



BIOVEXO

Effetti di antagonisti microbici e sostanze naturali nel ridurre la progressione dei sintomi indotti da *Xylella fastidiosa*

Crescenza Dongiovanni & BIOVEXO consortium partners

Fruit communication Fruit Lab   Antesia

IV edizione
**BIOCONTROL
CONFERENCE**

28 Ottobre 2025

Napoli

Gold Tower Lifestyle Hotel



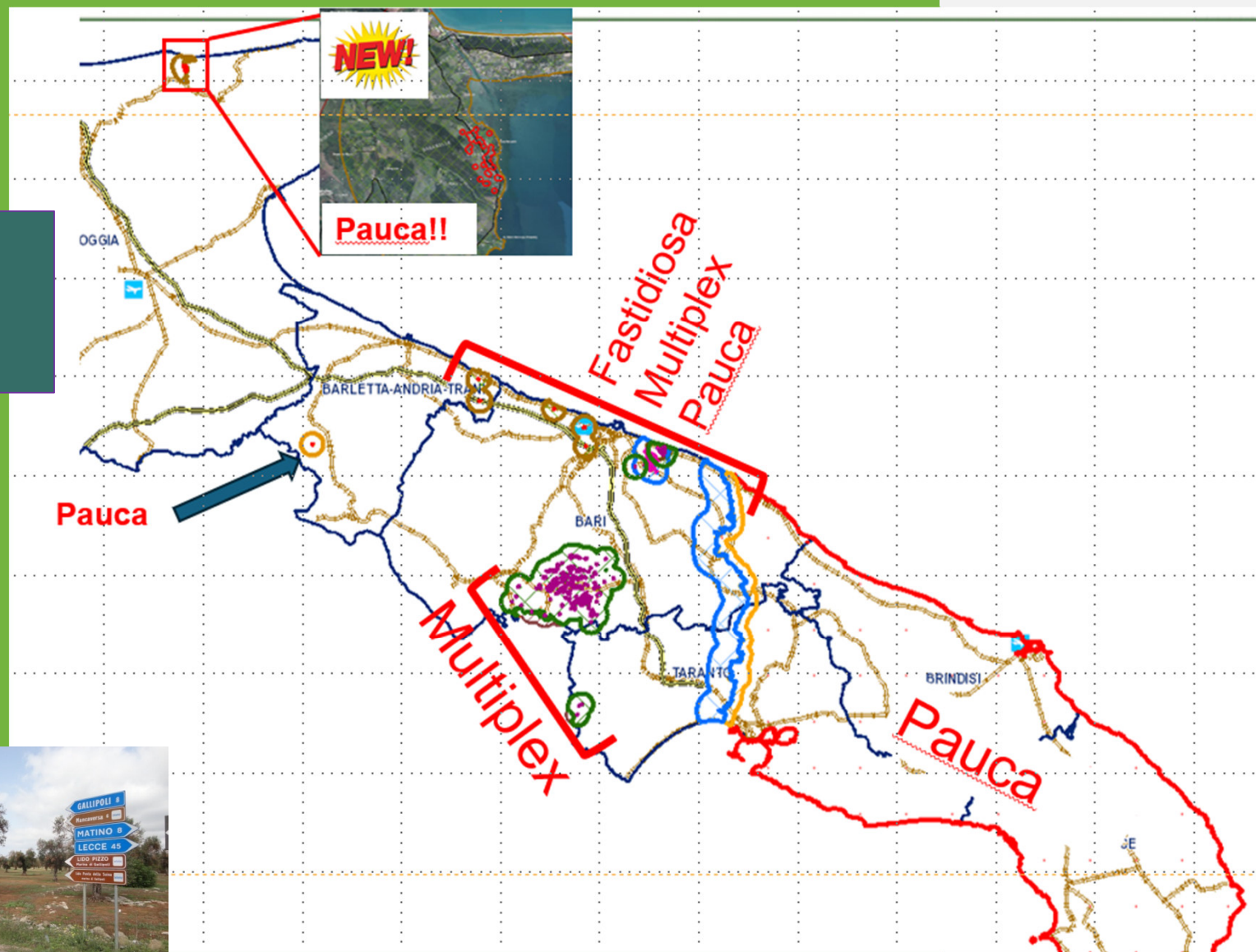
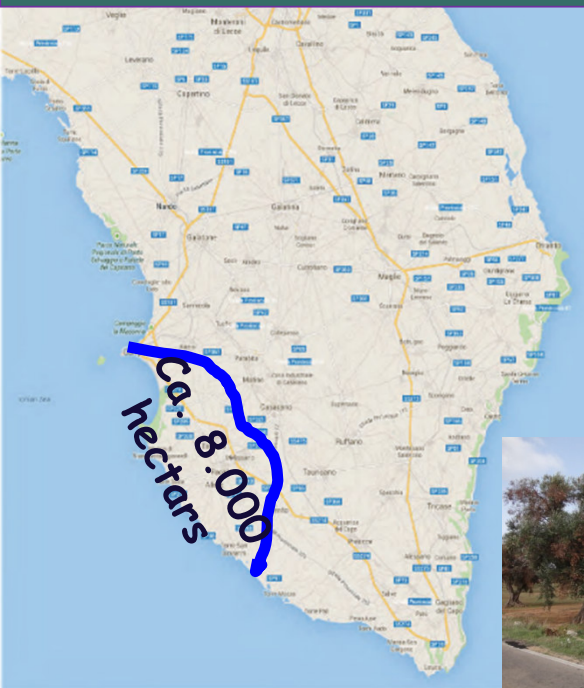
Horizon 2020
European Union Funding
for Research & Innovation



Bio-based Industries
Consortium

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under grant agreement No 887281. The JU receives support from the European Union's Horizon 2020 research and innovation programme and the Bio Based Industries Consortium.

October 2013:
In Apulia first discovery of
established infections of *X.
fastidiosa* in EU



