
**Oil of nutmeg, Indonesian type (*Myristica
fragrans* Houtt.)**

*Huile essentielle de noix muscade, type Indonésie (Myristica fragrans
Houtt.)*

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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.

International Standard ISO 3215 was prepared by Technical Committee ISO/TC 54, *Essential oils*.

This second edition cancels and replaces the first edition (ISO 3215:1974), which has been technically revised.

Annexes A and B of this International Standard are for information only.

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International Organization for Standardization
Case postale 56 • CH-1211 Genève 20 • Switzerland
Internet iso@iso.ch

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Oil of nutmeg, Indonesian type (*Myristica fragrans* Houtt.)

1 Scope

This International Standard specifies certain characteristics of the oil of nutmeg, Indonesian type (*Myristica fragrans* Houtt.), in order to facilitate assessment of its quality.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

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

ISO 211, *Essential oils — General rules for labelling and marking 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 4715, *Essential oils — Quantitative evaluation of residue on evaporation.*

ISO 11024-1, *Essential oils — General guidance on chromatographic profiles — Part 1: Preparation of chromatographic profiles for presentation in standards.*

ISO 11024-2, *Essential oils — General guidance on chromatographic profiles — Part 2: Utilization of chromatographic profiles of samples of essential oils.*

3 Term and definition

For the purposes of this International Standard, the following term and definition apply.

3.1

oil of nutmeg, Indonesian type

essential oil obtained by steam distillation of the dried and crushed nuts of *Myristica fragrans* Houtt. of the Myristicaceae family, cultivated primarily in the Indonesian archipelago

4 Requirements

4.1 Appearance

Clear mobile liquid.

4.2 Colour

Almost colourless to light yellow.

4.3 Odour

Spicy, sweet, aromatic, with characteristic nuances.

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

Minimum: 0,885 0
Maximum: 0,907 0

4.5 Refractive index at 20 °C

Minimum: 1,475 0
Maximum: 1,485 0

4.6 Optical rotation at 20 °C

Between + 6° and + 18°.

4.7 Miscibility in ethanol (volume fraction 90%) at 20 °C

1 volume of the oil shall not require more than 5 volumes of ethanol (volume fraction 90 %) to obtain a solution, sometimes with opalescence. However, 3 or 4 volumes are adequate in the case of freshly distilled oils.

4.8 Residue on evaporation

Maximum: 2%

4.9 Chromatographic profile

Analysis of the essential oil shall be carried out by gas chromatography. In the chromatogram obtained, the representative and characteristic components shown in Table 1 shall be identified. 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.

4.10 Flashpoint

Information on the flashpoint is given in annex B.

5 Sampling

See ISO 212.

Minimum volume of test sample: 25 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}

See ISO 279.

6.2 Refractive index at 20 °C

See ISO 280.

6.3 Optical rotation at 20 °C

See ISO 592.

6.4 Miscibility in ethanol (volume fraction 90 %) at 20 °C

See ISO 875.

6.5 Residue on evaporation

See ISO 4715.

Evaporation time: 3 h.

6.6 Chromatographic profile

See ISO 11024-1 and ISO 11024-2.

