This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 635646

Main findings and results

POnTE Project findings and achievements

The POnTE Project

POnTE stands for 'Pest Organisms Threatening Europe' and the project bearing this name has been one of the first and most integrated responses of the European scientists to the emerging menace of invasive plant pests. From 2015 to 2019 the researchers in the POnTE Project investigated pests damaging economy and biodiversity in Europe, causing diseases such as the ash dieback in the UK, the olive quick decline in Southern Italy and an infection harming the carrot and celery growers' income in Finland, France and Spain.
Once considered to be a 'Northern world' problem originated by trade, today non-native plant pests are a global threat. According to some estimates, they cost global economies up to 1.4 trillion dollars per year in biodiversity and economic losses. Global threats require a global response, and scientists and governments are expanding research networks all over the world, as well as the set of disciplines involved, to be prepared to grapple with crop and forestry destructive pathogens invading new territories before they arrive.

Financed by the European Union Horizon 2020 program, the POnTE Project brought together 25 partners from Europe and Latin America with expertise in plant sciences, entomology, agro-engineering and economics in order to develop a comprehensive and multidisciplinary investigation on a group of plant 'pathosystems'.

The pathosystems

In epidemiology, the pathosystem is a complex of interactions among the potentially harmful organisms, the environment, the potential hosts and the vectors transmitting the infection from one host to another. This is precisely the POnTE Project approach to study a group of plant pests that threaten strategic crops and natural landscapes in the EU. The specific objectives of POnTE are focused on the investigation of genetics, biology, epidemiology, vector ecology and economic impacts of four pathosystems, in order to identify economically, technically feasible and sustainable integrated management strategies for the containment of each of them.

Profiles

Xylella fastidiosa

Xylella fastidiosa is one of the most harmful 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 America, *Xylella fastidiosa* was first detected in Europe in 2013, on olive trees in Apulia, Southern Italy.

Credits: **IPSP-CNR Bari**

Olive groves affected by *Xylella fastidiosa* in Apulia, Italy

Hymenoscyphus fraxineus

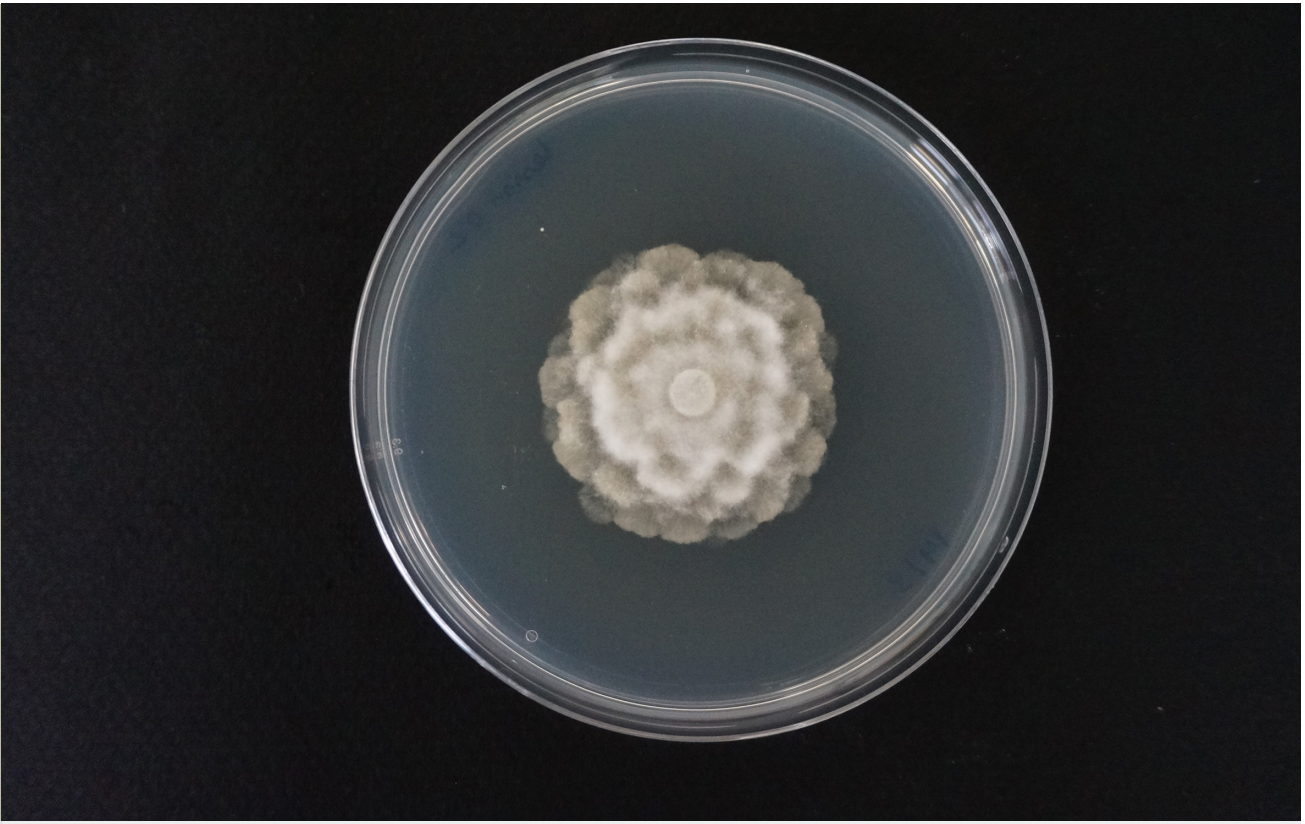
Hymenoscyphus fraxineus is a fungus responsible for the ash dieback disease in Europe. The organism was first detected in Europe (Poland), in 1992. Since then, it has colonized the continent woodlands, killing the European ash subspecies (*Fraxinus excelsior*) and the many organisms dependent on ash trees. In 2012, it was detected in the UK, where today the fungus is spread in nearly the whole territory threatening the native British ash as a woodland, hedgerow and urban tree species.

