

# How to Brew Fruit and Kit Wines

## An Introduction



**Paul Humber**

## Preface

In this book I've tried to bring together common knowledge, which is known almost universally among winemakers, the best I've read in various books, information and wisdom I've learned from more experienced winemakers, and the personal knowledge I've gleaned through trial and error.

As you proceed through this guide, I recommend that you weigh and consider the information contained herein, if you find it useful use it. Perhaps with these facts you'll produce excellent wine, perhaps not, you may have a better way of doing an operation than presented here, by all means use it. No book on winemaking should be considered an authority or "Bible." There is too huge a latitude in personal taste for adherence to only one method. Besides, if people didn't experiment with new ideas, equipment, and yeast strains we wouldn't have all the advancements modern winemakers now enjoy.

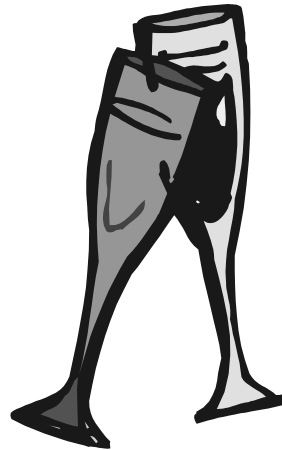
This hobby always provides room for improvement in technique, knowledge, and the ability to appreciate. It easily becomes a long term pursuit, the output of which you can share and enjoy with your friends. I can only hope you secure the same amount of satisfaction from your winemaking efforts that I have from mine.

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## GETTING STARTED

This book is intended for the novice winemaker. Most often you will use either fruits native to Newfoundland, those which will grow well in our gardens, or which are available for a reasonable price. Although this book will not make you a winemaster (it's not intended to) or even guarantee you an excellent wine on the first try, it will give you the basic background to an interesting and rewarding hobby. With patience and a little instruction most people can and do accomplish very good wines on the first try.

From the outset I'll be promoting modern winemaking procedures. Although Nan or your Uncle Jake may have been making wine for most of their adult life, (and it's pretty tasty), it still tastes homemade. Even people who don't drink much wine can distinguish it as such. But with the methods to be outlined in this book, you will be producing wines which will be as good or better than those commercially produced.

*“Better Than Store Bought!” How could it possibly be better?*

The simple fact is large wineries are not as fussy or as selective as you are. They don't always pick their fruit by hand, be it grapes (in France or Italy), or blueberries and partridgeberries (in Newfoundland). They use machinery or hire people who use berry rakes to harvest their fruit. During this process the fruit may get heavily bruised. Lots of twigs, leaves, and immature white berries get into the fruit, not all of which is removed before the winemaking process begins. They have time constraints, possibly wanting to get the product on store shelves. Commercial wineries also have employees, which without a doubt do not put as much effort and care into their wine as you will into yours. They may also not make their wine in the style which you most prefer, i.e., it may be sweeter or drier than you might like.

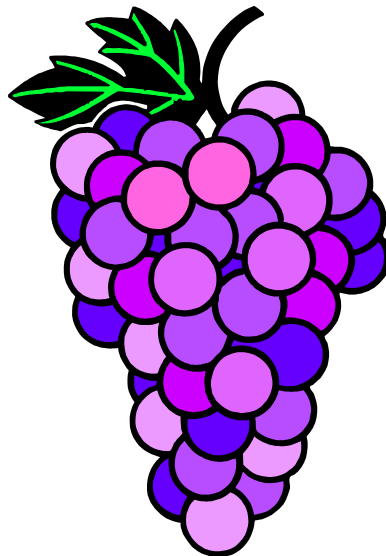
Nan used to (perhaps she still does) ferment her wine in an open bucket placed close to the wood stove using bread yeast. Old habits die hard. Because her baker's yeast and the brewers yeast used in beer production needs warmth people often assume the same conditions are needed for wine yeast. This is **wrong**. Wine yeasts today preserve the fruity flavours and bouquets best when used at cooler temperatures (12°C to 18°C) while being robbed of oxygen. Never use bread yeast to ferment a wine, it has been selected over eons for the ability to throw off large amounts of carbon dioxide gas to enable bread to rise. The yeast you will need converts sugar into alcohol with a minimum of foaming.

You will be discouraged in this book from using wine recipes. Instead, we will use one general purpose recipe which may be applied for any type of fruit you may be using. Although there are plenty of wine recipe books out there, it is best to produce your wine to your own taste. Staying always within specific target ranges for acid level, specific gravity, sulphites, and so on. Fruits always vary from year to year. (i.e., acid content, sugar content, etc.) so it becomes impossible to achieve consistent results while adhering to a regimented recipe. Keeping within the allowable limits gives you freedom to find the taste you like in a wine while preventing stuck fermentations and spoilage.

In some books I have read the author takes for granted that the reader is a chemist. In others, the various writers assume that most home winemakers are either experienced enough to bypass the basics, or lack the intelligence to ever really understand what's going on, so they never go beyond the most basic principles.

In this book I hope to outline the principles which are fundamental to making wine. While doing this I will also elaborate on why something happens without getting overly technical and telling you things you probably don't care to know.

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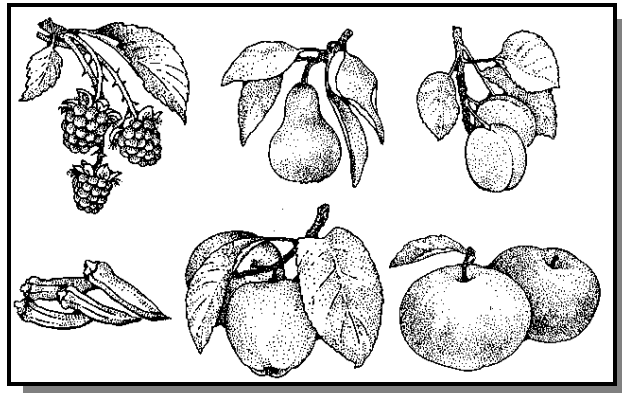
## WINE: A DEFINITION

What is wine? Nectar of the gods? Yes, many people think so. I am always amazed at what yeast cells can do to a fruit juice. People before the discovery of the microscope must have genuinely believed some mystical force was at work. But let us get a tad more technical.

Wine is the fermented juice of fruits. Most often the fruit is grapes. Vinifera grapes and the flavours created by them, are the benchmark by which we judge everything else. This entire process, from picking of fruit to serving of wine, is called Vinification.

Grapes descended from the wild European grape (*vitis vinifera*) have been cultivated and used to make wine since before the time of Christ. A wine snob believes that *only* *vitis vinifera* grapes can make suitable wine. The only requirement is to squeeze out the juice. Purists don't even add yeast. They allow the natural yeasts on the skins of the fruit to ferment and convert the "must" to wine. While it's true that a *vinifera* grape at early ripeness contains just the right amount of every component to produce wine, I'm a little more open minded. After all, how can we expect to compare the wines from two completely different fruits? "You can't compare apples to oranges," holds true here. I think that just about any fruit with adjustments for acids, sugar, and the use of a pure strain of yeast can make a good wine.

No, you cannot manipulate dogberries to produce a fine Muscadet, you can't get lamb chops off a cow either, but both have their individual charms. I am not very fond of dogberry wine. I don't like dogberries either, but my father loves both. Some fruits carry more of their characteristic flavour through the winemaking process than others, (raspberries for example make a very strong flavoured wine). Personal taste should have a lot to do with the fruit your going to use. If you don't like the fruit you generally will not appreciate the wine.



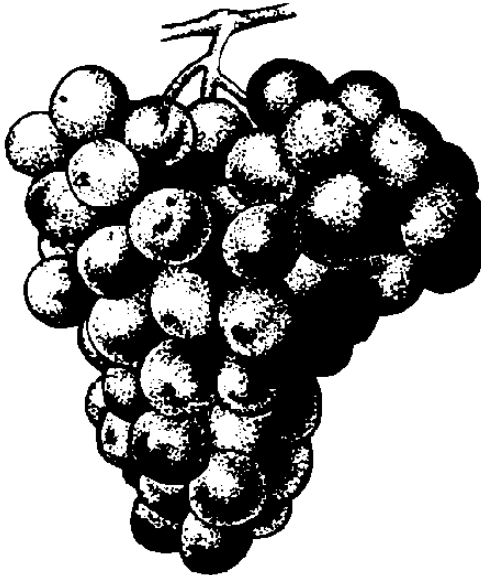
Any fruit can produce wine.

Many people blend their wines after it is finished fermenting or they blend the fruit to be used before the process is begun. I recommend the latter. This is done to help balance different acids in the wine and to enhance the bouquet, flavour, and colour of a more bland fruit. (i.e. malic acid in cherries with citric acid in blueberries). Blending is usually done with roughly 80 to 90% primary fruit and 10 to 20% blending fruit.

A Frenchman can say "all that is needed for excellent wine is the vine, the sun, and the soil" and he would be right. I don't live in the Loire valley on the coast of France. I live in the Humber valley in Newfoundland, a part of the world where deciduous trees have a hard time. What chance could a grapevine have? Instead I've chosen to make the best with what I have. With the addition of sugar, acids, tannins, and other natural additives in the proper amounts, truly

excellent results can be achieved with the abundance of fruits and berries available to us in our local area.

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## WINEMAKING TERMINOLOGY

Before going further, let me explain a few of the basic winemaking terms I will use throughout this book.

**ACIDS:** Available in crystal or powder form. Acids (tartaric, malic, citric, and succinic) are one of the most important components to a wine.

**AEROBIC FERMENTATION:** A fermentation which occurs **in the presence of oxygen**. This is usually the first few days of your winemaking procedure.

**AGEING:** The period of the winemaking process when the wine sits in carboy or bottles in a cool dark location and quietly improves. Even a mediocre wine will improve somewhat with age.

