

Research Article

Histopathological Changes in the Liver and Heart of Wistar Rats Treated with *Maerua Pseudopetalosa* (Glig. and Bened) De Wolf. Tubers

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Abstract: The present study was conducted to evaluate the histopathological effects of *Maerua pseudopetalosa* ethyl acetate and ethanol tuber extracts on the liver and heart of Wistar rats. The extracts were administered at 50, 250 and 500 mg/kg body weight for one week. Daily oral dose of 500 mg/kg body weight of the ethanol extract led to six spontaneous mortalities; three in the second day of dosing and the other three at day six. Liver sections of rats given the ethanolic extract at a concentration of 50 mg/kg body weight (bw) showed loss of hepatocyte nuclei, nuclear pyknosis and in some cells cytoplasmic acidophilia. Increasing the concentration to 250 mg/kg bw was associated with dilated blood vessels and hepatic sinusoids. Rats receiving the ethyl acetate extract at a concentration of 50 mg/kg bw exhibited variations in the size of hepatocyte nuclei and karyolysis in some cases while the 250 mg/kg bw dose caused only slight sinusoidal dilation. Cytoplasmic vacuolation and dilated sinusoids were seen in liver sections of rats given the 500 mg/kg bw dose of the ethyl acetate extract. The heart sections of rats treated with 50 mg/kg bw and 250 mg/kg bw of the ethanol extract showed almost normal appearances but pale staining and elongated muscle nuclei were observed in some sections. The heart sections of the rats treated with 50 mg/kg bw of the ethyl acetate extract showed separation of muscles; some myocytes exhibited slight fragmentation and others had deep eosinophilic staining. Separation of heart muscles and increased interstitial cells were seen in heart sections of rats treated with 250 mg/kg and 500 mg/kg bw, respectively.

Keywords: Ethyl acetate extract, ethanolic extract, histopathology, *maerua pseudopetalosa*, sudan, tubers, wistar rat

INTRODUCTION

Plants provided effective sources of traditional medicines against many ailments since ancient times. Peoples of all continents, especially in Africa, with its diverse culture and rich plant flora, used folklore medicine for their health needs Ouedraogo *et al.* (2007). Medicinal plants contain various pharmacologically active compounds which have useful therapeutic applications Azaizh *et al.* (2003) and many are utilized in the development of the drug industry Baker and Carte (1995). About thirty percent of the drugs sold world-wide contain compounds derived from plants WHO (2003).

The plant *Maerua pseudopetalosa* (Glig and Bened.) De Wolf (Family: Capparaceae) is known as 'Kordale' among the Nuba of the Nuba Mountains and 'Amyok' among the Dinka of the Republic of the South Sudan, where the fruits are eaten during famine times after careful treatment to remove possible toxic substances Burkill (1985). The roots are traditionally used as a remedy for cough and as cure for tumors. Even though this plant is of a wide spread use, yet there

is little available literature on the scientific evaluation of its therapeutic uses and toxicological effects.

The present work was carried out to study toxic effects of the ethanol and ethyl acetate tuber extracts of the plant on heart and liver tissues of Wistar rats.

MATERIALS AND METHODS

Plant materials: The plant under investigation (*M. pseudopetalosa*) was collected from the Upper Nile, Republic of South Sudan. The plant was authenticated at the Department of Botany by Prof. Hatil, H. EL-Kamali, Omdurman Islamic University.

Preparation of crude plant extracts: The plant material (tubers) was air dried and ground into coarse powder using mortar and pestle. One hundred and fifty grams from the powder were soaked first in ethyl acetate for three days in a shaker and then filtered using Whatman No. 3 filter paper. The residue was similarly soaked in ethanol for three days and filtered. The filtrates were evaporated to dryness using a rotatory evaporator and then weighed (This yielded 7.7% and 1.5% for the ethanol and ethyl acetate extract,

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respectively). Three replicates of each solvent extract were used. These were reconstituted in distilled water and the required doses of 50, 250 and 500 mg/kg bw from each extract were prepared.

Experimental animals: Forty eight male Wistar rats weighing 55-90 g were obtained from Pharmacology Department, Medicinal and Aromatic Plants Research Institute, Khartoum. They were kept under standard conditions of management, with an alternating 12 h light/dark cycles. Commercial standard rat's diet and water were provided *ad libitum* throughout the one week experiment.

Experimental design: The rats were divided into eight equal groups (six each); each group was kept in suitable plastic cage. Group 1 and 2 animals were each orally dosed daily for seven days with distilled water and acted as control for the ethyl acetate and ethanol experiments, respectively. Rats of groups 3, 4 and 5 were daily dosed each with 50, 250 and 500 mg/kg bw ethyl acetate extract, respectively while groups 6, 7 and 8 rats were dosed similarly with the ethanol extract. The extracts were administered using special stomach tube with smooth tip.

