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ARTICLE

Performance and Nutrient Retention of Broilers fed Treated Pumpkin Kernel Diets in Replacement for Groundnut Cake.

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SUMMARY

A study was conducted to examine the Proximate Composition of raw Pumpkin Kernel and to assess its nutritional value with broilers. Analysis showed that the Kernel contained crude protein level (38.51%), crude fibre (13.34%), ether extract (42.69), total ash (5.14%), nitrogen free extract (0.32%), calcium (0.29%) and phosphorus (0.07%). One portion of Pumpkin Kernel was used raw and another autoclaved at 120C for 20 minutes. A third portion similarly autoclaved, coarsely ground and soaked in water for 24 hours before washing and drying were used. The three pumpkin kernel groups were finely ground and used each at single level of 225g/kg diet while the control did not have Pumpkin meal. Each diet was fed to twenty four, 2-day old, broiler chicks in three replicates of 8 chicks and feeding lasted 56 days. Weight gain of birds offered the control diet did not differ significantly ($P > 0.05$) from those fed other diets although the consumption of raw or autoclaved pumpkin kernel diets was significantly ($P < 0.05$) lower than that of control or water-washed pumpkin kernel diets. Feed utilization efficiency was similar among the dietary groups but protein efficiency ratio was superior ($P < 0.05$) with raw or autoclaved pumpkin kernel diets than with control or water washed pumpkin diets. The dietary treatments did not affect ($P > 0.05$) mortality of chicks. In addition, nutrient retention study did not reveal any significant effect of diets on the parameter. Pumpkin kernel could be a good plant protein source for broiler production. The kernel could be used raw since heating and water washing did not improve feeding value of the kernel

KEYWORDS: Groundnut cake, Pumpkin Kernel, Broilers, Performance.

INTRODUCTION

The shortage and high cost of conventional plant protein sources such as cowpea, soybean and groundnut cake due to its ever increasing demand as staple food for man, raw materials in industries and as feed ingredients for livestock has called for alternative plant proteins (legume grains) which are rich in protein and of less industrial use and human preference (Akinmutimi and Oke, 2002). Pumpkin (Cucurbita maxima Duchesne) seeds which are thrown away as wastes after removal of the flesh for food, can be utilized as poultry feed to replace groundnut cake. The kernel has crude protein of 38.51% but has some anti-nutritional factors like phenolic compounds (Zdunczyk *et al.,* 1999). Different processing methods like cooking, boiling, soaking etc. can be employed to detoxify the anti-nutritive factors. This study was conducted to determine the effect of replacing treated pumpkin kernel for groundnut cake on growth performance and nutrient retention of broilers.

MATERIALS AND METHODS

Pumpkin seeds were bought from village markets in Sokoto State. Dehulling was manually done and portions of the full-fat kernels were ground in hammer mill and analyzed for chemical constituents (AOAC, 1990). Other ingredients were purchased from reputable feed mill in Sokoto state.

Four isonitrogenous diets (23% protein) were formulated from corn-groundnut cake based diet. The test diets contained 22.5% of raw, autoclaved or autoclaved and water-washed pumpkin kernel diets were compounded, as presented in Table I. The feeding value was assessed using ninety-six, 2 -day-old broiler chicks of Ross strain. The chicks were allocated 4 treatment groups, with each treatment having three replicates of eight birds each in a complete randomized design. Chicks were reared in deep litter system using infra-red lamps for brooding

for four weeks before returning to natural illumination of above 12 hours per day. Routine management and vaccinations were carried out during the rearing period. Diets as mash and fresh water were supplied ad-libitum. Body weight of individual broiler and feed consumption (grammes) were measured weekly while mortality was recorded as it occurred. The growth study and feeding lasted for 8 weeks. Apparent nutrient retention was conducted from 50th to 56th day of the feeding trial using 12 broilers (1 bird per replicate). The birds were transferred to metabolism cages where a 3 day adjustment period was allowed before the commencement of fecal collection during the last 4 days. Daily fecal output were dried at 55^0C, ground and stored for analysis. The diets and excreta were analyzed for their chemical constituents (AOAC, 1990). All data obtained from the experiments were analyzed using SAS, (1988) based on the principles of one-way analysis of variance of completely randomized design. Treatment means were compared by Duncan multiple range test (Steel and Torrie, 1980).

