



## THE EFFECTS OF RHIZOPHORA RACEMOSA (RED MANGROVE) FEED ADDITIVE ON THE BLOOD CHOLESTEROL, LIPID, AST, ALT AND TESTOSTERONE OF BROILER CHICKENS

<sup>a</sup>Ogbamgba, K. O., <sup>a</sup>Wekhe, S.N., <sup>b</sup>Banigo, E. B. & <sup>c</sup>George, O.S.

<sup>a</sup>Department of Animal Science, Rivers State University of Science and Technology, Nkpolu, Port Harcourt

<sup>b</sup>Department of Food Science and Technology, Rivers State University of Science and Technology, Nkpolu, Port Harcourt.

<sup>c</sup>Department of Animal Science and Fisheries, University of Port Harcourt.

### ABSTRACT

In a completely randomized experiment in the Teaching and Research Farm of Rivers State University of Science and Technology, Nkpolu- Port Harcourt, the effect of the consumption of pulverized *Rhizophora racemosa* feed additive on the blood cholesterol, lipid, Aspartate amino-transferase AST (SGOT) and Alanine amino-transferase ALT (SGPT) levels was studied in broiler chickens. Sixty day-old Anak broiler chicks were distributed to four treatment groups A, B, C and D of 15 birds per group, and five birds per replicate. The four groups were replicated thrice. The birds were given the *R. racemosa* incorporated feed at the rate of 0g/kg feed (group A, control), 40g/kg feed (group B), 50g/kg feed (group C) and 60g/kg feed (group D), respectively. At the end of the experiment which lasted for eight weeks, the blood levels of cholesterol, lipid, AST, ALT and testosterone were determined by slaughtering the sixty birds. Results showed higher levels of cholesterol (Cholesterolemia), lipid (lipidemia), AST and ALT in group B, C and D over the control group (A). Increase in testosterone levels was observed in groups B, C and D as well. It was therefore concluded that *R. racemosa* is atherogenic even though it has been reported to possess a spermatogenic effect. That it could be used as an aphrodisiac with caution, to enhance broiler production.

**KEY WORDS:** Mangrove, broilers, feed, cholesterolemia, lipidemia, testosterone.

### INTRODUCTION

Feed cost has posed a limitation to poultry production due to the high cost of ingredients which are also in high demand by humans. There is the need not only of alternative feed sources but also to ensure that the feed provided yields high economic return within the minimum rearing period of these birds. Improvement of the productivity of livestock in Nigeria is a major concern of researchers in animal science in Nigerian Universities and Research Institutes. In order to enhance the productivity of birds, plant proteins, minerals nutrients and carotene have been incorporated in their feeds. For example, the leaf of *Leucaena leucocephala*, a rich source of protein, mineral nutrient, carotene and xanthophylls was reported to have enhanced egg production and yolk pigmentation (D' Mello and Thomas, 1978; Okonkwo and Alhassan, 1997). The red mangrove tree, *Rhizophora racemosa* (known as Ngala in Nigeria), grows as a succulent green foliage in the rain forest zone of West and Central Africa, and along the east coast of tropical America. Succulent green feeds are believed to be sources of protein, minerals, vitamins and other unidentified growth factors. There is relatively little information in published sources of the effect of incorporating the mangrove leaf, *Rhizophora racemosa* in broiler diets. However, the gathering of mangrove leaves for animal fodder remains widespread in the near East and South Asia (Collins, 1995). In India and Iran, the gatherings of mangrove leaves are used to feed camels (Bandaranayake, 1996). It is reported that some mangrove

plants and extracts are used as incense, perfumes, hair preservatives, condiments and aphrodisiacs (Bandaranayake, 1996). Wekhe et al (2007) reported a lineal body weight gain of *R. racemosa* in broiler chickens. Similar growth promoting effects of plants, shrubs and browses have been reported. Oliver (1980) reported on *Alchornea cordifolia*, a browse plant, as a stimulant, intoxicant and aphrodisiac; Wekhe (2002) reported on weight gain and increase in organ size of broilers fed *Alchornea Cordifolia*; Ogbamgba and Wekhe (2005) reported on the use of the pulverized bark of the timber tree *Mansonia altissima* to increase egg production and fertility; Ogbamgba and Wekhe (2006) reported on the use of *Mansonia altissima* a growth promoter, to cause weight gain in laying hens and cocks. The objective of this study is to further explore the additive qualities of the leaves of *Rhizophora racemosa* (red mangrove) in broiler feeds in the tropics.

