Title First report of *Penicillium griseofulvum* causing blue mold on stored apples in Italy (Piedmont)

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Citation Plant Disease 95 (1): 76. 2011.

Keywords apple; blue mold rot

Abstract

In northern Italy, blue mold can occur generally on apples after 3 months of storage under controlled atmospheres. The mold can be caused by *Penicillium griseofulvum* Dierckx (synonym *P. urticae* Bainier). During 2008, several postharvest fruit rots were observed on apples (cv. Golden Delicious) after 180 to 240 days of storage at 1°C. Approximately 8% of the fruits showed blue mold. Apples had been cultivated in Aosta (Aosta Valley Region) and Lagnasco (Piedmont Region). Infected fruits showed soft, watery, brown spots enlarging rapidly at 20°C. There was a distinct margin between soft rotted flesh and firm healthy tissues. Under high humidity, masses of blue-green spores formed on the surface of the lesion. Apple fruit excisions from the margin between the healthy and diseased tissues were plated on potato dextrose agar (PDA), pH 5.6. The recovered fungus produced abundant mycelium and conidia, with the colonies attaining a diameter of 2.0 to 2.4 cm after 7 days at 20 ± 2°C on PDA. Colonies were mostly yellow-green, with a yellowish-to-orange brown underside. Conidiophores were mononematous or loosely synnematous, hyaline, with branches strongly divergent. Phialides were cylindrical with a very short neck. Conidia were ellipsoidal, sometimes subglobose, 2.5 to 3.5 × 2.2 to 2.5 µm, hyaline to greenish. Preliminary morphological identification of the fungus (2) was confirmed by PCR using genomic DNA extracted from mycelia of pure cultures. Two sequences, obtained through the amplification of ribosomal region ITS1-5.8S-ITS2 (1), were blast searched in GenBank and showed 99% sequence coverage and 99% similarity to ribosomal sequences of *P. griseofulvum*. Two sequences were deposited in GenBank with Accession Nos. HQ012498 (a strain from Aosta Valley) and HQ012499 (a strain from the Piedmont Region). Pathogenicity was tested on 20 ripe fruits each of four apple cultivars (Golden Delicious, Red Chief, Granny Smith, and Royal Gala). Fruits were surface sterilized with 1% sodium hypochlorite. Conidial suspensions (30 µl of 105 conidia/ml) of the fungus were placed on artificial wounds generated on the apple surface. Control fruits were treated with sterile water. Seven days after inoculation, the symptoms were reproduced on the four cultivars and *P. griseofulvum* was reisolated on

PDA from the inoculated fruits of all four cultivars. Control fruits were symptomless. An analysis using high-performance liquid chromatography with diode array of the rotting tissues associated with inoculated fruits of all four cultivars (4) confirmed, as in the case of other strains of *P. griseofulvum*, the production of the mycotoxin patulin (12.1 to 44.4 mg kg^{-1}). Previously, *P. griseofulvum* was reported on apple in other countries such as the United States (3), Japan, Egypt, and Brazil. To our knowledge, this is the first report of *P. griseofulvum* on apples during storage in Italy.