MAKING BIG RED WINES

By
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Consumers expect big red wines to have great color, flavor, phenolic backbone and alcohol. In addition, good big red wines should show good varietal character, complexity and have a long finish. Big Zinfandel wines were the norm 50 years ago, and the popularity of big red wines is increasing again. Making a big red wine is not difficult if suitable techniques are used and if appropriate grapes can be obtained. A few of the important issues and some of the common winemaking techniques used for making high quality big red wines are discussed below.

FRUIT

Under ripe grapes are low in sugar, have poor color, lack red fruit flavors and varietal character. In addition, under ripe fruit are high in acid, have green tannins and herbaceous flavors. On the other hand, ripe grapes are lower in acid, higher in ripe tannins, color, flavor, varietal character and complexity. Trying to make a good red wine from under-ripe grapes is a hopeless task. So, the grapes used to make big red wines must be ripe. For most varieties of red grapes grown in San Diego County, Brix values at harvest should be between 24 and 26 Brix.

Sugar level is often used to judge grape ripeness. But, grapes from one vineyard may be ripe at 23 Brix, while the same variety of grapes in a nearby vineyard may not be ripe until they reach 24 or even 25 Brix. So sugar level does not tell the whole story. High quality wines must have good varietal character, and they must show a good flavor intensity and good mouth feel. So, experienced winemakers consider Brix plus several other parameters when making harvest decisions**.**

CRUSHING

Crushing breaks the skins of the berries and allows the juice to flow. Crushing should be done with a minimum of grinding and tearing of the grape tissues, and the seeds should never be cracked. De-stemming is done to remove the fruit from the stems. Stems contain much phenolic material, and stem phenols contribute bitterness and astringency to wine. In addition, excessive quantities of stems in a red fermentation can introduce a green, herbaceous character to the wine. So most red grape varieties should be de-stemmed before fermentation is started.

Crushing Red Grapes by Hand

Crushing a small quantity of red grapes by hand is easy, but wine yields may be lower than expected unless a good winepress is used to separate the wine from the solids at the end of fermentation. Several hand-crushing techniques have been developed, and most of these procedures are satisfactory for small quantities. The following procedure can be used for quantities of a few hundred pounds of fruit.

(1) Place a **clean** plastic milk crate on a **clean** 32-gallon plastic trash can or any other suitable ridged container.
(2) Place several pounds of grapes in the crate. Smash the clusters with a board or hands.
(3) Use a "wash board," scrubbing motion with one hand. The grapes and juice will fall through the bottom of the crate into the container, and the stems will remain in the crate.
(4) Remove the bare stems from the crate.
(5) Repeat this procedure.

Not all of the grapes will be crushed, but the unbroken berries will not cause problems. When the fermentation is pressed, the winepress will break the skins of the whole berries, and the juice will be recovered then. In fact, some winemakers deliberately leave some whole berries in their fermentations. These winemakers feel the presence of whole grapes during fermentation increases the fruitiness of the finished wine.

The stems of some grape varieties are abrasive, and the above procedure can be hard on the hands. After an hour or two, fingers can become raw and hands become badly stained, so a pair of heavy rubber gloves may be desirable when large quantities of fruit are crushed by hand.

Crushing by Foot

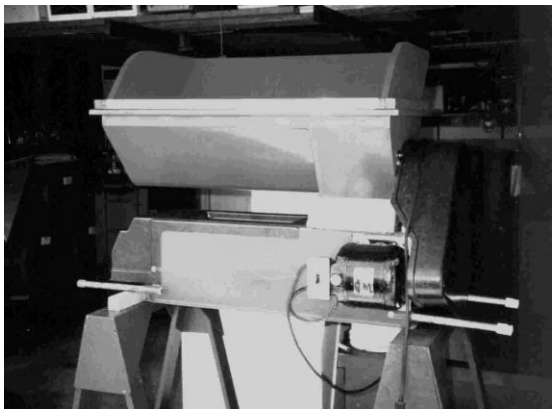
Crushing grapes with bare feet is a popular notion. But, grape tannin can cause bare feet to become very dry, and the skin around the toes sometimes cracks. Some varieties of grapes have stiff, sharp stems. These stems can be uncomfortable to tender bare feet, so bare feet are not always practical. Crushing several hundred pounds of red grapes by foot is quite feasible, but instead of bare feet, a pair of well-scrubbed rubber boots should be used. A shallow, rigid container of some kind is needed to hold the fruit. Plastic mortar boxes are available at Home Depot and other hardware stores, and these shallow boxes make suitable containers. A rhythmic motion should be used when crushing and the feet should be kept moving around in the container to make sure the grapes in the corners of the container are crushed. **Grapes can be slippery, so some kind of hand support will be needed**.

