



2024 Assembly Meeting

WP2: “Testing of new alternative plant protection products: biopesticides, biocontrol agents, innovative adjuvants and formulations”

5th NOVATERRA General Assembly 26th of June 2024

IRTA, VITEC, IFV, IPB, TERRAS GAUDA, MYROLION, SOGRAPE, UNICATT, CORTEVA



The NOVATERRA project has received funding from the European Commission's Horizon 2020 Grant Agreement Number 101000554.



WP2 general comments

- Huge amount of work carried out during 3 seasons:
 - 110 trials
 - 6 Lab studies
- Climate change affected crops and pest incidence (especially olive fly, olive moth and powdery mildew) and impacted part of the results.
- Some deviations from the initial plan, widely compensated by alternative products.
- Excellent collaboration among parties and common learnings achieved.



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Summary of WP2 works and conclusions I

TASK	MEMBERS	OBJECTIVE	TESTED PRODUCTS	CONCLUSIONS	ABSTRACTS	PAPERS	WORKSHOPS	NEXT STEPS
2.1	IRTA CORTEVA	PPP's Database + Protocols	N/A	Protocols and PPP's Database allowed 36-37 studies every season	No	No	No	N/A
2.2.1	IFV TERRAS GAUDA VITEC	Evaluation of new bio-solutions	<u>Downy Mildew:</u> BIO_CNTR-079, BIO_CNTR_0115, JDE0 1, APX12, COS OGA. <u>Powdery Mildew:</u> Paraffinic oil, Sodium hydrogenocarbonat, BIO_CNTR_079	Bio-solutions are not sufficient when diseases pressure increased. But biosolution can be integrated in strategies.	2 (Terras)	No	1-SITEVI (technicians & growers) 2- BORDEAUX (advisors)	IFV will integrate those products in the strategy developed
2.2.2	UCSC SOGRAPE	Strategies of use for Resistant Inducers vs PM & DM	Laminarin, Cerevisane, Fosetyl aluminium, Potassium phosphonate for both Downy and Powdery mildew.	Resistance inducers (RI) are not sufficient when diseases pressure increased. But RI can be integrated in the treatment program strategy.	1 (UCSC)	4 (Plant Pathology, Agronomy, Plants)	Workshop Mirandela and Quinta do Seixo (Portugal)	Dataset for meta-analysis paper (UCSC , Sogrape, IFV); Workshop (Sept 24) - Alentejo (Portugal)



Summary of WP2 works and conclusions II

TASK	MEMBERS	OBJECTIVE	TESTED PRODUCTS	CONCLUSIONS	ABSTRACTS	PAPERS	WORKSHOPS	NEXT STEPS
2.2.3	UCSC	Commercial BCA's vs Botrytis	Bacillus amyloliquefaciens D747; Aureobasidium pullulans DMS 14941-14940; Metschnikowia fructicola NRRL Y-27328; Trichoderma atroviride SC1	Multiple criteria should be considered for the selection of the BCA for a specific application in the vineyard – The integrative use of the predictive model and BCAs represents a valid alternative to conventional methods of gray mold control in vineyards, with more than 75% reduction in fungicide usage	4 (UCSC)	2 (Plants, & Pest Manag Science) 1 technical paper		Not planned
2.2.4	CORTEVA IRTA IPB MYROLION	Bioinsecticides vs olive moth	BIO_CNTR_0026 BIO_CNTR_0104 BIO_CNTR_0107 BIO_CNTR_0096 BIO_CNTR_0161 Bacillus thuringiensis	Application timing fine-tuned increasing > 25% efficacy of current bio-insecticides like BT. 2 tools selected for Corteva development.	2 (Corteva) 1 (IPB)	1 ongoing (Journal of Economic Entomology or Insects)	Internal training	Corteva to continue development, registration & launch
2.2.5	CORTEVA IRTA-VITEC SOGRAPE UNICATT	Bio-degradable Pheromone vs Lobesia & Eupoecillia	Enrapta Lobesia Press & Enrapta Eupoecillia Press	Efficacy below current standards. Application device not efficient taking long time and formulation not bio- degradable.	1 (Corteva)	No	No	N/A



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Summary of WP2 works and conclusions III

