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Research Article

Effect of Gum Arabic on Nephrotoxicity Induced by *Aristolochia bracteata* in Rats

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Abstract: The present study was designed to investigate the effect of Gum Arabic (GA) on nephrotoxicity induced by *Aristolochia bracteata* aqueous extract . Thirty six Albino rats were used, divided into 6 groups. Group 1 rats were orally given 1ml distilled water daily for 10 days and served as the control group, group 2 were orally administered with 1ml distilled water for 10 days and from day 5 to day 10 given 1000mg/kg.bwt of *Aristolochia bracteata* aqueous extract . Group 3 and 4 were treated orally with Gum Arabic 250mg/kg and 500mg/kg respectively for 10 days and then given *Aristolochia bracteata (*1000mg/kg.bwt) from day 5 to day 10. Group 5 and 6 were given Gum Arabic alone at 250mg/kg and 500mg/kg respectively for10 days. The concentration of urea and creatinine as well as the activity of AST and ALT was measured. RBCs, Hb, PCV, MCH and MCHC were determined and the kidney histopathology was microscopically examined. Administration of G.A. was significantly decreased the elevated urea, creatinine, AST and ALT levels caused by *Aristolochia bracteata* . These findings were strongly correlated with decreased damage of the kidney tubules when compared to the group treated with *Aristolochia bracteata.* This study indicates that, GA. Possesses constituents with nephroprotective activity.
Keywords: *Aristolochia bracteata*, Gum Arabic, Nephrotoxicity

INTRODUCTION

Aristolochia is a large plant genus with over 500 species, they are spread in the most diverse climates. *Aristolochia* is a genus of ever green woody vines and herbaceous perennials. The flowers have a specialized pollution mechanism, the plants are aromatic and their strong scent attract insects [1]. Every part of the plant is used, seeds, leaves, root and stem [2]. *Aristolochia bracteata* is known locally in Sudan as Umm Galagil, it is used in folk medicine as anti malarial, treat snake bites and vermicidal against guinea worms and anthelmintics although it was reported that, *Arisolochia* species are nephrotoxic and carcinogenic [3]. Gum Arabic is called Gum Acacia, Acacia trees are spiny shrubs or small trees preferring sandy or sterile regions. Chemically Gum Arabic is a branched chain complex mixture of polysaccharides and glycol proteins either neutral or slightly acidic, found as a mixed calcium, magnesium and potassium salts of polysaccheridic acid [4]. Gum Arabic was widely used by Eastern folk medicine practitioners as a restorative agent and is thought to be an excellent curative for renal failure patients [5].

MATERIALS AND METHODS

Plant material

Aristolochia bracteata (Umm Galagil) the whole plant, was collected from the river Nile valley and identified at the Medicinal and Aromatic Plants Research Institute (MAPRI), Khartoum, Sudan by Botonist.

Preparation of the plant extract

The plant was air dried , the coarse plant was powdered in a blender and subjected to successive aqueous extraction. The powder was soaked in 400 ml of hot distilled water with continuous stirring till became cool, the extract was filtered through cotton filter. Extract was stored in deep freeze till freezed [6], yield percentage was calculated as 66 grams.

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Animals

White albino rats weighing 90-120 grams were maintained in a room under standard environmental condition and controlled temperature (22±2.5˚C), and relative humidity (60%) and maintained on standard animal pellets with free access to water.

