

# Identification of *Golovinomyces cichoracearum* as the Powdery Mildew-Causing Agent of Chicory in Brazil

APS [apsjournals.apsnet.org/doi/10.1094/PDIS-07-17-1123-PDN](https://apsjournals.apsnet.org/doi/10.1094/PDIS-07-17-1123-PDN)



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July 2018, Volume 102, Number 7

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<https://doi.org/10.1094/PDIS-07-17-1123-PDN>

DISEASE NOTES

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## Citation

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Chicory (*Cichorium intybus* L.) is an annual herbaceous species similar to endive (*C. endivia* L.) but clearly distinguished by its peculiar bitter-flavored leaves. It is often used in fresh salads in the Southeast region of Brazil. During two consecutive dry seasons (August 2016 and July 2017), severe powdery mildew (PM) symptoms were observed on three field-grown chicory cultivars in Brasília-Federal District (DF), Brazil. White, circular colonies with profuse sporulation (mainly on the adaxial leaf surface) were observed at the onset of the disease. Later on, progressive chlorosis and necrosis of the leaf tissue were seen. Samples of symptomatic leaves were examined under a microscope and images of the fungal structures were captured with a Leica DFC 490 camera connected to a computer. Morphometrical analyses were carried out with the program Leica QWin-Plus. Conidiophores ( $n = 30$ ) were straight (to slightly curved) and hyaline, displaying cylindrical foot cells adjacent to 2 to 3 short cells and measuring  $73$  to  $130 \times 10$  to  $12 \mu\text{m}$ . Conidia ( $n = 30$ ) were hyaline, cylindrical,  $28$  to  $40 \times 16$  to  $22 \mu\text{m}$ , and devoid of fibrosin bodies. These morphological characteristics are in agreement with that of *Golovinomyces cichoracearum* (Braun 1999). Total genomic DNA was extracted from conidial suspensions of two isolates ('GolAlm1' and 'GolAlm2'), obtained on two distinct chicory cultivars, aiming to determine consistently the fungal species associated with the disease. The fungal DNA was purified using a modified CTAB protocol (Boiteux et al. 1999) and used as template in PCR assays with the pair of primers ITS1 and ITS4 primers targeting conserved segments of the ITS rDNA region (White et al. 1990). Gel-purified amplicons were directly sequenced using the same primer pair. Nucleotide BLAST of the 526-bp ITS rDNA fragments of the two isolates from chicory (KY962730 and KY962731) revealed 99% identity with two bona fide *G. cichoracearum* isolates reported infecting *C. intybus* (AB077666) and *Sonchus* species (AB077669) in Europe (Matsuda and Takamatsu 2003). Pathogenicity assays were performed in a greenhouse with 20 seedlings of the chicory cultivar Verde Spadona inoculated via leaf-to-leaf contact (Reifschneider and Boiteux 1988). Inoculated plants displayed ide

ntical field symptoms 10 days after inoculation. The noninoculated controls remained free of symptoms. Individual plants with resistant reaction to the fungus were found segregating within the cultivar Verde Spadona. To our knowledge, this is the first formal report of *G. cichoracearum* causing PM of chicory in Brazil. In this context, chicory may function as a source of *G. cichoracearum* inoculum to other crops since this fungal species is reported as an important pathogen of many Asteraceae species in other countries (Matsuda and Takamatsu 2003).

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