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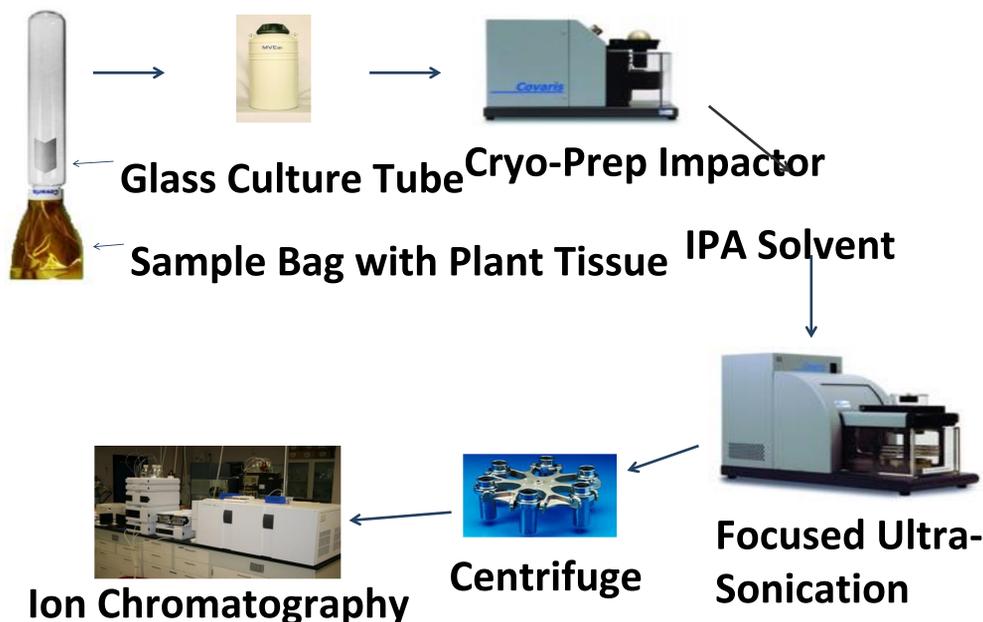
Introduction

Analysis of degradation products from Chemical Warfare Agents (CWAs) requires time consuming sample preparation and sophisticated analytical techniques. This procedure outlines a fairly simple and straightforward methodology to conduct routine analysis of EMPA following the exposure of plant leaves to VX.

The nerve agent VX reacts with water in the environment to form ethyl methylphosphonic acid (EMPA). Eventually this acid reacts slowly with water to form methylphosphonic acid (MPA).



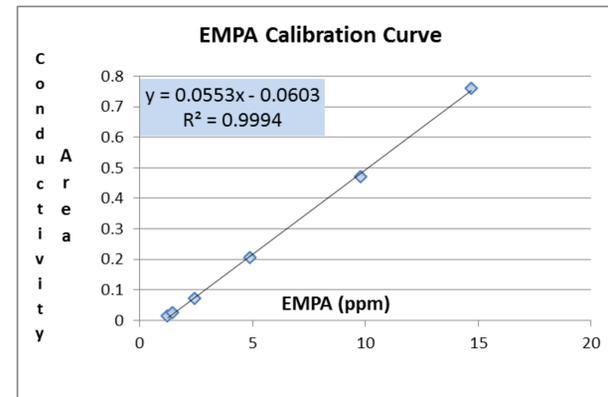
Sample Preparation



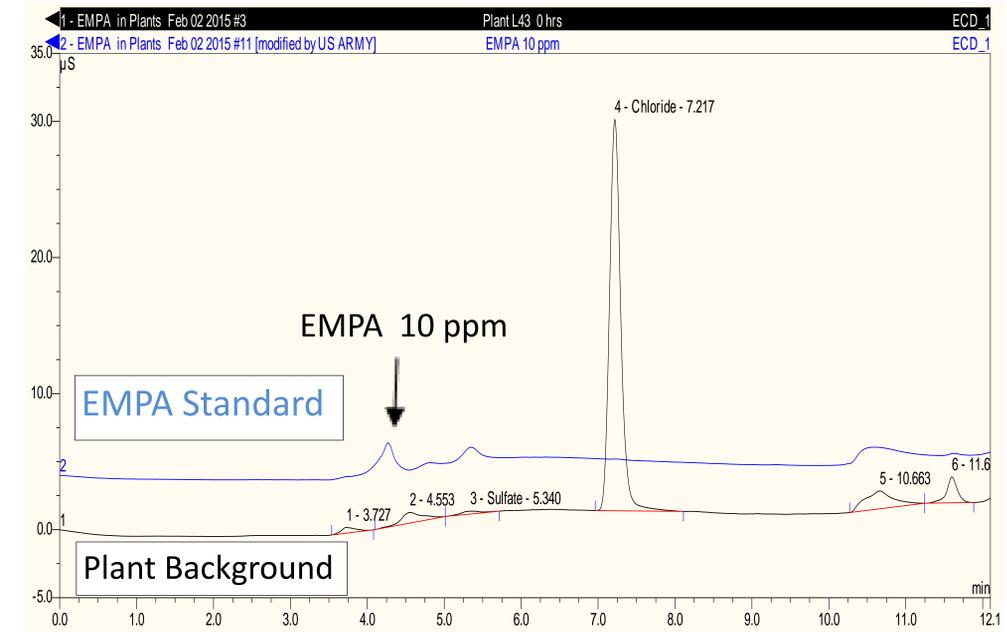
Ion Chromatography Analysis

All plant samples were extracted for VX and EMPA with the final sample extract contained in 10mL of isopropyl alcohol (IPA). A 25 μL sample of each extract was injected directly into the ion chromatograph for subsequent separation and quantitation for EMPA. The separation of EMPA from other anion species (*ie.*, fluorides, chlorides) was accomplished using a gradient elution of potassium hydroxide (5mM – 40 mM) at a flow rate of 1 mL/min.

EMPA Calibration Curve



Standard and Matrix Chromatograms



Separation performed on an Ion Pac® AS 18 (4 x 250 mm) analytical and guard column AG (4 x 50 mm) with suppressed (ASRS Ultra 4-mm) conductivity detection.

Results

VX Contact Time on Leaf	EMPA (ppm)	Number of Leaves
0 hr	< 1.2	4
1 hr	< 1.2	4
4 hr	< 1.2	4
24 hr	18.6 \pm 1.3	4
48 hr	22.6 \pm 3.0	4
120 hr	24.9 \pm 7.0	8
168 hr	57.1 \pm 8.8	4

Conclusions

- Method is applicable down to low ppm levels of EMPA.
- Permits separation of EMPA from other anions present in plant tissue.
- Results show increased EMPA concentration vs increased residence time of VX on the plant.