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Research Article

## The Effects of Ethanol Extract of *Allium Sativum* Leaves on Aspartate Aminotransferase, Alanine Aminotransferase and Alkaline Phosphatase in Albino Rats

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**Abstract:** The effects of ethanol extract of *Allium sativum* on aspartate aminotransferase (AST), alanine aminotransferase (ALT) and alkaline phosphatase (ALP) activities in albino rats were investigated by spectrophotometric methods. Sixteen albino rats were divided into four groups (A, B, C, and D) of four animals in each group. Ethanol extract of *Allium sativum* was administered through oral intubation at the doses of 200 mg/kg, 400 mg/kg, 600 mg/kg and 0mg/kg to the animals in groups A, B, C, and D respectively for fourteen days. Blood samples were collected on the fifteenth day following the last day of administration. The aspartate aminotransferase activities ( $\mu$ l) recorded  $0.75 \pm 0.03$ ,  $0.93 \pm 0.06$ ,  $1.38 \pm 0.05$  and  $0.73 \pm 0.02$  for the animals in groups A, B, C and D respectively with corresponding alanine aminotransferase activities ( $\mu$ l) as  $0.45 \pm 0.03$ ,  $0.76 \pm 0.02$ ,  $1.35 \pm 0.04$  and  $8.51 \pm 0.02$ . The alkaline phosphatase activities also recorded  $13.34 \pm 0.12$ ,  $14.64 \pm 0.11$ ,  $19.21 \pm 0.07$  and  $8.51 \pm 0.03$  respectively. There were significant ( $P < 0.05$ ) increases in dose dependent elevations in all the enzyme activities and body weights of the animals.

**Keywords:** *Allium sativum*, ethanol extract, AST, ALT, ALP, enzyme activity, dose-dependent

## INTRODUCTION

Medicinal plants provide inestimable projections for new drug discoveries because of the matchless availability of chemical range. The practice of herbal medicines in Asia and Africa signifies a long antiquity of human interactions with the environment<sup>1</sup>. Natural products from plants can be another potent source for the discovery of excellent biological activities, that is: anticancer and antioxidant activities<sup>2</sup>. Plant has been the source of help, survival and good health. Plants are able to be functioning in this capacity because they have many important chemical substances found all over their various parts such as alkaloids, carbon compounds, nitrogen, glycosides, essential oils, fatty oils, resins, mucilage, tannins, gums and others<sup>3</sup>.

Historically, *Allium sativum* has been used for centuries worldwide by various societies to combat infectious disease. Garlic can be provided in the form of capsules and powders, as dietary supplements, and thus differ from conventional foods or food ingredients. Louis Pasteur was the first to describe the antibacterial effect of onion and garlic juices. *Allium sativum* vegetables, exhibit a broad antibiotic activity against both Gram-positive and Gram-negative bacteria<sup>4</sup>. From the published research articles it is clear that the raw juice of garlic was effective against many common pathogenic bacteria<sup>5</sup>, against the strains that have become resistant to antibiotics<sup>6</sup> and even toxin production by some pathogenic strains prevented by garlic<sup>7</sup>.

The Liver is the center of drug metabolism, in the case of an overdose, the liver is overwhelmed by the drug and this can lead to oxidative stress and toxicity<sup>8</sup>. This study therefore investigated the effect of the extract of *Allium sativum* on some liver enzymes (AST, ALT and ALP) of apparently healthy albino rats with the aim of ascertaining the safety or otherwise of the potential medicament. The weights of the albino rats were accordingly evaluated after the administration of the ethanolic extracts of *Allium sativum*.

## MATERIAL AND METHODS

**Plant Material and Extract Preparation:** The fresh leaves of *Allium sativum* were collected from Abakaliki and the albino rats were brought from the Department of Veterinary Medicine, University of Nigeria, Nsukka. The fresh leaves of *Allium sativum* were dried under room temperature for 72 hours. The dried sample was ground powdery form. 500 g of *Allium sativum* leaves powder were soaked in 200 ml of ethanol for 24 hours 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 *Allium sativum* 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<sup>9</sup>. While alkaline phosphatase (ALP) was determined by Zhary and Denis<sup>10</sup>.

