

The emergence of *Xylella fastidiosa* and research efforts to mitigate its impact

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Keywords pathogenic bacterium, plant epidemic, surveillance, containment, olive, outbreaks

The bacterium *Xylella fastidiosa* (Xf) is renowned worldwide as one of the plant pathogens causing the most severe diseases affecting many important woody crops; it is regulated as quarantine pathogen in several countries and ranked as priority pest for the European Union (EU). In the last century, the bacterium has been widely reported in the Americas affecting mainly grapes and citrus, but it is only in the last decade that it emerged as serious threat for the European and Mediterranean agriculture. It was at the end of 2013, when unexpectedly it was detected in olive trees affected by a deadly disease decimating olive trees in southern Italy (in the region of Apulia). This represented the first finding of *Xylella*-established infections under field conditions in EU. The investigation on the pathogenic role of Xf in the aetiology of the olive disease (termed “olive quick decline syndrome”) confirmed that a hitherto-undescribed strain of the bacterium was introduced in Apulia, most likely from Central America, through the importation of infected ornamental plants, escaping the phytosanitary quarantine controls. Subsequently, the insect vector (*Philaenus spumarius*) responsible for the local spread of the bacterium and the continuous expansion of the front of the epidemic, was identified. Thereafter, epidemiological studies revealed that olive-to-olive is the main pathway of spread of the bacterium under the specific conditions occurring in the Italian olive groves, while studies of the climatic suitability showed that the majority of the Mediterranean olive growing areas (i.e., Italy, Spain and Greece) are vulnerable. Projections of the future direct economic impact estimate that Xf full spread could ultimately cost to the EU olive industry over €5.5 billion per year and a still undetermined severe impact on landscape, environment, and agroecosystem services.

To face such potential devastating impact and the lack of effective therapeutic means, numerous research programs have been developed and activated in Europe establishing, for the first time outside the Americas, a consolidated international multidisciplinary research network. While initial research initiatives aimed to fulfil the knowledge gaps on the bacterial strain, the insect vectors, the susceptible host range, providing enormous amounts of scientific knowledge; more recent initiatives are addressed to develop sustainable practical solutions to support farmers facing the spread of the bacterium in the infected areas. Ongoing testing of different biocontrol agents, mineral, and chemicals to target Xf or the insect vectors, along with the extensive screening of olive germplasm and new breeding programs for resistance, are progressively disclosing new information and opportunities. However, based on the American experience, it is realistic to affirm that it could take years before effective solutions are found. In the meanwhile, it is crucial to implement preventive measures and IPM approaches based on strategies for vector control, efficient and early detection (i.e., taking advantages of the remote sensing technologies), the search for and adoption of resistant or tolerant species and cultivars and the rapid application of phytosanitary measures, consisting among others of removal of infected sources and vector control.