Effects of feeding varying levels of bakery waste meal on the performance and carcass values of growing *Coturnix quails (Coturnix coturnix japonica)*

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Abstract

Since bakeries are scattered all over Nigeria and beyond, such feed materials like bakery waste abound and this can be tapped as a feed resource for poultry having little pressure of competition. A feeding trial of 6 weeks duration was conducted to determine the effect of replacing maize with bakery waste of CP; 3.32% and ME; 3221.88kcal/kg on the performance of growing Japanese quails. Two hundred two –week old quails of mixed sexes were randomly allocated to five diets in a completely randomized design. The five isonitrogenous (25% CP) diets incorporated 0, 8.31, 16.61, 24.92 and 28.69% of bakery waste at the expense of maize. The diets, however, varied in energy levels from 2,706.92 (Diet A) to 2,610.76kcal/kg ME (Diet E). Diets B (2,679.17), C (2,650.57) and D (2,623.75) were lower than diet A. Each diet was replicated three times. Feed intake (21.99, 20.34, 21.25, 23.83 and 22.97g/bird/day), weight gain (3.39, 3.29, 3.46, 3.61, 3.75g/bird/day) and feed conversion ratio (6.32, 6.17, 6.16, 6.62 and 6.31) did not differ significantly from the control. Water intake was significantly higher ($p < 0.05$) on diet D (33.78ml/b/day) than on diets A (30.90) and B (30.99) only. Water intake on diets C (31.89) and E (32.91ml/bird/day) were not different. Feed cost/kg gain was significantly higher ($p < 0.05$) for birds on diets B (632.00) and A (617.67) than on diets C (542.33) and D (550.67) only. Other differences were not significant. Live weight, slaughter weight, plucked weight and drumstick were better on the diet with 100% bakery waste. Feed cost per kg diet decreased from 84.62 (diet A) to 78.75 (diet E) and has a cost saving of 6.94% over the control diet. Therefore, bakery waste could completely replace maize in diets for Japanese quail chicks without adverse effect on performance.

Keywords: Bakery waste meal, water intake, Japanese quails.

Introduction

The major problem of the poultry industries is the escalating price of feed materials resulting in exorbitant products prices (Fafiolu *et al.*, 2004).

Bakery waste consists mainly of dough, sugar, icing, butter and probably other edible products used in the bakery. Since bakeries are scattered all over Nigeria and beyond, such feed materials like bakery waste abound and this can be tapped as a feed resource for poultry having little pressure of competition. Catala-Gregori *et al.* (2009), Al-Ruquaie *et al.* (2011) and Ayanrinde *et al.* (2014) supported the inclusion of bakery waste and bread waste

in broiler diets because of the benefits on performance and feed cost. The objective of this study is to determine the effect of replacing maize with bakery waste meal on the performance of growing Japanese quails. Japanese quails are little-known birds that are small-sized and early maturing (Robbins, 1981). This early maturing nature enables them to start laying as early as from the 5th week of life although adult plumage is not attained until the 12th week (Martins, 1987). Persons prone to high blood pressure and related diseases could consume the meat and eggs with less risk of experiencing such conditions. Recommended levels of some nutrients (CP, 25; ME, 2,600kcal/kg) when

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maintained in the feed is useful in achieving optimal performance in growing Japanese quails, (Haruna *et al.*, 1997; Edache *et al.*, 2005). There is paucity of information regarding the use of bakery waste in quail diet hence the need to determine the value of bakery waste for growing Japanese quails.

Materials and methods

Birds and management

200 two-week old Japanese quail birds of mixed sexes obtained from the National Veterinary Research Institute poultry farm were used in this study. They were uniform in size and body conformation and housed in deep litter house partitioned into 15 units with wire mesh to allow for adequate ventilation. There were 13 birds per unit although five units had an extra bird each. Each diet was randomly allocated three units of cages in a completely randomized design. All birds from each unit were

weighed at the beginning and weighed weekly for six weeks. The experimental diets were designated A, B, C, D and E. Diet A contained no bakery waste meal. Feed and water were given ad libitum for six weeks.

Bakery waste

Bakery wastewas collected from several bakeries in Bukuru, Jos South LGA of Plateau State. They were dried and crushed into meals and incorporated into the diets free from mould and weevils. They were analyzed for proximate chemical contents, (AOAC, 2000).

Experimental diets

Five isonitrogenous (25%CP) diets containing graded levels (0, (control), 8.31, 16.61, 24.92 and 28.69%) of bakery waste meal at the expense of maize were used in this study. The diets were designated A, B, C, D and E respectively and contained metabolizable energy (ME) levels; 2706.92, 2679.17, 2650.57, 2623.75 and 2610.76 kcal/kg respectively (Table 1).