**AIR LOCK:** A device which holds a sulphite solution through which fermentation gasses pass out of the carboy. The air lock is fitted into a rubber bung and sits in the neck of the carboy. Air locks are available in one and three piece models.

**ANAEROBIC FERMENTATION:** A fermentation which occurs **in the absence of oxygen**. Usually the final stage of your winemaking procedure.

**BALANCE:** A wine will have balance when the acids, sugars, and tannins are combined in the correct proportions, then fermented correctly to produce a well-rounded pleasant flavour. Proper balance allows a wine's bouquet to come forward without being overpowered by alcohol or off flavours.

**BLENDING:** Blending is simply the mixing of fruit or wine to improve flavour. I always combine 80% Cherries with 20% blueberries. Cherries are a fruit high in malic acid and blueberries are high in citric acid. These two fruits complement each other. Any additional acid adjustment that is required would be done using tartaric acid giving the wine more balance. Wines may also be blended after fermentation is complete. Personally, I find blending finished wines difficult.

**BODY:** A wine's fullness; the sum of it's flavours.

**BOUQUET:** The smell or fragrance of a wine. Often a wine as it matures will develop a more pronounced or different bouquet. A wine may have a grassy, flowery, peppery, or one of many other bouquets which are generally identifiable.

**CAMPDEN TABLETS:** Potassium Metabisulphite in tablet form. One Campden tablet added to one Imperial gallon of wine or must will increase the metabisulphite level by 50 parts per million (PPM). Sulphites are essential in winemaking. This chemical is safe and has been used for hundreds of years. It's still widely used in the food industry.

**CARBON DIOXIDE:** A by product of fermentation. A wine which is fermenting or "working,"

produces two - yes, two - useful products. Alcohol of course is one. But carbon dioxide is also important, it is heavier than air and as it rises to the top of your fermentation vessel it stays on top of the wine, thus protecting it from oxidation. It also has a stirring effect in a wine as it rises to the top, which moves the must and yeast around together.

**CARBOY:** A glass bottle used to ferment your wine. Always insist on the 23 litre (5 gallon) model. The 19 litre type is for beer. If your thinking of buying a wine kit, you'll need the 23 litre size. If you purchase a wine making equipment kit the 23 litre carboy is included. For those producing larger amounts of berry wines a 54 litre size is also available.

**CHAPTALIZATION:** The addition of sugar to a must to bring it to the correct specific gravity before the yeast is pitched. This compensates for the lack of available sugars in the fruit being used.

**DRYNESS:** Wine is referred to as dry when the yeast has used up all or most of the available sugar. The amount of tannin also has the effect of making a wine taste dry, the more tannin the drier a wine tastes. Tannin gives dry reds that distinctive "bite." This effect can be observed by biting into the stem off a bunch of grapes, what you taste are the tannins.

**FINING:** The addition of compounds which helps suspended particles in a wine settle to the bottom of the carboy. Anything you do to improve a wine.

**GALLON:** Throughout this book metric measures will be used. For simplicity, (because so many vessels in use are approximately 1 or 5 gallons) I will occasionally use this term. One Campden tab per gallon is more easily visualized than one Campden tab per 4.55 litres.

**GLYCERINE:** Adds body and smoothness to young wines without adding sweetness. Use sparingly.

**GROUTS or LEES:** Yeast deposits, and suspended solids (fruit pulp and skin particles) which have settled to the bottom of the carboy during fermentation.

**HYDROMETER:** A hollow, weighted glass tube scaled to measure the specific gravity of a liquid.

**J-TUBE:** A long rigid length of tubing with an anti-sediment device at the end, used for racking.

**MUST:** The combination of crushed fruit, water, pectic enzyme, yeast nutrient, sugar, acids, and yeast.

**PATIENCE:** An essential ingredient to good winemaking.

**PECTIC ENZYME:** Sold in granular form it looks similar to sugar. This natural product helps break down fruit and aids in juice extraction. It also prevents cloudy pectin hazes in wines that require very long spans of time to clear otherwise. It is essential to modern winemaking. Except for 28-day kits, I add it to all my musts.

**PECTIN:** A gum of water soluble pectinic acid present in the cell walls of fruits. Fruits such as blackberries, currants, and sour plums are fairly high in pectin. Others, such as cherries, grapes, peaches, strawberries, and rhubarb contain less.

**POTASSIUM CARBONATE:** Use this chemical to lower the amount of total acid in your wine.

**POTASSIUM METABISULPHITE:** See Campden tablets.

**POTASSIUM SORBATE:** Sold as white elongated pellets, this chemical prevents yeast reproduction, thus preventing renewed fermentation. I have seen it listed as an ingredient on many grocery items in your refrigerator from apple juice to taco sauce. It is used by the winemaker when sweetening a wine after it has stopped working, or to stop a fermentation before a wine becomes too dry.

**RACKING:** Using a J-tube or similar device, wine is siphoned off its grouts into a clean container. The carboy is then cleaned and the wine is siphoned back into the carboy so the fermentation can continue. If you have a second carboy, this operation is greatly simplified. Wine must be racked, this is a basic procedure that must be performed at least every two weeks if you are to avoid undesirable yeast like flavours.

**SODIUM METABISULPHITE:** Serves the same purpose as potassium metabisulphite. Both are sources of sulphur dioxide.

**TANNIN:** Sold as a finely ground dark brown powder. It gives wine astringency or bite.

**WINE LOG:** A record of what you did and when. It does not need to be fancy. A scribbler with each batch of wine on a different page is fine. As long as all the important dates, amounts, and procedures are recorded. Your wine log will enable you to refer back and determine what you did wrong, or exactly how you produced that especially good batch of wine.

**YEAST:** Yeast is a fungus. There are literally thousands of different types of yeasts. The type most useful to people are the related species and strains of *Saccharomyces cerevisiae*. Wine yeasts are in this group. When choosing a yeast buy a Champagne-type dry wine yeast. Both Lalvin and Red Star have consistent quality, low-foaming yeasts. I would recommend either of these brands.

**Do not use bread yeast** it is designed to provide lots of CO<sub>2</sub> for raising bread. Good wine yeasts are sulphur tolerant. Sulphur tolerance enables a yeast to survive, reproduce and feed in a must in which harmful bacteria find it impossible to survive.

**YEAST ENERGIZER:** Sold as a fine white powder, you may use it to restart stuck fermentations. It is a blend of amino acids and vitamin compounds.

**YEAST NUTRIENT:** Sold as coarse white granules, it contains Dibasic Ammonium Phosphate as the active ingredient. Think of it as a fertilizer.

**ZYMURGY:** The science of fermentation and winemaking.

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## SUPPLIES

Before we can produce wine, you'll need a few basic supplies. Stores which supply equipment often offer a "basic kit" which may include many of the items listed below. Usually these kits are put together for making wine from concentrates and may lack some essential tools required to make wine from unprocessed fruit.

If, for example, you produced five gallons of wine from your first batch (30 x 750 ml bottles), you would have approximately \$300 worth of wine. You certainly would not need \$300 dollars worth of equipment. Even if you wanted certain types of wine; i.e., Chianti, or Bordeaux, you could purchase the grape concentrates and still produce excellent, inexpensive wines which are virtually identical to those commercially available.

You may be concerned about the cost and want to know exactly what you will need to spend. Okay, let's say a beginners kit costs you \$130, and a box or can of concentrate, which will produce five gallons, costs \$50. So the first batch is going to cost about \$6 a bottle, approximately \$4 a bottle cheaper than the liquor store, and you have written off the cost of your equipment. Each subsequent batch from store-bought concentrate will cost only \$1.70 a bottle. Wine from berries you pick yourself, will be pennies a bottle, to cover the cost of cleaning supplies and chemicals.

### Stuff ya gotta have

- Primary Fermentation vessel. Seven gallons or larger, so the must has room to foam. Generally any food grade container with a lid will do. So you can attach an air lock from the very start of your fermentation, select a container that you can make air tight. The earlier you get your wine under air lock the better. I know many people who use 30 gallon herring barrels that they have cleaned and sterilized. If you have 2 of these barrels (or 1 and plenty of smaller containers in which to rack your wine), you can use them as carboys to make large amounts of wine.
- Carboy or Secondary Fermentation vessel. Buy the 23 litre size, if your planning to produce wine from store-bought kits. I use a glass 23 litre carboy that I bought as part of a starter kit. The great advantage to glass is you can see what's going on inside the carboy. Whatever you use, you will need to fill it close to the neck (2½cm - 5 cm) with your must. It must also be able to receive a bung, fitted with an air lock. Sometimes you may only have enough fruit for a small batch. I've found 1 gallon glass or plastic jugs, such juice or vinegar jugs, ideal for these occasions.
- A stirring spoon. Long enough to stir from the bottom of a mixing bucket. Used for stirring sugar up from the bottom of your carboys.
- A siphon system that includes a J-tube, 2 meters of hose, and a spigot or hose clamp.
- Hydrometer
- \*Acid test kit

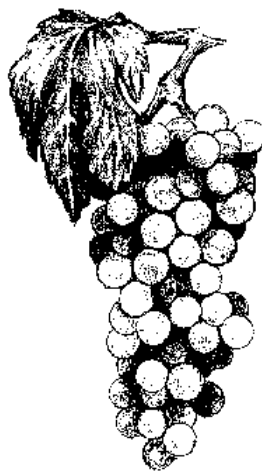
- \*Tartaric acid or acid blend
- Air lock and carboy bung
- Thermometer
- Cleaning solution. Chlorinated Trisodium Phosphate cleanser, a fairly expensive pink powder, is the best you can buy. Usually, after you have sterilized your equipment with once with CTP - to remove any stubborn stains - a solution of metabisulphite and water will be sufficient for most cleaning purposes. Metabisulphite is also easier to rinse.
- To make a sulphite cleaning solution, dissolve 50 grams of sodium metabisulphite or three Campden tabs in 4 litres of cool water. Do not use hot water as SO<sub>2</sub> fumes will be released. Do not mix the CTP and metabisulphite solutions together, as a poisonous gas will form.
- \*Wine yeast. Lalvin or Red Star brand.
- \*Yeast nutrient
- \*Campden tablets
- \*Pectic enzyme
- \*Potassium sorbate
- Wine log
- Bottles. Start collecting wine bottles. Wash and rinse them well then place them on their heads to drain. When ready to bottle your wine all you will have to do is give them a quick swish with some sulphite solution followed with some cool water. I save on sulphite solution by pouring it from one bottle to the next using only ½ a litre to sterilize 30 or so bottles. A 5 gallon batch of wine will require 30, 750 ml bottles. Use only glass bottles. The cork type is preferable, as the necks are heavier and the bottle itself will stand up to more washing and banging together in the sink or laundry tub. If you use corks you won't have the nuisance of lost or rusted screw caps, damaged threads, or leaking wine bottles. Never use empty plastic soda bottles. Nothing underwhelms a guest like seeing their glass of wine decanted from a 2 litre Pepsi bottle.

