

ORGANIC YEAST NUTRIENTS AND CHARDONNAY AROMA

IN A RECENTLY PUBLISHED STUDY¹ RESEARCHERS EVALUATED THE EFFECT OF DIAMMONIUM PHOSPHATE (DAP) AND A COMMERCIALY AVAILABLE ORGANIC YEAST NUTRIENT ON CHARDONNAY AROMA. BY KARIEN O'KENNEDY

The main finding of the study was that the addition of yeast nutrients, compared to no additions in a control wine, enhanced the typical Chardonnay aromas in the final wines.

Between the two types of nutrients used, the organic yeast nutrient enhanced the aromatic complexity of the wines the most. Organic in this context refers to a yeast nutrient that contains mainly specialised inactivated yeast and not any added inorganic nitrogen sources, such as DAP or ammonium sulphate.

THE LAYOUT OF THE STUDY

Chardonnay grapes from the La Mancha Region of Spain were harvested at 20.25°Brix (pH 3.23, TA 6.71 g/l and YAN 217 mg/l). The

juice was clarified and equally distributed between nine 50 l stainless steel tanks. Three tanks were supplemented with DAP (40 g/hl) and three with a commercial organic yeast nutrient (40 g/hl). Additions were made after the onset of fermentation when the must sugar level had reached approximately 15.5° Brix. Three tanks served as controls with no nutrient additions. Fermentation was conducted with a commercial yeast at ±16°C. Sulphur dioxide (SO₂) was added after completion of fermentation. The wines were cold stabilised, filtered and stored at 10°C until chemical and sensory analyses were performed three months later. The sensory analysis was performed by a trained panel of 10 expert tasters.



TABLE 1. Mean aroma attribute scores of Chardonnay wines according to the sensory trials.

Attributes	Control wine	DAP	Fermaid O®
Aroma intensity	6.15±0.15 a	7.15±0.32 b	7.45±0.04 b
Fruity	5.75±0.09 a	6.68±0.03 ab	7.23±0.04 c
Banana	2.17±0.14 a	4.68±0.54 b	6.86±0.98 c
Apricot	6.17±0.34 a	4.21±0.41 b	4.01±0.21 b
Apple	6.20±0.05 a	4.19±0.10 b	4.07±0.12 b
Pineapple	2.82±0.31 a	3.91±0.17 ab	4.75±0.42 b
Floral	4.12±0.23 a	6.21±0.47 b	7.82±0.34 c
Green	2.89±0.01 b	1.71±0.05 a	4.79±0.09 c
Fresh	3.71±0.04 b	2.01±0.03 a	4.99±0.01 c
Sweet	1.56±0.49 a	6.61±0.04 b	7.83±0.04 c
Honey	1.71±0.24 a	3.32±0.28 b	3.68±0.74 b
Toffee	6.15±0.15 a	6.22±0.02 a	5.97±0.10 a

Mean ± standard deviation (n = 3); mean values followed by different letters in a row are significantly different (p < 0.05 level), according to the Student-Newman-Keuls test; mean = 0, attribute not perceptible; mean = 10, attribute strongly perceptible. (This table is reproduced from Izquierdo Cañas *et al.*, 2018 as permitted by the Creative Commons Attribution License: <http://creativecommons.org/licenses/by/4.0>. No alterations were made to the data.)

