HISTOLOGICAL RESPONSES OF INTERNAL ORGANS OF BROILER CHICKEN FED RAW AND TREATED TEAK SEED MEALS

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ABSTSRACT
A six weeks feeding trial was conducted to investigate the histological responses of internal organs of broiler chicken fed raw and treated teak seed meal (TSM) as replacement for maize bran. Four diets were used for the experiment. T1 was the control, T2 was (raw) TSM, T3 was (boiled) TSM, and T4 was (fermented) TSM. A total of two hundred (200) day old broiler chicks were randomly arranged in a complete randomized design (CRD) with four dietary treatments, each with five (5) replicates. Each replicate contained (10) birds. Feed and water were supplied ad-libitum throughout the period of the study. Result of this study showed that birds on fermented teak seed meal performed better than other treatment groups and compared favorably with the control group followed by those on boiled teak seed meal group at 3.75% level of inclusion.

Keywords: Histological, Internal organs, Teak seed Meal, broiler chickens

DESCRIPTION OF PROBLEM

One of the most pressing challenges in poultry farming is the high cost of feed, which accounts for approximately 60–70% of total production expenses [1]. Maize is the primary energy source in poultry diets, but its increasing demand for human consumption, biofuel production, and livestock feed has led to fluctuations in its availability and price. This has necessitated the search for alternative, cost- effective, and nutritionally viable feed ingredients that can replace maize without compromising broiler growth performance.

Teak (*Tectona grandis*) is widely cultivated for timber, and its seeds, which are often discarded as waste, have the potential to serve as an alternative energy-rich feed ingredient. Teak seed meal (TSM) contains high levels of carbohydrates and lipids, making it a promising substitute in poultry feeding. However, raw TSM is limited in its use due to anti-nutritional factors (ANFs) such as tannins, phytic acid, saponins, and oxalates, which can interfere with nutrient digestion and absorption in poultry [2].

To improve its nutritional quality, processing methods such as boiling and fermentation can be employed to reduce tannins and other ANFs and enhances protein digestibility and make nutrients more available. However, there is limited research on the histological responses of internal organs of broiler chicken fed raw and treated teak seed meals.

MATERIALS AND METHODS

The poultry unit of the Teaching and Research Farm, Kwara State University, Malete, Nigeria was used as an experimental site for the feeding trial. Malete is situated on Latitude 8.7^{O}N and Longitude 4.46667^{O}E. Teak seeds used for this research were obtained from University of Ilorin teak plantation

Diets formulation

Four experimental diets formulated were a control diet without teak seed meal (diet1) and three other diets 2, 3, and 4 contained raw, boiled and fermented Teak seed meal (TSM) at the same 3.75% level of inclusion meeting the nutrient requirements of broiler chickens as recommended by NRC [3]. The composition of experimental diets as fed to the animals including the calculated nutrient contents of the diets are shown in Table 1.

Table 1: Composition of Experimental Diets (%)

Ingredients	Control	Raw TSM	Boiled TSM	Fermented TSM
Maize	50	50	50	50
Maize offal	7.5	3.75	3.75	3.75
Teak seed meal	0	3.75	3.75	3.75
Soya beans meal	18.1	18.1	18.1	18.1
Groundnut cake	17.5	17.5	17.5	17.5
Fish meal	3	3	3	3
Bone meal	2	2	2	2
Methionine	0.25	0.25	0.25	0.25
Lysine	0.2	0.2	0.2	0.2
Premix	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25
Limestone	1	1	1	1
Total	**100**	**100**	**100**	**100**
Calculated analysis				
Crude protein	23.08	23.00	23.2	23.5
Crude Fiber	3.98	4.01	3.98	3.98
Ether Extract	4.19	4.19	4.18	4.18
Metabolizable energy	2966.15	2966.15	2965.1	2965.35

TSM = Teak Seed Meals

Experimental animals and feeding trial

Two hundred Arbor acre broiler chicks were used for the trial. The experiment was designed as a one-way classification. Each of the four dietary treatments contained five replicates with ten (10) chicks per replicate. The chicks were fed on a conventional diet for a week to get acclimatized to the environment prior to introduction of the experimental diets. The birds were thereafter fed the experimental diets *ad libitum* during a feeding trial that lasted 42-days.

Data collection and measurements

At the end of the experiment, one broiler per replicate in all the treatments was taken at random and slaughtered for the histological examination of liver which was carried out by taken its representative tissue samples during slaughtering and immediately fixed in 10% formalin-saline solution for 24 h before preparing the histological sections by using Paraffin method technique. All the excised sections were stained with hematoxylin and eosin stain, examined under light microscopes (X40) and then photographed by using Canon digital camera.

