

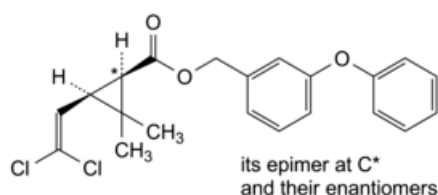


Edition: BP 2025 (Ph. Eur. 11.6 update)

Permethrin (25:75)

[General Notices](#)

(Ph. Eur. monograph 1762)



$C_{21}H_{20}Cl_2O_3$ 391.3 Undefined *cis/trans* ratio 52645-53-1

Action and use

Insecticide.

Ph Eur

DEFINITION

Mixture of the *cis* and *trans* isomers of (3-phenoxyphenyl)methyl (1*RS*,2*RS*)-2-(2,2-dichloroethyl)-3,3-dimethylcyclopropane-1-carboxylate.

Content

- *total*: 98.0 per cent to 102.0 per cent (anhydrous substance);
- *cis isomer*: 23.0 per cent to 27.0 per cent (anhydrous substance);
- *trans isomer*: 73.0 per cent to 77.0 per cent (anhydrous substance).

CHARACTERS

Appearance

Colourless or slightly brownish viscous liquid, semi-solid or crystalline solid.

Solubility

Practically insoluble in water, very soluble in heptane, freely soluble in anhydrous ethanol, sparingly soluble in ethylene glycol.

IDENTIFICATION

A. Infrared absorption spectrophotometry ([2.2.24](#)).

Comparison [permethrin \(25:75\) CRS](#).

B. Examine the chromatograms obtained in the assay.

Results The 2 principal peaks in the chromatogram obtained with the test solution are similar in retention time and in *cis/trans* ratio to the 2 principal peaks in the chromatogram obtained with the reference solution (*cis/trans* ratio = about 0.3).

TESTS

Related substances

Gas chromatography ([2.2.28](#)): use the normalisation procedure.

Test solution Warm the substance to be examined at 70-85 °C for 20 min. Dissolve 1.0 g of this substance in [heptane R](#) and dilute to 20.0 mL with the same solvent.

Reference solution (a) Dissolve 50 mg of [permethrin for system suitability CRS](#) (containing impurities B, C and G) in [heptane R](#) and dilute to 1.0 mL with the same solvent.

Reference solution (b) Dilute 1.0 mL of the test solution to 100.0 mL with [heptane R](#). Dilute 1.0 mL of this solution to 20.0 mL with [heptane R](#).

Column:

- *material*: fused silica;
- *size*: $l = 15$ m, $\varnothing = 0.53$ mm;
- *stationary phase*: [methylpolysiloxane R](#) (film thickness 1.5 μ m).

Carrier gas [nitrogen for chromatography R](#).

Flow rate 12.0 mL/min.

Split ratio 1:10.

Temperature:

	Time (min)	Temperature (°C)
Column	0 - 2	45
	2 - 26.5	45 → 290
	26.5 - 40.5	290
Injection port		250
Detector		290

Detection Flame ionisation.

Injection 1 μ L.

Identification of impurities Use the chromatogram supplied with [permethrin for system suitability CRS](#) and the chromatogram obtained with reference solution (a) to identify the peaks due to impurities B, C and G.

Relative retention With reference to permethrin (retention time = about 24 min): impurity B = about 0.5; impurity C = about 0.7; impurity G = about 0.9.

System suitability Reference solution (a):

- **resolution**: minimum 2.0 between the peaks due to impurity G and permethrin.

Limits:

- **correction factor**: for the calculation of content, multiply the peak area of impurity B by 1.5;
- **impurities B, C**: for each impurity, maximum 0.15 per cent;
- **unspecified impurities**: for each impurity, maximum 0.10 per cent;
- **total**: maximum 0.5 per cent;
- **reporting threshold**: 0.05 per cent (reference solution (b)).

Water (2.5.32)

Maximum 0.25 per cent, determined on 0.100 g using the evaporation technique:

- **temperature**: 110 °C;
- **heating time**: 3 min.

Sulfated ash (2.4.14)

Maximum 0.1 per cent, determined on 1.0 g.

ASSAY

Liquid chromatography (2.2.29).

