

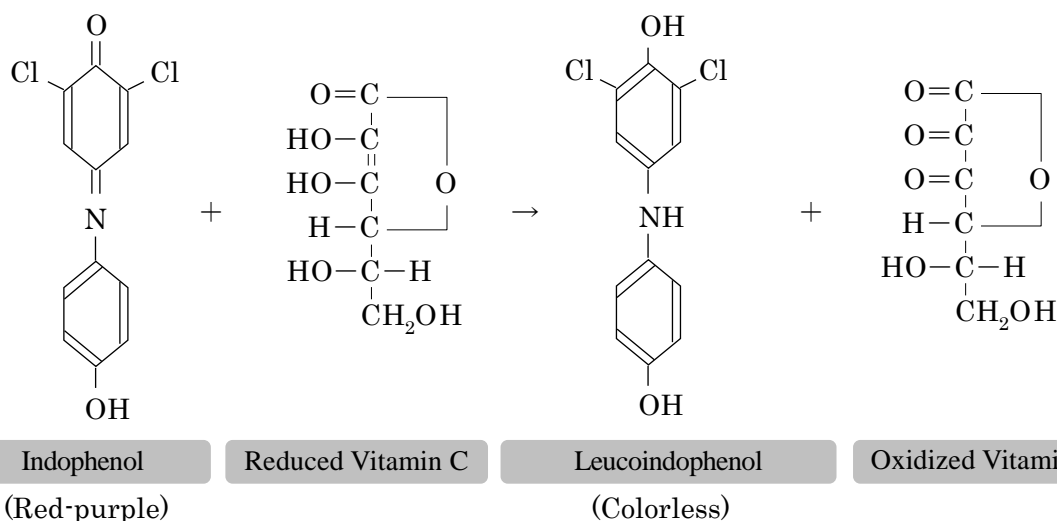
FOOD

Measurement of vitamin C in soft drink with
indophenol method

1. Abstract

Many soft drinks contain vitamin C (ascorbic acid). Vitamin C is included as not only nutrient factor but also an antioxidant for drinks. There are iodine titration method and indophenol method for analysis of vitamin C, this report introduces indophenol method.

Firstly, acidify the sample with mixed solution of metaphosphoric acid and acetic acid. After that, titrate with indophenol standard solution. The endpoint of the titration is detected as color change from colorless to red-purple with photometric probe.



2. Configuration of instruments and Reagents

(1) Instruments

- Main unit : Hiranuma Automatic Titrator COM series with Photometric unit (M-Type)
Electrode : Probe for photometric detection with optical filter 530 nm

(2) Regents

- Titrant : Indophenol standard solution
Dissolve 50 mg of 2,6-dichlorophenol-indophenol sodium salt dehydrate into 200 mL of DI water containing 50 mg of sodium hydrogen carbonate. Filter the solution with No. 42 grade of Whatman filter (2.5 μm).
- Additive solvent : Mixed solution of metaphosphoric acid and acetic acid
Take 30 g of metaphosphoric acid and dissolve with 80 mL of acetic acid and 800 mL of DI water. Obtain 1 L of the solution by filling the volumetric flask with DI water.
- Standard solution : Ascorbic acid standard solution (for use of factor determination of titrant)
Weigh 50 mg of L(+) - ascorbic acid precisely and dissolve with additive solvent. Obtain 100 mL of the solution by filling the volumetric flask with the mixed additive solvent.

3. Measurement procedure

3.1. Factor measurement for indophenol standard solution

- (1) Take 1 mL of standard solution into 100 ml tall-beaker with volumetric pipet.
- (2) Add 60 mL of additive solvent.
- (3) Immerse the probe and start titration with indophenol standard solution.

3.2. Measurement of vitamin C in sample

- (1) Take 2 mL of sample into 100 ml tall-beaker with volumetric pipet.
- (2) Add 60 mL of additive solvent.
- (3) Immerse the probe and start titration with indophenol standard solution.

