Establishment of Quality Parameters of Roots and Rhizomes of *Oxystelma esculentum*

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**ABSTRACT**

**Introduction:** *Oxystelma esculentum* is a perennial twiner growing near water-logged areas. Its roots are traditionally used as diuretic, galactagogue, anthelmintic, antiulcer, laxative and antiperiodic. The roots are also used ethnomedicinally by the tribes of Orissa in India for treating hepatitis. **Methods:** The present investigation deals with the pharmacognostic study of the roots and rhizomes of *Oxystelma esculentum* and establishment of its quality parameters, including physicochemical and phytochemical evaluation. **Results:** It was found that the roots and rhizomes of *O. esculentum* have almost similar microscopic features. They show the presence of cork and occasional lenticels, followed by phelloderm and cortex consisting of triangular or oval stone cells having U-shaped lumen. The pericycle consists of 4-5 continuous bands of stone cells followed by stele having endarch xylem. Sheath of calcium oxalate rosette crystals is present above the xylem. Pith is present in rhizome but absent in root. Microscopy of the powder revealed the presence of cork in surface view, stone cells, parenchymatous tissue lined internally by a large number of calcium oxalate rosette crystals and xylem vessels with different types of thickening. Various physico-chemical parameters and quantitative microscopic parameters were established. From the phytochemical screening, the roots and rhizomes were found to contain cardenolides, flavonoids, phenolics and sugars, which were estimated by their respective procedures. **Conclusion:** Establishment of these quality parameters can be useful in the identification, authentication and standardization of the plant material while also paving a way for exploring its phytoconstituents and possible therapeutic applications.

**Key words:** *Oxystelma esculentum*, Jaldudhi, Dudhlata, Asclepiadaceae.

**INTRODUCTION**

*Oxystelma esculentum* R. Br. syn. *Oxystelma secamone*, *Periploca esculenta*, *Periploca secamone*, *Sarostemma secamone*, *Sarostemma esculentum* and *Asclepias rosea* (Family – Asclepiadaceae) is commonly known as ‘Jaldudhi’ or ‘Dudhlata’ and is found near water logged areas of the plains and lower hills of the Indian subcontinent and Java.[1] The roots have been reported to possess antiperiodic, anthelmintic, diuretic, laxative, antiulcer and galactagogue activity.[2] They are used ethnomedicinally by the tribes of Orissa in India in throat infections, skin diseases and also in the treatment of hepatitis.[3] The present study deals with the pharmacognostic study of the roots and rhizomes of the plant and establishment of its various quality parameters.

**MATERIALS AND METHODS**

**Collection and authentication of the plant**

*O. esculentum* was collected in the flowering and fruiting stage from Barda Hills, Gujarat, India in November, 2008. Voucher specimen (No. RKCP/COG/01/2008) was deposited in R K College of Pharmacy, Rajkot. Authentication of herbarium was done by Dr. N. R. Sheth, Head of Department of Pharmaceutical Sciences, Saurashtra University.

**Pharmacognostic studies**

Fresh roots and rhizomes were used for pharmacognostical studies and quantitative microscopy. The roots and rhizomes were dried under shade and powdered to 60# separately and stored in airtight containers and used for physico-chemical evaluation and phytochemical studies. Macroscopical and
Physico-chemical evaluation

This included determination of moisture content, ash values (total ash, acid insoluble ash and water soluble ash) and extractive values (water and alcohol soluble extractives) (Table 2).[5]

Phytochemical studies

Phytochemical screening was performed (Table 3).[6-11] Estimation of phytoconstituents included that of cardenolides,[12] phenolics,[13] flavonoids[14] and sugars[15] (Table 4).

RESULTS AND DISCUSSION

Pharmacognostic study

Macroscopy

Roots and rhizomes are rough, creamish brown, cylindrical, 5-8 mm wide, having wiry lateral roots, lenticels and longitudinal striations. No characteristic odor or taste is present (Figure 1).

