

TITRATABLE ACIDITY

TITRAMETRIC PROCEDURE USING NaOH (Sodium Hydroxide)

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This procedure is a measure of the organic acid content of a juice, must or wine sample and yields titratable acidity (TA). The procedure is based on titrating the originally acid sample with a standard NaOH solution to a slightly alkaline, pink phenolphthalein endpoint (approximate pH = 8.2).

The standard AOAC procedure calls for the use of a pH meter to determine the precise endpoint of 8.2, as well as a magnetic stirrer to allow more consistent and thorough stirring during the titration. However, as long as volumetric measurements and procedural operations are reasonably accurate, neither piece of equipment is required to produce a value of adequate accuracy for our purposes.

EQUIPMENT

1. pH meter (preferred, but optional)
2. Magnetic stirrer and bar (preferred, but optional)
3. 10 or 25 ml burette
4. 5 ml volumetric pipettes (wide tip preferred)
5. 250 ml Erlenmeyer flask(s) and/or 250 ml beaker(s)

REAGENTS

1. Standardized sodium hydroxide solution (0.0667N gives results directly without calculation, but any known concentration is valid. However, concentrations above 0.1N are not recommended because of accuracy limitations due to small volumes required to reach the endpoint). See previous paper on preparation of test solutions, for quantities and instructions.
2. Phenolphthalein indicator (1% wt/vol): Using a 100 ml volumetric flask, dissolve 1 gram of reagent grade phenolphthalein in approximately 70 ml of denatured ethyl alcohol. Using a pH meter if available, add sufficient dilute NaOH (<0.1N) to give a pH of 8.2 (if pH meter not available, add dilute NaOH until the solution achieves a light pink color). Dilute to 100 ml with distilled water.
3. (If using a pH meter): Standard buffers of pH 7.00 and 4.00 (3.00 or 3.55 fine if available).

PROCEDURE: BASIC (NO pH METER)

1. Pipette 5.0 ml of juice, must or wine into a 250 ml Erlenmeyer flask. For red juice/must/wine, it is helpful to add 50-100 ml of distilled water to lighten the color and clarify the endpoint.
2. Add 5 drops of phenolphthalein indicator, and swirl.
3. Using the standard sodium hydroxide solution in a 10 or 25 ml burette, swirl sample and titrate to a pink color that is stable for a minimum of 20 seconds.
4. Calculate results using the following equation:

$$\text{Titratable Acidity (g/L tartaric acid)} = \frac{(\text{ml NaOH})(N \text{ NaOH})(0.075)(1,000)}{\text{ml sample}}$$

5. For 0.0667N NaOH, the quantity of this solution used yields total acidity in the appropriate units without the necessity of any calculations. For example, a total volume of 7.12 ml of 0.0667N NaOH corresponds directly to a TA of 7.12 g/L as tartaric acid.

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PROCEDURE: ADVANCED (MODIFIED AOAC)(WITH pH METER)

1. Standardize pH meter according to operator's manual.
2. Add approximately 100 ml of boiled and cooled distilled or deionized water to a 250 ml beaker. Place the stir bar in the beaker and position the beaker on the magnetic stirrer.
3. *Carefully* immerse pH electrode(s) into the solution so the electrode tip(s) are away from the stir bar.
4. (Optional but preferred): Add 2-3 ml of juice/must/wine sample to beaker (this is *not* a critical or volumetrically accurate measurement!). Rapidly titrate with standard NaOH to pH 8.2.
5. Note and record level of standard NaOH in burette, *or*, refill burette.
6. Transfer 5.0 ml of juice/must/wine into solution using a volumetric pipette. Titrate to pH 8.2. Record the volume of standard NaOH used for this titration **ONLY**.
7. Calculate the TA using the following equation:

$$\begin{aligned}\text{Titratable Acidity (g/L tartaric acid)} &= \frac{(\text{ml NaOH})(\text{N NaOH})(0.075)(1,000)}{\text{ml sample}} \\ &= \frac{(\text{ml NaOH})(\text{N NaOH})(75)}{\text{ml sample}}\end{aligned}$$

8. For 0.0667N NaOH, the quantity of this solution used yields total acidity in the appropriate units. For example, a total volume of 6.85 ml of 0.0667N NaOH corresponds directly to a TA of 6.85 g/L as tartaric acid.

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Questions or comments may be directed to the author. Consult the WVAWS membership list for contact information.