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HEPATIC HISTOPATHOLOGY OF WEANED PIGS FED SUNDRIED CASSAVA - MAIZE COB MEAL SUPPLEMENTED WITH ENZYME AS PARTIAL REPLACEMENT FOR MAIZE

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Abstract:

The study is aimed at investigating the hepatic histopathology of weaned pigs fed sundried cassava - maize cob meal supplemented with enzymes as partial replacement for maize (SCMCM). Twenty-four healthy male weaned pigs, about 4 weeks of age with an average initial body weight (BW) of 7.44 ± 0.25 kg, were used for the experiment. Pigs were weighed and stratified based on their body weight into four treatments containing; treatment 1 (T1) control diet (0 % SCMCM), T2 (10 % SCMCM with enzyme), T3 (20 % SCMCM with enzyme), T4 (30 % SCMCM with enzyme). Experimental diets were formulated according to meet the nutritional requirement of pigs by (NRC, 1994). Liver samples were collected at the end of experiment for histopathological analysis. Samples in all the treatments revealed normal tissue architecture with normal hepatic lobules, central vein, kupffer cells and hepatic sinusoids. In conclusion, SCMCM with enzyme can be used to replace maize up to 30 % without compromising the health status of animals.

Keywords: Cassava peel, maize cob, histopathology, feedstuffs, pig

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Introduction

Livestock contribute significantly to food and nutrient supply particularly high quality protein, minerals, vitamins and micro-nutrients for the majority of African people. Meat, milk and egg provide about one fifth of the protein in African diets (All African Society of Animal Production, 2010). According to All African Society of Animal Production (2010), in 2003, Africa's livestock population was estimated at 231 million cattle, 244 million sheep, 273 million goats and 22 million pigs. In

developing countries including Nigeria, the shortages of cereal grains and high market price of other high energy concentrate feed makes poultry feed expensive (Anakebe, 2006; Buchanan et al., 2007). According to Anakebe (2006), feed cost accounts for 70 – 80% of the total cost of poultry production, the large segment of which is attributed to high market price of maize. Maize (*Zea mays* L.) is a major staple food grain throughout the world, particularly in Africa, Latin America and Asia. The maize grain is a major feed grain and a standard component of livestock diets where it is used as a source of energy (Bamgbose et al., 2004; Ezieshi et al., 2011). Other grains are typically compared to maize when their nutritional value particularly energy content is estimated (Ezieshi et al., 2011). In Nigeria, maize is the popular cereal grains widely used both as human food and livestock feed. Nevertheless, maize availability under the current Nigeria condition and in the future is under question due to its higher demand for different processing industries. The continual increase in prices of conventional poultry feeds seems to be justified by the use of cereal grains particularly maize as source of starch industry (Ezieshi et al., 2011). Anti-nutritional factors and high fibre are some of the limiting factors affecting the use of unconventional feedstuffs in monogastric diets (Ogungbesan *et al*., 2004).

This situation warrants the evaluation of other locally available non-conventional feed resource and inclusion of the promising ones into swine feeding (IFRU, 2003). Cassava peel and maize cob are feed resource appealing for inclusion into swine ration under the current Nigerian condition (Akinfemi et al., 2009). This justifies research efforts on alternative feed ingredients that are not staple food for human consumption. Pigs cannot fully utilize high fibre diet (cassava peel + corn cob) because they lack the digestive frame work that can elaborately digest large amount of fibres, it become imperative to incorporate exogenous enzymes into their diet in order to enhance the breakdown of non-starch polysaccharides present in the fibre (Bamgbose *et al*., 2004).

There is a direct relationship between nutrition and the health of animals (Alagbe, 2017). Therefore, this experiment was carried out to determine the hepatic histopathology of weaned pigs fed sundried cassava - maize cob meal supplemented with enzyme as partial replacement for maize.

Materials and methods

Experimental site

The study was carried out at the Piggery Unit of the Teaching and Research Farm of University of Abuja, Gwagwalada, Nigeria located between latitudes $8^{o}57^{1}$ and $8^{o}55^{1}$N and longitude $7^{o}05^{1}$ and $7^{o}06^{1}$E (Balogun, 2001).

Acquisition and preparation of test materials

The cassava peels and maize cobs was collected fresh from different processing centers in Gwagwalada, Nigeria. They were sundried to reduce their levels of anti-nutritional factors as well as avoiding microbial reactions leading to spoilage and leaching of nutrients. The dried peels was milled separately in hammer mill into meals and mixed in the ratio of 1:1 before it was incorporated into the experimental diets.

