

The spores are out there: Observations from the 6th International Workshop on Grapevine Trunk Diseases



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Key messages for trunk disease control

- do paint your pruning wounds
- younger vines are at higher risk
- obtain your source material from good nurseries
- try not to prune in the rain
- try to reduce stress factors in at-risk vines
- double pruning reduces risk on spur-pruned systems
- not all fungi automatically cause disease, it's a complex system

Black foot, Bot cankers, Verticillium wilt – they don't sound pretty and they're not. These are just a few of the grapevine trunk diseases that wreak varying degrees of havoc on vineyards around the world. They, and their cohorts Esca, Petri disease and *Eutypa*, were the subjects of the 6th International Workshop on Grapevine Trunk Diseases, held in Florence, Italy, in early September.

A bi-annual event initiated and organised by Laura Mugnai (a viticultural fungal researcher at the University of Florence), the workshop has been gathering strength and numbers since its first session in 1999. Today, attendees and contributors come from around the world.

Initially, the workshop was formed to investigate Esca, the major trunk disease of grapevines in Europe. Esca continues to cause widespread damage, but thanks largely to the workshop group's efforts, the nature of the disease, the fungi that cause it, and the way it spreads in vineyards are becoming much better understood.

The Grapevine Trunk Diseases Workshop now includes researchers and industry members who work on all forms of trunk diseases. Over time, several key research centres have emerged in this area: Cecelia Rego's team at the Technical University of Lisbon in Portugal, Doug Gubler's team at the University of California, François Halleen's and Lizel Mostert's group at the University of Stellenbosch in South Africa, Jacqueline Edwards and associates at the Cooperative Research Centre for Viticulture in Victoria, Australia, and Marlene Jaspers' team at Lincoln University in New Zealand.

This year's conference saw several major research presentations on Esca (comprising about half of the conference) with research on other grapevine trunk diseases forming the remainder. This latter group includes Petri disease, Verticillium wilt, *Eutypa*, Black foot (*Cylindrocarpon*) and several diseases related to the group of *Botryosphaeria* fungi.

Basically, a grapevine trunk disease is any one of a number of fungal diseases that are systemic, in that they are located inside the trunk or cordons of the vine. Such diseases are usually associated with decline conditions, such as dead arms, die-backs, cankers, and whole or partial vine collapse. Typically, they end in the death of the affected vines. In some situations, however, vines can be cut back to

clean wood, re-trained and rescued, while in other instances vines may recover spontaneously.

Most trunk diseases, such as *Eutypa* and Black foot, are well known to viticulturists and plant pathologists. One of the recent findings presented at this year's conference, however, indicated that *Botryosphaeria* fungi are being traced to some problems in grapevines that were not previously understood. These problems include conditions such as die-backs, dead-arms, cankers, bud-burst failures and shoot death.

The *Botryosphaeria* fungi, of which there are at least five different species present in Australia and New Zealand vineyards, are known to be extremely common. They exist as part of the natural mixed flora on many, if not most, woody plants and are not necessarily a problem unless conditions change to favour an increase in their population.

What these changes might be is of course the million-dollar question. Could we have changed something in our methods of propagation or viticulture? Or is our increased reliance on stronger and more species-specific chemical fungicides upsetting the balance of the natural flora? Species of *Botryosphaeria* are now known to be wound "colonisers" – that is, they will quickly colonise injuries to vines (such as pruning wounds). Once internalised in the vines, *Botryosphaeria* disease situations can possibly be expected to develop. While these questions remain speculative, the research being done by this workshop group will help us to understand and (ultimately) control such diseases.

At this year's conference, there were three research presentations



Symptoms of verticillium wilt. ▶

pest & disease

and about a dozen posters on *Botryosphaeria*, all presented in the third session of the conference. It is evident from the research results that some of the *Botryosphaeria* species can be more pathogenic than others, in that they are more likely to cause disease than others. Nonetheless, there are also examples of fungi being found in virtually all the vines in a vineyard, yet the vines remain symptomless and the fungi are clearly not causing any disease. It appears that these fungi need a particular set of conditions to arise before they can effectively cause disease. Such conditions could include the presence of recent pruning wounds followed by rain-triggered spore release, or perhaps vines that are already under stress from other factors such as age, drought, nutritional deficit or other physical factors.

