

Floral Notes *Newsletter*

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Growing Spring Crops in Greenhouses - Get Ready for Spring 2016!

November 10, 2015 10AM-3PM
TownePlace Suites Wareham MA

9:30 – 10:00 Registration and coffee

10:00 – 10:50 Greenhouse Sanitation and Weed Management

Russ Norton, Barnstable County Extension

Sanitizers and weed control are an important part of integrated pest management in greenhouses. In this presentation, Russ will cover greenhouse sanitizers, how they work and how to use them and weed management including herbicides for greenhouse use.

11:00 – 12:00 Managing Plant Nutrition of Greenhouse Ornamentals

Dr. Douglas Cox, UMass Extension and Stockbridge School of Agriculture

Doug will review the use of water soluble, controlled-release fertilizers and organic fertilizers for spring crops (containers and bedding plants) grown in greenhouses. Many symptoms on greenhouse crops are a result of improper fertility and often confused with insect and diseases. After this presentation you will know how to select fertilizers, identify and manage nutritional disorders, and how to use nutrients to manage plant growth.

12:00 – 1:00 Lunch (provided)

1:00 – 2:00 Managing Insects and Mites

Tina Smith, UMass Extension Greenhouse Crops and Floriculture Program

Tina will present detailed information about managing insects and mites in greenhouses such as aphids, fungus gnats, shore flies, thrips and mites using biological control and pesticide management strategies including organic materials.

2:10 – 3:00 Disease Management: Powdery Mildews, Botrytis, Downy Mildews and more...

Dr. Angela Madeiras, UMass Plant Disease Diagnostic Lab

Powdery mildews, Botrytis, and Downy Mildews are important plant pathogens in the nursery and greenhouse industry. Angie will cover tips for proper diagnosis and the specific management strategies for these pathogens including the use of biofungicides when applicable.

3 Pesticide recertification credits

Registration Information

Mail-in Registration: Cost \$40 for first registration, \$35 for additional registrations from same company.

Online Registrations with a credit card **include a processing fee** which is applied at checkout. Also note that you may see a discrepancy for on-line discount vs mail-in discount when registering more than one. Please contact Tina for more information.

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Organic Nutrition Project for Vegetable Transplants and Herbs

Geoffrey Njue, UMass Extension

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Douglas Cox, UMass Extension and Stockbridge School of Agriculture

Introduction

Organic vegetable gardening and small scale farming has gained popularity over the past few years. As a result some greenhouse growers are interested in growing organic vegetable and herb transplants to take advantage of the increased demand. To produce certified organic transplants and herbs, growers are required to use growing media (substrate) and fertilizers that are approved by a USDA accredited organic certifying agent. Products that are listed by Organic Materials Review Institute (OMRI) fit this criteria. There are many OMRI listed growing media and fertilizers commercially available, however there has been a lack of information for growing organic vegetable transplants and herbs in commercial greenhouses.

For of the past several years Dr. Douglas Cox of UMass Extension and Stockbridge School of Agriculture has evaluated the use of organic fertilizers for ornamental greenhouse crops. He evaluated fertilizers that could be applied using methods familiar to growers who use traditional water soluble fertilizers or granular slow release chemical fertilizers. While Doug continues to test new products, based on his research to date, he recommends Nature's Source 3-1-1 liquid fertilizer and Sustane 8-4-4 granular slow release fertilizer. Both products are approved by the Organic Materials Review Institute (OMRI), readily available and have good label directions for greenhouses. In his trials he has had the best success using Nature's Source and Sustane together to take advantage of each fertilizer's strengths. In his trials Sustane was incorporated into the substrate before planting. Nature's Source was then applied beginning 4 weeks after planting as a supplement.

Project

During the 2015 spring growing season, the UMass Extension Greenhouse Crops and Floriculture team invited growers to trial and evaluate Nature's Source fertilizer on a greenhouse crop. Nature's Source fertilizer and technical assistance was provided. Three growers participated. Here is a summary of the project at each greenhouse.