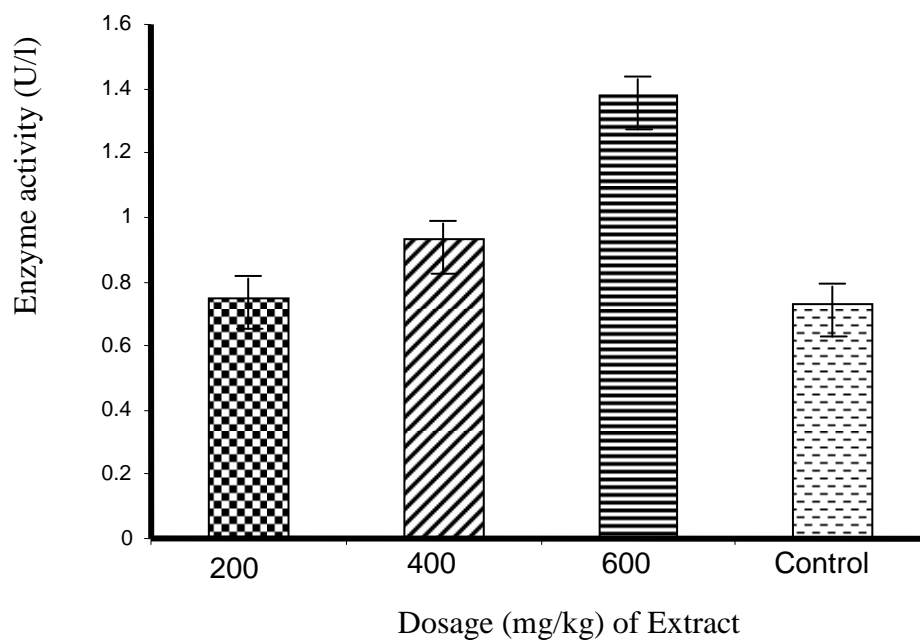
**Determination of Body Weights:** The body weights of all the animals were determined on daily basis with a weighing balance.

## RESULTS AND DISCUSSION

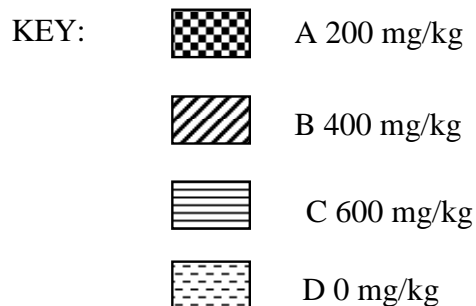
The various results for the various tests done are shown below.

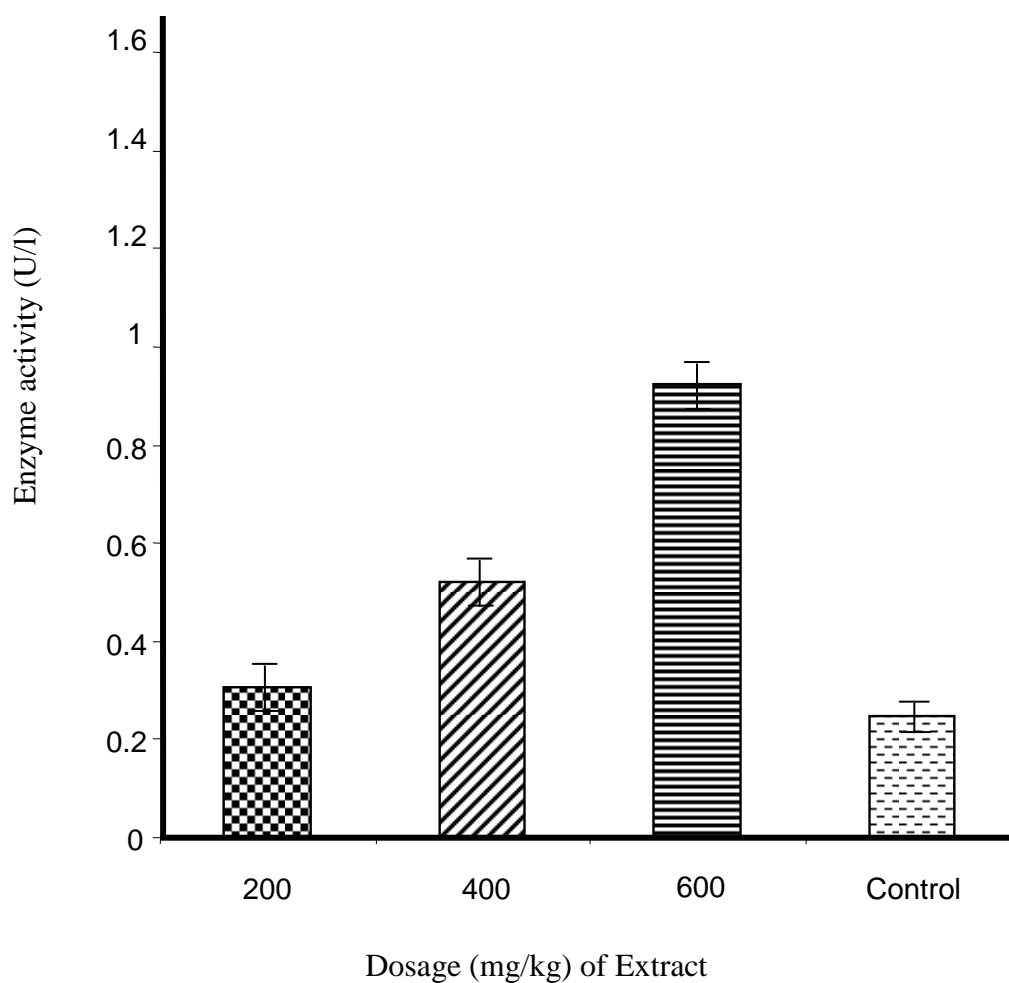
**Table 1: Weight of sample and colour of yield**

