

Introduction to Grape Wine Beginnings

Your White Bordeaux Grape Wine Beginning brings a little bit of Western France to your home. Like the traditional White Bordeaux of France, you will ferment a blend of Sémillion and Sauvignon Blanc to make a delicate, complex, yet dry wine, accented by a touch of oak. Your White Bordeaux Grape Wine Beginning includes 5-gallons of pressed and settled Sémillion and Sauvignon Blanc grape juice already blended in a ratio common for a White Bordeaux.

If you ordered more than 5-gallons of juice, you will receive the proper amount of yeast, lysozyme and oak cubes to make your wine. The guide for making 50-gallons is the same as it is for 5-gallons, only you have a higher volume. You may need to make a few adjustments to your winemaking based on the volume of juice you are fermenting. If you have questions, please give Brehm Vineyards a call.

Your grape juice not only reflects the geographical region and particular site where grown, it is a canvas upon which you, the winemaker, can freely express your style and preferences. A White Bordeaux is crisp, fermented dry without malolactic fermentation. It is fresh and clean with a hint oak flavoring. White Bordeaux is a style of wine perfect for seafood, chicken and vegetables.

This winemaking experience will impart on you the classic winemaking style for producing White Bordeaux wine. If you follow these instructions and monitor your winemaking progress in the included White Bordeaux Grape Wine Beginning's Log, you will produce a refined, premium White Bordeaux. We will guide you through the production the wine, but it is up to you to enjoy it.

There are many ways to produce this style of wine. The methods described herein are personal, based on classic winemaking techniques that have been proven over decades. It is the way Peter Brehm, our winemaker, wishes to guide you through this production of fine wine - it is not the only way.

Grape Juice Fermentation

Grape juice fermentation refers to the conversion of grape juice into wine by the actions of yeast reproduction. Brehm Vineyards provides you with your winemaking starting point, premium quality California Coastal Sémillion and Sauvignon Blanc juice blended at the time of harvest for production of White Bordeaux.

Yeast are single celled organisms that, under anaerobic conditions (oxygen-free environments), use sugars as a carbon source to grow and divide. As the yeast reproduces, sugar is converted into alcohol. This process is known as alcoholic fermentation. In winemaking, alcoholic fermentation by yeast is also

known as the Primary Fermentation or Sugar Fermentation.

Within the grape juice, as the yeast multiply, sweet sugars are converted by the yeast into pyruvate. Through an enzymatic reaction, the pyruvate is converted to acetylaldehyde, releasing carbon dioxide (CO₂). The acetylaldehyde, through another enzymatic reaction, is converted to ethyl alcohol or ethanol as a by-product.

The yeasts' production of ethanol is a natural part of their life cycle. It is not the primary goal of the yeast to produce ethanol, but to produce energy carrying molecules to be used in other biological reactions by the yeast. It is the winemakers' goal that yeast consumes the sugar in the grapes and excretes alcohol.

Winemakers strive to use yeast that match their future wine's desired style, alcohol content, age, related enzymatic activity and fermentation characteristics (fast, slow, low, foam, etc). The presence of alcohol in higher concentrations will actually impede yeast growth and may eventually kill yeast.

Brehm Vineyards has provided a selected winemaking yeast, Lalvin's CY3079, for use with your White Bordeaux Grape Wine Beginning.

In most cases, the sugar content of the grapes in conjunction with the use of proper winemaking yeast will eventually convert all of the sugar in the grape juice into alcohol. Grape juice that is 24% sugar (or 24° brix / balling) will produce a wine of approximately 14% alcohol.

Fermentation at a cool temperature and a closed fermentor do not allow as much evaporation of alcohol as with an open, warm fermentor. White wine fermentations usually produce higher alcohol per given sugar concentration than red fermentations.

Winemaking yeasts are usually not affected by alcohol in the fermenting juice if there is an adequate amount of nutrient sources until the concentration of the alcohol reaches 15+%; some are happy at 17%.

Winemaker Preparation

A good winemaker is ready for anything. Their equipment and fermentors are clean and sterile prior to taking receipt of their juice. This should be your goal as well.

Read through this comprehensive guide and the included White Bordeaux Grape Wine Beginning's Log so you will be prepared to make wine once you receive your juice. After receiving your juice, for approximately two weeks you are tending to the fermenting juice daily. This is not for a long period of time, but daily. A few hints to prepare yourself for this endeavor:

- Make sure that you read through and understand this White Bordeaux Grape Wine Beginning's Guide before you notify your supplier (or Brehm Vineyards) to ship you the juice.
- Read and familiarize yourself with the included White Bordeaux Grape Wine Beginning's Log.
- Purchase and receive the necessary winemaking equipment.

- Read and understand all the instructions that come with your equipment as well as reading the recommended book.

