

## FAULT FOCUS – GEOSMIN DRAGGING YOUR WINE THROUGH THE MUD



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[Basic Wine](#)

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Imagine your wine being described as “damp soil”, “earthy”, “musty”, “muddy” and “beets”. A compound called geosmin is usually responsible for these unwanted nuances in wine. Often confused for TCA, which contribute (among others) attributes such as “dusty”, “mouldy”, “cardboard” and “swimming pool”, **geosmin has a distinct “earthy” or “muddy” character** to it - think muddy forest soil after warm rains or the scent in the air when rain falls after a dry spell.

## GEOSMIN IN WATER<sup>1-3</sup>

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The naturally occurring organic compound is often **problematic in especially water sources**. Geosmin and 2-methylisoborneol are primary metabolites of soil bacteria and algae (blue-green algae or fungi, principally the actinomycetes) and are responsible for the off-odours in town water supplies/storage. The occurrence of these compounds is usually associated with wide **water temperature fluctuations and/or low water levels**. Odours in treated water can also originate from **stagnant water conditions in low-flow sections of distribution systems or in raw and treated water reservoirs**.

Although not health-threatening, geosmin can be a major problem to potable water treatment plants. During the recent Western Cape drought, the occurrence of geosmin in the water was reported and likely due to the critically low water levels in the major dams. Earlier this year (2021), the City of Cape Town temporarily advised residents of the CBD and Atlantic Seaboard not to drink municipal tap water after complaints from residents. Tests revealed that geosmin was the cause of the off-odour in the water and, however unpleasant, the water was declared safe for consumption. The problem was addressed by treating the water with activated carbon.

## GEOSMIN IN WINE<sup>4-6</sup>

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Geosmin has been known for decades but was not common knowledge amongst winemakers when it seriously tainted Beaujolais in the 2000 and 2002 vintages. It also affected wines from other regions including Bordeaux, Burgundy and the Loire since at least 2000. Isolated cases of geosmin in wines have been reported in South Africa and multiple sources are possible:

### *Water*

- Contaminated water in the cellar is the most likely (and “easiest”) cause for geosmin in wine (especially if the wine did not show geosmin characters during the vinification process - see below). **Dirty water used to clean tanks and cellar equipment** can lead to wine contamination. Also, **tanks with stagnant water** are often a source, while **pushing contaminated water through pipes** can cause significant geosmin increases in the wine.

## *Grape microbiota*

- Grapes infected with *Botrytis cinerea* together with *Penicillium expansum* show elevated concentrations of geosmin due to the complementary action between the two moulds. Thus, **grey rot on grapes often results in geosmin formation** especially with **wet conditions during ripening and harvest**. This was likely the cause for geosmin contaminated wines in the French wines mentioned above.

## *Other sources*

- **Dirty barrels or corks** can also be a source of contamination. Several moulds isolated from corks have been shown to be capable of geosmin biosynthesis.

# PREVENTATIVE AND REMEDIAL ACTION

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## *Preventative treatments*

- **Avoiding contaminated water**
- **Harvesting healthy grapes or doing cluster sorting before crushing**
- **Good cellar hygiene**

## *Remedial treatments*

Geosmin is relatively **unstable in an acidic medium**. Long-term barrel ageing might reduce concentrations significantly, however, there are no guarantees and the exact amount of time needed to reduce the geosmin levels to below the perception threshold (25 ng/L) varies and **could last several years**.

Temperature also plays an important role with **higher temperatures accelerating geosmin breakdown**. Thermal treatments at 70°C for 24 hours in closed bottles could potentially lead to 80% degradation. However, you are likely to end up with additional problems due to the high temperature treatment.

**Fining agents** show potential for the partial/complete removal of geosmin:

- Potassium caseinate
- Grape seed oil (very effective, however, currently not allowed in oenology)
- Activated carbon

Unfortunately, effective **treatments also result in a decrease in desirable aroma compounds**. By removing the pleasant aroma, the perceived intensity of geosmin might be increased due to unmasking effects.

## CONCLUSION

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Next time you suspect TCA contamination, but laboratory results come back negative, it might be worth testing for geosmin. Prevention is always better than remediation. Geosmin is not something that is often seen, but its presence can, very quickly, cause havoc in a cellar and lead to great losses.

## REFERENCES

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