

# Certificate of Analysis<sup>(Ver.2.0)</sup>

## Alternariol, Alternariol monomethyl Ether, Tentoxin, Tenuazonic acid in Acetonitrile

### 1. General information

This document is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31<sup>[1]</sup>.

### 2. Description of the Reference Material (RM)

Product name:	Alternariol, Alternariol monomethyl Ether, Tentoxin, Tenuazonic acid in Acetonitrile
Product number:	STD#7056
Lot#:	2B00C12
CAS number:	Alternariol:641-38-3; Alternariol monomethyl Ether:26894-49-5; Tentoxin:28540-82-1; Tenuazonic acid: 610-88-8;
Formula weight:	Alternariol:258.23; Alternariol monomethyl Ether:272.25; Tentoxin:414.50; Tenuazonic acid: 197.23
Formula:	Alternariol:C <sub>14</sub> H <sub>10</sub> O <sub>5</sub> ; Alternariol monomethyl Ether:C <sub>15</sub> H <sub>12</sub> O <sub>5</sub> ; Tentoxin:C <sub>22</sub> H <sub>30</sub> N <sub>4</sub> O <sub>4</sub> ; Tenuazonic acid: C <sub>10</sub> H <sub>15</sub> NO <sub>3</sub>
Result concentration:	Alternariol:100.1±1.0µg/mL; Alternariol monomethyl Ether:100.4±1.2µg/mL; Tentoxin:100.8±1.2µg/mL; Tenuazonic acid: 100.2±1.8µg/mL
Starting material :	Alternariol, lot#I19018P, Pribolab Pte.Ltd.; Alternariol monomethyl Ether, lot#I19823P, Pribolab Pte. Ltd. ; Tentoxin, lot#I19018P, Pribolab Pte.Ltd.; Tenuazonic acid, lot#J20623P, Pribolab Pte.Ltd
Matrix:	Acetonitrile, LiChrosolv®, Merck
Amount:	1.2mL
Production date:	12, Mar, 2022
Expiry date:	11, Mar, 2023
Name of the supplier:	Pribolab Pte. Ltd.

#### 2.1 Intended use of the RM

- for laboratory use only
- calibration of analytical instruments

#### 2.2 Instruction for the correct use of the RM

The compound should be stored at 2-8°C in a dark place. Before usage of the RM, the compound should be allowed to warm to temperature (20±3°C). 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.

## 2.3 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.

Hazardous Ingredients	Concentration in%	Pictograms	Signal word	Hazard statement(s)
Acetonitrile	>99.9		Danger	H225,H302,H312,H319,H332

## 3. Certified values and their uncertainties

Alternariol, Alternariol monomethyl Ether, Tentoxin, Tenuazonic acid in Acetonitrile					
Compound	Mass concentration <sup>a</sup>		Compound	Mass concentration <sup>a</sup>	
	Certified value <sup>b</sup>	Uncertainty <sup>c</sup>		Certified value <sup>b</sup>	Uncertainty <sup>c</sup>
Alternariol	100.1 µg/mL	±1.0 µg/mL	Alternariol monomethyl Ether	100.4 µg/mL	±1.2 µg/mL
Tentoxin	100.8 µg/mL	±1.2 µg/mL	Tenuazonic acid	100.2 µg/mL	±1.8 µg/mL

a Mass concentration based on weighed amount, purity and dilution steps  
b Values are based on preparation data and confirmed experimentally by HPLC-DAD  
c Expanded uncertainty U(k=2) of the value u<sub>c</sub> according to GUM<sup>[2]</sup>

## 3.1 Calculation of uncertainty

After the concentration of the gravimetric prepared solution was confirmed by HPLC-DAD, the uncertainty of the calibrant was calculated on the basis of preparation<sup>[3]</sup>.