Biological/chemical measure	Host/Subspecies	Sequence Type/strain	Methodology	Location	Reference
Antibiotics, olive mill wastewaters (OMV), phenolics, fungal extracts and toxins	Olive/pauca	Salento-1/ST53	Agar disk diffusion and agar disk dilution methods	Italy	(Bleve et al., 2018)
<i>Methylobacterium mesophilicum</i>	Sweet orange/pauca	-	<i>In vitro</i> broth dilution test using bacteria culture filtrate	Brazil	(Lacava et al., 2004, 2009)
Endophytic and epiphytic xykroorganisms	Olive/pauca	ST53	An <i>in vitro</i> dual culture method was employed to evaluate antagonistic activity, and well diffusion assays using culture filtrates were conducted to screen for antimicrobial activity.	Italy	(Mourou et al., 2022)
<i>Bacillus</i> spp.	Olive/pauca	ST53	The dual culture method on solid nutrient media was used to assess antagonistic interactions, while antimicrobial activity was evaluated through well diffusion assays using culture filtrates.	Italy	(Zicca et al., 2020)
Pomegranate peel extract	Olive/pauca	De Donno	The broth microdilution method was used to assess both planktonic growth and biofilm formation, while <i>in vivo</i> evaluations were conducted through endotheapeutic treatments in olive trees.	Italy	(Rongai et al., 2023)
Endophytes (<i>Pseudomonas fluorescens</i> , <i>Achromobacter xyloosidans</i> , <i>Cochliobolus</i> sp.)	Grapevine <i>fastidiosa</i>	-	<i>In vitro</i> and <i>in planta</i> bioassays were performed, including assessment of symptom development and quantification of <i>Xylella fastidiosa</i> titer in planta using qPCR. Pathogen inoculation was carried out through vacuum infiltration and needle injection methods.	USA	(Rokhausen et al., 2018)
Nián A	<i>Nicotianabenthhamiana/pauca</i>	strain AOPT1	Viable-qPCR, spot assay, turbidity reduction assay, fluorescence microscopy, and transmission electron microscopy, RPLC-ESI-MS/MS analyses	Italy	(Sabri et al., 2024b)
<i>Paraburkholderia phytofirmans</i>	Grapevine/ <i>fastidiosa</i>	Strain Temecula	The droplet puncture method was used to measure bacterial population size, disease severity, diffusible signal factor (DSF) production, and plant gene expression.	USA	(Lindow and Baccari, 2018; Baccari et al., 2019; Lindow et al., 2024)
Phage MATE 2	Olive/pauca	strain AOPT1	Genomic and electron microscopy analyses, spot assay, and broth dilution assay	Italy	(Sabri et al., 2024a)
<i>Curtobacterium flaccumfaciens</i>	<i>Catharanthus roseus/pauca</i>	-	Stem puncture inoculation with bacterial cultures was followed by evaluation of disease symptoms. PCR primers were designed for <i>Curtobacterium flaccumfaciens</i> to verify its presence in plant tissues and to complement an existing assay for <i>Xylella fastidiosa</i> .	Brazil	(Lacava et al., 2007)
Bacteriophages	Grapevine/ <i>fastidiosa</i>	Strain Temecula 1	Serial dilution spot assays were performed on overlays using a panel of 50 <i>Xylella fastidiosa</i> isolates as hosts. Grapevines were inoculated with both bacteria and phage to evaluate therapeutic and prophylactic phage treatments. Quantitative reverse transcription PCR (qRT-PCR) was used to detect phage and <i>X. fastidiosa</i> , and twitching motility was also assessed.	USA	(Das et al., 2015)
Transfer of bacteriophages by insects	Grapevine/ <i>fastidiosa</i>	Strain Temecula	Rearing of glassy-winged sharpshooters (GWSS, <i>Homalodisca vitripennis</i>) was followed by feeding them on cowpea plants (<i>Vigna unguiculata</i> subsp. <i>unguiculata</i>) infected with the virulent phage Paz. Phage uptake by GWSS and its subsequent transmission to plants were assessed using qRT-PCR with specific primers targeting phage Paz.	USA	(Bhowmick et al., 2016)
<i>Leuconostoc mesenteroides</i> strain MS4-derived bacteriocins	Olive/pauca	ST53	Spot assays, fluorescence microscopy (FM), and transmission electron microscopy (TEM) were conducted, along with <i>in planta</i> assays involving stem inoculation using an insulin syringe on one-month-old <i>Nicotiana benthamiana</i> plants.	Italy	(Sabri et al., 2025)

Fonte: Mourou et al., 2025

SCIENTIFIC OPINION

ADOPTED: 28 April 2019

doi: 10.2903/j.efsa.2019.5665

Update of the Scientific Opinion on the risks to plant health posed by *Xylella fastidiosa* in the EU territory

EFSA Panel on Plant Health (PLH),
 Claude Bragard, Katharina Dehnen-Schmutz, Francesco Di Serio, Paolo Gonthier, Marie-Agnès Jacques, Josep Anton Jaques Miret, Annemarie Fejer Justesen, Alan MacLeod, Christer Sven Magnusson, Panagiotis Milonas, Juan A Navas-Cortés, Roel Potting, Philippe Lucien Reignault, Hans-Hermann Thulke, Wopke van der Werf, Antonio Vicent Civera, Jonathan Yuen, Lucia Zappalà, Donato Boscia, Daniel Chapman, Gianni Gilioli, Rodrigo Krugner, Alexander Mastin, Anna Simonetto, Joao Roberto Spotti Lopes, Steven White, José Cortinas Abrahantes, Alice Delbianco, Andrea Maiorano, Olaf Mosbach-Schulz, Giuseppe Stancanelli, Michela Guzzo and Stephen Parnell

The last EFSA opinion on the “Effectiveness of *in planta* control measures for *Xylella fastidiosa*” (EFSA et al. 2019) concluded that although some experiments show some effects in reducing symptoms developments there is currently no control measure available to eliminate the bacteria from a diseased plant in open field conditions.



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BIOVEXO in a nutshell



Jose M. Garcia Madero

X-biopesticides selected
small-scale trials



Dr. Liesbeth Zwarts

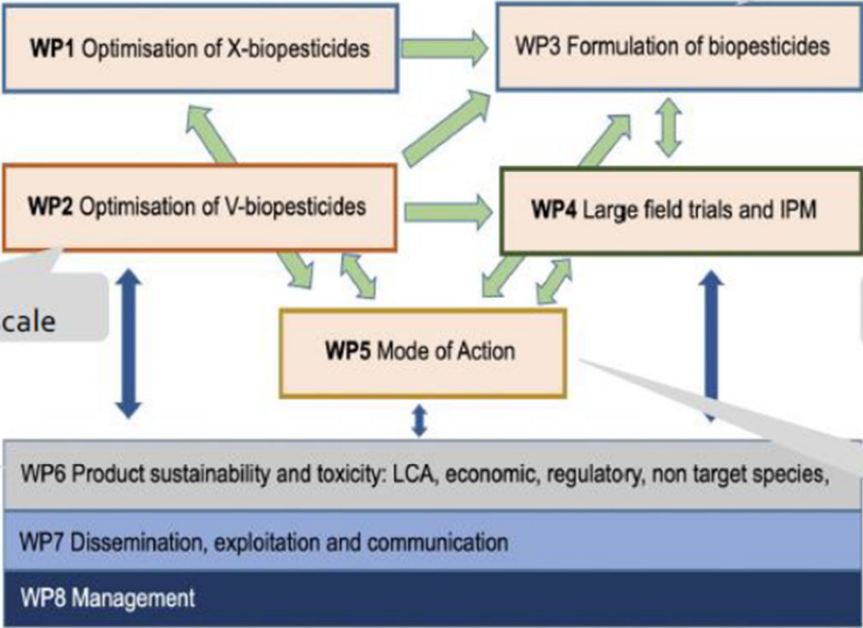


V-biopesticide
selected small-scale

life cycle, toxicity,
regulatory, sustainability



Dr. Stephen Webb



production optimized at laboratory scale
production upscaled at industrial scale



Monitoring efficacy in IPM
strategy



Alberto Baños Arjona



Pasquale Saldarelli



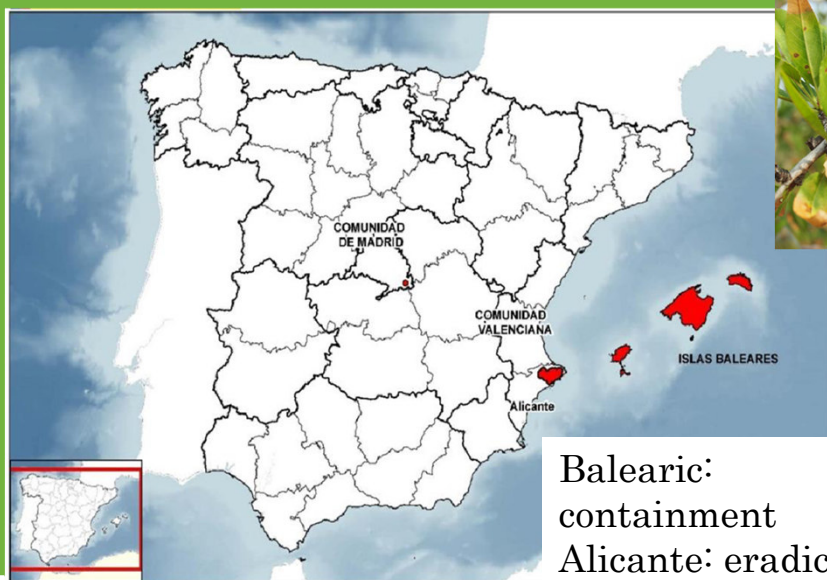
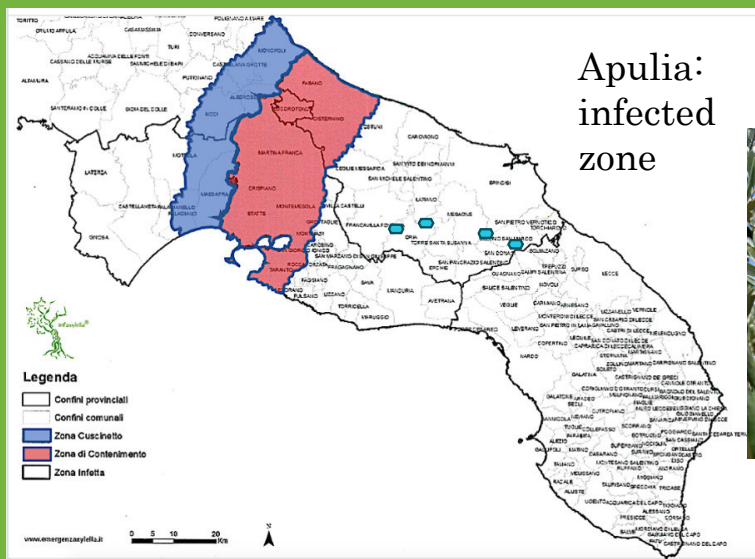
Genomic, RNA seq, advanced
microscopy, colonization in
planta /insects

