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# A study on preliminary phytochemical and diuretic activity of leaves of *Portulaca oleracea*

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**ABSTRACT**

The shadedried powder of *Portuleca oleracea* was subjected to successive extraction using the solvents (Pet. ether, chloroform, alcohol and water) in the increasing order of polarity and also 70% ethanolic extract was prepared. Thus prepared extracts were subjected to the preliminary phytochemical analysis. It was found that the leaves possess alkaloids, carbohydrates, flavonoids, glycosides, tannins and proteins. Since the phytochemicals present in the alcoholic, water and hydroalcoholic extract (70% ethanolic extract) were similar, the 70% ethanolic extract was selected for the further study. The diuretic potential of 70% ethanolic extract of the leaves was assessed in albino rats. The Volume of urine, urinary concentration of Na, K and Cl ions were the parameters of the study. Fursemide (100 mg/kg) was used as standard. The 70% ethanolic extract (400 mg/kg) has shown significant increase in the volume of urine, urinary concentration of Na, K and Cl ions. However 200mg/kg dose has not increased the volume of urine and urinary concentration of chloride, but significantly elevated the urinary levels of Na and K ions. From the present study it may be concluded that the 70% ethanolic extract possess polyphenolic compounds, carbohydrates, proteins and possess natriuretic and diuretic activities.

**KEY WORDS:** *Portuleca oleracea,* polyphenolic compounds, natriuretic, diuretic

## INTRODUCTION

*Portuleca oleracea* is an edible plant grown wildly in all the parts of India and cultivated in the southern India. The leaves are used as salad and vegetable by the natives of Karnataka. The native practitioners in and around Harapanahalli have claimed that the leaves are being traditionally used as a diuretic. Upon literature review it was found that the plant possess nor adrenaline, dopamine, dopa, vitamin C, olearacins – I and II, omega 3 fatty acids, saponins, tannins, flavonoids, saccharides, triterpenoids, tannins, α - tocopherol and glutathione (1, 2, 3). Several workers have reported many pharmacological properties including analgesic, anti-inflammatory (4), antifertility (5), muscle relaxant (6), antifungal (7) and wound healing properties (8). However there are no reports on the diuretic activity of the plant. Hence, the present study was designed to verify the claims of the native practitioners.

## MATERIALS AND METHODS

### *Plant collection and authentication*

The leaves of *Portuleca oleracea* were collected from the fields of Harapanahalli. The plant was identified and authenticated by Prof. K. Prabhu, Dept, of Pharmacognosy, S.C.S. College of Pharmacy, Harapanahalli. A Herbarium specimen is deposited in our college museum (SCSCP03/2005).

### *Preparation of extracts*

Shade dried powder of leaves (300 gm) was successively extracted with pet. ether, chloroform, alcohol and water (the marc was macerated for one weak in chloroform water) in the increasing order of their polarity (9). In addition the fresh quantity of powder was defatted with pet ether and extracted with 7% ethanol. The solvents from the extracts were removed by using rotaflash evaporator

### *Preliminary phytochemical screening*

All the extracts were screened for the presence of various secondary metabolites like steroids, alkaloids, carbohydrates, proteins, flavonoids, tannins and glycosides using the standard methods (10).

### *Animals*

The albino rats and mice (for acute toxicity study) of either sex were obtained from Sri Venkateshwara enterprises, Bangalore. All the animals were stored in standard polypropylene cages and maintained at $27^0$ C ± $2^0$ C under 12 hrs dark/light cycle. The animals were fed with standard rat feed (Gold Mohur Lipton India Ltd) and water was given ad libitum. Ethical clearance for handling of the animals and the procedures used in

the study was obtained from the institutional animals ethical committee prior to the beginning of the study.

***Acute toxicity study***

The acute toxicity of 70% ethanolic extract of the leaves of *Portuleca oleracea* was determined as per the CPCSEA guideline no. 420 (fixed dose method). It was observed that the test extract was not mortal even at 2000mg/kg dose hence, $1/10^{th}$ (200mg/kg) and $1/5^{th}$ (400mg/kg) of this dose was selected for further study.

