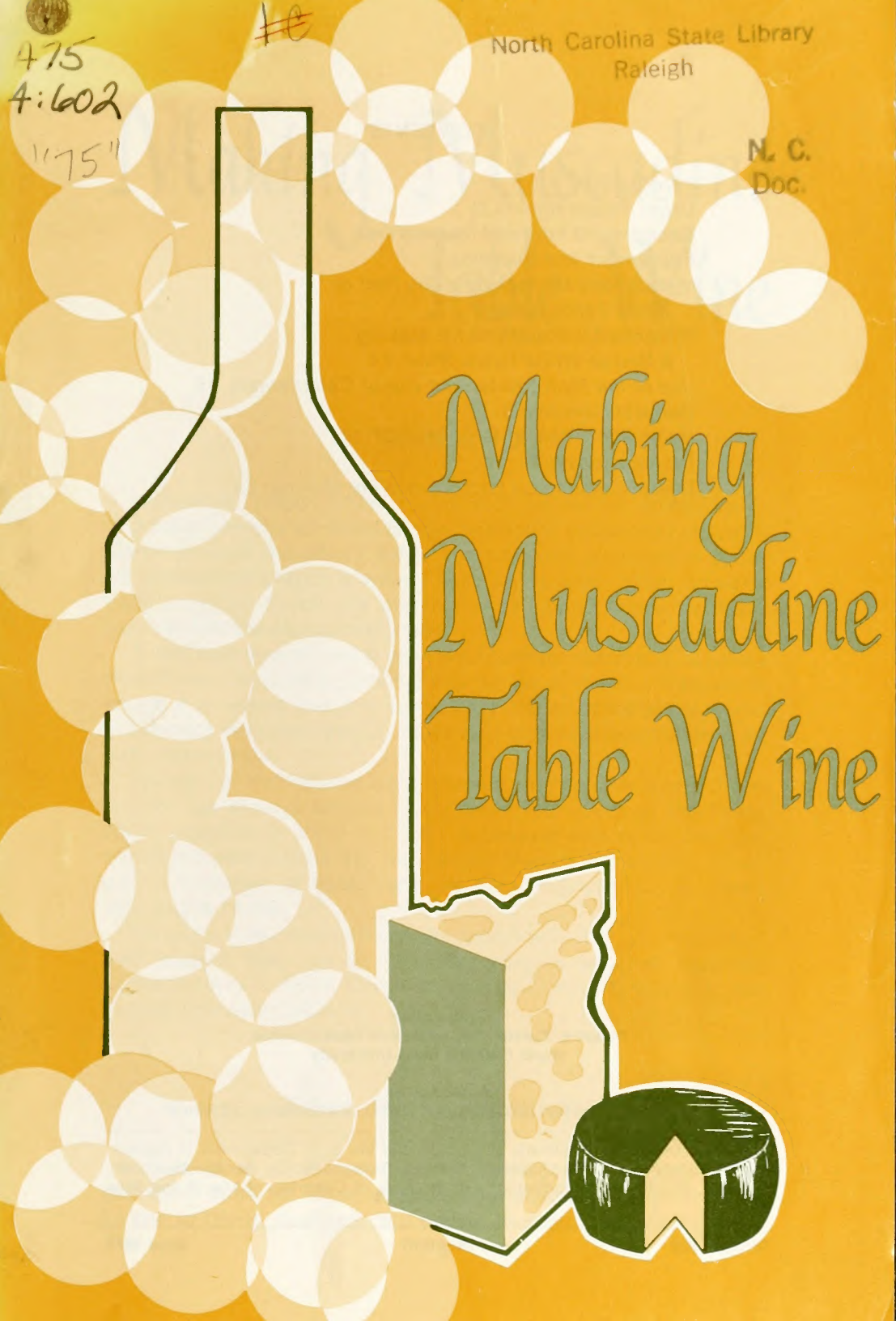
Making Muscadine Table Wine



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INTRODUCTION

Muscadine grapes (*Vitis rotundifolia*) are native to the South and have become an increasingly important commodity in North Carolina since the early 1960's. The principal commercial outlet for Muscadine grapes is wine. These wines when made properly have a unique flavor and aroma that is valued highly by those familiar with the Muscadine grape.

In the past several years we have received numerous requests from North Carolinians seeking information on making Muscadine wines. It is hoped that this publication will be of benefit to those individuals who have found wine making to be a fascinating and enjoyable hobby.

Two sets of instructions are presented. The *detailed instructions* are for the serious amateur who desires to produce the finest wines possible at home and with the lowest rate of failure. The *simplified instructions* are for making Muscadine wine at home with a minimum of equipment, supplies and attention to detail (see pages 14-15).

