

Development of decision rules for pest vineyard management

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Vine crop protection is nowadays based upon systematic sprays. A new approach is thus necessary for the generalisation of Integrated Pest Management (IPM). This concept must clearly describe decisions to control diseases and insects pests. INRA develops such type of tool called Decision Rules (DR). The IPM strategy takes into account indicators that are activated through an "if-then" decision making process. Linking the value of the successive indicators along a DR-chain leads to decisions: spray, do not spray, or wait. Based on this scheme, we have developed DR for the management of diseases and for insect pests management. Available knowledge on arthropods pests was condensed into a single DR, our aim being:

- (1) to maintain a good functional quality of foliage throughout the season (leafhoppers and mites)
- (2) to produce grapes that are suitable to the high quality standards of AOCs (grape moths).

Outbreaks of Flavescence Dorée, against which regulations impose compulsory pesticide applications leads to two scenarios: with or without this disease. Monitoring of insect population is then used as a basis for management, based on injury thresholds. Management actions are firstly directed against the grape berry moths and secondarily against leafhoppers. The strategy is preventive, at the insect populations levels, and makes use of diverse insect traps and insect counts. Side-effects on beneficial organisms (such as predatory mites) are included in the criteria for selection of chemical compounds. Mating disruption technology is also used, and applied if the level of grape berry moths population exceeds a value which would require sprays at each generation.

The DR has been tested since 2003 on four plots in AOCs production, 0.25 to 0.5 hectare in size, planted with merlot or cabernet-sauvignon. Over three years of experiment, situation changed with various levels of populations of insect pests and with or without compulsory FD control. *Lobesia botrana* Den. & Schiff. was well controlled by use of *Bacillus thuringiensis* or Insect Growth Regulators, without mating disruption justification. No control of *Empoasca vitis* Goethe larvae was necessary. The *Typhlodromus pyri* Scheuten population level was high and no Tetranychidae was observed during the experiment.

This type of pest management based on the hierarchical importance of species, injury thresholds and side effects on beneficial organisms leads to use biological or no chemical control options. This point favours beneficials, including Phytoseiidae. In the future, transfer to growers needs to explore new decision models to simplify the system. A new approach using fuzzy logic is in progress.

Key words: integrated pest management, decision rule, pests, vineyard