INTERNATIONAL STANDARD

ISO 4731

Third edition
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Essential oil of geranium (*Pelargonium* × ssp.)

*Huile essentielle de géranium (*Pelargonium × *ssp.)*

Reference number
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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 4731 was prepared by Technical Committee ISO/TC 54, *Essential oils*.

This third edition cancels and replaces the second edition (ISO 4731:2006), which has been technically revised.

Essential oil of geranium (*Pelargonium* × ssp.)

1 Scope

This International Standard specifies certain characteristics of essential oil of geranium (*Pelargonium* × spp.) coming from different *Pelargonium* species commonly known as *Pelargonium graveolens*, in order to facilitate assessment of its quality.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/TR 210, *Essential oils — General rules for packaging, conditioning and storage*

ISO/TR 211, *Essential oils — General rules for labelling and marking of containers*

ISO 212, *Essential oils — Sampling*

ISO 279, *Essential oils — Determination of relative density at 20 °C — Reference method*

ISO 280, *Essential oils — Determination of refractive index*

ISO 592, *Essential oils — Determination of optical rotation*

ISO 875, *Essential oils — Evaluation of miscibility in ethanol*

ISO 1242, *Essential oils — Determination of acid value*

ISO 11024 (all parts), *Essential oils — General guidance on chromatographic profiles*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
essential oil of geranium
essential oil obtained by steam distillation of the fresh or slightly withered herbaceous parts of *Pelargonium* × spp. of the Geraniaceae family, which have given rise to differing ecotypes according to geographical regions

Note 1 to entry: For information on the CAS number, see ISO/TR 21092.[2]

4 Requirements

4.1 Appearance

Clear, mobile liquid.

4.2 Colour

Various shades of amber yellow to greenish yellow.

For the Bourbon type[1)]: yellowish green to brownish green.

4.3 Odour

Rose-like, with a varying minty note.

4.4 Relative density at 20 °C, d_{20}^{20}

Value	North Africa	China	Bourbon type[1]	Madagascar
Minimum	0,885	0,882	0,885	0,887
Maximum	0,905	0,899	0,897	0,897

4.5 Refractive index at 20 °C

Value	North Africa	China	Bourbon type[1]	Madagascar
Minimum	1,461	1,460	1,460	1,462
Maximum	1,475	1,472	1,470	1,471

4.6 Acid value

North Africa	China	Bourbon type[1]	Madagascar
<10	<10	<10	<10

4.7 Optical rotation at 20 °C

Value	North Africa	China	Bourbon type[1]	Madagascar
Maximum	–14°	–14°	–17°	–17°
Minimum	–8°	–7°	–9°	–9°

4.8 Miscibility in ethanol 70 % volume fraction at 20 °C

It shall not be necessary to use more than 3 volumes of ethanol 70 % volume fraction to obtain a clear solution with 1 volume of essential oil.

4.9 Chromatographic profile

Carry out the analysis of the essential oil by gas chromatography. Identify in the chromatogram obtained the representative and characteristic components shown in Table 1. The proportions of these components, indicated by the integrator, shall be as shown in Table 1. This constitutes the chromatographic profile of the essential oil.

1) Bourbon type includes Reunion Island origin (Bourbon Island is the former name of Reunion Island).