11 partners (industries, smes, academia, farmer association) from
Austria, Spain, Italy, Belgium, and Slovenia



European Union funding
for Research & Innovation



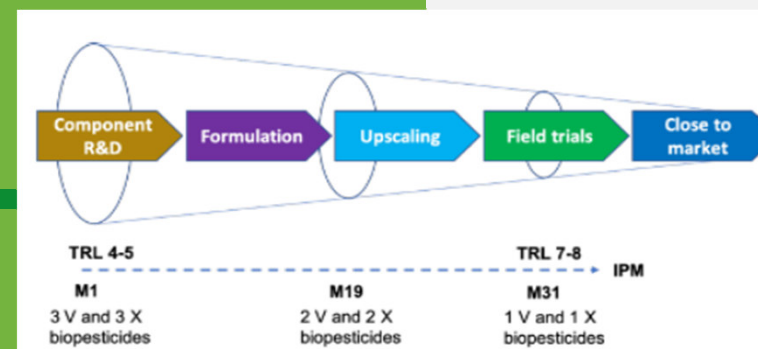
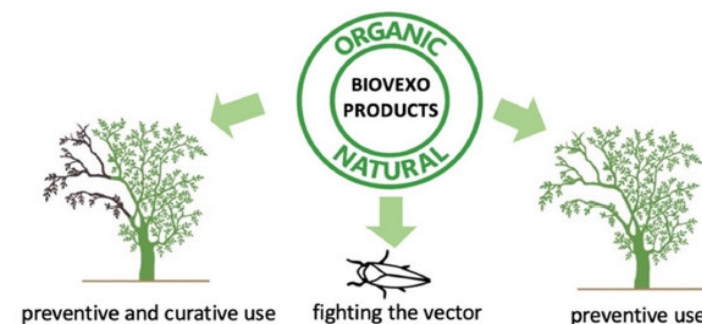


Balearic:
containment
Alicante: eradication

The BIOVEXO Project explores innovative biopesticides, which target the *Xylella* bacterium.

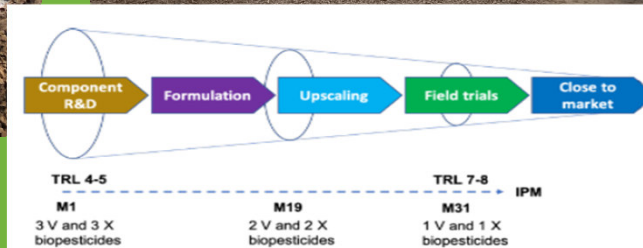
Six candidate biocontrol solutions acting either against *Xylella* or its vector are tested within the BIOVEXO Project:

- bacterial strains
- a microbial metabolite
- two plant extracts
- an entomopathogenic fungus





Xylem limited bacterium



Large scale field trials

Paraburkholderia phytofirmans strain PsJN

X. fastidiosa subsp fastidiosa

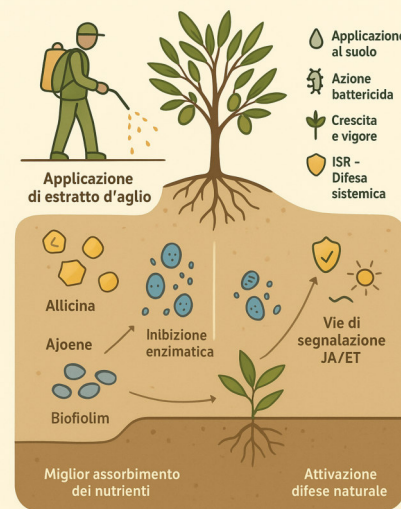
ACIES BIO
AciesBio
www.aciesbio.com

DOMCA
www.domca.com

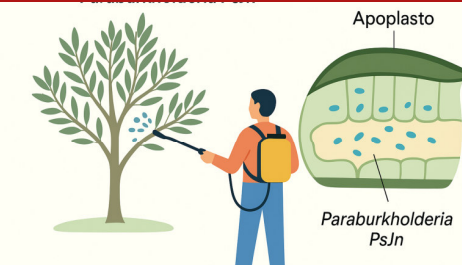
Onion extract

Verticillium dahliae

Onion: mechanism of action and interaction with plants



PsJN: mechanism of action and interaction with plants



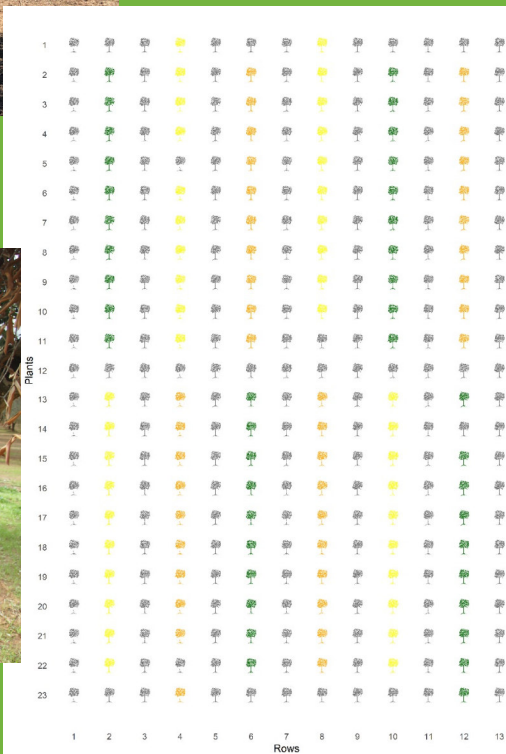
taking (JU) under grant agreement No 887281. The JU receives programme and the Bio Based Industries Consortium.

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Severe Xf-symptoms – Around 55% of plants infected at the beginning of the trial