Hand Crank Crushers

Most home winemakers use a hand crank crusher. Crushers with both single and double rollers work well, although, some machines are easier to crank than others. These little machines are simple to operate. Place the crusher on top of a suitable container, and fill the hopper with fruit. Turning the crank at a moderate rate pulls the clusters of grapes between the rollers. The grape skins are broken, and the crushed grapes, juice and stems drop into the container. Hand crank crushers should be adjusted to a convenient working height, and cranking the crusher will be much easier if a clamp is used to hold the machine steady. Most home winemakers crush all of the grapes with a hand crank crusher, and then they remove the stems. A few winemakers do not de-stem some red varieties like Pinot Noir because these varieties are naturally low in tannin content. But some care is needed here because stems can give wine a green, herbaceous taste.

Crusher/Stemmer

Commercial wineries and some advanced home winemakers use motor driven crusher/stemmers to process the grapes. A crusher/stemmer crushes the berries and removes the stems in one easy operation. The better machines have power driven augers to move the fruit along the hopper into the crushing mechanism. Operation of a good crusher/stemmer is quite simple. The grape clusters are dumped into the hopper, and the machine does the rest. Even the smallest machines can crush and de-stem large quantities of fruit in a short time. One person is kept busy just keeping the hopper full



Tip #1 Save Some Whole Clusters

Some winemakers retain 5 to 10% whole clusters when they plan to do extended fermentations in small, open fermenters. Late in an extended fermentation, most of the sugar will be gone and little carbon dioxide gas remains to protect the must from oxidation. Then, the winemaker

crushes a few of the whole grape clusters by hand each time the cap is punched down. **The small amount of added sugar produces a little more carbon dioxide and the CO_2 gas provides additional oxidation protection**.

Sulfur Dioxide

Small amounts of sulfur dioxide (SO_2) help winemakers control fermentations by deactivating the enzymes that cause browning and by suppressing unwanted microbes. Reasonable amounts of SO_2 will **not** kill wild yeast, but the added SO_2 can suppress wild yeast activity for several hours. Sulfur dioxide can also subdue most wine bacteria. Malolactic bacteria are sensitive to sulfur dioxide, so pre fermentation sulfur dioxide additions should be limited to 50 PPM or less if malolactic fermentation is desired later. Most winemakers add 30 to 50 PPM of SO_2 when red grapes are crushed.

Sulfur dioxide is more effective when it is added early and uniformly distributed throughout the must. Commercial wineries often have an SO_2 container and a metering pump mounted on the crusher and sulfur dioxide is automatically dispensed anytime grapes are going through the crusher. Home winemakers usually dissolve potassium metabisulfite powder in a small amount of water and small amounts of the sulfite solution are added as the grapes are crushed.

Tip #2 Removing Some Juice

Much of the flavor producing materials and all of the color pigmentation are in the grape skins, so the flavor and color intensity of red wines can be increased simply by removing 10 to 15 percent of the free run juice before fermentation is started. This process, called *saign*é (say-NAY), has been used in France for hundreds of years and **it is a very effective way of producing big red wines**. The excess juice can be added to a batch of blush wine.

MUST ADJUSTMENTS

Most winemakers start testing as soon as juice is available so they can make any needed must adjustments before fermentation is started. Sugar content (Brix), titratable acid (TA) and pH are the basic parameters measured.

Sugar Additions

Home winemakers are sometimes advised to add sugar when making "big" wines. But, adding sugar does not increase the flavor intensity, or improve the color, or improve weak varietal characteristics. The added sugar does raise the alcohol level, but the sugar does little else and the finished wine is often badly out of balance. Sugar additions may be satisfactory for making some kinds of fruit wines, but adding sugar is seldom advisable when making big red wines. Always try to get the best grapes available and make sure the grapes are ripe.

Tip #3 Acid additions

Tartaric and malic are the major acids in grapes. Citric and several other organic acids are also present in very small amounts. The tart taste of wine is directly related to the quantity of acids present. When a wine contains too much or too little acid, the wine will be out of balance and balance is particularly important in big red wines. Titratable acid is a measure of the sum of all the organic acids present in juice or wine and TA is measured by titration using calibrated sodium hydroxide. The end point can be determined with phenolphthalein solution or with a pH meter.

