

EFFECT OF ORAL ADMINISTRATION OF AQUEOUS GARLIC (*Allium sativum*) EXTRACT ON LIVER FUNCTION ON RATS

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ABSTRACT

*The effects of aqueous garlic extract on liver function were studied by assessing the changes in serum activities of alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP) and total bilirubin (TBIL) concentration in albino rats. The doses of 100, 250, 400 and 550mg per kilogram body weight were administered orally for three (3) weeks. The serum ALT, AST, ALP and TBIL levels were determined, 24 hours after the last dose. The result showed no significant increases ($P>0.05$) in the activities of ALT, AST, ALP and TBIL for 100 and 250mg per kilogram body weight dosage when compared with the control group. However, significant increases ($P<0.05$) in these markers were observed for 400 and 550mg per kg doses. Therefore, the result of this work indicates clearly that aqueous dosage of *Allium sativum* of 400mg and 550mg/kg can induce liver damage.*

KEYWORDS: *Allium sativum*, Liver function, Markers, Total bilirubin, aqueous extract.

INTRODUCTION

Liver is a vital organ having both secretory and excretory functions. It also plays an important role in detoxification, protein synthesis, glycogen storage, decomposition of red blood cells, hormone and biochemical production necessary for digestion. The liver supports almost every organ in the body and is vital for survival. As a result of its strategic location and multidimensional functions, the liver is also prone to many diseases (Cirrhosis overview, 2010), in which its management rises a challenge in modern medicines. Therefore, strong need arises to evaluate the function of this vital organ on administration of garlic aqueous extract.

Garlic is a bulbous perennial food plant of the family *Alliaceae* which give it a botanical name known as *Allium Sativum* and the common name Garlic (which comes from old English genlac meaning "spear lack"). Its close relatives include the onion, shallot, leek, chive and rakkyo (Block, 2010). When crushed, *Allium sativum* yield allicin, an antibiotic and antifungal compound (phytoncide). It has been claimed that it can be used as home remedy to help speed recovery from strep throat or other minor ailments because of its antibiotic properties (Wikipedia, 2010). It also contains the sulphur containing compounds allinin, ajoene, diallylsulfide, enzymes, B-vitamins, proteins, minerals, saponins, flavonoids and maillard reaction products, which are not sulphur containing compounds. Furthermore, a phytoalexin (allixin) was found, a non sulfur compound with a γ -pyrone skeleton structure with antioxidant effects, inhibition of aflatoxin B₂ DNA binding, and neurotrophic effects (Koderá et al., 1989). Analogs of this compound have exhibited anti-tumor promoting effect in-vitro. Here in, allixin and/or its analogs may be useful compounds for

cancer prevention or chemotherapeutic agent for other diseases.

Garlic is rich in selenium which helps to prevent countless of diseases (Abiodun and Oduwaye, 2010). It is effective in purification of blood, treatment of boil, reducing cell aging and degeneration, respiratory remedy, regulation of blood pressure, reduction of cholesterol level, diabetic treatment, prevention of cancer, serve as immune booster and enhances sexual activeness (Abiodun and Oduwaye, 2010). It is also used in the treatments of cough, dyspepsia, arterosclerosis, antidote (scorpion), hepatitis, typhoid, ulcer, leukemia and malaria (Aliyu, 2006). Hence, considering both ethanomedicinal and culinary uses of garlic, it is also extremely vital to determine its hepatotoxic effect, although the mechanism of the hepatotoxicity remain unknown.

MATERIALS AND METHODS

Animals

Twenty five (25) albino rats, wister strain, body weight ranging from 100-160g were purchased from Animal House Unit, Department of Biological Science, Bayero University, Kano State - Nigeria. The rats were kept in clean metallic cages under 12/12 hours normal light/dark cycle. They were fed *ad libitum* with vital feed growers (normal pellets), manufactured by Grand Cereals Nigeria Limited, Jos - Plateau State.

Collection and Preparation of Aqueous Garlic Extract

Fresh garlic cloves (*Allium sativum*) were purchased from Kofa in Bebeji Local Government Area, Kano. The cloves were authenticated by Botanist at the Botany Unit of the Biological Science Department, Bayero University, Kano-Nigeria. They were sliced into pieces, air dried under shade and pulverized to coarse powder using mortar and pestle (Onoruvwe and Olurumfemi, 1998).

A portion of the powdered sample (100g) was soaked in 600cm³ of distilled water for 24 hours after which it was filtered with fine and normal sieve. The filtrate was evaporated to dryness at 50°C. A known quantity was reconstituted with distilled water to obtain the desired concentration for administration to the rats.