Microscopy: Transverse section

Roots & rhizomes of *O. esculentum* have almost similar microscopic features (Figure 2, 3). They show the presence of 5-7 layers of tangentially elongated brownish cork cells (Ck) and occasional lenticels (L). Phelloderm (Pd) consists

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Measured values (µ)</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Xylem vessel length</td>
<td>120.3 – 201.77 – 259.89</td>
<td></td>
</tr>
<tr>
<td>Xylem vessel diameter</td>
<td>92.23 – 109.24 – 119.27</td>
<td></td>
</tr>
<tr>
<td>Stone cell diameter</td>
<td>52.48 – 63.31 – 77.15</td>
<td></td>
</tr>
<tr>
<td>Rosette crystal diameter</td>
<td>12.88 – 23.39 – 37.2</td>
<td></td>
</tr>
</tbody>
</table>

Number of observations = 50

<table>
<thead>
<tr>
<th>Parameters</th>
<th>% w/w ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss on drying</td>
<td>70.20 ± 0.50</td>
</tr>
<tr>
<td>Ash values</td>
<td></td>
</tr>
<tr>
<td>Total ash</td>
<td>10.20 ± 0.25</td>
</tr>
<tr>
<td>Acid insoluble ash</td>
<td>0.75 ± 0.20</td>
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<tr>
<td>Water soluble ash</td>
<td>6.15 ± 0.20</td>
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<tr>
<td>Extractive values</td>
<td></td>
</tr>
<tr>
<td>Water soluble extractive</td>
<td>4.1 ± 0.18</td>
</tr>
<tr>
<td>Alcohol soluble extractive</td>
<td>2.2 ± 0.16</td>
</tr>
</tbody>
</table>

Number of observations = 5
SD = Standard Deviation

Figure 1: *Oxystelma esculentum* (At column width)
of stone cells, almost triangular or oval, isolated or in groups of 2-4, having U-shaped lumen. The cortex is narrow, consists of 4-6 layers of parenchymatous cells and stone cells (St) similar to those present in the phelloderm. (Figure 3A). 4-5 continuous bands of stone cells are present in the pericycle (Per) (Figure 3B). The stele of rhizome is large and consists of bicollateral vascular bundles having endarch xylem (X), whereas the vascular bundles of roots are collateral. The xylem vessels are mainly surrounded by thick-walled lignified xylem fibres. Xylem parenchyma cells are few (Figure 3D). Sheath of rosette crystals of calcium oxalate (CrS) is present above the xylem (Figure 3C). Parenchymatous pith (P) lies in the centre in rhizome, but is absent in root (Figure 3E).

**Microscopy: Powder characteristics**

It is a creamish white powder with no distinct odor or taste. The diagnostic feature of the powder is parenchymatous tissue filled with large number of rosette crystals of calcium oxalate. Stone cells, rectangular, oval or triangular in shape, isolated or in groups, sometimes with U-shaped lumen, were present in abundance. Xylem vessels with pitted, bordered pitted, reticulate and annular thickening were present. Cork in surface view was also visible (Figure 4).

### CONCLUSION

A detailed study of roots and rhizomes of *Oxystelma esculentum* was performed. Microscopic study revealed the presence of diagnostic features like cork in surface view,
stone cells, parenchymatous tissue having large number of calcium oxalate rosette crystals and xylem vessels with different types of thickening. Various quantitative microscopic parameters and physico-chemical parameters were established. Values of water soluble extractives were greater than those of alcohol soluble extractives, indicating the presence of water soluble phytoconstituents in higher amounts. Cardenolides, phenolics, flavonoids and sugars were detected by a thorough phytochemical screening procedure and they were estimated by their respective methods. This indicates that the plant can be useful for treating different diseases, especially those related to the cardiovascular system, as the therapeutic activity of a plant is always due to the presence of particular class of phytocompounds. The present study can serve as a useful gauge in the identification, authentication and standardization of the plant material as well as investigating its phytochemical composition, which would help in investigation of its possible pharmacological actions.

REFERENCES

Figure 4: Powder study (X400)
A, Stone cells; B, Parenchymatous tissue filled with rosette crystals of calcium oxalate; C, Xylem vessels with pits and bordered pits; D, Xylem vessels with reticulate thickening; E, Cork in surface view.