

BIOLOGICAL APPROACH IN the FIGHT AGAINST the DISEASES AND THE RAVAGEURS OF the VINE.

CONCEPT OF BIORÉSISTANCE

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ABSTRACT

Since the 19th century, the uses of chemical products was the principal way to fight the outbreak of fortifies parasitic. Nevertheless, thesis kinds of technical cuts not been enough to push away the phylloxera invasion. The grafting, has biological approach, has been, and still being the only way of perpetuate the European vineyard. The hybridization has also pointed out its capacities to reduce the fungus presses despite its drawbacks.

The biological approach should rapidly supplements gold become has substitute to the chemical uses because of the growth of environmental presses.

This way of fight is sided: the biological fight *senso stricto* consisting in using organisms (but to their by-products) is common used to struggle the fortifies parasitic. Another facet is the tweaking of the fortifies metabolism which concerns the resistance system; this technology is more recent.

Finally, the bioresistance concept is proposed for this approach. Physiological, metabolically and genetically process are integrated in this term.

PRESENTATION

The vine is a plant sensitive to many diseases. The French vineyard was subjected to attacks of parasites come from the continent of North America about the middle of the 19th century.

The oïdium is the first American disease introduced in Europe, in 1847. The first way of fight was found fortuitously by KYLE in 1846, gardener in the English greenhouses: it used sulfur. In France, GONTIER invented in 1851 the first bellows to spread it sulfur in the vines. Copper was used but had a limited action. Inhibitors of the synthesis of sterols (IBS) were then employed.

The mildew discovered in the Gironde in 1878, is another American mushroom which invades all wine Europe quickly. Its attack was particularly disastrous in France, in 1886. Since, the mildew remained a dreaded parasite, particularly the rainy years. The fight against mildew is primarily preventive, it passes by the search of the primary education hearths and their destruction. The first fungicide employed was copper then, starting from 1950, organic fungicides were used: to the preventive action was then added the systemic action.

The black-rot originating in the American Atlantic area was identified in France in Herault by VIALA and RAVAZ in September 1885. The fight imposes preventive medications, but also pulling up and prophylactic measurements.

In 1864, the phylloxera added its damage to those of the cryptogams. The chemical fight, by the use of carbon bisulphide injected into the ground being insufficient, one turned to a biological approach by grafting on resistant understocks.

At the 20th century and in particular after the second world war, the pest-destroying fight grew rich by many pesticides of synthesis. However, if the effectiveness of the new molecules were often spectacular, those gradually lost their pest-destroying properties by the appearance of resistances.

In Parallel, the impact on the natural environment of the pesticides was underlined (surface and underground waters) as well as the risks of presence of residues in the wine with sometimes of the consequences fermentaires and often a deterioration of the image of the product within the framework of the concept of wine and health.

All these elements contribute in search of alternative methods of fight. Thus the biological fight is the object of a broad development in the vineyard.

Another more recent approach for which we propose the concept of biorésistance is based on the mechanisms of natural resistance of the vine.

Biological Fight

The biological fight perhaps defined in its direction strict like the use of living organisms to control others of them known as vermin. The control of the populations of ravageurs passes by the use of auxiliaries and the diffusion of the phéromones in practice of sexual confusion.

The reasoned fight is halfway to the chemical fight and of the biological fight, it utilizes the concept of thresholds of infection beyond which one will implement the chemical fight.

Working groups exist, of the tools are available in order to know and to apply the currently available techniques of fight reasoned for better apprehending the plant health intervention appropriateness.

The decision to treat must be done according to the various elements which each expert must take into account:

- identification of the parasites or ravageurs as well as possible predatory the or auxiliary ones,
- methods of enumerations,
- estimate of the risks dependant on the climatic conditions, the soil types, the modes of control, type of vines,
- search or estimate of the possible side-effects of other interventions.

Concept of biorésistance of the vine

With the image of the approach adopted for the phylloxera, it is possible to consider a tweaking of the process of resistance of the plant with respect to the parasites. In This Case, typical case it is the easy way of the grafting which made it possible to overcome the disease and by the same one to save the viticulture of an irremediable destruction.

Within the framework of this biological approach related to the plant to be protected, we propose to introduce the concept of BIORÉSISTANCE.

