

## SAUVIGNON BLANC AND PLANT WATER STATUS



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[Basic Wine](#)

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**Water stress**, due to insufficient water supply, may have direct and/or indirect effects on the physiology of the vine and the composition of the berries. Some of the physiological responses to water stress include<sup>1</sup>

- **Reduced cell division and expansion**
- **Closing of leaf stomata**
- **Reduced photosynthesis**
- **Cell desiccation and death**

These physiological effects would normally result in **reduced vine growth and increased sunlight exposure in the bunch zone**. Further implications would be a **reduction in the production and transport of sucrose** which reduces the availability of metabolites<sup>2</sup>.

The **leaf water potential** estimates the **capacity of the cells to retain water** by pressurising a leaf with a neutral gas. This is usually done using a pressure chamber. The less free water there is in the plant, the greater the pressure required to cause it to exude. The result is expressed in bar or kPa / MPa, always as a negative value.

A study was conducted to investigate the **effect of water stress, measured as the leaf water potential (LWP), on South African Sauvignon blanc vine performance and bunch development**. External symptoms at various LWP values were reported<sup>2</sup>.

## MATERIALS AND METHODS

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Twenty-one Sauvignon blanc plots (Stellenbosch) were used in this study. The **LWP** of the vines was tested using a pressure chamber. Measurements were recorded at **pre-dawn** (04h00 until sunrise) and **midday** (11h00 until 14h00)<sup>2</sup>. **External water stress symptoms** were also recorded using a vineyard scorecard with adapted evaluation criteria for South African conditions<sup>3,4</sup>.

## LEAF WATER POTENTIAL CATEGORIES

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**Pre-dawn LWP** is generally accepted as the **best physiological indication of vine water stress** as it is in direct relation to soil water that is accessible by the roots<sup>5</sup>. During this stage, the stomata of the plant are closed and the grapevine has been able to equilibrate its water potential with the most humid layer of the soil.

The **pre-dawn LWP** results can be categorised as follows<sup>5</sup>:

- 0 to -200 kPa = absent/mild water stress
- -200 kPa to -400 kPa = mild/moderate water stress
- -400 to -600 kPa = moderate/severe water stress
- < -600 kPa = severe to drastic water stress

**Midday LWP** is greatly affected by environmental and weather conditions and the use of this parameter for the scheduling of irrigation has been questioned<sup>2</sup>.

The **midday LWP** results can be categorised as follows<sup>6</sup>:

- -1000 to -1200 kPa = light water stress
- -1200 kPa to -1400 kPa = medium water stress
- -1400 kPa to -1600 kPa = high water stress
- < -1600 kPa = severe water stress

## VISUAL SYMPTOMS

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Results showed that the **measured LWP reflected the external visual stress symptoms well** with a good correlation observed between pre-dawn LWP and midday LWP.

- Pre-dawn LWP 0 to -200 kPa = absent/mild water stress  
**Visual symptoms:** Some inactive shoot tips, some yellow-green leaves
- Pre-dawn LWP -200 kPa to -400 kPa = mild/moderate water stress  
**Visual symptoms:** Some inactive shoot tips, yellow leaves, tendrils at 90° in relation to shoot apex
- Pre-dawn LWP -400 to -600 kPa = moderate/severe water stress  
**Visual symptoms:** Inactive shoot tips, leaves yellow and/or drooping and/or desiccated, tendrils at 90° in relation to shoot apex or wilted
- Pre-dawn LWP < -600 kPa = severe to drastic water stress  
**Visual symptoms:** Inactive shoot tips, many chlorotic and necrotic leaves, leaves drooping and abscising, tendrils wilted and abscising

Higher water stress at ripening correlated with **shorter shoots, a lower cane mass and reduced berry size and berry volume**. According to Prof Alain Deloire<sup>5</sup>, the pre-dawn LWP should preferably not be lower than -400 to -500 kPa<sup>5</sup> as the smaller berry size does not necessarily result in increased quality.

# EFFECT OF PLANT WATER STATUS ON THE AROMATIC DEVELOPMENT IN SAUVIGNON BLANC BERRIES

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The water availability and/or degree of sunlight exposure could affect the concentration of aroma compounds such as the **methoxypyrazines (green aromas) and the volatile thiol (tropical fruit aroma)** precursors in the berries. Typically, high water availability will result in more vegetative growth and thus increase canopy density and cluster shading. Increased water stress could result in a decreased canopy coverage and increased sunlight exposure in the bunch zone.

A study showed that **irrigated vines produced grapes with higher methoxypyrazine content** compared to non-irrigated vines<sup>7</sup>, possibly due to the impact on the **canopy density and sunlight exposure** (see blog - [Managing green aromas in the vineyard: Methoxypyrazines](#)). Another study showed that **severe water stress** (predawn LWP reaching -1000 kPa) **limited the aroma potential in Sauvignon blanc grapes and resulted in a lower volatile thiol precursor content**<sup>8</sup>. To the contrary, a **mild water deficit** (in combination with a non-limiting nitrogen status) **enhanced the thiol precursor development**<sup>8</sup>. Mild water stress can thus be beneficial for the production of the volatile thiol precursors and reduce berry methoxypyrazine concentrations (if desired).

## CONCLUSION

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**Water stress could directly and/or indirectly affect the development in the berries** as canopy microclimate is a result of the inherent water relationship between soil and vine. Studies have shown that **water stress symptoms correlate well with field measurements of LWP<sup>2</sup>** and that the **water status can affect the aroma development** in Sauvignon blanc berries<sup>7,8</sup>.

The general recommendation is that **water supply during early season should be adequate** to quickly fill the trellis system with active leaves but at the same time not to induce too large berries and unbalanced aroma development<sup>2</sup>. **Moderate water stress during berry growth** will lead to smaller berries and perhaps a more balanced aroma composition. However, care should be taken to not negatively affect other metabolic processes.

## REFERENCES

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