### MATERIALS AND METHODS

Sixty (60) day-old Anak broiler chicks were randomly allotted to four treatment groups A, B, C and D of 15 birds each. The groups were sub-divided into five birds each and replicated thrice. Group A was used as the control while birds in groups B, C and D received pulverized *Rhizophora racemosa* (red mangrove leaf) at the rate of 40g/kg feed, 50g/kg feed and 60g/kg feed, respectively. Whole fresh leaves of *Rhizophora racemosa* were harvested at Eagle Island, Port Harcourt, Nigeria, oven dried at 70°C for two hours, pulverized using a motorized mill and weighed out according to their dosage levels with

the aid of an electronic balance (Ohans Scout II). A proximate analysis of the *R. racemosa* (red mangrove) leaf was done to determine the crude protein, ash and fat contents. The pulverized specimen was dispensed to the birds in their feed from day one to the 8<sup>th</sup> week (56 days) being the end of the experiment. The birds were brooded using electric bulbs of 200 watt to provide the heat. Feed consumption was monitored daily by calculating the difference between the served feed and the left-over quantities. The data on feed consumption and weight gain by the birds were taken on a weekly basis. At the end of the experiment all the birds were slaughtered and blood samples collected in both anti-coagulant specimen bottles and bottles without anti-coagulant, respectively, and then sent to the laboratory for blood chemistry and hormone (testosterone) analysis.

**RESULTS**

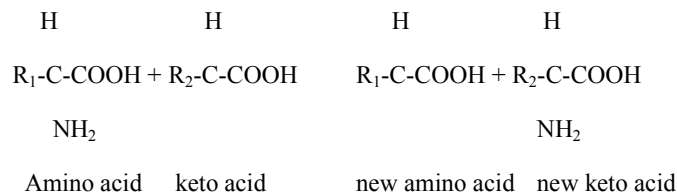
The proximate analysis of the specimen, pulverized *R. racemosa* (red mangrove) was: crude protein (18.5%), ash (2.37%), fat (1.21%), fibre (1.05%), moisture (76.87%); also iron (0.76mg) and phosphorous (0.33mg). The result of the analysis of the blood for cholesterol, ALT (SGPT), AST (SGOT), total lipid and testosterone levels are as shown in Table 1. there was a general increase in the level (%) of cholesterol (cholesterolemia) as group B recorded (11.00%), group C (23.17%) and group D (35.37%) over the control group a (0.00%). Similarly there was an increase in the level of ALT as B was (0.00%); C, (16.67%); and D, (66.67%) over the control group A, (0.00%); and an increase in AST level as B recorded (60.00%), C, (72.00%) and D (60.00%) over the control A (0.00%) while blood lipid also increased (lipidemia) in B (16.05%), C (13.41%), D (29.63%) over A (0.00%). For testosterone the values were B (12.90%), C (6.45%), D (25.81%), over the control A (0.00%), signifying an increase in level of the male hormone (Table 1).

**DISCUSSION**

The observed cholesterolemia and lipidemia are indicative of a state of predisposition to atherosclerosis or arteriosclerosis. This is similar to the report of Oruwari (2006) that high cholesterol level (Cholesterolemia) and high total lipid (lipidemia) were observed in the blood of quails and rabbits following the feeding of these animals with graded levels of palm oil supplemented diets for 12 weeks. Palm oil was therefore referred to as atherogenic. This observation would suggest that *R. racemosa* leaves have atherogenic properties. Cholesterol is present in tissues and in blood plasma either as free cholesterol or as

a storage form, combined with a long-chain fatty acid as cholesteryl ester. It is also an essential structural component of cell membranes and of the outer layer of plasma lipoproteins. It is a moderator molecule in plasma membranes for the maintenance of adequate membrane fluidity. Cholesterol is synthesized in many tissues from acetyl-CoA and is the precursor of all other steroids in the body such as glucocorticoids/corticosteroids, sex hormones (testosterone, estrogen and progesterone), bile acids, and vitamin D. this means that without cholesterol there can be no steroidogenesis and therefore no reproduction (Oruwari et al, 2006). However, as a typical product of animal metabolism, cholesterol occurs in foods of animal origin such as egg-yolk, meat, liver and brain, which are unavoidably consumed by most people. Cholesterol is inevitable in our daily life; high level cholesterol predisposes to atherosclerosis, hypertension and death in man. This is the paradox of the nutritionist. However, this is not applicable to the broiler that has a short life. The increase of cholesterol level in poultry should be advantageous especially to male parent stock as it would form abundant substrate for production of testosterone, spermatozoa and act as an aphrodisiac.

