REFERENCE MATERIAL CERTIFICATE

ALTERNARIOL

1. General information

This document is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31 [1] and Eurachem / CITAC Guides [2,3].

2. Description of the Reference Material (RM)

Name:	Alternariol
CAS number:	641-38-3
Catalog number:	DRE-C10143000
Lot #:	L17494A
Certificate version:	1
Expiry date:	17.12.2020
Starting material:	Alternariol, Lot#S10191C
Physical description of RM:	Thin film, dried down standard
Packaging and amount of RM:	Amber glass ampoules fitted with teflon faced butyl septa and PP screw caps
Name and address of the manufacturer:	Romer Labs Diagnostic GmbH Technopark 5, 3430 Tulln, Austria www.romerlabs.com
Name and address of the supplier:	LGC Standards GmbH Mercatorstraße 51, 46485 Wesel, Germany Tel +49(0)2 81 98 87 0, Fax +49(0)2 81/98 87 199 www.lgcstandards.com

2.1 Intended use of the RM

- for laboratory use only
- calibration of analytical instruments

2.2 Reconstitution instruction

The standard that you have received may appear at first glance, as an empty vial. The target compound (s) is (are) in a film at the bottom of the vial. Do not open the vial until you are ready to reconstitute.

To reconstitute this RM use the following procedure:

1. Add 1 mL ± 0.014 mL of acetonitrile (HPLC grade quality) with a graduated syringe or a volumetric pipette
2. Cap vial tightly
3. Mix on a vortex mixer for 3 minutes, or shake vigorously by hand for 5-8 minutes.
4. Always keep vial tightly capped.
5. Store the reconstituted standard at +2-8°C in a dark place

2.3 Instruction for the correct use of the RM

The ampoules should be stored at +2-8°C in a dark place. Before usage of the RM, the ampoules should be allowed to warm to room temperature. The recommended minimum sub-sample amount for all kinds of application is 100 µL. The expiry date of this RM is based on the current knowledge and holds only for proper storage conditions in the originally closed flasks/packages.

2.4 Hazardous situation

The normal laboratory safety precautions should be observed when working with this RM. Further details for the handling of this RM are available as safety data sheet (SDS).

3. Certified values and their uncertainties

Alternariol		
Compound	**Mass concentration [a]**	
	Certified value [b]	Uncertainty [c]
Alternariol	100.3 µg/mL	± 2.2 µg/mL

[a] Values are based on preparation data and confirmed experimentally by HPLC-UV
[b] Mass concentration based on weighed amount, purity and dilution step
[c] Expanded uncertainty U (k = 2) of the value u_c according to GUM [4]

3.1 Calculation of uncertainty

After the concentration of the gravimetric prepared solution was confirmed by HPLC-UV, the uncertainty of the calibrant solution was calculated on the basis of preparation [5].

Uncertainty components	Description	Standard uncertainty (u)	
Purity (P) of solid Alternariol	P = 98.5 % ± 1.5 %	**u (P) = 0.9 %**	a
Weighing procedure weighted sample: m_{ws}= 10.182 mg	U(m) = 0.0000008g + 1.26 * 10^{-5} * m_{Toxin} u(m) = U(m)/2	**u (m) = 0.0005 mg**	b
Dilution procedure volumetric flask: V_f = 100 mL pipette: V_p = 1 mL	calibration: 100 mL ± 0.1 mL repeatability: 0.04 mL volume expansion solvent calibration pipette: 1 mL ± 0.014 mL volume expansion solvent pipette	u (cal) = 0.04 mL u (rep) = 0.04 mL u (Vol. exp.) = 0.24 mL **u (V) = 0.244 mL** u (cal2) = 0.006 mL u (Vol. exp.2) = 0.002 mL **u (V_p) = 0.006 mL**	c d e f g h i

[a] Maximum tolerance of purity (rectangular distribution) was divided by $\sqrt{3}$

[b] Calculation of this u-value is based upon the uncertainty formula for the weighed amount as given in the calibration report from annual balance calibration

[c, g] A triangular distribution (division by $\sqrt{6}$ *) was chosen for the calculation of u (cal)*

[d] Based on a series of ten fill and weigh experiments on a typical 100 mL flask; the value was used directly as a standard deviation

*[e, h] Based on the density of 0.7857 g/cm³ at temperature T = 20°C and a maximum temperature variation of ± 3°C, of volume expansion, relative volume expansion coefficient of acetonitrile is 1370 * 10^{-6}/°C [6], volume expansion term (rectangular distribution) was divided by* $\sqrt{3}$

[f, i] The three contributions are combined to give the u (V) = $\sqrt{u(cal)^2 + u(rep)^2 + u(Vol.\exp.)^2}$

