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New Director of the UMass Soil and Plant Testing Lab

Soil Scientist John Spargo joined UMass Extension this fall as the Director of the Soil and Plant Tissue Testing Lab. Located in the West Experiment Station on the UMass Amherst campus, the lab provides test results and recommendations to commercial growers and home gardeners to help them make well-informed and economical decisions related to plant nutrition, soil fertility, and nutrient management. As John familiarizes himself with New England, he is learning about local issues related to soil fertility and plant nutrition and exploring potential solutions. He is especially excited about working with the large diversity of crops and production systems in found in Massachusetts.

Prior to joining UMass, John worked for the USDA – Agricultural Research Services in Beltsville, Maryland where he focused on soil fertility management and nutrient cycling in organic forage and grain cropping systems. During his tenure, John collaborated with several organic farmer-collaborators who helped identify critical issues related to soil fertility and nutrient management, and who facilitated the design and execution of relevant on-farm research. John earned his doctoral and master's degrees from Virginia Tech, and his bachelors from Texas A&M. His graduate and undergraduate studies examined a range of soil management related issues including carbon sequestration, soil quality, phosphors availability, nitrogen cycling, nutrient runoff and leaching, and soil erosion.

In his new position with UMass, John will be working with other Extension faculty and staff to carry on the legacy of the UMass Soil and Plant Tissue Testing Lab as a valuable resource for growers, landscapers, and gardeners of the Commonwealth.

When not engrossed in laboratory analysis and field research, John enjoys spending time with his family – hiking, gardening, and homesteading.

2012 Connecticut Easter Lily Schedule

Weeks Prior to Easter	Date	Forcing method: Case-Cooled	Forcing method: Pot-Cooled (CTF)
24	Oct. 23	**This schedule designed to produce 16" lilies that bloom 1-week before Easter.** Notes on next page & accompanying article for details. Programming starts immediately. Prep for lily arrival. Test soil & inspect bulbs.	
23	Oct. 30	**Start bulb programming as soon as bulbs arrive but no later than 23 weeks before Easter.**	
		Cool at 40-45F for 6 weeks	Pot and allow roots to grow at 60-62F for 3 weeks
20	Nov. 20	---	Cool at 40-45F for 6 weeks
17	Dec. 11	**Pot no later than 17 weeks before Easter** Force in greenhouse at 60-62F in pot.	---
14	Jan. 1	**Shoots emerging ~ 0.5" tall & buds beginning to set.** Start fertilizing & keep moist.	
		---	Force in greenhouse at 60-62F in pot.
13	Jan. 8	1.25-1.5" tall. Keep lilies moist & use fungicide drench as needed. Bud initiation coincides with stem root development.	
12	Jan. 15	2.25-2.5" tall. Run 60-62F day/ night during bud initiation. Begin leaf counting as soon as bud set is complete.	
11	Jan. 22	3-3.5" tall. Apply growth regulator when 3-5" tall. Repeat leaf count on late batches of lilies. Maintain temperature below 65F until bud initiation is done.	
10	Jan. 29	4-4.5" tall. Check for bud set & begin leaf counting and graphical tracking. Use temperature to control the rate of lily development & DIF to control height. ADT 65-70F. Check for aphids & root problems. Apply Marathon sometime during weeks 10, 9, or 8.	
9	Feb. 5	4.75-5.5" tall. Space lilies to avoid yellow leaves & stretching. Soil test & if leaf scorch is evident, use calcium nitrate for balance of schedule.	
8	Feb. 12	5.5-6.5" tall. Adjust temperatures as needed.	
7	Feb. 19	6.5-7.5" tall. 42 days to sale. Buds can be felt. If buds are visible on early planting run 60F until finish.	
6	Feb. 26	7.25-8.5" tall. Buds ~0.75". Lilies are about half final height. Buds should be visible no later than 30 days prior to sale. Grade for uniformity as buds become visible. Apply Fascination or Fresco if leaf yellowing is evident, or if cooling is anticipated.	
5	Mar. 4	Lilies 9-10.25" tall. Buds 1.25" long.	
4	Mar. 11	Lilies 10.5-12" tall. Buds 1.75-2" some bending down.	
3	Mar. 18	Lilies 12-13.5" tall. Buds 2.75". If aphids present, use a total release smoke or aerosol.	
2	Mar. 25	Lilies 13.5-15.25" tall. Buds 4-4.25" long. some turning whitish. Stop fertilizing & apply clear water once before sale. Cool lilies at 35-45F to hold. Apply Fascination or Fresco prior to cold storage.	
1	Apr. 1	Final lily height 15-17" tall. Buds 6-6.25" long & at or near bloom. Shade lilies immediately after they are removed from storage.	
0	Apr. 8	**Easter Sunday 2012**	

Notes & Comments on the 2012 Connecticut Easter Lily Schedule

Easter 2012 outlook: Easter falls on a mid-date in 2012 (April 8). Mid-date Easter schedules are the easiest to manage. You will have plenty of time to follow the full schedule and force at normal temperatures.

