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The effects of ethanol extract of *Mucuna pruriens* leaves on aspartate aminotransferase, alanine aminotransferase and alkaline phosphatase in albino rats

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ABSTRACTS

All parts of *Mucuna pruriens* has been known to possess valuable medicinal properties. This calls for the need to ascertain the effect of some of this plant extracts on some liver function indices in animal models to provide valuable information on the safety/toxicity of the consumption of the crude extracts. The effect of ethanol extract of *Mucuna pruriens* leaves on aspartate aminotransferase (AST), alanine aminotransferase (ALT) and alkaline phosphatase (ALP) activities in albino rats were evaluated using spectrophotometric method. Sixteen albino rats were grouped into four (A, B, C and D) containing four rats each. Ethanol extract of *Mucuna pruriens* was administered through oral intubation to the animals in groups A, B, C and D at the doses of 200 mg/kg, 400 mg/kg, 600 mg/kg and 0 mg/kg of body weights respectively for fourteen days. Blood samples were collected through the eye vein on the 15th to the last day of administration. The aspartate aminotransferase activities (µ /l) recorded 34.67±2.52, 18.67±0.58, 31.67±1.53 and 23.33±2.31, for the animal in group A, B, C and D respectively. The alanine also recorded for group A, B, C and D respectively with correspondin activities of alkaline phosphatase as A, B, C and D. Alanine aminotransferase activities (µ/l) recorded 26.00±1.00, 40.00±1.00, 55.33±0.58 and 66.67±0.58. Subsequently, alkaline phosphate activities (µ/l) recorded 28.52±11.15, 39.56±15.20, 12.88±4.22 and 29.44±4.22 for animals in groups A, B, C and D. The ethanol extract of *Mucuna pruriens* exerted an insignificant dose-dependent decrease in AST, ALT, and ALP activities at all the specified doses.

Key words: *Mucuna pruriens*, AST, ALT, ALP, enzyme activity, ethanol extract, dose-dependent

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INTRODUCTION

Mucuna pruriens is a tropical legume known as velvet bean or cowitch and by other common names, found in Africa, India and the Caribbean. The plant is infamous for its extreme itchiness produced on contact, particularly with the young foliage and the seed pods. The plant is an annual, climbing shrub with long vines that can reach over 15 m in length [1]. Roots, leaves and seeds of the plant are commonly used in the treatment of impotence, snake bite, diabetes, cancer and Parkinsonism. The endocarp of *Mucuna pruriens* is non-toxic and is 2-3 times more potent than leavodopa in controlling hyperprolactinemia1 motor symptoms of Parkinson's disease animal models [2].

Mucuna pruriens has also shown to exhibit neuroprotective effect by increase brain mitochondrial complex-I activity and significantly restoring dopamine and norepinephrine levels in Parkinsonism animal model [3].

It is important to note however, that in spite of the isolation of the hypoglycaemic principle of some traditional herbs leaves like *Bougainvillea spectabilis*, and the fact that the crude extract of some of these leaves are still being consumed in many parts of Nigeria (particularly among the Nupe people of Niger State) as a remedy for diabetes, Malomo and his colleague in 2006 studied the effect of the ethanolic extract of some of these leaves on some liver and kidney function indices in rats to provide valuable information on the safety/toxicity of the consumption of the crude extract. According to their report however, the activities of liver ALP, AST, and ALT were generally not significantly affected yet they concluded that results of their study suggest that the administration of the extract may adversely affect liver and kidney function; what a contradiction[4]. Therefore, medicinal these plants may prove to be a rich source of compounds with possible antimicrobial activities but more pharmacological investigations are necessary [5].

In this study however, the wider distribution and versatility in the use of *Mucuna pruriens* in health and in treating several disease conditions gives it more edge over other traditional herbs and its safety/toxicity is the propelling force and the main reason for chosen it for this study since it has neither being fully understood nor documented. *Mucuna pruriens* contains many chemicals and it is plausible that one or more of these phytochemicals extract have influenced markers of hepatic damage and clinical diagnosis of hepatocellular damage is most often establish by the measurement of marker enzymes [6]. Aspartate aminotransferase (AST), Alanine aminotransferase (ALT) and Alkaline phosphate (ALP) are determined in this study since they are often used as marker of hepatic injury. These enzymes are either cytosolic or mitochondrial or both and any serious insult to the hepatocytes will evoke the release of these enzymes into the serum [7].

