

Seasoning

Acid Degree of Apple Vinegar

Acid-base titration by
Automatic Potentiometric Titrator

Standard

Japanese Agricultural
Standard

1. Abstract

Determination of acid degree of apple vinegar is popularly practiced by potentiometric acid-base titration using a glass electrode according to Japanese Agricultural Standard quoted below.

After pure water is added, titrate with 0.5mol/L sodium hydroxide up to pH8.3, and the titration volume is converted to acid degree (acetic acid) by calculation.

2. Reference

- 1) JAS specification for measurement of vinegar (Bulletin No. 1381 noticed by Ministry of Agriculture, Forestry and Fisheries, September 3, 1996)

3. Cautions in measurement

- 1) Handle with care when you work on chemicals.
- 2) If acidity is high, you may use fixed dose mode to shorten measuring time.

4. Post-measurement care

After the electrode is rinsed with pure water, keep its tip dipped in a beaker filled with pure water in order to avoid drying up.

5. Test equipment

Main unit : Automatic potentiometric titrator (Standard preamplifier: STD-)
Electrode : Standard Combination glass electrode
Standard Temperature compensation electrode

6. Reagent

Titrant : 0.5mol/L Sodium hydroxide (f=0.9762)
Additive : Pure water

7. Measurement procedure

—Measurement—

- 1) Deliver 10.0mL sample into a 200mL beaker.
- 2) Add 100mL pure water.
- 3) Titrate with 0.5mol/L Sodium hydroxide to obtain acid degree.

8. Formula

Acid degree (Acetic acid w/v%) = (EP1 - BL1) × F × C1 × K1 / SIZE

EP1 : Titration volume (mL)
BL1 : Blank level (0.0289mL)
F : Factor of titrant (0.9762)
C1 : Concentration conversion coefficient (30.025mg/mL)
(0.5mol/L NaOH 1mL ≡ 30.025mg Citric acid)
K1 : Unit conversion coefficient (0.1)
SIZE : Sample size (mL)

9. Example of measurement

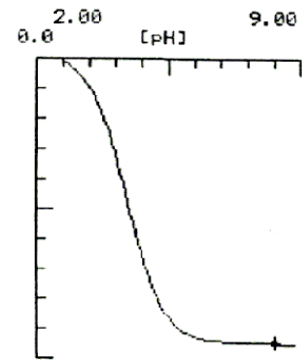
— Ambient condition —

Room temperature : 25.0 °C	Humidity : 57 %	Weather : Cloudy
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- Titration parameter -

Model : AT-500N Method No. : 08 Titr.mode : Auto Intermit Titr.form : Level [Titration parameter] Titr.Form : Level Buret No. : 1 Preamp : STD Detector No. : 1 Unit : pH Max. Volume : 40.0mL Titr. Wait : 0s Direction : Auto [Control parameter] 1st Level : 8.3 pH 2nd Level : 8.3 pH Gain : 1 Ctrl Speed : Medium Sampling mV : 4.0mV Sampling mL : 0.5mL	<Calculation> Sample Measurement Conc. 1 Calculation No. : 05 End Point No. : 1 Unit : [%] Coefficient1 : 30.025 Blank1 : 0.0289mL Factor1 : 0.9762 EP Data : Epn-Blank
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- Titration curve -

*** Result ***	
Sample No. : 14-09 Date : 1999/06/25 13:43 Sample ID : Method No. : 08 <Auto intermit> Method Name :	
I.Level	2.66pH
I.Temp	25.2C
Titr. Time	00:17:16
Size	<u>10.0mL</u>
Conc-1	<u>5.0188%</u>
EP-1	<u>17.1518mL</u> 8.30pH
	
Name: Kem-1	

(The above test results were printed out from titration by AT-500N unit.)

<<Titration parameter>> Form: of titration / APB No. the burette used in titration / Unit No.: APB Unit File number Detector No.: the detector used in titration / Max Volume. of titration / Wait Time: before titration starts Direction.: of titration <<Control parameter>> 1st Level potential at EP1/ / 2nd Level: potential at EP2/ Gain: sensitivity of detection signal Ctrl Speed: control of speed / Sampling mV: sampling potential / Sampling mL: data sampling volume <<Result parameter>> Calc No.: formula of conc.1/ End Point No. EP order for concentration 1/Unit conversion unit Temp.Comp.: temperature compensation of titration liquid/ C1(mg/mL): concentration conversion coefficient K1: unit conversion coefficient / Factor: of reagent / Blank1: blank level 1/ EP Data: titration volume formula

–Measurement results–

n	Sample (mL)	Titration (mL)	Acidity (w/v%)	Batch processed acidity	
				Mean	
1	<u>10</u>	<u>17.1518</u>	<u>5.0188</u>	Mean	5.0184 w/v%
2	10	17.1726	5.0249	SD	0.0067 w/v%
3	10	17.1270	5.0115	RSD	0.1337 %

* The above results were obtained by 3 tests of the same sample.

* Red underline shows the data from page 3/4.

10. Summary

The apple vinegar is made of apple juice more than 300g/L fermented, which contains organic acids like acetic acid, apple acid and citric acid. Acid degree of these acids is important in quality control of product.

The sample measurement shows a good repeatability with 0.1% relative standard deviation. Precise and reliable measurement is assured by the automated potentiometry.