
**Tin in canned foods, atomic absorption
spectrophotometric method**

ICS: 77.40.30

Descriptors: foods, chemical analysis, determination of content, heavy metals, tin spectrophotometer

Foreword

This Ethiopian Standard has been prepared under the direction of Agricultural and Food Technology Technical Committee and published by the Quality and Standards Authority of Ethiopia (QSAE)

In the preparation this Ethiopian Standard references have been made to the following:

- Official methods of analysis 15th edition 1990 (AOAC)
- Codex Alimentarius commission Vol.10
- Codex Stan 88-1981 codex standard for corned beef

Acknowledgement is made for the use of information from the above publications.

Tin in canned foods, atomic absorption spectrophotometric method

1 Scope

1.1 This Ethiopian Standard prescribes method of determination of tin in canned foods

2 Principles

2.1 Samples are digested with nitric acid and then Hydrochloric acid and are diluted. Aqueous potassium chloride is added to samples and standards to reduce positive instrument interference. Tin is determined by atomic absorption at 235.5 nm with oxidizing nitrous oxide acetylene flame.

3 Apparatus

- 3.1 Atomic Absorption Spectrophotometer with simultaneous background correction and nitrous oxide - acetylene burners
- 3.2 Analytical balance readable to 0.1mg
- 3.3 Volumetric flasks
 - 1000ml
 - 100ml
- 3.4 Erlenmeyer flask 250ml
- 3.5 Pipettes
 - 10ml
 - 1ml
- 3.6 Oven maintained at 120⁰C
- 3.7 Hot plate

4 Reagents

- 4.1 Nitric Acid concentrated
- 4.2 Potassium chloride solution

10 mg/Kg .Dissolve1.91g Potassium Chloride in distilled water and dilute to 100ms with distilled water.

ES 1117:2005

4.3 Standard Solutions

4.3.1 Stock solution-1mg/ml. Dissolve 1.000 gram Tin A.A. grade in 200ml concentrated Hydrochloric acid, add 200 ml distilled water, cool to ambient temperature and dilute to 1 litre with distilled water

4.3.2 Working Solutions

Pipette 0, 50, 100, 150 and 200 µg Tin/ml in to each of five 100ml volumetric flasks. Pipette 10ml concentrated hydrochloric acid and 1ml potassium chloride solution and dilute to volume with distilled water.

4.4 Concentrated Hydrochloric acid

5 Procedure

5.1 Preparation of sample

5.1.1 Accurately weigh 30 - 40g juice or drinks 20 g foods containing 50 - 75% water, and 5 - 10g solids or semi solids in 250 ml Erlenmeyer flask. limit fat or oil content to 2 - 4 g and total organics to 5 g. Dry in oven at 120°C.

5.1.2 Add 30 ml concentrated nitric acid to the flask and within 15 minutes heat gently in fume hood to nitrate digestion, avoiding excessive frothing.

5.1.3 Gently boil until 3 to 6 ml digest remains or until sample just begins to dry on bottom. Do not let the sample char. Remove the flask from heat.

5.1.4 Without delay add 25ml concentrated Hydrochloric acid including 2 empty flasks for reagent blanks, and heat gently for about 15 minutes until sample bombing from evaluation of chlorine stops. Increase heat, and boil until 10 to 15 ml sample remains using similar flask with 15 ml water to estimate volume of the sample. Add 40 ml water, swirl, and pour into 100ml volumetric flasks rinsing once with approximately 10 ml water. When HCl is present in digest, samples may stand over night or longer. Do not add nitric acid to samples unless there is time to complete this stage of digestion in the same day.

5.1.5 Pipette 1ml potassium chloride solution into each volumetric flask cool to ambient temperature and dilute to volume with distilled water adding additional water to approximately compensate for volume of fat in the flask. If any.

5.1.6 Mix well and filter approximately 30 to 50 ml through dry medium porosity filter paper into dry, polypropylene or polyethylene screw cap bottle.

Do not filter blanks. Cap bottles until analysis

5.1.7 Determination

5.1.7.1 Using 200 µg/ml tin standard solution and at 235.5nm Tin line optimize the spectrophotometer, burner and flame according to manufacturer's instructions.

5.1.7.2 Increase nitrous oxide flow or decrease acetylene flow to give oxidizing flame, red part shall be approximately 4 mm above burner slot. This reduces sensitivity but improves precision to 0 ± 0.0004 Absorbance for blank and 0.201 ± 0.001 Absorbance for 100 µg/ml tin standard solution. Periodically monitor sensitivity of standard tin solution. If sensitivity decreases above 20 percent turn off flame and carefully clean burner's slot.

5.1.7.3 Zero the instrument while aspirating water, but do not adjust zero until after determinations, auto zero reduces precision. Aspirate water before and after each sample, standard and blank solutions. Take five readings for each solution, average and reference all absorbance measurements to absorbance of water.

5.1.7.4 Record absorbance for standards draw calibration curve and visually check for accurate standards. Two time blank corrected absorbance for 50 µg/ml standard tin solution shall not differ by more than 3 percent from blank corrected absorbance for 100 µg/ml tin standard solution.

5.1.7.5 Determine absorbance of sample and blank solutions correct for sample absorbance and calculate Tin concentration from the calibration curve.

5.2 Calculation

$$\text{Tin, mg/kg} = \frac{M1}{M2}$$

Where,

M1 = mass in μg of tin from standard curve

M2 = mass in g of sample