Although these instructions are specifically for use on Muscadine grapes, they can be used successfully on other types of grapes grown in North Carolina such as Concords and the new French-American hybrids.

LEGAL REQUIREMENTS

Any head of a family household can legally make up to 200 gallons of wine for home consumption. However, he is required by law to file in duplicate two copies of Form 1541 with the In-

ternal Revenue Service Regional Office five days prior to beginning wine production. The address of our Regional Office is:

Assistant Regional Commissioner
Internal Revenue Service
Alcohol and Tobacco Tax Division
Federal Office Building
275 Peachtree Street
Atlanta, Georgia 30303

BACKGROUND INFORMATION ON WINES

Wine is the product of a sound alcoholic fermentation of grape juice by yeast. In this process, yeast consume the grape sugars and produce ethyl alcohol and carbon dioxide gas. In addition, many other chemical substances are produced in small quantities which contribute to the flavor and aroma of the wine. Flavor and aroma are further enhanced by proper aging of the wine.

There are many different types of wine. *Table wine* contains 14% or less ethyl alcohol. It may be either dry or slightly sweet and white, red, or pink in color. Table wine seldom contains more than about 4% residual sugar after fermentation is completed. It is used with food to refresh the palate and complement a meal without satisfying the appetite.

Dry wine is the best type to make in the home because it is less likely to spoil than sweet wine, and also it can be sweetened at any time by dissolving the desired amount of sugar in it. Red wine is made from dark-skinned varieties, such as 'Hunt' or 'Tarheel', and contains coloring matter extracted from the grape skins during fermentation of the crushed grapes "on the skins." Pink (rosé) wine is also made from dark-skinned varieties, but is vinted to contain smaller amounts of coloring matter. White wine is usually pale yellow in color and made from green or bronze varieties of grapes such as 'Magnolia', 'Scuppernong', and 'Carlos.'

Dessert wine contains between 14-24% ethyl alcohol and is produced by commercial wineries and not by the amateur wine maker. It is usually fortified with brandy to increase the alcohol to the desired level. Dessert wines are usually sweet and contain about 5 to 14% sugar or more.

Champagne, in the American usage of the term, is a sparkling white or pink wine made from dry table wine. It derives its effervescence solely from a secondary fermentation of the wine within a closed container.

EQUIPMENT AND SUPPLIES

The following basic equipment and supplies are needed in order to attain consistent and successful results:

1. A *primary fermentor* is an open vessel in which the initial fermentation takes place. It must be large enough to accommodate the increase in volume due to foaming which accompanies the beginning of active fermentation of the grape juice. These vessels may be of any non-toxic and inert material such as glass, plastic (polyethylene), wood and ceramic (Figure 1). Metal containers, other than stainless steel, must not be used unless they are lined with a heavy duty polyethylene bag of suitable size.

Figure 1. Primary fermentors.

2. A *fermentation lock* (water seal) allows the carbon dioxide gas (CO_2) produced during fermentation to escape but prevents air from contact with the wine (Figure 2).

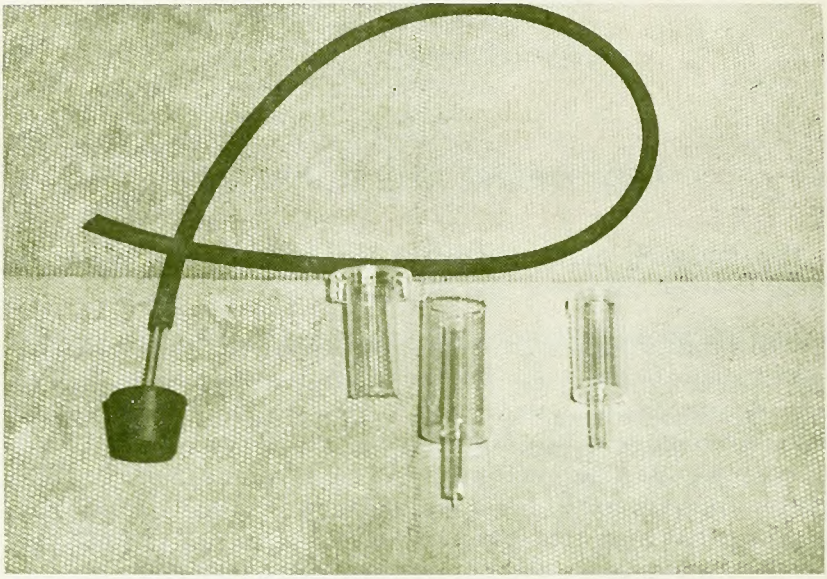

Figure 2. Fermentation locks. The one on the left is homemade while the other ones are two-piece commercial plastic locks.

