

COMMON WINEMAKING MATERIALS

by
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Various materials are used throughout the winemaking process. Some materials are used to satisfy the unique cleaning requirements common to all wineries. Other materials are added to the wine to prevent or minimize specific wine problems. For example, bentonite is always added to white and blush wines to prevent excess protein from forming a haze after the wine is bottled. The most common wine additives are sulfur dioxide, fining agents, stabilizing materials and wine preservatives.

Most winemaking materials are used throughout the food and beverage industries and these materials are available to the winemaker as normal commercial products. However, a few wine additives are unique to the winemaking industry and sources of these materials are more limited. Many winemaking materials come from the manufacturer in dry, granular form. These materials are usually shipped in heavy paper or plastic bags containing about 50 pounds. With a few exceptions, such as yeast and sulfite, most winemaking materials can be kept for several years when properly stored. The characteristics of several common winery materials are briefly discussed below.

Anti-foam

Anti-foam is a clear, silicone oil product. It has no smell or taste. Anti-foam is used to prevent foam from overflowing containers during active fermentation. About 250 milliliters of anti-foam added to a 1000-gallon wine tank will reduce foaming to a minimum. This material is completely inert and does not react with the wine in any way. Most of the anti-foam will be left behind when the wine is racked. Even if a few drops remain, they will be removed when the wine is filtered. Unfortunately, it is not the easiest stuff to clean off the walls of a tank.

Ascorbic Acid

Ascorbic acid is vitamin C. Winemakers add ascorbic acid when wines contain disulfide. In larger amounts, disulfide can smell like a skunk. Smaller quantities give wines a rubber or garlic smell. When very small quantities are present, disulfide can give wine a vague, dirty odor. At even lower levels, disulfide may not produce a specific odor. Sometimes they are not detectable, but minute quantities of disulfide can kill the normal bouquet of a fine wine.

When ascorbic acid is added to wine, it reacts with the disulfide, and the disulfide is converted into a material called mercaptan. When all of the disulfide are converted into mercaptan, the winemaker adds a very small quantity (0.05 to 0.5 milligrams per liter) of copper sulfate. The copper sulfate removes the mercaptan from the wine. This treatment is only effective when the ascorbic acid is added to the wine several days before the copper sulfate addition.

Many Australian winemakers use ascorbic acid as an anti oxidant when bottling wine. The ascorbic acid is used in combination with sulfur dioxide.

Calcium Carbonate

Sometimes, grapes grown in cold climates contain too much acid. Then winemakers often use calcium carbonates to reduce the acid content of juice before fermentation. This material is occasionally used to reduce the acid content of finished wines by small amounts. However,

flavors can be changed, pH values raise other problems can be developed when carbonates are used to reduce the acidity of a finished wine. Grapes grown in warm climates are usually low in acid, so carbonates are seldom used with warm climate fruit.

Citric Acid

Citric acid is one of the work horse materials in the winery, and it is used for several different purposes. Citric acid is mixed with sulfite powder and water to prepare sulfur dioxide solutions. Sulfur dioxide solutions are used to sterilize winery pumps, hoses, filters and other winery equipment. Sulfur dioxide solutions are also used for wet barrel storage. Winemakers use weak (1- percent) citric acid solutions to remove the “paper” taste from new filter pads. Stronger solutions (5 percent) of citric acid are often used to sanitize bottling equipment.

Sometimes, citric acid is added to finished wines specifically to increase acidity and improve acid balance. In small quantities, it provides a fresh, citric characteristic, and the citric quality is often appreciated in white table wines. Significant additions of citric acid are seldom made to red wines. The citric taste does not seem appropriate in most red wines. About half a gram of citric acid per gallon is often added to commercial wines to improve long term stability. Bench trials should always be done before making any large additions of citric acid.

