

Bottle maturation, colour and ullage

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Sam Chafe, research scientist now retired from Australia's CSIRO, sent these [thoughts on screwcaps](#) back in 2004. He has clearly been rummaging around in his cellar quite a bit since then and sends the following interesting observations on what he has learnt in the interim.

Recently, the manner of maturation of wine in bottle, especially white wine, has been a topic of great interest and controversy. The defenders of screw-caps, as a replacement for cork, maintain that wine in bottle under these closures matures well, and that oxygen, as supplied by ingress through cork or from the lumens of cork cells, is unnecessary. Their argument is supported by certain experimental evidence, where wines have matured in hermitically-sealed containers or in crown-sealed bottles, and by the few wines experimentally sealed by screw-caps (or their equivalent) which, after three to four decades, have showed full maturation.

The contrary view, of which I have been a supporter, is that wine in bottle needs oxygen to mature and cork allows this. Therefore, cork is the better choice, notwithstanding the occasional occurrence of corked wines. However, I have had cause to reconsider my opinion.

I have always routinely sorted wines of a particular type in terms of bottle ullage such that the most ullaged bottles are drunk first, the proposition being that the greater the ullage the more oxygen available to the wine and thus the more advanced the maturation. However, I noticed recently that this did not necessarily follow for white wines. Some bottles with greater ullage seemed to be less mature than bottles with less ullage. Then, I decided to check the colour, as best it can be done through usually coloured bottles. Deepening of colour in white wines is associated with greater maturation and so it proved to be in my wines. But the very interesting observation, to me, was that there seemed to be a rough negative relationship between the amount of ullage and the deepening of the colour, that is, the less the ullage the deeper the colour. This was completely contrary to what I had expected.

These observations were made on wines with 10 to 20 years of bottle age and may not have been evident when the wines were young. My sample is small and, further, the relationship did not extend to wines which were severely ullaged, by two inches or more, where the wine was badly oxidised. However, my experience has caused me to, when possible, sort white wines by colour and not by ullage.

By extension, therefore, the proponents of a reductive maturation in bottle may be right. The postulation might be that with limited oxygen availability, maturation proceeds at a given pace; but a greater amount of oxygen (greater ullage) counterbalances this maturation (as when reductive elements in wine prior to bottling are removed through oxygenation) and retards it. This proposition may receive support from observations on the breathing of wine: here, in my experience, wines 'go backward', that is, they become 'younger' than before breathing; thus, exposure to oxygen reduces the extent of bottle maturation and freshens up the wine. I have encountered this on numerous occasions, regardless of the state of maturity of the wine. However, the proposal may be inconsistent with the reputed slower maturation of wine under screw-caps, although perhaps that has yet to be validated.

The big question then remains as to whether such a process operates in red wines. Or, rather, why shouldn't it? Limited

evidence suggests that it does, and what applies to one type of wine should, to a very large extent, operate for another, although the high tannin content of red wine may mitigate the process. The colour in the bottle certainly can't be used as an indicator and, until the proposition of the inverse relationship between ullage and maturation is established, or otherwise, there is little to go on. And I am left wondering whether to drink my most ullaged or least ullaged bottles of red first.

And what of old, mature reds with highly saturated corks and consequent significant ullage? If we assume that the primary maturation process is reductive, the gradual release of oxygen from cork cells must be a mediating process. Perhaps by slowing development through the release of oxygen, cork allows the wine to achieve its highest quality. And while this is conjecture piled on conjecture, I wouldn't dismiss cork just yet. Perhaps this antiquated '200-year-old technology' still has a critical role to play.