
بسم الله الرحمن الرحيم

King Saud University

College of Pharmacy

Pharmacognosy Department

BIOLOGICAL STUDY FOR SOME DIURETIC PLANTS

Introduction

- **Diuretics are defined as compounds that increase urine flow.**

- **Therapeutic use of diuretic compounds is:**
  - **Lower hypertension by decreasing blood volume through the excretion of water in the urine.**
  - **Diuretics are beneficial in many life threatening disease conditions such as:**

    heart failure, renal insufficiency, hepatic cirrhosis, hypercalcemia, diabetes insipidus, glaucoma, cerebral edema, drug intoxication, hyperaldosteronism and polycystic ovarian syndrome (PCOS).

Research Objective

- **A number of diuretics like mannitol, thiazides, furosemide and ethacrynic acid are used in practice. However, there is still need for more effective and less toxic diuretic.**

- **In this work, we report on evaluation of the diuretic properties attributed to six endemic plant species from Saudi Arabia.**

Plant choices were:

Corchorus olitorius Linn

(الملوخيه)

Indigofera oblongifolia Forsk

(دسم، صرح)

Ocimum basilicum L.

(الريحان، الصعتر الهندي)

Carthamus tinctorius L.

(عصفر)

Lavandula pubescens Decne

(خزامى زغبيه)

Alchemilla vulgaris (hort.)

(رجل الأسد)

Corchorus olitorius Linn. (Tiliaceae)

- The leaves are used as:
  Demulcent, diuretic, febrifuge and tonic.
- and in the treatment of chronic cystitis, gonorrhea and dysuria.

Indigofera oblongifolia Forsk (Fabaceae)

- Traditionally used in urinary tract infection, cough and skin infection.

Ocimum basilicum L. (Lamiaceae)

- Leaves and flowering parts of *O. basilicum* are traditionally used as antispasmodic, aromatic, carminative, digestive, galactogogue, stomachic, diuretic and tonic agents.

Carthamus tinctorius L. (Safflower) (Asteraceae) is

- Traditionally used as purgative
- and in the treatment of menstrual problems, cardiovascular disease, pain and swelling associated with trauma, rheumatism, chronic nephritis and as diuretic.

Lavandula pubescens Decne. (Lamiaceae)

- The plant has been used as an antispasmodic, carminative, diuretic and general tonic.

Lady's mantle (*Alchemilla vulgaris* hort.) (Rosaceae).

- It has a long history of use, mainly for external treatment for cuts and wounds, and internally for treatment of diarrhea.
- Menstrual problems.
- Diuretic

Materials and Methods

Extraction

- **The dried ground aerial parts of *I. oblongifolia, O.basilicum, L. pubescens, A.vulgaris.***
- **The leaves of *C. olitorius.***
- **The flower of *C. tinctorius* (100 g from each plant) were extracted to exhaustion by percolation at room temp. with 90% ethanol and the extract was evaporated in *vacuo* to leave 12.2g, 12.6, 13.3, 11.5, 12.8, 12.9 g of residue.**

Pharmacological Evaluation

Experimental design

- **5 groups of 6 male Wister albino rats (150-180g/kg, b.w.) were used.**
- **All the animals received normal saline (25mL/kg, b.w) orally, prior to start of the experiment.**
- **Group I which received normal saline was treated as control.**
- **Group II received urea (1g/kg).**
- **Group III received furosemide (Lasix) (5mg/kg).**
- **Group IV and V received the alcoholic extracts at the dose of 200 and 400mg/kg b. w. respectively.**
- **The total urine volume over the period of 5hrs was measured for the all the ethanolic extracts, (200 and 400mg/kg b.w), standard diuretics (urea and furosemide) and control.**
- **Urine volume pH and electrolyte excretion were measured and used to obtain parameters such as activity and diuretic action.**
- **The significance of results was explored using (ANOVA) and student`s *t-test.***

Diuretic activity and urinary volume extraction

$$\text{Urinary Excretion} = \frac{\text{Total urinary output}}{\text{Total liquid administered}} \times 100$$

$$\text{Diuretic action} = \frac{\text{Urinary excretion in test group}}{\text{Urinary excretion in control group}} \times 100$$

$$\text{Diuretic activity} = \frac{\text{Diuretic action of drug}}{\text{Diuretic action of urea}} \times 100$$

Results and Discussion

Table 1: Dose response diuretic activity after 5th hour by I.P. administration of the ethanolic extracts of *A. vulgaris* (AV), *I. oblongifolia* (IO), *C. tinctorius* (CT), *C. olitorius* (CO), *O. basilicum* (OB) and *L. pubescens* (LP) in normal rats.