Table 1: Composition of experimental diets (%)

Ingredients	A	B	C	D	E
Maize	33.22	23.61	13.97	4.37	-
Bakery waste meal	-	8.31	16.61	24.92	28.69
Groundnut cake	39.08	40.38	41.72	43.01	43.61
Palm kernel cake	20.00	20.00	20.00	20.00	20.00
Rice offal	2.00	2.00	2.00	2.00	2.00
Fish meal	1.50	1.50	1.50	1.50	1.50
Bone meal	2.00	2.00	2.00	2.00	2.00
Limestone	1.50	1.50	1.50	1.50	1.50
Premix	0.25	0.25	0.25	0.25	0.25
Salt	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
Calculated composition					
CP (%)	25.00	25.00	25.00	25.00	25.00
ME (Kcal/kg)	2706.92	2679.17	2650.57	2623.75	2610.76
Ca (%)	1.63	1.50	1.51	1.53	1.54
P (%)	0.65	0.52	0.53	0.56	0.57
C.F. (%)	5.25	5.13	5.01	4.88	4.82
Cost/kg(N)	84.62	82.91	81.23	79.52	78.75

*Hi Nutrient premix supplied the following per 100kg of diet: Vitamin A, 1,200,000 I.U; Vitamin D3 250,000 I.U; Vitamin E, 3,000 I.U; Vitamin K, 200mg; Thiamin, (B1) 225mg; Riboflavin, (B2) 600mg; Pyridoxine (B6), 450mg; Niacin, 4000mg; Vitamin B12, 2mg; Pantothenic acid, 1,500mg; Folic acid, 150mg; Biotin, 8mg; Choline chloride, 30,000mg; Anti oxidant, 12,500mg; Manganese, 8,000mg; Zinc, 5,000mg; Iron, 2,000mg; Copper, 500mg; Iodine, 100mg; Selenium, 20mg; Cobalt, 50mg. Key: C.P, crude protein; M.E, metabolizable energy; Ca, calcium; P, phosphorus; C.F, crude fibre.

Data Collection

The mean weekly body weights, water intake and feed intake were recorded throughout the experimental period. From the mean body weight and feed intake, feed conversion ratio was calculated. Feed cost/kg gain and 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) and where significant differences occurred, means were separated by Duncan's multiple range test (Duncan's, 1955).

Carcass evaluation

At the end of the 6 weeks feeding trial, two birds per replicate comprising one male and one females of live weight as close as possible to the mean of the treatment were randomly selected. The birds were starved overnight; weighed and slaughtered, plucked and dressed. Dressing percentage, prime cuts (drumstick, breast, back, wings and thigh) and visceral organs (heart, gizzard, liver, and intestines) expressed as a percentage of live weight was determined according to the procedure outlined by Oluyemi and Roberts (2002) for chicken.

Results and discussion

Results of measurements recorded in the trial are presented in table 2. Proximate analysis of bakery waste showed that it contained; moisture, 5.15%; crude protein, 3.32%; crude fibre, 0.00%; ether extract, 2.09%; total ash, 1.25%; N.F.E, 87.79% and dry matter, 94.45%. Values reported for bakery waste samples in this study compare closely to values for bakery waste reported by Al-Tulaihan et al. (2004) and Al-Ruquaie et al. (2011). Values for crude protein and crude fibre were not close. Crude protein was higher (12.22 – 12.93%) in their samples than what was

reported in this study probably because of the type of materials used in bakeries in the Middle East. Samples studied in this locality showed zero content for crude fibre as against 0.18 – 0.53% in previous studies (Al-Tulaihan et al., 2004; Al-Ruquaie et al., 2011) possibly due to the same factor observed earlier. Moreover, the energy level of the sample used in this study is lower than that (3,854 – 3,895kcal/kg ME) reported by previous authors (Al-Tulaihan et al., 2004; Al-Ruquaie et al., 2011). Data on feed intake, weight gain and feed conversion ratio are presented in Table 2. Feed intake and weight gain on the bakery waste diets were similar ($p > 0.05$) to the control diet. This report and that of Ayanrinde et al. (2014) were similar in terms of weight gain of broiler starters. However, Ayanrinde et al. (2014) observed significant effect of bread waste on feed intake of starter broilers. This was not observed in this study and may be due to the differences in the type of birds used. The non significant effect of the diets on feed intake, weight gain and feed conversion ratio in this study has been reported earlier (Al-Ruquaie et al., 2011). Water intake was significantly higher ($p < 0.05$) on diet D (33.78ml/b/day) than on diets A (30.90) and B (30.99) only. Water intake on diets C (31.89) and E (32.91ml/bird/day) were not different. Feed cost /kg gain was significantly higher ($p < 0.05$) on diets B (25%) and A (0%) than on diets C (50%) and D (75%). The value on diet E (100%) did not differ significantly from the control and other diets containing bakery waste showing an inconsistent trend. Similar result has been reported by Adeyemo et al. (2013) for broilers fed biscuit waste. Feed cost/kg feed decreased consistently as the levels of bakery waste increased in the diet and have a cost saving of 6.94% over the control diet.

