GLYCERYL TRINITRATE SOLUTION

Glycerol trinitratis solutio

C₃H₅N₃O₉  M, 227.1

DEFINITION
Ethanolic solution of glyceryl trinitrate.

Content: 1 per cent m/m to 10 per cent m/m of propane-1,2,3-triol trinitrate and 96.5 per cent to 102.5 per cent of the declared content of glyceryl trinitrate stated on the label.

CHARACTERS
Appearance: clear, colourless or slightly yellow solution.

Solubility: miscible with acetone and with ethanol.

Solubility of pure glyceryl trinitrate: practically insoluble in water, freely soluble in ethanol, miscible with acetone.

IDENTIFICATION
First identification: A, C.

Second identification: B, C.

Upon diluting glyceryl trinitrate solution, care must be taken always to use anhydrous ethanol, otherwise droplets of pure glyceryl trinitrate may precipitate from the solution.

After examination, the residues and the solutions obtained in both the identification and the test sections must be heated on a water-bath for 5 min with dilute sodium hydrosulphite solution R.

A. Infrared absorption spectrophotometry (2.2.24).

Preparation: place 50 µl of a solution diluted, if necessary, with ethanol R, to contain 10 g/l of glyceryl trinitrate, on a disc of potassium bromide R and evaporate the solvent in vacuo.


B. Thin-layer chromatography (2.2.27).

Test solution. Dilute a quantity of the substance to be examined corresponding to 50 mg of glyceryl trinitrate to 100 ml with acetone R.

Reference solution. Dilute 0.05 ml of glyceryl trinitrate solution CRS to 1 ml with acetone R.

Plate: TLC silica gel G plate R.


Application: 5 µl.

Development: over 2/3 of the plate.

Drying: in air.

Detection: spray with freshly prepared potassium iodide and starch solution R. Expose the plate to ultraviolet light at 254 nm for 15 min. Examine in daylight.

Results: the principal spot in the chromatogram obtained with the test solution is similar in position, colour and size to the principal spot in the chromatogram obtained with the reference solution.

C. It complies with the limits of the assay.

TESTS

Upon diluting glyceryl trinitrate solution, care must be taken always to use anhydrous ethanol, otherwise droplets of pure glyceryl trinitrate may precipitate from the solution.

After examination, the residues and the solutions obtained in both the identification and the test sections must be heated on a water-bath for 5 min with dilute sodium hydrosulphite solution R.

Appearance of solution. If necessary dilute the solution to be examined to a concentration of 10 g/l with ethanol R.

The solution is not more intensely coloured than reference solution Y₇ (2.2.2, Method II).

Inorganic nitrates. Thin-layer chromatography (2.2.27).

Test solution. If necessary dilute the solution to be examined to a concentration of 10 g/l with ethanol R.

Reference solution. Dissolve 5 mg of potassium nitrate R in 1 ml of water R and dilute to 100 ml with alcohol R.

Plate: TLC silica gel plate R.


Application: 10 µl.

Development: over 2/3 of the plate.

Drying: in a current of air until the acetic acid is completely removed.

Detection: spray intensively with freshly prepared potassium iodide and starch solution R. Expose the plate to ultraviolet light at 254 nm for 15 min. Examine in daylight.

Limit:

nitrate ion: any spot corresponding to the nitrate ion in the chromatogram obtained with the test solution is not more intense than the spot in the chromatogram obtained with the reference solution (0.5 per cent of the content of glyceryl trinitrate calculated as potassium nitrate).

Related substances. Liquid chromatography (2.2.29).

Test solution. Dissolve a quantity of the substance to be examined corresponding to 2 mg of glyceryl trinitrate in the mobile phase and dilute to 20.0 ml with the mobile phase.

Reference solution (a). Dissolve 0.10 g of glyceryl trinitrate solution CRS and a quantity of diluted pentaerythritol tetranitrate CRS equivalent to 1.0 mg of pentaerythritol tetranitrate in the mobile phase and dilute to 100.0 ml with the mobile phase. Sonicate and filter if necessary.
**Glycine**

**EUROPEAN PHARMACOPOEIA 6.0**

**Reference solution (b).** Dilute 1.0 ml of the test solution to 100.0 ml with the mobile phase.

**Column:**
- size: l = 0.25 m, Ø = 4.6 mm,
- stationary phase: octadecylsilyl silica gel for chromatography R (5 µm).

**Mobile phase:** acetonitrile R, water R (50:50 V/V).

**Flow rate:** 1 ml/min.

**Detection:** spectrophotometer at 210 nm.

**Injection:** 20 µl.

**Run time:** 3 times the retention time of the principal peak.

**System suitability:** reference solution (a):
- **resolution:** minimum 2.0 between the peaks due to glyceryl trinitrate and to pentaerythritol tetranitrate.

