

## Serum biochemistry and liver histology of female rabbits fed white mangrove (*Languncularia racemosa*) leaves as feed additive

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### ABSTRACT

This study was conducted to assess the effect of white mangrove (*Languncularia racemosa*) leaves (as feed additive) on some serum biochemistry in adult female rabbits. Twenty four mature female rabbits (does) were randomly allocated to four equal groups (Group A, B, C, and D) in a Randomized Complete Block Design (RCBD). Group A was served with control diet, while the does of Group B, C and D were fed growers mash mixed with the additive dosed at 70 g, 80 g, and 90 g/kg of feed, respectively. Blood samples were collected from the animals for biochemical analysis at the end of the 12-week study. Sections of the liver were collected from same does for histological investigations. The results of the serum biochemistry showed no significant difference ( $p>0.05$ ) in the values of Aspartate Transaminase (AST), while significant differences ( $p<0.05$ ) were observed in the values of Alanine Transaminase (ALT), and Alkaline phosphatase (ALP). The histology of the liver was normal. It was concluded that the test ingredient (*L. racemosa*) was safe to be used in the diet of female rabbit dosed at 70-90g/kg feed since the enzyme levels remained within normal range of healthy rabbit.

### Keywords

Biochemistry, Feed additive, *Languncularia racemosa*, Liver, Rabbit

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### INTRODUCTION

In recent years, Nigerian Government (NG) has emphasized agricultural production through a range of policies and strategies to achieve self-sufficiency in food production. The average consumption of animal protein in Nigeria is low, and estimated at 4.5 g/head/day as compared with a minimum requirement of 35 g/head/day, as recommended by the Food and Agricultural Organization of the United Nations (Atsu, 2002). Several attempts have been taken by the NG to solve the low protein intake (Nworgu and Hammed, 2009). The low animal protein intake in developing countries including Nigeria has been blamed on over dependence on large animal species with prolonged production cycles, for example cattle, sheep and goats (Yusuf et al., 2009). Therefore, there is in need to diversify and shifting emphasis from these large animal species to those that need relatively low capital input, less time, easy maintenance, and short production cycles such as rabbits (Owen et al., 2008; Yusuf et al., 2009; Yahaya and George, 2013; Yahaya and Wekhe, 2014).

Apart from the reputed proficiency in reproduction, rabbits have other advantages over many other farm species, including higher quality protein, much lower fat/cholesterol, and steady source of income (Owen et al., 2009). Rabbits also eat vegetation in proportion to its abundance (Forys and Humphrey, 1994). The most abundant species in the rabbits' diets include *Sporobolusvirginicus* sp., *Salicorniavirginica* sp., *Sportinaspatinas* sp., *Borrchiafruescens*, *Rhizophora mangle*, and *Languncularia racemosa*, the white mangrove (Forys and Humphrey, 1994; Bandaranayake, 2002).

Hematological indices are reflections of the effects of dietary treatments on animals in terms of the type and amount of feed ingested and available for the animal to meet its physiological, biochemical and metabolic necessities (Ewuola et al., 2004). Thus, dietary components have measurable effects on blood components; hence blood constituents are widely used in nutritional evaluation, and survey of animals (Church et al., 1984; Olorode et al., 1995).

Aspartate Transaminase (AST) is found in appreciable quantities in the heart, pancreas, muscle, and liver. It is the serum enzyme that reflects the functionality of heart and liver. Alanine Transaminase (ALT) is found principally in the liver and in many tissues, thus it is of limited use for rabbit disease (Jekins, 2000). When there is liver cell damage, the serum or plasma level of both AST and ALT rises tremendously. Thus, ALT is more specific for detecting liver inflammation, liver cell damage, and necrosis such as that caused by parasites and hepatic lipidosis (Jekins, 2000). Alkaline phosphatase (ALP) is also found in appreciable amounts especially in the liver, small intestines, kidney, placental tissues, and osteoblasts; the organs usually release the enzyme into the blood. Some ALPs are normally excreted in the bile. However, according to Ravel (1995), ALP is found in many tissues in the body, with the highest concentrations found in the liver, biliary tract, epithelium, bone, and intestinal mucosa. AST is found in several organs and tissues (for example, liver, skeletal muscles, heart, and red blood cells). ALT is predominantly found in the liver, with a moderate-sized component in the kidney, and small quantities in the heart and skeletal muscles.

When rabbits become sick with suspected liver disease(s), chemistry panel (part of the blood work) is performed to determine liver disease that caused elevated levels of AST, ALT and ALP (Meredith and Rayment, 2000). Blood biochemistry could be used to monitor the progress of disease before final evaluation by pathology of arteries and organs (Aguilera et al., 2002; Marinou et al., 2010; Tsantila et al., 2010). Thus, the applications of laboratory tests can be used to evaluate the functional status of several organs notably the liver, pancreas, and kidneys. This study was aimed to examine the suitability of using *L. racemosa* in diets of does to ascertain its suitability as an additive, and its effects on the liver function.

