The MAYFLOWER & Floral Notes

A Joint Publication
Massachusetts Flower Growers' Association
& UMass Extension

October 2016

New England Greenhouse Conference

November 9 & 10, Holiday Inn, Boxborough, MA

Show Information

Join other growers and retailers for the Northeast's premier floricultural trade show! This biennial event is hosted by New England Floriculture, Inc., which represents the greenhouse grower associations of the six New England states plus New York. NEF's members collaborate with Cooperative Extension specialists from those seven states to develop the conference.

Conference Highlights

EDUCATIONAL SESSIONS — Attend stimulating educational workshops on a wide range of topics by industry experts; acquire knowledge and gain valuable insight.

TRADE SHOW — Visit with innovative exhibitors during dedicated tradeshow time, to gather information on products and services that will benefit your business.

NETWORK — Share ideas and build relationships, and make important face-to-face connections with others in the floriculture industry.

AMBASSADOR PROGRAM — New to the show? Our veteran planning committee and Board will be on hand to give you one-on-one guidance on how to make the best of your trade show shopping experience. Sign up on the registration form and we'll set you up!

DAZED AND INFUSED — Join Sue Adams, Adams Farm and Greenhouses, for an educational cocktail hour on Tuesday evening featuring specialty cocktails using herbs and other plants. Advance registration is required. No charge to attend, and cash bar will be available.

BREAKFAST WITH THE SPEAKERS — Sign up for breakfast Thursday morning with a presenter who is an expert in your area of interest! Presenters and their topics will include: Sinclair Adam, Penn State (Perennials); Mandy Bayer, Univ. of Massachusetts (Irrigation, plant height control); Raymond Cloyd, Kansas State (insect pests and controls); Stephanie Cohen, Perennial Diva (Perennials); Chris Currey, Iowa State (greenhouse herbs, greenhouse environment); Kathy Kelly, Penn State (Social Media); Tom Manning, Rutgers (Greenhouse design, energy efficiency); Jeffrey Marstaller, Cozy Acres Greenhouses (zero emissions, advanced biocontols); Anna Meyerhoff, Bassett Healthcare Network (worker protection); Kelly Norris, Des Moines Botanical Gardens (Iris, perennials, marketing); Suzanne Wainwright-Evans, Buglady Consulting (biocontrols of pests); Brian Whipker, North Carolina State (plant diagnostics, PGRs). Advance registration is required. Tickets are $25.

HARVEST MARKET LUNCH - The Planning Committee worked closely with the Holiday Inn to develop lunch options showcasing local farms and producers. This will be located in the center of the show hall and open from 11:30 - 1:30 p.m. Wed. and Thurs. Stay and shop during lunch, show your support for the local farms!

Drought Information

The drought this summer has been a challenge for some growers in MA. Many towns have water bans and some towns have discouraged new plantings. Some retailers have reported that the hot, dry weather has also reduced demand for plants. (*Hopefully this all changes by the time you read this!*) Depending upon the water source, another consequence of the drought may be the quality of water being used for irrigation. Equipment clogged with sediment (surface water), or high salt (Na and Cl) concentration in irrigation water due to low water levels are possible considerations.

While likely sources of sodium (Na) and chloride (Cl) in the Northeast is road salt, water softeners and some fertilizers may also be contributors. High sodium acts to inhibit plant uptake of calcium, and may result in excess leaching of calcium and magnesium from the media. Acceptable levels of Na and Cl for ornamentals are less than 50 ppm and 140 ppm, respectively, however higher levels may be tolerated depending on crop sensitivity. Na and Cl can be directly toxic to plants, may contribute to raising the soluble salts (EC) level of the growing medium, or may inhibit water uptake by plants. Plant problems include injury from excess soluble salts, growth reduction, and increased susceptibility to disease. Foliar chlorosis caused by high Na and Cl is similar in appearance to that caused by deficiencies of nitrogen, iron, and magnesium. If high levels of Na and Cl are suspected as plant problems, the suspicion should be confirmed by water testing.

A 2004 study of 50 Massachusetts greenhouse growers showed that most growers were irrigating greenhouse crops with water containing safe levels of EC, Na, and Cl. However, a small, but significant number, of growers were using water containing elevated levels of Na and Cl and accompanying high EC with the result being lower quality and even crop loss. Most often this water was from a private well or pond (usually near a road), but sometimes public drinking water was the source. With the current drought, it might be helpful to have water tested and test again prior to the spring growing season to prevent any potential problems.