RESULTS

The proximate composition of pumpkin kernel is shown in Table II. The kernel is rich in crude protein (38.51%), crude fibre (13.34%), ether extract (42.69), total ash (5.14%), nitrogen free extract (0.32%), calcium (0.29%) and phosphorus (0.07%). The growth performance characteristics of broilers fed test diets are presented in Table III. No significant difference ($P > 0.05$) was observed in the live weights of birds fed the different experimental diets. The weight gain (28.14g/day) by broiler chicks fed the control diets was numerically similar to those given water-washed pumpkin diet (28.54g/chick/day). Both were however, lower than the weight gained by birds placed on raw pumpkin diet (29.16g/chick/day) but marginally higher than the one of those fed autoclaved pumpkin diet (26.59g/chick/-day).On the contrary, birds fed the control and water-washed pumpkin diets consumed significantly more ($P < 0.05$) feed than the raw (67.04g/chick/day) or autoclaved pumpkin diets ((65.02g/chick/day). Gain to feed ratio however, did not differ ($P > 0.05$) among the different treatment groups. Protein efficiency ratios were significantly ($P < 0.05$) inferior with control (1.64) or water-washed pumpkin diets. Mortality of chicks (8.3%) was remarkably the same for all the dietary groups and was not affected by the diets. Results of the apparent nutrient retention study are presented in Table IV. Protein retention value (748.50g/kg) was higher for water-washed pumpkin and least

TABLE I: Composition of Experimental diets (%)

	Diets			
Feed Ingredients	**Control**	**RPK**	**APK**	**WWPK**
Pumpkin meal	0.00	22.50	22.50	22.50
Maize	52.84	48.18	48.18	48.18
Groundnut cake	27.11	8.22	8.22	8.22
Fish meal	4.00	4.00	4.00	4.00
Blood meal	2.00	3.00	3.00	3.00
Wheal offal	7.00	7.00	7.00	7.00
Palm oil	2.00	2.00	2.00	2.00
Bone meal	2.50	2.50	2.50	2.50
Limestone	1.50	1.50	1.50	1.50
Salt	0.30	0.30	0.30	0.30
Vit.Min.Premix	0.30	0.30	0.30	0.30
DL-Methionine	0.25	0.30	0.30	0.30
Lysine	0.20	0.20	0.20	0.20
Total	100	100	100	100
Determined analysis (dry matter)				
Crude protein	22.77	22.91	23.51	23.01
Crude fibre calculated (%)	4.78	3.79	2.79	3.79
Metabolizable energy (kcal/kg)	2985.71	4754.22	4754.22	4754.22

TABLE II: Proximate Composition of Pumpkin Kernel

Nutrients	Composition (%)
Crude protein	38.51
Ether extract	42.69
Crude fibre	13.34
Total ash	5.14
Nitrogen-free extract	0.32
Calcium	0.29
Phosphorous	0.07

TABLE III: Growth Performance of Broilers Fed Treated Pumpkin Kernel Diets Replacing Groundnut Cake

	Diets				
Performance traits	Control	RPK	APK	WWPK	SEM
Initial weight(g)	47.01	46.30	47.57	48.57	0.95
Final weight(g)	1658.56	1642.63	1633.13	1592.83	70.62
Weight gain (g/birds/d)	28.14	29.16	26.59	28.54	2.35
Feed consumption(g/bird/d)	78.81^{a}	67.04^{b}	65.02^{b}	81.39^{a}	4.33
Gain: feed ratio	0.37	0.44	0.41	0.35	0.04
Gain: protein ratio	1.64^{b}	1.88	2.06^{a}	1.52^{b}	0.13
Mortality (%)	8.3	8.3	8.3	8.3	-

^{a,b} means within the row with different superscripts letter differ significantly. ($P < 0.05$);
SEM= standard error of means.

