ISSN 0975 – 2633
Research Article
Arch Pharm Sci & Res Vol 9 No 3 December 2017

# Evaluation of Nephroprotective Effect of *Ailanthus excels* on Gentamicin-Induced Nephrotoxic Rats

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The aim of the current study was to evaluate the nephroprotective effect of the methanolic extract of *Ailanthus excels* on gentamicin induced nephrotoxicity. For nephrotoxicity, thirty rats were evenly divided into 5 groups. Group 1 and group 2 served as untreated and diseased control, respectively while group 3 were the treated group with standard drug vitamin-E. Group 4 and 5 served as the test groups, which were pretreated with 100 and 200 mg/kg body weight per day of *Ailanthus excels,* 1 hour before each dose of the nephrotoxicants. On the 10$^{th}$ day, blood samples for serum urea, total protein and creatinine were given and the kidney for histopathology were taken under inhaled diethyl ether anesthesia. Along with it antioxidant studies were done with *Ailanthus excels* leaves extract and were compared with standard compounds for its anti-oxidant strength. The extract shows significant nephroprotective activity in Gentamycin induced nephrotoxicity model as evident by a decrease in elevated serum creatinine, blood urea, and total protein which was further confirmed by histopathological study and calculated statistically to evaluate the nephroprotective effect of *Ailanthus excels*, and the high dose 200 mg/kg weight of AE was found to more effective against the low dose 100 mg/kg body weight of AE. From the result it was concluded that MEAE possesses nephron-protective activity against gentamycin induced nephrotoxicity in Albino rats.

**Keywords**: Nephrotoxicity, Ailanthus excels, Nephro-protectivity, Gentamicin and Albino rats.

## INTRODUCTION

Acute kidney injury (AKI) is defined as an abrupt reduction in kidney function. In critically ill patients, AKI is associated with increased morbidity (1–31%) and increased mortality (28–82%) [1] . This broad spectrum of outcome is due to the severity of illness, the population under study and nonstandardized criteria used to define AKI [2, 3] .

Medications are responsible for nearly 20% of all cases of AKI in intensive care units [4] . Among the drugs that cause AKI are aminoglycoside antibiotics such as gentamicin (GM). GM-induced AKI is manifested clinically as nonoliguric renal failure, a slow rise in serum creatinine levels, a decrease in the glomerular filtration rate (GFR), acute tubular necrosis, aminoaciduria, hypokalemia and hypocalcemia [3, 5–8] .

In recent years, many compounds and therapeutic strategies have been utilized to prevent injury and to attenuate the progression of AKI. Likewise, medicinal herbs have been used to reduce or protect against nephrotoxicity. Ethanol extracts from the roots of Cassia auriculata Linn. showed a nephroprotective effect in cisplastin- and GM-induced renal injury [9] .

Similarly, aqueous extracts of Phyllanthusamarus and green tea reduced GM-induced nephrotoxicity and oxidative damage in the rat kidney [10, 11] .Echinodorusmacrophyllus (EM) and Echinodorusgrandiflorus from the Alismataceae family, popularly known in Brazil as ‘chapéu de couro’, are widely distributed in the tropical regions of Brazil.

The leaves of both species have been used in folk medicine for their anti-inflammatory and diuretic properties [12] . Pinto et al. [13] have shown the immunosuppressive effects of EM , providing support for its use in the treatment of inflammatory diseases. However, to date, experimental studies on the diuretic activity of EM have not been performed. The objective of this study was to evaluate the diuretic properties of EM and to investigate its protective effect on GM-induced AKI in rats.

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## MATERIALS AND METHODS

*Obtaining EM and Method of Extraction*

The leaves of Ailanthus excelsa were collected in the city of Tirupati. They were identified and authenticated by Dr.K.MadhavaChetty, Assistant professor, Department of Botany, Sri Venkateswara University, Tirupati, Andhra Pradesh, India. The dried and pulverized leaves of AE (1.2 kg) were successively extracted by percolation with 80% ethanol, and then, the solvent was evaporated to dryness. The yield of the evaporated residue was 23% (mg of residue for each 100 g of the original dry leaves). The dried alcoholic extract from the leaves of AE was dissolved in 0.9% NaCl solution and was used for further experimental assays.