The solutions to the problem of high Na and Cl include regular water testing during the growing season in borderline cases of excess Na and Cl and avoidance of over-fertilization to prevent high growth medium EC; installation of water treatment systems to remove Na and Cl; efforts to protect wells and ponds from salt contamination by runoff; mix existing water sources with collected water to dilute the high salts levels or, in extreme cases, finding a new source of water.

Resources

Northeast Regional Climate Center, Cornell University
http://www.nrcc.cornell.edu/

UMass Extension Floriculture Water Quality Project: I. Salinity, Sodium and Chloride
https://ag.umass.edu/fact-sheets/umass-extension-floriculture-water-quality-project-i-salinity-sodium-chloride

Greenhouse Best Management Practices
https://ag.umass.edu/greenhouse-floriculture/greenhouse-best-management-practices-bmp-manual

MA DEP Municipal Water Restrictions in MA (Map)
http://www.mass.gov/eea/agencies/massdep/water/watersheds/municipal-water-use-restrictions.html

Partial List of Water Testing Laboratories (for greenhouse water samples used by some growers)

QAL (http://www.qal.us/).
Everris Testing Lab http://protestinglab.everris.us.com/waterTesting.php
JR Peters http://www.jrpeters.com/lab-services/testing-services/nutritional.html
Water Agricultural Lab http://watersag.com/

Tina Smith, UMass Extension

Tree Assistance Program (TAP)

Some greenhouse growers also grow nursery stock, so I thought this article from Tom Smiarowski, UMass Extension Agricultural Risk Management Consultant, might interest some of you. *Tina Smith, UMass Extension*

Nursery tree & shrub growers, orchardists, and small fruit growers who experience losses from natural disasters during calendar year 2016 may be eligible for assistance under TAP, which is administered by the USDA - Farm Service Agency (FSA). Producers must submit a TAP application either 90 calendar days after the disaster event or the date when the loss is apparent.

TAP was authorized by the Agricultural Act of 2014 as a permanent disaster program. TAP provides financial assistance to qualifying orchardists and nursery tree growers to replant or rehabilitate eligible trees, bushes and vines damaged by natural disasters.

Eligible tree types include trees, bushes or vines that produce an annual crop for commercial purposes. Nursery trees include ornamental, fruit, nut and Christmas trees that are produced for commercial sale. Trees used for pulp or timber are ineligible.

To qualify for TAP, orchardists must suffer a qualifying tree, bush or vine loss in excess of 15 percent mortality from an eligible natural disaster. The eligible trees, bushes or vines must have been owned when the natural disaster occurred; however, eligible growers are not required to own the land on which the eligible trees, bushes and vines were planted. If the TAP application is approved, the eligible trees, bushes and vines must be replaced within 12 months from the date the application is approved. The cumulative total quantity of acres planted to trees, bushes or vines, for which a producer can receive TAP payments, cannot exceed 500 acres annually.

Interested growers should contact the FSA Office that serves their farming operation.

Questions regarding eligible trees, vines and bushes should be directed to the FSA Offices. To find your local office in MA see: https://www.fsa.usda.gov/state-offices/Massachusetts/index or http://offices.sc.egov.usda.gov/locator/app?state=ma&agency=fsa

Trial Garden Tour August 25th. Thank-you to our hosts/speakers Dave Fiske and staff at Elm Bank, Mass Hort Society; Laura Abrams and Robin Messer at JP Bartlett; Paul Cavicchio, Kerri Stafford and Cathy Davis at Cavicchio Greenhouses (photo shown here); and Heather Gartner, Pleasant View Gardens! **More on summer meetings in next issue.**

A Publication of the UMass Extension Greenhouse Crops & Floriculture Program

Floral Notes Newsletter

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In This Issue

Cultural Methods to Prevent Production and Disease Problems of Poinsettia 2

Tips on Storing and Using Beneficial Nematodes 5

Soil Testing in High Tunnels.....6

Elm Bank Trial Garden Tour – August 2016

Cultural Methods to Prevent Production and Disease Problems of Poinsettia

Geoffrey Njue, UMass Extension with input from Tina Smith

Growing poinsettias can be challenging because of their susceptibility to several diseases and production problems over the course of the long growing season. Growers are advised to monitor their poinsettia crops for potential problems and take actions to prevent the problems before they occur. The following are some of the common production problems and diseases and how to prevent them:

Production problems

- **Poor and uneven branching.** Plants become tall and lateral shoots emerge before pinch and break unevenly after pinch. Poor and uneven branching can be caused by delayed pinching of plants, hardened growth, high temperatures (>75 °F) during growth, plants spaced too close (not enough light in lower canopy). Also, some cultivars are more prone to poor branching.
  Management: This can be prevented by choosing cultivars that have a strong branching habit, pinching at the proper time (maximum 14 days from plant to pinch) , avoiding high greenhouse air temperatures (>75 °F during growth) and spacing plants properly.
- **Leaf distortions.** Plants develop distorted or cupped leaves. Leaf distortions can be caused by physical damage to the expanding leaves, overhead fertilization with phosphorus, dramatic changes in temperature and humidity and thrips damage.
  Management: Avoid physical damage to plants, for example when watering plants with a wand or handling plants during spacing or scouting. Avoid fertilizers containing high phosphorus. Use low P fertilizers such as 13-2-13 Cal-Mag to provide necessary phosphorus. Avoid large changes in temperature or humidity. Changes in temperature and humidity as plants are moved from propagation to finishing houses can lead to leaf distortion. It is thought that rapid changes in humidity, result in an accumulation of salts along the leaf margins and veins, resulting in leaf injury. This distortion becomes apparent as the injured leaves grow and expand. Thrips feeding also causes distorted leaves (and white scarring). Poinsettias are not a favored host of thrips, however, they may migrate from summer crops, garden mums or weeds onto poinsettias.
- **Bract or leaf edge burn.** The margins of the leaves or bracts turn brown and necrotic. This can occur when calcium is deficient and can also be caused by excessive soluble salts in the growing media.
  Management: To prevent bract or leaf edge burn, use fertilizer with calcium or use a calcium spray. Also, increase air circulation so that there is good transpiration for calcium movement inside the plant. Test growing media for soluble salts and monitor root health.
- **Lateral stem breakage.** The crop may look healthy and the roots look good, yet an occasional branch will wilt for no apparent reason. There are several possible causes for this condition such as:

- Too many nodes were left on the poinsettias during the pinch. Lower branches on these plants may be shaded and grow in a more horizontal position putting pressure on the junction of the branch and the main stem.
- Not enough calcium was used in the fertilizer program resulting in weak shoots.
- Poinsettias were pinched too early resulting in side branches growing too long.
- Low light levels during the vegetative growth phase after the pinch causing weak lateral branches.
- Lack of care when hand watering can cause a small physical break at the junction of the branch and main stem that is not observed until the branch wilts. The branch feels like a "loose tooth", still attached, but the vascular system is broken.

Also, some poinsettia cultivars are more susceptible to lateral stem breakage due to their growth habit. Although this condition usually occurs late in the production cycle or during shipping, it can occur at any time. Once the branch is wilted, it will not recover. It will have to be gently removed.

Diseases

For treatment options for diseases on poinsettias see the New England Greenhouse Floriculture Guide. The 2017-2018 New England Greenhouse Floriculture Guide will be available for a at the Northeast Greenhouse Conference, November 9-10, Holiday Inn, Boxborough, http://www.negreenhouse.org/

- **Botrytis blight (*Botrytis cinerea*).** Fuzzy gray sporulation and brown spots occur on flowers, leaves or stems. On poinsettias, *Botrytis* can cause leaf blights and then move from the leaf petiole into the stem, causing a stem canker. Water early in the day and heat and vent as needed to reduce humidity levels.
  Management: Increase plant spacing and air circulation and maintain night temperatures above 60^{O}F. Proper environmental management by using horizontal air flow (HAF) fans to promote air circulation and minimize cold spots is critical to managing *Botrytis*. Also, practice good sanitation such as removing plant debris and placing this debris in a covered trash can.
- **Poinsettia scab (*Sphaceloma poinsettiae*).** Slightly raised, circular or elongated lesions occur on leaves, petioles and stems. The lesions are tan in the center surrounded by white, red or purple margins. Lesions can encircle the stem causing dieback above the infected area. Affected leaves may yellow and drop. Plants that are infected also have abnormally long stems.
  Management: Minimize leaf wetting and avoid high humidity to prevent the disease from advancing. Remove and destroy all plants that display scab symptoms. If in doubt, isolate the plants and observe them. Remove plant debris from the greenhouse. Disinfect hands, tools, and other equipment frequently and immediately after handling plants with disease symptoms.
- **Pythium root and stem rot (*Pythium Spp.*)** Infected plants are stunted and lower leaves may turn yellow and fall off due to diseased roots. The fungus is favored by saturated growing media and high soluble salts. Pythium tends to occur during rooting of cuttings and again at the end of production when weather is cool and cloudy and growing media remains too wet.
  Management: Rogue out infected plants, avoid water logged media, and avoid high soluble

salts. Good sanitation is also crucial for prevention. Keep hose ends off the floor, wash hands before handling plants and avoid contaminating growing medium.

