Replacement Value of Sweet Potato(*Ipomea Batatas*) Meal For Maize In Practical Diets Fed To Quail (*Coturnix cotu-rnix japonica*) Chicks

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Abstract

A six -week feeding trial was conducted to determine the value of sweet potato meal in diets fed to 216 Japanese quail chicks in a brooding house. Four isonitrogenous (22%CP) diets tagged A, B, C and D incorporating graded levels (0, 13.73, 23.73 and 38.73%) of sweet potato meal respectively as replacement for maize were used in the trial. The M.E levels of the diets fluctuated between 2692; diet D and 2708kcal/kg M.E.; diet B. Each treatment was replicated thrice. Feed intake, weight gain, feed conversion ratio and feed cost/kg gain were measured among the treatments. Feed intake was higher ($P<0.05$) on diet B (818.62g) than the rest of the diets (A; 702.10g, C; 688.51g, and D; 689.96g.). Differences in weight gain (A; 122g, B; 130.50g, C; 121.37g, D; 122.15g) were not significant($P>0.05$). Feed conversion ratio (A; 6.69, B; 7.61, C; 6.12 D; 6.26) did not differ significantly ($P>0.05$) among the treatments. Feed cost/kg gain was higher ($P<0.05$) for diet D (134.81) than for other diets (A; 97.87, B; 94.23, C; 104.94) Results of this study showed that dietary level of 38.73% sweet potato meal was suitable for growth of Japanese quail chicks provided the diets are isonitrogenous and contained metabolizable energy of between 2692 and 2708kcal/kg.

Key words: Sweet potato meal, quail chicks, productive performance.

Introduction

Much care is being exercised by many people on the quantity of animal fat consumed regularly because of the health implications. Japanese quails are small-bodied birds low in body fat and cholesterol (Garwood and Diehl, 1987, Schwartz

and Allen, 1981). Therefore, much effort should be targeted to multiplying these birds for increased consumption of meat with low fat and high protein.

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. According to Bangbosc *et al.* (2004), maize accounts for about 45 to 55% of poultry feed. Therefore, any effort to substitute maize in poultry feed will significantly reduce the cost of production. They successfully replaced 40% maize with maize offal/cashew nut meal based diet and recorded no deleterious effect on carcass yield and nutrient digestibilities of broilers. The most relevant option to arrest the present feed crisis of the livestock industry is by-product utilization (Atteh, 1986). These deductions point clearly to alternative feed stuffs for use in livestock feed production in order to cut down feed prices and make them more affordable by livestock farmers. Olubamiwa, *et al.* (1999) and Edache *et al.* (2005) had also successfully replaced 14 % maize with cocoa husk meal (CHM) and 42% maize with guinea corn respectively with no depressive effect on the growth of quail chicks. Ugwuene *et al.* (2005) reported that replacement of maize with full-fat palm kernel meal at 40% supported greater weight gain in broilers and higher economic returns than control. Morrison (1961) reported that sweet potato produces more dry matter and has greater feeding value per hectare than maize. Agwunobi (1999) reported that sweet potato meal can substitute for maize in broiler starter and finisher diets at 27 and 30% respectively. Higher levels of sweet potato meals according to him resulted in wet droppings but higher carcass quality due to low abdominal fat. This study investigated the effect of replacing maize with sweet potato meal in quail chick diets.

Materials and Methods

Sweet potato: 100 kg was obtained from the open market in Bukuru, Plateau State and was verified to be in good condition, free from weevils.

Birds: Two hundred and sixteen (216) day old Japanese quail (*Coturnix coturnix japonica*) chicks hatched at National Veterinary Research Institute, Vom Poultry farm were selected on the basis of fitness, uniformity and bodyweight. They were housed in pens in a standard poultry brooding house and spaced 75 sq cm per bird as recommended (NVRI, 1996). Each pen housed 18 unsexed quail chicks. In all there were 12 experimental pens each fitted with 100-watt electric bulbs. One kerosene stove heated the entire room. Cardboard sheets designed to keep the chicks from straying away from the heat source were put in each pen. These measures were to achieve the desired brooding conditions. All chicks were weighed together in groups before they were placed in the pens and thereafter all the birds from each pen weighed at weekly interval (for six weeks). Three groups each were randomly allocated the experimental feeds (B, C and D) while control group (A) was fed with feed containing no sweet potato meal (0% level). Feed and water were given *ad libitum*.