Phytophthora on forest plants

Phytophthora organisms are well-known and very damaging organisms affecting many plant species. One of them, *Phytophthora infestans*, was among the causes of the Great Irish Famine of the XIX Century. In the last 10 to 20 years, scientists discovered about 60 new species of *Phytophthora* and aggressive species such as *ramorum* and *cinnamomi* have made regular appearances on broadleaf (for instance beech and oak) and conifer trees (for example larch) in woodlands all across Europe.

Candidatus Liberibacter solanacearum – Lso

Candidatus Liberibacter solanacearum, Lso in brief, is a plant bacterium. In North America and New Zealand, this pathogen infects tomatoes and potatoes (*Solanaceae*), causing significant economic damages. In Europe, the infection produces serious vegetative disorders in plants of the *Apiaceae* family only, especially carrot and celery, disrupting these crop yields in Finland and Spain, and seed market in France and Spain.



Credits: Forest Research, UK

***Phytophthora* culture**

Main findings and results

Xylella fastidiosa

After the first detection of *Xylella fastidiosa* in 2013, European scientists discovered new outbreaks in France, Spain, Germany and Portugal. Given the threat posed by the bacterium to the EU crops and landscape, researchers mobilized to fill the knowledge gaps on this pathogen, as an essential step to support effective and balanced control measures. The POnTE Project gave the first responses.

- Demonstrated that *Xylella fastidiosa* was the principal cause of the olive desiccation epidemics (known as Olive Quick Decline Syndrome, OQDS) in Southern Italy
- Provided evidence on molecular mechanisms characterizing the response of olive cultivated varieties to infections, profiling those that might be resistant/tolerant to *Xylella fastidiosa*. In particular, two varieties have shown a lesser susceptibility and a smaller bacterium population, suggesting that their adoption may attenuate the transmission of the pest. This finding enabled the repeal of the prohibition of planting new olive trees in the infected area in Southern Italy, giving new hope to olive growers living in the lands where the bacterium is impossible to be eradicated
- Gathered and shared the first essential information on vectors, a wide range of strategies for the control of their population and the pattern of the disease spreading on olive trees
- Proved the scientific robustness of the disease airborne early detection even before the symptoms became visible, thanks to sophisticated hyperspectral cameras
- Indicated which areas in Europe are under greater threat from *Xylella fastidiosa*, with an estimate of the economic losses for growers and consumers

Hymenoscyphus fraxineus

In the POnTE project, scientists carried out research on the ash dieback disease caused by *Hymenoscyphus fraxineus*. Scientists:

- Detected the fungus **for the first time in Serbia**, on the European ash and narrow-leafed ash and, also for the first time found the disease on different non-ash species, in particular, *Phillyrea* subspecies and *Chionanthus*
- Built on former research to investigate the role of ash fruits as a potential source for the spread of the disease, to determine if the infection was present on ash pericarps, seeds or embryos
- Tested a **hot-water treatment** as a control measure for *Hymenoscyphus fraxineus* eradication in seeds, to reduce biosecurity risks and facilitate the movement of seeds between diseased and non-diseased areas
- Identified **asymptomatic ash seedlings and trees**, an essential step in the research of tolerant trees
- In Britain, found that spores are produced and ready to infect other plants from June to September although under favorable conditions they can be released earlier and last until October.