3. A *secondary fermentor* must be a glass jug, or carboy, or wooden barrel that has only one small opening which can be fitted with a fermentation lock (Figure 3). The wine is transferred to this container 4-5 days after the start of fermentation.

4. A *hydrometer* is a simple and inexpensive instrument for measuring the amount of sugar in the grape juice (Figure 4). It is essential for consistent results in wine making. Its use is explained on pages 15-16.

The sugar content can also be measured with a refractometer. It is a highly accurate optical instrument which is very easy to use; however, it is expensive to purchase.

5. Either *sodium bisulfite* or *potassium metabisulfite* is used as a source of SO_2 to check the growth of undesirable yeast and bacteria in the grape juice or wine. It also functions as an antioxidant in protecting the finished wine from adverse effects of excess oxygen.

Figure 3. Secondary fermentors with fermentation locks in place.

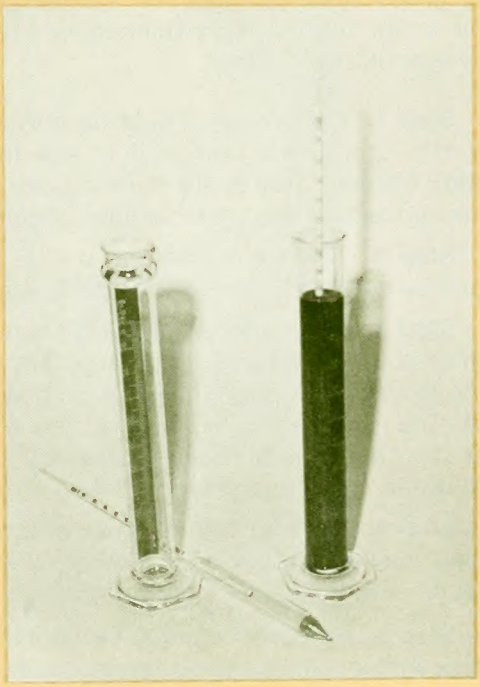

Figure 4. Hydrometer with cylinder.

6. A *plastic* or *rubber hose* about 3/8 inch inside diameter and about 6 feet long is needed for siphoning the wine.

7. A *culture of wine yeast* is desirable to insure a sound and clean fermentation. Montrachet No. 522 is good strain of yeast to use. Such cultures are available in powdered form and are very easy to use. An acceptable second choice for yeast is baker's yeast which is available in any supermarket.

All of the equipment and supplies listed in this section can be obtained from wine or scientific supply houses. Also, your local pharmacist might be a source of some of the supplies.

INSTRUCTIONS FOR MAKING A DRY RED OR WHITE TABLE WINE

The instructions that follow are for production of either a dry red or white wine from one bushel (about 50 pounds) of Muscadine grapes. A red wine *must* be made from a dark-skinned variety of grape such as 'Hunt' or 'Tarheel' while a white wine should be made from a light-skinned variety such as 'Scuppernong', 'Magnolia', or 'Carlos.'

Step 1. The grapes should be fully ripe without being overripe Unripe grapes are high in acid, low in sugar and flavor, and the dark-skinned grapes are poor in color. The grapes should be processed as soon as possible after harvesting.

Step 2. Remove stems and unripe and rotten fruit. Rinse the grapes with cool water and allow to drain.

Step 3. Crush the grapes. This can be done by spreading the grapes in a thin layer in a large flat bottom pan and by crushing them with a potato masher, rolling pin, or similar tool (Figure 5). The objective is to crush all the grapes without crushing the seeds. Commercial crushers are available. They crush the grapes between a pair of aluminum rollers (Figure 6).

Step 4. Transfer the crushed grapes to a 10 gallon polyethylene bucket (should be a new one) or some other suitable container. Mix the contents thoroughly.

Step 5. Remove a sample of the juice and test it for sugar content with a hydrometer or refractometer. (See pages 15-16.)

Figure 5. Crushing grapes by hand.