TASK	MEMBERS	OBJECTIVE	TESTED PRODUCTS	CONCLUSIONS	ABSTRACTS	PAPERS	WORKSHOPS	NEXT STEPS
2.2.6	IRTA IPB	Develop strategies with Entomopathogenic fungi	<i>Beauveria bassiana</i> Kaolin Spintor Cebo	Strategies with <i>B. bassiana</i> and support sprays of kaolin and or spinosad offered similar efficacies than conventional pesticides.	No	No	4 Technical Seminars (Tarragona)	IRTA expects to continue assessing entomopathogenic fungi in further projects
2.3.1	IFV	Minimizing conventional pesticides with ozonated water	Ozonated water	Equipment to maintain the needed concentration of ozonated water for an anti-contaminant impact on fungi has not been solved.	1 (IFV)	No	SITEVI (technicians and growers)	IFV will keep working within other projects
2.3.2	VITEC IFV IPB	Understand efficacy of Copper and Sulphur Nanoparticles	Copper and Sulphur Nanoparticles	Positive reduction vs olive leaf spot. Some efficacy observed with variable results on powdery mildew and downy mildew due to high temperatures and draught.	1 (IPB)	No	SITEVI Bordeaux	Vitec and farmers want to continue, and IPB will continue in another project
2.4	IRTA IPB	Develop Mass trapping for olive fly	Mass trapping (Cone-trap & Dacus-trap) Kaolin Spintor Cebo	Strategies based on mass trapping and support treatments with kaolin and or spinosad offered similar efficacies than conventional pesticides under different crop managements, locations, and varieties.	1 (IPB)	No	SITEVI + 4 Technical Seminars	IRTA expects to continue improving efficacy of alternative strategies against olive fly



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WP2 overall conclusions

- Disease control is more challenging than insect control for biopesticides.
- All bio-control tools need to be considered part of Integrated Program Management strategies and cannot substitute conventional products.
- It takes longer developing bio-control tools than conventional, given the variability in the results and the need to develop right strategies.
- Some of the tested tools (Ozonated water, Sulphur and Copper Nanoparticles, and early stage Corteva products) will need more time to be developed, registered and launched in the market, so it has not been possible to cover all desired steps within Novaterra project.



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Innovative strategy for sustainable viticulture in Portugal's Douro Valley

- ❖ **PROBLAD®** is a new **natural fungicide** based on a protein obtained from the aqueous extract of germinated seed of sweet lupine (*Lupinus albus*) - APV in **Portugal** (n°2069 - October 2022).



France	April 2023
Greece	January 2024
Italy	Pending - expected in July 2024
Spain	Pending - expected in July 2024



- ❖ **PROBLAD®** is developed and patented by CEV, SA, a Portuguese biotechnology company in Cantanhede (Portugal) and authorized in **organic farming**.
- ❖ **PROBLAD®** has been described for **powdery mildew** and **Botrytis** control.



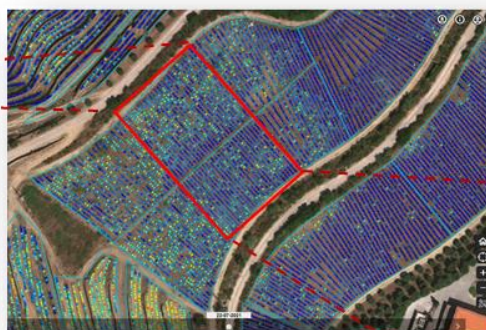
This new product was tested by **SOGRAPE in the 2023** campaign, as a sidekick of trials executed for the **NOVATERRA project**.



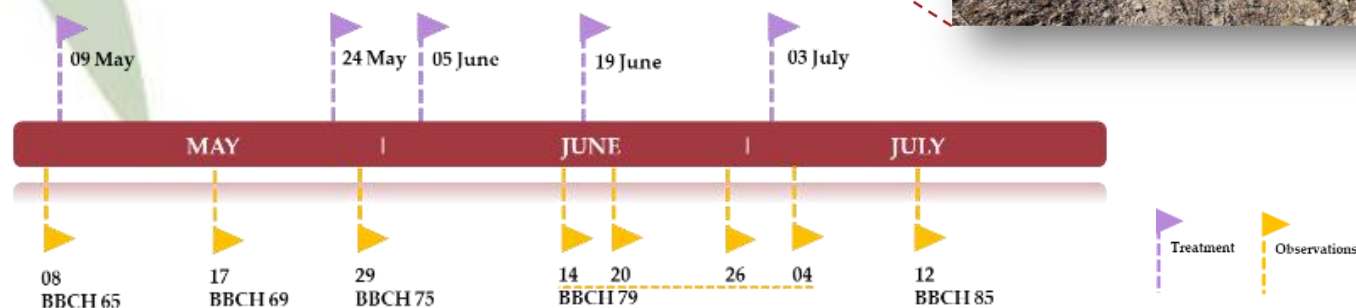
Innovative strategy for sustainable viticulture in Portugal's Douro Valley



