



Northern Shrub Fruit

Applications for Wine

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Tongue River Vineyard

& Winery

Miles City, Montana



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Tongue River Vineyard & Winery LLC



(c) Bob Thelen, Tongue River Winery

Who says fruit wine isn't real wine?!



(c) Bob Thaden, Tongue River Winery

Can it be award winning?



Some basic questions:

1. Are you growing fruit now?
2. If so, what kinds of fruit?
3. Why do you want to grow fruit?
4. How much do you want to grow (hobby, commercial)
5. What is the proposed use of your fruit?
6. If commercial, who are the potential buyer(s)?
7. Have you contacted them to see what they want?
8. What ripeness parameters do they want from you?

Conditions Necessary for Shrub Fruits:

WATER



- Adequate, decent water is a must.
- Check water pH
- Water filter needed?
- Water volume
- Water rights
- Drainage/penetration
- Drip irrigation is best

How to determine drip volume

1. How many seconds to fill 5 gallon bucket?
Ex: 10 seconds = 30 gal/minute = 1800 gallons/hour.
2. How is your ram tubing rated?
3. How close are your emitters?
4. Back pressure loss estimate (I use 65% efficiency).

Example: We use ram tubing with emitters every 24 inches, rated at .9 gal/hour. How many vineyard feet can we water?

Answer: Assuming 65% efficiency, 1170 gallons/hour.

At 2-foot spacing, $2340 \text{ feet} / .9 = 2600 \text{ feet of row}$.

Other Conditions: Summer Heat

Season Length

<http://www.greencastonline.com/growing-degree-days/home> Greencast by syngenta.
Calculate average over last 10 years.

Spearfish example:

2017: Ap 29th 26°F: Day 119

Oct 4th 28° F: Day 277

Season length: 277-119 = 158 days.

GDD base 50° F = 2336 GDD.

Spearfish GDD:

(Apr 1- Oct 31)

2017: 2336 GDD

2016: 2436

2015: 2119

2014: 1934

Apr 17: 24° F

Sept 12: 26° F

BUT: Actual 2014 values:

148 ff days, GDD 1632.

Always adjust for ACTUAL.

How Much Heat do I need?

Hybrid grapes: approx
2200 GDD for full ripeness
and hardening off.

Cherries? Much less

Haskaps: Less yet.

Select fruits based on your
season length and amount
of heat. If you have a
short season/early
ripening varieties, use
short season varieties.

Also pay attention to
spring frost sensitivity.

Soil Conditions

Soil Type

Many plants have specific best practices for soil type.

E.g. Rhubarb likes deeply worked well-manured soils.

You can test easily with a canning jar and water.

Take representative sample of soil about half full in jar. Fill jar almost full and shake vigorously. Let stand a day or two.

TOP: organic matter floating

Near Top: Clay

Middle: Silt

Bottom: Sand

This is an easy estimation of soil granularity.

Soil pH & Nutrition

Soil pH

Most fruiting shrubs like a pH between 6.5 and 7. However many berry plants prefer much more acidic soil.

High pH soils (7.5-8+) have difficulty with iron uptake. Sulfur can be added.

Low pH soils can be amended with lime. All soils benefit from compost.

Soil Nutrition

Good soil tests are necessary.

Tissue tests can tell you what nutrients actually got into the plants.

Protection from Critters: Fencing

We use polypropylene black plastic fencing, heavyweight. (165 ft/roll x 7.5 feet— 35 lbs.) Don't buy the 330-ft lighter weight fencing. Posts every 15-20 feet. Attached with bent nails. We run H-braces in corners, high-tension 12 ½ gauge wire along top attached with H-curves. The bottom 6" is turned out and is secured with steel 12" tent stakes, or old posts.

Tizer Gardens in Jefferson City, MT is best source for us. Approx. \$2000-\$3000/acre. Without fencing in deer country, you don't have a chance!



Protection From Critters: Netting



There is nothing more beautiful than a vineyard or shrub-orchard covered with birdnetting...a quiet, bird-free sanctuary where you are free to prune, sample, train, harvest without removing nets! Ours are 260 feet long (over a 250 ft long vineyard), 50 foot wide sections snapped together with C-Clips.

Pests: Robins & hornworms



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Insect Pests

- Grape Cane borers
- 8 spotted Foresters
- Sphinx moth larvae
- *Drosophila* (moisture loving)

Several thousand species. One to be concerned about is *Drosophila suzuki*, the spotted wing drosophila.



Cottontail rabbits!



