Status: Currently Official on 14-Feb-2025
Official Date: Official as of 01-Aug-2017
Document Type: USP Monographs
DocId: GUID-58E89938-348E-44F0-A0C8-F5E5C79F458E_1_en-US
DOI: https://doi.org/10.31003/USPNF_M13720_01_01
DOI Ref: g0p62

Cascara Sagrada

DEFINITION

Cascara Sagrada is the dried bark of *Frangula purshiana* (DC.) A.Gray [syn. *Rhamnus purshiana* DC.] (Fam. Rhamnaceae). It yields NLT 7.0% of the total hydroxyanthracene derivatives, calculated as cascaroside A and calculated on the dried basis. NLT 60% of the total hydroxyanthracene derivatives consists of cascarosides, calculated as cascaroside A.

[Note—Collect Cascara Sagrada NLT 1 year before use.]

IDENTIFICATION

- **A.**

  Sample: 100 mg of powdered Cascara Sagrada

  Analysis: Add the *Sample* to 10 mL of hot water, shake the mixture occasionally until it is cold, filter, dilute the filtrate with water to 10 mL, and add 10 mL of 6 N ammonium hydroxide.

  Acceptance criteria: An orange color is produced.

- **B.**

  Sample: A portion of Cascara Sagrada

  Analysis: Treat the *Sample* with 6 N ammonium hydroxide.

  Acceptance criteria: It becomes red to reddish brown in color.

- **C.**

  Sample: 100 mg of powdered Cascara Sagrada

  Analysis: Macerate the *Sample* with 1 mL of alcohol, add 10 mL of water, boil the mixture, then cool, filter, and shake the filtrate with 10 mL of ether: a greenish-yellow ether layer separates. Shake 3 mL of the ether layer with 3 mL of 6 N ammonium hydroxide, and dilute the separated ammonia solution with 20 mL of water.

  Acceptance criteria: A distinct orange-pink color remains.

COMPOSITION

- **Content of Total Hydroxyanthracene Derivatives**

Perform all extractions by shaking vigorously, and allow all phases to separate completely before transferring. Entrainment of aglycones into the aqueous phase, as indicated by a value of less than 2.6 for the ratio of the absorbance of the final solution at 515 nm to that at 440 nm, may lead to false results.

Throughout this procedure, use 1 N sodium hydroxide that is prepared without added barium ions as directed in *Reagents, Indicators, and Solutions—Volumetric Solutions*.

Ferric chloride solution: 1 g/mL of ferric chloride in water

Sample stock solution: Add 1 g of Cascara Sagrada to 70 mL of boiling water, boil for several minutes, with stirring. Allow to cool, and transfer with the aid of water to a 100-mL volumetric flask. Dilute with water to volume, mix, and filter through suitable filter paper.

Sample solution: Pipet 10 mL of *Sample stock solution* into a separatory funnel containing 5 mL of water and 2 drops of 1 N hydrochloric acid. Extract with 40 mL of methylene chloride, and transfer the lower layer to a second separatory funnel. Add 10 mL of water to the second separatory funnel, and shake. Allow to separate, discard the lower layer, and transfer the water layer to the first separatory funnel. Extract the combined water layers with 40 mL of methylene chloride, and transfer the lower layer to the second separatory funnel. Add 10 mL of water to the second separatory funnel, and shake. Allow to separate, and discard the lower layer. Transfer the combined water layers, with the aid of water, to a 50-mL volumetric flask, dilute with water to volume, and mix.

Instrumental conditions

(See *Ultraviolet-Visible Spectroscopy* ⟨857⟩.)

Mode: Visible

Analytical wavelength: 515 nm

Cell: 1 cm

Blank: Methanol

Analysis

Sample: *Sample solution*

Pipet 15 mL of *Sample solution* into a flask containing 2 mL of *Ferric chloride solution* and 12 mL of hydrochloric acid. Attach a condenser arranged for refluxing, and heat for 3 h by keeping the flask immersed in boiling water or continuously exposed to steam heat. Cool, wash down the condenser, and transfer to a separatory funnel with the aid of 4 mL of 1 N sodium hydroxide and five 6-mL portions of water. Extract with 20 mL of methylene chloride, and transfer the lower layer to another separatory funnel. Repeat the extraction with

three additional 20-mL portions of methylene chloride, wash the combined methylene chloride extracts with two 10-mL portions of water, shaking each time for 2 min, and discard the water washings. Transfer the washed methylene chloride extract to a 100-mL volumetric flask, dilute with methylene chloride to volume, and mix. Evaporate a 15.0-mL portion carefully on a water bath to dryness, and dissolve the residue in 10.0 mL of a 5-mg/mL solution of magnesium acetate in methanol.

Calculate the weight, in mg, of total hydroxyanthracene derivatives (T_{HD}) in the portion of Cascara Sagrada taken:

$$T_{HD} = A_U \times F$$

A_U = absorbance of the *Sample solution*

F = conversion factor, 138. [NOTE—This conversion factor considers an absorptivity of 16.1 for cascaroside A and the dilutions to prepare the solution for analysis.]

Calculate the percentage of total hydroxyanthracene derivatives, calculated as cascaroside A:

$$\text{Result} = (T_{HD}/W) \times 100$$

T_{HD} = weight of total hydroxyanthracene derivatives (mg)

W = weight of Cascara Sagrada taken to prepare the *Sample stock solution* (mg)

Acceptance criteria: NLT 7.0%, calculated as cascaroside A, on the dried basis

• **CONTENT OF CASCAROSIDES**

Perform all extractions by shaking vigorously, and allow all phases to separate completely before transferring. Entrainment of aglycones into the aqueous phase, as indicated by a value of less than 2.7 for the ratio of the absorbance of the final solution at 515 nm to that at 440 nm, may lead to false results.

