



FREQUENTLY ASKED QUESTIONS

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WHY DOES THE CATECHIN/TANNIN RATIO GO DOWN AS GRAPES RIPEN?

Phenolics in grapes and wine come from two main sources, grape skins and seeds. The balance between skin and seed phenolics shifts during grape ripening due to the different physiological roles these compounds have in these two different plant tissues

Seed phenolics are present on the seed surface where they have a structural role in the formation of the seed coat. As grape ripen, these compounds combine with other seed coat constituents to form a hard, lignin like shell that protects the seed. As seed phenolics are incorporated into this structure they become harder to extract. Catechin and tannin are part of this process so as grapes ripen, the amount of extractable seed catechin and tannin decreases.

Skin tannin is present in the vacuoles of surface cells where its role is primarily one of defense. It protects against microbial attack and serves as a taste aversion chemical to prevent premature animal feeding. Skin phenolics are primarily anthocyanins (in red varieties) tannin and flavonols. There is no catechin in ripe grape skins. Skin tannin amounts do not change much during ripening however, at the very end of maturation, cell senescence may make skin tannin easier to extract.

It is difficult to follow grape ripening by measuring only extractable tannin. The skin amount is either static or increasing while the seed tannin is decreasing. The two processes pull in opposite directions and it is hard to say which process is responsible for a change in the total. By measuring catechin (which is only in seeds) and comparing it to total tannin as a ratio, we can see the effects of seed ripening independently from total tannin changes. Seed contributions to extractable phenolics decline as grape ripen. The catechin/tannin ratio shows that process.

WHY NOT JUST MEASURE CATECHIN? WHY DO YOU HAVE TO USE A RATIO?

Total amounts of all phenolics are affected by concentration and dilution from changes in grape water content. Grapes dehydrate in dry weather and rehydrate in wet weather. These changes are particularly dramatic during the very end of ripening – during “hang time”. But since tannin and catechin are affected equally by these processes the ratio is insensitive to moisture swings and plots of the catechin/tannin ratio generally show smooth decreases.

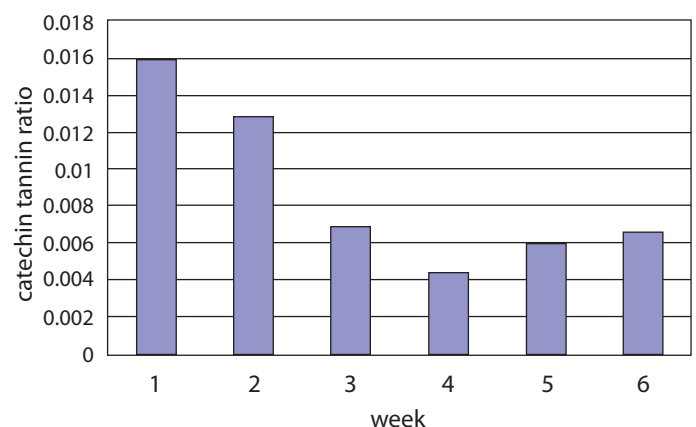
DOES THE CATECHIN/TANNIN RATIO CHANGE IN WINES AS WELL?

Yes. The following example is from Syrah wines made from one vineyard block. Grapes were harvested weekly for six weeks and separate wines made from each harvest. The catechin/tannin ratio decreased for the first four weeks then leveled off. The seeds were completely ripe at that point

DOES THE CATECHIN/TANNIN RATIO DECREASE IN ALL VARIETIES?

Yes, there is a decrease in all seeded varieties but the degree of decrease and the value of the ratio may be quite different. Syrah is a variety that tends to have ripe seeds in warm areas and yet the ratio still declines if the seeds are not fully ripe.

Catechin Tannin Ratio Over Time



PHENOLIC MATURITY - FAQ

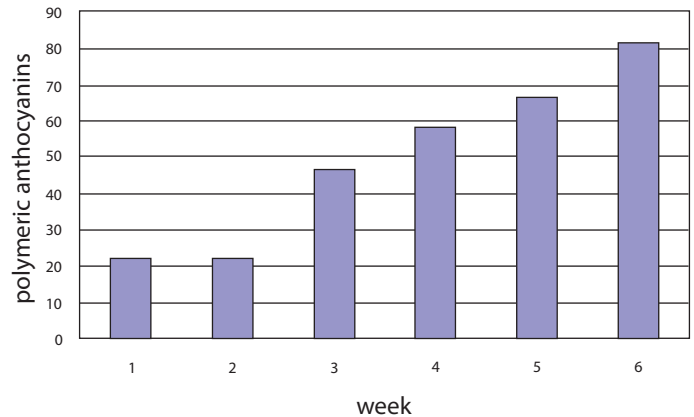
Pinot noir is a variety that tends to have unripe seeds. The ratio may decline substantially during a harvest window and the value of the ratio is much higher, as much as ten times higher than Syrah for example.

ARE THERE OTHER INDICATORS OF PHENOLIC RIPENING?

Yes. In all red varieties, anthocyanins increase from veraison to harvest. They usually reach a peak before harvest then start to decline. In cool climates areas or in situations of very high crop loads, anthocyanins may not reach maximum levels and monitoring anthocyanin development could be useful. Polymeric anthocyanins are formed from the chemical binding of tannin and anthocyanins. This process appears to occur in the grape itself and progresses during ripening. In the Hang Time Trail run by The University of California Cooperative Extension Service on Cabernet Sauvignon in the Napa Valley, polymeric anthocyanins increased an average of 80% from the first to the seventh week of the trial in five vineyards over three years.

Polymeric anthocyanin are subject to the concentration and dilution effects discussed above but there is a strong trend toward higher levels during ripening. The effect also shows up in wine. The chart is from the same Syrah trial shown above. Wine polymeric anthocyanins increased almost four fold during the six weeks of the trial.

Polymeric Anthocyanins Over Time



CAN THESE TOOLS BE USED FOR OTHER COMPARISONS?

The relative ripeness of skins and seed phenolic components are affected by a range of viticultural variables. Seed ripening may be affected by crop load, grape sun exposure, vine vigor and irrigation. The rapid phenolic panel for grapes has been useful in evaluating many vineyard experiments over the years and the catechin/tannin ratio has been on one of the most sensitive components of the panel.

ARE RIPER PHENOLICS ALWAYS BETTER?

The changes that occur in grape seed and skin phenolics are just two of the many changes that occur in grape composition during maturation. These changes have major impact on wine style and taste. An understanding the degree of skin and seed ripening is a useful tool for harvest and wine making decisions. That understanding may lead to better wine, but the grapes with the ripest seeds do not automatically make the best wine.

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