- Familiarize yourself with the other books and articles posted at Brehm Vineyards' web site.

- It is also recommended that you read the books listed in the White Bordeaux Grape Wine Beginning's Log as Optional Equipment.

Where To Ferment Your Juice

The location you choose to ferment your grapes should be cool (around 55°F /13°C), dry and free of any airborne contaminants. Anything that falls into your juice can impart off flavors or cause other problems with the wine. A wash down floor is a real plus. Make sure to keep your winemaking environment as clean as possible.

Sterilize Equipment

Before, as well as during the primary sugar fermentation, other biological organisms such as fungi, bacteria, and naturally occurring wild yeast can, and will, contaminate your wine and compete with your selected winemaking yeast for critical nutrients. These biological infections can cause incomplete sugar fermentation, the creation of off flavors in the wine, as well as a host of other winemaking misfortunes. Therefore, it is very important that your winemaking equipment be as sterile as possible before you begin to ferment.

For your White Bordeaux Grape Wine Beginning, you will need to sterilize your fermentor (glass carboys and jugs) and

other pieces of winemaking equipment so that you don't contaminate your juice. The most convenient method of sterilization is to use common household bleach. The bleach will kill any live contaminants as well as dissolving dormant mold and fungi spores.

Use the following method for sterilizing your fermentor, carboys and winemaking equipment.

(DO NOT USE THE BLEACH SOLUTION ON YOUR PVC TUBING!)

- Add 2 fluid ounces of liquid (non-scented) bleach to 19 liters / 5 gallons of water.

- Fill your glass carboys and jugs about 3/4 full with water before adding the bleach. Then fill your containers to the top with water. The addition of water will thoroughly mix the bleach.

- Allow your containers to sit in the bleach solution for at least 15 minutes.

- After 15 minutes, safely dispose of the bleach solution. This bleach solution can also be used to sterilize your other equipment.

Bleach is a highly basic solution (with a pH much greater than 7). Simply rinsing your containers and equipment with water will not be enough to remove the bleach. To bleach must be neutralized by an acid to be completely removed. If the bleach is not neutralized, a slick residue will remain (as well as the smell of bleach).

Follow these steps to neutralize the bleach solution when rinsing your containers:

- Rinse containers thoroughly with cold water.
- Fill the containers 3/4 full with water and add 1/4 cup of Citric Acid crystals.
- Fill the container to the top with water.
- Stir the citric acid solution thoroughly so that all the crystals have dissolved.
- Let sit about 5 minutes.
- Pour out the acidulated water (you can pour this out directly, or use it to neutralize the bleach used on your other equipment).
- Rinse containers and equipment thoroughly with water.
- Smell the containers and equipment for bleach.

Make sure you smell your containers and equipment after you have completed the rinsing process. If you can smell bleach, repeat the rinsing process with citric acid until you cannot smell the bleach. When you are satisfied that your containers are clean, sterile and free of residual bleach, place the containers upside down to allow the containers and equipment to drain and dry completely.

Once the carboys are thoroughly dry, you can simply cover the mouth of your carboy with some plastic wrap. Use a rubber band to secure the seal. Store until needed.

Receiving Your Juice

It has been our experience over the years that about one out of three pails of frozen grapes will slightly implode during the

defrosting cycle causing the pail to appear dented. There is nothing wrong with the pail or the juice, it is the natural consequence of the ice thawing. However, you should not leave these pails upside down.

Swollen pails, pails venting CO2, leaking pails (probably not usable), and any other serious conditions as a result of the shipment of the grapes should be received from the transport agent “with exception” to the specific condition. You should write a detailed description of the condition and have the driver, or agent write their name, date, and recognition of the condition on the bill of lading or air waybill BEFORE you leave with the pails. Please notify supplier, or Brehm Vineyards immediately of the problem.

How to Thaw Your Juice

Depending on the method used to ship you your White Bordeaux Grape Wine Beginning juice, you will need to let the pails of grape juice thaw for 1-4 days. It is important that you thaw your juice in an environment at constant temperature. Your goal is to thaw the juice quickly and evenly. Room temperature, 70°F / 21°C, is ideal for thawing, but the ambient temperature for white grape juice fermentation should be cooler, around 55°F / 13°C.

Under no circumstances should you let your juice thaw slowly in a refrigerated environment. If you let the juice thaw out slowly, you greatly increase your chance of allowing bacteria, fungi or mold from taking hold and contaminating your grape juice.

Once you add your yeast and the primary sugar fermentation begins, the bubbling

CO₂ released as a by-product of the sugar to alcohol fermentation acts as a natural barrier against bacteria, fungi or molds. Take advantage of this CO₂ barrier by keeping the fermenting juice always sealed with an airlock when in carboys.

