Pharmacognosy of the stems of *Portulaca quadrifida* L. and *Portulaca oleracea* L.

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Abstract. Pharmacognostic details of the stems of *P. quadrifida* L. and *P. oleracea* L. are reported to distinguish one from the other.

Keywords. Pharmacognosy; *Portulaca quadrifida* L.; comparison with *P. oleracea* L.

1. Introduction

*Portulaca quadrifida* and *Portulaca oleracea*, commonly known as Chhota Luniya and Bara Luniya respectively, are succulent annual herbs and grow abundantly in wild state throughout warmer regions of India (Anon 1969). It has been suggested that from the therapeutic point of view they are quite similar and one can be used as a substitute for the other by the drug dealers (Dymock *et al* 1980; Kirtikar and Basu 1975). Detailed chemical analysis of leaf and stem of *P. oleracea* was worked out by Sadana and Ahmed (1947). Recently Lal (1980) described the pharmacognostic features of the leaf of *P. quadrifida*. The pharmacognostic details of the stems of both species are presented in this paper.

2. Materials and methods

Fresh plants of *P. quadrifida* and *P. oleracea* collected from the Botanical Garden of Aligarh Muslim University were fixed in FAA. After usual processing, free hand and microtome sections were cut and stained in safranin and fast green. Fluorescence analysis and extractive and ash values of the powdered mass of stems were carried out by Chase and Pratt (1949) and *Indian Pharmacopoeia* (Anon 1966) methods respectively.
2.1 Macroscopic characters

The stem of *P. quadrifida* is succulent, diffuse, filiform, purple in colour at maturity, less than a millimeter in diameter; on crushing mucilaginous; mucilage slimy; rooting at the nodes; nodal appendages many, pilose, white; internodes 1.5 to 3 cm long; without any smell and taste acidic. The stem of *P. oleracea* (figure 8) on the other hand, is about 2 mm in diameter; internodes 1.5 to 3.5 cm long; nodal appendages less in number, minute, scarious. The other morphological characters are more or less similar to *P. quadrifida*.

2.2 Microscopic characters

The cross-section of the stems of both the species are almost circular (figures 2 and 9). The epidermal cells are polygonal in shape in both species and are surrounded externally by thick striated cuticle. The outer wall of some of the

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Epidermal cells of *P. quadrifida* slightly bulge out. Acicular crystals which appear as crystals and in cross section are present in some of the epidermal cells of *P. quadrifida* (figure 4). Epidermis is followed by 2-3 layers of collenchyma cells in the stem of *P. oleracea* (figures 9 and 10A), whereas it is parenchymatous in *P. quadrifida* (figure 3A). The parenchyma in both species consists of thin-walled, more or less isodiametric cells with large intercellular spaces. These cells are loaded with starch grains, simple as well as compound. The compound starch grains are usually 2 or 3 celled (figures 5F and 11). Druses, prisms, acicular crystals and colourless mucilage cells are commonly present in both the species. The endodermis in both species is not well defined. Collateral vascular bundles are arranged in a ring in both but the number of bundles in *P. oleracea* is almost double or even more than those in *P. quadrifida* (figures 2 and 9). Pith consists of thin-walled isodiametric cells some of which contain calcium oxalate crystals (figure 3B). The macerated xylem consists mostly of helical and scalariform vessel elements with simple perforation (figures 6, 7A, B, C and 12) and fibres with intrusive growth.

The measurement of different tissues and cells is given in table 1.

