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Distinguishing colour variants of
Serapias perez-chiscanoi (Orchidaceae) from related
taxa on the Iberian Peninsula

by

Caspar Venhuis & J. Gerard B. Oostermeijer

1 Derde Goudsbloemdwarsstraat 21, 1015 KA Amsterdam, The Netherlands. casvenhuis@gmail.com
2 Institute for Biodiversity and Ecosystem Dynamics (IBED), Universiteit van Amsterdam, Science Park 904, 1098 XH Amsterdam, The Netherlands. j.g.b.oostermeijer@uva.nl

Abstract


Serapias perez-chiscanoi has a stable and uniform appearance with green flowers. Throughout its distribution area, however, plants have been found with deviant pink to red flowers that show similarities with other taxa that are occasionally pale flowered. S. perez-chiscanoi is easy to differentiate from S. cordigera subsp. cordigera by the colour of the flowers (S. cordigera subsp. cordigera has red to purple flowers) and the fact that the hypochile dimensions of S. perez-chiscanoi are significantly smaller. It is, however, more difficult to distinguish it from individuals of S. cordigera subsp. gentilii with pale flowers, which occur frequently. The two taxa differ in colour pattern and floral dimensions, especially the hypochile length, which is shorter in S. perez-chiscanoi. Pale-flowered individuals of another species, S. parviflora, are easily distinguished by their significantly smaller flowers. S. perez-chiscanoi occurs in Spain in the autonomous regions of Extremadura and Castilla-La Mancha and in Portugal, S. cordigera subsp. gentilii seems to occur along the coastal regions of SW Portugal, while S. cordigera subsp. cordigera and S. parviflora are distributed throughout the Iberian Peninsula.

Keywords: Orchidaceae, Serapias perez-chiscanoi, Serapias cordigera subsp. gentilii, flower colour, floral dimensions, Spain, Portugal.

Resumen


La Serapias perez-chiscanoi tiene una apariencia estable y uniforme con flores verdes. Sin embargo, a lo largo de su área de distribución, se han encontrado ejemplares de flores con colores desviados de color rosa hasta rojo que muestran similitudes con otros táxones que presentan ocasionalmente flores pálidas. Serapias perez-chiscanoi es fácil de diferenciar con respecto a S. cordigera subsp. cordigera por el color de las flores (S. cordigera subsp. cordigera tiene flores de rojizas hasta purpura) y por las dimensiones significativamente más pequeñas del hipoquilo de S. perez-chiscanoi. Sin embargo es más difícil hacer una distinción con respecto a S. cordigera subsp. cordigera por el color de las flores (S. cordigera subsp. cordigera tiene flores de rojizas hasta purpura) y por las dimensiones significativamente más pequeñas del hipoquilo de S. perez-chiscanoi. Sin embargo es más difícil hacer una distinción con respecto a S. cordigera subsp. gentilii, ya que los individuos de este taxón presentan flores pálidas, lo que ocurre con frecuencia. Estos dos táxones se diferencian por el patrón de colores y por las pequeñas dimensiones de las piezas florales, especialmente el tamaño del hipoquilo más corto en S. perez-chiscanoi. Los individuos de flores pálidas de S. parviflora se pueden distinguir fácilmente gracias a sus flores de pequeño tamaño. Serapias perez-chiscanoi se localiza en España en las comunidades autónomas de Extremadura y Castilla-La Mancha y en Portugal, S. cordigera subsp. gentilii se puede encontrar en las zonas costeras del suroeste de Portugal, mientras que S. cordigera subsp. cordigera y S. parviflora se encuentran en la mayor parte de la Península Ibérica.

