Wine Lees

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Basic Wine

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What are wine lees?

The word 'lees' is used to define the heterogeneous matrix that is deposited during pre- and post-fermentative decantation of must and/or wine. It is the **residue/sediment that settles at the bottom** of vessel after pressing, fermentation, during the storage or after specific treatments, as well as the residue obtained following the filtration or centrifugation of wine.

What does lees consist of?

Wine lees consists of **dead yeast cells, the cell membranes of pulp, stem and skin fragments, insoluble salts and macro-molecules**. Basically, all the components that are deposited during the making and ageing of wine. Over the course of winemaking, the lees are progressively depleted of their constituents due to decantation processes and their exact composition varies depending on the origin of the grapes, the grape variety and the winemaking processes applied.

Lees contact

Lees contact is where the newly fermented wine is deliberately left in contact with the lees (and thus not decanted) therefore allowing a period of contact. Over time, yeast cell components are released into wine due to both the **passive transfer from cells and their autolysis**. Lees contact is becoming increasingly popular in modern winemaking, although it is not a new technique as it is part of traditional winemaking in many parts of Europe. It is most commonly associated with white winemaking where the term 'sur lie' or 'on lees' originated to describe the practice.

When does lees contact take place?

Lees contact can take place during various stages of the winemaking process, from the large tanks used for fermentation, all the way to the bottle, however it is often performed in an oak barrel.

The effect of lees contact on the wine composition and other benefits

- Many winemakers believe that allowing lees contact of white wines **improves the sensory experience of the wine (improved mouthfeel and aromatics)** and it is not uncommon for still white wines to be left in contact with lees for months after fermentation. Reported benefits includes the enhancement of the wine's body and roundness; reduction in astringency, greater oak, fruit, and yeast integration; more complexity, texture and structure; and improved aromas and flavours.

- Wine lees has the ability to **scavenge dissolved oxygen molecules** (more about this in a previous blog post) which can improve the antioxidant capacity of the wine preventing oxidation reactions from taking place. The significant decrease in oxidation–reduction potential brought by lees contact also favours the **reduction of copper** and, consequently, the appearance of copper casse. At the same time, the presence of yeast lees promotes the fixing of copper, which tends to prevent copper casse.

- Researchers[1] demonstrated the **protective effect of lees on the premature ageing** of Sauvignon Blanc aroma. When a Sauvignon Blanc wine was aged under reducing conditions, (on total lees in used barrels), the loss of fruity aroma was limited and the formation of sotolon and 2-aminoacetophenone were attenuated. On the contrary, ageing dry white wines in new oak without their lees promoted premature ageing.

- Mannoproteins which are released by the yeast during ageing on the lees, can contribute to the **tartrate stabilization** of wine.

- Ageing white wines on their lees can **improve the filterability** due to hydrolysis of the yeast glucanes by glucanases in the lees.

- It has been observed that some white wines, kept on their lees for several months during traditional barrel aging, were capable of acquiring a **certain stability in relation to protein**.

Compounds responsible

Wine lees is complex and rich of wine active compounds. During ageing, autolysis (the breaking open or rupturing) of the yeast cells modifies the composition of lees and compounds such as mannoproteins, polysaccharides, fatty acids, amino acids and enzymes are released by the yeast lees into the wine during post-fermentative contact.

How long does it take?

The duration of lees contact depends on the desired result. Lees contact is performed for a duration of a few days up to several years in the case of some sparkling wines. In most cases lees contact is performed for a few months after fermentation.

What is bâtonnage?

Bâtonnage is the French term for **stirring settled lees back into the wine to enhance extraction**. The lees are periodically re-suspended by stirring to increase the amount of compounds extracted into the wine. Note that the periodic stirring of lees has certain pros and cons which should be considered.

The different types of lees

There are fine lees and gross lees. **Gross lees** are the larger sediments in the juice/wine. **Fine lees** are the smaller, finer particles that settle at a slower rate. Wine ageing on lees is usually performed with fine lees originated after alcoholic fermentation (with or without some racking operations).

Practical considerations

The **stirring of lees encourages continued cell viability**, and while it has been shown that cell viability is not an important factor in the improvement of organoleptic properties associated with lees contact, viability does encourage the assimilation of residual sugar. Therefore, a small amount of stirring at the end of fermentation is recommended.

Due to the oxygen scavenging potential of the lees, a reductive environment is created. Care should thus be taken, especially when performing lees contact in stainless steel tanks, to **avoid the formation of reductive sulphur compounds**. It is advised that the wine and lees (be sure to obtain a sample of the lees from the bottom of the vessel) is **smelled and tasted frequently** as sulphur off-odours may occur rapidly. If at any point you experience unpleasant aromas, the wine should be **racked off the lees immediately**. The lees may sometimes smell bad but the wine is not yet affected. The earlier the detection, the faster the appropriate action can be implemented to minimize further damage.

Conclusion

Lees contact can be an advantageous process if done carefully and managed correctly. The entire process should be monitored during the lees contact period and action needs to be taken immediately at the first sign of off aroma formation.

References[2]

(1) Dubourdieu, D.; Lavigne-Cruège, V. 13`eme Symposium International d'oenologie, International Association of Enologie Management and Wine Marketing, ENSA de Montpellier. In *13`eme Symposium International d'oenologie, International Association of Enologie Management and Wine Marketing, ENSA de Montpellier.*; 2002.

(2) Ribéreau-Gayon, P.; Dubourdieu, D.; Donèche, B.; Lonvaud, A. *Handbook of Enology. The Chemistry of Wine Stabilization and Treatments.*, 2nd ed.; John Wiley & Sons Ltd: Chichester, 2006; Vol. 2. https://doi.org/10.1002/0470010398.