Groups	Urine Volume (ml)	Urinary Excretion $(V_0/V_1)X100$	Diuretic Action (UE_t/UE_c)	Diuretic Activity (DA_t/DA_u)	pH
Control (saline)	0.99±0.15	26.40	-	-	7.63±0.32
Urea (1 g/kg)	1.95±0.33*	52.00	1.96	-	8.55±0.38
Furosemide (5 mg/kg	3.45±0.34***	92.00	3.77	1.92	9.61±0.19***
AV (200 mg/kg)	1.68±0.17*	45.80	1.69	0.86	8.95±0.30*
AV (400 mg/kg)	2.15±0.26**	57.33	2.17	1.10	9.00±0.28*
IO (200 mg/kg)	2.08±0.27**	55.46	2.10	1.07	8.43±0.32
IO (400 mg/kg)	2.70±0.16***	72.00	2.72	1.38	9.06±0.28**
CT (200 mg/kg)	0.81±0.20	21.60	0.81	0.41	7.63±0.30
CT (400 mg/kg)	0.80±0.06	21.33	0.80	0.40	7.16±0.29
Control (saline)	1.14± 0.092	30.4	-	-	7.13±0.9
Urea (1 g/kg)	2.57±0.01***	68.53	2.254	-	8.4±0.15***
Furosemide (5 mg/kg)	4.22±0.10***	112.53	3.70	1.64	9.18±0.11***
CO (200 mg/kg)	1.16±0.05	30.93	1.017	0.47	7.31±0.18
CO (400 mg/kg)	1.63±0.07**	43.467	1.429	0.63	8.26±0.10***
OB (200 mg/kg)	2.25±0.09***	60.00	1.973	0.87	8.36±0.21***
OB (400 mg/kg)	2.28±0.10***	60.80	2.00	0.88	8.01±0.24**
LP (200 mg/kg)	1.77±0.10***	47.20	1.552	0.68	8.03±0.20**
LP (400 mg/kg)	2.08±0.10***	55.47	1.824	0.80	8.16±0.15***

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Table 2: Electrolyte concentration (mMol/L) in urine collected in 5th hour by I.P. administration of the ethanolic extracts of *A. vulgaris, I. oblongifolia, C. tinctorius, C. olitorius, O. basilicum* and *L. pubescens* in normal rats

Groups	Electrolytes excretion in mMol/L		
	Na^+	K^+	Cl^-
Control (saline)	124.46±2.67	64.83±5.94	174.99±31.94
Urea (1 g/kg)	176.19±5.56***	89.33±8.82*	238.18±42.93
Furosemide (5 mg/kg)	195.69±5.79***	111.16±8.58***	277.07±30.59*
AV (200 mg/kg)	191.14±2.46***	75.66±3.98	262.49±41.24
AV (400 mg/kg)	205.48±8.00***	94.66±3.61**	330.54±39.84*
IO (200 mg/kg)	173.21±3.48***	94.33±10.26*	262.49±48.80
IO (400 mg/kg)	180.02±6.73***	96.00±6.81**	369.43±39.84**
CT (200 mg/kg)	124.03±3.86	65.16±4.30	160.41±30.58
CT (400 mg/kg)	124.35±7.06	73.16±6.76	184.71±35.31
Control (saline)	145.95±1.45	52.5±1.35	170.45±9.00
Urea (1 g/kg)	210.57±13.37***	92.83±2.85***	247.90±12.48***
Furosemide (5 mg/kg	203.25±1.98***	76.66±2.23***	301.37±17.92***
CO (200 mg/kg)	161.55±8.82	55.5±1.97	204.15±16.84
CO (400 mg/kg)	161.59±3.29**	60.66±1.60**	228.45±17.53*
OB (200 mg/kg)	157.04±2.90**	55.66±2.07	213.87±12.30*
OB (400 mg/kg)	161.74±1.69***	69.16±1.85***	233.32±10.64**
LP (200 mg/kg)	199.81±3.72***	78.83±1.99***	243.05±9.72***
LP (400 mg/kg)	205.26±2.70***	88.00±1.86***	272.21±12.29***

Table 1: Dose response diuretic activity after 5th hour by I.P. administration of the ethanolic extracts of *A. vulgaris*, *I. oblongifolia*, *C. tinctorius*, *C. olitorius*, *O. basilicum* and *L. pubescens* in normal rats.