Table 1 — Chromatographic profile

Component	North Africa		China		Bourbon type[a]		Madagascar	
	min. %	max. %	min. %	max. %	min. %	max. %	min. %	max. %
(*Z*)-rose oxide	0,7	1,5	1,3	3,5	0,3	1,1	0,4	1,4
(*E*)-rose oxide	0,3	0,6	0,5	1,5	0,1	0,5	0,1	0,6
Menthone	n.d.[b]	2,1	n.d.[b]	2,5	n.d.[b]	2,0	n.d.[b]	2,0
Isomenthone	4,0	8,0	4,0	7,0	5,0	10,0	5,0	10,0
Linalool	4,0	8,5	2,0	4,5	8,0	11,0	4,0	10,0
Guaia-6,9-diene	n.d.[b]	0,5	4,0	7,0	5,0	8,5	5,0	9,0
Citronellyl formate	4,0	8,0	7,0	12,0	6,5	11,0	6,5	11,0
α-Terpineol	0,3	0,6	0,1	0,5	0,3	1,2	0,3	1,0
Geranyl formate	2,0	7,0	1,0	3,0	4,0	8,0	3,8	7,0
Citronellol	25,0	36,0	32,0	43,0	18,0	26,0	18,0	26,0
Geraniol	10,0	18,0	5,0	12,0	12,0	20,0	10,0	20,0
Geranyl butyrate	0,7	2,0	0,4	1,0	0,7	2,0	0,7	1,7
10-*epi*-γ-Eudesmol	3,0	6,2	n.d.[b]	n.d.[b]	n.d.[b]	n.d.[b]	n.d.[b]	n.d.[b]
Geranyl tiglate	0,9	2,0	1,0	1,6	0,7	2,0	0,7	2,0
β-Phenylethyl tiglate	0,5	1,2	0,4	1,0	0,4	1,0	0,4	1,0

NOTE The chromatographic profile is normative, contrary to typical chromatograms given for information in Annex A.