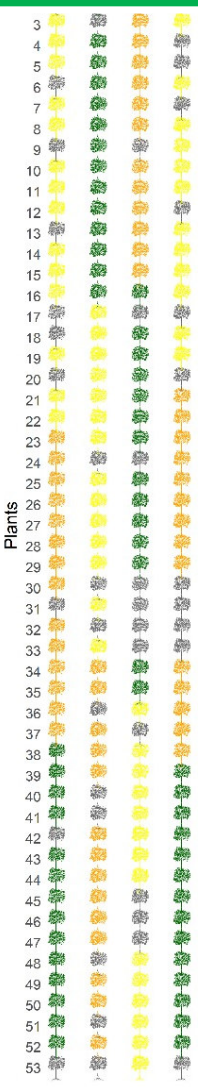


Oria



Curative trials

No symptoms – Few infected plants at beginning of the trial

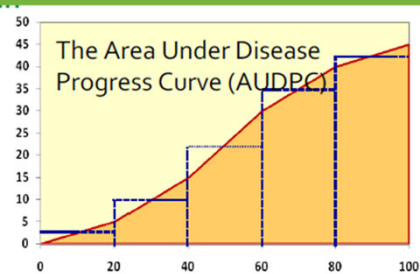
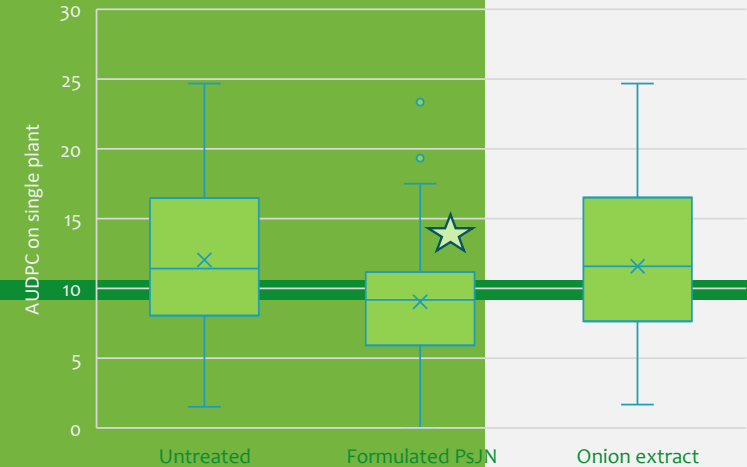
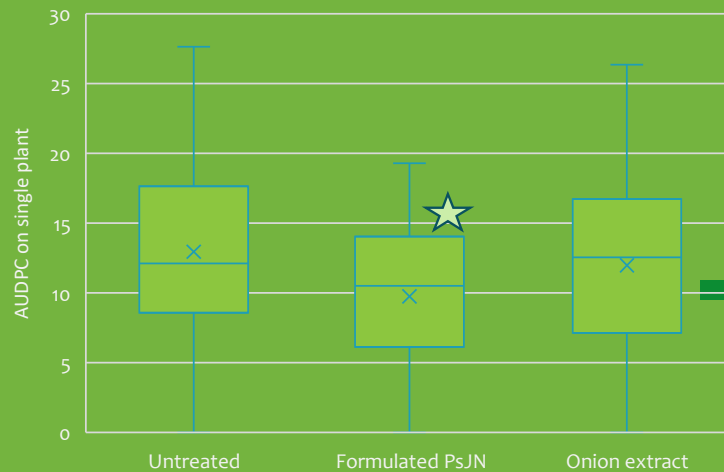
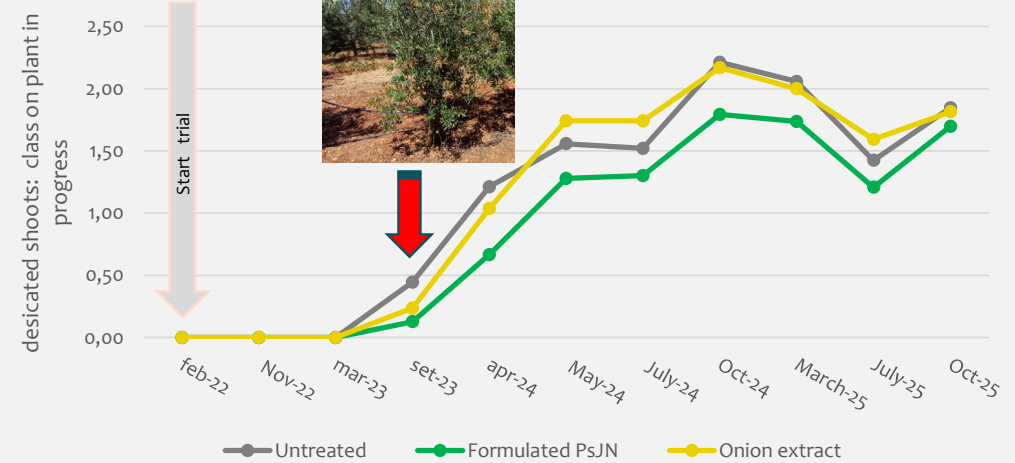
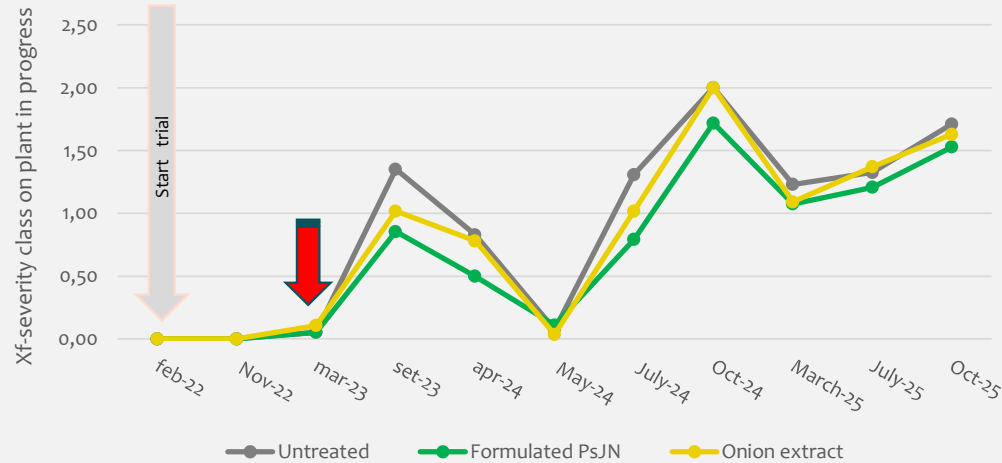


San Vito dei Normanni



Severity symptoms progression in San vito dei Normanni (Br)

