural wastes such as oil palm slurry, the residue obtained after extraction of palm oil has to be investigated. Webb *et al.* (1977) reported that the utilization of oil palm slurry as an animal feed ingredient would minimize its pollution problem as well as supply cheap energy animal feed. Atuahene *et al.* (1986) performed feeding trials with oil palm slurry on seven-day-old broilers. They reported a significant increase in the performance of the birds in terms of feed conversion efficiency and weight gain.

This study was undertaken to investigate the optimum level of oil palm slurry that can substitute maize in the diet of broiler chickens from one-day-old to finishing.

MATERIALS AND METHODS

The feeding trial was conducted with seventy two 1-day-old unsexed Cobb commercial broiler chicks at the poultry section of the experimental farm of the University of Education, Winneba, Mampong-Ashanti, Ghana. Three groups of 24 each of the 1-day-old Cobb broiler chicks from Darko Farms Company Limited in Kumasi were fed three different dietary rations for ten weeks using a completely randomised design with four replicates. Each replicate had 6 birds. The maize component of the ration was partially substituted by 75 and 150 g kg^{-1} oil palm slurry meal. The control diet did not contain oil palm slurry. The composition of the rations and the calculated analysis are shown in Table 1. The 1-day-old-chicks of each unit were weighed and their initial weights recorded. Each chick was given equal amount of glucose solution for energy. The chicks were then given their experimental diets that had been previously formulated. The chicks of each unit were weighed at weekly intervals when other measurements such as mean feed intake, mean body weight gain, mean feed conversion efficiency per bird, and mortality rate per treatment were also recorded.

At the end of the trial, three birds were randomly selected per treatment replicate and their live weights recorded. They were then slaughtered, de-feathered and eviscerated. The viscera or large internal organs of the body such as the heart, lungs, liver and intestines, and also the head and feet were removed. The carcass weights were then recorded.

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The feed conversion efficiency (FCE) was calculated by dividing feed intake by live weight gain. The live weights and the carcass weights were used to compute the dressing percentage for the various treatments. The dressing percentage was defined as the ratio of eviscerated weight to live weight multiplied by 100. The abdominal fat content was determined by removing the quantity of fat deposited mainly in the lower abdominal region after recording the dressing percentage.

The analysis of variance (ANOVA) was used in data analyses. Tukey post-hoc test was used to determine the significant differences among treatment means. All statistical analyses were conducted using Minitab for Windows (version 14), Minitab Inc., State College, PA, USA; Ryan *et al.* (1985).

RESULTS

Feed intake

There was a significant ($P<0.05$) difference among the treatment means (Table2). Broilers fed on 75 g kg^{-1} level of oil palm slurry substitution for maize recorded the highest mean weekly feed intake (6.90 kg). This was followed by birds that were fed on the control diet (6.83 kg) and lastly those that were fed on 150 g kg^{-1} oil palm slurry substitution for maize (6.52 kg).

Table 1: Composition of experimental diets, g kg^{-1} diet

	Dietary Treatment, g kg^{-1} diet		
Item	0	75	150
Ingredient			
Oil palm slurry	0	75	150
Maize	600	525	450
Wheat bran	150	150	160
Fish meal	220	220	210
Oyster shell	10	10	10
Salt	5	5	5
Palm oil	10	10	10
Vitamin-mineral premix	5	5	5
Total	1000	1000	1000
Calculated analysis			
Crude protein (g/kg)	201.2	199.1	191.7
Crude fibre (g/kg)	26.9	30.6	32.2
Ether extract (g/kg)	49.2	84.7	121.3
ME, MJ kg^{-1}	12.6	12.7	12.8