When you receive your pails of juice, to determine the degree of thawing, take one of the pails by the handle and twist the pail in your hand. If you can hear and feel the juice sloshing around inside, they are well on their way to being thawed. If you don't hear anything, then the juice is still frozen solid inside.

During the first day or two after you receive the juice, leave the lids on the pails. Flip the pails on their top in the morning, back on their bottom when you get home, and then turn them again on their top when you go to bed. The turning of the pails helps to mix the juice inside as well as speed the thawing process.

Each pail of Sémillion / Sauvignon Blanc provided for your White Bordeaux Grape Wine Beginning is 5 U.S. gallons of crushed, pressed and settled white grape juice contained in a 6-gallon pail. There is roughly one gallon of air space above the juice.

After a day or so of turning the pails over, go ahead and take the lids off the pails. Use stainless steel / food grade plastic spoon or your racking tube to stir your grape juice. Be sure to scrape the bottom of the pail while stirring. There is a layer of cream of tarter and sugar that settles at the bottom of the pail. You want to mix this in completely with the rest of the juice.

The temperature of the juice might still be cold. If there is still ice floating in the juice, this means you have about one more day until you can add your yeast. Stirring the grape juice will speed the thawing process. Try not to froth the juice or add excess air while stirring.

Add Tartaric Acid

At the time of processing, Brehm Vineyards measured the Total Acidity of the Sémillion / Sauvignon Blanc juice as being 0.54 grams per 100 ml (or 0.54%.) This is a bit on the low side for Total Acidity (TA). Therefore, you will need to add Tartaric Acid to the juice to raise the TA of the juice.

3.8 grams Tartaric Acid added to 1-gallon of juice will raise the total acidity by 0.1%. You will want to raise the Total Acidity of your entire juice volume by 0.2%. This will bring the TA of the Sémillion / Sauvignon Blanc juice to about 0.75%.

You will need to add 38 grams (or 1.34 ounces) of Tartaric Acid to each 5 gallons of juice to raise the TA of the entire volume by 0.2%.

For 10 gallons of juice, add 76 grams to raise the TA by 0.2%. For 50 gallons of juice, add 380 grams to raise the TA by 0.2%.

Add Lysozyme

Included with your White Bordeaux Grape Wine Beginning, we have provided you enough lysozyme to add 500 parts per million to 5-gallons of juice. We use 0.32 ounces of lysozyme to give 500 parts per million lysozyme for each 5-gallons of juice. Once the juice in the pail has thawed, simply add the provided

lysozyme to the juice and stir the juice to completely mix the lysozyme.

WARNING: Lysozyme is an enzyme isolated from egg whites. If you are allergic to egg whites, DO NOT add the lysozyme.

When used in winemaking, lysozyme can postpone or prevent malolactic fermentation. Lysozyme's basic action is to poke holes in bacterial cell walls causing the bacteria to lyse, or basically pop due to an influx of liquid into the bacteria. This level of lysozyme will inhibit malolactic fermentation and preserve the crisp acidity and delicate fruit flavors in your White Bordeaux.

Add Yeast Nutrient

A yeast nutrient is to be purchased as part of the Essential Equipment for your White Bordeaux Grape Wine Beginning. The yeast nutrient gives your growing yeast vitamins and minerals to keep them healthy while fermenting your grape must.

For each 5-gallons of juice, you will use about one rounded tablespoon of the yeast nutrient; this is roughly 15 grams. Follow the directions provided with your yeast nutrient and add the appropriate amount to the bottom your fermentation carboy. The yeast nutrient will be efficiently mixed into the juice once you fill the carboy.

Prepare Juice For Fermentation

Make sure that you have thoroughly mixed the juice in the pail completely. As you stir, be sure to scrape the bottom of the pail as to put back into the juice solution any cream of tartar and sugar

that has precipitated to the bottom of the pail.

Once thoroughly mixed in the pails, siphon the juice into your fermentation carboy. If you notice any airspace above the juice, use distilled water to top the juice up to the neck.

To avoid juice loss from foaming during fermentation, we will use a 3-liter jug to ferment a portion of the juice from each carboy. The amount a juice will foam during fermentation is dependant on the activity of the yeast used, temperature and the rate of fermentation.

Siphon some of the juice out of the carboy into a 3-liter jug. Fill the jug to the shoulder.

Initially, the juice in the jugs will be used to make your Yeast Starter. After you add the Yeast Starter into the juice in your fermentation carboy, you will siphon a portion of the juice back into jugs and ferment this juice in the jug. This will prevent any loss of the juice from foaming during fermentation.

Once the alcohol percentage in the wine increases, the surface tension in the juice / wine decreases and foaming is not a problem. At this point, we will add the fermenting juice from the jugs back into their appropriate carboy to finish the sugar fermentation.

