STUDIES OF SCULPTURE PATTERNS IN SOME SPECIES OF CROTALARIA 
FAMILY: FABACEAE

S. John Britto, S. Senthilkumar,
S.J., Department of Botany, St. Joseph’s College (Autonomous) 
Tiruchirappalli 620 002, South India.

Abstract
Sculpture pattern present on wing petals of Crotalaria shows constancy within the 
group and helps in the separation of species from each other. The present study on 
Crotalaria analyses this character among different species and a key is provided for 13 
species of Crotalaria.

Key words: sculpture, Crotalaria, wing petals

Introduction
Sculpture pattern present on the outer surface of wing petals of several 
Papilionaceous genera has been variously termed as wrinkles, lunae, cavae, rugae and 
lamellae. In India, Nair and Tewari (1978) and John Britto (1983) reported their occurrence 
and keyed them out accordingly. An extensive study undertaken by Stirton (1981) established 
the promising taxonomic potentiality in the sculpture pattern of wing petals. Information 
available in general and the genus Crotalaria in particular is scanty (John Britto, 2000). 
Therefore, the present study has been undertaken to give a comprehensive idea of the 
sculpture pattern of this genus and to prepare a key for the identification of the species 
studied.

Materials and Methods
A dried wing petal was removed from a Herbarium specimen (Rapinat Herbarium, 
St.Joseph's College) and boiled for 2-3 minutes in of distilled water till all the air bubbles 
were expelled and material sank to the bottom (John Britto, 2000). The sculpture pattern was 
described and illustrations were made using the pattern provided by Stirton (1981).

Results and Discussion
The sculpture pattern on the wing petal is represented in Table 2. On the basis of 
sculpture, the present species included in the genus fall into six groups (see Table 1). The 
Darkened region merely indicates the presence of lunae in respective regions. (The regions 
may have varying number of lunae and need not occupy the full area in a particular region.) 
In Aspalathus the sculpture pattern was always correlated to the shape of their petals, laxness 
or compactness of inflorescences (Stirton, 1981).

Applying the above observations to Crotalaria species groups I, II and III with lunae 
only up to lower central region may be considered to have reduced sculpture, and groups IV, 
V and VI with lunae in lower and upper regions to have elaborate sculpture. The former have 
lesser number of flowers (below 10), dense, in a cyme or a subcapitate cluster. The keel 
invariably shows twisting of the beak. Group IV, V and VI have copious (numerous) flowers 
loosely spread in racemes/panicles (except C. pusilla). In groups IV and VI keels are 
untwisted, with their beak deeply or faintly incurved except C. verrucosa. Thus Crotalaria 
species seem to corroborate further conclusions proposed by Stirton (1981).

Polhill, while evaluating the sections proposed for Crotalaria by earlier workers did 
not agree with the usage of leaf-character (simple or compound) for division of tribes. In his 
system, he based the primary divisions on the shape and position of standard appendages 
and the form of the beak in keels. The species of Crotalaria investigated in this study show that 
reduction of sculpture is associated with twisted in keel and elaborate sculpture by the 
absence of a twist. This conclusion seems to supportive character to Polhill's division (John 
Britto, 1983, 2000). In Crotalaria as well as in some other genera, the outer surface of wing
petals shows prominent folds or pockets. Correlation of sculpture with other floral features indicates that sculpture can be a taxonomic character and even used to solve the ambiguities of taxonomic schemes. On the basis of sculpture patterns a tentative key for the identification of these species of *Crotalaria* is suggested below.

1  Lunae present only in upper region of wing petal  
   2  Highest number of lunae per row 5-8. Lunae present only in upper basal.  

   *priestleyoides*  
   2  Highest number of lunae per row above 8. Lunae extending to central and distal  
   3  Sculpture spreading to distal  

   *pallida*  
   3  Sculpture spreading to central  
   4  Length of sculpture zone less than 2 mm  
   5  Wing lanceolate. Sculpture zone 0.6 mm long.  

   *umbellata*  
   5  Wing oblong. Sculpture zone 1.5 mm long.  

   *prostrata*  
   4  Length of sculpture zone 3-6 mm  
   6  Lunae mostly intercostal  

   *willdenowiana*  
   6  Lunae mostly transcostal  

   *speciosa*  

1  Lunae present in lower and upper region of wing petal  
   7  Sculpture area up to distal zone  
   8  Length of sculpture zone less than 6 mm  

   * verrucosa*  
   8  Length of sculpture zone more than 8 mm  
   9  Lunae intercostal and transcostal  

   *shevaroyensis*  
   9  Lunae intercostal  

   *pulchra*  
   7  Sculpture area up to central zone  
   10  Wing more than 1 cm long. Sculpture zone more than 4.5 mm long  
   11  Pocket or fold present  

   *retusa*  
   12  Sculpture zone 7.5 mm broad  

   *semperflorens*  
   12  Sculpture zone 3 mm broad  

   *paniculata*  
   11  Pocket or fold absent  

   *pusilla*  

   10  Wing less than 7 mm long. Sculpture zone less than 3 mm long  

**References**


Plate 1: Sculpture patterns of wing petals of different Crotalaria spp.


