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Effect of Chronic Consumption of *Piliostigma thonningii* on Activities of Alanine Aminotransferase and Aspartate Aminotransferase in Serum and Liver in *Rattus norvegicus*

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Abstract: The effect of chronic consumption of *Piliostigma thonningii* on the activities of Aspartate Aminotransferases (AST) and Alanine Aminotransferases (ALT) on serum and liver of *Rattus norvegicus* was investigated in this research. The aim of this study was to check the possible effect of chronic consumption of *Piliostigma thonningii* on the activities of the liver biomarkers (ALT and AST) in *Rattus norvegicus*. The results from this study revealed that the activities of aspartate aminotransferase (AST) in serum, showed a significant increase ($34.20 \pm 12.9^*$) at ($p < 0.05$) upon chronic consumption of ethanolic extract of *P. thonningii* when compared with that of the control B (18.02 ± 1.54). The result also showed that the liver AST was significantly increased ($32.75 \pm 5.89^*$) when compared to that of the control B (17.01 ± 1.81) at ($p < 0.05$). The results from the study also revealed that there was a significant increase in the activity of alanine aminotransferase in the liver ($17.01 \pm 5.86^*$) when compared with that of the control B (5.1 ± 1.11) at ($p < 0.05$). There was a corresponding increase in serum activity of the enzyme ALT ($13.65 \pm 3.79^*$) when compared with that of the control B (9.4 ± 1.98) at ($p < 0.05$). The results from this research has shown that chronic consumption of *P. thonningii* may cause liver injury thereby, increasing the liver enzyme activity ($17.01 \pm 5.86^*$). This was shown in the corresponding increase in the serum level. Excessive consumption of the extract of *P. thonningii* has a toxicity potential on the liver and possibly other organs and tissues.

Key words: Chronic consumption, *Piliostigma thonningii*, liver, *Rattus norvegicus*, alanine aminotransferase, aspartate aminotransferase, herbal medicine

INTRODUCTION

The use of medicinal plants and animal-derived remedies for treating illness by Africans goes back many years. Traditionally, rural African communities have relied mainly on the invaluable spiritual and practical skills of traditional medicine practitioners (TMPs) for their healthcare (Busia, 2005).

Traditional herbal medicine has often be used side by side western medicine more so when herbal medicine is of lower cost than western medicine. Literature has documented that *Piliostigma thonningii* plant has diverse ethnomedical applications (Togola *et al.*, 2005).

Piliostigma thonningii is a leguminous plant which belongs to the family of trees or shrubs called *Caesalpinaceae*.

Piliostigma thionningii is a perennial tree that is between 4-15 m in height with a rounded crown and a short but often cooked bole.

In Nigeria, the seed of *P. thonningii* is called Abefe in the Yoruba land, Kalgo in Hausa and Okpoatu in Ibo. The roots of the plant have been used for the treatment of dysentery, fever, infections, snake bites, hookworm and skin diseases (Jimoh and Oladiji, 2005).

Various parts of the plant have been used to arrest bleeding, in the treatment of fever as well as bacterial infections, it has also been used as laxatives and as an anthelmintic and as anti-inflammatory agents (Igoli *et al.*, 2005; Fakae *et al.*, 2000).

The plant has also been observed to exhibit potency against five bacterial and three fungi at 25 mg mL⁻¹ concentration and the leaves are a good source of some minerals, antioxidant-vitamins and efficient source of energy (Ighodaro *et al.*, 2012).

The liver has the unique capacity to regulate its growth and mass (Fausto and Campbell, 2003). In rodents and humans, it grows rapidly after resection of more than 50% of its mass. This growth process, as well as that

following acute chemical injury is known as liver regeneration, although growth takes place by compensatory hyperplasia rather than true regeneration. Fausto and Campbell (2003) also observed that in addition to hepatocytes and non-parenchymal cells, the liver contains intra-hepatic "stem" cells which can generate a transit compartment of precursors named oval cells. Liver regeneration after partial hepatectomy does not involve intra or extra-hepatic (hemopoietic) stem cells but depends on the proliferation of hepatocytes. Transplantation and repopulation experiments have demonstrated that hepatocytes which are highly differentiated and long-lived cells, have a remarkable capacity for multiple rounds of replication. The liver is known for the detoxification of substances that enter into the body. In the event of liver damage or alteration of function the liver enzymes are found to increase.

The consumption of herbal medicine does not have a defined dosage; hence one may consume what may be too much for the system.

This study investigates the effect of chronic consumption of *Piliostigma thonningii* on activities of Alanine Aminotransferase (ALT) and Aspartate Aminotransferase (AST) in serum and liver in *Rattus norvegicus*.

MATERIALS AND METHODS

Animal care ethics: Twelve *Rattus norvegicus* (Wister rats) of both sexes with average weight of 200 g were randomly assigned into two groups A and B. Group A served as treatment group while group B served as the control group. The rats were obtained and maintained in the Animal Holdings of the department of Anatomy, School of Basic Medical Sciences, University of Benin. The animals were fed with grower's mash obtained from Top feeds and flower mills Limited, Sapele, Delta State with batch number 023465 and given water liberally.

Preparation and administration of aqueous *piliostigma thonningii*: *Piliostigma thonningii* stem bark sample used for the experiment were harvested within the University of Benin premises. The samples were then identified by Dr. A.B. Bamidele of the Department of Pharmacognocny, Faculty of Pharmacy, University of Benin. The stem bark were washed clean free from debris and dust particles and were air dried at ambient and sun room temperature for two weeks. The samples were reduced in size using wooden mortar and pestle. The smaller size sample was pre-dried in drying oven at 25°C for five hours. It was immediately pulverized using plant milling machine available in the Department of Pharmacognocny, University of Benin. Each of the samples

was accurately weighed (100 g) with a Top loading balance. It was packed in giant size thimble of a soxhlet and subjected to ethanolic extraction for ten (10) h. This procedure was repeated four times. The *Piliostigma thonningii* powder (37 g) was then dissolved in 530 mL of distilled water, it was then transferred into suitable container and freeze dried ready for the experiment.

