PRESQUE ISLE
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Acid Reduction in Juice & Wine

Musts with total acidity (expressed as tartaric acid) above 1.2% may produce wines too high in acidity for most people to enjoy. Such musts will benefit from either the addition of water to dilute the acidity (added as a 20% sugar solution before fermentation) or by chemical reduction of acidity with calcium carbonate or potassium bicarbonate. Amelioration with sugar and water is preferred where you can have high flavor intensity (especially with eastern varieties such as Concord, Catawba, Niagara and Delaware), but are not concerned with body. The amount of reduction will be approximately the percent of volume increase (ie. 1 gallon added to 9 gallons juice = 1/9 or 0.11% reduction).
Some natural reduction in acidity occurs during fermentation when about 10 to 25% of the malic acid is lost and during cold stabilization when tartrates precipitate. Typically, the reduction in acidity will be 0.1 to 0.2% from these causes. There will be an even greater drop if a malolactic bacterial fermentation occurs when a reduction of 0.2 to 0.5% will normally result. Such a fermentation will be desirable with most reds, but not with fresh, fruity whites.

Tartaric Acid Retention when using Calcium Carbonate to reduce TA (total acid):

Calcium carbonate will react with both tartaric and malic acids when used to reduce acidity in grape wines, but it reacts more rapidly with tartaric acid. It is desirable to retain as much tartaric acid as possible because it is more stable and because it buffers to a lower pH level. Reduction with calcium carbonate also raises the pH dramatically; try to keep the pH below 3.5.

1. Using calcium carbonate at the rate of **2.4 grams per gallon will reduce total acidity by 0.1%**. We offer the caveat that you **must do bench tests** if you plan to drop acidity more than about 0.2% because of the risks of getting the pH too high and picking up a `salty metallic' character in the wine.

2. How to determine the amount of calcium carbonate (CC) you will use on the batch to be treated: For example, you have 55 gallons of wine at 0.9% TA and want to drop the acidity by 0.1% you calculate as follows: 55 [volume to be treated] x 0.1 [percent of acidity to be reduced] x 10 [number of tenths of a percent to be dropped] x 2.4 [grams CC to reduce one gallon by 0.1%] = **132 grams**. If you wish to reduce the acidity by 0.15% then the formula would be 55 gallons x 0.15 x 10 x 2.4 = 198 grams. Record this amount!

3. Next, you need to calculate how many gallons of the batch are needed so the carbonates reduce all the acid in that fraction. To further our example, if the titratable acidity of the wine (or juice) is 0.9% (parts per hundred) then you calculate the grams of calcium carbonate needed to neutralize all the acid in a gallon. The calculation would be 0.9 (TA) x 10 (tenths) x 2.4 grams = **21.6 grams** of calcium carbonate needed to neutralize all the acid in one gallon.

4. Then, the total number of gallons needed to add the calcium carbonate to is the number of grams of acid for the entire batch divided by the number of grams needed to neutralize one gallon. 132 grams/21.6 grams per gallon = 6.11 gallons (of the 55 gal batch in our example).

5. Add the total # of calcium carbonate grams to the 6.11 gal of wine to be treated being careful to have enough room to handle the reaction of foaming. Don't be concerned with what happens to the color of the treated wine; it may look off but will be fine when it is added back to the rest of the batch. After thirty (30) minutes the treated batch should be added back to the larger lot. In our example, add the 6.11 gallons back to the 48.89 gallons for complete acid reduction.

6. The wine should be cold stabilized at some point after treatment to reduce the risk of calcium malate or potassium tartrate crystals in the bottled wine.

7. Calcium ions may affect the flavor of the wine for several months after the treatment so don't use it close to the time the wine will be consumed!

SUMMARY OF CALCULATIONS:
1. Number of grams of calcium carbonated needed = **size of batch in gallons x percent drop in acidity desired x 10 x 2.4**

2. Number of grams of calcium carbonate needed to completely neutralize the acid in one gallon of wine at different acidity levels = **TA% x 10 x 2.4.** Some helpful calculations:

Titratable Acidity	**Grams $CaCO_3$ Needed/Gal**	**Titratable Acidity**	**Grams$CaCO_3$ Needed/Gal**
0.80	**19.2**	**1.25**	**30.0**
0.85	**20.4**	**1.30**	**31.2**
0.90	**21.6**	**1.35**	**32.4**
0.95	**22.8**	**1.40**	**33.6**
1.00	**24.0**	**1.45**	**34.8**
1.05	**25.2**	**1.50**	**36.0**
1.10	**26.4**	**1.55**	**37.2**
1.15	**27.6**	**1.60**	**38.4**
1.20	**28.8**	**1.65**	**39.6**

3. Number of gallons of wine needed to get total neutralization of the acids =
Number of grams for total batch ÷ number of grams needed for one gallon = number of gallons of wine needed to achieve total neutralization of acidity.

If you have both high acid and high pH you may have to add tartaric acid (to lower pH even though it increases acid) at a rate of up to 4.5 grams per gallon before you treat with calcium carbonate. Afterwards, you must cold stabilize to reduce acidity.

Acid reduction using Potassium Bicarbonate

The addition of 3.4 grams of potassium bicarbonate per gallon will reduce acidity by 0.1%. This material may be added immediately before drinking and cold stabilizes more easily than a wine treated with calcium carbonate but has the disadvantage of raising the pH more. A reduction of about 0.25% is a practical maximum. About 70 to 75% of the acid reduction will occur immediately and the remainder during cold stabilization. A salty or bitter taste will be evident in the wine from the potassium ions when used at the upper levels. Potassium carbonate may also be used, but most of the research indicates a preference for using potassium bicarbonate. You will get foaming when it is used because of the CO_2 released.

It is possible to use a combination of acid reduction methods but remember that you cannot combine both calcium and potassium carbonate or bicarbonate treatments without considering the effect of whichever one you used first. In other words, you cannot take a 0.4% reduction with calcium carbonate and then a 0.2% reduction with potassium bicarbonate – use of one precludes the other.

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