Beyond *Xylella*, Integrated Management Strategies for Mitigating *Xylella fastidiosa* impact in Europe

Practice abstract 11 - Extended Version

Use of sentinel plots for early detection of *Xylella fastidiosa* across contrasting climates and cropping systems

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Use of sentinel plots for early detection of *Xylella fastidiosa* across contrasting climates and cropping systems



Early detection is essential to limit the spread and impact of ***Xylella fastidiosa.*** However, surveillance is difficult when infections remain at low levels, symptoms are absent or unclear, and the bacterium is not yet established in an area. To address this problem, the BeXyl project developed an international network of sentinel plots as an early-warning system.

Sentinel plots are groups of known host plants placed in strategic locations where the risk of ***X. fastidiosa*** introduction or spread is considered high. These plots are established either near infected areas, along possible pathways of spread, close to biosecurity facilities or in locations where environmental conditions are favourable for pathogen establishment. By exposing susceptible plant species to natural inoculation pressure, sentinel plots make it possible to detect infections under realistic field conditions and to compare disease risk across regions.

How did BeXyl make a difference?

BeXyl has established a network of 12 sentinel plot sites in 8 countries across Europe and the Americas, covering a wide climatic gradient from Mediterranean and semi-arid environments to humid subtropical, tropical, and arid conditions. The network includes sites in Italy, Spain, France, Portugal, the USA, Costa Rica, Brazil, and Argentina (Figure 1). This broad geographic coverage allows surveillance under very different ecological situations and helps identify where natural transmission is more likely to occur.

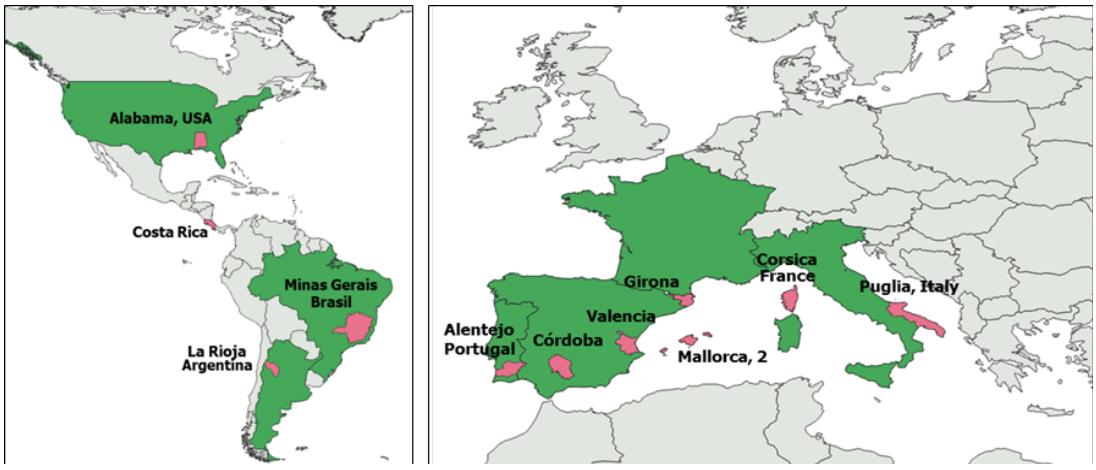


Figure 1. Geographic distribution of BeXyl sentinel plots

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A common set of host plants was used at many sites, including olive, almond, sweet orange, and Spanish broom, to support comparisons between regions. Additional plant species of local agronomic or ecological relevance were included depending on the site. Standardised protocols were applied as far as possible for plot design, plant establishment, symptom observation, sampling, and laboratory testing, allowing the network to function as a coordinated surveillance platform rather than as isolated local trials.

Sentinel plots were regularly inspected for symptoms such as leaf scorch, chlorosis, marginal necrosis, and defoliation. Plant material was collected for molecular testing, mainly by real-time qPCR, and insect vectors were also monitored at several sites. This combined surveillance approach made it possible to assess both plant infection and the local context for transmission, including vector abundance and diversity.



Most sentinel plots remained negative for ***X. fastidiosa*** during the monitoring period, which is important because it provides baseline evidence from diverse environments and confirms the value of long-term surveillance in areas where the pathogen is absent or only sporadically present. Negative results were obtained in plots such as Córdoba, Valencia, Apulia, and Corsica, despite repeated sampling and, in some cases, exposure to infected regions nearby.

Positive detections were confirmed at two sites, Son Real in Mallorca and Puriscal in Costa Rica. In Son Real, infections were detected over time in fig, ash, and Spanish broom, showing that sentinel plots can reveal natural infections in different host species even when the number of positive plants is still low. In Puriscal, the results were more extensive, with positive detections in sweet orange, oleander, and several additional plant species present on the farm. These findings confirmed active pathogen circulation and showed that symptom observation alone is not sufficient, because some infected plants were asymptomatic while some symptomatic plants tested negative.
The results also showed that local ecological context matters. In some sites, low vector abundance may help explain the absence of infection, whereas

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in others, such as Brazil and Costa Rica, early and abundant vector activity suggests favourable conditions for natural transmission. The network therefore provides not only early detection capacity, but also a framework to study how climate, host composition, and vector communities influence infection risk.



Impact: the BeXyl sentinel plot network shows that coordinated field surveillance using sentinel host plants is a practical and informative tool for early detection of *X. fastidiosa*. It complements official surveys by increasing the chances of detecting incipient infections under natural conditions, especially in areas at risk of introduction or expansion.

This approach is useful for plant health authorities, researchers, nurseries, and growers because it helps identify emerging risks before widespread outbreaks develop. It also generates comparable data across countries and climates, improving understanding of host susceptibility, transmission dynamics, and environmental drivers of disease emergence.

Several partners are already planning to maintain their sentinel plots beyond the end of the project. Continued long-term monitoring will increase the value of the network and strengthen preparedness against future *X. fastidiosa* outbreaks.

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