## MATERIALS AND METHODS

The study work was carried out at the Teaching and Research Farm of Rivers State University of Science and Technology, Port Harcourt, Nigeria. The test

additive *Langucularia racemosa* leaves were harvested from the Eagle Island in Rivers State of Nigeria, and were oven dried in accordance with the method of Wekhe and Oboh (2007). A Metler grinding machine was used to grind the leaves into powdery form for easy scientific application. The test additive was weighed with sensitive electronic balance (EA 163) into the required dosage.

Twenty four (24) mixed breed of New Zeland White and Chinchilla does were randomly assigned into four equal groups (Group A, B, C, and D) with six (6) does per treatment (i.e., 2 does per replicate). Treatment A served as the control, and were fed diet that was free of the test ingredient, while the does in Group B, C, and D were fed diet containing *L. racemosa* leaves dosed at 70 g, 80 g, and 90 g/kg of feed daily throughout the experimental period of 12 weeks (84 days).

At the termination of the feeding trials, blood samples were collected from one (1) doe per replicate through the ear vein. The blood samples were stored in sterilized test tubes which were adequately labeled and immediately sent to the laboratory section of the University of Port Harcourt Teaching Hospital for serum biochemistry screening. The serum activities of AST, ALT and ALP were determined using an automated spectrophotometric analyzer as described by Hoder and Rej (1983). Sections of liver tissue were collected from the does of each replicate, and kept in formalin bottles. Then, these were sent to the laboratory where they were prepared into slides and observed microscopically for any morphological alterations. The data collected were subjected to analysis of variance using SAS (1990), and where difference exist in the mean, it was separated using Duncan Multiple Range Test.

## RESULTS AND DISCUSSION

No significant difference ( $p>0.05$ ) was observed in the values of AST obtained from the serum of the does fed the experimental diet as compared to those fed the control diet (Table 1). The non-significant difference observed in AST values showed that the test ingredient (additive) did not affect the does physiologically. This is ostensibly due to the biological activities of saponin present in the additive which may have contribution to the enhancement of the does' health status, thus reconfirming the study of Mahato et al. (1988a, b) who reported that saponin in mangrove plant acted as antimicrobial, ant-inflammation and inhibiting factors performing anti-cytotoxic activities. The results of this work were therefore similar to the findings of Diop et

**Table 1:** Serum biochemistry of does fed white mangrove leaves as feed additive.

Parameters	Treatments				SEM
	A (0 g) control	B (70 g)	C (80 g)	D (90 g)	
AST (SGOT) iu/L	9.00	9.20	9.10	9.35	0.40
ALT (SGPT) iu/L	12.50 <sup>ab</sup>	12.00 <sup>b</sup>	13.60 <sup>a</sup>	14.00 <sup>a</sup>	0.45
ALP iu/L	19.00 <sup>c</sup>	20.7 <sup>b</sup>	32.00 <sup>ab</sup>	38.50 <sup>a</sup>	0.18

a, b, c Means with different superscript within the same row differed significantly ( $p < 0.05$ ); SEM = Standard Error Mean

al. (2005) and Al-Qarawi et al. (2003) who worked separately with *Baobab* leaves, fruits and seeds, and reported that these parts of the plant were immunostimulant, anti-inflammatory, analgesic, antipyretic, febrifuge and astringent.

Significant differences ( $p < 0.05$ ) were observed in the mean values of ALT and ALP of the test and control does. The test does depicted increased enzyme levels with increasing dosage of the test additive (*L. racemosa* leaves). The significant differences ( $p < 0.05$ ) observed in the ALT and ALP still remains within the normal values as 11.7- 13.7 iu/L obtained by Ezenwanne and Ucheya (2012), whereas 17-192 iu/L was reported by Ewuola and Egbunike (2008) in clinically healthy rabbits respectively. The values of the serum enzymes obtained in this study showed that the activities of the osteoblasts were not affected. Thus, the results suggested good quality and safety of the tested feed additive. This was in line with earlier report of Yahaya and George (2013) who reported better feed conversion, lesser feed cost/kg weight gain, and better weight gain (0.49 kg for the control and 0.57 kg, 0.67 kg, 0.73 kg, respectively) for female rabbits fed *L. racemosa* leaves in diet at 0 g, 70 g, 80 g, and 90 g/kg of feed daily.

The results of the histological examination of the liver did not show any visible alteration in the liver cells among all groups. This implied that, the livers of the rabbits were able to cope with the test ingredient without signs of toxicity at the highest level of inclusion in this study, thus explaining why there were no signs of disease in the experimental does. It is possible that *L. racemosa* may possess hepatotoxic properties in large doses, since all compounds of plant origin ingested orally for food are potentially hepatotoxic as they undergo metabolism by the liver.

## CONCLUSION

The results obtained in this study show that *L. racemosa* leaves at the levels used do not disrupt the activities of the liver and heart. This indicates its safe usage as growth additive in female rabbits. Rabbit producers and livestock farmers are therefore encouraged to

improve their animals' overall productivity by the use of the additive. Necessary potency for its commercialization could be embarked upon by the agricultural policy makers to create jobs opportunities for our timing youths.

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