academicJournals

Vol. 8(4), pp. 84-87, April 2014
DOI: 10.5897/AJBR2013.0738
Article Number: 3AF6D8544720
ISSN 1996-0778

http://www.academicjournals.org/AJBR

African Journal of Biochemistry Research

Full Length Research Paper

Aqueous *Bridelia ferruginea* stem bark transaminase activities in albino rats

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Received 06 November, 2013; Accepted 10 March, 2014

The major objective of this study was to evaluate the transaminase activities of albino rats fed with aqueous extract of *Bridelia ferruginea* stem bark. Sixteen (16) albino rats with weight ranging between 100-190 g were used. The rats were divided into four groups; with group four as the control group. Increasing doses (100, 200 and 400 mg kg^{-1} body weight) of the extract were administered orally to the other three groups for a period of two weeks. Compared with the control, the aspartate (AST) and alanine (ALT) activities significantly (P< 0.05) increased in the serum and liver tissues whereas no significant consistent difference was observed for the kidney tissues. The results of this study justifies the widespread consumption of *B. ferruginea* and has shown that daily, oral administration of the aqueous extract of *B. ferruginea* stem bark for the duration of the experiment, might somewhat confer protection basically to the liver and kidney although higher prolonged doses/usage might be dangerous.

Key words: Aqueous extract, *Bridelia ferruginea,* Aspartate (AST) and Alanine (ALT) transaminase activity, Albino rats.

INTRODUCTION

From time immemorial, folk medicine was the essential part of therapeutic arsenal. Plants constituted the bulk of the treatments that were available for treatment, according to formulas handed down by tradition. Nearly half of medications that are used today have their composition origin from plant and the quarter contains plant extracts or active molecules from plants directly. Thus, though synthetic drugs provided as much as folk medicine, using plants in health was the most common worldwide. Indeed, plants play an important role in human disease treatment for developing countries populations, particularly in the areas where it is difficult for most to access health facility because of their remoteness from cities or their low purchasing power.

Bridelia ferruginea belongs to the family Euphorbiaceae which is commonly found in Savannah regions (Ekanem et al., 2008). It is usually a gnarled shrub which sometimes reaches the size of a tree in suitable condition. Its common names are Kizni (Hausa), Marehi (Fulani), Iralodan (Yoruba), Ola (Igbo); and Kensange Abia (Boki). Its habitat is the Savannah, especially in the moister regions extending from Guinea to the Democratic

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Republic of Congo and Angola. The tree is 6 - 15 m high, up to 1.5 m in girth and bole crooked branching low down. The bark is dark grey, rough and often marked scaly (Rashid et al., 2000). A decoction of the leaves has been used to treat diabetes. It is also used as purgative and a vermifuge (Cimanga et al., 1999). The bark extract has been used for the coagulation of milk and also lime juice for the formulation of a traditional gargle “egun efu” (Orafidiya et al., 1990). It is also reported of having potentials for waste-water treatment (Kolawole and Olayemi, 2003). In Togo, the roots of the plant are used as chewing sticks and the root bark is used for intestinal and bladder disorder remedies as well as skin diseases (De Bruyne et al., 1997). Other reported activities of the bark extract include typanocidal (Iwu, 1984), molluscidal (Adeoye et al., 1988), antimicrobial (Olajide et al., 1999) and anti-inflammatory (Ndukwe et al., 2005). Antimicrobial properties of stem bark of *B. ferruginea* against facultative Gram negative rods have been reported by (Ndukwe et al., 2005). The plant was found to contain Alkaloids, Tannins, Terpenoids, Glycosides, Flavonoids, Saponins, Anthraquinones and Steroids. The activities of the methanol, petroleum ether and chloroform bark extracts of the *B. ferruginea* against some potential pathogenic organisms have been extensively investigated (Iwu, 1984); (Adeoye et al., 1988); (Olajide et al., 1999). *B. ferruginea* has a great antioxidant potential which can be used to protect the body against damage caused by free radicals which is regularly produced *in- vivo* and oxidative stress induce these free radicals (Oloyede and Babalola, 2012).

Due to the widespread consumption of *B. ferruginea*, it is necessary to study its effect on blood, the tissue that transports substances in the body (Janqueira and Carneiro 2005), the Liver and Kidney. This study was therefore designed to evaluate the effects of aqueous extracts of *B. ferruginea* stem bark on the aminotransferases of albino rats.

MATERIALS AND METHODS

Extraction of plant material

Fresh stem bark peelings of *B. ferruginea* were collected at a farm in the suburbs of Ado Ekiti, Nigeria. The plant was identified and authenticated by a plant scientist in the Department of Plant Science, Ekiti State University, Ado-Ekiti, Nigeria and a voucher specimen was deposited accordingly at the herbarium of the Department of Plant Science, Ekiti State University, Ado-Ekiti, Nigeria.

