

Fundamentals of Winemaking

Introduction to Sulfur Dioxide and Sulfite Solutions

The antiseptic qualities of sulfur and sulfur dioxide have been known for more than two thousand years. But it wasn't until the mid 1800's, when the association of sulfur compounds and their biological effect on bacteria and yeast began to be understood. In recent years, significant research has revealed the importance of sulfur dioxide (SO₂) in the wine making process. This research along with the health concerns associated with excessive exposure to sulfur dioxide has resulted in an industry wide awareness of reducing SO₂ levels in wines.

Sulfur dioxide provides three important properties in winemaking. First, its antiseptic qualities stun if not kill wild yeast and bacteria that are present in or on the fruit. Second, it has anti-oxidative properties, that is, it helps protect wine from the deleterious effects of oxygen. And third, it destroys the enzyme that causes enzymatic browning in juice (similar to what happens to apples when they are sliced and exposed to the air). Without or SO₂, wine would likely be brown or amber in color, smell oxidized (or have a sherry-like aroma), and probably be ruined by bacterial spoilage.

Amounts of sulfur dioxide (or SO₂) added to juice or wine are usually stated in parts per million, expressed as ppm. SO₂ is typically added to the juice or must prior to fermentation, added following the completion of fermentation, and added before bottling. Home winemakers should strive to keep the total SO₂ added to any wine (from fermentation to bottling) under 100 ppm. Recipes that call for initial SO₂ dosages of 120 ppm or more can be reduced to between 30 ppm to 50 ppm and, depending upon the wine's pH, still provide the intended protection required. A sensitive palate can detect amounts over 50 ppm and too much can destroy the bouquet of a wine, eliminate delicate flavors and add a chemical taste as well.

The total amount of SO₂ in a finished, bottled wine should be the least amount required. For the home winemaker a few basic principals need to be understood and applied.

1. SO₂ should never be a substitute for general sanitation.
2. SO₂ should never be a substitute for using anything less than sound, ripe fruit.
3. SO₂ in the quantity used in winemaking, does not sterilize wine; it may kill some species of yeast and bacteria, but many are only stunned.

Note: Cultured yeast are generally tolerant of SO₂ however, if you are adding a dry yeast culture to your juice or must it is critically important that you first hydrate the yeast in warm water (70° F to 80° F) 10 to 15 minutes before adding to juice or must.

4. SO₂ should only be used in the smallest amount required to preserve the juice or wine. Always seek to have less than 100 ppm total in the finished, bottled wine.
5. SO₂ is toxic and requires appropriate handling.

Sulfur dioxide that is initially added to must or juice becomes chemically bound to the many and various compounds present in the juice and pulp or formed during fermentation. These compounds settle out as lees following fermentation and are separated from the wine by being siphoned off during the first racking. Following the first racking, it's not unusual to find very little if any SO₂ present in the wine. The addition of SO₂ following the first racking and usually just prior to bottling are typical.

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Sulfur dioxide can be added to wine several ways. Larger wineries use SO_2 gas dissolving it directly into solution. It is impractical and dangerous for the home winemaker to handle SO_2 gas and therefore we must rely on either sodium bisulfite or potassium metabisulfite as the principal source of SO_2 . Sodium Sulfite is available in powdered form, but because of its elevated level of toxicity, is not recommended for use in juice or wine and should only be used for washing equipment. Potassium metabisulfite is available in white powdered form or in tablet form, also called Campden Tablets. Potassium metabisulfite is approximately 55% SO_2 by weight.

Sulfite is added to wine by dissolving a measured amount in water, juice or wine. This is in turn added this to the must or wine. It is essential that the SO_2 addition be thoroughly (but gently) distributed throughout the juice or must prior to fermentation to ensure appropriate protection. When using a bisulfite solution for washing, rinse well afterwards with clean, preferably sterile, water. Residual SO_2 remaining on the surfaces of primary fermentors, bottles, etc., can elevate the total SO_2 level beyond acceptable levels.

Sodium bisulfite and Potassium metabisulfite are corrosive and will degrade upon exposure to oxygen and moisture. It is best to purchase only what you will need for the immediate season and suspect the quality of the chemical if it becomes hard or forms a cake. Keep either of these chemicals in an air-tight container, preferably a glass container with a plastic lid.

Sulfites must be handles with extreme care! Small particles of these chemicals, if inadvertently inhaled, will destroy mucus membrane including lung tissue . Always use a dust mask or respirator when handling sulfites in powdered form.

See additional information on preparing SO_2 solutions used in wine making.