Grower One

Grower one is a retail grower that currently grows organic vegetable transplants certified by Bay State organic certifiers using primarily fish emulsion and are not satisfied with the quality of the plants. They decided to try Nature's Source and Sustane plus two other slow release granular fertilizers; Plant Tone (5-3-3) and Pro Gro (5-3-4). All fertilizers were OMRI approved. They also decided to try four different substrates used for organic production: Fafard organic mix, Espoma organic soil, Moo Doo organic potting soil, and Ideal compost. The trial consisted of four sets of media -fertilizer combinations with eight combinations for each media type. Sustane, Plant Tone and Pro Gro slow release granular fertilizers were incorporated in the media using a small portable cement mixer before planting.

Red Brandywine tomato transplants were grown in 4 inch pots. Four plants were grown in each substrate media combination. Plants were fertilized with Nature's Source using 250 ppm at every watering (constant feed). Plants were observed for 8 weeks. Soil tests were conducted during week 7 after planting and the results showed that there were differences in pH and EC in the different growing substrates.

Week 7 Growing Media Test Results

Growing Media	pH	EC
Espoma organic soil	4.96	1.22
Fafard organic	5.70	1.73
Ideal Compost	6.39	3.63
Moo Doo	6.35	1.90

Observations on the quality of the plants, comparing the size and color of the plants showed that the best quality transplants were produced using Fafard Organic mix with Sustane and Nature's Source fertilizer combinations. Other combinations that produced good quality transplants were; Fafard Organic Mix with Pro Gro and Nature's Source; Fafard Organic Mix with Pro Gro; Moo Doo Potting Soil with Nature's Source and Pro Gro; and Moo Doo with Nature's Source. The four sets of media fertilizer combinations are shown in Tables 1-4.

Table 1 Treatments Using Fafard Organic Mix and Organic Fertilizers

Substrate	Granular Fertilizer	Liquid Fertilizer	Grower Comments on Plant Quality
Fafard Organic Mix			Plants were short and stunted.
Fafard Organic Mix	Sustane (8-4-4)		Good growth and were plants healthy.
Fafard Organic Mix		Natures Source (3-1-1)	Growth ok. Better than without fertilizer.
Fafard Organic Mix	Sustane (8-4-4)	Natures Source (3-1-1)	Very good growth. Strong healthy Plants.
Fafard Organic Mix	Plant Tone (5-3-3)		Plants looked good at the beginning.
Fafard Organic Mix	Plant Tone (5-3-3)	Natures Source (3-1-1)	Growth ok. Lost one plant.
Fafard Organic Mix	Pro Gro (5-3-4)		Good growth. Plants healthy.
Fafard Organic Mix	Pro Gro (5-3-4)	Natures Source (3-1-1)	Good growth. Plants healthy.
Summary: Best combination for Fafard mix was Sustane with Natures Source			

Table 2 Treatments Using Ideal Compost and Organic Fertilizers

Substrate	Granular Fertilizer	Liquid Fertilizer	Grower Comments on Plant Quality
Ideal Compost			Growth ok. Plants healthy and acceptable.
Ideal Compost	Sustane (8-4-4)		Very good growth and good healthy plants.
Ideal Compost		Natures Source (3-1-1)	Good growth overall. Plants healthy.
Ideal Compost	Sustane (8-4-4)	Natures Source (3-1-1)	Good growth. Plants shorter that with just Sustane.
Ideal Compost	Plant Tone (5-3-3)		Plants were green but stunted.
Ideal Compost	Plant Tone (5-3-3)	Natures Source	Growth ok. Plants better than

		(3-1-1)	with just Sustane.
Ideal Compost	Pro Gro (5-3-4)		Plants were smaller but green and healthy.
Ideal Compost	Pro Gro (5-3-4)	Natures Source (3-1-1)	Plants were smaller but green similar to only Pro Gro.
Summary: Ideal Compost worked well with Sustane only. Natures Source did not make any difference.			

Table 3. Treatments Using Moo Doo Potting Soil and Organic Fertilizers			
Moo Doo Potting Soil			Good growth. Plant quality acceptable
Moo Doo Potting Soil	Sustane (8-4-4)		Good growth overall. Acceptable Plants quality
Moo Doo Potting Soil		Nature's Source (3-1-1)	Good growth. Strong healthy plants.
Moo Doo Potting Soil	Sustane (8-4-4)	Nature's Source (3-1-1)	Lost one plant. Other plants healthy
Moo Doo Potting Soil	Plant Tone (5-3-3)		Inconsistent growth
Moo Doo Potting Soil	Plant Tone (5-3-3)	Nature's Source (3-1-1)	Inconsistent growth but plant quality better
Moo Doo Potting Soil	Pro Gro (5-3-4)		Very good growth and quality plants
Moo Doo Potting Soil	Pro Gro (5-3-4)	Nature's Source (3-1-1)	Plants taller and a bit stretched
Summary: Moo Doo worked very well with only Nature's Source.			

