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Effects of Replacing Maize with Yam Peel Meal on Short Term Laying Performance of Japanese Quails (*Coturnix coturnix japonica*)

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Abstract: A 6-week feeding trail was conducted to determine the effect of varying levels of yam peel meal (CP; 8.07% and ME; 2701 kcal/kg) on the laying performance of Japanese quails. One hundred and fifty 4 - week old female quails divided into 4 groups having 3 replicates of 12 birds each were used in this study. Four isonitrogenous (20% CP) diets incorporating graded levels (0, 10, 20 and 30%) of yam peel meal were compounded. The diets, however, varied in energy levels having 2,626 (Diet A), 2,553 (Diet B), 2,480 Diet C and 2,406 kcalME/kg (Diet D) respectively. Each diet was replicated three times. Average daily feed intake (34.77, 31.13, 31.50 and 33.23 g/bird) and hen-day production (30.06, 22.17, 18.81 and 16.19%) were significantly ($p<0.05$) affected by the test diets. However, respective daily weight gains (10.23, 8.93, 10.40, 7.83 g/bird), feed conversion ratio (7.96, 7.78, 6.90, 8.07) and egg weights (7.0, 8.8, 8.67 and 7.47 g) were not significantly ($p>0.05$) affected. As the level of yam peel meal increased in the diet, hen-day egg production was dropping. Feed cost/kg diet (N) decreased from diet A (41.24), B (38.02), C (34.52) to 31.02 (diet D) which had a cost saving of 25% over the control diet. By this study, it is indicated that at dietary crude protein level of 20% and Metabolizable Energy of between 2,480 and 2,626 kcal/kg, 20% level of yam peel meal inclusion in Japanese quail diet is acceptable for satisfactory egg production.

Key words: Yam peel, productive performance, Japanese quail

INTRODUCTION

Japanese quails are small-sized, early maturing, hardy and prolific birds (Robbins, 1981). They come into egg production between the 5th and 6th week of life, but adult plumage is not attained until the 12th week of age (Martins, 1987). The eggs are small, mottled and weigh between 8 and 10 g each (Edache *et al*., 2003a; Musa *et al*., 2008) with egg fertility and hatchability levels of 90% and 65% respectively, (Edache *et al*., 2003b). The meat and eggs are low in body fat and cholesterol (Schwartz and Allen, 1981) which is of public health significance. Persons prone to high blood pressure and related diseases could consume these products with less risk. Crude protein diet content of 20% has been recommended for optimum egg production in Japanese quails (Edache *et al*., 2003a; Akpan *et al*., 2008).

The usual high inclusion of maize translates into high cost of feed because of seasonality of production and competition for maize by man (Agbede *et al*., 2002). According to Bamgbose *et al*. (2004) maize accounts for about 45 to 55% poultry feed. This necessitates the need to replace maize either partially or totally in poultry diets to reduce overall cost. Increasing use of alternatives to maize has been recommended (Ani, 2007; Ani and Omeje, 2007; Obikaonu and Udedibie, 2007).

Yams belong to the Genus; Dioscoreae, species; (*D. rotundata*, *D. alata*). Yam peels are wastes or by-products of processing when the tubers are being prepared for human use. The peels contain a reasonably high level of energy (2701 kcal/kg) and can be fed to livestock and poultry as a component of their diet. It is best fed when dried (less than 12% moisture). The dry matter level preventing microbial growth in yam peels and other feedstuff if they are to be preserved for longer periods of time is above 88%. Diets containing 10 or 20% yam peels were reported not to depress weight gain and feed conversion ratio in West African Dwarf (WAD) goats and the diet containing 20% dietary yam peel produced the best cost/kg live weight gains in W A D goats (Olatunji *et al*., 2007). Yam peels have been analyzed to contain crude protein levels of 11.21%, crude fibre: 9.47%, ether extract: 1.17%, ash: 9.76% and nitrogen free extract: 68.29% (Aduku, 1993) and also antinutritional factors such as tannins and alkaloids (Olatunji *et al*., 2007). Waghorn *et al*. (1987) reported that tannins reduce digestibility and possible utilization of feed. Onwueme (1978) reported that alkaloids are deactivated by soaking in water. With increasing levels of trifoliate yam tuber meal in broiler diets (Agwunobi *et al*., 2007), there was corresponding increase in feed intake and body weight gain. Okon *et al*. (2008) had