*Animals*

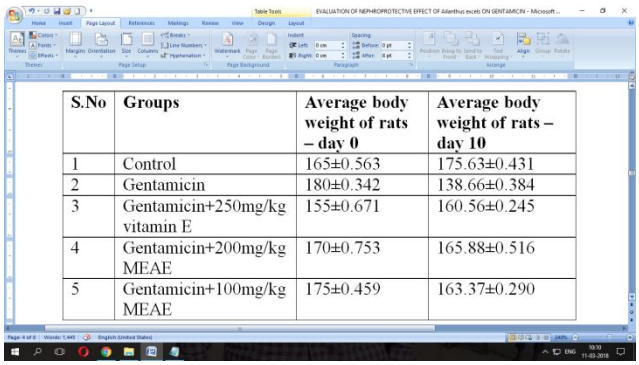
Male Wistar rats (250–300 g) were obtained from NIMHANS, Bangloreand were housed in standard conditions with free access to commercial chow and water. Animals were kept at a room temperature of 22°C with a light/dark cycle of 10/14 h. All procedures described here were approved by the Institute's Animal Ethics Committee (IAEC) of Karnataka College of Pharmacy, Bangalore.

## RESULTS AND DISCUSSION

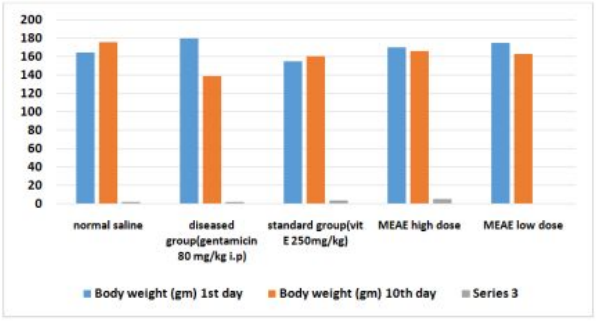
### Effect of *Ailanthus excels* on Gentamicin induced nephrotoxicity.

### Physicial parameter:

Effect of MEAE 100-200 mg/kg/day, on the average body weight and kidney weight of gentamicin induced nephrotoxic rats.



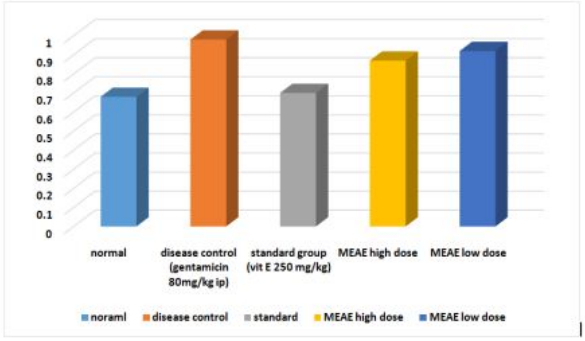
| S.No | Groups | Average body weight of rats – day 0 | Average body weight of rats – day 10 |
|---|---|---|---|
| 1 | Control | 165±0.563 | 175.63±0.431 |
| 2 | Gentamicin | 180±0.342 | 138.66±0.384 |
| 3 | Gentamicin+250mg/kg vitamin E | 155±0.671 | 160.56±0.245 |
| 4 | Gentamicin+200mg/kg MEAE | 170±0.753 | 165.88±0.516 |
| 5 | Gentamicin+100mg/kg MEAE | 175±0.459 | 163.37±0.290 |




### Effect of gentamicin, standard and test drug on the wet kidney weight.

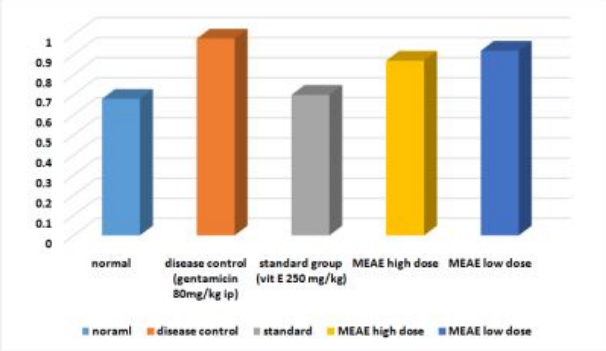
A significant increase of kidney weight in gentamicin treated group when compared with the control group and dose dependent decrease in kidney weight was observed on animals pretreated with MEAE along with gentamicin. These values are tabulated below.