As an educational aside:

The freezing and thawing of juice (to a lesser degree in the crushed grapes than juice) efficiently separates and concentrates the principal components of the grapes. You may recall that ice burgs are made of ice without salt. As water freezes, sugars and acids are

concentrated by density. Grape's principal acid is 'tartaric', which decreases in solubility with a decrease in temperature and/or an increase in alcohol, producing cream of tartar. You can adjust the amount of sugar by separating the frozen from the unfrozen. You can decrease the acidity by racking off the cream of tartar.

Take Initial Measurements

Now that your juice has thawed and you have siphoned the juice into your fermentation carboy, it is time to take your first analysis of the wine. This is your White Bordeaux winemaking starting point.

Temperature:

As with fermenting black grape must, temperature is very important for fermenting white grape juice. In general, you want to ferment your white grape juice between 50-55°F / 10-13°C until the juice reaches about 7-10° brix. Once the juice reaches that brix level, you want to raise the temperature of the juice to about 65°F / 18.3 °C to complete the fermentation.

White grape juice fermentation tends to get stuck as the sugar level decreases. The slight increase in temperature will aid the yeast in finishing the sugar fermentation.

If you have access to a spare refrigerator, this can be an ideal place to ferment your grape juice in. A cool spot in your garage can also be a good place to ferment your juice.

Record the Temperature of the Sémillon / Sauvignon Blanc blend in your White Bordeaux Grape Wine Beginning's Log.

Yeast are able to ferment grape juice at low temperatures, albeit inefficiently. The natural yeast present on the grapes at the time of harvest will be greatly diminished by freezing. The survivors will start to multiply once the juice is thawed. The initial goal is to get the juice to 50-55°F / 10-13°C and maintain this temperature until the sugar level falls to about 7-10° brix.

Measure Sugar:

Degrees Brix or Degrees Balling are identical units for measuring the percentage of sugar in your grape must. Specific Gravity is another method for measuring sugar concentration in your must.

Please review the Brix / Balling / Specific Gravity Chart at the end of your White Bordeaux Grape Wine Beginning's Log. Degrees Brix and Balling will be used interchangeably throughout this guide.

To measure your brix starting point, take a sugar sample of the juice from your carboy separately and fill your hydrometer container. With the juice about one inch below the top of the jar, slowly insert the Hydrometer. Take the reading from the bottom of the meniscus between the hydrometer and the jar. Record the Initial Degrees Brix of the Sémillon / Sauvignon Blanc juice in your White Bordeaux Grape Wine Beginning's Log.

The temperature of the juice has an effect on the hydrometer reading, as does the alcohol content of the wine. These conditions are minor for our purposes.

Monitoring the degrees brix is your fermentation speedometer. It will show you where you are in the race to total

conversion of sugar to alcohol. The race starts with a slow rate of sugar consumed per hour. A cold environment slows down the initial stages of fermentation, as well as its continuing rate of sugar conversion.

After 8° brix, the alcohol content in the fermenting juice will begin to be toxic to the yeast. The combination of the increasing alcohol concentration and the diminishing nutrients in the fermenting juice will cause the fermentation rate to dramatically decrease. To help the yeast finish the sugar fermentation, raise the temperature of the juice to about 65°F / 18.3 °C. This may be as simple as taking your carboys out of the refrigerator or placing the carboys in a warmer part of your house.

Add Oak Cubes

Included with your White Bordeaux Grape Wine Beginning, we have provided you with medium-toasted, French oak cubes. This to add a hint of oak flavor to 5-gallons of wine. To make a rich, White Bordeaux style, you want to ferment the juice in the presence of oak. This will mimic oak barrel fermentation. Add the oak cubes to the juice in the carboy. You will be provided with 1 ounce of oak cubes for each 5-gallons of juice.

Make a Yeast Starter

The juice in the jug will serve as your Yeast Starter. Initially, a vigorously fermenting white grape juice will produce a lot of foam. It is quite difficult to ferment 5-gallons of white grape juice in a 5-gallon carboy without the juice bubbling out of the airlock due to foaming. Ideally, you would conduct your primary fermentation in a 6-1/2 gallon carboy and

near end of fermentation transfer the wine to a 5-gallon carboy.

While the white grape juice is actively fermenting, the airspace above the juice is filled with carbon dioxide. This CO₂ layer prevents oxidation. Once the juice is fully fermented and you open the carboy, the CO₂ will seep out. At this point, it is necessary to minimize the wines contact with air. This is when you make sure that the wine in your 5-gallon carboy is filled it up to the neck, minimizing the surface area of the wine.

For your White Bordeaux Grape Wine Beginning, you will ferment most of the juice in the carboy and a portion of it in a jug.

