FINING AGENTS FOR WINE
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Webster’s dictionary defines fining to mean "to become pure or clear". This definition can be broadened considerably. For wine, fining means to add an adsorptive or reactive substance to reduce or remove the concentration of one or more undesirable components. Fining agents are used to achieve clarity and to improve color, flavor and physical stability.

Fining agents can be grouped according to their chemical nature and mode of action.
1. Earths: bentonite
2. Proteins: gelatin, isinglass, casein, albumen
3. Polysaccharides: agars
4. Carbons
5. Synthetic polymers: PVPP
6. Silicon dioxide (kieselsol)
7. Others, including chelators and enzymes

Fining trials. Fining is one of the least expensive operations in wine production but one that can have the greatest impact on wine quality. Fining trials should always be done at several levels to ensure that the fining objective is achieved using the smallest possible amount of fining agent. Consider all the changes to color, flavor and aroma that are occurring during the laboratory trials. Fining is often a trade off between achieving a specific goal, such as protein stability, and producing a palatable wine. Many different fining agents can often be used to achieve the same goal. If you are not satisfied with the results of your fining trials, try another fining agent.

To achieve consistent results, it is essential that the preparation methods, temperature, mixing and timing are the same between laboratory fining trials and winery application. Bentonite, protein and polysaccharide fining agents must be prepared for use. The effectiveness of these fining agents can be reduced by 50% or more by improper preparation. Use fining agents designed for wine and follow the supplier's or manufacturer's directions. Always prepare the fining agent in exactly the same way for laboratory and winery use. Preparation equipment, temperatures and timing are critical. The difference between a blender in the lab and a paddle mixer in the winery is overfining.

Fining agents have to be removed from wine. Most fining agents react within seconds and the contact time between the fining agent and the wine should be as short as possible. Carbon and PVPP can be filtered out immediately, but most other fining agents require a week or two to settle.

Bentonite. Bentonite is a claylike material of volcanic origin. It is often called Montmorillonite clay after the French town where bentonite was first mined. The clay consists of complex hydrated aluminum silicate with exchangeable cationic components. Calcium and sodium bentonite are two forms that are commercially available for wine use. The sodium form hydrates best, has more reactive surface area and is thus more effective.

The mode of action of bentonite is electrostatic. The flat surface of a hydrated bentonite platelet is negatively charged. Positively charged particles adsorb onto the surface of the bentonite. The reaction takes place quickly but gravity slowly drops the bentonite to the bottom of the container.

Bentonite is principally used to remove proteins (protein stabilize) from white wine and juice. It also attracts other positively charged compounds such as anthocyanins, other phenolics and nitrogen. Bentonite can also be used to remove polyphenoloxidase from juice. Since nitrogen is removed, juices that are fined with bentonite or fermented with bentonite must have additional yeast nutrients added to complete fermentation.

Bentonite is available in a traditional form that has to be prepared in hot water and allowed to set for 24 to 48 hours to hydrate and in an agglomerated formulation that can be mixed in cooler water and used almost immediately. Dosage can range from less than 2 lb./1000 gallons to about 8 lb./1000 gallons.

Protein fining agents.

Protein fining agents have a positive charge at wine pH. They generally have an affinity for polyphenols and react by forming hydrogen bonds between the phenolic hydroxyl and the peptide bonds of the protein component. Large polyphenols such as tannins and polymerized anthocyanins are preferentially removed. Young wines are more forgiving of the action of protein fining agents than aged wines because aged wines have more polymerized compounds.

Gelatin. Gelatin is prepared from bone derived sources of collagen. It's primarily used to soften red wines but can also be used to reduce the phenol level and brown color in white juice before fermentation.

The potential for overfining with gelatin is great. Sometimes when the astringent phenolics are removed the bitter phenolics are unmasked having a dramatic effect on mouthfeel. In addition to the loss of tannins, color loss is also a problem in red wines. Gelatin is available in both solid and liquid forms and in many grades. Always use gelatin produced for wine use to avoid off flavors. A bloom number of 75 or 100 is suitable for wine. Usage levels range from 0.2 to 0.8
charged and electrostatically bind to and adsorb positively charged proteins and initiate flocculation and settling. Several levels rarely exceed 10 lb./1000 gallons. In general, kieselsol is used at a rate of 7 times the amount of gelatin. Gelatin different kieselsol formulations are available at a variety of pH levels. Use a kieselsol that is recommended for wine. Usage the wine while stirring constantly. A gel forms instantly so slow addition is critical. Immediate counterfining with kieselsol, lb./1000 gallons. Much larger doses, up to 4 lb./1000 gallons, are required for juice fining. Add the gelatin very slowly to the wine while stirring constantly. A gel forms instantly so slow addition is critical. Immediate counterfining with kieselsol, a negatively charged silica compound, is recommended for white wines. Kieselsol helps moderate the effect of gelatin on wine flavor, it reduces the amount of gelatin needed and the volume of lees produced. Kieselsol or tannin must be added to most white wines following gelatin fining or the gelatin will remain suspended in solution. Kieselsol is usually not necessary in red wines because of the large levels of tannin. Settling takes 1 to 2 weeks.

