



EVALUATION OF DIURETIC ACTIVITY OF METHANOLIC EXTRACT OF *OXALIS CORNICULATA L.* IN RATS

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ABSTRACT

The present study was undertaken to investigate diuretic effect of methanolic extract of whole plant of *Oxalis corniculata L.* in albino wistar rats. The methanolic extract of *Oxalis corniculata* was administered to experimental rats overall at doses of 200 mg/kg, and 400mg/kg, p.o. furosemide (20mg/kg) was used as standard control in this study. The diuretic effect of the extracts was evaluated by measuring urine volume, sodium, and potassium content using flame photometry. Urine volume was significantly increased by the two doses of MEOC in comparison to control group. Excretion of electrolytes Na⁺, K⁺, increased by both doses. The diuretic effect of the extracts was comparable to that of standard furosemide. We can conclude the MEOC produced notable diuretic effect which appeared to be comparable to that produced by the reference diuretic furosemide. The present study provides a quantitative basis for explaining the folkloric use of *Oxalis corniculata L.* as a diuretic agent.

Keywords: Diuretic activity, *Oxalis corniculata L.*, MEOC, Furosemide, Electrolytes.

INTRODUCTION

Diuretics are the drugs that increase the rate of urine flow, sodium excretion and are used to adjust the volume and composition of body fluids in variety of clinical situations. Diuresis is beneficial in many life-threatening disease conditions such as congestive heart failure, nephritic syndrome, cirrhosis, renal failure, hypertension and pregnancy toxemia (Aguna *et al.*, 2005) only few drugs produce diuresis by increasing the filtration rate at the glomeruli, and there are weakly in action most of the diuretics used therapeutically act by interfering with sodium reabsorption by the tubules. Most diuretic drugs have the adverse effects including fatigue, impotence, and weakness, natural diuretics like caffeine in coffee, tea and cola, which inhibit Na⁺ reabsorption and alcohol, beer, wine and mixed drinks inhibit secretion of

ADH (Agus & Goldberg, 1971). Many plant drugs like *Erythrina Indira*, *Centratherum Anthelminticum*, *Cuscuta Reflexa*, *Clevmerutidosperma*, *Lepidium Sativum*, *Lagenaria Siceraria* were shown potent diuretic activity, Most of the diuretics proved very effective in promoting Na⁺ excretion but loss of potassium will occur in all causes. Hence search for a new diuretic agent that retains therapeutic efficacy and avoiding the loss of potassium from the body.

The plant *Oxalis corniculata L.* (creeping wood sorrel) also called procumbent yellow sorrel belongs to family Oxalidaceae. It is very common perennial herb that is distributed in world wide. The leaves of wood sorrel are quite edible with a tangy taste (Lee Allen Peterson, 1977).

The entire plant is rich in Vit-C the plant *Oxalis corniculata L.* leaves having three major C-glycosylflavans are reported. There are isoorientin, isovitexin and swertisin of (Hiroki Mizokami *et al.*, 2008) *Oxalis corniculata L.* used in wound healing (Taranalli *et*

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al., 2004) Antibacterial activity (Satish *et al.*, 2008). Abortifacient, Anti implantation (Sharangouda and Patil, 2004), and used in Dementia (Yalla Reddy *et al.*, 2010) and other traditionally used in anaemia, dyspepsia, cancer, piles, diuretic, convulsions, (Madhavachetty *et al.*, 2008). Literature survey revealed that the plant extract has yet not been screened for its traditional diuretic activity in experimental animals. Therefore the present study was carried out to provide pharmacological evidence for the folklore medicinal consideration of whole plant as diuretic.

Hence the present work we evaluated the effect of two different doses of methanolic extracts of *Oxalis corniculata L.* on wistar rats.

MATERIALS AND METHODS

Animals used

Albino wistar rats (150-200g) were obtained from the animal house in Sree Vidyanikethan College of Pharmacy, Tirupati, Andhra Pradesh. The animals were maintained in a well-ventilated room with 12:12 hour light/dark cycle in polypropylene cages. The animals were fed with standard pellet feed (Hindustan Level Limited, Bangalore) and water was given *ad libitum*. Ethical committee clearance was obtained from IAE (Institutional Animal Ethics Committee) of CPCSEA (Ref. No./AEC/XIII/05/SVCP/2008-09).