Uncertainty components	Description	Standard uncertainty (u)	
Purity (P) of solid Alternariol Alternariol monomethyl Ether Tentoxin Tenuazonic acid	P <sub>1</sub> =99.1±0.9% P <sub>2</sub> =98.9±1.1% P <sub>3</sub> =99.0±1.0% P <sub>4</sub> =98.6±1.4%	u(P <sub>1</sub> )=0.5% u(P <sub>2</sub> )=0.6% u(P <sub>3</sub> )=0.6% u(P <sub>4</sub> )=0.8%	a
Weighing procedure: Weighted sample: m <sub>Alternariol</sub> =5.050 mg m <sub>Alternariol monomethyl Ether</sub> =5.076 mg m <sub>Tentoxin</sub> =5.091 mg m <sub>Tenuazonic acid</sub> =5.081 mg	U <sub>(m)</sub> =0.0000008g+1.30*10 <sup>-5</sup> *m <sub>Toxin</sub> u <sub>(m)</sub> =U <sub>(m)</sub> /2	u <sub>(m)</sub> =0.0004 mg	b
Dilution procedure Volumetric flask: V <sub>f</sub> =50 mL	calibration: 50±0.05 mL repeatability: 0.03 mL volume expansion solvent	u(cal)=0.02 mL u(rep)=0.03 mL u(Vol.exp.)=0.12 mL u(v)=0.13 mL	c d e f

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 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 50 mL flask; the value was used directly as a standard deviation

e Based on the density of 0.7857 g/cm<sup>3</sup> 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<sup>-6</sup>/°C<sup>[5]</sup>, volume expansion term (rectangular distribution) was divided by  $\sqrt{3}$

f The three contributions are combined to give the u(v)= $\sqrt{u(\text{cal})^2 + u(\text{rep})^2 + u(\text{Vol.exp})^2}$

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

$$C_{\text{Toxin}} = \frac{10 \times m_{\text{ws}} \times P}{V_f} = \frac{10 \times 5.050 \times 99.1}{50} = 100.1 \text{ mg / L}$$

$$\frac{u_c(C_{\text{Toxin}})}{C_{\text{Toxin}}} = \sqrt{\left[\frac{u(P)}{P}\right]^2 + \left[\frac{u(m)}{m_{\text{ws}}}\right]^2 + \left[\frac{u(V)}{V_f}\right]^2} = \sqrt{\left[\frac{0.5}{99.1}\right]^2 + \left[\frac{0.0004}{5.050}\right]^2 + \left[\frac{0.13}{50}\right]^2} = 0.005$$

$$u_c(C_{\text{Toxin}}) = C_{\text{Toxin}} \times 0.005 = 100.1 \times 0.005 = 0.5 \text{ mg / L}$$

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

$$U(C_{\text{Toxin}}) = u_c(C_{\text{Toxin}}) \times 2 = 0.5 \times 2 = 1.0 \text{ mg / L} = 1.0 \mu\text{g / mL}$$

**4. Discussion of traceability**

This calibrant is certified on the basis of gravimetric preparation<sup>[4]</sup>. Thus the certified value (mass concentration of Multi-Toxin) 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 LC-MS/MS**

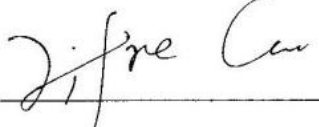
The certified concentration of Multi-Toxin of the gravimetric prepared solution was confirmed by LC-MS/MS against an independently prepared reference batch of Multi-Toxin.

**6. Further information**

The purchaser must determine the suitability of this product for its particular use. Pribolab makes no warranty of any kind, express or implied, other than its products meet all quality control standards

set by Pribolab. We do not guarantee that the product can be used for a special application.

Inspected by

  
 Quality System Specialist

## References:

- [1] ISO Guide 31, 1-7, (2000), "Reference Materials - Contents of Certificates and Labels"
- [2] International Organization for Standardization (ISO), (2008), "Guide to the Expression of Uncertainty in Measurements ", (GUM 1995 with minor corrections) 1<sup>st</sup> Ed. Geneva, Switzerland
- [3] R.D. Josephs, R. Krska, S. MacDonald, P. Wilson, H. Pettersson, J. AOAC Int. 86, 50-60. (2003), "Preparation of a Calibrant as Certified Reference Material for Determination of the Fusarium Mycotoxin, Zearalenone"
- [4] E.W. Flick, (1998), "Industrial Solvents Handbook ", 5<sup>rd</sup> Ed., Noyes Data Corp. Westwood NJ