Pot-cooled bulbs are normally potted & held for three weeks at 60-62F before the six weeks of bulb cooling (at 40-45F) begins (see the 2012 Easter Lily schedule for details). The bulbs then require 14 weeks of greenhouse forcing. This entire process requires 23 weeks from initial potting to Easter. This same process is used for both naturally cooled or CTF bulbs.

Case-cooled bulbs require six weeks of cooling followed by 17 weeks of greenhouse forcing to flower in time for Easter. Be sure that commercially case-cooled bulb arrive & are planted by Dec 11, 2011. If you cool your own bulbs, start as soon as bulbs arrive but no later than Oct 30, 2011 (23 wks before Easter).

Insurance lighting: Insurance lighting should not be needed this year. However you can substitute 1-week of insurance light for 1-week of bulb chilling if the

Fertigation: Start fertilizing using a 15-0-15 or comparable formulation when lilies emerge. If phosphorus was not added to the medium, 20-10-20 can be used on an alternating basis with a 15-0-15. Fertilizer rates should range from 200-400 ppm. Do not allow medium EC to exceed 3-3.5 mmho/cm based on a Saturated Media Extract. Stop fertilizing 1-week prior to sale. Provide one clear watering before shipping lilies - this will reduce salt levels in the potting medium and maximize keeping quality. Do not withhold water or fertilizer to slow development. Do not over water (i.e. water too frequently) or root rot problems may occur.

Decrease Leaf Yellowing & Delay Flower Senescence: To prevent early-season leaf yellowing (7 to 10 days before visible bud) & mid-season leaf yellowing (7 to 10 days after visible bud) spray Fascination at 10/10 ppm. (Note: Fascination contains two active ingredients and recommendations include the concentration of each). Apply only to lower leaves & cover thoroughly. To prevent late-season leaf yellowing and post-harvest flower senescence, spray 100/100 ppm to thoroughly cover all foliage & buds. Apply when buds are 3 to 3 ½" long BUT NOT MORE than 14 days before shipping or cooling. Protects leaves from yellowing for up to 14 days. Note: Avoid direct contact of spray to immature leaves during early- & mid-season applications or increased stem stretch will result.

Disease and pest control: Before planting, clean bulbs of debris removing any damaged scales, especially scales that show evidence of infection. Once potted, root rots associated with Rhizoctonia, Fusarium, and Pythium are a concern. Drench immediately with Banrot or Insignia, broad-spectrum fungicides, or you can treat to control these diseases separately by selecting from the fungicides specifically registered for Rhizoctonia, Fusarium and Pythium control on lily. Materials registered for Rhizoctonia and/or Fusarium include 26GT, 26/36, Contrast (Rhizoctonia),, and Terraclor WP (Rhizoctonia). Materials registered for controlling Pythium include Alude, Banol, Subdue Maxx, and Truban. Check with manufacturers regarding compatibility when tank mixing fungicides. Fungicides may also need to be re-applied later in the crop, check labels for guidance. Preventative biological fungicides (RootShield, CEASE, Actinovate, Mycostop or Companion) may also be applied for disease suppression and to enhance root growth. Check with company or product labels information on time intervals between application of biological fungicides and traditional fungicides.

Aphids, fungus gnats and bulb mites are a major concern. Use only aerosols once in bud. Many chemicals are listed for aphid control, including, Safari,, Flagship, Tristar, Marathon, DuraGuard, Distance, Enstar AQ, Preclude TR, Tame, UltraPure Oil, Insecticidal Soap, Talstar and Endeavor. Fungus gnats can be controlled with many of these same chemicals as well as Citation, Adept, insect parasitic nematodes (Nemasys, NemaShield, Scanmask) and Gnatrol. Bulb mites, Rhizoglyphus robini, represent one of the more troublesome insect pests on lilies and effective management requires an integrated approach. Bulb mites are considered a secondary pest and are commonly associated with decay caused by fungus gnat damage and soil-borne fungal pathogens. To best manage this problem, sort out diseased and damaged bulbs before planting, handle bulbs gently and monitor and control fungus gnats. Duraguard is labeled as a drench for soil borne organisms that may include bulb mites.

Note: Registration of pesticides varies by state so consult and follow labels for registered uses. To avoid any potential phytotoxicity or residue problems, spot test first before widespread use. No discrimination is intended for any products not listed.