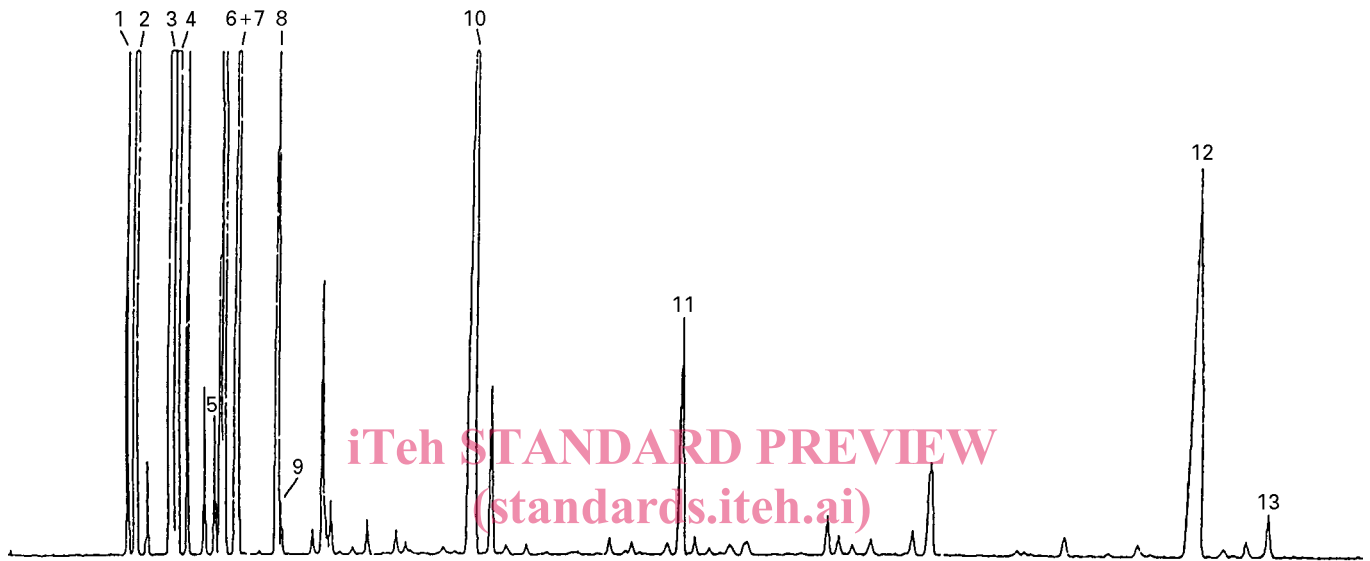
Table 1 — Chromatographic profile

Component	Minimum %	Maximum %
α -Pinene	15	28
β -Pinene	13	18
Sabinene	14	29
δ -3-Carene	0,5	2,0
Limonene	2,0	7,0
γ -Terpinene	2,0	6,0
Terpinen-4-ol	2,0	6,0
Safrole	1,0	2,5
Myristicin	5,0	12

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

Annex A (informative)

Typical chromatograms of the analysis by gas chromatography of the essential oil of nutmeg, Indonesian type (*Myristica fragrans* Houtt.)



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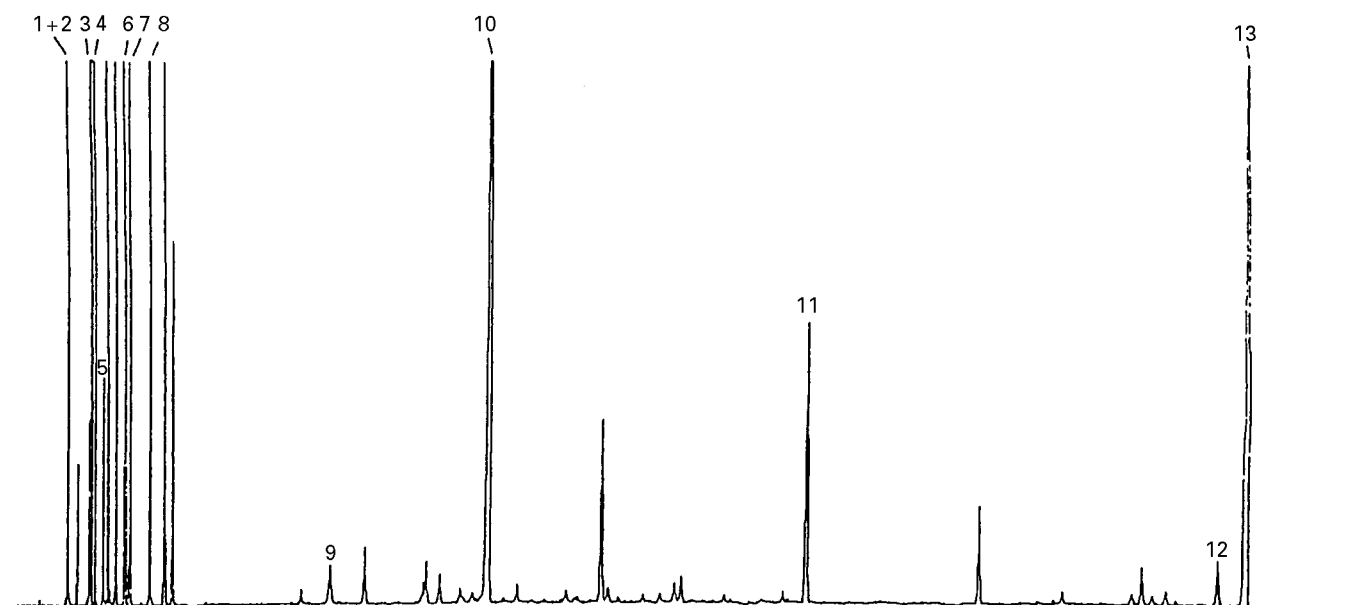
Peak identification