Extraction

The fresh bark peelings of the plant were air-dried, pulverized and extracted exhaustively in distilled water. The filtrate was concentrated and evaporated to dryness at 60°C, using rotary evaporator (Stuart Barloworld, Model RE 300). The yield was calculated and the dry extract was stored in a refrigerator at -4°C until use for the experiments.

Animals

A total number of 16 albino rats weighing between 100-190 g were used in this study. The animals were obtained from the animal house of the Department of Chemical Sciences, Afe Babalola University, Ado-Ekiti, Nigeria. The animals were randomly distributed into cages and allowed to acclimatize for 14 days in a well-ventilated room at a room temperature of 28.0 ± 2.0°C under natural lighting condition. The animals were allowed free access to standard mouse chow (Topfeeds Ltd., Sapele, Nigeria) and tap water *ad libitum*. All animals used in this study were handled in accordance with the ethical certified standards of the University.

Experimental protocol

Animals were divided into four groups: A, B, C and D, representing group 1, 2, 3 and control, respectively. Group A was given single daily doses of 100 mg kg^{-1} of *B.ferruginea* for 14 days. Group B received single daily doses of 200 mg kg^{-1} of *B.ferruginea* for 14 days. Group C was given single daily doses of 400 mg kg^{-1} of *B. ferruginea* for 14 days. The control group (group D), containing four animals, was given only distilled water daily for 14 days. *B. ferruginea* was administered orally using a calibrated 1 mL syringe with attached polythene cannula. At the end of the treatment period, the animals were sacrificed by cervical dislocation.

Transaminase activities

Whole blood was collected from the animals by cardiac puncture into ordinary bottles, allowed to stand for 30 min to clot and thereafter centrifuged at 2500 rpm for 10 min. Serum samples, and tissue homogenates of the Liver and Kidney were used in the study. The serum alanine transaminase (ALT) activity was assayed by the method of Reitman and Frankel (1957).

Statistical analysis

Data were expressed as Mean±SE of mean. Comparisons between control values and values of treated groups of albino rats were performed with one-way analysis of variance (ANOVA). Statistical significance was set at $p<0.05$.

RESULTS

Transaminase activities results

The results of the effect of different doses of aqueous extract of *B. ferruginea* stem bark on the enzyme markers of tissue damage are shown in Tables 1 and 2.

The aspartate transaminase activity values observed at the end of the experiment for the serum were 21.00 ± 0.70 U/L for the control group, 28.25 ± 0.25, 29.50 ± 0.50, and 36.25 ± 0.47 U/L for the experimental groups. This shows an increase in the transaminase level at the higher dose administration. The mean activity of the control group animals (21.00 ± 0.70 U/L) were significantly ($P<0.05$) lower than treatment group 3 (36.25 ± 0.47 U/L) and group 1 (28.25 ± 0.25 U/L) which is similar ($P>0.05$) but no significant difference to group 2 (29.50 ± 0.50 U/L). The Liver transaminase activity of the control group (61.00 ± 0.00 U/L) was significantly lower ($P<0.05$) and

Table 1. Aspartate transaminase activity (U/L) of albino rats administered aqueous extracts of *Bridelia ferruginea* stem bark

Tissue	Control	Group 1 100 mg/kg	Group 2 200 mg/kg	Group 3 400 mg/kg
Serum	21.00 ± 0.70[a]	28.25 ± 0.25[b]	29.50 ± 0.50[b]	36.25 ± 0.47[c]
Liver	61.00 ± 0.00[a]	66.25 ± 1.43[b]	63.00 ± 0.00[a]	61.00 ± 0.00[a]
Kidney	52.25 ± 1.03[a]	48.50 ± 1.75[a]	63.25 ± 2.28[c]	58.50 ± 0.28[b]

[abc]Means within a row with different superscripts are significantly (P<0.05) different.

Table 2. Alanine transaminase activity (U/L) of albino rats administered aqueous extracts of *Bridelia ferruginea* stem bark

Tissue	Control	Group 1 100 mg/kg	Group 2 200 mg/kg	Group 3 400 mg/kg
Serum	10.00 ± 0.70[a]	36.75 ± 1.10[c]	23.50 ± 6.39[b]	43.25 ± 1.49[c]
Liver	52.25 ± 0.85[a]	55.25 ± 0.62[b]	52.25 ± 0.47[a]	56.00 ± 0.70[b]
Kidney	48.25 ± 4.13[c]	10.00 ± 0.91[a]	32.0 ± 1.68[b]	42.75± 6.94[bc]

[abc]Means within a row with different superscripts are significantly (P<0.05) different.

different from treatment group 1 (66.25 ± 1.43 U/L) but similar (P>0.05) to group 2 (66.25 ± 1.43 U/L) and group 3(61.00 ± 0.00 U/L). The Kidney activity values gives a mean value of (52.25 ± 1.03 IU/l) for the control group animals with no significant difference (P>0.05) to animals of treatment group 1(48.50 ± 1.75(U/L) while groups 2 (63.25 ± 2.28 (U/L) and 3(58.50 ± 0.28 U/L) have higher values with significant differences (P<0.05) to the control group.

