

Analysis Report

1.0 DESCRIPTION: Matrix Reference Material *AgroMAT - Sandy Soil (AG-2)*
 Catalogue Number: 140-025-102
 Lot Number: S220425004
 Expiration Date: 2 years from date of shipment (See Ship Date label on bottle)

2.0 CONSENSUS VALUES (See section 8 for additional details):

Parameters	Extraction Method	Units	Consensus Value	Uncertainty (+/-)	Confidence Interval	Tolerance Interval
Phosphorus	Mehlich III	mg/kg	69.9	9.5	60.4 – 79.4	10.9 – 129
	Olsen	mg/kg	51.5	2.8	48.7 – 54.3	37.1 – 66.0
Potassium	Ammonium Acetate pH 7	mg/kg	513	33	480 – 547	356 – 670
	Mehlich III	mg/kg	525	30	495 – 555	326 – 723
Calcium	Ammonium Acetate pH 7	mg/kg	1718	100	1618 – 1818	1250 – 2186
	Mehlich III	mg/kg	1666	88	1578 – 1754	1083 – 2250
Magnesium	Ammonium Acetate pH 7	mg/kg	169	12	157 – 181	114 – 224
	Mehlich III	mg/kg	254	11	243 – 266	184 – 325
Sodium	Ammonium Acetate pH 7	mg/kg	50.2	3.0	47.1 – 53.2	36.9 – 63.5
	Mehlich III	mg/kg	57.1	3.9	53.2 – 61.0	36.5 – 77.7
Zinc	DTPA	mg/kg	(1.11)			
	Mehlich III	mg/kg	4.0	0.3	3.7 – 4.3	2.0 – 6.1
	Amm. Ace. pH 7 + EDTA	mg/kg	(2.5)			
Manganese	DTPA	mg/kg	(22.9)			
	Mehlich III	mg/kg	155	11	144 - 165	89.4 - 220
	Amm. Ace. pH 7 + EDTA	mg/kg	(43.3)			
Copper	DTPA	mg/kg	(1.3)			
	Mehlich III	mg/kg	1.2	0.1	1.0 – 1.3	0.4 – 1.9
	Amm. Ace. pH 7 + EDTA	mg/kg	(2.8)			
Iron	DTPA	mg/kg	(100)			
	Mehlich III	mg/kg	969	101	869 - 1070	345 – 1594
	Amm. Ace. pH 7 + EDTA	mg/kg	(221)			
Boron	Hot Water	mg/kg	0.44	0.08	0.36 – 0.51	0.14 – 0.73
	Mehlich III	mg/kg	0.67	0.12	0.55 – 0.79	0.10 – 1.25
Sulfur	Mehlich III	mg/kg	25.1	1.2	23.8 – 26.3	19.2 – 30.9
Aluminum	Mehlich III	mg/kg	1502	93	1409 - 1596	932 – 2072
pH	1 :1 (Soil:Water)	----	6.94	0.07	6.87 – 7.01	6.50 – 7.39
	1 :2 (Soil:Water)	----	6.99	0.11	6.88 – 7.10	6.42 – 7.57
	1 :5 (Soil:Water)	----	(7.15)			
	Saturated Paste	----	6.78	0.11	6.67 – 6.89	6.33 – 7.23
	Buffer SMP	-----	7.06	0.03	7.02 – 7.09	6.90 – 7.22
Organic Matter	LOI	%	3.5	0.2	3.3 – 3.7	2.3 – 4.8
	Walkley Black	%	2.6	0.3	2.3 – 2.9	1.2 – 4.0
Nitrogen as Nitrate	KCl	mg/kg	143	2	141 - 145	129 - 156
Soluble Salts	1 :2 Soil :Water	uS/cm	643	53	591 - 696	389 - 898
	Saturated Paste	uS/cm	(1177)			

Note : Values in bracket are not certified. They are listed for information only.

3.0 APPROVAL AND REVISION:

Approval: Daniel Boisvert, Chemist
 Date of Issue of Report: August 25th, 2022
 Date of revision: December 15th, 2022

Daniel Boisvert

4.0 DESCRIPTION AND INTENDED USE:

The Matrix Reference Material (MRM) AG-2 is a naturally agricultural sandy soil (not spiked or fortified) with a particle size of -200 mesh. It is designed to be used for quality control verification, internal standards validation or methods development for the analysis of the listed parameters using the indicated extraction methods. Not intended for calibration.

5.0 INSTRUCTIONS FOR USE AND STABILITY:

Instructions for use: Before weighing, mix the material by shaking the container to avoid segregation in the bottle. In order to have a representative sample, the minimum use quantity must be 1 g to conform to previous homogeneity testing. Analysis has been performed on a dry weight basis.

