

Fining Agents 101

A Wine Circle Tutorial and Tasting

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Acknowledgement

- Thanks to Pat Othen for her assistance in providing some of the smaller carboys involved in the experiment.



Motivations

- Members of the Wine Circle omit various fining agents. What, if any, are the effects?
 - “...some fining agents also **reduce astringency or bitterness, remove off-odors**, and strip out browning caused by oxidation....With some fining agents there is a trade-off; while removing suspended solids and doing the job they were intended for, **they may also strip or remove some color, body, taste and aroma from the wine...**” [WineMaker Magazine]



Fining vs Filtration

- Fining is the process where a substance (fining agent) is added to the wine to create an adsorbent, enzymatic or ionic bond with the suspended particles, producing larger molecules and larger particles that will precipitate out of the wine more readily and rapidly.
- Fining can remove soluble substances such as polymerized tannins, coloring phenols and proteins.
- Filtration can only remove particulates (such as dead yeast cells and grape fragments).



Types of Fining Agents

Organic compounds: generally animal based, the most common organic compounds used include egg whites, gelatin, and isinglass obtained from the bladders of fish

Pulverized minerals and solid materials: can also be used, with bentonite clay being one of the most common, thanks to its effectiveness in absorbing proteins and some bacteria.



How do Fining Agents Work?

1. Most of the suspended solids in your must or wine have an electrical charge, positive or negative (see next slide). Many fining agents also have an electrical charge. When fining agents are added to your must or wine, they will attract and bind — like a magnet — to particles of the opposite electrical charge, then become heavy and sink to the bottom of the wine as sediment, leaving the wine clearer.
2. Some fining agents work through absorption. The agent may have no electrical charge at all, but has “sponge-like” qualities allowing it to bind with elements in the wine, and settle to the bottom.



Pluses and Minuses

- The most common positively charged [+] particulate is protein, although some metallic compounds also carry positive charges.
 - Protein is easily removed using negatively charged [-] fining agents such as: tannin, yeast, bentonite, and Kieselsol.
- There are numerous negatively [-] charged particulates, including tannin, phenolics, anthocyanins, yeast, and bacteria.
 - Removed using positively charged [+] fining agents such as gelatin, albumin, casein, Isinglass, chitin (Chitosan), and Sparkolloid.



Reds versus Whites

- Red wines, with their natural (or added) tannin, should not suffer from haze caused by proteins, but white wines easily could. This is why commercial white wines are routinely protein stabilized with bentonite fining and red wines are not.
- Young red wines, when cloudy at all, usually can trace their cloudiness to pectin or a negatively charged particulate.



When are Fining Agents Applied?

- Fining agents can be applied to the wine:
 - before fermentation begins
 - after the wine has stabilized, and
 - just before bottling.



Bentonite [-]:

- A type of volcanic clay. Probably the most common fining agent for home winemakers.
- Very high water absorption properties, expands to almost 20 times its original size.
- Can be added to your wine either before or after fermentation.
- Pre-fermentation, it first settles to the bottom of the grape must. But when the turbulence of fermentation begins, CO₂ gas bubbles form in the must and grab onto the Bentonite and lift it up to the top of the fermenting must, attracting [+] charged solids as it rises. The bubble will burst when it reaches the surface, and the Bentonite particle will fall to the bottom again, still gathering positively charged solids as it sinks.
- Helps keep wine stable during fermentation avoiding overly vigorous fermentation (foaming over).



Isinglass [+]

- Made from a protein called collagen, extracted from the swim bladders of fish.
- Not usually recommended for clearing out heavy haze in wine, Isinglass is best known for its extremely gentle nature. It does not strip flavor or character from wine, and creates a final high quality polish to wine (especially whites and blush) that have already been cleared by other agents.
- It will produce a thin layer of fine sediment, as the last of the suspended solids precipitate to the bottom. Thus, Isinglass works best as a final touch, applied just before bottling.



Chitosan [+]

- Composed of chitin, which is the structural element of the exoskeletons of crustaceans, such as crabs, shrimp and other shell fish.
- Chitosan is especially popular in clearing white wines, since it does not require the aid of tannins to clear, as do some fining agents like gelatine.
- When used with negatively-charged Kieselsol it is an effective remover of most suspended proteins and solids.
- Chitosan and Kieselsol are often sold as a set, in sealed liquid envelopes as fining A (negatively charged Kieselsol) which is added to the wine first, and then fining B (positively charged chitosan) added about a day afterwards.
- Chitosan has a reputation for being fairly gentle on the character of finished wine.



Kieselsol [-]

- Also known as silicon dioxide.
- Kieselsol works well with gelatine as a clearing agent, since it acts as a tannin substitute and works well to remove bitterness from white wines.
- When used with gelatine, the gelatine is added to the wine first, and then 24 to 48 hours later, a very small amount of Kieselsol is added, and should be racked off within 2 weeks.
- Kieselsol also works with chitosan.



