



Evaluation of diuretic activity of ethanolic extract of leaves of *Nerium oleander* Linn. albino rats

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Research article

Abstract

Background and objectives:

Diuretics are the drugs which cause increase in urinary output of electrolytes and water from kidneys. The net loss of sodium and water in the urine is due to one or more re-absorptive processes occurring at different segments of the nephron. The increase water loss is actually secondary to the increased excretion of sodium chloride. This is achieved either by directly acting on different segments of the nephron or by indirectly modifying the contents of the urinary filtrate.

Materials and Methods:

The leaves of *Nerium oleander* Linn. were air dried, powdered and the plant materials are extracted by soxhlet extraction method. The extracts are concentrated using rotary vacuum to get solid mass. The study was carried out by using saluretic method in rats. The diuretic activity of ethanolic extract of leaves of *Nerium oleander* was evaluated by various parameters such as saluretic activity, natriuretic activity and carbonic anhydrase inhibition (CAI).

Result:

The different doses of EENO treated group have shown a significant increase in saluretic activity when compared to the other groups and in CAI activity the extract of EENO didn't shows any significant result.

Conclusion:

From this study, it is clear that EENO have significant saluretic activity in animal models. The extract is non-toxic even at relatively high concentrations.

Keywords: Saluretic, CAI, *Nerium oleander*, Furosemide, Albino rats

Introduction:

Diuretics are the drugs which cause increase in urinary output of electrolytes and water from the kidney. The net loss of sodium and water in the urine is due to one or more re-absorptive processes occurring at different segments of the nephron. The increase water loss is actually secondary to the increased excretion of sodium chloride. This is achieved either by directly

acting on different segments of the nephron or by indirectly modifying the contents of the urinary filtrate.¹

Hence, the search for better drugs with lesser adverse effects, which are more efficacious and economical is need of the hour. Plants are source for various drugs. They offer an untapped potential for newer drugs. The present research work is an effort to reveal the diuretic and analgesic activity of *Nerium oleander* Linn. belonging to the family apocynaceae in experimental animal models.



Fig 1: Nerium Oleander Linn.

Materials and Methods:

Animals:

Wistar albino rats of both sex and Swiss albino mice were obtained from Mahaveera Enterprises, D.No.2-2-647/258, Srinivas Nager Colony, Bagh Amberpet, Hyderabad-500013. Animals were housed in polypropylene cages at $24 \pm 2^\circ\text{C}$ and fed with pellet diet and water *ad libitum*. All animal experiments are carried out in accordance with the guidelines of CPCSEA and the study was approved by the Institutional Animal Ethics Committee, Ref. no. HKES'S/MTRIPS/IAEC/138/2022-2023 HKE'S MTRIPS, Gulbarga.

Plant material:

The *Nerium oleander Linn.* were collected from GIMS & PWD Bhavan, Kalaburagi area during December 2022 and authenticated by Principal N. G. Patil, Department of Botany, Smt. V. G. Womens Degree College, Kalaburagi-585102. The leaves of *Nerium oleander Linn.* were air dried, powdered and the plant materials are extracted by soxhlet extraction method. The extracts are concentrated using rotary vacuum to get solid mass.

Saluretic activity in rats:

The wistar albino rats weighing 180-200g of either sex are divided into 4 groups, each group consists of 6 animals. Group-I: served as control received 1.0ml/kg p.o 0.9% Sodium Chloride (NaCl)

Group-II: treated with Furosemide as standard (20mg/kg, p.o.)

Group-III: treated with EENO (100 mg/kg, p.o.)

Group-IV: treated with EENO (200 mg/kg, p.o.).

Saluretic activity:-The sum of Na^+ and Cl^- excretion
 Natriuretic activity:-The ratio Na^+/K^+ is calculated for natriuretic activity. (Values greater than 2.0 indicate a favorable natriuretic effect. Ratio is greater than 10.0 indicate a potassium-sparing effect).³ Carbonic anhydrase inhibition:- The ratio $\text{Cl}^-/(\text{Na}^++\text{K}^+)$ is calculated to estimate carbonic anhydrase inhibition. (Carbonic anhydrase inhibition can be excluded at ratios between 1.0 and 0.8. With decreasing ratios slight to strong carbonic anhydrase inhibition can be

assumed).²

Results:

Effects on saluretic, natriuretic and carbonic anhydrase inhibition:

The EENO at both the doses (100 and 200 mg/kg) and the furosemide (20 mg/kg) showed potent saluretic activity. EENO only at the dose of 200 mg/kg and the furosemide (20 mg/kg) showed significantly ($**p < 0.01$, $***p < 0.001$, respectively) increase in saluretic activity when compared to the control group (Figure 2 and Table 1). Natriuretic ratio >2.0 indicates a favorable natriuretic activity. EENO at 200 mg/kg, showed a favorable natriuretic activity and furosemide showed significant ($*p < 0.05$) natriuretic activity when compared to the control group (Figure 3 and Table 1). EENO didn't show carbonic anhydrase inhibition in our study (Figure 4 and Table 1).