Calculation of the combined uncertainty u_c and the expanded standard uncertainty U

$$c_{Toxin} = \frac{10 \times m_{ws} \times P}{V_f} = \frac{10 \times 10.182 \times 98.5}{100} = 100.3\ mg/L$$

$$\frac{u_c(c_{Toxin})}{c_{Toxin}} = \sqrt{\left[\frac{u(P)}{P}\right]^2 + \left[\frac{u(m)}{m_{ws}}\right]^2 + \left[\frac{u(V)}{V_f}\right]^2 + \left[\frac{u(V_p)}{V_p}\right]^2} = \sqrt{\left[\frac{0.9}{98.5}\right]^2 + \left[\frac{0.0005}{10.182}\right]^2 + \left[\frac{0.244}{100}\right]^2 + \left[\frac{0.006}{1}\right]^2} = 0.011$$

$$u_c(c_{Toxin}) = c_{Toxin} \times 0.011 = 100.3 \times 0.011 = 1.1\ mg/L$$

Calculation of expanded standard uncertainty U using a coverage factor k = 2

$$U(c_{Toxin}) = u_c(c_{Toxin}) \times 2 = 1.1 \times 2 = 2.2\ mg/L \approx 2.2\ \mu g/mL$$

4. Discussion of traceability

This calibrant is certified on the basis of gravimetric preparation [5]. Thus the certified value (mass concentration of Alternariol) is based on the weighed amount of the starting material and is therefore traceable to the stated purity of the solid raw material. High purity material represents a practical realization of concentration units, through conversion of mass to molar quantity.

5. Confirmation of certified value by HPLC-UV:

The concentration value of Alternariol of the gravimetric prepared solution was confirmed by HPLC-UV against an independently prepared reference batch.

column	Phenomenex Luna C18(2), 250x3.00 mm, 5µ	
flow rate	0.5 mL / min	
injection volume	10 µL sample	
solvent A	Acetonitrile / water (10 / 90)	
solvent B	Acetonitrile	
oven	30°C	
gradient	time in minutes (min)	% solvent B
	0 – 2.0	50
	2.0 – 10.0	50-70
	10.0 – 15.0	70
	15.0 – 15.1	70-50
	15.1 – 20.0	50
DAD settings	250 nm	
sample dilution	1:10 with water/acetonitrile 50/50	

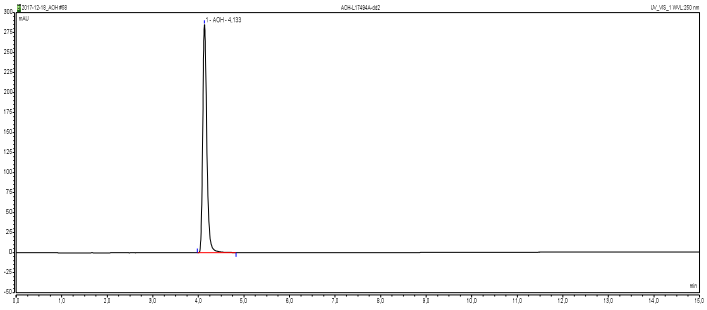

Figure 1: HPLC-UV chromatogram of Alternariol, Lot# L17494A

	time [min]	area	concentration [a] [µg/mL]
Alternariol	4.133	29.522	100.2 ± 2.9

[a] Mean of 6 replicate measurements against reference batch, confidence interval with P = 95 %

6. Further information

The purchaser must determine the suitability of this product for its particular use. LGC Standards GmbH makes no warranty of any kind, express or implied, other than its products meet all quality control standards set by LGC Standards GmbH. We do not guarantee that the product can be used for a special application.

approved for release by: *Laurence Treccani-Chinelli, Global Supply Chain Manager - LGC Standards* *date:* 18.12.2017

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References:

[1] ISO Guide 31:2015 - 1-18, *"Reference materials – contents of certificates, labels and accompanying documentation"*

[2] Eurachem / CITAC Guide, 1-37, (2003), *"Traceability in Chemical Measurement"*

[3] Eurachem / CITAC Guide CG4, 1-133, (QUAM:2012.P1), *"Quantifying Uncertainty in Analytical Measurement", 3rd Ed.*

[4] International Organization for Standardization (ISO), (1995), *"Guide to the Expression of Uncertainty in Measurement"*, 1st Ed. Geneva, Switzerland

[5] R.D. Josephs, R. Krska, S. MacDonald, P. Wilson, H. Pettersson, **86**, 50-60, (2003), *"Preparation of a Calibrant as Certified Reference Material for Determination of the Fusarium Mycotoxin Zearalenone"*

[6] E.W. Flick, (1996), *"Industrial Solvents Handbook"*, 3rd Ed., Noyes Data Corp. Westwood NJ