Young Vine Decline... Continued from page 21

15, 20 and 25°C. After twenty-eight days pycnidia were very abundant on wood at these same temperatures and most abundant at 25°C. Pycnidia were dark, superficial to slightly embedded, subglobose to globose in shape and ranged in size from 110 to 190 μm. A cloudy gray conidial cirrus could be seen oozing from the ostiole after 21 days. Conidia contained in pycnidia were hyaline, subglobose to oblong and ranged in size from 2.0–3.0 μm x 1.0–1.5 μm. Conidia were viable and germinated after 48 hours on water agar. After twenty-one days, wood pieces inoculated with *Pm. inflatipes* incubated at 10, 15, 20, and 25°C were observed to have microsclerotia-like structures on their surface as well as on the agar surface near and around the pieces. Structures appeared as dark compacted masses of hyphae. They were globose, superficial to slightly embedded and ranged in size from 65 to 120 μm. Conidia could be found on conidiophores extending from mycelium around and attached to the structures. Conidia were hyaline, oblong to ellipsoidal and ranged in size from 2.5–5.0 μm x 1.25–2.0 μm. Neither pycnidia nor microsclerotia could be found on wood pieces or media inoculated with *Pm. aleophilum*. These findings are important to our understanding of the biology of these elusive fungi. The finding, that *Pm. inflatipes* is able to produce microsclerotia-like structures on grapevine wood as well as on artificial media, along with previous research (unpublished) showing that it can be recovered from soil and the fact that this species is a good root pathogen indicates that this fungus is a soil-borne pathogen. This is the first reported study on the effect of temperature on pycnidia production of *Pa. chlamydospora*.

Syrah Decline in French Vineyards

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Because of its great potential to produce quality wine, Syrah is one of the most important grape varieties cultivated in southern French vineyards. Since the 1990s, a unique problem has been observed by grape growers and researchers on Syrah plants: leaf reddening and swollen graft unions. The scions of affected vines declined and died more or less rapidly. By contrast, the rootstock often stays alive and canes can be observed suckering below the union.

**Symptom description**

Syrah decline is characterized by two symptoms on mature plants:

- swelling and cracking at the graft union (Fig. 1)
- early leaf reddening (from July)

The graft union becomes enlarged and the wood hard. After peeling the bark, deep and parallel grooves can be observed in this specific localized area. The vines can also show a premature discoloration of the leaves during the spring, becoming red in autumn.

All rootstocks and clones are known to demonstrate this problem although there are some indications that their sensitivity might vary.

**Development of the problem**

Development of the symptoms is very different depending on the site. In the last few years, symptoms seem to be observed on more young plants than previously, perhaps due to more careful observation. Four year-old vines are now recorded to show typical symptoms.

![Figure 1: Swelling and cracking at graft union.](Photo courtesy of ENTAV)
Syrah vineyards have been surveyed and some sites have been followed since 1999. Each plant is identified and observed from one year to another with the aim of describing the spatial and temporal evolution of the problem. Statistical analyses of these records will aid in better understanding of symptom development.

As explained previously, two types of symptoms are associated with Syrah Decline. The relationship between those two symptom types needs to be well established. Careful observations in a number of different situations showed that many plants show only cracking without leaf reddening. By contrast, very few plants showing only leaf reddening (without cracking) could be found. This has led us to suggest that two different factors could be implied in this problem: the first one would be involved in the cracking of the wood and a second one (different from the first) is responsible for inducing the leaf reddening and the death of the plant.

To understand cracking morphology, several graft unions were dissected for observation under a microscope. Precise observations in the cracking areas suggest a dysfunction of the cambial zone with a disruption of the local area. We are trying to determine the origin of this disruption.

**Current studies and preliminary results**

A pathogen?

A study was set up to identify this disorder and tests were carried out to look for any associated transmissible agent(s).

Disease associated viruses were sought with ELISA and biological indexing tests. The virus tests were performed on traditional grapevine viruses responsible for Leafroll, Fanleaf, Fleck, Corky Bark, Rupestris Stem Pitting and Kober Stem Grooving. No correlation could be established between one or more viruses’ presence and the previously described symptoms. No phytopathogenic bacteria (Crown Gall, Bacterium Blight, Pierce’s disease) could be found.

As far as the fungi, some of them associated with wood diseases were found in symptomatic plants but also in control vines. Thus, it does not seem that their presence could be correlated with the specific Syrah decline. Nevertheless, these fungi involved in wood diseases might play a second role in increasing or quickening the decline of already weakened plants.

The cracking may be a point of entry for penetration of these fungi. They could also induce necrosis, leading to plant death. The possible involvement of these fungi with Syrah decline will be further studied by a field experiment.

Furthermore, experiments were conducted to determine if the problem was associated with a graft transmissible agent. Some interesting results were obtained several months after green grafting as leaf reddening was sometimes observed with Syrah or rootstock taken from diseased vines. No symptoms at the graft union have been observed so far but experiments are on-going.

**An incompatibility?**

The previously described symptoms might be similar to those observed in incompatible grafted fruit trees. To confirm this hypothesis, an important experiment is currently being conducted to describe the first events after vine grafting. The process of graft union development was studied in Syrah compared to two other grape varieties (Cabernet-Sauvignon and Grenache) used as controls. Histological studies are being performed on the first events following grafting: callus proliferation, cambium formation and vascular connections are compared among the varieties. The first results seem to indicate that the level of vascular connections is lower during the healing of Syrah than for the other two varieties.

**Possible grafting factors?**

As the primary symptoms of Syrah decline involve the graft union, studies were conducted to compare different grafting techniques. Experiments were made comparing bench grafted Syrah (“long-whip” and omega cut), field grafted Syrah (with and without hormone applications) and green grafted plants. Five years after establishment, many plants show cracked and swollen unions but none have died yet. No significant difference could be found between these grafting techniques up to now.

The problem of Syrah Decline appears to have no simple explanation. We believe that the problem is very complex, and may involve multiple factors. Results of our experiments with possible graft transmission of a potential pathogen agent are awaited with hope. In the meantime, our research will go on.