AN OUTLINE REVISION OF THE SUBTRIBE SIPHOCAMPYLLINAE (LOBELIACEAE)

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Abstract

Morphological diagnostic characters to differentiate genera of subtribe Siphocampylinae (family Lobeliaceae) are indicated. A key to the genera of this subtribe is included.

Introduction

Lobeliaceae includes about 1200 species widespread in tropical and subtropical areas. Reviews by Wimmer (1943, 1953, 1968) have greatly clarified the taxonomic arrangement of the family, and many taxa are now better known. In this contribution a preliminary arrangement of subtribe Siphocampylinae "Eusiphon" is presented, as well as distributions areas of the accepted genera (fig. 1).

Wimmer (1948) described Siphocampylinae to include those Lobeliaceae with bilocular ovary, loculicidic capsule (dehiscent by two apical valves), and flowers crowded in apical racemes or solitary at the basis of uppermost leaves. The new subtribe included three groups ("rami"), of which "Eusiphon" grouped plants with a long entire (not longitudinally opened) tube of corolla. In this "ramus" he placed Siphocampylus Pohl, Diastatea Scheidw., and Laurentia (including other small genera as Enchysia C. P. Presl, Hippobroma G. Don, Isotoma (R. Br.) Lindl., Palmerella A. Gray, Porterella Torrey, or Solenopsis C. Presl).

Nevertheless, as Laurentia Adans. was published to replace the former Lobelia L. is to be treated as illegitimate (Meikle, 1979). In this situation, a rearrangement of the "ramus" is needed to clarify the position of genera related to the former Laurentia, which is here attempted from the basis of morphological, carpological, and biogeographical features.

Diagnostic characters

Several morphological characteristics are useful to distinguish genera of subtribe Siphocampylinae. Features used in this survey (Table 1) are as follows:

Biotype and habit

Siphocampylus is the only genus formed always by shrubs up to 6 m, and even vines. Other genera include annual or herbaceous perennial plants.

Stems are commonly erect. Nevertheless, Enchysia includes decumbent plants, and Isotoma fluviatilis is the only known species in the subtribe with rooting prostrate stems.
Fig. 1. World distribution of the studied genera.
<table>
<thead>
<tr>
<th>Genus</th>
<th>Annual</th>
<th>Perenn.</th>
<th>Inflor. axillary</th>
<th>Inflor. terminal (1-flower)</th>
<th>Inflor. terminal (many-flowered)</th>
<th>Length of calyx-lobes</th>
<th>Length of corolla</th>
<th>Position of ovary</th>
<th>Length of filaments</th>
<th>N° of free filaments</th>
<th>Length of the anther tube</th>
<th>Length of capsules</th>
<th>Length of seeds</th>
<th>Shape of seeds</th>
<th>Surface of seeds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Siphocampylus</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>1-26</td>
<td>20-70</td>
<td>Inferior</td>
<td>10-80</td>
<td>0</td>
<td>4-16</td>
<td>4-20</td>
<td>0.6-1.5</td>
<td>ovate, ellipsoid or rounded</td>
<td>reticulate</td>
</tr>
<tr>
<td>Diastatea</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>1.5-6.5</td>
<td>3-25</td>
<td>Superior</td>
<td>3-11</td>
<td>0</td>
<td>0.5-2</td>
<td>3-13</td>
<td>0.5-0.6</td>
<td>elliptic</td>
<td>lustrous, nearly smooth</td>
</tr>
<tr>
<td>Isoloma</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>2-10</td>
<td>3-30</td>
<td>Inferior</td>
<td>3-20</td>
<td>0</td>
<td>1.3-5</td>
<td>3-18(22)</td>
<td>0.4-0.7</td>
<td>elliptic to orbicular</td>
<td>reticulate, weakly striate, verrucose-rugose or sulcate</td>
</tr>
<tr>
<td>Hippobroma</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>10-22</td>
<td>50-140</td>
<td>Inferior</td>
<td>55-95</td>
<td>0</td>
<td>4-6</td>
<td>18-25</td>
<td>0.6-0.8</td>
<td>cylindrical</td>
<td>isodiometrically foveate-reticulate</td>
</tr>
<tr>
<td>Falmerella</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>5-14</td>
<td>20-30</td>
<td>Inferior</td>
<td>9.5-17</td>
<td>3</td>
<td>2-3</td>
<td>5-8(12)</td>
<td>0.5</td>
<td>ellipsoid-lenticular</td>
<td>lustrous, sulcate with flattened walls</td>
</tr>
<tr>
<td>Porterella</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>3-8(11)</td>
<td>(9)13-20</td>
<td>Inferior</td>
<td>3-7</td>
<td>5</td>
<td>1.5-2.6</td>
<td>5-10(16)</td>
<td>1</td>
<td>fusiform</td>
<td>lustrous, sulcate</td>
</tr>
<tr>
<td>Enchysia</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>1-3</td>
<td>3-18</td>
<td>Inferior</td>
<td>2-6</td>
<td>5</td>
<td>0.8-1</td>
<td>2.5-6</td>
<td>0.4-0.5</td>
<td>subglobose</td>
<td>lustrous, sulcate with flattened walls</td>
</tr>
<tr>
<td>Solenopsis</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>1-4</td>
<td>3.5-12</td>
<td>Inferior</td>
<td>1.5-2.5</td>
<td>5</td>
<td>0.7-1.75</td>
<td>1-3</td>
<td>0.3-0.55</td>
<td>ellipsoid</td>
<td>lustrous, sulcate-keeled</td>
</tr>
</tbody>
</table>

