Alternatives to copper-based treatments for the control of grapevine downy mildew (Plasmopara viticola): 5-year synthesis of trials in France and Italy

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Introduction

In organic viticulture so far only copper can assure an efficient Plasmopara viticola (P. v.) control. However, many studies have demonstrated the agronomical and environmental drawbacks of repeated copper spraying in vineyards:

- Copper impacts soil organisms and accumulates in the soil in the long term,
- A high soil copper concentration is phytotoxic, leading to potential decrease of yield.

Copper use is currently limited to 6kg/ha/year by the European community. In the future, this copper dose should decrease.

The objective of the UE-funded programme REPCO involving 6 European countries was to identify new alternatives to copper fungicides in organic farming. Some of the most promising results on downy mildew control are here presented.

Experimental design

A screening of 43 products was firstly realised in a greenhouse to identify promising products.

The efficiency against downy mildew of 39 alternatives to copper formulations was assessed in experimental plots in South of France and North of Italy during the 2004-2008 period. Moreover, copper reduced-doses were tested.

Product efficiency was measured on leaves and bunches in July, August and just before harvest.

Results were expressed as leaf incidence, i.e. the frequency of leaves with at least one P.v. spot. The experimental design was composed of 4 repetitions of 12 plants per treatments.

Example of products tested in experimental fields against downy mildew in France and Italy

Among the tested antagonists, the highest efficiency was observed for Trichoderma harzianum-based product. Its efficiency was significantly higher than the untreated plot but decrease just before harvest. However, this T.h.-based product did not provide a level of P.v. control similar to copper in this trial.

Results & discussion

Efficiency under high pressure

Under high P. viticola pressure, copper-based treatments and potassium phosphate are the most efficient products to control downy mildew.

- Clay-based treatments such as Mycosin are promising alternatives. However, under high disease pressure, their efficiency are low for commercial vineyard protection (see also Tamm et al., 2006).

- Plant extracts and B-based products used without copper have a low efficiency in P. viticola high pressure vineyards.

The combination of both field experiments and screenings of a wide range of copper-alternatives is optimal to assess the efficiency of potentially interesting products.

- Under P.v. high pressure, copper-based treatments are the most efficient.
- Some alternative products gave promising results.
- Further research is needed to identify other efficient alternative products when P. viticola pressure is high.