

CHANGES IN BODY WEIGHT AND SERUM BIOCHEMICAL PARAMETERS OF WISTAR RATS ORALLY DOSED WITH *MAERUA PSEUDOPETALOSA* (GILG AND BENED.) DE WOLF TUBER EXTRACTS**Manal, A. Ibrahim**Department of Botany, Faculty of
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Sudan**ABSTRACT**

The effect of ethanol and ethyl acetate extracts of *Maerua psuedopetalosa* administered to Wistar rats at 50, 250 and 500 mg/kg body weight doses for a week was investigated on body weight and serum biochemical parameters. Rats given the ethanolic extract had no significant differences in the values of AST, total protein, cholesterol, total bilirubin and urea whereas had significantly increased ALP activity, and albumin concentration (at all doses used) and direct bilirubin (at 250 mg/ kg dose), compared to control ($p < 0.05$). Mortality occurred in the 500 mg/ kg dose group. Rats dosed with the ethyl acetate extract showed higher AST activity but comparable ALT and ALP activities to that of control. Compared to control values total protein and D.B were significantly lower in the three treated groups, T.B and albumin were significantly lower at the 250 and 500 dose level ($p < 0.05$), Cholesterol was significantly low in the 250 dose group and no significant difference was observed for urea levels. Administration of the extracts at all doses investigated proved that only the 250 mg/kg BW concentration- of the ethyl acetate and ethanol tuber extracts- were able to reduce the Wistar rats body weights. These alterations in some parameters indicated that the tuber extracts of *M. psuedopetalosa* possess slight toxicity. Therefore, crude extracts of tuber may not be completely safe as oral remedies.

Keywords: Biochemical parameters; Wistar rats; body weight and *Maerua psuedopetalosa*.

INTRODUCTION

Plants have been used as sources of remedies for the treatment of many diseases since ancient times by peoples of all continents, especially in Africa, with its diverse culture and rich source of traditional medicines. Many African countries use folkloric medicine for their health needs (Ouedraogo *et al.*, 2007). In West Africa, new drugs are not often affordable, thus, up to 80% of the population use medicinal plants as remedies (Hostettmann and Marson, 2007).

Medicinal plants typically contain several different pharmacological active compounds that may act individually, additively or synergistically to improve health (Azaizeh *et al.*, 2005). The continuous interest in the evaluation of natural products as potential chemotherapeutic agents was encouraged by the isolation of phytochemicals in plants which could become important drugs in modern medicine (Wintola *et al.*, 2010). Plants produce bioactive compounds which act as defense mechanisms against predators and at the same time, may be toxic in nature (Da Roch *et al.*, 2002; Bents, 2004). With the upsurge of interests in medicinal plants, there is need for thorough scientific investigations on their efficacy and potential toxicity (Ashafa *et al.*, 2010). The study of medicinal plants toxicity is useful for the improvement of traditional medicine as well as for the development of new therapeutic

molecules (Fransworth, 1994). Recently, concerns had been raised over the lack of quality control and scientific evidences for the efficacy and safety of medicinal plants (Firenzuoli and Gori, 2007; Rousseaux and Scachter, 2003). Therefore screening plants for toxicity, and ascertaining their safety is a vital ethical issue.

The plant *M. pseudopetalosa* (family Cappariaceae) is known as Kordale among the Nuba of the Nuba mountains and Amyok among the Dinka of the Republic of the South Sudan, the fruits are eaten during famine times after careful preparations to remove the toxic substances. The roots are traditionally used as cough remedy and as cure for tumors. The toxic principle known as tetramethyl ammonium iodide (tetramine) is reported to be present in the tuberous root, root and leaf of the plant (Henry, 1948). Although this plant is of a wide spread use in tropical Africa yet there is little available literature on the scientific evaluation of its toxicological effects. This work therefore, investigates the effects of tuber extracts on some biochemical parameters and body weight of Wistar rats.

