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Replacement Value of Enzyme Supplemented Dried Cassava Peel Meal for Whole Maize on the Performance of Laying Birds

M.U. Mbachu[1], A.U.C. Ohanaka[3], C.I. Akalonu[2], V.N. Okonkwo[2], T.K. Obih[2] and B.U. Ekenyem[2]

[1]Department of Agriculture, Alvan Ikoku Federal College of Education, Owerri Nigeria; [2]Department of Animal Science and Fisheries, Imo state University P.M.B 2000, Owerri Nigeria; [3]Department of Animal Science and Technology, Federal University of Technology, Owerri, Nigeria

Corresponding author: M.U. Mbachu; E-mail: mbachumarita@gmail.com; Tel: 08033534153

Abstract

The objective of this study was to determine the replacement value of enzyme supplemented dried cassava peel meal (ESDCPM) for whole maize on the performance characteristics of laying birds. Sixty (60) laying birds were randomly assigned in triplicates of five birds per replicate to four experimental diets containing graded levels of EDSCPM at 0, 18, 36 and 54% respectively. Proximate composition of the dry cassava peel meal (DCPM) was determined at the beginning of the experiment. Results of the experiment indicated that the control (0%) and T2 (18%) ESDCPM inclusion had similar ($p>0.05$) and superior hen day production percentage ($p<0.05$) over diets containing 36% and 54% ESDCPM inclusion while feed intake were higher ($p<0.05$) for ESDCPM based diets. Total egg production was also negatively affected with increasing inclusion of ESDCPM in the diets. Cost implication revealed that eggs were cheaply produced with 0 % and 18 % ESDCPM. It can be concluded that ESDCPM can be used up to 18% for optimum production and cost effectiveness in the diets of laying birds.

Key words: enzyme, dried cassava peel meal, performance, cost benefit, layers

Introduction

The escalating prices of livestock/poultry feeds which stems from the high cost of conventional energy and protein sources have adversely affected production in Nigeria. Consequently, Madubuike (2004) had reiterated that the search for alternative feed ingredients especially for the non-ruminants has become necessary to save both man and his livestock from hunger and malnutrition. In proffering solution to the high cost of feed ingredients in the livestock industry, Obih (2009) stated that the possible option is to explore the utilization of those feed resources that are not directly dependent by humans for food. In this regard, the agricultural by-products that are hitherto discarded can have a major effect in reducing the production cost since there is little or no competition for them. One of such agricultural by-products that could be used for partial replacement of maize in animal diets is the processed cassava peel meal (Salami, 2000).

Cassava plant from where the peel is generated is a tropical crop that can be successfully grown on marginal soils, giving reasonable yields where many other crops cannot thrive. Cassava peel is the outer covering of the cassava tuber accounting for about 10-13% of the tuber weight (Tewe, 2000). However, the utilization of CPM as a feed resource in livestock feeding is limited by some naturally occurring toxins like cyanogenic-glucosides which on hydrolysis produce hydrogen cyanide that is poisonous to monogastrics. Though some work has been carried out with cassava peels on pigs and broiler birds. However, less attention has been given to the effect of cassava peels on laying birds.

The focus of this work is to determine the effect of ESDCPM on the overall performance in laying birds.

Materials and Methods

The fresh cassava peels were sourced from rural farmers in Irete and Orogwe in Owerri West Local Government Area of Imo State. The peels collected were sun dried on clean dry zinc surface until they become crispy and were subsequently milled using a hammer mill to produce CPM. Thereafter, the CPM was subjected to proximate analysis (Table 1) using the standard method (AOAC, 1995).

