



<https://ijrps.com/>

ISSN: 0975-7538  
Research Article

## Evaluation of diuretic activity of *Delonix regia* (Gul mohr) flowers in albino rats

Senthil Velan S<sup>\*1</sup>, Jeeva Prakash G<sup>1</sup>, Sindhan V<sup>2</sup>, Somasekhar E<sup>1</sup>, Bharathi S<sup>1</sup>, Rajani B<sup>1</sup>

<sup>1</sup>Department of Pharmacology, S.Chaavan College of Pharmacy, Jangalakandriga (V), Muthukur (M), Nellore (Dt), Andhra Pradesh, India

<sup>2</sup>Department of Pharmacology, C.L. Baid Mehta College of Pharmacy, Thorapakkam, Chennai, Tamil Nadu, India

### ABSTRACT

The Diuretic activity of *Delonix regia* (Gul Mohr) flower extract was evaluated by Lipschitz test model in Albino rat. The animals were divided into four groups. Group I serving as control, received normal saline (25ml/kg,p.o), the group II received methanolic extract (100mg/kg,p.o) and group III also received methanolic extract (200mg/kg,p.o), the group IV received Furosemide (20mg/kg,p.o), respectively, in normal saline. Immediately after the administration, the animals were kept in metabolic cages (3 per cage) specially designed to separate urine and fecal matter and kept at room temperature of 25 ± 0.5°C throughout the experiment. The volumes of urine, urinary concentration of sodium, potassium and chloride ions were the parameters of the study. The results indicate that methanol extract at a concentration of 100 mg/kg and 200 mg/kg body weight shows an increase in the urine volume and electrolyte excretion when compared to control. Thus, the methanol extract of the flower of *Delonix regia* (Gul Mohr) showed a significant diuretic activity. From the present study, it may be concluded that the phytoconstituents present in methanol extract may be responsible for diuretic activity.

**Keywords:** *Delonix regia* (Gul Mohr); Electrolyte excretion; Furosemide; Lipschitz test model; Metabolic cages

### INTRODUCTION

*Delonix regia* (Gul Mohr) is a species of flowering plant from the Fabaceae family, Caesalpinioideae sub-family, noted for its fern-like leaves and flamboyant display of flowers. In many tropical parts of countries around the world it is grown as an ornamental tree and in English it is given the name Royal Poinciana or Flamboyant. It is also known as Flame tree. The flowers are large, with four spreading scarlet or orange-red petals upto 8 cm long, and a fifth upright petal called the standard, which is slightly larger and spotted with yellow and white. The naturally occurring variety *flavida* has yellow flowers. Seed pods are dark brown and can be upto 60 cm long and 5 cm wide; the individual seeds, however, are small, weighing around 0.4 g on average. The compound leaves have a feathery appearance and are a characteristic light, bright green. They are doubly pinnate. Each leaf is 30–50 cm long and has 20 to 40 pairs of primary leaflets or pinnae on it, and each of these is further divided into 10-20 pairs of secondary leaflets or pinnules. The decoction of the leaves is traditionally used in treating gastric problems, body pain, and rheumatic pains of joints (J. A. Parrota, 2000; *The*

*Wealth of India*, 2002). Ethanolic extracts of flower and bark were investigated to anti-inflammatory activity in rats (K. Srinivasan *et al.*, 2001). The leaves are reported to antibacterial (J. Parekh *et al.*, 2005) and antimalarial (N.A. Ankrah *et al.*, 2003).

Diuretics are drugs that increase the rate of urine flow, sodium excretion and are used to adjust the volume and composition of body fluids in a variety of clinical situations. Drug-induced diuresis is beneficial in many life threatening disease conditions such as congestive heart failure, nephritic syndrome, cirrhosis, renal failure, hypertension, and pregnancy toxemia (Agunu .A *et al.*, 2005). Most diuretic drugs have the adverse effect on quality of life including impotence, fatigue, and weakness. Naturally occurring diuretics include caffeine in coffee, tea, and cola, which inhibit Na<sup>+</sup> reabsorption and alcohol in beer, wine and mixed drinks, which inhibit secretion of ADH (Agus, Z.S *et al.*, 1971, Stookey, J.D, 1999). Diuretics relieve pulmonary congestion and peripheral edema. These agents are useful in reducing the syndrome of volume overload, decreases cardiac workload, oxygen demand and plasma volume, thus decreasing blood pressure (Hoeland R.D *et al.*, 2000). No systematic studies have been reported for diuretic activity of *Delonix regia* (Gul Mohr) bark. Hence an effort has been made to establish the diuretic activity of alcoholic extracts of *Delonix regia* (Gul Mohr).

