

Freeze Fractionating Grape and Fruit Juices for the Production of Ice-style Wines

by John Tummon – K-W Winemakers Guild – June 1999

Freeze fractionating or cryo concentrating has been used for decades to increase the concentration of grape juice and musts. It has also been used to produce ice-style wines from grapes. In Canada, wineries cannot call these wines ice-wine nor can they receive VQA recognition.

When we freeze fractionate fruit juice, we have the luxury of being able to choose our starting brix. The type of fruit and the intensity of the fruit should probably determine what brix level that you will want to achieve. The most popular fruits, so far, appear to be apple and pear, which are relatively mild tasting so I would recommend that the starting brix be between 38 and 44. If however you were to start with a more intensely flavored fruit juice or if you wish to make a dessert style wine, your starting brix could be lower. In Canada, ice wine juice must have a starting brix of at least 38, but they commonly range from 38 to nearly 50.

The acid level of your juice can also determine what your final brix will be. Freeze fractionating concentrates the acid as well as the sugar. High acid fruit juices such as sour cherry or even peach should be freeze fractionated to lower brix levels in order to have a balanced wine. Unlike grape juice, fruit juice contains little tartaric acid so fermentation and cold stabilizing will not significantly lower the acid level.

Your yield will depend on the starting brix of your fruit juice and the brix level that you are trying to achieve. Your final volume should be between 15% and 30%.

How do we get 40 brix or higher out of a juice with only 5% sugar? We start by freezing the juice in 5-gallon pails. Sulfite the juice to 25 PPM and put into pails only 2/3 full to allow for expansion. Make sure you use a freezer with a very low temperature and leave for a minimum of 4 days.

If I have a small number of pails, I remove them from the freezer and drill a series of hole in the lids near the edge. Save these lids and use them again next year. I then invert the pail and place it on an angle with the holes down into another pail. You may want to provide some sort of support so that it does not fall over. If I have a larger number of pails, I use a large plastic primary fermenter with a spigot. I simply dump the blocks of ice into this large vessel and open the spigot. Some wineries pile the blocks of ice like pyramids on top of stainless steel drip tables.

At what temperature do we now melt or fractionate our block of ice? This is a tough question because I have tasted medal winning dessert wines that were done at 20 C and at ?5 C.

I believe that if you are trying to achieve brix levels of 40 or higher that it is best to fractionate at or slightly above freezing. This is even more important if we are fractionating juices with relatively low sugar levels.

The first juice to come off will have very high brix that will be difficult if not impossible to measure, but this will eventually begin to fall. Stir this juice and keep measuring the brix. With one pail at 2 or 3 C the process may take 24 to 48 hours before the brix of the freeze fractionated juice drops to your desired level. The juice dripping out now may in fact have a brix level of 30 or lower. You can continue to catch this juice until this second batch of freeze fractionated juice drops to 15 brix. Refreeze this second batch and go through the same process.

When measuring the specific gravity there are several potential sources of error. The freeze-fractionated juice will be stratified. In other words the stuff on the bottom will be a lot denser than the

stuff on the top so make sure that you mix well before measuring. In addition this liquid is very cold and your readings will be high. Either warm it up or compensate. If you do not have a hydrometer that goes to 40 brix or higher, you will have to dilute your sample by adding an equal volume of water. You will then double your measurement.

Once you have your juice at the desired brix level, you should add pectic enzyme and cold settle to clean up the juice as much as possible. Freeze fractionation produces a lot of solids and a pretty muddy-looking juice. Sulfite levels should not exceed 40 or 50-PPM because the yeasts that you will use have a rough enough time with the sugar. They do not need the added stress of high sulfite levels.

You may need to adjust your acid level, but freeze fractionating concentrates the acid as well. The acid level needs to be very high in order to produce a balanced wine. Normally, final TA would be between 12 and 18 grams/liter. I have had good success with both R2 and Epernay II yeasts. It is tough to get them going so you may wish to use a yeast starter made with some freeze fractionated juice that is less than 30 brix. These yeasts are easy to control and can be stopped at your desired alcohol level. Use yeast nutrient in both the starter and the ice wine juice.

As stated, the high sugar level of an ice wine must be very stressful on these yeasts. Add about 10% alcohol and they are pretty well ready to give up. I would recommend fermenting relatively cold but not lower than 50F or you may get a stuck fermentation. Once I have about 8 or 9 % alcohol, I will move the wine into a slightly warmer area to finish. Fermentation will be very slow and should take several months. In Canada, the alcohol content of commercial ice wines range from 9 % to 12% with 10 % being the most common. German ice wines are traditionally even lower. Some are as low as 6%.

When I am ready to stop fermentation, I add sulfite to 80-PPM and put it in my refrigerator at around freezing for several days. You should be able to use lower sulfite levels but I have a problem with malo-lactic fermentation in my basement and I am concerned about oxidation.

There are several areas where faults can develop. Oxidation can be a problem due to the extended exposure to air at cold temperatures. If the juice is muddy and fermentation is very long, off flavors can develop, so start with a clean juice and rack as necessary. Freeze fractionating concentrates bitter tannins so it is important to start with a clean juice that has had minimal contact with skins, pits and seeds. Vigorous yeast varieties can produce too much alcohol and make fermentation difficult to stop.

Editor's Note: Brix is a measurement of percentage of sugar by weight, not by volume. Most hand held refractometers have an upper limit of 32 Brix. In order to get an accurate measurement of the Brix level of a juice that is over 32 Brix, it is necessary to dilute the sample with an equal weight of water (which is more than an equal volume of water) and then double the result.