



# The Home Winemaking Book

*by Michiel Pesgens*

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## Preface

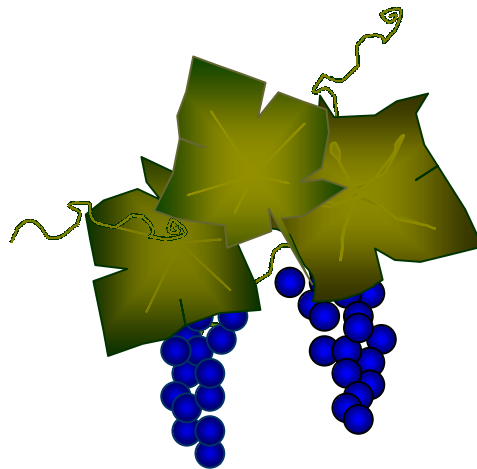
The basis of this book was the content of my internet page "The Home Winemaking Page". The root of this book is the "Procedures" chapter. The other chapters are built around it, but can also be read separately.

Every winemaker has a different view on winemaking. As your winemaking skills evolve, you'll start combining methods and views from others and eventually you'll create your own. That's why the following reflects my view on home winemaking.

I consider home winemaking as a very rewarding hobby and I wrote this book to share it with you. If you read all the info, you should be able to successfully produce your own batch of wine. Enjoy the winemaking hobby!

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The electronic version of this book as well as downloads can be found at:

**The Home Winemaking Page**

<http://www.geocities.com/NapaValley/8280>

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# Procedure

## Getting started

First thing you need is a recipe. You find recipes on the web or in winemaking books or you can compose your own recipe by combining several recipes. You can find a couple of recipes I've tested myself in the Recipes chapter.

If you want to compose a recipe yourself, measure the acidity with an acid test kit. Adjust the acidity to the amount you like, typically 5 to 8 g/l for wine. See the Acids chapter for more info on this subject. Check if the recipe requires a juice fermentation (for white wines) or a pulp fermentation (for red or blush wines). Both require their own approach to the first stages of winemaking.

Specific procedures for pulp and juice fermentations for red and white wines respectively will be indicated with the bold headings **red** and **white**.

### **white**

A juice fermentation must be used for making white wines. In this case juice is extracted from the fruit by pressing (with a wine press) and then fermented in a carboy or fermentation bottle (secondary fermentor).

### **red**

A pulp fermentation is used to maximize color and flavour extraction, necessary in making red wines. It basically means making a pulp of fruit by crushing and fermenting on the pulp without extracting juice first. This can't be done in a carboy (secondary fermentor), but in a primary fermentor like a bucket. This fermentor must be sealable against the air and vinegar flies to some extent e.g. by placing a lid on top with an airlock or you can use a plastic bag attached to the top with a rubber band. Be inventive.

For beginners, it's best to start with some juice or concentrate bought in a shop. This is easy to start with and requires little equipment. This way you can start with a juice fermentation without having to press the fruit with a wine press, and avoiding a pulp fermentation.

Keep records of all ingredients and all events. See the Winemaker's log chapter.

## Preparing the must

Sanitize your must to kill wild yeast and bacteria. This can be done by means of:

- Adding sulphite or crushed campden tablets (1g/10kg), the most common way
- Pouring boiling water over fruit, to kill most wild yeast and bacteria on the fruit skins
- Boiling, this helps extracting juice, but can result in change of flavour and could cause a pectin haze, if not using pectic enzyme

The sulphite is the most commonly used and probably the best way.

Crush the fruit, try to be inventive. A home made pulp cutter on a drilling machine can be very handy.

Juice fermentation requires the extraction of juices now. This can be done by boiling or by means of pressing.

Clean fermenting vessel and other material and rinse it with a sulphite solution to sterilize it.

Fill the fermentor with the must and add water, and other ingredients that the recipe calls for except the sugar and yeast.

Take a hydrometer reading first. Calculate the amount of sugar needed for the desired alcohol content.

For more info on this subject, see the Sugar and alcohol chapter.

Dissolve the sugar and take a reading of the starting SG (Specific Gravity). If you haven't got a hydrometer, add the sugar according to the recipe. Take out some must with a measuring jar, dissolve the sugar and gently pour off the liquid. This way all the sugar gets dissolved properly. You can boil the water before adding to the must and dissolve the sugar in the hot water first.

Crush and dissolve one campden tablet and add it to the must if you haven't already done so and let it stand for 24 hours for the sulphite to do its thing. For more info on sulphite use see the Sulphite chapter.

Leave some room (at least 1/5) on top, otherwise the foam will leave you with a big mess when the fermentation starts and the fermentor overflows.

**red**

Cover the primary fermentor with a lid that doesn't close perfectly or use a plastic bag with a rubber band. Air must be able to get in to promote yeast growth during the first few days. Further, the carbon dioxide gas produced by the fermenting process must be able to escape. Vinegar flies must be kept out. A lid with a hole would be best, a piece of cotton or a paper towel could be applied.

Try making a little more wine than your secondary fermenting vessel can take for topping up purposes when racking later on.

**white**

Plug the bottle with some wadding or a paper towel to allow oxygen into the bottle and to keep fruit flies out. This is necessary to promote yeast growth during the first few days. Fill the carboy to 4/5 part. Put the rest of the wine in another bottle, so that you can completely fill the carboy later on in the process.

## Making the yeast starter

A yeast starter can be made (24 hours before fermentation start), but rehydrating the yeast is usually sufficient (about 15 minutes before fermentation start) if you are not making large batches of wine (less than 10 liters). A yeast starter gives the fermentation a more vigorous start.

For a simple yeast starter you'll need:

- Must (5 to 10 % of the amount to be fermented)
- Sugar (when the must contains little sugar)
- Small amount of yeast nutrient
- Small amount of citric acid (or some lemon juice)
- Wine yeast

Slightly heat the juice until lukewarm (about 30 degrees Celsius), nutrient and the citric acid. Put this mixture in a sterile bottle. Add the yeast and stir well. Cover with some wadding. Let it stand for about 24 hours until foam has formed. When foam has formed, it is ready to be added to the must.

Another way to prepare the yeast is rehydration. Rehydration means dissolving the yeast in half a glass of tepid water and letting it stand for about 15 minutes. You can toss in a teaspoon of sugar to give it something to do. This of course must be done the day you're going to start the fermentation.

When you're lazy, just sprinkle the yeast on the must.

A yeast starter usually works best and it's necessary for larger quantities. For smaller quantities, rehydration usually is sufficient. The faster the must will start to ferment, the better. A yeast starter is the fastest way, rehydration comes next, and just adding the yeast dry takes the longest until fermentation start. The longer the period before fermentation gets going, the more chance oxygen, bacteria and mold get to spoil your wine.

**white**

Go to the Secondary fermentation paragraph and skip the ones in between.

## Primary fermentation

**red**

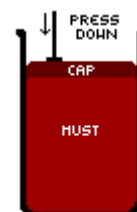
24 hours after the campden tablet has been dissolved in the must, the yeast starter can be added to the must.

The actual start of fermentation will take place within about 2 days after adding the starter. This will be perceptible due to foam formation and bubbles will start rising towards the surface.

Pulp fermentation generally takes a few days to a week.

Foam will form in the primary fermentation vessel, but as it should be significantly larger than the amount of must to be fermented, the foam shouldn't be a problem.

The rising bubbles will cause a cap of fruit pulp to form on top, which must be pressed down at least once a day to keep it submerged to avoid mold growth. This can be done using a clean spoon. Pressing also maximizes color and flavour extraction.