Palabras clave: Orchidaceae, Serapias perez-chiscanoi, Serapias cordigera subsp. gentilii, color de las flores, dimensiones de las flores, España, Portugal.
Introduction

In 1976 Jose Luis Pérez Chiscano discovered deviant Serapias plants along the Guadiana river basin in Extremadura (Spain). After a twelve-year study, Pérez Chiscano (1988) described these plants as a new species, Serapias viridis Pérez Chiscano. Acedo (1990), however, found that the same name had been used for a Brazilian species by Vellozo (1825). To avoid confusion, the Spanish species was renamed S. perez-chiscanoi C. Acedo. Pérez Chiscano & al. (1991) reported that only some eight populations of this species were known, all located in the Guadiana river basin in Extremadura. However, due to an increased interest in this species, many new populations were found in Extremadura during the past ten years (Venhuis & al., 2006). Furthermore, the species was also found in Castilla-La Mancha (Venhuis & al., 2006), and also in Portugal (Jansen, 1993). Observations on these recently found populations have increased our knowledge of the species. One new aspect is that plants with deviant reddish flower colours were found among the “normal” S. perez-chiscanoi individuals that have pale green flowers, or pale green flowers with a red venation. In this article, we describe the variation in flower colour in S. perez-chiscanoi and the differences and similarities in morphology and geographic distribution with other Serapias taxa.

Material and methods

In 2004 and 2010, we obtained morphological data for populations of Serapias cordigera subsp. cordigera L., S. cordigera subsp. gentilii C. Venhuis, P. Venhuis & Kreutz, S. perez-chiscanoi and S. parviflora Parl. in Spain and Portugal. For both subspecies of S. cordigera, we measured 25 plants, from one population of subsp. cordigera in Extremadura, and likewise for subsp. gentilii in the Algarve. With S. perez-chiscanoi we measured 75 plants from three populations in Extremadura (Spain), and 5 plants from a population in mid-western Portugal. For S. parviflora, 50 plants were measured from two populations (Algarve and Extremadura) (Table 1). The latter data is not included as this species is morphologically readily distinctive from the other taxa. According to the analyses by Venhuis & al (2007), the dimensions of the epichile and hypochile are the most distinctive characters, and so in each population we measured the width and length of both the epichile and hypochile (Fig. 1).

Results and discussion

Variation in flower colour

Serapias perez-chiscanoi in Extremadura has a fairly uniform morphology and flower colour. The plants can be divided into two extremes, which present “green” or “red veined” variants. In the green variation (Fig. 2a, b), the leaves, stem, bracts, ovary, gynostegium, lamellae, flowers and veins are all pale green, with whitish hairs on the labellum. The lateral lobes of the flowers are yellowish and greenish. The “red veined” variation (Fig. 2c, d) is also greenish but with a red venation on the leaves, stem, bracts and ovary. It also has red veins and reddish hairs on the labellum and pinkish to reddish lateral lobes and lamellae. Intermediate colour variations occur very frequently (Venhuis & al., 2004).

In Portugal, most of the known populations mainly comprise the “red veined” variation. A population of about 80 flowering plants in C Portugal contained in-

Table 1. Sampled populations of the studied Serapias taxa.

<table>
<thead>
<tr>
<th>Species</th>
<th>Location</th>
<th>Region</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>S. cordigera subsp. cordigera</td>
<td>Badajoz</td>
<td>Extremadura</td>
<td>Spain</td>
</tr>
<tr>
<td>S. cordigera subsp. gentilii</td>
<td>Cotillo</td>
<td>Algarve</td>
<td>Portugal</td>
</tr>
<tr>
<td>S. perez-chiscanoi</td>
<td>Badajoz</td>
<td>Extremadura</td>
<td>Spain</td>
</tr>
<tr>
<td>S. perez-chiscanoi</td>
<td>Aljucén</td>
<td>Extremadura</td>
<td>Spain</td>
</tr>
<tr>
<td>S. perez-chiscanoi</td>
<td>Trujillanos</td>
<td>Extremadura</td>
<td>Spain</td>
</tr>
<tr>
<td>S. perez-chiscanoi</td>
<td>Ereiras</td>
<td>Beira Litoral</td>
<td>Portugal</td>
</tr>
</tbody>
</table>

