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

Practice abstract 3 - Extended Version

Innovative and environmentally friendly approach for controlling *Xylella fastidiosa* insect vectors using entomopathogenic fungi

BEXYL
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Entomopathogenic fungi for controlling *Xylella fastidiosa* vectors

BeXyl project is addressing the urgent need for sustainable alternatives to chemical insecticides to control insect vectors of *Xylella fastidiosa* (***Xf***) .

BeXyl solution is to harness **entomopathogenic fungi** (naturally occurring microorganisms) that target insect pests effectively and sustainably, and can easily be integrated into Integrated Pest Management (IPM) strategies.

These **entomopathogenic fungi** do more than just kill ***Xf***-insect vectors; they can also disrupt insect reproduction and behaviour, potentially reducing the spread of ***Xf***.

How will BeXyl make a difference?

Identifying Local Beneficial Fungi: **BeXyl** is exploring the **olive agroecosystem**—including olive plants, associated vegetation and cover crops, and insect communities—to discover **native strains of entomopathogenic fungi** naturally adapted to local environmental conditions.

Effective Pest Control: Selected fungal strains will be tested directly against both juvenile and adult forms of key insect vectors of ***Xf***, such as ***Philaenus spumarius*** and ***Neophilenus campestris.*** Furthermore, we will evaluate the potential of these entomopathogenic fungi to colonize olive and other plants internally (as endophytes), providing indirect pest control by impacting insect survival and reproduction when feeding.

Reducing Disease Transmission: These entomopathogenic fungi will also be assessed for their ability to **modify insect feeding behaviour**; thereby, decreasing the transmission efficiency of ***Xf*** to olive trees.

By thoroughly understanding and harnessing these natural enthomopathogenic fungi, BeXyl aims to provide growers and stakeholders with practical, sustainable, and highly effective biocontrol tools (to be included in IPM programs) to protect olive crops from *Xylella fastidiosa*.

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Impacts achieved:



Harnessing Nature's Own Pest Control Agents: Recent **BeXyl** research results has shown that different elements within olive orchards—including olive trees, ground cover plants, and insects living in these ecosystems—host naturally occurring beneficial fungi (fungal strains) that can infect and kill insect pests. Furthermore, they have environmental competence in their respective isolation habitats.

Fungal Warriors Against Insect Vectors: Several strains of these beneficial fungi (*Beauveria* sp., *Metarhizium* sp., and *Lecanicillium* sp.) collected from olive groves have demonstrated a high ability to infect and kill young (nymphs) and adult stages of key insect pests that transmit ***Xf*** such as *Philaenus spumarius* and *Neophilenus campestris*. These specific strains are called entomopathogenic fungi.

Fungi That Protect From Within: Selected strains of these fungi have the ability to live harmlessly inside certain plants (endophytic strains) that are commonly used in experiments for ***Xf***-insect vector studies, such as sowthistle (*Sonchus oleraceus*). Additionally, due to this plant endophytic activity these fungi indirectly caused increased mortality in insects feeding on these plants both of nymph and adults of the vector.

Disrupting Insect Feeding to Reduce Disease Spread: These fungal strains also alter the feeding behaviour of insect pests. When insects feed on plants colonized by these beneficial entomopathogenic fungi—particularly olive trees—they spend less time feeding from the plant's internal vessels (xylem), potentially reducing the risk of spreading the harmful bacterium ***Xf***.

BeXyl's final aim is to harness naturally occurring beneficial entomopathogenic fungi to sustainably control insect vectors and reduce the spread of *Xylella fastidiosa* in olive orchards and other important crops. This beneficial fungal strains will be used to implement tailored Integrated Pest Management (IPM) strategies to mitigate the impacts of current *Xylella fastidiosa* outbreaks, helping the agricultural/forestry sectors to remain productive and sustainable at long-term.

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