The yeast provided with your White Bordeaux Grape Wine Beginning has been freeze-dried. You can simply sprinkle the freeze-dried yeast into your juice and fermentation will eventually begin. This is a quick and dirty method and not very efficient.

A better way to add the yeast to your juice is to first create a yeast starter. The starter is a way to wake up the yeast and build up a large, active population of healthy yeast. Adding a good starter to your juice will more efficiently, and quickly, ferment the sugar in the juice.

Since the yeast is freeze-dried, it must first be re-hydrated before the yeast can be used. Take 1 cup of water at 100°F / 38°C and add all the yeast to it. (You may need more water if you are fermenting more than 5-gallons of juice.) Do not mix the yeast in to the water, simply pour the yeast over the water and let it sit for 20 minutes. Be sure to use a large bowl to

hydrate the yeast because the yeast will foam.

Add the re-hydrated yeast to your Yeast Starter jug. Set the jug in a dry, warm location in your kitchen to get the yeast started fermenting for 2-8 hours. Use an airlock to seal the starter in the jugs.

Add The Yeast Starter

Once your grape juice has reached at least 45°F / 7.2°C, and you have a bubbling, active Yeast Starter prepared, it is time to begin the sugar fermentation.

Before you add the Yeast Starter, record the following in your White Bordeaux Grape Wine Beginning's Log:

- **Temperature** of the juice
- **Degrees brix** of the juice

It is also a good time to record any sensory perceptions you have about the grape juice including taste and smell.

Now siphon or pour all of the Yeast Starter into your carboy. Give the juice a good stir to mix wholly the yeast into the juice.

You will now want to siphon out some of the juice from the carboy into your 3-liter jug. Fill the jug only to the shoulder. You should have your 5-gallon fermentation carboy filled with about 4+ gallons of juice and one 3-liter jug filled to the shoulder. Make sure to firmly seal these containers with airlocks.

Keep Juice at Proper Temperature

White grape juice should be fermented at a cool temperature, around 50-55°F / 10-

13°C. Fermenting at a cool temperature preserves the delicate fruit flavors. Warmer fermentations tend to lose their fruit flavor and often can be result in a bland flavor in the wine.

To do this, folks usually ferment their juice in the wintertime when the ambient temperatures in their garages or basements are cool. If you live in Phoenix, Arizona, it may be hard to keep the temperature of your juice cool.

A spare refrigerator is an ideal place to ferment white juice. You can keep the temperature constant, and when the sugar level of the fermenting juice reaches about 7-10° Brix, you can easily raise the temperature of the refrigerator to help finish the sugar fermentation.

If you find your juice getting too warm, above 65°F / 18.3°C, you need to cool it down. Place towels tightly around fermentor with their ends in a cool water bath. Direct a fan at the wet towels so it creates an evaporative cooling affect on the fermentor. You can also pack ice around the carboys to cool them down.

Measuring the progress of the yeast Record the degrees brix or balling of the wine juice at least once every other day. You will be able to track the progress of the yeast. As the fermentation progresses, there will be less and less sugar available. The degrees brix will get lower each day. Try to take the measurement at the same time each day. This way, you can chart sugar consumption as actual data points.

Once the vigorous bubbling from fermentation subsides in the White Bordeaux carboy, go ahead and siphon

the fermenting juice from the White Bordeaux jug into the carboy.

When the juice reaches 7-10° brix, move the White Bordeaux carboy to a warmer location so the temperature of the juice can rise to about 65°F / 18.3°C. This increase in temperature will help the yeast finish the primary sugar fermentation.

Know Your Wine

It is essential that you become one with your wine throughout the winemaking process. Even though the wine can't talk, it will be able to communicate with you in many ways.

- Smell your wine. From start to finish, you must smell your wine. Fruit and alcohol and other natural grape and wine smells will be apparent.

Also apparent is the presence of Hydrogen Sulfide (H₂S). H₂S smells like rotten eggs or sulfur and can be perceived at the level of a few molecules per million. By smelling your wine, you can take action early to prevent problems later.

- Taste your wine. As the juice ferments, you will be able to notice that the sweet taste of the sugar will subside as the fermentation progresses. Tasting your wine is a critical way to monitor the health of the wine as it ages.

Residual Sugar Testing

If, using your hydrometer, the wine measures less than 0° on the brix / balling scale, this does not mean that the sugar fermentation is complete. Residual sugar may remain.

A hydrometer is simply not accurate enough to measure the small amount of sugar left in the wine. Wine is not considered 'stable' until it is 0.2% or less residual sugar. There is not a risk of sugar-related bacterial degradation or the wine starting to re-ferment at 0.2% or less.

Once all signs of CO₂ production have stopped, use the Dextro-Check Kit to perform the Residual Sugar test. Use a 10-drop (0.5 ml) sample of the wine to determine how much residual sugar is remaining in the wine.

