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Olive "Quick Decline" in southern Italy may be associated with pathogen common in California

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The report of a new disease on olive in Italy, called "quick decline," marks the first report of the bacterial pathogen, *Xylella fastidiosa,* in Europe. This pathogen is not new to the Americas and has been in California

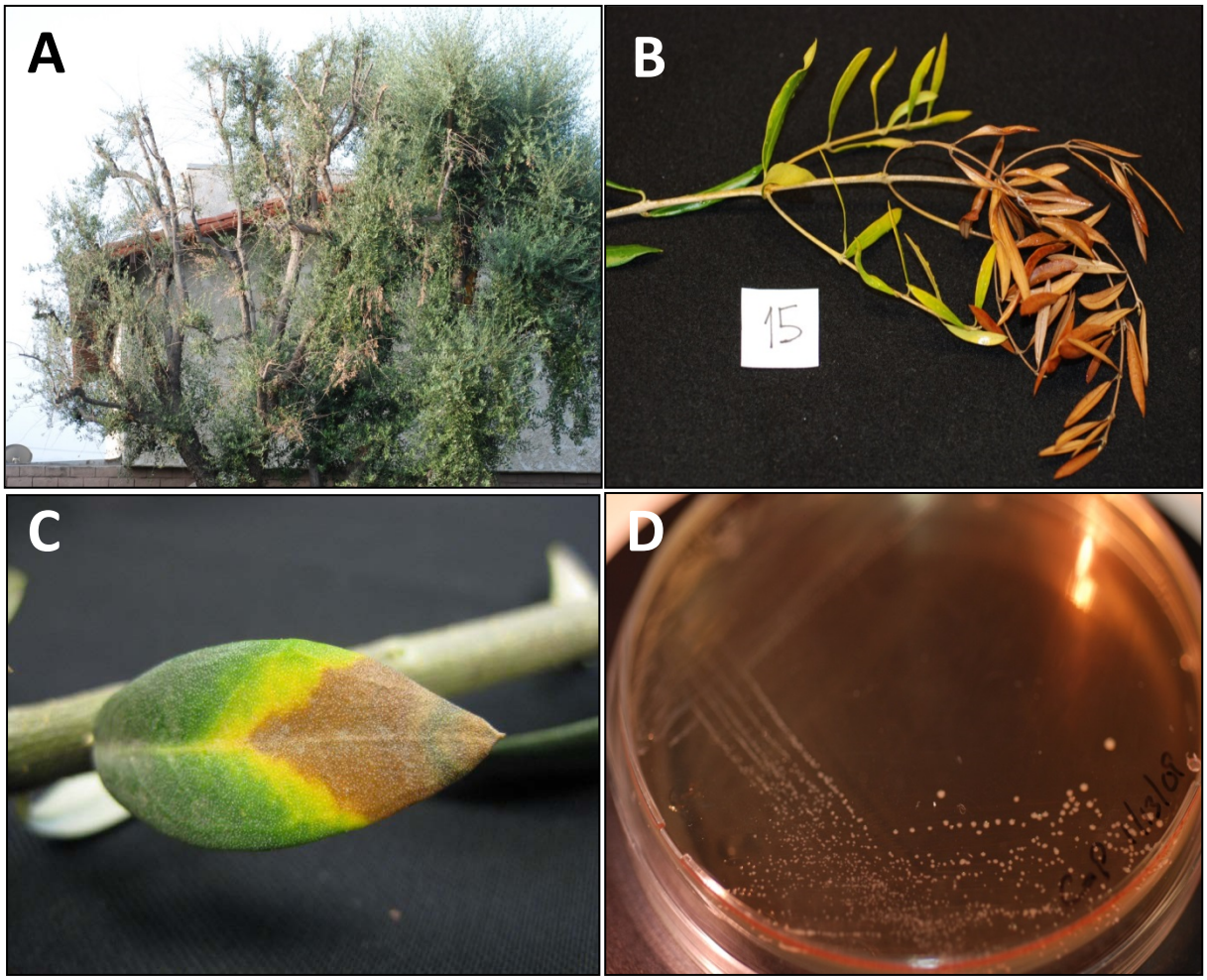

Figure 1. In southern California landscapes, olives exhibited dieback (A and B) and leaf scorch (C). Six strains of *Xylella fastidiosa* subspecies *multiplex* were isolated into pure culture (D) from symptomatic olives trees in southern California. Photos: R. Krugner

for over 100 years. It is perhaps best known as the cause of Pierce's Disease on grape, but also causes citrus variegated chlorosis, peach phony disease, alfalfa dwarf, and scorch on almond, oleander, and pecan. In response to scorch and dieback symptoms (Figure 1 A-C) on landscape and orchard plantings of olives in California, Dr. Rodrigo Krugner, an entomologist with the USDA ARS in Parlier, CA, established a research program to investigate the epidemiology of *X. fastidiosa* on California olives.

The Pathogen

X. fastidiosa is a gram-negative, xylem-limited bacterium affecting over 100 known plant hosts. The pathogen multiplies within the xylem and is thought to cause disease by interfering with water and nutrient transport. It is spread naturally from plant to plant by xylem-fluid feeding insects. The pathogen is difficult to culture (Figure 1D); consequently, prompt identification often relies on use of PCR techniques that detect pathogen DNA in plant tissues.

The pathogen may be grouped into subspecies based on host specificity. For example, *X. fastidiosa* subsp. *fastidiosa* causes Pierce's disease on grapevine as well as scorch on almond; however, the *X. fastidiosa* subsp. *multiplex,* causes disease on almond but not on grapevine.

