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Textiles — Determination of index ingredient from coloured textiles —

Part 2: Turmeric

Textiles — Détermination d'indicateurs d'ingrédients de textiles colorés —

Partie 2: Curcuma

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Foreword

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This document was prepared by Technical Committee ISO/TC 38, *Textiles.*

A list of all parts in the ISO 22195 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

There is no doubt that dyeing plays the most important role in expressing the colour of clothes. Until the invention of synthetic dyes capable of expressing diverse colours, materials obtained from nature to dye fabric have been used. Typically, colourants were obtained from plants or various materials were extracted from minerals or insects. When dyeing fabrics using materials derived from these natural substances, it becomes necessary to identify which substances the colourant was derived from. In other words, there has been a demand to confirm whether a fabric is dyed using a natural substance.

A test is method is developed to identify which type of natural substances have been used.

Textiles — Determination of index ingredient from coloured textiles —

Part 2:
Turmeric

1 Scope

This document specifies a test method which determines the index ingredient of chemicals in coloured textile/fabric with turmeric.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 3696, *Water for analytical laboratory use — Specification and test methods*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
turmeric
Curcuma longa Linne
type of rhizomatous herbaceous perennial plant of the ginger family, *Zingiberaceae*

Note 1 to entry: Plants are gathered annually for their rhizomes and propagated from some of those rhizomes in the following season. When not used fresh, the rhizomes are boiled and then dried in ovens, after which they are ground into a deep-orange/yellow powder).

3.2
coloured
expressing of colours to textiles by dyeing or printing

3.3
natural colourant
colourant obtained from plants, wood, rocks, soil, insects or any other thing existing on earth without any chemical reaction adopted before colouring of textiles

4 Principle

Natural colourants usually contain several chemical constituents. Depending on the type of natural colourant, each contains a distinctive chemical. This characteristic chemical remains in the fabric dyed

with natural colourant. Therefore, analysis of natural coloured fabrics by chromatography can detect characteristic chemicals depending on the kind of natural colourant.

NOTE If the index component curcumin is detected through this test method, it cannot be said that it is necessarily stained with turmeric alone. However, based on this principle, applying this test method to unknown coloured fabrics or textiles is useful to provide a minimum amount of information that can be used to confirm whether the fabric is coloured using turmeric.

5 Reagent

Unless otherwise specified, use only reagents of recognized HPLC grade.

5.1 Water, glass double distilled water or grade 2 water complying with ISO 3696.

5.2 Methanol.

5.3 Acetonitrile.

5.4 Formic acid, volume fraction of 30 %.

5.5 Curcumin, reference standard with percentage purity indication, e.g. 95 % or more.

6 Apparatus

6.1 Analytical balance, resolution at 0,001 g.

6.2 Ultrasonic water bath, to be set up at (60 ± 2) °C.

6.3 Borosilicate glass container, 50 ml.

6.4 Rotary evaporator.

6.5 Membrane filter, with 0,2 µm pore size.

6.6 Liquid chromatograph (LC) with mass spectroscopy (MS).

7 Procedure

7.1 Standard preparation

Stock solution of curcumin is prepared in methanol containing 1 000 mg/l.

7.2 Preparation of specimen

Cut the sample into pieces of approximately (5 × 5) mm and approximately 2 g. Weigh it to the nearest 0,01 g, and then place it into the glass container (6.3).

Pipette 20 ml of water and methanol each into the other glass container and it poured to cut specimen containing glass container. Place the glass container containing cut specimen into an ultrasonic water bath (6.2) at (60 ± 2) °C for (20 ± 1) min. Afterwards, let the extract evaporate using by rotary evaporator (6.4) at (60 ± 2) °C until all used water and methanol has evaporated.

Dilute the concentrated extract with water and methanol to a concentration of approximately 100 mg/l. Filter about 1 ml of the diluted solution into a HPLC vial using disposable syringe equipped with a membrane filter (6.5).

7.3 Analysis

The detection and qualification of curcumin is conducted using LC-MS (6.6) with ESI mass spectrometer.

The recommended chromatographic conditions are given in Annex A.

7.4 Determination of curcumin

Comparison between analyses of standard and sample through 7.3 can show the result of existence of curcumin in sample.

Detection of curcumin may vary due to conditions of coloured sample. In this case, the amount of specimen and extraction solution can be modified, and the concentration of extracted solution be adopted. The modified sample preparation conditions should be described in test result.

