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TANNIA COCOYAM TUBER MEAL (XANTHOSOMA SAGITTIFOLIUM) AS A REPLACEMENT FOR MAIZE GRAIN IN THE DIETS OF RABBITS

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ABSTRACT

Growth rate, reproductive efficiency and serum metabolites were assessed on rabbits fed diets in which tannia cocoyam was used to replace maize at 0, 25, 50, 75 and 100% levels. Thirty weanling rabbits averaging 6 weeks in age and 520g body weight were used for the study. The 20 does and 10 bucks were randomly divided into five treatment groups and each group contained 4 does and 2 bucks. Results showed that feed intake, live-weight gain and feed efficiency were not significantly affected ($P > 0.05$) by the treatments. The reproductive performance showed that there were no significant difference ($P > 0.05$) among the treatments for litter size and weight at birth, and litter size and weight at weaning. Blood analysis results showed that 100% (Cocoyam based diet) did not differ ($P > 0.05$) from 0% (maize based diet) on the levels of serum glucose, serum cholesterol, serum glutamic oxaloacetic acid transaminase (SGOT) and serum glutamic pyruvic acid transaminase (SGPT). The results showed that sun-dried tannia cocoyam tuber meal can replace maize grain completely in the diet of weanling and breeding rabbits without any adverse effect on growth rate and reproductive efficiency.

KEY WORDS: Tannia Cocoyam, Rabbits, growth rate, Reproductive efficiency, serum metabolites.

INTRODUCTION

Maize is by far the most extensively used feed ingredient in the diets of poultry and other classes of livestock. Unfortunately, maize production in Nigeria, is not sufficient to meet up with the demand for direct human consumption, food and drug industries. It's prohibitive cost also makes it less available for livestock feeding. This calls for research into alternative feed ingredients which can replace maize with little or no adverse effect on the animal. Some studies have been undertaken on some tuber crops like cassava, sweet potato, and yam as alternative sources of carbohydrates in livestock feeds (Agwunobi, 1997) but little on nothing has been documented for cocoyam as a feed ingredient.

Nearly, half of the world's cocoyam is produced in Nigeria (Onwueme, 1982). The dry matter yield per hectare of cocoyam is greater than that of maize (Umudike, 1990). However, cocoya is only sought for as food by man when other tuber crops (cassava, yam and sweet potato) are in short supply. An important factor which limits its use as food is its toxicity (Idusogie and Olayide, 1973) and poor storage quality (Arene and Okpala, 1980; Jackson and Gollifer, 1975). The corms of some varieties cause irritation in the buccal cavity and itching in the anus even after thorough cooking. The irritation and itching are not observed with the cormels. This is not only peculiar with tannia but also with taro. calcium oxalate has been identified in cocoyam as the cause of the irritation and itching in man (Onwueme, 1982). Storage problem limits the plot sizes of cocoyam. It could be overcome by converting excess of cocoyam produced into animal feed. This will increase the sales out-let and encourage the farmers to increase farm sizes for cocoyam. The less demand for cocoyam as food for man is an advantage for using cocoyam as feed for livestock.

Tannia cocoyam belongs to the genus *Xanthosoma*, which is also a member of the family, Araceae. The most important species is *Xanthosoma sagittifolium*. The use of cocoyam as a substitute ingredient for maize in rabbit diets requires a careful study of its effect on growth rate, reproductive performance and health (by monitoring changes in the blood

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Table 1: The Composition of the diets

Ingredients	D1	D2	D3	D4	D5
Maize	50	37.5	25	12.5	-
Cocoyam	-	12.5	25	37.5	50
Soybean	23	23	23	23	23
Crayfish dust	2	2	2	2	2
Wheat offal	20	20	20	20	20
Bone meal	2	2	2	2	2
Salt	0.5	0.5	0.5	0.5	0.5
Palm oil	2.5	2.5	2.5	2.5	2.5
Total	100	100	100	100	100

Table 2: Proximate Composition of Tannia Cocoyam on Fresh basis

Dry matter	30.0
Crude protein	4.37
ether extract	0.9
crude fibre	2.50
ash	5.46
Nitrogen Free Extract	86.44

composition) of this species. It has been reported that litter size and weight at birth not only depend on the genetic make up of the parents, but also on the quantity and quality of dam's feed intake before conception and throughout gestation period (Odubete and Akinokun, 1991). Similarly, litter size and weight at weaning relate directly to the amount of milk received by the dam (Odubete and Akinokun, 1991). There is also a relationship between dietary content and body composition of the animal (Hamana and Taura 1981 and Pessu 1981). The nutritional, physiological and pathological status of an animal can be assessed using changes in the components of the blood. Nothing in this regard has been established for tannia cocoyam as a dietary substitute for maize, in rabbit production.

