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Research Article

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Effect of *Allium sativum* aqueous extract on phosphatases activity in some selected tissues of albino rats

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ABSTRACT

The effect of aqueous extract of Allium sativum on phospatases activity in albino rats was investigated. Twelve rats were randomly grouped into four where rats in B, C and D groups were treated daily with oral administration of aqueous extract of Allium sativum at 50mg/kg, 100mg/kg and 150mg/kg body weight respectively for two weeks. The control group A received no treatment. The results showed that treatment of rats with the respective doses of the extract did not significantly ($p>0.05$) alter the serum alkaline phosphatase activity. However, there was a slight increase in serum acid phosphatase activity which is of great concern. The results suggest that Allium sativum aqueous extract could offer protection against tissue injury and the extract may not be toxic at the level of doses investigated.

Keywords: *Allium sativum*, alkaline phosphatase, acid phosphatase, aqueous extract.

INTRODUCTION

Man has been using various indigenous plants to treat different ailments for very long time without the actual knowledge of their toxic potential as well as determining their précised therapeutic efficacy. In the tropics, *Allium sativum* commonly known as garlic is one of the plants used by many localities which are thought to be of high medicinal benefits to mankind.

Garlic which is a member of liliaceae family is a perennial plant that possesses medicinal properties which of course is an endowment to the physical environment most especially in the tropics where it often grows naturally [1]. *Allium sativum* it is grown for its essential oils in its cloves and various research methodologies have be designed to evaluate the inherent potentials of its extract in a bid to explore the basis for its traditional use.

The liver is a large chemical reactant pool of cells having high rate of metabolism. It is also involved in sharing substrates and energy from one metabolic system to another, synthesizing many substrates that are transported to other areas of the body for metabolic function [2]. The activities of phosphatases are measured as marker traceable to changes in the pathological condition of the liver and kidney [3]. The levels of serum ALP and ACP can be used as differential diagnosis of liver and kidney diseases.

EXPERIMENTAL SECTION

Plant Material

The plant sample (garlic clove) was identified by a plant scientist in the Department of Plant Science, Ekiti State University with herbarium number UHAE 2013/109.

Extraction

The garlic cloves were air-dried macerated, pulverized and extracted exhaustively with distilled water. This was thoroughly filtered to obtain the aqueous extract.

Animal Management

Twelve albino rats weighing between (150-200) g were used for this experiment. The animals were obtained from Agricultural Research Institute, Moore Plantation, Apata-Ibadan, Nigeria. The animals were randomly distributed into cages and allowed to acclimatize for 14 days at room temperature of 25 ± 2^0C and 12hours alternating day and night cycles. Throughout the experiment, the rats were allowed free access to standard rat chow diet and water *ad libitum*.

Experimental Design

Animals were divided into four groups A, B, C and D where group A animals serve as control and were given only distilled water. Group B was administered single daily doses of 50mg/kg, C received 100mg/kg while animals in group D were fed 150mg/kg aqueous extract of *Allium sativum* respectively for 14 days. The extract was administered with the use of calibrated syringe with attached polythene cannula. All the animals from each group were sacrificed 48hr after the last dose under light ether anesthesia. Liver and kidney were removed, weighed, washed clean and free of extraneous materials while blood was collected into heparinized vials for serum preparation. These were used for the biochemical assay of alkaline phosphatase (ALP) and acid phosphatase (ACP) by method described by [4].

Statistical Analysis

Data were expressed as Mean ± SEM of mean. Comparison between values obtained in control and treated groups of animals were performed with One-way Analysis of Variance (ANOVA) and ($p<0.05$) was considered significant.

RESULTS

Table 1: ALP Activity (U/L) of Serum, Liver and Kidney of rats administered with *Allium sativum* aqueous extract for 2 weeks

Tissues	Group A	Group B (50mg/kg)	Group C (100mg/kg)	Group D (150mg/kg)
Serum	20.50 ± 0.77^a	24.75 ± 3.50^b	25.50 ± 4.75^b	25.89 ± 3.51^b
Liver	25.43 ± 0.27^a	31.02 ± 4.35^a	27.48 ± 2.03^a	49.11 ± 0.17^b
kidney	21.60 ± 1.22^a	25.18 ± 0.38^a	61.13 ± 4.36^b	63.72 ± 2.67^b

Values are expressed as mean of three determinations ±SEM. Row values with different superscripts are significantly ($p<0.05$) different.

DISCUSSION

Table 1 shows the ALP activity of serum, liver and kidney of rats fed with aqueous extract of *Allium sativum* for 14 days. Significant ($p<0.05$) difference was observed in liver and kidney ALP activities of rats administered *Allium sativum* extract when compared with control. Significant ($p<0.05$) increase was observed in serum and kidney ACP activities of rats fed with *Allium sativum* extract when compared with control in Table 2. The significant increase observed in ALP liver and kidney tissues might be due to increase in functional activity of the tissues, resulting in de novo synthesis of the enzyme molecule [5]. It could also due to sharp increase in metabolic activity of the tissues in response to the administered extract. However, the elevated level of serum ACP activity in group D animals (Table 2) may be attributed to labilization of the plasma membrane and hepatobiliary duct of the liver. This development

further indicates organ dysfunction which allows leakage of the enzyme into the extracellular fluids that contributed to the increase in serum ACP [6].

This could serve as a biochemical symptom of liver cytolysis or kidney damage. Besides, the significant ($p<0.05$) reduction in liver ACP activity in rats fed (150mg/kg) *Allium sativum* extract in group D may be attributed to reduced rate of synthesis of the liver enzyme or there could be tendency of the extract causing leakage of the enzyme into the blood through altered membrane permeability [7]. Alkaline phosphatase is marker enzyme for plasma membrane and endoplasmic reticulum [8] of the tissues studied. It is often employed to assess the integrity of plasma membrane [9]. Acid phosphatase is basically a phosphomonoesterase [10] which is an enzyme used to free attached phosphate groups from other molecules during digestion. It is widely used as indicator or diagnostic enzyme in kidney and liver diseases, especially in prostate cancer where its serum levels are evaluated [11]. This result may signify that the liver and kidney tissues of the animals are intact as increase in ALP activity observed in the tissues might be due to de novo synthesis of the enzyme [12]. In addition decrease in serum ALP activity perhaps suggest that the administered extract doses might be safe at that concentration. The decrease serum ALP activity also indicates that the extract confers protection on the tissues against injury or diseases, which are always the direct cause of elevation of the enzyme in the blood [13]. The levels of ALP activity in the tissues were similar in both control and treated groups. This implies that *Allium sativum* may be safe at the doses investigated without any toxicological threat to the liver and kidney when used. However, the extract might not be safe for liver at (150mg/kg) dose-concentration as it induced elevated level of serum ACP activity in this study.

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