(E). *C. semperflorens*  (F). *C. shevaroyensis*
Plate 2: Sculpture patterns of wing petals of different Crotalaria spp. (contd.)
(G). C. verrucosa  (H). C. speciosa  (I). C. pallida  (J). C. priestleyoides
(K). C. umbellate  (L). C. willdenowiana  (M). C. prostrata
Table 1. Position of sculpturing in *Crotalaria*

<table>
<thead>
<tr>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
<th>VI</th>
</tr>
</thead>
<tbody>
<tr>
<td>C. riestleyoides</td>
<td>C. umbellata</td>
<td>C. prostrata</td>
<td>C. pallida</td>
<td>C. paniculata</td>
<td>C. pulchra</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C. speciosa</td>
<td></td>
<td>C. retusa</td>
<td>C. shevaroyensis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C. willdenowiana</td>
<td></td>
<td>C. pusilla</td>
<td>C. semperflorens</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C. verrucosa</td>
</tr>
</tbody>
</table>

Note: Darkened area indicates the presence of lunae in respective regions

Table 2. Analysis of Sculpture in *Crotalaria* species

<table>
<thead>
<tr>
<th>Sp.No.</th>
<th>Name of the Species</th>
<th>Sculpture zone (mm)</th>
<th>Lunae (no. of rows)</th>
<th>Lunae per row</th>
<th>Sculpture region</th>
<th>Sculpture pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>C. pallida</td>
<td>4.2</td>
<td>6-7</td>
<td>5-12</td>
<td>upper basal, central to distal</td>
<td>mostly intercostal</td>
</tr>
<tr>
<td>2.</td>
<td>C. paniculata</td>
<td>4.5</td>
<td>9-10</td>
<td>3-20</td>
<td>basal and central of upper and lower</td>
<td>mostly intercostal</td>
</tr>
<tr>
<td>3.</td>
<td>C. priestleyoides</td>
<td>0.8-1.0</td>
<td>3</td>
<td>5-8</td>
<td>upper basal</td>
<td>intercostal</td>
</tr>
<tr>
<td>4.</td>
<td>C. prostrata</td>
<td>1.5</td>
<td>3</td>
<td>3-8</td>
<td>upper basal and central</td>
<td>intercostal</td>
</tr>
<tr>
<td>5.</td>
<td>C. pulchra</td>
<td>8.0</td>
<td>10-12</td>
<td>8-12</td>
<td>basal, central, distal of upper and lower</td>
<td>mostly intercostal</td>
</tr>
<tr>
<td>6.</td>
<td>C. pusilla</td>
<td>0.8</td>
<td>4</td>
<td>4-7</td>
<td>basal and central of upper and lower</td>
<td>mostly intercostal</td>
</tr>
<tr>
<td>7.</td>
<td>C. retusa</td>
<td>6.0</td>
<td>14</td>
<td>4-17</td>
<td>basal and central of upper and lower</td>
<td>transcostal and intercostal</td>
</tr>
<tr>
<td>8.</td>
<td>C. semperflorens</td>
<td>6.0</td>
<td>9 or 10</td>
<td>3-18</td>
<td>basal and central of upper and lower</td>
<td>transcostal and intercostal</td>
</tr>
<tr>
<td>9.</td>
<td>C. speciosa</td>
<td>4.2</td>
<td>7</td>
<td>7-17</td>
<td>upper basal and central</td>
<td>mostly transcostal</td>
</tr>
<tr>
<td>10.</td>
<td>C. shevaroyensis</td>
<td>8.0</td>
<td>11-13</td>
<td>7-30</td>
<td>basal central distal of upper and lower</td>
<td>intercostal and transcostal</td>
</tr>
<tr>
<td>11.</td>
<td>C. umbellata</td>
<td>0.6</td>
<td>4</td>
<td>5-10</td>
<td>upper basal and central</td>
<td>mostly intercostal</td>
</tr>
<tr>
<td>12.</td>
<td>C. verrucosa</td>
<td>5.5-6.0</td>
<td>8 or 9</td>
<td>3-17</td>
<td>basal central and distal of upper and lower</td>
<td>mostly intercostal</td>
</tr>
<tr>
<td>13.</td>
<td>C. willdenowiana</td>
<td>3.0</td>
<td>8 or 9</td>
<td>5-15</td>
<td>upper basal and central</td>
<td>mostly intercostal</td>
</tr>
</tbody>
</table>