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Hardy Northern Fruits

- Amelanchier Juneberry
- Aronia Chokeberry
- Lonicera Haskap/Honeyberry
- Malus Apple
- Prunus Stone fruits
- Ribes Currants/Gooseberries
- Rosa Rose
- Rubus Bramble fruits
- Sambucus Elderberry
- *And of course, Grapes!!*

Amelanchier: Juneberries

- **Taste**— mild blueberry, with hint of apple and almond
- **Soil**— tolerant of high pH soils; wants plenty of water during fruiting.
- **Culture**— rich soil, heavy mulch
- **Uses**— Make delicious pies. Related to roses and apples. Some people make wine from them.
- **Pests**— Birds!



Juneberries, sarvisberries, serviceberries, saskatoons. Very hardy. Many named varieties.

Juneberries ripening



Aronia Melanocarpa: chokeberry

- High Tannins
- Very high antioxidants
- Hardy to -40°. Good yields.
- Can make awful wine....
- Can make great wine!
- Can tolerate many conditions.
- Raw press, ferment on skins.
- Written up in several NIH reports on health benefits
- Nero, Viking, McKenzie.
- Evidence that these are crossed with Mountain Ash.
- Now called Photinia melanocarpa.

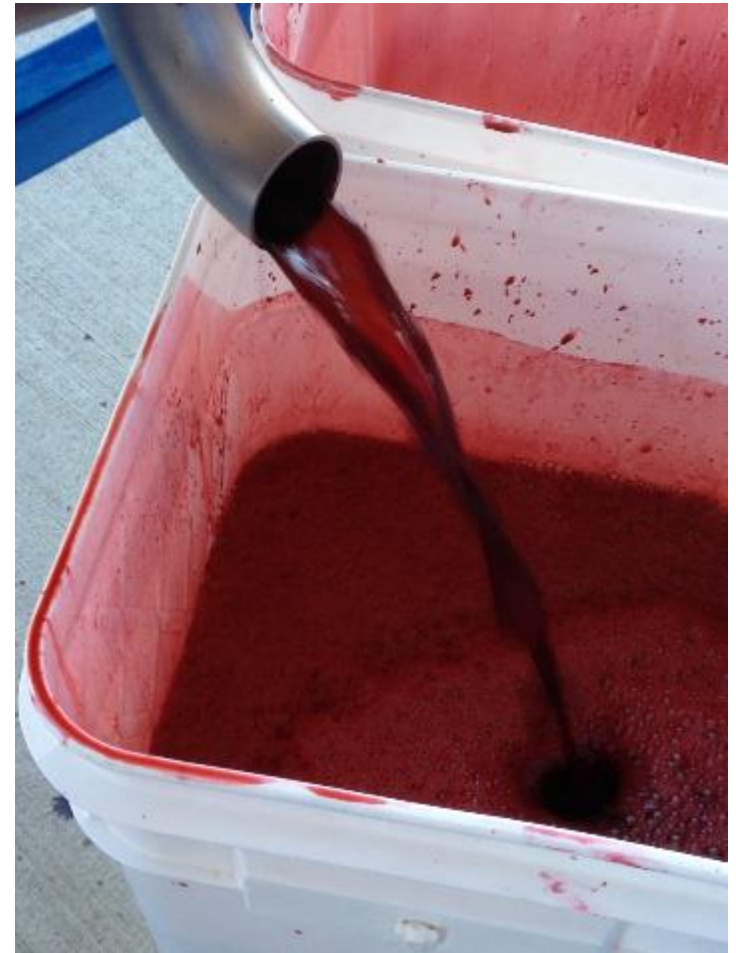


Shrub; 8 x 8 planting. Organically enriched soil, plenty of moisture. Generally, birds won't touch until everything else is gone. Native to eastern US, but popularized in Russia and Poland.

First Press of Aronia



Pressed. Then water added equal to juice pressed. Soaked overnight and pressed again. Notice how pigmented this first press is.



Aronia



(c) Bob Thaden, Tongue River Winery

Lonicera (Haskap/Honeyberry)



Taste—blueberry, raspberry, strawberry

Culture—pH tolerant, hugely hardy; early ripening.

Seeds—almost invisible

Uses—wine, juice, jelly, jam, ice cream

Haskap in Blossom, May 3 2011



Borealis Haskap fruit



- **Borealis released about 2010.**
- **Newer varieties available next year. (bigger, taller, great flavor.)**
Boreal beauty,
boreal beast,
boreal blizzard.