Discussion:

EENO at dose of 200 mg/kg showed that significant ($**p < 0.01$) saluretic effect when compared to control (Table 1). The ratio of Na^+/K^+ was the indicator for natriuretic activity and a value greater than 2.0 indicate a favorable natriuretic effect. In present study EENO at 200 mg/kg showed a value greater than 2.0 which indicates a good natriuretic effect (Table 1). The ratio of $\text{Cl}^-/(\text{Na}^++\text{K}^+)$ is calculated for CAI and Carbonic anhydrase inhibition can be excluded at ratios between 1.0 and 0.8. With decreasing ratios slight to strong carbonic anhydrase inhibition can be assumed.³ In present study EENO at 100 and 200 mg/kg dose did not exhibit any CAI, as the values of CAI ratio were 0.90 and 0.73 respectively (Table 1).

Conclusion:

EENO showed significant saluretic activity and natriuretic activity and absence of carbonic anhydrase inhibition (CAI) compared to control.

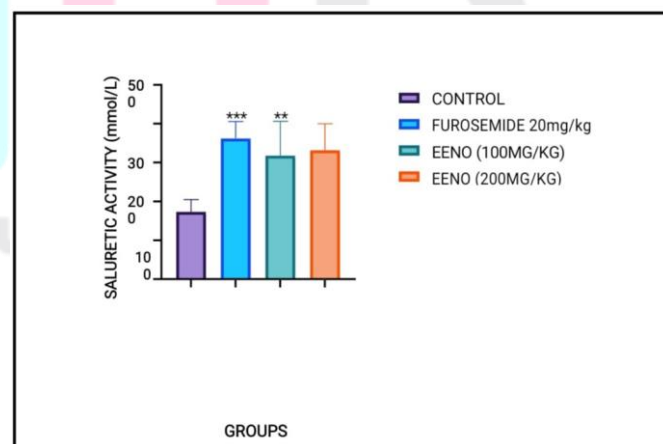


Fig. 2: Effect of EENO on Saluretic activity

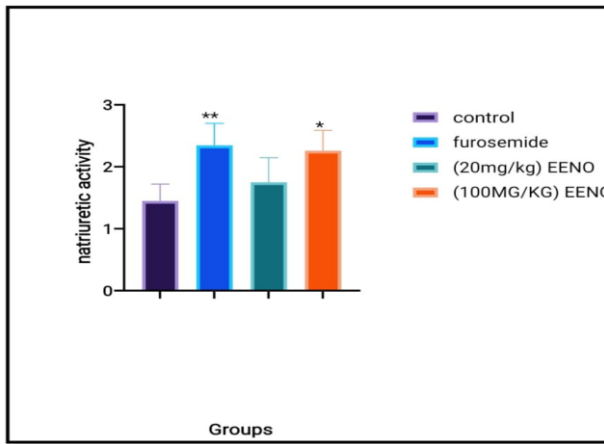