Diammonium Phosphate (DAP)

Diammonium phosphate is a major ingredient in many proprietary yeast foods. It is added to juice or must before fermentation to supply extra nitrogen. The additional nitrogen encourages rapid yeast growth and more dependable fermentations. California Chardonnay grapes are often deficient in nitrogen, and many winemakers add DAP to all Chardonnay juices to help the yeast complete fermentation and not leave residual sugar in the wine.

Juices lacking nitrogen can cause another problem. Some types of yeast produce excessive quantities of hydrogen sulfide when a juice lacks sufficient available nitrogen. In this case, experienced winemakers add DAP early in the fermentation to provide extra nitrogen and reduce hydrogen sulfide formation.

Enzymes

Wineries use enzymes to increase the amount of free run juice when crushing white grapes, to extract more color from red fermentations, to minimize pectin hazes, enhance floral aroma in aromatic grapes, etc., etc. Many types of enzymes are available to winemakers and they can help resolve a variety of winemaking problems. But, excessive quantities of some enzymes can produce off-odors and bad tastes, so the directions supplied by the manufacturer should be followed carefully.

Fumaric Acid

In the past, winemakers often added small quantities of fumaric acid to their red wines. The acid prevented malolactic fermentation from occurring after the wine was bottled. However, since sterile filtration equipment became widely available, fumaric acid is seldom used commercially. Many home winemakers lack filtration equipment, so home winemakers continue to use fumaric acid to control ML fermentation. The customary dose levels range from one to three grams of acid per gallon of wine. Bench testing should always be done before fumaric acid is added to wine. This acid can improve the taste of some red wine, but sometimes fumaric acid produces unusual or off-flavors.

Lysozyme

This naturally occurring protein is extracted from egg whites and it is used to control bacteria activity. It is effective against the lactic bacteria *Oenococcus*, *Pediococcus* and *Lactobacillus*. It is not effective against vinegar bacteria or yeast. Sometimes grapes contain excessive populations of *Lactobacillus* and lysozyme is an effective way of reducing the bacteria population during fermentation. Lysozyme is also used to kill bacteria when malolactic fermentation is not wanted in a wine. Lysozyme is a protein, so it will react with phenols in the wine. An average lysozyme treatment is equivalent to a light egg white fining.

Pantothenic Acid

When grapes are deficient in pantothenic acid, the yeast often produce excessive amounts of hydrogen sulfide. So, small wineries often add very small quantities (1 tablet per ton) of this material to juice or crushed grapes before starting fermentation. Pantothenic acid is a common vitamin, and it can be purchased in any drug store.

Potassium Bitartrate

Small quantities of potassium bitartrate (cream of tartar) are often added to young wines to promote the precipitation of excess tartrate material during the cold stabilization treatment. . The time required to stabilize the wine is shortened, and winery refrigeration costs are reduced. One to four pounds of potassium bitartrate per 1000 gallons of wine is the normal dose.

Potassium Carbonate

Potassium carbonate is often used to de-acidify juice and wine instead of calcium carbonate. However, when this material is added to wine, the potassium content can be increased and the additional potassium increases wine pH. Besides increasing pH, a stability problem sometimes occurs because the potassium reacts with tartaric acid in the wine. Potassium bitartrate is formed, and unless this material is removed, it can precipitate out of the wine after bottling. Wines are usually cold stabilized after a potassium carbonate treatment to remove most of the added potassium. Potassium carbonate should not be used after wine has been cold stabilized because of this instability problem.

Potassium Caseinate

Potassium caseinate is a common, wine fining material. It is often used to reduce the tannin content in red wines, and sometimes it is used for white wine clarification. Potassium caseinate is also used to remove odors and brown colors from oxidized white and blush wines. Sometimes, it is effective for removing excessive oak character from white wines. Potassium caseinate reacts with wine acids and coagulates quickly, so fining is more successful when a caseinate-water solution is injected into the wine under pressure. Then, a very fine suspension is formed, and much better mixing is achieved. Potassium caseinate can strip desirable wine flavors, and it can give wine a cheesy taste when excessive quantities are used. Dose levels range from 1/10 to 1/4 gram per gallon, but bench trials should always be done.