Malus (apples)

**Persistent
Crabs make
great Ice
Wine!**

**Russet apples
are generally
best for cider.**



Prunus—Cherries



- **Carmine Jewel from Univ. Saskatchewan.**
- **Hardy to -50°F**
- **Acid of a pie cherry**
- **Sugar of a table cherry**
- **Big enough to pit**
- **Excellent wine!**
- **6 feet tall, 25 lb/plant.**

Carmine Jewel fully ripe



- **Carmine Jewel should be almost black when picked.**
- **Will hang a long time with netting.**

Carmine Jewel, Aug 22nd



- **Pick these cherries as late as you dare to reduce acids and increase sugars.**

Chokecherries



Most chokecherries are almost black. About 10-15% of Black Hills chokecherries are red.

12/13/2018



Yellow chokecherries are rare but do happen. They are difficult to locate for planting.

Sand Cherries



- Available from Conservation Districts.
- Tannic!
- Black Cherry flavor.
- Not for fresh eating.
- Beautiful spring blossoms.
- Hardy as all get out!

Prunus: Plums

- **More pulp than juice**
- **Acidic**
- **Great semi-sweet wine**
- **Best pancake syrup!**
- **Lovely for a sweet/sour sauce.**
- **Incredible jam with wild plums, but tedious!**



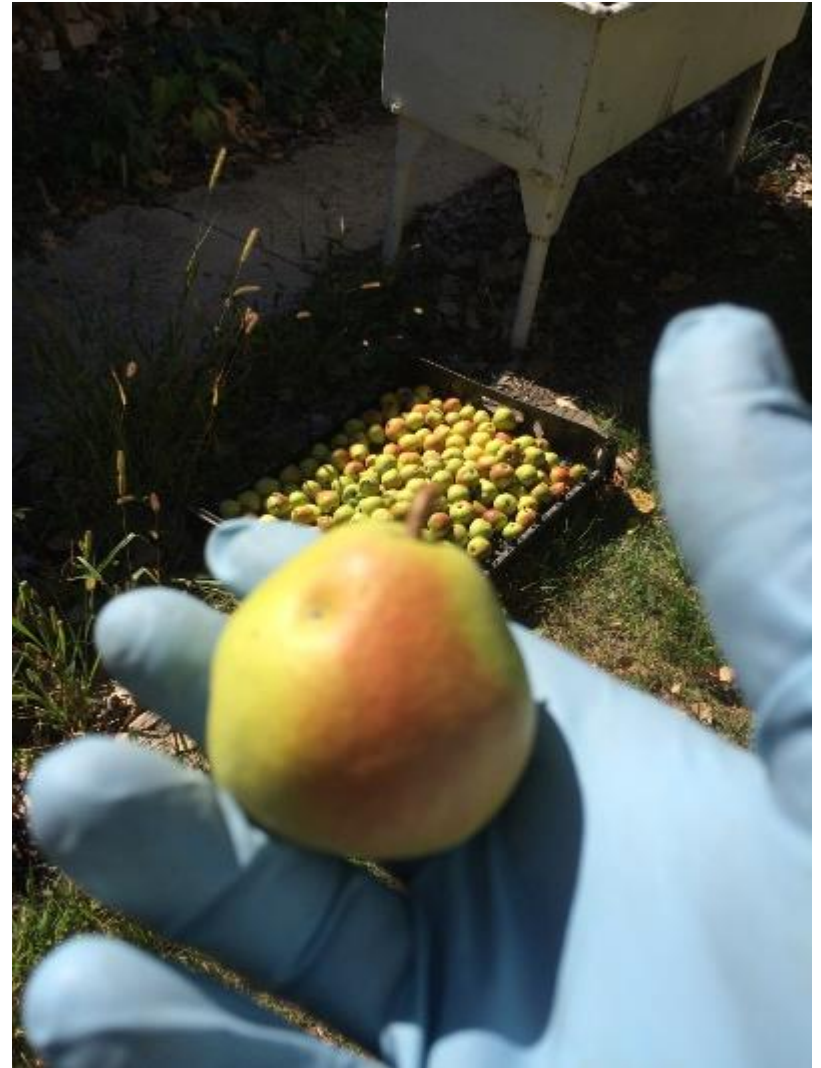
The suspended solids in plum wine are considerable. Bentonite fining plus lots of time is the best solution.

Pyrus calleryana (Pears)



- **Golden Spice Pears make a rich, crisp wine.**
- **Novas are great table pears. Both very hardy.**

Golden Spice Pears



(c) Bob Thaden, Tongue River Winery

290 lbs of pears!