Materials And Methods

Plant Material

The plant under investigation (*M. pseudopetalosa*) was collected from Upper Nile (Aaly Al Neel), Republic of South Sudan .The plant was authenticated at the Department of Botany by Prof. Hatil Alkamali, Omdurman Islamic University, Sudan.

Preparation of crude plant extracts

The tuberous roots were air dried, ground into a coarse powder form and soaked for 3 days in each of ethyl acetate and ethanol consecutively. The plant material was then shaken overnight on a shaker, then filtered, evaporated to dryness under reduced pressure in a rotatory evaporator and weighed.

Experimental Animals and Dosing

Forty tow male Wistar rats weighing 150 grams were obtained from the Medicinal and Aromatic Plants Research Institute (MAPRI), Khartoum. The rats were divided into eight equal groups (G1 – G7). Each group was kept in a plastic cage, freshly spread with saw wood to absorb urine and housed under standard conditions of temperature, and humidity with alternating 12 hours light/ dark cycles. Commercial standard diet and water was supplied *ad libitum* throughout the experimental period (one week).

Group 1, 2, and 3 rats were orally dosed with 50, 250 and 500 mg/ kg body weight (BW) ethyl acetate plant extract, respectively, while rats of groups 5, 6 and 7 were dosed similarly but with the ethanolic plant extract. Rats of groups 4 were orally dosed with distilled water and acted as a control group. The extract doses were administered using special stomach tube with a smooth tip to protect the oral mucosa and esophagus from injury.

Monitoring of Body Weights

Animals were individually weighed at the beginning and at the end of the experiment to record changes in body weight.

Blood Sampling and Processing

At the end of the experiment the rats were decapitated and two blood samples were obtained from each rat. One sample was collected in a tube containing potassium ethylene di-amine tetra acetate (anticoagulant) for hematological analysis and the other sample was collected in plain tube to obtain serum; blood was left for one hour to clot and the tube was centrifuged at 3000 rpm for 15 minutes and the harvested serum was used for biochemical analysis.

Biochemical Parameters

Serum samples were analyzed for the activities of aspartate aminotransferase (AST), alanine aminotransferase (ALT) and for the concentrations of total protein, albumin, cholesterol, total and direct bilirubin, alkaline phosphate and urea by the Roche Diagnostic Hitachi 902 Analyzer.

Statistical Analysis

The collected data will be analyzed and expressed as means \pm SD of six replicates and were subjected to one way analysis of variance (ANOVA) followed by Duncan multiple range test to determine significant differences in all the parameters. Values were considered statistically significant at $p < 0.05$ (Gomez and Gomez, 1984).

Results And Discussion

There is lack of information about possible toxic effects of *M. pseudopetalosa*. The only available toxicity study was reported by Henery (1948) in rabbits and mice given aqueous extracts of the plant tubers *per os*. Purification of the aqueous extracts gave crystals of iodide salts (tetra methyl ammonium salts), which was lethal within two minutes when injected into rabbits in concentrations of 2 and 8 mg/kg body weight. The present study may be considered as pioneer investigation on the effect of the plant tuber extracts, administered to rats, on the serum biochemical parameters and body weight.

Effect of *M. pseudopetalosa* extracts on body weight of Wistar rats

Generally, there was no significant difference in body weight between the control and test groups of rats dosed with various concentrations of the ethyl acetate or ethanol extracts. However, rats given the 250 mg/ kg BW dose of both extracts had the lowest weight gains. Moreover, the results showed that the 500 mg/ kg BW dose of the ethanol extract was fatal to rats; three animals died on day 2 and the other 3 on day 6 of the experiment (Table 1 & 2). On the contrary, the high concentration of the ethyl acetate extract (500mg/ kg BW) was not lethal to the Wistar rats. Konate (2011) tested the toxicity of aqueous and acetone extracts of *Cienfuegosia digitata* on mice and rats, he recorded wide insignificant variations in weights of rats with no other detectable clinical signs.