***Diuretic activity (11, 12)***

Albino rats of either sex weighing 150 to 200 gm were divided in to four groups of six animals each. The animals were fasted for 24 hrs and water was given ad libitum during fasting. On the day of experiment the animals of group I was administered with saline (25ml/kg po) and this group served as control. Similarly the animals of group II, III and IV were administered with frusemide 100 mg/kg (standard), test extracts 200mg/kg and 400mg/kg orally respectively (dissolved in saline and suitably diluted so as to adjust the volume of administration to 25 ml/kg). Immediately after the respective treatments the animals were placed in metabolic cages (3 animals in one metabolic cage) and urine was collected in the measuring cylinder up to 5 hrs. The volume of urine, Na, K and Cl (13, 14,) were estimated in the urine for assessing diuretic activity.

**RESULTS**

The phytochemical tests revealed that the leaves of the plant possess alkaloids in chloroform, ethanolic, aqueous and hydroalcoholic extracts. The other constituents like flavonoids, tannins, glycosides, carbohydrates and proteins in ethanolic, aqueous and hydroalcoholic extracts. The results of phytochemical screening are given in table – 1. The treatment with 70% ethanolic extract (400mg/kg) has significantly enhanced the volume of urine. However, the test extract at lower dose (200mg/kg) failed to do so. The urinary levels of Na, K and Cl were significantly increased by 400mg/kg of test extract. However lower dose has significantly elevated the Na and K levels but not the Cl levels. The diuretic activity demonstrated by the test extract at 400 mg/kg was significantly lesser than the standard 100mg/kg. The results are compiled in the table – 2

**DISCUSSION**

All the extracts have demonstrated the presence of alkaloids and extracts with polar solvents like alcohol, water and 70% ethanol have demonstrated the presence of flavonoids, tannins, glycosides and proteins. The results of the present study are in conformity with the reports that the plant possess flavonoids like α-tocopherol, etc.(1)

The 70% ethanolic extract has enhanced the volume of urine significantly at 400 mg/kg and lower dose i.e. 200mg/kg failed do so. The Na and K ion excretion is significantly elevated in the dose dependant manner. But Cl ion excretion was not elevated significantly by the lower dose. The results are indicating that the extract is potent natriuretic but its diuretic potency is lesser. That means the natriuretic effect of the lower dose may not be sufficient to induce diuresis. However the natriuretic effect at higher dose is sufficient cause diuresis.

***Table-1: Preliminary phytochemical screening of Portuleca oleracea leaf extracts***

| Type of Phytoconstituents | Pet. ether extract | Chloroform extract | Ethanolic extract | 70% Ethanolic extract | Aqueous extract |
|---|---|---|---|---|---|
| Alkaloids | -- | + | + | + | + |
| Carbohydrates | -- | -- | ++ | +++ | +++ |
| Flavonoids | -- | -- | ++ | +++ | ++ |
| Glycosides | -- | -- | + | ++ | ++ |
| Tannins | -- | -- | + | +++ | ++ |
| Proteins | -- | -- | + | ++ | ++ |
| Steroids | -- | -- | -- | -- | -- |

***Table – 2: Diretic activity of 70% ethanolic extract of leaves of Portuleca oleracea***

| Gr No. | Treatment | Volume of urine in ml | Sodium (meq/l) | Potassium(meq/l) | Chloride (meq/l) |
|---|---|---|---|---|---|
| I | Control | 2.69 ± 0.02 | 60.25 ± 3.65 | 1.13± 0.12 | 0.19 ± 0.03 |
| I I | Frusimide (100mg/kg) | 10.33 ± 0.21*** | 156.50± 3.40*** | 5.67± 0.29*** | 0.51± 0.02*** |
| I I I | 70% ethanolic Extract (200mg/kg) | 2.49 ± 0.19 | 97.26± 3.16*** | 2.74 ± 0.15*** | 0.26 ± 0.02 |
| IV | 70% ethanolic Extract (400mg/kg) | 5.90 ± 0.13*** | 123.62 ± 2.51*** | 4.40 ± 0.19*** | 0.43 ± 0.02*** |

*** *P<0.001 V/s Control*

The diuretic effect of the test extract was significantly lesser than that of frusemide 100 mg/kg (standard). Since the plant possesses cardiac glycosides and cardiac gycosides are also know to possess diuretic effect (15), the diuretic effect of the test extract may be attributed to the cardiac glycosidal content. However, the contribution of polyphenolic compounds to diuretic effect can not be ruled out. Further studies like isolation and characterization of diuretic principle from the leaves of the plant is needed to confirm. From the study it may be concluded that the claim of the native practitioners that, the leaves possess diuretic effect, is justifiable.

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