- **Rhizoctonia stem and root rot (*Rhizoctonia solani*).** Brown rot of stems beginning at the soil line, roots may have brown lesions and leaves can be infected where they touch the media under moist conditions.
  Management: Avoid planting too deep and injuring the stems and avoid high soluble salts.
- **Black root rot (*Thielaviopsis basicola*).** Roots develop black rotted areas, black sclerotia may form in the pith of the stem and spots may develop on the undersides of lower foliage. Plants show lack of vigor, leaf yellowing, leaf drop and sometimes sudden collapse of entire plants. Thielaviopsis is favored by cool soil temperatures (55-60F) and is most likely to develop when plants are being finished.
  Management: Avoid overwatering plants and maintain growing media pH above 6.0.

References

Paul Ecke Poinsettias, 1990. The Poinsettia Manual, Third Edition

Getter K., 2013. Common Greenhouse Poinsettia Production Problems. Michigan State University http://msue.anr.msu.edu/news/common_greenhouse_poinsettia_production_problems

Lopez R., 2008. Poinsettia production problems and disorders. Purdue University Extension fact sheet. https://www.ppdl.purdue.edu/PPDL/weeklypics/9-15-08.html

Whipker B., 1999. Physiological disorders of poinsettias. NC state university Extension fact sheet. https://www.ces.ncsu.edu/depts/hort/poinsettia/corrective/a11.html

Whipker, B. 2014. Poinsettia Fertilization: Getting Phosphorus Right. http://www.e-gro.org/pdf/354b.pdf

New England Greenhouse Update Messages

- Poinsettia Stem Breakage
  http://negreenhouseupdate.info/updates/poinsettia-stem-breakage
- Leaf Distortion on Poinsettias
  http://negreenhouseupdate.info/updates/leaf-distortion-poinsettia
- Poinsettia Diseases
  http://negreenhouseupdate.info/updates/poinsettia-diseases
- Pythium Root Rot on Poinsettias
  http://negreenhouseupdate.info/updates/pythium-root-rot-poinsettias

Tips on Storing and Using Beneficial Nematodes

Beneficial nematodes (*Steinernema feltia*) are best applied as a media drench to target the fungus gnat larvae. Treat as soon as possible (2 to 3 days) after sticking cuttings, planting plugs or starting seeds.

Storage and Viability
Biocontrol nematodes need to be stored at a constant 40° F. Avoid storing them in a refrigerator that gets opened frequently. It is best to purchase a dedicated refrigerator just for biocontrols so you have more even temperatures.

Let the nematodes sit at room temp for a little while before mixing them in the tank solution to avoid drastic changes in temperature.

Check their viability before application. To do this, place a small amount of the product in a small container. Add 1 or 2 drops of room temperature water; wait a few minutes and look for actively moving or swimming nematodes. Use a dark black background and a hand lens to see the small (0.6 mm or 0.02 inches in length) nematodes. Or shine a flashlight on them. Live nematodes actively move. Dead nematodes are usually straight, like an arrow.

Applying Nematodes
Nematodes are very sensitive to UV light and desiccation. Therefore, apply nematodes in the evening or at dusk or on a cloudy, overcast day.

Nematodes can be applied using a sprayer (remove screens and filters), injector, hose end sprayer or even a watering can in very small operations. Remove any screens and filters to prevent clogging. The hose nozzle should have large openings so the nematodes can move freely through this opening. If using a sprayer, keep spray pressure below 300 psi.

Media temperatures should be above 50° F but avoid applying when soil temperatures are above 80°F. Optimum media temperatures are between 60-70°F. (Use a soil thermometer to monitor temperatures).

Although nematodes are applied in water, they are not aquatic animals so they need extra care while in stock and tank solutions. Adequate aeration of the nematode suspension during application is important. This can be done using a small battery powered submersible pump or even mechanically with a stirrer to keep the solution agitated. A small pump will also keep them from settling on the bottom of the stock solution container, which they tend to do. The suspension in the spray tank should be kept cool and applied as soon as possible after mixing. This is especially important during the warmer months. The longer they are kept before spraying and the warmer the tank water, the more quickly their energy reserves are used up. Weaker nematodes are less robust during and after application, and less able to search for and infect a susceptible host.