(c) Bob Thaden, Tongue River Winery

Shredding Pears



- We use a Mulimax apple shredder for apples and pears.
- Approx. \$1500
- Approx 1 bushel/minute
- Ferment on pulp
- Press at 6-8° brix
- Finish dry or semi-sweet

Ribes (currants, gooseberries)



**Currants come in
black, red and white.**

Red Currants



(c) Bob Thaden, Tongue River Winery

Rosa Rugosa hips



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Rosa (especially rugosa)

- Rose hips after frost have a strawberry-like flavor, lots of vitamin C and make a very tannic wine!
- Rugosa varieties have largest hips.



Rubus (bramble fruits)



- **Josh prepping planting rows for Anne Yellow Primocane Raspberries in a high tunnel.**

Prepping Raspberry Soil



- Elemental sulfur to drive down pH.
- Aged manure compost
- Peat moss to add humus and lower pH.
- Use ammonium sulfate for Nitrogen in high pH soils.

Raspberries/Blackberries

Floricanes Varieties:

- Fruit on second year canes.
- Consequently fruit earlier.
- But...summer heat.
- Need to prune out floricanes after fruiting.

Primocane Varieties:

- Fruit on current year canes.
- Fruit later (good/bad)
- Fruit in cool fall (better)
- Can simply mow off in fall or spring.
- CAN take 2 crops if treated like Floricane.

Planting Prep for brambles

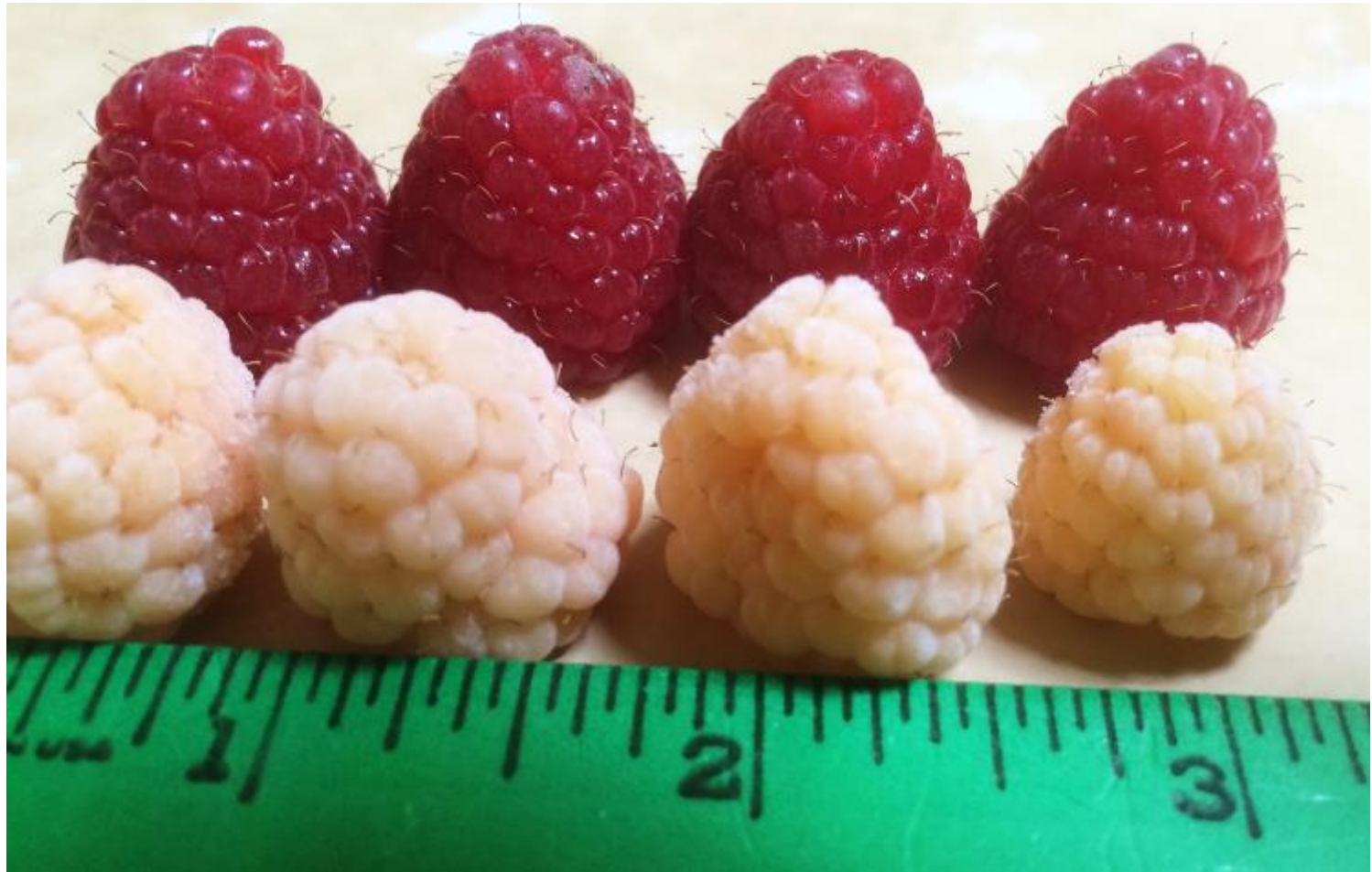


- **Dormant Anne canes soaking before planting.**
- **Keep roots moist!**

First Crop (year planted!)