Test solution Warm the substance to be examined at 70-85 °C for 20 min. Dissolve 0.100 g of this substance in the mobile phase using sonication and dilute to 50.0 mL with the mobile phase.

Reference solution Warm [permethrin \(25:75\) CRS](#) at 70-85 °C for 20 min. Dissolve 0.100 g of this substance in the mobile phase using sonication and dilute to 50.0 mL with the mobile phase.

Column:

- **size**: $l = 0.25$ m, $\varnothing = 4.6$ mm;
- **stationary phase**: [silica gel for chromatography R](#) (5 μ m);
- **temperature**: 30 °C.

Mobile phase [dioxan R](#), [heptane R](#) (1.1:98.9 V/V).

Flow rate 1.2 mL/min.

Detection Spectrophotometer at 280 nm.

Injection 20 μ L.

Run time Twice the retention time of *cis*-permethrin.

Retention time *cis*-permethrin = about 6 min.

Elution order *cis*-permethrin, *trans*-permethrin.

System suitability Reference solution:

- **resolution**: minimum 2.0 between the peaks due to *cis*-permethrin and *trans*-permethrin.

Calculation of percentage contents:

- calculate the percentage content of *cis*-permethrin and *trans*-permethrin by normalisation;

— calculate the percentage content of $C_{21}H_{20}Cl_2O_3$ taking into account the assigned content of [permethrin \(25:75\) CRS](#).

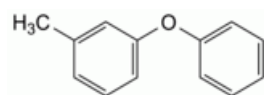
STORAGE

Protected from light.

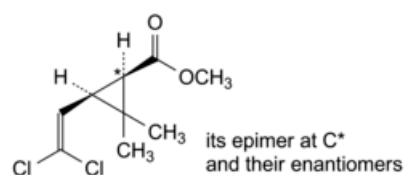
IMPURITIES

Specified impurities B, C.

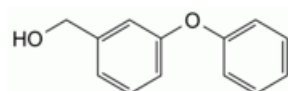
Other detectable impurities (the following substances would, if present at a sufficient level, be detected by one or other of the tests in the monograph. They are limited by the general acceptance criterion for other/unspecified impurities and/or by the general monograph [Substances for pharmaceutical use \(2034\)](#). It is therefore not necessary to identify these impurities for demonstration of compliance. See also [5.10. Control of impurities in substances for pharmaceutical use](#)) A, D, E, F, G, H.



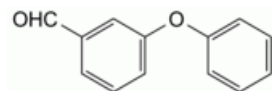
A. 1-methyl-3-phenoxybenzene,



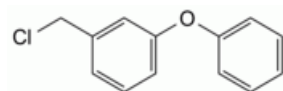
B. methyl (1RS,2RS)-2-(2,2-dichloroethenyl)-3,3-dimethylcyclopropane-1-carboxylate,



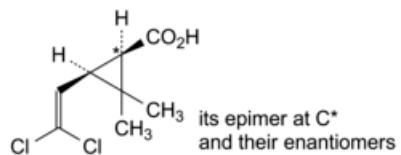
C. (3-phenoxyphenyl)methanol,



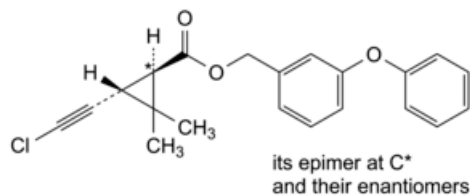
D. 3-phenoxybenzaldehyde,



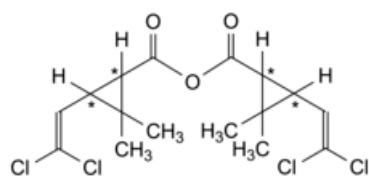
E. 1-(chloromethyl)-3-phenoxybenzene,



F. (1*RS*,2*RS*)-2-(2,2-dichloroethenyl)-3,3-dimethylcyclopropane-1-carboxylic acid,



G. 3-(phenoxyphenyl)methyl (1*RS*,2*RS*)-2-(chloroethynyl)-3,3-dimethylcyclopropane-1-carboxylate,



H. 2-(2,2-dichloroethenyl)-3,3-dimethylcyclopropane-1-carboxylic anhydride.

Ph Eur