

Application Note - Digestion of Agricultural Leaves CRM

Introduction:

This study evaluated the effectiveness of the **MiniWAVE** microwave digestion system for the digestion of various agricultural leaves.

Sample Type:

NIST CRM 1515 (apple leaves), 1547 (peach leaves), 1570a (spinach leaves)

- Sample weight: 0.2 to 0.5 g
- 4 Replicates

Supplies and Reagents:

- 1) Microwave digestion system **MiniWAVE***
- 2) Quartz Vessels, 75 ml*
- 3) Fluoropolymer Caps and Safety Pressure Release Caps*
- 4) **PlasmaPURE HNO₃** (70%), 10 ml
- 5) **PlasmaPURE H₂O₂** (30%), 1 ml
- 6) ICP-MS Spectrometer, ELAN 6100, Perkin-Elmer
- 7) Crossflow Nebulizer, Mini-X-Flow*
- 8) Alumina torch injector, 1.2 mm*
- 9) Cyclonic Spray Chamber, Baffled*

* Manufactured by **SCP SCIENCE**

Sample Preparation Procedure:

The samples were weighed on a 4 place analytical balance directly in the quartz tubes. After adding 10 ml of HNO₃ and 1 ml of H₂O₂ the samples were allowed to sit at room temperature for 5-10 minutes. They were placed in the rack and digested following the heating profile. After cooling down to room temperature, the samples were vented, diluted and analyzed on the ICP-MS.

Heating Program:

STAGE	RAMP TIME (MINUTES)	PRESSURE (PSI-LIMIT)	TEMPERATURE (°C)	HOLD TIME (MINUTES)
1	10	435	190	20



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Results:

NIST CRM 1515 (Apple Leaves)

ELEMENT	AMU	MiniWAVE (PPM)	RSD (%)	NIST CRM 1515 (PPM)	RECOVERY (%)
Al	27	275	2.5	286	96
B	11	24	1.6	27	91
Ba	134	51	2.8	49	105
Ca	43	14027	1.5	15260	92
Cu	63	5.1	0.7	5.6	91
Fe	57	90	1.9	83	106
K	39	17008	2.2	16100	105
Mg	26	2737	1.7	2710	101
Mn	5	53	1.9	54	99
Na	23	25.6	1.2	24.4	105
P	31	1613	2.6	1590	101
Sr	88	24	1.4	25	96
V	51	0.24	1.5	0.26	92
Zn	66	13.4	2.3	12.5	104

NIST CRM 1547 (Peach Leaves)

ELEMENT	AMU	MiniWAVE (PPM)	RSD (%)	NIST CRM 1547 (PPM)	RECOVERY (%)
Al	27	238	1.6	249	96
B	11	27	1.9	29	94
Ba	134	120	2.7	124	97
Ca	43	14493	1.4	15600	93
Cu	63	3.4	1.2	3.7	93
Fe	57	232	1.8	218	106
K	39	23393	1.4	24300	96
Mg	26	4593	2.0	4320	106
Mn	55	105	1.5	98	103
Na	23	25	1.4	24	108
P	31	1328	2.3	1370	97
Sr	88	56	1.5	53	107
V	51	0.38	1.3	0.37	104
Zn	66	18.5	2.5	17.9	104

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NIST CRM 1570a (Spinach Leaves)

ELEMENT	AMU	MinIWAVE (PPM)	RSD (%)	NIST CRM 1570A (PPM)	RECOVERY (%)
Al	27	291	1.5	310	94
B	11	38	0.8	37	103
Cd	111	3.2	2.4	2.9	110
Ca	43	14547	2.6	15270	95
Cu	63	11.8	1.8	12.2	97
K	39	29622	1.7	29030	102
Mn	55	71.8	1.6	75.9	94
Na	23	194495	2.3	18180	107
Ni	62	2.0	1.9	2.1	95
P	31	4932	1.5	5180	95
Sr	88	57.2	0.5	55.6	103
V	51	0.54	1.8	0.57	95
Zn	66	84	1.6	82	103

Conclusion:

The **MinIWAVE** is suitable for the digestion of various agricultural leaves. Good recoveries are achieved in an efficient amount of time.

References:

Certificate of Analysis SC9261560 from **SCP SCIENCE**
Certificate of Analysis NIST CRM 1059c
USCPSC-CH-E1001-08 method

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