

Growth response of quails (*Coturnix coturnix japonica*) to varying levels of cassava tuber meal (*Manihot esculenta*) as replacement for maize (*Zea mays*)

Respuesta del crecimiento de la codorniz (*Coturnix coturnix japonica*) a distintos niveles de yuca (*Manihot esculenta*) como reemplazo del maíz (*Zea mays*)

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ABSTRACT

The study was conducted to determine the growth response of quails (*Coturnix coturnix japonica*) to varying levels of cassava as a replacement for maize. Thirty two Japanese quails were randomly allotted to four dietary treatments. In each of the four diets, sun-dried cassava tuber meal (SDCTM) was used to replace maize at 0, 25, 50, and 75% levels. The quails were fed one of four experimental diets over a period of 42 days (6 weeks). Result showed that there was no significant difference ($P>0.05$) in feed intake between quails fed 0% (T_1) and 25% (T_2) and those fed 50% (T_3) and 75% (T_4) levels of inclusion of SDCTM as a replacement for maize. However, mean weekly feed intake was significantly higher ($P<0.05$) in T_3 (152.2 ± 12.07) than T_2 (131.94 ± 11.24) group. No significant difference ($P>0.05$) was observed in weight gain between T_1 and T_3 groups just as there was no significant difference ($P>0.05$) in weight gain between T_2 and T_4 groups. Mean weekly weight gain was significantly higher ($P<0.05$) in T_3 (125.60 ± 10.96) than T_2 (111.41 ± 10.31) group. Mean weekly feed conversion ratio was highest in T_4 (1.58 ± 0.23) with 75% inclusion level of SDCTM and lowest in T_1 (1.18 ± 0.10) with 0% inclusion level of SDCTM. It implies that SDCTM can favorably replace maize at 50% level of inclusion in quail diet.

Key words: Quails, cassava tuber meal, maize, performance

RESUMEN

El estudio se realizó para determinar la respuesta del crecimiento de codornices (*Coturnix coturnix japonica*) a diferentes niveles de yuca como un reemplazo del maíz. Treinta y dos codornices japonesas se asignaron aleatoriamente a cuatro tratamientos dietéticos. En cada una de las cuatro dietas, se utilizó harina de raíces de yuca secadas al sol (HRYSS) para reemplazar el maíz a niveles de 0, 25, 50, y 75%. Las codornices se alimentaron con una de las cuatro dietas experimentales durante un periodo de 42 días (6 semanas). Los resultados mostraron que no hubo diferencia significativa ($P>0,05$) en el consumo de alimento entre codornices alimentadas con 0% (T_1) y 25% (T_2) y aquellas alimentadas con niveles de inclusión de HRYSS de 50% (T_3) y 75% (T_4) como reemplazo del maíz. Sin embargo, el consumo de alimento semanal promedio fue significativamente mayor ($P<0,05$) en T_3 ($152,2 \pm 12,07$) que en el grupo T_2 ($131,94 \pm 11,24$). No se observó diferencia significativa ($P>0,05$) en la ganancia de peso entre los grupos T_1 y T_3 justo como no hubo diferencia significativa ($P>0,05$) en la ganancia de peso entre los grupos T_2 y T_4 . La ganancia de peso semanal promedio fue significativamente ($P<0,05$) mayor en T_3 ($125,60\pm 10,96$) que en el grupo T_2 ($111,41\pm 10,31$). La relación de conversión de alimento semanal promedio fue más alta en T_4 ($1,58\pm 0,23$) con 75% del nivel de inclusión de HRYSS y más baja en T_1 ($1,18\pm 0,10$) con 0% del nivel de inclusión de HRYSS. Por lo tanto, esto implica que la HRYSS puede reemplazar favorablemente al maíz a un nivel de 50% de inclusión en la dieta de las codornices.

Palabras clave: Codornices, harina de raíces de yuca, maíz, rendimiento

INTRODUCTION

The protein intake level of humans in most developing countries including Nigeria are very low due to the high cost of the product (Abeke *et al.*, 2003). There has been call for substantial increase in the intake of proteins of animal origin in the

developing countries (F.A.O., 1985) as they are richer in the essential amino acids. Quail meat is renowned for its low caloric value in addition to having high quality protein of high biological value (Haruna *et al.*, 1999). These qualities mainly the low fat content is likely to divert the attention of people especially the hypertension-prone ones to quail meat consumption.

The quest and effort to substitute maize in poultry feed with other less costly energy sources was inculcated significantly to reduce the cost of production in poultry (Bamgbose *et al.*, 2004). Cassava tuber, a primary source of carbohydrate can completely replace maize as an energy source in feeds of pigs and birds. It is a woody shrub of the Euphorbiaceae (spurge family) native to South America. It is extensively cultivated as an annual crop in tropical and subtropical regions of the world for its edible starchy root, a major source of carbohydrate. As a matter of fact, its use for this purpose is presently limited to research centre and small scale pig producers. For adoption by large scale commercial producers, appropriate technology needs to be developed to reduce the high moisture and hydrocyanic acid (HCN) contents of the tubers (Tewe *et al.*, 1976.)

Maize (*Zea mays*) forms the base of most livestock feeds, and it is particularly relished by poultry, rabbits and pigs (Durunna *et al.*, 2000). The grains are very useful as food to man and animals as well as raw materials for industries. Hence, there is stiff competition between man and livestock for this feed resource. This competition has resulted in scarcity of feed ingredients in Nigeria. Also, it has increased the cost of feeding animals beyond the reach of the average Nigerian farmers (Aringeniwa *et al.*, 2000; Chinkwuju and Osuagwu, 2000). The high cost of cereals and uncertainty about their sustainable supply as energy source for livestock and poultry calls for investigations for alternative and possibly cheaper option (Agiang *et al.*, 2004). This therefore justifies the study on the evaluation of the usefulness of cassava tuber meal as a replacement for maize in quail diet in southeastern Nigeria.

