

Organic High Tunnel Nutrient Management

Vern Grubinger www.uvm.edu/vtvegandberry



nutrient management for quality and yield



often a diversity of crops and conditions

organic usually = amended soil culture

the soil may be in containers

amendments typically include compost

in Distances

high rate of aged manure





synthetic fertilizers, wetting agents...?



'reading the plants' is not precise



plan ahead for heavy nutrient demand

hydroponics can be precisely monitored and controlled



organic growing medium is a 'black box' looks good, feels good...what's in it?



'field' soil test not very helpful: nutrients usually 'off the chart' also does not include soluble salts, nitrate-N, ammonium-N

UVM Soil Test Kit

Vegetable, Lawn, Omamental, Fruits, & Trees

for Home Grounds & Commercial Production

Payment Must Be Enclosed

UVM Extension System

UVM Agricultural Testing Lab

Saturated media extract (SME) is "the" method of testing soilless greenhouse media and it is almost universally done by commercial and university labs.

In this test a paste is made using soil and water and then the liquid portion (the extract) is separated from the solid portion for pH, soluble salt, and nutrient analysis.



Greenhouse 'Soil' Tests = SME

for samples less than ~20-50% mineral soil

UConn: saturated media extract \$10

UMass: 'soilless greenhouse media' \$12

UMaine: 'greenhouse media analysis' \$15 (or high tunnel package for \$22)

Cornell: 'greenhouse root media analysis' \$15

A&L: 'potting media test' \$27

General interpretation guidelines for greenhouse growth media analyzed by the Saturated Media Extract Method.

	Low	Optimum	Very High
Soluble salts (dS/m)	075	2.0-3.5	5.0+
Nitrate-N (ppm)	0-39	100-199	300+
Phosphorus (ppm)	0-2	6-10	19+
Potassium (ppm)	0-59	150-249	350+
Calcium (ppm)	0-79	200+	
Magnesium (ppm)	0-29	70+	

From: Recommended Test Procedures for Greenhouse Growth Media by Daryl Warnke, Michigan State University Extension. 2009.

optimal soil nutrient levels for greenhouse tomatoes or lettuce using the SME test

- pH
- nitrate-N
- P
- K
- Ca
- Mg
- soluble salts

5.8 - 6.8125 – 200 ppm 8 – 13 ppm 175 – 275 ppm > 250 ppm > 60 ppm 1.5 - 3.0 (mmhos)

Adapted from: Greenhouse Tomatoes, Lettuce and Cucumbers. by S. H. Wittwer and S. Honma. 1979 . Michigan State Univ. Press.

Get accurate results

Sample prior to adding amendments

Take a representative sample

Keep warm and moist for ~2 weeks prior

Send at least 1 pint to the lab

pH: 6.2 Soluble Salts (mS/cm): 4.97 Macronutrients mg/L Nitrate-N (NO3-N): 520 Ammonium-N (NH4-N): 1 Phosphorus (P): 66 Potassium (K): 539 Calcium (Ca): 376 Magnesium (Mg): 280

pH: 7.4 Soluble Salts (mS/cm): 1.25

<u>Macronutrients</u> mg/L

Nitrate-N (NO3-N): 72 Ammonium-N (NH4-N): 0 Phosphorus (P): 3 Potassium (K): 23 Calcium (Ca): 139 Magnesium (Mg): 43

most growers need this test

2008 – 2009 study

75 'soil'samples

for greenhouse / tunnel tomatoes

pH of greenhouse 'soil' 75 samples 2008-09



NO₃-N in greenhouse 'soil' 75 samples 2008-09



NH₄-N in greenhouse 'soil' 75 samples 2008-09



P in greenhouse 'soil' 75 samples 2008-09



K in greenhouse 'soil' 75 samples 2008-09



'Salts' in greenhouse 'soil' 75 samples 2008-09





know your organic fertilizer options, beyond compost

organic fertilizers

- Ca: lime, gypsum (mined)
- Mg: dolomite, sul-po-mag, epsom salts
- P: rock phosphate, bone meal or char
- K: potassium sulfate, sul-po-mag
- N: dried blood, Chilean nitrate* seed meals (alfalfa, soy, peanut)
- Blends: pelletized poultry manure, etc.
- Micros: borax, chelates, sulfates

PRO-GRO 5-3-4 A NATURAL/ORGANIC FERTILIZER

This product is blanded from the following list of natural ingredients:

BONEMEAL ROCK PHOSPHATE COLLOIDAL PHOSPHATE CYSTER MEAL KELP MEAL

GREENSAND LANGBEINITE VEGETABLE PROTEIN MEALS MEAT AND BONE MEAL NATURAL NITRATE OF SODA LEATHER NEAL FISH MEAL BENEFICIAL BACTERIA HUMATES TFACE MINERALS



NITRATE OF SODA For Greener Growth 16-0-0 NET WT. 5 LBS.