Effect of Gum Arabic on Nephrotoxicity induced by *Aristolochia bracteata*

Thirty six healthy adult albino rats weighing 90-100 grams were divided into 6 groups each of 6 rats. Rats were housed under standard conditions in cages at the Department of Pharmacology and Toxicology, Faculty of Veterinary Medicine, University of Khartoum .Rats were identified by colored marks on tails and left for one week adaptation period . After the adaptation period, rats were

divided according to weight into 6 groups each of 6 rats.Group 1 given orally 1ml distilled water daily for 10 days and act as a control group, group 2 were orally given 1ml distilled water for 10 days and from day 5 to day 10 given 1000mg/kg.bwt *Aristolochia bracteata* extract . Group3 and 4 were treated with Gum Arabic 250mg/kg and 500mg/kg respectively for 10 days and *Aristolochia* extract from day 5 to day 10. Group 5 and 6 were given Gum Arabic 250mg/kg and 500mg/kg respectively for 10 days

Statistical analysis

All results were expressed as mean ±S E. One Way Analysis of Variance (ANOVA) was used for the analysis of data. Duncan's multiple range tests was used for determining the significance. A probability of $p<0.05$ was considered as significant [7].

RESULTS

Biochemical findings:

The effect of GA on serum constituents of rats intoxicated with *Aristolochia bracteata* are presented in Table 1.The concentration of urea ,creatinine, ALT and AST were significantly higher in the group treated with *Aristolochia bracteata* (group 2) when compared to the control, while groups 3 and 4 recorded lower concentration of the same parameter when compared to group 2. Groups 5 and 6 that treated with GA alone showed lower concentrations in urea, creatinine, AST and ALT.

Heamatological results:

Heamatological findings are presented in Table 2.The values of RBCs, PCV, Hb, MCV, MCH and MCHC were significantly reduced in the intoxicated group (group 2) while these values were significantly improved in the groups treated with GA on *Aristolochia bracteata* and in the groups treated with GA alone.

Histopathological findings:

Histopathological sections of the kidneys of rats treated with GA on *Aristolochia bracteata* are presented in Fig1(a-d).Fig 1-a showed necrosis , heamorrhage and shrinkage of glomeruli.Fig 1-b showed mild necrosis and hemorrhage while Fig 1. –c showed lymphocyte infiltration of the golmeruli and Fig 1.-d showed no abnormalities.

Table -1: Biochemical changes in rats treated with GA. on nephrotoxicity induced by *Aristolochia bracteata*

Group	Urea (mg/dl)	Creatinine (mg/dl)	ALT i.u./l	AST i.u./l
G1	42.65 ± 1.28^{a}	0.63 ± 0.04^{a}	61.50 ± 1.49^{a}	73.94 ± 2.09^{a}
G2	46.62 ± 1.81^{b}	0.88 ± 0.04^{b}	62.80 ± 2.12^{b}	82.97 ± 2.41^{b}
G3	42.48 ± 0.35^{ab}	0.52 ± 0.07^{ab}	59.30 ± 2.34^{ab}	77.47 ± 2.71^{ab}
G4	43.60 ± 2.46^{c}	0.53 ± 0.04^{c}	59.63 ± 6.12^{c}	76.29 ± 2.14^{c}
G5	40.65 ± 1.17^{bc}	0.56 ± 0.07^{ab}	53.10 ± 3.27^{bc}	74.14 ± 2.07^{bc}
G6	36.75 ± 1.22^{d}	0.53 ± 0.05^{d}	61.30 ± 0.32^{d}	76.28 ± 2.13^{d}

Means with same letter are not significantly different (p>0.05)