## Transfer to secondary

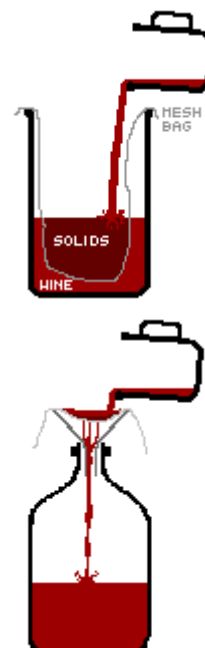
- **red**

When the color and tannin extraction has been sufficient (a few days to a week after fermentation start) the must needs to be transferred to the secondary fermentor (a carboy or jug). The sediment and cap have to be separated from the wine. This can be done in a process called straining.

You may want to take a hydrometer reading here, if you have one. It should read about SG=1030.

Straining can be done like this:

- Clean the secondary fermentor and all equipment and rinse all with a sulphite solution. Wash your hands carefully.
- Clean and sterilize another bucket and put a nylon straining bag into it.
- Pour the must through the straining bag. You can use a measuring cup to do this. Avoid excess splashing.
- Take the bag out of the must and gently press the liquid out.
- Dispose of the solids.
- Pour the wine into the secondary fermentation vessel through a large funnel. Put some cheesecloth over the funnel to catch small solid particles. If the cheesecloth becomes filled with particles and the flow through it is slowed down too much, pull the cloth a bit aside, such that a clean part covers the funnel.



After straining, place an airlock on top of the bottle.

Do not fill the carboy completely yet, because of overflow danger. If you've made some excess wine that doesn't fit the carboy, put it into a smaller bottle, also under airlock. You can use it for topping up while racking later on in the process.

## Secondary fermentation

- **red**

After primary fermentation (and having racked the wine to the secondary fermentor when you've pulp fermented) the next fermentation step starts, the secondary fermentation (obvious isn't it?). Fermentation will continue here, but not as vigorously as primary fermentation. Fill your carboy almost to the top, when no foam is being formed any more.

Place a bung and airlock on top of the carboy.

- **white**

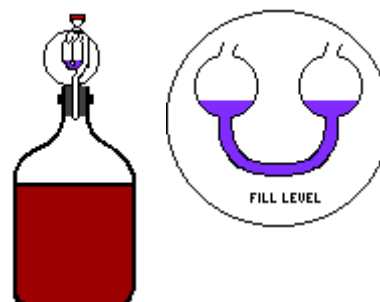
When fermenting clear juice, you've skipped a few paragraphs. The process continues here.

You'll only fill the carboy for 4/5 part. Fill another bottle with juice so you'll be able to fill up the head space later on.

Add the yeast starter and get both bottles fermenting. Put a piece of wadding in the neck of the bottles to keep fruit flies out.

Foam will form on top of the must due to rising bubbles. That's why you only filled the carboy partially. The amount of foam depends on the ingredients used and fermentation conditions. Although you've only filled the bottle partially, the danger of overflowing still exists. That's why it's a good idea to place your carboy somewhere where spillage can't hurt like in a bucket or bath tub.

When the yeast has started doing its work, put a fermentation lock in place of the wadding.



When fermentation slows down (you can tell by the bubbling rate of the airlock or by hydrometer readings) it's time to add the rest of the total amount of sugar required if you want to get a higher alcohol

content. The SG should be about 1010 now. It's best to add the sugar in several steps. Take a hydrometer reading before and after each sugar addition to be able to calculate the alcohol content when the wine is finished. Siphon off some wine, dissolve the sugar in it and siphon back. Notice that dissolved sugar needs some bottle space. Don't just throw dry sugar into the wine, unless you want to get a volcano foam eruption. Even worse, most sugar will sink to the bottom, not dissolving completely.

## Topping up

When the fermentation process really slows down (usually after a month or so) and all sugar has been added, you need to fill the bottle all the way to the top to minimize the surface area. This should be done because the wine doesn't provide itself a CO<sub>2</sub> blanket any more (only during vigorous fermentation), and could oxidize (and get spoiled). Use the excess wine you've made to top up, use a similar wine, or water.

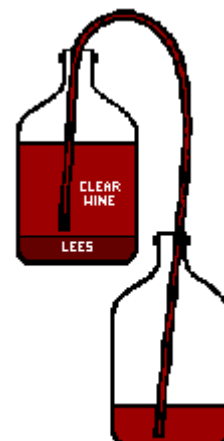


## Racking

When the wine has stopped fermenting (it has stopped bubbling) it has to be racked. The wine has to be siphoned to another bottle leaving the sediment behind. The process has to be done several times so that you end up with a clear batch of wine. You'd better practice with some water first, if you've never racked before to avoid spilling the wine.

Racking is done like this:

- Find a carboy or big bottle to take all the wine.
- Clean the bottle and all equipment and sterilize all with a sulphite solution. Rinse with water.
- Dissolve a crushed campden tablet in half a glass of water and pour it into the empty bottle.
- Now put the full bottle a little higher (not over 1 m) than the bottle about to be filled. Place it on a kitchen chair or table for instance and the other one on the ground.
- Place the siphoning hose into the must and suck until the wine starts to flow. Pay attention not to suck up the lees.
- Then pinch the hose and lower it into the other bottle. Release the tube and the wine will start flowing. Avoid vigorous splashing (to avoid oxidation).
- Stop the flow just before sucking up sediment.
- To avoid losing the wine mixed with lees, you can pour the remainder into a small bottle and let it stand overnight in a cool place like a refrigerator. The next day you can pour the wine off the lees and add it back to the rest of the wine.
- Rinse out the sediment. Use a bottle brush, if necessary.
- If the bottle in which the wine is now is bigger than the original one, siphon the wine back again.
- You will lose some volume here, so you'll have to refill the bottle to the top. You can use some excess wine you made by fermenting in a small bottle beside the carboy. If you didn't you can top it off with a similar wine or use water. Make sure that you've refilled the fermentation bottle within a day to avoid too much oxidation.



You'll have to repeat this sequence every time a reasonably thick layer of sediment has accumulated until the wine is clear. About three rackings should do. If the wine doesn't clear out of itself, there are fining agents like bentonite to help you out. If you don't mind the haze, don't worry.

## Bottling

When the wine is clear, and the fermentation process has fully ceased, the wine can be bottled. Take the hydrometer if you have one to check for residual sugars and to be able to calculate the alcohol content. The Sugar and alcohol chapter explains how to do this

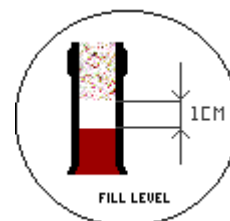
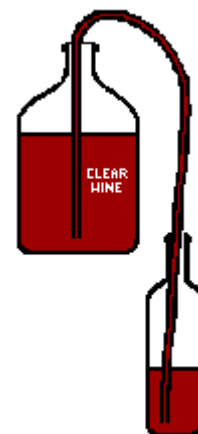
The wine can also be matured in the fermentation bottle (bulk aged), but if you haven't got that many of those the choice is easy. Beware that if you bottle too soon, your corks might start popping out due to re-fermentation in the bottle, and leave you with a terrible mess. So it's best to wait a few months after fermentation stop to make sure that fermentation has fully ceased and the wine is stable.

Just before the actual bottling, the wine can be sweetened to taste. Check the Sugar and alcohol chapter on how to do this.

Use green or brown glass bottles for red wines, and white or colored bottles for white wines. The easiest bottle to work with is the Bordeaux type (easy to pile up).

