Cassava Root Meal as an Alternative Source of Energy to Grain Sorghum in Broiler Feeding

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SUMMARY

Cassava root meal when used to replace 0, 25, 50 and 75% of the energy supplied by grain sorghum for broilers, depressed growth rate and feed conversion efficiency, but the depression was only significant ($P < 0.05$) at the highest level of cassava. A significant ($P < 0.05$) reduction in eviscerated carcass weight, dressing percentage and increase in viscera weight, particularly that of liver and abdominal fat and chemically extracted muscle fat and ash were recorded when cassava supplied 75% of sorghum grain on energy basis .

INTRODUCTION

In many tropical countries cereals are the staple food and their production is inadequate to meet the rising human demand. Poultry compete with human beings for cereal grains, which limit Poultry production in those regions. Cassava is envisaged as an alternative source of energy for poultry. Incorporation of 10% and 20% of cassava meal

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in poultry diets depressed growth (Muller et al., 1974., Vogt, 1966). This was attributed to the presence of cyanogenic glucosides, the powdery characteristic of cassava roots, the high ash contents of the roots and the low concentration of protein and essential amino acids such, as methionine, cystine and tryptophan in cassava roots. Gomez et al. (1983) found that addition of 10% or 20% cassava meal to a commercial broiler diet produced similar performance as the control commercial diet. Enriques and Ross (1967) and Hutagalung (1977) have shown that 45 - 50% of cassava may be used satisfactorily in chick diets when supplemented with methionine. Pelleted broiler diets containing up to 58% cassava promoted growth rates and food efficiency simslar to those obtained with maize based diets, but performance was poorer with cassava based diets offered in mash form (Chou and Muller, 1972, Hutagalung et al., 1973). Dried cassava root meal was found to replace the main cereal source of broiler diets up to 50% without affecting body weight and food intake, the carcass and the abdominal fat weights as well as the chemical composition of the carcass were also unaffected (Stevenson and Jackson, 1983). Recently, Gomez et al., (1987) fed broilers diets containing 0,20 or 30% cassava root meal with or without animal fat or vegetable oil to provide 5% of the dietary metabolizable energy and found that growth rate was not affected. Body weight gain, feed consumption and feed efficiency were not affected by any of the dietary treatments during the finishing period (28 to 56 days).

In this study cassava root meal was incorporated in broiler diet as a replacement of 0, 25, 50 or 75% of grain sorghum energy. Chick performance, carcass yield and meat chemical compsition were evaluated .

Material and Methods:

Two * hundred - and - forty one - day - old chicks (Lohmann) were used . Chicks were fed on a mixture of equal proportion of the four experimentral diets for one week. Thereafter hundred - and - sixty - eight chicks were selected and distributed into 24 pens each containing an equal weight and number. The pens were then randomly allocated to four exerimental diets. Diet I was the control while in diets 2, 3 and 4 cassava root meal energy replaced 25, 50 and 75% of grain sorghum energy of the control diet. The four experimental diets were adjusted to contain similar concentrations of Metabolizable Energy (ME) and crude protein (Table 1). No trace elements or vitamins were added other than those supplied by the super concentrates. Diets were offered in mash form on ad-Libitum bases, while water was available all the time. Food intake was recorded daily and the liveweight of each pen was taken weekly.

After 8 weeks birds were individually weighed after an overnight fast (except for water) and slaughtered without stunning. Birds were then scalded, manually plucked, washed and allowed to drain on a wooden table, Evisceration was performed by a ventral cut and viscera as well as thoracic organs were removed and weighed to give total viscera weight. Internal organs and heads and shanks were then individually weighed. Total viscera weight and that of internal organs were expressed as percentages of slaughter weight. Eviscerated carcasses were Five carcasses were randomly selected from each pen for dissection. Breast, thigh and drum stick were removed, individually weighed and dissected into meat (including skin, tendons and subcutaneous fat) and

Table 1. Ingredients Proportions (g/kg) of the Experimental diets .

