# Innovative Zeo-biopesticide: ecofriendly and sustainable disease management strategies for grapevine, olive and tomato

**F. Modica[1] , L. Fagioli[2] , M. Cortiello[1] , F. Bellameche[1] , D. Giovanardi[1] , E. Stefani[1]**

[1] Department of Life Sciences, University of Modena and Reggio Emilia, 42122 Reggio Emilia, Italy;

[2] Consorzio Agrario di Ravenna, via Madonna di Genova 39, 48010 Cotignola (Italy). E-mail: francesco.modica@unimore.it

## Introduction

The use of copper in agriculture and its accumulation in soil are no longer sustainable. As an alternative strategy, a biopesticide has been developed, based on a combination between a zeolite and a biocontrol agent.

## Materials and Methods

*In vitro* and *in vivo* tests, followed by field trials, were done against these pathogens: *P. syringae* pv. *tomato* (*Pst*), *Xanthomonas vesicatoria* (*Xv*), *P. savastanoi* pv. *savastanoi* (*Pss*) and *Spilocaea oleaginea* and following crops: tomato and olive. Additionally, extensive field trials were conducted in vineyards against downy mildew. The chosen antagonist was *P. synxantha*, strain DLS65. Field trials were conducted during spring/summer 2023 in Italy, Croatia and Spain. The Zeo-biopesticide was produced by Symbiagro Srl, Roncadelle (BS) and named "**Microfighter**".

## Results

### *In vitro* test:

The pure culture of the biocontrol agent DLS65 was effective against all the pathogenic bacteria tested and the highest effect was observed against *Pss,* with 20% of growth inhibition (Fig. 1).

Spilocaea oleaginea as well was clearly inhibited by the antagonistic isolate DLS65 (Fig. 2).

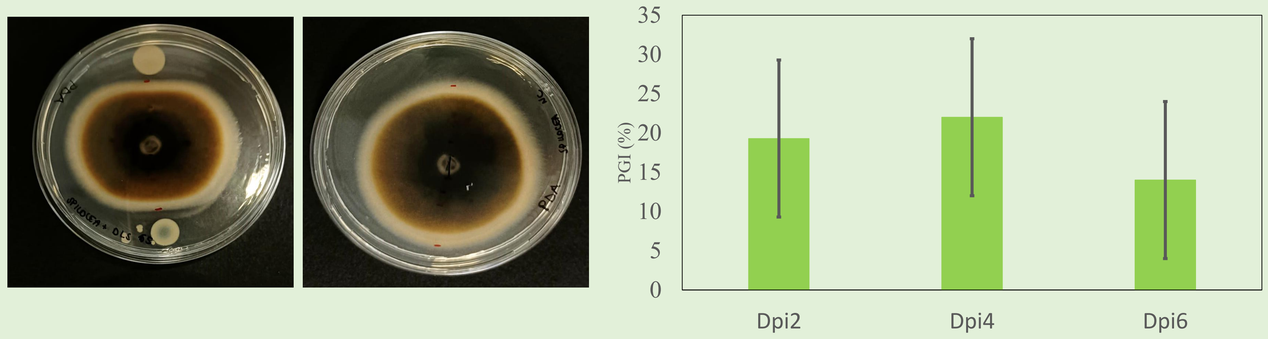


**Fig. 2** : The effect of DLS65 on *Spilocaea oleaginea* growth 4 days post inoculation.

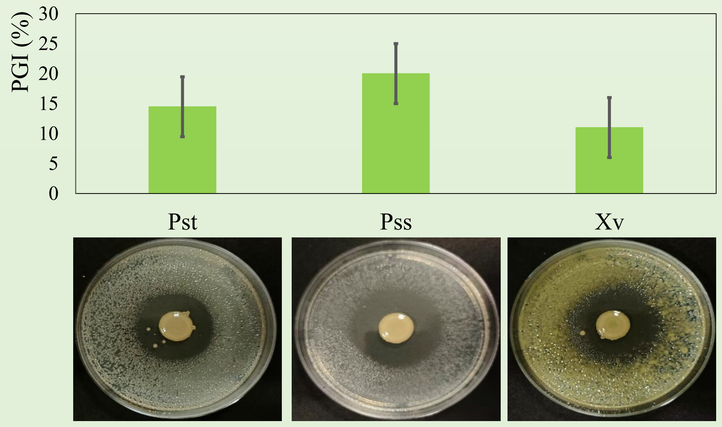


**Fig. 1** : The antagonistic effect of DLS65 against pathogenic bacteria 48 hours post inoculation.

### *In vivo test:*

**Olive**: **Microfighter** showed a similar protection against the knot disease as copper (Fig. 3). An alternative, well known antagonist, *Streptomyces* spp. SA51, used as an additional control, did not show any protective effect.

**Grapevine**: **Microfighter** was able to significantly inhibit the development of downy mildew on 1-year trees. Such protection was evident when using a higher dosage than that one applied in commercial vineyards (Fig. 4).

**Fig. 4:** Symptoms of downy mildew in greenhouse assays.

**Grapevine**: In commercial vineyards, three different scenarios were observed in the three EU countries. Spain: downy mildew outbreaks were not observed, due to extreme drought; Croatia: **Microfighter** and copper showed a similar protection activity and downy mildew was excellently managed by **Microfighter**; Italy: due to the heavy spring rains, both **Microfighter** and copper did not get an optimal disease control, and systemic fungicides were needed to give and additional protection.

**Tomato** and **Olive**: Trials in commercial fields are still ongoing

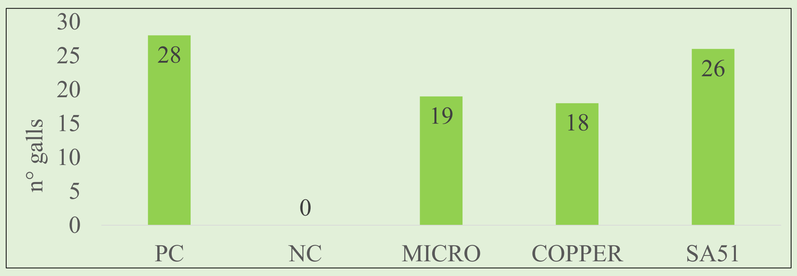


**Fig. 3:** Olive knot severity on 2 years potted plants, experimentally infected by *Pss* and treated with **Microfighter** and copper

## Conclusion

An innovative biopesticide, named **Microfighter**, was developed. Results from *in vitro* and *in vivo* experiments, together with extensive field trials, indicate that **Microfighter** has the potential to reduce copper inputs in agriculture. Field trials in vineyards, olive groves and tomato fields will continue for additional two years to confirm **Microfighter** activity.

**Acknowledgements :** Research funded by the European Commission under the LIFE-2021-SAP-ENV-ENVIRONMENT project (Acronym: LIFE-MICROFIGHTER), GA Nr. 101074218.