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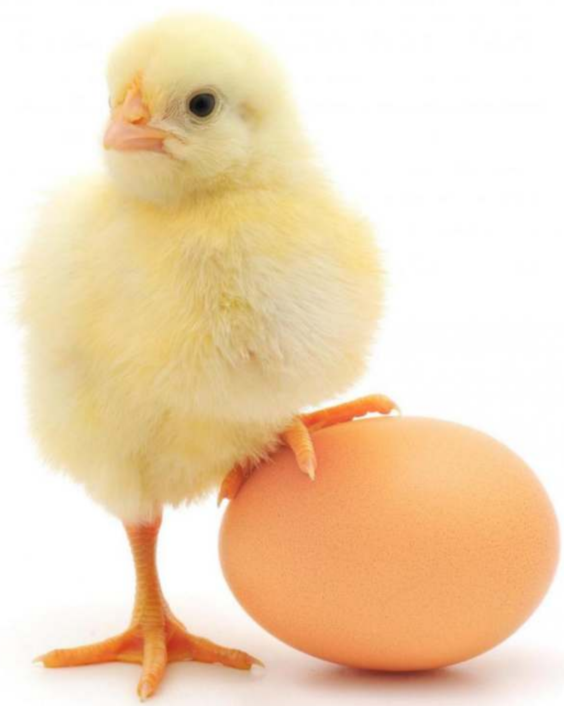

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# Effect of Enzyme Supplemented Cassava Root Sieviate on Egg Quality Gut Morphology and Performance of Egg Type Chickens

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**Abstract:** Enzymic supplementation of cassava root sieviate (CRS) in cassava –based diet was investigated in layers. One hundred and twenty laying birds of Nera strain at 22 weeks old were divided into twelve groups and randomly assigned to the four groups of diets. It lasted for 84 days at the teaching and research farm of the university of Ibadan Nigeria. Results of control avizyme and dried pure yeast (DPY) supplemented diet were similar and significantly (P<0.05) higher than unsupplemented cassava diets. Feed intake revealed that layers fed cassava-based diet had lower consumption when compared to those fed control. Feed conversion however showed that those layers on DPY supplemented diet were significantly (P<0.05) better than others. Final body weight of the layers showed that those on control were significantly (P<0.05) heavier than others. The kidney, heart, abdominal fat and oviduct of layers cassava diet either supplemented or not were significantly (P<0.05) reduced when compared with others on control. The gizzard weight of layers fed unsupplemented and supplemented was also significantly (P<0.05) increased. No mortality was recorded during the feeding trial. Considering egg production layers on control performed better than others, economically DPY diet ranked second to control.

**Key words:** Cassava root sieviate, performance, egg quality parameters, gut morphology

## Introduction

Scarcity of animal feedstuffs has ostensibly assumed an emergency state in Nigeria and conceivably for other less developed countries. In fact, this singular problem is conspicuously responsible for the widening animal protein intake shortage in these countries because animal products are produced at costs out of reach of the populace. Invariably, the negative feed balance sheet has resulted into food and nutrition crises not only in our livestock but also in human beings.

Within the past three decades the interest of animal producers has been centered mostly on the search for cheaper feed ingredients that are always available and have no competition with man's dietary demands. Although some agro - industrial by products and plants have been used so far with varied levels of success, Some including the cassava root sieviate (CRS) have not been used enough and these wastes constitute environmental hazards. Their conversion to useful animal feed will be of advantage. But their utilization for livestock feeding is highly limited because of high crude fiber and low protein levels. These problems however can be overcome by application of exogenous enzyme. Exogenous enzyme supplements are used widely in poultry diets in an attempt to improve nutrient utilization, the health and welfare of the birds, product quality and to reduce pollution as well as to increase the choice and content of ingredients which are acceptable for inclusion in diets (Acamovic, 2001).

Objective of this study will be to reduce inhibition imposed by fibrousness of CRS in cassava-based diet by the addition of DPY and Avizyme 1500, the components of the two supplement were as reported by Aderemi (2001)which presumably may improve its utilization by the layers .Also to determine the economy of production in using CRS for layers.

## Materials and Methods

Four diets were formulated in this study Table 1, diet I was maize - based had 10% wheat bran, 0% CRS and served as control while diets II – IV were cassava – based. Diet II had 0% of the wheat bran, 15% of CRS and 21% of Groundnut (GNC) cake without any supplement. Diets III-IV had similar composition as II but III was supplemented with DPY at 300g/100kg of feed while Avizyme 1500 was added to diet IV at 100g /100kg of feed.