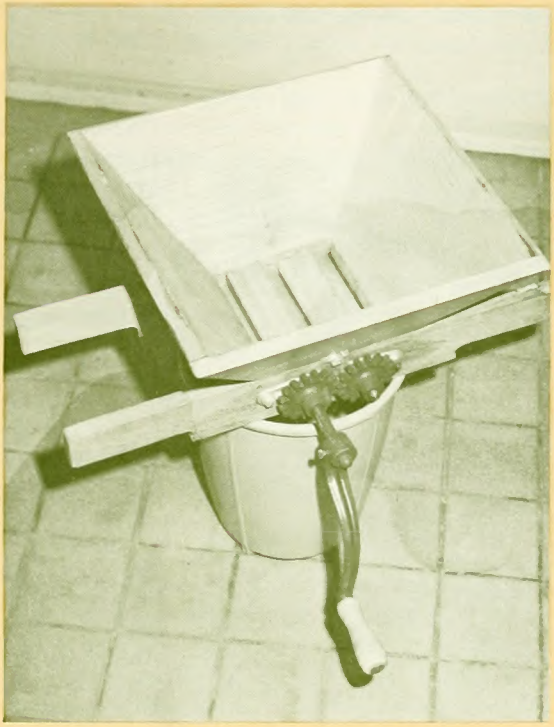

Figure 6. Small commercial grape crusher.

Figure 7. Squeezing grapes by hand.

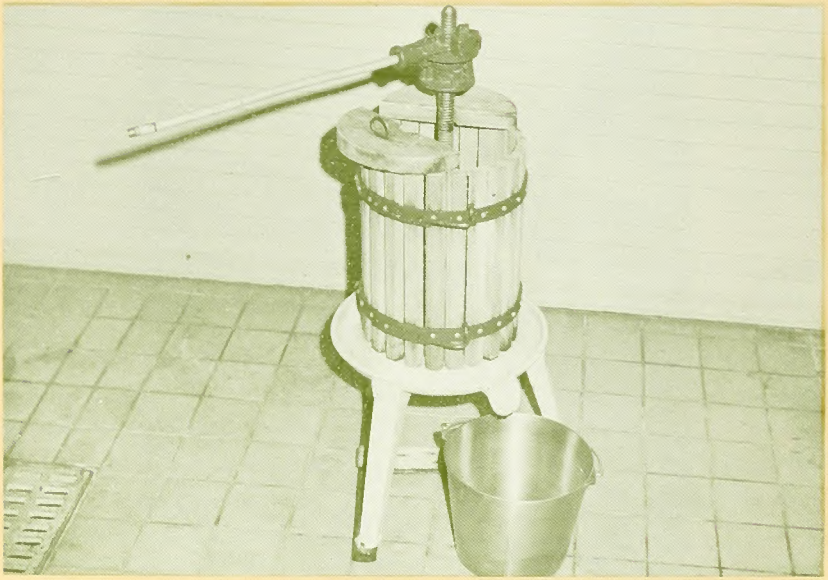

Figure 8. Small grape press.

Step 6. Dissolve 1/2 level teaspoon of either potassium metabisulfite or sodium bisulfite in about a pint of the grape juice and add it to the bushel of crushed grapes. Mix thoroughly, cover the opening of the container with cheesecloth, and wait four hours before proceeding to the next step.

Step 7. Activate a five gram package of dried wine yeast by mixing it into one cup of warm grape juice (about 100° F). Add it to the crushed grapes and mix. If a wine yeast is not available, use dried baker's yeast. Cover the bucket with cheesecloth and store it at a constant temperature between 60-75° F. Fermentation should begin within 24 hours after addition of the yeast.

Step 8A. FOR WHITE WINE ONLY. When fermentation begins, usually within 24 hours of adding the yeast, immediately proceed to Step 9. If the fermentation is allowed to proceed for 4-5 days "on the skins", as is done in the manufacture of a red wine, the wine will be harsh in character and lack the desired fruity quality.

Step 8B. FOR RED WINE ONLY. After fermentation begins, thoroughly mix the crushed grapes at least twice a day for 4-5 days. This is known as "breaking up the cap" and it is done to aid in the extraction of color (pigment) from the grape skins.

Step 9. Draw-off the fermenting juice and squeeze the remaining skins and pulp through several layers of cheesecloth (Figure 7), or use a small grape press if available (Figure 8). When using cheesecloth, it is easier to squeeze several small size portions rather than try to squeeze the entire mass in one batch. Juice yield will usually be about 3½ gallons for 50 pounds of dark-skinned grapes fermented "on the skins" and about 3 gallons or less for the light-skinned grapes.

Step 10. Measure the number of gallons of juice obtained. Calculate the quantity of sugar you need to add to it to increase the original sugar level of the juice, as measured in Step 5, to a level of 22%. (See pages 15-16.) Dissolve this quantity of sugar in 1 to 2 quarts of the juice by gradually warming the mixture with stirring on the stove. Return this mixture to the fermenting juice.

Step 11. Dissolve one pound of sugar in two quarts of warm water, add the mixture to the fermenting juice and mix well. This dilution is known as amelioration. Cover the opening of the primary fermentor with cheesecloth and wait for 48 hours before proceeding to Step 12.

