The genera *Polygonum* and *Bilderdykia* (Polygonaceae) in southern Africa: morphology and taxonomic value of the ocrea and fruit

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**ABSTRACT**

The external morphology of the fruit and the ocrea of 16 taxa of *Polygonum* and *Bilderdykia* in southern Africa was studied. Fruits are either lenticular or trigonous. Six types of fruit surfaces were distinguished. Five types of ocreae were found, characterized by: a green undulating limbus; a silvery hyaline sheath; a brown tubular sheath without terminal hairs; a terminal fringe of short cilia or setae; and a bristly hairy sheath fringed with long rigid setae.

**INTRODUCTION**

The aim of this study was to examine the morphology of the ocrea and fruit of 16 of the southern African species of the genera *Polygonum* and *Bilderdykia*, and to determine their taxonomic importance.

**MATERIALS AND METHODS**

The herbarium voucher specimens mentioned in the captions of the figures are all kept at the National Herbarium (PRE), Botanical Research Institute, Pretoria.

Fruits were coated with gold-palladium and studied and photographed with the aid of a scanning electron microscope (Hitashi-Akashi Model MSM-4). The negatives are stored in the Botanical Research Institute, Pretoria.

**RESULTS**

Organography of the fruits

In *Polygonum* and *Bilderdykia* the ovary is superior, sessile, 1-locular, with a solitary basal, sessile or stalked ovule. The fruit is a nut enclosed by the persistent perianth (Dyer 1975). During dispersal the seed remains enclosed in the entire fruit wall (Harder & Firbas 1965).

Based on the shape of the fruit, two types are recognized (Table 1): 1. trigonous or 3-angled fruits (Figure 1A) and 2. lenticular fruits (Figure 1B). In both types the surfaces are either concave (Figure 1A) or convex (Figure 1C). Trigonous fruits and lenticular fruits with convex surfaces

**TABLE 1.—Fruit shape, surface type and ocrea type found in species of *Polygonum* and *Bilderdykia***

<table>
<thead>
<tr>
<th>Fruit shape</th>
<th>Fruit surface</th>
<th>Ocrea</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>P. aviculare</em> plebeium</td>
<td>with protuberances</td>
<td>silvery hyaline</td>
</tr>
<tr>
<td><em>kistabilianum</em></td>
<td>smooth, shiny</td>
<td></td>
</tr>
<tr>
<td><em>maritimum</em></td>
<td>smooth, shiny</td>
<td></td>
</tr>
<tr>
<td><em>meissnerianum</em></td>
<td>criss-cross</td>
<td>shiny</td>
</tr>
<tr>
<td><em>B. convolvulus</em></td>
<td>with protuberances</td>
<td></td>
</tr>
<tr>
<td><em>P. salicifolium</em></td>
<td>smooth, shiny</td>
<td></td>
</tr>
<tr>
<td><em>P. lapathifolium</em> senegalense</td>
<td>lenticular, concave</td>
<td>smooth, shiny</td>
</tr>
<tr>
<td></td>
<td>without terminal hairs</td>
<td></td>
</tr>
<tr>
<td><em>P. nepalense</em> hystricum</td>
<td>areolate</td>
<td>without terminal hairs</td>
</tr>
<tr>
<td><em>amphibium</em></td>
<td>ridged</td>
<td>without terminal hairs</td>
</tr>
<tr>
<td><em>undulatum</em></td>
<td>wartly</td>
<td>without terminal hairs</td>
</tr>
<tr>
<td><em>hydriper</em></td>
<td>smooth, shiny</td>
<td>short rigid setae</td>
</tr>
<tr>
<td><em>limbatum</em></td>
<td>ridged</td>
<td></td>
</tr>
<tr>
<td><em>pulchrum</em></td>
<td>smooth, shiny</td>
<td></td>
</tr>
<tr>
<td></td>
<td>smooth, shiny</td>
<td>short rigid setae</td>
</tr>
<tr>
<td></td>
<td>spreading limb</td>
<td>bristly hairy</td>
</tr>
</tbody>
</table>
FIGURE 1.—Electron micrographs of Polygonum spp. A, trigonous fruit, P. plebeium, Germishuizen 1386, x 36; B, lenticular-concave fruit, P. senegalense subsp. senegalense, Germishuizen 1169, x 30; C, lenticular-convex fruit, P. nepalense, Scheepers 1130, x 54.

are common, whereas lenticular fruits with concave surfaces are found only in Polygonum lapathifolium and P. senegalense (Table 1).

