Some kidney function parameters of wistar albino rat fed Pentaclethra macrophylla seeds meal

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Abstract
The study was designed to investigate the effect of feeding Pentaclethra macrophylla meal on kidney parameters of Wister albino rats. Twenty animals were randomly assigned into four groups, with each group consisting of 5 animals each. Group A served as the control group which had meal without Pentaclethra macrophylla, Group B had 5% of Pentaclethra macrophylla incorporated in their diet, Group C had 10% Pentaclethra macrophylla incorporated in their diet while Group C had 20% Pentaclethra macrophylla incorporated in their diet. The animals were fed for twenty eight days, at the end of experimental period, the animals were sacrificed by cardiac puncture, and blood collected for biochemical estimation. Urea, Creatinine, Sodium ion and Potassium ion concentration were determined in blood serum and probability values taken at (p<0.05). The result revealed that Pentaclethra macrophylla could improve proper functioning of the kidney.

Keywords: Creatinine, Sodium ion, potassium ion, Pentaclethra macrophylla, Urea, Wistar albino rats.

1. Introduction
Pentaclethra macrophylla is a multipurpose tree from Africa with potential for agro forestry in the tropics (Ladipo, 1984). It is the sole member of the genus occurring naturally in the humid lowlands of West Africa (Aju et al., 2005). It is a leguminous tree (family leguminosae; sub-family mimosoideae) and recognized by peasant farmers in the south east of Nigeria for its soil improvement properties (Akindahunsi, 2004).

It has been cultivated in Nigeria since 1937 (Ladipo et al., 1995). The tree grows to about 21 m in height and about 6 m in girth (Keay et al., 1989). The bark is grayish to dark reddish brown. The compound leaves possess a stout angular petiole. The local names include “Congo acacia” in Congo, “Duala Kombola” in Cameroon and “Ugba”, Ukpkala” in South Eastern part of Nigeria, (Enujiugh et al., 2000).

Fruits are available at most periods of the year because the large woody pods are persistent. Fruits split open explosively with valves curling up. Common uses of P. macrophylla include food, salt substitute, edible oil, seed craft, dye, fencing and palings, charcoal, carving bowls, medicine (Enujiugh et al., 2000; Asogwu et al., 2006). Some parts of the plant have medicinal values. The seed, when crushed and eaten with red ants, can induce abortion (Abbiw, 1990; Isawumi, 1993; Tico, 2005).

The edible seeds require tedious but careful processing and fermentation before they can be eaten as food supplement. The flat glossy brown edible seeds, averaging 8 (6-10) in number, are contained in a brownish flattened pod (Enujiugh 2003), which explodes at maturity and disperses the seeds. The number of seeds in the pod depends on the length of the pod and the size of the seeds.

The mature dispersed seeds are harvested by gathering them manually from around the tree. The kernel (a dicotyledon), which is gray in color, is embedded in a glossy brownish seed coat. The seeds may be said to be irregular and oval and lies flat in its natural position. Okafor (1987) identified Pentaclethra macrophylla as a minor food supplement, while other workers (Oyenuga, 1968; Okigbo, 1977; Okafor, 1979) have investigated and found that this oil seed contains 23% – 28% protein. It also contains the twenty (20) essential amino acids and essential fatty acids that make up over 10% of the fatty acids in the oil (Enujiugh, et al., 2000; Ikediobi, 1981).
2. Materials and Methods

i. Collection and Identification

The *Pentaclethra macrophylla* seeds were collected from Ogbe Ahia-azu Mbaise L.G.A of Imo State and was identified by Mr. A Ozike a taxonomist of Bio resources and development centre, Nsukka, Enugu State. Wister albino rats were collected from the University of Nigeria, Nsukka at the Veterinary Medicine Department.

2.1 Experimental Design

i. Animals

Wister albino rats, obtained from the laboratory animal units of the faculty of Veterinary Medicine, University of Nigeria, Nsukka were used for the experiment. The animals were kept in a well-ventilated stainless steel cages at room temperature of about 28 °C and was acclimatized for 7 days, normal feed and clean drinking water was provided to them. Twenty (20) rats were distributed into four groups, each group contain five animals. Group A served as the control group, Group B had 5% dietary incorporation of *Pentaclethra macrophylla*, Group C had 10% incorporation, Group D had 20% incorporation of the seed in their diet. Guide rules for the use of laboratory animals according to Zimmerman (1983), was strictly observed.

2.2 Preparation of *Pentaclethra macrophylla* Seed Meal for i. Animal Feeding

The *Pentaclethra macrophylla* seeds were cooked for 1 hour peeled and was sliced. It was oven dried at the temperature of 60 °C. The dried sample was milled into powdery form with the aid of a mechanical grinder and was stored in an air tight container.

2.3 Collection of Blood Samples

The animals were sacrificed after 28 days, blood collected through cardiac puncture by dazing using 5 ml syringe. The blood was centrifuged at 3000 rpm for 10 mins and the serum was separated from the plasma. The serum was collected in a serum bottle and was kept in the refrigerator until when used.

2.4 Biochemical and Electrolyte Tests

**Serum Urea**

This was done using the method of Chaney and Marbesh (1962).

Calculation:

\[
\text{Conc. of sample (mg/dl)} = \frac{\text{Abs SAMPLE} \times (\text{standard conc})}{\text{Abs STANDARD}}
\]

**Serum Creatinine**

This was done using the method of Taussky (1961).

