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FOLIAR FERTILISATION

EFFECT ON VOLATILE THIOLS



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It is well known that adding fertilisation to vineyard soils contribute to soil fertility and vine nutrition and development. Nutrient deficiencies in the vineyard will not only hamper the health and growth of the vine, but it will also affect the must and wine composition possibly leading

to sluggish or stuck fermentation (due to low YAN concentrations). Corrections to these deficiencies can be done by adding soil fertilisation, however, over the past few years, adding nutrients to the soil for the uptake by roots is **no longer the most effective solution** due to climate change and more frequent summer droughts. **Foliar fertilisation** has been widely applied where deficiencies or imbalances cannot be rectified by soil fertilisation applications.

A few studies have looked at the effect of foliar fertilisation on the chemical composition of Sauvignon blanc¹. These studies show that **nitrogen and nitrogen together with sulphur applications can positively affect various volatile and non-volatile compounds in grapes and musts**, enhancing the aromatic expression.

The main findings of these studies as well as the advantages and disadvantages of foliar fertilisation are reported in this article.

Advantages of using foliar fertilisation

The advantages of applying fertilisation through foliar spray are that the application is **lower in cost** compared to soil fertilisation, the uptake of the nutrients is **not dependant on the roots** (thereby faster compared to soil fertilisation) and **smaller quantities** of fertilisation are needed.

Foliar fertilisation is also preferred above soil fertilisation in cases where the **topsoil is dry**, the **soil has low available nutrients**, or with **decreased root activity**.¹

Disadvantages of using foliar fertilisation

The limitations of foliar fertilisation include **leaf burn**, **leaf necrosis**, **low penetration rate**, **solubility problems**, the fact that the fertilisation can be **readily washed off**, **limited amounts can be applied** at a time and it requires specific **weather conditions** for efficient uptake.²

During a **drought**, the **absorption of the nutrients is reduced** due to increases in the wax of the cuticle. It is therefore not advised to apply foliar fertilisation to grapevines experiencing a drought.³

Effect of foliar fertilisation on volatile thiols

Many studies have reported nitrogen and sulphur fertilisation applications to result in Sauvignon Blanc wine having **higher volatile thiol levels** and **improved aromatic potential** when compared to the control. Below a summary of some of these results:

- Foliar application of urea (10 kg N/ha twice before véraison) to Sauvignon Blanc vines with naturally low nitrogen status resulted in an **increase in 4MMP** compared to the control, while there was no difference in the concentration of 3MH and 3MHA.⁴
- Foliar application of urea (10 kg N/ha twice before véraison) together with sulphur (5 kg S/ha twice before véraison) applied to Sauvignon Blanc vines with naturally low nitrogen status resulted in higher **concentrations of especially 3MH** (from 738 ng/L to 1212 ng/L), **while 3MHA and 4MMP concentrations also increased** marginally compared to the control. The increase in aroma intensity was also confirmed by sensory analysis.⁴
- Foliar application of nitrogen (10 and 20 kg N/ha) and sulphur (5 and 10 kg N/ha) resulted in a **three- to four-fold increase in varietal thiols**. These wines were also described as having a higher intensity of “grapefruit” and “tropical fruit”.⁵
- Foliar fertilisation with urea (10 or 15 or 20 kg/ha twice before véraison) and sulphur (5-10 kg/ha) resulted in **increased 3MH and 3MHA** (up to 13 times higher) in the resulting wine when compared to the control.⁶
- Soil fertilisation (50 kg N/ha – two applications and 100 kg N/ha – two applications) and foliar fertilisation of urea (15 kg/ha – three applications) resulted in vines with higher nitrogen status and produced wines with **more 3MH** compared to the control (100% increase in the case of foliar fertilisation).⁷
- Foliar fertilisation performed on **South African Sauvignon Blanc** resulted in **higher 3MH levels** compared to the control, although not all treatments were significantly higher. The dosages tested: nitrogen (10 kg/ha urea), sulphur (5 kg/ha) and nitrogen with sulphur (10 kg/ha urea and 5 kg/ha S).

Effect on Methoxypyrazines

Researchers found **no practical differences in the methoxypyrazine** concentration of Sauvignon Blanc grapes when treated with foliar fertilisation compared to the control⁸. In some cases, the control had slightly higher methoxypyrazine concentrations compared to foliar fertilisation⁹. Another study also tested the effect of soil nitrogen application on the methoxypyrazines and found the control to contain higher levels of IBMP⁷.

The **secondary effect** of fertilisation on the aroma impact compounds of Sauvignon Blanc needs to be considered. Fertilisation leading to a denser canopy can, for instance, lead to higher methoxypyrazine content due to the lower UV exposure.

Effect on YAN

In a study conducted in **South African Sauvignon Blanc**⁸, the application of nitrogen foliar fertilisation did not significantly affect the concentration of YAN when compared to the control treatment. However, **when applying a nitrogen and sulphur foliar fertilisation, the YAN in the juice was marginally higher (statistically significant) and could be the difference between low and high YAN musts.**

Another study reported a **60% increase in YAN** levels of a Sauvignon Blanc vineyard that was reported as being nitrogen-deficient before treatment. The leaf blade nitrogen content also increased significantly, however, **no significant differences were found in bunch weight, yield, bunches per vine and pruning weight.** The absence of these effects could be due to the application of nitrogen **late** in the season.^{1,4}

It is worth mentioning that the overall YAN concentration was considered to be quite low to begin with. The practical **significant influence is especially prevalent in low YAN** circumstances and not so much for vines with a higher YAN status. Applying small additions of nitrogen to a vineyard with adequate nitrogen levels, will not result in increased growth and yield¹⁰.

Conclusion

There is concrete evidence that foliar fertilisation (especially nitrogen in combination with sulphur) have the potential to positively affect various volatile and non-volatile compounds in grapes, musts and the resulting wines.

Various factors need to be considered when applying foliar fertilisation such as timing, composition and the overall state of the vine. The full references can be consulted for more details.

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