Defence systems against pathogens, the link between vine health and human health
Or
The Good New and the Good News

In the last 10 years or so, we have greatly increased our understanding of one particular aspect of plant physiology; the plant's own ability to defend itself against pathogens.
Research has shown that plants not only have passive defence systems in place, they can also actively respond to pathogen attack. Plants have the ability to "recognise" pathogens and respond to their presence or respond to their attempts to colonise or infect plant tissue. Some of these active responses occur at the local level of the pathogen presence or "infection", other mechanisms are systemic – they affect the whole plant.
Different plants have different defence mechanisms they can call upon, generally speaking each plant has a range of different responses available; varying form killing the plant cells around the point where pathogens may have tried to penetrate cell walls (thus robbing the pathogen from access to live cells to feed from), to systemic reactions that produce pathogens fighting proteins that prime the whole plant to defend itself against pathogen attack.

So it is with the grapevine, which uses a number of self defence tactics to protect itself against pathogens like Botrytis, Downy mildew, powdery mildew etc..
One of the mechanisms the vine uses revolves around the production of a compound called resveratrol. Once attacked by for instance Botrytis cinerea (from here on we will concentrate on Botrytis as an example of a grape pathogen), the vine will start produce resveratrol. Not just on the site of infection; there is a systemic effect as well. Tissue that has high levels of resveratrol has a fairly good level of protection against Botrytis, as well as against some of the other pathogens the vine may have to deal with. This includes the tissue from the berry skin; high levels of resveratrol offer good protection. The problem is that background resveratrol levels are low, resveratrol will only be produced in significant quantities after the vine is under Botrytis attack, or if it "perceives to be" under attack. Once resveratrol levels are raised they will decline slowly (unless there are new Botrytis infections leading to the production of more resveratrol). To raise resveratrol levels to a point where the vines ability to protect itself against Botrytis is optimised may however take around 2 days. However if Botrytis pressure is high, infection will take place before the defences are up and running.

There are different ways the plant "recognises" the presence or activity of pathogens. One revolves around certain types of molecules that occur in the cell walls of pathogenic fungi, or molecules that are produced during the pathogens attempt to infect grapevine tissue. The vine has the ability to "recognise" some of these molecules, and will respond (certain genes will be triggered) by producing, amongst other compounds, resveratrol.

Not unlike the human species, vines are not perfect. We can "elicit" the resveratrol producing response by spraying some dead Botrytis cell wall material on the vine leaf surface, and the vine responds as it if it under attack of live Botrytis. We can even apply other compounds which contain similar molecules to the ones grapevines 'recognise" as being from Botrytis and get the same response.

Some products in the market already have this ability to elicit resveratrol production in vines. They contain molecules that elicit the resveratrol response in grapevines.

What is good about this, is, that this enables us to prepare the plant by making sure the defence systems are up and running before the fist sign of infection. In fact, it is very much like vaccination in humans. Use a harmless substance to let the body/vine produce the defence proteins or compounds in readiness for the disease. With grapevines it is important to give some booster shots

to maintain the defence capabilities or keep them on high alert, just as is the case with some of the human vaccinations.

This is particularly important as berries, when they start maturing, slowly loose their ability to produce resveratrol, unless elicited from time to time. It is important to maintain their ability to produce resveratrol, as ultimately we try to protect berries from Botrytis infection,.

So what's in it for wine drinkers? The short answer is better wines and probably cheaper wines as botrytis losses are reduced.
The long answer is even more interesting; wine drinkers (especially red wine drinkers) could benefit considerably from this resveratrol business. A large portion of the positive health benefits that have been associated with the consumption of (red) wine in moderation, are linked directly to the presence and levels of resveratrol in the wine. Resveratrol has anti-oxidant and anti-inflammatory properties and has been associated with increased protection against the onset and progression of a number of cancers, as well as possibly increasing the effectiveness of certain anti cancer drugs. Resveratrol may help protect against some chronic lung diseases, and has also been implicated in reduction of coronary heart disease and in lowering cholesterol levels.

Too good to be true? Yes and no. The health benefits only apply to wine drinking in moderation, excessive consumption will nullify the positive effects. It also mostly applies to red wines, as resveratrol is mostly found in the skin and seeds of the grapes (and more so in red grapes). During fermentation of red wine, there is a much higher degree of extraction of compounds from the skins (there is much more and longer skin and seed contact during red wine making than is the case with white wines which often have minimal skin contact).

Do all red wines contain resveratrol? Probably yes, but in different quantities. Grapes that have been 'elicited" to produce resveratrol during their growth (be it through pathogen elicitation or non pathogenic elicitation) will produce more resveratrol in the end product. Final resveratrol levels also depend on wine making practices (length and intensity of skin contact during fermentation). Some filtering techniques used in winemaking could actually remove most of the resveratrol during filtering.

For those that drink red wine for medicinal purposes, and for those that drink wine using the medicinal purposes excuse, it will be relevant to know how much resveratrol is present in different wines. It is not unthinkable that a number of producers will in future start indicating resveratrol content of the wine on the label, next to the alcohol percentage for instance.

In my view the increased understanding of resveratrol's role in vine and human health, and of elicitation of vine resveratrol production, will lead to management practices that increase resveratrol levels in the berries (Botrytis protection) and in the wine (Human health benefits). Part of these management practices will undoubtedly be the use of products that elicit resveratrol production. It seems silly not to utilise the vines own defence systems to protect against pathogens if resveratrol production can be elicited through the foliar application of safe and harmless compounds.
Even though the application of fungicides will still be required in many cases, minimising the number of fungicide sprays is good for the grower and for the consumer.

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