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Broiler performance on starter diets containing different levels of rejected cashew kernel meal

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Abstract

Growth performance of broiler starter chicks fed diets containing 0, 25, 50 or 75 g/kg of RCK were investigated in a feeding trial set up as a completely randomized design with four treatments, replicated four times and lasting 28 days. Broilers were finished on a common finisher diet containing 150 g/kg of RCK and growth parameters were compared after eight weeks to determine if there were any residual effects of the diets tested up to four 4 weeks. There were no significant differences (P>0.05) among treatments in growth performance (growth rate, total feed intake, feed conversion ratio). Cost of gain was, however, significantly different (P<0.001) with the control feed (0RCK) being significantly (P<0.001) more expensive than the feeds containing RCK. At the end of eight weeks, none of the experimental feeds fed in the starter phase appeared to have given any group of birds a comparative advantage. It was concluded that RCK could be included in broiler starter feeds up to a level of 75 g/kg without any deleterious effects. The need to look at optimum levels of inclusion for broilers and other classes of poultry was emphasized.

Keywords: Growth performance; reject cashew kernel; broilers; feeding trial

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Introduction

The search for alternative, locally available feed ingredients continues to be a major research focus in animal nutrition, owing to the heavy reliance on imported feed ingredients like soya bean meal and fishmeal. The development of cashew (*Anarcardium occidentale*) as an important cash crop in Ghana has led to the processing of cashew nuts into kernels. The process generates some kernels which are discarded because they are not suitable for sale as a result of being broken or oily, or because they are scorched during the drying process. It is estimated that up to about 30% of kernels may be lost in this manner depending on the quality of nuts. Although not suitable for sale, these reject cashew kernels (RCK) may find some use in animal feeding.

Fetuga et al. (1975), Fanimo et al. (2004) and Oddoye et al. (2011) reported that RCK gave good results when used in growing pig diets at a rate of 200 g/kg, 100 g/kg and 300 g/kg respectively. Reports by Odunsi (2002) and Ojewola et al. (2004) also indicated its usefulness in the feeding of poultry.

Recently, Oddoye et al. (2012) included the material in broiler finisher (4-8 weeks) diets (up to 150 g/kg) with excellent results. This trial was therefore designed to investigate the feeding of RCK to starting broilers (0-4 weeks).

Materials and methods

The experiment was carried out between October and December 2012. Reject cashew kernels (RCK) were bought from a cashew processing plant at Mim in

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the Brong Ahafo Region of Ghana and transported to the Cocoa Research Institute, Tafo (Eastern Region) where it was sun dried, bagged and stored for later use. Other feed ingredients used for the experimental diets were purchased from reputable local feed ingredient dealers. The experiment was carried out at the Bunso Sub-station of the Cocoa Research Institute of Ghana, Bunso, in the Eastern Region of Ghana. Four experimental diets were formulated; a control treatment using no RCK, and three treatments using 25, 50 or 75g/kg RCK (Table 1). As the level of RCK increased, the levels of other ingredients such as soya bean, wheat bran, fish and maize were adjusted to ensure that diets were iso-energetic and iso-nitrogenous. Diets were formulated to meet NRC (1994) minimum protein requirement of 230 g/kg for broiler starter diets. All experimental diets were subjected to proximate analysis (AOAC, 2000). Calcium and phosphorous were determined using atomic absorption spectrophotometry. Reject cashew kernels used in this experiment formed part of a batch used in an earlier experiment (Oddoye et al., 2012) and the proximate analysis was carried out in that earlier experiment was relied on (Table 1).

A total of 352 day-old unsexed COBB-500 broiler chicks were procured from Darko Farms and Company Limited, Kumasi, Ghana. Each treatment was replicated four times and each replicate had 22 birds, making 16 experimental units in all. Replicate groups of birds were placed in separate pens in a concrete floored, deep litter house, using wood shavings as litter. The upper half of the building was completed with wire mesh to ensure adequate ventilation. Pens were randomly allocated to the treatments. The initial weight of each replicate was taken. Birds were maintained on a 23-hour light regime. Water and feed were supplied to them *ad libitum* over the experimental period. Other management practices such as routine vaccination and drug administration were carried out as and when required. Any feed left over at the beginning of the next day was weighed and subtracted from that which had been fed the previous day to determine feed intake. This was pooled for the experimental period of 28 days. Final weight of the replicate, weight gain and average daily gain were also determined.

Feed conversion ratio (quantity of feed required for one kilogram of gain) was calculated as weight gain in kilograms divided by the weight of feed consumed in kilograms during the experimental period. Similarly, the cost of gain was calculated as the weight of feed consumed in kilograms multiplied by the price of feed per kilogram.

