

64150 Citric acid

Prepared at the 49th JECFA (1997)

superseding specifications prepared at the 46th JECFA (1996), published in FNP 52 Addendum 4 (1996)

SYNONYMS	INS No. 330
DEFINITION	
Chemical name	2-hydroxy-1,2,3-propanetricarboxylic acid
C.A.S. number	77-92-9 (anhydrous) 5949-29-1 (monohydrate)
Chemical formula	C ₆ H ₈ O ₇ (anhydrous) C ₆ H ₈ O ₇ · H ₂ O (monohydrate)
Formula weight	192.13 (anhydrous) 210.14 (monohydrate)
Assay	Not less than 99.5% and not more than 100.5% on the anhydrous basis
DESCRIPTION	White or colourless, odourless, crystalline solid. The monohydrate form effloresces in dry air
FUNCTIONAL USES	Synergist for antioxidants, sequestrant, acidity regulator, flavouring agent
CHARACTERISTICS	
IDENTIFICATION	
<i>Solubility</i>	Very soluble in water; freely soluble in ethanol; slightly soluble in ether
<i>Positive Test for citrate</i>	Passes test
PURITY	
<i>Water</i>	Anhydrous: Not more than 0.5% (Karl Fischer method) Monohydrate: Not less than 7.5% and not more than 8.8% (Karl Fischer method)
<i>Sulphated ash</i>	Not more than 0.05%
<i>Lead</i>	Not more than 0.5 mg/kg Prepare a sample solution as directed for organic compounds in the Limit Test and

	determine the lead content by atomic absorption spectrometry
Oxalate	Passes test See description under TESTS
Readily carbonizable substances	
	Passes test See description under TESTS
TESTS	
PURITY TESTS	
Oxalate	Neutralize 10 ml of a 10% solution of the sample with dilute ammonia TS. Add 5 drops of dilute acetic acid TS, cool and add 2 ml of calcium chloride TS. No turbidity should be produced.
Readily carbonizable substances	
	Heat 1.0 g of sample with 10 ml of 98% sulfuric acid in a water bath at 90±1° for 60 min. No colour darker than <i>Matching Fluid K</i> (25°) should be produced (not more than 0.5 absorbance units at 470 nm in a 10 mm cell).
METHOD OF ASSAY	Weigh, to the nearest mg, 2.5 g of the sample and place in a tared flask. Dissolve in 40 ml of water and titrate with 1N sodium hydroxide, using phenolphthalein TS as the indicator. Each ml of 1N sodium hydroxide is equivalent to 64.04 mg of C ₆ H ₈ O ₇ .

Chemical composition : C₆H₈O₇

Large rhombic prisms that crystallize with 1 mole of H₂O and melt at about 100°C. Crystals may surface weather to a white powder at 30-40°C with water release. The crystal-free form melts at 153°C. Citric acid dissolves very readily in water with an acid taste and reaction. It is also readily soluble in alcohol (100 tsp. 80% alcohol dissolves 87 tsp. citric acid), but is sparingly soluble in ether. When heated above 75°C, destruction occurs with formation of aconitic acid.

In the organism, citric acid has some anti-rachitic effect, as it facilitates calcium absorption.

Citric acid is one of the most common plant acids. It has been detected in lemon juice (5-7%), pineapple, apples, black elderberry, currants, milk, conifers, oranges, orchids, mushrooms (mushroom, truffle), beet juice, tobacco leaves, wine, etc. Fresh milk contains 2.5 - 2.8 g of citric acid per liter.

Due to bacterial degradation, the concentration decreases rapidly.

Preparation

40-50 l of ordinary lemon juice is concentrated by heating to about 6 l and boiling milk of lime is allowed to act on the liquid heated with steam to 80°C. This precipitates insoluble calcium citrate, which is subsequently decomposed with sulfuric acid into free, insoluble acid and sparingly soluble gypsum.

Nowadays, citric acid is industrially produced using a transgenic variant of the mold *Aspergillus niger*, which precipitates citric acid at low pH values and under iron deficiency in the presence of strong glucose and oxygen supply in and after the late logarithmic growth phase, as its citrate cycle is disturbed (source: <http://de.wikipedia.org>).



Use

As an addition to baking powders, fizzy lemonades, lemonade cubes, for ink production, engraving and silvering, for bleaching and degreasing olive oil, against caustic lime burns, as a thirst-quenching and cooling agent (vinegar substitute).

Citric acid was first prepared from lemon juice in 1784.