### MATERIALS AND METHODS

#### Collection of plant

\* Corresponding Author  
Email: senlans@gmail.com  
Contact: +91-8179977875  
Received on: 27-03-2012  
Revised on: 10-05-2012  
Accepted on: 15-05-2012

The fresh flowers of *Delonix regia* (Gul Mohr) were collected in the month of June from Nellore, Andhra Pradesh, India, and authenticated by Prof. P. Jayaraman, Ph.D., Plant Anatomy Research Centre, Chennai, Tamil Nadu. The voucher specimen was deposited at the department for future reference.

#### Extraction of plant material

About 400g of air dried powdered flowers was taken in 1000ml soxhlet apparatus and extracted with petroleum ether for 2 days. At the end of second day the powder was taken out and it was air dried. After drying it was again packed and extracted by using methanol as the solvent, till the colour disappeared. The temperature was maintained at 55°C-65°C. After that, the extract was concentrated by distillation and solvent was recovered. The final solution was evaporated to dryness and dry residue was obtained.

#### Animal

Male Albino rats, weighing 150-200g were used in the present study. All the rats were kept at room temperature (24°C±2) in the animal house. All the animals were housed and treated as per the internationally accepted ethical guidelines for the care of laboratory animals. Prior to the experiments, rats were fed with standard food and were acclimatized to laboratory conditions. All the experimental procedures were performed on animals after approval from the ethics committee and in accordance with the recommendations for the proper care and use of laboratory animals.

#### Preliminary phytochemical analysis

The preliminary phytochemical analysis (Kokate, C.K, 2004; Finar I.L., 1975) were carried out to find out the phyto constituents present in the crude extracts.

#### Experimental Procedure

The method of Lipchitz (Lipschitz W.L. et al., 1943) was employed for the evaluation of diuretic activity. The Male Albino rats were divided into four groups of six rats in each as mentioned below.

**Group I** - received Normal saline (25ml/kg, p.o) as control.

**Group II** - received (100mg/kg, p.o) methanol extract of *Delonix regia* (Gul Mohr) flower.

**Group III**- received (200mg/kg, p.o) methanol extract of *Delonix regia* (Gul Mohr) flower.

**Group IV** - received Furosemide (20mg/kg, p.o) as standard.

The animals were fasted and deprived of food and water for 18hrs prior to the experiment. On the day of experiment, the group I animals serving as control, received normal saline (25ml/kg,p.o), the group II animals received methanolic extract (100mg/kg,p.o) and group III animals also received methanolic extract (200mg/kg,p.o), the group IV animals received Furo-

semide (20mg/kg,p.o), respectively, in normal saline. Immediately after the administration the animals were kept in metabolic cages (3 per cage) specially designed to separate urine and fecal matter and kept at room temperature of 25 ± 0.5°C throughout the experiment. The total volume of urine was collected at the end of 5hrs after dosing. During this period no water and food was made available to animals.

#### Estimation of electrolytes in urine

The concentration of Na<sup>+</sup> and K<sup>+</sup> were measured by flame photometry (Jeffery, G.H et al., 1989) and Cl<sup>-</sup> concentration was estimated by titration with silver nitrate (N/50) using three drops of 5% potassium chromate solution as indicator (Beckette, A.H. et al., 1997).

#### Statistical analysis

All the values are expressed as mean ± S.E.M for groups of six animals each. Analyzed by one way ANOVA and compared by using Tukey- Kramer multiple comparison test. The values are statistically significant at three levels, \*\*\*p<0.001. \*\*p<0.01. \*p<0.05. But ns if p > 0.05.