The objective of this study, therefore, was to examine the growth rate, reproductive performance and blood characteristics of rabbits fed sun-dried tannia cocoyam tuber meal as a substitute for maize grain in rabbit diets.

MATERIALS AND METHODS

Thirty weanling cross bred rabbits (New Zealand white X Chinchilla) of mixed sexes were used for the experiment. The rabbits were between the ages of five and seven weeks and weighed between 500 and 550g. The rabbits were randomly divided into five treatment groups with six rabbits (4 does and 2 bucks) per group. There were three replicates per treatment with two rabbits per replication. Experimental rabbit groups were balanced for sex and body weight. The plan of the experiment was completely randomised design.

The corms and cormels of tannia cocoyam were purchased from a local market in Calabar. They were sliced into chips (unpeeled) about one milimetre thickness and spread on a concrete floor in the sun to dry. The chips were dried to 10% moisture after 3 days. The chips were then milled using hammer mill. Small samples of the milled cocoyam were removed for proximate analysis (A.O.A.C. 1984). The rest of the milled cocoyam was used formulating the experimental diets in which maize was replaced at 0 (D1), 25 (D2), 50 (D3), 75 (D4) and 100% (D5) levels. Other ingredients used in the formulation were soybean, crayfish dust, wheat offal, bone meal, salt and palm oil (Table 1). Green feed consisting of *Centrosema pubescens* and *Pueraria phaseoloides* were fed *ad libitum* to all the group under a mixed feeding regime. Records of daily feed intake and weekly body weight were taken from the 7th to 22nd week (period of 15 weeks) of age.

After taking the final weight at 22nd week, two does and a buck from each treatment were brought together in one cage for the purpose of mating. They were fed the same diet as in the growth phase. Successful mating took place within two weeks when there were noticeable changes in the weight and size of the does. The bucks were later removed from the does as the pregnancy progressed. Two kindling boxes of known weights were introduced in each of the cages on the 3rd week of gestation. Within 24 hours of kindling, the kittens were weighed together with the kindling box and the litter weight at birth obtained by substraction. Records of litter sizes and weights both at birth and weaning were obtained. Weaning was done at an average age of 6 weeks and a total of 4 litters were monitored per treatment group. The post-partum mating interval for the 4 parities was 8 weeks.

At the end of experiement, four does each from 0% (maize based diet) and 100% (cocoyam based diet) were sacrificed. Blood samples were collected from each doe into test tubes. The serum was separated and decanted by means of centrifuge. Enzymatic colorimetric method was used to determine the serum glutamic oxaloacetic acid transaminase (SGOT) and serum glutamic pyruvic acid transaminase (SGPT) as described by Halkenscheid and Pentila (1979). Serum glucose level was measured by the method of Trinder (1969) and serum cholester level by the method of Allain and Richmond (1974).

All data were subjected to analysis of variance by the method of Steel and Torrie (1960).

RESULTS AND DISCUSSION

The proximate composition of tannia cocoyam tuber meal is shown in Table 2. The dry matter, ether extract, crude fibre, ash and nitrogen free extracts were slightly higher than those reported by Oyenuga (1968). However, the crude protein value (4.37%) is lower than the value (6.34%) by Oyenuga (1968). The reson for the slight difference may be due to

Table 3: Chemical Compostition of green forage

	Centrosema Pubescens	Pueraria Phaseoloides
Dry matter	45.6	46.0
Crude protein	18.86	13.14
Crude fibre	30.5	30.7
Potassium	2.28	2.85
Phosphorus	0.24	0.14
Calcium	2.28	2.85

Table 4: Growth Performance of Rabbits on the experimental diets

Parameters	D1	D2	D3	D4	D5	LSD
Average Initial weight (kg)	0.50	0.52	0.54	0.51	0.55	N/S
Average Final weight (kg)	2.20	2.10	2.30	2.00	2.20	N/S
Mean daily feed intake (g)	47.70	48.30	49.20	49.00	49.70	N/S
Mean daily weight gain	9.00	10.10	10.20	11.10	9.20	N/S
Feed efficiency	5.30	4.80	4.80	4.40	5.40	N/S

differences in stage of growth of cocoyam when the analysis was done. Also the type of cocoyam used for analysis (corms or cormels) will influence the level of chemical composition since the distribution of nutrients in the corms is slightly different from that of the cormels. Even within the same cocoyam, the distribution of nutrients varies from one part of the tuber to the other. Reports indicate that the dry matter and the starch content of the corm are lower at the apex of the corm than at the base (Onwueme 1982). The chemical compostions of Centrosema and Pueraria are shown in Table 3. Controsema was higher in crude protein and phosphorus than Pueraria. Both are similar in the content of potassium and calcium.