Fig. 3: Effect of EENO on natriuretic activity

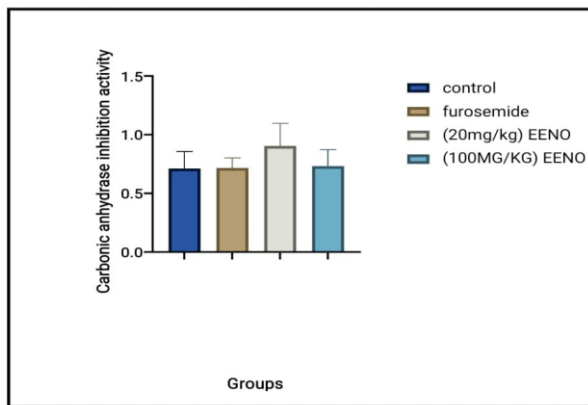


Fig. 4: Effect of EENO on natriuretic activity

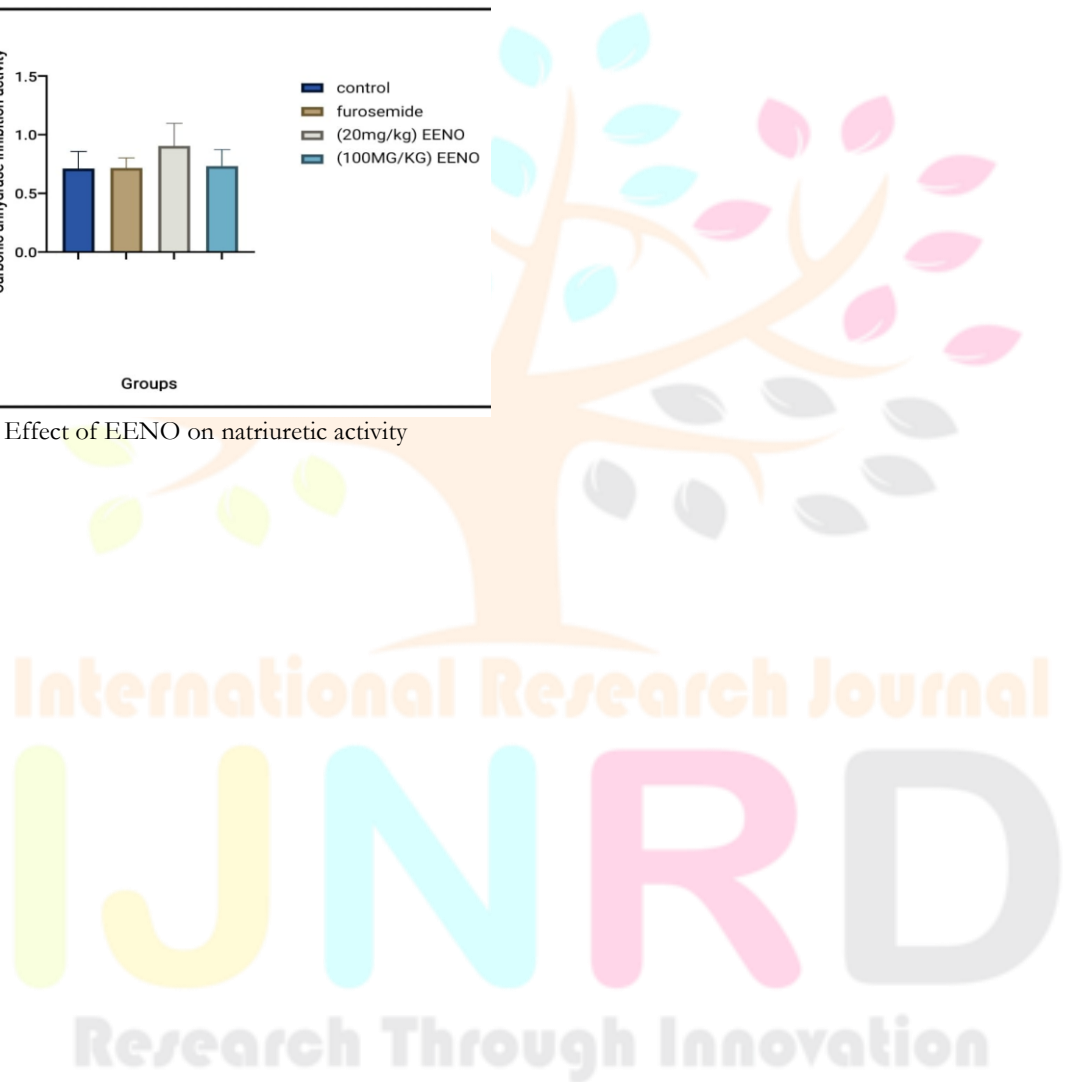


Table 1: Effect of ethanolic extract of leaves of Nerium oleander Linn on saluretic, natriuretic and carbonic anhydrase inhibition activity.

Groups	Saluretic effect (Na +Cl) ^a	Natriuretic effect (Na/K) ^a	CAI [Cl/(Na + K)] ^a	Saluretic index ^b	Natriuretic index ^b	CAI index ^b
Control (10 ml/kg)	173.3± 12.79	1.45± 0.11	0.71± 0.05	1.00	1.00	1.00
Furosemide (20 mg/kg)	362.2± 17.97***	2.34± 0.14***	0.71± 0.34	2.09	1.61	1.02
EENO(100 mg/kg)	318.0± 36.08**	1.75± 0.16	0.90± 0.07	1.08	1.20	0.90
EENO (200 mg/kg)	331.8± 27.92***	2.26± 0.13**	0.73± 0.05	1.91	1.55	1.01

a. n=5; Values are expressed as mean ± S.E.M; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ compared to control group.

b. Index = excretion in test group/excretion in control group. CAI – Carbonic anhydrase inhibition.

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