3-years old plants at starting of the trial



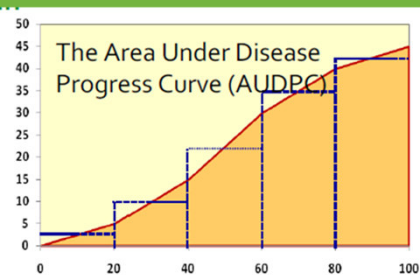
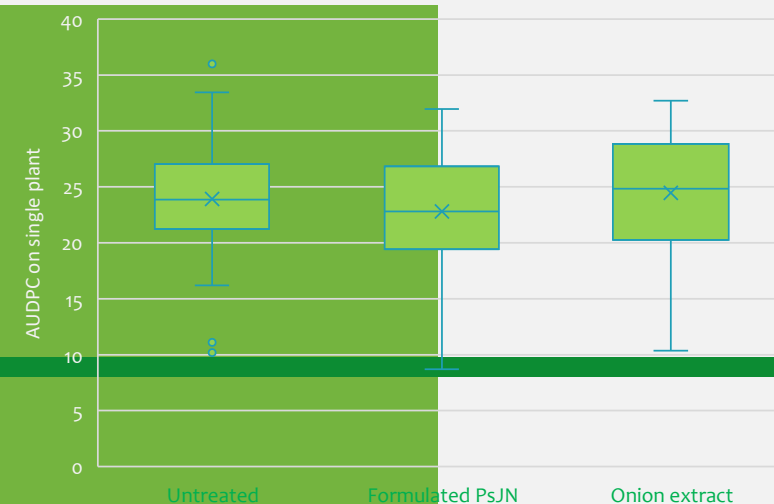
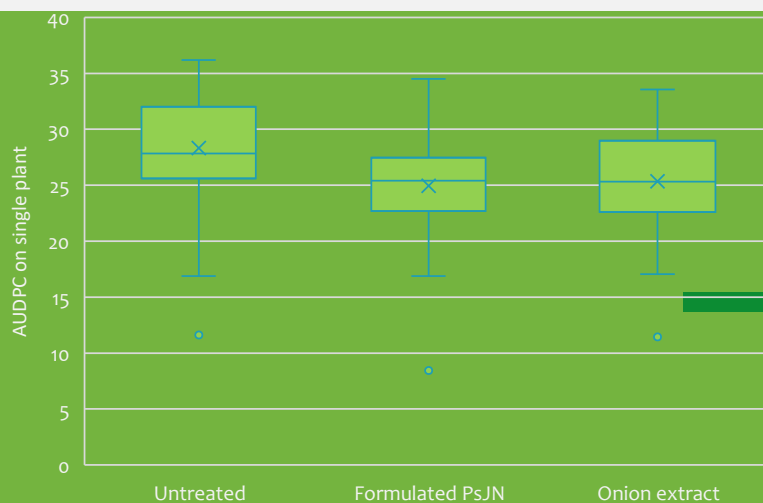
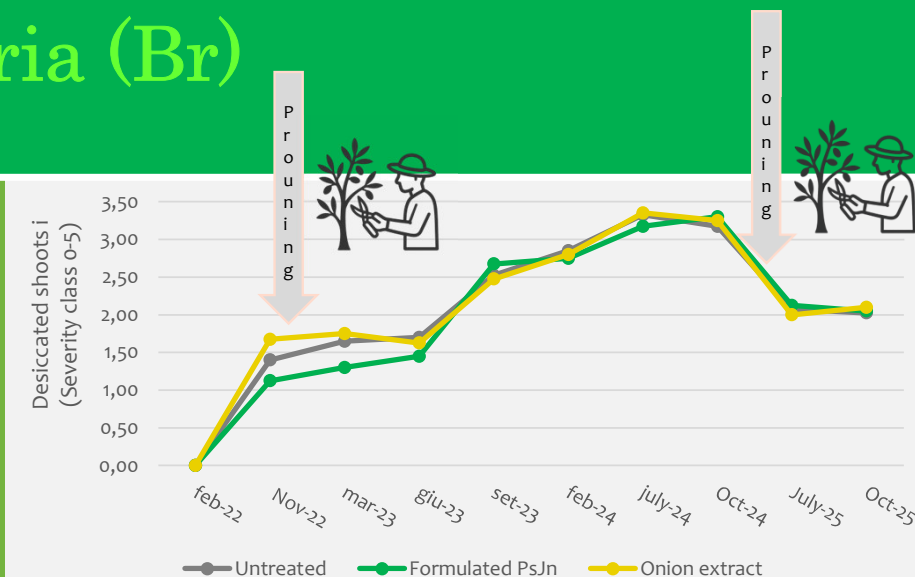
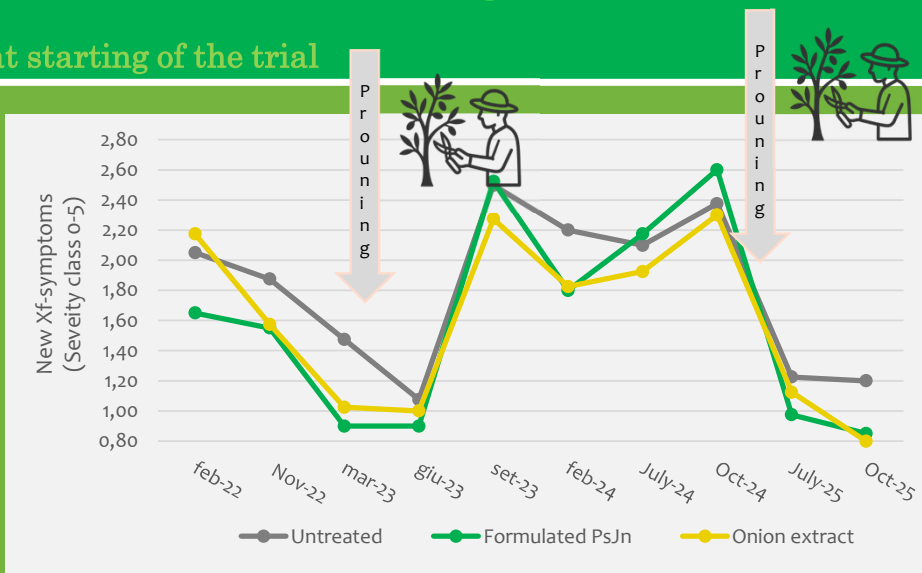
Bio-based Industries Consortium

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Severity symptoms progression in Oria (Br)

20-years old plants at starting of the trial



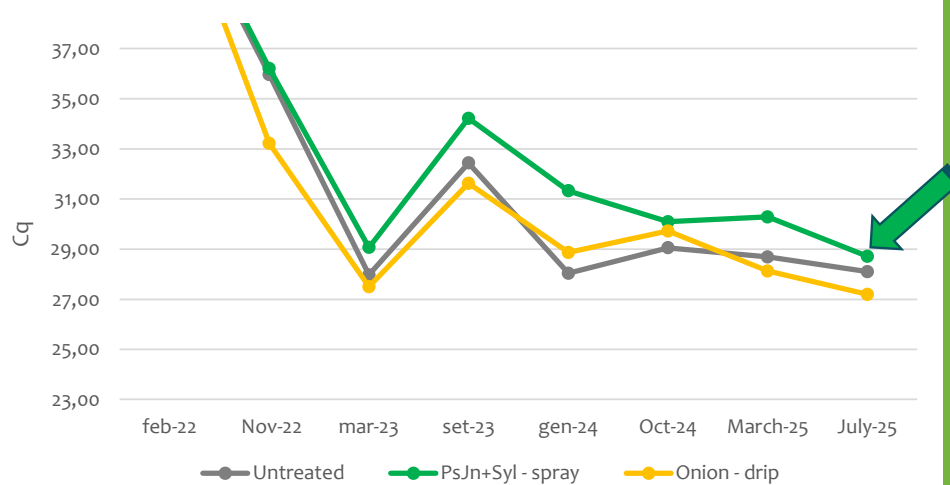
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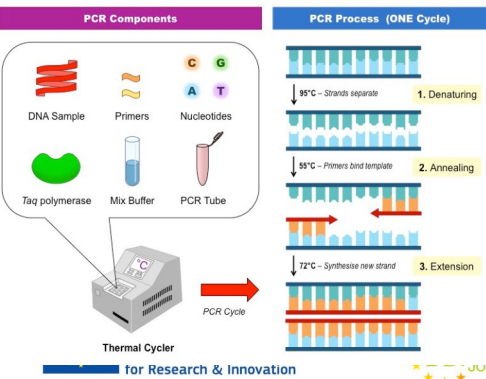
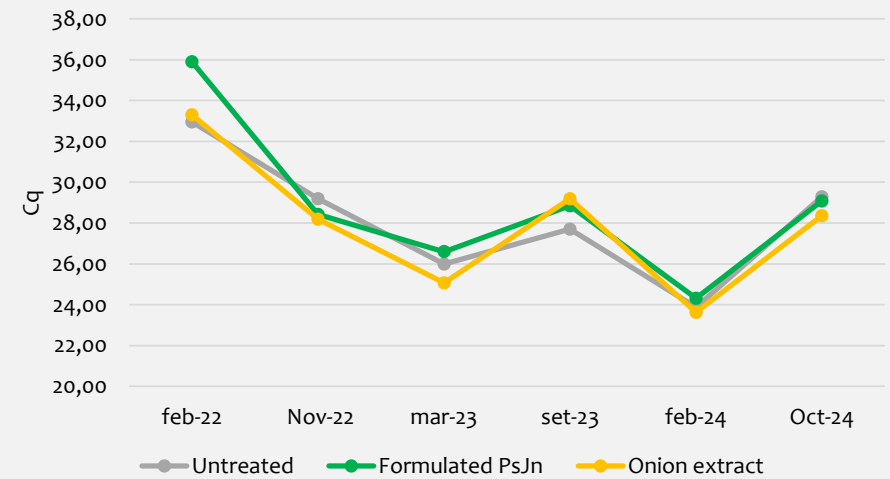
Effects of tested products on *Xylella* concentrations (CFU/mL) in shoots

Determined by qPCR analysis

San Vito dei Normanni (Br)



Oria (Br)