Joan J reds, Anne yellows



Pressing raspberry wine



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The old fashioned way!



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Rhubarb



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Rhubarb in process



(c) Bob Thaden, Tongue River Winery

Sambucus (elderberry)



Elderberries are plenty hardy and productive. They make a decent jelly. But for wine? Why bother!! I've tried cooking, steaming, raw pressing, still don't like it!

Destemming Elderberries



Not a fruit, but it's out there and
you're lovin' it!



(c) Bob Thaden, Tongue River Winery

And of course, Grapes!



↑ Somerset Seedless above
← La Crescent

The Frontenacs: Gris, Blanc & Noir



Swenson Red, Petite Pearl



**Photo above by Tom Plocher,
Breeder of Petite Pearl**

Winter damage, Dec 2013



- We had total dieback in 2014 except Frontenacs.
- Then late spring frost took out the buds of all three Frontenac cultivars.
- Total 2014 loss.
- 9600 lbs in 2013!
- 12,025 lbs in 2017!

Importance of Pruning



- VSP trained
Marquette in July
- Right: Pruned and tucked
- Left: unpruned
- Don't forget lateral thinning
- Note weed control in row.

Mutations can happen



- Frontenac blanc mutation on Frontenac gris cluster.
- We've had three Frontenac mutations at Tongue River Vineyard
- Probably just color, but..
- Could be other characteristics too.
- We have our own Front noir sports from gris.

Main Harvest: Marquette grape



(c) Bob Thaden, Tongue River Winery

The Harvest!



This is what we wait for!



Serve to Satisfied Customers



Fruits Bob doesn't like for wine

- Elderberry. I've tried making several wines. I don't like any of them. Maybe if the bottles sit 10 years!
- Juneberry. It seems too mild to us.
- Crandall's black currant (native). Insipid and bitter. Any European black is better.
- Cooked fruits. We always prefer raw.

Fruits Bob does like for wine

- Red Raspberries
- Sour Cherries
- Rhubarb
- Chokecherry
- Apple
- Pear, esp golden spice
- Plums
- Currants (black, red)

Exotics: Exotics help you attract heightened interest.

Haskaps

Aronia

Yellow Raspberries

Yellow Chokecherries

Red Chokecherries

Sand Cherries

Rosehips

Blackberries (won't grow here, but...)

Have Passion for your craft!



Some favorite sources for fruits

- Nourse Farms
- Double A Vineyards
- Honeyberry USA
- NE Vine Supply
- Conservation District for seedlings
- Hartmanns
- Burnt Ridge Orchards

Some favorite sources for other stuff

- MDT & Associates
 - Berry Hill Drip
 - Boelter Company (wine glasses)
 - Color Label Solutions (label printers)
 - Davison Winery Supply (drip ram tubing)
 - Ganau America (corks)
 - GW Kent (winery hardware)
 - ST Pats (tanks, pumps, etc.)
 - LD Carlson (chemicals)
 - Scott Labs (yeast, nutrients, etc.)
 - Presque Isle Wine (chemicals, winery tools, etc.)
 - Pro-Pack Solutions (label applicators for wine bottles)
 - Smart-Net Systems (full overhead bird netting)
 - Spartan Packaging (tapered nesting primary HDPE drum fermenters)
 - Tizer Lakes Distributing (black poly deer fencing)
 - www.unionjackstable.com Pricey brushes specifically for food industry.
 - VinMetrica (We love their simple, relatively low cost test equipment.)
 - www.webs.com (not web.com) Inexpensive web-hosting and domain hosting company.
-
- **END!**

True Ice Wines

For True Ice Wines,

1. the fruit must be frozen when picked. (Cryoextracted.)
2. The fruit must be frozen when pressed.
3. No added sugar or water.
4. Starting brix at least 35° brix.
5. Alcohol between 7-13%.