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Furosemide (5mg/kg	3.45±0.34***	92.00	3.77	1.92	9.61±0.19***
AV (200 mg/kg)	1.68±0.17*	45.80	1.69	0.86	8.95±0.30*
AV (400 mg/kg)	2.15±0.26**	57.33	2.17	1.10	9.00±0.28*
IO (200 mg/kg)	2.08±0.27**	55.46	2.10	1.07	8.43±0.32
IO (400 mg/kg)	2.70±0.16***	72.00	2.72	1.38	9.06±0.28**
CT (200 mg/kg)	0.81±0.20	21.60	0.81	0.41	7.63±0.30
CT (400 mg/kg)	0.80±0.06	21.33	0.80	0.40	7.16±0.29
Control (saline)	1.14± 0.092	30.4	-	-	7.13±0.9
Urea (1 g/kg)	2.57±0.01***	68.53	2.254	-	8.4±0.15***
Furosemide(5 mg/kg	4.22±0.10***	112.53	3.70	1.64	9.18±0.11***
CO (200 mg/kg)	1.16±0.05	30.93	1.017	0.47	7.31±0.18
CO (400 mg/kg)	1.63±0.07**	43.467	1.429	0.63	8.26±0.10***
OB (200 mg/kg)	2.25±0.09***	60.00	1.973	0.87	8.36±0.21***
OB (400 mg/kg)	2.28±0.10***	60.80	2.00	0.88	8.01±0.24**
LP (200 mg/kg)	1.77±0.10***	47.20	1.552	0.68	8.03±0.20**
LP (400 mg/kg)	2.08±0.10***	55.47	1.824	0.80	8.16±0.15***

Table 1: Dose response diuretic activity after 5th hour by I.P. administration of the ethanolic extracts of fractions of *A. vulgaris and I. oblongifolia* in normal rats

Groups	Urine Volume (ml)	Urinary Excretion $(V_0/V_1)X100$	Diuretic Action (UE_t/UE_c)	Diuretic Activity (DA_t/DA_u)	pH
Control(saline)	0.95±٠.٠٦	25.33	-	-	6.68±0.22
Urea (1gm/kg)	1.73±0.06***	46.13	1.82	-	7.41±0.16*
Furosemide (5mg/kg)	3.76±0.08***	100.26	3.95	2.17	8.6±0.19***
AV A (100mg/kg)	0.95±0.06*	25.33	1.00	0.55	6.95±0.12
AV A (200mg/kg)	1.08±0.09	28.8	1.14	0.63	6.93±0.15
AV C (100mg/kg)	1.23±0.06*	32.8	1.29	0.71	7.05±0.13
AV C (200mg/kg)	1.36±0.04***	36.26	1.43	0.78	7.1±0.11
AV P (100mg/kg)	1.76±0.08***	46.93	1.85	1.02	7.75±0.13**
AV P (200mg/kg	2.43±0.13***	64.8	2.56	1.41	7.9±٠.١٣***
IO A (100mg/kg)	1.6±0.08***	42.66	1.68	0.92	7.56±0.21*
IO A (200mg/kg)	1.7±0.10***	45.33	1.79	0.98	8.01±0.13***
IO C (100mg/kg)	0.96±0.06	25.6	1.01	0.55	6.96±0.1
IO C (200mg/kg)	1.21±0.08*	32.26	1.27	0.70	7.51±0.17*

Values are expressed as mean ± SEM (Number of animals, n=6)

V_0 = Total Urinary output V_1 = Total fluid input UE_t = Urinary excretion in test group

UE_c = Urinary excretion in control group DA_t = Diuretic action of test sample, DA_u = Diuretic action of urea

*P<0.05, **P<0.01, ***P<0.001, student's *t*-test

Conclusion:

- **The present study justified the use of *A .vulgaris, I. oblongifolia* and *L. pubescens* as diuretics.**
- **They were proved to be effective as hypernatramic, hyperchloremic and hyperkalemic diuretic; a fact that correlated well with the traditional use of the plant as a diuretic**
- **The effect may be produced by stimulation of regional blood flow or initial vasodilation, or by producing inhibition of tubular reabsorption of water and anions.**
- **Increased Na^+ and water excretion activity also provide strong basis for the anti-hypertensive action ascribed for the plants under investigation. However, the mechanism of action is still to be explored.**

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