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Full Length Research Paper

Assessment of the hepatic effects, heamatological effect and some phytochemical constituents of *Ximenia americana* (Leaves, stem and root) extracts

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The aqueous extracts of the leaf, stem bark and root of *Ximenia americana* was evaluated for its phytochemical constituents. A study was also conducted with 20 albino rats (Wistar strain) weighing between 100-130 g to access for hepatic effect and haematological effect. The extracts were administered every day for a period of 21 days. Group 1 was the control animals and those of groups 2 and 3 and 4 were administered 0.5 mg/rat/day of each of the different extracts. The results showed that the stem extract significantly ($P<0.05$) elevated the serum activities of alanine transaminase (ALAT), aspartate transaminase (ASAT) and alkaline phosphatase (ALK-P), the root extracts significantly ($p<0.05$) elevated both the ALT and ALK-P. Except for root extract which significantly ($p<0.05$) reduced albumin, there was a non-significant ($P>0.05$) reduction in the serum concentration of total protein and albumin for all the extracts. Haematological parameters revealed no significant ($P>0.05$) change, while the root extract significantly ($p<0.05$) increase the weight of the animals compared to the animals administered leaf and stem extracts for the period of 3 weeks of administration. There was significant ($p<0.05$) increase in liver and kidney weight for the animals administered the extracts compared to control. The root extracts have significantly ($p<0.05$) higher content of all phytochemical constituents determined.

Key words: *Ximenia americana*, aqueous extraction, hepatic, haematological, albino rats.

INTRODUCTION

Ximenia americana is a plant of the family olacaceae. It originated in the African tropics but can be found in many parts of the world; West Indies, Pacific Islands, New Zealand, Central and South America. It is commonly called wild plum, tallow wood, sour plum or hog plum. It is a thorny solitary shrub of about 6-8 high. It has small leaves pale yellowish green in colour with greenish cream scented flower and yellow fruits oval in shape. It has zig zag branches (Arbonnier, 2004).

Traditionally, especially among the Hausa/Fulani's communities in Nigeria, *X. americana* has allegedly been used to treat malaria, leprotic ulcer, skin infections (Ogunleye and Ibitoye, 2003) and headaches. It may also be used for colds and as a laxative. An infusion of the leaves is used as eye wash, and for toothache, constipation and angina. The roots can also be used to treat veneral diseases, oedema and also as a poison antidote. The root in combination with the root of *Annona chrysophylla* has been used to treat sleeping sickness. In tropical Africa, it is used (the leaf) to remedy cough and fever. The plant has been alleged to have antineoplastic activity, antimicrobial activity (Ogunleye and Ibitoye, 2003; James et al., 2007) and anti inflammatory action (Ogunleye and Ibitoye, 2003).

Despite the wide spread use of *X. americana*, not much has been reported in the literature about the toxicity of the different part of the plant. A recent publication is in connection with acute toxicity (LD50) effect where the lethal dose of the stem bark extract was determined for mice; the result revealed no death with doses up to 5000 mg/kg (Maikai et al., 2008). However lethal dose determination shows a wide variation in results between species and even the same species under different expe-

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rimental conditions; this gives LD50 little predictive capacity for assessing toxicity in humans (Jollow et al., 1974., Lorke, 1983). Also LD50 measures only lethality, ignoring other adverse effect which often correlates poorly with mortality. thus a chemical can be extremely harmful but non lethal at doses far short of LD50 dosage. When an herbal product is ingested the body interacts with it in an attempt to get rid of any harmful toxins, especially if the body cannot convert the foreign substances into cellular components. In this communication the pytochemical screening of the aqueous extracts, the haematological and biochemical effects of the extracts of *X. americana* were investigated.

MATERIALS AND METHODS

Collection and preparation of plant sample for analysis

The samples of leaf, stem and root of *X. americana* used for this work were collected from their natural habitat on a farmland at Shika-Giwa, Zaria. The plant was identified at the Biological Science Departmental Herbarium, Ahmadu Bello University Zaria, Nigeria. They were thoroughly washed and rinsed in distilled water and sun dried. The dried plant samples were ground to fine powder with a mill, packaged in sample bottles and stored. 100 g of *X. americana* leaf and root fine powder were each dissolved in 300 ml distilled water and allowed to stay for 24 h, after which it was filtered, and the filterate was concentrated on a water bath at 45^{o}C.

The residues of the leaves, stem and roots were dissolved in normal saline to make the aqueous extracts. A concentration of 50 mg of the extract residue in 100 ml of normal saline was made. The solutions were then stored at 4^{o}C until required.

