# Copper reduction and copper replacement – results and experiences of 12 years on farm research.

## Verrringerung der Kupferaufwandmenge und Kupferersatz – langjährige Erfahrungen in praktischen Betrieben.

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An ecological, organic vineyard is a complex living system (Pic. 1) where the grower actively tries to encourage the self regulation of the ecosystem and the health of this organism.
One of the primary interests in organic viticulture is to grow healthy and disease resistant plants. With the help of plant health enhancing products which are accepted by organic standards, and with the correct soil-and plant management the regulation of fungal diseases through the induction and enhancement of the plant's own defence mechanisms, can be approached.
This does not involve the application of synthetic and toxic compounds to plants.
Only as a last resort,biological fungicides (copper,sulfur,limesulfur) are to be used to manage fungal problems

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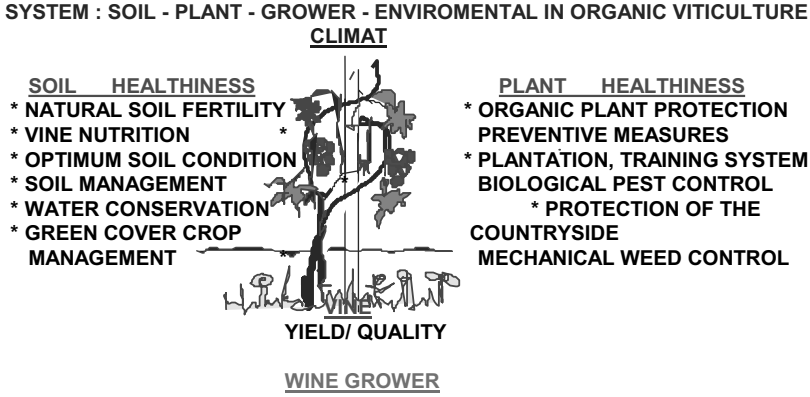


Copper is a very common pesticide in organic viticulture, used against different diseases. But it is long term toxic for soils. That is why organic winegrowers try to reduce its use. Since 1988 ECO-Consult and the Organic Winegrowers Association of Germany (BÖW) has coordinated a on farm research program concerning copper reduction in organic vine protection.

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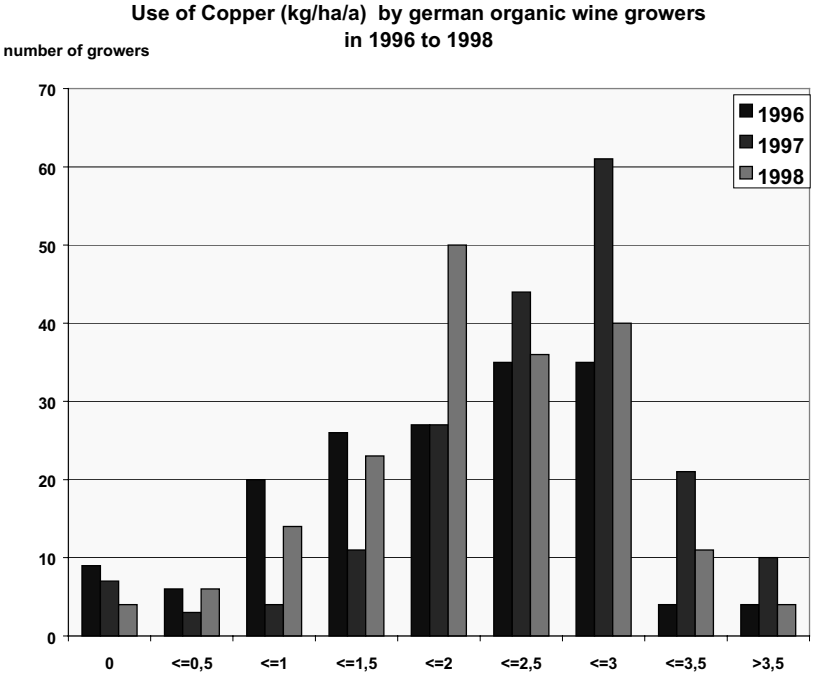
For most organic winegrowers in collclimate regions downy mildew is the main problem. Organic Winegrowers pay more attention to this diseases: they follow official advices and pretection methods, make their own observations and are keen on prophylactic methods.




In Germany, Swiss and Austria the input of Metallic Copper in organic production is limitated, not more than 3–4 kg / ha and year are allowed (Pic. 2).
Experimentations showed that copper preparations like Copper hydroxid, Copper Oxychloride or Copper Oxalate used in a low dosis of 80–150g/ha copper before flowering, 200–400 g/ha after flowering and alternative products like–Ulmasud, Myco-Sin ( algamatholithe -natural Bentonit with high aluminium content) has an efficiency against mildew under normal infection pressure (Tab. 1, Pic. 4)) .

**Tab. 1:** Frequency of Plasmopara viticola infection on clusters in the years 1990–2000 ( ring trial–on farm research)

| Variants<br>5–10 Treatments | Number of trials | Mean of infection | Maximum | Minimum |
|---|---|---|---|---|
| Copper Ø < 3 kg / ha | 155 | 28,7 | 90,5 | 0 |
| Myco-Sin | 27 | 33,0 | 89 | 0 |
| Myco-Sin – VP | 16 | 32,5 | 89 | 0 |

| Variants<br>5–10 Treatments | Number of trials | Mean of infection | Maximum | Minimum |
|---|---|---|---|---|
| Ulmasud | 12 | 33,5 | 87 | 0 |
| Ulmasud<br>2 x Copper<br>(1,5–2 kg/ha) | 21 | 26,8 | 51 | 0 |
| Ulmasud VP<br>2 x Copper<br>(1,5–2 kg/ha) | 5 | 34 | 80 | 4 |
| untreated | 40 | 85 | 100 | 10 |

Under humid conditions, early and strong primary infection and high infection pressure (3 of 10 years) the plant protection agents were not so efficient in prevention the spread of downy mildew.

In the future new plant protection strategies ( Tab. 2) like the combination of 2 or 3 copper treatments and Ulmasud also new copper preparations and microbiological antagonists or Plant extracts to increase a natural defense mechanisme (SAR) can help to reduce the copper input in organic viticulture.

PLANT PROTECTION STRATEGY AGAINST PLASMOPARA VITICOLA–DOWNY MILDEW

- Planting of interspecific, resistent grape varieties
- Preventive Measures:
  Training system, winter and summer pruning
  foliage treatment, leaf removal, side and short shoots removal, thinning and pinchin out–work in time to reduce the condition for the diseases.
- Plant Treatments:
  Spraying of compost- equesetum extrakt, lactic-bacterial extrakt, on the soil to increase a higher biological aktivity and a higher population of antagonists.

  If there are optimal conditions for the primary infection (infection from the soil)
  2 or 3 pre-blosseming treatments with Ulmasud, Myco-Sin (6–8 kg/ ha).
  In case of rainstorm, high humidity using of Copper in a low concentration of 0,1–0,2 kg Cu / ha.
  Last pre-blossom spray and first post blossom spray using of Copper 0,5–1 kg Cu / ha.
  In dependency of the infection and climatic
  condition using of Ulmasud, Myco-Sin or Copper.

Ulmasud and Myco-Sin are natural bentonits and limestones with an low ph-Value and a high aluminium content.
It‘s possible to use this treatments in combination with sulfur or Bacillus thuringiensis.