

Protective Effect of Myrianthus Arboreus Leaves Aqueous Extract in Acetaminophen-Induced Liver Toxicity in Rats

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Submitted: 16 Oct 2018; Accepted: 23 Oct 2018; Published: 01 Nov 2018

Abstract

Owing to changes in living pattern of humans and constant environmental changes, different life challenging diseases now exist. Traditional system has clam that some of these diseases could be cured with plant. Plants and their components are source of large amount of drugs. This study was design to examine the protective effect of Myrianthus arboreus leaves extract against acetaminophen induced liver toxicity in rats. A suspension of 750 mg/kg acetaminophen was administered once every 72 hours to induce toxicity in the rats. Oral administration of 500, 1000 and 2000 mg/kg body weight of the extract and 100 mg/kg of silymarine (reference drug) were administered for 10 days. The result of effect of pretreatment with Myrianthus arboreus leaves on the enzyme makers of tissue damage in acetaminophen induced toxicity showed significant different when compared with the result of group induced without pretreatment. The values of AST, ALT and ALP in the untreated group significantly ($p < 0.05$) increased. Elevated serum level in these enzymes revealed the integrity and functionality of the liver. Thus the increased value of these enzymes indicates damage to the liver by the induced acetaminophen. Also the values of non-enzyme markers (T.B., ALB and TG) for the treated groups decreased when compared with the untreated group. The significant different in the values between the groups pretreated with Myrianthus arboreus leaves and the untreated group showed that MA extract could protect the liver.

Keywords: Myrianthus Arboreus, Enzyme Markers, Non Enzyme Markers

Introduction

Myrianthus arboreus is a tropical tree up to 15m high which contain both male and female flower with spreading branches from a short stem [1-4]. It is usually divided close to the base, much-branched and with stilt roots, the roots forming a network structure above ground. It is found in wet situations and on stream-banks of the forest region of Guinea to West Cameroons and extending across Africa. The wood is yellowish-white, soft, fibrous and difficult for art work [4, 5, 6]. Though perishable, it is used in Guinea in making soap. The slash is slightly tinted but rapidly darkens to brown; there is little or no exudation. The bark is said to be variable in appearance: In parts of SE Nigeria, it may be greenish white and slightly flaky, or almost white and smooth and it is used in Ghana for chest-complaints [4-8].

Plants and their components are the only source of most drugs which comprise of distinct groups [9, 10]. There have been claims worldwide by the traditional system that some plants possessed antibiotic properties [9, 10]. Chemicals in plants (phytochemicals) are compound that naturally occur in plants [9, 10]. These components are important for the various plants activities [9-11]. It is now believed that nature has given the cure of every disease in one way or another [9, 10].

Among the three Myriathus spp. present in Ivory Coast, MA is the most commonly used pain relief drug for muscular pains, it is also used to reduce fractures and put into enemas for swollen anal vein [3, 6, 7]. However, fluid or dry particles of the leaves when added to soup or to palm wine are said to initiate madness. The Akye of Ivory Coast pound the leaves with those of Holarrhena floribunda (Apocynaceae) and cool to a paste which is diluted with warm water for administration as an enema for pain [2-4, 6, 12]. In Congo, the extract of Myrianthus arboreus leaves is drunk for treating coughing and diarrhoea and as a remedy for blood in urine [2-4, 6, 8]. Myrianthus arboreus is valued in Ghana to be called God's heart [2-4, 6, 8]. Hepatoprotective/ameliorative effect of plant drugs and herbal formulations are studied against chemicals and drugs hepatotoxicity in experimental animals, as they mimic any form of naturally occurring liver disease [13].

Materials and Methods

Plant Material

Myrianthus arboreus (MA) was obtained from Ekuku-Agbor in Ika South Local Government of Delta State, Nigeria. The name of the plant was confirmed by O.B. Green of the Department of Plant Science and Biotechnology, Rivers State University, Nkpolu-Oroworukwo, Port Harcourt, Nigeria.