Table 1. Comparison of some characters among all studied genera (all measurements in mm).
Leaves

As commonly occurs in Lobeliaceae, leaves should not be used to separate genera within the subtribe. They are generally lineal to orbicular, and entire to pinnate. Nevertheless, leaves can be useful to distinguish amongst species within a genus.

Inflorescence

Three inflorescence types are present in Siphocampylinae which can be successfully used to taxonomy in generic and infrageneric ranks.

First of all, one-flowered scapes arising from a basal rosette of leaves are quite rare, and are found only in most of Solenopsis species and Isotoma scapigera (R. Br.) G. Don. Moreover, in Solenopsis flowering scapes bear 1-3-bracteoles at the middle, which are always basal or absent in the other genera.

Secondly and related to the former type, one-flowered inflorescences arising from bracts generally quite similar to cauline leaves. This second type appears in all genera, excepting Diastatea, Palmerella, and Porterella.

Finally, dense to lax racemose axillary inflorescences (few- to many-flowered) are quite common in the subtribe, although lacking in Hippobroma and Solenopsis.

Calyx

Calyx features are quite similar in all cases. All calyx-lobes are similar in size (1-26 mm long) and shape (linear to lanceolate), and generally erect (some species of Siphocampylus have reflexed lobes). In Diastatea and Isotoma calyx indumentum, size or margin can be used for taxonomic purposes.

Corolla

In all genera, corolla is generally bluish or whitish, sometimes with spotted throat. Nevertheless, several species of Siphocampylus have sometimes cream, greenish-white, purplish, reddish or yellowish-green corolla. Hippobroma has the largest corolla, up to 140 mm, which is long tubular. Only several Siphocampylus have also a larger corolla up to 70 cm. All the other genera have a quite smaller corolla (3-30 mm).

With regard to the corolla shape, Hippobroma is the only genus with clearly regular flowers, although some species of Isotoma have very slightly zygomorphic ones. In all the other genera, flowers are strongly zygomorphic, and commonly 2-lipped (2 erect lanceolate lobes in the upper lip, and 3 wider lobes in the lower). Siphocampylus, however, has long tubular flowers weakly curved near the apex, with all lobes erect and acute.
Filaments and anther tube

Both characteristics are quite interesting to separate genera in Lobeliaceae. Staminal filaments are adnate to corolla or not (free), and vary in length according to corolla size. Attending to number of free filaments, the following situations appear: 1, Diastatea, Hippobroma, Isotoma and Siphocampylus have all filaments connate to corolla. 2, Palmerella has only two filaments connate to corolla. 3, Enchysia, Porterella and Solenopsis have all filaments free. This latter case is quite common in Lobeliaceae.

Anthers are connate into a tube round the style, always with apical setae (bearded). Diastatea, Enchysia, Palmerella, Porterella and Solenopsis bear the smallest anthers (0.5-3 mm). Isotoma and Hippobroma vary from 1.3 to 6 mm, and Siphocampylus has again the largest anthers (4-16 mm).

Anther colour is generally grey or brightly black, and only Hippobroma has white anthers.

