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**Oil of neroli (*Citrus aurantium* L. ssp.  
*aurantium* syn. *Citrus aurantium* L. ssp.  
*amara* var. *pumilia*)**

*Huile essentielle de néroli bigaradier (Huile essentielle de fleurs d'oranger bigaradier) (Citrus aurantium L. ssp. aurantium syn. Citrus aurantium L. ssp. amara var. pumilia)*

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Tel. + 41 22 749 01 11  
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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.

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 International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 3517 was prepared by Technical Committee ISO/TC 54, *Essential oils*.

This second edition cancels and replaces the first edition (ISO 3517:1975), which has been technically revised.

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

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# Oil of neroli (*Citrus aurantium* L. ssp. *aurantium* syn. *Citrus aurantium* L. ssp. *amara* var. *pumilia*)

## 1 Scope

This International Standard specifies certain characteristics of the oil of neroli (*Citrus aurantium* L. ssp. *aurantium* syn. *Citrus aurantium* L. ssp. *amara* var. *pumilia*), cultivated principally in Tunisia and Morocco, with a view 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/TR 210, *Essential oils — General rules for packaging, conditioning and storage*

ISO/TR 211, *Essential oils — General rules for labeling 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 709, *Essential oils — Determination of ester value*

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

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

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 applies.

**3.1 oil of neroli**  
essential oil obtained by steam distillation of the flowers of *Citrus aurantium* L. ssp. *aurantium* syn. *Citrus aurantium* L. ssp. *amara* var. *pumilia*, of the Rutaceae family, cultivated principally in Tunisia and Morocco

NOTE For information on CAS numbers, see ISO/TR 21092.

## 4 Requirements

### 4.1 Appearance

Clear mobile liquid.

### 4.2 Colour

Pale yellow to amber with a slight blue fluorescence.

### 4.3 Odour

Characteristic, in bloom, fresh, recalling that of orange blossom.

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

Minimum: 0,863 0

Maximum: 0,876 0

**4.5 Refractive index at 20 °C**

Minimum: 1,464 0

Maximum: 1,474 0

**4.6 Optical rotation at 20 °C**

Between + 2° and + 11°.

**4.7 Miscibility in ethanol, 85 % (volume fraction), at 20 °C**

It shall not be necessary to use more than 3,5 volumes of ethanol 85 %, (volume fraction), to obtain a clear solution with 1 volume of essential oil.

**4.8 Acid value**

Maximum: 2,0

**4.9 Ester value**

Minimum: 26

Maximum: 60

**4.10 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.

**4.11 Flashpoint**

Information on the flashpoint is given in annex B.

**5 Sampling**

See ISO 212.

Minimum volume of the test sample: 30 ml.

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

**Table 1 — Chromatographic profile**

| Components   | Minimum<br>% | Maximum<br>% |
|--|--------------|--------------|
| $\alpha$ -Pinene   | traces       | 2            |
| Sabinene   | traces       | 3            |
| $\beta$ -Pinene  | 7            | 17           |
| Myrcene  | 1            | 4            |
| Limonene   | 9            | 18           |
| <i>trans</i> - $\beta$ -Ocimene  | 3            | 8            |
| Linalool   | 28           | 44           |
| $\alpha$ -Terpineol  | 2            | 5,5          |
| Linalyl acetate  | 3            | 15           |
| Neryl acetate  | traces       | 2,5          |
| Geranyl acetate  | 1            | 5            |
| <i>trans</i> -Nerolidol  | 1            | 5            |
| <i>trans, trans</i> -Farnesol  | 1            | 4            |
| NOTE The chromatographic profile is normative, contrary to typical chromatograms given for information in annex A. |              |              |

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**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, 85 % (volume fraction), at 20 °C**

See ISO 875.

**6.5 Acid value**

See ISO 1242.

## 6.6 Ester value

See ISO 709.

## 6.7 Chromatographic profile

See ISO 11024-1 and ISO 11024-2.

## 7 Packing, labelling, marking and storage

See ISO/TR 210 and ISO/TR 211.