Most red grape varieties grown locally will be deficient in acid when fully ripe. So, winemakers often make significant acid additions and any large acid additions should be made before fermentation is started. Many winemakers prefer to adjust the titratable acid of red must to about 0.6% before starting the

fermentations, but some caution is needed here because estimating large acid additions accurately is difficult. Making a small second addition is much easier than trying to remove excess acid.

Alcohol adds body and a perception of sweetness in the finished wine. Acid produces tartness in the wine. Tannin produces bitterness and astringency. Acid and tannin act in a synergistic way and together, they produce harsh, rough tasting wines. Big red wines always contain lots of tannin; so **many winemakers keep the acid levels in their big red wines low to obtain better balanced wines.**

pH

Winemakers are always interested in pH because it provides information about how much sulfur dioxide will be needed to control microorganisms. Juices with low pH values (3.0 - 3.3) require little sulfur dioxide. Medium pH juices (3.4 - 3.6) require an average dose of SO_2 and high pH juices (3.7 - 4.1) require very large doses of SO_2 to control microbes. Paper strips are nearly worthless for measuring pH and a good pH meter is required for meaningful juice pH measurements.

Tip #4 Add Yeast Nutrients

Yeast needs nitrogen and an assortment of vitamins and minerals. Most grapes contain adequate quantities of these nutrients, but some vineyards consistently produce grapes deficient in a particular growth factor. A further complication is that high sugar levels are toxic to yeast. So, big red wine fermentations often start slowly and **they can be difficult to ferment to dryness unless extra nutrients for the yeast are added.** Many winemakers routinely add a little diammonium phosphate and a complete yeast food such as SuperFood to big red fermentations to supply a little extra nitrogen. All nutrients should be added with care. Excessive amounts can produce off-odors and other problems, so follow the directions supplied with the nutrient. Yeast sometimes produces hydrogen sulfide when the juice lacks *pantothenic acid*. So, many winemakers add tiny quantities (2 tablets per ton) of *pantothenic acid* to their fermentations. *Pantothenic acid* is a B-complex vitamin and can be purchased in any drug store.

STARTING FERMENTATION

Large differences exist in wine yeasts. The differences relate to speed of fermentation, color extraction, alcohol production, tendencies to stick, the quantity of foam generated, hydrogen sulfide production, etc. However, byproducts produced by yeast contribute little to the flavors of aged red wine.

Tip #5 Cold Soaking

Small producers often use the following procedure to increase the color and flavors of their red wines. First the grapes are crushed, and sulfur dioxide is added to help control bacteria and native yeast. Then plastic milk cartons fill with ice or blocks of dry-ice are added to cool down the must. The crushed grapes are held at the cold temperature for a time ranging from several hours to a couple of days. Then the crushed grapes are allowed to warm to room temperature and the must is inoculated with yeast. Significant quantities of color and flavors are extracted from the grape solids during the prolonged skin contact time. Tannin is more soluble in alcohol than water and juice contains no alcohol. So, **relatively little tannin is extracted during the cold soak period.**

Tip #6 Yeast

High Brix must is often difficult to ferment to dryness, so most winemakers use vigorous, alcohol tolerant yeast such as Prise de Mousse, Premier Cuvée, EC-1118, etc. when making red wines. Dry yeast should be hydrated at the temperature stated by the supplier. Many cells die if rehydration temperature is too warm or too cold, so use a thermometer. After rehydration, the yeast should be added to the must within 20-30 minutes. Yeast is very sensitive to temperature shock so rapid temperature changes of more

than fifteen degrees should always be avoided. **Warm yeast solutions should be tempered with two or three small additions of cold juice before the rehydrated yeast is added to the must.**

CONTROLLING EXTRACTION

Big red wines contain four or five grams per liter of phenolic compounds. Although this is a small quantity, phenolic compounds are among the most important red wine ingredients because phenols are responsible for wine color, some bouquet and flavor components, bitterness and astringency. The phenolic materials of greatest interest to winemakers are tannin and anthocyanin. Tannins are responsible for wine astringency and bitterness, and the color pigments are anthocyanins.

The phenolic materials in red wines come from the grape skins, seeds and the stems. The juice and pulp contain little phenolic material. Some phenolic compounds are more soluble than others and they are extracted from the grape solids quickly. Pigments and many flavor compounds are more soluble in water, and these materials are extracted earlier in a fermentation. Tannins are more soluble in alcohol than in water, so tannins are extracted later in the fermentation cycle when the alcohol level is high.

