

PHARMACOGNOSTICAL STANDARDIZATION OF THE ROOTS OF *Rumex hastatus* D. Don

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## ABSTRACT

*Rumex hastatus* D. Don (Polygonaceae), commonly known as 'khatimal' is a perennial shrub, widely distributed in India. Traditionally the roots of the plant are used in various diseases. As no sufficient data is available regarding pharmacognostical standardization of the roots, so in this study various standardization parameters has been determined. The macroscopy, microscopy, physicochemical analysis such as ash values, loss on drying, extractive values, crude fibre content, swelling index, foaming index, bitterness value, haemolytic value were determined. The heavy metal analysis and microbial contamination study was also performed. The preliminary phytochemical screening was also performed which showed the presence of carbohydrates, anthraquinone glycosides, tannins, steroids and saponins. These pharmacognostic parameters would serve as a standard reference in terms of quality control for the future studies.

**Keywords:** *Rumex hastatus*, polygonaceae, standardization, phytochemical screening.

## INTRODUCTION

Standardization of herbal medicines is the process of prescribing a set of standards or inherent characteristics, constant parameters, definitive qualitative and quantitative values that carry an assurance of quality, efficacy, safety and reproducibility. It is the process of developing and agreeing upon technical standards. Specific standards are worked out by experimentation and observations, which would lead to the process of prescribing a set of characteristics exhibited by the particular herbal medicine. Hence standardization is a tool in the quality control process<sup>1</sup>. *Rumex hastatus* D. Don (Polygonaceae), commonly known as 'khatimal' is a perennial shrub, widely distributed in India in Jammu and Kashmir, Himachal Pradesh, Uttaranchal and Kumaun<sup>2</sup>. As per traditional uses, the decoction of the roots of the plant is used in asthma, backache and rheumatism<sup>3</sup>. The leaves and young shoots are used as flavouring agent, carminative, purgative, diuretic and in stomach problems<sup>4</sup>. The main chemical constituents which are reported from the plant belong to various classes viz; anthraquinones, naphthalenes, flavonoids and phenolic compounds<sup>5</sup>. Various pharmacological activities like anti-viral<sup>6</sup>, anti-bacterial, antifungal<sup>7</sup>, anti-diarrheal<sup>8</sup> and antioxidant<sup>9</sup> are reported from the plant. In case of *Rumex hastatus* roots, not much work regarding quality control parameters have been reported. The present paper describes the pharmacognostical parameters like macroscopical and microscopical features, physicochemical parameters, heavy metal analysis, microbial contamination study and preliminary phytochemical screening of the roots of *Rumex hastatus*. These parameters would serve as a standard reference in terms of quality control for the future studies.

## MATERIALS AND METHODS

## Plant material

The collection of whole plant of *Rumex hastatus* D. Don was done in the month of September, 2010 from Darlaghat, Distt Solan, Himachal Pradesh (India). The plant specimen was identified and authenticated by Dr.H.B.Singh, Head, Raw Material, Herbarium and Museum Division, NISCAIR, New Delhi (Ref.NISCAIR/RHMD/Consult/-2010-11/486/84).

## Macroscopic and microscopic study

The macroscopic study of the plant was done with naked eye and simple microscope. For the microscopic studies, roots were soaked in water and cross sections of the root were cut with the help of a sharp blade. The lignified tissues were stained with phloroglucinol and hydrochloric acid and then observed under compound

microscope. The powder microscopy of the root was performed according to standard methods<sup>10,11</sup>.

## Standardization parameters

The ash values such as total ash, acid insoluble ash, water soluble ash and sulphated ash were determined according to standard procedures<sup>12-15</sup>. The extractive values were studied according to standard procedures. Using various solvents of increasing polarity viz. petroleum ether, chloroform, ethyl acetate, methanol and water, successive extractive values of *Rumex hastatus* D. Don root powder were determined<sup>12-15</sup>. Crude fibre content, swelling index, foaming index, bitterness value, haemolytic value, heavy metal analysis and microbial contamination of root powder was determined according to WHO guidelines<sup>15</sup>.

## Preliminary phytochemical screening

The Preliminary phytochemical screening of the powdered root was carried out using standard procedures<sup>16,17</sup>.

## RESULTS

## Macroscopic characteristics

*Rumex hastatus* D. Don is a bushy shrub or under shrub 30-90cm high. The roots are cylindrical and 3.5-6.5 cm long and 0.5-0.9 cm wide. They are dark brown in colour and on the outer surface transverse fissures are present. The inner surface is brown in colour. The roots possess characteristic taste and odour. The fracture is short and mealy (Figures 1 and 2).