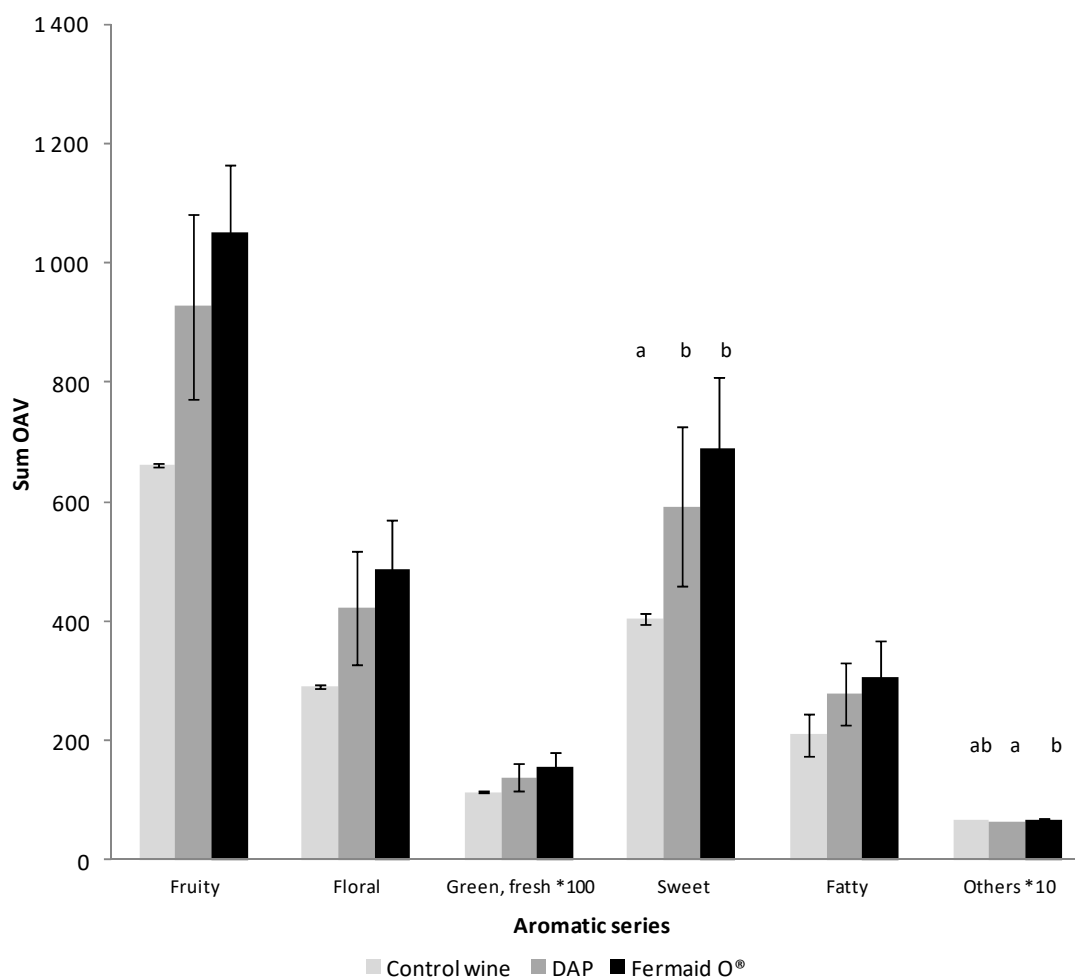


FIGURE 1. Aromatic series in Chardonnay wine. (This figure is reproduced from Izquierdo Cañas *et al.*, 2018 as permitted by the Creative Commons Attribution License: <http://creativecommons.org/licenses/by/4.0>.)

RESULTS OF THE STUDY

The basic chemical compositions of the three types of wines were similar, except for the DAP wines containing slightly lower succinic acid levels. However, significant differences were found between the volatile aroma compounds in the wines. Nineteen compounds were identified as having odour active values (OAV) above one. Odour active value is a measure of importance of a specific compound to the odour of a sample.² It is calculated as the ratio between the concentration of the individual substance in a sample and the threshold concentration of the substance. A value above one thus indicates that the compound can be a possible impact compound.

Although the other compounds tested had lower than one OAV's, they can also potentially contribute to final wine aroma indirectly through synergistic effects with the more odorous compounds.

The aroma descriptors used in this study comprised fruity (banana, apricot, apple and pineapple), floral, green/fresh, sweet (honey and toffee), fatty and other. In Figure 1 the total intensities for every aromatic series were calculated as the sum of the OAV of each of the compounds in every series. The aromatic series fruity, floral and sweet seem to be the dominant aromatic descriptors in the nine wines. It is clear from these results that the addition of yeast nutrients enhances the volatile compounds of the wine, as measured by chemical analysis, with the organic nutrient enhancing it the most.

The sensory analysis confirmed the chemical analysis with sensory descriptors becoming more intense in the nutrient added wines, especially in the organic nutrient (Table 1).

SIGNIFICANCE OF THIS STUDY

This study indicates that the use of a yeast nutritional supplement based on a more holistic approach in terms of what it can offer the fermenting yeast, instead of just being a source of YAN, can be more beneficial for final Chardonnay aroma. Apart from contributing to YAN mostly via amino acids, organic yeast nutrients are also sources of vitamins, minerals, sterols and long chain fatty acids. These are essential enzymatic co-factors and survival factors for yeast. Having optimal concentrations of these compounds in fermenting must can greatly benefit some yeasts, *Saccharomyces cerevisiae* and non-*Saccharomyces*. Various studies in this regard have also been conducted at Nietvoorbij and the Institute for Wine Biotechnology at Stellenbosch University.

TOO MUCH OF A GOOD THING?

An earlier research project published by the AWRI in 2011,³ investigated the role of different nitrogen sources on Chardonnay aroma. The researchers found that supplementing the must with amino acids to increase YAN can be more beneficial for final wine aroma than adjusting it with DAP alone. When the adjustment with DAP was moderate, the resulting wine had an increase in positive aromas compared

to the control. When the adjustment with DAP was excessive (adjusted from 160 mg/ℓ up to 480 mg/ℓ) the final wine aroma had negative descriptors, especially increased ethyl acetate (nail polish remover).

A conclusion from this study is that DAP (the more cost effective source of YAN) used with caution in terms of concentration and timing of addition, can have very beneficial effects on wine aroma (in addition to fermentation security). Great care should, however, be taken to not adding too much. The generalised addition of a standard dose to every tank is therefore greatly discouraged.

THE PROOF IS IN THE PUDDING

Recently Lallemend presented, at their nutrition school held at Nederburg, Chardonnay wines produced with a complex yeast nutrient and a specialised organic yeast nutrient. The differences between the two wines were obvious with most people preferring the organic yeast nutrient in terms of mouthfeel and aroma. Winemakers interested in the results are advised to contact Lallemend directly for more information.

FINAL NOTES

- Research is usually conducted on small scale and results obtained in a specific setting (specific cultivar, specific yeast and specific yeast nutrient) is not always replicable in other settings. Winemakers are advised to do cellar trials to verify the applicability of research results in their specific settings. If positively verified, the implementation of large scale changes in terms of yeast nutrient management can greatly increase product quality and consumer liking.
- In terms of complex and organic yeast nutrients there are various offerings from different suppliers available in South Africa. There can be big differences between formulations and winemakers should not just assume that, if a desired result was obtained with one company's product, that exactly the same result will be obtained with a product from a different supplier.

REFERENCES

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