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Replacement value of millet for maize in practical diet fed to Japanese quail chicks

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Abstract

The effects of inclusion of 0, 25, 50. 75 and 100% millet in replacement of maize in the diets of quail chicks on growth and nutrient utilization were studied in a five-week feeding trial. One hundred and eighty (180) one week old (unsexed) Japanese quail chicks having a mean initial weight of 27.61g ± 0.14 were used in a completely randomized design. Daily feed intake, daily weight gain, feed conversion ratio and digestibility of nutrients were statistically similar across the treatment groups (P>0.05). Dietary inclusion of millet reduced the cost of producing 1kg of feed. Therefore, millet can be used to replace maize at 100% inclusion level in the diets of quail chicks without any deleterious effect.

Key words: millet/ maize/ performance/ utilization and Japanese quails.

Introduction

Quail farming has become an important poultry business in Nigeria. Unlike in the past when all emphasis has been on domestic fowl production. Japanese quails have been reared for both egg and meat production in Nigeria, mainly by small and medium scale breeders. Quail has both nutritive and economic benefits since it is fast growing and resistant to many diseases (Oluyemi and Roberts, 2000; Abatcha *et al.*, 2009). The quail is a low volume and weight farm animal with unique advantages over other species of poultry which include fast growth, attaining market weight of 150 – 180g between 5 – 6 weeks of age, early attainment of sexual maturity, ability to come to lay as early as 5- 6 weeks of age and having a short generation interval, making it possible to have many generations in a year (Robbins, 1981; Anon, 1991) and a high rate of egg production between 180 – 250 per year (Shwartz and Allen,1981; Garwood and Diehl , 1987). In addition, quails require less floor, space about 8- 10 adult quails being reared in a space meant for one adult chicken (Haruna *et al.*, 1997), less feed requirement,whereby an adult quail requires only 20- 25g feed per day producing quail meat and egg are of high quality protein, high biological value, low body fat and cholesterol level, making it a choice product for hypertension - prone individuals (Haruna *et al.*, 1987; Olubamiwa *et al.*, 1999).

Livestock feeds have become very expensive resulting in decrease in livestock production. There is increasing competition between man and livestock for available feedstuffs for food, feed and industrial raw materials Bamgbose *et al.*, (2004) reported that maize accounts for about 45-50% of poultry feed being the most commonly used cereal by feed miller as source of energy. Therefore, any effort to substitute maize in poultry feed to reduce cost, competition as well as enormous pressure on the usage of maize will be a worthy one. The authors successfully replaced 40 % maize with maize offal / cashew nut meal based diet and

recorded no deleterious effect on carcass yield and nutrient digestibility of broiler. Olubamiwa *et al.*, (1999) and Edache *et al.*, (2005) successfully replaced 14% maize with cocoa husk meal and 42% maize with guinea corn respectively with no depressive effect on the growth of quail chicks.

Millet, maize and sorghum are carbonaceous concentrates refered to as cereals. Millet has a crude protein value varying from 9.7 – 12.87%, ether extract 2 -5%, 2 – 9% crude fibre and metablizable energy of 2984 Kcal/Kg. It has some indigestible fibre due to presence of hulls which are difficult to remove (Aduku, 2004). Sharma *et al.*, (1999) fed isonitrogenous and isocaloric diets containing maize, millet and sorghum to laying hens and obtained comparable results. Aduku (2004) also reported that millet was good substitute for either sorghum or maize in the diets of animals. There seems to be paucity of information on the use of millet as source of energy in poultry ration. Therefore, this study was designed to investigate the effect of replacing maize with millet in quail chick diets.

Materials and methods

A total of one hundred and eighty (180) one – week old (unsexed) Japanese quail (*Coturnix coturnix japonica*) chicks hatched at National Veterinary Research Institute, Vom poultry farm were selected on the basis of fitness, uniformity and body weight. They were randomly allotted to five dietary treatment groups formulated to contain graded levels of millet (0, 25, 50, 75 and 100%) in replacement of maize and designated A,B,C,D and E respectively (Table 1). All the diets were formulated to be isonitrogenous containing 22% crude protein and energy ranging between 2606.46 and 2856.64Kcal/kg (Table 1).

