

INFORMATIVE NOTE

Xylella, the olive grove in risk

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During October 2013, in the olive grove of Lecce, damages from the ‘Olive Quick Decline Syndrome’ (OQDS) were identified for the first time in Europe. The major agent of this disease was defined as the bacterium *Xylella fastidiosa*. In Puglia, the Italian region where Lecce is located, the subspecies which has been detected is *X. fastidiosa* subsp. *Pauca*, molecularly identical to an isolate from Costa Rica (Martelli *et al.*, 2016). Nevertheless, the diversity of *X. fastidiosa* in infected olive trees in Puglia has been the subject of a recent study (Mang *et al.*, 2016).

According to the European and Mediterranean Plant Protection Organization (EPPO, 2015a), *X. fastidiosa* represents a serious threat to the region under its tutelage. *X. fastidiosa* has a broad host range, including many cultivated and wild plants common in Europe (Potere *et al.*, 2015). Therefore, in this continent, this bacterium may affect several crops such as citrus (Niza *et al.*, 2015), grapevine and stone fruits (almond, peach, plum), but also several tree and ornamental plants, for example oak, sycamore and oleander (EFSA, 2015). Recently, in application of the Implementing Decision (EU) 2016/764 of the European Commission, which amended the Decision (EU) 2015/789, with Determination n. 203 of May 24, 2016, the Department of Agriculture, Rural and Environmental Development of the Apulia Region, has defined the newly demarcated areas for *X. fastidiosa* subspecies *Pauca* strain CoDiRO (from the Italian, *complesso del disseccamento rapido dell'olivo*). The infected zone includes the whole province of Lecce and part of the provinces of Brindisi and Taranto. The buffer zone, to the north of the infected zone, extends from the Ionian to the Adriatic Sea, with a width of not less than 10 km. The northernmost part of the infected zone is a “containment zone”, which covers an area adjacent to the southern boundary of the buffer zone from the Ionian to the Adriatic Sea, with a width of 20 km (POnTE, 2016). Currently, the affected area in Italy is more than 300,000 Has.

The protagonist of this disease is an aerobic bacterium Gram negative which develops inside the plant xylem vessels. These vessels, located in the inner medulla of the tree trunk and stems, carry the crude sap. Besides olive trees, the bacteria have been detected in many host plants, mostly ornamental. As often happens, the most severe phytosanitary threats are not native. There are many well-known cases illustrating this, among which we may remember the vine phylloxera or the palm weevil, the latter much more recent. It may be useful to bear in mind that phylloxera (*Dactylosphaera vitifoliae*) forced the removal of almost all the European vineyards from its arrival in 1868, as well as its replacement with American vine rootstock. His entry into Europe was caused by the import of the variety of American vine “Isabela” from the State of Georgia, USA (Piqueras, 2005). The purpose being to content the pest of *Oidium*, which the European vines were suffering at the time. In common with the vine phylloxera, the major distribution area of *X. fastidiosa* occupies large territories in the Americas, both in north and south, where it have emerged as some of the most significant new

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disease threats (Hopkins & Purcell, 2002). Casually, or at least for the moment there is no reason to think the contrary, *X. fastidiosa* was cultured and properly described for the first time in 1987 in the USA as the cause of Pierce's disease (PD) of grapevine, *Vitis vinifera* (Janse and Obradovic, 2010). However, the case is very different, as discussed below.

In the outbreak of the OQDS in Italy, the drying affected leaves, branches, and even whole trees. However, little is known about the pathogenicity of *X. fastidiosa* in olive trees, and it is not yet clear whether these damages are due to this bacterium exclusively. In most affected olive trees, they have also been detected pathogenic fungi belonging to the genera *Phaeoacremonium* and *Phaeoconiella*, and wood borer *Zeuzera pyrina* (SSV, 2015). All xylem fluid-feeding insects are considered to be potential vectors. Species of the families Cicadellidae, Aphrophoridae and Cercopidae are identified as vectors in the Americas and, hence, should be considered potential vectors in Europe. The Cicadidae and Tibicinidae should be considered with the same ability. The hemipteran *Philaenus spumarius* has been identified as a vector in Apulia, Italy.

On December 30, 2014, the European Commission requested scientific opinion from The Panel on Plant Health of the European Food Safety Agency (EFSA) on the pest risk posed by *Xylella fastidiosa* for the European Union territory. Opinion on risk management choices and evaluation on their effectiveness in reducing the risk to plant health posed by the organism was required to the EFSA also. The main conclusion of the report was that the major route of entry into the EU are plants intended for planting from countries or areas where the bacteria is present. Seeds are excluded. It is considered also as a possible route the infectious insect vectors transported in shipments of plants. Other plant materials (wood, cut flowers, fruits, ornamental foliage) are considered to have little risk for transmitting the bacteria. On risk decrease choices, the EFSA Panel settled that a thorough review of the literature yielded no suggestion that eradication is completely successful once the disease is established in an area (EFSA, 2015). Past attempts, in Taiwan and Brazil, proved unsuccessful, probably because of the broad host range of the pathogen and its vectors. Therefore the danger is serious, and the priority should be to prevent the entry of the pathogen.

Because of the report issued by EFSA, the Commission adopted temporary measures to prevent the spread of pest to the rest of the EU (Decision 2014/87/EU). Forbidding the movement of plants outside the province of Lecce was included. Since the implementation of these measures, the producing countries have fixed contingency plans for *X. fastidiosa*. This is the case of

Spain, the leading producing country, where the Ministry of Agriculture, Food and Environment has fixed precautions in case of suspicion of the presence of harmful organism, measures to be taken in case of confirmation, eradication rules, and measures to take in case of default (MAAMA, 2015). This Contingency Plan defines also the competencies of the State and the Autonomous Communities. The latter hold the executive competencies, except inspecting consignments from third countries at the points of entry. The State holds all the competencies on planning and coordination.