Credits: Forest Research, UK

Ash leaves infected by
Hymenoscyphus fraxineus

Phytophthora on forest species

The POnTE project focused on the identification and isolation of *Phytophthora* species damaging conifers and other forest tree species. The abundance and high diversity of both known and new *Phytophthora* species discovered thanks to the POnTE project are an alarm ring for European forests, agriculture and horticulture. Within the POnTE project:

- Different *Phytophthora* species have been identified associated with specific tree declines in Europe
- The combination of various state-of-the-art testing methodologies allowed the detection of up to 34 *Phytophthora* species
- Furthermore, it was shown by these studies that **Southeast Asia is the center of origin of highly invasive wide-host-range *Phytophthora* species** which cause currently devastating forest epidemics in Europe and North America. This suggests that extensive host-range testing among European forest tree and horticultural crop species is urgently required to assess the **potential threat posed by the import of living plants from Southeast Asia**.

Candidatus Liberibacter solanacearum – Lso

Lso is an abbreviation of the acronym *Ca*Lsol, that stands for the plant bacterium *Candidatus* Liberibacter solanacearum. Psyllids, small plant lice, are the vectors of this pathogen that infects tomatoes and potatoes (*Solanaceae*) in North America and New Zealand, causing the so-called zebra chip disease, driving significant economic damages. In Europe, the infection is associated with vegetative disorders in plants of the *Apiaceae* family, especially carrot and celery.

Credits: ANSES

Lso symptoms on carrot

However, the possibility of the introduction of the Lso strain affecting potatoes and the psyllid transmitting it (*Bactericera cockerelli*) is not excluded, and the emergence of Lso in carrots and celery has raised serious concerns about the risk that they pose to potato and other solanaceous crops across the EU.

Within the POnTE Project, scientists:

- Mapped the geographical distribution of the Lso variants in Europe, excluding the presence of the potato strain and its insect vector
- Found for the very first time Lso on new psyllid vectors as well as hosts, both cultivated plants that were not known to be susceptible of infection – such as parsley, fennel, chervil, and parsnip – and wild plants.
- Designed diagnostic assays to rapidly identify important psyllid vectors of Lso. These will be important tools in the prevention and detection of possible introductions of psyllids such as *Bactericera cockerelli*.
- Developed a remote-controlled robot to inspect the presence of Lso in horticultural crops by remote sensing and automated traps as a permanent monitoring and surveillance system
- Suggested integrated pest management approaches including mechanical tools such as nets, insecticide products – both synthetic and 'natural' such as kaolin, and technologies such as drip irrigation.

Credits: IPSP-CNR Bari

Researchers talk to farmers

The communication

Besides the serious concern that the recent or possible introduction of the mentioned pests raises among experts, at least two of the diseases have another common feature. Differently from other plant pests, the ash dieback in the UK and the olive quick decline in Southern Italy made the headlines news. The announcement of their respective eradication programs also sparked debate beyond the experts' circle. This reaction unveiled the importance of social and economic dimensions of plant pest management.

The need for supplying science-based solutions that are feasible on the ground and the ability to explain the research contributions to non-experts are among the main challenges for scientists dealing with invasive plant species. This is why the POnTE project included social scientists and gave importance to communicate the most relevant achievements to citizens. This is a small yet significant first step to shorten the gap between science and society and reinforce the trust between scientists and citizens, that appear to be the most sensitive issues of our time.

Text: Angelo Di Mambro
Layout: Surrender Media Solution

To know more:
www.ponteproject.eu
Video material
Ponte Project:
https://www.youtube.com/watch?v=qoMKT-U-XLc
Xylella fastidiosa:
https://www.youtube.com/watch?v=BrDGAzQ3YS8
Lso:
https://www.youtube.com/watch?v=qYU8EnDIgeM
Forestry Pathogens:
https://www.youtube.com/watch?v=O6StaycymiM

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 635646