Water the growing media before and after application. (Nematodes need moisture for movement). But, avoid over watering, so they are not washed out of the container.

Repeated applications are often needed. Reapply in 2 to 4 weeks under moderate to heavy infestations. For longer term crops, apply at the beginning and at mid-crop.

Fact sheets, Pesticide Compatibility Charts, and Databases

Beneficial Nematodes, UConn
Biological Control: Using Beneficial Nematodes, UMass
Nemasys from BASF (*Steinernema feltiae*)
NemaShield from Bioworks (*Steinernema feltiae*)
Koppert, Inc., (see side effects on left) – this brings you to their data base where you can input “Steinernema feltiae” under “latin name” and then plug in the product you plan to use.
Biobest, Check under 'Side Effects' – easy to use data base
Bioline compatibility chart from Syngenta - see Exhibitline (*Steinernema feltiae*)
Tina Smith, UMass Extension and Leanne Pundt, UConn Extension February 18, 2016

Soil Testing in High Tunnels

Katie Campbell-Nelson, UMass Extension and Vern Grubinger, UVM Extension (Thanks to Andy Radin, URI Extension and Bruce Hoskins, UMaine Soil Lab for review.)

(**Editor's note:** This article was published in the May 5, 2016 issue of Vegetable Notes. I'm publishing it here because I've had questions from flower growers about what test to use. I think this article will be helpful).

The soil in compost-amended greenhouses and high tunnel soils is somewhere between a field soil and a potting mix. In other words, the soil has been 'juiced' with extra organic matter and nutrients to meet the demands of crops that produce a lot more biomass than they typically do outdoors. That's why the results of a standard field soil test for these situations will often show nutrient levels 'off the charts' and no additional fertilization will be recommend because the target levels of nutrients are based on yield expectations in the field. In a high tunnel, crops can produce a lot more plant biomass and they grow for longer periods than in the field, requiring more nutrients to reach their yield potential. Nutrient runoff from high tunnel soils is not a concern but leaching could be a source of environmental contamination if crops are unhealthy and do not produce more biomass.

Fertility management in high tunnels depends greatly on whether the growing media is behaving more like a field soil or a potting mix, therefore it is helpful for a lab to conduct both a Modified Morgan standard soil test and a Saturated Media Extract (SME) test on the sample and pick one result for the best interpretation. The University of Maine soil lab is currently the only one in New England that offers a "Long Term High Tunnel Test" in which both tests (standard soil test and SME) are run on the same sample including nitrate, ammonium, soluble salts and organic matter. Bruce Hoskins, the UMaine soil lab director, then interprets both results side by side to determine if the soil is more like a potting mix or field soil and sends the appropriate result back to the grower. The UMass soil lab offers both tests, but not the interpretation appropriate for high tunnels. If you have either an SME or standard soil test from UMass for a high tunnel and need help with interpretation, contact Katie Campbell-Nelson (413)834-1090 (kcampbel@umass.edu).

Why use the Modified Morgan standard soil test? If your tunnel is still less than three years old, or you have not applied organic matter annually (compost, peat, leaf mulch, manure etc.), then your high tunnel soil is still likely to behave much like field soil. Therefore, a standard soil test is appropriate. These tunnel soils typically have <8% OM and <2 mmhos/cm of soluble salts. Keep in mind that results will be interpreted with the expectation for increased biomass and yields therefore optimum ranges are increased (Table 1).

Why use the Saturated Media Extract (SME) test? Often, a SME test is the most appropriate for high tunnel production because it measures what is immediately available in soluble form when plant growth is expected as soon as transplants are set into the soil and when crops will be fertigated. In addition, the SME test provides measures of soluble salts, nitrate-nitrogen and ammonium-nitrogen. These are not tested by the standard soil test, and they provide important information for tunnel fertility management. See Table 1 for optimum ranges based on the SME test.

Always test for soluble salts and soil nitrate and ammonium. Organic matter should also be included if you add it every year, otherwise, this may be tested once every 3 years. These tests may cost more, but for high tunnels, the information is worth it.

Sampling. As in the field, you want to take a representative sample consisting of a dozen or more subsamples taken throughout the tunnel. For the SME test, it is important that the soil has been moist and warm (~68-75°F) for at least a week before testing. Bring some soil into your home if

Table 1. Use this table to gauge whether your high tunnel test results indicate sufficient nutrients.