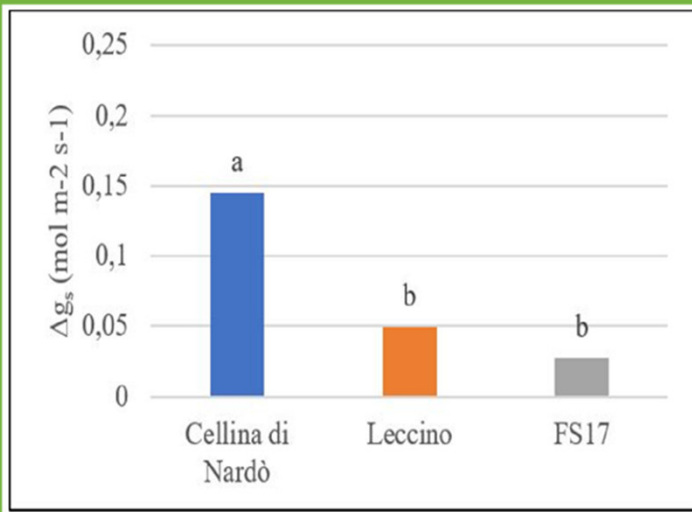


No statistically difference in *Xylella* concentration across the years were observed in both trials

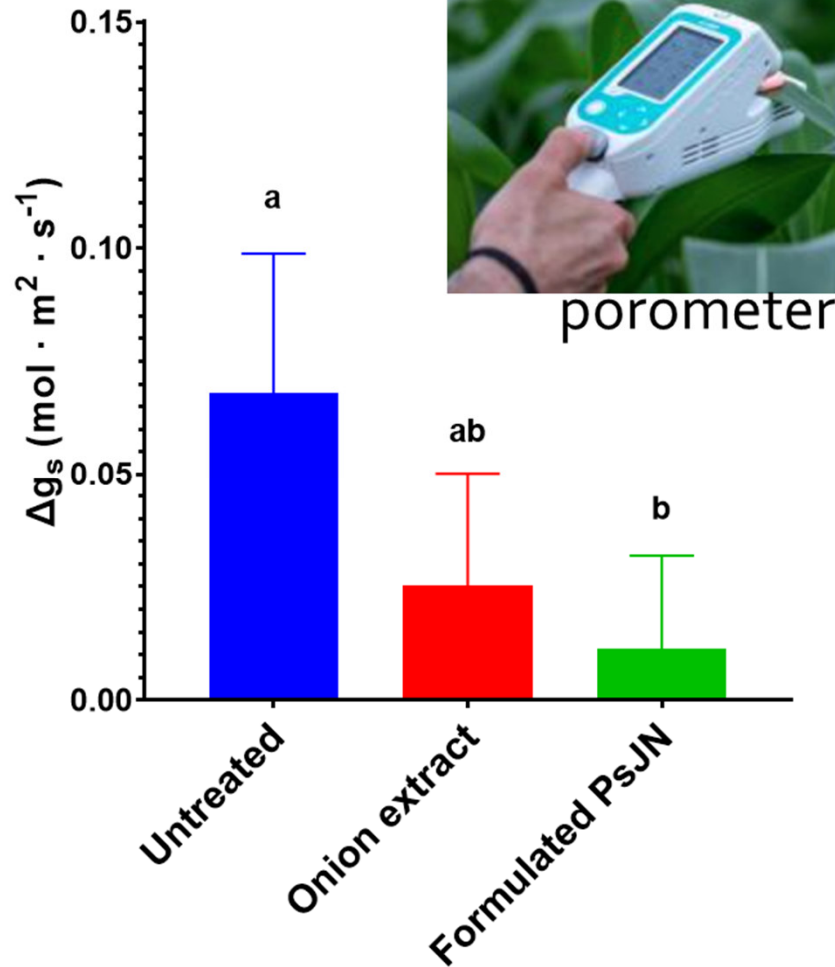
Physiological measurements determined in S. Vito dei Normanni (Br)

Stomatal conductance

$$D_{gs} = H_{gs} - I_{gs}$$



Surano et al., 2023



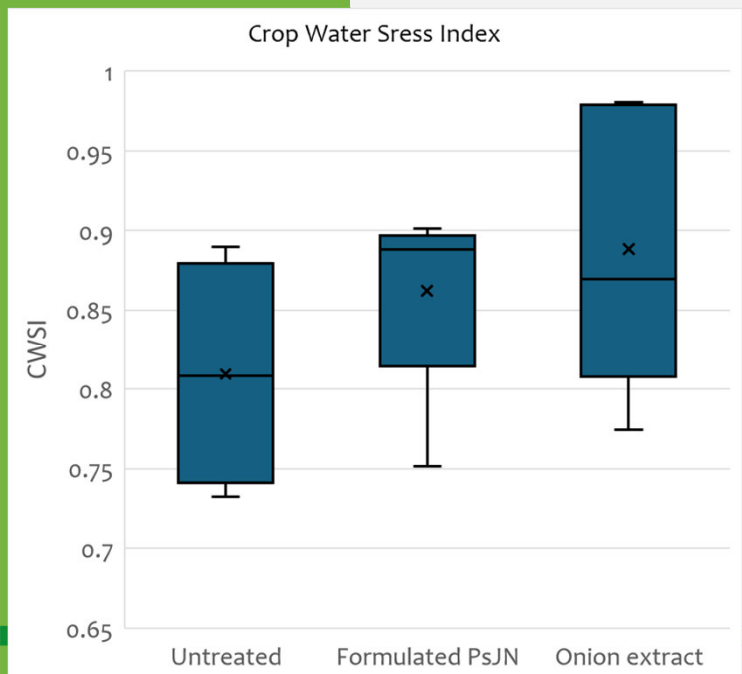
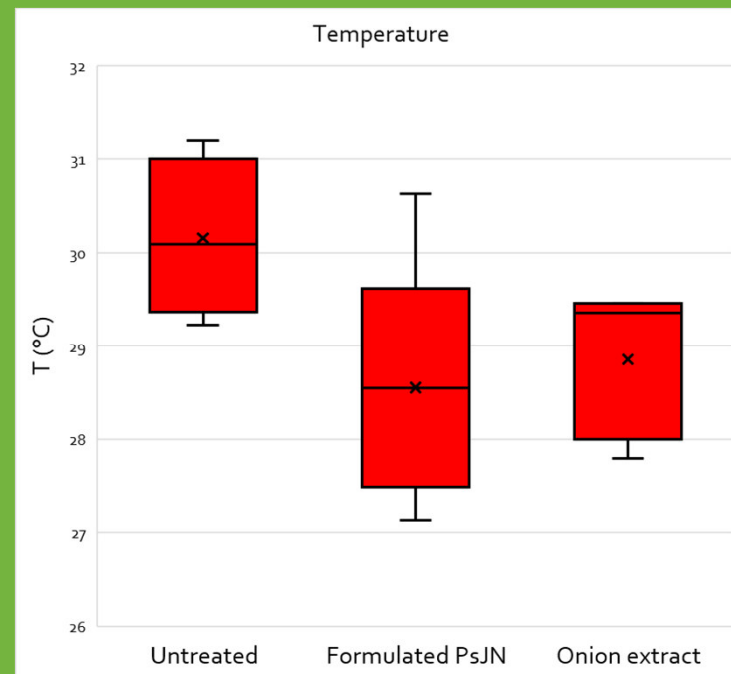
Olives infected by *Xylella* and treated did not suffer the drought stress imposed by the bacterium

Physiological measurements determined in S. Vito dei Normanni (Br)