Record the percentage of Residual Sugar in your White Bordeaux Grape Wine Beginning's Log.

If your residual sugar is above 0.3%, make sure the temperature of the wine is between 65-70°F / 18.3-21°C. This warmer temperature should encourage the yeast to finish the primary sugar fermentation. Repeat the residual sugar testing until you measure 0.2% or less.

Send a sample to a wine lab

If your residual sugar test shows your White Bordeaux wine has 0.2% residual sugar, an accurate measurement of the wine's pH is necessary. Act promptly – time is important.

Send a sample of the White Bordeaux wine to a wine-testing laboratory for pH test. The pH of the wine is important in determining how much SO₂ to add to protect the wine from oxidation.

Many laboratories have specific procedures for receiving samples of either the unfermented juice, or the

finished wine. It is advisable to contact the laboratory before sending them a sample so that you follow the proper procedures and that you send the correct volume of wine for the tests you will have performed. Let them know if you added Lysozyme to the juice before fermentation.

Please see the list of recommended testing laboratories at the end of your White Bordeaux Grape Wine Beginnings Log.

Initial SO₂ addition

Based on the results of the pH of your White Bordeaux wine, immediately add the appropriate amount of SO₂ and move the carboy back to a cool location (55-65°F /12.8-18.3°C). This initial SO₂ addition in conjunction with the Lysozyme will protect the wine from undergoing a malolactic fermentation.

To determine the amount of SO₂ to add, please see the **pH & SO₂ Additions** Section on page 19.

Also, now that your White Bordeaux has finished the sugar fermentation, you will begin batonnage, or stirring of the lees.

Batonnage - Stirring the Lees

Once the primary sugar fermentation has completed, for the next 8 weeks, you will be performing Batonnage on your wine. Batonnage is the act of stirring the dead yeast cells, or the lees, back into solution in your wine. The lees will sediment at the bottom of your carboy. Once a week for two months, you will stir the lees up into the wine. Be careful not to introduce air to the wine.

Stirring the lees has been a technique long used by Burgundy and Bordeaux winemakers. Exposing the wine to the lees adds complication to the flavor of the wine that would not be realized if you did not perform batonnage. Batonnage is used for many styles of white winemaking, especially in the production of Chardonnay and White Bordeaux.

The actual effects on the wine as a result of batonnage are not clearly known. Testing has shown that wine allowed to aged sur-lees, or on the lees, will be less yellow in color than the same wine not aged on the lees.

It has also been shown that tannins in the wine are attracted to the yeast cell walls and polysaccharides released by the lees. This means that the wine is made less tannic by aging on the lees.

Another benefit from batonnage is wine aged on the lees are less susceptible to turning pink due to oxidation. If you have ever made a white wine and had it oxidize on you, you will have noticed that the color of the wine took on a grayish-pink hue. This is due to oxidation of the wine. *Batonnage* adds complication to the flavor of the wine as well as playing a role in the final color of the wine.

It is very important that each time you stir the lees that you smell your wine. Hydrogen Sulfide (H₂S) can readily form in the lees even if the wine is properly sulfited.

If, during batonnage, you smell H₂S, which smells like rotten eggs or sulfur, it is important that you rack your wine off the lees immediately. If this happens, follow the directions under Gross Lees Racking and Second SO₂ Addition. Try to

rack over only a small amount of the lees (so that there is a light dusting on the bottom of your carboy). At this point, your batonnage would be complete.

Post Batonnage Fining

Once batonnage is complete, you will want to clarify your wine. A wine can be clarified in many ways, through filtering, centrifugation and also through chemical methods. A very efficient and cost effective way to fine your wine is to use bentonite.

Bentonite is a clay that attracts particles in your wine and causes them to settle to the bottom of the carboy. Bentonite is quite specific in fining for protein.

Use 10 grams of bentonite per 5-gallons of wine. Follow the directions for preparation of the bentonite. Simply pour the bentonite slurry into each carboy at the appropriate time and stir it into the wine. You do not need to stir the wine as you did during *batonnage*.

The bentonite will also precipitate, and thereby inactivate the Lysozyme you added prior to sugar fermentation. This will make the wine susceptible to malolactic fermentation. Therefore, as soon as you perform the Gross Lees Racking on your wine, you must protect the wine by adding the proper amount of SO₂.

Cold Stabilization

Once you have added the bentonite to fine your wine, holding the wine at 35-40°F / 1.7-4.5°C for two to three weeks before bottling will help settle out cream of tartar, lessening deposits in the finished bottles. This is called cold stabilization.