Pathological methods: Postmortem examination was carried out for rats that were euthanized at the end of the experiment. Tissue samples were taken from liver and heart and fixed in 10% neutral buffered formalin. Paraffin sections 5-6 μm were prepared and stained with Haematoxylin and Eosin (H and E) for histopathology Bancroft and Gamble (2007).

RESULTS AND DISCUSSION

The liver is vulnerable to various environmental toxicants which may cause structural and functional abnormalities Shyamal *et al.* (2010).

The present results showed that liver of rats treated with 50 mg/kg bw ethanol tuber extract exhibited slight hepatocyte changes seen as nuclear pyknosis, karyolysis and cytoplasmic acidophilia (Fig. 1). Ethyl acetate tuber extract at the same dose was also associated with slight variations in the size of hepatocyte nuclei and karyolysis in some liver cells (Fig. 2).

On the other hand, liver sections of rats treated with the dose of 250 mg/kg bw ethanol extract, exhibited sinusoidal dilatation and dilated central veins (Fig. 3). Slight sinusoidal dilatation was also seen in liver section of rats that received a similar dose of the ethyl acetate extract (Fig. 4). Moreover, rats dosed with 500 mg/kg bw ethyl acetate extract showed hepatocyte swelling and slight to moderate cytoplasm vacuolations, indicative of hydropic degeneration (Fig. 5). All rats of

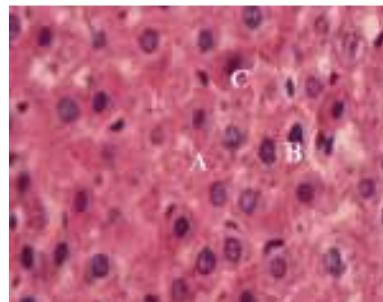


Fig. 1: Liver: Rat, 50 mg/kg bw ethanol extract, showing: A.nuclear pyknosis. B.karyolysis. C. cytoplasmic acidophilia. H and EX100

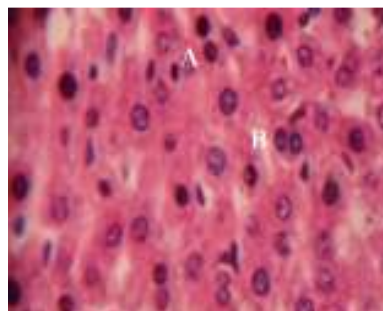


Fig. 2: Liver: Rat, 50 mg/kg bw acetyl acetate extract, showing: A.variation in size of hepatocyte Nuclei. B.karyolysis. H and EX100



Fig. 3: Liver: Rat, 250 mg/kg bw Ethanol extract, showing: A: dilated congested central vein; B: sinusoidal dilatation. H and E X 40H and EX40

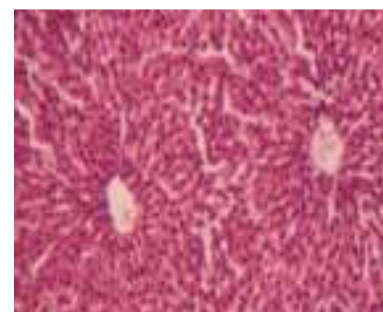


Fig. 4: Liver: Rat, 250 mg/kg bw ethyl acetate extract, showing sinusoidal dilatation

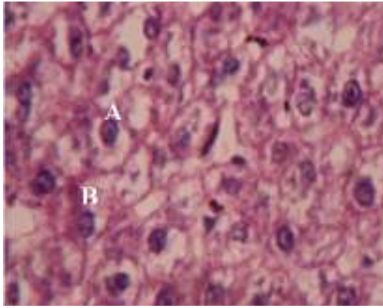


Fig. 5: Liver: Rat, 500 mg/kg bw ethyl acetate extract, showing: A: hepatocyte swelling; B: cytoplasmic vacuolation; H and EX100

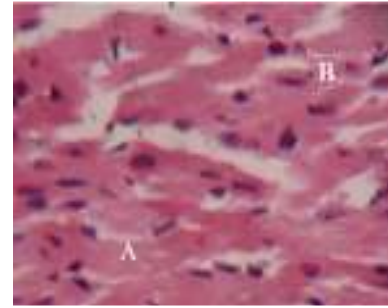


Fig. 9: Heart: Rat, 250 mg/kg bw ethanol extract, showing: A: staining staining muscle; B: Elongated H and EX250

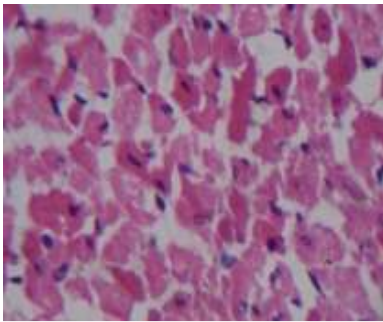


Fig. 6: Heart: Rat, 50 mg/kgbw ethyl acetate extract, showing separation deep eosinophilic staining of muscles. H and EX100

