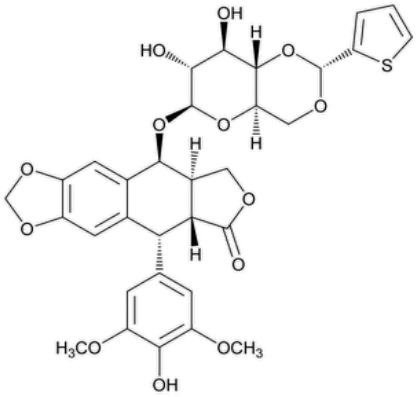
Status: Currently Official on 16-Feb-2025
Official Date: Official as of 01-May-2020
Document Type: USP Monographs
DocId: GUID-07D8FF33-B440-456B-B3EE-CB02D3307DBD_2_en-US
DOI: https://doi.org/10.31003/USPNF_M5362_02_01
DOI Ref: i2g7j

Teniposide



$C_{32}H_{32}O_{13}S$ 656.65

Furo[3',4':6,7]naphtho[2,3-*d*]-1,3-dioxol-6(5a*H*)-one, 5,8,8a,9-tetrahydro-5-(4-hydroxy-3,5-dimethoxyphenyl)-9-[4,6-*O*-(2-thienylmethylene)-β-D-glucopyranosyloxy]-, [5*R*-[5α,5aβ,8aα,9β(*R**)]]-;
4'-Demethylepipodophyllotoxin 9-[4,6-*O*-(*R*)-2-thenylidene-β-D-glucopyranoside];
(5*S*,5a*R*,8a*R*,9*R*)-9-(4-Hydroxy-3,5-dimethoxyphenyl)-8-oxo-5,5a,6,8,8a,9-hexahydrofuro[3',4':6,7]naphtho[2,3-*d*][1,3]dioxol-5-yl 4,6-*O*-(thiophen-2-ylmethylidene)-β-D-glucopyranoside CAS RN®: 29767-20-2; UNII: 957E6438QA.

DEFINITION

Teniposide contains NLT 97.0% and NMT 103.0% of teniposide ($C_{32}H_{32}O_{13}S$), calculated on the anhydrous and solvent-free basis.

[**Caution—**Great care should be taken in handling teniposide, because it is a cytotoxic agent.]

IDENTIFICATION

Change to read:

• **A.** ▲**Spectroscopic Identification Tests** ⟨197⟩, *Infrared Spectroscopy*: **197K**▲ (CN 1-May-2020)

• **B.** The retention time of the major peak of the *Sample solution* corresponds to that of the *Standard solution*, as obtained in the *Assay*.

ASSAY

• **Procedure**

Buffer: 5 mM monobasic potassium phosphate in water

Solution A: Acetonitrile and *Buffer* (36:64). Adjust with dibasic potassium phosphate to an apparent pH of 7.0.

Solution B: Acetonitrile and water (90:10)

Mobile phase: See *Table 1*. Return to original conditions and re-equilibrate the system for 15 min.

Table 1

Time (min)	Solution A (%)	Solution B (%)
0	100	0
25	100	0
60	0	100

Time (min)	Solution A (%)	Solution B (%)
66[a]	0	100

[a] This time may be adjusted if needed to be at least 2.2 times the retention time of the teniposide peak.

Diluent: Acetonitrile and *Buffer* (1:1)

Standard solution: 0.4 mg/mL of USP Teniposide RS, prepared as follows. Transfer USP Teniposide RS to a suitable volumetric flask, add acetonitrile equivalent to 10% of the final volume, and sonicate to dissolve. Dilute with *Diluent* to volume.

Sample solution: 0.4 mg/mL of Teniposide, prepared as follows. Transfer Teniposide to a suitable volumetric flask, add acetonitrile equivalent to 10% of the final volume, and sonicate to dissolve. Dilute with *Diluent* to volume.

Chromatographic system

(See *Chromatography ⟨621⟩, System Suitability*.)

Mode: LC

Detector: UV 220 nm

Column: 4.6-mm × 25-cm; 4-µm packing L11

Flow rate: 1 mL/min

Injection volume: 10 µL

System suitability

Sample: *Standard solution*

Suitability requirements

Relative standard deviation: NMT 0.85%

Analysis

Samples: *Standard solution* and *Sample solution*

Calculate the percentage of teniposide ($C_{32}H_{32}O_{13}S$) in the portion of Teniposide taken:

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

r_U = peak response from the *Sample solution*

r_S = peak response from the *Standard solution*

C_S = concentration of USP Teniposide RS in the *Standard solution* (mg/mL)

C_U = concentration of Teniposide in the *Sample solution* (mg/mL)

Acceptance criteria: 97.0%–103.0% on the anhydrous and solvent-free basis

IMPURITIES

• **Residue on Ignition ⟨281⟩**

Analysis: Ignite the sample at 700°–800°.