Infrared thermography

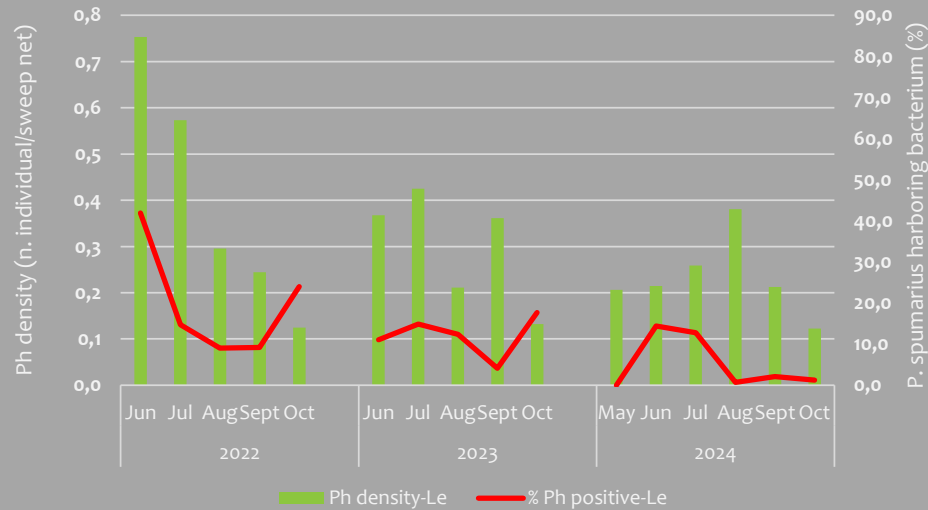
Crop Water Stress Index (CWSI)

	Tdry	Twet	Tcanopy
4Onion ext	29,63	21,71	29,24
5Onion ext	29,63	21,71	29,4
13Onion ext	31,47	23,57	29,9
14Onion ext	31,47	23,57	30,12
136Onion ext	32,16	23,12	30
39FormPsJN	29,74	22,25	28,67
40FormPsJN	29,74	22,25	28,9
41FormPsJN	29,18	21,8	28,19
43FormPsJN	28,77	21,92	27,3
48FormPsJN	32,16	23,55	31,06
94Untreated	31,82	23,66	30,27
20Untreated	32,26	24,38	31,34
21Untreated	32,26	24,38	31,1
27Untreated	31,6	23,91	29,92
28Untreated	31,6	23,91	29,4