	DIETS			
	I 1	I 2	I 3	i 4
Sorghum Grains	570.0	402.5	220.0	80.0
Cassava Root Meal		137.5	275.0	400.0
Groundnut Cake	310.0	365.0	**385.0**	405.(1
Wheat Bran	30.0	5.0	5.0	
Oyster Shell	25.0	25.0	25.0	25.0
Salt	2.5	2.5	2.5	2.5
Super Concentrate [a]	62.5	62.5	87.5	87.5
Caluculated Analyses **(DM** Base) **b**				
ME (MJ / kg)	**11.3**	**11.4**	**11.4**	11.4
Crude Protein (g / kg)	**274.0**	**270.0**	**269.0**	272.0
Lysine (g / kg)	**10.5**	**10.7**	**12.5**	**12.5**
Mrthionine (g / kg)	**4.4**	**4.3**	**4.5**	**4.2**

a) The super concentrate supplied 9.63 MJ / **kg ME ; 50% CP : SO% Ca : 5% P 3.5%** lysine : 1.5% methionine ; **2% methionine & cystine; 25000 IU/kg vitamin A and traces of other minerals.**

b) calculated according to the MAFF (1974) .

bone. The weight of each component was recorded and expressed as a percentage of joint weight .

The meat from the three joints was minced twice, thoroughly hand mixed and analyzed for moisture, protein, fat and ash as in Association of Official Analytical Chemist (1975). Data were statistically analyzed as in Snedecor and Cochran (1967).

RESULTS

Chick Performance:

Replacement of grain sorghum by cassava root meal energy up to 50% in broiler diets reduced final body weight in comparison with the control group but not significantly (table 2). Only in group 4 where cassava replaced 75% of grain sorghum energy the reduction in final body weight was significant (**P** < 0.05). Liveweight gain decreases with the increase of cassava root meal energy and was significant (**P** < 0.05) only at the high level of cassava.

Table 2. Chick Performance of the Experimental Diets.

	DIETS				
	1	2	3	1 4	SE
Initial Chick Weight (g)	70.0	69.0		69.0	0.88
Final Chick Weight (kg)	2.2^{a}	202^{ab}	70.0 2.1	$2D^{h}$	0.04
Liveweight Gain (kg / Brid)	2.1^{a}	2.1^{a}	2.0ah	1.9h	0.04
Food Intake (kg / Bird)	6.4^{a}	6.3^{a}	$6•0^{a}$	6.0^{a}	0.06
Food Conversion Efficiency (kg Food / kg gain)	2.9a	30a	2.9^{a}	3.2^{b}	0.04

a , b Means on the same line with different superscripts differ significantly (P<0.05).

Food intake though not significantly different among the various dietary groups was lower in the groups fed cassava containing diets than in the control. Groups 2 and 4 where cassava replaced 50 and 75% of grain sorghum energy had the lowest food intake.

Substitution of grain sorghum energy by cassava root meal energy up to 50% did not induce any significant reduction in feed conversion efficiency compared with the control group (Table 2). However, a significant ($P < 0.05$) reduction in feed conversion officiency was found when 75% of grain sorghum energy was replaced by cassava.

Carcass Characteristics and meat Chemical Composition :

Cold eviscerated carcass weight was significantly ($P < 0.05$) lighter in chicks raised on the diet containing 75% of cassava root meal energy than on other levels. Birds raised on diets containing 25%, 50% or no cassava (control) had similar eviscerated carcasses (Table 3). Dressing percentage showed the same trend as eviscerated carcass weight. Muscle : bone ratio was also not significantly different among the different groups.

No significant difference was found in the composition of broiler meat (Table 3). Replacement of grain sorghum energy with 75% of cassava root meal energy in broiler diet resulted in a marked increase in meat fat than in other replacements. Meat ash content gradually increased with increase in cassava in the diet up to 50% and then remained constant.

Table 3. Carcass Charactoristics and Meat Chemical Composition of Broiler Chickens.