8 Test report

The test report shall include the following information:

a) a reference to this document, i.e. ISO 22195-2:2020;

b) identification of the sample;

c) detection result of curcumin

d) conditions of chromatographic analysis;

e) any deviation from the specified procedure in this document;

f) date of the test.

Annex A
(informative)

Example of test result

A.1 Analysis of turmeric colourant

A.1.1 General

The powdered turmeric colourant was dissolved with water and methanol tested in according to 7.3. and the result chromatogram is shown Figure A.1.

A.1.2 Chromatographic conditions for the LC-MS

As the instrumental equipment of the laboratories may vary, no generally applicable parameters can be provided for chromatographic analyses.

— Mobile phase: (phase A) water (phase B) acetonitrile, both in 0,1 % formic acid

— Column: Kinetics EVO C18 (100 × 2,1) mm 1,7 µm

— Column Oven: 35 °C

— Flow rate: 0,3 ml/min

— Injection: 2 µl

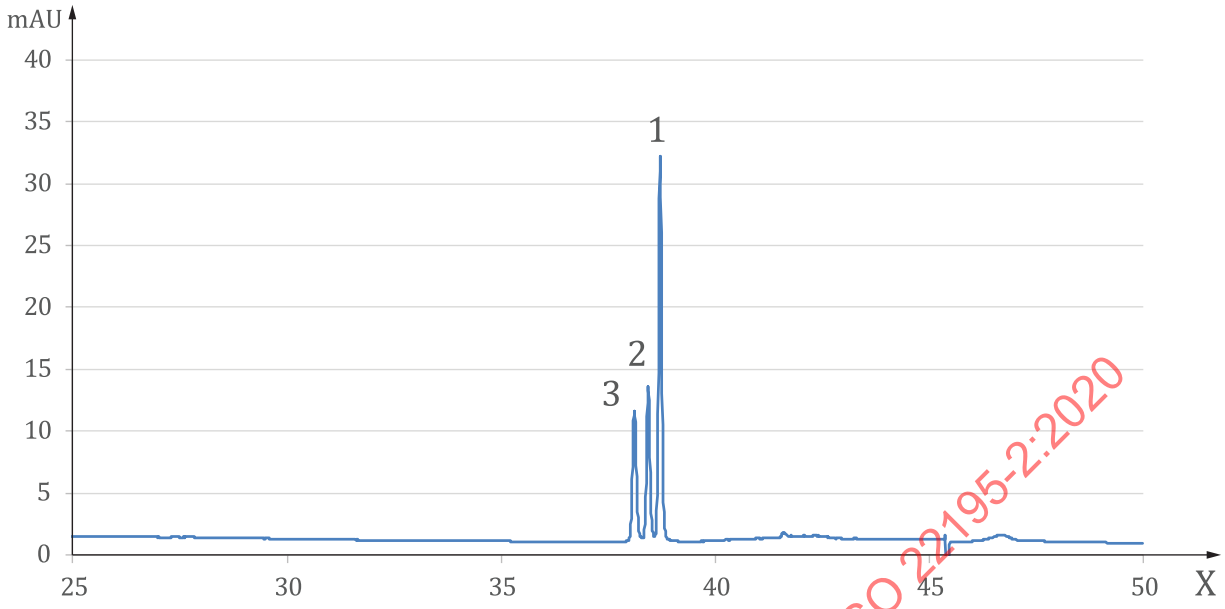
— Ionization: ESI-, ESI+

— Data acquisition: scan (100 approximately 1 000) *m/z*

— Nebulizer gas flow: 1,5 l/min

— Interface temperature: 250 °C

— Interface voltage: 3 500 V



Key

1 curcumin
2 dimethoxycurcumin
3 bis- dimethoxycurcumin
X min

Figure A.1 — Chromatogram of turmeric colourant by LC-MS

A.1.3 Chromatographic conditions for the HPLC-DAD

The HPLC-DAD analysis is adopted to find out the specified wavelength in 430 nm by DAD (Diode Array Detector). And its chromatographic conditions are as follows:

— Detection wavelength: 430 nm

— Column: Phenomenex C18(2) 150 × 4,6 mm

— Mobile Phase: (phase A) water (phase B) acetonitrile, both in 0,1 % formic acid

Table A.1 — Condition of the mobile phase

Time (min)	A water (%)	B acetonitrile (%)
0	90	10
5	90	10
35	50	50
40	5	95
43	5	95
43,1	90	10
48	90	10