Quinta do Seixo (Coordinates: 41°10'05.3"N 7°33'18.5"W, property of SOGRAPE, in the Douro Wine Region), a mountain viticulture region.



MODALITIES	
1	PRODI (Integrated Production)
2	50% PROBLAD + 50% PRODI
3	100% PROBLAD
4	UNTREATED CONTROL



Tinta Roriz variety



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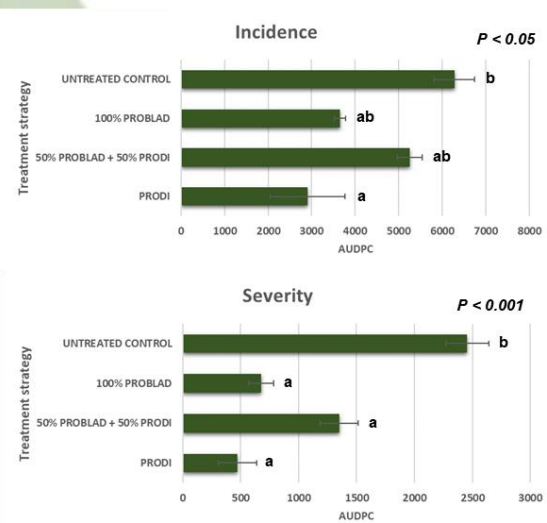