### Stuff that's nice to have

- A Wine filter or polisher. These are expensive (\$70-\$80 range). Many brew shops often rent them. If you have trouble clearing your wine it may be worth the investment. Discussed within finings.
- \*Finings: Discussed on page 19.
- Bottle corks. Similar in appearance to a bottle-capper. This device has a tapered tube through which the cork is forced. As you push the cork through the corks you reduce it's circumference,

thus allowing it to slide easily into a bottle. Once in the bottle neck, it expands again to make a tight seal. Without a corker, you will have to hammer the corks home using a flogger or wooden mallet (not recommended).

- Bottle brush. It will shorten the job of removing stubborn dirt from bottles.
  - Bottle or carboy sprayer. This device attaches to a water faucet (often a garden hose or thread converter is needed) and shoots a stream of water into a bottle when its turned upside down and pushed on over it. The jet of water can be very forceful and often eliminates the need for a brush. The sprayer is especially handy for large carboys, as most sinks are not deep enough to get carboys under the tap.
  - Plastic funnel
  - \*Measuring spoon. The type used to dispense medicine, calibrated in millilitres are inexpensive and accurate. Calibrated syringes, made for the same purpose are even better, but they can only measure liquids.
  - A Red Oak stick. “Oaking” adds depth and complexity to a wine. The stick (about the size of a paint stir stick) is sterilized by holding it over steam for a minute or so. It is then pushed down into the wine during fermentation. Alternately, you may oak by adding an extract after the wine is finished. These extracts, made by soaking oak chips in N-Isoprophyl alcohol, work well. For the serious winemaker, however, there is nothing like an oak barrel (discussed in detail later).
- \* these items not required if using grape concentrate or 28 day kit.
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## 28 DAY KITS

When they start out many people are impatient and want their wine ready quickly. The 28-day kit is about as fast as it gets. This speed is achieved through the use of chemicals and processing of the grape juice before it arrives to the customer.

The producers prepare the grapes much as if a commercial winery were to use them. They are stemmed, crushed, and the juice is extracted using enzymes like those available to you. The extracted juice is then filtered and refined to remove any fruit particles or fibers which could cause additional sediment or slow down the fermentation. Since this juice is not always satisfactory, the producer adds liquid invert sugar, tartaric acid, and other ingredients to bring it up to scratch.

The grape concentrate is made by putting this prepared grape juice in a vacuum kettle. Very low heat is required for it to boil in a vacuum. (**Very low** are the buzz words here, because heat destroys the fruity aromas of wine and would caramelize the sugar, causing off flavours). Through this rapid evaporation process, the juice is reduced to about ¼ of its original volume. The concentrate must then be diluted back to its original volume when used by the home winemaker.

There are several no-cost ways to improve 28-day kits. When starting out, most beginners follow the directions on the kit to the letter. They assume producers know what they are talking about because it is their product. You must realize, however, that they have prepared these concentrates for a specific consumer, one who has very little patience for winemaking. This consumer wants an inexpensive wine of good quality, which hasn't been taxed to death by the government. They want it instantly. Unfortunately for them, the only way to enjoy excellent wine without waiting is to walk into a liquor store and pick a bottle off the shelf. Many of my friends like making wine but lack the required patience to wait until it matures. Thus, when they come to my house I get complimented on my wine. They compliment me not because I did anything special with the kit, as they think, but because I'm serving wine which is often two or more years old. Even several months will make a dramatic difference to most wines. My friends always consume all of their stock within 6 months or less.

In many kits you're told to ferment your wine between 21°C and 30°C. The fermentation at 30° will be very vigorous and as a result will be finished faster. If you desire speed, then this is the temperature you should use. On the other hand, if you wish to preserve the aromas and flavours of your wine, I strongly suggest a fermentation temperature range between 14°C and 18°C. This will lengthen the fermentation time a little (possibly 3 to 5 days) but you will notice the improvement. A corner of the basement is ideal. The temperature is steady and cool, and your spouse is less likely to complain the house is starting to smell like a "brewery".

Another little trick is to put your wine into a sealed carboy straight off. Instructions in your kit will probably tell you to place it in an open fermenter for several days. You are told this because, when fermenting at high temperatures, a great deal of foaming occurs. When you ferment at a lower temperature this is not such a problem. This will reduce unnecessary handling of the wine

and immediately rob the yeast of air, reducing the chance of oxidation. To accommodate for a little foaming, though, you should still leave a small head space in the carboy .

After you have added the potassium sorbate to stop the fermentation, your instructions will direct you to add some type of clearing agent, usually isinglass, and let it sit for 8 days. In my experience wine has never cleared in 8 days. I usually rack it after it has settled for 8 to 10 days and then I allow it to settle for another three weeks or more before bottling.

### **Summary of smart Kit brewing:**

- *Let it mature.* A couple of months at least.
- Use a *cool fermentation.* 12°C to 18°C is good.
- Put it in a carboy under *air lock* at the very start.
- Let the wine have enough *time to settle.*

A word to the thrifty minded. Do not attempt to stretch out your concentrate, say, to make seven gallons of wine instead of five. You will be disappointed in a thin, watery wine. If you insist on watering the concentrate down to more than the specified amount, make adjustments for acid and sugar levels.

Some concentrates are better than others. Ask your friends, fellow winemakers, and wine supply store-owner which brands they consider superior. I've found those brands made with European grape concentrates, such as ABC Prestige, Wine-Art, and Vintage Classic, the best. Don't be afraid to try something new. The Gerwurztraminer concentrate isn't the biggest seller, but that doesn't mean it is not delicious. It may become your favorite.

Wine kits are a great way for the beginning winemaker to start. They familiarize you with the basic steps of racking, clearing and bottling. They enable you to become proficient at these procedures before you progress to making berry and fruit wines, which can be somewhat more involved.

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## THE HYDROMETER AND HOW TO USE IT

The hydrometer is a hollow glass tube with a weight in one end and a graduated scale in the other. The hydrometer I use has two scales, a specific gravity scale and a potential alcohol scale. Specific gravity is the scale used to measure the amount of dissolved sugar in a must relative to distilled water.

The potential alcohol scale indicates the percentage of alcohol which would be present in your wine if all the sugar were fermented out. This reading must be taken before yeast is added to the must.

To get the *actual* alcohol content of your wine you must:

- 1 record the specific gravity of your must just before you add the yeast;
- 2 record the specific gravity of your wine just before you bottle it;
- 3 subtract the second reading from the first number;
- 4 find that value on the specific gravity scale of your hydrometer; then
- 5 turn the instrument to the potential alcohol scale and take the reading.

### Example

starting s.g. = 1.085  
finishing s.g. = 0.995  
s.g. difference = 0.090  
alcohol = 12<sup>3</sup>/<sub>4</sub>%

Most winemakers will find this degree of accuracy unnecessary. In my experience the difference between measured potential and actual alcohol is always less than 1%.

Often there is a third scale, a Brix or Balling scale (B), marked on your hydrometer. This scale measures the amount of sugar in grams in 100 grams of must, thus giving you a percentage of sugar by weight; i.e., a reading of 6°B means there is 6 grams of sugar per each 100 grams of must. I've always found this an odd system. You will probably have limited use for it as a home winemaker.

The specific gravity range for white wines, regardless of the fruit used, is between 1.070 and 1.085. You should adjust red wine musts to between 1.080 and 1.095.

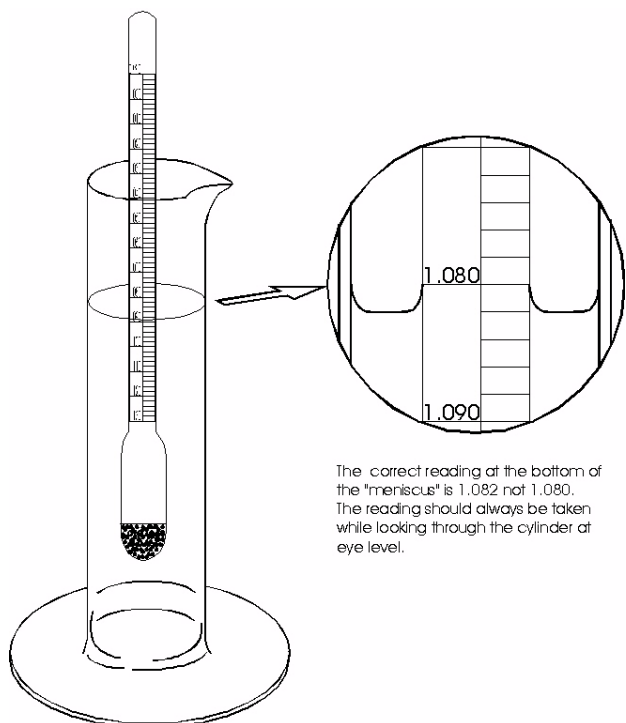
### How to read your hydrometer.

