What is the Better Solution for Fungicide Resistance Management in Grapes: Sequence or Alternation?

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INTRODUCTION
Several modes of action are affected by resistance in grapes, for both Plasmopara viticola and Erysiphe necator. Limitation of the number of treatments per season and mixtures are recommended to cope with resistance. In a context of a multiple application programme, what is the better strategy: Alternation or Sequence?

SELECTION PRESSURE
Trials to evaluate the selection pressure are rarely conducted in the vineyards. We reported two examples on powdery mildew and downy mildew, respectively.

Grape powdery mildew and SBI Class 1 (or DMI)
A long term trial was carried out in Azambuja (Portugal) using large plots (320 m²), no replicates, and 2 DMIs applications (triadimenol). Samplings were done three times per year and the sensitivity of the population was assessed (EC50 values) for each program (Figure 1).

Grape downy mildew and QoI
A downy mildew trial was carried out in Cognac (France), cv. Ugni blanc, using large plots (425 m²), no replicate and 2 QoI treatments (azoxystrobins). Samplings were done four times and percentages of resistant phenotypes for each program were determined. The highest percentage of resistant strains to QoI seems to be present following the alternation program.

EFFICACY IN RESISTANCE SITUATION
Fields trials were conducted in St. Martin d’Armagnac (France) during two consecutive seasons under artificial infection at the beginning of the experiment (50% of CAA resistant phenotypes). Efficacy was calculated following assessment on bunches (50 per plot). A significant loss of efficacy was observed with CAA alone. There is no difference between the
sequences (CAA+mancozeb) and the reference program. On the other hand, poor control is observed for the programs considering 2 CAA+mancozeb in alternation with Ref. 2.

CONCLUSIONS

Alternations of 2 treatments with the same mode of action are not always reliable strategies in grapes for two reasons:

- Selection pressure is higher than a sequence of 2 consecutive applications (prolonged period of selection);
- Efficacy is sometimes inferior in comparison to the reference program or sequence.

Figure 1 Sensitivity development to DMIs and spray programs of grape powdery mildew trials in Azambuja (Portugal), cv. Carignane from 1990 to 1992.
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Figure 2: Frequency of resistance to QoI and spray program of grape downy mildew trials in Cognac (France), cv. Ugni blanc.

Figure 3: Efficacy of different spray programmes to control downy mildew in St. Martin d’Armagnac, (France) using artificial inoculum consisting of 50% CAA resistance.