False Ice Wines

False Ice Wines can be cryoextracted and also be Cryoconcentrated. Here are the steps:

1. Press frozen fruit to approx. 25-30° brix.
2. Continue pressing in a different plastic carboy until the bucket is at 15-20° brix.
3. Press further down to about 8° brix in a third container.
4. Freeze 2nd and 3rd carboys (with headspace!) solid.
5. Invert carboys over bucket and let drip to desired brix level. This is cryo-concentration.
6. Add to original concentrate!

Notice that the right bucket is almost fully extracted, the middle is almost done and the left bucket still has plenty of flavor to extract.



FALSE ICE WINES

- Why a False Ice Wine?

1. Cannot label it Ice Wine commercially, but can call it “Apple Frost”, “Chilled Apple”, “Frosted Apple” etc.
2. Can pick fruit “not frozen” and freeze any way you can do it.
3. Can add sugar for fermenting and sweetening.
4. This is the only way to make an ice-style wine with many fruits, because they won’t hang on the plant after the first hard frost or they ripen way before any frosts (like strawberries).
5. **REMEMBER**: Everything is concentrated: sugars, acids, flavors and aromas. IT IS INTENSE!

Blending Fruits for Flavor

- Mild fruits can be used as a 'carrier' or extender for more intense fruits in a blend.
- —for example, 30% raspberry, 70% apple.
- These can be blended before or after ferment. After is better, so proportions can be varied.

Blending for other reasons

- Tannin addition: the previous blend could be better as 30% raspberry, 65% apple, 5% rosehip for tannin.
- Acid balancing. A weak acid fruit (juneberries) could be blended with an acidic fruit (lemon is the classic).
- Body: an intense fruit like raspberry might benefit from 20-30% white grape wine.

Wine Intensity

- Wine body and flavor can be intensified by using less water. Less water increases flavor, aroma, acidity, brix, etc.
 - For example, apple WINE sometimes has added water.
 - Apple CIDER typically is 100% juice.
 - Apple ICE WINE has ***removed*** water. Water can be removed by cryoextraction or cryoconcentration. We'll return to those terms in a while.

Fruit Recipe Issues

- Generally speaking, dissolved solids in juice/must is almost all sugar,
- thus ° brix = % sugar. Generally aim at 12.5% alcohol (22-23° starting brix).
- Aim at good balance of fruit to water (3-6 lbs of fruit/gallon of water.) If too much, wine will have overwhelming fruit flavors. If too little, wine will taste thin.
- Test for pH, and aim at somewhere between 3.2 and 3.6 pH. Keep the sweeter wines to the lower end of this range. High pH wines taste flabby. Low pH wines are sharp. High pH wines don't keep as well and require more sulfite.
- Enological tannins can add structure to wine. Tannin-free wines are kind of like fruit juice with vodka! We add tannins to every wine.

Fruit Recipe Issues Continued

- Always start yeast with yeast hydration supplement and use yeast nutrient at 1/3 and 2/3 fermentation, especially with over-ripe or damaged fruit. Many fruits are low in nitrogen and can result in a stalled ferment or worse— hydrogen sulfide.
- Always treat with sulfite at the finish of fermentation. (measure brix with hydrometer.)
- Consider whether to add oak chips, staves or barrel age. Barrels give wonderful micro-oxidation and softening but can become infected with brettanomyces.

SWEET WINES

The Biggest danger is fermentation in the bottle. There are two practical ways to make a sweet wine:

1. Bottle dry. Sweeten just before serving. This avoids all of the worst complications with sweet wines.

Bottle sweet:

1. After 2-3 rackings (with or without fining), sterile filter to .45 microns. Use nominal rated cartridges first, and then an absolute filter cartridge. Test for Free SO₂. Test for pH.
2. Add META to reach the recommended dosage for Free SO₂ to reach .8 ppm Molecular SO₂. Here's a useful chart:

2. The numbers listed represent the ppm of free sulfite necessary to reach a safe level of molecular sulfite. We use FermCalc for all of our winemaking calculations because it's free, simple & accurate.

	Whites	Reds
pH	.8 Molecular	.5 Molecular
2.9	11 ppm	7 ppm
3.0	13 ppm	8 ppm
3.1	16 ppm	10 ppm
3.2	21 ppm	13 ppm
3.3	26 ppm	16 ppm
3.4	32 ppm	20 ppm
3.5	40 ppm	25 ppm
3.6	50 ppm	31 ppm
3.7	63 ppm	39 ppm

Fermcalc for Preparing Must:

Chaptalizing a must to achieve desired potential alcohol

EXAMPLE: You have 5 gallons of rich fresh pressed apple cider at 7° brix and want to have 10 gallons of must at a brix of 22°, which will give right around 11.5% alcohol to the finished wine. How much water and sugar do you need to add?

