

## Water versus DTPA extractants for soil testing



**Internal Report for Young Plant Research Center Partners.**

Not for publication or reproduction in part or full without permission of authors.

Copyright UNH, June 25, 2005.

By Amy Bestic, Paul Fisher, University of New Hampshire, Durham, NH 03824.  
[aec7@unh.edu](mailto:aec7@unh.edu), [Paul.Fisher@unh.edu](mailto:Paul.Fisher@unh.edu), tel 603 862 4525, fax 603 862 4757.

### Table of Contents

	Pages
<b>Executive Summary</b> .....	<b>1</b>
<b>Introduction</b> .....	<b>2</b>
<b>Evaluation Methods</b> .....	<b>2-3</b>
<b>Results</b> .....	<b>3-4</b>

### **Executive Summary**

Three sets of SME (saturated media extract) tests using triple-distilled water and 0.005M DTPA as extractants were run to compare the two extractants for a range of peat and propagation media samples. The first set consisted of 12 samples of media components (peat) from media companies/greenhouses throughout the US. The second included 18 peat specimens from each of two Sun Gro-owned bogs in Canada. And the third was 21 propagation media from various media companies/greenhouses.

Similar macronutrient levels were found with both extraction methods leading to a 1: 1 linear relationship. Levels of boron were similar for both extraction methods, but extractable iron and manganese were much higher with DTPA. No linear relationship resulted for iron and manganese in the combined data. When analyzed separately, the Sun Gro peat data appeared to have a linear relationship for manganese and to a lesser extent iron.

Further research is needed to refine recommended levels using the DTPA extractant, but the DTPA method appears to be superior for micronutrient management.

## Introduction

Several testing methods have been developed for soilless media, including the saturated media extract (SME), 2:1 by volume and PourThru. SME method uses deionized water as the extractant to determine the micronutrients available in the media solution and give a more reliable measure of the available nutrients (Warncke, 1986; Warncke, 1995). However, Berghage *et al.* (1987) have found that a modified SME method that uses the DTPA acid at 0.005M resulted in a more accurate correlation with the actual reserves of nutrients in the sample. They developed calibration curves for phosphorus, potassium, calcium and magnesium and found that macronutrient levels were similar for both extraction methods. Micronutrient levels, however, were higher in the DTPA extractions. The DTPA acid is a stronger extractant than water and helps to remove more of the nutrients from the media exchange sites.

Today almost all SME extractions in the greenhouse are run using water. Unfortunately, levels of micronutrients measured are usually near the resolution limits of the analytical instrument. Therefore, micronutrient recommendations are more typically based on media-pH than actual soil test levels. Can't we do better at providing soil test assistance to greenhouse managers?

Objectives:

1. Compare water and DTPA extractants for a range of peat and propagation media samples.
2. Develop calibrations curves for determining macro- and micronutrients in media when using SME method.

## Evaluation Methods

Three sources of growing media were evaluated:

(a) *Media Component Survey*: 12 samples of peat were collected from media companies/greenhouses throughout the US.

(b) *In-depth Peat Bog (Sun Gro) Samples*: 18 peat specimens from each of two Sun Gro-owned bogs in Canada (36 samples total).

(c) *Propagation Media*: 21 propagation media from various media companies/greenhouses.

The 51 samples from the three trials were tested using SME method with triple-distilled (TD) water and 0.005M DTPA as extractants. Three replicates of each sample with each extractant type were run for a total of 153 extractions.

- 400mL of media from each sample was oven-dried, weighed and placed in a reclosable plastic bag [100mL of media for (b)].
- 100mL of either TD water or 0.005M DTPA was added to each bag [25mL for (b)].



- Additional TD water was added to saturate each sample. The samples were left for 1 hour, checked for saturation state, and left for an additional hour.



- Samples were then filtered using funnels and 70mm filter papers into test tubes and then bottled.
- Dry-weight and mL of extractant added to each sample were recorded.
- EC and pH for each extraction were measured followed by further testing of macro- and micronutrient contents using ICP analysis.
- After data was analyzed, calibration curves were developed for both macro- and micronutrients and compared to those calculated by Berghage *et al.* 1987.

### Literature cited

- Berghage, R.D., D.M. Krauskopf, D.D. Warncke, and I. Widders. 1987. Micronutrient Testing of Plant Growth Media Extractant, Identification and Evaluation. *Commun. In Soil Sci. Plant Anal.* 18(9): 1089-1109.
- Warncke, D.D. 1986. Analyzing Greenhouse Growth Media by the Saturation Extraction Method. *HortScience* 21(2): 223-225.
- Warncke, D.D. 1995. *Recommended Test Procedures for Greenhouse Growth Media*. Ch. 11, pp76-82. In: *Recommended Soil Testing Procedures 2<sup>nd</sup> Edition*. University of Delaware, Newark, Delaware. pp 94.

### Results

- Consistent with the findings of Berghage *et al.*, similar macronutrient levels were found with both extraction methods (Figure 1, left graphs). The relationship between the two extractants was close to 1: 1.
- Levels of boron were similar for both extraction methods, but extractable iron and manganese levels were much higher with DTPA (Figure 1, right graphs).
- No linear relationship resulted for iron and manganese in the combined data. However, when looking at the Sun Gro peat samples separately, the data appears to be more linear. Berghage *et al.* (1987) also observed a lot of variability in the relationship for some micronutrients, probably in part because water-extracted Fe and Mn tend to be low and hard to accurately measure.
- We are currently analyzing these data in more depth, in order to develop reliable calibration curves and to develop recommended levels for DTPA extractions.

**Figure 1.** Regression analysis of macronutrient (left graphs) and micronutrient (right graphs) contents of three sources of media (Sun Gro peat, media component peat, propagation media) tested using SME with water and DTPA. Calibration curves for the combined three sources of media were calculated. Phosphorus and potassium graphs also contain curves developed by Berghage *et al.*