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recommended a dietary replacement of not more than 50% of the maize with taro cocoyam for growing Japanese quails, while Edache *et al.* (2008) reported a possibility of 100% replacement for the same birds. The focus of this study is to evaluate the short term laying performance of Japanese quails fed diets containing graded levels of yam peel meal.

MATERIALS AND METHODS

Birds: 150 four-week old female Japanese quail birds obtained from the National Veterinary Research Institute poultry farm were used in the study. They were selected to be uniform in size and body weight. They were housed in two cages, each partitioned into six units in a completely randomized design. The cages were housed in a room well ventilated and well lit. There were 12 birds per unit with six units having an extra bird to make up to 150. Each treatment or diet was randomly allocated three units of cages. All birds were weighed at the beginning before the trial started and all birds from each unit weighed weekly for six weeks. The experimental diets were A, B, C and D incorporating graded levels of 0, 10, 20 and 30% of yam peels respectively. Feed and water were given *ad libitum*.

Yam peel: Yam peels were collected from several commercial points in Jos South Local Government Area. They were sun-dried and crushed into meals and incorporated into the diets free from weevils and other contaminating insects. They were analyzed for proximate and chemical composition (AOAC, 2000).

Experimental diets: Four isonitrogenous (20%CP) diets containing graded levels (0, (control), 10, 20 and 30%) of yam peel meal at the expense of maize were used in the study. The diets were designated A, B, C and D respectively and contained Metabolizable Energy (ME) levels; 2626, 2553, 2480 and 2406 kcal/kg respectively.

Data collection: The mean initial body weight, weekly body weight, feed consumption, hen-day egg production and egg weight of birds were recorded throughout the experimental period. From the mean body weight and feed intake, feed conversion ratio was calculated. Feed cost/kg diet was calculated from prevailing local market price of feed materials. Data collection was subjected to analysis of variance; ANOVA (Steel and Torrie, 1980) with the appropriate use of single degree of freedom comparison among treatments.

Table 1: Composition of experimental diets (%)

	Levels of yam peel meal inclusion (%)			
Ingredients	0	10	20	30
Maize	39.50	29.50	19.50	9.50
Yam peel meal	0.00	10.00	20.00	30.00
Groundnut cake	27.30	27.30	27.30	27.30
Palm kernel cake	20.00	20.00	20.00	20.00
Rice bran	3.00	3.00	3.00	3.00
Fish meal	1.00	1.00	1.00	1.00
Bone meal	2.00	2.00	2.00	2.00
Limestone	6.50	6.50	6.50	6.50
Premix	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25
Methionine	0.10	0.10	0.10	0.10
Lysine	0.10	0.10	0.10	0.10
Calculated composition				
CP (%)	20.27	20.18	20.11	19.99
ME (kcal/kg)	2626.00	2553.00	2480.00	2406.00
Ca (%)	3.18	3.22	3.25	3.28
P (%)	0.47	0.49	0.50	0.52
Cost/kg (Naira)	41.24	38.02	34.52	31.02

CP = Crude Protein, ME = Metabolizable Energy, Ca = Calcium, P = Phosphorus

RESULTS AND DISCUSSION

Proximate analysis of yam peel meal (Table 1) showed that it contained; moisture, 11.98%; crude protein, 8.07%, crude fibre, 17.13%, lipids, 0.44%, total ash 2.14% and NFE, 72.22%.