**Experimental birds and management:** One hundred and twenty laying bird of Nera strain at 22 weeks old were used for this study. They were divided into twelve groups and three group of each were randomly assigned to same set of dietary treatment. The rearing and routine management were carried out. Feed and

Table 1: Gross Composition of Experimental diets

| Ingredients | Diets | | | |
|---|---|---|---|---|
| | I | II | III | IV |
| Maize | 20 | - | - | - |
| Corn Offal | 20 | 20 | 20 | 20 |
| Cassava flour | - | 20 | 20 | 20 |
| Palm Kernel cake | 20 | 14 | 14 | 14 |
| Cassava root sieviate | - | 10 | 10 | 10 |
| Wheat bran | 10 | - | - | - |
| Groundnut cake | 24 | 30 | 30 | 30 |
| Fish meal | 3 | 3 | 3 | 3 |
| Oyster shell | 1.5 | 1.5 | 1.5 | 1.5 |
| Bone meal | 1 | 1 | 1 | 1 |
| Premix oyster | 0.25 | 0.25 | 0.25 | 0.25 |
| Salt | 0.25 | 0.25 | 0.25 | 0.25 |
| Avizyme | - | - | 0.1 | - |
| Dried pure yeast | - | - | - | 0.3 |
| Calculated analyzed | | | | |
| CP% | 22.29 | 22.13 | 22.13 | 22.13 |
| CF% | 7.28 | 7.59 | 7.59 | 7.59 |
| ME kcallkg | 2509 | 2429 | 2429 | 2429 |

To provide the following per kg diet, vitamin A 10,000 in, vitamin $D_3$ 1500iu, Vitamin E3iu, Vitamin K 2mg, riboflavin 3mg, Panthothenic acid 6mg, niacin 15mg, chlorine 5mg, vitamin $B_{12}$ 0.08mg, folic acid 4mg, Mn 8mg, Zn 0.5mg, iodine 1.0mg, Co 1.2mg and Fe 20mg.

water were provided ad-libitum. The experiment lasted for eighty four days. Records of feed intake, weight gain, egg production was determined weekly on all replicates.

**Gut morphology study:** At the end of the 12$^{th}$ week of feeding trial, six layers per dietary treatments randomly selected were starved of feed over night but allowed access to water. The live weight of the selected layers were taken and were killed by the cervical bone dislocation method. The carcasses were defeathered, dressed and cleaned. The intestine was removed, the kidney, liver, spleen, gizzard, heart lung and oviduct were removed from the bird each weighed fresh and expressed as a percentage of live weight.

**Egg quality analyses:** Parameters measured were the haugh unit, yolk weight, Albumen weight, have hay production quality measurement five eggs per replicate were randomly selected from the eggs laid on the last day of every two weeks. The weights were taken and the eggs were broken with the aid of a blunt edged knife so as not to rupture the albumen. The contents of each egg so broken were carefully transferred to a clean level glass plate. Albumen height was measured using a tripod spherometer. while the shell was peeled off its membrane and allowed to dry for a day under room condition and its thickness measured at the broad narrow and equatorial regions with a micrometer screw gauge. The haugh unit was calculated using the formula

$$Hu = 100 \log H + 7.57 – 1.7W^{0.37} \text{ (Haugh 1937)}$$

Where Hu = Haugh unit %

H = albumen height

W= egg weight (g)

**Chemical analysis:** Samples of diets were analyzed for proximate composition and detergent fiber components using the procedures of AOAC (1990) and Goering and Van Soest (1970) respectively.

The dry matter were determined by heating at 105$^{o}$C for 16 hours. The detergent fiber constituents Neutral detergent fiber, Acid detergent fiber and lignin were determined according to the methods of Wisker *et al.* (1985).

The NDF was analyzed by extraction with neutral detergent sodium lauryl sulfate (SLS)/ethylenediamine tetra acetic (EDTA) followed by drying and ashing. ADF was determined through treatments with acid detergents $HSO_4$. Hemicellulose and cellulose were also estimated according to standard methods. Hemicellulose contents was the difference of NDF and ADF while cellulose contents was the difference of ADF and lignin.