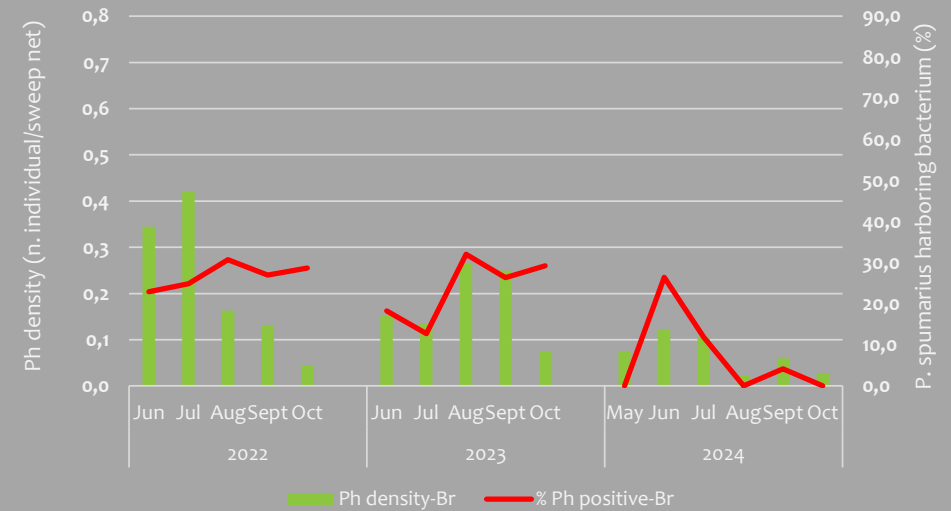


P. spumarius density population & % individual arboring bacterium

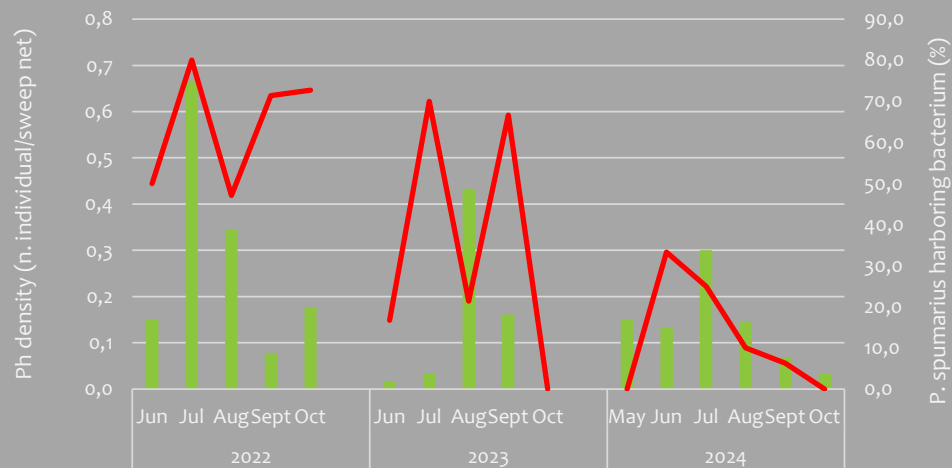
Average - Le



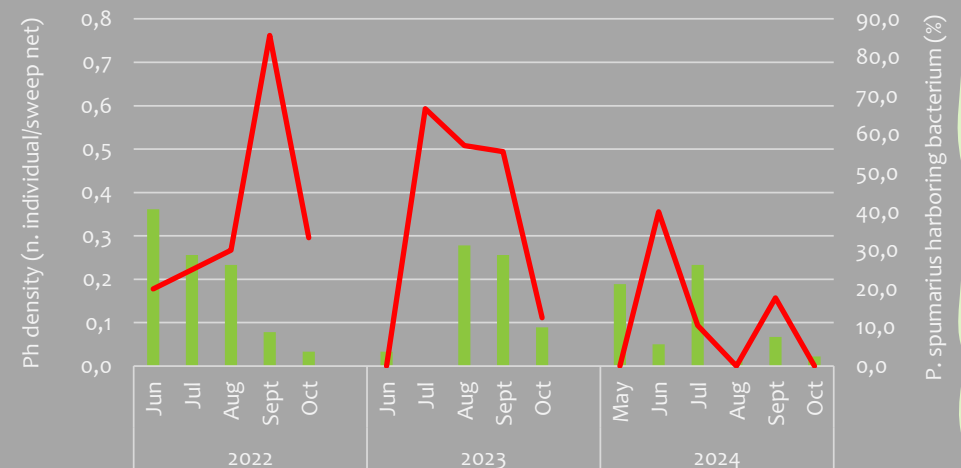
Average - Br



San Vito dei Normanni



Oria



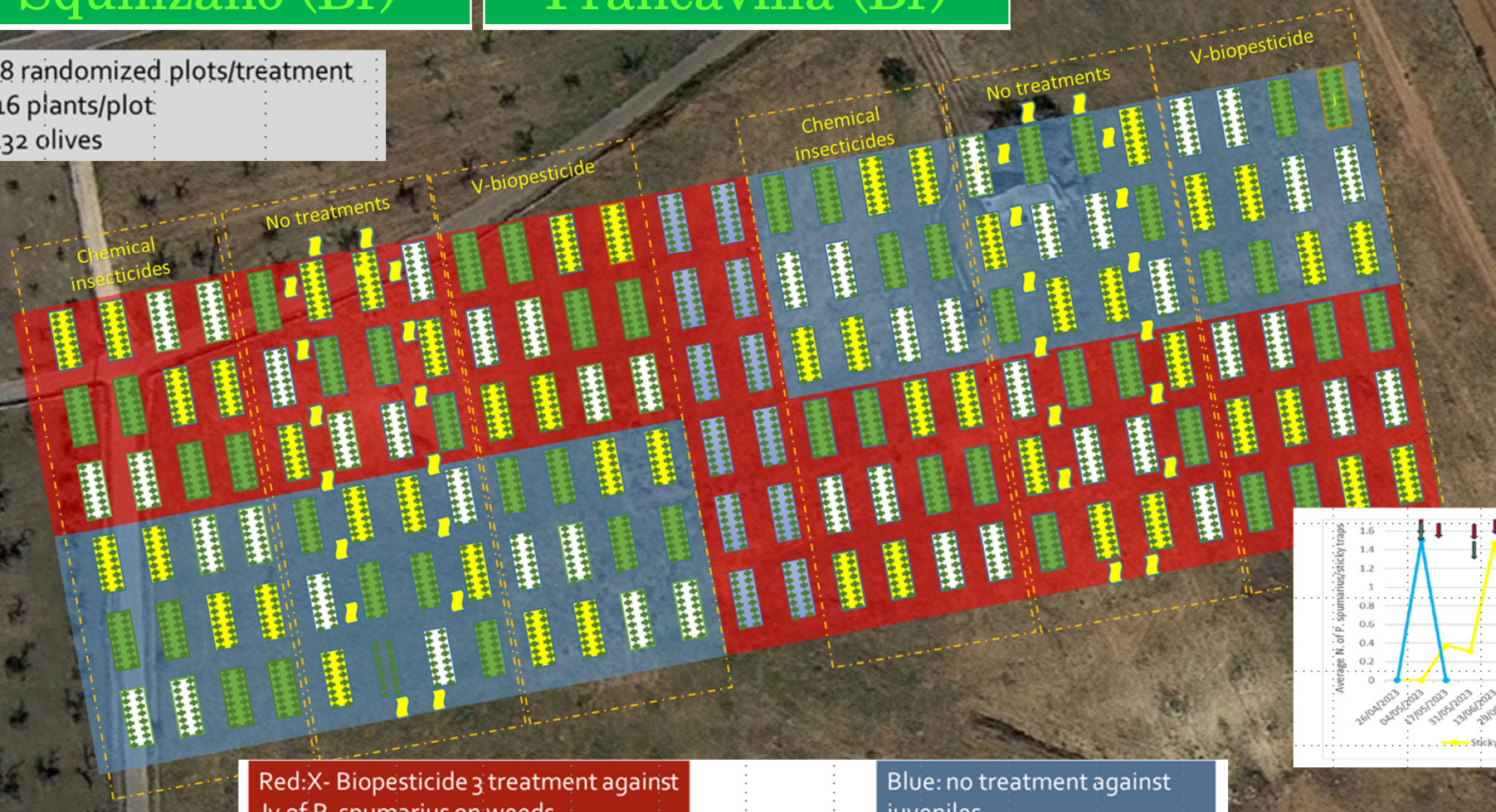
Preventive trials

IPM management scheme

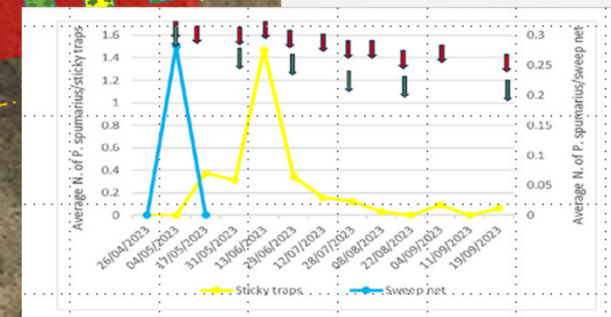
Squinzano (Br)

Francavilla (Br)

- 18 randomized plots/treatment
- 16 plants/plot
- 432 olives



	Untreated chek
	Formulated PsJN
	Onion extract



Red:X- Biopesticide 3 treatment against Jv of *P. spumarius* on weeds

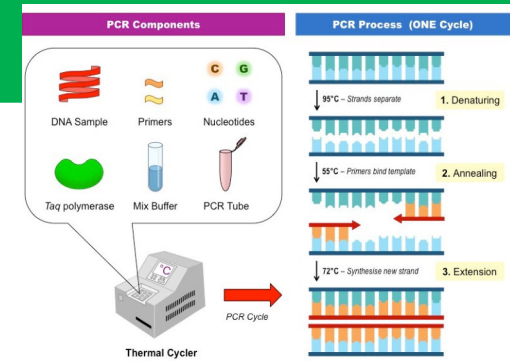
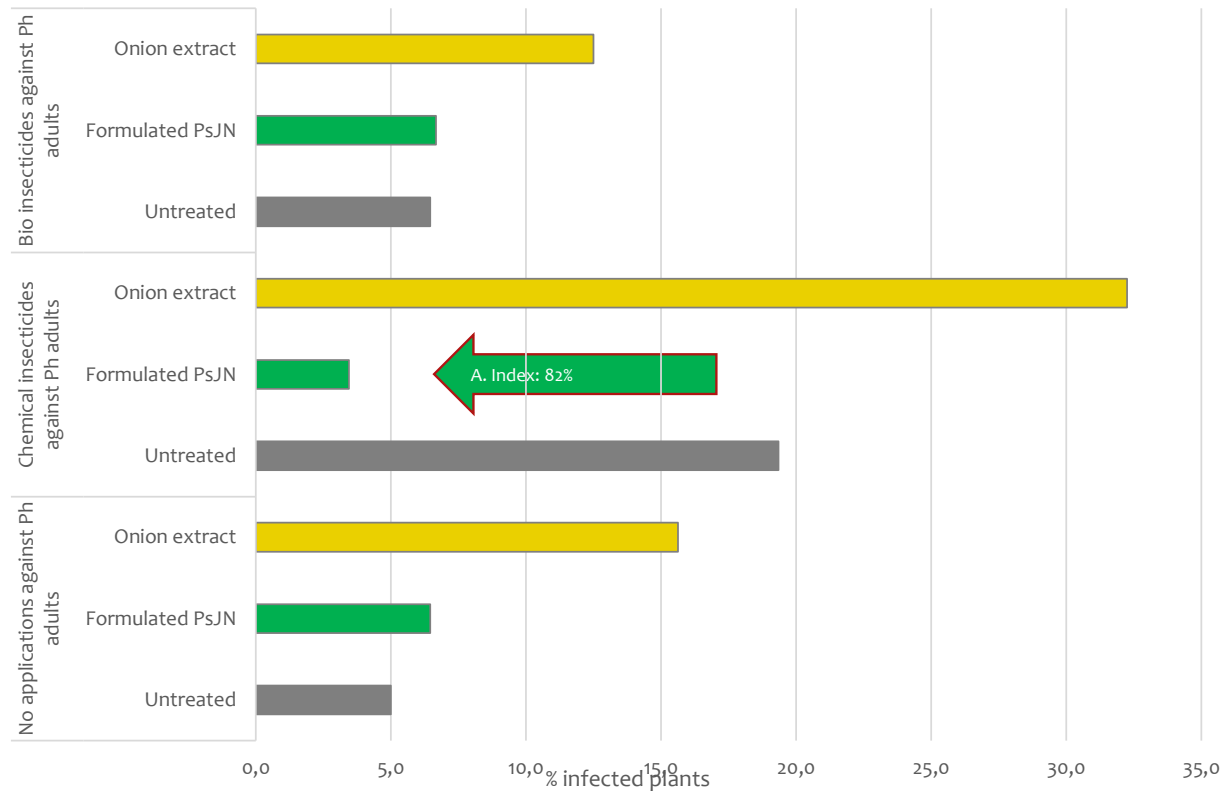
Blue: no treatment against juveniles

sea industries Consortium.

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Effects of tested products on *Xylella* concentrations (CFU/mL) in shoots

Determined by qPCR analysis after



- **Formulated PsJN:**
 - slow down symptoms on young plants when applications were started at the early stages of infections;
 - improves stomatal conductance;
 - lower the Xf-population but without statistical significance difference among treatments;
- **Onion extract:**
 - improves stomatal conductance;
 - does not reduce symptoms and Xf-population concentration;
- **Integrated pest management** can slow the progression of Xf-diseases in PsJn treated plants;
- No product yet on the market.





Biocontrol of Xylella and its vector in olive trees for integrated pest management

Crescenza Dongiovanni
& consortium partners

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under grant agreement No 887267. The JU receives support from the European Union's Horizon 2020 research and innovation programme and the Bio Based Industries Consortium.