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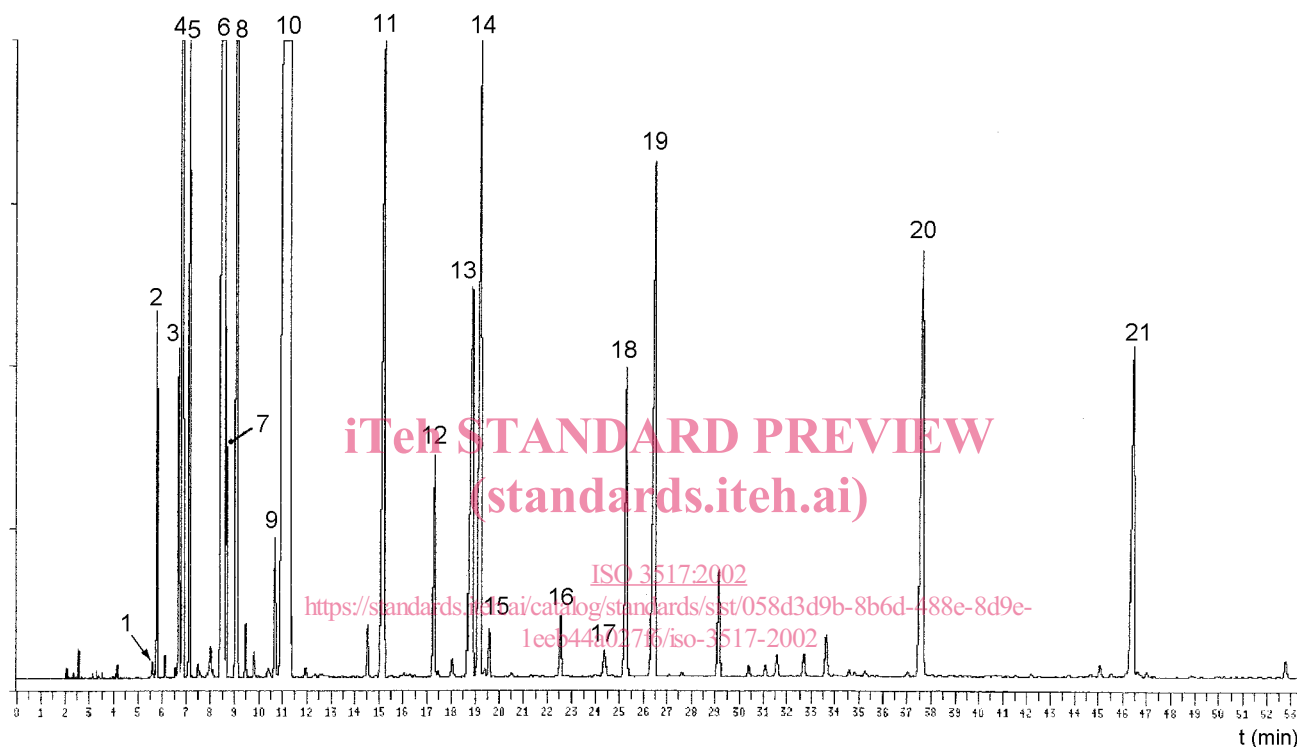
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## Annex A

(informative)

**Typical chromatograms of the analysis by gas chromatography of the essential oil of neroli (*Citrus aurantium* L. ssp. *aurantium* syn. *Citrus aurantium* L. ssp. *amara* var. *pumilia*)**