Step 12. Transfer the juice to 1 gallon glass jugs, or preferably, to a 3 gallon glass carboy and 1 or more gallon jugs if needed. Fill these containers about 95% full and add a fermentation lock (water seal). This is a most important step because the lock allows carbon dioxide to escape from the jugs, excludes air from the wine, and prevents the wine from turning to vinegar.

Step 13. Store the fermenting juice at a constant temperature between 60-75° F for about 2 months (October-November) or until all bubbling in the fermentation lock stops and the wine begins to clear. The lower temperature (60° F) is desirable for white wine fermentation. *Important* - the fermentation lock must be kept on the containers at all times from now on or the wine will probably spoil.

Step 14. Siphon the wine from the sediment into clean carboys or gallon jugs (Figure 9). Replace the fermentation lock, and store the wine at 60 to 70° F for 1 month (December).

Step 15. Siphon the wine from the sediment into clean carboys or gallon jugs.

Step 16. Dose the wine with potassium metabisulfite or sodium bisulfite at the rate of ⅛ level teaspoon for every 3 gallons of wine.

Figure 9.
Siphoning the wine on first racking. Note the outlet of the hose is held near the top of the container. This is to allow slight aeration of the wine but it is done only at the first racking.

Step 17. Store the wine in a cold place in the basement or in the barn at a temperature of 20-40° F for a period of 2 months (January-February). The cold temperature encourages natural clarification of the wine. It also helps to eliminate excess potassium bitartrate, called "wine stones", which will appear as crystals in the bottom of the container.

Step 18. Siphon the clear wine from the sediment into clean containers (Figure 10). Replace the fermentation locks and store the wine at cool room temperatures 60-70° F for 2 months (March-April). The wine will probably deposit more sediment during this period. Repeat this step if necessary (May-June).

Step 19. Repeat the siphoning step and dose the wine with potassium metabisulfite or sodium bisulfite at the rate of ⅛ level teaspoon for every 3 gallons.

Step 20. Siphon the clear wine into *clean* wine bottles. The bottles should be tightly corked. (See pages 18-20.) For a second choice, clean soda pop bottles can be used and sealed with crown caps or screw caps. The wine can be consumed after storage for 1 month in the bottle, but will continue to improve in quality with age. Additional sediment may deposit in the bottle during aging. This is normal and the clear wine can be carefully poured from it.

Figure 10.

Siphoning the wine on second and all subsequent rackings. Note the outlet of the hose is held to the bottom of the container thus minimizing aeration of the wine.

SIMPLIFIED INSTRUCTIONS FOR MAKING A RED OR WHITE TABLE WINE

The instructions given in this section are for making Muscadine wines at home with an absolute minimum of equipment and care. However, the more detailed instructions given previously are the recommended ones and will usually yield a superior product with lower rate of failure.

Follow the procedure given in the previous section (see pages 8-13) with the following changes:

Steps 1-4 No Change.

Steps 5-6 Omit.

Steps 7-9 No change.

Steps 10-11 Omit and substitute the following step.

Measure the number of gallons of fermenting juice obtained from Step 9 and determine the total amount of sugar you need to add from the following table.

Total Number of Gallons Of Fermenting Juice	*Total Amount Of Sugar to Add*
4	4 lbs.
3½	3 lbs. 10 oz.
3	3 lbs. 4 oz.
2½	2 lbs. 14 oz.
2	2 lbs. 8 oz.

Dissolve the sugar in 2 quarts of hot water and allow the sirup to cool. Add it to the fermenting juice and mix well. Cover the opening of the primary fermentor with cheesecloth and wait for 48 hours before proceeding to step 12.

Step 12. There is no change in this step. If you do not have a fermentation lock (water seal) you can plug the opening of the containers with a wad of non-absorbent sterile cotton as a substitute. This is not as satisfactory as the use of a fermentation lock, however. In either case, the containers must be kept full and the fermentation lock or cotton plug kept in place from now on or the wine will surely spoil.

Steps 13-15	No change.
Step 16	Omit.
Steps 17-18	No change. The wine can be used at this time if desired.
Step 19	Omit.
Step 20	No change.

USE OF THE HYDROMETER AND SUGAR CALCULATIONS

Fresh Muscadine grape juice usually contains 11 to 17% sugar which is less than is desirable to make a quality wine; therefore, additional sugar must be added. Grape juice should contain about 20 to 22% sugar to make a satisfactory wine. If the juice is deficient in sugar, the resulting wine will be thin in character and will spoil easily. If too much sugar is added to the juice, the fermentation process may proceed with great difficulty and never go to completion. Therefore, it is of great value to know the amount of sugar present in the juice prior to fermentation in order to be able to calculate and add the exact amount of sugar necessary to increase the level to 22%.