Table 4. Treatments Using Espoma Organic Soil and Organic Fertilizers			
Espoma Organic Soil			Plants short and stunted
Espoma Organic Soil	Sustane (8-4-4)		Good growth overall. Plants healthy
Espoma Organic Soil		Nature's Source (3-1-1)	Poor growth overall . Plants shorter
Espoma Organic Soil	Sustane (8-4-4)	Nature's Source (3-1-1)	Good growth. Some plants stunted
Espoma Organic Soil	Plant Tone (5-3-3)		Good growth overall. Plants healthy
Espoma Organic Soil	Plant Tone (5-3-3)	Nature's Source (3-1-1)	Good growth, but a few plants stunted
Espoma Organic Soil	Pro Gro (5-3-4)		Growth growth and vigor. Plants generally healthy
Espoma Organic Soil	Pro Gro (5-3-4)	Nature's Source (3-1-1)	Better growth and better quality plants the other combinations
Summary: Espoma soil worked best with Pro Gro and Nature's Source. However plant quality was not acceptable			

Grower Two

Grower two is a wholesale grower. They grow spring ornamental plants and an assortment of herbs conventionally with water soluble fertilizers through an injector. They were interested in growing herbs organically and investigate expanding their market. They grew celery and basil in 4 inch pots using Fafard Organic Mix with Sustane and Nature's Source. We compared the soil analysis of the organically grown celery with the celery grown using chemical fertilizers and found that the media pH was about the same. Soil pH of organically celery was 5.81 and the soil pH of celery with chemical fertilizers was 5.90. However the media EC was lower in celery grown using chemical fertilizers (organic EC was 1.01 and chemical fertilizer EC was 0.31). Observations on the quality of the plants comparing the size and color of the plants showed that the organically grown herbs were very good quality plants but they were slightly smaller than those grown using chemical fertilizers. Although the organic herbs were slightly smaller, they maintained their quality longer than those grown using chemical fertilizers. The grower felt that it was more expensive to grow the herbs organically than conventionally, and it was not economically feasible at this time.

Grower Three

Grower three is a wholesale farm with a small greenhouse. They grow vegetable and herb transplants organically for their own use in the field. They currently grow transplants using fish emulsion and kelp as fertilizers in Ideal compost as a growing media. They mix up small batches of fertilizer and apply using a watering can or sub-irrigate by dipping the flats into a tray containing fertilizer.

In the first trial the grower grew beet transplants and compared plants grown with Nature's Source (100 ppm) vs fish emulsion. Plants were fertilized sporadically (not at every watering). At 3 weeks, the plants grown with Nature's Source were chlorotic and small, showing symptoms of nutrient deficiency. Plants grown with fish emulsion were larger and darker green. The plants grown with Nature's Source improved in size and color after one week of constant feed and increasing the rate of Nature's Source fertilizer to 200 ppm.

In the second trial, the grower grew kale transplants and compared plants grown in Promix MP vs Ideal Compost. Plants grown in Promix MP and fertilized with Nature's Source were compared with plants grown in Promix MP and fertilized with fish and kelp, both at 100 ppm. Plants grown in Ideal compost did not receive supplemental fertilizer. After 3 weeks, soil tests were conducted and plants evaluated. The pH of Promix MP growing media was 5.7 for both, Nature's source and fish/kelp and EC was less than 100 for both. The ideal compost pH was 6.91 and EC was 3.5. Assessing size and color and root health, the following observations were made:

Promix MP with Nature's Source – Small plants, chlorotic lower leaves and excellent root systems.

Promix MP with fish emulsion/kelp – Small plants, chlorotic lower leaves and good roots. Similar to Nature's Source.

Ideal Compost – Large leaves, large plants, weak stems (leggy) and very few roots.

Final Thoughts: More trials would need to be conducted using the Promix MP to adjust the fertilizer rate for better quality plants. All composts should be tested prior to use for EC and pH and rates of supplemental fertilizer adjusted as needed.

The grower did not want to use a fertilizer injector or use constant feed and expressed that the use of compost that contained nutrients was better suited for his purpose.