When reading your hydrometer, always do so in a testing vessel which you can see through. A proper glass or plastic test cylinder is inexpensive and tall enough to enable you to get a reading without the instrument touching the bottom. To take a reading properly:

1. Place the hydrometer in the test cylinder;
2. Pour in wine or must you wish to measure until the hydrometer floats;
3. Gently swirl or spin the hydrometer to dislodge any air bubbles or berry particles which could give a false reading;
4. With the hydrometer not touching the bottom or sides of your cylinder, observe and record the number at the bottom of the meniscus. The “meniscus” is the curved top of the liquid in your cylinder where the liquid touches the sides. The smaller the space between the hydrometer and the cylinder the more pronounced the meniscus. This is due to capillary action. **See fig. below**
5. Record the temperature of the liquid.

On most hydrometers you will notice a small remark which reads, “s.g. temp 15°C” or something similar. This is the temperature for which the instrument was calibrated. Any change above or below this temperature will result in a false reading. The difference, however, is meaningless unless your measuring very cold or very hot liquids. As a matter of interest, the correction is  $\pm 0.001$  s.g. for every 5°C above or below the specified calibration temperature, until you are measuring above 35°C, at which point the correction jumps to  $\pm 0.002$  s.g. for every 5°C.

After you have taken your first reading, more than likely your must will require an adjustment of sugar or water. If the s.g. is low, add sugar; if it is high, add water. Take your time. Add sugar or water in small amounts and stir well before you take another reading.



## METABISULPHITES

Sulphur dioxide (SO<sub>2</sub>) has a bad reputation. We constantly hear how high levels of this awful gas are polluting our environment. As by-products of industry, they are harmful in our atmosphere, but to the winemaker SO<sub>2</sub> is essential. There are magnesium and sodium sulphites in ocean water and in the expensive mineral waters many people drink. It is also used in hundreds of commercial products we buy, from pickles to soy sauce. Metabisulphites also occur in living plant and animal tissues, as part of the amino acids. These organic sulfur compounds are especially abundant in garlic, cabbage, onions, and mustard seed. With the exception of a small number of asthmatics, this compound is harmless when ingested. Our bodies, like most living things, produce this chemical.

### Why are sulphites used in wine?

Metabisulphites are used in wine for two reasons:

- 1 To help prevent oxidation; and
- 2 To kill bacteria and any yeast except wine yeast; i.e., bread yeast, beer yeast, and wild yeasts. Wine yeast can tolerate moderate levels of SO<sub>2</sub> without effect on performance.

Ancient winemakers produced sulphur dioxide by burning brimstone. The SO<sub>2</sub> modern winemakers use comes in the form of sodium metabisulphite (powder or crystals) or potassium metabisulphite (campden tablets). While sodium metabisulphite can be used in winemaking, I generally use it for sterilizing equipment by dissolving 50 grams in 4 litres of water. Be sure to rinse equipment well after using this solution.

It is better to use potassium metabisulphite in your wine.

- It comes in pre-measured tablets (1 campden tab per gallon adds 50 ppm SO<sub>2</sub> to your wine).
- It doesn't add sodium to your diet.
- It's more widely available.

### How much is required?

When first preparing a must, I add 1 campden tablet per gallon when I add my pectic enzyme powder. This kills any wild yeast which may be on the skins of the fruit. At each rack I add ½ to 1 campden tablet per gallon. **The fermentation helps protect the wine.** After fermentation is complete, I rack it a final time and put it in a cool place to settle and clear. At this final rack I add 1 Campden tablet per gallon. I also often add a further ½ tablet per gallon at bottling, for wines which I fear could oxidize easily (i.e., low acid wines). It is perfectly acceptable, however, to add as many as two Campden tablets per gallon at every racking, up to four tablets per gallon total. Although I find this excessive.

Number of Campden Tablets Required to Produce Adequate Levels of Sulphur Dioxide in Wine or Must. (displayed in parts per million)

<b>Litres of Wine</b>	<b>1</b>	<b>4</b>	<b>8</b>	<b>16</b>	<b>23</b>	<b>46</b>	<b>50</b>
<b>No. of SO2 tabs</b>							
¼	<b>57</b>	14.3	7.2	3.5	2.5	1.2	1.1
½	114	28.5	14.3	7.2	5	2.5	2.3
¾		42.8	21.4	10.7	7.4	3.7	3.4
1	<b>57</b>	28.5	14	10	5	4.5	
1½	<b>85.5</b>	42.8	21.4	14.9	7.4	6.8	
2	114	<b>57</b>	28.5	19.8	9.9	9.1	
2½		<b>71.3</b>	35.6	24.8	12.4	11.4	
3		<b>85.5</b>	42.8	29.7	14.9	13.7	
3½		<b>99.8</b>	49.9	34.7	17.3	16	
4		114	<b>57</b>	39.7	19.8	18.2	
4½			<b>64.1</b>	44.6	22.3	20.5	
5			<b>71.3</b>	49.6	24.8	22.8	
6			<b>85.5</b>	<b>59.5</b>	29.7	27.4	
7			<b>99.8</b>	<b>69.4</b>	34.7	31.9	
8			114	<b>79.3</b>	39.7	36.5	
9				<b>89.2</b>	44.6	41	
10				<b>99.1</b>	49.6	45.6	
15				<b>74.3</b>	<b>68.4</b>		
20				<b>99.1</b>	<b>91.2</b>		

50 ppm should be considered the minimum acceptable level in a wine or must.

100 ppm (approximately) should be considered the maximum acceptable level.

Many commercial wines (particularly whites) often contain upwards of 150 ppm.

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## WINE ACIDS

All fruits contain fruit acids. There are many types of acids in wine production and in the raw fruits themselves. Generally, most fruits reach their best at the firm ripe stage - well ripened but not too soft. At this point the natural acids are usually fairly balanced. For example, grapes are somewhat too malic when under ripe. As the grape ripens, tartaric acid becomes more plentiful and dominates the grape, making for good wine.

<b>Must</b>	<b>% of acid</b>
White Grape	.75 to .80
Red Grape	.70 to .80
White non-grape	.55 to .65
Red non-grape	.50 to .60

Amount limits for various musts.

I cannot over stress the importance of acids. Yet the beginner often does not deal sufficiently with this factor of winemaking, or worst, overlooks it entirely. The problems many beginners encounter dealing with acids are often compounded by their strict adherence to a recipe. As I've already stated, it is better to stay within certain *amount limits* than to just blindly follow a recipe. Let me offer several examples to demonstrate why a recipe cannot work consistently.

- Wild verses garden grown fruit. Wild berries and fruit tends to be higher in naturally occurring acid. The addition of acid as called for in a recipe may be too much, if you are using fruit harvested from the wild. The must may actually need the addition of water or other methods to lower acid levels.
- Different growing conditions. Growing conditions vary from year to year, from location to location, and farmer to farmer.
- Time of harvest. Each year when fruit is harvested it will not have the same degree of ripeness. Also, due to weather, convenience, or time on store shelves, when you are ready to make your wine the acid level will differ in the fruit each time.

So what can we do to help insure consistent results? I recommend an acid test kit which uses the Titrate method for determining acid content. This type of kit is inexpensive (approx. \$10), portable, and accurate.

### How to use a test kit.

1. For most kits you add a 15 cc sample of wine or must to a clear bottle or drinking glass.
2. To this is added 3 drops of pH indicator (phenolphthalein)
3. Fill a 10 cc syringe with titrate solution (sodium hydroxide)
4. Add the titrate solution  $\frac{1}{2}$  cc at a time to the must and swirl.

5. When a colour change takes place (pink for white wines, gray for red) note how much titrate solution was used; i.e., if you started with 10 cc and finished at 4 cc, you used 6 cc of solution. For each cc of solution you used, the must contains 0.1% acid. Your wine, therefore, contains 0.6% acid.

6. To increase the acid content, add tartaric acid or acid blend to your must. Adding 5 ml (1 tsp.) per gallon will raise the acidity 0.1%. If you would like an acid content of .75% for a 5 gallon container of white grape wine and it now contains 0.6%, you would have to add 37.5 ml (7½ tsp.) of acid.

Generally when adjusting a wine, acid will be added. Occasionally, though, you will need to lower the acid level. There are several methods to accomplish this:

- Severe chilling of the wine, to within a couple of degrees of freezing, will cause acid crystals (also known as wine diamonds) to form. Once formed they will not dissolve again, and are, in effect, removed from the solution.
- The addition of potassium carbonate at a rate of approx. 1 ml per gallon will lower acidity by 0.1%. When using this chemical, however, do not lower the acid level by more than 0.4%.
- The addition of a little water can help, but care must be taken to insure against a watery tasting, thin wine. A thin wine, while containing less acid when tested, will appear more acidic when tasted. This effect also works in reverse. A full bodied wine, although it may be high in acid, will not appear so astringent as a thin wine with an identical test reading. Experience is really the only way of learning where to draw this fine line.
- A wine may be blended with one of low acidity.
- Although glycerine, like water, has no taste or acid reducing properties, a little (1 ml per bottle max.) added to a wine will “appear” to make a wine less astringent and more full bodied. The reverse is also true with water, as mentioned above.

