

Copper reduction strategies in viticulture

Problem

Copper is widely used in organic plant protection in horticultural crops. It is easy to use and effective against many fungal and bacterial diseases. However, the accumulation of copper in soil causes adverse conditions for beneficial organisms. Furthermore, the useable amount is limited to 4 kg/ha/year (an average over seven years) in most European countries.

Solution

Plant health strategies that aim to reduce the current use of copper combine:

- Preventive measures: beginning with the vineyard's design and complemented with agrotechnical practices applied throughout the year. If appropriate, use of disease-tolerant cultivars.
- Direct plant protection methods: including the application of copper alternatives.

Outcome

Reducing the use of copper helps to decrease the negative environmental impact of copper mining and production. The decreased copper load in the soil helps keeping beneficial organisms in the vineyard.

Practical recommendations

Preventive measures for new vineyard plantations

- Choose resistant or tolerant varieties that are recommended for organic viticulture (e.g., Solaris, Nero).
- Choose the optimal area with favourable climatic conditions for viticulture. Do not establish a vineyard in a valley where cold temperatures and humidity persist.
- The rows must be parallel to the dominant wind direction. The spacing between rows and plants should allow air to flow easily.
- Apply optimal row and planting distances; the optimal row spacing depends mostly on the canopy form. For organic vineyards, the cordon canopy can be a good choice. In this case, the optimal space between the rows is 200-250 cm and 80-100 cm between the plants.



Picture 1: Defoliated bunch zone, healthy berries (Photo: Jade Ducretot, ÖMKi)



Picture 2: Well-managed canopy and cover crops (Photo: Bence Trugly, ÖMKi)

Applicability box

Input used

- | | |
|--|--|
| <input checked="" type="checkbox"/> Copper | <input type="checkbox"/> Anthelmintics |
| <input type="checkbox"/> Mineral oil | <input type="checkbox"/> Antibiotics |
| <input type="checkbox"/> Fertilizers | <input type="checkbox"/> Vitamins |

Geographical coverage

Continental climate

Application time

At vineyard planning and/or several times depending on the season

Equipment

Sprayer; useful to have: weather station and decision support system

Best in

Organic viticulture, against downy mildew

Strategies for maintenance of the established vineyards

A well-managed canopy preventing favourable environment for fungal diseases:

- Prune vines 2-4 times in a season and do not allow the plants of different rows to touch each other.
- Keep the bunches reachable for the wind and the sprayer.
- Remove the foliage in the bunch zone to help aerate the grapes and develop stronger skin.
- Keep the space under the rows clear by managing the weed or the cover crops mechanically.

Healthy plants for better resistance against fungal or bacterial diseases:

- Provide harmonic nutrition and irrigation.
- Find a good balance between yield and the condition of the plants. Remove some bunches if necessary.
- Apply foliar fertilizers and plant strengtheners if needed as they can improve plant health.

An integrated approach for direct interventions:

- Collect and remove the infected parts of the plants to help slow down the spread of infection in the vineyard.
- Consider the weather preferences and biology of the pathogens. Use a decision support system on your vineyards, if available. This can help identify the ideal time for the application of plant protection products, prevent unnecessary work and reduce the pesticide load.
- Apply copper alternatives to avoid further increasing the copper load in the soil.

On-farm application

System approach and evaluation

The design of copper reduction strategies in organic vineyards relies on a system approach to plant health. Preventive measures provide the basis for effective plant protection in organic farming. Despite the deployment of preventive strategies, further direct disease control against downy mildew, for instance, is often necessary. When necessary, the use of copper, copper alternatives, or a combination of both should be considered.

Further information

Videos

- Ecological plant protection options for grapes, complemented by our experiments on copper replacement from RELACS (HU with EN subtitles). Available at https://youtu.be/A7M5Ry2_xHQ.
- Under the Row Weed and Soil Management video from NVGrapegrowers (EN). Available at <https://youtu.be/uBWWx90s9p4>.
- Vineyard Shoot Thinning and Suckering Grapevines from Jordan Vineyard & Winery (EN) Available at <https://blog.jordanwinery.com/suckering-rainy-spring-means-extensive-grapevine-shoot-removal/>.
- A Year in the Vineyard the Four Seasons from Wine Discover (EN). Available at <https://youtu.be/xNIZS4sW7Wc>.

Further readings

Hoffmann, U. et al. (1995). Handbook - Ökologischer Weinbau (1995). Available at <http://www.ecowein.de/buecher/oekologischer-weinbau/>.

Häseli, Andreas; Tamm, Lucius und Wyss, Eric (1999) Krankheits- und Schädlingsregulierung im biologischen Rebbau. FiBL-Merkblatt. Forschungsinstitut für biologischen Landbau (FiBL), CH-Frick.

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RELACS: 'Replacement of Contentious Inputs in Organic Farming Systems' (RELACS) builds on results of previous research projects and takes far-advanced solutions forward. As a system approach to sustainable agriculture, organic farming aims to effectively manage ecological processes whilst lowering dependence on off-farm inputs. The RELACS partners will evaluate solutions to further reduce the use of external inputs and, if needed, develop and adopt cost-efficient and environmentally safe tools and technologies.

Project website: www.relacs-project.eu

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