This is purely a cosmetic procedure that will help clarify the wine. Precipitating out the cream of tartar in your carboy and then bottling the clarified wine prevents you from opening a bottle (or more importantly, having someone you gave a bottle to) opening that bottle and having cream of tartar crystals floating around in the glass.

Gross Lees Racking

Once the wine falls clear through the actions of the bentonite and the cold stabilization, which will take from 7-21 days, it is time to rack your wine off of the lees, oak cubes and other sediment. The first racking off the lees is called the Gross Lees Racking.

To prepare for the Gross Lees Racking, you need to be sure that the wine is protected with SO₂. Add a full dose of SO₂ into the bottom of the receiving carboy. The amount of SO₂ to add is the same as what was added at the end of the sugar fermentation.

Please see page 19 of the White Bordeaux Grape Wine Beginning's Guide to determine how much SO₂ you need to add.

Racking entails siphoning or pumping the wine off the sediment into a sterile carboy. You must be very careful not to disturb the sediment in the carboy you are racking from. This is the material that makes the wine cloudy. This means that you must leave the carboy in a position so that you do not have to move it (and thereby disturb the sediment) before racking.

Also make sure not to splash the wine or cause it to bubble in the carboy you are

racking into. Allowing too much oxygen to be exposed to your wine can cause it to oxidize prematurely.

Rack as much of the wine as you can into your sterilized carboys. Leave an inch or two of wine above the sediment. You will want to rack this remaining wine into one of your 3-liter jugs. Most likely you will transfer over some of the sediment.

Siphon off as much of the wine as you can, minimizing the amount of sediment you transfer.

Place an airlock on your carboy and jug. Allow the wine in the jugs to settle for a few hours and then rack this into their appropriate carboys.

It is extremely important to minimize the air contact with your wine. If you find that you do not have enough wine to top up the carboys, then you must use distilled water to top up the wine. You can also add sterilized glass beads or marbles to displace the wine, thereby eliminating airspace.

Allow the wine to settle, undisturbed, in a cool location for 3 weeks before bottling.

Record the Smell and Taste of the wine after the Gross Lees Racking in the White Bordeaux Grape Wine Beginning's Log.

Total Acidity and pH

The balance between acids and bases is a hypothetical measurement that quantifies the way elements are, and helps us predict the future. The pH of the wine affects the amount of free SO₂ that is available to the wine. The actual amount of SO₂ to add to a wine can only be determined once the pH of the wine is known. The pH of a wine can change

dramatically between harvest and the end of fermentation.

Alcohol concentration, as well as the cold temperature will decrease the solubility of tartaric acid, causing it to settle to the bottom of the carboy as cream of tartar. Thus, since the overall Total Acidity (TA) is decreasing, there is a corresponding increase in the pH of the wine. After the sugar fermentation is complete, it is a good time to check where the wine stands, especially if a malolactic fermentation is not planned.

Tartaric acid addition is common to lower the pH in wines and to increase their acidity. In North America, Total Acidity is measured in grams of Tartaric Acid per 100 ml. In France, Total Acidity is measured in units of sulfuric acid per a given volume.

Temperature, SO₂ content, nutrient availability, the malolactic culture's activity characteristics as well as the alcohol percentage of the wine are all considerations. If the pH of the wine is less than 3.20, malolactic fermentation becomes more difficult. As the pH decreases, special cultures may be required. Malolactic bacteria are inhibited by wine with over 14.5% alcohol. At 15% only special cultures will work reliably. Temperatures below 65°F / 18°C will inhibit malolactic fermentation. Free and / or combined SO₂ inhibits malolactic fermentation.

Citric acid is only added after malolactic fermentation; tartaric acid may be added at any time. Tartaric acid has the nasty habit of precipitating cream of tartar after addition to the wine. In your future wines, if it is necessary to add more tartaric acid, make sure to add it at least 6 weeks before bottling

Malolactic Fermentation

Malolactic Fermentation is also known as the secondary fermentation in winemaking. It is considered fermentation because CO₂ is released in the chemical process. Lactic acid bacteria use the malic acid in the wine as an energy source converting the malic acid into lactic acid and CO₂. Lactic acid is perceived to be softer and milder when compared to malic acid in tasting wine.

In production of your White Bordeaux Grape Wine Beginning, you inhibited this malolactic fermentation by the addition of Lysozyme prior to fermentation as well as the addition of SO₂ at the end of the sugar fermentation and after the Gross Lees Racking. This was done as to preserve the crisp acidity present in the juice.

However, the Lysozyme will only protect the wine from malolactic fermentation while it is present in the wine. Because you fined your wine with Bentonite, the Lysozyme will be removed upon the Gross Lees Racking and your White Bordeaux will be susceptible to malolactic fermentation. Therefore it is quite important that you keep your wine protected by adding the proper amount of SO₂ to the wine at specific points in the winemaking process.