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Table 2: Effects of various bakery waste meal levels on parameters measured

Parameters	A	B	C	D	E	SEM
Feed intake (g/b/d)	21.44	20.32	21.31	23.93	23.39	1.68N.S
Water intake (ml/b/d)	30.90a	30.99a	31.89ab	33.78b	32.91ab	0.98*
Weight gain (g/b/d)	3.39	3.29	3.46	3.61	3.75	0.20N.S
Feed/gain ratio	6.32	6.17	6.16	6.62	6.31	0.40N.S
Feed cost/kg gain	617.67b	632.00b	542.33a	550.67a	587.00ab	35.47*
Initial weight (g/bird)	22.62a	17.86b	19.05ab	19.05ab	19.05ab	1.84*
Final weight (g/bird)	146.67b	158.33b	150.00b	150.00b	175.00a	6.95NS

a,b. Means with different superscripts within a row differ significantly ($P<0.05$)

Live weight (Table 3) was significantly higher ($p<0.05$) on diet E than on the control and other diets. Slaughter and plucked weight were significantly higher on diet E than on the control. Thus showing a trend of increased live weight on the diet with complete replacement with bakery waste. This result is contrary to the report of Adeyemo et al. (2013) for broilers. It is possible that for Japanese quail, a better balance between energy and protein with increased content of biscuit waste might have promoted higher body weights and hence higher values of these carcass measures. Dressed weight was similar across the diets. It is possible that the major differences in the previous measures were responsible to internal organs. Therefore,

with the removal of internal organs, dressed weight balanced out across the diets. This is contrary to the report of Al-Tulaihan et al. (2004) for broilers and may be due to differences in species used. Gizzard percentage decreased significantly from diet A and was lowest on diet D but appreciated slightly on diet E. This is similar to what was reported by Adeyemo et al. (2013) for broilers. Aderoluet al. (2007) had shown that gizzard weight must increase due to increased activity of the gizzard to blend feed. The tendency to high gizzard value on the complete replacement with bakery waste is not clear since bakery waste was finer than maize. The value for drumstick followed the same trend with gizzard showing a higher value for birds on diet E indicating increased

Table 3: Effects of different levels of bakery waste meal on carcass values of Japanese quails

	A	B	C	D	E	SEM
Liveweight (g/bird)	146.67b	158.33b	150.00b	150.00b	175.00a	6.95*
Slaughter weight (g/b)	130.00b	143.33b	140.00ab	135.00b	150.00a	6.06*
Plucked weight(g/b)	115.00a	125.00a	125.00ab	123.33ab	135.00b	6.06*
Carcass weight(g/b)	105.00	110.00	110.00	111.67	121.67	4.83
Dressed weight(g/b)	100.00	100.00	100.00	106.67	113.33	1.83
Prime cuts and organ weights as a percentage of live weight; %						
Breast	29.36	30.90	30.70	30.13	32.05	3.62 NS
Back	25.81	34.49	29.85	27.85	30.38	4.46 NS
Drumstick	8.54a	6.67b	5.93b	5.87b	7.31ab	0.81*
Thigh	11.29	11.87	11.52	10.05	11.87	0.83 NS
Neck	5.45	8.96	6.47	5.47	5.83	1.60 NS
Wing	8.94	6.77	8.77	6.04	6.06	1.75NS
Liver	3.78	3.65	4.19	3.48	6.69	1.39 NS
Heart	1.40	1.41	1.42	1.18	1.39	0.18 NS
Intestine	7.39a	5.52b	7.95a	5.21b	9.23a	1.46*
Gizzard	5.22a	6.01a	5.42a	2.21b	5.42a	1.27*

a, b, means in the same row with different superscripts differ significantly ($P<0.05$). SEM = standard error of mean, N.S = not significant, A; control (no bakery waste meal) B; Diet with 25.60% bakery waste meal, C; Diet with 50% bakery waste meal, D; Diet with 75% bakery waste meal, E; Diet with 100% bakery waste meal.

musculature. This may be because bakery waste has higher sugar content leading to increased water and feed intake. Increased sugar intake results in acidity of the body which promotes thirst. Intestine percentage was significantly higher on diet A, C and E than on diets B and D showing no particular trend. Values measured in this study compared favourably with reports by Yisa et al. (2013) on weight for weight basis.

Conclusion

Bakery waste is obtainable from several bakeries around us and at times constitutes a waste disposal burden. The escalating cost of poultry feed could effectively be alleviated by use of cheaper feed resources like this. Comparison of the mean values of parameters (feed intake, weight gain and feed/gain ratio) showed that the mean values of these parameters were similar ($p > 0.05$). However, water intake was significantly higher on diet D than on diets A and B only. Feed cost/kg gain decreased significantly but inconsistently with increasing content of bakery waste. Bakery waste seemed to promote greater live weight, drumstick and gizzard percentage than maize and it's recommended to completely replace maize in the diet of quail chicks for profitable performance.

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