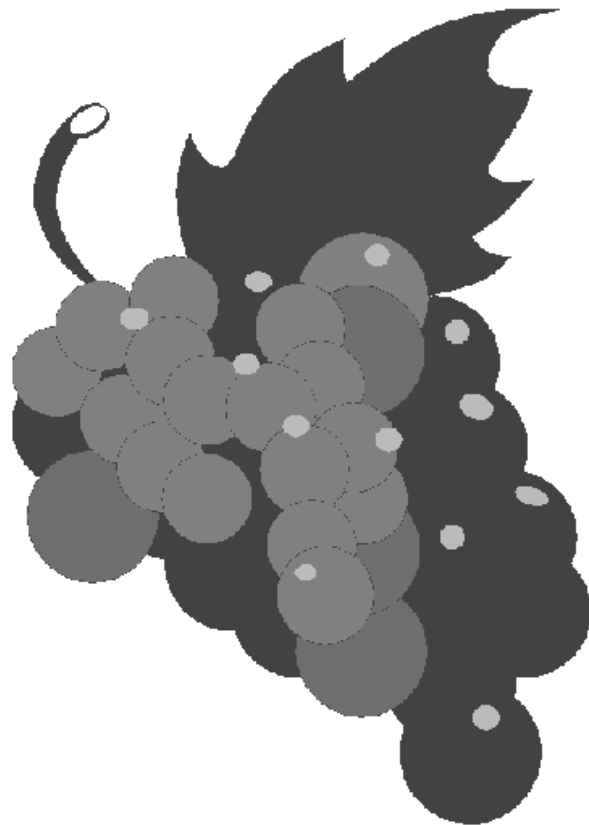
When making wine you must keep in mind the type you are producing. A wine must have balance. To achieve good wine, satisfactory balance is necessary. For example, assume you wish to make a dessert wine using raspberries. Raspberries have a strong distinctive flavor which comes through in a wine. Dessert wines are sweet by definition. Thus, contrary to what many people hear, a raspberry dessert wine will require a fairly high acid level, to give it balance. Otherwise, the sweetness and flavour will overpower the wine. Other acids you may hear mentioned include succinic acid and lactic acid.

A little succinic acid will be present in all your wine. It is formed during fermentation, and is superior to all others previously mentioned in its ability to produce esters, giving wine extra flavour. To do this, however, your wine will need several years maturation.

Lactic acid occurs naturally in wine which has undergone a malo-lactic fermentation. You can

encourage this by using specific types of yeast, and adding bacterial culture. This is an advanced technique in winemaking, so I will not go into too much detail here. While it is even superior to succinic acid, it is difficult to achieve, as you do not add the cultures until fermentation is nearing completion. You must also allow the level of sulphites in the wine to drop before the fermentation will begin, otherwise, the bacteria (*Leuconostoc oenos*) will be destroyed. It also requires long maturation.

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## SUGARS

To produce alcohol in wine at least one type of sugar must be present. It could be fructose, glucose, dextrose or dozens other different types which occur naturally in most fruits. Also present in many fruits and honey is the sugar, sucrose. Sucrose may be added to your must in the form of common white cane (table) sugar.

Beer brewers know to use only corn sugar in their wort, or their beer will taste cidery and off. Unlike beer yeasts, wine yeast is not particular about the type of sugar you use. Wine yeast can totally digest most basic sugars. This is a bonus for the home wine brewer, as corn sugar is about three times as expensive as regular sugar.

As a general rule, you should adjust red wine musts to a specific gravity in the range of 1.080 to 1.095. White wines are usually within a range between 1.070 to 1.085. Do not attempt to produce wine with a potential alcohol level above 14%. Many wine yeasts will not survive in liquids with more than 14% alcohol. It is easy to add too much sugar. What you will then have is a strong wine with too much residual sugar, thus making it oversweet and undrinkable. It is better to stick within the aforementioned guidelines, ferment to dryness, and then stabilize your wine (1 gram or 1 ml of potassium sorbate and 1 Camden tablet per gallon) and then sweeten to taste.

Sweetness must be balanced with acidity, and vice versa. A sweet wine must have a relatively high acid content, to cut the sweetness and give the wine a finish. Otherwise the wine will taste insipid. Generally, high acid wines (most but not necessarily all) must have some residual sugar to impart smoothness, add balance, and round out what would otherwise be a harsh wine.

**Note:** 1 cup of sugar weighs 210 grams. 114 grams of sugar will raise the specific gravity of 1 gallon of must .010; i.e., from 1.050 to 1.060. 114 grams of sugar is a little more than ½ cup. Always add sugar slowly (in small amounts) and, after each addition, stir well before taking a specific gravity reading. It's much easier to add more sugar than to try and correct a must which has been over sweetened.

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## FININGS: DESCRIPTIONS AND USE

With the exception of certain problems; e.g., pectin haze, almost all wine will clear given enough time. Gravity will have its way with even the smallest of particles, if they are left in a still liquid long enough. Trouble is people find it hard to wait, especially when it is their first batch. This is where the various fining agents come in. Finings work either by sticking to particles making them heavy enough to sink or by using charged ions to cause particles to stick to each other making them settle to the bottom.

### **Sparkolloid**

Sparkolloid is a natural albuminous protein extracted from kelp and sold as a very fine powder. While Sparkolloid may be used any time after fermentation has been established, I find it is best used when fermentation is complete and you are ready to set the wine aside to settle. The directions often specify boiling approximately 10 ml in 100 ml of water to clear 5 gallons. I always boil it in wine taken from the carboy, as it dissolves better. Once boiled pour it directly back into the carboy. Most often used for red wine. **CAUTION:** If your carboy is made of glass pour this and all hot liquids through a funnel being careful not to let the liquids come in contact with the bottle neck, for fear of cracking the carboy.

### **Gelatine**

These white granules are an all purpose fining. You can use it for red or white wine and beer. But it is most useful for white wines. It is a mixture of gelatine and silicon dioxide, with the active ingredient being animal collagen. It is the best fining available for white wines, but you must take care using it. Too much, and some of a wine's flavour and bouquet can be removed.

### **Bentonite**

Bentonite is sold as a powder and as coarse granules. It is refined clay. In 28-day kits it is added directly to the must just before the yeast, and this is perfectly acceptable. A better way is to add the same amount to a litre of hot water, stir well and let stand for 36 to 48 hours. In this time the clay will swell and become almost gelatine like. Pour this into the must, or a wine which has slowed or finished its fermentation. Bentonite is also valuable to the winemaker, because it provides a nucleus in a must on which CO<sub>2</sub> gas can form to aid fermentation.

### **Isinglass**

Produced from sturgeon swim bladders, isinglass is sold either as a fine white powder or as dry hard fragments. It is protein, extracted from the bladders of these fish, which is useful for red wines. While it is hard to use, it is always included in 28-day kits, possibly because it is hard to damage a wine with this fining. This product is easier to use when bought as a prepared liquid called "super-clear".

## **Potassium Sorbate**

Sold as pure-white rice sized granules, this chemical stabilizes a wine by inhibiting the activity or growth of yeast. Be careful when measuring and adding this to your wine. Add 2 ml per gallon of wine. Any less and the wine may begin to re-ferment. Much more and you will be able to taste the sorbate. There are also bacteria which will react with sorbate if too much is added, producing a strong odor of geraniums which will ruin your wine. To help prevent this always add at least ½ Campden tablet per gallon when adding sorbate.

## **Sodium Benzoate**

Sold in tablet form this stabilizer works to stop fermentation the way potassium sorbate does. The dosage is 1 crushed tablet per gallon. It is not so widely available as potassium sorbate.

## **Filters or Polishers**

If you do not like to wait for a wine to clear (even with finings), then filters are for you. The best of these are motorized and pressurize the carboy to force the wine through paper filter pads (course pads for red wines, fine pads for white). These may be rented from your local brew store or you may purchase your own for about \$70 - \$200. With a fine porosity pad, filters are very effective at removing particles (yeast cells, proteins, etc.) from your wine. The things to be aware of are:

- the chance of oxidizing your wine (be sure there is no leakage between the plates)
- always force a gallon or two of clean water through new pads. This will reduce the chance of anyone being able to detect a “cardboard” like taste.
- always add metabisulphite **before** you filter.

To me filtering a wine is not a necessity. It doesn't always improve a wine, and is an admission of impatience. To be palatable the wine must age for several months regardless. So what's the rush.

## **Oaking**

Many people like the addition oak gives a wine. Again, care must be taken. When wine is brewed in an oak cask or barrel the effect is often overpowering. Alternately, aging in oak can also have its hazards, and is best left to the advanced amateur or pro. But when a few oak chips or a small red oak stick is added to a carboy no damage can be done and the slight oaking achieved will add complexity to certain wines. Personally, I find oaking best for medium to full bodied reds; i.e., Chianti or Black Currant. But there is no rule, many people like to oak whites.

Wine may also be flavored by using oak aging compounds. These are made by soaking or boiling French oak in alcohol. These can be added to wine after fermentation is finished. The amount of oak flavour in the wine is also easier to control with this method. If your serious about winemaking and interested in aging your wine in oak, see the section of this book dealing with

barrels and kegs.

### **Pectic Enzymes**

Almost all fruits contain pectin, some more than others. I consider pectic enzyme an additive, like I consider wine yeast an additive. You can not make wine without it. When added as directed, it eliminates pectin haze. There is no other way to prevent this condition, and if it is in a wine, the haze will never clear on its own. Always add to the must as directed (except 28-day kits).

### **Rohament P**

This is the trademark name of a German company, Rohm GmbH, Chemische Fabrik (Darmstadt, F.R.G.). Rohament P, is a macerating enzyme preparation isolated from the fungus, *Aspergillus alleaceus*. It contains an endo-polygalacturonase (pectinase) as the major ingredient, but it also contains minor amounts of cellulases, hemicellulases, B-glucanase and protease\*. Lundy (1978: 82-85) describes its use in the extraction of juice from pulpy fruits. You can still buy it separately, but it is usually an additive in pectic enzyme powder now. Just thought you might like to know.

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\*[Sreenath, H.K. and B.J. Radola (1986) *J. Biotech.* 4: 269-282.