Weight of sample (g)	Weight of extract (g)	Percentage of extract (%)	Colour of the <i>Allium sativum</i> before extraction	Colour of the extract after extraction
60	20	33.3%	Ash	Brown







**Figure 1: AST activity against dosage of extract**

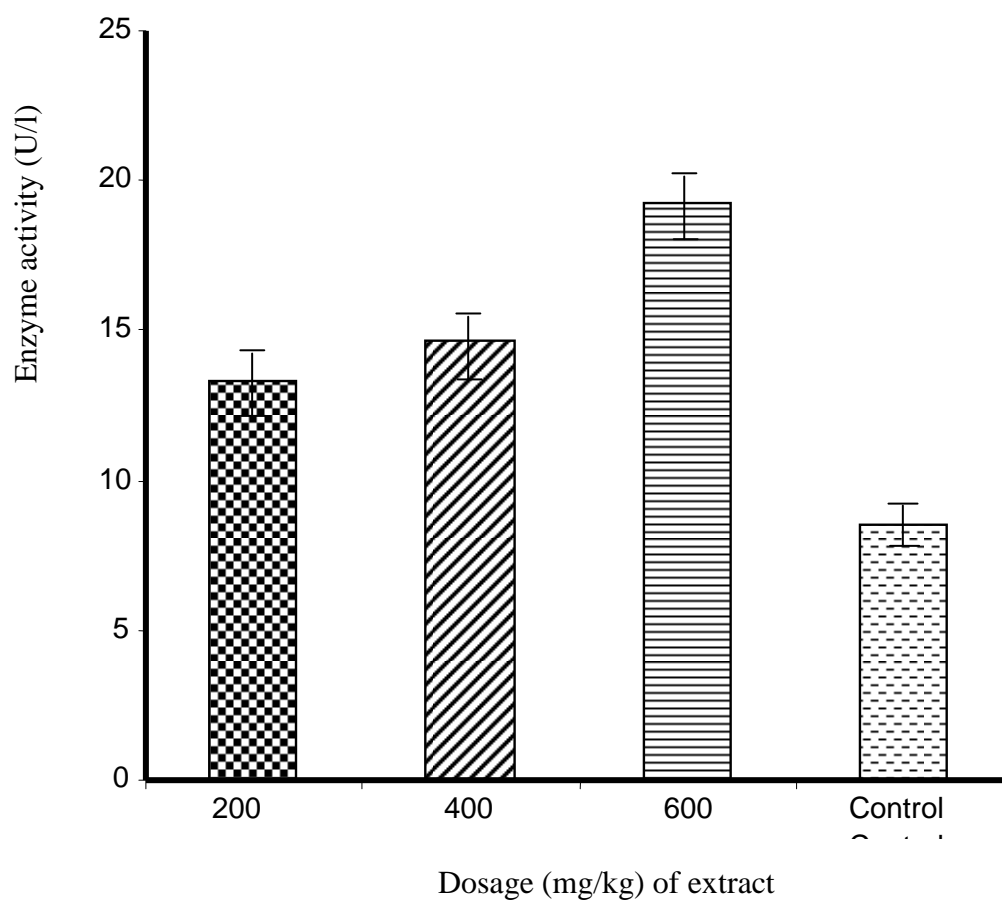




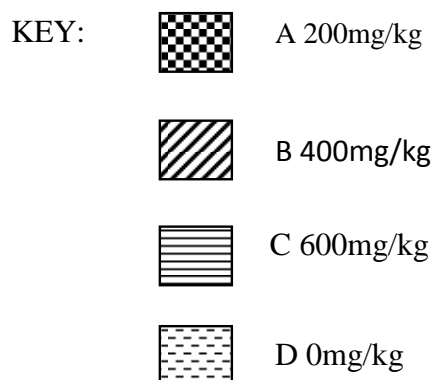
**Fig. 2:** ALT activity against dosage of extract

