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Articles

Toxicological Effects of Aqueous Leaf Extract of Bitter (*Vernonia Amygdalina*) on Liver Enzymes of Albino Rats

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Abstract

The research was conducted to ascertain the hepatotoxic potentials of the leaves extract of Vernonia amygdalina on liver enzymes of apparently healthy albino rats. A total of sixteen (16) albino rats were clustered into four (4) groups of four (4) rats each designated as group A-D, Group A served as control while groups B, C and D were treated with 200mg/kg, 300 mg/kg, and 400 mg/kg aqueous leaves of extract of *Vernonia amygdalina* respectively for a period of two weeks. The liver enzymes were determined using spectrophotometric method. The results revealed a significant ($P < 0.05$) decrease in the activity of serum ALP of the rats treated with 400 mg/kg body weight of *Vernonia amygdalina* extract when compared with control rats. In conclusion, acute oral administration of aqeous extract of *Vernonia amygdalina* was found to be relatively safe at a low dosage. However, the extract at the dose of 400 mg/kg brought about alterations in the serum ALP activity.

Keywords: Vernonia amygdalina, Hepatic, ALP, AST, ALT, Liver and Enzymes.

1. Introduction

Nigeria is blessed with an abundance of rich genomic resources of cultivated, semi-wild and wild species of crops being used as traditional vegetables and different types are consumed by various ethnic groups for different reasons (Billah, Kabir, 2015). Edible leaves from vegetable plants are eaten as supporting food or main dishes. They may be aromatic, bitter or tasteless (Jaca, Kambizi, 2011), but they are the cheapest and most accessible source of proteins, vitamins, minerals, essential amino acids (Billah, Kabir, 2015; Alara et al., 2018). Leaf vegetables are highly beneficial for maintenance of health and prevention of diseases. They contain valuable source of food ingredients that can be utilized to build up and improve the body successfully (Alara et al., 2018). They contain high carbohydrate vitamin and mineral contents (Ülger et al., 2018).

Vernonia amygdalina, a member of the Asteraceae family, is a small shrub that grows in tropical Africa. *Vernonia amygdalina* is commonly called bitter leaf in English because of its bitter taste (Oyeyemi et al., 2018). The cooked leaves are a staple vegetable in soups and stews of various cultures throughout equatorial Africa. Africa common names includes Grawa (Amharic), Ewuro

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(Yoruba), Etidot (Ibibio), Onugbu (Igbo), Nyuna (Tiv), Oriwo (Edo), Labwori (Acholi), Olusia (Luo) and ndoleh (Cameroon) (Michael, Stanley, 2018).

Vernonia amygdalina is well known as a medicinal plant with several uses attributed to it, including for diabetes, fever reduction, and recently a non-pharmaceutical solution to persistent fever, headache, and joint pain associated with AIDs, infusion of the plant is taken as needed (Michael, Stanley, 2018). The leaves have a sweet and bitter taste, they are sold fresh or dried, and it is a typical ingredient in egusi soup (Oyeyemi et al., 2018).

These leaves are exported from several Africa countries and can be purchased in grocery stores aiming to serve African clients. The roots *V. amygdalina* have been used for gingivitis and toothache due to its proven antimicrobial activity (Ülger et al., 2018).

Medicinal plants used to treat illness are of considerable interest for ethnobotanical community (Chekole, 2017; Jima, Megersa, 2018). They are recognized to contain valuable medicinal properties in different parts of the plant. Various plants have shown varying degree of ethnobotanical medicines. Most of these plants have been claimed to possess medicinal properties but most claims are hearsay and few have received adequate medical or scientific evaluation (Olufunmilayo, 2017). Little toxicological (adverse effect) information exists concerning traditional medicinal plants (Ibisi et al., 2017). The study was designed to investigate the toxicological effects of Vernonia amygdalina with a view to providing valuable information which may lead to the development of alternative drugs and therapeutic strategies with little or no side effects.

2. Materials and methods

Plant Materials

The fresh leaf of *Vernonia amygdalina* was purchased from Muda Lawal market in Bauchi State, Nigeria and was taken to the Biological Science Department, Abubakar Tafawa Balewa University Bauchi.

Preparation of the Extract

The leaves were sorted out separately to obtain only fresh leaves and washed with distilled water without squeezing to remove debris and dust particle. They were air-dried and ground into coarse powder using pestle and mortar and sieved to fine powder. 150 g of the fine powder was extracted or cold macerated into 900 ml of distilled water for 24 hours and the macerated mixture was then filtered through muslin cloth. It was then filtered to obtain the *Vernonia amygdalina* and mixture aqueous extract through filter paper. The filtrated was concentrated in an electric oven at 50^{o}C until a semisolid residue dark solid extract was obtained.