In July 2015, the bacteria *X. fastidiosa* was detected in the island of Corsica (France) affecting ornamental plants of *Polygala myrtifolia*. Later, in October 2015, it was detected for the first time in Alpes-Maritimes department (Southern France). A first case (*X. fastidiosa* subsp. multiplex, same subspecies as in Corsica) was detected in Nice on a *P. myrtifolia* plant, and then in 5 other plants located nearby. Soon after, another focus was found in the area of Mandelieu La Napoule, also located in the Alpes-Maritimes department. In this case, the bacterium was detected in one *P. myrtifolia* planted in a public garden. Eradication measures are being applied in all infected areas (EPPO, 2015b).

In November 2016, the presence of *X. fastidiosa* was confirmed in Islas Baleares. This is the first report of the bacterium in Spain. The bacterium was detected in sweet cherry (*Prunus avium*) in a garden centre in Porto Cristo, municipality of Manacor, on the island of Mallorca. A focus zone of 100 m radius and a buffer zone of 10 km have been delimited, and phytosanitary measures will be applied to avoid any further spread (EPPO, 2016).

The EPPO diagnostic protocol on *X. fastidiosa* (PM7/24) is currently under revision and in a few months, the final version should be officially released. In early March 2016, the draft protocol was circulated for an official EPPO Country Consultation, closed at the end of April. The comments received during the Country Consultation have been discussed by the EPPO Panel on Diagnostics in Bacteriology in Paris (France) past June 1–2, 2016, with the aim to finish the protocol. The EPPO Standard on diagnostics will provide guidelines on inspection and diagnostics and support the work of the National Plant Protection Organizations (PONTE, 2016a).

Among the aims intending to face this threat, it must be highlighted an initiative of scientific research. PONTE (Pest Organisms Threatening Europe) is a four-year International Research Project, funded by the European Union under the program Horizonte Challenge 2020. This proposal focuses on minimizing the risk of introduction and the impact of emerging pests threatening EU agriculture and forestry. Major attention is given to

X. fastidiosa and its vectors in olive, grapevine, citrus, stone fruit, ornamentals, which receive 40% of the project's budget, which is near 7 million €. The major expected outcomes from this research project include the finding of biomolecules which can be applied to prevent or reduce host colonization, as well as chemical compounds that prevent vectors. The selection of tolerant or resistant varieties, discovery of endophytic bacteria that can cross protect against *X. fastidiosa*, instruments for early detection of the pathogens that can be used for inspection at port of entry, and discovery of an optimal biological control agent for vectors of *X. fastidiosa* are targets of the POnTE project also. Other recent progress is the draft genome sequence of the *X. fastidiosa* CoDiRO strain, which has been isolated from olive plants in southern Italy (Puglia) (Giampetruzzi *et al.*, 2015).

Returning to the differences in the threat from *X. fastidiosa* with respect to the above mentioned case, the phylloxera vine, first, the historical moment is different. In the century and a half elapsed, available technology has largely improved, as the previous lines highlights. But there is one more essential difference. Phylloxera, an homopterous insect, develops a part of their life cycle in the roots of the vine, producing damage to plants directly. Phytosanitary treatments are difficult at this stage. In the case of the 'Olive Quick Decline Syndrome', the infection by *X. fastidiosa* requires always a sap-sucking insect as a vector as previously discussed. The specificity between *X. fastidiosa* and the vector is usually very low, so virtually any species of Cycadelids or Cercopids can be potential vectors of this bacterium. Vectors, however, only act as efficient dispersers in short distances. The main risk of entry of the bacterium is trade and transport of infected plant material (Servicio de Sanidad Vegetal, 2015).

The Regional Government of Andalusia, Spain, is making a great effort to keep the public opinion aware of the big potential threat represented by the bacterium to olive crops in Spain, following the recent outbreaks of *X. fastidiosa* in Italy and France (POnTE, 2016b). Andalusia has the largest area of olive grove in the world, providing about half of the production of olive oil. The main measure of phytosanitary control must be to maximize the care in the trade of sensitive plant material and especially from areas where the bacteria has been detected. This plant material should always come from officially licensed producers and, where appropriate, with plant passport. Right now, considering the proximity of the outbreak in Italy, it should especially take care of the phytosanitary quality of the sensitive plant material from that country. In any case, it is essential to communicate immediately to the plant health authorities the suspected presence of this

bacterium. Once detected an initial infection on the field, chemical treatments against bacteria or vectors are usually not effective. In these cases the removal of the affected trees and the surrounding wild vegetation that can act as host, is necessary (SSV, 2015).

Besides, it is reasonable to think that a high attention to the presence of insect vectors on the crop is advisable for an effective prevention. The sap-sucking insects are vectors only when infected, therefore the official information does not encourage the olive growers to especially fighting these pests. The damage threshold of a sucking insect as vector of a bacterium as *X. fastidiosa* is very different case from consideration as a pest that has a direct damage to the crop. However, the fight against sucking insects is easy and well resolved by phytosanitary treatments. It seems desirable for the olive growers to be well informed about the evolution of *X. fastidiosa* threat, as well as regarding the official recommendation on vectors treatment. This information is available at the corresponding point of the Agricultural Administration. And in case of being necessary, any of the preventive measures that are in their hand can be taken.

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