Pre-experimental operations

Open sided pens with standard dimensions (2.0 × 1.5 × 1.2 m) was used for the experiment. It was disinfected with Morigad two weeks before the commencement of the experiment. Feeding and water troughs were properly washed. Foot bath was be provided at the entrance of the pen to ensure proper biosecurity.

Experimental animals, design and management

Twenty-four healthy male weaner pigs, about 4 weeks of age with an average initial body weight (BW) of 7.44 ± 0.25 kg, were used for the experiment. On arrival, pigs were quarantined for two weeks and administered prophylactic treatment comprising injection with Ivermectin® at 0.25 ml/12.5 kg of the BW for the control of endo and ecto parasites and injection with a long acting oxytetracycline HCl at 1 ml/10 kg BW. Pigs were stratified based on the body weight into four treatments with six animals, each treatment comprises of three replicate with 2 pigs each in a completely randomized design. Feeding was twice in a day at 08:00 h and 16:00 h and clean water was supplied daily *ad libitum*. Feed intake was calculated by subtracting the weight of leftover feeds from the original weight of feed supplied throughout the experiment which lasted for 8 weeks.

Experimental diets

Four experimental diet were formulated to meet the nutrient requirements for swine according to NRC (1994). Sundried cassava and maize cob meal (SCMCM) will be incorporated into the experimental diet to replace maize as follows: treatment 1 (T1) control diet (0 % SCMCM), T2 (10 % SCMCM with enzyme), T3 (20 % SCMCM with enzyme), T4 (30 % SCMCM with enzyme) as presented in Table 1.

Histopathological evaluation

Three pigs were randomly selected per treatment for histopathological analysis, sections of the livers were collected and fixed by immersion in 10% buffered formalin for 24h, followed by dehydration in increasing concentrations of ethanol, diaphonization in xylol, and embedding in paraffin. Sections of 5 µm were stained with hematoxylin and eosin (H&E), for histopathological analysis under optical microscope coupled to a camera, under magnification of 10× and 40×.

Proximate composition of feed samples

The AOAC (1990) methods was employed for ether extract (EE), crude protein (CP) and crude fiber (CF) determinations. The Nitrogen Free Extract (NFE) on dry matter basis will be calculated by simply subtracting the values of crude protein, crude fiber, ether extract and ash from 100.

Table 1: Ingredient and chemical composition of weaner diets

Ingredients	T1 (0 %)	T2 (10 %)	T3 (20 %)	T4 (30 %)
Maize	55.00	49.50	44.00	38.50
Wheat offal	6.97	6.97	6.97	6.97
Soya beans	24.00	24.00	24.00	24.00
Groundnut cake	7.00	7.00	7.00	7.00
SCMCM	0.00	5.50	11.00	16.50
Bone meal	3.00	3.00	3.00	3.00
Limestone	1.50	1.50	1.50	1.50
Methionine	0.20	0.20	0.20	0.20
Lysine	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25
Enzymes	0.00	0.03	0.03	0.03
Salt	1.80	1.80	1.80	1.80
Total	100.0	100.0	100.0	100.0
Determined analysis (% DM)				

Crude protein	18.30	18.00	17.90	17.80
Crude fibre	4.00	4.38	4.50	4.71
Ether extract	3.00	2.92	2.90	2.87
Calcium	0.45	0.45	0.45	0.45
Phosphorus	0.30	0.30	0.30	0.30
Energy (Kcal/kg)	2601.8	2558.7	2556.0	2550.1

*Premix supplied per kg diet: - vit A, 13,000 I.U; vit E, 5mg; vit D3, 3000I.U, vit K, 3mg; vit B2, 5.5mg; Niacin, 25mg; vit B12, 16mg; choline chloride, 120mg; Mn, 5.2mg; Zn, 25mg; Cu, 2.6g; folic acid, 2mg; Fe, 5g; pantothenic acid, 10mg; biotin, 30.5g; antioxidant, 56mg.