Fig. 1. Measured floral dimensions of the labellum: a, hypochile width; b, epichile length; c, epichile width; d, hypochile length.
Fig. 2. a, Serapias perez-chiscanoi, Obando, Extremadura, Spain, 27-IV-2007; b, S. perez-chiscanoi, Trujillanos, Extremadura, Spain, 29-IV-2010; c, S. perez-chiscanoi, Vila Nova da Baronia, Baixo Alentejo, Portugal, 23-IV-2007; d, S. perez-chiscanoi, Alange, Extremadura, Spain, 30-IV-2010. All photographs: C. Venhuis.
individuals with three flower colour variations. About ten plants were of the “green” variation, whilst some 50 plants were quite similar to the “red veined” variation, but differed from it by a bright red hypochile and lateral lobes, an epichile that was both greenish and pinkish, and the sepals, petals and bracts were also often slightly pinkish (Fig. 3a, b). The most deviant plants, however, about 20 individuals, had a bright red labellum (hypochile, lateral lobes and epichile), red petals and red veins on all plant parts. In addition, the bracts and sepals were pinkish (Fig. 3c, d).

Hybridization

Although hybridization cannot be excluded, the occurrence of hybrids is unlikely. The pollinia of S. perez-chiscanoi flowers disintegrate very rapidly onto their own stigmatic surface, often before the flowers open (Perez Chiscano & al., 1991), and so the possibility that intact pollinia are transferred to another flower is limited. Moreover, S. perez-chiscanoi, is a diploid (Bernardos & al., 2004), while S. lingua L., a species with which it frequently sympatric, is tetraploid (D’Emerico & al., 2000), so that the difference in ploidy level makes cross-fertility unlikely. In contrast, S. perez-chiscanoi very rarely co-occurs with the diploid S. cordigera, which makes hybridisation between these two species also highly unlikely. Nevertheless, hybrids between S. perez-chiscanoi and S. lingua and S. cordigera have been reported. A hybrid between S. perez-chiscanoi and S. cordigera was mentioned by Wallenwein & Breier (1992) and was described subsequently as S. × venhuisia by Vázquez (2009). However, the photo in Wallenwein & Breier (1992), is clearly of S. lingua; Vázquez did not provide any photographs. Furthermore, Venhuis & al. (2004) and Vázquez (2009) suggested hybridization between S. perez-chiscanoi and S. cordigera. This putative hybrid was based on a plant near Aljucén (Venhuis & al., 2004), from the same population as the photographs presented in this paper (Fig. 4a, b). The inflorescences of these very rare individuals contained salmon-pink and pink flowers, and it is noteworthy that flower colour varied within single plants. However, morphological measurements on the flowers of these ‘hybrid’ individuals revealed floral dimensions identical to S. perez-chiscanoi, and since the other putative parent, S. cordigera, did not occur in the vicinity, and no morphological character of any other Serapias species was present, we now conclude that these plants probably represent a pink-flowered form of S. perez-chiscanoi rather than a hybrid.

Related species

In the south-western part of the Iberian Peninsula about seven taxa of Serapias occur, which can be divided into two main groups based on their flower color: the S. vomeracea group and the S. parviflora group (Venhuis & al., 2007). In this region, the S. vomeracea group includes S. cordigera subsp. cordigera, S. cordigera subsp. gentilii, S. perez-chiscanoi and S. occidentalis. C. Venhuis & P. Venhuis. The occurrence of S. vomeracea subsp. vomeracea in SW Spain and Portugal is uncertain (Venhuis & al., 2007), and the taxonomic status of the new species, S. maria F.M. Vázquez (Vázquez, 2008), needs further study since the dimensions of morphological characters of this species overlap to a large extent with those of S. occidentalis. Further research on these taxa is necessary to determine their occurrence and taxonomic status respectively.

Taxa belonging to the S. parviflora group are S. parviflora, S. strictiflora Welwitsch ex Vega and S. lingua. Furthermore, two varieties of S. strictiflora are found in our region: var. elsaes (P. Delforge) C. Venhuis & P. Venhuis, and var. distenta Presser. In the field, S. perez-chiscanoi is easy to distinguish from most other co-occurring Serapias taxa on the basis of flower colour or floral dimensions. However, some taxa that occasionally have pale flowers, such as S. cordigera subsp. gentilii and S. parviflora, resemble S. perez-chiscanoi, and the differences between such individuals and S. perez-chiscanoi are clarified below.