Sample Preparation

The leaves of MA were air dried and ground to powder. Extraction was carried out with warm distilled water in the ratio of 1g to 5ml. The plant was soaked for 30 minutes and filtered using what man No. 1 filter paper and also with a funnel plunged with glass wool [14]. The residues of the plant was re-extracted in warm distilled water for same duration and filtered. The filtrates were pooled together with the previous ones and concentrated with a water bath at 50 °C. The concentrated form of the sample was stored at 4 °C until needed [15]. Stock solution of the concentrated plant sample

was constituted with distilled water at concentration of 500 mg/ml and different doses (500, 1000 and 2000 mg/kg) were prepared.

Experimental Animals

Wistar albino rats weighing between 150-200g were used in this study. The rats were acclimatized for one week prior to the commencement of the experiment. The animals were housed under standard laboratory conditions of light and dark cycles of 12 hours and were provided with rodent pellet food and water ad libitum. The animals were categorized into control and experimental groups.

Result and Discussion

Table 1: Protective effect of pretreatment with Myrianthus arboreus leaves aqueous extract on enzyme markers of tissue damage in acetaminophen induced toxicity

Group	Treatment	AST(u/l)	ALT(u/l)	ALP(u/l)
1	Normal control	34.75±4.5 ^a	14.75±0.5 ^a	36.50±5.0 ^a
2	Acetaminophen 750 mg/kg	103.00±2.0 ^{b*}	29.25±1.0 ^{b*}	57.75±4.5 ^{b*}
3	Silymarin 100 mg/kg	93.00±4.2 ^{bc}	17.25±0.5 ^{a*c}	34.50±3.0 ^{a*c}
4	500 mg/kg Extract	74.75±10.4 ^{b*d}	17.00±0.0 ^{a*c}	55.00±1.4 ^{bd}
5	1000mg/kg Extract	63.50±4.0 ^{b*d}	16.75±0.5 ^{a*c}	47.25±3.9 ^{b*d}
6	2000 mg/kg Extract	44.50±13.1 ^{a*d}	15.75±2.5 ^{a*c}	36.00±1.6 ^{a*c}

Key: AST= aspartate aminotransferase, ALT= alanine aminotransferase, ALP=alkaline phosphatase

Values are mean ± standard deviations of n=4 determinations. Values in each column with different superscript letter (a, b) differ significantly when comparing Group 1 and other Group (2, 3, 4 and 5), values with superscript (*) differ significantly when comparing Group 2 with other Group (3, 4 and 5) and values with different superscript letter (c, d) differ significantly when comparing Group 3 with 4, 5 and 6 at 5% level p<0.05.

The result of effect of pretreatment with Myrianthus arboreus leaves on the enzyme makers of tissue damage in acetaminophen induced toxicity is shown in (Table 1). Comparing the result of group 1 (control) and 2 (induced without pretreatment), the values of AST, ALT and ALP in group 2 significantly (p<0.05) increased. Elevated serum level in these enzymes revealed the integrity and functionality to the liver organ. Thus the increased value of these enzymes indicates damage to the liver organ by the induced acetaminophen. The result showed that the values of these enzymes in the pretreated groups were significantly less than values of group 2.

The protective activity of these plants could be attributed to the phytochemicals present in the plants. Silymarin (reference drug) is known to protect the hepatic cell by acting on the cell membrane, stabilizing and protecting the liver against deleterious agent. It directs action to liver cells, protect the membrane integrity, stabilize and strength membranes of cell organs and nuclei in the cells to prevent mutation and death. Qualitative and quantitative phytochemical analysis of and MA has shown that both plants contain flavonoids. Silymarin is a flavonoid, which is present in the plant. This silymarin act in the same way with that of the reference drugs thus has the ability to confer protective activity to the liver [16]. Ezeonwu and Dahiru in their work on the protective effect of bi-herbal formulation of Ocimum gyatissimum and Gongronems latifolium aqueous extract on acetaminophen-induced hepato-nephrotoxin in rats, reported, that the biherbal formulation protected the liver from acetaminophen damage. They noted that plants could confer protection to hepatic cells.

