Notes on a plant parasite fungus in Portugal: *Gymnosporangium cornutum*

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Summary A rust fungus identified as *Gymnosporangium cornutum* was found on *Sorbus aucuparia* in Serra da Estrela (Manteigas), and the disease was severe at that location. Despite the abundance and worldwide occurrence of the genus *Gymnosporangium*, studies in Portugal are still limited.

Key words *Gymnosporangium cornutum*, Portugal, rust, *Sorbus aucuparia*.

Sorbus aucuparia is found in the highlands regions of Estrela and Gerês Mountains and Trás-os-Montes in Portugal. From the ecological point of view, this species integrates coastal rainforest communities and its fruits are an important food source for the avian fauna [4]. In August 2004, symptoms of the mountain ash juniper rust (*Gymnosporangium cornutum)* associated with a strong attack on the leaves of *Sorbus aucuparia* were observed (Figure 1). Diseases referred to as "Juniperus rusts" belong to the *Gymnosporangium* genus that includes species with (a) uredia and telia on Cupressaceae, and (b) aecia and spermogonia on Rosaceae [2,5,8].

The preliminary identification of the fungus was done by microscopic examination of the crushed material mounted in water. The specimens were subsequently sectioned on a freezing microtome and sections from fresh material were mounted in lactic acid or lactic/cotton blue. The dried herbarium material was rehydrated by soaking in 20% KOH, washed with water and mounted in lactic acid. Spore measurement was obtained from freshly and dried mounted material and 30 spores were measured. Observations were made using a Nikon E600 microscope (Tokyo, Japan) equipped with a DIC system. Photomicrographs were taken with a microscope camera DXM1200. After being processed, the fresh material was placed in the Herbarium from National Agronomic Research Station (LISE, Oeiras, Portugal). The species identification of *G. cornutum* Arthur ex Kern was made according to the existing morphological descriptions of the *Gymnosporangium* species [3,5,6] and observation of herbarium material, from the National Agronomic Research Station (LISE) and National Forestal Research Station (LISFA, Oeiras, Portugal).

Gymnosporangium cornutum Arthur ex Kern, Bulletin of the New York Botanical Garden 1911; 7: 444-445.

Synonyms

Aecidium cornutum Pers., Synopsis Methodica Fungorum 1801: 205.

Gymnosporangium juniperinum (L.) Fries, Systema mycologicum 1832; 3:506.

Gymnosporangium juniperini Link, Magaz Ges Naturf Freunde. Berlin, 1809; 3: 7.

Gymnosporangium cornutum Arth., Mycologia 1909; 1: 240.

Morphological aspects of *G. cornutum* (LISE 85170, 95047; LISFA 391): spermogonia (picnidia) are epigenous, in small groups, on orange bright coloured spots that become dark with age. The aecia are hypogenous, in clusters, initially subepidermic becoming erumpent (Figures 1 and 2). The peridium is typically roestelioide (Figure 1), causing moderate hypertrophy, and is verrucose, pale brown in colour, with cylindrical shape and coarsely lacerated at the apex (Figure 1). The peridial cells (Figure 3) are elongated with thicken walls that continue to grow during the production of spores; aeciospores catenulate, globe-shaped, yellow-brown to brown in colour, cell walls are verrucose, 18-25 X 18-20 µm (Figure 4). Teliospores are of indetermined shape, broadly ellipsoid, and cell wall pale yellow to chestnut in colour, 36-42 X 18-21 µm (Figure 5). The telia of *Gymnosporangium sabinae* (LISE 24419) are red-brown and conical and teliospores are quite different from those of *G. cornutum* and characteristically are red-brown in colour and conical; the teliospores are elliptical, pale brown, 36-45 X 18-23 µm, with a long hyaline and cylindrical pedicel (Figure 6).

Specimens examined: Portugal: *G. juniperi* Link, *S. aucuparia* L., Beira Alta, Serra da Estrela; Maria R. Dias & Pereira Silva, Octobri 1978; LISE 85170.