Here is the bottling procedure:

- 24 hours before bottling add one crushed campden tablet to the wine. Add potassium sorbate and sugar, if you want to obtain a sweet wine.
- Prepare corking, as this follows the bottling procedure immediately.
- Bottling requires some wine bottles which should have been cleaned when you got them. Just before bottling rinse them with a sulphite solution and drain them. This can be done by filling one bottle for 3/4. Shake well and use a funnel to transfer the solution to the next bottle.
- Filling the bottles can be done with your siphoning tube. This is done like racking, only now you don't have to worry about the lees. Bottles need to be filled to about 1 cm below the cork. Don't try to fill the bottles exactly to this level in one operation, but stop the flow a little earlier and top up a funnel afterwards to avoid spilling the wine.
- When you exchange bottles, you'll have to stop the flow. This can be done by pinching the hose. Another way to stop the flow is by lifting the bottle to the same level as the fermenting bottle. But don't lift it too high, or the wine will flow back and out of the hose and you'll have to suck again. A little tap attached to your siphoning hose together with another piece of hose to reach the bottom of the wine bottles facilitates bottling.



Move right on to the next step.

## Corking

Now that you've just finished filling your bottles it's necessary to cork them (if you've chosen to use wine bottles). Corking bottles really can't be done without a corking machine (believe me, I've tried). This could use some practice. When you're not making large quantities a hand held corking tool will do. Large quantities require a floor corker.

Here's how:

- 12 to 24 hours before bottling soak your corks in a sulphite solution to sterilize them and to make them more flexible. Make sure that the corks are fully submerged, so put some weight on top.
- Insert a cork in the device. and put it on top of the bottle.
- Push very hard until the cork is in place.
- Take the corker off.
- If the cork hasn't been driven deep enough into the neck of the bottle, adjust the corker. If you've got a hand corker, put only the upper part of the device on the cork, and hammer it down with a wooden or rubber hammer. Do not try pushing while using only the upper part of the corker because the cork will overshoot and end up in the wine.
- Freshly corked bottles are best left standing up straight for a few days in order to prevent wine spillage due to popping corks (they still could pop, put a bottle standing won't leak empty). Corks could pop due to the force of the wine and compressed air. This risk goes away after a couple of days.



- Eventually the bottles must be layed on their sides, otherwise the corks will dry out, leak, and the wine will oxidize.

## Labeling and capsuling

All bottles should be labeled. It is necessary to identify the type of wine, but a nice label also looks better.

A couple of things that could appear on it are: type of fruit, sweet/dry, year, month, date of fermentation start and bottling date, type of wine, your name, %<sub>vol</sub> alcohol. You can buy labels ready made or you can have some custom designed for you. But homemade wine looks good with homemade labels. Labels can be made with pen and paper or on the computer. Almost every paint program or wordprocessor can produce nice labels.



For more info on making wine labels with a computer, see the Label making chapter.

Labels are best glued on with water soluble glue like Pritt or UHU stick. This is necessary for getting them off easily in order to reuse the bottle.

You can use capsules to cover the top of the bottle neck and the cork. It is mainly for decorative purposes. Most capsules must be heated to attach them to the bottle neck. This can be done by means of a candle or a heat gun for removing old paintwork. Pouring boiling water over them also works. Of course this must be done before labeling.

## Bottle aging

Aging means letting your wine lie down for a period of time before consumption so that its quality improves. This can be done before (bulk aging) or after bottling (bottle aging).

Almost every wine improves with time. A few months will cause significant change, a year or more will be better.

This process doesn't continue into infinity. There is something like a peak in quality, but most wine is being drunk too early. The time that home made wine will ages usually depends on how long you can bare to wait. A typical aging time for your first bottle is something between 1 second and one week after bottling. So the more wine you make, the better chance it gets to age.

To age wines you need a place where it is dark and where temperature is cool and relatively constant.

## Drinking

That's what it's all about! Consuming your wine. You can drink it with some company so that you get opinions from outsiders about your wine.

It may taste different from commercial wine, you should be aware that you've really made something a bit special.

Use wine glasses, if you have some available. White wine should be drunk rather cool, red wine at room temperature.

Enjoy!

# Sugar and alcohol

This chapter will explain how the sugar and alcohol content of a must or wine can be measured, calculated and adjusted.

The sugar content is usually expressed in grammes of sugar per liter (g/l) of must or wine.

Sugar present in the must and the final alcohol content in the wine are correlated.

Measuring and adjusting the sugar and alcohol content of a wine or must is better than just adding the amounts of sugar stated in a recipe. The amounts of sugar in a recipe can differ much from the amount needed to get the same final alcohol content than in the recipe. This is because the other ingredients in the must also contain sugars, and that content is never the same. It depends on a lot of factors like the amount of sun the fruit got that year, the location where grown etc.

The sugar content of a wine or must cannot be measured directly. The specific gravity (SG) is measured and is expressed in grammes per liter (g/l). Another scale is degrees Oechsle (°Oë) which is equivalent with  $SG - SG_{\text{water}}$ , thus  $SG - 1000$ .

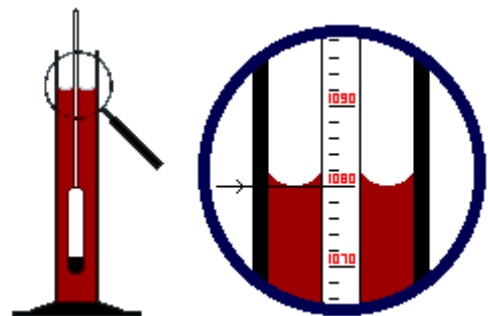
The SG of a wine or must is roughly equivalent to the sugar content of a must, so that the sugar content can be calculated.

The alcohol content is expressed in percents by volume (% vol). Most commercial wines have an alcohol content between 9 and 12 % vol.

## Measuring the Specific Gravity

The hydrometer is a device which can be used to measure the specific gravity of a fluid or solution. To take readings, you also need a hydrometer jar, which is often also a measuring cylinder. This is the procedure to take a SG reading:

- Take a sample of the wine or must to be measured, which contains no solid particles. Fill the jar for about 4/5 with wine or must.
- Place the cylinder on a straight surface and gently lower the hydrometer into the cylinder, so that it doesn't hit the bottom.
- Make sure the hydrometer floats freely and does not touch the sides of the cylinder.
- When you look closely at the fluid surface it is slightly curved, which is called the meniscus. Now take a reading of the number that matches the lower part of the meniscus, see the figure on the right. In this case the SG is 1080.
- Take the hydrometer out, clean and put it away. The sample of wine or must can be added back to the rest of the batch. Clean the jar and put it away.



## Calculating sugar and alcohol before fermentation

After taking a hydrometer reading of the must to be fermented, the amount of sugar that should be added to reach a certain alcohol level in the wine can be calculated on two ways. The first way is by using the hydrometer table and the second is by using a couple of easy formulas.

When not using a hydrometer, just use the amount of sugar stated in the recipe you are following, although this a very unreliable method.

When calculating the sugar to be added before fermentation, it is a good thing to keep the starting SG below 1100 to avoid a stuck fermentation. Here is how both ways of computation can be performed:

• **Calculating sugar and alcohol using the hydrometer table**

Sugar and possible alcohol content can be calculated using the hydrometer table printed below.

Hydrometer table		
Specific gravity (S.G.)	Potential % <sub>vol</sub> alcohol	Grammes sugar / litre
1010	0.9	12.5
1015	1.6	25
1020	2.3	44
1025	3.0	57
1030	3.7	76
1035	4.4	95
1040	5.1	107
1045	5.8	120
1050	6.5	132
1055	7.2	145
1060	7.8	157.5
1065	8.6	170
1070	9.2	182.5
1075	9.9	195
1080	10.6	208
1085	11.3	225
1090	12.0	240
1095	12.7	252
1100	13.4	265
1105	14.1	277
1110	14.9	290
1115	15.6	302.5
1120	16.3	315
1125	17.0	327.5
1130	17.7	340
1135	18.4	352

**Example**

We want to get **10** litres of wine with **12.5** %<sub>vol</sub> alcohol content.

