

## Petrol tainted Riesling and some South African responses

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My previous article ('Bad Riesling and unleaded petrol') posed the idea that the petrol or kerosene smell on aged Rieslings came from poor vineyard practices, specifically over exposure to sunlight.

My article was based on a widely-held belief in Australia that the smell (caused by TDN, or 1,1,6,-trimethyl-1,2-dihydronaphthalene) was a fault.

I posed the theory to South African winemakers and scientists and the responses were interesting. But first, some academic research;

**Professor Andy Waterhouse** (UC Davis 2016) states that firstly, many varieties contain TDN including Chardonnay, Sauvignon Blanc, Pinot Noir and Cabernet Sauvignon. Secondly, TDN occurs through the degradation of products from  $\beta$ -carotene and lutein. Thirdly, TDN was 'close to zero at harvest and *increases with wine aging* due to the hydrolysis and rearrangement of TDN precursors over time'. Exposure to sunlight and a warmer climate would increase the level of TDN precursors 2 to 4 fold. TDN concentrations in both red and white wines can be increased by sunlight exposure and leaf removal. '...exposure to sunlight after veraison was able to increase TDN concentration to the greatest extent. Defoliation treatments at early growth stages would contribute to more production of TDN.' And lastly, TDN has a sensory threshold of 2ug/L. It exists in highest quantities in aged Riesling wines, reaching as high 50ug/L (but see below).

So it is present, often, in other varieties, but may be masked by treatments such as oaking. Riesling has around five times more TDN than any other variety.

**Dr Ulrich Fischer**, head of the Department of Viticulture and Oenology at the Rheinland-Pfalz state wine research centre in Germany presented findings in 2014 which firstly denied Michel Chapoutier's claim that "Riesling should never smell of petrol. That is a result of a mistake during winemaking", then stated emphatically, 'TDN is developed in Riesling if there are enough precursors in the skin of the grapes, depending on their exposure to sunlight combined with high temperatures and water stress. These non-volatile precursors then form both free and bound TDN, whose expression in the finished wine is also accentuated by high acidity'. Dr Fischer found TDN was higher in riper years and warmer climates, such as the Eden Valley, Australia where it hit 255 ug/L. The bound part of the TDN is released over time – hence the increasing smell of petrol.

Nearer home, **Dr Erna Blancquaert** of the Viticulture and Oenology Dept. at Stellenbosch University agrees that exposure after veraison increases TDN. An increase in sunlight exposure results in an increase in TDN and thus the value of cool sites for Riesling.

**Phillip Minnaar**, expert in wine phenolics at the ARC, adds that TDN originates from coal tar and when things burn, so veld fires may cause an increase and it may also be found in insecticides. Phillip, 'doubts very much that sunburn is the cause of excessive TDN. The source could be bacterial in origin, whether it is infection in the vineyard (due to sunburn berry damage causing a wound) or in the cellar (resident bacteria)... I have done a study on the effect of row orientation, i.e. different light regimes (microclimates/sun-exposure) in the fruiting zone and found differences in flavonoid concentrations'. It

could also be, says Phillip, 'the yeast/bacteria used for fermentation, grape sugar level at harvest, single inoculation, co-inoculation...'

**Bertus Van Niekerk** (Osbloed Wines) agrees that it may not be down to viticulture; 'it would surprise me if the flavours develop in the vineyard already. My instinct guides me to believe that flavour and unique characteristics develop beyond 18° Balling only, by which time some resistance to sunburn might have been developed in the bunches with enough exposure. Not all bunches show signs of sunburn, though. Even then, terpenes are not detectable in the grapes but develop during fermentation and bottle aging.

**Koen Roose**, winemaker at Spioenkop, says, 'if you use yeast and enzymes you destroy the queen of grapes (Riesling) and you have more kerosine flavours in your wine because enzymes that are not from the grape itself exaggerate that kind of smell. There is Carotenoide in the skins and when you have too much sun (not sunburn) the grape turns yellow and the enzymes give you the typical kerosine flavour. So now more enzymes and the wrong yeast cultivar equal more kerosine; Rule 1 : don't use yeast and Enzymes!!!'. 'With age the pH changes in Riesling and acidity comes down, it starts to release more of this kerosine flavour, it's no more protected and the threshold is noticeable'.

**Lukas Wentzel** (Groote Post) says, 'we try to expose the bunches to minimal direct sunlight, so by default we do something right by keeping the bunches more shaded. The other method that I use is whole bunch pressing. By doing this you also minimize the effect of the skins into the juice'.

**Martin Meinert** (Meinert Wines), says, 'My sense (instinctive) is that it is vineyard related, but even then astute winemaking may remove that which is formed in the vineyard to prevent development of this character. Both may be right. I am not convinced one should be adamant that it is a fault even while I understand why many feel it detracts.

**Gary Jordan**, (Jordan Wines), agrees with Koen in that soil balance and canopy balance is important and says, 'I haven't worked with sunburnt Riesling (we don't like to work with any sunburnt grapes) so I wouldn't know about that. We don't pluck leaves on our Riesling but that said our canopies are wonderfully balanced so we don't have very dense canopies, without exposing the fruit to too much direct sun'.

Not sure if there is much that is definitive here, it seems no one theory dominates. It is clear that a) TDN is responsible, b) TDN could be the result of skin damage, enzymes, bacteria, diminishing acidity or sunburn, c) sunlight exposure increases the possibility of greater TDN, hence d) warmer climates are more likely to develop TDN, e) TDN can reveal itself at any time during fermentation or maturation and lastly f) I'm with Koen who says, 'There is nothing wrong with a touch of "gout de petrol" in Riesling...it gives an extra dimension'.