

Reducing the amounts of copper in vineyards against *Plasmopara viticola* by the use of a low dose of D-fructose

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Abstract

To find agronomic alternatives to reduce the amount of copper used as fungicide in vineyards against *Plasmopara viticola*, we tested a method using soluble carbohydrates as resistance inducers.

In semi-field conditions on the grapevine cultivar “Muscat de Hambourg”, Fructose at 10 ppm and sucrose at 10 and 100 ppm were as effective against the downy mildew as copper hydroxide applied at a dose equivalent to 600g per ha.

In field experiments on several cultivars in three regions of France, D-fructose water solutions at the dose of 100ppm allowed reducing 2 to 6 fold the quantities of copper applied over the season. The effects of associating D-fructose and copper against *P. viticola* were lower than the addition of their individual effects.



Material and methods

In semi-field conditions

Screening of sugars was carried on “Muscat de Hambourg” and “Grenache blanc”. D-glucose, D-fructose and sucrose at 1, 10 and 100 ppm doses in water were sprayed on the leaves seven days before inoculation (before 9:00 A.M.solar time). One week after infection and then every 4 days (8 times until September 20th), disease incidence (% leaves affected) and severity (% surface affected) were recorded on 5 leaves taken at random per plant (36).

In organic vineyards

D-fructose solutions and copper preparations (Kocide Opi®) were sprayed between 150 and 200 L per ha. Reduced preparations of copper were equivalent to 100 g per ha (Cu100). Observations were performed on 25 leaves and 25 grapes per plot every 8 to 15 days from the end of April to harvest. The variables measured on leaves and grapes were the same as in the semi field trials.

Results

On “Muscat de Hambourg” sucrose at 100 and 10 ppm and D-fructose at 10 ppm were the most active sugar treatments (same statistical group as Cu600)

The addition of D-fructose to Cu100 allowed reducing 2 to 6 fold the quantities of copper, while keeping treatment efficiency.

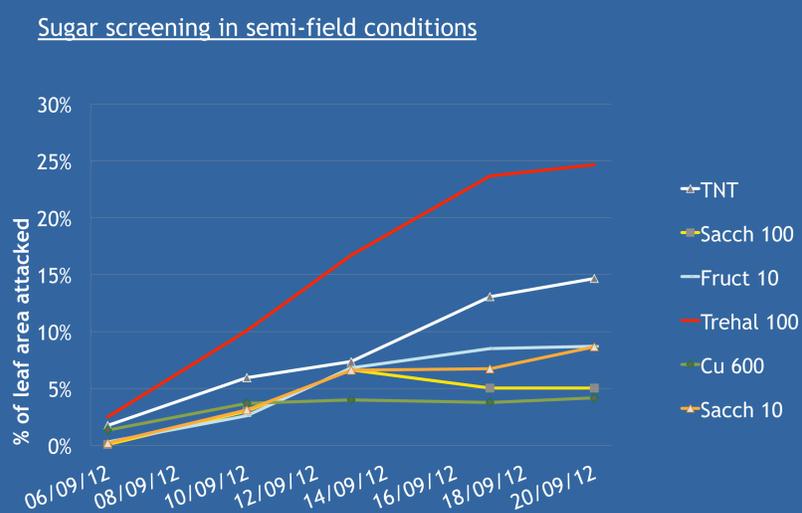


Figure 2. AUDPC intensities of attacks of *P. viticola* on “Muscat de Hambourg” after a single foliar application of water sugar solutions 7 days before infection.

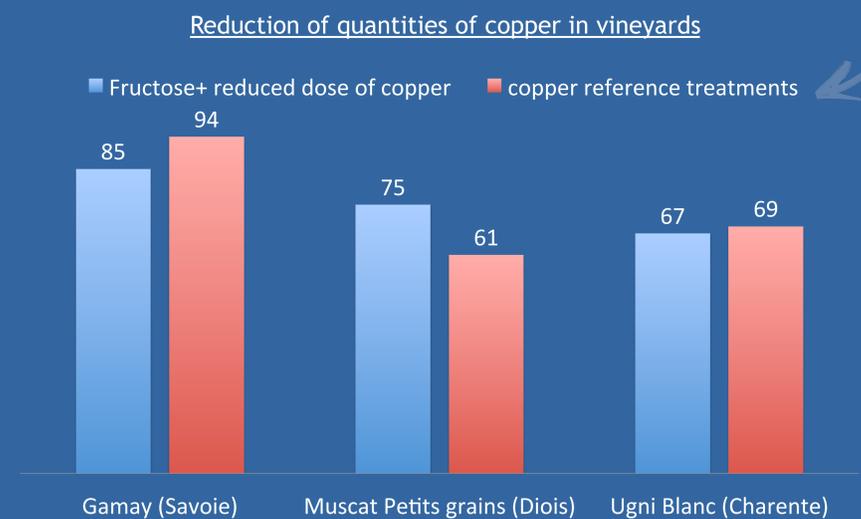


Figure 1. % of efficacy in field conditions on three cultivars (the doses of copper in the reference treatments varied according to the geographic region)

In Savoie D-fructose and Cu100 presented similar effects for reducing disease (results not showed). Their effect in association was lower than the addition of their individual effects. We can hypothesize that copper used as fungicide, also activates plant signalization pathways that could interact with the fructose ones.