Journal of Agriculture and Environment Vol. 7 No. 1, June 2011: 17-22
ISSN 1595465X

REPLACEMENT VALUE OF CASSAVA PEELS FOR MAIZE IN THE DIET OF BROILER STARTERS IN A SEMI-ARID ENVIRONMENT OF NIGERIA

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ABSTRACT

The study investigated the replacement value of cassava peels (CSP) for maize (MZ) in broiler starter diets. CSP replaced MZ at various levels (0, 25, 50, 75 and 100%) for diets 1, 2, 3, 4 and 5, respectively. A total of 150day old chicks were used for the experiment. The chicks were divided into 15 groups. Three groups were allocated to each treatment as replicates. The birds (*arbor acre* strain) were fed *ad libitum* for 28 days. Results showed that average feed intake (AFI) and body weight gain (BWG) were significantly higher ($P<0.5$) for birds fed diet 3. Feed conversion ratio (FCR) and cost of feed consumed/bird decreased as CSP level increased. Cost/kg live weight gain was lower ($P<0.5$) for diet 3. Results on cost-benefit ratio showed 21% reduction in cost for diets with cassava peels replacing maize. Average mortality of 10% was recorded during the trial for treatments except those fed diets 3 with significantly lower mortality of about 7% compared to those fed diet 5. It could be concluded that CSP could replace maize up to 50% in the diets of broiler starters without negative effect on performance characteristics.

Keywords: Cassava peels; Maize; Broiler starters

INTRODUCTION

In Africa, and indeed in Nigeria, the high cost of cereal grains and cassava could have been caused by weather fluctuations, huge foreign debt, currency devaluation and increasing demand of cassava pulp for human food and other industrial uses (Tewe, 2004). This has forced a number of developing countries, including Nigeria, to look for alternative feed ingredients.

The use of cassava peels in animal feed industry could be one of the ways of reducing high cost of broiler feed since abundant cassava peels are generated as by-products from cassava processing industries annually (Hahn, 1988). The peels could be used as source of energy in livestock feeds, provided the ingredient is adequately balanced with other nutrients (Tewe and Egbunike, 1992). Obioha (1992) reported that cassava peel constitutes 11-12% of the total cassava root, its chemical and proximate composition reveals high gross energy value (3810 kcal/kg), low protein (4.0%), digestible fat (0.9%),

crude fiber (4.7%), ash (1.9%), and nitrogen free extract (88.5%) that could be efficiently utilized by poultry.

Hydrogen cyanide and high fiber content are the most limiting factors in the use of cassava and its by-products in poultry rations. However, adequate processing methods like sun-drying and inclusion of additives such as methionine, cystine and Roxazyme-G enzyme in the diets had been reported to enhance its utilization in broiler chickens (Bashar, 1997; Ojo and Deane, 2002; Abubakar, 2005). This study was conducted to assess the performance characteristics of broiler starter chicks fed graded levels of cassava peels as replacement for maize.

MATERIALS AND METHODS

Study Area

The study was conducted at the Poultry Production Unit of the Department of Animal Science Teaching and Research Farm, Usmanu Danfodiyo University, Sokoto. The State is located in the Sudan Savannah zone in the extreme North-western part of Nigeria, between Longitudes 4^0 8' and 6^0 54'E and Latitudes 12^0 0' and 13^0 58'N (Mamman *et al.*, 2000). The State has a semi-arid climate, which is characterized by low rainfall of 750mm, potential evapo-transpiration rate of 162cm and long dry season from January to May and sometimes June. The mean annual ambient temperature is 34.9^0C, with the highest (41^0C) occurring in April and a minimum of 13.2^0C in January (Mamman and Udo, 1993). Humidity in the extreme northern part of the state in January could be as low as 20% while in the southern part it could be between 20 and 40%. Solar radiation is relatively high, resulting in dry atmosphere and clear skies.

Experimental Animals and their Management

One hundred and fifty day-old broiler chicks of both sexes were purchased from a reliable hatchery (Zartech Farm Ibadan) through their dealer in Sokoto. The chicks were housed in a deep litter pen. The chicks were acclimatized to the environment using a commercial broiler starter diet for seven days, they were managed intensively and group fed for physiological adjustment before the commencement of the experiment.

Preparation of Experimental Feed

The cassava peels used were obtained from cassava variety MR-8083 collected from Mange village in Tambuwal Local Government Area of Sokoto State. The peels were sun-dried for 10 days. Thereafter, the dried cassava peels were ground and packed in bags for storage and stored prior to feed formulation. All other ingredients used for diet formulation were purchased from the main market in Sokoto. Soy beans used for the experiment were processed by boiling at 100^0C for 30 minutes to reduce some of the anti nutritional factors Bashar (2008).

Experimental Diets and Design

Five diets were formulated with cassava peels (CSP) replacing maize (MZ) at various levels of 0, 25, 50, 75 and 100% (for Diets 1, 2, 3, 4 and 5) respectively. Diet 1 without cassava peels served as control (0% CSP and 100% MZ), diet 2 (25% CSP and 75% MZ), diet 3 (50% CSP and 50% MZ), diet 4 (75% CSP and 25% MZ) and diet 5

(100% CSP and 0%MZ). All diets were compounded to be iso-nitrogenous and iso-caloric. The gross and calculated chemical compositions of the experimental diets are shown in Table 1. A completely randomized design (CRD) was used for the experiment.

Data Collection

The chicks were weighed and balanced for weight (85g for each treatment group) before the commencement of the trial and thereafter on weekly basis. Daily records of feed intake and mortality (when it occurred) were taken throughout the 28day period.