September Greenhouse Clean-up and Biocontrol

It is best to clean greenhouses now rather than waiting until just before you start your spring production. This helps eliminate over-wintering sites for pests, in unheated greenhouses, especially if the winter is unseasonably warm. Remove all leftover plants, weeds and debris and clean the floor of spilled soil, and organic matter. Check areas around furnaces and alongside-walls and remove those small weeds that are often overlooked. Repair tears in worn weed barriers. If replacing worn weed barriers, do not place gravel on top of the weed mat for it traps spilled media and holds moisture creating an ideal environment for weeds, diseases, insects and algae. It is also a good time to correct any drainage problems and low spots in greenhouses.

The pre-emergence herbicide, indaziflam (Marengo®) is labeled for use on greenhouse floors in **empty greenhouses**. You must wait 24 hours before introducing plant material into the empty greenhouse after applying this material.

Biocontrols will not clean up existing, out of control pest populations. However, if a greenhouse is cleaned of weeds, old plants and debris, biocontrols may help prevent pests from overwintering especially during a warm fall. Here are some biocontrol options for two-spotted spider mites, aphids, thrips and whiteflies.

Two spotted spider mites: Predatory mites such as *Phytoseiulus persimilis*, *Neoseiulus californicus*, *Amblyseius andersonii*, *Neoseiulus (Amblyseius) fallacis* and the predatory midge larvae, *Feltiella acarisuga* are commercially available. Rove beetles (predatory ground beetle) and *Stratiolaelaps scimitus* (a type of predatory mite) will feed upon spider mites that have moved off of plants to find crevices in the greenhouse where they go into dormancy.

Aphids: Discard existing **banker plants** with established populations of *Aphidius* this month. Their effectiveness may be reduced in the late summer when *Aphidius* is often attacked by different species of naturally occurring parasitic wasps (called hyperparasites). These hyperparasites migrate into greenhouses from outdoors until hard frosts occur. So, they will continue to reproduce in *Aphidius* wasps by laying an egg inside the aphid (that is parasitized by *Aphidius*), within or near the egg of the parasitic wasp (*Aphidius*). These hyperparasites can disrupt the effectiveness of an aphid biological control program using *Aphidius spp.* in banker plant systems and will lessen aphid control throughout the fall and winter.

It is difficult to distinguish adult hyperparasites from parasites. The shape of the exit holes of parasitized aphid mummies may be used as an indicator. Aphid parasites, such as *Aphidius spp.* leave a round exit hole with a smooth edge in the aphid mummy. Hyperparasites make an exit hole that is not exactly round with jagged margins.

New banker plants can be placed into the greenhouse after hyperparasites no longer migrate in from outdoors and existing populations in the greenhouse have died. *Aphidius (Aphidius) matricariae*, *A. colemani*, *A. ervi* do not diapause (become dormant) in response to short days and can be released once greenhouses are free from hyperparasites.

The predatory midge *Aphidoletes aphidimyza*, is also effective for aphids and is not susceptible to hyperparasites, but will diapause when daylength is less than 16 hours. Low light affects the larva when it goes into its pupal stage. However, *Aphidoletes* can be released to clean up a few aphids, but they will not reproduce successfully for ongoing management without supplemental light. Low light diapause can also be overridden by temperatures of 78° F or higher. So *Aphidoletes* can be used in warmer greenhouses even with short day length and low light. *Aphidoletes* overwinter as larvae in cocoons in the soil and pupate and emerge as adults in spring. Most eggs are laid during the first few days after emergence.

Thrips: The predatory mite *Amblyseius cucumeris* can be used for thrips during September and October. In a recent newsletter, IPM Laboratories recommended releasing the soil dwelling rove beetles and *Stratiolaelaps scimitus* (predatory mite) that are effective against pupae in the soil. Both of these predators are active at cool temperatures (50F).

Whiteflies: Good weed management and the absence of plant material should eliminate whiteflies from the greenhouse, (assuming you are not growing poinsettias), however whitefly parasites such as *Eretmocerus emericus* (for use against silverleaf whitefly) or *Encarsia formosa* (for use against greenhouse whitefly) can be released.

Tina Smith, UMass Extension and Leanne Pundt, UConn Extension *Greenhouse Update*,
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UMass Greenhouse Crops and Floriculture Extension Program

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