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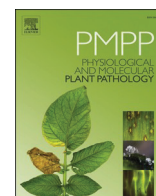


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Detection of fungal trunk pathogens from wood tissues and pruning wood debris of olive trees in Iran

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ABSTRACT

Between April 2015 and August 2017 a survey was conducted in olive orchards in different regions in Iran in order to collect and identify fungal trunk pathogens. Wood samples were collected from the trunk and branches of olive trees showing dieback and cankers, as well as pruning wood debris left in the orchards. Fungal isolation was performed from necrotic woody tissues, as well as fruiting bodies observed on bark of wood debris. Morphological identification of the fungal isolates was confirmed by DNA sequencing and comparisons of the internal transcribed spacer (ITS) nrDNA region and a partial sequence of translation elongation factor 1- α (*tef-1 α*) and β -tubulin (*tub2*) genes. In this study, eight species of *Botryosphaeriaceae* namely *Botryosphaeria* (B.) *dothidea*, *Diplodia* (D.) *gallae*, *D. intermedia*, *D. mutila*, *Dothiorella* (Do.) *sarmentorum*, *Neofusicoccum* (Neof.) *parvum*, *Neoscytalidium* (Neos.) *dimidiatum* (as the most abundant species) and *Neos. novaehollandiae* were identified. Moreover, *Pleurostoma* (Pl.) *richardsiae*, *Paecilomyces* (P.) *formosus*, a *Coniophora*-like fungus and several isolates of *Phoma*, *Chaetomium*, *Darksidea* and *Hypoxyton* species were obtained. Pathogenicity trials on detached shoots of olive trees conducted under greenhouse conditions showed that *P. formosus*, *Neos. dimidiatum*, *D. gallae*, *Neof. parvum*, *Dot. sarmentorum*, *Neos. novaehollandiae*, *Pl. richardsiae*, *B. dothidea*, *D. mutila*, *D. intermedia* and *Coniophora*-like fungus were pathogenic on inoculated olive shoots. *Paecilomyces formosus* was the most virulent and caused the longest lesions. Based on literature reviews, this study represents the first report on the occurrence of *D. mutila*, *Neof. parvum* and *Pl. richardsiae* from diseased olive trees in Iran. Moreover, this is the first report of *D. gallae* from fruiting bodies on the bark of branches, and four species (namely *D. intermedia*, *Neos. novaehollandiae*, *P. formosus* and *Coniophora*-like fungus) from affected olive trees worldwide. Our results provide new insights into the etiology of olive fungal trunk diseases.

1. Introduction

The olive tree (*Olea europaea*) is native to the Mediterranean region, tropical and central Asia, and various parts of Africa [1]. Iran has around 84,000 ha of olive orchards and an annual olive fruit production of 100,000 tons. This country is 14th in the world in terms of area under olive cultivation and 20th in terms of production [2]. Gilan, Qazvin, Zanjan, Fars and Markazi are the most important olive producing provinces in Iran.

Various fungal pathogens in the *Botryosphaeriaceae*, *Diaporthaceae*, *Diatrypidae*, *Nectriaceae*, *Pleosporaceae*, *Pleurostomaceae*, *Togniniaceae*, and *Valsaceae* families, and some Basidiomycota species have been reported as the causal agents of cankers and dieback diseases affecting olive trees worldwide [3–16]. Of these, the *Botryosphaeriaceae* family is

known to be the most prevalent associated with olive fungal trunk diseases [16–23]. Dieback and cankers caused by species in the family *Botryosphaeriaceae* are a major restriction to olive production. Members of this family are common endophytes of many woody plants, including fruit crops, and forest and ornamental plants worldwide [24,25]. According to literature reviews, numerous *Botryosphaeriaceae* species including *Botryosphaeria* (B.) *dothidea*, *B. wangensis*, *Diplodia* (D.) *corticola*, *D. mutila*, *D. olivarum*, *D. pinea*, *D. scrobiculata*, *D. seriata*, *Dothiorella* (Do.) *iberica* (Do.), *Lasioidiplodia* (L.) *theobromae*, *Macrophomina* (M.) *phaseolina*, *Neofusicoccum* (Neof.) *australe*, *Neof. cryptoaustrale*, *Neof. luteum*, *Neof. mediterraneum*, *Neof. occulatum*, *Neof. parvum* and *Neof. vitifusi-forme* have been reported from olive trees worldwide [4,6,11,16,20,21,25,26]. More specifically, some *Botryosphaeriaceae* species can cause significant and economically diseases of olive, such as Dalmatian disease

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