The must has an SG of **1035**.

Amount of sugar present in must:

SG 1035 gives us 95 g / litre

$10 * 95 = \mathbf{950}$  g

Amount of sugar needed at fermentation start:

(a good starting SG for a must is SG 1080, which equals 208 grammes sugar/l)

SG 1080 gives us 208 g / litre

$10 * 208 = \mathbf{2080}$  g

Amount of sugar needed totally:

12.5 %<sub>vol</sub> doesn't exist, so we look at 12.7 %<sub>vol</sub> and take a bit less. This gives us 250 g / litre

$10 * 250 = \mathbf{2500}$  g

Amount of sugar to be added totally:

$2500 - 950 = \mathbf{1550}$  g

Amount of sugar to be added before fermentation start:

$2080 - 950 = \mathbf{1130}$  g

Amount of sugar to be added during fermentation:

$2500 - 2080 = \mathbf{420}$  g

• **Calculating sugar and alcohol by using some simple formulas**

The simplest way to calculate sugar and possible alcohol content is by using a few simple formulas. Don't use this method if you plan to ferment to an alcohol content below about 10 %<sub>vol</sub> (which will not occur very often, I guess).

We'll use these relations:

1 °Oë	=	2.7	g sugar/l
1 % alcohol	=	19	g sugar/l
SG water	=	1000	kg/m <sup>3</sup>
1 % acid	=	10	g/l

**Example** (same as above)

We want to get **10 litres** of wine with **12.5 %<sub>vol</sub>** alcohol content.

The must has an SG of **1035**.

- Amount of sugar present in must:  
 $(1035 - 1000) * 2.7 * 10 = \mathbf{945}$  g
- Amount of sugar needed at fermentation start:  
(a good starting SG for a must is SG 1080, which equals 208 grammes sugar/l)  
 $(1080 - 1000) * 2.7 * 10 = \mathbf{2160}$  g
- Amount of sugar needed totally:  
 $12.5 * 19 * 10 = \mathbf{2375}$ g
- Amount of sugar to be added totally:  
 $2375 - 945 = \mathbf{1430}$  g
- Amount of sugar to be added before fermentation start:  
 $2160 - 945 = \mathbf{1215}$  g
- Amount of sugar to be added during fermentation:  
 $2375 - 2160 = \mathbf{215}$  g

**Calculating the alcohol content after fermentation**

When fermentation has stopped, the final alcohol content can be calculated using the starting and final SG readings. The following formula can be used:

$$Alcohol\ content = \frac{(SG_{start} - SG_{final})}{7.36}$$

**Example**

The wine started with a SG of 1080, and ended with a SG of 992. The alcohol content of the wine should be:

$$(1080 - 992) / 7.36 = 12.0\ %_{vol}$$

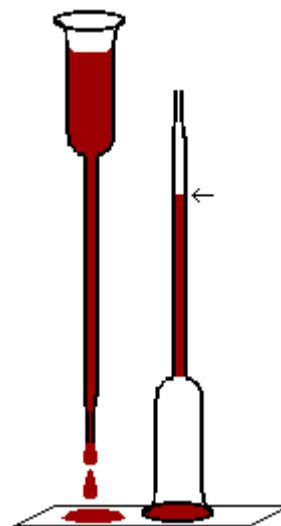
**Measuring the alcohol content after fermentation**

Of course, if you've taken proper hydrometer readings, you can calculate the amount of alcohol formed in your wine. But if you haven't got one or want to check your calculations, you can use a vinometer. But there is one mayor restriction: A vinometer can only produce accurate results in a dry wine (containing little or no residual sugar). The vinometer works on the principle of capillary action, so it actually measures viscosity, which is dependant on the alcohol/water ratio. It has a scale of alcohol content

marked on it.

The procedure goes as follows (note the image on the right):

- Fill the vinometer with some dry wine.
- Wait until some drops have fallen through. If the wine doesn't start to flow on its own, put your mouth on the funnel-side of the vinometer and blow gently.
- Then put a finger on the part where the drops form and turn it upside down.
- Place the vinometer on a straight surface. You might want to place it on a small plate to avoid making a mess.
- Release the finger. The level in the capillary will drop to a certain level, which indicates the alcohol content of the sample (the red arrow).
- Take two more measurements and take the average value of the measurements:  
Average = (Measurement1 + Measurement2 + Measurement3) / 3
- Clean the vinometer and store it away.



## Making a sweet wine

The trick of making sweet wines is to prevent yeast cells from fermenting the sugar you'll add to make the wine sweet. So the yeast cells must be gone or the time the sugar is present should be so short, that the yeast cells haven't got time to make alcohol from it.

So it's not that easy to make a sweet wine. It takes longer than a dry wine and there's always a risk of refermentation in the bottle.

Basically there are four ways to make sweet wine:

- Adding sugar just before you drink it  
Just before serving, add a few teaspoons of sugar to your wine. A sugar syrup of invert-sugar works best.  
This way you've always got dry wine which you can turn into sweet wine when necessary. Sweet wine cannot be made dry again. So you can make 2 wines from 1 bottle. The greatest advantage of this method is that you do not run the risk of refermentation.
- Adding liquor  
Before the wine has completely fermented out, pure alcohol or another high-alcohol liquor is added to the wine exceeding the level that the yeast can tolerate. This is about 16 %<sub>vol</sub>. The blending ratio can be calculated just like explained in the Acids chapter. Port and sherry wines are made using this method.
- Filtering  
The wine can also be filtered after it has fermented out and it is stable. A very fine filter is required to get all the yeast cells out. This method is usually the way commercial sweet wines are made. But you really need a good filter. The wine can then be sweetened.
- Using potassium sorbate  
First ferment to dryness, let the wine clear and rack it. It must be brilliantly clear and no yeast may be present any more. Often filtering is done to speed up the process. The wine is then aged. The wine must be absolutely stable. Then sugar can be added to taste, sulphite and potassium sorbate must be added. Potassium sorbate inhibits the last few yeast cells from reproducing. So it doesn't stop the yeast from fermenting, so really very few yeast cell can be allowed to be present at that time. Also, when using sorbate, sulphite level must be high enough, or you can get a geranium-like smell, produced by bacteria in the wine in the presence of sorbate. The normal dose of potassium sorbate is 200 to 250 milligrams per liter of wine. This about one level teaspoon per 10 liters of wine.

The amount of sugar to dissolve in the wine of course depends on your own taste, but here's a guideline:

<b>Sweetening</b>	
Sweetness	SG
Dry	<1000
Medium dry	1000-1010
Medium sweet	1010-1020
Sweet	1020-1030
Dessert	1030-1040

The amount to be added can be calculated using the hydrometer tables or the formulas from the Calculating sugar and alcohol before fermentation paragraph.

### **Example**

We'll use the formulas from above. We want to sweeten 10 liters of a wine that has SG=995 and we want it medium sweet.

Looking at the table above, let's make it **SG=1015**.

So we'll have to add:

$$(1015 - 995) * 2.7 * 10 = \mathbf{540 \text{ g}}$$

# Acids

The acid content, titratable acidity (T.A.), of a wine is usually expressed in grammes tartaric acid per liter (g/l). Most commercial wines have an acid content of 5 to 8 g/l. White wines usually contain a bit more acid (6-8 g/l) than red wines (5-7 g/l), because they generally contain less tannin than red wines.

Grapes contain mostly tartaric acid, other fruit contains mostly citric or malic acid.

A wine that contains too little acid doesn't keep well and tastes flat, a wine with too much acid can taste too harsh. Wines that contain more acid, need less sulphiting. Most winemakers try to keep the acidity between 5 and 8 g/l.

But in the end, it is up to your own personal preference what the acidity of your wine should be. Taking care of the acidity of your wines contributes to quality of the finished product, and more consistent results.