Sixty (Nera black strain) laying birds were randomly assigned in triplicates of five birds per replicate to four experimental diets containing graded levels of ESDCPM at 0, 18, 36 and 54% of the feed respectively (Table 2). The birds were managed intensively as practiced at the Teaching and Research Farm of Imo State University Owerri. The birds initial live weights were ascertained at day 0 and their final weights measured at day 56 of the experiment. Also measured were, feed intake, feed conversion ratio (FCR), egg weight. The percentage hen-day production was computed as the total number of eggs over the total number of days multiplied by the number of hen. Fresh eggs were collected per replicate, weighed and broken into a flat non-absorbent surface glass slab for the determination of internal and external egg characteristics. Albumin height was measured using the tripod micrometer as described by Haugh (1937) while shells of egg were also measured for thickness using

the micro meter screw gauge. Using the values obtained for albumin height and egg weight, the Haugh unit was calculated. H= observed albumin height in millimeters and W= observed egg weight in grams.

Data obtained were subjected to analyses of variance using SPSS version 20. (SPSS, 2012) and the differences between the treatment means were compared using the Duncan Multiple Range Test.

Table 1: Proximate composition of cassava peel meal

Nutrient composition	Percentage
Moisture content	10.60
Crude protein	5.51
Ether extract	3.53
Ash	5.01
Crude fibre	15.49
Nitrogen free extract	59.86

Table 2: Nutrient composition of the COLM based diet for laying hen

Ingredients g/100g	T1	T2	T3	T4
Maize	54.00	36.00	18.00	0.00
Cassava peel meal	0.00	18.00	36.00	54.00
Soya meal	10.00	10.00	10.00	10.00
Groundnut cake	8.00	8.00	8.00	8.00
Palm kernel cake	5.20	5.20	5.20	5.20
Fishmeal	5.00	5.00	5.00	5.00
Wheat offal	9.00	9.00	9.00	9.00
Bone meal	8.00	8.00	8.00	8.00
Common Salt	0.30	0.30	0.30	0.30
Vit./ trace mineral premix	0.25	0.25	0.25	0.25
Lysine	0.15	0.15	0.15	0.15
Methionine	0.10	0.10	0.10	0.10
Total	100.00	100.00	100.00	100.00
Calculated nutrient composition				
Crude protein%	19.09	17.74	16.39	15.04
ME Kcal/ kg	2759.96	2717.84	2675.72	2633.60

Results and Discussion

The growth performance data of layer birds fed varying levels of enzyme supplemented dried cassava peel meal (ESDCPM) are shown in table 3. Results of the experiment showed a progressive increase in average daily feed intake with ESDCPM inclusion in the diet. This is probably due to the high fibre content and energy dilution of the ESDCPM diets. The birds therefore ate to satisfy their energy requirement (Ukachukwu, 2008). This is in agreement with the findings of Ijaiya *et al*. (2002) who reported higher feed intake with increasing levels of fermented cassava peel meal (CPM) (up to 30%) in the diets of rabbits. Odunsi *et al*. (2001) also reported an increased intake when CPM was used to replace maize between 0-30% in broiler and layer diets.

Table 3: Performance characteristics of layers fed varying dietary levels of ESDCPM.

Parameters	T1	T2	T3	T4	SEM
Initial body weight (kg)	1.88	1.85	1.86	1.85	0.03
Avg. daily feed intake (g)	112.18^{b}	118.77^{b}	122.81^{b}	137.63^{a}	34.21
Total egg production	467.00^{a}	434.00^{b}	313^{c}	210^{d}	30.83
Hen day production %	69.46^{a}	64.64^{a}	46.60^{b}	31.25^{c}	4.61
Avg. egg weight (g)	56.00	60.33	58.00	57.33	1.5
FCR	2.90^{c}	3.03^{c}	4.20^{b}	6.88^{a}	0.5
Total feed cost (N)	9818.40^{a}	9340.40^{b}	7862.40^{c}	6784.40^{d}	3.66
Feed cost/kg of feed (N)	98.18^{a}	93.40^{b}	78.64^{c}	67.84^{d}	3.66
Feed cost/kg of egg (N)	284.73^{c}	283.00^{c}	330.22^{b}	466.76^{a}	22.63

Feed cost/ egg (N)	15.44^{c}	17.07^{c}	19.15^{b}	26.75^{a}	1.29

Means with different superscript on the same horizontal row are significantly different@ ($p<0.05$)