Figure 1: *Rumex hastatus* D. Don plantFigure 2: *Rumex hastatus* D. Don roots

### Microscopic characteristics

Transverse section of the root showed a single layer of cork cells. The cortex region consisted of 13-14 layers of polygonal parenchyma cells and in this region, rosette crystals, lignified sclerenchyma cells and fibres were present. A single layered endodermis was seen and inside the endodermis layer, phloem and xylem tissues were present. Pith was absent (Figure 3).

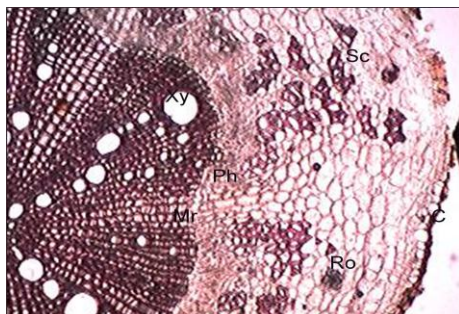


Figure 3: T.S of *Rumex hastatus* D. Don root.

C=Cork; Ro=Rosette crystal; Ph=Phloem ;Xy=Xylem

Mr=Medullary ray;Sc=Sclerenchyma tissue

### Powder characteristics

The root powder is dark brown in color with characteristic odour and taste. The microscopical examination revealed the presence of lignified cork cells, parenchyma cells, xylem vessels (reticulate and pitted), lignified sclerenchyma cells and fibres and rosette crystals (Figure 4).



Figure 4:(A-D): Powder characteristics of *Rumex hastatus* D. Don root

### Physicochemical analysis

The loss on drying content was found to be 7.6% w/w. The percentage values of total ash, acid insoluble ash, water soluble ash and sulphated ash was found to be 13.78, 0.77, 0.58, 2.3% respectively. The ethanol and water soluble extractive values by hot and cold methods were 4.90 and 0.56% w/w; 12.6 and 1.32 % w/w respectively. The roots yielded successive extractive values of 0.23%, 0.38%, 2.2%, 14.3% and 5.27% w/w with petroleum ether (60-80°C), chloroform, ethyl acetate, methanol and water respectively. The percentage of crude fibre content was 20.63%. The swelling index was found to be 5ml and the foaming index of the root was less than 100. *Rumex hastatus* root extract was found to be non-bitter. The haemolytic value was found to be 10.48%.

### Heavy metal analysis

Heavy metal analysis revealed the presence of lead, copper, iron, magnesium and sodium in the roots and the concentration of these elements was found to be below the WHO permissible limits (Table 1).

Table 1: Heavy metal concentration in *Rumex hastatus* D. Don root

Heavy metal	Concentration in ppm (root)
Arsenic	0.00
Lead	0.225
Sodium	0.162
Mercury	0.00
Iron	0.533
Copper	0.09
Magnesium	0.148

### Microbial contamination

The total microbial count was found to be below the maximum allowable limit and in the plant extract, *Escherichia coli*, *Salmonella typhi*, *Pseudomonas aeruginosa*, *Staphylococcus aureus* and *Clostridia* were absent (Table 2).

Table 2: Microbial studies of root of *Rumex hastatus* D. Don

Test	Specification	Value
Total bacterial count	NMT $1 \times 10^7$ CFU/g	$12 \times 10^2$ CFU/g
Total fungal count	NMT $1 \times 10^5$ CFU/g	$5.2 \times 10^4$ CFU/g
<i>Escherichia coli</i>	NMT $1 \times 10^4$ CFU/g	Absent
<i>Salmonella</i> spp.	Absent	Absent
<i>Pseudomonas aeruginosa</i>	Absent	Absent
<i>Staphylococcus aureus</i>	Absent	Absent
<i>Clostridia</i> spp.	Absent	Absent

### Preliminary phytochemical screening

As per preliminary phytochemical screening results, *Rumex hastatus* D. Don root extract revealed the presence of carbohydrates, tannins, sterols, saponins and anthraquinone glycosides.

### DISCUSSION

Standardization is a very important tool in the quality control process of medicinal plants and it distinguishes the authentic plant samples from its adulterants and substitutes. The present study establishes macro and microscopical characters, physico-chemical values, heavy metal determination and microbial study of *Rumex hastatus* D. Don roots. Preliminary phytochemical screening is one of the initial and necessary step to find out the nature of phytoconstituents present in different extracts of the plant which further leads to the isolation of compounds. The following parameters will be serving as a standard data for quality control studies of pharmaceutical preparations consisting of *Rumex hastatus* D. Don roots.

### CONFLICT OF INTEREST STATEMENT

The authors declare that there is no conflict of interest.

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