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Effect of oral administration of methanol leaf extract of *Terminalia catappa* (Tropical Almond) on serum hepato-markers

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Abstract

The aim of this study was to evaluate the effect of methanol leaf extract of *Terminalia catappa*. Freshly harvested leaves of *T. catappa* were washed, dried and ground into fine powder. The powdered plant sample was processed into extract. Twenty five adult male wistar rats were divided into five groups of five rats. Group I: was the normal control fed only with rat chow and water, Groups II-V were administered with 100, 200, 400 and 600 mg/kg of methanol leaf extract of *Terminalia catappa* (MLETC). Treatment lasted for 28 days, after which animals were sacrificed and blood sample collected analysed using standard procedures. The result obtained showed that oral administration of extract significantly ($P<0.05$) increased the activity of liver enzyme in a dose dependent manner. This may or may not necessarily imply that the extract is hepatotoxic as certain compounds can induce the said enzymes and may not mean that the liver is damaged.

Keywords: *Terminalia catappa*; Liver; Hepatotoxic; Blood

1 Introduction

Plants have been a source of therapy for mankind since prehistoric times [1]. The practice of employing plants in the treatment of diverse human ailments is known as traditional medicine and has been redefined over the years [2]. Nowadays, numerous medicinal plants have been domesticated globally and have been relied upon for the provision of useful substances known for their therapeutic potentials as remedies for certain diseases [3].

Terminalia catappa Linn (Combretaceae) known to inhabit the warmer part of India is called Indian almond or Malabar almond [4]. Extracts derived from different parts of the said plant have been reportedly employed in the treatment of cancer, [5], HIV [6], hepatitis [7]. It has also been used to ameliorate oxidative stress, inflammation [8], and aphrodisiac [9]. The plant has been revealed to contain phytochemicals such as tannins [10], flavanoids [11] and triterpinoids [12].

The liver constitutes 2 % of the total body weight and hence rated the second heaviest organ of the body and weighs approximately 1.5 kg of Total Body Weight (TBW). It contributes maximally to the maintenance of critical physiological functions which culminates to preservation of homeostasis [13]; [14]. Liver is primarily the site for important biochemical processes such as distribution and storage of nutrients and energy, synthesis as well as regulation of hormones and enzymes in addition to xenobiotics metabolism [15].

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Thus, owing to the its extensive blood supply and significant role in metabolism, the liver is particularly susceptible to xenobiotics Thus, it is exposed to high doses of the toxicant or its toxic metabolites, hence constitutes a target organ for a study such as this. The widely held impression that medicinal plants are generally safe is ambiguous and lacks credibility as certain toxic phytochemicals could abound in certain therapeutic plants unknown among users an observation which constitute the pivot upon which this study rests.

2 Material and methods

2.1 Plant Sample Collection

Fresh leaves of *Terminalia catappa* (tropical almond) were locally sourced from a local evening market in Ebonyi State.

2.2 Animals

Adult male albino rats were obtained from the animal house of School of Agric Science, Akanu Ibiam Federal Polytechnic Uwana Afikpo North Local Government Area Ebonyi State. The animals were housed in plastic cages and were fed rat chow and allowed free access to wather. Acclimatization of the animals lasted for two weeks.

2.3 Processing of and Extraction of Plant Material

Exactly 500 g of powdered plant sample was introduced into a flask containing 500 mL of methanol prior to maceration. The mixture was shaken intermittently trice each day and afterwards strained. Afterwards, the damp solid material was, pressed and the combined liquids filtered using cheese cloth and Whatman No. 1 filter paper. The filtrate was extracted using soxhlet apparatus for 5-6 hr and subsequently concentrated under pressure to dryness in rotary evaporator at 30 ^{o}C [15]. The extract was placed in the refrigerator and maintained at 5^{oC}.

2.4 Median Lethal dose 50% (LD50)

Three groups of three rats were used to perform the LD_{50}. 10, 100 and 1000 mg/kg of extract respectively were orally administered to groups 1-3 which were observed for 24 hr for signs of toxicity. When mortality was not seen in any of the groups, another three adult male wistar rats were individually administered with 1600, 2900 and 5000 mg/kg of extract separately. The animals were observed for 48 hr. for signs of toxicity [16].

2.5 Experimental Design

- **Group I:** Normal control: animals were fed rat chow and water
- **Group II:** Rats were administered with 100 mg/kg ethanol extract of *Terminalia catappa*
- **Group III:** Rats were administered with 200 mg/kg ethanol extract of *Terminalia catappa*
- **Group IV:** Rats were administered with 400 mg/kg ethanol extract of *Terminalia catappa*
- **Group V:** Rats were administered with 600 mg/kg ethanol extract of *Terminalia catappa*

2.6 Biochemical Analysis

The levels of alkaline phosphatase (ALP), alanine transaminase (ALT) and aspartate transferase (AST) were analysed spectrophotometrically with Randox assay kits using the procedure described by Reitman and Frankel (1957).

2.7 Statistical analysis

Data generated from the study was analyzed using statistic software IBM SPSS Statistics 21 (IBM Corporation, NY, USA). Data were expressed as mean ± standard deviation (SD). The results were considered significant at P value less than 0.05. Mean values were compared using one way analysis of variance (ANOVA).

3 Results

Table 1 Activities of Serum Hepatomarkers of Rats administered *T. catappa* Extract

Groups	Treatment	ALP	ALT	AST
Group I	Normal CTRL	35.25±6.19a	24.00±2.73 a	22.00±2.53a
Group II	100 mg/kg MLETC	69.10±6.91b	55.00±7.07 b	83.50±4.85b
Group III	200 mg/kg MLETC	94.75±0.49c	57.00±4.89 c	114.00±2.98c
Group IV	400 mg/kg MLETC	100.56±2.37d	86.50±3.48 d	169.50±2.78d
Group V	600 mg/kg MLETC	101.20±3.23e	94.07±2.45 e	182.49±2.31e

Results are expressed as mean ± standard deviation of three determinations. Values with different superscript in a column are significantly different at ($P \leq 0.05$).

4 Discussions

Exposure of the liver to hepatotoxic agent can adversely affect its integrity and consequently function. Very often, damage to the liver can be extremely life threatening. Although numerous man-made-hepatotoxins abound, some can be naturally found in certain plants which sometimes have therapeutic functions. Table 1 shows the activities of serum hepatomarkers; Alkaline phosphatase (ALP), Alanine transaminase (ALT) and Aspartate transferase indicating that oral administration of methanol leaf extract of *Terminalia catappa* significantly ($P<0.05$) increased the activities of the aforementioned liver enzymes in a dose dependent manner. Although the outcome of this study appears contradictory to the findings made by Jing et al. [17] which established that pretreatment with chloroform extract of *Terminalia catappa* significantly ($P<0.05$) reduced the activity of alanine amino transferase (ALT) and aspartate aminotransferase (AST) associated with CCL_4 induced liver damage in rats. The dose dependent increase in the activity of serum hepatomarkers observed in this study could not necessarily have resulted from damage to the liver, but could be as a result of the presence of certain aromatic phytochemicals inherent in the plant.

5 Conclusion

Although oral administration of methanol leaf extract of *Terminalia catappa* caused an increase in the activity of the aforementioned liver enzymes which ordinarily is a pointer to liver damage if further substantiated with tangible evidences.

Compliance with ethical standards

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Disclosure of conflict of interest

Authors hereby declare that no conflicting interest exists.

Statement of ethical approval

Ethical approval was obtained by the University's Committee on the Care and Handling of Laboratory Animals

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