Finisher phase

After data had been collected at the end of the fourth week, birds were finished on a common finisher feed with 190 g/kg crude protein and containing 150 g/kg reject cashew kernel until the end of week eight. Data on feed intake was collected for this final four-week period. Birds were weighed at the end of the period. Weight gain for this period was calculated as weight at the end of the period less the weight at the beginning of the period. This weight gain divided by the total feed consumed was expressed as the feed conversion ratio for the period. Average weight gain was estimated as weight gain divided by 28.

Statistical analysis

The experiment was laid out as a completely randomized design with four treatments replicated four times making a total of 16 experimental units. All data collected were subjected to analysis of variance using GENSTAT Release 9 (2007) software. Initial weight of each replicate was used as a covariate in the analysis of variance for average daily gain, total feed intake and feed conversion ratio for both starter and finisher phases. Significantly different means were separated using LSD.

Results

The composition of experimental feeds and their calculated nutrient analysis is shown in Table 1. The table shows that as the level of RCK in the diet increased, the level of maize and soya bean meal in the diet reduced. Table 2 shows proximate analysis of reject cashew kernel (Oddoye et al., 2012) and experimental feeds. Values for ether extract in the experimental feeds increased with increasing content of reject cashew kernel, probably because of the high fat content of the material (580 g/kg).

Average daily gain ranged from 25.31 g/bird (T3) to 27.02 g/bird (T1) (Table 3) and were not significantly ($P>0.05$) different. Similarly, total feed intake per bird for the twenty eight days period and the feed to gain ratio were not significantly different ($P>0.005$) and ranged from 1.65 kg in 25RCK to 2.07 kg in 0RCK and from 2.31 in 25RCK to 2.72 in 0RCK for total feed intake and feed conversion ratio, respectively (Table 3). Cost of gain was, however, significantly different ($P<0.001$) among the treatments. Treatment 0RCK was significantly more expensive ($P<0.001$) as compared to treatments 25RCK, 50RCK and 75RCK.

Table 4 shows data at the end of 8 weeks when the birds were market ready. The table indicates that all birds had grown uniformly and as such there were no significant differences ($P>0.05$) in growth parameters (final weight, feed intake and feed conversion ratio).

Table 1: Composition of experimental feeds

	Experimental feeds			
Ingredients (g/kg)	0 RCK	25 RCK	50 RCK	75 RCK
Reject cashew kernel	0	25	50	75
Maize	640	610	580	530
Wheatbran	0	16.5	31.5	76.5
Soyabean cake	251.5	240	230	210
Fishmeal	85	85	85	85
Oyster shell	10	10	10	10
Dicalcium phosphate	5	5	5	5
Common salt	2.5	2.5	2.5	2.5
Vitamin/mineral mix*	2.5	2.5	2.5	2.5
Synthetic lysine	1.5	1.5	1.5	1.5
Feed enzyme	1	1	1	1
Mycofix**	1	1	1	1
TOTAL	1000	1000	1000	1000
Calculated analysis				
Metabolizable Energy (MJ/Kg)	12.5	12.62	12.73	12.66
Crude protein (g/kg)	230	230	231	231
Lysine (g/kg)	14.4	14.7	15	15.1
Methione + cystine (g/kg)	4.4	4.4	4.5	4.5
Calcium (g/kg)	11.4	11.3	11.3	11.3
Available phosphorus (g/kg)	5	5.2	5.2	5.7
Cost (GH¢ metric/tonne)	1,500.00	1,140.00	1,130.00	1,100.00

NB; 1. 1GH¢ = 0.53USD as at December 31, 2012; * Vitamin/mineral mix (vital Broiler and Chick premix-G 2.5g kg-1) contains per kilogram of premix: vitamin A (11,000 IU); vitamin E (5 mg); folic acid (0.36 mg); calcium panthothenate (0.4 mg); vitamin B12 (12 µg); vitamin B6 (1.6 mg); vitamin D (2,000 IU); vitamin K (1.2 mg); niacin (1.6 mg); vitamin B2 (2.4 mg); vitamin B1 (0.6 mg); biotin (0.08 mg); choline chloride (24 mg); manganese (50 mg); zinc (40 mg); copper (2.8 mg); iodine 932 mg); selenium (0.16 mg); cobalt (0.4 mg); and ethoxyquin and BHT; ** Mycofix Select 3.0 (BIOMIN GmbH, Herzogenburg, Austria) is a commercial mould fixing agent which is added to feeds at a rate of 1 Kg per 1000 Kg of feed. It binds mycotoxins *in vivo* preventing them from causing harm to the animals; **Key:** 0RCK - Control, 25RCK - 25 g kg^{-1} reject cashew kernel in feed, 50RCK - 50 g kg^{-1} reject cashew kernel in feed, 75RCK - 75 g kg^{-1} reject cashew kernel in feed

Table 2: Proximate analysis of reject cashew kernels (RCK) and broiler starter feeds