GROWTH AND REPRODUCTIVE PERFORMANCE

Feed intake, weight gain and feed efficiency values are shown in Table 4. The differences in feed intake, weight gain and feed effiency among the treatments were not significant ($P>0.05$).

The reproductive performance of rabbits on the test diets is shown in Table 5. The differences in litter size and weight at birth, and litter size and weight at weaning among the treatments were not significant ($P>0.05$). The values for litter size at birth for the various treatments fall within the reported range of 2-9 (Odubete and Akinokun, 1991) 3-12 (Lebas *et al* 1986) and 3-10 (Somade, 1982) for rabbits. The mean litter weights at birth (Table 5) also fall within the range of 21-60.5g reported for rabbits (Odubete and Akinokun, 1991). The mean litter sizes at weaning (Table 5) were comparable to the range, 3·40-5·80, reported by Somade (1982). The mean weaning weights (Table 5) were also comparable to the value, 473.7g obtained for rabbits by Matheron and Poujardieu (1977), Cheeke *et al* (1982); Odubote and Somade (1992). However, the mean value (506.1g) was slightly higher than 431.8g reported by Lukefahr *et al* (1983a). The slight difference may be due to differences in the age of weaning when the weaning weight was obtained. The Kittens in this experiment were weaned at 6 weeks while Lukefahr *et al* (1983a) obtained their weaning weights at 5 weeks.

BLOOD PARAMENTERS

The comparison of serum enzymes, cholesterol and glucose levels for rabbits fed maize based diets (0%) and cocoyam based diets (100%) are shown in Table 6. The results show that the differences in serum glucose, serum cholesterol, serum glutamic oxaloacetic acid transaminase (SGOT) and serum glutamic pyruvic acid transaminase (SGPT) were not significant ($P>0.05$) between the two diets.

The reason for non-significant differences observed among the treatments on growth rate, reproductive performance and blood parameters could be as a result of efficient utilization of the cocoyam diets by the rabbits. Although tannia cocoyam is lower in protein and energy contents than maize (Oyenuga, 1968), the quantity and quality of protein and energy contents of feed are not as critical in rabbits as in poultry. This is as a result of a peculiar feeding habit exhibited by rabbits referred to as coprophagy, the phenomenon whereby rabbits recycle nutrients by feeding back on their soft faecal matter. Also, the ability of rabbits to subsist on green leaves even in the absence of concentrate feeds, indicates that the rabbit can make up for those nutrients deficient in test diets from the green leaves. This is in line with the work of Agwunobi *et al* (1997). It has been reported that cocoyam contains some anti-nutritional factors (Onwueme, 1982) which can hinder growth and performance in animals. However, certain processing methods such as heating and sun-drying, as used in this

Table 5: Reproductive Performance of rabbits on the experi mental diets: Experimental Diets

Parameters	D1	D2	D3	D4	D5	LSD
Mean litter size at birth	5.7 ± 4.30	5.5 ± 0.50	5.7 ± 0.80	5.7 ± 0.80	5.7 ± 0.80	N/S
Mean litter weight at birth (g)	55.5 ± 1.10	54.5 ± 1.10	54.7 ± 0.80	54.70 ± 1.60	55 ± 0.70	N/S
Mean daily weight gain (g)	5.5 ± 0.50	5.5 ± 0.50	5.5 ± 0.50	5.7 ± 0.83	5.5 ± 0.60	N/S
Feed efficiency	497.5 ± 10.00	495 ± 26.00	510 ± 33.70	519 ± 34.70	509 ± 29.00	N/S

Table 6: Comparison of Serum enzymes, Cholesterol and Glucose levels of rabbits fed maize and Cocoyam based diets

	Experimental Diets	
	0% (meal based diet)	100% (Cocoyam based [illegible])
Serum glucose (mg/dl)	99.67 ± 1.55	103.00 ± 0.72
Serum cholesterol (mg/dl)	59.30 ± 0.66	57.30 ± 0.12
SGOT (IU/dl)	83.00 ± 13.57	82.67 ± 13.65
SGPT (IU/dl)	67.33 ± 22.38	67.00 ± 22.50

experiment, may have destroyed the anti-nutritional factors in the cocoyam. Also the inclusion of between 50 and 75% of other feed ingredients in the diets may have a diluting effect on the anti-nutritional factors in tannia cocoyam.

The results show that growth rate, reproductive efficiency and serum metabolites were not significantly affected by replacing maize with tannia cocoyam tuber meal. It is, therefore, concluded that sun-dried tannia cocoyam tuber meal can replace maize grain completely in the diets of rabbits without any adverse effect on the growth rate, reproductive efficiency and blood composition of the animals.

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