



First report of *Phytophthora megasperma* causing crown and root rot of almond in Turkey

İ. Kurbetli^{1*} and A. Yılmaz²¹ Bati Akdeniz Agricultural Research Institute, Plant Health Department, Antalya, Turkey; ² Pistachio Research Station, Cultivation Technique Department, Gaziantep, Turkey*E-mail: kurbetli@gmail.comReceived: 07 Jul 2015. Published: 01 Dec 2015. Keywords: *Prunus dulcis*, almond decline

Young almond trees (two-three years old) in commercial orchards of Adiyaman province (Southeastern Turkey) were observed showing decline symptoms in April-July 2013. Symptoms in affected trees included chlorosis, reddish-brown cankers progressing from the roots to the stem (Fig. 1), and dieback. Lateral and feeder roots were decayed. Plant losses of up to 15% occurred in the orchards. Diseased almond roots were washed in tap water and air-dried. Small sections, 3-5 mm diameter, were cut from the margin of the lesions and ten sections were plated on 1.7% corn meal agar amended with 4 mg/l pimarin, 250 mg/l ampicillin, 10 mg/l rifampicin, and 75 mg/l pentachloronitrobenzene, without surface sterilization. Plates were incubated at 22°C in the dark. After three days, single hyphal tips from the edge of the growing colonies were cut and transferred onto carrot agar (CA) (200 ml boiled carrot juice, 800 ml distilled water and 20 g agar) to obtain pure cultures for identification.

The homothallic isolates produced oogonia abundantly in CA with a diameter of 30.6-49.5 µm (mean 41.2 µm). Plerotic or aplerotic oospores with paragynous antheridia measured 26.9-43.5 µm (mean 35.4 µm) in diameter (Fig. 2). Non-papillate and non-caducous sporangia were ovoid (Fig. 3), obovoid, obpyriform or ellipsoid. They had both rounded and tapered bases. The ovoid and obpyriform sporangia were 34.6-66.8 µm long (mean 50.6 µm) and 24.6-44.7 µm wide (mean 34.1 µm), with length-to-width ratios of about 1.48. External and internal proliferation of sporangiophores and nesting occurred. Cultures produced hyphal swellings in clumps or catenulate. Hyphal swellings sometimes occurred on sporangiophores in non-sterile soil extracts.

Based on these morphological characteristics, the isolates conformed to *Phytophthora megasperma*. Morphological identification was confirmed by sequencing the ITS. DNA was extracted from five isolates and the ribosomal DNA fragment was amplified with ITS1 and ITS2 primers (White *et al.*, 1990) and sequenced. Nucleotide sequences of these isolates (Accession numbers KF633448, KF633449, KF633450, KF633451 and KF633452) had 99% homology with other *P. megasperma* isolates in GenBank (e.g. EU194387, GU258779, KC753539, HE805270 and EU301166).

Two isolates of *P. megasperma* were tested for pathogenicity on three-year-

old almond rootstocks. Inoculum was produced by growing isolates for two weeks at 22°C in the dark on twice-autoclaved wheat grains moistened with distilled water. Each of the rootstock plants was transplanted to a 5-litre pot containing soil:sand mixture (1:1, v/v) mixed with inoculum at a rate of 5% of the total soil volume. For each isolate five control plants were used. Plants were incubated in a growth chamber for four months at 25 ±1°C and were kept constantly wet. At the end of the experiment canker lesions covered the whole roots, while no cankers developed in the roots of non-inoculated plants (Fig. 4). The pathogen was re-isolated from symptomatic tissues.

P. megasperma causes root and crown rot of almond in Australia and the USA (Wicks *et al.*, 1997; Browne & Viveros, 1998). In Turkey, some *Phytophthora* spp. such as *P. cactorum*, *P. citrophthora* and *P. niederhauserii* have been reported previously on almonds (Kurbetli & Değirmenci 2010; 2011) but this is the first report of *Phytophthora megasperma* causing crown and root rot of almonds in Turkey.

References

- Browne GT, Viveros MA, 1998. Diverse symptoms and losses associated with *Phytophthora* spp. in California almonds. *Acta Horticulturae* **470**, 570-575. <http://dx.doi.org/10.17660/ActaHortic.1998.470.80>
- Kurbetli İ, Değirmenci K, 2010. First report of root and crown rot of almond caused by *Phytophthora* spp. in Turkey. *Plant Disease* **94**, 1261. <http://dx.doi.org/10.1094/PDIS-06-10-0411>
- Kurbetli İ, Değirmenci K, 2011. First report of *Phytophthora* taxon *niederhauserii* causing decline of almond in Turkey. *New Disease Reports* **23**, 14. <http://dx.doi.org/10.5197/j.2044-0588.2011.023.014>
- White TJ, Bruns T, Lee S, Taylor JW, 1990. Amplification and direct sequencing of fungal ribosomal RNA genes for phylogenetic. In: Innis MA, Gelfand DH, Sninsky JJ, White TJ, eds. *PCR Protocols. A Guide to Methods and Applications*. San Diego, CA, USA: Academic Press, 315-322.
- Wicks TJ, Lee TC, Scott ES, 1997. *Phytophthora* crown rot of almonds in Australia. *EPPO Bulletin* **27**, 501-506. <http://dx.doi.org/10.1111/j.1365-2338.1997.tb00673.x>



Figure 1



Figure 2



Figure 3



Figure 4

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