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Performance of Quails (*Coturnix coturnix Japonica*) Fed Graded Levels of Boiled Sun-Dried Taro Cocoyam (*Colocasia esculenta*) as a Replacement for Maize

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Abstract: One hundred Japanese quails (*Coturnix coturnix japonica*) were randomly alloted to five dietary treatments. In each of the five diets, sun-dried taro cocoyam cormels (*Colocasia esculenta*) was used to replace maize at 0, 25, 50, 75 and 100% respectively. The quails were fed 1 of the 5 experimental diets over a period of 49 days (7 weeks). Feed intake was measured daily and the quails weighed once weekly. Quails on the 0% (control) diet had significantly ($p<0.05$) higher values in body weight and feed consumption compared to other treatments. In terms of weight gain, quails on 0% diet were not significantly ($p>0.05$) different from those on 25 and 50% diets. There were no significant ($p>0.05$) differences in the feed conversion ratio and feed efficiency of all the treatments. The results indicated that, boiled sun-dried taro cocoyam cormels meal could replace maize favourably at 25 and 50% levels in Japanese quails diets at 5% level of significance.

Key words: Japanese quails, taro cocoyam cormels, maize, body weight, feed consumption, feed efficiency

INTRODUCTION

Maize (*Zea mays*) forms the base of most livestock feeds and is particularly relished by poultry, rabbits and pigs (Durunna *et al*., 2000). The grains are useful as food to man and animals as well as raw materials for industries, hence there is stiff competition between man and livestock. The stiff competition for maize grains has further resulted in scarcity of feed ingredients in Nigeria, particularly those being competed for between animals and humans and has aggravated the cost of feeding animals beyond the reach of the average Nigerian farmers (Arinjeniwa *et al*., 2000; Chinkwuji and Osuagwu, 2000).

High cost of cereals and uncertainty about their sustainable supply as energy source for livestock led to the search for alternatives (Agiang *et al*., 2004). Taro cocoyam is a less well known source of energy, which is not in great demand for human food (Agwunobi *et al*., 2002). As an alternative to maize as much as 50% dietary Taro cocoyam has replaced all the maize in the diets for broilers (Abdulrashid *et al*., 2006). Although some anti-nutritional factors like, oxalates, proteinase inhibitors, phytates, tannins, acrid factors could be found in taro cocoyam (Cooke *et al*., 1982) processing could reduce their effect in the feed (Tang and Sakai, 1983; Agwunobi and Ina-Ibor, 2007).

The protein intake levels of humans in most developing countries including Nigeria is very low due to the high cost of the product (Abeke *et al*., 2003). There have been calls for substantial increase in the intake of protein of animal origin in developing countries (F.A.O., 1985). Quail meat is renowned for its low caloric value in addition to having high quality protein of high biological value (Haruna *et al*., 1997a). According to Olubamiwa *et al*. (1999), these qualities especially the low fat content, are likely to divert the attention of people especially the hypertensive-prone individuals to quail consumption.

This study therefore, investigated the effect of feeding boiled sun-dried taro cocoyam as a replacement for maize on the performance of Japanese quails (*Coturnix coturnix japonica*).

MATERIALS AND METHODS

The study was carried out in 2005 at the Teaching and Research Farm, Department of Animal Science, University of Calabar, Calabar, Nigeria.

One hundred Japanese quails (*Coturnix coturnix japonica*) of about 3 weeks of age were randomly grouped into 5 dietary treatments of 20 quails per treatment. Each treatment was replicated twice with 10 quails per replicate. The five diets had 0 (control), 25, 50, 75 and 100% boiled sun-dried taro cocoyam (*Colocasia esculenta*) cormel meal as replacement for maize.

Unpeeled taro cocoyam cormels were bought from Agbokim water falls village, Cross River, Nigeria, chopped into chips of about 1mm and boiled for about 10-15 min before sun-drying. Sun-drying lasted for about a week

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Table 1: The composition of the diets for boiled sun-dried taro cocoyam tuber meal

	Percentage replacement of maize in diet				
Ingredient	Diet I 0%	Diet II 25%	Diet III 50%	Diet IV 75%	Diet V 100%
Maize (%)	56.77	42.58	28.39	14.19	0.00
Cocoyam (%)	0.00	14.192	8.39	42.58	56.77
Roasted soyabean Meal (%)	20.12	20.12	20.12	20.12	20.12
Fish meal (%)	7.36	7.36	7.36	7.36	7.36
Wheat offals (%)	10.00	10.00	10.00	10.00	10.00
Bone meal (%)	5.00	5.00	5.00	5.00	5.00
Salt (%)	0.25	0.25	0.25	0.25	0.25
Vit./Min. Premix (%)	0.5	0.5	0.5	0.5	0.5
Total (%)	100	100	100	100	100
Calculated: Crude protein (%)	20.61	20.19	19.75	19.33	18.91
M.E (Kcal kg^{-1})	2810.22	2788.37	2766.84	2744.65	2722.79

(7 days) and this reduced moisture content to less than 10%. The boiled sun-dried taro cocoyam cormel and other ingredients were milled separately and used to compound the experimental diets (Table 1).