Differences with S. cordigera subsp. cordigera

Serapis cordigera subsp. cordigera is presumed to be the parental species of S. perez-chiscanoi, and both taxa are similar morphologically (Venhuis & al., 2007) and closely related according to molecular studies (Bellucci & al., 2008). Nevertheless, S. cordigera subsp. cordigera, with its dark red to purple flowers with a large, heart-shaped epichile (Fig. 4c, d) is easily distinguished in the field from S. perez-chiscanoi. It can also be distinguished on the basis of three other features: 1) epichile position, 2) emergence of the lateral lobes and 3) inflorescence architecture. The epichile of S. cordigera subsp. cordigera is normally positioned parallel to the stem (i.e., pointing downwards), whereas the epichile of S. perez-chiscanoi is generally positioned at an angle of about 45-90 degrees to the stem (pointing more or less outwards). In S. cordigera subsp. cordigera, the lateral lobes protrude from the casco, whereas in S. perez-chiscanoi the lateral lobes remain hidden inside the hood. The flowers in S. cordigera subsp. cordigera are placed more or less opposite each other, whilst those of S. perez-chiscanoi are positioned close together and in a spi-
Fig. 4. a, Serapias perez-chiscanoi, Aljucén, Extremadura, Spain, 28-IV-2010; b, S. perez-chiscanoi, Aljucén, Extremadura, Spain, 28-IV-2010; c, S. cordigera subsp. cordigera, Badajoz, Extremadura, Spain, 30-IV-2010; d, S. cordigera subsp. cordigera, Badajoz, Extremadura, Spain, 30-IV-2010. All photographs: C. Venhuis.
ral, which gives the inflorescence a “twisted” appearance.

Although there is a small overlap in the epichile dimensions between *S. cordigera* subsp. *cordigera* and *S. perez-chiscanoi*: length (18)23-30(36) mm and (14)16-18(21) mm respectively, and width (13)17-24(29) mm and (10)12-13(15) mm respectively, *S. cordigera* subsp. *cordigera* can be distinguished from *S. perez-chiscanoi* on the basis of the non-overlapping hypochile dimensions: length (10)11-14(17) mm and (6)7-8(9) mm respectively, and width (18)21-27(31) mm and (14)16-18(19) mm respectively (Fig. 7).

**Differences with *S. cordigera* subsp. *gentilii***

*Serapis cordigera* subsp. *gentilii* (Fig. 5a-d) is sometimes difficult to differentiate from *S. perez-chiscanoi* because it occasionally has pale flowers that resemble the latter species. Most flowers of *S. cordigera* subsp. *gentilii* are red, but in many populations some plants with pale flowers occur, which vary from red with white edges (resembling *S. nurrica* Corrias), or completely pink, pink with yellow and pink with reddish veins, to yellowish, greenish or whitish (resembling *S. perez-chiscanoi*). In addition, several features that are present in *S. cordigera* subsp. *cordigera* are absent in *S. cordigera* subsp. *gentilii* and in *S. perez-chiscanoi*: the position of the epichile in the latter taxa generally points more or less outwards (although frequently downwards), and the inflorescence is, when there are many flowers, quite dense and spiralled and the edges of the epichile are often curled upwards. Furthermore, *S. cordigera* subsp. *gentilii*, like *S. perez-chiscanoi*, seems to be autonomously self-pollinating (Venhuis & al., 2007). It differs from *S. perez-chiscanoi*, however, by lateral lobes that generally emerge from the hood in contrast to *S. perez-chiscanoi* in which the lateral lobes are always completely hidden inside it. Although the flowers of *S. cordigera* subsp. *gentilii* generally have a colour pattern quite different from *S. perez-chiscanoi*, some individuals have flowers with a greenish epichile that may superficially look similar. But in comparison with the “green” variation of *S. perez-chiscanoi*, these flowers have a red hypochile, while in comparison with the “red” variation of that taxon, they lack the reddish hairs on the labellum.
Fig. 7. Boxplots of *Serapias cordigera* subsp. *gentilii*, *S. cordigera* subsp. *cordigera*, *S. perez-chiscanoi* from Extremadura and *S. perez-chiscanoi* from Portugal (Ereiras). Outliers and extremes were not removed. **a**, epichile width; **b**, epichile length; **c**, hypochile width; **d**, hypochile length.
and the red venation on all plant parts. The red-flow-ered *S. perez-chiscanoi*, which until now was known from only one locality, is also very similar to the flow-ers of some plants of *S. cordigera* subsp. *gentilii* but differs from the latter subspecies by a striking red ve-nation on all plant parts.

