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Project Deliverables

POnTE Project

Remote sensing system for detection and monitoring of *Xylella fastidiosa*

- In the emergence of the *Xylella fastidiosa* epidemic on olive trees in Apulia, supporting the establishment of robust monitoring and early detection strategies was among the primary tasks for research and pest management authorities.
- Within the **POnTE project**, scientists developed a sound methodology leveraging airborne detection of the spread of the bacterium, before the symptoms become visible.

Xylella fastidiosa

The bacterium *Xylella fastidiosa* is one of the most threatening plant pests in the world. It can colonize more than 550 plant species and is pathogenic on a wide range of them, including grapevine, citrus, almond, oleander, peach, coffee, avocado, olive tree, and oak. Once confined to North and South America, *Xylella fastidiosa* was first detected in Europe in 2013.

POnTE Project

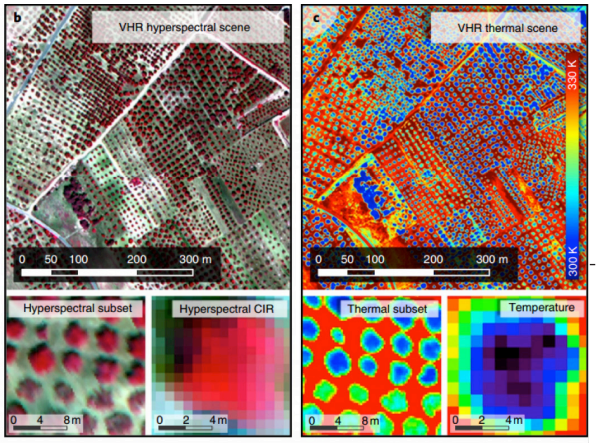
The EU Horizon 2020 financed POnTE project started in 2015 and concluded in 2019. POnTE gathered 25 organizations and 120 researchers from 10 EU and three non-EU countries to foster and share knowledge for the prevention, detection, control, and management of a group of plant pests threatening crops, biodiversity, and the economy in Europe.

- Once they identified the physiological traits of plants altered by *Xylella fastidiosa* infection, scientists collected high-resolution **hyperspectral and thermal imagery** acquired with an airplane.

Hyperspectral and thermal imagery

The pest infection of a plant alters its physiological functions. The biochemical constituents of the plants are rapidly affected under stress conditions. These alterations can be used as early indicators of the disease as they influence the way the plants emit radiation. The analysis of high- resolution images collected through thermal and hyper-spectral cameras (i.e. processing information from electromagnetic radiation) can measure these alterations, unveiling an infection before the symptoms become visible to the human eye.

- A 2-year campaign in Apulia collected high resolution (sub-meter) images of nearly 200,000 olive trees. In a 1,200 hectares study area within the *Xylella fastidiosa* infection zone, 3,500 trees were evaluated in the field for severity of *Xylella fastidiosa* symptoms, obtaining up to 80% accuracy in the detection of the disease.



New findings, new questions

To obtain accurate predictions of potential disease spread, simulation models usually require data on the actual prevalence of infected plants, including those that are still asymptomatic. To this end, the collection and analysis of high-resolution remote sensing imagery through thermal and spectral cameras as part of early detection systems, are a promising area of applied research on plant pests. Improving the promptness in the identification of diseased plants enables authorities to speed up eradication strategies. In the specific case of *Xylella fastidiosa*, the ability to detect pre-visual infection is particularly relevant. Airborne systems may reduce the invasiveness of controls in the field and have a positive impact on public acceptance of the eradication protocols. Moreover, the POnTE project researchers could highlight that the incubation of infection in olives is quite prolonged. It can take up to 12 months before symptoms appear. These characteristics make the establishment of scientifically sound early detection methodologies essential to mitigate the risk of infected but asymptomatic trees contributing to the epidemic.

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