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## FINISHING OR SWEETENING A WINE

When you are brewing a wine, never attempt to hit a desired sweetness by adding “to much” sugar to your must. It never works. Once the yeast has produced approximately 14% alcohol in the wine, it stops working, and there is always the improper amount of residual sugar. If you add the correct amount of sugar and stop fermentation early, you have a wine which may be too low in alcohol content. The better method is to stay within allowable specific gravity limits using your hydrometer. Ferment to dryness; i.e., ferment out all sugar. Stabilize the wine with potassium metabisulphite and potassium sorbate. Then, if desired, you may safely sweeten the wine. For winemakers who want to sweeten their wine a little after fermentation is finished, sugar may be added safely once sorbate and Camden tablets are used. Always boil your sugar in a little water before adding it to your wine. (One cup of sugar to ½ cup of water). This not only sterilizes the sugar but also makes it easier to measure. To be sure you get the taste your looking for, measure out 50 ml of finished wine. Add your sugar syrup to this sample 1 drop at a time. When you arrive at the sweetness you want, remember how many drops were added. Double the number of drops added to the 50 ml sample. This is the number of millilitres or cubic centimeters (cc) you add to each litre of finished wine to achieve the same sweetness. Here are some conversions you may find useful when sweetening your wine.

These conversions are all based on the number of drops in a 50 ml sample.

drops added to sample x 1.5 = ml per 750 ml bottle

drops added to sample x 2 = ml per litre

drops added to sample x 9 = ml per gallon

drops added to sample x 45 = ml per 5 gallons

**Caution:** Do not use the syringes which come with your acid test kit. The chemicals in the kit are very corrosive and you do not want to risk contamination. A child’s cough syrup syringe is very accurate and can be purchased at any drug store for less than \$1.

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## BOTTLING

Well, you've finally got the wine worked off, allowed it to clear, and possibly let it age in the carboy for awhile. Now your ready to bottle.

The first thing you need are bottles. Collect some second hand. These are cheap and of high quality. Not only will you save money but you'll be recycling. Alternatively, if there is a recycling depot in your area, it may sell you bottles. In either case, they will need to be washed. If you already have washed bottles, then a quick rinse with a sterilizing solution of 50 grams (2 tablespoons) of sodium metabisulphite dissolved in a gallon of water is all you require. I use about 500 ml and pour it from one bottle to the next to save chemicals and time. You may rinse with clean cold water, if desired. Often experienced winemakers will add ½ Campden tablet to their wine at bottling, but instead of this, I simply omit this final bottle rinse, thus leaving the residual metabisulphite in the bottle.

Next, you may insert additives into the bottles (oaking, glycerine, etc.). Adding chemicals to your bottles one at a time may be tedious, but I prefer it over racking the wine into a bucket, adding chemicals, then bottling. It reduces the risk of oxidation, by eliminating a rack. A small syringe will allow for accurate measurement to ensure every bottle receives the same amount.

Gently lower the j-tube about one third of the way down into your elevated carboy and begin to fill your bottles. When you reach the bottom of the j-tube lower it almost to the bottom of the carboy and fill the remaining bottles. If there are any bottles you would like to store long term, use the first ten you have filled. There should be absolutely no sediment in those bottles. Even sediment clinging to the sides of the carboy would not have had a chance to float off and get into these bottles.

Now put your corks in a bowl with water and a little metabisulphite solution and allow them to soak a few minutes to soften. Alternately you could bring them just to a boil in a covered pot. This makes corks very soft and easy to insert, but be careful not to boil too long. When you boil your corks you will notice that the water turns a light brown colour. This colour is the natural oils and resins, which keep the cork moist and elastic, being boiled out. The drawbacks to boiling are the cork will become quite hard in the bottle, and lose some of it's elasticity, thus increasing the risk of leakage. **Boiling is not recommended for bottles which you intend to store long term.**

When corking wine use a corker. Corkers, when you press down on the mechanism, force the cork through a tapered hole thus compressing it allowing it to enter the bottle neck easily. Never attempt to flog (hammer) corks in. Small diameter corks are required, and you end up with leaky bottles. A quality home corker can be purchased for less than \$20.

The only thing left now is to label and add shrink wraps, if desired. I advise labels. Once several months pass, it can be very hard to tell which wine is in which bottle. If you would like to add shrink wraps, be sure your corks are dried a little. This will help prevent mold forming on your

corks. If you do discover a little mold on your cork when you remove the shrink wrap, this will not affect the wine as long as it has not gone straight through the cork.

## **Storage**

Storage is important, because wine needs time to mature. Three months or so, minimum. Most of the finer chateaux in France have cellars which have been tunneled out of the chalky ground. Such a cellar is ideal. The wine rests in the cool dank ground quietly maturing until the wine master decides it is ready.

Most of us don't have such facilities and unlimited storage. Fortunately, it is not required. All you need is a fairly cool location (approx. 13°C) with a steady temperature, where the wine can sit undisturbed for as long as possible. Steel shelving in a corner of my basement next to the outside wall is my cellar. There is also an ideal humidity level for wine storage, but my handsaws would rust if I were to try to maintain it. So I don't worry about it.

## **Champagne**

If you make champagne your wine will require a secondary or bottle fermentation to carbonate the wine and thus give it some fizz. This, in turn, requires the use of a champagne type bottle. Champagne bottles are much heavier and thicker, to withstand the high pressures (5 or 6 atmospheres or 70 to 85 psi) generated within them. Inspect champagne bottles carefully for any nicks, chips, or scratches and discard any you find with defects. I do not recommend the production of champagne until a person is in the intermediate or advanced stage winemaking. If making this type of wine, the grouts or lees will have to be removed from the bottle, after the wine is carbonated. Since this is an involved process, I will not deal with it in this book which I have prepared for the winemaker in the beginner or basic stage of the hobby.

**NOTE:** There are various types and sizes of corks. Do not buy the reconstituted compressed particle type. The particles soak off in the bottle, they become hard, and are difficult to remove. I also get to wondering sometimes what they use to stick all those little cork bits together.

The cork you want is punched out in a single piece, straight sided (not tapered), size # 9. Corks sized #8 are OK, but are not as tight as #9's and are thus more prone to leakage. Corks also come in different lengths. Buy the longest cork you can find, you never know how long you may decide to keep a bottle of wine in the cellar.

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## VEGETABLE AND GRAIN WINES

One word of caution here. You will notice I have said you can make wine from any “fruit”, and that is just how I feel. Vegetable and grain-based wines are awful, as are flower petal wines. Wines made from root vegetables often produce a certain amount of methyl hydrate, a very dangerous alcohol which can poison and blind. Grain wines (i.e., sake), produce fusel oils which are also toxic. This is the reason products such as rye whiskey are distilled. The fusel oils are left as a residue during the distillation. Both these compounds are almost odorless, colourless and are hard to detect when mixed with other flavours. The fusel oils are also the cause of tremendous hangovers if even moderate amounts are consumed.

Vegetables and grains store sugar in the form of various starches. To ferment these starches, you must add an enzyme called amylase. This enzyme helps convert starch into sugar so that it may be fermented. Without the use of amylase, a starch haze will be present in the wine.

The only exception to this no vegetable rule is rhubarb. If handled correctly rhubarb produces a light, pleasant wine. Rhubarb contains oxalic acid, which is concentrated in the leaves. Never cut the stalks off too close to the leaf, always cut 2 to 3 cm below the leaf. You can also peel your stalks before slicing and crushing to help reduce the amount of fibrous material in your must. After adding amylase and pectic enzymes, extract the juice. You may find Rohament P useful in extracting juice from rhubarb. Once the juice is extracted, proceed with acid adjustment and process as you would any wine.

**Note:** oxalic acid is produced in rhubarb over time and is accumulated as the stalk grows. Pick your rhubarb early in the season, as soon as it is big enough. This will reduce the amount of this noxious acid in your wine.

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## WINE LOGS: KEEPING A RECORD

The best way to achieve consistent results is to know what you have done previously. Remembering what you did with a wine last year is impossible for most people. Thus, a record must be kept. This way, if your wine turns out well you can duplicate your results; if its not so good you may go back and see where you went wrong.

Your record doesn't have to be complicated. Note the things you feel are important; e.g., if you always make 5 gallons of wine, then you need not record it, unless you deviate from that amount. Some of the more important particulars you could keep track of are: type of wine, starting date, type of yeast, amount of fruit used, starting specific gravity, pH level, total acid, racking dates, amount of metabisulphite (Campden tabs) added and when, and the bottling date.

Many wine supply stores give you a wine log with the purchase of a kit. You may hang this on the neck of the carboy and fill in the appropriate slots as needed. The Fig. below is an example of a wine log which keeps track of the most important basics.

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Wine Log No. \_\_\_\_\_

TYPE OF WINE & BRAND \_\_\_\_\_ AMOUNT IN LITRES \_\_\_\_\_

YEAST STRAIN \_\_\_\_\_ DATE STARTED \_\_\_\_\_ DATE YEAST ADDED \_\_\_\_\_

STARTING S.G. \_\_\_\_\_ STARTING ACID \_\_\_\_\_

INGREDIENTS

\_\_\_\_\_ CAMPOEN TABLETS \_\_\_\_\_

\_\_\_\_\_ NUTRIENT \_\_\_\_\_

\_\_\_\_\_ GRAPE TANNIN \_\_\_\_\_

WATER \_\_\_\_\_ PECTIC ENZYME \_\_\_\_\_

SUGAR \_\_\_\_\_ ENERGIZER \_\_\_\_\_

COMMENTS \_\_\_\_\_

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RACKING DATES	S.G.	COMMENTS
1 _____	_____	_____
2 _____	_____	_____
3 _____	_____	_____
4 _____	_____	_____
5 _____	_____	_____

DATE FILTERED \_\_\_\_\_ # OF PAD \_\_\_\_\_

DATE SEALED FOR STORAGE \_\_\_\_\_

DATE BOTTLED \_\_\_\_\_ ADDITIVES \_\_\_\_\_

FINAL APPRECIATION

% ALCOHOL _____	ACID _____
BOUQUET _____	BODY _____
TANNIN _____	FLAVOUR _____

DRY  MEDIUM  SWEET

## WINEMAKING PROCEDURE OR RECIPE

1. Begin by ensuring that all your equipment is washed, sterilized with metabisulphite solution, and rinsed. If you use the pink sterilizing stuff, (chlorinated trisodium phosphate), ensure that all apparatus is rinsed very well.
2. Wash and inspect the fruit for any damage, and cull inferior fruit.
3. Insure you have the proper amount of fruit you need for the type of wine you intend to produce. For table wines a good rule of thumb is for small berries; (i.e., blueberries, black currants, partridgeberries, etc.), you will need about 7 kg of berries for 23 litres of wine, or 3 lb. per gallon. For pulpier fruit such as; cherries, plums, peaches, etc., you will need approximately 11.5 kg of fruit for 23 litres, or 5 lb. per gallon. Of course, if you are making a dessert style wine, you will need more fruit to achieve fuller body and flavour.
4. Crush the fruit and place in a bucket. Do not liquefy fruit in a blender or any high

speed food processor. As long as you break the fruit, you will enable juice extraction. Be sure to break all berries, to prevent them from floating.