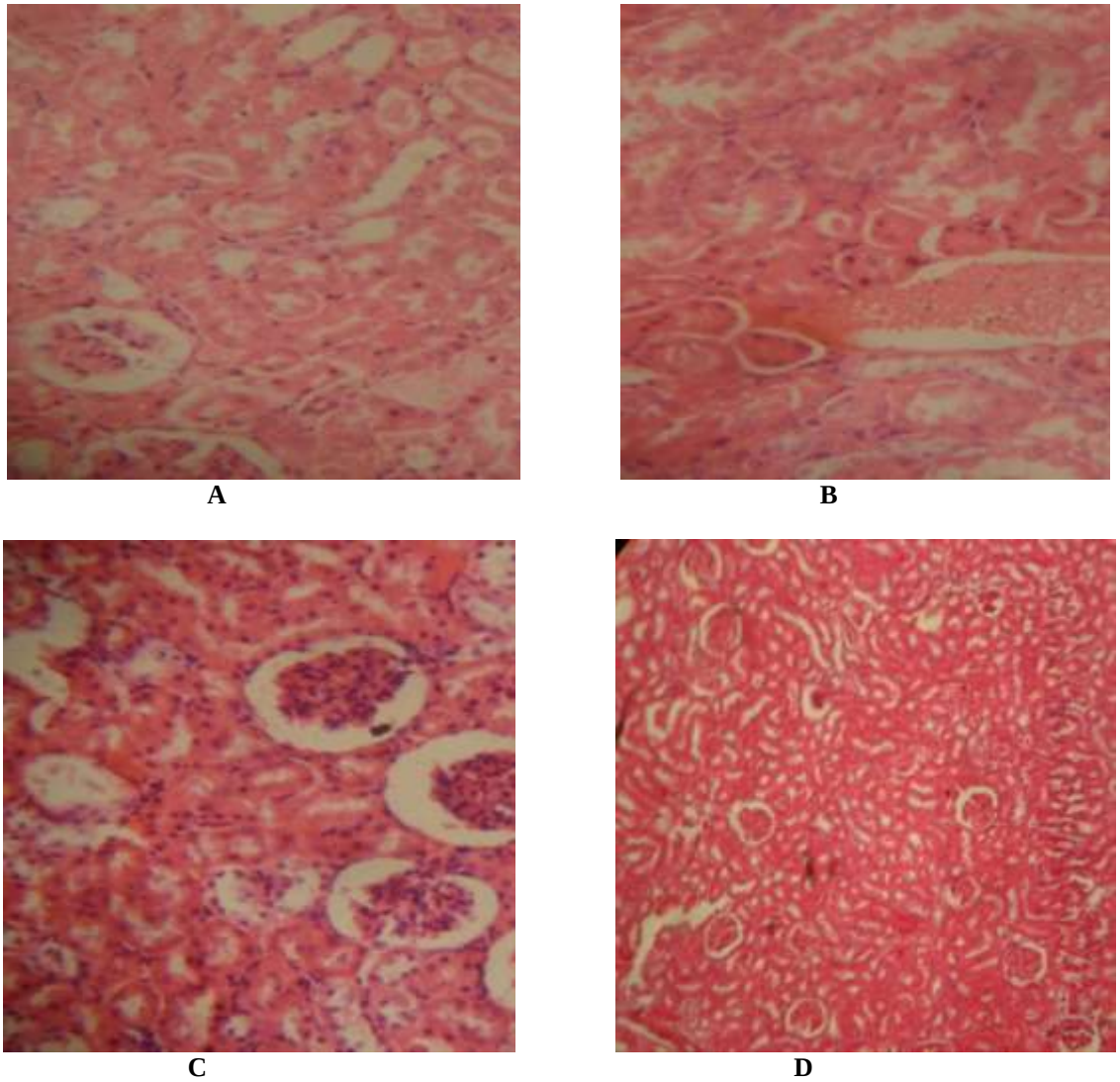
G1 : Control, G2 : Saline + *Aristolochia bracteata* 1000 mg/kg , G3 : *Aristolochia bracteata* 1000 mg/kg + Gum Arabic 250 mg/kg., G4 : *Aristolochia bracteata* 1000 mg/kg + Gum Arabic 500 mg/kg., G5 : Gum Arabic 250 mg/kg., G6 : Gum Arabic 500 mg/kg.