Treatments

Animals were divided into four groups, each consisting of six albino wistar rats the methanolic extract of *Oxalis corniculata L.* was blackish oily extract divided into two doses MEOC-200mg/kg, MEOC 400mg/kg given orally.

Group-I received normal saline (25ml/kg) and served as normal control,

Group-II received furosemide (20mg/kg) and served as standard.

Group-III & Group-IV are received 200mg/kg, 400mg/kg of MEOC respectively.

Diuretic activity

The method by Lipschitz *et al.*, was employed for the assessment of diuretic activity (Mukherjee, 2002, Lipschitz *et al.*, 1943) Healthy albino wistar rats of either sex were divided into six groups of six animals each. Methanolic extract of *Oxalis corniculata L.* were evaluated for diuretic activity. Furosemide (20mg/kg) was used as standard reference drug. Before the experiment the rats were fasted for 18 hours with free access to water. On the day of experiment, the animals of group-I were administered saline orally (2.5 ml of 0.9% NaCl/100g body weight) and this group served as control. Group-II rats were treated with standard drug furosemide

(20mg/kg) formulated in saline solution. Group-III and Group-IV rats received MEOC 200mg/kg and MEOC 400mg/kg respectively. Immediately after the treatment, the animals were individually placed in metabolic cage (Kuppost & Nayak, 2005).

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he urine was collected in measuring cylinder up to 5h for all control and treated groups. During this period no food and water was made available to the animals. The volumes of urine, electrolyte (Na⁺, K⁺) content were estimated in the urine for assessment of diuretic activity. Na⁺, K⁺ estimation was carried out using flame photometry (ELICO CL361 flame photometer)(Jeffery *et al.*, 1989). The diuretic action of tested drug was calculated by using the following formula.

$$\text{Diuretic action} = \frac{\text{urinary excretion in test drug}}{\text{urinary excretion in control}}$$

Statistical analysis

The statistical significance of the results of diuretic activity are analysed using ANOVA, followed by Tukey-kramer multiple comparison test, the p-values <0.05 were considered as significance.

RESULTS

Effect on urine volume

In this method the diuretic activity assessed. ANOVA followed by Tukey-kramer multiple comparison tests, the p-values <0.05 were considered as significant activity. The methanolic extract of *Oxalis corniculata L.* at two doses (200, 400mg/kg body weight) show marked diuresis during the 5h of test duration. The MEOC 200 mg/kg having less diuresis (9.6 ± 0.43mg) compared to MEOC 400mg/kg (12 ± 2.01mg) versus control 2.12 ± 0.09 ml, P < 0.001). Whereas both methanolic extracts of 200 & 400 mg/kg doses significantly increased urinary output compared to that of the control (MEOC 200 & 400 mg/kg, 9.6 ± 0.43mg & 12.2 ± 0.26 ml versus control 2.12 ± 0.08 ml, P > 0.001 but the effect less than that of standard drug furosemide (21.65 ± 0.15ml) versus control 2.12 ± 0.08 ml; P < 0.001, at 5hrs the animal were found normal and no evidence of dehydration was observed.

Effect on urinary electrolyte excretion

The effect of single doses of furosemide (20mg/kg) and two doses of MEOC 200mg/kg & MEOC 400mg/kg on urinary electrolyte Na⁺ and K⁺ concentration at 5h post administration is represented in table 2 MEOC 200mg/kg, MEOC 400mg/kg both extracts significantly enhanced the excretion of electrolytes (P < 0.001) compared to the control. The Na⁺/K⁺ excretion ratio was uniform (2.0 to 2.5) in all the groups studied.