Here are a few general extraction rules. (1) About 90 percent of the total available color will be extracted in the first five or six days of fermentation. (2) The color intensity of the liquid will start to **decrease** after about eight days of skin contact time. (3) After 20 days of skin contact, the color will drop to about three fourths of the maximum value. (4) Tannins, on the other hand, continue to accumulate for 30-days or more.

Cap management

Bubbles of carbon dioxide gas are formed during active fermentation, and the bubbles stick to the grape skins. The bubbles make the skins more buoyant, and the skins float to the surface of the fermenting liquid. After a few hours, a thick layer of skins and pulp is formed. As the layer of skins rises, liquid slowly drains away. The "cap" of skins becomes dry and a dry cap can create problems. Some skins are no longer in the liquid, so color and flavor extraction decreases. In addition, vinegar bacteria can grow in the cap. The vinegar bacteria convert alcohol into acetic acid, and the acetic acid spoils the wine. So, winemakers prevent dry caps by periodically breaking up and submerging the cap.

Tip #7 Punch Down Often

Few home winemakers are equipped to handle batches much larger than a half-ton and a half-ton of grapes can easily be fermented in a 150-gallon container. Caps on fermentations done in these small containers are only a few inches thick so they can be managed easily by manually punching down with a suitable tool. Many winemakers punch the fermentation cap down twice a day. But, **several studies have shown that more color and more flavors are extracted when the cap is gently punched down several times each day**.

Skin Contact Time

Most of the phenolic materials in wine come from the grape skins, seeds and stems. Some phenolic compounds are more soluble in water. Others are more soluble in alcohol. Contrary to popular notion, a long skin contact does not produce a darker colored wine. Color pigments and some flavor compounds are quite soluble in water, and these materials are extracted early in the fermentation. Tannins are more soluble in alcohol so they are extracted later in the fermentation cycle when the alcohol level is

high. So, more than 90 percent of the available color is extracted in the first five or six days of fermentation and the color intensity starts to decrease after about eight days of skin contact time.

Deciding just when to press a red fermentation requires some judgment, so taste the wine. Sugar will mask the tannins, but the astringency can be detected with a little practice. Many red wines are fermented with 8 to 10 days of skin contact time. If the wine tastes too harsh, keep the astringent press wine separate and blend it back into the main batch as needed to produce a balanced wine.

Extended Maceration

Winemakers in Europe often leave the liquid in contact with the skins after fermentation is finished. When the sugar is gone, the tank is sealed and the fermentation is not disturbed for several weeks. These winemakers feel that extended maceration results in a wine with improved mouth feel. But, studies done at UC Davis have shown that under California conditions, extended maceration produces insignificant differences in wine composition or sensory properties.

PRESSING

The process used to separate the liquid from the grape solids is called pressing. Squeezing a small amount of juice from white grapes by hand is possible but a surprising amount of labor is required. A wine press of some sort is a practical necessity for making more than a gallon or two of white wine or juice yields will be very low. Pressing red fermentations is a different situation. As red grapes ferment, alcohol breaks down the cell tissue in the pulp and the juice is much easier to extract from the partially disintegrated pulp. So, red pomace is much easier to press than white grapes. Pressing a small, red fermentation by hand is relatively easy, and reasonable quantities of wine can be recovered without an excessive amount of labor.

Pressing Red Pomace by Hand

Home winemakers often use the following method for pressing red fermentations by hand. But this method is only suitable if the red grapes where well crushed before the fermentation was started. About 80 percent or so of the available liquid will be recovered.

(1) Obtain a **clean** plastic milk crate, and then cut a piece of 3/4-inch plywood to fit inside the milk crate (the wood should fit loosely).

(2) When fermentation is complete, let the cap rise overnight and carefully siphon off as much free run wine as possible.

(3) Place the milk crate on a **clean** 32-gallon plastic trash can or other suitable container and fold a double layer of plastic window screen material into the crate.

(4) Nearly fill the crate with the wet pomace and place the plywood on top.

(5) Press the pomace by hand and then place a weight on the plywood.

(6) Let the pomace drain for 10 minutes or so, then stir the pomace and repeat step #5 several times.

Tip #8 Using Basket Presses

Most home winemakers use vertical basket presses of some kind. Most of these little presses are designed to produce high pressures because high pressure can dry out the pomace quickly. But, too much pressure can also produce astringent and bitter wines. High press pressures are not desirable when making big red wines, so compound, ratchet presses must be used with care. The following procedure produces good results.