This concept can be in the following way defined “biological approach associating physiology, the metabolism and the genetic inheritance of the vine, intended to ensure a protection screw has screw of the diseases and parasites”. This approach integrates various

complementary strategies and is registered like an alternative or a complement with the chemical fight.

Factors of biorésistance

3.1 Physiological and metabolic Approach

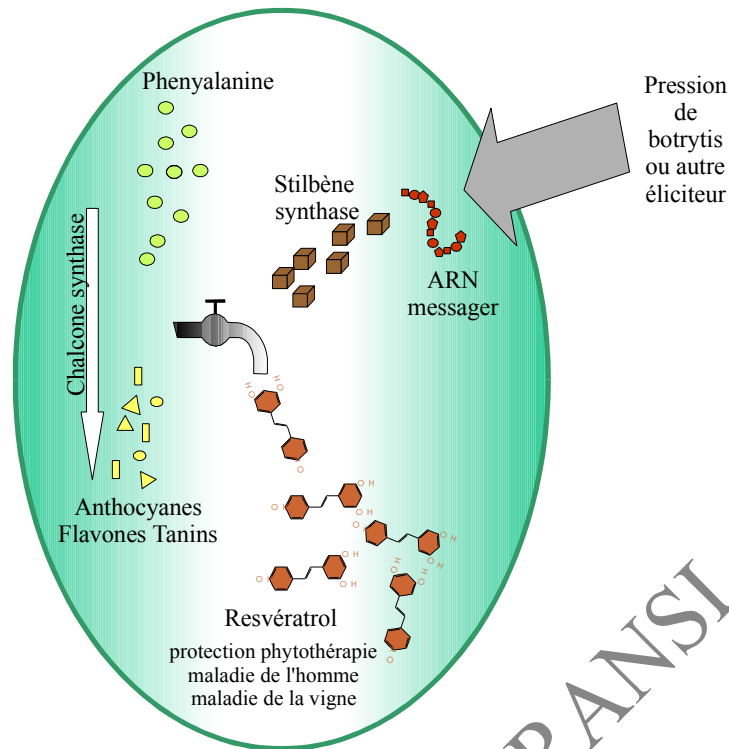
The control of the vine (manure, mode of control, training, possibly irrigation, etc...) intervenes not only on the parasitic pressure (conditions of sunning or hygroscoy on the level of the vegetative bodies) but also on the aptitude of the plant to generate it even a mechanism of defense with respect to the attacker. This preventive, known of all the wine growers but sometimes neglected approach deserves to be underlined in particular from the point of view of a more restrictive use of the pesticides.

3.2 Stimulative of natural defenses

The vine which undergoes a stress or a pressure of *Botrytis cinerea* is able, to a certain extent, to defend oneself by an internal process. Indeed in talkback with a stress, it deviates the way of biosynthesis of the flavonoïdes towards the biosynthesis of resvératrol.

The synthesis of the resvératrol appears quickly after the message of aggression called the elicitation. It was shown that the hexahydraté aluminum chloride can induce this synthesis.

A product containing of $AlCl_3$ and the cream of algae (intended to facilitate the penetration of $AlCl_3$) is currently offered on the market. Its use associated with a fungicide was tested, it was proven that it increases the effectiveness of the anti-*Botrytis* processing.



Appear: 1 Synthesis of the resvératrol in a grape_
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3.3 Approaches genetic

- Improvement by sexed way

The selection of the vine is practiced since the Roman epoch but the methods evolved continuously, first of all the selection in the spontaneous populations, the selection of natural crossings and later hybridization. Interspecific hybridization today is practiced little because of the losses of quality.

There exists a remarkable example of biorésistance dating from the 19th century: the fight against the phylloxera. Indeed, it is the association of a resistance obtained by hybridization and the easy way of the grafting which made it possible to save the vineyard of the devastating plant louse.