The liver is the cardinal tissue occupied with the function of biotransformation of xenobiotics, such as medicinal plant extracts and a target tissue where possible toxicity effect of same is first expressed. This study therefore investigated the effect of the extract of *Mucuna pruriens* on some liver biochemical indices of apparently healthy albino rats with the aim of ascertaining the safety or otherwise of the potential medicament. Liver weights and enzymes (AST, ALT and ALP) were accordingly evaluated in these rats. Hence this work was carried out to ascertain the effect of *Mucuna pruriens* leaves on aspartate aminotransferase, alanine aminotransferase and alkaline phosphatase in albino rats via the analysis of their liver enzymes.

MATERIALS AND METHODS

Plant Material and Extract Preparation

The fresh leaves of *Mucuna pruriens* were collected from Abakaliki in the month of September, 2011 and the albino rats were brought from the Department of Veterinary Medicine, University of Nigeria, Nsukka. The fresh leaves of *Mucuna pruriens* were dried under room temperature for 72 hours. The dried sample was ground powdery form. 500 g of *Mucuna pruriens* leaves powder were soaked in 200 mls of ethanol for 24hours after which they were squeezed with muslin cloth to get a solution. The extract was then allowed to evaporate under mild sunlight.

Administration of Plant Extract to the Animals

16 albino rats were grouped into four (A, B, C, and D). The rats in groups A, B, and C received crude ethanol extract of *Mucuna pruriens* at doses of 200mg/kg, 400mg/kg and 600mg/kg of body weights through oral intubations while 0.1ml of normal saline was administered to the animals in group D for two weeks.

Collection of Blood Sample

Blood samples were collected from the rat's eye through the eye vein. The blood was allowed to clot and then centrifuged to obtain serum.

Determination of AST, ALT and ALP

The aspartate aminotransferase (AST) and alanine aminotransferase (ALT) were determined by the method of Reitman and Frankel [8]. While alkaline phosphatase (ALP) was determined by Zhary and Denis [9].

Determination of Body Weights

The body weights of all the animals were determined on daily basis with a weighing balance.

RESULTS

The various results for the various tests done are shown below.

Table 1: Percentage yield and colour of the extract

Quantity of dry sample(g)	Quantity of extract (g)	Percentage yield (%)	Colour of extract
500	40.2	8.04	Greenish brown

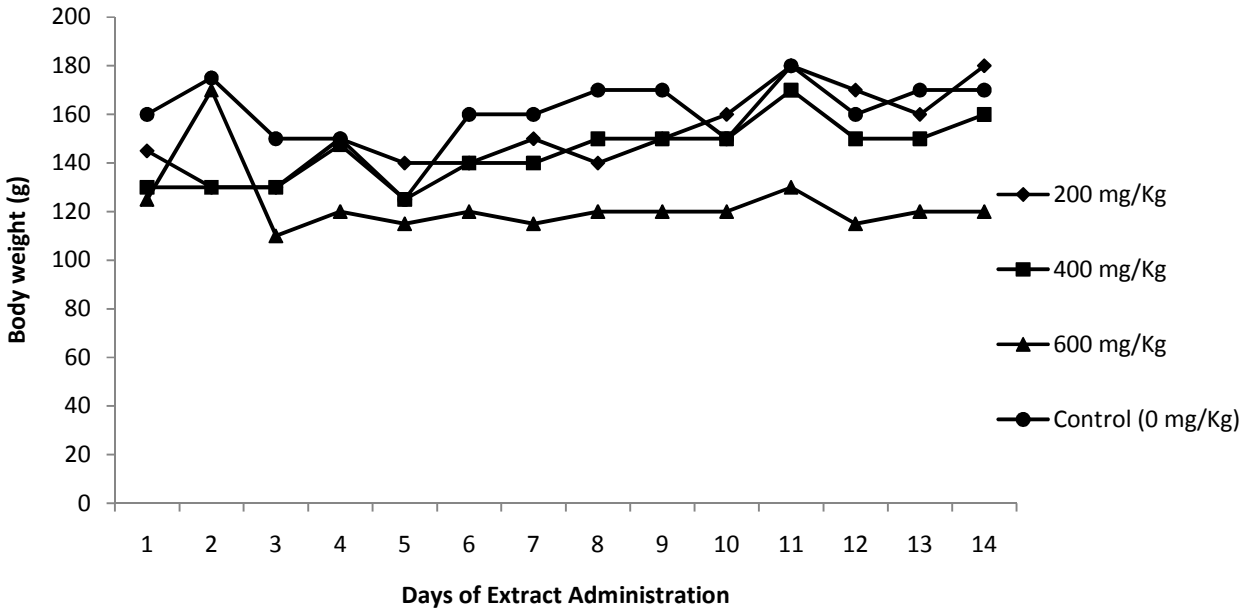

Figure 1: Effect of ethanol Extract formulated from *Mucuna pruriens* on body weight of albino rats

