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NEW

REDULESS®

Red, White

Reduces sulfur defects

#15115	2.5 kg

Reduless is a new, proprietary formulation of inactivated yeast developed by Lallemand to improve the overall quality of both red and white wines. Its formulation is naturally rich in copper, making it a useful option to decrease H_2S, dimethyl sulfide and other sulfur defects. Reduless helps increase mouthfeel and can decrease phenol related defects. Grape varieties prone to negative sulfur compounds (such as Syrah, Pinot Noir and Chardonnay) particularly benefit when treated with it.

To Use: Dissolve Reduless in 10 times its weight in must or water. Add immediately to the tank. If prepared in advance, re-suspend the product prior to its addition to the fermenter. Mix well and rack off after one week.

RECOMMENDED DOSAGE

15g/hL	1.2 lb/1000 gal

Sulfur Compounds and Wine: A Review of the Basics

Most winemakers think of volatile sulfur compounds (VSCs) in terms of olfactory sensations. It has also been shown that sulfur-containing compounds have an impact on palate components. Specifically they can influence the perception of volume (body) and increase the sense of wine bitterness. Some sulfur-containing compounds may add to varietal character and complexity while others may significantly detract (see Figure 1).

Off-Odor Compounds in Wine

SULFURS:

- 2-Methyl-3-thiophane: bread crumb (0.1-1.0 µg/L)
- Ethyl sulfur: garlic (15-18 µg/L)
- Dimethyl sulfur: olive (1.4-8.5 µg/L)

DI-SULFURS:

- Dimethyl disulfur: Brussel sprouts, cabbage (30-45 µg/L)
- Diethyl disulfur: onions, rubber (25-40 µg/L)

THIOLS:

- Methane-thiol: rotten (0.3 µg/L)
- Ethanothiol: onions, gas, garlic (1.1 µg/L)
- Mercaptoethanol: farmyard, chicken house (1-10 mg/L)

ALCOHOLS:

- 3-Methyl-sulfanyl-propanol: raw potato, tubers
- 2-Methyl-sulfanyl-ethanol: green beans (1-10 mg/L)
- Methionol: cauliflower, brussel sprouts, cooked cabbage (3.2-4.5mg/L)

ESTERS:

- Thio-methyl acetate: rotten vegetables, cheese (10-40 µg/L)
- Thio-ethyl acetate: burnt, sulfur (10-30 µg/L)
- Methyl sulfanopropiloacetate : garlic, mushrooms (100-115 µg/L)

Figure 1. Off-odor compounds found in wine.

Hydrogen sulfide (H_2S) contains sulfur in its most reduced, negatively charged form (S^{-2}). Oxidized sulfides such as sulfur dioxide (SO_2) or copper sulfate ($CuSO_4$) are also of interest. The oxidized sulfurs (mono- and di-) are milder in character than either H_2S or mercaptans. Dimethyl sulfide is the most abundant VSC. It increases with bottle age and contributes to bottle bouquet. It is one of the most important sulfides due to its ability to affect overall wine quality either positively or negatively.

The idea that sulfur odors are mostly linked with real reduction status is wrong in practice even though the term "reduced" is often used to describe these aromas. This misconception can lead to mistakes in the winery. Without measuring the redox potential, a winemaker might think a wine is reductive. As a result, more oxygen may be added. This may oxidize the wine even more and may lead to worse sulfur odors than originally present. It is known that some thiols have a more intense and negative aroma in their oxidized form (Delteil, 2007).

Yeast metabolism can result in H_2S formation by reduction of elemental sulfur, breakdown of sulfur containing amino acids or reduction of sulfur from inorganic sources (Butzke, 1997) (see Figure 2). Yeast strains are variable in their ability to form H_2S. The same yeast strain can give greatly differing levels of H_2S depending on must chemistry, yeast preparation methods, yeast nutrition, etc. Optimal fermentation management is needed to minimize the production of VSCs.