Body weight gain

There was a significant difference ($P<0.05$) between the mean body weight gain of the different treatment groups (Table 2). Body weight gain of the birds fed on 75 g kg^{-1} percent oil palm slurry was 8.3 percent greater than those fed without the oil palm slurry. However, doubling the rate of the oil palm slurry reduced the mean gain in body weight by 12.5 and 5.2 percent compared to the lower rate and the control, respectively. During the first week of the experiment, the mean body weight gain per bird was higher in treatments one and two and intermediate for treatment three. But from the third week until the termination of the experiment, birds in treatment two recorded the highest body weight gain per bird per week as compared to birds in treatments two and three. Over all, there was progressive increase in body weight gain for birds in all the three different dietary treatments until the end of the eighth week. However, the ninth and tenth weeks each recorded reduction in mean body weight gain per bird

Table 2: Effect of oil palm slurry on the performance of broiler chickens

Parameter	Dietary treatment, g OPS kg^{-1} diet 0	75	150	SEM
Initial body weight, kg	0. 48	0.48	0.48	-
Final body weight, kg	2.89^b	3.09^a	2.77^c	5.19
Body weight gain, kg	2.41^b	2.61^a	2.29^c	4.74
Feed intake, kg	6.83^b	6.90^a	6.52^c	2.67
FEC, kg feed/BWG	$2 83^a$	2.64^b	2.85^a	0.04
Abdominal fat, %LBW	$1 03^c$	1.85^b	3.14^a	0.09
Dressing percentage	70.49^a	70.71^a	66.83^b	2.02

a,b,c,d different at P<0.05

Feed Conversion Efficiency

Birds in treatment two which were fed on 75 g kg^{-1} oil palm slurry recorded the best mean feed conversion efficiency of 2.64 while those in the control group and those fed on 150 g kg^{-1} oil palm slurry recorded poorer values of 2.83 and 2.85, respectively (Table 2). The feed conversion efficiency of group two birds was significantly (P<0.05) higher than that of the control group and those in treatment three.

Mean Dressing Percentage

The mean dressing percentage per bird was the same for the control and the birds fed 75 g kg^{-1} oil palm slurry substitution for maize but these were greater than when the slurry was doubled. The control birds and those fed on 75 g kg^{-1} oil palm slurry were significantly different (P<0.05) from those fed on 150 g kg^{-1} oil palm slurry.

Abdominal fat content

There was a significant dietary treatment effect when abdominal fat was expressed as percentage of the live body weight (%LBW) of broilers in each group (Table 2). The abdominal fat content of the birds fed on 150 g kg^{-1} oil palm slurry substitution for maize was significantly (P<0.01) higher than that of birds in treatment one and two. Again, the abdominal fat content of the birds fed on 75 g kg^{-1} oil palm slurry was significantly (P<0.05) higher than that of birds fed the control diet. The results indicate that broilers fed the control diet had the highest proportion of lean meat and therefore recorded the best carcass quality. This was followed by those fed on 75 g kg^{-1} oil palm slurry. Broilers that were fed on 150 g kg^{-1} oil palm slurry recorded the lowest carcass quality.

Mortality

Throughout the ten-week experimental period, only two birds died (one each from treatments one and three). All the birds in treatment two survived the experiment. This shows that mortality was on the low side.