**5.** Many people like to blend their wine. You may blend finished wines, but a far easier way is to blend the fruit. Now is a good time to blend your fruit. When blending fruit, decide on the principal fruit, then blend this with approximately 10 % to 20 % of a fruit with a complementary acid content; i.e., if using cherries as the main fruit (malic acid is the predominate acid in cherries), blend with a fruit such as blueberries which contain mostly citric acid.

**6.** To the crushed fruit add an amount of room temperature water equal to about ½ the amount of wine you intend to produce; i.e., if you plan to produce 23 litres of wine add 12 litres of water to your fruit.

**7.** Add ½ Campden tablet per gallon of fruit and water slurry.

**8.** Add pectic enzyme to the fruit-water mixture. Approx. 13 ml for 23 litres or 2.5 ml (½ tsp.) per gallon.

**9.** If your using Rohament P add it now.

**10.** Now, place a clean cover on the bucket and give it a good stirring at least every 12 hours. If you have not used Rohament P, you must keep the mixture at room temp for between 36 and 48 hours, to break down fruit cell structure and aid juice extraction. During this time do not forget to stir as it prevents fungal growth. If, on the other hand, you did use Rohament P, your in luck. This wonderful product will generally reduce even the pulpiest of fruit to a liquid slurry in about 2 or 3 hours and allow you to get on with your winemaking. This product is used extensively in Europe and is only recently becoming available to the amateur winemaker. The dosage is approximately 0.2% of the weight of your fruit.

**11.** Pour your juice through a nylon straining bag to remove the fruit skins and seeds if they are large. Gently squeeze the remaining juice from the skins. Do not attempt to get every last drop. Squeezing too much will force out pectin from the berry skins. Discard the pulp. If you don't have a nylon straining bag, the clean and sterilized leg of a woman's pantyhose will do. Often a pantyhose is preferable for such small-seed fruit as blueberries.

**12.** Dilute your juice to within 2 or 3 litres of the desired volume of wine you wish to make. This couple of litres will make room for you to add sugar, which will bring up the volume of the juice.

**13.** Measure and adjust the acid level in the must to the recommended level, using an acid test kit. Appropriate acid levels for various wine styles are discussed in the chapter Wine Acids.

**14.** Measure and adjust the specific gravity in the must and add sugar as required. Stir well each time sugar is added or the specific gravity reading will be false. The hydrometer will only measure sugar dissolved in the must, not sugar sitting in the bottom of your carboy.

**15.** Add yeast nutrient and stir well. You now should add any other ingredients you prefer to your wine; e.g., bentonite, tannin, oak shavings or stick. Since the first stage of the fermentation is usually quite vigorous and there is usually some foaming, fill the carboy only to the “shoulder” where the sides of the bottle begin to curve in toward the neck. If for some reason you miscalculate and you have a little too much juice to fit in the carboy, store this juice in a clean jug in the refrigerator and use for topping up the carboy when racking.

**16.** Finally add your wine yeast. Sprinkle it on top of the must and do not stir in. Affix a rubber bung with attached fermentation lock into the neck of the carboy. Pour a small amount of sulphite solution in the fermentation lock to ensure that no microbes can enter the carboy.

**17.** Place the carboy (or whatever container your using) in an area where the temperature remains between 12°C and 18°C. After 24 hours or so, have a look at the fermentation lock. If there are no bubbles rising through it, move the carboy to a slightly warmer location 20°C to 24°C, until the fermentation starts. After it begins to bubble, return the carboy to its original cooler location. Allow the yeast to do what comes naturally.

**18.** It is a good idea now to start a wine log. Write down all your readings and measurements: specific gravity and acid, and the amounts of everything you added to the wine. Also note the dates on which you rack your wine, in this way it is easy to know approximately when you will need to rack again. A wine log is especially important if you have more than one batch of wine working at once, as it is all too easy to get mixed up in what you did to each batch and when. Anything else you feel is important should also be noted. In this way if a wine turns out to be exceptional it will be easy to duplicate your results. Conversely, if your results are disappointing it will be easier to find out where you went wrong.

**19.** After 7 to 10 days you will notice the fermentation beginning to slow. A wine will usually throw its largest sediment in the early stages of fermentation. The wine must be racked off these grouts before the dead yeast cells begin to decompose. Rack your wine into a clean carboy. If you do not have a second carboy, rack into a sterile food grade bucket, clean the carboy and return the wine to it.

**20.** Add ½ crushed Campden tablet per gallon of wine racked (if desired, see metabisulphites), top up the carboy to within an inch or two of the bung with water and replace the fermentation lock. (If when you prepared your must you had a little to much use this reserve juice instead of water for topping up.)

**21.** Many books will tell you to do various things with your wine on specific days; e.g., bottle at day 40. Relying on this system will lead to failure. Variables such as temperature, acidity, fruit sugars, and yeast type will all influence the speed at which a wine will be ready to bottle. The best procedure is to rack the wine every 2 to 3 weeks (after the first rack) until it is finished. I have had partridgeberry wines take over a year to finish working. Once the specific gravity of your wine reaches 1.000 or lower, then you are safe to proceed to the next step.

**22.** Rack the wine. Stabilize the wine using potassium sorbate or sodium benzoate. Add 1 Campden tablet per gallon. Add your fining compound, if desired. (For red wines I recommend sparkolloid. For whites gelatine is often the best. See finings). Set aside in a cool place to clear. Do not bottle until it is clear, usually 2 to 3 weeks or longer. Eight days will not be enough. Even with finings, I've never seen a wine clear in 8 days, as recommended by wine kits. Let it take as long as necessary, until the wine is crystal clear. It is clear when a flashlight is shone through the carboy and you cannot see a beam of light passing through the wine. The wine should also look "jewel like". The wine will not be at its best until it has aged for a few months anyway, so what is the rush. Alternately, you could filter the wine, but it will still need time to age.

**23.** When you are satisfied that your wine is ready to bottle, taste it for sweetness. If you find it a little dry, sweeten it. (see finishing a wine). Have plenty of clean bottles on hand. Too many is better than not enough. (see bottling).

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## COMMON PROBLEMS AND HOW TO PREVENT THEM

### **Fermentation will not restart after racking**

Often after you've racked your wine, added the necessary metabisulphite and replaced the air lock, nothing happens. Before you racked your wine, however, it was happily bubbling away. Why not now? It's normal to have a little lag (1 or 2 days) after you have racked a wine. The yeast is slightly stunned by the metabisulphite and it takes a while for it to begin reworking. You can take several actions. You can wait a little longer to allow some of the metabisulphite to dissipate. If after 4 or 5 days the fermentation still has not reestablished itself move the carboy to a warm (room temperature) location, or you may add yeast energizer (5 ml per 23 litres), or do both. Next rack reduce the Campden tabs, as there may be residual metabisulphite in the wine.

### **Wine smells of vinegar**

Once a wine smells of vinegar it is fit only to be poured down the drain. Vinegarization is caused by the Acetobacter bacteria. These organisms are very abundant in over ripe fruit. Acetobacter

favor high must or wine temperatures (25°C to 30°C) and low alcohol levels. Wines and musts above 10% alcohol are much less susceptible. There is nothing you can do after a wine is infected, but preventing infection of this common bacteria is easy. Brew at cooler temperatures (12°C to 18°C). Keep alcohol levels up, (10% or higher), low alcohol white wines are particularly susceptible. Don't use over ripe fruit when making wine. If you would not eat it fresh then it is unsuitable. Practice good hygiene in your winery at all times.

### **Hazy wine**

If you have racked your wine as recommended, given it sufficient time to clear after the end of fermentation (3 weeks minimum), and added enough metabisulphite, then the haze is probably a pectin haze. Always add pectic enzyme when preparing your fruit. Since wine yeast cannot digest pectin, the molecules must be broken into smaller chains by the enzyme or they will continue to float in the wine, defying easy removal. If you have added pectic enzyme or the wine from a kit, the haze is probably not serious. Given sufficient time, the particles will stick together in large enough clumps to allow gravity to pull them to the bottom and the wine will clear. If you do not like waiting, refer to "Finings" to speed things along.

### **Wine becomes thick and gelatinous**

If your wine takes on the consistency of egg whites (in the early stages it appears as though the wine has threads floating in it), it has been infected by lactic bacteria. Discard the wine away from where you make wine, thoroughly clean everything and start again. Prevention is your best remedy. I cannot overstress sanitation and the use of metabisulphite.

### **What appears to be "soap scum" is floating on the wine**

A wild yeast, *Candida mycoderma*, has infected the wine, probably because of a faulty air lock or lack of one to protect the wine. This yeast needs air to survive. Use of an effective air lock would have suffocated it. Proper use of metabisulphite would have killed it outright. It is not sulphur tolerant like wine yeast. *Candida mycoderma* feeds on alcohol and will quickly reduce your wine to CO<sub>2</sub> and water.