You can measure and adjust the acidity of a wine or must before fermentation start or after fermentation has completed.

## Measuring the acid content

I know there are some other types of wine acid test kits, but they basically work the same. Base (lye) is added to the must/wine until an indicator changes color. The amount of added base is equivalent to the amount of acid that was present in the wine. If you wish to get a better explanation of this subject check out a highschool chemistry book.

The type of acid test kits I'll try to explain contain a test tube (a small test cylinder) with a scale printed on its side, and a bottle containing a mixture of the indicator with the base solution (testing agent).

Using another type of testing solution, it's also possible to determine the sulphite level using the same method.

- First the test cylinder is filled with wine or must to the zero level indicated on the side of the test column. This can be done by using a small syringe (without needle).
- Then drop by drop, and with often shaking the cylinder for good mixing, add the reagent. Once in a while, especially when dark clouds form, put your thumb on top, turn it upside down, and back again. This will help mixing.
- Stop when a color change starts to appear, this can happen very rapidly.
- Read the number of milliliters of reagent added. The amount of milliliters added is the same as the acid content of the wine or must expressed in grams/liter.
- Dispose of the cylinder content. Do NOT add this back to your wine. This stuff is toxic!
- Clean the cylinder and put it away.

## Raising the acid content

There are two methods to raise the acid content of a wine:

- **Adding acid**

Adding acid means dissolving and adding an amount of an acid salt, usually tartaric acid, citric acid, malic acid, citric acid or an acid blend of the three. Citric acid is usually not added to red wines, because its taste doesn't suit red wines well. citric acid doesn't suit those wines well.

The amount of acid to raise the must or wine 1 g/l depends on the acid you're adding. See the table below how much the TA increases when 1 gram of acid is added to 1 liter of a must or wine:

Adding acid	
Kind of acid	TA increase per g/l
Tartaric	1.00
Malic	1.12
Citric	1.17

• **Blending**

Blending with a more acid wine or must of course requires that you have such a must or wine available at the same time. You can't get a resulting acid content higher than the TA of the wine to blend with. Blending doesn't just affect the acid content, it alters the wine overall. Try a sample blend of the mixture before you blend the whole batch to see if the two wines taste well together. We'll use the following blending ratio formulas related to the Pearson square.

Pearson square	
	A = Value wine 1
	B = Value wine 2
	C = Value wanted
	D = Part of wine 1
	E = Part of wine 2
	D = C - B E = A - C proportion = D : E

The proportion in which to blend for raising or lowering the alcohol content of a can be calculated in exactly the same way.

**Example**

We've got 10 liters of a wine that is too low in acidity, TA = 4 g/l. The wine we are going to blend with has an acidity of 10 g/l. Using the formulas from above (see the Pearson square at the right):

**A = 10** ('A' must be the highest number)

**B = 4**

We want to obtain a wine with a TA of 6 g/l, so:

**C = 6**

Now:

**D = C - B = 2**

**E = A - C = 4**

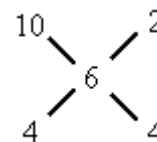
So we have to blend 2 parts wine 1 with 4 parts wine 2. The blending ratio (proportion) now becomes:

**proportion = D : E = 2 : 4 = 1 : 2**

So we have to add:

**10 \* 1 / 2 = 5 litres** (multiplication because the amount of wine 1 is required) of the wine to blend with.

So eventually we would end up with 15 liters of a wine that has an acidity of 7 g/l.



**Lowering the acid content**

There are four methods to lower the acid content of a wine:

• **Adding calcium carbonate**

Calcium carbonate (CaCO<sub>3</sub>) is a kind of chalk, which reacts with the acids in a wine. It neutralizes them. An amount of 0.66 grams CaCO<sub>3</sub> per liter lowers the TA with 1 gram per liter. Calcium carbonate can be



used up to an amount of 2 grams/liter maximum to avoid its taste getting noticeable in the wine. After the addition of  $\text{CaCO}_3$ , wait a day or two and rack the wine.

### • Diluting or blending

Blending with a less acid wine or must of course requires that you have such a must or wine available at that time. You can't get a resulting acid content lower than the TA of the wine to blend with.

Blending doesn't just affect the acid content, it alters the wine overall. Try a sample blend of the mixture before you blend the whole batch to see if the two wines taste well together. We'll use the same blending ratio formulas from above.

The blending ratio for raising or lowering the alcohol content of a wine by means of blending can be calculated on exactly the same way.

### Example

We've got 5 liters of a wine that is too high in acidity, TA = 15 g/l. The wine we are going to blend with has an acidity of 3 g/l (if you dilute with water, this acidity (B) is 0). Using the formulas from the conversion tables chapter on blending wines (see the Pearson square on the right):

**A = 15** ('A' must be the highest number)

**B = 3**

We want to obtain a wine with a TA of 7 g/l, so:

**C = 7**

Now:

**D = C - B = 4**

**E = A - C = 8**

So we have to blend 4 parts wine 1 with 8 parts wine 2. The blending ratio (proportion) now becomes:

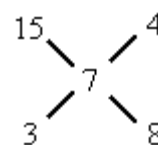
**proportion = D : E = 4 : 8 = 1 : 2**

So we have to add:

**5 \* 2 / 1 = 10 litres** (division because the amount of wine 2 is required)

of the wine to blend with.

So eventually we would end up with 15 liters of a wine that has an acidity of 7 g/l.



### • Cold stabilizing

Cold stabilizing causes tartaric acid to precipitate as potassium bitartrate crystals when the wine is being chilled. Because the procedure works on tartaric acid, it will only work effectively on grape wines. The wine must be fermented out.

You can cold stabilize the wine by placing it in a cold spot (between -4 and 5 deg C) for a week or two.

The wine will get cloudy and crystals will form on the bottom of the carboy. Wait until the sediment has settled and rack when the wine is still cold. For best effect you can add a small amount of potassium bitartrate first, so that the crystals will form more easily.

### • Malolactic fermentation

This is not a fermentation conducted by yeast, but it is bacteria converting malic acid into the less harsh tasting lactic acid. Malolactic fermentation (MLF) is generally considered a good thing in red wines, but not in white wines. MLF can occur spontaneously when the  $\text{SO}_2$  level is kept low. MLF starters also exist. To allow MLF to take place, do not add much  $\text{SO}_2$  before MLF fermentation is complete. Specific test kits are available, but a drop in titratable acidity (TA), the acid content of a wine can be noticeable.

# Equipment and additives

## Equipment

A lot of equipment you need for winemaking you are likely to have at your disposal already. But there is some specific winemaking equipment you'll need to acquire before starting to make your own wine. That's why you should locate a supplier near you (if you don't already have one).

I don't think I should tell you which equipment to buy, it all depends how serious you are going to take winemaking, or how much money you are willing to invest. There is always room to improvise. Articles that are printed **bold** I do advise you to consider purchasing before starting, if you haven't got them at your disposal already. I'll give some reasons why you might want to get a piece of equipment, so that you can decide by yourself.

This list may not cover anything you'll ever want, but I'm trying to be complete about basic equipment. Whatever you decide to do, don't let copper, galvanize, iron or steel (except stainless) come in contact with your wine. The acids in the wine will react with these metals and create off-flavours or even make your wine poisonous! Also, use food grade plastics.