The alanine transaminase activity values observed at the end of the experiment for the Serum were 10.00 ± 0.70 U/L for the control group and 36.75 ± 1.10, 23.50 ± 6.39, 43.25 ± 1.49 U/L for the experimental groups. This shows an increase in the transaminase level at the higher dose administration. The mean activity of the control group animals (10.00 ± 0.70 U/L were significantly lower than all treatment groups and significantly different from all experimental groups (P<0.05). No significant difference (P>0.05) was observed between group 1 (36.75 ± 1.10 U/L) and group 3 (43.25 ± 1.49 U/L), but group 2 (23.50 ± 6.39 U/L) exhibited a level of difference (P<0.05). The Liver transaminase activity values of the control group (52.25 ± 0.85 U/L) was lower than treatment group 2 (52.25 ± 0.47(U/L) with no significant difference (P>0.05), while treatment group 1 (55.25 ± 0.62(U/L) and group 3 (56.00 ± 0.70 U/L) were similar (P>0.05) but with significant difference (P<0.05) to the control group animals. The Kidney activity values gives a high mean value of (48.25 ± 4.13 U/L) for the control group animals than all treatment groups with a significant difference (P<0.05) but similar only to group 3 (42.75± 6.94 U/L). Treatment group 1 (10.00 ± 0.91 U/L) is significantly different (P<0.05) from group 2 (32.0 ± 1.68 U/L) and 3 (42.75± 6.94 U/L) while treatment group 2 (32.0 ± 1.68 U/L) and group 3 (42.75± 6.94 U/L) were similar (P>0.05).

DISCUSSION

This work tested the transaminase activity of aqueous extract of *B. ferruginea* stem bark of albino rats. For building of new amino acids, animals utilize excess of nitrogen either by deamination or transamination (Meister, 1955). All known natural amino acids but threonine and lysine, undergo transamination (Narawane, 1967). The possible role of transamination in promoting synthesis and growth has received consideration. Aspartate and alanine amino transferases play a role in between carbohydrate and protein metabolism and regulate the balance between them through the conversion of alpha ketoglutarate, pyruvate and glutamate, and serve as a provision of keto acids to Krebs Cycle.

Serum ALT and AST of the control group compared to test animals indicated an increase in activity levels. Serum ALT and AST are useful indices for identifying inflammation and necrosis of the liver (Tilkian et al., 1979). ALT has its highest concentration in the liver with kidney and skeletal muscles having lesser activity of the enzyme. ALT measurements are however more liver specific than the AST and its activity is usually greater

than AST activity at early or acute hepatocelluar disease (Whitby et al., 1989). AST on the other hand tend to be released more than the ALT in chronic liver diseases such as cirrhosis (Whitby et al., 1989).

In the Liver, Aspartate and Alanine transaminase activity levels increased in all test animals (but group 3 AST which remained constant) compared to the control animals probably due to tissue damage and subsequent leakage or due to increased synthesis of amino tranferases (Tilkian et al., 1979). The higher activity of Aspartate transaminase is related to its function in the malate-aspartate shuttle for the transfer of reducing equivalents across the mitochondrial membrane (Whitby et al., 1989).

In the Kidney, a significant rise in Aspartate levels for groups 2 and 3 and decrease in Alanine transaminase activity levels was observed as the control groups were compared with the test groups. The reduction in activity levels of ALT may suggest an attempt of recovery from the assault inflicted by the extract administered at a higher dosage leading to unavailability of amino acids for usage in Gluconeogenesis.

The results of the study show that in the Serum, Aspartate and Alanine transaminase activity levels were in decreased level in relation to the tissues (liver and kidney) indicating no cellular leakage and no loss of functional integrity of the hepatic and glomerular cell membranes which are markers of diseased conditions. Also, this study has shown that daily, oral administration of the aqueous extract of *B. ferruginea* stem bark for 14 days (duration of the experiment) continuously, might somewhat confer protection to the liver and kidney although higher doses and prolonged usage might be dangerous.

Conflict of Interests

The author(s) have not declared any conflict of interests.

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