INTRODUCTION

During a study of calicioid lichens of the Iberian Peninsula (Sarrión et al. 1999) some problematic specimens were encountered. One was identified as Calicium chlorosporum F. Wilson not hitherto recorded from Europe. Calicium chlorosporum was described from Australia, where it is widespread (Tibell 1987, McCarthy 2006), and has subsequently been reported from Mexico to Peru (Tibell 1987, 1996, Tibell & Ryan 2004), Madagascar (Aptroot 1990) and India (Tibell 2006). The Spanish specimen was found growing on wood of Abies pinsapo in southern Spain. The description of the taxa and related species as well as a world distributional map is provided.

Key words: Calicium, chorology, Europe, Spain.

Calicium chlorosporum new to Europe
Francisco J. Sarrión*, Ana Rosa Burgaz* and Leif Tibell**


Calicium chlorosporum has been found for the first time in Europe. It was growing on wood of Abies pinsapo in southern Spain. The description of the taxa and related species as well as a world distributional map is provided.

Key words: Calicium, chorology, Europe, Spain.


Calicium chlorosporum se cita por primera vez en Europa. Ha sido encontrado sobre madera de Abies pinsapo en el sur de España. Se hace una descripción del taxón, se publican las características taxonómicas para diferenciarlo de taxones afines y se publica el mapa de distribución mundial.

Palabras clave: Calicium, corología, Europa, España.

INTRODUCTION

During a study of calicioid lichens of the Iberian Peninsula (Sarrión et al. 1999) some problematic specimens were encountered. One was identified as Calicium chlorosporum F. Wilson not hitherto recorded from Europe. Calicium chlorosporum was described from Australia, where it is widespread (Tibell 1987, McCarthy 2006), and has subsequently been reported from Mexico to Peru (Tibell 1987, 1996, Tibell & Ryan 2004), Madagascar (Aptroot 1990) and India (Tibell 2006). The Spanish specimen was found growing on wood of Abies pinsapo in Sierra de Las Nieves (Málaga Province), at an altitude of 1,050 m. This pinsapo-fir woodland occurs in the meso-supra-Mediterranean bioclimatic belt, and it is part of the basophilic Paeonio broteroi-Abietetum pinsapo community (Rivas-Martínez et al. 2002). This community belongs to the relict circum-Mediterranean fir forests, which are formed by several endemic fir species that survive in isolated locations. It is fragmented and occupies deep soils formed from Jurassic calcareous and dolomite bedrocks. The localities have a very complicated and abrupt relief with an understorey rich in endemic and oceanic vascular plant species. The forest is surrounded by evergreen sclerophyllous forest of Quercus ilex subsp. ballota or deciduous Q. faginea woodlands.

The pinsapo-fir woodlands are located in the Sistema Bético range in southern Spain, in a varied topography close to the Mediterranean Sea. They receive the first humid clouds from the sea in the rainy season, and suffer many mists; during the summer drought the northern slopes have a high temperature, and a very high humidity. Sharp changes in microclimate and vegetation occur between the northern humid slopes and the cold, dry southern slopes. There is no climate data available for the locality of C. chlorosporum, but at the nearby Grazalema village the climate is Mediterranean with very little summer drought and a high annual mean rainfall (2223 mm – in fact the highest precipitation in Spain). The annual mean temperature is 16.6 ºC.

The discovered of C. chlorosporum in the area extends its known distribution considerably (Fig. 1), and reflects the climate diversity of the Iberian Peninsula.

* Departamento de Biología Vegetal I, Facultad de Ciencias Biológicas, Universidad Complutense de Madrid, 28040-Madrid, Spain. arbargaz@bio.ucm.es.
** Department of Systematic Botany, Norbyvagen 18D, Uppsala University, 75236-Uppsala, Sweden.

23
RESULTS

Calicium chlorosporum F. Wilson

In Bailey, Queensland Dept. Agric. Bull. 7: 29 (1891). Illustration: Tibell (1987, Fig. 8).