### Reusable winemaking equipment

- **secondary fermentor**  
carboy, jug or another big bottle, 5l or bigger, use glass, not plastic, it's too porous, 2 bottles are easier for racking, you could use a bucket for racking though
- **air lock**  
to keep air and bugs out, you could use a plastic wrap with a rubber strap
- **bored rubber bung or cap**  
to put the fermentation lock onto the bottle neck
- **funnel**  
to fit a wine bottle, you need it with almost every event
- **bucket**  
to serve as a primary fermentor, to crush fruit in, or a safety precaution when fermenting
- **siphoning hose**  
about 2m long, 0.8-1 cm diameter
- **stirring spoon or stick**  
to dissolve sugar and other ingredients, also for pressing the cap
- acid test kit  
to check the acidity
- bottle brush  
a large one that can clean your carboys as well as wine bottles
- kettle  
to boil water or must for disinfection
- primary fermentation vessel  
sealable container for pulp fermentation like a big bucket, necessary for making red wine
- sieve or mesh bag  
to separate pulp from must, you could also use a pair of panty-hose
- hydrometer  
to measure S.G., to determine amount of sugar accurately
- hydrometer jar  
perceptible tube standing upright, to place a hydrometer in
- siphon hose end  
device that redirects the flow, thus not sucking up the sediment, can be used instead of a j-tube
- teaspoons  
2 for crushing campden tablets easily before dissolving
- corking device  
if you decide to use wine bottles, without it, you won't get those corks inserted properly

- **vinometer**  
for roughly determining the alcohol content in finished dry wine
- **thermometer**  
one to check the temperature in the fermentation area, another to check the must temperature

### Consumable winemaking equipment

- **campden tablets**  
to sterilise equipment and must
- **labels**  
to identify your bottled wines, easy to make some yourself, see the Label making chapter for more info
- **bottles**  
for storage, wine bottles preferably. You could use other bottles, but make sure they are made out of glass
- **citric acid**  
for must acid addition and to use with campden tablets when sterilising to increase effect. You could use lemon juice too.
- **corks**  
if you decide to use wine bottles
- **fining agents**  
if your wine refuses to clear

### Additives

Below I've made a list of some substances that could be added to the wine. Those that are usually added to each wine are printed bold.

- **pecto-enzyme**  
to prevent cloudy wine due to a pectine haze
- **sulphite**  
or campden tablets, to avoid spoilage, see the Sulphite chapter for more info.
- **yeast nutrient**  
food for the yeast
- **citric acid or lemon juice**  
for acid addition if necessary
- **potassium sorbate**  
to keep sweet wines from refermenting, doesn't kill the yeast, only inhibits growth, only use on stable clear just sweetened wines just before bottling

# Sulphite

In winemaking, sulphite (SO<sub>2</sub>) is widely being used as sterilisation agent in must, wine (almost in every commercial wine) and on equipment . It also prevents wine getting oxidized (especially when racking) because the oxygen reacts with the SO<sub>2</sub> instead of the wine. Further, it prevents malo-lactic fermentation, especially when the wine has been bottled.

It doesn't cause harm, unless used in large quantities. Winemakers try to keep sulphite levels low. A few people are allergic to sulphite. If you are, don't use SO<sub>2</sub> in your wine.

Sulphite is available in two types: powder and tablets (campden tablets). It usually comes as the salt (potassium metabisulphite, K<sub>2</sub>S<sub>2</sub>O<sub>4</sub>). I use campden tablets of 0.5 grams a piece because there is no hassle weighing the fine powder on a very accurate weighing scale, especially when making small batches of wine. I use them for sterilising my must. For amounts see the table below.

For sterilising my equipment I use sulphite powder together with citric acid, as the powder is less expensive than tablets and the amount to use needn't be that accurately determined.

Less sulphite is needed in a more acid environment (must or sterilising solution) to be equally effective.

That's why you might consider adding some citric acid to you sterilising solution to increase effectiveness and using less sulphite in a more acid wine.

I use 1 crushed and dissolved campden tablet per 10 litres of must (0.5 g sulphite) while mixing the ingredients. When racking, I use the same amount. The second time again 1 tablet and just before bottling the last time.

Summarising this:

An example of SO <sub>2</sub> use in wine		
Step in winemaking	Number of campden tablets per 10 litres	Equivalent grams of sulphite per litre
Must preparation	1	0.1
First racking	1	0.1
Second racking	1	0.1
Bottling	1	0.1
TOTAL	4	0.4

I also sterilise my equipment by rinsing it in a sulphite solution just before use. In making 1 wine bottle full of sterilising solution I use about:

- 1 teaspoon sulphite powder (about 2 grammes)
- 1/2 teaspoon citric acid
- 0.75 litres water

There are other methods to fend off wine spoiling micro-organisms, like boiling (must and/or equipment) or rinsing with a chlorine solution (bleach). When using bleach, rinse equipment well after treatment with a lot of water. Use it only on equipment, NOT in must.

# Winemaker's log

A winemaker's log is necessary for recalling events and evaluating the fermenting process. This way you can learn from your mistakes and successes, and eventually become a better winemaker.

Your winemaker's log could contain:

- Type of wine
- Ingredients/quantities
- Dates of all events
- Sugar additions
- Hydrometer readings
- Sugar-alcohol calculations
- Racking dates
- Acid contents/corrections
- Alcohol content
- Bottling date
- Number of bottles
- Results of opened bottles
- Notes

It's better for it to contain excess information instead of too little so make a record of everything. You can use a piece of paper, which you attach to the carboy. Also wordprocessors or spreadsheets programs can be used. Even specific winemaking record keeping programs have been developed for this purpose.

Below is a simple example of what a winemaker's record might look like.

### Example

Apple wine 1			
Date			Remarks
1	2	1998	Must prepared, 800 g sugar added to SG 1080, 1 campden tablet added, total 5.5 liters of must.
2	2	1998	Champagne yeast rehydrated and added
4	2	1998	Slow start of fermentation
5	2	1998	Vigorous fermentation now
1	3	1998	SG 1010, 100g sugar added, carboy topped off with the sugar/water mixture
13	3	1998	SG 1003, 100g sugar added
10	4	1998	No bubbles any more, SG=1000
13	4	1998	First racking, 1 campden tablet added
21	4	1998	Second racking, 1 campden tablet added
3	5	1998	SG 998, Bottled, 1 campden tablet added, SG=998, alcohol content=11% <sub>vol</sub>

# Recipes

To give you an easy start in winemaking I've included some beginner's recipes below. The ingredients have been kept simple, they are cheap and don't require pulp fermentation when using clear juice. It's almost impossible to screw up, as long as you keep things clean. At least read the Procedures chapter before you start.

I've added a couple of more advanced recipes too.

For these recipes, you should also read the Sugar and alcohol and the Acids chapter before you start.

## Beginner's recipes

### • Apple juice wine (5 L.)

Ingredients:

- 2 l apple juice
- 1 l grape juice
- 2 lemons (only juice)
- 800 g sugar
- water
- 1/2 SO<sub>2</sub> tablet
- 1 teaspoon yeast-nutrient
- pectic enzyme
- champagne yeast

This wine is really cheap and easy to make. Took me about 3 months from fermentation start 'till bottling. Clears very well on its own. When using self-extracted juice, add some pectic enzyme, or it may get hazy. When crystal clear, it is ready to be bottled. Tastes pretty good for such an easy wine to make.

### • Grape juice wine (5 L.)

Ingredients:

- 3-4 l grape juice
- 2 lemons (only juice)
- 1000 g sugar
- water
- 1/2 SO<sub>2</sub> tablet
- 1 teaspoon yeast-nutrient
- pectic enzyme
- champagne yeast

When using white grape juice, you will get a white wine, with red juice a rose (pink) wine.

Calculate the starting amount of sugar, add the rest later when the fermentation slows down, in batches of 100 g.

As this is a grape wine, it will taste quite "winy", it will be slightly sweet.

- **Orange juice wine (5 L.)**

Ingredients:

- 2 l orange juice
- 1 l grape juice
- 2 lemons (only juice)
- 1000 g sugar
- 1 l water
- 1/2 SO<sub>2</sub> tablet
- 1 teaspoon yeast-nutrient
- pectic enzyme
- champagne yeast or sherry yeast

If you want to try something completely different, try this orange wine.