MATERIALS AND METHODS

Experimental site

The study was carried out at the Teaching and Research farm of Enugu State University of Science and Technology, Enugu, Nigeria. The site is situated at latitude 06° 4' N and longitude 08° 65' E and located at the equatorial rain forest vegetation zone of southeastern Nigeria. It has an annual rainfall that ranges from 1700-1800 mm and a mean temperature of 39 °C.

Experimental birds

Thirty two Japanese quails (*Coturnix coturnix japonica*) of 21 days of age were randomly grouped

into four dietary treatments of eight quails per treatment. Each treatment was further replicated twice with four birds per replicate. The four diets had 0, 25, 50 and 75% inclusion levels of sun-dried cassava as a replacement for maize.

Experimental diets

Cassava tubers sourced from Agbani market in Nkanu Local Government Area of Enugu State, Nigeria were peeled, washed and chopped into chips of 1mm, and sun-dried. Sun-drying which lasted for ten days was aimed at reducing the moisture level. The dried cassava and other ingredients were milled separately and used to compound the experimental diets shown in Table 1.

Experimental procedure

Thirty two quails sourced from Songhai farm, Amukpe, Sapele Local Government Area of Delta State, Nigeria were housed and managed intensively in battery cage. Each cage was assigned to each of the four dietary treatments. The quails were offered the experimental diets consisting of 0, 25, 50 and 75% levels of cassava respectively *ad libitum*. Clean water was also offered *ad libitum* throughout the experimental period.

Data collection and analysis

Data were collected on daily feed intake as well as on weekly body weight. Feed conversion ratio was computed as feed intake divided by weight gain. Data collected were subjected to analysis of variance according to Steel and Torrie (1980). Least significant

Table 1. Composition of the experimental diets.

Ingredients (%)	Inclusion levels of sun-dried cassava tuber meal (%)			
	T ₁ (0)	T ₂ (25)	T ₃ (50)	T ₄ (75)
Maize	50.00	37.50	25.00	12.50
Cassava	0.00	12.50	25.00	37.50
Soya bean cake	26.89	26.89	26.89	26.89
Fish meal	7.36	7.36	7.36	7.36
Wheat offal	10.00	10.00	10.00	10.00
Bone meal	5.00	5.00	5.00	5.00
Salt	0.25	0.25	0.25	0.25
Premix	0.50	0.50	0.50	0.50
Total calculated values	100.00	100.00	100.00	100.00
Crude protein	21.18	20.37	19.55	18.73
M. E. (kcal kg ⁻¹)	2527	2509	2491	2473

difference method was used to separate means that differed significantly ($P < 0.05$).

RESULTS AND DISCUSSION

Results of performance characteristics of quails fed varying levels of cassava meal as a replacement for maize are as summarized in Table 2. There was no significant difference ($P > 0.05$) in feed intake between quails fed 0 and 25% just as there was no significant difference in feed intake between those fed 50 and 75% inclusion levels of the sun-dried cassava tuber meal. However, feed intake was significantly higher ($P < 0.05$) in group fed 50% than those fed 25%. There is increased feed intake with decreased crude protein level. This contradicts the report by Whyte *et al.* (2000) and Rakpotobar and Ijiwo (2000) that quails fed 24% crude protein recorded better growth performance.

There was no significant difference ($P > 0.05$) in weight gain between T_1 and T_3 and between T_2 and T_4 groups. Values of weight gain were significantly higher ($P < 0.05$) in T_3 than T_2 groups. This is difficult to explain but Olubamiwa *et al.* (1999) has stated that growing quails are able to keep body growth rate over a wide range of dietary energy levels.

Feed conversion ratio (FCR) varied significantly ($P < 0.05$) among the different treatment groups. It was highest in T_4 group with 75% inclusion level of cassava tuber meal followed by T_3 , then T_2 and lowest in T_1 with zero percent inclusion level of the cassava tuber meal. This implies that there was increasing FCR with decreasing crude protein level.

CONCLUSION AND RECOMMENDATION

The best level of inclusion of cassava tuber meal as a replacement for maize is 50% since the quails achieved their highest feed intake and weight gain at this level.

Table 2. Performance characteristics of quails (*Coturnix coturnix japonica*) fed varying levels of cassava tuber meal as a replacement for maize.

Parameters	Inclusion levels of sun-dried cassava tuber meal (%)				SEM
	T_1 (0)	T_2 (25)	T_3 (50)	T_4 (75)	
MWFI (g)	136.10 ± 11.42 ^b	131.94 ± 11.24 ^b	152.22 ± 12.07 ^c	153.60 ± 12.12 ^a	9.25
MWWG (g)	123.75 ± 10.88 ^a	111.13 ± 10.31 ^b	125.60 ± 10.96 ^a	105.25 ± 10.40 ^b	8.38
MWFCR	1.18 ± 0.10 ^c	1.25 ± 0.16 ^c	1.31 ± 0.21 ^b	1.58 ± 0.23 ^a	0.15

MWFI: Mean weekly feed intake; MWWG: Mean weekly weight gain and MWFCR: Mean weekly feed conversion ratio
a,b,c: Means with different superscripts in the same row are significantly different ($P < 0.05$) according to Least Significant Difference Test

In view of the high cost of maize and the uncertainty about their sustainable supply as energy source for livestock and poultry, we recommend that cassava tuber meal can be used as a replacement for maize at 50% level in quail diet. This will obviously improve on the productivity.

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