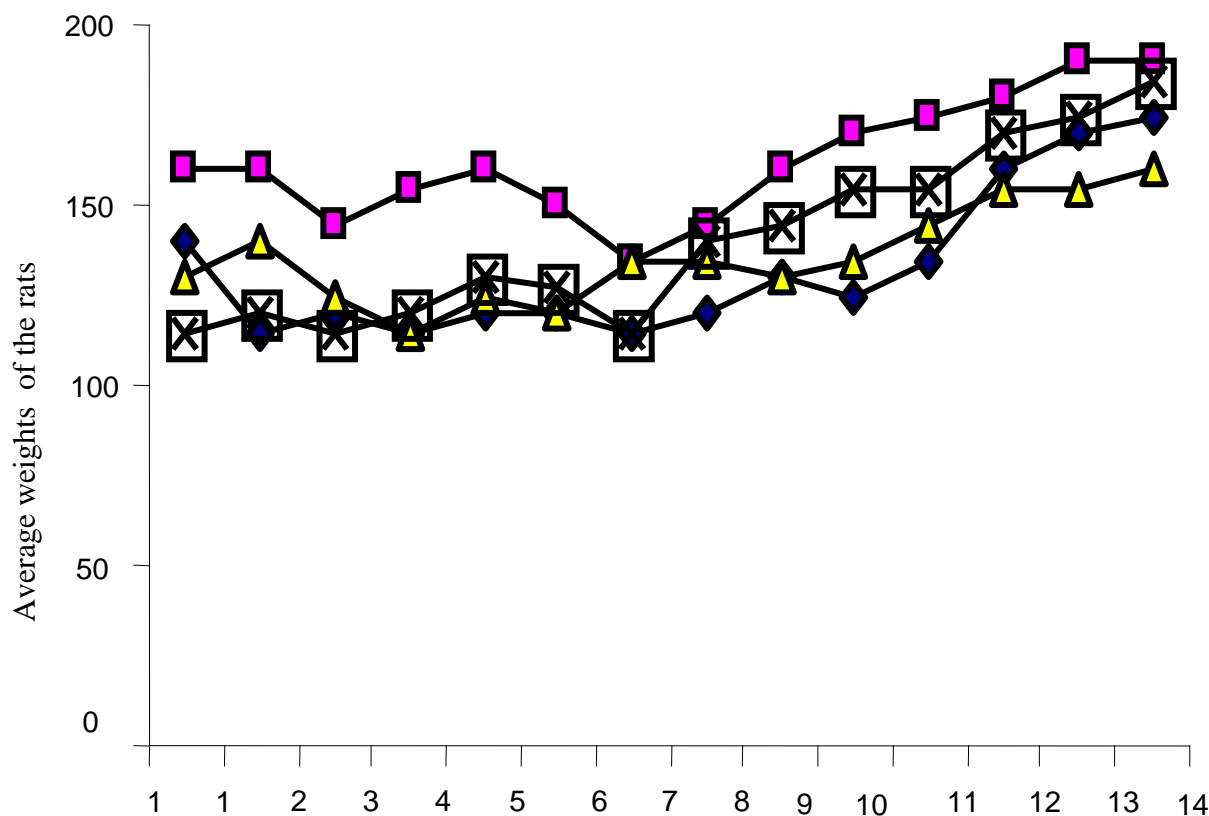
KEY:

-  A 200 mg/kg
-  B 400 mg/kg
-  C 600 mg/kg
-  D 0 mg/kg



**Fig. 3:** ALP activity against dosage of extract





Days of administration

**Fig.4:** Average bodyweights of the rats within the period of administration

Key:   
 ◆ — A   
 ■ — B   
 ▲ — C   
 ▼ — D

## DISCUSSION

The ethanol extract of *Allium sativum* resulted to 33.3% yield. Work by Hinson et al.<sup>11</sup> on protective potential of fresh garlic extract on acetaminophen toxicity resulted to 22% yield of the extract. Paul reported on the comparative effects of chlorpropanide and combined leaf extract of *Vernonia amygdalina* and *Azadirachta indica* on AST, ALT, ALP activities in albino rats yield 40.56%<sup>12</sup>. Combined leaf extract of *Azadirachta indica* and *Vernonia amygdalina* on alloxan-induced diabetic rats yielded 40.56 g<sup>13</sup>. Extract of *Mucuna pruriens* on hemoglobin and packed cell volume (PCV) levels in albino rats yielded 9.80 g<sup>14</sup>. The difference in percentage yields of the extracts is likely to be associated with loss of water contents of the plants during the drying process.

