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THE VALUE OF WINE: BETWEEN NATURE AND CULTURE

ŒNOLOGICAL INNOVATION, FROM LAB TO WINE-PRODUCE

ELIMINATING THE USE OF PESTICIDES, THE CHALLENGE OF VINE-GROWING OF THE FUTURE

Vine, Wine, bringing together every branch of science

Eliminating the use of pesticides, the challenge of vine-growing of the future

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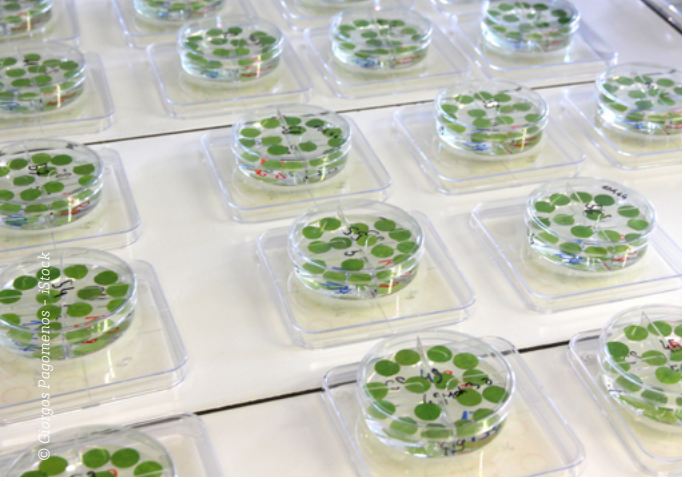
▲ *Phylloxera is a disease affecting grapevines, brought on by nymphs of the same name.*

Vines are under incessant attack from parasites which threaten the harvest. To control them, vine-growers use pesticides. In Bordeaux, scientists are actively working to find alternative solutions.

By **François Delmotte**,
Research Supervisor at the French National Institute for Agronomic Research (INRA Bordeaux)

Fungi, insects, bacteria, viruses... Every year these pests threaten harvests and sometimes kill the vine stock. Some are parasites that have been known about since Antiquity, such as certain moth larvae, but most are due to recent invasions. During the 19th century, European vines were hit by several invasions from America, with first of all the arrival of powdery mildew (1845) and then the famous *phylloxera* (1868), an aphid which attacked the roots and ravaged European vines in the space of a few years. It took no fewer than 30 years of research to find the solution: grafting French varieties of *vitis vinifera* onto American stock that was resistant to *phylloxera*. Later, black rot and downy mildew appeared. To combat downy mildew, Alexis Millardet developed the famous Bordeaux Mixture in 1884. Today, vines are at risk from other threats such as *xyllela*, a bacterium that has caused the destruction of fields of olive trees in Italy.

To control these parasites, vine-growers use chemical products called pesticides. But is there a way wine can be made without pesticides? One thing is



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◀ *Assessment in controlled conditions of the aggressiveness of downy mildew strains on a resistant grape variety created by INRA.*

certain: there is no single solution. On the contrary, it is only by combining all available springboards (ecological, genetic, agronomic) that we will be able to develop methods that use fewer pesticides.

Investing in biological control

To combat insect pests, one of the primary research areas is conservation biological control. It consists in encouraging populations of natural enemies (auxiliaries) of insect pests to reduce their impact on the vines. It is therefore necessary to understand the role of viticultural practices and the surrounding landscape in biodiversity and pest regulation.
But the other concern is pathogenic fungi, principally downy mildew and powdery mildew which currently account for 80% of vine treatment. To control these two diseases, synthetic or mineral products (copper, sulfur) are used. One solution is replacing these products with biological control techniques such as rival microorganisms, natural products, and techniques that stimulate the plants' natural defenses. We must not only look for new candidates, but also know how to best use them!

> "But is there a way wine can be made without pesticides? One thing is certain: there is no single solution."

Resistant grape varieties: the vine fights back!

Another strategy is also very promising: the selection of grape varieties that are resistant to powdery mildew and downy mildew, two diseases native to America that vines have no natural resistance to. INRA recently created new grape varieties that were resistant to these diseases through crosses with American vines. Experiments with these grape varieties show that it is possible to reduce the use of pesticides by 90%. Could this be revolutionary? Certainly, but vine-growers need to get hold of these new varieties. Socio-economists are studying the measures of support required to diffuse these grape varieties.
Another problem is if the pathogen tries to get around the vine's resistance. At the cutting edge of the question, researchers at the ISVV have shown that downy mildew can adapt, thus reducing the efficiency of resistance. It is therefore necessary to monitor the evolution of populations of powdery mildew and downy mildew and back up the use of resistant grape varieties with agronomic practices that preserve their durability. In addition, the drastic reduction in the use of fungicides could bring back so-called "secondary" diseases, such as black-rot and Anthracnose. In response to these challenges, INRA and the French Vine and Wine Institute have created the National Observatory for the Deployment of Resistant Grape Varieties. By federating vine-growers' initiatives, the observatory is a unique tool for research, monitoring and sharing experiences. ■

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▲ *A Merlot grape affected by downy mildew.*