G. cornutum Arthur ex Kern, *Juniperus phoenicea L.*, prov Estremadura, Almada, Pinhal do Rei; Natalina Azevedo, April 1967; LISFA 391. *G. cornutum* Arthur ex

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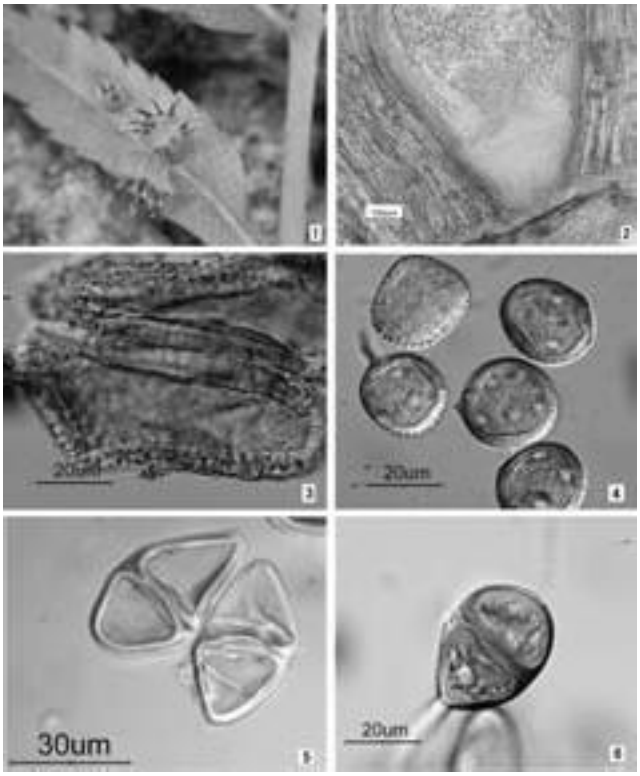

Figures 1-6, *Gymnosporangium cornutum*. 1 Aspect of aecia on the leaves of *S. aucuparia*. 2 Peridial cells and aeciospores. 3 Peridial cells verrucose in face view. 4 Aeciospores. 5 Teliospores. 6 *G. Sabina,* teliospore.

Kern, *Sorbus aucuparia* L., Prov. Beira Alta, Serra da Estrela; Maria Cristina Lopes & Victor C. Martins, August 2004; LISE 95047. *G. sabinae* (Dicks.) Wint. *Juniperus phoenicea* L., Estremadura, Sesimbra; F. Welwitsch, W. Rothaler, P. da Silva and G. Pedro; Martio 1938; LISE 24419.

The first reference to the presence of *G. cornutum* in Portugal was made by Winter (1884) in *S. aucuparia* and *Aronia rotundifolia* in Gerez Mountain [9]. Later Camara refers to the presence of several *Gymnosporangium* species in Portugal [1], but most of referred material was not located in herbarium.

Premature defoliation of mountain-ash occurred in some plants, as a result of heavy attacks found during this study. Juniper (*Junniperus communis*) scrub populations are situated near *S. aucuparia* populations in the Estrela mountain, and it will be important to study in the future the presence of the state III of the ash juniper rust in junipers. *Gymnosporangium,* reported as *G. cornutum,* is affecting the juniper (*J. phoenicea*) populations in Mata dos Medos – Almada [7] and, on the other hand, the species *G. sabinae* has been reported in an adjacent area, in *J. phoenicea* [1], so that different *Gymnosporangium* species seen to coexist in that region.

The plant diversity in Mediterranean forests is greater than in other European forests. In Portugal, this was to a large extent, the result of the traditional use of the environment. However, since the end of 20th century, this balance has been compromised by over exploitation of natural resources or a general shift away from the land. These two processes have had harmful consequences on the conservation of species and habitats, affecting the good health of the flora. Portugal is a nation where the forests (where junipers are present) and the orchards of some Rosaceae have great economic impact and it is important to study the genus *Gymnosporangium*. This paper is a preliminary study and others are required to be carried out, in order to determine the natural host range and characterize the different populations of the rust fungi genus *Gymnosporangium* in Portugal.

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