Table 2: Protective effect of pretreatment with Myrianthus arboreus leaves aqueous extract on non-enzyme markers of tissue damage in acetaminophen induced toxicity

Group	Treatment	T.C(mmol/l)	T.G(mmol/l)	HDL(mmol/l)	ALB(g/l)	T.B((µmol/l))
1	Normal control	3.75±0.2 ^a	1.42±0.1 ^a	2.10±0.4 ^a	37.25±1.0 ^a	9.75±0.9 ^a
2	Acetaminophen 750 mg/kg	3.80±0.4 ^{a*}	1.15±0.8 ^{a*}	1.90±0.2 ^{a*}	50.75±1.0 ^{b*}	14.52±1.3 ^{b*}
3	Silymarin 100 mg/kg	3.37±0.1 ^{ac}	1.05±0.1 ^{ac}	2.07±0.2 ^{ac}	38.50±0.6 ^{a*c}	9.75±0.9 ^{a*c}
4	500 mg/kg Extract	3.17±0.5 ^{ac}	0.77±0.1 ^{ac}	1.85±0.4 ^{ac}	36.50±2.4 ^{a*c}	9.25±1.5 ^{a*c}
5	1000 mg/kg Extract	2.87±0.1 ^{b*c}	1.20±0.3 ^{ac}	1.47±0.3 ^{ac}	43.50±1.0 ^{b*d}	4.65±1.1 ^{b*d}
6	2000 mg/kg Extract	2.60±0.3 ^{b*c}	0.30±0.1 ^{bc}	2.00±0.5 ^{ac}	36.00±2.8 ^{a*c}	6.05±0.9 ^{b*c}

Key: T.C = total cholesterol, T.G = total glyceride, HDL = high density lipoprotein, ALB = albumin, T.B = total bilirubin, C.B = conjugated bilirubin, PCV= packed cell volume, T.P total protein.

Values are mean \pm standard deviations of n=4 determinations. Values in each column with different superscript letter (a, b) differ significantly when comparing Group 1 and other Group (2, 3, 4, 5 and 6), values with superscript (*) differ significantly when comparing Group 2 with other Group (3, 4, 5 and 6) and values with different superscript letter (c, d) differ significantly when comparing Group 3 with 4, 5 and 6 at 5% level $p < 0.05$. Results of the impact of pretreatment with *Myrianthus arboreus* leaves extract on the non-enzyme makers of tissue damaged in acetaminophen induced toxicity in albino rats are shown in table 2. T.G values of the animals in the groups pretreated with MA extract were lower than that of the animals in the control group. This decrease is also observed for HDL values of groups 4 and 5 when compared with group 1. ALB and TB values of the animals in the pretreated groups with MA extract showed no significant ($p < 0.05$) difference with the values of group 1.

The observed decrease in the lipid profile in the pretreated groups with the extracts could be attributed to the activities of the phytochemicals capable of bringing down the lipid level. Saponins has the ability to bind with lipids to the bile salt and form micelles, enabling easy excretion, thus a reduction in the lipid values (phytochemical info, 2012). Nwachoko et al (2015) reported the presence of saponin in MA. Thus the observed reduction could be attributed to the activities of saponin and other phytochemicals. Also (Table 2) showed the values of Total bilirubin and Albumin in the pretreated and non-pretreated groups. Increase in the T.B. and ALB values in the non-pretreated group reflect the depth of pathophysiology of the liver and one of the most sensitive and useful ways to substantiate the functional integrity of the liver and the severity of hepatonecrosis Ezeonwu and Dahiru [16]. Therefore the significant increase in the T. B and ALB values of the non-pretreated group confirm the degree of damage to the liver of the rats.

Management of hepatic disease is based on some parameters/objectives: treat the specific cause of the disease, attend to the metabolic consequences of reduced hepatic function, facilitate hepatocellular regeneration and impede the progression of hepatic injury and pathological changes [17, 18]. A variety of markers are used in the assessment of response to medical treatment [19, 20]. Serum amino transferase (AST), alanine aminotransferase and alkaline phosphatase (ALP) are markers used to assess the level of recovery to the damaged organ. A decline in the serum activity of these enzymes usually indicates recovery. Serum albumin is clinically a useful marker of hepatic synthetic function [19, 20]. The ability of a drug or supplement to reduce injurious effect or preserve the normal hepatic physiological mechanisms, which have been disturbed by a hepatotoxin, is the index of its protective effect. The study has shown that *Myrianthus arboreus* leaves could possess hepatoprotective and ameliorative properties against acetaminophen induced toxicity.

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