In this experiment, testosterone level increased consistently from 0.00% in the control level A, to 12.9% in B, and 25.81% in group D chickens. Since testosterone is responsible for spermatogenesis and libido (sex drive) it means that *R. racemosa* (mangrove leaves) could be used as an aphrodisiac. This finding is consistent with that reported by Bandaranayake (1996) that mangrove plants and extracts are used as an aphrodisiac, and also with that of Wekhe et al (2007) that the administration of pulverized leaves of *R. racemosa* (mangrove) at the dosage of 10g/kg feed caused hypertrophy of the testes in male broiler birds and that it could be used to enhance the performance of breeder cocks in the broiler industry. The researchers further suggested an assay of the level of testosterone to confirm this hypertrophy of the testes. The hypertrophy of the testes and the observed rise in testosterone level produced by the administration of pulverized *R. racemosa* leaves by various researchers suggest that the red mangrove leaf is an aphrodisiac and so could be used to enhance the performance of breeder birds. Transaminases are enzymes that facilitate the reaction used to synthesize non-essential amino-acids (transamination), a process in which the amino group (NH<sub>2</sub>) is transferred from an amino acid to a keto-acid (a precursor of an amino-acid) such as pyruvic acid, to produce a different amino acid (Carola et al 1990).



Transferases are mostly derivatives of pyridoxine (Vitamin B<sub>6</sub>), acting as substrate. Without this vitamin the non-essential amino acids are synthesized only poorly and

therefore protein formation cannot proceed normally (Guyton, 1991). Serum levels of transaminases especially Aspartate amino transferase (AST) are markedly raised in

diseases and morbid conditions involving injury to large numbers of metabolically active cells e.g. in myocardial infarction (Keele and Neil, 1991), hepatitis, liver necrosis, trauma and liver cancers (Carola et al, 1990). Alanine amino transferase (ALT) levels are raised in myocardial infarction and viral hepatitis, respectively (Murray et al 2006). This may be explained as the body's attempt to increase enzyme action to facilitate more protein production from available pyridoxine in order to replenish the cells lost due to injury or morbidity (Wekhe and Wosu, 2004).

The rise in ALT and AST levels of the treatment groups B, C and D that received the additive *R. racemosa* over the control (A) suggest that *R. racemosa* is a stress factor. A rise in liver, blood and muscle AST (SGOT) levels signifies a depression of the metabolic activity of the liver which is the primary site of metabolism. Similarly, a rise in ALT (SGPT) signifies exhaustion of the skeletal

muscles of the body due to increased activity. According to Smith et al (1974) the measurement of serum levels of such enzymes as glutamic oxo-acetic acid transaminase, glutamic pyruvic transaminase, lactic dehydrogenase and creatine phosphokinase allows recognition of necrosis. It therefore follows that the presence of ALT and AST observed in the experiment is indicative of cellular damage in the body caused by the intake of pulverized *R. racemosa* leaves.

#### CONCLUSION

Powdered (pulverized) *Rhizophora racemosa* (red mangrove) leaves could be incorporated in feed or used as a feed additive as an aphrodisiac for male parent stock. Further research is suggested to demonstrate whether the rise in AST and ALT could reach pathologic levels in chickens and also to demonstrate the effect of *R. racemosa* on estrogen production.

**TABLE 1:** Blood Chemistry and Testosterone values

| S/N | Blood Parameter       | A(Control) | B(40g/kg Feed) | % Increase | C(50g/kg feed) | %       | D(60g/kg feed) | % increase |
|-----|-----------------------|------------|----------------|------------|----------------|---------|----------------|------------|
| 1.  | Cholesterol (U mol/l) | 8.2        | 9.1            | 11.00 ↑    | 10.1           | 23.17 ↑ | 11.1           | 35.37 ↑    |
| 2.  | ALT (SGPT) (iu./l)    | 6.0        | 6.0            | 0.00 ↓     | 7.0            | 16.67 ↑ | 10.0           | 66.67 ↑    |
| 3.  | AST (SGOT) (iu./l)    | 5.0        | 8.0            | 60.00 ↑    | 8.6            | 72.00 ↑ | 8.0            | 60.00 ↑    |
| 4.  | Total lipid (g/l)     | 8.1        | 9.4            | 16.05 ↑    | 9.2            | 13.41 ↑ | 10.5           | 29.63 ↑    |
| 5.  | Testosterone (Umol/l) | 12.4       | 14.0           | 12.9 ↑     | 13.2           | 6.45 ↑  | 15.6           | 25.81 ↑    |

#### Legend

|   |   |   |           |
|---|---|---|-----------|
| ↑ | = | % | increase  |
| ↓ | = | % | decrease  |
| ↕ | = |   | no change |

#### ACKNOWLEDGEMENT

We are grateful to Kentish Medical Diagnostic Laboratory, Port Harcourt, for the serological analysis of this work and Mr Gogo Uranta of Rivers State University of Science and Technology, Port Harcourt, Teaching and Research Farm for the management of the experimental animal.

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