Experimental diets

Four experimental diets were formulated to contain graded levels of sweet potato meal (0, 13.73, 23.73 and 38.73%) at the expense of maize. The diets represented as A, B, C, and D respectively were isonitrogenous containing 22 % crude protein. The energy level of the diets fluctuated between 2692; diet D and 2708kcal/

Table 1: Experimental diets (%)

Ingredients		A	B	C	D
1.	Maize	38.73	25.00	15.00	-
2.	Sweet potato meal	-	13.73	23.73	38.73
3.	Groundnut cake	30.57	31.57	31.07	32.07
4.	Wheat offal	8.00	8.00	8.00	8.00
5.	Palm kernel cake	15.00	15.00	15.00	15.00
6.	Fish meal	1.00	1.00	1.00	1.50
7.	Rice bran	2.00	2.00	2.00	1.50
8.	Bone meal	2.50	2.00	2.00	1.50
9.	Limestone	1.50	1.00	1.50	1.00
10.	Common salt	0.25	0.25	0.25	0.25
11.	Premix	0.25	0.25	0.25	0.25
12.	Methionine	0.10	0.10	0.10	0.10
13.	Lysine	0.10	0.10	0.10	0.10
		100	100	100	100
Proximate Composition (%) C.P		22.01	21.96	21.81	21.50
M.E					
Kcal/kg		2698	2708	2696	2692
Ca		1.62	1.27	1.40	1.12
P		0.56	0.47	0.40	0.40
Feed cost/kg N		29.52	27.50	25.97	23.95
Analyzed Composition (%)					
CP		22.20	22.15	22.30	22.50
Ca		1.11	1.21	1.40	1.15
P		0.61	0.64	0.67	0.69

kg M.E.; diet B. All experimental diets (Table 1) were analyzed for proximate chemical composition (A.O.A.C., 2000).

Data collection

The mean weekly body weight and feed consumption of birds were recorded throughout the experimental period. From the mean body weights and feed intake, feed conversion ratio

was calculated. Feed cost /kg diet was calculated using the prevailing market price of feed ingredients around Jos.

Data collected were subjected to two way Analysis of variance; ANOVA (Steel and Torrie, 1980).

Results and Discussion

Data on feed consumption, weight gain, feed conversion ratio and feed cost/kg gain are shown in table 2. By the 6th week of age, egg production (Table 3) had commenced among the treatment groups confirming the report of Martins (1987) that egg production among coturnix quails starts between the 5th and 6th week of age.

Data on feed consumption (Table 2) showed that treatment B had significantly higher ($P<0.05$) feed consumption values than

treatments A, C, and D. Other differences were not significant. This result disagrees with the report of Agwunobi (1999) who fed broilers with sweet potato meal and recorded no significant effect on feed intake even though the diets were isocaloric but generally agrees with the report of Akinmutimi *et al.* (2007) for rabbits. While the rabbits consumed more feed as the levels of sweet potato peels increased, the quail chicks in this study had significantly higher feed intake for diet B and thereafter leveled out with diet A with increasing content of sweet potato. However, this high feed intake for the first level of substitution seemed similar to that reported in the work of Ezeishi *et al.* (2004) who substituted maize with palm kernel cake for broilers.

Mean values for weight gain indicated that

Table 2: Effect of different sweet potato meal levels on mean feed consumption, weight gain, and feed /weight gain ratio of quail chicks at 6 weeks of age.

Parameters	A	B	C	D	SEM
Initial weight (g/bird)	9.03	8.78	9.03	8.93	± 0.112
Final weight (g/bird)	131.03	139.28	130.40	131.08	± 6.52
Feed Consumption (g)	702.10 ^a	818.62 ^b	688.51 ^a	689.96 ^a	± 7.20
Weight gain (g)	122.00	130.50	121.37	122.15	± 4.62
Feed/gain ratio	6.67	7.61	6.12	6.26	± 1.43
Feed cost (N/kg)	29.52	27.50	25.97	23.95	± 2.04
Cost/kg gain (N)	97.87 ^a	94.23 ^a	104.94 ^a	134.81 ^b	± 24.47

Table 3: Age at first/number of eggs produced by growing Japanese quails fed different levels of sweet potato meal.

Weeks	Diets			
	A	B	C	D
4	-	-	-	-
5	3	-	2	-
6	2	3	4	3
Total	5	3	6	3

there were no significant ($P > 0.05$) differences between the treatments which agrees with the report of Fatule *et al.* (2007) who fed pigs with sweet potato meal and observed no significant effect on weight gain of growing pigs. Feed conversion ratio was not significantly affected. Fatule *et al.* has also reported a non-significant effect of sweet potato meal on feed conversion ratio for growing pigs which is similar to the observations in this study. However, the work of Agwunobi (1999) reported depressive effect of sweet potato meal on broilers probably because of the wet droppings observed in his study. The mean feed cost/kg gain for diet D was higher ($P < 0.05$) than for the other diets.

This result is also contrary to the report of Turner, *et al.* (1976) but agrees with the report of Dominguez, (1990). This may be due to factors needing further investigation since the caloric level of the diets did not vary widely. Feed conversion ratio for quails is generally poor as compared to reports for chickens (Sobamiwa and Longe; 1998) and may be due to feed wastage

characteristics of quail birds. Thus, feed for growing quails may contain up to 38.73% sweet potato meal with no adverse effect on weight gain or feed conversion ratio provided the diets are isonitrogenous and contained metabolizable energy of between 2692 and 2708kcal/kg.