[a] Bourbon type includes Reunion Island origin (Bourbon Island is the former name of Reunion Island).

[b] Not detectable.

4.10 Flashpoint

Information on the flashpoint is given in Annex B.

5 Sampling

Sampling shall be performed in accordance with ISO 212.

Minimum volume of test sample: 50 ml.

NOTE This volume allows each of the tests specified in this International Standard to be carried out at least once.

6 Test methods

6.1 Relative density at 20 °C, d_{20}^{20}

Determine the relative density in accordance with ISO 279.

6.2 Refractive index at 20 °C

Determine the refractive index in accordance with ISO 280.

6.3 Optical rotation at 20 °C

Determine the optical rotation in accordance with ISO 592.

6.4 Acid value

Determine the acid value in accordance with ISO 1242.

6.5 Miscibility in ethanol 70 % volume fraction at 20 °C

Determine the miscibility in accordance with ISO 875.

6.6 Chromatographic profile

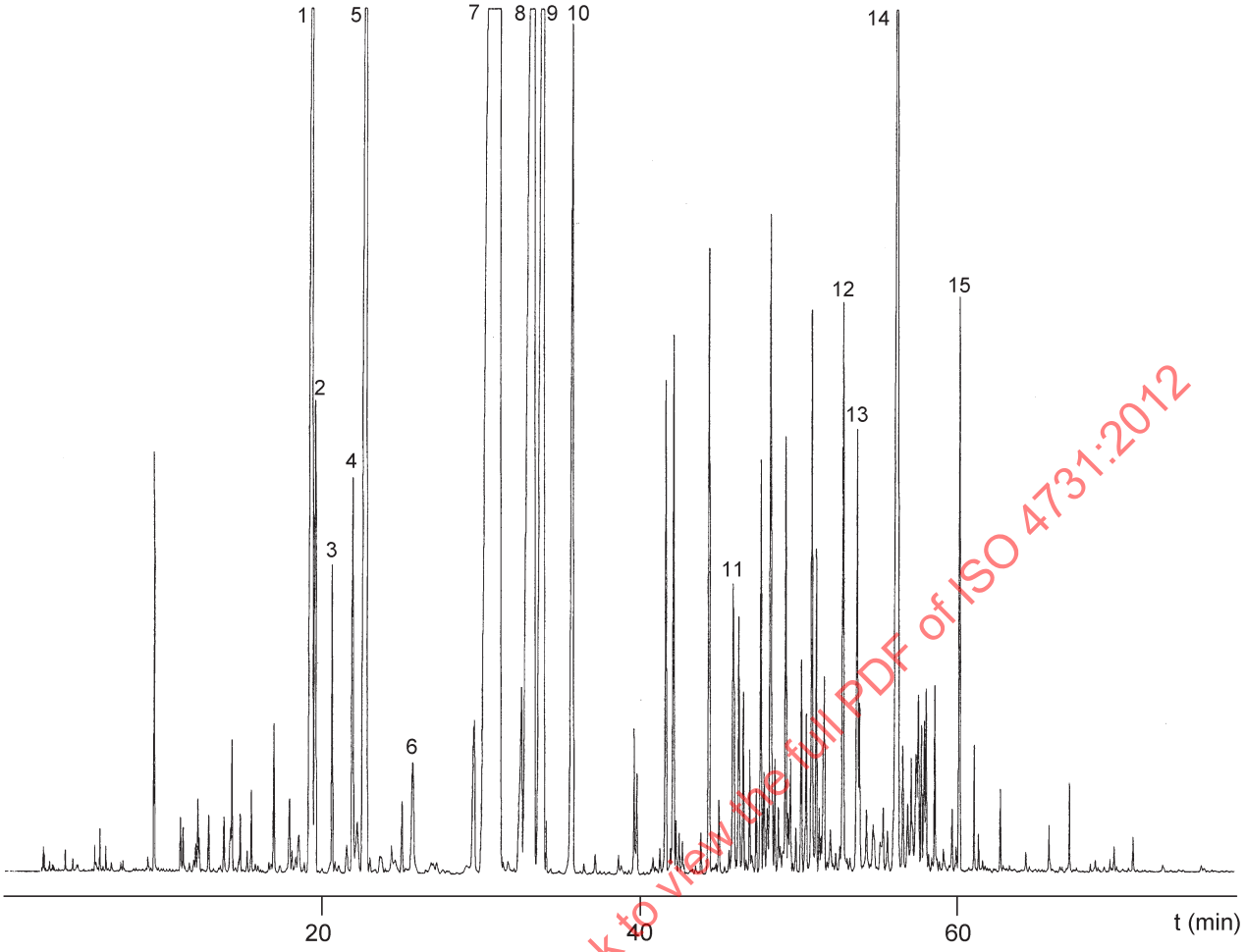
Determine the chromatographic profile in accordance with ISO 11024.