Throughout this procedure, use 1 N sodium hydroxide that is prepared without added barium ions as directed in *Reagents, Indicators, and Solutions—Volumetric Solutions*.

Ferric chloride solution and **Sample stock solution:** Prepare as directed in the test for *Content of Total Hydroxyanthracene Derivatives*.

Sample solution: Pipet 10 mL of *Sample stock solution* into a separatory funnel containing 5 mL of water and 2 drops of 1 N hydrochloric acid. Extract with 40 mL of methylene chloride, and transfer the lower layer to a second separatory funnel. Add 10 mL of water to the second separatory funnel, and shake. Allow to separate, discard the lower layer, and transfer the water layer to the first separatory funnel. Extract the combined water layers with 40 mL of methylene chloride, and transfer the lower layer to the second separatory funnel. Add 10 mL of water to the second separatory funnel, and shake. Allow to separate, discard the lower layer, and transfer the water layer to the first separatory funnel. Extract the combined aqueous phase with 30 mL of clear, freshly prepared, water-saturated ethyl acetate, and transfer the water layer to another separatory funnel. Repeat the extraction with two additional 30-mL portions of the freshly prepared, water-saturated ethyl acetate. Add 5 mL of water to the combined ethyl acetate extracts, shake, allow the phases to separate, discard the ethyl acetate extracts, and add 30 mL of the freshly prepared, water-saturated ethyl acetate to the water wash. Shake, allow the phases to separate, and discard the ethyl acetate phase. Transfer the combined aqueous phases, with the aid of water, to a 50-mL volumetric flask. Dilute with water to volume.

Instrumental conditions

(See *Ultraviolet-Visible Spectroscopy* ⟨857⟩.)

Mode: Visible

Analytical wavelength: 515 nm

Cell: 1 cm

Blank: Methanol

Analysis

Proceed as directed for *Analysis* in *Content of Total Hydroxyanthracene Derivatives*, except to evaporate a 20.0-mL portion of the methylene chloride solution instead of 15.0 mL.

Sample: *Sample solution*

Determine the absorbance and calculate the percentage of cascarosides with respect to the content of total hydroxyanthracene derivatives in the portion of Cascara Sagrada taken:

$$\text{Result} = (A_U/T_{HD}) \times F \times 100$$

A_U = absorbance of the *Sample solution*

T_{HD} = weight of total hydroxyanthracene derivatives (mg)

F = conversion factor, 103.5. [NOTE—This conversion factor considers an absorptivity of 16.1 for cascaroside A and the dilutions to prepare the solution for analysis.]

Acceptance criteria: NLT 60% of the total hydroxyanthracene derivatives consists of cascarosides, calculated as cascaroside A, on the dried basis.

CONTAMINANTS

• **Articles of Botanical Origin** ⟨561⟩, *Pesticide Residue Analysis*: Meets the requirements

SPECIFIC TESTS

• **Botanical Characteristics**

Macroscopic

Cascara Sagrada: The bark is usually in the form of flattened or transversely curved pieces, occasionally in quills of variable length and from 1 to 5 mm in thickness. The outer surface is brown, purplish brown, or brownish red, longitudinally ridged, with or without grayish or whitish lichen patches, sometimes with numerous lenticels and occasionally with moss attached. The inner surface is longitudinally striate, light yellow, weak reddish brown, or moderate yellowish brown. The fracture is short with projections of phloem fiber bundles in the inner bark.

Powdered Cascara Sagrada: The powder is moderate yellowish brown to dusky yellowish orange.

Microscopic

Cascara Sagrada: The transverse section of the bark shows a yellowish-brown, purple, or reddish-brown cork of up to 10 or more rows of small cells; stone cells in yellowish, tangentially elongated groups of 20–50 cells in the cortex, pericycle, and outer phloem regions; phloem rays 1–4 cells wide, 15–25 cells deep, frequently diagonal or curved, forming converging groups; phloem fibers in small bundles, more or less surrounded by crystal fibers and located between the phloem rays; parenchyma with brown walls and containing starch grains and calcium oxalate crystals.

Powdered Cascara Sagrada: It shows numerous broken phloem fiber bundles with accompanying crystal fibers containing monoclinic prisms of calcium oxalate; stone cells more or less adherent, in small groups with thick, finely lamellated and porous walls; fragments of reddish-brown to yellow cork; masses of parenchyma and phloem ray cells colored reddish brown to orange upon the addition of a solution of an alkali; starch grains spheroidal, up to 8 µm in diameter; calcium oxalate in monoclinic prisms or rosette aggregates from 6 to 20 µm in diameter, occasionally up to 45 µm in diameter.

• **Articles of Botanical Origin** ⟨561⟩, *Methods of Analysis*, *Foreign Organic Matter*: NMT 4.0%

• **Water Determination** ⟨921⟩, *Method III, Procedure for Articles of Botanical Origin*

Analysis: Dry at 105° for 5 h.

Acceptance criteria: NMT 12.0%

Auxiliary Information - Please check for your question in the FAQs before contacting USP.

Topic/Question	Contact	Expert Committee
CASCARA SAGRADA	Nam-Cheol Kim Scientific Liaison	BDSHM2020 Botanical Dietary Supplements and Herbal Medicines

Chromatographic Database Information: Chromatographic Database

Most Recently Appeared In:
Pharmacopeial Forum: Volume No. PF 42(2)

Current DocID: GUID-58E89938-348E-44F0-A0C8-F5E5C79F458E_1_en-US

DOI: https://doi.org/10.31003/USPNF_M13720_01_01

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