The amount of sugar in the juice is measured with a hydrometer (a refractometer can be used if one is available) and can be expressed in several different terms, each having essentially the same meaning. They are:

$$\%\ \text{sugar (by weight)} = {}^{\circ}\text{Brix} = {}^{\circ}\text{Balling}$$

For example, 22 pounds of pure sugar (sucrose) dissolved in 78 pounds of water yields a 22% sugar sirup having a °Brix = 22 or a °Balling = 22.

To use the hydrometer, a sample of grape juice is filled into a tall glass cylinder and the hydrometer is immersed in it (Figure 4). Twirl the hydrometer gently to dislodge air bubbles adhering to it and to insure it is free-floating. When it comes to rest, read the value on the stem of the hydrometer at eye level and at the point where the stem emerges from the juice. The temperature of the juice should be about 70° F or the true value of the reading may be measurably affected.

The exact amount of sugar to add to the juice can be calculated by the use of the following formula:

$$S = \frac{0.22 \times \text{wt. of juice} - \text{wt. of sugar in juice}}{0.78}$$

where,

S = the pounds of sugar needed to raise the sugar content of the juice to 22%.

wt of juice = the weight of juice when it is separated from the skins, seeds, and pulp after the start of fermentation.

$$\text{wt of sugar in juice} = \frac{\text{wt. of juice} \times \%\ \text{sugar in the juice}}{100}$$

An example of how to use this formula:

A sample of Muscadine grape juice, drawn from a bushel of freshly crushed grapes was found to contain 14% sugar when tested with a hydrometer. After the start of fermentation, 33 pounds of fermenting juice was separated from the skins, seeds, and pulp. How much sugar should be added to the 33 pounds of juice to increase the initial sugar level of the juice from 14 to 22%?

First, determine the number of pounds of sugar contained in 33 pounds of unfermented juice.

$$\text{wt. of sugar in juice} = \frac{33 \text{ pounds} \times 14\% \text{ sugar}}{100} = \frac{462}{100} = 4.62 \text{ pounds.}$$

Next,

$$S = \frac{0.22 \times \text{wt. of juice} - 4.62 \text{ pounds}}{0.78}$$

$$S = \frac{0.22 \times 33 \text{ pounds} - 4.62 \text{ pounds}}{0.78}$$

$$S = \frac{7.26 \text{ pounds} - 4.62 \text{ pounds}}{0.78}$$

$$S = \frac{2.64}{0.78} \text{ pounds} = 3.4 \text{ pounds}$$

Therefore, 3.4 pounds of sugar should be dissolved in the 33 pounds of fermenting juice.

GENERAL COMMENTS

Clean Equipment

All equipment used in wine making should be clean and free from off-odors. If a detergent is used in washing glassware, all traces of it should be removed by thorough rinsing with tap water. White wines are especially prone to acquiring off-odors and flavors from contaminated equipment.

Alternate Procedure for Making White Wine

A lighter-bodied and fruitier white wine can be made from juice that is separated from the grapes immediately after crushing. If this is done, however, the home wine maker should be prepared to accept a lower yield of juice. It is very difficult to extract the juice from freshly crushed Muscadine grapes because the pulp is thick and slippery. Fermentation of the crushed grapes for a short period of time greatly facilitates juice extraction.

In making white wine by the alternate procedure, follow steps 1-4. Next, immediately press-out the juice from the crushed grapes. Steps 5-7 are the same except substitute ¼ level teaspoon of potassium metabisulfite or sodium bisulfite in step 6. Omit steps 8A and 9. Steps 10-20 are unchanged.

Making a Pink Wine

Pink wine, also called rosé wine, can be made from dark-skinned varieties of Muscadine grapes by following the procedure given for making a white wine. Enough pigment is usually extracted from the grape skins within 24 hours after crushing the grapes to give the desired color in the finished wine.

Fining of Muscadine Wines

Muscadine wines usually clear easily on their own once fermentation is finished and the wine is left undisturbed. However, occasionally a given batch of wine remains hazy. In these cases, good results are often obtained by fining the wine with unflavored gelatin and tannin (tannic acid powder). Gelatin and tannin combine chemically in solution to form a coarse precipitate. The fine particles which cause haze in the wine are entrapped in the gelatin-tannin complex and thus are removed from the wine.