Vectors associated with *X. fastidiosa* in California

X. fastidiosa is transmitted by xylem-fluid feeding insects, such as spittlebugs, froghoppers, and sharpshooters. While many of these insects may have the potential to transmit *X. fastidiosa,* there are four sharpshooter species in California that are recognized to have the greatest role in *X. fastidiosa* spread. Three of these sharpshooters are native to California and present throughout the state: red-headed sharpshooter, blue-green sharpshooter, and green sharpshooter. The last vector is the invasive glassy-winged sharpshooter (Figure 2A), which became established in southern California in 1990 and is responsible for the rapid spread of *X. fastidiosa* on grapevine. Sharpshooters acquire *X. fastidiosa* when feeding on infected plant material. Once inside the vector's mouthparts, the bacterium multiplies rapidly and the insect is then capable of transmitting the bacterium for the remainder of its life (if it is an adult) or until it molts (if it is immature). Because sharpshooters are strong fliers and typically feed on multiple host plant species, *X. fastidiosa* may be spread to multiple hosts over the insects' lifetime.

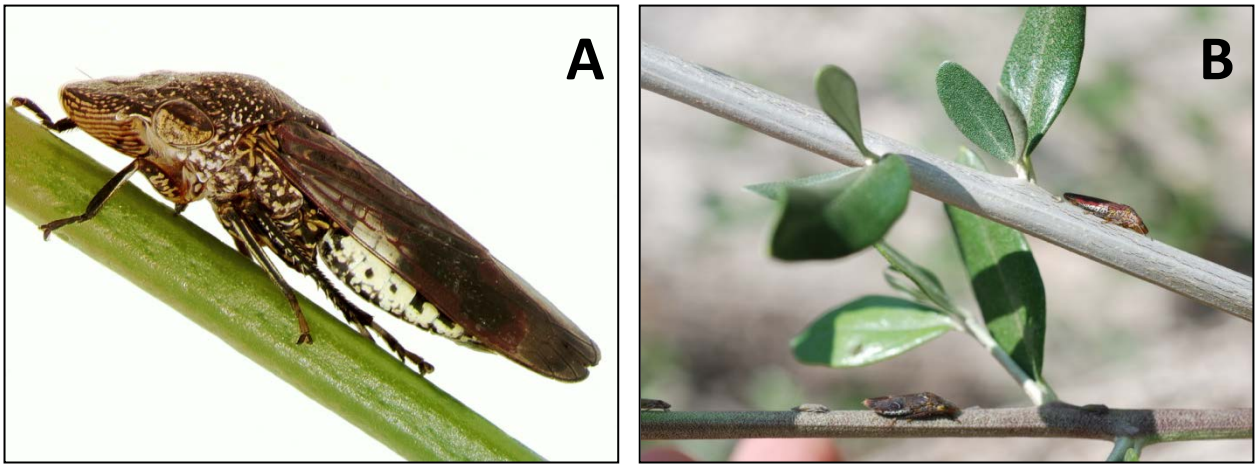

Figure 2. The glassy-winged sharpshooter (A), *Homalodisca vitripennis,* is a known vector of *Xylella fastidiosa* and contributes to the spread of Pierce's Disease on grapevine in California. The glassy-winged sharpshooter can reproduce and overwinter on California olives (B). Photos: R. Krugner.

'Quick Decline' in Italy

In October 2013, *X. fastidiosa* was reported in the Puglia region of southern Italy, marking the first report of the pathogen in Europe. Characteristic symptoms included extensive leaf scorch and branch dieback, as well as discoloration of vasculature. Along with isolation of several putative fungal pathogens, presence of *X. fastidiosa* was confirmed by serological and PCR tests. Almond and oleander plants near the infected olives

also tested positive for the pathogen. Scientists in Italy are currently surveying the area surrounding the outbreak and regulatory agencies have prohibited the movement of propagation materials from susceptible hosts out of the infected area. Additionally, researchers are working to determine the subspecies of *X. fastidiosa* associated with symptomatic olives and to obtain pure cultures of the pathogen for pathogenicity tests. Currently, the origin and strain(s) of *X. fastidiosa* introduced to Europe, as well as the insect species responsible for transmission, are unknown.

Association of *X. fastidiosa* with California olives

Leaf scorch and dieback symptoms have been observed in commercial olive orchards and landscape plantings (Figure 1 A and B) in California. Krugner's laboratory found that only 17% of the trees sampled tested positive for *X. fastidiosa* by PCR, with rates of pathogen detection higher in southern CA (39%) than in the Central Valley (2.5%). The pathogen was only successfully cultured from samples collected in southern California, suggesting that the pathogen population on olive is limited in the Central Valley. Reintroduction of the pathogen into multiple varieties of olive resulted in low levels of infection, and asymptomatic infections were common. Dr. Krugner's work also demonstrated that California strains of *X. fastidiosa* belong to the *multiplex* subspecies, which is pathogenic on almond, but not grapevine. Consequently, California olives are not considered a source of inoculum for Pierce's Disease on grapevine; however, olives may harbor insect vectors (Figure 2B) responsible for transmission of the bacterium to grapes or other crops.

What does the "'Quick Decline" in Italy mean for California olive growers?

Dr. Krugner's work demonstrated low levels of pathogen recovery from olives in the Central Valley and minimal association of the pathogen with disease upon reintroduction to healthy plants. Further studies, however, are necessary to determine a) the subspecies responsible for the 'quick decline' in Italy, and b) the pathogenicity of isolates recovered from symptomatic plants in Italy. It is possible that pathogen strains recovered in Italy may be different, and more aggressive on olive, than strains endemic in California. California olive growers and landscape managers should report new incidences of extensive dieback or scorch on olives to farm advisors.

Acknowledgements

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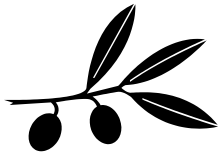

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