Experimental Animals

Sixteen (16) white albino rats with weighed between 80-100 g were purchased from National Veterinary Research Institute (NVRI) Vom, Plateau state. The animals were placed in cages and fed appropriately at biological science department, Abubakar Tafawa Balewa University Bauchi.

Experimental Design

At the end of the seven days' acclimatization period, the animals were randomly assigned into four different groups of four rats each, designated as groups of A – D. Group A received water and feed only and serves as control, group B were administered orally with 200 mg/kg, group C were administered orally with 300 mg/kg and group D were administered orally with 400 mg/kg doses of the extract for the period of fourteen days. On the 15th day all the rats were sacrificed and blood sample collected.

Administration of the Extract

Administration of the extract was done via oral route with the aid of oral cannula and syringe. Animals received their doses once per day for the period of two weeks. They were observed daily for clinical signs of toxicity or pharmacological signs, throughout the period of study.

Collection of Blood

At the end of the two weeks of extract administration, the albino rats were slaughtered to obtain blood from jugular vein. The collected blood sample from each rat were allowed to clot and then centrifuged at 3000 rpm for 10 minutes. Serum was obtained used for the assay of Aspartate aminotransferase (AST), Alanine aminotransferase (ALT), and Alkaline phosphatase (ALP).

Blood Analysis

Hepatic analysis of the serum enzymes for ALT and AST was done by the method of Reitman and Frankel (1957), ALP was assayed according to the method of Rec (1972).

Estimation of Parameters

Aspartate Aminotransferase (AST) assayed using Colorimetric method of Reitman and Frankel, 1957.

Alanine Aminotransferase (ALT) assayed by Colorimetric method of Reitman and Frankel, 1957.

ALKALINE PHOSPHATASE (ALP) assayed by method of Rec, 1972.

3. Results and discussion

From the Table 1 below, the results revealed a significant ($P < 0.05$) decrease of serum ALP activity (97.06±0.65) was observed in the rats treated with 400 mg/kg body weight of the *Vernonia amygdalina* but no significant changes were observed at lower doses. The extract appears to have no significant effect ($P < 0.05$) on serum AST, ALT activity and the Albumin concentration when compared with control rats.

Table 1. Effect of aqueous leaf extract of *Vernonia amygdalina* on liver enzymes in normal albino rats

Grouping	Parameters Assayed		
	AST(IU/L)	ALT(IU/L)	ALP(IU/L)
Group A (Control)	5.6±0.15	2.8±0.31	106.26±8.51
Group B (200 mg/kg)	6.4±0.50	2.64±0.19	108.56±1.30
Group C (300 mg/kg)	6.0±0.47	2.7±0.07	104.88±2.25
Group D (400 mg/kg)	6.0±0.52	2.6±0.04	97.06±0.65*

Table 1 showed the effect of aqueous leaf extract of *Vernonia amygdalina* on liver enzymes in normal albino rats. The activity of AST was slightly increased to 6.4±0.50 in the rats treated with 200 mg/kg body weight of the extract but slightly decreased to 6.0±0.47 and 6.0±0.52 in the rats treated with 300 and 400 mg/kg body weight of the extracts respectively when compared with untreated group (5.6±0.15) with no significant ($P > 0.05$) differences. However, the activity of ALT was slightly increased to 2.7±0.07 in the rats treated with 300 mg/kg body weight of the extracts but slightly decreased to 2.64±0.19 and 2.6±0.04 in the rats treated with 200 and 400 mg/kg body weight of the extracts respectively when compared with untreated group (2.8±0.31) with no significant ($P > 0.05$) difference. The result of ALP showed a significant ($P < 0.05$) decrease of serum ALP activity (97.06±0.65) was observed in the rats treated with 400 mg/kg body weight of the extracts but no significant ($P > 0.05$) increase 108.56±1.30 and 104.88±2.25 was observed in the rats treated with 200 and 300 mg/kg body weight of the extracts respectively when compared with untreated group (106.26±8.51).

4. Conclusion

Acute oral administration of the extracts was found to be relatively safe at a low dosage. However, at higher dose of 400 mg/kg the extract brought alteration in the serum ALP activity.

5. Recommendation

Further studies should be carried out by increasing the number of experimental animals, so that larger data could be obtained so as to reach a better conclusion. Biochemical parameters associated with liver function test such as bilirubin, albumin and total protein should also be analyzed so as to find out the detail hepatotoxic effect of *Vernonia amygdalina*.

Histological analysis of the liver of albino rat should also be conducted.

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