11 D Mg

Sulfate of

Potash-Magnes

ALCONTAN



peat moss adds organic matter, not nutrients

PEA



Sie

GYPSUM

Care for your Sail

0.5 - 2.5 compressed cubic yard peat moss per 1000 sq ft (+ lime as needed)

Estimated fertilizer rates to increase SME nutrient levels

Pounds/1,000 sq. ft needed to raise N approximately 10 ppm

Chilean nitrate 16-0-0	3.2
Blood meal 12-0-0	4.2
Alfalfa meal 2.5-2-2	20.1
Soy meal 7-2-1	7.2

Pounds/1,000 sq. ft needed to raise P approximately 2 ppm

 Bone meal 0-15-0
 26.6

 Rock phosphate 0-3-0
 133

Pounds/1,000 sq. ft needed to raise K approximately 20 ppm

Sul-po-mag 0-0-22-11Mg2.6Potassium sulfate 0-0-521.1

Estimated fertilizer rates to alter greenhouse soils

Pounds/1,000 sq. ft needed to raise Ca approximately 25 ppm

Calcium sulfate (gypsum)7.5Calcitic lime7.5Dolomite (high mag lime)5.3

Pounds/1,000 sq. ft of lime to raise pH approximately 1 unit

sandy soil40clayey / high organic matter120

Amount of lime needed to neutralize acidity of peat moss

8.5 lb/ loose cu. yd (=1/2 compressed)

ANALYSIS REPORT

GROWING MEDIUM

Type: Compst ammended soil Origin: Vt Compost Fort V Brand: % Field Soil: 60-70%

FERTILIZATION

Fertilizers: North Country Pro-Gr Slow Release?: Rates: Frequency:

GROWER CONCERNS:

ANALYSIS OF SATURATION EXTRACT

Micronutrients	mg/L
Zinc (Zn): Boron (B):	0.01
Copper (Cu): Iron (Fe):	0.01
Sodium (Na):	24.09
	Micronutrients Zinc (Zn): Boron (B): Manganese (Mn): Copper (Cu): Iron (Fe): Sodium (Na):

RECOMMENDATIONS AND COMMENTS

25 # blood 100 # soy 20 # sulpome 25

ANALYSIS REPORT

GROWING MEDIUM

FERTILIZATION

Type: Origin: Brand: % Field Soil: 15 % ??? Fertilizers: Slow Release?: Rates: Frequency:

GROWER CONCERNS:

ANALYSIS OF SATURATION EXTRACT

Micronutrients mg/L pH: 7.2 Soluble Salts (mS/cm): 4.65 Zinc (Zn): 0.05 0.23 Boron (B): Macronutrients mg/L Manganese (Mn): 0.03 Copper (Cu): 0.41 Nitrate-N (NO3-N): 456 0.97 Iron (Fe): Ammonium-N (NH4-N): 1 Sodium (Na): 399.0 Phosphorus (P): 8 Potassium (K): 334 Calcium (Ca): 200 Magnesium (Mg): 143

RECOMMENDATIONS AND COMMENTS 1 cm y & looge pert + 4 16 line 25 16 59prm

ANALYSIS REPORT

GROWING MEDIUM

Type: Origin: Brand: % Field Soil:

GROWER CONCERNS:

ANALYSIS OF SATURATION EXTRACT

pH: 7.2 Soluble Salts (mS/cr	n) :	1.40
Macronutrients I	ng/L	
Nitrate-N (NO3-N): Ammonium-N (NH4-N): Phosphorus (P): Potassium (K): Calcium (Ca): Magnesium (Mg):	110 0 4 34 126 65	

Micronutrients	mg/L	
Zinc (Zn):	0.00	
Boron (B):	0.11	
Manganese (Mn):	0.00	
Copper (Cu):	0.12	
Iron (Fe):	0.34	
Sodium (Na):	38.09	

RECOMMENDATIONS AND COMMENTS

Compost 1/2 Cn So 15 sog a prant 8 15 potessin sulfate 10 15 gopson

FERTILIZATION

Fertilizers: Slow Release?: Rates: Frequency:

leaf analysis is the next step: what's in the plant?

optimal leaf tissue nutrient levels for greenhouse tomatoes in leaves by latest open flowers

- N
- P
- K
- Ca
- Mg
- Mn
- B
- Cu

2.5 - 3.5%0.5 - 1.0%6.0 - 10%1.3 - 3.0%0.3 - 1.0%20 -100 ppm 20 - 40 ppm5 – 25 ppm

www.uvm.edu/vtvegandberry