**Limits:**
- **any impurity:** not more than the area of the principal peak in the chromatogram obtained with reference solution (b) (1 per cent, calculated as glyceryl trinitrate),
- **total:** not more than 3 times the area of the principal peak in the chromatogram obtained with reference solution (b) (3 per cent, calculated as glyceryl trinitrate),
- **disregard limit:** 0.1 times the area of the principal peak in the chromatogram obtained with reference solution (b) (0.1 per cent).

**ASSAY**

**Test solution.** Prepare a solution containing 1.0 mg of glyceryl trinitrate in 250.0 ml of methanol R.

**Reference solution.** Dissolve 70.0 mg of sodium nitrite R in methanol R and dilute to 250.0 ml with the same solvent. Dilute 5.0 ml of the solution to 500.0 ml with methanol R.

Into three 50 ml volumetric flasks introduce 10.0 ml of the test solution, 10.0 ml of the reference solution and 10 ml of methanol R as a blank. To each flask add 5 ml of dilute sodium hydroxide solution R, close the flask, mix and allow to stand at room temperature for 30 min. Add 10 ml of sulphanilic acid solution R and 10 ml of dilute hydrochloric acid R and mix. After exactly 4 min, add 10 ml of naphthylethylenediamine dihydrochloride solution R, dilute to volume with water R and mix. After 10 min read the absorbance (2.2.25) of the test solution and the reference solution at 540 nm using the blank solution as the compensation liquid.

Calculate the amount of glyceryl trinitrate in milligrams in the test solution from the following expression:

\[
\frac{A_T \times m_T \times C}{A_R \times m_S \times 66.8 \times 100}
\]

- **A_T** = absorption of the test solution,
- **m_T** = mass of the substance to be examined, in milligrams,
- **C** = percentage content of sodium nitrite used as reference,
- **A_R** = absorption of the reference solution,
- **m_S** = mass of sodium nitrate, in milligrams.

**STORAGE**

Store diluted solutions (10 g/l) protected from light, at a temperature of 2 °C to 15 °C. Store more concentrated solutions protected from light, at a temperature of 15 °C to 20 °C.

**LABELLING**

The label states the declared content of glyceryl trinitrate.

**IMPURITIES**

A. inorganic nitrates,

B. R1 = NO2, R2 = R3 = H: (2RS)-2,3-dihydroxypropyl nitrate,

C. R1 = R3 = H, R2 = NO2: 2-hydroxy-1-(hydroxymethyl)ethyl nitrate,

D. R1 = R2 = NO2, R3 = H: (2RS)-3-hydroxypropane-1,2-diyl dinitrate,

E. R1 = R3 = NO2, R2 = H: 2-hydroxypropane-1,3-diyl dinitrate.

**01/2008:0614 corrected 6.0**

**GLYCINE**

Glycinum

C₂H₅NO₂

M₉ 75.1

[56-40-6]

**DEFINITION**

2-Aminoacetic acid.

**Content:** 98.5 per cent to 101.0 per cent (dried substance).

**CHARACTERS**

Appearance: white or almost white, crystalline powder.

Solubility: freely soluble in water, very slightly soluble in ethanol (96 per cent).

It shows polymorphism (5.9).

**IDENTIFICATION**

**First identification:** A.

**Second identification:** B, C.

A. Infrared absorption spectrophotometry (2.2.24).

Comparison: glycine CRS.

If the spectra obtained in the solid state show differences, dissolve the substance to be examined and the reference substance separately in the minimum volume of ethanol (60 per cent V/V) R, evaporate to dryness and record the spectra again.

B. Examine the chromatograms obtained in the test for ninhydrin-positive substances.

Results: the principal spot in the chromatogram obtained with test solution (b) is similar in position, colour and size to the principal spot in the chromatogram obtained with reference solution (a).

See the information section on general monographs (cover pages)