Other Fining Agents

- Carbon (no charge)
- Egg whites (positive charge)
- Gelatine (positive charge)
- PVPP (Poly-vinyl-poly-pyrrolidone) (no charge)
- Sparkaloid (positive charge)
- Pectic enzyme/pectinase (enzyme)
- Casein (positive charge)
- Metatartaric Acid* / cold stabilization
- Gum arabic and others....

(Details provided in backup slides)

* Not a fining agent per se



Potassium Sorbate

- Produces sorbic acid when added to wine; it serves two purposes.
 - When the wine is racked for the final time after clearing, potassium sorbate renders any surviving yeast incapable of multiplying. Yeast living at that moment can continue fermenting any residual sugar into CO₂ and alcohol, but when they die, no new yeast will be present to cause future fermentation.
 - When a wine is sweetened before bottling, potassium sorbate is used to prevent re-fermentation when used in conjunction with potassium metabisulfite. It is primarily used with sweet wines, sparkling wines, and some hard ciders, but may be added to table wines, which exhibit difficulty in maintaining clarity after fining.
- Some molds (notably some *Trichoderma* and *Penicillium* strains) and yeasts are able to detoxify sorbates by decarboxylation, producing piperylene (1,3-pentadiene). The pentadiene manifests as a typical odor of kerosene or petroleum.



Wine Circle Experiments

- Today:
 - Effects of fining agent
 - Effects of sorbate
- Previous meeting, 28 May 2017
 - Effects of yeast



Participants / Details

ID	Fining Agent(s)	Sorbate	Yeast	Winemaker
1	Bentonite [-]	yes	EC-1118	Rowell
2	Bentonite [-] and Isinglass [+]	yes	EC-1118	Rowell
3	Isinglass [+]	yes	EC-1118	Osler
4	NIL	yes	EC-1118	Osler
5	Isinglass [+]	no	EC-1118	Jost
6	Chitosan [+], Kieselsol [-]	no	EC-1118	Jost
7	Bentonite [-] and Isinglass [+]	no	QA-23	Drysdale
8	Bentonite [-] and Isinglass [+]	no	D-47	Drysdale



About the Wine

Winexpert LE 16 Vermentino

- Provided: #5 Isinglass and Bentonite as fining agents
- Provided: EC-1118 yeast

“Although rare in North America, in Italy the Vermentino grape is a white star. Think of flavours like white peach, green apple, fresh lime and even a bit of dried tarragon on the finish. On the palate, it has a quenching acidity that makes your mouth water with delight and a delicate weight that allows this wine to be sip-worthy on its own. Although perfect on its own on a warm summer day, this wine also pairs beautifully with regional Italian cuisine like pasta tossed in olive oil with fresh shellfish or simply with grilled Mediterranean vegetables.”



Clearing Example (3 vs 4)

40 hours

3 days



Clearing Example (3 vs 4)

4 days

5 days



Clearing Example (3 vs 4)

6 days

7 days



Clearing Example (3 vs 4)

16 days

4.5 months



That brings us to today...



Tasting Flight (not in this order!)

ID	Fining Agent(s)	Sorbate	Yeast	Winemaker
1	Bentonite [-]	yes	EC-1118	Rowell
2	Bentonite [-] and Isinglass [+]	yes	EC-1118	Rowell
3	Isinglass [+]	yes	EC-1118	Osler
4	NIL	yes	EC-1118	Osler
5	Isinglass [+]	no	EC-1118	Jost
6	Chitosan [+], Kieselsol [-]	no	EC-1118	Jost



Comparisons

Effects of fining	2 – per kit instructions 1 – omit Isinglass, otherwise per kit instructions 3/5 - omit bentonite, use Isinglass 4 – no finings agents (control) 6 – alternate fining agents
Effects of sorbate	3 (with) vs 5 (without)



Tasting Flight Details

Order	ID #	Maker	Details
A	4	Osler	No fining agents
B	2	Rowell	Per kit instructions (Bentonite [-] and Isinglass [+])
C	6	Jost	Alternate Fining Agents (Chitosan [+], Kieselsol [-])
D	1	Rowell	Bentonite [-] only
E	3	Osler	Isinglass [+] only (with Potassium Sorbate)
F	5	Jost	Isinglass [+] only (without Potassium Sorbate)

Regarding F, Alan reported that he had to apply Isinglass twice, and that the wine still did not clear properly. Thus, a comparison of E and F may not be solely isolating the effect of sorbate.



Results

- Wine Circle members preferred A and E (with a more or less equal show of hands)
- Comments:
 - A. More complex, more flavour, sweeter, buttery, darker colour than B and C (in that order)
 - B. Smoother, harsh finish
 - C. Drier, more astringent, watered down, Identical to B?
 - D. Washed out
 - E. Similar to A (good), darker colour
 - F. Long finish but not a pleasant one, rough



Source Material

- https://en.wikipedia.org/wiki/Clarification_and_stabilization_of_wine
- Jeff Chorniak, A Clearer Understanding of Fining Agents, WineMaker Magazine, Oct/Nov 2007
- https://en.wikipedia.org/wiki/Potassium_sorbate
- <http://winemaking.jackkeller.net/finishin.asp>



Carbon (no charge)

- Carbon is not known as a clarifier so much as an effective remover of off-odors (same principle as household uses).
- Since carbon has no charge, it does not attract particles, but absorbs them. It can absorb the browning off-color and off-odors of oxidized wine.
- If overused, carbon can also strip wine of color, flavor and character, and will actually create an off-flavor of its own.



