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EFFECTS OF SWEET POTATO LEAF MEAL ON THE GROWTH PERFORMANCE AND CARCASS CHARACTERISTICS OF BROILER CHICKENS

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ABSTRACT

A five-week feeding trial was conducted using 180 Cobb commercial broiler chickens to study the nutritive value of sweet potato leaf meal (SPLM) in broiler diets. The 21-day-old broiler chickens were randomly allocated in groups of 45 birds to each of the four dietary treatments. One hundred, 200 and 300 g kg^{-1} levels of SPLM were included in a nutritionally balanced diet. The control diet did not contain SPLM. Feed and water was supplied *ad libitum*. Feed intake and body weight gains were significantly ($P< 0.05$) depressed by the addition of 10 %, 20 % and 30 % SPLM to broiler diets. The addition of 20 % and 30 % SPLM to the diets resulted in a significant ($P<0.05$) reduction in feed conversion efficiency (FCE). The carcass quality was significantly ($P<0.05$) improved due to a significant ($P<0.05$) reduction of abdominal fat in SPLM-fed birds. Dietary treatment had no impact on carcass dressing percentage. No deaths were recorded throughout the study. As the level of dietary SPLM increased, there was a corresponding increase in the intensity of yellow pigmentation of the skin, shanks and feet, and beaks of birds. The optimum level of inclusion of SPLM in the diet of broiler chickens was considered to be 10 % (100 g kg^{-1}). SPLM may be a good remedy for fatty broiler chickens.

KEY WORDS: Sweet potato leaf meal, nutritive value, broilers, 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 as compared to the developed countries. Protein malnutrition is a serious problem in the rural areas of Ghana. Poultry production provides a means by which rapid transformation in animal protein consumption can be achieved in Ghana. This has necessitated the increasing number of both small and large scale poultry farms in Ghana. However, one of the main obstacles to poultry production in Ghana is the high cost of feed, especially, maize and fish meal.

Feed cost is the largest component of total production costs of poultry production. Feed cost constitute about 60-65 percent of the total poultry production cost in Ghana (Koney, 1993). Expensive high carbohydrate feed resources such as maize is always used in poultry diets. According to Church (1991), energy is the most important item in the diet of animals, and all feeding standards and ration formulations. The commonest energy yielding feed ingredient available to poultry farmers in Ghana is maize (Kesse, 1988) However, the great competition between humans and poultry birds for maize usually results in acute shortage and high cost of the energy yielding feed ingredient If maize can be replaced by cheap local feeds, then, the cost of production can be reduced. In the search for substitutes for the maize portion of poultry diets, sweet potato leaf meal (SPLM) was investigated (Tewe, 1986; Teguia *et al* 1997)

The sweet potato (*Ipomoea batatas*) is a very important tropical plant whose tubers are widely grown for human consumption and as a commercial source of fresh starch (McDonald *et al*. 2002) This tuberous crop is a popular food in Ghana and many other African countries. Sweet potatoes are a staple in many of these countries and have been cultivated since time immemorial. Fresh tubers, surplus of requirement, are often cut into pieces, sun-dried and then ground to produce a sweet potato meal, a high-energy food of low protein content that is fed to farm animals (McDonald *et al*. 2002). Sun-drying does not destroy the trypsin inhibitors believed to be present in the in the tubers, and levels in the diets of animals are usually restricted. Although sweet potato serves as a fodder plant, much work has not been done to ascertain the nutritive value of its leaves. Published data show that the leaves of sweet potato contain high levels of high quality protein (Tewe, 1986; Teguia *et al*. 1997), calcium, several mineral elements and vitamins (Tweneboa, 2001). Teguia *et al*. (1997) fed diets containing 200, and 300 g SPLM kg^{-1} diet to broiler finishers and reported that the weight gain by birds on the 200 g SPLM kg^{-1} diet was similar to that of the control diet. However, at 300 g SPLM kg^{-1} diet, feed intake, growth rate and feed conversion efficiency were significantly depressed.