Use the second calculation type and enter your figures.

Result suggests you need to add 3.75 gallons of water and 17 lbs of sugar.

BUT: using Fermcalc, create a small test batch:

5 ozs juice 3.75 oz water 60.3 gm sugar

Add malic acid to 3.2 to 3.6 pH to taste. If the flavor is too bland, recalculate using less water in the blend.

HAVE:

5 gallons

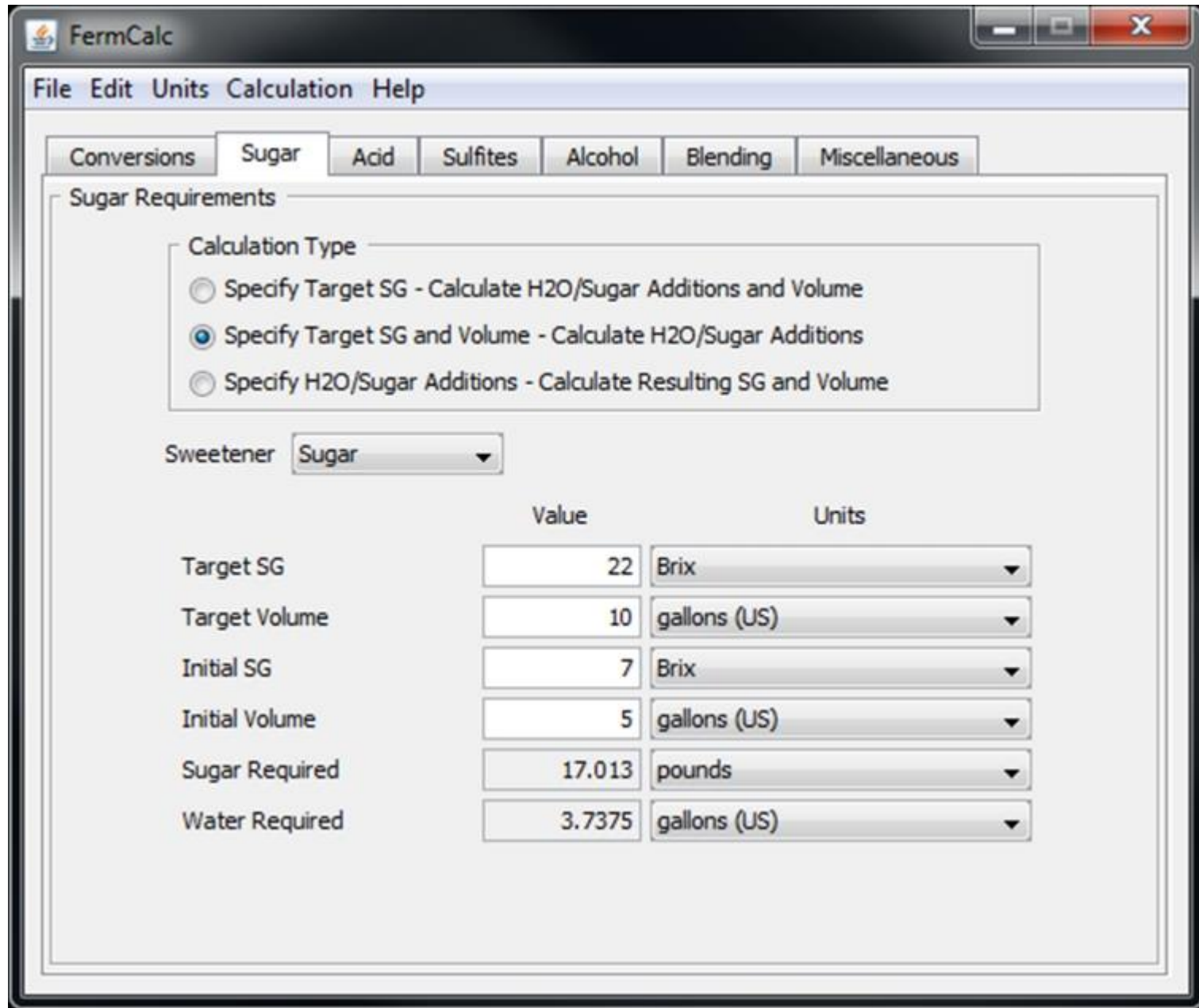
7° brix

WANT:

10

gallons

22° brix



FermCalc for Sugar additions- Sweetening a finished wine.

Here's a typical sugar addition. We want to calculate how much sugar to add to a finished, dry wine to make it a 4° brix wine. (That is, 4% reserved or finished sugar (RS)).