Table (1): Effect of different concentrations of *M. pseudopetalosa* ethyl acetate tuber extract on Wistar rats body weights.

parameter	Control	50mg/kg	250mg/kg	500mg/kg
Initial weight	150.37 ^a \pm 4.48	150.47 ^a \pm 4.71	150.30 ^a \pm 4.13	150.43 ^a \pm 4.25
Final weight	151.70 ^a \pm 0.1	150.83 ^a \pm 0.1	144.21 ^b \pm 0.2	148.32 ^{ab} \pm 0.3

Means with the same superscript across the row for each parameter are not significantly different ($p < 0.05$).

Table (2): Effect of different concentrations of *M. pseudopetalosa* ethanol tuber extract on Wistar rats body weights.

parameter	Control	50mg/kg	250mg/kg	500mg/kg
Initial weight	150.27 ^a ±4.47	150.60 ^a ±4.84	150.22 ^a ±4.96	-
Final weight	151.60 ^a ±0.2	149.23 ^{ab} ±0.01	145.00 ^b ±0.01	-

Means with the same superscript across the row for each parameter are not significantly different ($p < 0.05$). - not recorded (died)

Biochemical findings

Administration of the ethanol and ethyl acetate tuber extracts of *M. pseudopetalosa* to Wistar rats in the present study was associated with some changes in serum biochemical parameters. Compared to control, AST activity in the ethyl acetate groups was significantly higher in rats receiving 50 mg/ kg extract, almost similar in the group dosed with 250 and 500 mg/kg BW. On the other hand, ALT and ALP values were not significantly different compared to control (Table 3).

In case of the ethanolic extract AST, ALT and ALP activities were not significantly different from that of control (Table 4). It can be noticed that the changes observed in the three enzyme activities, especially AST and ALT, are not consistent to indicate hepatic damage, except perhaps for the elevated AST levels in rats receiving the ethyl acetate extract.

Table (3): Biochemical levels in Wistar rats orally dosed with different concentrations of *M. pseudopetalosa* tuber ethyl acetate extracts.

Parameter	Control	50 mg/kg	250mg/kg	500mg/kg
AST U/L	156.67 ^a ±7.80	168.33 ^a ±10.2	162.67 ^a ±9.20	-
ALT U/L	26.83 ^a ±2.0	25.33 ^a ±1.2	29.83 ^a ±1.3	-
ALP U/L	285.33 ^a ±10.6	302.83 ^a ±15.9	260.33 ^a ±16.6	-
T.P g/L	8.20 ^a ±1.1	6.08 ^b ±.001	5.80 ^b ±.002	-
Alb. g/L	5.37 ^a ±.80	3.48 ^b ±.31	3.58 ^b ±.32	-
Chol. mg/dL	93.5 ^a ±4.3	81.83 ^{ab} ±5.2	72.83 ^b ±4.6	-
T.B mg/dL	0.60 ^a ±.06	0.15 ^b ±.03	0.178 ^b ±.01	-
D.B mg/dL	0.122 ^a ±005	0.04 ^a ±.001	0.095 ^a ±.001	-
Urea mg/dL	52.83 ^a ±3.2	31.0 ^b ±1.2	40.17 ^b ±4.0	-

Means with the same superscript across the row for each parameter are not significantly different ($p < 0.05$)

Table(4): Biochemical levels in Wistar rats orally dosed with different concentrations of *M. pseudopetalosa* tuber ethanolic extracts.

