

## APPLICATION NOTE

# NIST 1573a - Tomato Leaves

## SUMMARY

The application note summarizes the digestion of NIST 1573a, a tomato leaves standard reference material using ColdBlock™ Digestion Pro Series Technology.

**Instrument:** ColdBlock CBM (with quartz test tubes), chiller, ICP-MS & ICP-OES

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**Digestion Time:** 20 Minutes

**Acid Used:** HNO<sub>3</sub> & H<sub>2</sub>O<sub>2</sub>

**Average ColdBlock Recovery vs. CRM:**

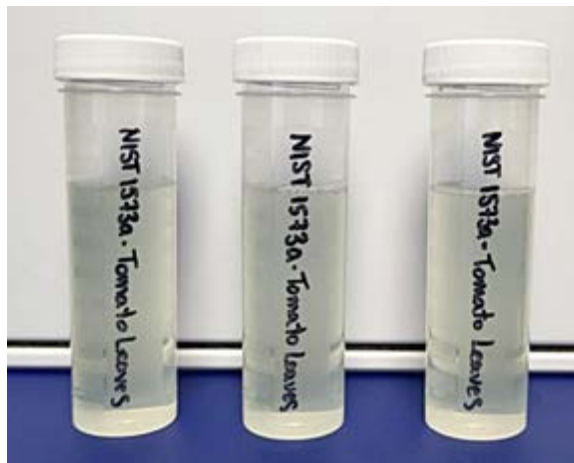
- 101% Boron
- 103% Iron
- 101% Phosphorus

## METHODOLOGY

1. Chiller temperature was set to -5°C
2. 0.5g of each sample was weighed and placed into a quartz ColdBlock™ Digestion vessel
3. 10 mL of HNO<sub>3</sub> was added
4. Sample was digested at 65% power for 20 minutes
5. 2mL of ≥ 30% H<sub>2</sub>O<sub>2</sub> was added slowly
6. Samples were cooled and bulked to 40mL using 2% HNO<sub>3</sub><sub>v/v</sub>

## DISCUSSION

- Samples were digested in triplicate
- Samples were filtered prior to analysis by ICP-MS & OES
- The NIST methods used for determination of certified Aluminum values included INAA & wet ashing with HNO<sub>3</sub>/HF/HClO<sub>4</sub>, so Aluminum recovered low (~60%) using HNO<sub>3</sub> & H<sub>2</sub>O<sub>2</sub>
- To improve the recovery the Aluminum, a second method was examined that included the addition of 1mL HF (10mL HNO<sub>3</sub> + 1mL HF 65% power for 20 minutes, then slowly add 2mL of 30% H<sub>2</sub>O<sub>2</sub>) See Table 2 for results
- NIST 1573a consists of dried tomato leaves



NIST 1573a after bulk up to 40mL

## NIST 1573a - Tomato Leaves

## Results

Table 1 - Results of HNO<sub>3</sub> & H<sub>2</sub>O<sub>2</sub> digestion - NIST 1573a Tomato Leaves

Method:	0.5g	10mL HNO <sub>3</sub> 65% power for 20 minutes, then slowly add 2mL of 30% H <sub>2</sub> O <sub>2</sub>							
Element	Consensus Value (ppm)	+/-	Sample A	Sample B	Sample C	Average (ppm)	Stdev	RSD	Recovery
As	0.1126	0.0024	0.1276	0.1272	0.1108	0.1	0.0078	6.4%	108%
B	33.13	0.42	33.19	34.81	32.17	33.39	1.09	3.3%	101%
Ca	50450	550	47435	46451	49915	47934	1457	3.0%	95%
Cd	1.517	0.027	1.455	1.453	1.507	1.472	0.025	1.7%	97%
Cr	1.988	0.034	1.947	1.849	1.844	1.880	0.047	2.5%	95%
Cu	4.7	0.14	4.57	4.78	4.80	4.7	0.1	2.2%	100%
Fe	367.5	4.3	351.8	401.0	380.2	377.7	20.2	5.3%	103%
Hg	0.0341	0.0015	0.0413	0.0415	0.0412	0.0413	0.0001	0.3%	121%
K	26760	480	25391	26497	28696	26861	1374	5.1%	100%
Mn	246.3	7.1	235.1	249.5	268.0	250.9	13.5	5.4%	102%
Na	136.1	3.7	126.4	145.7	146.6	139.6	9.3	6.7%	103%
P	2161	28	2138	2200	2230	2189	38.3	1.7%	101%
Rb	14.83	0.31	13.03	14.34	14.17	13.85	0.58	4.2%	93%
Sb	0.0619	0.0032	0.0567	0.0578	0.0567	0.0571	0.0005	0.9%	92%
V	0.835	0.034	0.853	0.804	0.854	0.837	0.023	2.8%	100%
Zn	30.94	0.55	30.60	28.33	31.49	30.14	1.3	4.4%	97%

Table 2 - Results of HNO<sub>3</sub> + HF & H<sub>2</sub>O<sub>2</sub> digestion (to improve recovery of Aluminum)

Method:	0.5g	10mL HNO <sub>3</sub> + HF 65% power for 20 minutes, then slowly add 2mL of 30% H <sub>2</sub> O <sub>2</sub>							
Element	Consensus Value (ppm)	+/-	Sample A	Sample B	Sample C	Average (ppm)	Stdev	RSD	Recovery
Al	598.4	7.1	522.5	538.3	539.1	533.3	7.6	1.4%	89%