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

Practice abstract 9 - Extended Version

Identification of crop plants resistant to *Xylella fastidiosa*

BEXYL
BEYOND XYLELLA



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The **BeXyl** project addresses the urgent need for sustainable and long-term solutions to mitigate the impact of ***Xylella fastidiosa*** (***Xf***) by focusing on the identification and deployment of crop plants with enhanced resistance or tolerance to infection. Rather than relying solely on vector control, **BeXyl** aims to exploit natural genetic and physiological variation in host plants to limit pathogen colonization, disease progression, and yield losses. Resistant or tolerant crops can be easily incorporated into existing agricultural systems and serve as a fundamental component of integrated pest and disease management strategies. Beyond reducing disease severity, the deployment of resistant plants will reduce reliance on chemical pesticides and enable more environmentally sustainable disease management strategies.



How will BeXyl make a difference?

Screening of Genetic Resources: large and diverse genetic collections of economically important crop species, primarily olive and almond, will be systematically screened to identify genotypes exhibiting resistance or tolerance to ***Xf***. Phenotypic evaluations under controlled and field conditions will allow the robust identification of resistant traits.

Integration into Breeding Programs: identified resistant or tolerant genotypes will be incorporated into targeted breeding programs aimed at developing new cultivars that combine durable resistance to ***Xf*** with key agronomic and commercial characteristics, ensuring suitability for real-world agricultural deployment.

Development of Genetic Markers: genetic markers associated with ***Xf*** resistance will be developed to enable rapid and efficient selection in breeding pipelines. Marker-assisted selection will significantly accelerate the breeding process and facilitate the transfer of resistance traits into elite cultivars.

Mechanisms of Resistance: the resistant genetic resources identified will also be exploited to investigate the molecular and physiological mechanisms underlying resistance to ***Xf***. Comparative analyses will be used to identify specific genes and pathways involved in host defense, providing fundamental insights that can inform future resistance-breeding strategies.

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Impacts achieved:

Unlocking natural resistance to *Xylella*: the **BeXyl** project has undertaken one of the most extensive efforts to identify crop plants that can naturally resist ***Xf***. Hundreds of olive, almond, grapevine, and other crop plants have been evaluated across different regions using both field observations and controlled tests. This work has greatly expanded the pool of plant varieties known to better tolerate or resist the disease. These resistant plants form a key resource for sustainable disease management.

Testing plants where it matters, real farming conditions: beyond identifying resistance, **BeXyl** evaluates how plants perform under realistic agricultural conditions, including environmental stresses such as limited water availability. Commercially relevant crop varieties are being tested to ensure that resistance goes hand in hand with good agronomic performance. Careful monitoring using both visual symptoms and laboratory diagnostics ensures reliable results. This approach helps ensure that selected plants are practical and effective for growers.



Understanding how resistance works: **BeXyl** is also uncovering the biological reasons why some plants are less affected by ***Xf***. By studying plant responses at the molecular level and developing new genetic resources, the project is identifying processes linked to resistance. This deeper understanding moves the field beyond observation toward explanation. Such knowledge is essential for designing durable, science-based solutions to the disease.

From research to resistant crops: the project is actively translating scientific discoveries into crop improvement. Resistant plants are being used in breeding programs to develop new varieties that combine disease resistance with desirable agricultural traits. Genetic tools are being developed to speed up this process and make breeding more efficient. Together, these efforts support reduced pesticide use and promote more environmentally friendly and sustainable farming systems.

Impact: BeXyl's ultimate goal is to harness naturally occurring resistance in crop plants to reduce the impact and spread of *Xf* in olive orchards and other economically important crops. By identifying, understanding, and breeding resistant plant varieties, the project supports long-term, sustainable disease management. These resistant crops can be readily integrated into existing farming systems and combined with integrated pest and disease management strategies. Together, these approaches will help safeguard agricultural and forestry production while reducing reliance on chemical inputs and promoting environmental sustainability.

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