Quails were fed at 8am with same quantity of feed daily for various treatments. Fresh clean water was supplied ad libitum and daily records of the feed intake were kept. The quails were weighed once weekly. The experiment lasted for 7 weeks. Chemical analysis of the experimental diets was according to the procedures of A.O.AC (1995). Data obtained were subjected to analysis of variance using the randomized completely block design as described by Steel and Torrie (1980). Least significant difference method was used to separate means that differed significantly (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

The determined proximate composition of crude protein in the experimental diets ranged from 17.50-20.58 (Table 2).

The crude protein decreased as cocoyam cormel content of the diets increased (i-v). Cocoyam has very low crude protein content of 7.0, which could reduce the total dietary crude protein content.

Although the diets were formulated to provide adequate protein levels for growing quails, the determined crude protein showed slightly lower values of 17.94 and 17.50 for treatments iv and v. Whyte *et al.* (2000) had suggested that a dietary protein level of 18-24% was adequate for good performance. Although the protein content in treatment I was 20.58%, higher protein feed enhance utilization. Quails fed with 24% CP have recorded better optimal performance (Whyte *et al.*, 2000; Rakpotobor and Ijiwo, 2006). The mean weekly weight gain in this study was significantly ($p<0.05$) influenced by dietary treatments (Table 3).

Table 2: Proximate composition of the (%) and energy content MΣ/Kcal/kg of experimental diets

	Composition				
Component	0%	25%	50%	75%	100%
Crude protein	20.58	20.12	18.38	17.94	17.50
Crude fibre	4.5	5.5	4.75	4.75	5.5
Nitrogen free Extract	61.67	61.38	62.87	64.81	64.5
Ether extract	4.75	5.0	8.0	5.0	6.0
Ash	8.5	8.0	6.0	7.5	6.5
MΣ/Kcal/kg	2808.93	2769.24	2757.94	2739.58	2718.97

It must be noted that, the body weight gains decreased weekly with increasing contents of cocoyam cormels in diets iv and v. Growing quails are able to keep body growth rate at constant rate over a wide range of dietary energy levels (Olubamiwa *et al.*, 1999). It is therefore probable that the presence of anti-nutrients in cocoyam (Sakai, 1979; Agwunobi *et al.*, 2000, 2002) may have affected utilization rather than lower energy content of the diets. Cocoyam has some anti-nutrients example oxalates which affects bioavailability of calcium (Sakai, 1979). In addition, the lower protein contents of the diets iv and v may have affected utilization. Rakpotober and Ijiwo (2006) had observed slight increase in feed intake probably due to palatability as the level of protein in the diet increased. This study shows depressed intake as protein content decreases, this may be because of the presence of anti-nutrients in cocoyam (acrid factor) which cause irritation and burning of the throat (Sakai, 1979) thereby lowering palatability and intake.

There was no significant difference ($p<0.05$) in the feed conversion ratios and feed efficiency in all the diets. The non significant effect of dietary intake on feed efficiency also have been reported (Edache *et al.*, 2005; Rakpotabor and Ijiwo, 2006; Olubamiwa *et al.*, 1999). The values in the present study are however higher

Table 3: Performance Characteristics of Quails (g)

Parameter	0%	25%	50%	75%	100%
Mean weekly body weight	111.450±16.81[a]	107.750±15.91[b]	105.680±15.52[c]	98.010±14.15[e]	95.090±13.73[e]
Mean weekly weight gain	93.360±2.60[a]	18.930±1.84[ab]	17.770±1.50[ab]	16.570±1.73[b]	15.600±1.55[bc]
Mean weekly feed consumption	170.64±14.58[a]	164.59±15.38[b]	162.007±15.58[b]	155.99±15.66[c]	150.40±16.13[d]
Feed conversion ratio	0.11±0.02	0.12±0.02	0.12±0.02	0.11±0.01	0.11±0.01
Feed efficiency	8.81±2.17	8.69±1.45	9.12±1.29	9.41±1.59	9.64±1.86

Different superscript (a, b, c, d and e) within row indicate significant ($p<0.05$) differences at the specified levels

compared to 4.66-5.71 reported by Olubamiwa *et al.* (1999) 5.76-7.00 by Edache *et al.* (2005) and 7.6-7.7 by Rakpotobor and Ijiwo (2006). The poor feed efficiency in this study may be due to the presence of anti-nutrients and lower protein contents of the diets (Sakai, 1979).

CONCLUSION

The results from this study suggest that, the optimum level of cocoyam replacement for maize should be 25 and 50% in the finishing diets of Japanese quails (*Coturnix coturnix japonica*) as there was no adverse effect on growth, weight gain and feed conversion ratios at these levels of replacement.

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