DISCUSSION

During the first week of the feeding trial, the feed consumption of broiler chicks fed each of the three different dietary treatments was quite low. It may be due to the fact that the birds were very young and not well acclimatized to the environmental conditions in the brooder house. Again, they were also not familiar with the feed. But from the second week until the end of the experiment, there was progressive increase in feed intake in all the three different dietary treatments. It may be explained by the fact that as the birds were growing, they became familiar with the feed and also became well adapted to the environmental conditions. Feed intake was significantly affected by the inclusion of oil palm slurry in the diets. In the present study, feed intake decreased with increasing level of oil palm slurry inclusion in the diet at 150 g kg^{-1}. This finding is contrary to earlier observations made by Atuahene *et al.* (1986) when they fed 7-days-old broiler chickens with diets containing 50, 100 and 150 g kg^{-1} oil palm slurry, respectively. They reported of improved feed intake with increasing levels of oil palm slurry. They however recorded peak feed intake at 100 g kg^{-1} level of oil palm slurry inclusion in broiler diets as opposed to 75 g kg^{-1} level of oil palm slurry inclusion in broiler diets in the present study. This discrepancy may be due to the age difference at the start of the trial. At the end of the feeding trial, the broilers fed on 75 g kg^{-1} oil palm slurry meal recorded the highest mean feed intake. This is probably associated with the high ether extract content of oil palm slurry that might have produced a satisfactory flavour that increased the palatability of the feed and stimulated the appetite of the birds to consume more feed. Broilers in the control group recorded the second highest mean feed intake. It may be attributed to the fact that they were used to the conventional feed given them. Birds fed on150 g kg^{-1} oil palm slurry recorded the lowest feed intake. The reason could be due to the high energy content of 150 g kg^{-1} ration. Birds consume less feed when the energy content is high (Table 1). The very high fibre content of the oil palm slurry might have accounted for this observation. Also the birds were at times seen with thick coating of feed hardened to their beaks and this constituted feed wastage.

From the first week of the experiment, the body weight gain per bird was quite low. But from the second week onwards, there was an increase in feed intake with a corresponding increase in body weight gain until the end of the eighth week. Even though the mean weekly feed intake continued to increase until the termination of the experiment, there was a decline in the weight gain during the ninth and tenth weeks. This may be attributed to the fact that as broilers attain their maximum body weight gain increase in feed intake does not lead to any corresponding body weight gain. This finding is consistent with the findings of Kesse (1988), who noted that the eighth and ninth weeks are the best ages at which broilers can be disposed off with the highest economic gains. In this trial, broilers fed on 75 g kg^{-1} oil palm slurry recorded the highest mean weekly body weight gain. They were followed by birds fed the control diet and lastly those fed on 150 g kg^{-1} oil palm slurry meal. As the level of oil palm slurry in the diet increased, the ether extract fraction of the diet also increased. This might have resulted in marked improvements in the feed conversion efficiency because both the feed intake and body weight gain of the birds increased in response to higher energy

contents of the diets. In real life situation, the energy to protein ratio of broiler diets is very critical since the optimum performance of the birds depends largely on the provision of a satisfactory energy to protein ratio. During the ninth and tenth weeks, the birds were already matured so the increase in feed intake did not result in any significant improvements in body weight gain. As a result, the feed conversion efficiency also reduced drastically. It was therefore not economical to keep the broilers after the ninth and tenth weeks so the trial was terminated.

The partial substitution of maize with oil palm slurry affected dressing percentage. To determine the accurate dressing percentage, the birds were starved 24 hours before slaughtering. The weight of abdominal fat increased in proportion to the level of oil palm slurry in the diets for the birds. Since excess dietary energy is stored as fat in the body, increasing the levels of fat as a result of increasing the oil palm slurry levels in the diet meant more extra energy available for storage as fat. This might be the reason why birds fed on 150 g kg^{-1} oil palm slurry recorded the highest fat fraction, followed by the group that were fed on 75 g kg^{-1} oil palm slurry and lastly the group fed control diet (Table 2).

The low mortality rate recorded throughout the feeding trial indicates that the maize content of broiler diet can be reduced without any adverse effects on the performance of broilers from one-day-old to finishing if oil palm slurry is used. This will promote increased broiler productivity to help solve problems of protein malnutrition in developing countries in Africa south of the Sahara, and Ghana in particular.

The conclusions of this study are that firstly, substituting maize by 75 g kg^{-1} oil palm slurry can be fed to broilers from one-day-old to finishing. This is because the inclusion of this amount of oil palm slurry in the diet led to a progressive increase in growth rate, a better feed conversion efficiency, a better carcass quality and a higher dressing percentage, and secondly, that the maize content of the diet can be reduced without any adverse effect on the growth performance of broiler starters when oil palm slurry is used. However, due to the high moisture and ether extract contents, oil palm slurry containing diets have to be compounded at frequent intervals to offset problems of rancidity and mould growth.

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