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Garcinia cambogia

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DEFINITION

Garcinia cambogia consists of the dried pericarp of the fruits of *Garcinia gummi-gutta* (L.) N. Robson, also known as *Garcinia cambogia* (Gaertn.) Desr. (Fam. Clusiaceae). It contains NLT 12% of the sum of (–)-hydroxycitric acid and (–)-hydroxycitric acid lactone, on the dried basis.

IDENTIFICATION

- **A.** *Garcinia cambogia* meets the requirements under *Specific Tests, Botanical Characteristics*.
- **B. HPLC:** The *Sample solution* chromatogram exhibits a peak for hydroxycitric acid at a retention time corresponding to that of *Standard solution A*, as obtained in the test for *Content of (–)-Hydroxycitric Acid and (–)-Hydroxycitric Acid Lactone*. The *Sample solution* also exhibits a peak for hydroxycitric acid lactone. The hydroxycitric acid and the hydroxycitric acid lactone peaks are the main peaks in the *Sample solution* chromatogram.

COMPOSITION

• CONTENT OF (–)-HYDROXYCITRIC ACID AND (–)-HYDROXYCITRIC ACID LACTONE

Solution A: 30% Phosphoric acid in water

Mobile phase: Dissolve 1.36 g of anhydrous potassium dihydrogen phosphate in 900 mL of water, adjust with *Solution A* to a pH of 2.5, dilute to 1000 mL with water, mix, filter, and degas.

Solvent: A mixture of *Solution A* and water (1:9)

Standard solution A: A solution of USP Calcium (–)-Hydroxycitrate RS equivalent to about 2.5 mg/mL of (–)-hydroxycitric acid in *Solvent*. Before injection, pass through a membrane filter of 0.45-μm or finer pore size, discarding the first few mL of the filtrate.

Standard solution B: 5 mg/mL of [USP Powdered Garcinia Hydroxycitrate Extract RS](#) in *Solvent*. Before injection, pass through a membrane filter of 0.45-μm or finer pore size.

Sample solution: Transfer about 5 g of *Garcinia cambogia*, finely powdered and accurately weighed, to a 250-mL round-bottom flask fitted with a reflux condenser. Add 50 mL of *Solvent*, reflux while stirring for 30 min, set aside to settle, and decant the supernatant. Repeat the extraction using four 50-mL portions of water, combine all extracts, cool, filter into a 250-mL volumetric flask, and dilute with water to volume. Before injection, pass through a membrane filter of 0.45-μm or finer pore size, discarding the first few mL of the filtrate.

Chromatographic system

(See [Chromatography \(621\), System Suitability](#).)

Mode: LC

Detector: UV 215 nm

Column: 4.6-mm × 25-cm; packing L1

Column temperature: 25°

Flow rate: 1.0 mL/min

Injection volume: 20 μL

System suitability

Samples: *Standard solution A*, *Standard solution B*, and *Sample solution*

[NOTE—The relative retention times for the hydroxycitric acid lactone and hydroxycitric acid peaks are about 0.9 and 1.0, respectively.]

Suitability requirements

Chromatogram similarity: The chromatogram of *Standard solution B* is similar to the reference chromatogram provided with the lot of [USP Powdered Garcinia Hydroxycitrate Extract RS](#) being used.

Resolution: NLT 1.0 between hydroxycitric acid lactone and hydroxycitric acid, *Sample solution*

Tailing factor: NMT 2.0 for the hydroxycitric acid peak, *Standard solution A*

Relative standard deviation: NMT 2.0%, determined from the hydroxycitric acid peak in repeated injections, *Standard solution A*

Analysis

Samples: *Standard solution A*, *Standard solution B*, and *Sample solution*

[NOTE—*Standard solution A*, *Standard solution B*, and *Sample solution* are stable for 6 h.]