Data on feed consumption, weight gain and feed conversion ratio are presented on Table 2. By five and half weeks of age the quail birds had started egg production confirming the report of Martins (1987). This also attests to the quality of the feed.

Differences in feed intake and hen-day egg production between dietary treatments were significant ($p<0.05$). The observed differences in feed intake is similar to that reported by Olubamiwa *et al.* (1999), Edache *et al.* (2005) and Edache *et al.* (2009) when they replaced maize with cocoa husk, sweet potato meal and guinea corn at graded levels in quail diets. Feed intake was significantly ($p<0.05$) less in birds fed diets containing

Table 2: Effects of various yam peel meal levels on performance parameters

	Levels of yam peel meal inclusion (%)				
Parameter	0	10	20	30	SEM
Feed intake (g)	34.77^{a}	31.13^{b}	31.50^{b}	33.23^{ab}	0.85
Weight gain (g)	10.23	8.97	10.40	7.83	0.72
Feed/gain ratio	7.96	7.78	6.90	8.07	1.05
Hen-day prod. (%)	30.06^{a}	22.17^{b}	18.81^{bc}	16.19^{c}	1.40
Egg weight (g)	7.00	8.80	8.67	7.47	0.59
Initial weight (g)	118.00^{a}	109.33^{ab}	107.00^{b}	112.00^{ab}	2.38
Final weight (g)	184.33	163.00	169.00	163.67	12.51

^{a,b}Means with different superscripts within the same row differ significantly ($p<0.05$)

yam peel meal compared to the control. This result is in contrast of what was reported by Inaku *et al*. (2011), when they fed graded levels of yam peel meal diets to broiler birds. They reported significant ($p<0.05$) increases in feed intake in birds fed diets containing yam peel meal compared to the control. Also in Inaku *et al*. (2011) study, as levels of dietary yam peel meal increased, the quantity of feed consumed by the broilers also increased. In the same vein, while daily weight gain and feed conversion ratio were not affected ($p>0.05$) by levels of yam peel meal in this study, reports by Inaku *et al*. (2011), showed that daily weight gain values were significantly less ($p<0.05$) in birds fed diets having yam peel meal inclusion of 30 and 40%, compared to the control. Feed conversion ratio was also significantly higher in birds fed yam peel meal diets compared to the control. Thus, the effect yam peel meal diets have on quails is different from what it has on broilers with respect to feed intake, weight gain and efficiency of feed utilization. Although the energy content of the diets decreased from 2626 (diet A) to 2406kcalME/kg (diet D) it apparently did not affect the weight gain of the quail birds. Weber and Reid (1967) had earlier reported that dietary energy levels of 1760-2400 kcalME/kg did not significantly alter weight gain in quail birds. Feed conversion ratio of laying quail was not significantly ($p>0.05$) affected by the diets. This result agrees with the observations of Bawa *et al*. (2006) for rabbits and Akpan *et al*. (2008) for laying hens. The report of Akpan *et al*. (2008) indicated that more than 5% neem leaf extract depressed egg production of hens. However, the result of this study showed that above 20% dietary yam peel meal level, hen-day production of laying Japanese quails is depressed.

Conclusion: Yam peels are available at several commercial points like restaurants, buka's, (local eateries) and processing points for 'amala' (processed yam powder) of our towns and villages and sometimes constitutes a waste disposal burden. The escalating cost of poultry feed could effectively be alleviated by use of cheaper resources like yam peel. Comparison of the mean values of parameters measured (feed consumption, weight gain, feed/gain ratio, hen-day egg production and egg weight.) showed that only feed intake and hen-day production were significantly ($p<0.05$) affected by yam peel level above 20%. Therefore, yam peels can be effectively used to replace maize (by 49.37%) as an energy source in diets of laying quails since such a level of replacement (or 20% dietary yam peel meal inclusion) did not significantly ($p>0.05$) depress laying performance but also resulted in a cost saving of 16.30% over the control diet.

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