#### RESULTS

The methanolic extract obtained was subjected to various phytochemical tests and the results were given in table 1. The results of the evaluation of diuretic activity carried out on the methanol extract of *Delonix regia* (Gul Mohr) are listed in Table 2 and 3. Table 2 shows the urinary volume (ml/kg/5h) and Table 3 shows other parameters related to excretion of electrolyte (Na<sup>+</sup>, Cl<sup>-</sup> and K<sup>+</sup>) content (µmol/kg) of urine of the animals. Table 2 shows that the reference diuretic, Furosemide, increased urine volume upto 5.58±0.76. For the methanol extract, the increase in urine volume at doses of 100 mg/kg body weight and 200 mg/kg body weight was 2.89±0.18 and 3.61±0.37 (P<0.05), respectively, compared to the control group which was 1.73±0.09. This shows that the methanol extract of *Delonix regia* (Gul Mohr), at high doses, may have equipotent diuretic activity as that of the Standard drug (Furosemide).

Table 3 shows the urinary electrolyte content following the administration of the extracts. The dose of 100 mg/kg and 200mg/kg methanol extract *Delonix regia* (Gul Mohr) produced a significant increase in Na<sup>+</sup>, K<sup>+</sup> and Cl<sup>-</sup> excretion, in a dose dependant manner when compared with the control group. The excretion of Na<sup>+</sup> and K<sup>+</sup> was very much significant at the dose of 200mg/kg of methanol extract when compared to control. However urinary electrolyte excretion of 100mg/kg and 200mg/kg methanol extract *Delonix regia* (Gul Mohr) were less when compared with standard drug (Furosemide).

#### DISCUSSION

The effect of methanolic extract of *Delonix regia* (Gul Mohr) on diuresis was accompanied by marked in-

**Table 1: Phytochemical screening of *Delonix regia* (Gul Mohr)**

S.No	Phytochemical Constituents	Methanolic extract
1	Alkaloids	--
2	Saponins	--
3	Tannins	++
4	Terpenoids	++
5	Flavonoids	++
6	Carbohydrates	--
7	Phenolic compounds	++
8	Phytosteroids	++
9	Amino acids	++
10	Gums	--

**Table 2: Effect of *Delonix regia* (Gul Mohr) on Urine Volume**

S.No	Treatment	Dose	Number of animals	Urine volume (ml/kg/5hr)	pH of urine
1	Normal Saline	25ml/kg	6	1.73±0.09	7.1±0.62
2	MEDR	100mg/kg	6	2.89±0.18	7.4±0.19
3	MEDR	200mg/kg	6	3.61±0.37*	7.3±0.51
4	Furosemide	20mg/kg	6	5.58±0.76***	7.3±0.81

Each value represents mean ± S.E (n=6) and was analysed by ANOVA Tukey-Kramer multiple comparison test. \* $P < 0.05$ , \*\* $P < 0.01$  compared with control group.

**Table 3: Effect of *Delonix regia* (Gul Mohr) on Electrolyte excretion**

Group	Total Na+ (µmol/kg)	Total K+ (µmol/kg)	Total Cl- (µmol/kg)	Na+/K+ ratio
I	89.72±2.90	20.45±1.71	52.79±5.45	4.39
II	112.08±6.31	38.78±4.56*	59.12±3.08	2.89
III	167.96±5.88**	61.96±4.11**	74.46±5.19	2.71
IV	204.64±7.35**	85.04±5.82**	91.23±7.64**	2.40

Each value represents mean ± S.E (n=6) and was analysed by ANOVA Tukey-Kramer multiple comparison test. \*\* $P < 0.001$ , \* $P < 0.05$  compared with control group.

crease in urine volume and urinary Na<sup>+</sup>, K<sup>+</sup> and Cl<sup>-</sup>. Higher doses of the extract of the plant may produce electrolyte and water excretion profile qualitatively similar to that of furosemide, albeit at a lower potency, due to the crude nature of the extract.