**Statistical analyses:** All the data generated were subjected to analysis of variance while Treatment means were separated by Duncan multiple range method using SAS package of 1995.

## Results

The gross composition of the experimental diets are as shown on Table 1. The performance characteristics of the layers are shown on Table 2. There were significant differences, ($P<0.05$) in the feed intake, body weight changes as well as the feed conversion efficiency. Layer on control had the best overall performance ($P<0.05$) and they consume uniformly greater quantities of feed than the birds on other diets. Egg quality parameters namely hen day production, feed intake, albumen weight, average egg weight and haugh unit of layers on control was significantly ($P<0.05$)higher than others. However layers on enzyme supplemented diets had values which were also significantly ($P<0.05$) higher than unsupplemented Fig. 1. The shell thickness showed no significant effect ($P>0.05$) of the dietary treatment. The kidney, heart, abdominal fat and oviduct of layers fed either supplemented or unsupplemented CRS in cassava-based diet recorded significantly ($P<0.05$) reduced weight. The lung and gizzard of layers fed either supplemented or unsupplemented CRS in cassava-based diet were significantly ($P<0.05$) higher than those fed maize diet. The result of the spleen did not have a particular trend.

## Discussion

The weight gain of layers fed cassava-based diet with avizyme supplemented CRS and DPY supplemented CRS had similar body weight gain while those fed on un-supplemented diet were lowered. Perhaps consequence to DPY and Avizyme supplementation, variation in subsequent layer performance was reduced

Table 2: Performance characteristics of layers on experimental diets

| | Diets | | | | |
|---|---|---|---|---|---|
| Parameters | I | II | III | IV | SEM |
| Initial body weight (kg) | 1.45 | 1.46 | 1.45 | 1.46 | 0.01 |
| Final body weight (kg) | 1.64$^{a}$ | 1.57$^{b}$ | 1.62$^{a}$ | 1.60$^{a}$ | 0.02 |
| Weight gain (g/bird/day) | 2.26$^{c}$ | 2.02$^{b}$ | 2.02$^{b}$ | 1.55$^{a}$ | 0.13 |
| Feed intake (g/bird/day) | 131.2$^{c}$ | 95.7$^{a}$ | 96.54$^{a}$ | 98.79$^{b}$ | 0.38 |
| Feed conversion ratio | 0.21 | 0.18 | 0.16 | 0.18 | 0.03 |

abc Means with the same superscript along a row are not significantly different (P>0.05)

Table 3: Mean live weight and organ weight as percentage of live weight of layers

| | Dietary treatments | | | | |
|---|---|---|---|---|---|
| Parameter | I | II | III | IV | SEM |
| Livewight (kg) | 1.64$^{b}$ | 1.63$^{b}$ | 1.62$^{b}$ | 1.59$^{a}$ | 0.2 |
| Kidney% | 0.64$^{d}$ | 0.58$^{c}$ | 0.55$^{a}$ | 0.57$^{b}$ | 0.01 |
| Gizzard | 1.71$^{a}$ | 1.80$^{b}$ | 1.78$^{b}$ | 1.81$^{b}$ | 0.06 |
| Heart% | 0.56$^{c}$ | 0.43$^{a}$ | 0.49$^{b}$ | 0.47$^{ab}$ | 0.10 |
| Lung % | 0.40$^{a}$ | 0.45$^{b}$ | 0.43$^{b}$ | 0.43$^{b}$ | 0.0 |
| Spleen % | 1.78$^{b}$ | 2.22$^{c}$ | 1.76$^{ab}$ | 1.73$^{a}$ | 0.05 |
| Abdominal fat % | 2.7$^{b}$ | 1.05$^{a}$ | 1.24$^{c}$ | 1.21$^{b}$ | 0.07 |
| Oviduct % | 4.11$^{c}$ | 3.20$^{a}$ | 3.24$^{b}$ | 3.29$^{b}$ | 0.11 |

abc means with the same superscripts along a row are not significantly (P>0.05) different from each other.

which results in a more uniform flock such effect is considered a benefit especially when livestock farmer is raising to a target size within a stipulated time . This has earlier been demonstrated by Classen *et al*. (1995); Scott *et al*. (1995) and Bedford *et al*. (1998). The layers on DPY diet had the best feed conversion ratio.

