

MEASURING TITRATABLE ACID

by
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Titrateable acid of wine or juice can be measured by several different analytical techniques. However, the measurement procedure below is simple, and the laboratory apparatus is inexpensive. Titrateable acid measures the sum of all the organic acids in juice or wine, but TA is expressed as if all of the acids were tartaric acid.

Distilled water is often added to juice or wine samples to simplify the measurement. The substance being measured is the acid in the container, and all of the acid in the container comes from the wine sample. Consequently, the added water does not affect the measured value.

The tart taste of wine is related to titrateable acid (TA). When wine contains too much acid, it will taste overly tart. When too little acid is present, wine often lacks freshness and tastes flat. Grapes grown in warm areas are usually low in acid, and additions of tartaric acid are often needed to produce a balanced wine. TA is measured when the grapes are crushed so any needed acid adjustments can be made before fermentation is started.

TA Measurement Materials

Titrateable acid can be measured by a simple titration procedure using a calibrated sodium hydroxide solution. Phenolphthalein solution is used as an indicator to show the titration end point. The following materials are needed for this measurement.

- 10-ml pipettes (two pipettes are convenient)
- 250-ml Erlenmeyer flask or other clear glass container
- 0.1 normal sodium hydroxide
- 1% phenolphthalein solution
- Distilled water

TA Measurement Procedure

The following procedure is satisfactory for measuring the TA of juices and white or blush wines.

1. Draw 5 milliliters (ml) of juice or wine into a pipette and transfer the sample into the flask.
2. Add about 50 ml of distilled water and three or four drops of phenolphthalein solution.
3. Fill a 10-ml pipette with 0.1 N sodium hydroxide solution.
4. Titrate with the sodium hydroxide while mixing the wine sample by rocking the flask.
5. Stop titration when the sample turns a faint pink.
6. Read the pipette scale and record the quantity of sodium hydroxide solution used.
7. Rinse the flask and pipettes with clean water and allow them to dry.

TA Calculations

When a 5-milliliter sample and 0.1 normal sodium hydroxide are used, titrateable acid can be calculated using the following formula.

$$\text{TA (\%)} = 0.15 \times \text{milliliters of sodium hydroxide used.}$$

TA is given in grams of acid per 100 ml of wine (%) in the above formula, but the TA can be expressed in grams per liter simply by moving the decimal point one place to the right (i.e., 0.65 grams/100 ml = 0.65% = 6.5 grams/liter). The value of the constant (0.15) in the above equation must be changed if a different size sample is used or if sodium hydroxide with a normality other than 0.1 is used.

Sample Calculation

Here is an example of how titratable acid is calculated from the measured data.....A 5-milliliter white wine sample was titrated drop by drop. During the titration, the flask was rocked from side to side to mix the sample. Eventually, a faint but persistent pink color was reached. The pipette scale was read and it showed 5.3 milliliters of 0.1 N sodium hydroxide solution had been added to the sample. The titratable acid of the white wine sample was calculated by multiplying 0.15 times 5.3. This gave a TA of 0.79 grams of acid per 100 milliliters of wine or 0.79 percent or 7.9 grams of acid per liter of wine.

Alternative TA Procedure for Red Wines

The above procedure does not work well for dark red wines because the end point is very difficult to recognize. Sometimes, diluting red wine samples with up to 200 milliliters of water makes the measurement easier, but most winemakers prefer to use the following procedure when testing dark red wines. However, a pH meter, ring-stand and a magnetic stirrer are required for this procedure (see pH measurement below).

1. Place the probe in a ring-stand clamp and center the probe above the stirrer plate.
2. Draw 5 milliliters (ml) of wine into the pipette and transfer it into the beaker.
3. Add about 50 ml of distilled water and place the stir bar in the beaker.
4. Place the beaker on the stirrer plate. Adjust the ring-stand so the probe is immersed in the sample but do not allow the stir bar to strike the end of the probe.
5. Turn the stirrer on.
6. Fill the pipette with 0.1 N sodium hydroxide solution.
7. Titrate the wine sample while watching the pH meter.
8. Stop the titration when the pH meter reads 8.2.
8. Record the quantity of sodium hydroxide used.
9. Discard the wine sample and rinse the probe, beaker, stir bar and the pipettes several times with clean water.