See pH & SO₂ Additions below for more information.

pH & SO₂ Additions

Sulfur Dioxide (SO₂) is a gas. Potassium Metabisulfite is used as a preservative in winemaking. When added to wine, the Potassium Metabisulfite will dissolve releasing SO₂. There are many

methods for adding SO₂ to your wine and many different theories for when to add SO₂. Brehm Vineyards feels that as long as the wine is active, either undergoing the primary sugar fermentation or the secondary malolactic fermentation, that addition of SO₂ is not necessary with fruit in good condition.

There are some conditions that require an addition of SO₂ at harvest. The juice provided for your White Bordeaux Grape Wine Beginning was harvested clean, but had 80 parts per million of SO₂ added before freezing. SO₂ addition before fermentation is quite common for white juices.

Your first addition of SO₂ will be upon receipt of the laboratory pH results of your White Bordeaux wine sample at the end of sugar fermentation. Your second addition of SO₂ will be after the Gross Lees Racking of the wine. Your final SO₂ addition will be at the time of bottling the wine.

To determine the amount of SO₂ to add, read the tenths and hundredths position of your pH reading and this will tell you the amount of potassium metabisulfite, in parts per million to add to your wine.

Example: If the pH is 3.68 you should add 68 parts per million SO₂ to the wine. If the pH is 3.25, add 25 parts per million SO₂ to effectively protect the wine.

The first two additions of SO₂ will be full doses based on the pH of the wine. Your 3rd addition, which will be added at the time of bottling, may need to be less than a full dose.

If you bottle exactly 3 weeks after the bentonite fining and cold stabilization

period, you will not need to add the full amount of SO₂. You need to determine how long it has been since your second SO₂ addition (after the Gross Lees Racking.) Divide the number of weeks it has been since you added SO₂ by 10, and then multiply this number by the amount of a full dose SO₂ addition. For example, if you added 50 parts per million SO₂ to the *White Bordeaux* wine after the Gross Lees Racking, and it has been 3 weeks since that addition, then you will add the following amount of SO₂ to the wine at bottling:

$$(50 \text{ ppm}) \times (3 \text{ weeks}/10) = \\ (50 \text{ ppm}) \times (0.3) = 15 \text{ ppm SO}_2$$

If you bottle the wine 10 weeks after the Gross Lees Racking, add a full dose of SO₂ at bottling.

Refer to the *White Bordeaux Grape Wine Beginning's Log* for a SO₂ addition chart and instructions for making a solution of SO₂ for easy addition to your wine.

Bottling

The wine is now stable. We have maintained a free SO₂ presence in the wine to inhibit oxidation and malolactic fermentation. Your wine should be young and aggressive, but pleasant without any off smells or flavors.

After the Gross Lees Racking, allow the wine to settle for at least 3 more weeks. The wine is now finally ready for bottling. Add the final amount of SO₂ to the bottom of the carboy from which you will bottle. Rack without splashing the wine. Set the carboy(s) on a bench or shelf from which you can siphon the wine.

Many winemakers will sparge their receiving carboy with Carbon Dioxide

(CO₂) or Nitrogen (N₂) before racking. This is a definite plus. It reduces oxidation significantly. It may cause a slight spritz if CO₂ is used.

I recommend beer, wine, soda or champagne bottles that can receive a crown cap for bottling. Bottle caps are extremely cost effective. Corks cost a lot of money and offer an inferior seal when compared to crown caps. You need to spend at least \$60.00 on a corker to get one that really works. The most recent corks I bought were over 20¢ each. For your *White Bordeaux Grape Wine Beginning*, a rental corker would be appropriate.

I do not want to project an image of a 'Wacko'. I use corks in my wine bottles because I do not want to distract the recipient from tasting the grapes. Here you are paying me for my best thoughts. For use in your home, for the best seal available, bottle with crown caps. The wine will age with crown caps equally as well if the bottle were corked.

If you decide to use corks and rent or buy a corker, make sure to get an irised floor model:

- Don't soak your corks before bottling. Use #9 corks with a light paraffin coating of good quality at least 1-1/2 inches long.
- Allow the corked bottles to stand upright for three days before putting them on their sides or upside down.

Drinking the Wine

It is important that you allow your wine to breathe before consuming. Open your bottle at least an hour before you are going to pour it. Give the wine a good swirl in your glass before smelling or sipping.

The amount of SO₂ you used to protect the wine can cause the wine to taste sharp if you drink the wine soon after bottling. Allowing the wine to breathe with lessening this SO₂ effect.

Your White Bordeaux will be pleasurable in 6-9 months after bottling, but they will both hit their stride in 12-18 months. Smaller bottles age faster than large. Be sure to label your wine.

Good Winemaking!

Peter Brehm