Most floral features are unhelpful to distinguish be-tween these taxa, and the only character that separates *S. cordigera* subsp. *gentilii* from *S. perez-chiscanoi* is the length of the hypochile, which in *S. cordigera* subsp. *gentilii* is (9)11-12(13) mm, and in *S. perez-chiscanoi* is (6)7-8(9) mm (Fig. 7). All floral dimen-sions as well as the flower colour of *S. cordigera* subsp. *gentilii* are more or less intermediate between *S. cordi-gera* subsp. *cordigera* and *S. perez-chiscanoi*.

**Differences to *S. parviflora***

*Serapias parviflora* is generally easily distinguished from *S. perez-chiscanoi* by its very small flowers. In the studied area, specimens of *S. parviflora* with pale pink and yellowish/greenish flowers (Figs. 6a, b) frequent-ly occur, but these resemble *S. perez-chiscanoi* in colour only. Both taxa can be readily distinguished on the basis of three of the four labellum dimensions: Epichile length in *S. parviflora* ranges from (7)9-11(12) mm and in *S. perez-chiscanoi* from (14)16-18(21) mm, the epichile width in *S. parviflora* falls be-tween (2)4-6(6) mm and in *S. perez-chiscanoi* between (10)12-13(15) mm. Furthermore, *S. parviflora* differs from *S. perez-chiscanoi* in hypochile width (8)10-11(13) mm and (14)16-18(19) mm respectively. Hy-pochile length does not differ: (5)7-8(9) mm and (6)7-8(9) mm, respectively.

**Distribution**

*Serapias perez-chiscanoi* is a rare tongue-orchid, which was previously only known from the Guadiana river basin in Extremadura (Spain) (Pérez Chiscano, 1988; Pérez Chiscano & al., 1991; Delforge, 2002). After a field study, Venhuis & al. (2004) reported six new populations, and after intensive searches during the last five years by, amongst others, employees of the regional government of Extremadura, several new populations were found along the river basin of the Tajo and also south of the Guadiana river basin in Ex-tremadura (Venhuis & al., 2006), which increases the total number of populations known in Extremadura to around 30 (Fig. 8). Yet another population was found in Castilla-La Mancha (Venhuis & al., 2006). In the Algarve (Portugal), Jansen (1993) found a pop-Ulation that disappeared soon after its discovery. And we have seen a population in the Baixo Alentejo province that was discovered by M. Pereira, and also four other populations that were discovered by either J. Moura, J. Pessoa and J. Monteiro, in the provinces of Beira Litoral and Ribatejo in the central part of Portugal and in the province of Trás-os-Montes e Alto Douro in northern Portugal (Fig. 8).

*Serapias cordigera* subsp. *cordigera* is found through-out the Iberian Peninsula, sometimes only locally but often abundantly. *Serapias parviflora* also occurs in the entire Iberian Peninsula, but is much more wide-spread and often abundant. *Serapias cordigera* subsp. *gentilii* is found predominantly along the coastal re-gions of the Algarve but also extends further north. The distribution map (Fig. 8) is based on populations seen by us, and photos, and also on literature, in which it was cited as a variety of *S. cordigera*.

**Identification key**

Here, we present a concise key for the identifi-ca- tion of species from the large flowered *S. vomeracea* group in the SW Iberian Peninsula. It will be clear from this article that the identification of the different species is not too difficult, despite the considerable variation in flower morphology, flower colours and venation patterns. More research on the relationships
between the morphological variation and the pollination ecology in *S. perez-chiscanoi* is underway.

**Identification Key for the Serapias Vomeracea Group in the Southwestern Part of the Iberian Peninsula**

1. Ratio epichile width/hypochile length = 0.6-1.2 ........................................... *S. occidentalis*
2. Hypochile length (6)-7-8(9) mm ............ *S. perez-chiscanoi*
3. Epichile slender, usually pale, often with divergent edges; pollinia friable ........................................... *S. cordigera* subsp. *gentilii*

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**References**