Experimental animals and biochemical analysis

Healthy wistar albino rats of both sexes weighing between 100-130 g were purchased from University of Jos, Plateau state, Nigeria and kept in well aerated laboratory cages. The rats were divided into four groups (control, leaf extract group, stem extract group and root extract group) of four rats each. The animals were fed rations containing commercial poultry feeds (growers mash, Guinea Feeds Nigeria Limited) *ad libitum* for two weeks to acclimatize them to laboratory conditions. After this period, the test animals were subjected to oral treatment with the aqueous extract (0.5 ml/rat/day) of the leaf, stem and root to the animals while the control group were given normal saline (0.5 ml/rat/day) every day using a feeding tube fitted to insulin syringes for a period of three weeks. During this period the animals were still placed on water and growers mash *ad libitum* and their growth, packed cell volume (PCV) and haemoglobin (Hb) were monitored every week. After this period, the animals were weighed anaesthized using chloroform and bled by cardiac puncture. The organs exercised and the blood samples were used for determination of some biochemical parameters [alanine transaminase (ALAT), aspartate transaminase (ASAT) and alkaline phosphatase (ALK-P), albumin and total protein] as well as some haematological parameters [packed cell volume (PCV), haemaglobin (Hb), red blood cell (RBC) and white bood cell (WBC)], while the organs were weighed.

Phytochemical analysis

Quantitative determination of saponins, tannins and cyanogenic glycosides were carried out according to the methods described by Harbone (1973) and Trease and Evans (1989). Oxalate contents were determined by the spectrophotometric methods of Hang and Lantzch (1973). Determinations were done in triplicate.

Statistical analysis

Data obtained were analysed by the use of student's t-distribution test and values for $p<0.05$ were considered statistically significant.

RESULTS AND DISCUSSION

The serum concentration of the marker enzymes is presented in Figure 1. The value obtained shows that animal administered stem extracts have significantly ($p<0.05$) elevated ALT, AST and ALK (P) activities, while the root extract also elevated ALT and ALK-P compared to those of the control group and other extracts. The albumin level of all the animal administered the root extracts (Figure 2) was significantly ($P<0.05$) lowered, while there was no significant ($P>0.05$) change in total protein when compared with control animals.

The change in weight of animals administered *X. americana* extract is showed in Figure 3. There was significant ($P<0.05$) increase in weight of the animals administered root extracts when compared with other extracts for the period of 3 weeks of administration. No significant ($P>0.05$) difference was found on the PCV level of the animals compared with the control (Figure 4). The effect of the aqueous extracts of *X. americana* on the haematological parameters is presented in Table 1. Table 3 shows the phytochemical constituents of *X. americana*. The result revealed significant ($P<0.05$) higher values of all the antinutrients determined in the root extract as compared to the leaf and stem extracts.

In the past years, researchers have analysed *X. americana* for antimicrobial, anti-inflammatory and antineoplastic activities to enable them determine the biological, chemical and pharmacological propertiesof the plant especially as the plant is used in folk medicine for the treatment of various ailments such as malaria, leprotic ulcer, skin infections (Ogunleye and Ibitoye, 2003), headache, as poison antidote, for veneral diseases and sleeping sickness. The results of this work shows that the extracts significantly ($P<0.05$) increased the level of serum AST and ALT. This is indicative of hepatocellular damage. The result also shows that the root has the ability to impair albumin synthesis as observed by the decrease level of serum albumin. The weight of the animal showed a significant ($P<0.05$) reduction on administering the leaf extract as compared to the control and the other extracts at week 3. This reduction might be due to poor intake and utilization of food by the animals in the leaf extract group. The significantly ($P<0.05$) higher content of hydrogen cyanide, saponins and oxalates in the root extracts indicates that the root extracts may be more toxic. Hydrogen cyanide is known to cause gastrointestinal inflammation and inhibition of cellular respira-