| S.No | Groups | Weight of wet Kidney(gm) |
|---|---|---|
| 1 | Control | 0.68±0.043 |
| 2 | Gentamicin | 0.98±0.054 |
| 3 | Gentamicin+250mg/kg vitamin E | 0.7±0.022 |
| 4 | Gentamicin+200mg/kg MEAE | 0.87±0.073 |
| 5 | Gentamicin+100mg/kg MEAE | 0.92±0.064 |



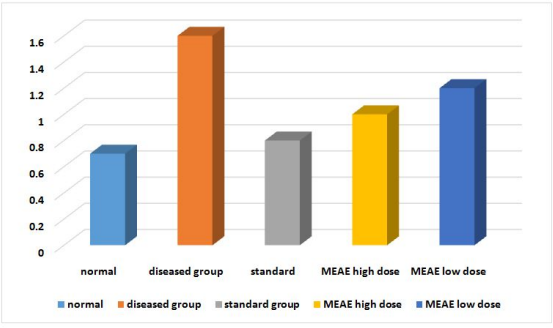

### Serum urea

| S.No | Groups | Serum urea (mg/dl) |
|---|---|---|
| 1 | Control | **18** |
| 2 | Gentamicin | **26** |
| 3 | Gentamicin+250mg/kg vitamin E | **20** |
| 4 | Gentamicin+200mg/kg MEAE | **22** |
| 5 | Gentamicin+100mg/kg MEAE | **23** |




## Serum creatinine

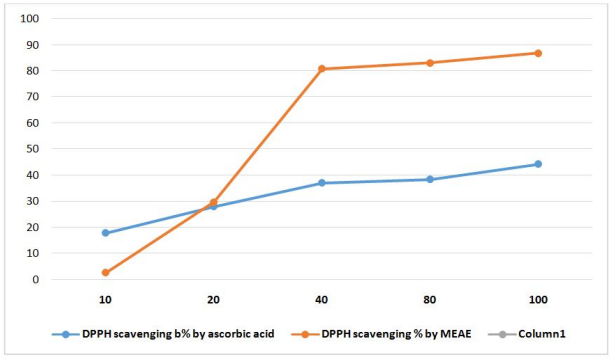
| S.No | Groups | Serum creatinine (mg/dl) |
|---|---|---|
| 1 | Control | **0.7** |
| 2 | Gentamicin | **1.6** |
| 3 | Gentamicin+250mg/kg vitamin E | **0.8** |
| 4 | Gentamicin+200mg/kg MEAE | **1** |
| 5 | Gentamicin+100mg/kg MEAE | **1.2** |




## Antioxidant activity

The DPPH scavenging percentage values are given below,

| S.No | Concentration (µg/ml) | DPPH scavenging percentage by MEAE | DPPH scavenging percentage by ascorbic acid |
|---|---|---|---|
| 1 | 10 | 17.9±0.3 | 2.6±0.2 |
| 2 | 20 | 28±0.05 | 29.66±0.7 |
| 3 | 40 | 37±0.32 | 80.8±0.75 |
| 4 | 80 | 38.5±0.61 | 83.01±0.81 |
| 5 | 100 | 44.3±0.9 | 86.8±0.61 |




## CONCLUSION

The present study indicated that administration of methanolic extract of *Ailanthus excels* at the dose of 200 and 100 mg/kg body weight possess nephroprotective activity in GM induced nephrotoxicity in rats. The acute toxicity study revealed that the extract was devoid of major toxic effect. The nephroprotective effect of MEAE was confirmed by its prevention over the GM induced toxicity. This MEAE reduced elevated serum urea and creatinine in GM treated rats. But experimental study should be followed by further experimental and clinical research to establish and exploit its protective role in drug induced kidney injury.

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