Each treatment group was further sub-divided into three (3) replicates of 12 birds each. All routine management practices and vaccinations were duly followed. Feed and water were provided *ad libitum*. All experimental diets were analysed for proximate chemical composition (AOAC, 2000). The birds were weighed at the beginning of the trial and weekly thereafter. The mean weekly body weight and feed intake of birds were recorded throughout the five (5) weeks experimental period. Feed conversion ratio was calculated from the mean body weights and feed intake.

Metabolic trial was carried out during the last 5 days of the experiment. Four birds were selected from each of the replicates and housed in cages well ventilated and maintaining the space requirement of 75cm^2 per bird as recommended by NVRI, (1996). Total droppings voided from each of the replicates were weighed and recorded. Wet droppings were oven dried at 65°C for 36 hours and dry matter content determined. Droppings from the same replicates were thoroughly pooled and ground. Proximate composition of the feed and droppings were determined using standard methods of AOAC (2000). Feed cost/kg was calculated using the prevailing market price of feed ingredients around Jos metropolis.

All data collected from the trial were subjected to one-way analysis of variance and Duncan Multiple Range test was used to separate the means using a computer package software statgraphics 2.0 (1987).

Results and discussion

The chemical composition of maize and millet is shown in Table 1 while the nutrient composition of the experimental diets is presented in Table 2. It was observed that millet has higher values than maize

Table 1. Proximate composition of maize and millet on dry matter basis.

Nutrients (%)	Maize	Millet
Dry matter	89.01	91.04
Crude protein	9.20	11.03
Crude fibre	2.70	8.65
Ether extract	4.60	4.63
Ash	2.15	3.20
Nitrogen free extract	70.36	63.53

Table 2. Composition of the experimental diets feed to the quail

Ingredients (%)	Replacement levels of millet (%)				
	A (00)	B (25)	C (50)	D(75)	E (100)
Maize	51.31	39.02	26.39	13.38	0.00
Millet	0.00	13.01	26.29	40.15	54.23
Groundnut cake	28.99	28.27	27.52	26.77	25.98
Wheat offal	10.00	10.00	10.00	10.00	10.00
Rice bran	3.00	3.00	3.00	3.00	3.00
Fish meal	2.00	2.00	2.00	2.00	2.00
Bone meal	2.50	2.50	2.50	2.50	2.50
Limestone	1.50	1.50	1.50	1.50	1.50
*Premix	0.25	0.25	0.25	0.25	0.25
Methionine	0.10	0.10	0.10	0.10	0.10
Lysine	0.10	0.10	0.10	0.10	0.10
Salt	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00
Calculated analysis:					
Crude protein (%)	21.04	21.03	21.04	21.04	21.02
ME (Kcal/kg)	2856.64	2749.34	2638.60	2624.04	2606.46
Ether extract (%)	4.61	4.60	4.59	4.58	4.55
Crude fibre (%)	3.73	4.48	5.27	6.04	6.90
Calcium (%)	1.64	1.64	1.64	1.64	1.64
Phosphorus (%)	0.58	0.58	0.58	0.59	0.59
Determined analysis:					
Dry matter (%)	89.80	90.30	87.80	90.20	85.80
Crude protein (%)	22.05	23.45	24.50	22.75	21.70
Crude fibre (%)	7.67	5.33	4.67	5.33	3.33
Ether extract (%)	16.50	15.00	16.00	15.00	14.00
Ash (%)	1.50	2.50	2.50	2.00	3.50
Nitrogen free extract (%)	55.28	53.72	52.33	54.92	57.47

*Premix to provide the following per kg of feed: Vit. A, 12,000 i.u ; Vit.B_1 1,200 i.u ; Vit. K, 1.8mg; Vit.B_2, 3.6mg; Biotin, 0.36mg; Vit.B_{12}, 0.01mg; Choline choride, 120mg; Chloteracycline, 48mg; Iron, 48mg; Zinc, 96mg: Copper, 60mg; Iodine, 1.8mg; cobalt, 0.4mg.