Proximate fraction (g Kg^{-1})	RCK*	0RCK	25RCK	50RCK	75RCK
Dry matter	870	985	983	985	984
Organic matter	980	937	931	935	932
Crude protein	229	229	225	227	225
Ether extract	580	10	45	47	53
Crude fibre	27.5	20	23	21	20
Nitrogen free extractives	13.5	663	617	625	618

* Data from Oddoye et al., (2012); **Key:** 0RCK - Control, 25RCK - 25 g kg^{-1} reject cashew kernel in feed, 50RCK - 50 g kg^{-1} reject cashew kernel in feed, 75RCK - 75 g kg^{-1} reject cashew kernel in feed

Table 3: Growth performance of broiler starter chicks on the experimental diets

Test Parameter	0RCK	25RCK	50RCK	75RCK	SED	SIG
Average daily gain (g/day)	27.02	25.51	25.31	25.76	1.789	NS
Total feed intake/bird (Kg/bird)	2.07	1.65	1.80	1.76	0.188	NS
Feed conversion ratio	2.72	2.31	2.56	2.44	0.209	NS
Cost of gain (GH¢)	4.08[a]	2.63[b]	2.89[b]	2.69[b]	0.250	***

SED: Standard error of the difference between two means; SIG : Level of significance; NS – not significant (P>0.05), * - P<0.05, ** - P<0.01, *** - P<0.001; Means in a row with different postscripts are significantly (P<0.05) different; **Key:** 0RCK - Control, 25RCK - 25 g/kg reject cashew kernel in feed, 50RCK - 50 g/kg reject cashew kernel in feed, 75RCK - 75 g/kg reject cashew kernel in feed

Table 4: Growth performance of broiler finisher chicks by the end of experimental

Test Parameter	0RCK	25RCK	50RCK	75RCK	SED	SIG
Average daily gain (g day^{-1})	57.0	58.9	57.8	59.8	2.78	NS
Total feed intake/bird (g $bird^{-1}$)	4328	4342	4320	4350	0.08	NS
Feed conversion ratio	2.71	2.63	2.67	2.60	0.22	NS

SIG: Level of significance; NS – not significant (P>0.05), * - P<0.05, ** - P<0.01, *** - P<0.001; Means in a row with different postscripts are significantly (P<0.05) different; **Key:** 0RCK - Control, 25RCK - 25 g/kg reject cashew kernel in feed, 50RCK - 50 g/kg reject cashew kernel in feed, 75RCK - 75 g/kg reject cashew kernel in feed

Discussion

Though not significantly (P>0.05) different, birds on feeds containing reject cashew kernel generally consumed less feed. Thus, even though the chicks ate less of the diets containing reject cashew kernels (RCK) they still grew at an appreciable rate. It is likely that the calorific value of reject cashew kernels was higher than what was estimated and may have led to lower feed intake in birds with reject cashew kernels in their diets as compared to the control as birds are known to eat to satisfy their energy requirements. It is also known that the inclusion of fat and oils in poultry feeds reduces dustiness of feed and also decreases wastage and these factors could also have had a part to play. Feeds with RCK, because of its high fat content (over 500 g/kg) were less dusty and easier for the chicks to pick. The reduction in feed intake in the feeds containing reject cashew kernels was reflected in the FCR figures with the feeds with reject cashew kernel having lower values than the control.

Odunsi (2002) reported similar findings in a feeding experiment with pullets which were fed with diets containing 0, 5, 10, 15 and 20% reject cashew kernel meal from week 12-20. Birds on feeds containing reject cashew kernel meal had lower feed intake than the control diet, although the differences were not significant (P>0.05). On the contrary, Oddoye, et al. (2012) found no such differences when he fed reject cashew kernels to broiler finishers.

The reduction in the level of maize and soya bean in the diets, as the level of RCK increased, coupled with the relatively low price of RCK accounted for a lower feed price for the feeds containing RCK and also affected the price of gain. As at the time of the experiment, reject cashew kernels, maize and soya bean meal cost GH¢0.50, GH¢ 0.76 and GH¢1.40, respectively per kilogram. Similarly, Oddoye et al. (2012) reported that broiler finisher feeds containing 100 g/kg RCK and 150 g/kg RCK were significantly cheaper (P<0.001) than the control feed with no RCK.

In conclusion, the results of the study indicate that reject cashew kernels can be included in broiler starter diets up to a level of 75 g/kg without any deleterious effects and that the feeds fed during the starter phase did not give any treatment an advantage by the end of the finisher phase. Reject cashew kernels could be a valuable feed ingredient for the poultry industry. This full-fat material has the potential to reduce the inclusion of maize, soya bean meal and fishmeal in poultry diets. It will also help reduce dustiness in poultry feeds because of its high fat content. Future work will need to look at optimum inclusion rate for both broiler starter and finisher diets, and also investigate its use in chick starter, grower and layer feeds as well.

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