	DIETS				
	1	**I**	**I**	**1**	
	1	2	3	4	SE
Eviscerated Carcass Weight (kg)	1.4 a	1.5 a	1.5 a	1.3 b	0.03
Dressing Percentage	68.1 a	69.0 a	67.9 a	63.2 b	5.70
Muscle : Bone	4.4	4.4	4.3	4.4	0.68
Chemical Composition					
Moistrure (%)	75.4	75.3	74.4	75.0	0.20
Protein (%) (Nx 6.25)	21.9	20.8	20.8	21.9	0.24
Ether Extract (%)	2.0	2.0	2.2	2.5	0.10
Ash (%)	1.3	1.4	1.7	1.7	0.03

a,b Means on the same line with different superscripts differ significsntly ($p < 0.05$).

Body Components :

As seen in Table 4 no significant difference was observed in the non-carcass body components of chicks from the different experimental groups. Abdominal fat, liver and alimentary tract weights were heavier in group 4 where cassava roplaced 75% of grain sorghum energy then in other groups.

Table : 4. Body Components of Broiler Chickens (g / kg of Final chick Weight).

	DIETS				
	1 1	I 2	I 3	1 4	SE
Head and Shanks	79.8	70.5	74.0	73.4	1.90 NS
Total Viscera	117.4	112.2	109.1	109.5	0.30 NS
Abdominal Fat	10.2	10.7	9.1	11.1	0.90 NS
Liver	17.5	18.2	17.4	18.4	0.30 NS
Heart	5.0	4.9	4.9	4.8	0.10.NS
Gizzard	19.0	20.0	18.0	19.0	0.5 NS
Alimentary Tract	47.0	47.0	48.0	50.0	0.1 NS

NS = Not Significant .

DISCUSSION

Chick Performance :

The fact that substitution of grain sorghum energy in chick diets with cassava root meal energy up to 50% did not induce any significant effect on liveweight gain, final body weight and feed converesion efficiency agreed with that of Chou and Muller (1972) where dried cassava meal replaced part of the maize in chick diets to a maximum of 58% without indvcing significant reduction in final body weight and feed conversion officiency. Similarly, Stevenson and jackson (1983) raised broiler chicks from the age of 7 days on diets containing 10, 20, 30, 40 or 50% cassava root meal and found that body weight, food intale and feed conversion efficiency were not affected. In this study the calculated dietary lysine and methionine contents of diets 1, 2, and 3 were within the Ministry of Agriculture Fisheries and Food (MAFF) (1974) recommended levels (Table 1) for broilers which might have overcome the growth depressing effect of high cassava level. Enriques and Rose (1967) have shown that 45-50% of cassava may be used satisfactorily in chick feeding when methionine supplementation is practiced.

On the other hand, the significant depressiqn in the rate of gain, final body weight and feed conversion efficiency in the group fed the diet in which cassava root meal energy replaced 75% of grain sorghum energy might possibly be due to the high level of cyanogenic glucosides, as a result of the high level of cassava root meal in the diet, which were not detoxified by the relatively low dietary methionine content. Omole (1977) explained the depressed efficiency of feed utilization as a result of feeding high level of cassava meal to different classes of livestock to the formation of reversible combination with the copper of the cytochrome oxidaze system inhibiting its function as an oxidative enzyme in energy metabolism.

Carcass Characteristics and Body Components :

The cold eviscerated carcass weight showed the same pattern of change in the different treatment groups as the rate of gain and final body weight. The growth depressing effect of the cyanogenic glucosides in the group fed on the diet with 75% cassava root meal energy might be responsible for their lighter carcass weights . High cassava root content in chick diet was found to associate with heavy weights of non-carcass body components as liver, alimentary tract and abdominal fat, coupled with lighter carcass weight. This might explain the significant reduction in dressing percentage of group 3.

Cassava being a fattening agent (Seerly, 1972) is responsible for the heavier weights of abdominal fat, liver and chemically extracted muscle fat in the group fed the diet containing 75% cassava root meal energy. Muscle ash content increased with the increase in the level of cassava in the diet possibly due to increased mineral intake as a consequence of increased level of super concentrate inclusion.

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