Stability: This MRM is guaranteed to be stable up to 2 years from the shipping date provided the material is kept sealed, stored under normal laboratory conditions and used according to good laboratory practices. Shipping date will be stamped on container at time of shipping. **SCP SCIENCE** will monitor the stability of representative samples regularly and if any changes occur that invalidate the reported results, **SCP SCIENCE** will notify purchasers.

Date of last verification: **N/A**

6.0 HAZARDOUS INFORMATION:

Please refer to the associated Safety Data Sheet (SDS) for information regarding this product (available at <http://www.scpscience.com/ecert>).

7.0 PREPARATION METHOD AND HOMOGENEITY:

Preparation Method: The initial sample has been dried, crushed and sieved through a 0.5 inch sieve. The "fines" portion has been further crushed and sieved with 80% of the material passing through a 200 mesh screen. This portion has been re-pulverized and sieved through a 200 mesh sieve to obtain 100% less than 200 mesh. The final material has then been packaged in 175 g containers and tested for homogeneity.

Homogeneity: The homogeneity of the material has undergone third party verification by Particle Size Analysis and by metals oxides analysis using X-ray fluorescence spectrometer. The method used for material homogeneity determination is based on ISO Guide 35.

8.0 ANALYSIS AND DETERMINATION OF CONSENSUS VALUES:

These values were the result of an inter-laboratory study involving thirteen laboratories. Each laboratory was asked to supply analysis data for a specific list of parameters employing specific extraction methods. Not all the laboratories supplied data for the different parameters. Consensus Values are based on an average of 19 values per parameter (36 values being the highest and 6 values being the lowest). Values in brackets are not certified as less than 9 values were received. They are provided for information only.

Several extraction methods have been used by lab participants. Mehlich III, Olsen, Ammonium and Acetate at pH 7 are methods that we had enough results to do statistical calculation. Almost all labs did their sampling by weight rather than by calibrated scoop. Extraction method soil ratio used by most labs is: Mehlich III (1:10), Olsen (1:20), Ammonium acetate pH 7 (1:10), DTPA (1:2).

Agricultural extraction methods for all elements are listed on section 2.0 of this certificate. Most participating labs used ICP or AA to test metals. ICP and colorimetric method have been used for phosphorus testing: Colorimetric for Olsen extraction methods, ICP for Mehlich III extraction method. For nitrates analysis, cadmium reduction with colorimetric method, ionic chromatography or segmented flow analyser have been used by most participating laboratories.

The outliers were removed using the Interquartile range rule and data comparison after confirmation that there was neither a connection between outliers and the methods used for analysis nor between the outliers and the nature of the sample.

The Confidence Interval has been calculated using the 95% Confidence Level (equivalent to 2σ) using the following formula:

$\bar{x} \pm ts/\sqrt{n}$ where

n:	number of data
s:	Standard Deviation of the Average
t:	factor for Student Test
x:	Reference Value

The Confidence Interval should be used for routine quality control.

The Tolerance Interval has been calculated using again a 95% probability with a 95% inclusion of the population. The following formula was used:

$\bar{x} \pm ks$ where

k:	factor for two-sided Tolerance Limits
s:	Standard Deviation of the Average
x:	Reference Value

The Tolerance Interval is an indication of the lowest possible value and the highest possible value based on the complete set of data, exclusive of outliers, used to calculate the Consensus Value.

The following table is a guideline on how to interpret the results:

Results within Confidence Interval	Method working properly
Results outside Confidence Interval but within Tolerance Interval	Method may need improvement
Results outside Tolerance Interval	Method not working properly

9.0 REFERENCES:

ISO Guide 30: Terms and definitions used in connection with reference materials
ISO Guide 31: Reference materials – Contents of certificates, labels and accompanying documentation
ISO Guide 35: Certification of reference materials--General and statistical principles
Standard Reference Materials-Handbook for SRM Users - John K. Taylor
Quality Assurance of Chemical Measurements - John K. Taylor
Handbook on Reference Methods for Soil Analysis (1992) - Soil and Plant Analysis Council

10.0 QUALITY SYSTEM CERTIFICATIONS:

ISO 9001 Certification: This standard was produced in a facility which operates under a **registered** ISO 9001 Quality Management System. Please consult our web site for a copy of the most recent revision of our certificate of registration.

ISO 17025 Accreditation: **SCP SCIENCE (Corporate Headquarters)** operates an ISO 17025 **accredited** laboratory. Please consult our web site for a copy of the most recent revision of our certificate and scope of accreditation.

ISO 17034 Accreditation: **SCP SCIENCE (Corporate Headquarters)** is an ISO 17034 accredited Reference Material Producer. Please consult our website for a copy of our most recent certificate and scope of accreditation.

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