7 Packaging, labelling, marking and storage

These items shall be in accordance with ISO/TR 210 and ISO/TR 211.

Annex A
(informative)

Typical chromatograms of the analysis by gas chromatography of essential oil of geranium (*Pelargonium* × spp.)

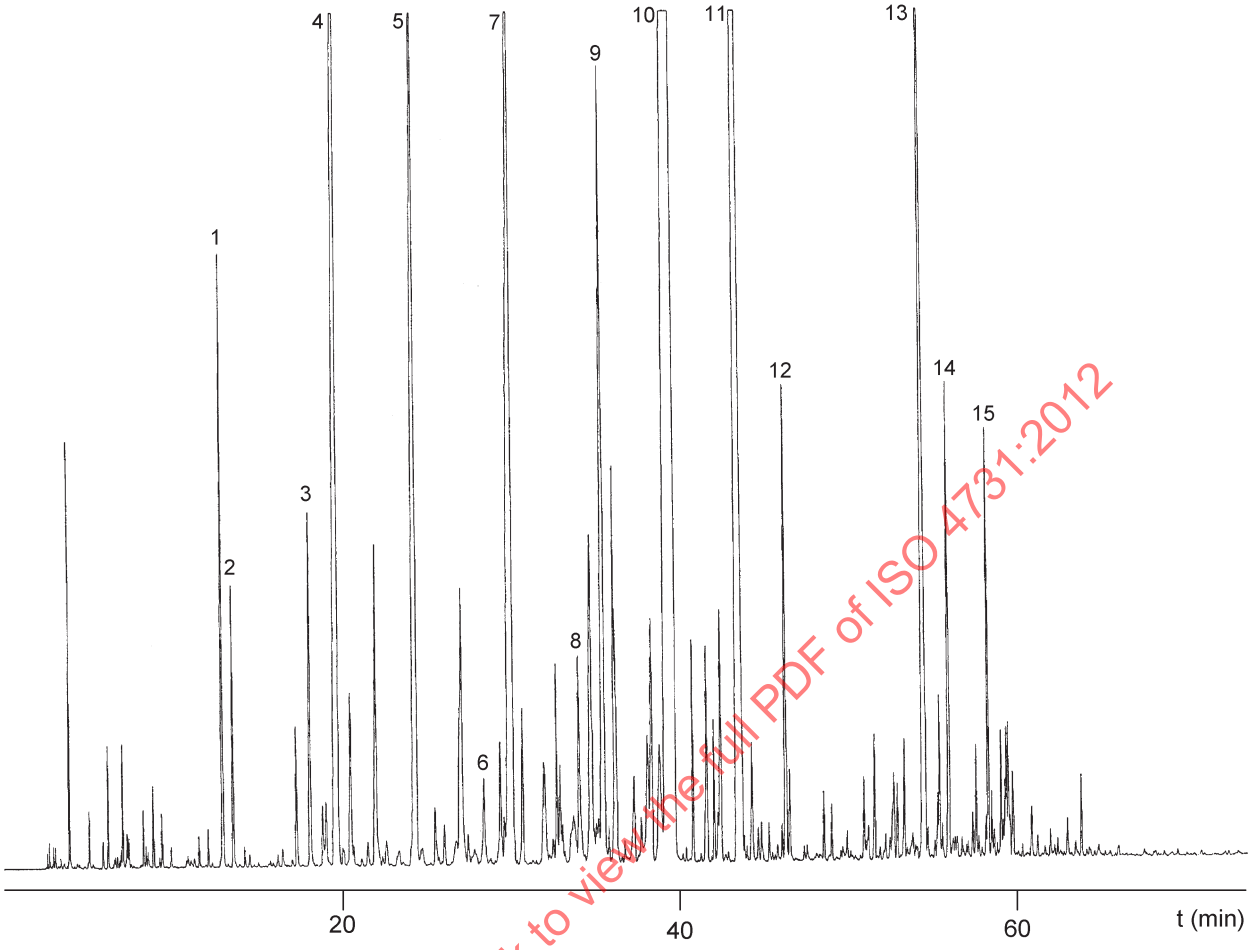


Key

Peak identification		**Operating conditions**
1	Linalool	Column: capillary, length 50 m, internal diameter 0,2 mm
2	(*Z*)-rose oxide	Stationary phase: poly dimethylsiloxane
3	(*E*)-rose oxide	Film thickness: 0,25 µm
4	Menthone	Oven temperature: temperature programming from 65 °C to 230 °C, temperature gradient 2 °C/min
5	Isomenthone	
6	α-Terpineol	Injector temperature: 230 °C
7	Citronellol	Detector temperature: 250 °C
8	Geraniol	Detector: flame ionization type
9	Citronellyl formate	Carrier gas: hydrogen
10	Geranyl formate	Volume injected: 0,2 µl
11	Guaia-6,9-diene	Carrier gas flow rate: 1,1 ml/min
12	Geranyl butyrate	Split ratio: 1/100
13	Phenylethyl tiglate	
14	10-*epi*-γ-Eudesmol	
15	Geranyl tiglate	

t time

Figure A.1 — Typical chromatogram of the analysis of North Africa oil of geranium taken on an apolar column



Key

Peak identification		**Operating conditions**
1	(*Z*)-rose oxide	Column: capillary, length 50 m, internal diameter 0,2 mm
2	(*E*)-rose oxide	Stationary phase: poly(ethylene glycol) (Carbowax 20 M®[a])
3	Menthone	Film thickness: 0,25 µm
4	Isomenthone	Oven temperature: temperature programming from 65 °C to 230 °C, temperature gradient 2 °C/min
5	Linalool	
6	Guaia-6,9-diene	Injector temperature: 230 °C
7	Citronellyl formate	Detector temperature: 250 °C
8	α-Terpineol	Detector: flame ionization type
9	Geranyl formate	Carrier gas: hydrogen
10	Citronellol	Volume injected: 0,2 µl
11	Geraniol	Carrier gas flow rate: 1,1 ml/min
12	Geranyl butyrate	Split ratio: 1/100
13	10-*epi*-γ-Eudesmol	
14	Geranyl tiglate	
15	Phenylethyl tiglate	

t time

[a] Carbowax 20M is an example of a suitable product available commercially. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of this product.

Figure A.2 — Typical chromatogram of the analysis of North Africa oil of geranium taken on a polar column