We have an initial specific gravity of .994, which is quite common. Use a hydrometer to measure.

We want 4° brix.

We have 10 gallons of wine.

Those three figures we type in.

Results require 4.8 lbs of sugar and will result in 10.35 gallons of finished wine.

HAVE:

10 gal wine

.994 SG

WANT:

**4° brix (4%
RS)**

GET:

10 1/3 gal

4° brix

The screenshot shows the FermCalc software window with the 'Sugar' tab selected. The 'Sugar Requirements' section is active, showing three radio button options for calculation type. The first option, 'Specify Target SG - Calculate H2O/Sugar Additions and Volume', is selected. Below this, the 'Sweetener' dropdown is set to 'Sugar'. A table displays the calculated values for various parameters.

	Value	Units
Target SG	4	Brix
Initial SG	.994	specific gravity
Initial Volume	10	gallons (US)
Sugar Required	4.7857	pounds
Water Required	0.0	gallons (US)
Resulting Volume	10.352	gallons (US)

Using Fermcalc for Sulfite Additions

EXAMPLE: Your ferment has just finished. You have effectively ZERO sulfite in the wine. Your pH is at 3.5. You have 10 gallons of wine. You are using META as powder (Potassium meta-bisulfite.) You are after .8 ppm Molecular SO₂ in the wine.

Target: Free SO₂ Sulfite Type META

Sulfite FORM: Powder/crystals

TARGET Free SO₂: enter 40 INITIAL Free SO₂: enter 0 (zero)

WINE VOLUME: enter 10 gallons WINE PH: enter 3.5

Don't worry about the equilb constant.

You need 2.63 grams of META. Make it 2.7 to be on the safe side.

Now retest your Free Sulfite to see if some of it was buffered out. Often compounds in wine will bind up some of the SO₂ and make it unavailable. If so, enter your tested value as the new Init Free SO₂ and calculate and add META again.

Many sulfite articles do not describe the effect of SO₂ buffering. If you only test BEFORE you add Sulfite, you have no idea how much has been buffered. ALWAYS test before AND after, and add more if necessary.

TARGET Free SO₂:
enter 40

INITIAL Free SO₂:
enter 0 (zero)

WINE VOLUME:
enter 10 gallons

WINE PH: enter 3.5

	Value	Units
Target Free SO ₂ Level	40	mg/L (ppm)
Initial Free SO ₂ Level	0.0	mg/L (ppm)
Wine Volume	10	gallons (US)
Wine pH	3.5	
SO ₂ Equilibrium Constant	1.81	
Powder/Crystals Required	2.6272	grams
Resulting Molecular SO ₂ Level	0.8004	mg/L (ppm)

Bench Trials

Things to Vary:

1. Acidity
2. Final brix
3. Fruit proportion
4. Tannin additions
5. Oak or not oak
6. Blending
7. Temperature of ferment
8. Ferment on skins or not
9. How long on skins?
10. Malolactic ferment?
11. Saignée (bleed off some juice, ferment the rest on skins. Bled juice is rose, the rest fuller bodied. (see at right.)



Sales and Marketing Strategies

1. Target Audience— Know what your audience/customers like, and produce wine in the style that sells!
2. Create your own special niche— i.e. become known for something special that sets you apart.
3. Use social media regularly.
4. Enter contests with your best wines, and make sure you make them well.
5. Take advantage of your Special Permits for commercial wineries.
6. Amateurs should enter county fairs, state fairs, and perhaps national contests to develop recognition and credibility.



This photo was on our facebook page promoting a wine and cheese tasting. Make sure you update at least weekly if you can. Stories, awards, musings. But graphics of any kind get the best response!

Don't be afraid to promote your products!

This Saturday and Sunday, Jan 17th and 18th, we invite you to "meet the dessert wines!" Apple Ice and White Raspberry, two of our pricey but damn worth it special wines. Of course all of our other wines will be available as well. 3-6 p.m. both days.

Only 10 people "liked" the above post. Only one shared it. **But 1222 people were reached!** In those 2 days alone we sold 17 bottles of apple ice, 19 white raspberry and several glasses of each for over \$800 income, not to mention our other wines. The advertising cost us...ZERO! **SOCIAL MEDIA WORKS!**

The more specific the message, the more it will grab your customers.



A dynamic image of a wine glass tilted to the left, pouring a clear liquid. The glass is rendered in a vibrant blue color. The text 'Tongue River Winery' is superimposed on the scene. 'Tongue' is in purple, 'River' is in red, and 'Winery' is in black. The text is arranged in a curved path following the arc of the pouring wine.

Tongue River
Winery