In the present study, we sought to examine the effect of sun-dried sweet potato leaf meal on broiler performance and carcass characteristics

MATERIALS AND METHODS

The sweet potato leaves used in the trial were harvested fresh from a small sweet potato farm that was established near the animal farm of the University of Education, Winneba, Mampong campus for this experiment The leaves were mixed together and sun-dried on a concrete drying surface for 4 days The dried leaves were ground in a maize mill to produce SPLM Representative samples were subjected to proximate analysis

One hundred and eighty unsexed Cobb commercial broiler chickens aged 21 days were initially weighed in groups to obtain the mean weight for the birds They were then individually weighed and allocated in groups of 45 birds to four experimental groups (0, 100, 200 and 300 g kg^{-1} SPLM) such that the group of birds were equalized for sex and weight The trial was conducted using completely randomised design.

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

Item	0	100	200	300
Ingredient				
Sweet potato leaf meal	0	100	200	300
Maize meal	580	510	460	400
Wheat bran	130	120	80	60
Fish meal	110	100	90	90
Soya bean	80	80	70	60
Groundnut cake	70	60	70	60
Oyster shell	10	10	10	10
Dicalcium phosphate	10	10	10	10
Vitamin premix	5	5	5	5
Salt	5	5	5	5
Total	1000	1000	1000	1000
Calculated analysis				
Crude protein	20.54	20.53	20.56	20.50
Crude fibre	30.25	40.57	50.15	50.27
Ether extract	30.97	30.86	30.82	30.72
ME (MJ kg^{-1})	11.14	11.06	10.97	10.84

Each dietary treatment was replicated three times and each replicate had 15 birds. The composition of the rations and calculated analysis are shown in Table 1. The experimental house was divided into 12 compartments using wire mesh as partitions. Each group of 15 birds were housed in a compartment measuring 3.4 × 1.16 × 2.20 m. Feed and water were supplied *ad libitum*. The trial lasted 5 weeks.

The feed intake and live weight gain were measured and feed conversion efficiency (FCE) calculated. On the final day of the trial, 5 broilers were selected randomly from each treatment replicate and slaughtered for carcass analysis.

The analysis of variance (ANOVA) was used in data analysis and significant differences among treatment means were estimated using Tukey post-hoc test. All statistical analyses were conducted using Minitab for Windows (version 14), Minitab Inc., State College, PA, USA; Ryan *et al.*, 1985). Statistical significance was determined at $P<0.05$.

RESULTS AND DISCUSSION

The results of proximate analysis of SPLM used for this study are as shown in Table 2. The figures for crude fibre, ether extract and ash contents in our experiment are comparable with those reported by Tewe (1994) and Teguia *et al.* (1997), except that our crude protein and dry matter contents were quite high. Sweet potato like any other fodder plant and its own varieties may either differ or look alike in their biochemical composition due to factors such as water supply, soil composition, climatic factors, manure, season, stage of growth, frequency of cutting and strain (Ranjhan, 1994; McDonald *et al.*, 2002). Therefore, the slight differences in nutrient status of our SPLM as compared to that of published data might be partly due to differences in plant maturity, site, climate and genotype.

Table 2: Proximate analysis of sweet potato leaf meal

Sample	Percentage composition
Crude protein	17.27
Crude fibre	19.05
Ether extract	3.06
Ash	12.06
Nitrogen free extract	47.47
Dry matter	89.15
Calcium	3.93
Phosphorus	1.70
Moisture	10.85

The effects of SPLM on broiler performance are summarized in Table 3. Feed intake, body weight gains and FCE significantly ($P<0.05$) decreased as the level of SPLM increased. A major factor affecting feed intake in poultry is the dietary energy content (Osei *et al.*, 1990; Church, 1991) because birds eat to satisfy their energy requirements. In this trial however, feed intake decreased with a slight decrease in dietary energy content. Therefore, it appears that the reduced feed intake and FCE were due to the increasing fibre content of the diets incorporating SPLM. According to Tewe (1986), sun-dried sweet potato leaf meal may contain trypsin inhibitor which can adversely affect digestion of the protein fraction of the feed and thereby reduce feed intake and growth performance of broilers. This may be the reason why levels of sweet potato meal in the diets of farm animals are usually restricted (McDonald *et al.*, 2002). There was significant ($P<0.05$) dietary treatment effect on gizzard and liver weights when they were expressed as percentage of the live body weight (%LBW) of broiler chickens in each dietary group (Table 3). There was a corresponding increase in the gizzard weights of broilers fed diets with 10 % and 20 % SPLM. However, the gizzard weight of the birds fed 30 % SPLM was comparable to that of birds fed 10 % SPLM. The increase in weight of the gizzard may be due to the effect of anti-nutritional factors in the diets incorporating SPLM. There was a corresponding decrease in the liver weights of broiler chickens fed diets with SPLM.