The surface of the fruits varies considerably and six different types of surfaces can be distinguished (Table 1):

1, with protuberances of varying size (Figure 2A). The fruits have a dull matted appearance;
2, smooth and shiny (Figure 2B);
3, with criss-cross pattern (Figure 2C);
4, ridged (Figure 2D);
5, areolate (Figure 2E), found only in P. nepalense;
6, warty (Figure 2F), found only in P. amphibium.

Organography of the ocrea

The ocrea (plural: ocreae; sometimes spelled ochreae), is a tubular sheath formed when the stipules are united into a hood, which covers the stem apex at first; later it is ruptured and remains as a membranous tube surrounding the stem at the nodes (Harder & Firbas 1965).

Ocreae of the southern African species of the genera Polygonum and Bilderdykia can be divided into five different types (Table 1):

1, a tubular membranous sheath ending terminally in a spreading or recurved, green, leaf-like undulating limb with a strigose margin (Figure 3A). This type occurs only in P. limbatum.

2, a silvery hyaline sheath, conspicuously veined, reddish at the base or red all over, lacerating easily (Figure 3B). This type is found in five species.

3, a brown membranous tubular sheath, conspicuously veined without or rarely with short terminal hairs (Figure 3C). This type occurs in six species.

4, a tubular membranous sheath fringed with short rigid cilia or setae (Figure 3D). This type occurs in three species.

5, a brown tubular sheath, bristly hairy and fringed with numerous long rigid setae and tearing readily on one side (Figure 3E). This type is found only in Polygonum pulchrum. Ocreae can be smooth and hairless (Figure 4A) or pubescent with multicellular trichomes (Figure 4B).

DISCUSSION AND CONCLUSION

From Table 1 a key has been compiled using only fruit shape, fruit surfaces and ocreae found in species of Polygonum and Bilderdykia.

1a Nut trigonous:
2a Ocrea silvery hyaline:
3a Nut smooth, shiny ................................................ P. plebeium
3b Nut with protuberances .......................................... P. kitaibelianum
3c Nut with criss-cross pattern .................................. P. aviculare

2b Ocrea not silvery hyaline:
4a Ocrea with short rigid setae ................................. P. salicifolium
4b Ocrea without terminal hairs:
5a Nut surface with protuberances ........................... P. meisnerianum
5b Nut surface with criss-cross pattern ...................... B. convolvulus

1b Nut lenticular:
6a Nut with concave surface:
7a Nut surface smooth, shiny ................................ P. lapathifolium
7b Nut surface ridged .................................................. P. nepalense
6b Nut with convex surface:
8a Ocrea with green spreading limb ....................... P. limbatum
8b Ocrea without spreading limb:
9a Nut surface smooth, shiny ................................ P. undulatum
10a Ocrea silvery hyaline ........................................ P. pulchrum
10b Ocrea bristly hairy .............................................. P. senegalense
9b Nut surface ridged, areolate or warty:
11a Ocrea without terminal setae: .............................. P. nepalense
12a Nut surface areolate .............................................. P. hystriculum
12b Nut surface warty ............................................... P. amphibium
11b Ocrea with short rigid terminal setae; nut surface ridged ........................................... P. hydropiper
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In their treatments of the family Polygonaceae, C.H. Wright in *Flora capensis* (1912) and R.A. Graham in *Flora of tropical east Africa* (1958) make some use of the fruit shape and ocrea type in their species keys, and they make reference to them in their descriptions.

In the *Flora of southern Africa* (Vol. 9,1 in prep.) fruit shape, fruit surface and ocrea type play a major role in the keys. In this paper it is the first time that these features have been illustrated. In the genera *Polygonum* and *Bilderdykia* the fruit and the ocrea are the two most important organs for distinguishing between the taxa.

REFERENCES