Table 1. Effect of *Oxalis corniculata L.* on excretion of urine

S. No.	Group	Dose (mg/kg)	Vol. of urine collected (in ml)					Diuretic action
			After 1hr	After 2hr	After 3hr	After 4hr	After 5hr	
1.	Control	---	2.12±0.08	2.17± 0.08	2.09±0.07	2.1±0.09	2.12± 0.08	1.00
2.	Standard	20	12.25±0.19***	17.7±0.39***	18.2±0.41***	20.83±0.31***	21.65±0.15***	10.21
3.	MEOC	200	2.52±0.13***	5±0.21***	7.7±0.34***	8.06± 0.43***	9.6± 0.43***	4.53
4.	MEOC	400	2.3±0.06***	5.7±0.35***	9.1±0.42***	11.1±0.29***	12.2± 0.26***	5.75

Values are expressed as Mean ± SEM, ANOVA followed by Tukey-Kramer multiple comparison test, n=6 in each group, ***P<0.0001 vs control group.

MEOC: Methanolic extract of *Oxalis corniculata L.*

Table 2. Urinary electrolyte concentration of *Oxalis corniculata L.*

S. No.	Group	Dose (mg/kg)	Vol. of urine (ml)	Na ⁺ (mmol/L)	K ⁺ (mmol/L)	Na ⁺ /K ⁺ ratio
1.	Control	---	2.1±0.08	138.9±0.50	54.73±0.60	2.54
2.	Standard	20	21.65±0.15	150.1±0.55***	71.06±0.75***	2.11
3.	MEOC	200	9.6±0.43	148.3±1.46***	72.01±0.34***	2.05
4.	MEOC	400	12.2±0.26	150.16±1.47***	72.21±0.37***	2.07

Values are expressed as Mean ± SEM, ANOVA followed by Tukey-Kramer multiple comparison test, n=6 in each group, ***P<0.0001 vs control group.

MEOC: Methanolic extract of *Oxalis corniculata L.*

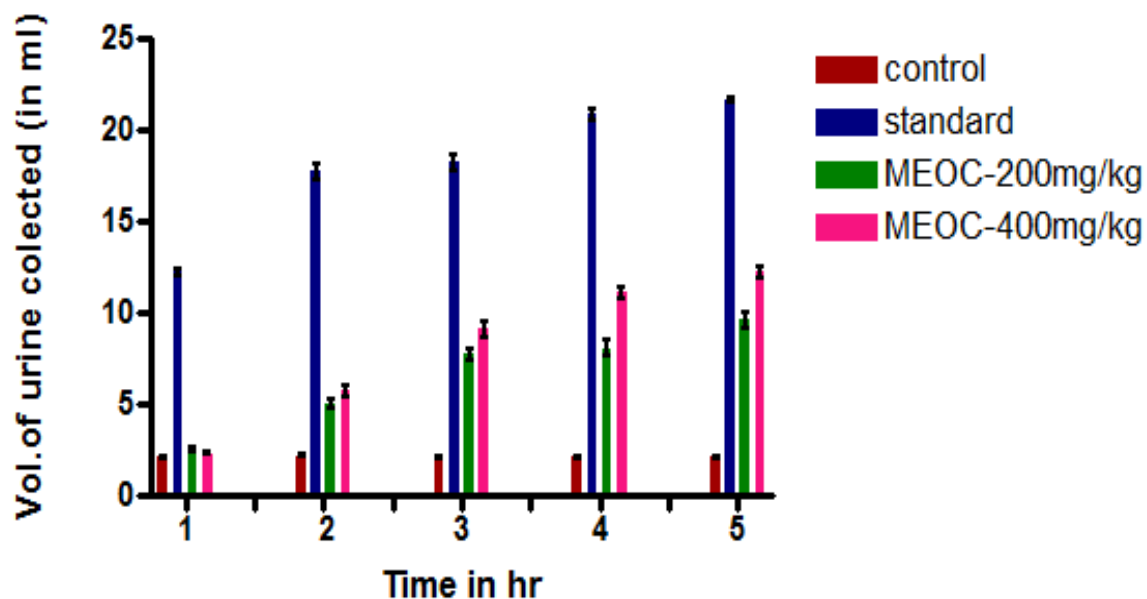
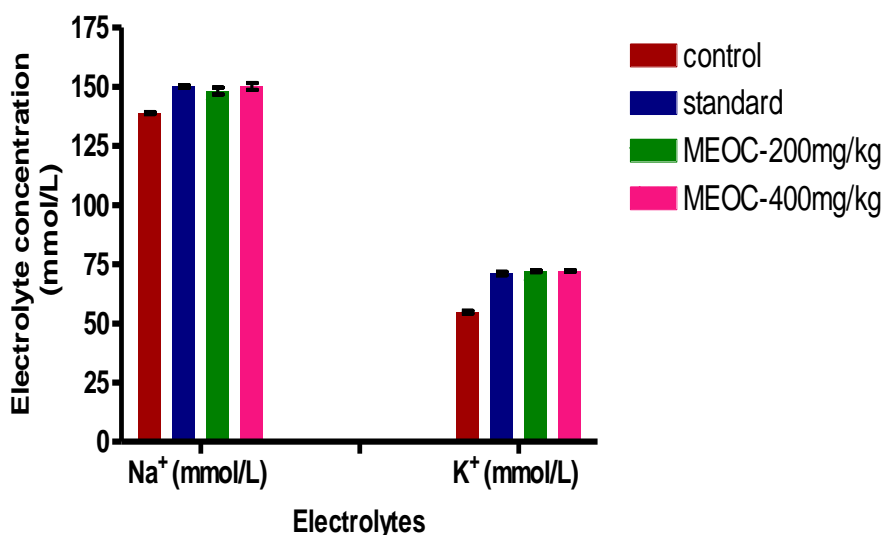
Fig 1: Effect of *Oxalis corniculata* on excretion of urine