Metabolism of YAN by the Yeast

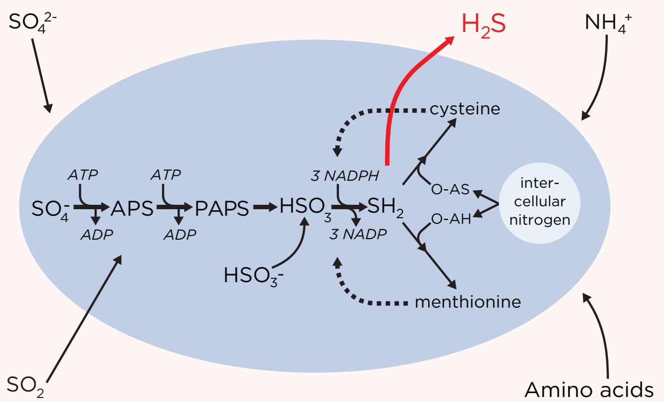

Figure 2. Metabolism of yeast available nitrogen (YAN) by yeast.

H_2S formation by yeast during fermentation occurs in two phases (Butzke, 1997). Phase 1 occurs during the exponential growth and phase 2 at or near the end of fermentation. The mechanism for sulfide formation in each phase is different. This helps explain why the addition of fermentable nitrogen (such as DAP) can solve H_2S formation or at other times increase the problem.

Phase 1 is sometimes called the "prevention phase" because it is much easier to make positive corrections at this point. During phase 1, additional nitrogen may help control H_2S formation if there is a nitrogen deficiency. The yeast cell is attempting to produce two sulfur containing amino acids (cysteine and methionine) which are essential for protein and peptide formation. During early growth the yeast brings in sulfates and sulfites to form these two amino acids. If nitrogen is limited, these amino acids cannot be produced. Reduced sulfur in the form of H_2S is excreted instead of being incorporated into amino acid synthesis. In such circumstances, nitrogen supplementation can be helpful.

In phase 2, the H_2S formation is not directly related to the nitrogen level. By the end of fermentation most of the H_2S formed during phase 1 has been removed by the rapid production of carbon dioxide (CO_2). Diminished CO_2 production late in fermentation, however, can result in high concentrations of H_2S remaining in the wine. There is a positive correlation in phase 2 between available nitrogen and H_2S formation. The higher the nitrogen, the higher the H_2S will be. Therefore, the simple addition of DAP or other nitrogen-containing supplement without knowing the concentration of fermentable nitrogen is counterproductive.

Elemental sulfur used in the vineyard has long been associated with H_2S formation. It should not be sprayed immediately before harvest (preferably no closer than six weeks before harvest).

Pre-fermentation addition of SO_2 can impact H_2S production. High levels of SO_2 bind acetaldehyde which normally is reduced to form ethanol. If not enough acetaldehyde is present, juice sulfates may form H_2S. Additionally, SO_2 can convert H_2S to elemental sulfur (which may later be reduced back to H_2S).

Mercaptans react with copper while oxidized sulfides generally do not. This is the basis for using ascorbic acid in evaluating VSCs. Ascorbic acid has the ability to reduce disulfide back to methyl mercaptan, which can be bound to copper by the addition of copper sulfate. Mercaptans can oxidize disulfides when exposed to air. This oxidation influences sensory attributes and the ability to bind with copper sulfate.

Traditional copper treatment is not always efficient and may negatively impact wine quality. There are other options to consider rather than just adding copper. Natural yeast solutions have been studied. Lavigne-Cruege and Dubordieu (2001) conducted a study with several treatments and demonstrated that yeast cell walls have the ability to absorb certain VSCs. It appears that disulfide bridges may be formed between some of the wine's VSCs and cysteine in the cell mannoproteins. Yeast lees can also bind some VSCs, helping eliminate the problem. Using fresh fine lees can avoid contamination associated with reusing the lees (Delteil, 2007).

Preventative measures for reducing the production of sulfur compounds include measuring the fermentable nitrogen, controlling the level of non-soluble solids in the juice, adding appropriate amounts of SO_2 at the crusher, careful inspection of barrels before filling and delaying SO_2 additions at least 10 days post fermentation (Lavigne-Cruege and Dubourdieu, 2001).

This article is compiled from information by Dr. Bruce Zoecklein, professor and head of the Enology-Grape Chemistry Group at Virginia Tech (www.vtwine.info) and Dominique Delteil, International Wine Consultant.

Lavigne-Cruege, V. and Dubourdieu, D. (2001) The aptitude of wine lees for eliminating foul-smelling thiols. The Australian Grapegrower and Winemaker, July 2001 : 37-44.

Butzke, C.E.(1997) A Review and Update on Sulfide Formation in Winemaking. American Vineyard: The Viticulture & Enology Lab, 6(4): 26-31

Delteil (2007) personal communication

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