To fine a white wine, use ¾ level teaspoon of tannin and ¼ level teaspoon of unflavored gelatin (approximately equal weights of each) for every 2 gallons of wine. Dissolve the tannin in a small amount of wine, add it to the main batch, and mix well. Next, dissolve the gelatin with heating in a small quantity of wine, add it to the main batch and mix well. Store the wine in a cool place

(50-60° F). The wine should be clear in 2 weeks to a month. Siphon the clear wine from the sediment. Red wines normally contain comparatively large amounts of tannin; therefore, it is necessary to add only gelatin in order to fine them.

Aging of Muscadine Wines in Wood

The question of the desirability of aging Muscadine wines in white oak barrels is often asked by home wine makers. In general, we do not recommend this practice in small barrels of 10 gallon capacity or less for several reasons: wooden barrels are difficult to keep clean and in good repair at home; it is easy to develop an excessive "woody" flavor in the wine and/or excessive oxidation of the wine stored in small barrels; the rate of evaporation of the wine from small barrels is excessively high. There is little doubt, however, that proper aging of Muscadine wines in wood will generally improve their quality. This is especially true of red wines.

White oak barrels having either a plain or wax inside finish can be used to age wine. Charred brandy or whiskey barrels *are not* suitable for aging Muscadine wine. If the home wine maker wishes to age his wine in wood, a minimum barrel size of 15 gallons is suggested. Wooden barrels should be pretreated before use. If a new wax-lined barrel is used, fill it full of cool tap water in which potassium metabisulfite or sodium bisulfite has been dissolved at a rate of five level teaspoons per 10 gallons of water. Allow the full barrel to stand for several weeks, then drain and rinse it thoroughly several times just prior to use. If the barrel has a plain wood finish (not waxed) on the inside, it should be soaked for 24 hours with a hot 2% solution of soda ash (sodium carbonate), rinsed several times with tap water, and filled full with tap water. After several weeks, the barrel should be drained, rinsed several times and used immediately.

If you are aging wine in wood, always keep the barrel filled with wine after active fermentation is finished. Wine will evaporate from the barrel during storage. Thus once or twice a month the amount lost should be replaced, or "topped", from a supply of wine in small capacity glass containers saved for this purpose. The wine should be tasted once every month so it can be removed from the barrel if excessive "woody" taste begins to develop.

Preparation of Corks and Bottle Aging of Wine

If the finished wine is to be stored for any appreciable length of time, corked wine bottles should be used. The corks should be premium grade, size no. 9, and be either 1½ or 1¾ inches in length. An inexpensive hand corker, which is driven by a mallet,

Figure 11.

Corking wine bottles with a hand corker which is driven by a mallet.

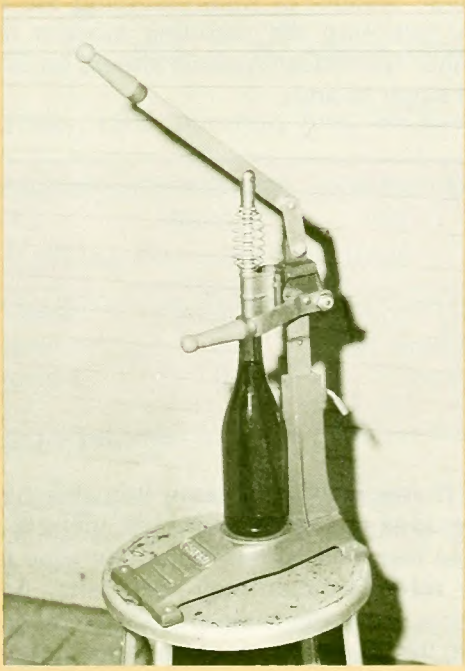

Figure 12.

Small corking machine operated by levers. The lower lever compresses the cork and the upper one drives it into the bottle.

can be purchased for a few dollars and is suitable for home use (Figure 11). A more elaborate unit, which is operated by levers, is convenient to use for a larger number of bottles (Figure 12). The corks themselves should be treated before use in the following manner.

Dissolve ½ level teaspoon of potassium metabisulfite or sodium bisulfite in 2 quarts of hot water. Submerge the corks in the solution and allow them to soak 15 minutes. Pour-off the dirty solution and replace it with fresh tap water and allow the corks to soak for an additional 15 minutes. Pour-off the water, rinse the corks under fresh tap water, and allow them to drain thoroughly on a lint free cloth or paper towel. The softened corks are ready to use.

Siphon the wine into the bottles to a level which will allow about ⅜ inch headspace in the filled bottle after it is corked. Cork the bottles and store them in an upright position for 1 week in order to allow time for the corks to harden into place. If this is not done, some of the bottles will leak. After 1 week, however, the bottles should always be stored on their side to keep the corks moist. A cool storage temperature of about 50-60° F is desirable.