Indumentum of anthers could be interesting to differentiate infrageneric taxa, mainly with regard to density, size, and also number of apical setae. Further studies are needed to establish their taxonomic value.

Fruit

In Siphocampylinae fruit is always a bilocular capsule. Inferior ovaries are quite common in this subtribe, excepting Diastatea with superior ovary which is present only in a few genera of Lobeliaceae. Other characteristics (indumentum, size, etc.) are quite variable within a single genus. Nevertheless, Solenopsis (1-3 mm) and Enchysia (2-6 mm) have the smallest fruits, and Hippobroma (18-25 mm) has the largest.

Seed

Seed features are perhaps the most important characters to distinguish most of genera of Siphocampylinae (fig. 2), since there are very small variations within a single genus. Most of genera have ellipsoid seeds, which also can be orbicular to cylindrical in both Isotoma and Siphocampylus. However, seeds are always cylindrical in Hippobroma, and subglobose in Enchysia. The largest seeds appear in Porterella (up to 1 mm) and Siphocampylus (up to 1.5 mm).

Testa surface is normally reticulate or sulcate and lustrous, excepting Diastatea which has nearly smooth seeds. In a few species of Isotoma testa can be also striate or rugose, and in Hippobroma and Siphocampylus it always is isodiometrically foveate-reticulate or reticulate. Other microsculptural features (e.g. shape and size of walls, aspect of the ornament, etc.) can be used to differentiate amongst genera or species.
Fig. 2. Testa of all accepted genera in Siphocampylinae “Eusiphon”; 1, Siphocampus (reticulate); 2, Diastatea (smooth); 3, Hippobroma (foveate-reticulate); 4, Isotoma (striate); 5, Porterella (sulcate); 6, Palmerella (sulcate with flattened walls); 7, Solenopsis (sulcate), and 8, Enchysia (sulcate with flattened walls).
Key to genera of Siphocampylinae “Eusiphon”

1. Perennial plants, small trees, shrubs, or vines. Corolla commonly with curved tube, and lobes always upright to the corolla tube. Anthers with tube 4-16 mm long .............................................. **Siphocampylus**
   - Herbaceous plants, generally annual. Corolla with straight tube, 2-lipped or rarely regular, and with at least 3 lobes almost perpendicular to the corolla tube. Anthers with tube 0.5-6 mm long ................. 2

2. Ovary and capsule superior. Calyx-lobes free from the base. Seed nearly smooth and bright ...................................................... **Diastatea**
   - Ovary and capsule inferior. Calyx-lobes shaping a crown. Seed ornamented ...... 3

3. Filaments of stamens adnate to at the corolla. Corolla nearly regular .......... 4
   Three or more filaments free to the corolla. Corolla clearly zygomorphic,
   - 2-lipped, the upper lip 2-lobed and the lower 3-lobed .............................................. 5

4. Corolla up to 30 mm. Calyx-lobes 2-10 mm long. Filaments 3-20 mm long. Anther tube bright black. Lower anthers setose at the apex .......... **Isotoma**
   - Corolla more than 50 mm. Calyx lobes 10-22 mm long. Filaments 55-95 mm long. Anther tube white. All anthers setose at the apex .......... **Hippobroma**

5. Filaments of 3 lower stamens free to the corolla. Corolla 20-30 mm long. Filaments 9.5-17 mm long .............................................. **Palmerella**
   - All filaments free. Corolla 3-20 mm long. Filaments 1.5-7 mm long ............. 6

6. Capsule 5-10 (16) mm long. Seed 1 mm long. Calyx-lobes 3-8 (11) mm long. Stems fleshy ...................................................... **Porterella**
   - Capsule 1-6 mm long. Seed 0.3-0.5 mm long. Calyx-lobes 1-4 mm long.
     Stems not fleshy ................................................................. 7

7. Seed subglobose, without strophiole, sulcate with flattened walls.
   Capsule 2.5-6 mm long. Filaments 2-6 mm long. Pedicels bracteate at the base. Decumbent herbs with axillary inflorescence, or erect plants with terminal many-flowered inflorescence.................................. **Enchysia**
   - Seed ellipsoid, strophiolate, sulcate with keeled walls. Capsule 1-3 mm long. Filaments 1.5-2.5 mm long. Pedicels with 1-3 bracteoles in the middle part. Plants erect, never decumbent, with 1-flowered axillary or terminal inflorescences ...................................... **Solenopsis**

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