Previous studies have demonstrated also that there are several compounds which could be responsible for the plants diuretic effects such as flavonoids, saponins or organic acids

(Maghrani M, et al., 2005). The effect may be produced by stimulation of regional blood flow or initial vasodilation (Stanic G, et al., 1993), or by producing inhibition of tubular reabsorption of water and anions (Pantoja CV, et al., 1993), the result in both cases being diuresis. Preliminary phytochemical investigation of *Delonix regia* (Gul Mohr) has suggested the presence of flavonoids and steroidal compounds. Phytochemical studies on *Delonix regia* revealed that it contains β-sitosterol, tannin, lupeol, and flavonoids (V. Lakshmi, 1987). Hentriacontane, hentriacontanol and its D-glucoside, and campesterol were identified as constituents of *Delonix regia* (R. P. Rastogi, et al., 1995). It may be suggested that these substances might be responsible, at least in

part, for the observed diuretic activity and that they may act individually or synergistically.

#### REFERENCES

- Agunu, A., Abdurahman, E.M., Andrew, G.O., Muhammed Z. Diuretic activity of the stem-bark extracts of *Steganotaenia araliaceahoechst*. *J Ethnopharmacol* 2005,96,471-5.
- Agus, Z.S., Goldberg, M. Role of antidiuretic hormone in the abnormal water diuresis of anterior hypopituitarism in man. *J Clin Invest.* 1971,50,1478-89.
- Anonymous, *The Wealth of India, A Dictionary of Indian Raw Material and Industrial Product*, vol. 3, CSIR, New Delhi, India, 2002.
- Beckett, A.H. and Stenlake, J.B., *Practical Pharmaceutical Chemistry, Part I*, 1st edition, CBS Publishers and Distributors, New Delhi 1997, 197.
- Finar I.L. *Organic chemistry stereochemistry and the chemistry of natural products*. 5th ed. Singapore: Pearson Education Ltd; 1975,518.

- Hoeland R.D and Mycek M.J, Lippincott's Illustrated Reviews: Pharmacology, Lippincott Williams and Wilkins, Philadelphia, 2000, 157-58; 240-241.
- J. A. Parrota, *Healing of Plants of Peninsular India*, CABI Publication, New York, NY, USA, 2000.
- J. Parekh, D. Jadeja, and S. Chanda, "Efficacy of aqueous and methanol extracts of some medicinal plants for potential antibacterial activity," *Turkish Journal of Biology*, vol. 29, pp. 203–210, 2005.
- Jeffery, G.H., Bassett, J., Mendham, J. and Denny .Vogel's Textbook of Quantitative Chemical Analysis, 5 th edition. Addison Westley Longman Ltd., England 1989, 801.
- K. Srinivasan, K. N. Muruganandan, and S. Chandra, "Anti-inflammatory and analgesic activity of some medicinal plants," *Journal of Medicinal and Aromatic Plant Sciences*, pp. 56–58, 2001.
- Kokate, C.K., Purohirt, A.R., Gokhale, C.B. Pharmacognosy. 27 th ed. Nirali Prakashan; 2004,344.
- Lipschitz W.L., Haddian Z and Kerpskar A ., Bioassay of Diuretics, *J.Pharmacol.Exp.Ther.* 1943, 79, 97-110.
- Maghrani M, Zeggwagh N, Haloui M, Eddouks M. Acute diuretic effect of aqueous extract of *Retama raetam* in normal rats. *J. Ethnopharmacol.* 2005; 99: 31–35.
- N.A. Ankrah, A. K. Nyarko, P. G.A. Addo et al., "Evaluation of efficacy and safety of a herbal medicine used for the treatment of malaria," *Phytotherapy Research*, vol. 17, no. 6, pp. 697–701, 2003.
- Pantoja CV, Chiang LCH, Norris BC, Concha JB. Diuretic, natriuretic and hypotensive effects produced by *Allium sativum* (garlic) in anaesthetized dogs. *J. Ethnopharmacol.* 1993; 31: 325–331.
- R. P. Rastogi and B. N. Mehrotra, *Compendium of Indian Medicinal Plants*, vol. 4, PID, New Delhi, India, 1995.
- Stanic G, Samarzija I. Diuretic Activity of *Satureja montana* subsp. *montana* extracts and oil in rats. *Phytother. Res.* 1993; 7: 363–366.
- Stookey, J.D. The diuretic effects of alcohol and caffeine and total water intake misclassification. *Eur J Epidemiol.* 1999, 15,181-8.
- V. Lakshmi, "Constituents of wood of *Delonix regia*," *National Academy Science Letters*, vol. 10, no. 6, p. 197, 1987.