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Der Pharmacia Lettre, 2011: 3 (5) 168-172
(http://scholarsresearchlibrary.com/archive.html)

Scholars Research Library
ISSN 0974-248X
USA CODEN: DPLEB4

Comparative diuretic activity of root and aerial part methanolic extracts of *Echinops echinatus* Roxb.

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ABSTRACT

The dried roots and aerial parts of Echinops echinatus Roxb. were subjected to Methanolic extraction. The prepared extracts were then subjected to preliminary phytochemical analysis. It was found that roots and aerial parts possess alkaloids, carbohydrates, flavonoids, tannins and phenolic compounds. The diuretic potential of methanolic extracts of the aerial parts and roots was assessed in albino rats using in-vivo Lipschitz test model. The volumes of urine, urinary concentration of sodium and potassium ions were the parameters of the study. Frusemide was used as standard. The results indicate that methanolic extracts at 250 mg/kg and 500 mg/kg body weight shows a significant increase in the urine volume and electrolyte excretion when compared to control. Both the extracts show significant diuretic activity. From the present study it may be concluded that the constituents present in methanolic extracts may be responsible for diuretic activity.

Key words: *Echinops echinatus*, Aerial parts, Roots, Diuretic, Methanolic extract.

INTRODUCTION

Echinops echinatus Roxb, (Asteraceae) is a pubescent annual herb of 1-3 ft height with branches widely spreading from the base. The species is found practically throughout India, Pakistan, Afghanistan, etc[1]. The Plant is bitter, increases the appetite and stimulates liver; used in diseases of the brain, pains in the joints, inflammations, etc. Roots and root bark of the plant are used in various indigenous systems of medicine for treating different ailments. The root is used as abortifacient and aphrodisiac[2], infusion of the root is given in seminal debility, impotence, hysteria, and its decoction is given in dyspepsia, scrofula, syphilis and fevers[3].

According to an ethnomedicinal survey carried out by Kakrani et al.[4], the rural population of Kutch region in Gujarat state, India, uses the suspension of root bark powder in milk (100g/ 250ml) for the treatment of diabetes. The traditional healers of Chhattisgarh in India use this herb in different ways both internally and externally for the treatment of sexual disorders. An aqueous paste of the root is applied in the lower abdominal region to hasten the process of delivery; also the patients are advised to take the paste internally for quick and safe delivery. In case of patients having poor sexual vitality, aqueous paste of the root bark powder is applied externally on the male genitals one hour before intercourse; pure honey can be used in place of water for better results. A paste prepared by mixing the root bark powder with the juice of *Datura stramonium* and *Blumea lacera* leaves is used to avoid premature ejaculation. The patients suffering from respiratory troubles, particularly asthma, are advised to inhale the fumes obtained by burning the leaves & roots of *E. echinatus* in order to get quick and permanent relief[5]. Though the plant has been reported for many biological activities like anti-inflammatory[6], hypoglycemic and diuretic[7], antibacterial and antifungal[8], antispasmodic[9] etc.

Since the diuretic activity of this plant has not been scientifically evaluated, the present study was undertaken to investigate the effect of Methanolic extracts of root and aerial part of *E. echinatus* for its diuretic activity with their electrolyte excretion.

MATERIALS AND METHODS

Plant material

The whole plant material of *E. echinatus* was collected in the month of October 2010 from the outfield of Modasa city, Sabarkantha, Gujarat, India and was authenticated by Dr. H. B. Singh Scientist and Head of Raw Materials Herbarium & Museum Dept of National Institute of Science and Communicationand Information Resources, New Delhi (NISCAIR) and preserved the herbarium in Dept. of Pharmacognosy, B. M. Shah College of Pharmaceutical Education and Research, Modasa.

Preparation of extract

Locally collected whole plants (3.0 kg) were shade-dried and its roots and aerial parts separated from each other and then powdered roots and aerial parts. Powdered roots and aerial parts separately extracted with Petroleum ether by Maceration and then with Methanol in a percolator at room temperature. The extracts were freed of the solvent under reduced pressure yielding brown semi-solid mass. This extracts (ME) were dissolved or suspended in distilled water, its pH brought to 7.0 and used for the Diuretic activity studies.

Preliminary phytochemical screening

Both the extracts were screened for the presence of various secondary metabolites like steroids, alkaloids, carbohydrates, flavonoids, essential oil and tannins using standard methods[10].