Calculate the percentages of (–)-hydroxycitric acid and (–)-hydroxycitric acid lactone in the portion of *Garcinia cambogia* taken.

$$\text{Result} = (r_U/r_S) \times C_S \times (V/W) \times F \times 100$$

r_U = peak area of the relevant analyte from the *Sample solution*

r_S = peak area of hydroxycitric acid from *Standard solution A*

C_S = concentration of (–)-hydroxycitric acid in *Standard solution A* (mg/mL)

V = final volume of the *Sample solution* (mL)

W = weight of *Garcinia cambogia* used to prepare the *Sample solution* (mg)

F = conversion factor: 2.17 for (–)-hydroxycitric acid lactone, and 1.00 for (–)-hydroxycitric acid

Acceptance criteria: The sum of percentages of (–)-hydroxycitric acid and (–)-hydroxycitric acid lactone: NLT 12% on the dried basis

IMPURITIES

- [ARTICLES OF BOTANICAL ORIGIN, Acid-Insoluble Ash\(561\)](#): NMT 2.0%
- [ARTICLES OF BOTANICAL ORIGIN, Limits of Elemental Impurities\(561\)](#): Meets the requirements
- [ARTICLES OF BOTANICAL ORIGIN, Foreign Organic Matter\(561\)](#): NMT 2.0%
- [ARTICLES OF BOTANICAL ORIGIN, Pesticide Residue Analysis\(561\)](#): Meets the requirements

SPECIFIC TESTS

• BOTANICAL CHARACTERISTICS

Macroscopic: Fresh fruits are spherical to oval in shape, 4–8 cm in height, 3–6 cm in width, yellowish to pale pinkish when ripe, resemble a miniature pumpkin, with 7–13 deep longitudinal grooves, extending up to a circular elevated base of stigma with blackish tip, situated in the depressed end of the fruit, containing 6–8 seeds surrounded by a succulent aril. Compendial article consists of dried pieces of pericarp, longitudinal, of variable size and shape, strongly curved inward; leathery; externally rough, irregularly wrinkled, longitudinally grooved; internally smooth, longitudinally faintly striated and ridged. Dark brown to blackish-brown odor characteristic; taste sour, astringent, and slightly bitter.

Microscopic: Transverse section of the pericarp shows a layer of epicarp, composed of rectangular to tangentially elongated cells covered with thin cuticle; wide mesocarp, composed of 100–150 rows of parenchyma cells of variable size and shape, the outer rows composed of relatively larger cells with wide intercellular spaces; vascular bundles appear throughout the mesocarp, more toward the inner zone; dark brown gummy exudates, simple and compound starch granules and prisms of calcium oxalate are present in the parenchyma cells throughout the mesocarp.

• LIMIT OF CITRIC ACID

Solvent and Chromatographic system: Prepare as directed in the test for *Content of (–)-Hydroxycitric Acid and (–)-Hydroxycitric Acid Lactone*.

Standard solution: 0.5 mg/mL of [USP Citric Acid RS](#) in *Solvent*. Before injection, pass through a membrane filter of 0.45-µm or finer pore size, discarding the first few mL of the filtrate.

Analysis

Sample: *Standard solution*

Calculate the percentage of citric acid in the portion of *Garcinia cambogia* taken:

$$\text{Result} = (r_U/r_S) \times C_S \times (V/W) \times 100$$

r_U = peak area of citric acid from the *Sample solution* in the test for *Content of (–)-Hydroxycitric Acid and (–)-Hydroxycitric Acid Lactone* (mg/mL)

r_S = peak area of citric acid from the *Standard solution*

C_S = concentration of [USP Citric Acid RS](#) in the *Standard solution* (mg/mL)

V = final volume of the *Sample solution* (mL)

W = weight of *Garcinia cambogia* used to prepare the *Sample solution* in the test for *Content of (–)-Hydroxycitric Acid and (–)-Hydroxycitric Acid Lactone* (mg)

Acceptance criteria: NMT 2% of citric acid on the dried basis

• [LOSS ON DRYING \(731\)](#)

Sample: 2.0 g of *Garcinia cambogia*, finely powdered

Analysis: Dry the *Sample* at 105° for 3 h.

Acceptance criteria: NMT 12.0%

• [ARTICLES OF BOTANICAL ORIGIN, Total Ash\(561\)](#): Determined on 1.0 g of finely powdered *Garcinia cambogia*: NMT 3.0%; NMT 8.0% if sodium chloride was added as a preservative during collection of the fruits

• [MICROBIAL ENUMERATION TESTS \(2021\)](#): The total aerobic bacterial count does not exceed 10⁵ cfu/g, the total combined molds and yeasts count does not exceed 10³ cfu/g, and the bile-tolerant Gram-negative bacteria do not exceed 10³ cfu/g.

• [ABSENCE OF SPECIFIED MICROORGANISMS \(2022\)](#): Meets the requirements of the tests for absence of *Salmonella* species and *Escherichia coli*