Summary 101

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Effects of timing and rate of N supply on leaf nitrogen status, grape yield and juice composition from Shiraz grapevines grafted to one of three different rootstocks

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These authors investigate the influence of nitrogen application and timing, as well as rootstock, on the leaf N status, yield, and final juice composition of Syrah.

• Research has shown that the amount of yeast assimilable nitrogen (YAN) in a juice is important because yeast require approximately 130 mg of assimilable nitrogen (N) per liter of must to bring a fermentation to dryness. As we know, if N is low, sluggish/stuck fermentations and sulfide formation can result. On the other hand, if N is high, fermentations are faster, and urea formation (hence ethyl carbamate) and higher-alcohol formation (hence off aromas) can result.

• Managing a vineyard to achieve grape N levels between these two extremes is not easy. And the facts that assimilable nitrogen is affected by vineyard N *fertilization rate* and *scion-rootstock interaction*, and that N uptake varies with *phenological stage*, make it even more difficult. We know, for example, that maximum N uptake takes place between bloom and veraison, followed by the period after harvest. Vine growth *before bloom* is strongly dependent on N mobilized from reserve tissues; whereas grape N from *veraison to harvest* derives mostly from redistribution to clusters from roots, shoots, and leaves.

• The authors compared the effect of 3 application timings (bloom to veraison, harvest to leaf fall, or both), the effect of 3 rates of N addition (0, 40, or 80 kg N/ha, applied as ammonium nitrate), and the effect of 3 rootstocks (Teleki 5C, Schwarzmann, and Ramsey) on: 1) lamina and petiole N status, 2) yield and berry size, 3) juice free amino acids and other juice composition.

• The trial took place in a hot area of NSW, Australia, with a sandy loam soil, in a commercial Syrah vineyard which happened to have vines planted in 1991 to all 3 rootstocks. The bilateral cordon-trained vines were spaced at 1.5 x 3 m. and were drip-irrigated with 2 emitters per vine. The N treatments were supplied weekly in the last 2 hours of the irrigation cycle. The treatments were applied for 3 growing seasons (1994-1996), but only data from the last 2 years is presented.

[*Rather than look at the results based on what was measured (tissue N, yield, juice N), I find it more useful to look at them based on the effects of each treatment studied (N rate, application time, rootstocks). I apologize if this might make the results look a bit choppy, given the many factors, and their interactions, the authors covered in their experimental design – a modified 3x3x3*]

• **Effect of timing of N application.** Syrah yields on 5C and Schwarzmann were significantly increased when N was applied after harvest, but not when N was applied from bloom to veraison. Regarding berry total amino acid levels and free amino N in the juice, bloom to veraison application raised levels more that a post-harvest application (Schwarzmann). In general, vines supplied with N during autumn had higher N status, as measured by %N at bloom, than those supplied with N from bloom to veraison.

• **Effect of rootstock.** N application always raised leaf N status and yields of vines on 5C and Schwarzmann, but vines on Ramsey were not affected. These two former rootstocks also had lower juice Brix (with the highest N rate). In general, higher yields were associated with lower Brix. But it was the rootstock Schwarzmann that presented the most enigma to the authors. Unlike the remaining rootstocks, Schwarzmann did not seem to respond to N applications after harvest. The authors believe that either Schwarzmann's N mobilization pattern is different, or else its roots are unable to take up N after harvest, although they were unable to discern which was true.

• **Effect of N rate.** *Juice free amino N* increased with increased rate of N application. But the pattern was different depending on the rootstock (rate x rootstock interactions were significant). Whereas free amino N and berry total amino acids on 5C and Schwarzmann responded to the application rate of N, and not so much to the timing, the levels of these compounds in Ramsey were only raised when N was applied from bloom to veraison irrespective of N rate.

• In contrast with what happened to juice free amino N, *leaf N status* was not responsive to the different N rates applied the previous fall: levels were higher in those vines that had received a post-harvest application of N, but those that had received 20 kg/Ha had similar levels than those that received 40 kg/Ha. In their trial, the authors found that **Syrah vines produced maximum yields with 2.9 % N in lamina at bloom**. This rate is less than the published "adequate range" for lamina at this stage (3.9-5.0%). According to the authors, this may reflect lower tissue requirements of Syrah compared to other varieties. This optimal level (2.9% N) was achieved with either 1) the higher dose of N applied at either stage for 5C and Schwarzmann, or 2) with any of the N rates (the control –or no N addition- included) applied at any stage for Ramsey.

• When N concentrations in *lamina* were compared to those in *petioles*, both were equally sensitive to N application, and so, there is no clear advantage to using one tissue over the other when determining N status.

In summary, in this Australian study, supplying N after harvest resulted in higher tissue N status at bloom, which in turn, resulted in higher yields, in 2 of the 3 rootstocks studied, as follows:
- *Teleki 5C* showed the most evident effect,
- *Schwarzmann* had somewhat of a mixed effect, responding well to N applied at bloom, but showing a small response to N applied post-harvest. Finally,
- *Ramsey* did not respond at all.

This work confirms the importance of taking the rootstock into consideration when making N fertilization decisions.

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