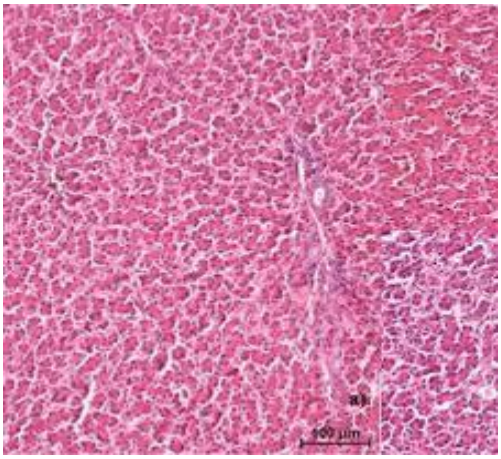

PLATE 1: 0 % Sundried cassava and maize cob meal (SCMCM)

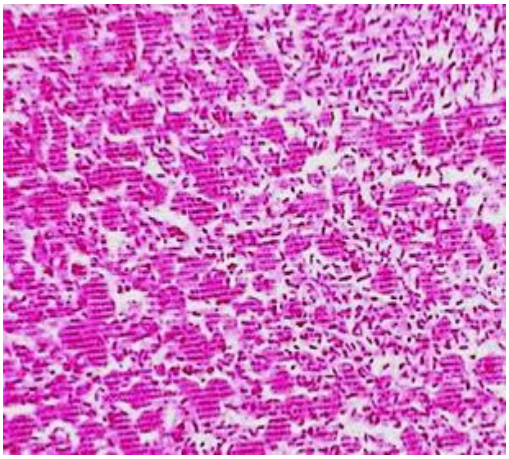

PLATE 2: 10 % SCMCM with enzyme

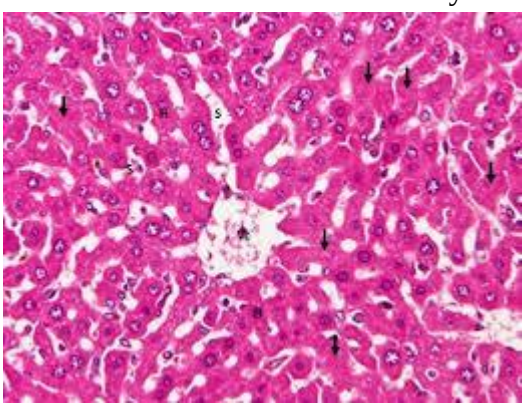

PLATE 3: 20 % SCMCM with enzyme

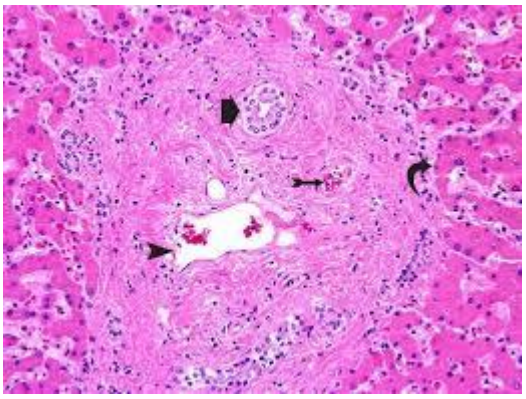

PLATE 4: 30 % SCMCM with enzyme

RESULTS AND DISCUSSION

The examined histopathogical liver sections are presented above. Liver samples in all the treatments revealed normal tissue architecture with normal hepatic lobules, central vein, kupffer cells and hepatic sinusoids. According to Alagbe (2022); Olatunji et al. (2016), the liver plays a major role in plasma protein synthesis, carbohydrate metabolism, bile production and toxin removal from the system of animals. The non-variation in the histological appearances of the liver cells in all the treatments revealed that the experimental diet were not toxic to the animals. Cassava peels are known to contain cyanide, however, drying process are amongst the method to reduce the concentration of the chemicals in diets for easy utilization by animals. Antinutrients have also been reported to alter the histology of animals (Soetan and Oyewole, 2009). Oloruntola *et al*. (2018) stated that among the numerous function of kupffer cells in the liver is proinflammatory cytokines production and phargocytosis. They are also the first area of contact to any foreign materials from the intestine thus; higher concentrations of toxins or pathogenic organisms could lead to haemorrage or damage of the liver cells (Hassan *et al*., 2014; Alagbe, 2019). The current studies agrees with the findings of Ishibashi et al. (2009) but contrary to the reports of Alagbe (2017); Alagbe et al. (2023) when *Prosopis africana* oil was supplemented in the diets of broilers.

Conclusion

In conclusion, sundried cassava - maize cob meal (SCMCM) can be used to partially replace maize up to 30 % without affecting the health of animals. The drying of SCMCM drastically reduced the level of anti-nutrients to allow animals to be able to utilize the feed.

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