4. Measurement conditions and results

Examples of titration conditions

Factor measurement for indophenol standard solution

Condition No. 1					
Method	F-Cross	Constant No.	1	Mode No.	20
Buret No.	1	Size	0.0503 g	Pre Int	0 sec
Amp No.	2	Blank	0 mL	Del K	0
D.Unit	T%	Molality	0 mol/L	Del Sens	0 mV
S-Timer	5 sec	Factor	0	Int time	15 sec
CP mL	3 mL	K	0	Int Sens	15 mV
T Timer	15 sec	L	0	Buret Speed	4
D.P. mL	0.5 mL	Unit	mg/mL	Pulse	160
End Sens	100	Formula	S*10/D		0.2 mL
Over mL	0.5 mL	Digits	4		
Max. Vol.	10 mL	Auto input Parameter	None		

Measurement of vitamin C in sample

Condition No. 2					
Method	F-Cross	Constant No.	2	Mode No.	20
Buret No.	1	Size	2 g	Pre Int	0 sec
Amp No.	2	Blank	0 mL	Del K	0
D.Unit	T%	Molality	0 mol/L	Del Sens	0 mV
S-Timer	5 sec	Factor	0.0965	Int time	15 sec
CP mL	0 mL	K	0	Int Sens	15 mV
T Timer	15 sec	L	0	Buret Speed	4
D.P. mL	0 mL	Unit	mg/mL	Pulse	160
End Sens	100	Formula	D*F/S		0.2 mL
Over mL	0.5 mL	Digits	4		
Max. Vol.	20 mL	Auto input Parameter	None		

Measurement results

Factor measurement for indophenol standard solution

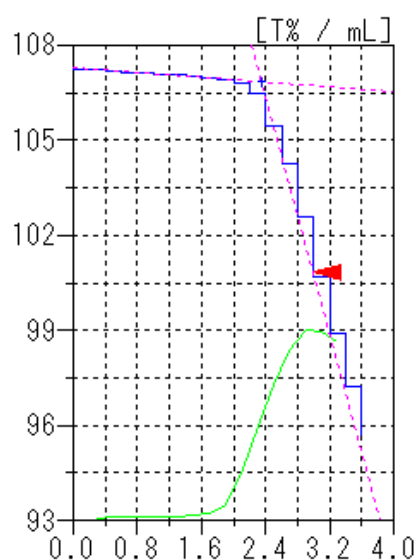
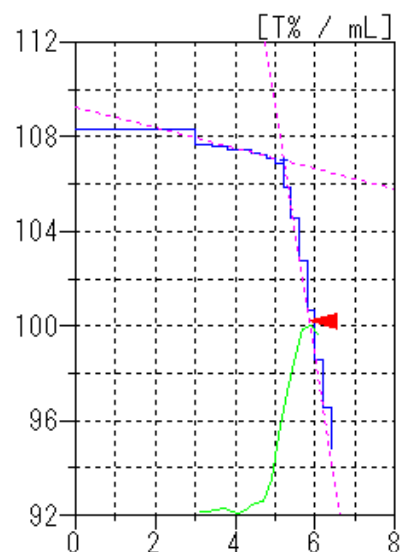
Measurement No.	Size (g)	Titrant volume (mL)	Factor (mg/mL)
1		5.224	0.0963
2	0.0503 (*)	5.200	0.0967
3		5.217	0.0964
		Avg. (mg/mL)	0.0965
Statistical result		SD (mg/mL)	0.0002
		RSD (%)	0.22

(* Weighed amount of vitamin C at preparation of standard solution)

Measurement of vitamin C in sample

Measurement No.	Size (g)	Titrant volume (mL)	Conc. (mg/mL)
1		2.343	0.1130
2	2	2.337	0.1128
3		2.335	0.1127
		Avg. (mg/mL)	0.1128
Statistical result		SD (mg/mL)	0.0002
		RSD (%)	0.14

Examples of titration curve



5. Note

In this measurement, indophenol titrant tends to gradually become clear on each dropping when each drop has a small volume (0.05 mL. etc.), the titration doesn't proceed well in this case. Therefore the amount of each titrant dropping was set to relatively large volume (0.2 mL), and the waiting time with each dropping was set to longer than normal titration condition.

When measuring the color sample like a grapefruit juice, the measurement of vitamin C by photometric titration is possibly affected by the sample color. In that case, you can reduce the influence by diluting the sample.

Keywords : Food, Soft drink, Vitamin C, Indophenol method, Photometric titration

*Some measurement would not be possible depending on optional configuration of system.