- 1 α -Thujene
- 2 α -Pinene
- 3 Sabinene
- 4 β -Pinene
- 5 δ -3-Carene
- 6 Limonene
- 7 1,8-Cineole
- 8 γ -Terpinene
- 9 *trans*-Sabinene hydrate
- 10 Terpinen-4-ol
- 11 Safrole
- 12 Myristicin
- 13 Elemicin (γ -asarone)

Operating conditions

Column: capillary, fused silica, length 30 m; internal diameter 0,25 mm
 Film thickness: 0,25 μ m
 Stationary phase: dimethyl polysiloxane (SE 30)
 Oven temperature: temperature programming from 70 °C to 250 °C at a rate of 2 °C/min
 Injector temperature: 250 °C
 Detector temperature: 250 °C
 Detector: flame ionization type
 Carrier gas: nitrogen
 Volume injected: 0,3 μ l
 Carrier gas flow rate: 1 cm³/min
 Split ratio: 1/100

Figure A.1 — Typical chromatogram taken on an apolar column

**Peak identification**

- 1 α -Thujene
- 2 α -Pinene
- 3 β -Pinene
- 4 Sabinene
- 5 δ -3-Carene
- 6 Limonene
- 7 1,8-Cineole
- 8 γ -Terpinene
- 9 *trans*-Sabinene hydrate
- 10 Terpinen-4-ol
- 11 Safrole
- 12 Elemicin (γ -asarone)
- 13 Myristicin

Operating conditions

Column: capillary, fused silica, length 30 m; internal diameter 0,25 mm
 Film thickness: 0,25 μ m
 Stationary phase: polyethylene glycol bonded (Supelcowax 10)
 Oven temperature: temperature programming from 70 °C to 250 °C at a rate of 2 °C/min
 Injector temperature: 250 °C
 Detector temperature: 250 °C
 Detector: flame ionization type
 Carrier gas: nitrogen
 Volume injected: 0,3 μ l
 Carrier gas flow rate: 1 cm³/min
 Split ratio: 1/100

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NOTE On this phase co-elution between α -pinene and α -thujene is often observed.

Figure A.2 — Typical chromatogram taken on a polar column

Annex B (informative)

Flashpoint

B.1 General information

For reasons of safety, transport companies, insurance companies, people in charge of safety services, etc. require information on the flashpoint of essential oils, which in most cases are flammable products.

A comparative study on the relevant methods of analysis (see ISO/TR 11018¹⁾) concluded that it was hard to find a single method for standardization purposes, given that:

- essential oils are varied and their chemical compositions differ to a large extent;
- the volume of the sample needed for certain test equipment is incompatible with the high price of essential oils;
- there are different types of equipment that satisfy the desired objective, but users cannot be obliged to use one type of equipment rather than another.

Consequently, it was decided to give a mean value for the flashpoint in an informative annex in each International Standard, for information purposes, in order to meet the requirements of the interested parties.

If possible, the method by which this value was obtained should be specified.

For further information see ISO/TR 11018¹⁾.

B.2 Flashpoint of oil of nutmeg, Indonesian type

The mean value is +48 °C (see note 1); +38 °C (see note 2).

NOTE 1 Obtained with “Luchoire” equipment.

NOTE 2 Obtained with “Setaflash” equipment.

1) ISO/TR 11018, *Essential oils — General guidance on the determination of flashpoint*.

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