DISCUSSION

There was a decrease in body weights and physical activities of the albino rats when treated with the ethanol extract of *Mucuna pruriens* within few days at a dose of 200mg/kg and 400mg/kg, while at a dose of 600mg/kg there was a decrease both in weight and physical activities throughout the period of administration. Similarly, Nwinyi [10] reported a decrease in weight and physical activities within few days of administration but using crude extract of *Gongronema latifolium*. This decrease and fluctuation of weight may be attributed to metabolic changes caused by the chemical constituents of the leaf extract [11]. Subsequently, rats given ethanolic extract of *Mucuna pruriens* at a dose of 200mg/kg and 400mg/kg, gained higher body weight after few days of administration compared to controls, those that are given normal saline. According to Rao and Alice [12], plant extracts can cause changes in the general metabolic status, affecting the body or organ weight of these animals. According to Gauthaman et al. [13], this increase in the body weight due to administration of plant extracts usually result to appetite stimulation.

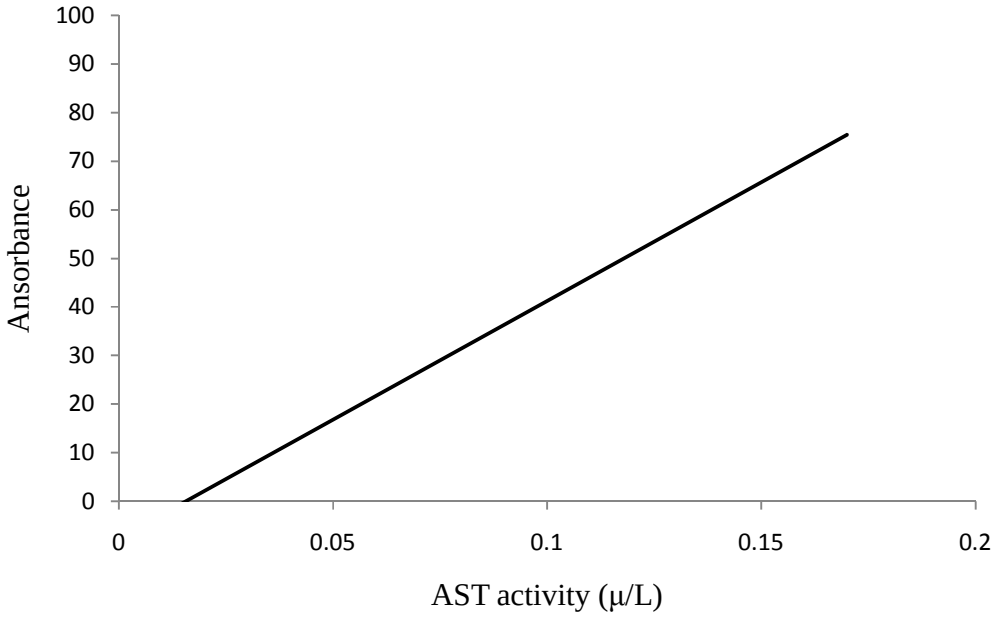

Figure 2: Standard curve for determination of AST Activity

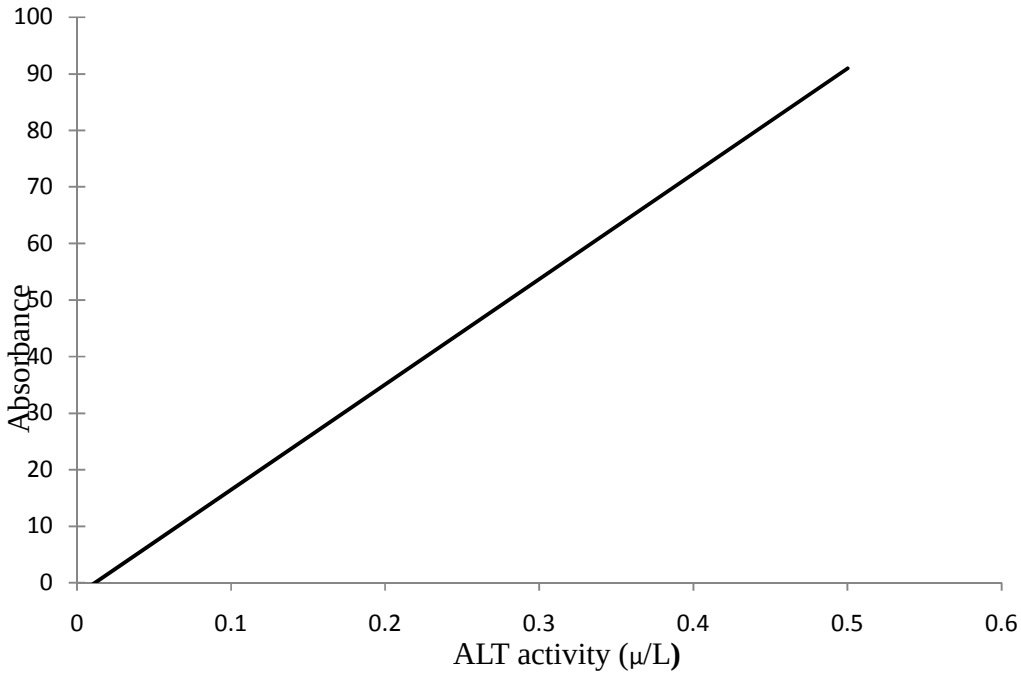

Figure 3: Standard curve for determination of ALT Activity

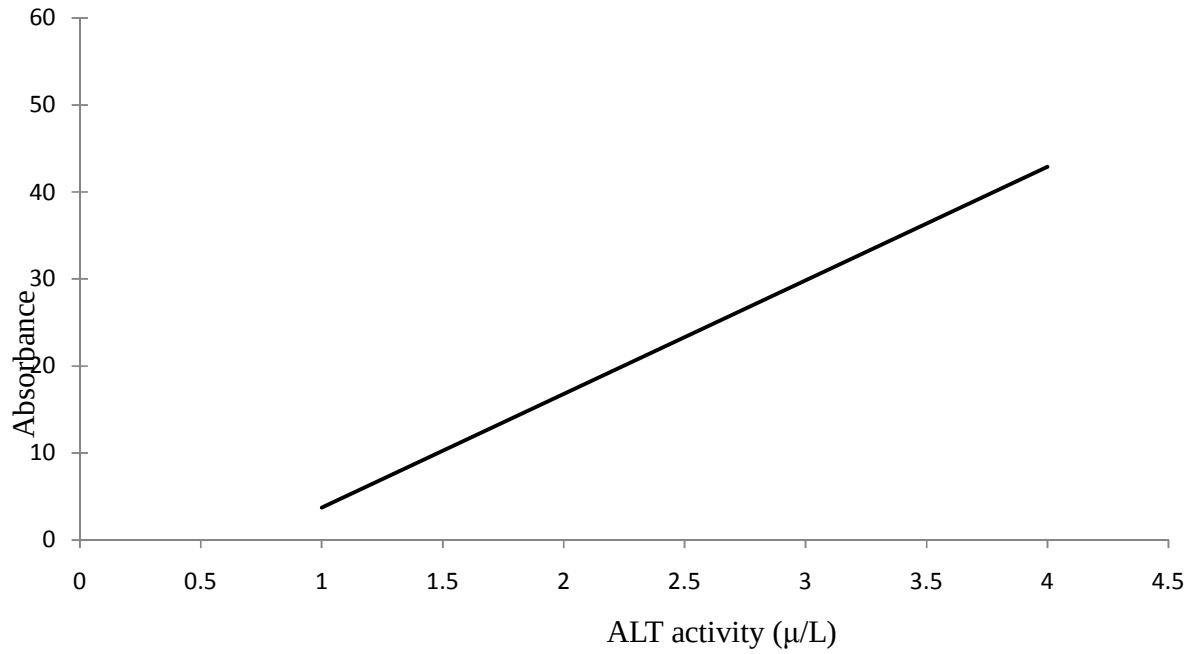