Table 3: Performance and nutr ient utilization of quail chicks fed diets containing maize and millet

Ingredients (%)	Replacement levels of millet (%)						
	A (00)	B (25)	C (50)	D (75)	E (100)	SEM	
Initial weight (g/bird)	27.78	27.78	27.77	27.59	27.23	0.14	NS
Final weight (g/bird)	141.0	147.22	150.00	142.22	140.00	1.91	NS
Daily weight gain (g/bird)	3.23	3.41	3.49	3.26	3.23	0.24	NS
Daily feed intake (g\/bird)	3.69	3.48	3.26	3.34	3.42	0.29	NS
Feed conversion ratio (FCR)	1.34	1.26	1.22	1.67	1.37	0.14	NS

NS = Non – significant (P>0.05)

Table 4. Nutrient utilization of quail chicks fed diets containing maize and millets

Nutrient digestibility	Replacement levels of millet (%)						
	A (00)	B (25)	C (50)	D (75)	E (100)	SEM	
Dry matter (%)	99.57	99.54	99.41	99.54	0.04		NS
Crude protein (%)	99.42	99.45	99.10	99.67	0.08		NS
Crude fibre (%)	97.92	98.02	97.62	97.86	0.19		NS
Ether extract (%)	99.62	99.54	99.31	99.48	0.05		NS
Ash (%)	97.90	98.61	96.86	97.93	0.29		NS
Nitrogen free extract (%)	99.77	99.81	99.65	99.67	0.03		

NS = Non – significant (P>0.05)

Table 5: Economics of feed conversion of quail chicks fed diet containing maize and millet.

Ingredients (%)	Replacement levels of millet (%)						
	A (00)	B (25)	C (50)	D (75)	E (100)	SEM	
Cost of feed/Kg (₦)	99.68	98.93	98.15	97.33	96.49		
Cost of feed/g (₦)	0.997	0.989	0.982	0.973	0.965		
Average daily feed intake/bird (g)	3.69	3.48	3.26	3.34	3.42	0.29	NS
Cost of daily feed feed intake/bird (₦)	3.68	3.44	3.20	3.25	3.30		
Daily weight gain (g)	2.23	3.41	3.49	3.26	3.23	0.24	NS
Cost of feed intake/ daily weight gain (₦)	1.14	1.01	0.92	1.00	1.02		

NS = Non – significant (P>0.05)

for all the nutrients except nitrogen free extract. A linear relationship was observed between the levels of inclusion of millet and metabolizable energy, ether extract and crude fibre fractions of the calculated nutrient compositions while crude protein and ash values did not follow any well defined trend with increased levels of millet. The metabolizable energy and ether extract contents of the diets decreased as a result of incremental substitution of maize with millet which confirmed that maize has higher energy concentrate than millet, the crude fibre content of the diets increased as the level of inclusion of millet increased which showed that millet is more fibrous than maize. This agrees with the observation of Aduku (2004) that millet has a crude fibre content of 8% while maize has 2%. The linear increase in dietary crude fire as millet level increased was a potential disadvantage because high intake of fibre has been reported to have a proportional decline in the feed utilization (Longe and Ogedegbe, 1989).

Data on the performance of quails fed graded levels of millet at the in replacement of maize are shown in Table 3. There were no significant differences ($P>0.05$) in the daily feed intake, daily weight gain and feed conversion ratio. However, birds fed diet C (50% maize: 50% millet) had the highest ($P>0.05$) daily weight gain (3.49g/bird) and the best ($P>0.05$) feed conversion ratio (1.22). The data on the nutrient utilization of quails fed graded levels of millet in replacement of maize are shown in Table 4. The digestibility of dry matter, crude protein, crude fibre, ether extract, ash and nitrogen free extract among the dietary treatment groups were similar ($P>0.05$). The result obtained in this study agrees with earlier findings that other cereals such as sorghum and millet could be a good substitute for maize in the diets of animals. Sharma *et al.*, (1999) substituted maize with sorghum and millet in the diets of laying hens and obtained comparable results. Edache *et al.*, (2005) replaced 42% of maize with guinea corn in the diets of quail chicks with no depressive effect on the growth performance.

The economics of feed conversion of the quail chicks is presented in Table 5. The cost of producing 1kg of feed decreased as the percentage dietary inclusion of millet increased. Diet A (100% maize: 0% millet) was the poorest in the economy of production by gaining 1g body weight with N 1.14 while diet C (50%maize: 50% millet) was the best as N 0.92 was expended to produce the same quantity of body weight among the treatment groups. The decrease in the feed cost per meat produced as the level of millet inclusion increased suggests that the feed ingredient (millet) is economically viable alternative for maize in the diets of quail chicks.

Conclusion

The over all results of this study showed that millet could be used as a replacement for maize at 100% level in the diets of quail chicks without any deleterious effect on growth performance and nutrients utilization.

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