- Improvement sees molecular

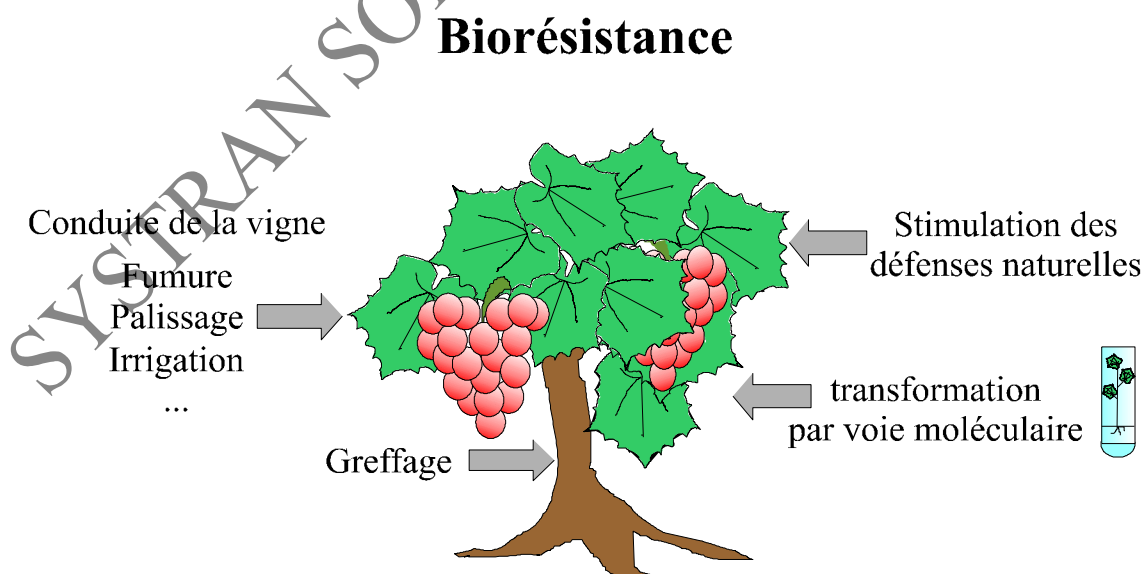
Since 1990, pointed techniques calling on molecular biology allow the improvement of the vine in order to obtain a resistance to various parasites. Various works are undertaken in several producing countries in order to obtain understocks and type of vines resistant to the virus diseases and the fungous diseases.

The techniques used make it possible to introduce into the genome of the vine a gene of interest (conferring a resistance) which can come from another living organism.

Interesting results but still not validated in fields, were got concerning the resistance of the vine to short-tied and the eutypiose.

Various strategies can be used, the fight can be directed against the virus, by the gene introduction coding for proteins capsidales, or against toxin in the fight against the eutypiose by the gene introduction coding for an enzyme making it possible to degrade the eutypine, Work develops in order to introduce genes coding for chitinases (enzymes degrading the wall of mushrooms) into the fight against the oïdium, or of genes coding for a bacterial toxin, in the fight against insects ravageurs.

The experiments did not lead yet to publications announcing the acquisition of a really effective resistance on tests in fields. The vine being a perennial culture, the experimentation requires much time. While considering that the genetic transformation of the vine is indeed an interesting technique to reduce the use of the plant health products and that the social debate related on a side to the problems of pesticide residues and other with the genetic transformation, turns in favor of the tech news, the consumption of wine resulting from vine processed will not be effective before about ten years.



CONCLUSION

The evolution of the requirements of the consumer brings the viticulture to a debate which integrates at the same time technological changes and concepts of ethics. It is clear that the use of the pesticides will be subjected more and more to lawful restrictions at the same time because of their impacts on the natural environment and of the risks toxicological or supposed like such.

Thus, the biological approach, which integrates at the same time the biological fight and the concept suggested of biorésistance must be integrated in the pest-destroying approach of fight.

With Respect To the mechanisms of internal resistance, the farming approach and the knowledge of the intrinsic mechanisms must be privileged.

The genetic approach is more delicate, taking into account the debate related to the genetically modified organisms. Is it Necessary to advance in this field with the risk to run up against the consumers sensitive to the concept of engineering genetic?

One can also wonder which will be their reaction in about ten years since there will be the choice between a wine resulting from grapes GMO with step or few pesticides used and a wine obtained with grapes for which the parasitic pressure imposes a minimum of processing even under the conditions of integrated production.

All these questions must be discussed within the framework of international structures of the Vine and the Wine and in particular within the structure in project "Ethics and Environmental Protection mission".

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