Figure 4: Standard cure for determination of ALT Activity

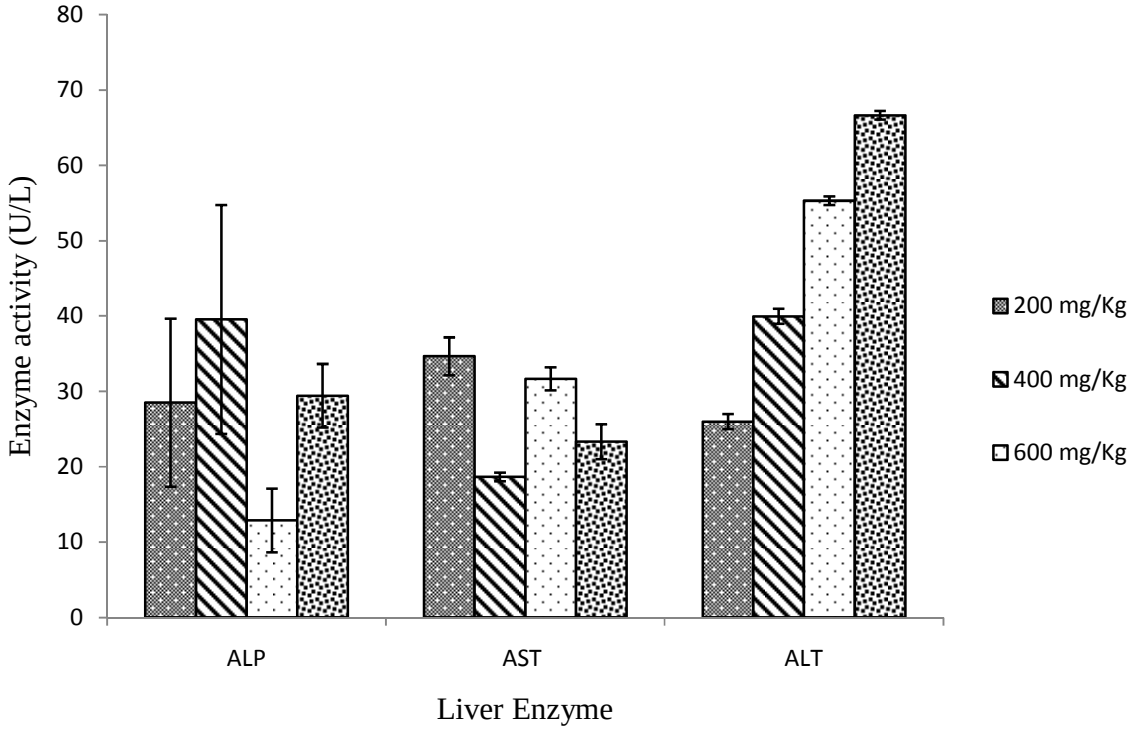

Figure 5: Effects of ethanol extract formulated from *Mucuna prurience* on liver enzyme activities in albino rats

The ethanol extract of *Mucuna pruriens* caused a dose dependent significant decrease (P<0.05) in serum AST activity. Ahmad et al., [14] reported a decrease in the activity of AST in both low and high doses of *Mucuna pruriens* extract. Ita et al. [11] who carried a similar work but using the leaves of *Ageratum conyzoides* (which is of

the same family) reported decrease at doses of 100mg/kg, 200mg/kg and 300mg/kg. The work done by Ahmad et al. [14] and Ita *et al*. [11] are in line with the above stated result.

The extract of *Mucuna pruriens* exerted a dose dependent reduction in ALP activities ($P<0.05$) in the treated animals. Muthu and Krishnamoorthy [15] worked on the evaluation of androgenic activity of *Mucuna pruriens* in male rats and reported a decrease in ALP activities. Decrease serum ALP activity is indicative of Wilson's disease and chronic myelogenous Leukemia [16].

There was also a dose dependent significant decrease ($P<0.05$) in ALT activities. This is also in line with the work carried out by Chukwudi et al. [17] on analysis of some biochemical and haematological parameters for *Mucuna pruriens* (DC) seed powder in male rats, reported that the biomarker enzymes (ALT, ALP and AST) were decreased and were detected rapidly, hence, can be used for the prediction and diagnosis of metabolic insults. Therapy with antihypertensive drugs has been observed to produce low serum ALT activity [18]. Ingestion of plant extract has been reported to reduce serum ALT activity [19]. The reason for this decreased observation in enzyme level has been attributed to the fact that *M. pruriens* is a known antioxidant [20-21]. Therefore, the suppression of liver enzymes to significant amounts could be explained by the enhanced suppressive effect displayed by some components in *Mucuna pruriens* extract, thereby, preventing over-sensitization of enzymes to the metabolism of various substances foreign to the normal system in the rats used for the study [21]. But the finding of this work is contrary to the work carried out by Ezeja and Omeh, [22], who reported that the level of liver enzymes increase with increase in the percent level of *Mucuna pruriens* inclusion in the feed prepared for albino rats.

CONCLUSION

The crude ethanol extract of *Mucuna pruriens* leaves reduced the levels of aspartate aminotransferase, alanine aminotransferase and alkaline phosphatases activities. The overall effect was dose dependent; hence, the study suggests that the extract of this plant may be hepatoprotective.

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