Thallus verrucose, pale yellowish, or immersed, photobiont trebouxoid. Ascomata c. 1 mm high, with brownish pruina on the outer side of the capitulum, and young mazaedium often with a superficial yellowish pruina. Asci cylindrical, 35-50 x 3,5-4,5 µm, with uniseriate or somewhat overlapping spores. Ascospores brownish, ellipsoidal, 8-12 x 4-5 µm, with spirally arranged ridges and some cracks which distort the ridges in mature ascospores. Thallus K+ yellow turning red, KC+ orange to reddish, Pd+ orange yellowish. It contains norstictic and placodiolic acids, an unidentified xanthones.

C. chlorosporum is similar to C. salicinum and C. viride in the presence of brown pruina covering the lower side of the capitulum, but faint yellowish pruina of the young mazaedium is diagnostic. Asci with biseriately arranged spores and spirally arranged ridges in semi-mature spores are also features shared with C. viride, but in contrast to C. viride the asci of C. chlorosporum are cylindrical. C. salicinum can be distinguished from C. chlorosporum by the slightly smaller spores and a yellow pruina is never found in C. salicinum. C. chlorosporum is closely related to C. adspersum. In a recent molecular analysis of a selection of Calicium species along with other species in the Caliciaceae, C. adspersum is the sister-group of C. chlorosporum (Tibell 2006). These two species are also similar in spore ornamentation, and C. adspersum sometimes has a yellow pruina on the mazaedium. They differs, however, in so far that C. adspersum has clavate asci, larger spores and usually much shorter and stouter apothecia, which do not have a brown but a yellow pruina on the lower side (Table 1).

It is an epiphytic or lignicolous species in Spain occurring in the south, in a humid and warm climate. It has a temperate to subtropical world distribution. C. salicinum is a widespread species common in woodland areas of the Iberian Peninsula, while C. viride has a circumboreal distribution being more common in the Euro-Siberian Region, and is rare in the Mediterranean Region (Sarrión et al. 1999). C. adspersum has a wide distribution in the Northern Hemisphere and occurs both in Europe and North America. In Spain it occurs in the Málaga Province (Sarrión et al. 1999).

Specimen examined: Hs, Málaga: Parauta, Sierra de Las Nieves, 30SU1860, 1050 m, on wood of Abies pinsapo, 3-1-1993, F. J. Sarrión 41 (MACB 91876).

ACKNOWLEDGEMENTS

We are grateful to G. Aragón for critically reading the manuscript.
Francisco J. Sarrión, Ana Rosa Burgaz and Leif Tibell

Calicium chlorosporum new to Europe

Table 1

Diagnostic features of Calicium chlorosporum, C. adspersum, C. salicinum and C. viride.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Thallus</td>
<td>verrucose, yellowish</td>
<td>granular, grey</td>
<td>immersed, grey</td>
<td>granular, green</td>
</tr>
<tr>
<td>Capitulum</td>
<td>brownish pruina and often yellowish pruina</td>
<td>yellowish pruina</td>
<td>brown pruina</td>
<td>brown pruina</td>
</tr>
<tr>
<td>Ascus size (µm) and shape</td>
<td>33-50 x 3.5-4.5 cylindrical</td>
<td>24-33 x 6-8 clavate</td>
<td>35-44 x 3-4 cylindrical</td>
<td>20-25 x 4-5 clavate</td>
</tr>
<tr>
<td>Ascospore size (µm)</td>
<td>8-12 x 4-5</td>
<td>13-17 x 6-8</td>
<td>8-10 x 3.5-4.5</td>
<td>11-14 x 5-7</td>
</tr>
<tr>
<td>Arrangement of spores in the asci</td>
<td>uniseriate to biseriate</td>
<td>biseriate to threeseriate</td>
<td>uniseriate</td>
<td>biseriate to threeseriate</td>
</tr>
<tr>
<td>Ascospore ornamentation</td>
<td>spirally arranged ridges; occasional irregular</td>
<td>cracks spirally arranged ridges; occasional irregular cracks</td>
<td>spirally arranged ridges to cracked-areolate</td>
<td></td>
</tr>
<tr>
<td>Chemistry</td>
<td>norstictic and placodiolic acids, xanthones</td>
<td>norstictic and vulpinic acids</td>
<td>norstictic and placodioloic acids</td>
<td>rhizocarpic acid and epanorin</td>
</tr>
</tbody>
</table>

REFERENCES