The relationship between voluntary feed intake and caloric content of animal diets is that animals eat more of a low energy diet than a high energy diet in an attempt to cancel out energy deficit (Ojewole and longe (1999). Hen-day production percentage was negatively affected beyond 18% ESDCPM inclusion despite the increased feed intake recorded by the birds in these groups. This may be attributed to the energy dilution of the ESDCPM supplemented diets and the high dietary fibre content of the test diets. The result also conforms to the findings of Aderemi *et al*. (2012), who reported decreased hen-day percentages with increased inclusion of whole cassava meal in the layer ration.

The mean egg weights across the means were similar which is suggestive that even at a higher inclusion; ESDCPM did not affect egg weight. The egg weights obtained in this study were within the recommended weights of 56-65 grams for exotic strain (Oyenwumi, 2013). Egg size and number are the major cost indices in commercial egg production because they determine to a large extent the price of eggs in the poultry industry. Feed conversion ratio (FCR) was however negatively affected by ESDCPM inclusion beyond T2 (18%). This also indicates that T1 and T2 ate significantly less amount of feed to produce a kilogram of egg. Ijaiya *et al.* (2002) noted that a high dietary crude fibre level due to CPM reduced feed conversion efficiency. The reduced efficiency may be due the dustiness/powdery nature of the CPM, low energy and high HCN content of the CPM diets (Ukachukwu, 2008).

The total cost of feed and feed cost per kilogram of feed produced were lowered with increased ESDCPM inclusion. The ESDCPM supplemented diets were cheaper than the control diet hence could reduce the cost of feed required for egg production. However, feed cost per kilogram of egg produced and feed cost per egg produced were lower for the control birds while it increased progressively in the test diets. Diet T2 was similar to T1 but differed significantly from T3 and T4. It was cheaper to produce a kilogram of egg using the T2 diet. The result of the experiment also showed that feed cost/kg of egg and feed cost/egg were all functions of FCR. Birds that had lower FCR values (T1 and T2) produced cheaper eggs in comparison with high FCR values (T3 and T4). The fibrous nature of the T3 and T4 diets may have diluted the energy required by the birds to lay.

The results of the egg quality characteristics of laying birds fed ESDCPM are summarized in table 4. The test diets had the best egg shell thickness. This is in agreement with the findings of Aderemi *et al*. (2012) and Oyenwumi (2013) who reported increased egg shell thickness when cassava grit meal and whole cassava meal were included in the diet of layer birds. Ensiled dried cassava peel meal may have substances that increases shell thickness of eggs or releases the minerals in the diet. Again, it has also been reported that cassava based diets did not interfere with calcium metabolism in laying hen (Lawal, 1992).

Table 4: Egg characteristics of layers fed varying dietary levels of ESDCPM

Parameters	T1	T2	T3	T4	SEM
Avg. egg shell thickness(mm)	0.29^{b}	0.37^{a}	0.35^{a}	0.37^{a}	0.00
Albumen height (cm)	0.87	0.92	0.90	0.8e	0.00
Albumen width (cm)	7.17	7.10	7.17	7.17	0.1
Yolk height (cm)	1.73	1.87	1.80	1.73	0.00
Yolk width (cm)	4.27	4.40	4.23	4.13	0.00
Haugh Unit	93.09	94.55	94.65	89.91	1.70

Means with different superscript on the same horizontal row are significantly different@ ($p<0.05$)

Conclusion and Recommendations

Feed intakes of birds with increased ESDCPM inclusion were comparatively high at the expense of egg production. Beyond 18% ESDCPM inclusion in the diets, efficiency of feed conversion decreased resulting in wastage of feed and increased feed cost per kg egg produced. It can therefore be concluded that cassava peel meal can be used up to 18% for optimum production and cost effectiveness. Also, the addition of enzyme is necessary if CPM is to be used as livestock feed to help breakdown fibre, improve birds' health and reduce digesta viscosity.

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