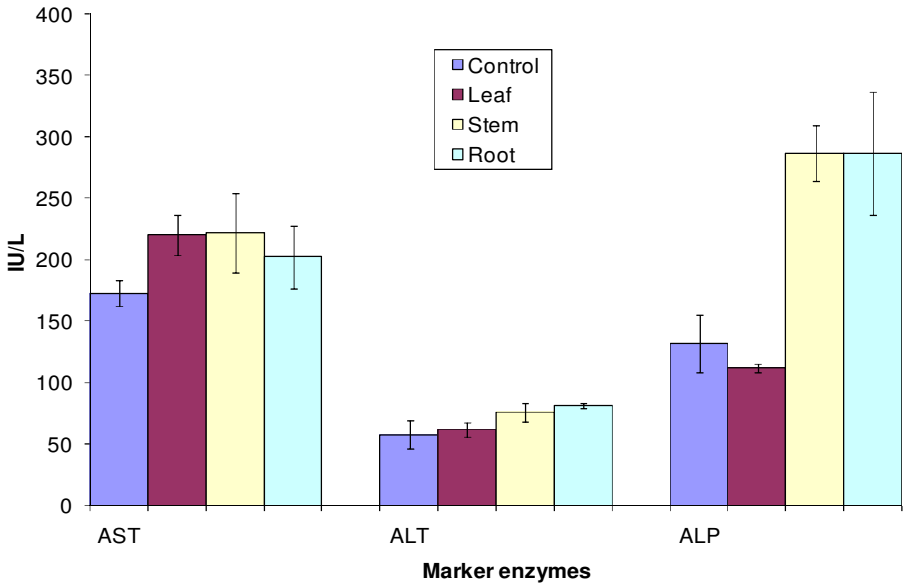

Figure 1. Effects of aqueous extracts of *Ximenia americana* on some serum marker enzymes of albino rats.

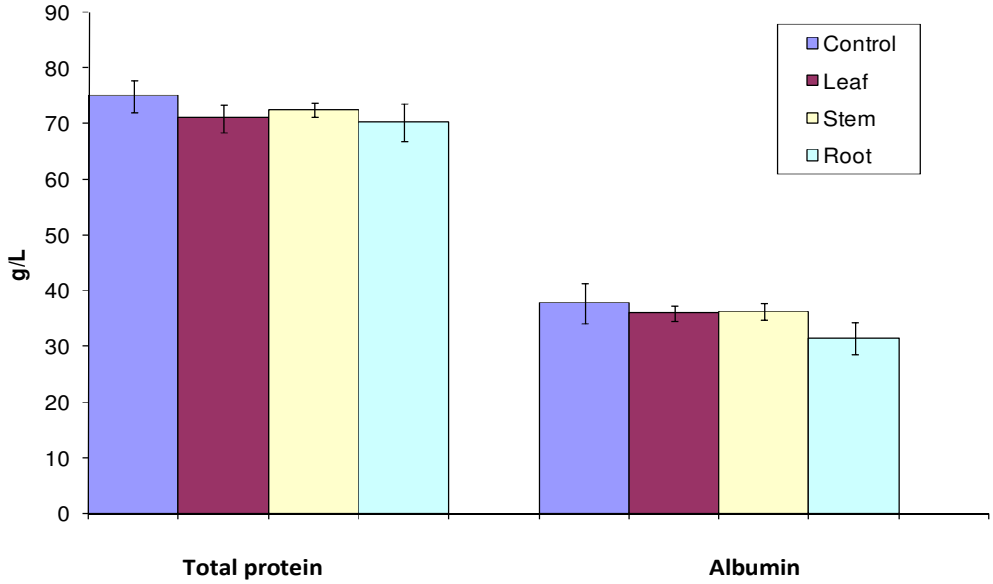

Figure 2. Effects of aqueos extracts of *Ximenia americana* on some biochemical parameters of albino rats.

Table 1. Effect of aqueous extracts (leaf, stem and root) of *Ximenia americana* on some haematological parameters of albino rats.

Extract	Packed cell volume (%)	Haemaglobin (g/dl)	Red blood cell (x10^6/mm^3)	White bood cell (x10^3/mm^3)
Control	35.25 ± 9.26^a	11.73 ± 3.10^a	8.51 ± 6.29^a	6.13± 3.07^a
Root	41.75 ± 3.30^a	13.80 ± 1.24^a	6.96 ± 0.55^a	6.06± 0.95^a
Stem	39.25 ± 3.5^a	13.03 ± 1.18^a	6.54 ± 0.59^a	6.48± 1.18^a
leaf	37.33± 0.02^a	11.30 ± 2.00^a	5.65± 0.98^a	7.20±2.99^a

Values are mean of four determinations ± standard deviation.Values with different superscript in a column differ significantly (P<0.05).