Each workshop begins with a session on identification, diagnosis and occurrence of grapevine trunk diseases. From a practical point of view, scientists – and viticulturists – need to ensure that we are all referring to the same fungi when we discuss or work on specific diseases. Scientific names and common names can often result in confusion. “Black dead arm” for instance, is a term in France used to describe a type of trunk disease that is now known to be an early manifestation of Esca. In Hungary, “Black dead arm” is a disease associated with *Botryosphaeria* fungi.

The second session of the conference focused on host-pathogen interactions, how a fungus causes disease and what mechanisms the vines can use to try and defend themselves. This session covers the biochemistry of toxins secreted by the various fungi, and how they damage the vines and interfere with the normal physiological processes of vine growth. This session sounds complex, and for the most part it is. The knowledge derived from this type of work will hopefully lead to the identification of natural chemicals that will form the basis of future control strategies.

The third session of the conference was on epidemiology, which is the way the fungi spread, what the alternative hosts are and what



Botryosphaeria-affected vine.

climate factors assist their spread. This section focused closely on alternative hosts: we now know that many other woody plants, such as pip fruit and stone fruit trees, can harbour a plethora of the fungi which can also cause grapevine trunk diseases. One presentation in this session looked into propagation practices in nurseries and identified risk points in nursery production where fungal contamination was demonstrated. The conclusion? Grapevine nurseries need to pay close attention to hygiene with respect to fungi.

The focus on nurseries generated some spirited discussion, and it was quickly pointed out that most grapevine nurseries are already paying close attention to hygiene. Modern nurseries are in fact doing much, much more than they have ever done in the past to improve hygiene and vine health, so there must also be other factors at

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Grape Phylloxera Workshops

work – factors that we have not yet identified, but which also share responsibility for the apparent increase in grapevine trunk diseases.

Other presentations in the section on epidemiology looked at the times of the year fungal spores are released and the climatic factors, such as rain and temperature, that favour their release. This research will have practical applications in the vineyard.

The last workshop session was dedicated to research focusing on control of the various trunk disease fungi. Two interesting presentations (and quite a few posters) dealt with the efficacy of hot water treatment to eradicate fungi from grapevine propagation material. The general feeling seemed to be that hot water treatment, if used correctly, can remove most (but not all) fungi from propagation material.

On a related topic, however, was an extremely well-researched presentation by Dr Leonardo Casieri (an Italian working at the Wädenswil Research Institute in Switzerland), which examined the complex fungal flora before and after hot water treatment. Dr Casieri identified a complex community of fungi present inside the vines before hot water treatment, and then re-assessed the situation after hot water treatment. His findings? While hot water treatment did reduce the overall numbers of some of the better known pathogenic fungi, the biggest effect was seen in the changes of the relative population sizes of the different fungi. In other words, most of the fungi remained, but their relative populations changed.

Dr Casieri's research sparked a lively question period. Several members of the group asked what happens to hot water treated vines after they are planted. After all, a vineyard is very different from a nursery. Once vines are planted out, there are multitudes of fungi naturally present all around them. After being "cleared" of fungi by hot water treatment, presumably the vines will be quickly re-colonised by the first fungal cab off the rank. What that first colonising fungi might be, and whether it will be beneficial, are not known.

The session devoted to control also included a couple of presentations on bio-control of trunk disease by *Trichoderma*. *Trichoderma* species are fungi that are parasitic on other fungi: the theory is that they will eat invading fungi, but not cause any damage to the vine themselves. A study on pruning paints showed that almost any fungicidal preparation is better than none (so don't forget to paint your pruning wounds, because it does work!).

Dr Doug Gubler's presentation revisited the concept of double pruning, showing this practice to be economical and successful. Double pruning involves a single pass with a tractor trimmer in early-to mid-winter to trim the canes well above where the final cuts will be targeted, and then returning in late winter – as close to bud-burst as possible – to hand-prune to spurs. Obviously, this is not going to be of much value unless you are working on a spur-pruning system. Doing the close pruning as late as possible means that sap flow may be underway by the time any close cuts are made, and this makes it harder for fungal spores to enter the wounds.

This year's workshop demonstrated just how much valuable work has been done – and continues to be done – on grapevine trunk diseases. The four sections of the meeting meshed well and the presence of nursery operators, vineyard owners and researchers made for a good mix. The focus remains on the industry as a whole, not only on the science. It's becoming quite apparent that diseases of this type are rarely straightforward. Interacting conditions and stresses as well as the presence of the fungi are often required before a disease situation develops. Grapevine trunk diseases are best understood if viewed as complex diseases. The next workshop will be held in Chile in 2010.

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