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## Powdery mildew on *Salvia officinalis* in Corrientes, Argentina

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We studied a powdery mildew species that affects *Salvia officinalis* plants in Corrientes, Argentina. Based on the features of the fungus we identified it within the genus *Oidium*, and its anamorph belongs to the species *Golovinomyces biocellatus*. The chasmothecia were not observed. A description and an illustration of the specimen are given.

**Key words** – *Erysiphales* – *Golovinomyces* – *Salvia officinalis*

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### Introduction

*Salvia officinalis* L. (*Lamiaceae*) popularly known as “salvia” or common sage, is a species that belongs to a group of aromatic plants widely grown throughout the world. The common sage is an herbaceous and perennial plant used as a culinary herb, as a medicinal plant for its healing properties, and for its essential oil extracts in the perfume industry. This plant is cultivated in Argentina because it is commonly used in popular medicine.

During a survey of plant diseases in June 2008, powdery mildew symptoms were observed on *S. officinalis* plants growing in greenhouses of commercial plantations in the province of Corrientes (northeast region of Argentina). The white mycelia covered leaves and stems. As the disease progressed, the spots coalesced and the entire leaves turned necrotic. A microscopic observation of the samples revealed the existence of a fungus with an anamorph and chains of conidia characteristic of the genus *Oidium*. The genus *Oidium* belongs

to the order *Erysiphales*.

Several reports demonstrate that fungal species in the order *Erysiphales* affect *Lamiaceae* plants (Amano 1986, Braun 1987, Liberato & Cunningham 2007, Marcum et al. 2010). In particular, *Erysiphe cichoracearum* DC was identified on *S. officinalis* in the province of Buenos Aires, Argentina (Madia & Gaetán, 2005).

The aim of this study was to describe the morphology and to study the pathogenicity of erysiphacean fungi that affect *S. officinalis* in the province of Corrientes.

### Methods

#### Examined material

Plants of *Salvia officinalis* were collected from greenhouses of commercial plantations in Corrientes, Argentina. The area where the specimens were collected belongs to the “Provincia Paranaense”, phytogeographical region of Argentina (Cabrera 1976).

### Morphological study

Fresh hyphae, conidiophores and conidia were stripped off the leaf surface with clear adhesive tape, mounted on a microscope slide with water and examined using a light microscope.

### Pathogenicity test

Pathogenicity was assessed by spraying spores from naturally infected leaves onto three healthy common sage plants: control plants were sprayed with distilled water only. The plants were maintained in a greenhouse at temperatures ranging from 20 to 26°C.

Voucher specimens were deposited in the herbarium of the National University of the Northeast, Argentina.

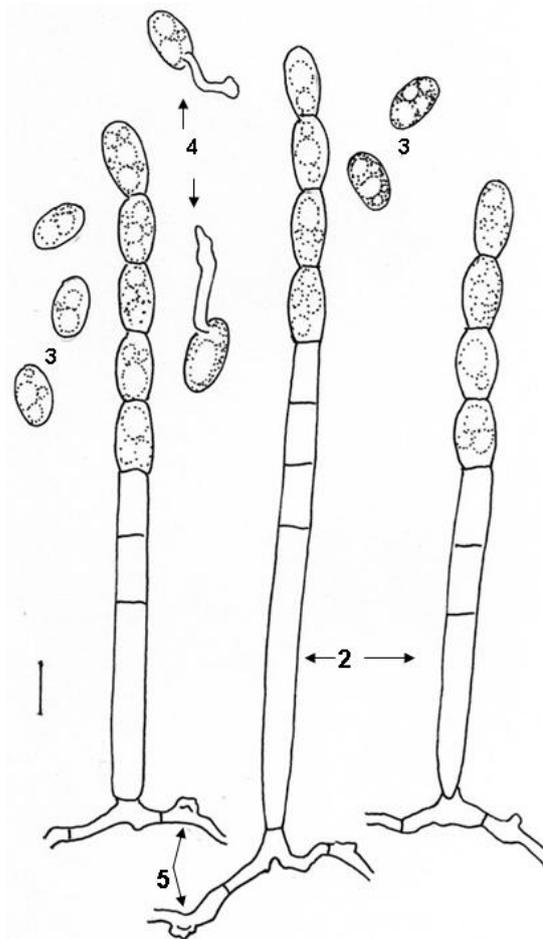
### Results

We observed the presence of powdery mildew on *Salvia officinalis* during June 2008. We studied the morphological features of this erysiphacean fungus, the white superficial fungal growth covering leaves and stems (Fig. 1)



**Fig. 1** – Symptoms of powdery mildew on *S. officinalis*.

The anamorphic stage of the fungus was founded on diseased leaves (Figs 2–5). The production of chasmothecia was not observed. The mycelium was superficial, hyaline, thin, amphigenous and scattered. The mycelial



**Figs 2–5** – *Golovinomyces biocellata* anamorphic structures. 2. Conidiophores with chains of conidia. 3. Mature conidia. 4. Germination of conidia. 5. Papillate to crenate appressoria. Bar = 20 µm.

appressoria were papillate (nipple-shaped) to crenate. The conidiophores were cylindrical, average  $66.5 \times 11.25 \mu\text{m}$ . The foot cells were straight, with a constriction on the basal septum, and averaged  $42.5 \times 11.25 \mu\text{m}$ . The conidia were formed in chains, which were sinuate in outline. The conidia were hyaline, short, cylindrical or ovoid to doliform in shape; averaging  $33.2 \times 16.5 \mu\text{m}$ , lacking fibrosin bodies. The germination of the conidia was similar to the cichoracearum type. Pathogenicity was confirmed with initial symptoms of powdery mildew observed on the inoculated plants after 10 days; the control plants remained symptomless.

### Discussion

Based on the anamorphic characters of catenate conidia, without distinct fibrosin bodies and nipple-shaped appressoria, we concluded that the *Oidium* fungus on *S. officinalis*

is a mitosporic fungus that belongs to the subgenus *Reticuloidium*. The morphological features of the conidial stage were consistent with those of *Oidium hormini* Farnetti, the anamorph of *Golovinomyces biocellatus* (syn. *Erysiphe biocellata* (Ehrenb.) V.P. Gelyuta. Braun (1987).

Liberato & Cunningham (2007) reported that *G. biocellatus* causes powdery mildew on *Mentha* sp. in Australia and they founded indistinct appressoria in the specimens studied. Recently, Marcum et al. (2010) reported the presence of *G. biocellatus* on peppermint in California. They confirmed its identification by PCR (polymerase chains reaction).

Similarly stems of *Salvia verbenaca* L. were affected by an anamorph of *G. biocellatus* in Bahía Blanca, Argentina, (R. Delhey personal communication). In addition, *Erysiphe cichoracearum* DC was found on *S. officinalis* in Buenos Aires (Madia & Gaetán 2005). We hypothesize that these two fungi could be a single pathogenic species affecting *S. officinalis* in the province of Corrientes. However, the precise taxonomic position of the local fungus is uncertain due to lack of the perfect stage.

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