TABLE IV: Apparent Nutrient Retention (%) of Broilers Fed Treated Pumpkin Kernel Diets Replacing Groundnut Cake

	Diets				
Nutrients	Control	RPK	APK	WWPK	SEM
Dry matter	734.4	763.5	731.9	799.7	0.035
Protein	645.9	650.4	585.7	748.5	0.055
Lipid	941.4	968.5	920.6	941.8	0.018
Total ash	382.6	314.3	422.7	454.2	0.048
Total Carbohydrate	904.6	877.0	930.0	880.2	0.042
Calcium	457.8	483.9	513.4	550.4	0.065

RPK= raw pumpkin kernel
APK= autoclaved pumpkin kernel
WWPK= water-washed pumpkin kernel
SEM= standard error of means

(645.9g/kg) with autoclaved pumpkin diets, but did not differ significantly. Similarly, autoclaved or water-washed pumpkin kernel diets enhanced apparent availability of total ash (422.7 and 545.2g/kg) and calcium (513.4 and 550.4g/kg) better than groundnut cake or raw pumpkin diets.

DISCUSSION

The high protein content of the pumpkin kernel indicated that it is a good potential protein concentrate for broiler production. The values for proximate composition of the kernel is similar to the 39.22% crude protein, 43.69% ether extract, 5.24% total ash, and 2.13% crude fibre reported by Alfawaz, (2004). However, these values are higher than those reported for the pumpkin kernel in an earlier work possibly due to different ecological zones.

The study also revealed that autoclaving alone or the combined heating and water-washing did not improve the nutritional value of raw pumpkin kernel. Instead, pumpkin may be fed in broiler diets without any deleterious effect on the performance of the birds. By implication

therefore, pumpkin kernel does not contain appreciable amount(s) of heat-labile anti-nutritional factors.

The significantly lower intake of raw or autoclaved pumpkin diets with no concomitant reduction in weight gain of broilers on these diets was surprising. The observation showed that the two diets were higher in caloric density than the groundnut cake or water-washed pumpkin diets. Moreover, it is common knowledge that birds eat to primarily meet their energy needs. The consumption of higher quantities of the control or water-washed pumpkin diets was an attempt by birds to consume equivalent amounts of energy as those fed the full-fat pumpkin diets. The presumably lower energy content of water-washed pumpkin diet was attributed to the water-washing of grated and heat-treated pumpkin kernel. During water-washing, considerable amount of oil might have leached out of the kernel. Consequently, the raw and the autoclaved pumpkin diets were more efficiently utilized and their protein efficiency ratios significantly superior to those of the other diets.

The protein efficiencies in this study were similar to the 1.65 recorded for defatted pumpkin but lower than the 2.26 for raw full-fat pumpkin kernels reported in earlier studies (Salgado and Takashima, 1992). The similarity in survival rates of chicks on the treatment groups was an indication of absence of necrotic toxins in pumpkin kernels. Even if present, the concentration would have been too low to cause any serious health hazard to the birds.

The non-significant effect of pumpkin kernels on nutrient retention strongly suggests the presence of minimal levels of anti-nutritional factors in pumpkin kernel. This is in consonance with the report of Zdunczyk *et al.* (1999) in which only small quantities of phenolic compounds, alpha-galactosides, inositol and low activity of trypsin inhibitors were found in pumpkin seed.

CONCLUSION

The study showed that pumpkin kernel contains high level of protein, which can replace groundnut cake at a level of 22.5g/kg diet. Therefore, it is potentially a good protein source for broiler production. The feeding trial revealed that raw pumpkin kernel can be used directly as protein supplement in place of groundnut cake with no deleterious effects on performance of broiler chickens. The non significant effect of pumpkin kernel on nutrient retention shows the presence of minimal levels of anti-nutritive factors in pumpkin kernel Autoclaving and water-washing had no additional value; hence further treatment seems to be unnecessary.

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