Data Analysis

Data generated were subjected to analysis of variance (ANOVA) using SPSS (1999) package. Means were compared using Duncan's New Multiple Range Test (DNMRT) following the procedure outlined by Steel and Torrie (1980).

Table 1: Composition of experimental diets for broiler starters (g kg^{-1})

Ingredients	Diets				
	1	2	3	4	5
Maize	51.00	38.25	25.50	12.75	0.00
Cassava peels	0.00	12.75	25.50	38.25	51.00
Wheat offal	9.10	8.90	8.13	7.80	7.10
Groundnut cake	21.80	22.50	22.50	22.60	24.00
Soybean meal	6.00	6.00	7.00	7.80	7.90
Fish meal	3.20	4.10	4.77	5.50	5.80
Bone meal	0.30	0.10	0.05	0.01	0.01
Groundnut oil	4.60	3.40	2.55	1.29	0.19
Others*	4.00	4.00	4.00	4.00	4.00
Total	100	100	100	100	100
Calculated analysis					
Crude protein (g kg^{-1})	24.03	24.03	24.01	24.01	24.01
ME (Kcal kg^{-1})	2965	2965	2966	2966	2966
Cost/kg (N)**	39.57	36.78	33.97	33.11	31.14

* Vitamin premix (0.3g kg^{-1}), Blood meal (3.0 g kg^{-1}), Methionine (0.20g kg^{-1}), Lysine (0.25g kg^{-1}), salt (0.25 g kg^{-1}); **Feed cost per kg was calculated on the basis of prevailing market prices of ingredients as at the time of experiment.

RESULTS AND DISCUSSION

Results of the study (Table 2) showed that total feed intake (TFI) of chicks on diets 2 (1,470g), 3 (1,469g) and 4 (1360g) were significantly higher ($P<0.05$) compared to other treatments, with the lowest recorded for chicks on diets 1 (1,183g) and 5 (1260g). The increased feed intake recorded by chicks fed cassava peel diets could be a direct

consequence of poor utilization, so the birds had to eat more to satisfy their energy requirement. The result of this study is in agreement with findings of Iyayi and Tewe (1994) and Aderemi (2001) who reported increased feed intake in swine and layers as cassava by product level increased in the experimental diets. Average final weights (AFW) and body weight gain (BWG) of chicks on diets 1, 2, 3, and 4 were statistically similar, but the chicks on diet 5 recorded the lowest ($P<0.05$) final body weight (701g). Feed conversion ratio (FCR) followed similar pattern. Chicks on diets 1, 2, 3, and 4 had similar FCR but significantly higher than chicks fed diet 5. Mortality of 6.6% for chicks fed diet 3 was significantly lower ($P<0.05$) compared to mortality of 10% recorded for chicks fed diets 1, 2 and 4. The Highest mortality of 13.3% was recorded for the chicks fed diet 5. The mortality was not as a result of the inclusion of cassava peels but possibly due to coccidiosis outbreak during the trial. The disease could affect birds earlier than the prescribed initial vaccination day (Ross, 2007) as the majority of the deaths occurred between the $3^{rd} – 8^{th}$ days.

Table 2: Performance characteristics of broiler starter chicks (1 to 5 weeks).

Parameters (Average/bird)	DIETS					SE ±
	1	2	3	4	5	
Initial body weight (g)	85.0	85.0	85.0	85.0	85.0	0.00
Final body weight (g)	970^{a}	1039^{a}	1038^{a}	909^{a}	701^{b}	17.63
Body weight gain (g)	885^{a}	954^{a}	953^{a}	824^{a}	616^{b}	42.60
Total feed intake/bird (g)	1183^{c}	1470^{a}	1469^{a}	1360^{ab}	1263^{cb}	47.80
FCR	1.59^{b}	1.86^{ab}	1.84^{ab}	1.80^{ab}	2.37^{a}	0.20
Mortality (%)	10.0^{ab}	10.0^{ab}	6.66^{b}	10.0^{ab}	13.3^{a}	4.53

a, b, c. means not followed by same letters are significantly different ($p<0.05$) along the same row.

Cost-benefit Analysis

Results on cost benefit are shown in table 3. The results indicated that cost of feed (₦/kg) decreased from ₦39.57 for chicks on diet 1 to ₦31.14 for those on diet 5. Percentage cost reduction range from 7.1 for chicks on diet 2 to 21.3 for chicks on diet 5. The cost of feed consumed per bird/day was lower (₦39.33/day) for those on diet 5 and higher (₦54.06/day) for those on diet 2. The cost of feed consumed/bird (₦/day) did not indicate any significant difference between chicks for all treatments. Cost of feed per kg live weight gain (₦/kg) was similar to cost of feed consumed per bird. In a related study with pigs, Adesehinwa *et al.* (2011) reported significant reduction in total cost of feed consumed per body weight gain when maize was replaced with cassava peels.

Table 3: Cost-benefit analysis of broiler starter experiment.

Parameters (Average/bird)	Diets					
	1	2	3	4	5	SE ±
Cost of feed (₦/kg)	39.57	36.78	33.97	33.11	31.14	
Cost reduction (%)	0.00	7.10	14.20	16.30	21.30	
Cost of Feed Consumed/bird (₦/day)	46.81	54.06	49.90	45.03	39.33	1.67
Feed Cost/kg weight gain(₦/kg)	52.89	56.67	52.36	54.65	63.85	7.05

CONCLUSION

The results showed that cassava peels can replace maize up to 50 % without any adverse effects on the performance characteristics of broiler starter chicks.

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