Conclusion

Data on feed consumption, weight gain, feed conversion ratio and feed cost/kg gain showed that the means of the various levels of sweet potato meal had significant effect on feed consumption and feed cost/kg gain. Values for weight gain and feed conversion ratio were similar. Therefore, 38.73% dietary sweet potato meal will support acceptable growth performance for Japanese quails in Plateau State during the months of March/April.

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References

- A.O.A.C (2000). Official methods of analysis Association of Official Analytical Chemist Inc. 15th Ed. Washington.
- Agwunobi, L.N. (1999). Performance of broiler chickens fed sweet potato meal (IPOMOEA BATATASL.) diets. *Tropical Animal Health and Production*, 31:383-389.

- Akinmutimi, A.H., S.F. Abasiokong and C.C. Osuagwu (2007). Growth performance of weanerrabbits fed sweet potato peels in place of maize-based diet. *Proceedings of the 32nd Annual conference of the Nigerian Society for Animal Production*.32: 347-349
- Atteh, J. O. (1986). Towards Animal protein self-sufficiency. A case of increased production of monogastric animals. The Uni Ilorin/ Fariner. 2nd Ed. 1986
- Bamgbose, A. M., Ogungbenro, S. D., Obasohan, E. E., Aruna, M. B., Oteku I. T., Igene, U. R, Otoikhian, C. S. O. and J. A. Imasuen (2004). Replacement value of maize offal/cashew nut for maize in broiler diet. *Proceedings of the 29th Annual conference of the Nigerian Society for Animal Production*.29: 219-221.
- Edache, J.A., Musa, U., Haruna, E.S., Esilonu, J.O., Jibrin, I., Okpala, E.J., and Dogo, I.G. (2005) Replacement value of guinea corn for maize in practical diet fed to quail chicks. *Animal Research International* 2(2):311-313.
- Dominguez, P.L. (1990) Sistema de alimentacion porcina con desperdicios procesados y otros subproductos agroindustriales. Taller Regional Sobre Utilizacion de los recursos alimentarios en la produccion porcina en America Latina y el Caribe FAO- Institute de investigaciones Porcinas, Habana, Cuba.
- Ezieshi, E. V., I.F. Okhuevbie, C.C. Ezennabike and J.M. Olomu (2004). Comparative performance of broiler chickens fed varying levels of palm kernel cake and maize offal. *Proc. 29th Ann. Conf. Nig. Soc. Anim. Prod.* 29: 253- 256.
- Fatule, A.A., E.G. Akinfala, and O.O.Tewe (2007). Growth performance of growing pigs fed either graded levels of sweet potato meal as a replacement for cassava flour meal or sweet potato leaves and vines meal as a replacement for wheat bran. *Proc. 32nd Ann. Conf. Nig. Soc. Anim. Prod.* 32: 512- 515.
- Garwood, V. A. and Diehl, R. C. J. (1987). Body volume and density of live coturnix quail and associated genetic relationships. *Poultry Science*. 66 (8): 1269
- Haruna, E. S., Musa, U., Okewole, P. A., Shamaki, D., Lombin, L. H., Molokwu, J. U., Edache, J. A., and Karsin, P. D. (1997). Protein requirement of quail chicks in Plateau State, Nigeria. *Nigerian Veterinary Journal*. 18: 108-113.
- Martins, B. (1987). Guinness world birds. Guinness superlatives Ltd. p. 158.
- Morrison, F.B. (1961). Feeds and feeding. 9th Ed. Morrison publishing co. IOWA. 263-341.

- N.R.C (1971).** Nutrient Requirement of Domestic Animals. No. 1. Nutrient Requirements of Poultry. 6th edition Washington D.C National Academy of Science- National Research Council.
- N.V.R.I, (1996).** Manual of quail production and Health managemant, National Veterinary Research Institute publication, Vom.
- Olubamiwa, O., Haruna, E. S., Musa, U., Akinwale, T. O., Lombin, L. H., And Longe, O.G. (1999).** Effect of different energy levels of cocoa husk-based diets on productive performance of Japanese quails. *Nigerian Journal of Animal Production*.26:88-92.
- Schwartz, R. W. and Alien, N. K. (1981).** The effect of aging on the protein requirement of mature female Japanese quail for egg production. *Japanese Poultry Science*. 60 (2) 342 - 348.
- Sobamiwa, O., And Longe, O. G. (1998).** An assessment of the optimal level of cocoa husk in broiler starter diets. *In: proceedings Silver Anniversary Conf. Of the Nig. Soc. Anim. Prod, and inaugural conf. West African Soc. Anim. Prod.*(Oduguwa, O. O., Fanimu A. O and Osinowo O. A. eds) March 1998. Abeokuta, Nigeria. Pages 161 - 162.
- Steel, R. G. D. and Torrie, J. H. (1980).** Principles and procedures of statistics. McGraw - Hill Book Co. Inc. New York.
- Turner, W.J., Malynicz, G.L. and Nad, H. (1976)** Effect of feeding rations based on sweet potato and a protein supplement to broiler and crossbreed poultry. *Papua New Guinea Agricultural Journal* 27(3)69-72.

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