Calculation:

\[
\text{Conc. of sample (mg/dl)} = \frac{\text{Abs SAMPLE} \times 2.06 \times (\text{standard conc})}{\text{Abs STANDARD}}
\]

**Serum potassium level**

Potassium is determined colorimetrically in human serum and plasma using the method (AOAC, 1984).

3. Result and Discussion

**Fig 1:** urea concentration of test and control animal.

The results of serum urea concentration of animal fed with diet contain *Pentaclethra macrophylla* at different percentage (%) incorporation in diet is presented in Fig. 1. The result showed urea significant increase (p<0.05) in the 20% and 10% group when compared with the control group. Thus giving the value of control group as 28±1.826, 20% group as 34±0.213, 10% group as 36±1.826 and 5% group as 26±0.817 as the concentration of urea in the serum.

**Fig 2:** creatinine concentration of test and control animal.
The results of serum creatinine concentration of animal fed with diet contain *Pentaclethra macrophylla* at different percentage (%) incorporation in diet is presented in Fig. 2. The result showed creatinine significant increase (p<0.05) in the 20% and 10% group when compared with the control group. Thus giving the value of control group as 1.05±0.129, 20% group as 1.30±0.312, 10% group as 1.35±0.129 and 5% group as 0.90±0.081 as the concentration of creatinine in the serum.

![Fig 2: Creatinine concentration of test and control animal.](image)

The results of serum sodium ion concentration of animal fed with diet contain *Pentaclethra macrophylla* at different percentage (%) incorporation in diet is presented in Fig. 3. The result showed sodium ion significant decrease (p<0.05) in the 20% and 10% group and 5% group when compared with the control group. Thus giving the value of control group as 150±1.826, 20% group as 139±0.241, 10% group as 105±1.825 and 5% group as 91±1.826 as the concentration of sodium ion in the serum.

![Fig 3: Sodium ion concentration of test and control animal.](image)

The results of serum potassium ion concentration of animal fed with diet contain *Pentaclethra macrophylla* at different percentage (%) incorporation in diet is presented in Fig. 4. The result showed potassium ion significant decrease (p<0.05) in the 10% and 5% group when compared with the control. Thus giving the value of control group as 7.07±0.171, 20% group as 7.45±0.129, 10% group as 6.0±0.141 and 5% group as 4.45±0.129 as the concentration of potassium ion in the serum.

![Fig 4: Potassium ion concentration in test and control animal.](image)

### 4. Discussion

Urea, creatinine, sodium ion and potassium ion are parameters elevated in an event of kidney damage. They serve as markers of renal function. Urea, however, is formed at variable rates perhaps at increased cases of high protein diet, Gastro intestinal bleed, catabolic states - cachexia and excretion which also depends upon extent of water reabsorption as well as upon GFR (Jozef, et al., 2002).

The urea and creatinine concentration of the 5% group was insignificant (p<0.05) at 26±0.817 urea concentration of the 5% group when compared to control group 28±1.826 and 0.90±0.081 for creatinine concentration of the 5% group when compared with the control group 1.05±0.129. The proportion of *Pentaclethra macrophylla* incorporated in the diet was in small quantity and must have possessed little or no effect on urea and creatinine concentration in the 5% group.

There was a significant decrease (p<0.05) from 91±1.826 sodium concentration of the 5% to 150±1.826 sodium concentration of the control group. Also there was a significant decrease when the concentration of Potassium ion for the 5% group 4.45±0.129 was compared with the control group 7.07±0.171. The action of urea transporter 2 whose mechanism is important to prevent the loss of water, to maintain blood pressure and to maintain a suitable concentration of sodium ions in the blood plasma (Jacki et al., 2007), the consumption of *Pentaclethra macrophylla* could have an effect on the transporter and thus cause the increase concentration of sodium ion and potassium ion in the serum.

10% group showed a significant increase (p<0.05) 36±1.826 in urea concentration, when compared with the control group 28±0.816. For creatinine concentration, the 10% group also showed significant increase 1.35±0.129 when compared with the control group 1.05±0.129. This could be attributed to the quantity of protein in the meal since urea level can increase due to increase cases of high protein diet consumption and excretion also depends upon extent of water re-absorption as well as upon GFR, also since the rats used were males it could be due to increased degradation of the muscle mass resulting in a decrease in muscle mass and increases creatinine production through creatine as reported by (Verma et al., 2006).

There was a significant decrease (p<0.05) in sodium and potassium ion concentration when the 10% group 105±1.825 for sodium ion concentration was compared with the control group 150±1.826. The concentration of potassium ion between the 10% group 6±0.141 and control group 7.08±0.171 also revealed a significant decrease. The decrease in sodium and potassium ion concentration could be attributed to water re-absorption.

20% group showed a significant increase (p<0.05) 34±0.213 in urea concentration, when compared with the control group 28±0.817.

20% group showed a significant increase (p<0.05) 7.45±0.129 in Potassium concentration when compared to the control group 7.08±0.170, it could have led to increase in muscle mass degradation (Verma et al., 2006).
5. Conclusion
The study has revealed that African oil bean (*Pentaclethra macrophylla*) seed is composed of carbohydrate, protein, fat, ash, moisture and crude fibre which makes it a good source of food for humans. In conclusion this study has indicated that the consumption of *Pentaclethra macrophylla* in large quantity may have some positive effect on the urea, creatinine, sodium ion and potassium ion level in the serum of a Wister Albino Rats, and thus can be said to be nephro friendly therefore *Pentaclethra macrophylla* is good for nutritional purposes.

6. References
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