

VineMan.org

Integration of plant resistance, cropping practices, and biocontrol agents for enhancing disease management, yield efficiency, and biodiversity in organic European vineyards.



Main research questions:

Insufficient disease control is often the main reason for growers to abandon organic production. The request by the authorities to progressively reduce the use of copper fungicides (Council Regulation (EEC) 2092/91, Annex II) further increases this problem. The major research objective of the VineMan.org project is the development of innovative cropping strategies and techniques able to solve the issue of growing healthy plants in an organic way. To develop these comprehensive strategies different specific research questions had to be firstly answered:

- selection of natural resistance inducers for an effective application in organic viticulture.
- improvement of cultural operation to obtain less favorable clusters' microclimate for pathogens development, but more ideal microclimate for grapes ripening.
- selection of epidemiological models against the main grapevine diseases and development of an electronic platform for the organic management of the vineyard.
- improvement of fitness and efficacy of four commercially available biological control agents (BCAs).



Main outcomes at this stage?

80 different substances have been tested to identify potential resistance activator compounds: one compound demonstrated, both in controlled environment and in the field, the ability to reduce sporulation of *Plasmopara viticola*.

Different operational activities were tested in vineyards to modify the cluster microclimate in order to make it less favorable to pathogens growth and more favorable to berry ripening: pre-flowering basal leaves removal showed to be a good solution.

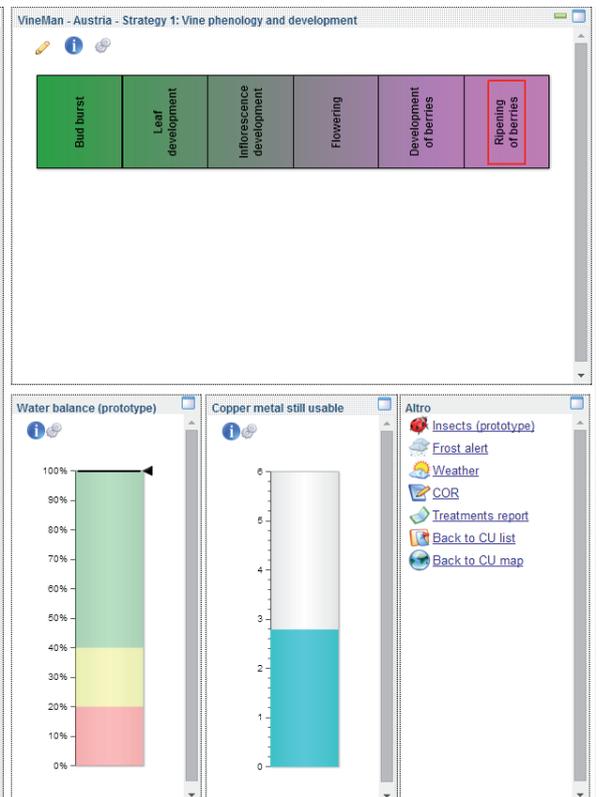
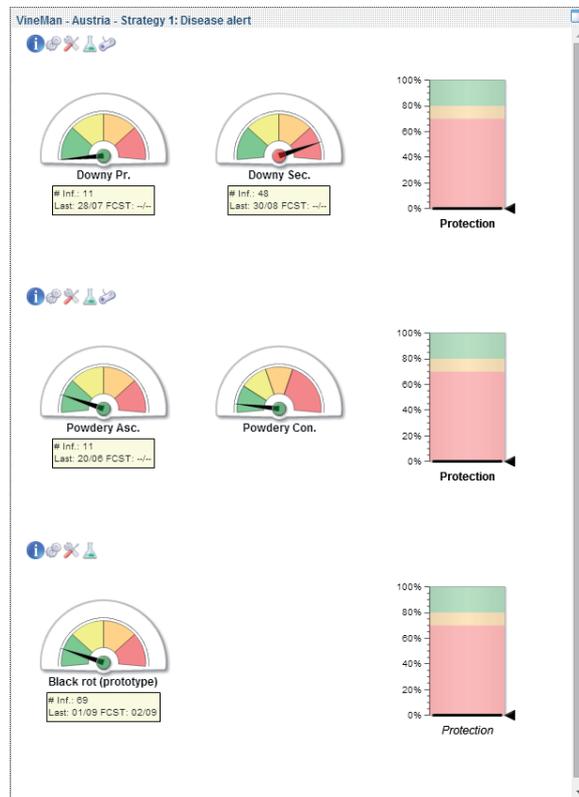
Mechanistic models for infection of both powdery and downy mildew, developed by the team of the Università Cattolica del Sacro Cuore, were implemented in a web-based platform and were used to schedule treatments in the experimental fields.

Strain-specific detection systems for *Bacillus amyloliquefaciens* QST713, *Aureobasidium pullulans* CF 10 and CF 40 and *Ampelomyces quisqualis* AQ10 were developed. Experiments on the efficacy of BCA mixtures were performed in controlled environ-



ment and they revealed that copper has a tendency to negatively influence the persistence of the microorganisms on vine leaves. Moreover, tests in laboratory showed that *Lecanicillium lecanii* (Mycotal™) is virulent to the second larva instar of *Scaphoideus titanus*.

Finally, considering all the above mentioned results two innovative and comprehensive strategies for the organic management of the vineyard were developed and tested in experimental fields. A first “risk-adverse strategy” is based on the combination of: i) fall treatments with the hyperparasite *Ampelomyces* spp. for the reduction of the overwintering chasmothecia of *Erysiphe necator*, ii) the web-portal with models for the prediction of downy and powdery mildews to schedule copper and sulphur treatments at label dose during the season; iii) use of Botector for the control of grey mold. A second “risk-seeking strategy” is based only on: i) low-dose copper and sulphur applications according to the models and ii) early leaf removal for the control of grey mold. These strategies were compared with the farmer’s usual strategy: the same disease control was achieved using less plant protection products, in particular with the “risk-seeking strategy”.





Recommendations to end-users

- Perform leaf removal at pre flowering stage on varieties with very compact clusters
- Use epidemiological models to better schedule treatments against downy and powdery mildew
- Do not mix the BCA Botector, Serenade and AQ10 with copper
- A possible bio control strategy for the larvae of *Scaphoideus titanus* could be the use of *Mycotal*.

Relevance

Main end-users are organic and integrated grape producers, producers' associations, private and public advisors.

All the above mentioned recommendation can be implemented in other countries and other types of farms taking into account the single country regulations (i.e., registration of BCA). In particular the use of epidemiological models to better schedule plant protection products could be also implemented on other agricultural crops.

New and important research questions

How long are the BCAs persistent in the vineyards and what is the ecological impact of their use? Can additional applications of water improve the development of the microorganisms on the plant surface?



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Further information

This project is funded via the ERA-net CORE Organic II by national funds to each partner. CORE Organic II is a collaboration between 21 countries on initiating transnational research projects in the area of organic food and farming. In 2011, CORE Organic II selected VineMan and 10 other projects.

Read more at coreorganic2.org/Vineman.org.