



GREEN INFRASTRUCTURE IN WINE-GROWING LANDSCAPES

Nature-based solutions and recommended
best practices in vineyards

Identified problem:

The **use of copper-based fungicides** is a preventive measure used against vine diseases (such as mildew). However, it is necessary to take into account soil properties and copper storage dynamics to determine, at the vineyard and wine-growing region level, the ecotoxicity thresholds that must not be exceeded in order to maintain good soil biological quality. Use below the authorised average level of metallic copper could delay the point at which the copper ecotoxicity which negative effects in the soil and the plant, which could occur in the medium term. However, exploring alternatives to copper will improve the quality and sustainability of wine production.

Best practice recommended by ECOSPHEREWINES:

MANAGEMENT OF COPPER IN THE SOIL AND USE OF ALTERNATIVE PRODUCTS

In many cases, the use of copper is necessary to protect vines, but excessive application can damage the soil and the environment. Therefore, the vineyard protection strategy can be adapted by combining several management practices to achieve the objectives of reducing copper use. The effectiveness of these measures depends on climatic conditions, their combination with copper-based products and the level of disease pressure. Alternative management can contribute to improving soil nutrition and water quality or the natural regulation of pests and diseases. When properly managed, copper management and the use of alternative products provide **multiple** environmental, social, economic and cultural **benefits**, commonly described as **ecosystem services**.

How can this best practice be implemented?

1. **Use disease infection prediction models** (e.g. SSD) to vary treatment rates according to needs and optimise the doses applied: treat at the right time and with the right dose, as this is the best way to reduce copper, and follow the recommendations of the infection models without following a pre-established treatment schedule.
2. **Observe the foliage**, which will allow you to monitor disease pressure in the plot and detect any signs of disease early on.
3. **Use alternative products (alone or as a supplement to copper)** as agents of protection, such as:
 - a. Preparations based on phosphorous acid or phosphonates.
 - b. Plant extracts from horsetail (*Equisetum arvense*), sage (*Salvia officinalis*), or other types of vegetation of the genus *Salix* sp., *Urtica* sp., among others, in case of low pressure, and in combination with a reduced dose of copper in case of higher pressure.
 - c. Essential oils such as orange oil.
 - d. Other natural products (seaweed, tea tree, etc.) with highly variable efficacy depending on the vintage and disease pressure. They are preferably used as part of a mixed strategy of copper and biocontrol with microorganisms such as *Trichoderma* sp. However, when used alone, these products seem to be clearly reserved for situations with low or medium parasitic pressure. It is the user's responsibility to quickly change strategy if parasitic pressure increases and to accept the likely variations in efficacy.
4. **Use bioadsorbents** (vegetable compost, biochar or shredded pruning debris) that bind to available copper (complexation), reducing its availability and toxicity in the soil. Use the necessary type and dose of bioadsorbent and maintain a soil pH ≥ 7 to reduce the amount of copper available to plants. You can also use siderophore-producing bacteria, which produce molecules that complex Fe and can reduce the availability of other metals (e.g. Cu) to plants.

What ECOSYSTEM SERVICES does the management of the copper in the soil and the use of alternative products?

• Regulation:

- Natural control of pests and diseases affecting vineyards.
- Improved soil health, contributing to ecological restoration, increased biodiversity (microorganisms, plants and invertebrates) and water purification capacity.
- Improvement of the soil nutrition cycle by reducing the amount of copper in the environment.



TO
LEARN
MORE...

scan this QR code