

**Original Article****Diuretic Activity of Aerial Parts of *Rorippa indica***K Patel ^{1,*}, M Kukkar ², P Sachdeva ³, A Saluja ², R Kukkar ¹¹ Department of Pharmacognosy, School of Pharmacy, Rai University, Saroda, Ahmedabad, Gujarat, India.² Department of Pharmacognosy, A.R. College of Pharmacy & G. H. Patel Institute of Pharmacy, Vallabh Vidyanagar, Anand, Gujarat, India.³ Department of Pharmacology, A.R. College of Pharmacy & G. H. Patel Institute of Pharmacy, Vallabh Vidyanagar, Anand, Gujarat, India.

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Rorippa indica is commonly known as Indian field cress, chamsuru belonging to the family Brassicaceae. It is also known as Brassica or the mustard family. Whole plant is used as antiscorbutic, stimulant and diuretics. Literature survey showed that *Rorippa indica* is extensively used as a diuretic agent in herbal practice but its diuretic activity is not yet reported. Hence, in order to derive scientific evidences to the reported traditional claims, diuretic activity of hydro-alcoholic extract of *Rorippa indica* was carried out using Lipschitz model (*in-vivo* method). Excretion of urine was recorded at 5 and 24hrs and sodium and potassium content of the collected urine were estimated by Flame Photometer. For the calculation and presentation of results, urine volume excreted per 100g body weight was worked out and Na⁺/K⁺ ratio was calculated. All data were analysed for statistical significance (p<0.05) by one-way ANOVA followed by Tukey's test in comparison to control. The results of the present study revealed that the high dose of test extract of *Rorippa indica* showed significant increase in urine output as compared with the control group and Na⁺/K⁺ ratio calculated was found to be highly significant when compared to control group, suggesting good Diuretic activity possessed by HARI.

Keywords: Diuretic activity, Lipschitz value, Flame photometer, Na⁺/K⁺ ratio, Urine volume.**Corresponding author ***Kajal Patel
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E-mail: kajalp0507@gmail.com**1. INTRODUCTION**

Rorippa indica is commonly known as Indian field cress or chamsuru belonging to the family Brassicaceae. It is also known as Brassica or the mustard family. It is mainly found all over the world and distributed to the Mediterranean and North temperate regions [1, 2]. It is mustard like family with yellow flowers which is usually grown in moist or wet soils. It is native to Europe, Africa, North America and Asia. It is

found in India, along the roadsides and in wet agricultural fields. Literature reports that the whole plant contains organic acids, alkaloids and flavonoids [3].

The plant is reported to be used as antiscorbutic, stimulant and diuretic. It is also used in cold and pyrexia, dyspnoea and cough, measles with insufficient eruptions, rheumatic arthralgia, swelling, pain in the throat, anthracias and furunculosis, menostasia, injuries from falls, jaundice and edema, promotes blood circulation and is used as detoxifying agent [4].

The drugs that increase urine flow and disturb the extra cellular fluid balance are called diuretics. Diuretics are of great clinical significance and are used in various conditions such as hypertension, congestive cardiac failure, nephrotic edema, edema of pregnancy, edema of hepatic cirrhosis, glaucoma, acute renal failure and obesity [4].

Literature survey showed that *Rorippa indica* is extensively used as a diuretic agent in herbal practice but its diuretic activity is not yet reported. Hence, the present study "Diuretic activity of aerial parts of *Rorippa indica*" was undertaken.

2. MATERIALS AND METHODS

Collection and preparation of plant materials:

The fully grown, fresh entire leaves and stem of Chamsuru (*Rorippa indica*) were collected in the month of November from surrounding area of Anand, Gujarat, India. The drug was identified by a Taxonomist. A herbarium of the plant has been preserved in Department of Pharmacognosy, A. R. College of Pharmacy & G. H. Patel Institute of Pharmacy, Vallabh Vidyanagar. (Voucher specimen no. **KP/RI-02/06/19/ARGH-19**)

The collected whole plants of *Rorippa indica* were washed and the leaves and stem were separated from the entire plant. The dried plant material was pulverized with the help of mixer and sieved #40 mesh sieve to get the powder.

Preparation of hydro-alcoholic extract [5-10]

To defat the plant material 100gm dried powder of aerial parts (leaf & stem) of *Rorippa indica* was weighed and extracted with Petroleum ether (60^o-80^oC). The filtrate was then concentrated to dryness in a rotary evaporator to obtain crude Petroleum ether extract. Remaining marc was then dried and again exhaustively extracted with 70:30 ratio of water and alcohol. The pooled extract obtained was then concentrated under vacuum to give defatted Hydro-Alcoholic extract of *Rorippa indica* (HARI).

Phytochemical screening [5-10]

The dried extract was subjected to qualitative analysis for the detection of various phytoconstituents present.

Animals:

Wistar Albino rats weighing 200g-300g were acclimatized in the Animal House of A. R. College of Pharmacy & G. H. Patel Institute of Pharmacy, Vidyanagar. The animals were fed ad libitum with normal rat pellet diet and water.

The experimental protocol of the study was approved by the IAEC (Institutional Animal Ethics Committee) of A. R. College of Pharmacy & G. H. Patel Institute of Pharmacy, Vallabh Vidyanagar. Protocol no (CPCSEA/IAEC/ARCP/2018-2019/01).

Acute-toxicity studies [11]

Acute toxicity study was carried out as per OECD (Organization of Economic Co-operation and Development) guidelines 423 (Acute Toxic Class Method).