	Optimum and Normal Ranges		
Analysis	**Standard soil test for field soil[y]**	**Standard soil test for high tunnels[z]**	**SME test for high tunnels[z]**
pH	6.0-7.0	6.0-7.0	5.8-6.8
Organic Matter	-	8-12%	8-12%
Soluble Salts	<0.6 (1:2) dS/m	2-4 mmhos/cm	2-4 mmhos/cm
Nitrate-N	25-30 ppm	100-200 ppm	100-200 ppm
Ammonium-N	-	<10 ppm	<10 ppm
Phosphorous	4-14 ppm	20-40 ppm	1-5 ppm
Potassium	100-160 ppm	200-300 ppm	150-275 ppm
Calcium	1000-1500 ppm	-	>250 ppm
Magnesium	50-120 ppm	-	>60 ppm
Sulfur	>10 ppm	>25 ppm	25-100 ppm
Boron	0.1-0.5 ppm	0.5-1.2 ppm	0.05 -0.5 ppm
Copper	0.3-0.6 ppm	0.8-1.2 ppm	0.01 -0.5 ppm
Iron	2.7-9.4 ppm	6-10 ppm	0.3 -5.0 ppm
Manganese	1.1-6.3 ppm	4-8 ppm	0.1 – 3.0 ppm
Sodium	-	<200 ppm	<100 ppm
Zinc	1.0 -7.6 ppm	1-2 ppm	0.3 – 3.0 ppm
Aluminum	<75 ppm	-	-
Lead	<22 ppm	-	-

[y]Optimum and normal ranges based on the UMass Soil Lab for recommendations found in the New England Vegetable Management Guide: https://nevegetable.org/. [z]Optimum and normal ranges based on the UMaine Soil Lab for the long term high tunnel test: http://anlab.umesci.maine.edu/soillabfiles/prices/soiltest12.pdf

needed to allow it to incubate. While the field soil test only requires a cup of soil, the SME test requires a pint of soil. Take your samples prior to adding any fertilizers or compost.

Interpretation. Whether fertigating, making foliar applications, or soil incorporating; using organic or conventional materials, there are many successful fertility strategies for high tunnel production. For example, based on an SME test, here are recommendations for growers using organic soil amendments Table 2.

Table 2. Estimated fertilizer rates to increase SME nutrient levels. Adapted from 'Greenhouse Tomatoes, Lettuce & Cucumbers, by S.H. Wittwer and S. Honma. Michigan State Univ. Press. 1979.

	Material	Fertilizer analysis N-P-K	lbs of material needed/1,000 ft²
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
Pounds/1,000 sq. ft needed to raise P approximately 2 ppm	Bone meal	0-15-0	26.6
	Rock Phosphate	0-3-	133
Pounds/1,000 sq. ft needed to raise K approximately 20 ppm	Sul-Po-Mag	0-0-22-11Mg	2.6
	Potassium Sulfate	0-0-52	1.1
Pounds/1,000 sq. ft needed to raise Ca approximately 25 ppm	Calcium sulfate	(gypsum)	7.5
	Calcitic lime	(low Mag)	7.5
	Dolomitic lime	(hi Mag)	5.3
Pounds lime/1,000 sq. ft needed to raise soil pH ~1 full unit	Sandy loam	-	40
	Loam	-	80
	Clay loam or peat	-	120

The key to success is monitoring moisture, pH, soluble salt (EC) and once your plants are flowering and beginning to set fruit, it's time to plan for leaf tissue sampling. It's not a bad idea to do this several times during the season, regardless of whether you suspect a nutrient deficiency. These records are valuable both within the season and for seasons to come. For tomatoes, the most critical nutrients and the ones most often on the verge of insufficiency, especially when the plants are laden with several sets of fruit, are nitrogen and potassium. If attended to in time, these deficiencies can be corrected with fertigation.

Resources

Grubinger, V. 2010. Organic Greenhouse Tomato Nutrition. Univ. of Vermont Extension. https://ag.umass.edu/sites/agcenter/files/pdf-doc-pt/Organic%20Greenhouse%20Tomato%20Nutrition.pdf

Cox, D.A. How to Use pH and EC "Pens" to Monitor Greenhouse Crop Nutrition. UMass Extension. https://ag.umass.edu/fact-sheets/how-to-use-ph-ec-pens-to-monitor-greenhouse-crop-nutrition.

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