Egg Whites (positive charge)

- Used for generations in the Old World to clear red wines during barrel aging.
- Egg whites contain a water soluble protein called albumen. It has a reputation of softening astringency and mellowing wine with no negative residue or effects.
- To use whole eggs, the whites need to be completely separated from the yolks and added to salted water to ease solubility of the globulin-a protein.
- One egg will effectively clarify 23.5 L of wine
- Egg whites are also available commercially in powder form (and avoids the possibility of bacteria that may exist in whole eggs).



Gelatine (positive charge)

- An animal protein.
- Can be applied as a clearing agent pre- and post-fermentation.
- Recommended for red wines since its positive charge helps reduce excessive tannins (tannin carries a negative charge).
- Can also be used on white wine to remove the bitter taste of excessive tannins. But in white wine excess gelatine can create a protein instability and develop a haze of its own.
- To prevent over stripping of white wine, gelatine can be used with Kieselsol as its [-] charge works as a tannin substitute to neutralize excess gelatine in the wine. The two agents with different charges working together also have the potential to both reduce astringency, and collect a greater number of charged solids.



PVPP (Poly-vinyl-poly-pyrrolidone) (no charge)

- PVPP is a synthetic polymer, insoluble in water, and therefore does not break down to leave an off-flavor in the wine.
- Not really considered as a clarifier. Rather, PVPP is sometimes used in place of gelatine when reducing tannins in white wines.
- It works well in reducing or removing oxidative odors and reduces browning from wine. When all fruit comes in contact with oxygen, enzymes are activated that begin turning the fruit dark. PVPP works by removing the portion of the enzyme that causes oxidation.
- PVPP is most effective when used in conjunction with carbon to remove off-flavors, and can also be used with Bentonite to help compact the sediment.



Sparkalloid (positive charge)

- A popular brand name of a fining agent developed by Scott Labs, made from a blend of polysaccharides and diatomaceous earth — the fossilized skeletons of hard shelled algae.
- It is available as a powder for a hot mix or cold mix. The hot mix is recommended for fining wine; the cold mix is for juices.
- Has a reputation for creating brilliant wine, and does not strip character if used moderately.
- As the hot mix name implies, it is first dissolved in hot water before being added to the wine while still warm. The preparation instructions are very easy to follow.
- Sparkalloid takes time to settle out and should be applied at least a month before bottling.



Pectic enzyme/pectinase (enzyme)

- An excellent clarifier when applied to fruit wines, or wines that can develop pectin haze.



Metatartaric Acid

- Grapes contain both tartaric acid, and potassium, the potassium reacts with tartaric acid in the finished wine and forms potassium bitartrate.
- Potassium bitartrate eventually precipitates out as a clear, odorless, tasteless, crystalline material sometimes called “cream of tartar,” “tartrate crystals” or “wine diamonds.” Tartrate crystals often precipitate out of the wine after bottling — especially if the wine is cellared at lower temperatures, or when white wine is chilled before serving.
- They look like granules of broken glass in the bottle, harmless.
- Metatartaric acid is a polymerized tartaric acid which prevents potassium bitartrate dissolved in wine from forming crystals. Adding metatartaric acid to finished wine can inhibit the formation of wine diamonds for about 18 months if the wine is stored under 68 °F (20 °C).
- The other option for removing wine diamonds is to drop the temperature of the finished wine to just above freezing for several months.



Casein/Potassium Caseinate (+ charge)

- A protein found in milk and commercially available as potassium caseinate. It can be used as a gelatine substitute to reduce the tannins in red wine, and remove brown color from oxidized white wines or blush. If over used, it can strip character and desirable qualities from the wine.
- Some home winemakers actually use skimmed milk as a fining agent. Nevertheless, casein can be difficult to add to wine since it will react with the acid in wine immediately and lose its effect as a fining agent when you try to simply stir it in.
- If it is injected into the wine with a large syringe or basting bulb it enters the wine under pressure as a visible cloud burst, and will work more effectively.



Participants

Pat/Terry:

1. Use Bentonite [-] but omit Fining Agent
 2. Standard instructions (use Bentonite [-] and Isinglass [+])
- Use Potassium Sorbate

John:

3. Omit Bentonite [-] and use Fining Agent provided (Isinglass [+])
 4. Omit Bentonite [-] and omit Fining Agent
- Use Potassium Sorbate

Allan:

5. Omit Bentonite [-] and use Fining Agent provided (Isinglass [+])
 6. Omit Bentonite [-] and use alternate Fining Agents (Chitosan [+], Kieselsol [-])
- Omit Potassium Sorbate

Jim/Ann:

7. Omit Bentonite [-] and use Fining Agent (Isinglass [+]), Yeast QA-23
 8. Omit Bentonite [-] and use Fining Agent (Isinglass [+]), Yeast D-47
- Omit Potassium Sorbate