Isinglass. Isinglass is a positively charged fining agent derived from the air bladder of a sturgeon. It is available as sheet or flocculated isinglass. The flocculated form is easiest to work with because it does not have to be rinsed to remove fishy odors. Isinglass is used principally in white still and sparkling wines and to clean up the aroma, improve clarity and modify the finish without significantly modifying tannin levels. Usage levels are typically from 0.2 to 0.5 lb./1000 gallons.

**Casein.** Casein is the principle protein in milk. Casein is nearly insoluble and must be dissolved at pH 11. Potassium caseinate is water-soluble and is preferred for this reason. Sodium caseinate is usually not used because it increases the sodium content of the wine.

Casein is a positively charged protein that flocculates in acidic media such as wine. When added to wine, casein adsorbs and mechanically removes suspended material as it settles. In general, casein is used to remove undesirable odors, to bleach color and to clarify white wines. It is sometimes used as a substitute for carbon in color modification of juice and white wine and often used to removed the cooked character from baked sherries. Usage levels are typically 0.2 to 2 lb./1000 gallons.

**Egg albumen.** Egg albumin is a common fining agent for red wines. Albumen is found in egg whites. Fresh eggs contain approximately 3 to 4g of active product per white and are preferred over frozen egg whites. Albumen is colloidal in nature and has a positively charged surface that attracts negatively charged tannins. Egg whites remove fewer phenols and less of the fruit character than gelatin. To prepare the albumin, make a 0.7% salt solution (about 1/2 teaspoon per cup of water). Measure the volume of the egg whites and mix with 2 times the volume of salt solution. For example, if you have 30 mL of egg white (1 egg) you need 60 mL of salt water. Lightly mix the egg whites and salt water until they become less sticky and gently stir into the wine. Do not mix into a froth. Usage levels vary from 1 to 8 egg whites per 60 gallon barrel, with 2 to 4 being average.

**Sparkolloid.** Sparkolloid is a proprietary product made from alginic acid extracted from marine brown algae. Algicines are polymeric and positively charged; they are usually bound to an inert carrier such as diatomaceous earth to facilitate settling when used as a fining agent. The primary use of this fining agent is to clarify wines. It is often used to remove haze left by other fining agents. Sparkolloid has little effect on flavor or color and makes wines much easier to filter. Both hot and cold mix formulations of this compound are available. The hot mix form is much more effective in clarifying wines than the cold mix form. This product is somewhat difficult to prepare and must be used while still hot. The clarifying effect is sometimes enhanced by counterfining with bentonite or gelatin. Usage levels range from 1 to 8 lb./1000 gallons. Klear-mor is another proprietary formulation of alginic acid that produces similar results.

**Carbon.** Activated carbons are nonspecific adsorptive agents made from wood. The sponge like carbon binds with weakly polar molecules, especially those containing benzene rings. Carbon effectively removes phenolic compounds, especially small phenolic compounds. Compounds larger than dimers are too large to be adsorbed. Stripping of wine is often a problem with carbon because of the low selectivity and great care has to be taken with its use. Carbon also contains a large quantity of air, and oxidation sometimes follows carbon addition if the carbon is not quickly and thoroughly removed. The addition of carbon to juice rather than wine helps to diminish carbon induced oxidation. Usage levels seldom exceed 3 lb./1000 gallons.

**Kieselsol.** Kieselsol is a generic name for aqueous suspensions of silicon dioxide. Kieselsol is a byproduct of the glass industry. Most, kieselsols are produced in Germany and are sold as 30% colloid solutions. The primary use of kieselsol is for clarification and as a replacement for tannin during gelatin fining of white wines. Kieselsols are negatively charged and electrostatically bind to and adsorb positively charged proteins and initiate flocculation and settling. Several different kieselsol formulations are available at a variety of pH levels. Use a kieselsol that is recommended for wine. Usage levels rarely exceed 10 lb./1000 gallons. In general, kieselsol is used at a rate of 7 times the amount of gelatin. Gelatin should be added first, and fining trials must be done to assure proper settling.

**PVPP.** Polyvinyl polypyrrolidone (PVPP) is a high molecular weight fining agent made of crosslinked monomer of polyvinlypyrrolidone. It complexes with phenolic and polyphenolic components in wine by adsorption and attracts low molecular weight catechins. It removes bitter compounds and browning precursors in both red and white wines. PVPP is quick acting with no preparation required. Wines must be filtered to remove the PVPP and wines may seem more astringent when the bitter compounds are removed. PVPP is sold as Polyclar® V and VT. Polyclar® V has a finer particle size than VT. Polyclar® VT is a new designation to replace the old Polyclar® AT. Usage levels range from 1 to 6 lb./1000 gallons.
Table 2. Fining treatments presented for demonstration on 1988 Limberger wine.

1. Control -- No Treatment
2. Gelatin at 1 g/G (2.2 lb./1000 G)
3. Gelatin at 2 g/G (4.4 lb./1000 G)
4. Egg Whites at 1 medium egg/20 G
5. Egg Whites at 1 medium egg/10 G
6. Sparkolloid at 1.5 g/G (3.3 lb./1000 G)
7. Bentonite at 1 g/G (2.2 lb./1000 G)
8. PVPP at 3 g/G (6.6 lb./1000 G)

Reference.