Innovative strategy for sustainable viticulture in Portugal's Douro Valley

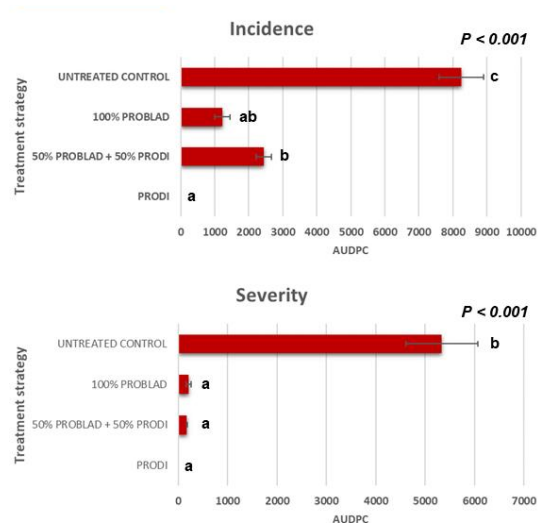
Downy mildew

Yield

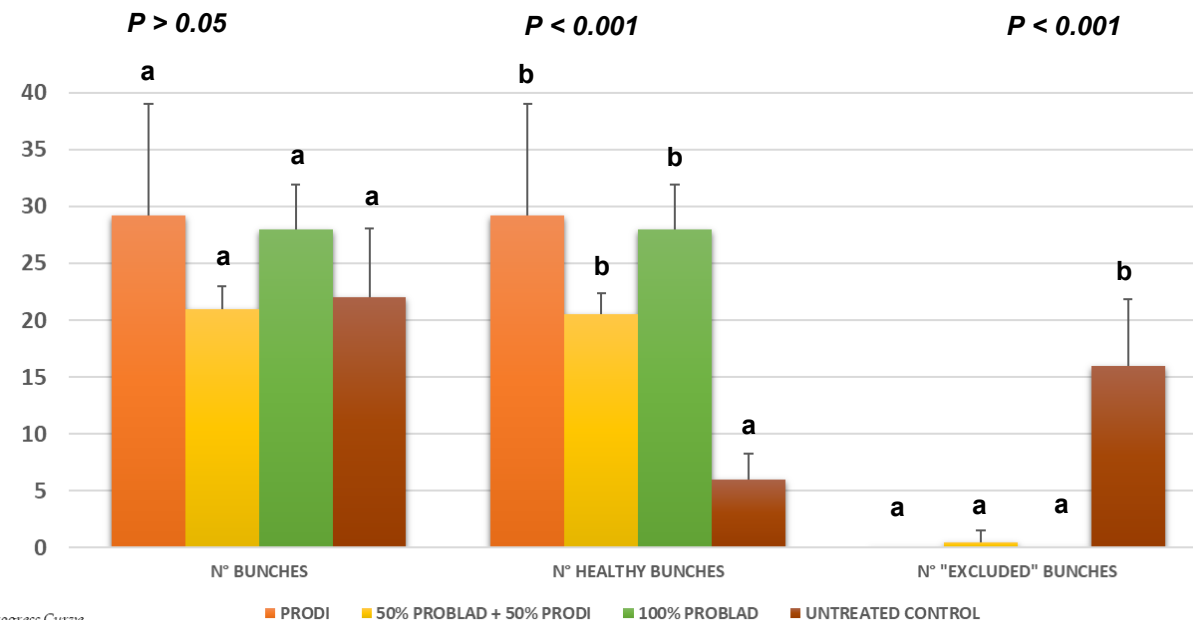
Leaves



Bunches



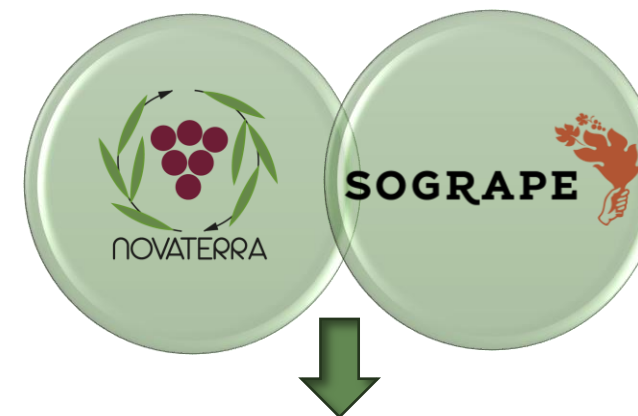
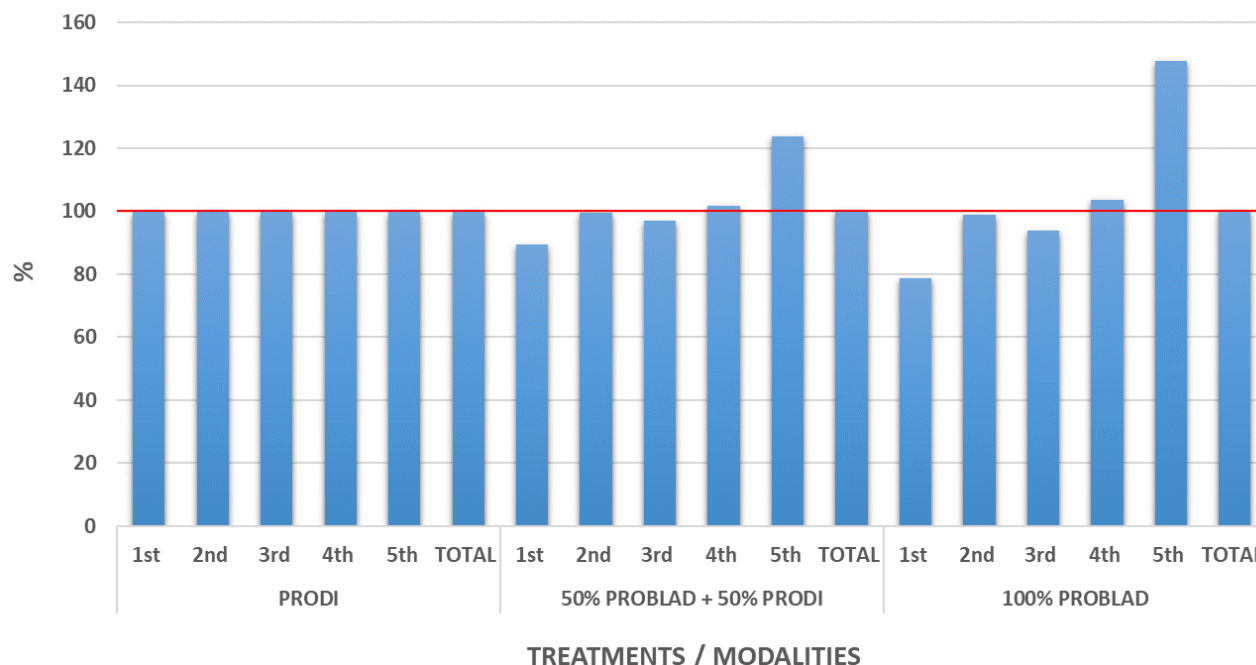
AUDPC - Area Under the Disease Progress Curve



