MANAGING GREEN AROMAS IN THE CELLAR

METHOXYPYRAZINES

Dr. Carien Coetzee

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Typically, the green aromas perceived in Sauvignon Blanc wines come from methoxypyrazines (MPZ) present in the grapes at the time of harvest. This is **not the only source** of green aromas and other compounds, especially the C6 compounds, and some thiols, can also contribute significantly.

Some consumers will reject overly green flavours in wine, however, **if the wine is made thoughtfully with enough complexity and support, green attributes can be an exceptional trait**. A good example is one of this year's FNB Sauvignon Blanc top10 wines, the Spier Ideology Sauvignon Blanc 2019: a wine with high levels of methoxypyrazines driving the overall style of the wine (according to the judges), while complexity manifests with fruit layers supporting the green flavours.

Depending on the wine style, the winemaker may choose to **adjust oenological practices** in order to enhance or reduce the green aroma in the wine. This article will discuss the options available to specifically craft the aromatic contribution of MPZ.

CELLAR PRACTICES TO ADJUST MPZ LEVELS

SORTING OF THE GRAPES

As mentioned in a previous blog post, "Managing green aromas in the vineyard", the MPZ concentration in the berry decreases with ripening. Harvesting **unripe grapes will result in elevated MPZ content** in the juice and in the resulting wine. By removing unripe bunches by sorting (or excluding unripe bunches during harvest), the contribution of MPZ can be controlled. Conversely, harvesting grapes **slightly earlier will allow higher levels of MPZ** at the time of harvest.

Sorting will also allow the **removal of unwanted material** harvested with the grapes, such as **leaves and ladybugs**, which can also contain significant amounts of MPZ, therefore, removal before crushing and destemming will prevent excessive amounts of MPZ in the juice.

DESTEMMING

The stems (and leaves) contain high amounts of MPZ as well as other compounds (such as the C6 volatiles). It is therefore important to **ensure that all stems are removed effectively** during the destemming process. Alternatively, the **addition of stems can be used as a tool to increase the MPZ content of wine**[1], however, care should be taken as unwanted phenolic compounds might also be extracted in the process.

SKIN CONTACT

Even though most of the MPZ are located in the skin of the berry, MPZ is highly soluble and will **readily be extracted from the skins** into the juice during crushing and pressing. Conversely, allowing a **moderate skin contact time can increase the MPZ** levels without extracting too much unwanted phenolic compounds. Because the MPZ are extracted quite rapidly, **extended skin contact is not advised** as the gain in MPZ will be minimal while phenolic extraction is increased. Studies have also shown that **skin contact had a greater impact on MPZ extraction when compared to pressing.**[2]

JUICE SETTLING

Settling and clarification of the juice prior to fermentation is an effective tool to decrease the MPZ concentration[3]. Thorough settling and racking of the juice before fermentation can reduce MPZ content by more than half, however, it should be noted that in this particular study, the initial turbidity of the juice (prior to settling) was 1280 ntu.[3]

THERMO VINIFICATION

Thermo-vinification has been shown to be effective at **reducing MPZ content in must**. Heating the must for a short period between 60°C – 80°C can potentially reduce the MPZ concentration by up to 67%.[4] However, this is not a practice typically done on Sauvignon Blanc must due to unfavourable effects impacting the wine quality.

FERMENTATION

In general, the concentration of MPZ remains **relatively constant during fermentation**.[5] There is currently no evidence that commercial yeast strains can degrade MPZ during fermentation and some studies even report an increase in MPZ levels during the process.[6] This topic needs further investigation to determine the exact interaction with yeasts.

By **selecting specific yeast strains**, the contribution of the MPZ to the wine aromatic composition can be tweaked due to interactive sensory effects that occur between aroma compounds (such as masking). Yeasts differ in their ability to produce aroma compounds and by selecting a yeast that will contribute fruit aromatics (for example), the **inherent greenness of the juice can be complemented and supported or even masked by fruity aroma compounds** (depending on the type of compounds produced and the concentration). Thus, the MPZ concentration will remain unchanged, however, the overall aroma could be complementary.

FINING

MPZ are **generally resilient to standard wine fining practices** and with the exception of oak chips and some enological tannins, traditional additives and fining agents does not have an effect on MPZ concentration preserving the green aromatics.[7]

There are, however, some products that hold considerable promise for **remediating wine with too high MPZ content**.[8] Even though it is not traditionally used in winemaking processes, the addition of silicone and a polylactic acid-based polymer resulted in a significant decrease of MPZ without altering the desirable aromas[9–12]. The exact protocol for the use of these polymers still need to be developed, however, there are several potential applications and uses. Polylactic acid can be manufactured in a variety of forms with different physical properties. Due to this flexibility of processing, the product can be integrated into existing filtration systems, manufactured as inserts for larger tanks or added as pellets directly to the juice and/or wine.[8,9]

An odorant-binding protein (mMUP) with **high specificity for MPZ** has recently been developed.[13] The protein binds the MPZ whereafter the complex is removed from the must or wine during bentonite fining. Product development and optimization are underway at Brock University, Ontario, Canada.[8]

BLENDING

Blending a high MPZ wine with a low MPZ wine is probably one of the most useful tools to dilute overly green aroma contributed by too high MPZ content. Blending can be done to obtain the perfect balance between greenness and fruit flavours, while dilution to below the sensory detection threshold can be done to eliminate the green aroma. Sensory interactive effects still need to be considered and **blending trials are advised**.

LIGHT EXPOSURE

Some studies have found **exposure to sunlight to reduce the MPZ** concentration in wine, however other studies reported no consistent effects from light exposure or bottle colour.[14,15] The indirect effect of sunlight exposure also needs to be considered as sunlight treatment can **lead to increases in temperature** which can have detrimental effects on wine quality.

OAK

The use of **oak could potentially support low concentrations of MPZ**, however, this treatment could result in a wine with non-complementing aromatics if the oak aromas are too prominent in combination with higher MPZ wines. When used cleverly, like in the De Grendel Koetshuis 2019 and Tokara Reserve Collection Elgin Sauvignon Blanc 2019 (both in the FNB Sauvignon Blanc Top10 and high in MPZ), the **oak can serve a supporting role, subtly complementing the green aroma**.

AGEING AND OXIDATION

MPZ are stable compounds and the **concentration during ageing did not alter when exposed to different ageing conditions such as temperature variations and oxygen exposure**.[14,16,17] This is beneficial for many MPZ-driven wines, however, a sensory interaction study showed that certain aldehydes formed during ageing and oxidation (specifically methional), could lead to unwanted odours due to **interactive enhancing effects between the aldehydes and MPZ**.[18] This enhancement will amplify the aged character of the wine and for that reason it is important to **properly cellar MPZ-driven wines or to rather opt for early consumption**, especially as the aroma compounds responsible for fruity nuances usually decrease early-on during ageing, diminishing the complexity and supporting effects.

CONCLUSION

Adapting the methoxypyrazine content in **grape must and wine** is challenging. Ideally, the methoxypyrazine concentration should be **managed already in the vineyard**, especially during the pre-vériason stages. Several options exist to manage MPZ in the cellar, however secondary effects due to treatments should be considered.

For more information, contact Carien at carien@basicwine.co.za

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