Table- 2: Heamatological changes in rats treated with GA. on nephrotoxicity induced by *Aristolochia bracteata*

Group	RBCs $(10/mm)^3$	PCV %	HGB (g/dl)	MCV (fl)	MCH (pg)	MCHC (g/dl)
G1	6.92 ± 0.11^{b}	51.27 ± 2.16^{b}	12.90 ± 0.30^{b}	76.17 ± 0.82^{b}	18.88 ± 0.30^{b}	24.90 ± 0.39^{b}
G2	6.51 ± 0.13^{a}	49.78 ± 0.95^{a}	12.50 ± 0.33^{a}	74.78 ± 2.94^{a}	19.00 ± 0.30^{a}	24.52 ± 0.78^{a}
G3	6.88 ± 0.20^{ab}	53.22 ± 1.45^{ab}	12.58 ± 0.37^{ab}	77.42 ± 1.18^{ab}	18.28 ± 0.04^{ab}	23.63 ± 0.34^{ab}
G4	6.53 ± 0.22^{c}	52.20 ± 1.63^{c}	12.34 ± 0.29^{c}	79.76 ± 1.09^{c}	19.08 ± 0.15^{c}	23.94 ± 0.25^{c}
G5	6.77 ± 0.17^{bc}	51.18 ± 1.57^{bc}	12.70 ± 0.33^{bc}	75.55 ± 0.93^{bc}	18.75 ± 0.14^{bc}	24.83 ± 0.42^{bc}
G6	6.53 ± 0.13^{d}	53.15 ± 0.96^{d}	12.35 ± 0.30^{d}	81.48 ± 0.88^{d}	18.92 ± 0.20^{d}	23.25 ± 0.31^{b}

Means with same letter are not significantly different (p>0.05)

G1 : Control, G2 : Saline + *Aristolochia bracteata* 1000 mg/kg., G3 : *Aristolochia bracteata* 1000 mg/kg + Gum Arabic 250 mg/kg., G4 : *Aristolochia bracteata* 1000 mg/kg + Gum Arabic 500 mg/kg., G5 : Gum Arabic 250 mg/kg., G6 : Gum Arabic 500 mg/kg.



A **B**

C **D**

Fig 1: Sections of kidney of rats given *Aristolochia bracteata* extract

A- Necrosis, hemorrhage and Shrinkage of the glomeruli (*Aristolochia* 1000mg/kg-G 2)
B- Mild necrosis of glomeruli and kidney tubules (*Aristolochia* 1000mg/kg +GA 250mg/kg-G3)
C- Lymphocytic infiltration of the glomeruli (*Aristolochia* 1000mg/kg +GA 500mg/kg-G4)
D- Normal kidney tubules and glomeruli (Normal control-G1)

DISCUSSION

In this study oral adminstration of *Aristolochia bracteata* aqueous extract significantly increase the values of urea, creatinine, Ast and ALT.The Same results were found when *Aristolochia* extract given to goats [8], similarly *Aristolochia* extract in goats revealed an increase in urea concentration that correlated with pathological and histopathological changes of kidneys [9]. In the present study , oral administration of Gum Arabic to rats intoxicated with *Aristolochia* extract showed a marked decrease in concentration of urea and creatinine and in another study Gum Arabic was found to attenuated renal dysfunction in adenine induced chronic renal failure [10].

It was also reported that , Gum Arabic could be beneficial adjuvant therapy in patients with acute and chronic renal failure to prevent disease progression and delay the need for renal replacement therapy and could conceivably alleviate adverse effects of chronic renal failure[11], [12].Medicinal plants was found to produced nephroprotective activity as it was reported in studies of *Khaya senegalensis* [13], *Zingiber officinale* [14] and *Nigella sativa* and *Allium sativum*[15] .

CONCLUSION

The aqueous extract of *Aristolochia bracteata*, whole plant at a dose of 1000 mg/kg, given orally to albino rats has a nephrotoxic effect . Gum Arabic in a dose of 250 and 500 mg/kg dissolved in distilled water and given orally to rats, make a considerable effect in lowering concentrations of urea and creatinine levels and improving the kidney damage caused by *Aristolochia bracteata* .

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