Bicarpellate gynoecium in two species of *Senna* (Fabaceae, Caesalpinioiidae, Cassiinae)

Natan Messias Almeida¹, José Alves Siqueira Filho², Paulo Eugênio Oliveira³, Reinaldo Rodrigo Novo⁴ and Cibele Cardoso Castro⁴,⁵*

Received: March 30, 2016
Accepted: April 28, 2016

**ABSTRACT**

Flowers of species of *Senna* are very morphologically diverse, however, nothing has been reported regarding variation in the presence of a unicarpellate gynoecium, which is characteristic of the group. This study reports the occurrence of a bicarpellate gynoecium in two enantiostyly species of *Senna* in an area of dry forest (Caatinga) in NE Brazil. Observations of floral morphology and estimates of the proportions of floral morphs in the populations were performed. The species produce three floral types: left (L), right (R) and bicarpellate (B). The proportion of these floral morphs were similar in the populations of *Senna macranthera* var. *micans*, but the number of B flowers in populations of *S. trachypus* was lower than that recorded for L and R flowers. The occurrence of this morphological variation may be related to enhancing pollen capture in both species; in *S. trachypus*, this variation may also be related to reducing florivory by caterpillars that were observed eating sexual elements of the flowers.

**Keywords:** Leguminosae flower, pluricarpellate Fabaceae, reproductive fitness, *Senna macranthera* var. *micans*, *Senna trachypus*

Enantiostyly flowers (Carvalho & Oliveira 2003; Laporta 2005) with a unicarpellate gynoecium (Queiroz 2009) are very common among species of the genus *Senna* Mill. (Caesalpinioiidae – Cassiinae). Patterns of enantiostyly vary, and seem to enhance reproductive ability (Almeida *et al.* 2013). Although enantiostyly flowers with a pluricarpellate gynoecium are not common within Fabaceae, their occurrence is interpreted as a strategy to maximize pollen capture by the stigma, thereby increasing reproductive success (Prenner 2004; Endress & Doyle 2009; Paulino *et al.* 2013).

Pluricarpellate gynoecia have been recorded in *Bauhinia* L., *Ceratonia* L., *Caesalpinia* L. and *Cassia* L. (Tucker 1988; 1992; Stergios & Aymard 2008), but not in *Senna*. This study reports the occurrence of bicarpellate gynoecia in two enantiostyly species of *Senna* in an area of dry forest (Caatinga) in NE Brazil.

Flowers of *Senna macranthera* var. *micans* (Nees) H.S. Irwin & Barneby (five individuals, two populations) and of *S. trachypus* (Mart. ex Benth.) H.S. Irwin & Barneby (Pós-Graduação em Botânica, Universidade Federal Rural de Pernambuco, Dom Manoel de Medeiros, s/n, 51280-400, Recife, PE, Brazil)

¹ Universidade Estadual de Alagoas, Rodovia AL-115, 57600-005, Palmeira dos índios, AL, Brazil
² Universidade Federal do Vale do São Francisco, BR 407, n 12, 56300-000, Petrolina, PE, Brazil
³ Instituto de Biologia, Universidade Federal de Uberlândia, Av. Pará, 1720, 38405-382, Uberlândia, MG, Brazil
⁴ Pós-Graduação em Botânica, Universidade Federal Rural de Pernambuco, Dom Manoel de Medeiros, s/n, 51280-400, Recife, PE, Brazil
⁵ Unidade Acadêmica de Garanhuns, Universidade Federal Rural de Pernambuco, Av. Bom Pastor, s/n, 55292-270, Garanhuns, PE, Brazil

* Corresponding author: cibelecastro@hotmail.com
(eleven individuals, one population) were collected in the municipalities of Mauriti and Brejo Santo (Ceará State, NE Brazil) and preserved in 70% alcohol. The number of left, right and bicarpellate flowers was recorded for each species, and their proportions compared using the Chi-square test (software BioEstat 5.0, Ayres et al. 2007). Samples of both species were deposited in the HVASF (Vale do São Francisco Herbarium; 21488 for S. macranthera var. micans and 16792 for S. trachypus).

The three floral morphs of S. macranthera var. micans occurred in similar proportions (Tab. 1; Fig. 1A-C), as did those of right and left flowers of Senna trachypus; the proportion of bicarpellate flowers in this latter species was much smaller (Tab. 1; Fig. 1D-F). Similarities in the proportions of floral morphs had already been reported for Chamaecrista flexuosa (L.) Greene, which is considered an atypical enantiostylyous species (Almeida et al. 2013). The presence of two fruits in S. macranthera var. micans reinforces the hypothesis that variation in plant reproduction may be the result of selective pressures favoring reproductive success. These data corroborate the study of Paulino et al. (2013), which recorded double fruit in the bicarpellate Swartzia dipetala Wild. ex Vogel.

The reproductive structures of Senna trachypus were consumed by caterpillars, and so the observed production of more pistils by this plant may be interpreted as a strategy to compensate for the losses caused by these herbivores. Additionally, the formation of more pistils may result in satiation of the caterpillars, thereby reducing the chances of attack on other flowers in the population (Coley & Kursar

Table 1. Number of right, left and bicarpellate flowers of Senna trachypus and S. macranthera var. micans in an area of Caatinga, NE Brazil. Different letters in the same line indicate significantly different values (Chi-square test).

<table>
<thead>
<tr>
<th>Species</th>
<th>Floral morph</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Left</td>
<td>Right</td>
<td>Bicarpellate</td>
</tr>
<tr>
<td><strong>Senna trachypus</strong> (n=11)</td>
<td>72c</td>
<td>58c</td>
<td>15c</td>
</tr>
<tr>
<td><strong>S. macranthera var. micans</strong> (n=5)</td>
<td>32c</td>
<td>33c</td>
<td>28c</td>
</tr>
</tbody>
</table>

**Figure 1.** Flowers of Senna macranthera var. micans and S. trachypus bearing bicarpellate gynoecium in an area of Caatinga, NE Brazil. A-C: Left, right and bicarpellate flowers of Senna macranthera var. micans, respectively; D-F: Left, right and bicarpellate flowers of S. trachypus, respectively.
However, studies that measure the impact of florivory upon the reproductive biology of this species are needed to test this hypothesis.

Acknowledgements

The authors thank the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES, Brazil) for grants awarded to N. M. de Almeida, and the Programa de Pós-graduação em Botânica, Universidade Federal Rural de Pernambuco and the Centro de Referência para Recuperação de Áreas Degradadas da Caatinga (CRAD-UNIVASF) for logistic support.

References