Table 3: Effect of sweet potato leaf meal on the performance of broiler chickens

	Dietary treatments, g SPLM kg^{-1} diet				
Parameter	0	100	200	300	SEM
Initial body weight, kg	0.47	0.47	0.47	0.47	-
Final body weight, kg	2.47^{a}	1.90^{b}	1.09^{c}	0.76^{d}	0.39
Body weight gain, kg	2.00^{a}	1.43^{b}	0.62^{c}	0.29^{d}	0.58
Feed intake, kg	4.43^{a}	3.96^{b}	2.79^{c}	2.24^{d}	7.49
FCE, kg feed/kg BWG	2.22^{a}	2.77^{a}	4.50^{b}	7.72^{c}	1.26
Dressing percentage	79.68^{a}	77.34^{a}	77.39^{a}	76.00^{a}	1.76
Abdominal fat, %LBW	2.10^{a}	1.21^{b}	0.83^{c}	0.59^{d}	0.13
Liver weight, %LBW	2.02^{a}	1.58^{b}	1.37^{c}	1.37^{c}	1.15
Gizzard weight, %LBW	2.02^{c}	2.58^{b}	2.75^{a}	2.63^{b}	0.22
Mortality	-	-	-	-	-

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

This is probably due to the presence of anti-nutritional factors in the SPLM that adversely affected the proper growth and development of the liver. The liver is very important for processing feed and to aid absorption of nutrients from the gut. Therefore, the decrease in liver weights with increasing levels of SPLM in the diets might have adversely affected the processing of feed by the liver and its absorption from the gut. This might have affected the efficiency of feed utilization and hence resulted in the poor FCE which ultimately resulted in poor growth performance of birds fed diets incorporating 20 % and 30 % SPLM.

There were no deaths or health related problems recorded during the study. This indicates that SPLM up to 30 % level of inclusion had no effect on the survival of broiler chickens. This observation disagree with the report made by Tewe (1986) that the dustiness and high soluble sugar content of SPLM causes respiratory disturbances and gastrointestinal disorders in poultry and increases mortality. Again, this observation is also contrary to the assertion made by Moi and Chi (1992) that the poor performance of SPLM-fed broilers is mainly due to microbial growth on sun-dried sweet potato leaves which are used in formulating SPLM.

The intensity of yellow pigmentation of the shanks and feet, beaks and skins of broiler birds increased with increased levels of SPLM in the diets from almost pale white in the control group to very deep yellow in treatment four (30 % SPLM). This is because the leaves of sweet potato contain oxy-carotenoids which are pigments responsible for producing yellowish colouration on the shanks and feet, beaks and skin of poultry that feed on them (Nelson, 1995).

The carcass quality was significantly ($P<0.05$) improved due to a significant ($P<0.05$) reduction of abdominal fat in SPLM-fed birds. Abdominal fat content of the carcass decreased markedly with increased levels of SPLM. The fat content of the control birds was significantly ($P<0.05$) higher than that of birds fed on test diets. As a result, treatment four (30 % SPLM) had the best carcass quality followed by treatments three and two with the control birds showing the poorest carcass quality.

Dietary treatment had no impact on carcass dressing percentage. The carcass dressing percentage of the control birds was comparable with that of birds fed the test diets. This shows that SPLM up to 30 % had no effect on the carcass dressing percentage.

The results of this study appear to indicate that sun-dried sweet potato leaves could be incorporation into broiler diets up to 10 %. SPLM may be a good remedy for fatty broiler chickens.

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