This recipe will give you a white wine, as the yellow stuff will settle down eventually. Be sure not to let the must stand on the sediment too long to avoid off-flavours, it starts to form soon after fermentation start.

Calculate the starting amount of sugar, add the rest later when fermentation slows down, in batches of 100 g.

May have trouble clearing on its own, I used some bentonite to get it clear.

It's a cheap wine to make. Tastes strange but nice.

## Advanced recipes

- **Blackberry wine (10 L.)**

Ingredients:

- 4 kg blackberries
- 500 g raisins
- 1700 g sugar
- 8 litres water
- 1 SO<sub>2</sub> tablet
- 1 teaspoon yeast-nutrient
- pectic enzyme
- wine yeast

Make a yeast starter 2 days in advance. Crush berries and chop up raisins, put into primary fermenting vessel. Add water, crushed sulphite tablet and pectic enzyme and let it rest for 24 hours. Add the rest of the ingredients. Bring the SG up to 1080, add the rest of the sugar later. When the yeast starter has started fermenting, add it to the must. After 3 days, remove the solids, and a few days later, when fermentation has really slowed down, rack to the secondary. Wait until sediment has accumulated, and rack until clear and stable (no signs of fermentation whatsoever). Then bottle. Nice wine, can be sweetened.

- **Elderberry wine (10 L.)**

Ingredients:

- 3 kg elderberries
- 500 g raisins
- 2400 g sugar
- 8 litres water
- 1 SO<sub>2</sub> tablet
- 1 teaspoon yeast-nutrient
- pectic enzyme
- wine yeast

Make a yeast starter 2 days in advance. Put berries in a kettle and boil for 15 minutes. Crush berries and chop up raisins, put into primary fermenting vessel. Add water, crushed sulphite tablet and pectic enzyme and let it rest for 24 hours. Add the rest of the ingredients. Bring the SG up to 1080, add the rest of the sugar later. When the yeast starter has started fermenting, add it to the must. After 3 days, remove the solids, and a few days later, when fermentation has really slowed down, rack to the secondary. Wait until sediment has accumulated, and rack until clear and stable (no signs of fermentation whatsoever). Then bottle. This is a table wine.

- **Elderberry port (10L)**

Ingredients:

- 4 kg elderberries
- 600 g raisins
- 3200 g sugar
- 10 litres water
- 1 SO<sub>2</sub> tablet
- 1 teaspoon yeast-nutrient
- pectic enzyme
- potassium sorbate (wine stabilizer)
- Port yeast

Boil the berries with the raisins for 15 minutes. Crush the berries, preferably with a pulp cutter. When cool, add the water, pectic enzyme and campden tablet and let it stand for 24 hours. Bring the SG up to 1080, add the yeast nutrients and the yeast(starter). After 5 days, strain and transfer to secondary. When the fermentation slows down (sg<1000) add sugar up to SG=1040. We are trying to reach about 14 to 15% alcohol, as we will not add liquor, which is the commercial way. Now ferment to dryness. Wait until the wine is stable. This can take a long while. Wait another month, add 1 level teaspoon sorbate, and bring the SG up to 1020 (about 550 g sugar). Bottle and age.

- **Grape wine (10 L.)**

Ingredients:

- 14 kg red grapes
- 1400 g sugar
- 8 litres water
- 2 SO<sub>2</sub> tablets
- 1 teaspoon yeast-nutrient
- pectic enzyme
- wine yeast

Make a yeast starter 2 days in advance, preferably with some of the grape juice. Destem the grapes and crush them, put into primary fermenting vessel. Add 2 crushed sulphite tablets and pectic enzyme and let it rest for 24 hours. Add the rest of the ingredients. Bring the SG up to 1090. When the yeast starter has started fermenting, add it to the must. After 5 days, strain to remove the solids, and transfer to secondary. Wait until sediment has accumulated, and rack until clear and stable (no signs of fermentation whatsoever). Then bottle. The simplest wine, and often the best.



# Label making

You can get your wine labels from a lot of sources: from your supplier, have some labels designed and printed for you, etc.

But why not like your wine just make them yourself? It's probably the cheapest way, which really doesn't mean they will look inferior. It's just like winemaking: you set your own standards.

Below I'll try to give you an idea how to make your own labels using a pc. If you have one at your disposal, you probably have everything you need to make your own labels.

Downloads are available from my homepage.

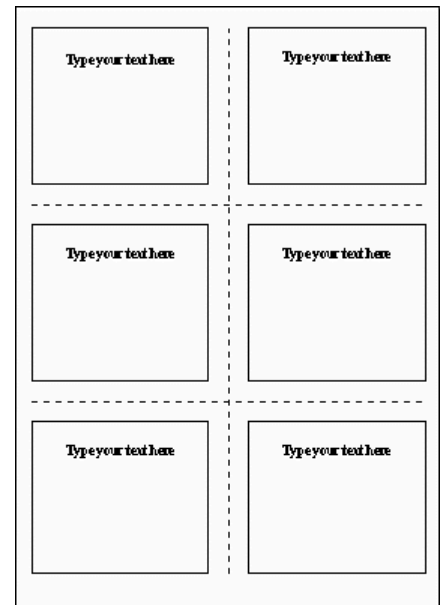
## Making labels using a wordprocessor

Using a wordprocessor you can make simple text labels with a border like these on the right (6 on a page). To make your own labels, just type in the text you want and print!

You can also add some images. You can get some images by downloading them from the internet, painting some yourself, or scanning some photos.

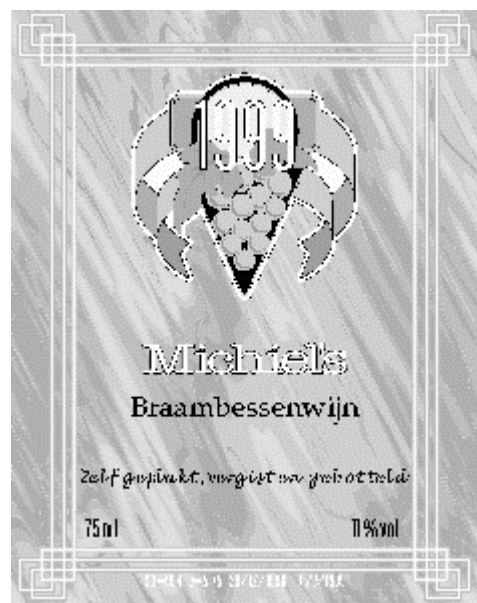
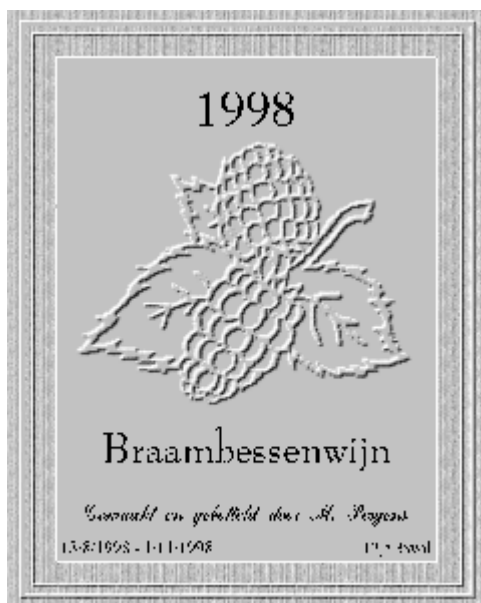
You can also use an image as a background in a wordprocessor and type your own text on top of it. This way you can make your own templates and only change the text each time you've finished a batch of wine.