Experimental Design

A total of fifteen (15) rats with weight range from 100-160g used in this work were randomly divided into five groups of three (3) rats each. Group I served as normal control and were administered orally with distilled water (1cm³) daily. Groups II, III, IV, V served as test groups and were administered orally with the 100, 250, 400, 550mg per kilogram body weight of *Allium sativum* aqueous extract for 21 days.

Collection of Samples

The rats were all slaughtered using razor blade 24 hours after the last administration of the aqueous extract and blood samples were collected in dry, clean centrifuge tubes. The blood samples were allowed to clot for 30 minutes at room temperature after which they were centrifuged at 2,500rpm for 15minutes. Collected sera samples were analysed for the activities of alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline

phosphatase (ALP) and concentrations of total bilirubin (TBIL).

Method of Analysis

Alanine aminotransferase (ALT) and aspartate aminotransferase (AST) were determined using the method of Reitman and Frankel (1957), alkaline phosphatase (ALP) by the method of Roy (1970) and Demetrius (1974) while levels of total bilirubin (TBIL) were determined according to Jendrassik and Grof (1938) method.

Statistical Analysis

Data were presented as mean ± standard deviation. The significant difference between the means groups was assessed by the student T-test (Mukhtar, 2003).

RESULTS

The effect of oral administration of aqueous garlic (*Allium sativum*) extract on albino rats for 21 days was studied. The result (Table I) of this work revealed that, there is no significant increase (P>0.05) in the activities of ALT, AST, ALP and in the concentrations of total bilirubin in group II and group III compared with normal control (group I). However, significant increases (P<0.05) in the activities of ALT, AST, ALP and in the levels of total bilirubin were observed in groups IV and V compared with normal control.

Table I: The changes in some markers of liver function after 21 days oral administration of garlic aqueous extract in rats.

ANIMALS	DOSE (mg/kg)	ALT (IU/L)	AST (IU/L)	ALP (IU/L)	TBIL (mg/dl)
Group I (control) n = 3	0	33.30±1.15	32.66±2.88	41.66±9.07	1.22±0.13
Group II n = 3	100	16.00±5.29 ^a	38.33±2.0 ^a	102.33±24.00 ^a	2.19±0.06 ^a
Group III n = 3	250	25.00±0.00 ^a	50.66±9.07 ^a	108.00±29.80 ^a	2.70±0.54 ^a
Group IV n = 3	400	40.00 ±8.51 [*]	77.70±11.59 [*]	115.33±2.08 [*]	2.88±0.62 [*]
Group V n = 3	550	42.70±9.00 [*]	90.00±29.80 [*]	122.66±42.85 [*]	2.16±0.00 [*]

n = Number of rats

a = Statistically no significant increases (P>0.05) in comparison with normal control.

* = Statistically significant increases (P < 0.05) in comparison with normal control.

DISCUSSION

The study was undertaken to determine the hepatotoxic effect of garlic in experimental rats. The result showed that daily oral administration of 100 and 250mg per kilogram body weight of garlic aqueous extract (Groups II and III) had no significant increases (P>0.05) in the serum ALT, AST, ALP activities and TBIL concentration in comparison with normal control (Group I). However, doses of 400 and 550mg per kilogram body weight of garlic (*Allium sativum*) aqueous extract revealed significant increase (P<0.05) in

the serum ALT, AST, ALP activities and levels of the TBIL compared with normal control.

Amino transferases are elevated in some diseases such as myocardial infarction, infectious hepatitis or other damage to either the heart or liver (Murray et al., 1993). An increase in the activities of ALT in the liver occurs when there is liver damage (Sembulingam, 2006). Aspartate amino transferase (AST) is also usually present within the hepatocytes and its activities increases in the serum when hepatocytes membrane integrity was disturbed during hepatocellular injury (Kew, 2000; Dobbs et al, 2003).

Increased activity of ALP, a marker enzyme for plasma membrane and endoplasmic reticulum (Wright and Plumer, 1974) can be used to determine the integrity of plasma membranes (Akanji et al, 1993), since it is localized in the microvilli of the bile canaliculi located in the plasma membranes.

The significant increases in the total bilirubin concentrations in the groups administered with 400 and 550mg per kilogram body weight of garlic aqueous extract orally, indicates that, the excretory function of the liver has been impaired

as a result of the damage caused to the liver by the higher doses of the garlic extract administered.

Results from this study have shown that daily oral administration of the aqueous extract of garlic (*Allium sativum*) at the doses of 400 and 550mg per kilogram body weight for 21 days can significantly induced hepatotoxicity in rats. The dose of 550mg per kilogram body weight being the most toxic dose, thus, *Allium sativum* aqueous extract hepatotoxicity is dose dependent.

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