The decrease in feed intake of the cassava based diet could be due to high fiber ingestion which led to increase water intake that created a stomach fill sensation and a subsequent depression of appetite. However, the similarity in feed intake between DPY supplemented cassava based diet and un-supplemented diet is at variance with the finding of Kumar and Dingle 1996 and Abubakar 1997. Both groups reported increased feed intake in boilers fed diet with yeast supplementation. This is in line with findings of Bedford (1995) who worked with laying hens and enzyme. He reported that intestinal viscosity is lowered regardless of dietary treatment in older birds. According to him this could probably be due to increased digestive capacity and gut maturity/motility of the older birds. High fiber elicited gizzard hypertrophy in layers fed cassava diet either with supplemented or unsupplemented CRS obviously because greater grinding action was required on the more fibrous diet. Cherry and Jones (1982), Savory and Gentle (1976) reported that gizzard weight as a percentage of body weight was significantly influenced by dietary energy and fiber contents of the diets. Pond *et al*., (1989) have documented hypertrophy response of the gut intestinal tract (GIT) to a high fiber diet in poultry and swine. The results here conformed with the assertion of Savory and Gentle 1976 that a differential response by intestinal segment is possible. Abdominal fat and oviduct weight of layers fed unsupplemented diets were significantly lower when compared with others. This may be due to reduced feed intake coupled with maintaining egg production at a level thus drawing from the body reserves, which resulted in low abdominal fat. This result indicated that unsupplemented CRS was being efficiently converted. This agrees with Leclerq *et al*. (1980) who observed that laying birds that accumulate excessive abdominal fat indicate inefficient conversion of the feed. The results for the physical egg quality are shown in Fig. 1, the haugh unit which is an expression relating egg weight and height of the albumen quality showed that dietary treatment had significant effect (P<0.05) eggs of layers fed undegraded CRS supplemented with brewers yeast had best quality in this regard. The shell thickness showed no significant (P> 0.05) effect of the dietary treatment. This possibly was due to age of the layers as it has been established that there is a reduction in thickness of the shell and thus lessen based percentage of egg weight. Haugh unit values yolk weight egg weight and the hen day production values indicated significant differences (P<0.05) of the dietary treatments. Significant effect of dietary treatment on egg production agrees with the results of Nasi (1988), Graham and Aman (1991) who worked with multi-enzyme product said to contain cellulase, glucanase and protease were found to significantly improve egg production and feed conversion late in the laying period. The non significant effect of the dietary treatment on shell thickness indicated that the CRS inclusion in layers diet had no deleterious effect on it.

Conclusively inclusion of 15% level of CRS for laying birds had no adverse effect on performance characteristics and gut morphology of layers. Variation in

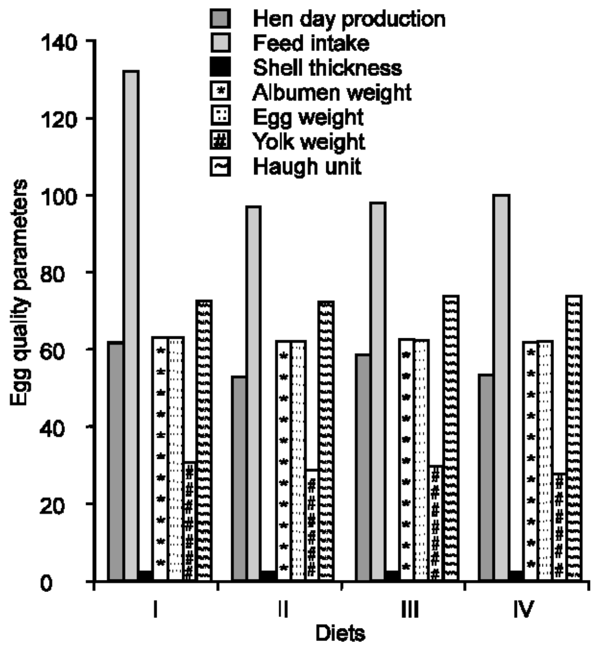


Fig. 1: Egg quality parameters

layers performance was mediated upon and consequently improved by avizyme and DPY supplementation. So their inclusion was profitable in a high fiber diet for layers as these led to abdominal fat reduction which was desirable in laying hen as this promote egg production. The inclusion of CRS either supplemented or not in egg type chicken would probably not result in mortality.

The addition of brewers yeast however was not found to improve the feed intake of the layers so its inclusion was not justified.

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