R. norvegicus were then sacrificed by cervical dislocation on the twenty ninth day of the experiment. The abdomen was quickly opened to expose the liver. The liver was then dissected; blot dry weighed using the Mettler Toledo weighing balance and quickly homogenated with 10% normal saline for biochemical assay.

Biochemical assay: The measurement of enzyme activity was done using the spectrophotometer. ALT and AST activity were determined by the method of Reitman and Frankel (1957).

Statistical analysis: The results were expressed as Mean±SD. The student t-test was used for the evaluation of statistical significance. The results were judged significant if $p < 0.05$.

RESULTS AND DISCUSSION

Traditional medicine is known to be popular in sub-Saharan Africa, where over 80% have reported its utilization. It is claimed to be easily accessible, affordable, available and acceptable (Sato, 2012).

The reasons for the continued dependence of Africans on traditional medicine range from their belief systems to the relatively high cost and limited access to Western medicine (Busia, 2005).

Piliostigma thonningii has been known to be of diverse application in economic and ethnomedical purposes in Africa (Igoli *et al.*, 2005; Togola *et al.*, 2005). The leaves, roots and twig of *Piliostigma thonningii* have been useful for the treatment of fever, wound infection, jaundice, chicken pox, respiratory ailments, diarrhea, tooth ache and chronic ulcer.

Piliostigma thonningii has been used for different and several medicinal purposes and its aqueous leaf extract likely contains antilipidaemic and anticholesterolaemic substance (s) which may be useful in the prophylactic and curative management of lipid peroxidation, high blood pressure and cardiovascular disorders (Ighodaro and Omole, 2012).

The results from this study revealed that the activities of aspartate aminotransferase in serum, showed a significant increase (34.20±12.9*) at ($p < 0.05$) upon

chronic consumption of ethanolic extract of *P. thonningii* when compared with that of the control B (18.02±1.54). The result also showed that the liver AST was significantly increased (32.75±5.89*) when compared to that of the control B (17.01±1.81) at (p<0.05). The implication of this result is that chronic consumption of *P. thonningii* is injurious to the liver. This is corroborated by the increase in the serum level of the enzyme activity. Though AST is principally to assay for the kidney and the heart activity. This increase in AST in serum may be connected with kidney and heart tissue damage, one may not conclude that since that analysis was not done but it is a possibility.

The results from the study also revealed that there was a significant increase in the activity of alanine aminotransferase in the liver (17.01±5.86*) when compared with that of the control B (5.1±1.11) at (p<0.05). There was a corresponding increase in serum activity of the enzyme ALT (13.65±3.79*) when compared with that of the control B (9.4±1.98) at (p<0.05). The implication of this result is that the liver may have suffered injury hence the leakage of the enzyme in the serum. These findings are in agreement with Giboney (2005). He stated that ALT and AST are two of the most reliable markers of hepatocellular injury or necrosis and that their levels can be elevated in a variety of hepatic disorders. ALT and AST are considered to be two of the most important test to detect the liver injury.

Although, ALT is more specific than AST, sometimes AST is compared directly to ALT and the ratio is calculated. The ratio may be used to distinguish between the different causes of liver damage. ALT and AST are associated with inflammation of the and/or injury to the liver cell, a condition known as hepatocellular liver injury. Damage to the liver typically results in a leak of AST and ALT into the blood stream which was shown in Table 1, 2. However, the causes of elevated enzyme activity of ALT can be further narrowed down by

Table 1: Activities of Aspartate Aminotransferase in serum and liver of *Rattus norvegicus* after chronic consumption of ethanolic extract of *Piliostigma thonningii*

Parameters	Treatment (A)	Control (B)
Serum AST (μL^{-1})	34.20±12.9*	18.02±1.54
Liver AST (μL^{-1})	32.75±5.89*	17.01±1.81

Values are Mean±SD, n = 6, * represent significant differences of test groups in comparison with respective controls at p<0.05

Table 2: Activities of Alanine Aminotransferase in serum and liver of *Rattus norvegicus* after chronic consumption of ethanolic extract of *Piliostigma thonningii*

Parameters	Treatment (A)	Control (B)
Serum ALT (μL^{-1})	13.65±3.79*	9.4±1.98
Liver ALT (μL^{-1})	17.01±5.86*	5.1±1.11

Values are Mean±SD, n = 6, * represent significant differences of test groups in comparison with respective controls at p<0.05

measuring other enzyme activities. For instance, elevated ALT activity due to liver-cell damage can be distinguished from urinary duct problems by measuring alkaline phosphatase. Also myopathy-related ALT levels can be ruled out by measuring Creatine kinase enzymes.

CONCLUSION

This research has shown that chronic consumption of *P. thonningii* may cause liver injury thereby, increasing the liver enzyme activity (17.01±5.86*). The implication of this result is that excessive consumption of the extract of *P. thonningii* has a toxicity potential on the liver and possibly other organs and tissues in the system more so when there is no proper dosage formula for herbal medicine which is the danger of the use of herbal medicine in the treatment of diseases. However, if the extracts are taken in the right proportion, it would serve its medicinal purpose otherwise the individual being given such extracts Excessively, would end up having his/her liver and other tissues of the body destroyed.

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