Fig 2: Urinary electrolyte concentration of *Oxalis corniculata*



DISCUSSION

The aim of this study was to investigate the diuretic activity of methanolic extract of *Oxalis corniculata* L. According to previous ethnopharmacological survey carried out in the south Indian region. The plant materials are used in various diseases like dyspepsia, cancer, piles, convulsion, dementia and traditionally used as diuretic, but no previous pharmacological clinical study has been carried out to test the diuretic activity of this plant. In this study the methanolic extracts were tested at 200mg/kg, 400mg/kg respective doses. The diuretic response was compared with that produced by furosemide, a widely used loop diuretic in clinical practice. The effect on electrolyte balance was also determined along with diuretic response.

The methanolic extract of *Oxalis corniculata* L. (200mg/kg) showed lesser diuretic activity compared to MEOC 400mg/kg during the 5h of the test duration (Diuretic action 4.53 and 5.75) when compared to control the MEOC 200mg/kg MEOC 400mg/kg both doses showed more significant diuretic activity but less than that of standard furosemide (Diuretic action 10.21). Urine output continued to be enhanced throughout the study period and the cumulative urinary excretion was significantly higher compared to that of the control. Furosemide is reported to increase urinary output and urinary excretion of sodium by inhibiting Na⁺/K⁺/Cl⁻ transports system in the thick ascending loop of henle (Jackson, 1996). The MEOC 200mg and MEOC 400mg/kg both doses significantly increase the urinary excretion of Na⁺ and K⁺ ions was observed when compared to control.

The secondary metabolites such as flavanoids, saponins are known to be responsible for diuretic activity (Sood *et al.*, 1985). In this plant, three major C-glycosyl flavones are reported (Hiroki Mizokami *et al.*, 2008). The diuretic activity of this plant may be due to these flavanoids. The probable mechanism of action of tested extracts may be similar to furosemide. The diuretic activity of MEOC 400mg/kg shown higher level of diuretic action compared to MEOC 200mg/kg. However, the exact constituents responsible for the diuretic activity of the extracts studied need to be evaluated in future studies.

CONCLUSION

It is concluded from this study that the methanolic extract of *Oxalis corniculata* L. possess significant diuretic activity and may prove to be effective for the treatment of many life-threatening disease conditions such as congestive heart failure, nephritic syndrome, cirrhosis, renal failure, hypertension and pregnancy toxemia. The diuretic action may be due to the presence of flavonoids. However, further studies are required to elucidate the exact mechanism of action for development of its as a potent diuretic drug. The results obtained in this study provide a quantitative basis to explain the traditional folkloric use of *Oxalis corniculata* L. as a diuretic.

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