### **Wine smells of geraniums**

Anaerobic bacteria have reacted to the potassium sorbate used to stabilize your wine. Pour it down the drain. Proper use of metabisulphite is the only sure prevention. Add the sorbate in the correct dosages and always add metabisulphite when it is used. Alternately, you may use sodium benzoate as it does not have the same susceptibility to bacterial attack.

### **Wine tastes metallic**

This is a very serious problem. With the increased popularity of home brewing it is inevitable that some do-it-yourselfers will attempt to fabricate their own storage or brewing vessels. This is OK as long as you remember, there are four and only four materials suitable for brewing and storing wines. Glass, French (red) or American white oak, food grade white plastic, (no garbage

pails allowed no matter how well they are washed) and food grade stainless steel. Adherence to this is critical. Crockery jars are out, unless the glaze is new and intact. Crockery can be a source for lead. Galvanized sheet metal is coated with zinc and is highly toxic. Most dark coloured plastics are of low quality and contain impurities. Aluminum readily reacts with high acid wines. No copper or brass fittings are allowed. Even certain stainless steels are not suitable. I work in a papermill and papermills are full of stainless pipe. In the past, when old pipe has been taken out employees often welded a plate on a section of 14" or 16" pipe and used it for a large pot, possibly for lobster boils and the like. Perhaps this pipe steel has the correct mix of nickel, chrome, iron, etc., to make it safe for winemaking, perhaps not. It does not hurt for boiling, because the food is not in contact with the metal for an appreciable amount of time. But when a wine is in a vessel for months or a year you need to be sure that the steel will not be affected by the fruit acids and yeast. You need to know the metals will not leach into the wine. If a wine tastes metallic spit it out and dispose of the rest of the batch. Find out where the metal has come from and correct the problem.

### **Wine turns brown and smells "off"**

When the wine is working, you must prevent air from reaching it, to prevent oxidation. This is done through the use of an air lock. Get the acid level up to the recommended level for the style of wine being made (See "Wine acids") and use metabisulphite. When a bottle of wine is opened and only half consumed, it is normal for it to oxidize after a week in the cupboard or refrigerator.

### **Wine smells like rotten eggs**

The smell is hydrogen sulfide gas (H<sub>2</sub>S). Certain strains of yeast react with raw sulphur present on the skins of fruit. The sulphur is used in the vineyard (and on farms which grow other fruit as well) to kill mildew, molds and fungi which grow on fruit. To prevent this problem, always wash fruit well and inspect before processing. No workable cure for this condition.

### **An ounce of prevention...**

When making wine cleanliness is imperative: Clean and proper equipment, clean raw materials, clean working area and clean hands. With a little attention to sanitation and proper use of metabisulphite all of the above problems will be someone else's.

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## OAK KEGS AND BARRELS

If you have decided to use an oak cask, you must consider several factors.

**Size:** The smaller the keg you use, the more oaking the wine inside will receive. This is a result of the surface area of the barrel in relation to the volume of wine. There is a formula for this, but let me just say that if you are using a very small cask (50 litres or less) you will have to reduce your barrel aging time and get your wine into bottles earlier; i.e., 6 or 8 months, as opposed to 12 months in a larger barrel.

**New or used:** If you buy a new barrel, you will have to condition it. This is done by filling it with water until it swells and stops leaking. Rinsing it with a soda ash (baking soda) solution to remove the harshest tannins and oak elements from the wood, then re-rinsing with fresh water. After this process it must be immediately filled with wine. If your buying a used barrel, be sure it is a wine barrel. Old whiskey or rum “swish” barrels are useless for wine. If purchasing an old wine barrel, a conditioning similar to that for a new barrel will have to be done.

**French Or American Oak:** Which type of wood you use will depend on the type of flavour you want to add to your wine. I simply say here that I think you should buy French Red Oak if you can get it and it is in your price range.

**Care and storage:** Once you've got your barrel full of wine, now what? Well, you cannot just let it sit on its side. A barrel resting on its side on the hard basement floor is supporting all the weight within it on one stave and it will leak. You must make a cradle which holds the barrel on both ends close to its heads. This spreads the load over many staves. Some people cut blocks which conform to the curve of the vessel, others use wide straps perhaps made of nylon or the like and sort of suspend the barrel in a hammock. Now that you have it all set up, the only thing left to do is check periodically to ensure that it remains topped up with wine. Topping it up ensures that the barrel does not dry out and begin to leak.

**Aging time:** This is a matter of taste. Usually a few months will suit most people's tastes, depending on the type of wine produced. Dark full bodied reds will generally benefit most from the barrel aging. Aging in oak also adds complexity to an otherwise lackluster wine.

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## THINGS TO REMEMBER

- *It's always better to have a little too much acid in your wine than not enough.*
- 1 cup of sugar weighs 210 grams. 114 grams of sugar will raise the specific gravity of 1 gallon of must .010 (i.e., from 1.050 to 1.060). 114 grams of sugar is a little more than ½ cup.
- 25 grams per litre = 114 grams per gallon
- 5 ml of acid will raise the acidity in 1 gallon of wine by .1% (i.e., from 0.5% to 0.6%)
- *Always ferment your wine at lower temperatures.* It will preserve the fruity aromas and bouquet of your wine. Between 12°C to 18°C degrees is ideal.
- *Don't rush things.* Do not rush the fermentation with high temperatures. Do not rush the clearing with too many finings. Do not rush the bottling before the wine has

cleared. Do not rush the drinking before the wine has had at least minimal time (three months) to mature.

- *Rack your wine early*, (10 days after fermentation starts) and often, (every four weeks thereafter) more frequently if a lot of sediment continues to accumulate. The reason for this is that after a yeast cell has died and settled to the bottom of your carboy it will begin to decompose. This will add an awful taste to a wine which is impossible to remove. High temperatures (above 18°C) will accelerate this decomposition process.
- *Never boil fruit or immerse in boiling water*. Crush fresh or frozen fruit, add pectic enzyme, and metabisulphite, and process your juice from there.
- *Always put your wine under airlock at the start of the fermentation*. If you use a plastic bucket for the primary fermentation be sure its lid fits tightly and drill a hole in the lid where you can fit a bung and airlock.
- *If a berry or fruit is not fit to eat, it is not fit to make wine*.
- *Always use wine yeast*. They are available in various cultures for various wine styles. Never use bread or beer yeast as a substitute. For berry and fruit wines I suggest Lalvin 71B-1122 or K1V-1116.
- The range for sugar adjustment in a must for red wines is s.g. 1.080 - 1.095; for white wines is s.g. 1.070 - 1.085
- There are two types of yeast nutrient. The stuff which contains only dibasic ammonium phosphate and looks like salt crystals and the type which contains dibasic ammonium phosphate, ammonium sulphite, and magnesium sulphite. This type is a fine white powder. The second type is supposed to be superior, although I've never had any problem with either and find both work well.
- *Always brew in glass when possible*. It comes clean easily, does not stain, and you can readily see what is going on inside. Plastic is OK in a pinch but it has many drawbacks. Plastic scuffs and scratches. These scratches are excellent hiding places for bacteria. Plastic will also hold odors. Anyone who has ever put fish in a plastic bucket or bowl knows, the smell never disappears. Glass is even superior to stainless steel for the home brewer. While large commercial wineries use stainless vats (they must because of the sizes involved) the cost of even a small stainless container for the home brewer is very expensive, when compared to glass.
- *Sweetness and acidity must be balanced*. If you like your wine fairly sweet, then your acid level should be up a little to balance this sweetness.
- Four campden tablets per gallon of wine is the maximum, so keep track of what your adding to your wine in a wine log.

- *Give your wine time to age.* Three months is the minimum.
- When bottling, have enough empties ready. Having too many bottles clean is better than not having enough.
- If you are using small berries; e.g., blueberries, black currants, partridgeberries, to make table wine, you'll need about 7 kg of berries for 23 litres of wine or 3 lb. per gallon. If you are using pulpier fruit such as cherries, plums, peaches, you will need approximately 11.5 kg of fruit for 23 litres, or about 5 lb. per gallon.
- *Experience is valuable.* As you become more proficient at making wine you will learn. This winemaking knowledge, in turn, will improve the wine. Patience now will pay large rewards when you are ready to drink what you produce.
- *Sample well made wines.* If your standing in your local brew shop looking at all the different names on the wine concentrate kits and wondering, "which should I try, which will I like," head directly for the liquor store and buy a bottle of the type which interests you. If you enjoy it, buy the kit and produce 30 bottles. If you don't like that particular type, then your only out \$10 or so and you have not wasted your time making wine you would probably never drink.
- *Not all wines are better when old.* Most are best enjoyed young. All commercial wine has a minimum of one year to mature. Some wines can improve each year for up to sixty years, but every wine has it's peak. Exceptionally few amateur winemakers ever have the problem of letting a wine age past it's peak.

## MEASUREMENT CONVERSIONS

<b>Metric (liquid)</b>	<b>Imperial (liquid)</b>	<b>Metric (dry)</b>	<b>Imperial (dry)</b>
5 ml (millilitres)	1 tsp.	5 g (grams)	1/6 ounce
15 ml	1 Tbs.	15 g	½ ounce
28 ml	1 ounce	28 g	1 ounce
250 ml	1 cup	250 g	½ pound
1.14 litre	1 quart	454 g	1 pound
4.55 litres	1 gallon	1 Kg	2.2 pounds
23 litres	5 gallons	23 Kg	50 pounds

## **Sugar**

white granulated	1¼ cups	225 g	½ pound
corn granulated	1½ cups	225 g	½ pound
white granulated	2½ cups	450 g	1 pound
corn granulated	3 cups	450 g	1 pound
white granulated	5 cups	1 Kg	2.2 pounds
corn granulated	6 cups	1 Kg	2.2 pounds

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