Animals

Wistar rats of either sex, weighing 180-240 g purchased from ZRC, Ahmedabad were used. They were housed in standard environmental conditions of temperature, humidity, light and provided with standard rodent food and water *ad libitum.*

Diuretic Activity

The diuretic activity of Methanolic extract of Root, Methanolic extract of Aerial part and frusemide was carried out by using *in-vivo*, Lipschitz test method[11-13].The Wistar rats were divided into six groups of six animals each. Group I served as control and received normal saline orally. Group II served as positive control and received Furosemide (20 mg/kg). Group III and IV received Root Methanolic extract, orally at a dose of 250 (Low dose) and 500 (High dose) mg/kg respectively. Group V and VI received Aerial part Methanolic extract, orally at a dose of 250 (Low dose) and 500 (High dose) mg/kg respectively.

Immediately after administration, the rats (one in each cage) were placed in metabolic cages specially designed to separate urine and faeces and kept at room temperature of 25±0.5ºC. The urine was collected in a measuring cylinder upto 6 h. During this period, no food or water was made available to animals. The volume of urine collected was measured for all the groups. The parameters taken for each individual rat were body weight before and after test period, urine volume (concentrated for water intake during the test period), concentration of Na+ and K+ in urine. The content of Na+ and K+ in the urine was estimated by ICP-OES (Inductive Coupled Plasma-Optical Emission Spectroscopy.)

Statistical analysis

All the results are expressed as mean ± standard error. The data was analyzed statistically using ANOVA followed by Dunnett's Multiple Comparison Test.

RESULTS AND DISCUSSION

The phytochemical tests revealed the presence of Carbohydrates, phenolics and Tannins in methanolic extract of root and Carbohydrates, Flavanoids and Alkaloids in methanolic extract of aerial part. The results of phytochemical screening are given in Table 1.

Table 1: Phytochemical screening of *Echinops echinatus* Roxb

Chemical constituents	Methanolic extract of root	Methanolic extract of aerial part
Carbohydrates	+	+
phenolics	+	-
Tannins	+	-
Flavanoids	-	+
Alkaloids	-	+

+, -- represent presence and absence of phytoconstituents respectively

The results of diuretic activity of *Echinops echinatus* obtained from the urine samples of the rats are shown in Table 2.

The data showed that, the root and aerial part methanolic extracts (Low and High doses) of *Echinops echinatus* produced significant diuretic activity, evidenced by the increased excretion of sodium and potassium salts. High dose of the root and aerial part methanolic extracts of *Echinops echinatus* produced more diuretic activity than Low dose of the root and aerial part methanolic extracts of *Echinops echinatus.* High dose (500mg/kg) of root methanolic extract showed significant diuretic activity comparable to the standard drug, furosemide. Diuretic activity of root methanolic extract of *Echinops echinatus* is due to presence of Carbohydrates,

phenolics and Tannins. Diuretic activity of aerial part methanolic extract of *Echinops echinatus* is due to presence of Carbohydrates, Flavanoids and Alkaloids.

Table 2: Diuretic activity of *Echinops echinatus* Roxb

Group	Urine volume (ml/kg)	Concentration of excreted ions		
		Na+ (mEq/L)	K+ (mEq/L)	Na+/K+ Ratio
I	2.64±0.079	63.45±0.053	54.61±0.015	1.161875
II	12.69±0.083*	155.25±0.190	139.51±0.092#	1.112823
III	6.98±0.048	96.18±0.0745	81.77±0.029#	1.176226
IV	11.85±0.049*	143.33±0.168	138.50±0.038#	1.034874
V	5.74±0.045	82.23±0.048	149.63±0.040#	0.549556
VI	8.93±0.043*	138.42±0.110	164.78±0.023#	0.840029

*Statistical analysis by ANOVA and Dunnet's Multiple comparison Test. Results are expressed as mean ± standard error, n = 6 in each group. *Significantly difference compared to control group at p < 0.05. #Significant difference compared to control group at p<0.001*

CONCLUSION

Diuretics relieve pulmonary congestion and peripheral edema. These agents are useful in reducing the syndrome of volume overload, including orthopnea and paroxysmal nocturnal dyspnoea. They increase plasma volume and subsequently venous return to the heart. This decreases cardiac work load, oxygen demand and plasma volume, thus decreasing blood pressure. Thus diuretics play an important role in hypertensive patients. On the basis of the results of the present investigations, we can conclude that the root and aerial part methanolic extracts of *Echinops echinatus* showed effective diuretic activity by increasing the total urine output and increased excretion of sodium and potassium salts. Further research is warranted to evaluate the exact mechanism and chemical compounds responsible for this activity.

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