- ❖ Although **PROBLAD** has been described for powdery mildew control, in this trial it showed **good efficacy in downy mildew control**.
- ❖ The grapevines treated with the **PRODI** and **100% PROBLAD** modalities had **all healthy bunches**.
- ❖ As **powdery mildew pressure was low in 2023**, this year, 2024, the trial was repeated on **the same plot and also on another vineyard**.

Innovative strategy for sustainable viticulture in Portugal's Douro Valley

Economic impact compared to the usual treatment (PRODI)



NOVATERRA was a "gateway" for **SOGRAPE** to continue testing new ways to operate and invest smartly in **reducing its environmental footprint**, implementing **nature-positive innovations**, paving the way towards **sustainable agriculture**.

- ❖ There were **no significant cost differences** for the three treatment modalities, with the **100% PROBLAD** modality showing more promising results than the 50% PROBLAD + 50% PRODI modality (in terms of **downy mildew control** and **yield**).

Use of mass trapping for olive fly

- The olive fruit fly, *Bactrocera oleae*, is the pest with the highest economic impact on Mediterranean olive crops, with pesticides currently being the main control method.
- This project aimed to develop alternative strategies to minimize the impact of pesticide use.
- **Mass trapping** is effective for reducing adult populations of *B. oleae* but requires complementary treatments to ensure complete crop protection.
- The project tested **mass trapping** combined with low-impact strategies across three regions and different crop management systems in Spain and Portugal, assessing damage and pest populations over three years in nine field trials.



Conetrap



Dacus trap



2021-2022

- Conetrap + kaolin
- Conetrap + kaolin+ Spinosad
- Dacus trap + kaolin
- Dacus trap + kaolin + Spinosad



2023

- Conetrap + conventional insecticide program
- Conetrap + Kaolin+ Spinosad
- Conetrap + Kaolin



Kaolin spray



Use of mass trapping for olive fly

- ❖ **Mass trapping** effectively reduces *B. oleae* populations in olive crops but needs to be complemented with additional treatments and monitoring.
- ❖ Adverse weather conditions affected pest populations and fruit availability during the three-year project, yet trials were adapted and results obtained.
- ❖ The project tested mass trapping and low-impact strategies in different olive production zones, finding no significant differences between traps, orchards, or years.
- ❖ Combining **mass trapping** with kaolin or Spintor sprays proved to be an effective low-impact method for managing *B. oleae*.



Use of entomopathogenic fungi to control *Bactrocera oleae*

- ❖ Entomopathogenic fungi, such as *Beauveria bassiana* and *Metarhizium brunneum*, are used in biological control strategies against pests. *B. bassiana* is effective against the olive fly, with bioinsecticides used in foliar applications during fruit maturation in summer and autumn.
- ❖ Soil treatments with *M. brunneum* can reduce olive fly populations, though it is not commercially available, leading to the use of *B. bassiana* as a substitute for targeting pupae and emerging adults.
- ❖ The objective is to demonstrate the efficacy of entomopathogenic fungi and mass trapping as alternatives to conventional treatments across various regions, varieties, farming systems, and crop management practices.
- ❖ During 3 consecutive years, three large-scale field trials in Portugal (1) and Spain (2) were carried out each year with different varieties, farming systems, and crop management practices.



Use of entomopathogenic fungi to control *Bactrocera oleae*

- ❖ During 2021 and 2022 the Trial 1 suffered from the general lack/shortage of olive fruits, not only in the trial site but in the region, did not allow us to assess the efficacy of the different strategies in terms of % of attacked olives as we planned in the protocol.
- ❖ *Metarhizium brunneum* is currently not available in 2023.
- ❖ In the three trials where we could assess the efficacy of the strategies tested, strategies based on the applications of *B. bassiana* offered similar efficacies to the strategy based on the application of chemical pesticides.





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