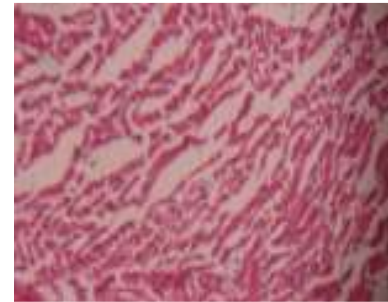


Fig. 10: Heart: 250 mg/kg bw ethylacetate extract showing thin atrophied muscle, H and EX40

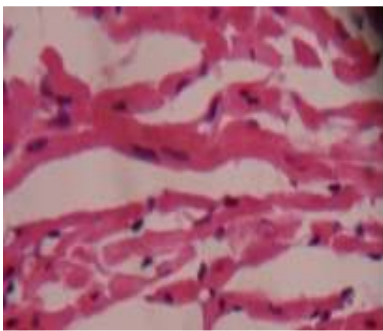


Fig. 7: Heart: Rat, 50 mg/kgbw Ethyl acetate extract, showing some atrophied separated muscles H and EX10

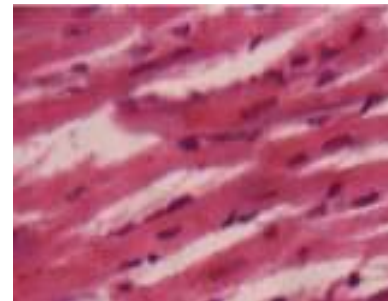


Fig. 11: Heart: Rat, 500 mg/kg ethyl Acetate extract showing: rather normal appearance with increased interstitial cells in rats, H and EX250

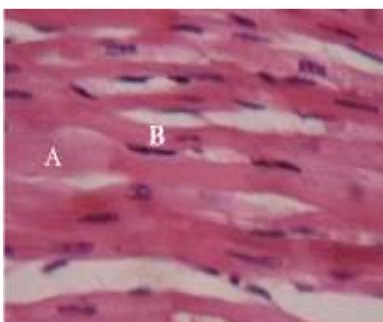


Fig. 8: Heart: Rat, 50 mg/kgbw ethanol extract, showing: A; pale muscle; B: elongated nuclei pale nuclei; H and EX250

the group dosed with 500 mg/kg bw ethanol extract were died; three at the second day of dosing and the rest at day six. These were not examined postmortem and the cause of death is difficult to be ascertained. However, toxicity of the extract cannot be entirely excluded.

The hepatic changes associated with the low and medium doses of both ethanol and ethyl acetate tuber extracts seem to be mild compared with the changes seen in the rats given the high (500 mg/kg bw) dose of the ethyl acetate extract. In a previous study on the protective and therapeutic effects of the *Ptrocarpus santalinus* on D-galactosamine hydrochloride-induced hepatic damage in rats, Dhanabal *et al.* (2007) reported nuclear pyknosis and intense cytoplasmic acidophilia in hepatocytes. Similar results have also been reported in liver of rats receiving *Trifolium sp.* extract Al-Rawi

(2007). Heart sections of rats treated with 50 mg/kg bw ethyl acetate tuber extract showed atrophy and separation of cardiac muscle cells with dark eosinophilic staining of some muscles, suggestive of hyaline degeneration (Fig. 6 to 9). On the other hand, sections of rats receiving 250 mg/kg bw ethyl acetate extract exhibited atrophied separated muscles (Fig.10) and those of rats treated with 500 mg/kg bw of the extract had slight increase in interstitial cells (Fig. 11). Acidophilia of cardiac myocytes has been reported in rats receiving methanol extract of *Cassia fistula* bark Khatib *et al.* (2010) and aqueous extract of *Moringa lam*. Stem bark Mahendra *et al.* (2010).

Atrophy and separation of cardiac muscle have also been observed by Ahmed (2009) in rats treated with 50 mg/kg bw ethanol extract of *Nerium oleander*.

The rat groups receiving 50 or 250 mg/kg bw ethanol extract exhibited almost normal myocardium but with slight variation in stain ability of muscle (some pale staining of muscles) and appearance of elongated nuclei (Fig. 8 and 9). Similar findings were recorded by Ogbonnia *et al.* (2010) in heart muscle of rats dosed with hydroethanolic extract of *Chromolaena odorata*.

However, any possible effects on the heart muscle related to the two tuber extracts used here could be due to their content of steroidal glycoside Manal (2012).

These glycosides are toxic and many have pharmacological activity on the heart Harborne (1998) and may specifically affect the dynamics of the rhythm of the insufficient heart muscles.

CONCLUSION

The study showed that rats treated with ethanol or ethyl acetate tuber extracts of *M. pseudopetalosa* in the different concentrations, caused mild hepatic or myocardial changes which appear to be relatively more noticed in case of the ethyl acetate extract. Therefore, further studies are necessary to isolate and characterize the constituents in the plant and elucidate their extract modes of action.

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