(1) Fill the basket with crushed fruit. Add the top plates, the blocks and the press head. **Place one hand on the handle** and apply a small amount of pressure until a steady flow of juice is produced.
(2) When the flow almost stops, increase the pressure by a small amount and wait again. Large amounts of foam between the basket slats will oxidize the juice, and the foam is an indication that pressure is being applied too rapidly.
(3) Continue increasing the pressure in steps until little more liquid can be obtained.
(4) Disassemble the press by removing the press head, blocks, top plates and the basket.
(5) Remove the pomace cake from the press. Place the pomace in a shallow container or on a clean concrete floor and crumble the cake with a shovel.
(6) Replace the basket on the press. Fill the basket, reassemble the press and start the next pressing cycle.

Depending on the variety of the grapes, about 150 gallons of high quality juice can be produced from a ton of grapes using these procedures. But, the pomace cake must be crumbled several times to produce 150 gallons of liquid and much labor is required to break down the press and crumble the pomace. Labor is expensive, so most commercial wineries no longer use vertical basket presses. Instead, they use horizontal presses because horizontal machines can crumble the pomace cake automatically. So instead of using high pressures and two or three press cycles, modern horizontal winepresses use low pressures and many press cycles to produce 160 to 180 gallons of high quality juice from a ton of fruit.

Racking

The new red wine should be racked a couple of times in the first three months or so. The first racking should be done a couple of weeks after the sugar fermentation is complete and the wine should be splash-racked at this time to get lots of air into the wine. The second racking should be done after ML fermentation has completed and a small amount of splashing may be beneficial at this time.

Malolactic Fermentation

Malic acid in the grapes is converted into lactic acid during this secondary fermentation and the necessary enzymes are produced by bacteria rather than by yeast. Several different types of bacteria can produce malolactic fermentation (MLF), and these bacteria are called lactic bacteria. Lactic acid is weaker than malic acid, so malolactic fermentation reduces the overall acidity of the wine. In addition, the lactic acid bacteria can produce byproducts such as diacetyl that can make positive contributions to the complexity of the wine.

Fining/Filtering

Many home winemakers try to avoid fining or filtering their red wines. Microbial stability should not be an issue if (1) all the sugar is gone and (2) if the wine has completed malolactic fermentation. Even so, fining to reduce astringency is sometimes needed. Protein fining materials such as egg whites, casein or gelatin are the commonly used materials. Any of these fining materials can strip desirable color and flavors, so trials should always be done on a small quantity of wine before adding any fining material to the whole batch.

Bulk aging

Red wines contain lots of tannin, and aging these wines in bulk storage containers for a year or so helps smooth out the rough tannins. New oak barrels are expensive so many home winemakers use older, neutral barrels costing $25 to $50. Loose oak chips can be added directly to neutral barrels to enhance

wine flavors. The chips will float for several days and then sink to the bottom of the barrel. Red wines can also be bulk aged in glass, plastic or stainless steel containers. However, wine stored in these inert containers should be racked more often to periodically introduce small amounts of oxygen. Loose oak chips can also be used in inert containers. All bulk wine containers must be kept full or the wine will oxidize.

Bottling

The free sulfur dioxide (SO_2) content and the pH of the wine should be measured a few days before bottling time, and the sulfur dioxide content should be raised to 0.8 milligrams of **molecular** sulfur dioxide per liter of wine. If a pH meter is not available, the free SO_2 should be raised to about 30 milligrams per liter. The proper level of SO_2 is important, and bottling wine with less than 30 milligrams per liter of free sulfur dioxide will result in a short-lived product.

Wine is always exposed to a significant amount of air when the bottle is filled, so some type of bottle filler should be used to minimize wine oxidation. Many home winemakers use a plastic hose fitted with plastic, wand-type bottle filler to fill bottles. These fillers are designed with a small valve on the end of a rigid plastic tube. The plastic tube is placed in the empty bottle and the valve opens when it contacts the bottom of the bottle. Wine begins to flow when the valve opens, and the bottle is filled from the bottom. Little splashing occurs when filling is done slowly, and wine oxidation is held to a minimum.

Small, gravity type bottle fillers can be purchased for about one hundred dollars, and these little fillers are very convenient when several cases of wine are bottled at one time. These gravity fillers consist of a small tank to hold the wine, a float valve assembly that keeps the wine in the tank at a constant level and the filler spouts. The filler tank is kept full by siphoning from a bulk storage container.

Tip #9 Bottle Age Longer

Light bodied red wines can develop a bottle bouquet quickly and six months of bottle time may be enough for these wines. However, big red wines need more bottle aging to allow the wine to smooth out and develop a bigger bottle bouquet. **Two or more years of bottle aging are common for high quality big red wines.**