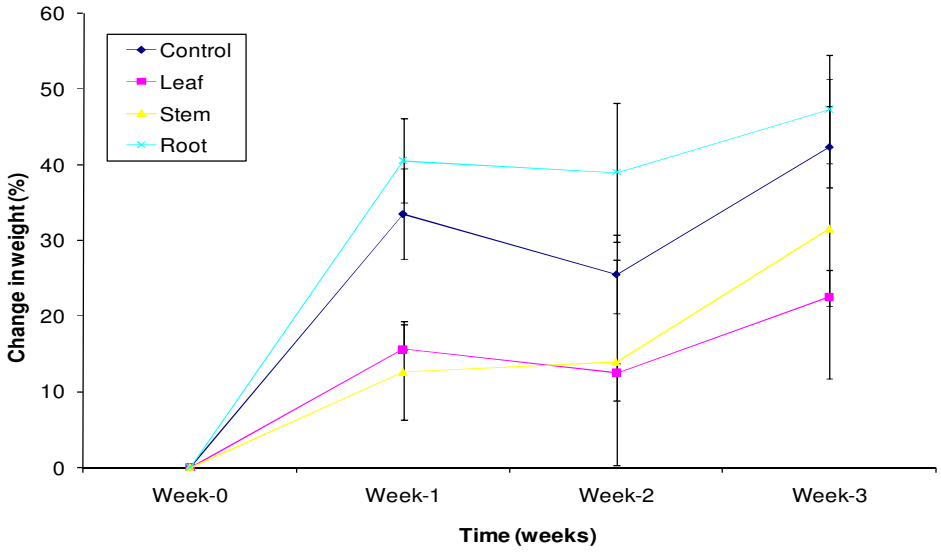

Figure 3. Effects of aqueous extracts of *Ximenia americana* (leaf, stem and root) on weight changes of albino rats.

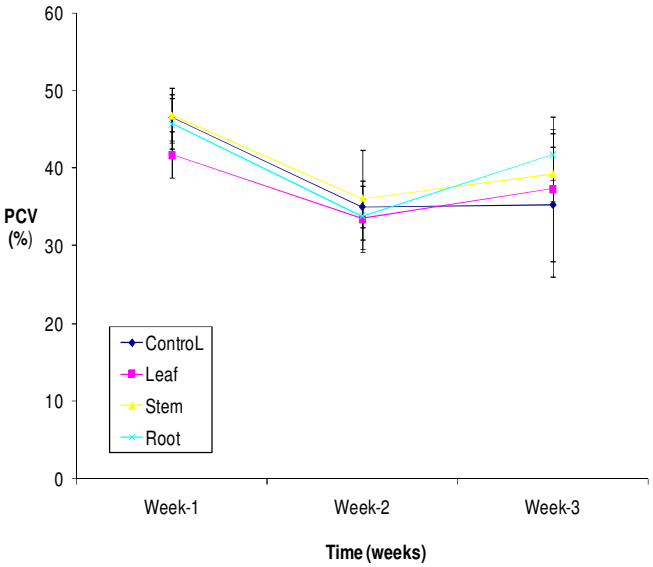

Figure 4. Effects of aqueos extracts of *Ximenia americana* on PCV level of albino rats.

Table 2. Effect of aqueous extracts (Leaf, stem and root) of *Ximenia americana* on kidney and liver weights of albino rats.

Extracts	Kidney (% body weight)	Liver (% body weight)
Control	0.36 ± 0.04^{c}	3.14 ± 0.07^{c}
Root	0.39 ± 0.08^{bc}	3.36 ± 0.30^{b}
Stem	0.42 ± 0.01^{b}	4.45 ± 0.04^{a}
Leaf	0.59 ± 0.01^{b}	3.47 ± 0.05^{b}

Values are mean of four determinations ± standard deviation. Values with different superscript in a column differ significantly (P<0.05).

Table 3. Some phytochemical compositions of *Ximenia americana* aqueous extracts (leaf, stem and root).

Phytochemical	Leaf	Stem	Root
Hydrogen cyanide (%)	0.06 ± 0.10^{c}	0.83 ± 0.03^{b}	1.25 ± 0.02^{a}
Saponin (%)	0.19 ± 0.03^{c}	0.45 ± 0.01^{b}	2.01 ± 0.02^{a*}
Tannin (%)	0.02 ± 0.01^{b}	0.07 ± 0.03^{a*}	0.10 ± 0.02^{a*}
Phytate (%)	0.44 ± 0.02^{c}	4.53 ± 0.02^{b}	5.86 ± 0.03^{a*}
Oxalate (%)	8.6 ± 0.04^{c}	11.2 ± 0.1^{b}	16.4± 0.02^{a*}

Values are mean of triplicate determinations ± standard deviation. Values with different superscript in a row differ significantly P<0.05).

tion. Saponins are known to have haemolytic properties and the ability to reduce body cholesterol by preventing its reabsorption. The high saponin content in the root may lead to gastroenteritis manifested by diarrhoea (Awe and Sodipo, 2001). Oxalates have been known to cause irreversible oxalate nephrosis when ingested in large doses.

Conclusion

There is need to isolate the specific component(s) responsible for the toxicity in the root extracts in order to standardised the plant preparation for maximum therapeutic benefit.

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