### Peak identification

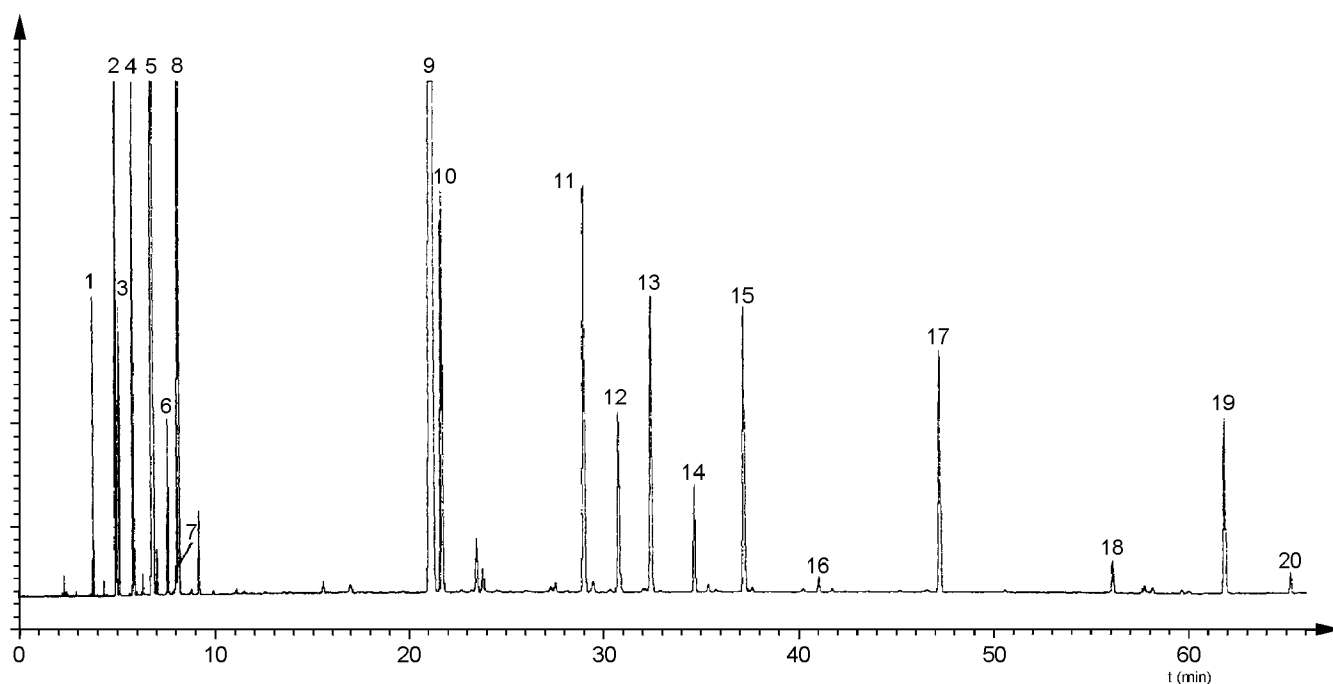
|                                   |                                  |
|-----------------------------------|----------------------------------|
| 1 $\alpha$ -Thujene               | 12 Nerol                         |
| 2 $\alpha$ -Pinene                | 13 Geraniol                      |
| 3 Sabinene                        | 14 Linalyl acetate               |
| 4 $\beta$ -Pinene                 | 15 Indole                        |
| 5 Myrcene                         | 16 Methyl anthranilate           |
| 6 Limonene                        | 17 Terpenyl acetate              |
| 7 <i>cis</i> - $\beta$ -Ocimene   | 18 Neryl acetate                 |
| 8 <i>trans</i> - $\beta$ -Ocimene | 19 Geranyl acetate               |
| 9 $\gamma$ -Terpinene             | 20 <i>trans</i> -Nerolidol       |
| 10 Linalool + phenylacetonitrile  | 21 <i>trans, trans</i> -Farnesol |
| 11 $\alpha$ -Terpineol            |                                  |

### Operating conditions

Column: silica capillary; length 30 m; internal diameter 0,25 mm  
 Stationary phase: poly(dimethyl siloxane) (SE 30®)  
 Film thickness: 0,25  $\mu$ m  
 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  $\mu$ l  
 Carrier gas flow rate: 1 ml/min  
 Split ratio: 1/100

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



**Peak identification**

- 1  $\alpha$ -Thujene +  $\alpha$ -pinene
- 2  $\beta$ -Pinene
- 3 Sabinene
- 4 Myrcene
- 5 Limonene
- 6 *cis*- $\beta$ -Ocimene
- 7  $\gamma$ -Terpinene
- 8 *trans*- $\beta$ -Ocimene
- 9 Linalool
- 10 Linalyl acetate
- 11  $\alpha$ -Terpineol + terpenyl acetate

- 12 Neryl acetate
- 13 Geranyl acetate
- 14 Nerol
- 15 Geraniol
- 16 Phenylacetonitrile
- 17 *trans*-Nerolidol
- 18 Methyl anthranilate
- 19 *trans, trans*-Farnesol
- 20 Indole

**Operating conditions**

Column: silica capillary; length 30 m; internal diameter 0,25 mm  
 Stationary phase: poly(ethylene glycol) 10 000 (Supelcowax 10®)  
 Film thickness: 0,25  $\mu$ m  
 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  $\mu$ l  
 Carrier gas flow rate: 1 ml/min  
 Split ratio: 1/100

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