Stepwise doses of HARI (5,50,300,2000 mg/Kg b.w. p.o.) was administered and animals were observed individually at least once during the first 30 minutes and periodically during the first 24 hrs., with special attention given during the first 4hrs and daily thereafter, for a total of 14days.

Diuretic activity:

This test was based on the principle of water, sodium and potassium excretion in rats of test group as compared to rats treated with a dose of saline solution in control group.

Wistar Albino rats (200-300gm) were divided into four groups (n=6). The animals of Group (I) served as normal control which received normal saline (0.9% NaCl, 5ml/Kg b.w., p.o). The animals of Group (II) served as standard which received furosemide (10mg/Kg b.w., i.p.). Group (III) and Group (IV) received 200 and 400 mg/Kg b.w., p.o. of HARI. Three animals per group were placed in metabolic cages individually provided with a wire mesh bottom and a funnel was used to collect the urine passed. The rats were fed with standard diet and water ad libitum. 5 to 24 hrs prior to the experiment, food and water were withdrawn. Additionally, 5ml of 0.9% of NaCl solution per 100g of body weight was given by gavage. Urine excretion was recorded at 5 and 24hr [12, 13].

The sodium and potassium content of the collected urine were estimated by Flame Photometer. All data were analysed for statistical significance using one-way ANOVA followed by Tukey's Test and p<0.05 was considered statistically significant as compared to control.

3. RESULTS AND DISCUSSIONS

Phytochemical screening:

Qualitative chemical examination of hydro-alcoholic extract of the leaves and stem of *Rorippa indica* showed the presence of Alkaloids, Phytosterols and terpenoids, Tannins, Flavonoids, Oils and Fats and Carbohydrates.

Acute toxicity studies:

The acute oral toxicity study showed that HARI was devoid of any toxicity even at the dose of 2000mg/Kg b.w. Hence 200mg/Kg and 400mg/Kg b.w doses were selected for the study.

Diuretic activity:

Diuretic activity of HARI was done by using Lipschitz model (in-vivo method).

Both the doses of hydro-alcoholic extract of *Rorippa indica* produced a significant increase in excretion of Na⁺ and K⁺ ions and urine output when compared with control group.

HARI showed an increased diuretic effect with increase in dose. Thus results with high dose of *Rorippa indica* were found to be highly significant as compared to the results obtained with control group. (Table1)

Table 1: Diuretic effect of hydro-alcoholic extract of *Rorippa indica* in Wistar albino rats

Group	Treatment (mg/Kg)	Urine volume (ml/5hr/100g m) (X ± SD)	Na ⁺ (meq/l) (X ± SD)	K ⁺ (meq/l) (X ± SD)	Na ⁺ /K ⁺ ratio
Group I (Control)	0.9% NaCl (5ml/Kg, p.o)	1.77 ± 0.15	83.5 ± 1.54	83.2 ± 2.12	1
Group I (Standard)	Furosemide (10mg/Kg, i.p) + saline 0.9% NaCl (5ml, p.o)	4.54 ± 0.44 **	195.2 ± 4.5 **	137.3 ± 6.8 **	1.42
Group III (Low Dose)	200 mg/Kg + saline 0.9% NaCl(5ml, p.o)	2.02 ± 0.8	120.8 ± 2.19**	116.6 ± 6.6 **	1.04
LIV Group (High Dose)	400 mg/Kg + saline 0.9% NaCl (5ml, p.o)	2.27 ± 0.21 *	157 ± 0.77 **	128.6 ± 2.5**	1.21

Data are presented as mean ± standard deviation (n=6)

*p<0.05. Compared to control,**p<0.001 compared to control by one-wayANOVA followed by Tukey's test.

Aldosterone is a hormone secreted by adrenal cortex. It possess the ability to retain Na⁺ and water The concentration of aldosterone is found to be dependent on Na⁺/K⁺ ratio. If the Na⁺/K⁺ ratio falls below the normal level (in plasma), the aldosterone secretion will be decreased and if the ratio rises above the normal value the aldosterone secretion will be increased. The normal value of Na⁺/K⁺ ratio is reported to be 1.05 to 1.50.

Hydro-alcoholic extract in both the doses reduced the Na⁺/K⁺ ratio, indicating that it decreases the secretion of aldosterone. Since aldosterone secretion decreases excretion of urine and Na⁺ and K⁺ ion increases.

As seen in table1, the extract increases sodium excretion to larger extent than potassium, which is a very good quality of diuretic with lesser hyperkalaemic side effect.

The results of the present study revealed that the high dose of test extract of *Rorippa indica* showed significant increase in urine output as compared with the control group and Na⁺/K⁺ ratio calculated was found to be highly significant when compared to control group, suggesting good Diuretic activity possessed by HARI.

4. CONCLUSION

Through the present studies on the selected plant parts leaves and stem of *Rorippa indica*, its phytopharmacological evaluation could be validated to a reasonable level. The results can be used as scientific validation for the plant regarding its uses mentioned in traditional literature.

Biological studies of high dose of hydro-alcoholic extract of aerial parts (leaves and stem) of *Rorippa indica* reveals its significant diuretic activity, supporting its ethno-pharmacological use as diuretic. These results could be

attributable to the presence of flavonoid compounds in HARI or due to its ability to reduce the secretion of aldosterone [14].

This Diuretic effect of *Rorippa indica* can also be explored in the use of the plant in the management of some cardiovascular diseases like hypertension [15].

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