Acceptance criteria: NMT 0.2%

• **Organic Impurities**

Solution A, Solution B, Mobile phase, Diluent, and **Sample solution:** Proceed as directed in the *Assay*.

System suitability solution: Use the *Standard solution* in the *Assay*. [Note—USP Teniposide RS contains a small amount of *R*-3-thienylidene regioisomer.]

Chromatographic system: Proceed as directed in the *Assay*, except for *Detectors*.

Detectors

UV 242 nm: For thiophenealdehyde

UV 220 nm: For all other impurities

System suitability

Sample: *System suitability solution*

Suitability requirements

Resolution: NLT 1.0 between *R*-3-thienylidene regioisomer and teniposide peaks

Analysis

Sample: *Sample solution*

Calculate the percentage of each impurity in the portion of Teniposide taken:

$$\text{Result} = r_U/\{\Sigma[r_U \times (1/F)] + r_T\} \times (1/F) \times 100$$

r_U = peak area of each impurity from the *Sample solution* at 242 nm for thiophenealdehyde and 220 nm for all other impurities

F = relative response factor for each individual impurity (see *Table 2*)

r_T = peak area of teniposide from the *Sample solution* at 220 nm

Acceptance criteria

Individual impurities: See *Table 2*. Disregard any impurity peaks less than 0.05%.

Table 2

Name	Relative Retention Time	Relative Response Factor	Acceptance Criteria, NMT (%)
Lignan P[a]	0.12	1.0	0.1
Teniposide related compound A[b]	0.29	1.4	0.1
Thiophenealdehyde[c]	0.30	1.0	0.1
S-3-Thienylidene regioisomer[d]	0.91	1.0	0.1
R-3-Thienylidene regioisomer[e]	0.92	1.0	0.5
Teniposide	1.0	—	—
Picroteniposide[f]	1.09	1.0	0.1
Demethylepipodophyllotoxin dimer[g]	1.39	1.3	0.1
Tetrabenzyl benzoyl lignan P[h]	2.11	0.81	0.1
Any individual unspecified impurity	—	1.0	0.1
Total impurities	—	—	3

[a] 4′-Demethylepipodophyllotoxin 9-β-D-glucopyranoside.

[b] 4′-Demethylepipodophyllotoxin.

[c] Thiophene-2-carbaldehyde. It is quantitated at 242 nm.

[d] 4′-Demethylepipodophyllotoxin 9-[4,6-*O*-(*S*)-3-thenylidene-β-D-glucopyranoside].

[e] 4′-Demethylepipodophyllotoxin 9-[4,6-*O*-(*R*)-3-thenylidene-β-D-glucopyranoside].

[f] (5*R*,5a*S*,8a*R*,9*S*)-9-[4,6-*O*-(*R*)-2-Thenylidene-β-D-glucopyranosyloxy]-5,8,8a,9-tetrahydro-5-(4-hydroxy-3,5-dimethoxyphenyl)furo[3′,4′:6,7]naphtho[2,3-*d*]-1,3-dioxol-6(5a*H*)-one.

[g] (5*R*,5a*R*,8a*R*,9*S*,5′*R*,5a′*R*,8a′*R*,9′*S*)-9,9′-Oxybis(5,8,8a,9-tetrahydro-5-(4-hydroxy-3,5-dimethoxyphenyl)furo[3′,4′:6,7]naphtho[2,3-*d*]-1,3-dioxol-6(5a*H*)-one).

[h] (5*R*,5a*R*,8a*R*,9*S*)-9-[(O^2,O^3,O^4,O^6-Tetrabenzyl)-β-D-glucopyranosyloxy]-5,8,8a,9-tetrahydro-5-(4-benzoyloxy-3,5-dimethoxyphenyl)furo[3′,4′:6,7]naphtho[2,3-*d*]-1,3-dioxol-6(5a*H*)-one.

SPECIFIC TESTS

• **Water Determination,** *Method I*⟨921⟩**:** NMT 1%

• **Optical Rotation,** *Specific Rotation*⟨781S⟩

Sample solution: 5 mg/mL in chloroform and methanol (9:1)

Acceptance criteria: −101.0° to −113.0°, at 20° on the anhydrous and solvent-free basis

ADDITIONAL REQUIREMENTS

• **Packaging and Storage:** Preserve in tight, light-resistant containers. Store at room temperature.

• **USP Reference Standards** ⟨11⟩

USP Teniposide RS

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

Topic/Question	Contact	Expert Committee
TENIPOSIDE	Documentary Standards Support	SM32020 Small Molecules 3
REFERENCE STANDARD SUPPORT	RS Technical Services RSTECH@usp.org	SM32020 Small Molecules 3

Chromatographic Database Information: Chromatographic Database

Most Recently Appeared In:
Pharmacopeial Forum: Volume No. 50(1)

Current DocID: GUID-07D8FF33-B440-456B-B3EE-CB02D3307DBD_2_en-US

DOI: https://doi.org/10.31003/USPNF_M5362_02_01

DOI ref: i2g7j