RESULTS AND DISCUSSION

Histology of the liver of broiler birds fed treated teak seed meals

The photomicrographs showing the liver of the birds fed treated Teak seed meal (TSM) are given in Figure 1(P-S). The sections of the liver revealed degeneration of the hepatocytes and coagulative necrosis with the inclusion of raw TSM in the diets of the birds, and were less marked in birds fed treated diets, whereas no changes were noticed in birds fed control, boiled and fermented treated TSM diets. With the inclusion of boiled and fermented TSM in the diets of the birds, the density of the hepatocyte appears normal with characteristic delineation. Non-existence of histological lacerations in these birds could be due to the reduced amount of residual anti-nutrients in the treated TSM diets. King[4] observed modification in the measurable structure acutely poisoned with seed

haemagglutinins in the liver of rats. Aletor and Fetuga[5] also reported focal infection and fatty acid changes in livers of rats when fed with untreated lima bean.

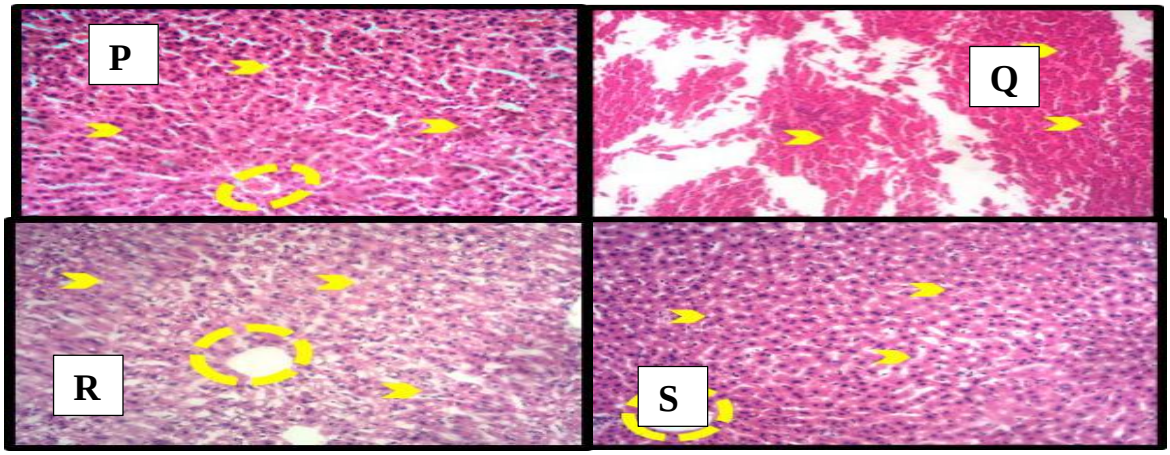


Figure 4.1 (P-S): Photomicrographs showing the liver of broilers fed the experimental diets, control (P) with normal hepatocyte, Raw TSM (Q) with severe haemorrhage of hepatic blood vessel, Boiled TSM (R) with mild hemorrhage of hepatic blood vessel, Fermented TSM (S) with mild hemorrhage of hepatic blood vessel. H/E Stain Mag. X40

Histological observations: The histological structure of livers from different experimental groups fed treated TSM diets is illustrated in Figure 1 (P-S). It is clear from Fig. 1 (p) that the hepatocytes of the control chickens are normal with some dark-stained eosinophilic cells surrounding the central vein. This structural appearance of hepatocytes was also observed in hepatic sections of birds fed boiled and fermented TSM diets Fig. 1(R&S) respectively. However, some congested areas, moderate hypertrophy of hepatocytes, necrotic areas and in filterable fluids could be seen in all sections. The sections of the liver revealed degeneration of the hepatocytes and coagulative necrosis, Progressive changes in the liver architecture with the inclusion of raw TSM in the diets of the birds, and were less marked in birds fed treated treated teak seed meals

CONCLUSION AND APPLICATION

It is concluded from the result of this study that fermented TSM at 3.75% inclusion level gave the best result and it is therefore recommended to replace maize bran in broiler chicken diets.

REFERENCES

1. Olukosi, O. A., Ahmed, M. T., Balogun, F. O. and Adekunle, I. A. (2021). Fermentation as a processing method for alternative poultry feed ingredients. *Poultry Science Review*, *28*(2), 112–126. https://doi.org/10.xxxx/psr.2021.28.2.112

2. Adeyeye, A. O., Bello, T. K., Ogunbanwo, S. T. and Alabi, O. M. (2020). Effect of boiling on anti-nutritional factors in plant-based feed ingredients. *Journal of Animal Nutrition*, *15*(3), 234–245. https://doi.org/10.xxxx/jan.2020.15.3.234

3. National Research Council (1994). *Nutrient Requirements of Domestic Animals. In*: Nutrient Requirement of Poultry (9th Ed.). National Academic of Science, Washington. D.C., USA. Pp 71-73.

4. King, T. P., A. Pusztai, and E. M. Clarke. (1980). Kidney bean (*Phaseolus vulgaris*) lectins induced lesions in the rat small intestine, 1 Light microscopic studies. *Journal of Comprehensive Pathology*, 90:585-595.

5. Aletor, V. A., and Fetuga, B. L. (1988): Dietary interactions of limabean (*Phaseolus lunatus*) trypsin inhibitors, haemagglutinins and cyanide: Effect on growth, performance, nitrogen utilization and physiopathology of growing albino rats. *Journal of Animal Physiology and Animal Nutrition* (Berl.), 60:108-112.