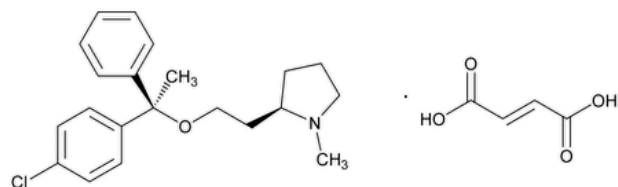


Status: Currently Official on 14-Feb-2025
 Official Date: Official as of 01-May-2020
 Document Type: USP Monographs
 DocId: GUID-462446F7-61A9-49AB-A32A-CF53F335BE40_4_en-US
 DOI: https://doi.org/10.31003/USPNF_M18020_04_01
 DOI Ref: b5yto

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Clemastine Fumarate



$C_{21}H_{26}ClNO \cdot C_4H_4O_4$ 459.96

Pyrrolidine, 2-[2-[1-(4-chlorophenyl)-1-phenylethoxy]ethyl]-1-methyl-, [*R*-(*R**,*R**)]-, (*E*)-2-butenedioate (1:1);

(+)-(2*R*)-2-[2-[[[*R*]-*p*-Chloro- α -methyl- α -phenylbenzyl]-oxy]ethyl]-1-methylpyrrolidine fumarate (1:1) CAS RN®: 14976-57-9; UNII: 19259EGQ3D.

DEFINITION

Clemastine Fumarate contains NLT 98.0% and NMT 102.0% of clemastine fumarate ($C_{21}H_{26}ClNO \cdot C_4H_4O_4$), calculated on the dried basis.

IDENTIFICATION

Change to read:

- **A.** ▲ [SPECTROSCOPIC IDENTIFICATION TESTS \(197\)](#), [Infrared Spectroscopy: 197M](#) ▲ (CN 1-MAY-2020)
- **B.** The retention times of the fumarate and clemastine peaks of the *Sample solution* correspond to those of the *Standard solution*, as obtained in the Assay.

ASSAY

• PROCEDURE

Buffer: 4.1 g/L of monobasic potassium phosphate in water. Adjust with phosphoric acid to a pH of 4.0.

Mobile phase: Methanol, acetonitrile, and *Buffer* (35:35:30)

Standard solution: 0.28 mg/mL of [USP Clemastine Fumarate RS](#) in *Mobile phase*

Sample solution: 0.28 mg/mL of Clemastine Fumarate in *Mobile phase*

Chromatographic system

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

Mode: LC

Detector: UV 220 nm

Column: 4.6-mm × 5-cm; 1.8- μ m packing L7

Flow rate: 1.2 mL/min

Injection volume: 5 μ L

Run time: 3 min

System suitability

Sample: *Standard solution*

Suitability requirements

Tailing factor: NMT 1.8 for clemastine

Relative standard deviation: NMT 0.73% for clemastine

Analysis

Samples: *Standard solution* and *Sample solution*

Calculate the percentage of clemastine fumarate ($C_{21}H_{26}ClNO \cdot C_4H_4O_4$) in the portion of Clemastine Fumarate taken:

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

r_U = peak response of clemastine from the *Sample solution*

r_s = peak response of clemastine from the *Standard solution*

C_s = concentration of [USP Clemastine Fumarate RS](#) in the *Standard solution* (mg/mL)

C_u = concentration of Clemastine Fumarate in the *Sample solution* (mg/mL)

Acceptance criteria: 98.0%–102.0% on the dried basis

IMPURITIES

• ORGANIC IMPURITIES

Buffer: 4.1 g/L of monobasic potassium phosphate in water. Adjust with phosphoric acid to a pH of 4.0.

Solution A: Methanol, acetonitrile, and *Buffer* (35:35:30)

Solution B: Methanol, acetonitrile, and *Buffer* (40:37.5:22.5)

Mobile phase: See [Table 1](#).

Table 1

Time (min)	Solution A (%)	Solution B (%)
0	100	0
3	100	0
3.1	0	100
18	0	100
18.1	100	0
25	100	0

Standard stock solution 1: 0.14 mg/mL of [USP Clemastine Fumarate RS](#) in *Solution A*. Sonication may be needed to aid dissolution.

Standard stock solution 2: 0.14 mg/mL of [USP 4-Chlorobenzophenone RS](#) in methanol. Sonication may be needed to aid dissolution.

Sensitivity solution: 0.14 µg/mL of [USP Clemastine Fumarate RS](#) in *Solution A* from *Standard stock solution 1*

Standard solution: 0.28 µg/mL of [USP Clemastine Fumarate RS](#) and 0.36 µg/mL of [USP 4-Chlorobenzophenone RS](#) in *Solution A* from *Standard stock solution 1* and *Standard stock solution 2*, respectively

Sample solution: 0.28 mg/mL of Clemastine Fumarate in *Solution A*

Chromatographic system

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

Mode: LC

Detector: UV 220 nm

Column: 4.6-mm × 5-cm; 1.8-µm packing L7

Flow rate: 1.2 mL/min

Injection volume: 50 µL

System suitability

Samples: *Sensitivity solution* and *Standard solution*

Suitability requirements

Resolution: NLT 1.5 between clemastine and 4-chlorobenzophenone, *Standard solution*

Relative standard deviation: NMT 2.0% for clemastine, *Standard solution*

Signal-to-noise ratio: NLT 50 for clemastine, *Sensitivity solution*

Analysis

Samples: *Standard solution* and *Sample solution*

Calculate the percentage of 4-chlorobenzophenone in the portion of Clemastine Fumarate taken:

$$\text{Result} = (r_u/r_s) \times (C_s/C_u) \times 100$$

r_u = peak response of 4-chlorobenzophenone from the *Sample solution*