Potassium Metabisulfite (Sulfite)

Small wineries use potassium metabisulfite crystals to introduce sulfur dioxide into their wines. When potassium metabisulfite sulfite is added to wine, it produces 57% its weight in SO₂. But, sulfite is not stable because it reacts with water in the air. Unless it is carefully stored, old

sulfite powder should be discarded (or used for making sterilization solutions) and a fresh supply purchased each season.

Potassium Sorbate (Sorbate)

Potassium sorbate is used to stabilize wines containing residual sugar. The sorbate does not stop the yeast from fermenting the sugar, but it can prevent the yeast cells from reproducing. Consequently, sorbate is only effective when most of the active yeast cells have been removed from the wine by racking or filtering. The usual procedure for using potassium sorbate is to clarify, stabilize and age the wine. Then the wine is sweetened, and the sorbate is added at bottling time. Potassium sorbate will not stop active fermentations. For most people, the taste threshold of sorbate is 200 or 300 milligrams per liter of wine. However, some people are more sensitive to the taste of sorbate, and a small fraction of the population can detect less than 50 milligrams per liter. Fortunately for the winemaker, many people sensitive to sorbate do not find its bubble-gum taste objectionable in wine. The normal dose level is 200 to 250 milligrams of potassium sorbate for each liter of wine. If too little sorbate is added, the wine may start fermenting again. If too much sorbate is added, the quality of the wine may be adversely affected. Dose levels of more than 250 mg/l can produce noticeable changes in wine taste and smell.

Sodium Bisulfite

TTB does not allow sodium bisulfite to be used as a source of sulfur dioxide in wine because it contains sodium. However, sodium bisulfite is an inexpensive source of sulfur dioxide for small wineries. Sodium bisulfite is mixed with water and used for sterilizing winemaking equipment and for wet barrel storage. One teaspoon of sulfite powder and two teaspoons of citric acid in a gallon or two of water makes an effective solution for sterilizing equipment. Old, inert barrels can be safely stored by adding a cup of citric acid and a cup of sulfite crystals to the barrel. Then the barrel is filled with clean water. Inert barrels can be successfully maintained in this way for several months but this method is not suitable for newer barrels that can impart oak flavors.

Soda Ash

One of the cleaning agents used in any winery is soda ash (sodium carbonate). It is used to clean and sanitize equipment, tanks, pumps, hoses and even barrels. Soda ash in water produces a strong caustic solution, and a soda ash solution is particularly useful for removing heavy tartrate deposits from the surfaces of wine storage containers. Soda ash solutions must be carefully rinsed to remove the residue. Home winemakers often use soda ash to soak labels off old wine bottles.

Tartaric Acid

Winemakers add tartaric acid to juice or must to raise acidity and lower pH. Large acid adjustments should be made before fermentation is started. An addition of four grams of tartaric acid per gallon of juice will raise the TA about 0.1 percent. Calculated acid additions are seldom accurate, so calculated acid values should not be relied upon. A small sample should be tested before making large acid additions. Care must be taken when tartaric acid is added to wine late in the winemaking process. The wine may need to be cold stabilized again if very much tartaric acid is added or tartrate crystals may form in the bottled wine.

Tri Sodium Phosphate (TSP)

Tri sodium phosphate is a popular cleaning material for all types of winery surfaces. This material is inexpensive, effective, and it washes away easily. A chlorinated form of tri sodium phosphate is also available, and the chlorinated form is a potent sterilizing material. In many wineries, chlorinated TSP is the material of choice for decontaminating stainless steel wine storage tanks. But, this material must be rinsed away completely.

Yeast Extract

Yeast extract is added to juice to stimulate healthy yeast growth and prevent stuck fermentations. Yeast extract provides additional vitamins, amino acids, etc. Yeast extract is the major ingredient in many proprietary yeast supplements such as SuperFood. It is more effective when added before fermentation is started.