Sweetening the Finished Wine

If a sweeter wine is desired, the wine should be sweetened after bottling and aging by adding sugar shortly before use. This can be done by dissolving the appropriate amount of sugar in a small amount of wine (warming the wine slightly will help) and by returning the resulting mixture to the original container of wine. The following table should be useful in selecting the amount of sugar to add:

Desired Wine Type	Approximate *% Sugar*	*Amount of Sugar To Add (per ⅕ gallon)*	*Amount of Sugar To Add (per gallon)*
Dry Table	0.25	None	None
Mellow Table	3	2 level Tbls.	½ Cup
Sweet	10	6 level Tbls.	2 Cups

If you wish to sweeten the wine before bottling, this can best be done at step 19. However, there is an element of risk involved. Use this method only when the wine is bright and perfectly clear or refermentation may occur after bottling. Be sure to dose the wine with potassium metabisulfite or sodium bisulfite as it will aid in preventing renewed fermentation after bottling.

Wine Spoilage

Conversion of wine into vinegar by vinegar bacteria is one of the most common spoilage problems for home wine makers. However, if air is excluded from contact with the wine from step 12 onward, as indicated in the instructions, this type of spoilage will not occur. Also, the use of potassium metabisulfite or sodium bisulfite inhibits the activities of the vinegar bacteria in the wine.

HOME WINE MAKING SUPPLIERS

The following list of companies that sell wine making supplies is reprinted from: Wines and Vines, 1971. *Directory of the Wine Industry,* 703 Market Street, San Francisco, California, p. 115. No endorsement of these companies is intended or implied by the author; the list is reprinted simply as a convenience to the reader.

1. Baird Enterprises & Mfg. Co., 131 Glenn Way, Belmont, Calif. 94002.
2. Compleat Winemaker, P. O. Box 2470, Yountville, Calif. 94599.
3. Fessler, Juluis, P. O. Box 2842, Rockridge Station, Oakland, Calif. 94618
4. Fleming-Potter Company, Inc., 1028 S. W. Adams Street, Peoria, Ill. 61602.
5. Oak Barrel Winecraft-Winery, 1201 University Ave., Berkeley, Calif. 94702.
6. Presque Isle Wine Cellars, RD No. 1, US Route 20, North East, Pa. 16428.
7. Vino Corporation, P. O. Box 7885, Rochester, NY. 14606.
8. Wine Art, Inc., 4324 Geary Blvd., San Francisco, Calif. 94118.

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USEFUL CONVERSION FACTORS IN WINE MAKING

Table 1. Relationship of percent sugar to specific gravity of grape juice.

Percent Sugar (by weight)	*Specific Gravity*
10	1.0381
11	1.0423
12	1.0465
13	1.0507
14	1.0549
15	1.0592
16	1.0635
17	1.0678
18	1.0721
19	1.0765
20	1.0810
21	1.0854
22	1.0899
23	1.0944
24	1.0990

Table 2. Relationship of common measures of potassium metabisulfite or sodium bisulfite to average weight in grams and ppm of SO_2 generated per gallon wine

Common Measure	*Average Weight*	*Amount of SO_2 per Gallon of Wine*
⅛ level Tsp	0.64 grams	100 ppm
¼ level Tsp	1.27 grams	195 ppm
½ level Tsp	2.17 grams	330 ppm
1 level Tsp	5.63 grams	870 ppm

Table 3. Relationship of common measures of gelatin to average weight

Common Measure	*Average Weight*
¼ level Tsp	0.60 grams
½ level Tsp	1.13 grams
1 level Tsp	3.16 grams

Table 4. Relationship of common measures of tannin (tannic acid) to average weight.

Common Measure	*Average Weight*
¼ level Tsp	0.25 grams
½ level Tsp	0.45 grams
1 level Tsp	1.10 grams

Table 5. Relationship of common measures of table sugar to average weight

Common Measure	*Average Weight*
1 level Tsp	4.32 g or 0.15 oz. (av.)
1 level Tbs	12.05 g or 0.42 oz. (av.)
½ Cup	105.19 g or 3.7 oz. (av.)
1 Cup	190.28 g or 6.7 oz. (av.)

Miscellaneous conversion factors

1 US gallon of water weighs 8.34 pounds.
1 US gallon of dry wine weights 8.26 pounds.
1 US gallon of fresh Muscadine grape juice weighs about 8.8 pounds.
8 pints = 4 quarts = 1 US gallon.
128 ounces (fluid) = 1 US gallon.
16 ounces (fluid) = 1 pint.
1 liter = 0.88 quarts.
1 pound (avoirdupois) = 16 ounces (avoirdupois) = 454 grams.
1 ounce (avoirdupois) = 28.4 grams.


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AT RALEIGH