Parameter	Control	50 mg/kg	250mg/kg	500mg/kg
AST U/L	156.67 ^b ±16.0	211.83 ^a ±10.1	150.83 ^b ±14.0	144.67 ^c ±602
ALT U/L	26.83 ^a ±1.3	31.67 ^a ± 3.1	32.33 ^a ±1.0	25.17 ^a ±6.1
ALP U/L	285.33 ^a ±30.1	282.17 ^a ±30.5	222.00 ^a ±30.5	248.50 ^a ±30.5
T.P g/L	8.20 ^a ±1.0	7.40 ^b ±1.0	5.90 ^c ±2.1	5.55 ^c ±2.1
Alb. g/L	5.05 ^a ±1.0	4.73 ^a ±1.0	3.60 ^b ±2.2	3.87 ^b ±2.5
Chol. mg/dL	93.50 ^a ±8.5	84.83 ^{ab} ±2	69.33 ^b ±6.1	90.33 ^{ab} ±7.1
T.B mg/dL	0.60 ^a ±.01	0.53 ^a ±.01	0.092 ^b ±.002	0.072 ^b ±.002
D.B mg/dL	0.122 ^a ±.001	0.0767 ^b ±006	0.050 ^{cb} ±.001	.0117 ^c ±.002
Urea mg/dL	52.83 ^a ±5.3	59.33 ^a ±1.2	59.17 ^a ±1.6	41.50 ^a ±6.2

Means with the same superscript across the row for each parameter are not significantly different ($p < 0.05$).

- not measured (died).

However, AST and ALT are considered useful markers for liver damage (Kaneko and Cornelius, 1985; Bush, 1991; Mumoli and Cosimi, 2006; Ojiako and Nwanjo, 2006; Afolayan and Yakubu, 2009). Mohammed et al.(2010) observed that decreased levels of ALT and AST in rats receiving ethanol and butanol fraction of *Buchholzia coricea* seeds (which belong to the same family of the plant used here) to which streptozotocin was added. Nwanjo (2007) considered insignificant increases in AST and ALT levels in serum to indicate non- hepatotoxic effects of the *Phyllanthus niruri* leaf extract.

Changes in T.P exhibited significant decrease ($p < 0.05$) in all rats dosed with ethyl acetate and ethanolic extracts compared to control. Serum or plasma protein is a very complex mixture of proteins and their determination is clinically valuable and reflects the internal status of an individual. Proteins are essential for growth and replacement of worn-out tissues. The rate of cell divisions is determined chiefly by the rate of protein synthesis (Baxter et al.,1987). These results may indicate liver damage and reduction in hepatic function due to the plant extract treatment (Naganna, 1989 ; Tietz, 1994; Yakubu et al., 2007). A decreasing trend in serum total protein levels was reported by Atere and Ajoa (2009) in rats administered with crude alkaloidal fraction from *Gnestis ferruginea* D. C. roots.

In addition, Alb levels were significantly low in rats receiving 250 and 500 mg/kg bw ethyl acetate extract with no significant differences in the low dose group. Similarly, Alb concentrations were significantly low in rat receiving the ethanolic extract. liver damage reduced albumin synthesis and overall decreased plasma protein is observed (Dhanotiya ,2004). The decreased levels of total protein and albumin may be due to reduction in protein intake from the intestine (Rolls,2000) which considered as an indication of diminished synthetic function of the liver damage.

The 250 mg/ Kg ethyl acetate and ethanolic extract groups showed a significant decrease ($p < 0.05$)in cholesterol values compared to control while no significant differences were seen

in other treated groups. Total and direct bilirubin showed significant decrease ($p < 0.05$) in all rats dosed with ethyl acetate extract but no significant change was observed in the dose of 50 mg/kg bw of T.B. Ethanolic extract exerted no significant difference in D.B values, while T.B values showed significant decrease.

Urea concentrations showed no significant change in ethyl acetate groups, while a significant decrease was observed ($p < 0.05$) in the ethanol rat groups. (Table 4). In a previous study, Wistar rats given leaf extracts of *Marinda lucida* showed no significant differences in urea concentrations compared to control (Ashafa and Olunu, 2011).

The changes and variations seen in the biochemical parameters in treated rat groups for both ethyl acetate and ethanol extracts may be attributed to the difference in extractable ingredients with different solvents (Habrone, 1973). It seems that the ethyl acetate has more positive extractability for components which would influence blood biochemical parameters.

CONCLUSION

These alterations in some of the parameters reported in this study may indicate that the tuber extracts of *M. psuedopetalosa* possess mild toxicity affecting liver function. Therefore, crude extracts of tuber may not be completely safe as oral remedies.

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