Increased physical activities were observed in animals administered with ethanol extract of *Allium sativum* than the control. Contrarily, Lee et al. reported on effect of extract of aged *Allium sativum* on liver enzymes observed a reduction in physical activities in animals administered with the extract. The observation explains the claim by researchers that there was a reduction in the nutritional contents in aged

garlic than the fresh garlic<sup>15</sup>. The result of this study is in line with the work by Izunya *et al.*, who reported an increase in physical activities of the rats administered with the crude aqueous extracts of *Mangnifera indica*<sup>16</sup>. The liver enzymes AST, ALT and ALP activities increased significantly ( $P < 0.05$ ) in the animals administered with the extracts. Work done by Lee *et al.* on effects of aged garlic extracts on liver enzymes resulted in increase in AST, ALT and ALP activities in the animals administered with the extracts<sup>15</sup>. Work by Izunya *et al.* On biochemical and morphological effects of crude aqueous extracts of *Mangnifera indica* in albino rats resulted increased in AST, ALT and ALP activities in the animals administered with the extracts<sup>16</sup>. Increased in AST, ALT and ALP activities in the animals administered with the extracts is as a result of the rich in the nutritional contents of the *Alliumsativum* extract<sup>17</sup>.

AST activities increased significantly ( $P < 0.05$ ) in group C than groups A and B administered with 600 mg/kg, 200 mg/kg and 400 mg/kg of the extract respectively. Similarly, Abd-El and Ebraheem reported an increased in AST activities in albino rats administered with 800mg/kg of the *Alliumsativum* extracts compared to group A and B administered with 400mg/kg and 600mg/kg of the extracts<sup>18</sup>. Bioassay on liver enzymes resulted in increased in enzyme activities<sup>9</sup>.

ALT activities increased significantly ( $P < 0.05$ ) in group C administered with 600 mg/kg of the extracts as compared with 200 mg/kg and 400 mg/kg of the extract. Similarly, significantly ( $P < 0.05$ ) increase of ALT activities in albino rats in group C administered with 600 mg/kg of the garlic extracts compared to group A and B administered with 200 mg/kg and 400mg/kg of the extracts respectively<sup>17</sup>. *Mangnifera indica* extracts administered to albino rats also resulted in increased in ALT activities<sup>16</sup>.

ALP activities increased significantly ( $P < 0.05$ ) in group C administered with 600 mg/kg of the extract as compared to group A and B administered with 200 mg/kg and 400 mg/kg of the extracts. Albino rats administered with 600 mg/kg of garlic extracts showed significant ( $P < 0.05$ ) increase in ALP activities compared to group A and B administered with 200 mg/kg and 400 mg/kg extracts<sup>17</sup>. Crude aqueous extracts of *Mangnifera indica* in albino rats also resulted in increased in ALP activities<sup>16</sup>. This is an indication that the enzyme activities of this extracts are dose dependent.

There was significant increase in average body weights of albino rats in groups A, B and C administered with the extracts during the periods of administration. Aged garlic extract on liver enzymes also showed an increase in body weights of the animals in groups A, B, and C administered with 400 mg/kg, 600mg /kg and 800 mg/kg of the extracts<sup>19</sup>. In the same vein, there is also an increased in body weights of the albino rats administered with extract of *Mucuna pruriens*<sup>14</sup>. Similarly, Imafidon and Okunrobo reported significant ( $P < 0.05$ ) increase in body weights of albino rats administered with aqueous extract of *Hibiscus rosa-sinensis* Linn<sup>20</sup>.

## CONCLUSION

Ethanol extracts of *Allium sativum* increased the activities of liver enzymes; AST, ALT and ALP in albino rats. The overall effect was dose dependent; hence, this study suggests that the extract of this plant may be hepatoprotective at appropriate dosage. Elevated liver enzymes may indicate inflammation or damage to cells in the liver. Furthermore, efforts are needed for the choice of appropriate dose, duration of treatment, and possible side-effects on major organs.

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