

## First report of *Penicillium allii* as a field pathogen of garlic (*Allium sativum*)

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Blue mould disease in garlic (*Allium sativum*) is associated worldwide with various *Penicillium* species, and has been attributed to significant annual crop losses in Argentina; the world's second largest exporter of garlic. To identify the pathogenic *Penicillium* species responsible, affected plants were sampled in La Consulta station (33°45' S, 69°02' W) and placed in a damp chamber. Characteristic disease symptoms are stunted and chlorotic plants with withered leaves and reduced bulb size. Bulbs are often covered with blue/green conidial masses. Isolations were made from fungal colonies emerging on affected bulbs. Pure cultures (IBT 26466, 26467, 26511 and 26512; CMB collection, BioCentrum-DTU, Denmark) were initially identified by micromorphology as *Penicillium allii*, and identifications were confirmed by comparing reversed phase-HPLC secondary metabolite profiles with those of *P. allii* type strains.

To confirm pathogenicity, sterilized garlic cloves were injured with a needle and inoculated with 5 µL *P. allii* spore suspensions (adjusted to  $5 \times 10^6$  conidia mL<sup>-1</sup>). Inoculated cloves were planted in a field not previously cultivated with garlic, and the original disease symptoms were produced on inoculated plants while water-inoculated control plants remained healthy. The survival rate of inoculated plants was 68% and *P. allii* was reisolated from diseased field plants.

*Penicillium viridicatum* was first reported as the causal agent of blue mould of garlic in Argentina (Gatica & Oriolani, 1984) before the characterization of *P. allii* (Vincent & Pitt, 1989). *Penicillium allii* is micro-morphologically similar to *P. viridicatum* and both species produce yellow exudates in pure culture. To compare pathogenic ability, standard *P. viridicatum* strains IBT 16939 and 15053 were inoculated into sterilized garlic cloves and incubated for 12 days. The *P. viridicatum* strains were not able to sporulate on the garlic cloves.

*Penicillium hirsutum* was recently reported as a pathogen on garlic in Argentina (Cavagnaro *et al.*, 2005). However, *P. allii* but not *P. hirsutum* has been reported as an aggressive pathogen of garlic in comparative pathogenicity trials conducted in damp chambers (Overy *et al.*, 2005). The results reported here suggest that *P. allii*, rather than *P. hirsutum* or *P. viridicatum*, is the pathogenic species responsible for garlic crop losses due to blue mould rot in Argentina. This is the first report confirming *P. allii* as a field pathogen of *A. sativum*.

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## First report of *Armillaria gallica* on highbush blueberry (*Vaccinium corymbosum*) in Italy

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Since 2003, highbush blueberry plants (*Vaccinium corymbosum*) with atypical growth were found in the Trentino Region (north-eastern Italy). At the beginning, plants were stunted and developed small leaves that reddened prematurely in autumn. Later the roots rotted, several branches wilted and plants usually died within a few months. An *Armillaria* sp. was isolated on malt extract agar (MEA) from the roots of dead or stunted plants.

DNA extracted from two isolates growing in the bark mulch used in the orchard, and from a further seven isolates infecting roots, was amplified by PCR using seven primer combinations designed on internal transcribed spacer and intergenic spacer regions of rDNA (Pérez-Sierra *et al.*, 2000; Sicoli *et al.*, 2003). RFLP analysis with *AhlI* and sequencing after amplification with the LR12R/O1 primer combination (Pérez-Sierra *et al.*, 2000) included three isolates for *Armillaria borealis*, and one each for *Armillaria mellea*, *Armillaria gallica* and *Armillaria cepistepes* for reference. All the isolates had the same restriction patterns and sequences (GenBank accession numbers DQ336609–17) as the reference for *A. gallica*.

The pathogenicity of two isolates, one isolated from the bark mulch and one from the root, was tested on blueberry plants. The inoculum was prepared using autoclaved applewood pieces inoculated with the two isolates on MEA in Petri dishes (kept in the dark at 25°C). When the wood pieces had been completely colonized, they were placed between roots of 2-year-old potted blueberry plants. Infected plants were kept in a glasshouse (average daily temperature 20 ± 5°C, natural light) and after 10 months inoculated plants showed symptoms similar to those observed on plants

with symptoms in the original orchard of isolation. *Armillaria gallica* was reisolated from the infected plants and reidentified using RFLP analysis and sequencing.

*Armillaria* species induce root disease on a broad range of plants and cause economic losses, especially on fruit and forest trees. Both *A. mellea* and *Armillaria ostoyae* have been reported on highbush blueberry in the USA (Caruso, 1995), but this is the first report of root rot caused by *A. gallica* on this host.

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