### Table 1. Measurement of different tissues and cells in microns.

<table>
<thead>
<tr>
<th></th>
<th><em>P. quadrifida</em></th>
<th><em>P. oleracea</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cuticle</td>
<td>$M = 3.33 - 6.66$ thickness</td>
<td>$3.66 - 6.89$ thickness</td>
</tr>
<tr>
<td>Epidermis</td>
<td>$M = 23.31 \times 6.66 - 39.96$</td>
<td>$39.6 \times 26.4 - 42.9 \times 29.7$</td>
</tr>
<tr>
<td></td>
<td>$\times 19.98 - 79.92 \times 49.94$</td>
<td>$- 49.6 \times 36.4$</td>
</tr>
<tr>
<td>Parenchyma</td>
<td>$M = 6.66 - 13.32 - 93.24$ diameter</td>
<td>$46.8 - 124.8 - 156.0$ diameter</td>
</tr>
<tr>
<td>Collenchyma</td>
<td>Absent</td>
<td>$M = 33.3 - 66.6$ diameter</td>
</tr>
<tr>
<td></td>
<td>$T = 79.92 \times 23.31 - 123.21$</td>
<td>$90.0 \times 28.54 - 223.31 \times 68.27$</td>
</tr>
<tr>
<td></td>
<td>$\times 63.27 - 404.0 \times 31.10$</td>
<td>$- 532.98 \times 35.30$</td>
</tr>
<tr>
<td>Fibres</td>
<td>$M = 15.55 - 23.32 - 31.10$ diameter</td>
<td>$46.8 - 124.8 - 153.50$ diameter</td>
</tr>
<tr>
<td></td>
<td>$T = 155.50 \times 23.32 - 233.25 \times 31.10$</td>
<td>$- 532.98 \times 35.30$</td>
</tr>
<tr>
<td>Pith</td>
<td>$M = 16.65 - 23.31 - 66.60$ diameter</td>
<td>$46.8 - 124.8 - 153.50$ diameter</td>
</tr>
<tr>
<td>Druse</td>
<td>$M = 33.30 - 39.96 - 49.96$ diameter</td>
<td>$46.8 - 78.0 - 124.8$ diameter</td>
</tr>
</tbody>
</table>

$M$ = measurement in cross-section; $T =$ measurement of macerate

### 2.3 Macerate

Macerate consists of cuticle, parenchyma cells, xylem vessel elements, fibres, starch grains and druses (figures 5, 6, 7, 11 and 12).

### 2.4 Extractive and ash values

Extractive and ash values were determined according to Anon (1966) and the results are given in table 2.

Table 2. Extractive and ash values of the stems of *P. quadrifida* and *P. oleracea*.

<table>
<thead>
<tr>
<th>Extractive and ash values</th>
<th><em>P. quadrifida</em></th>
<th><em>P. oleracea</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Water soluble extractive (chloroform water)</td>
<td>19.73%</td>
<td>25.00%</td>
</tr>
<tr>
<td>Alcohol soluble extractive</td>
<td>10.32%</td>
<td>18.50%</td>
</tr>
<tr>
<td>Total ash</td>
<td>9.09%</td>
<td>25.18%</td>
</tr>
<tr>
<td>Acid insoluble ash</td>
<td>0.63%</td>
<td>3.18%</td>
</tr>
</tbody>
</table>

2.5 Fluorescence analysis of the powdered drugs

The stem powders prepared by drying fresh specimens at 60°C were chemically treated and exposed to ultraviolet light. The fluorescence observed is recorded in table 3.
2.6 Chromatographic studies

Alcohol extracts of the stems of *P. quadrifida* and *P. oleracea* were subjected to thin layer chromatography with the solvent system methanol : chloroform (3:7). The plates were developed by iodine vapours. They showed the presence of four spots (figure 13) with Rf values 0.05, 0.65, 0.73, 0.90 and 0.05, 0.65, 0.76, 0.88 respectively. This indicates that the two species have more or less the same chemical constituents.

3. Conclusion

The two species differ considerably in their measurements of cells and tissues (table 1), extractive and ash values (table 2) and fluorescence analysis of the powdered drugs under uv light (table 3). Little or no differences were obtained in TLC studies as shown in the chromatogram (figure 13). Undoubtedly, the
stems of *P. quadrifida* and *P. oleracea* differ morphologically and anatomically. They also differ in extractive and ash values as well as in fluorescence analysis under UV light; yet in view of the similarities in therapeutic properties the stem of *P. quadrifida* can be used as a substitute for that of *P. oleracea*.

Acknowledgements

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**Abbreviations:**  
CA : Cambium;  
ACO : Angular collenchyma;  
CR : Druses;  
CS : Crystal sand;  
CST : Compound starch grains;  
CU : Cuticle;  
EP : Epidermis;  
INV : Involucre;  
LF : Leaf;  
NA : Nodal appendages;  
PAR : Parenchyma;  
PHL : Phloem;  
FTH : Fith;  
PR : Prismatic crystal;  
ST : Starch grains;  
VB : Vascular bundle;  
XY : Xylem.