Grapevine trunk diseases. A real problem.

Document elaborated by the OIV Secretariat general

Grapevine trunk diseases are considered the most destructive diseases of grapevine of the past three decades and are of rapidly growing concern in all wine producing countries. Grapevine trunk diseases (GTD) have become a real problem during the last years, causing in the shorter or longer term the death of the vines and also, meaning a substantial economic cost for their replacement. It is well accepted that almost the 20% of the vineyards are affected by these diseases around the world.

In this framework, OIV owes be an active partner and committed within the frame of several initiatives and actions developed at international level. In that sense, OIV has taken part in the last national meeting about GTD impact at the French *Assemblée Nationale* [1](Paris, May 2015), the GTD international workshop (Cognac, June) or the last workshop about decay of vine depression (Paris, July 2015). OIV also, has started up again the work in this line, which first action was settle down in 2006 (VITI 02/2006 resolution[2]) but some actions are needed nowadays in order to complete this resolution about preventive measures.

Grapevine trunk diseases are mainly caused by the Esca and Black Dead Arm (BDA), two typologies of fungi. There are many different types of fungi which develop several diseases like *esca, excoriose, eutipiosis, phomopsis*, black decay, petri, black foot, *fusarium, verticilosis*, etc. Each of these microorganisms have different ways to attack the plant (at the trunk level or also at the leaves and shoots), but a common pattern.

The life cycle and epidemiology are very similar for all the fungi known that cause trunk diseases. Fungal spores cause a sectorial or central necrosis joined with vascular discoloration at a wood level that causing a depressive status to the plants: weakened vegetative development or defoliation but sometimes chloroses weaknesses or also, some deformations of their leaves. Finally, the disease produces the slowly death of the vines. Other diseases, like Pierce disease, rugose wood complex or Grapevine leaf roll viruses (GlRaV) caused by bacteria and viruses are also associated to GTD, being responsible of a high rate of mortality in the vineyard (70%).

Generally, these trunk diseases damage above all, old plants but recently, it has been seen that they have become more rapid in their extension and also they start to affect young plants (2-3 years old) or vineyards over 7-years-old.

There are several factors which could explain the recently trunk diseases development, but mainly they could be summarized in the ban on the sodium arsenate (only method known to control the ESCA) from 2001 to 2003 in Europe; the high rate of asymptomatic stocks contaminated in the vineyard and non-appropriated cultural practices.

For instance, there is a real annual increase of the mortality rate from 0.5 to 1 % each year in plots of land where the treatment by the sodium arsenate has been stopped.

[1] http://www.assemblee-nationale.fr/14/pdf/rap-info/i2946.pdf
[2] http://www.oiv.int/oiv/info/enresolution?lang=en

Methods of control and mitigation

Since the ban of arsenite sodium, control methods are mainly focused on preventive measures. Preventive or sanitation measures like removing dead/dying vines and pruning dead arms are used in order to reduce the source of spore inoculum originating from within a vineyard. Late pruning in the dormant period is also a recommended cultural practice, because wounds heal faster with high degree-day temperatures.

In order to limit the spread of inoculum, OIV recommended in 2006 (VITI 02/2006 resolution) some preventive measures: ensure good vineyard drainage; check solidity at the grafting area; remove vine stocks and old branches; pruning preferably during the dry period and reduce and protect pruning wounds, among others. However, for grapevine viruses' control an early detection is the only preventive measure recommended.

Even if vineyard soils constitute the main source of inoculum for grapevine infections (management practices based on soil disinfestation and amendments, plant-based resistance to infection, and prophylactic cultural practices should be investigated) beside from some exceptions (e.g. *Fomitiporia spp*), fungal diseases and other diseases can spread by trading plant material and thus, they can be introduced in areas where they do not exist before. Some guidelines seem to be expected in this area (ie. Draft OIV Recommendations for Certification and Trading Material of Vine Plants/ VITI-PROTEC 14-565 A and B Et3).

Nowadays, there are not chemical products allowed for controlling trunk diseases because of their toxicity for the wine grower and their residues could be a risk for human health. Further researches in alternative solutions like the use of boron; organic products (acid molecules, biofumigants or plant fortifiers) or bio agents (microorganisms used in biological control; e.g. *Trichoderma*) are needed.

Future perspectives should go through research also in precision breeding: cultivars and clones are needed for preventing damages; for the genetic improvement of grapevine or their resistances. However, more wide spread and robust evaluations, must be done in the future in order to confirm the utility of cultivars (plants contain lot of genetic elements useful for grapevine) produced by precision breeding, which should be tested within next years.

Moreover, growing conditions and the climate change constitute a huge challenge: there is a direct effect on the fungal development in the vineyard and its externalizing symptoms. The indigenous microflora also, could be very important in order to limit and prevent the development of pathogens and thereby inhibit the onset of symptoms.

GTD Workshop (Cognac, France)

Recently, experts from different countries had a meeting about Sustainable control of GTD (*Eutypa*, *Esca* and *Botryosphaeria* diebacks mainly) in Cognac. In four sessions this group discuss about several areas:

- ✓ Pathogen characterization, detection and its epidemiology. Life cycles, molecular detection, taxonomy, study of environmental change related to fungal spread and its evolution.
- ✓ Microbial ecology. Symptomatic and asymptomatic plants. Phytotoxic secondary fungi metabolites. Potential resistance of grapevine cultivars.
- ✓ Disease managements. Use of *Trichoderma* and *Pythium (*biocontrol agents), phytoprotectors, nutrients and defense induction, Culture practices (training systems and trunk renewal, pruning wounds).

- ✓ Reports from nurseries propagation protocols and first European assessment on the distribution of GTD in adult vineyards.

Future and perspectives

In this framework, OIV carried out meetings with different relevant actors (e.g. coordinator of COST action), in order to give the chance to know future perspectives and the real state of this great problem, which is currently affecting moreover to 20% of the vineyard worldwide. OIV starts to evaluate the potential collaborations with the International Council of Grapevine Trunk Diseases (ICTGD; www.icgtd.org); International Society Plant Pathology (ISPP) and other relevant International or National institutions, for doing a document of expertise about GTD, getting the information about the real impact in cost management, and further actions. We will work together in getting the information to the growers, their education about identifying the problem, training in preventive measures and also, providing real, practical and sustainable solutions.

In addition, OIV members should do a real effort to prevent and give adequate surveillance and monitoring their evolutions rates (percentage of damage, type of pathogen, etc.) around the wine world and finally, taking into account their impact in all the vitivinicultural sector. OIV should be also vigilant concerning to their evolution and spread, risks, effects, cutting edge lines and control measures, not only for the trunk diseases or other biological agents; even if other factors (like cultural practices, climatological agents or vine plant material) cause the vine depression.