There's an example of a label template on the right, You can edit all of the text to your own preferences.



## Making labels using a paint program

To make more complex labels, it's better to use a paint program. Virtually anything's possible now! It may be harder to get started, but the results count. Save them in formats like .pcx, or so.



## **Printing labels**

The best printer for printing wine labels is a laserprinter, because its prints are not sensitive to water and look great.

Most inkjetprinters and matrixprinters use water-soluble ink, which causes your labels to fade out with the least bit of water spilled on them. So be careful with water around your labels. A way to avoid this problem is photocopying.

When making color labels using a color inkjet printer, make sure you print as much labels on one piece of paper possible, for colorcopying can be quite expensive.

The easiest way to print .pcx, .bmp, .gif -files or the like in exactly the size you want is to load them into a wordprocessor first. I usually print them H X B = 11 X 8.5 cm (about 4.3 X 3.3 in), which fits the bordeaux-type bottles. For other bottles you often need a smaller label size.

## **Labeling**

For information on labeling, see Labeling in the Procedures chapter.

# Conversion Tables

US System - Metric System			
1 cup	=	237	ml
1 gallon	=	3.79	l
1 ounce (oz)	=	28.35	g
1 fl. ounce (fl. oz)	=	29.57	ml
1 pint	=	0.47	l
1 pound (lb)	=	453.6	g
1 quart	=	0.946	l
1 teaspoon (tsp)	=	5	g

Imperial System - Metric System			
1 gallon	=	4.54	l
1 ounce (oz)	=	28.35	g
1 fl. ounce (fl. oz)	=	28.4	ml
1 pint	=	0.568	l
1 pound (lb)	=	453.6	g
1 quart	=	1.136	l

Typical Wine Conversions			
1 °Oë	≈	2.7	g sugar/l
1 % alcohol	≈	19	g sugar/l
1 % acid	=	10	g/l
SG water	=	1000	kg/m <sup>3</sup>
1 kg sugar dissolved	=	0.625	l

Sweetening	
Sweetness	SG
Dry	<1000
Medium dry	1000-1010
Medium sweet	1010-1020
Sweet	1020-1030
Dessert	1030-1040

Adding acid	
Kind of acid	TA increase per g/l
Tartaric	1.00
Malic	1.12
Citric	1.17

Temperature Table	
Degrees Fahrenheit	Degrees Celcius
10	-12.2
20	-6.7
30	-1.1
40	4.4
50	10.0
60	15.6
70	21.1
80	26.7
90	32.2
100	37.8

Hydrometer Table		
Specific gravity (S.G.)	Potential %vol alcohol	Grammes sugar / litre
1010	0.9	12.5
1015	1.6	25
1020	2.3	44
1025	3.0	57
1030	3.7	76
1035	4.4	95
1040	5.1	107
1045	5.8	120
1050	6.5	132
1055	7.2	145
1060	7.8	157.5
1065	8.6	170
1070	9.2	182.5
1075	9.9	195
1080	10.6	208
1085	11.3	225
1090	12.0	240
1095	12.7	252
1100	13.4	265
1105	14.1	277
1110	14.9	290
1115	15.6	302.5
1120	16.3	315
1125	17.0	327.5
1130	17.7	340
1135	18.4	352

Pearson square	
	A = Value wine 1 B = Value wine 2 C = Value wanted D = Part of wine 1 E = Part of wine 2  D = C - B E = A - C proportion = D : E

# Glossary

- Acidity  
The amount of acid in a wine
- Acetification  
Wine turning to vinegar
- Aerobic fermentation  
Fermentation in the presence of air (primary fermentation)
- Aging  
The process of maturing wine
- Air lock  
A valve filled with water that lets CO<sub>2</sub> out, but no air inside
- Alcohol  
Ethanol or ethyl alcohol (C<sub>2</sub>H<sub>5</sub>OH), the liquid produced from sugar by fermentation that can make you drunk
- Anaerobic fermentation  
Fermentation in the absence of air (secondary fermentation)
- Blending  
Mixing finished wines to get a better balanced wine
- Body  
The fullness of a wine
- Bouquet  
Smell of a wine
- Bungs  
See Stoppers
- Campden tablets  
Tablets that contain sulphite in a handy form
- Cap  
A floating layer of solids that forms on a fermenting must during primary fermentation
- Carbon dioxide  
The gas produced by the fermentation process (CO<sub>2</sub>)
- Carboy  
A large fermentation bottle
- Cask  
A white oak barrel
- Concentrate  
Concentrated juice of fruit, usually grapes
- Country wines  
Wines made from ingredients other than grapes
- Demi-john  
A 1 gallon (about 4 litres) fermentation bottle
- Deposit  
See Sediments
- Dregs  
See Sediments
- Dry wine  
A wine with all the sugars fermented out
- Enzyme  
Proteins that change or break down unwanted ingredients, also see Pectic enzyme
- Ethyl alcohol  
See Alcohol
- Fermentation  
The conversion of sugar to carbon dioxide
- Fermentation trap  
See Airlock
- Fermentor

- Container in which the fermentation process takes place
- Fining**  
Process to make cloudy wine clear
- Flogger**  
Simple wooden corking device
- Fortification**  
Raising the alcohol content (per volume) of a wine by adding a liquor with higher alcohol content
- Fruit fly**  
Small fly found around rotting fruit. One fly into your wine, and your wine will turn into vinegar
- Haze**  
Suspension of small solid particles in wine
- Hydrometer**  
A device used to measure the SG of a wine or must
- Hydrometer jar**  
A cilinder of glass or plastic to place the hydrometer into
- Inoculate**  
To sterilize a must
- Juice fermentation**  
A fermentation on the presses juice of the fruit, in a secondary fermentor
- Lees**  
See Sediment
- Macerate**  
To soak ingredients for extraction of soluble components
- Mash**  
See Must
- Maturing wine**  
To let wine age, so that flavour and aroma improve.
- Metabisulphite**  
Undissolved sulphite
- Must**  
Unfermented wine
- Nutrient**  
Food for yeast
- Oxidation**  
Reaction with the oxygen in the air, causes wine to go bad
- Pectic enzyme**  
To break down the pectin in fruit
- Pectin**  
A substance that makes jams jel
- P.P.M.**  
Particles per million, the same as milligrams per liter (mg/l)
- Primary fermentor**  
An open container used for the first stage of fermentation, also see Pulp fermentation
- Proof**  
A scale used for alcohol content
- Pulp fermentation**  
A primary fermentation on the fruit pulp to extract colours and flavours
- Racking**  
Siphoning wine into another container and leaving the sediments behind
- Rose**  
Pink colored wine
- Sacrometer**  
See Hydrometer
- Secondary fermentor**  
A closed container used for the latter stage of fermentation
- Sediment**  
Small particles that settle on the bottom of the fermentation container

- Specific gravity**  
The weight per volume of a liquid (SG), related to sugar content
- Spirits**  
Distilled alcohol
- Stable wine**  
A wine without the risk of refermentation, that has fermented out
- Stopper**  
A rubber plug or cap used to attach an airlock to a bottle and to plug bottles
- Stuck fermentation**  
Premature stop of fermentation, before enough sugar has been converted
- Strength**  
Alcohol content of a wine
- Sulphite**  
A substance used for sterilisation of wine, must and equipment
- Sulphiting**  
To sterilize with sulphite
- Suspension**  
Small pieces that don't settle and float through wine, making it hazy
- Topping up**  
Filling the secondary fermentor to the top, to prevent oxidation
- Trap**  
See Air lock
- Ullage**  
The air space in a fermentor between the wine surface and the stopper
- Vinegar fly**  
See Fruit fly
- Yeast**  
The one-celled micro-organism that turns sugar into alcohol and carbon dioxide