Controlling Lily Height: Use A-Rest, Chlormequat E-Pro, Concise, Cycocel, Topflor or Sumagic as needed when shoots are 3-5" tall. Split applications provide the best results. You can apply any of the PGRs at ¼ to ½ normal rate as needed, to control height. Reduce the concentrations of Sumagic used when combined with DIF. Use DIF, or cool morning DIP, to control lily height. Equal day/night temperatures, high night/low day temperatures or a cool morning temperature dip will keep lilies short.

Lily storage: Lilies can be stored for up to 14 days in the dark at 35-45F when buds turn white but before they open. Spray for Botrytis control prior to moving lilies to cold storage. Materials registered for botrytis control on lilies include 26GT, 26/36, Daconil, Exotherm Termil, Sextant, and Protect DF. Follow label directions. Water Easter lilies thoroughly before starting cold storage. After removing from the cooler, place lilies in a shady location to avoid excessive wilting.

Graphical Tracking of Lily Height: Monitor lily height regularly during forcing. If height exceeds the target size, run negative DIF to slow stem elongation. If height is less than the target size, run positive DIF to increase stem elongation.

Heating Your Greenhouse with Grain Corn Hybrid Yield Evaluation

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Massachusetts has over 1,000 growers producing greenhouse crops in over 17 million square feet of protected growing space (2007 Census of Agriculture). This includes over 16.5 million sq ft. in bedding plants, flowers and floral greens, foliage plants and potted flowering plants and over 1.2 million sq ft in vegetable crops. Temperature needs of the crops vary, but often require a night temperature of at least 60° F. Most of Massachusetts' greenhouses are heated with either fuel oil or liquid propane. A 20,000 sq. ft. greenhouse, heated all winter with a night temperature of 60° F, uses an estimated 3200 gallons of fuel oil or the equivalent (Bartok, 2006). While there are no firm figures on the total fossil fuel used for greenhouse heat in the state, we know that we have the equivalent of at least 800 greenhouses that are 20,000 sq. ft. in size. If only one third of these greenhouses are heated all winter, and two thirds of these greenhouses begin heating in late winter (using one-third the heat energy), our total use of fossil fuels for greenhouse heat is equivalent to more than 1.5 million gallons of fuel oil.

This project focuses on shelled com, a renewable heat source that can be grown and used in Massachusetts more cheaply than fossil fuels, using available and proven technology. We chose com for this project because, unlike other potential biomass fuel sources, it is an annually renewable fuel source, bums cleanly, requires minimal processing, helps to preserve agricultural land and businesses, and can be produced in quantity locally. At current prices, com compares very favorably with the standard fossil fuels that are used for greenhouse heat. Changing to energy sources that can be produced locally, travel a short distance from producer to user, and that have a high ratio of energy output to fossil. Fuel input is the key to a viable future for farming in Massachusetts. To that end, we have partnered with a number of growers across the state that has begun using com furnaces and boilers for heating their greenhouses. We collect information on their experiences with this technology and share their experiences with a wider circle of interested growers through field days, on-farm meetings, newsletter articles, and the umassvegetable.org website.

The emphasis of this project is on making the best possible use of our land for food and fuel production and not to detract from our ability to grow food crops. We're envisioning a system where fuel crops become a valuable rotational crop in vegetable farms and an alternative revenue stream for dairy farmers in a time of shrinking demand for silage; not a system in which the production of fuel shifts acreage away from food production.

Com silage hybrids were evaluated for grain yield performance at the University of Massachusetts Crops Research and Education Center Farm, in South Deerfield, Massachusetts in 2010. Hybrids were placed in three groups based on relative maturity (RM) provided by the seed companies; Group I, shorter season maturity group (85-94 days), group II mid maturity group (95-100 days), and group III, full season group (101-115 days). Ears were handpicked on October 7, October 11, and October 14 for Group I, Group II, and Group III, respectively. In 2010 the corn crop experienced hot and dry conditions especially in August which coincides with grain filling stage. The late dry condition had less negative impact on shorter-season hybrids compared to full-season hybrids. As a result, the shorter-season maturity hybrids in general performed better compared to full-season maturity groups. The result of grain yield, grain moisture at harvest, and cob/ear ratio of all hybrids tested in 2010 are presented in the following table.

Table 1. Grain yield, grain moisture at harvest, and cob/ear ratio for three maturity group hybrids planted on May 6th, 2010 and harvested at about 20% grain moisture.

Brand	Hybrid	Maturity group	Grain yield (Bu/acre)	Grain moisture (%)	Cob/ear (%)
TASeeds	TA290-11 (CB/LL)	I	208	18	13
Dairyland	ST-9789 (RR)	I	208	19	9
Agrisure (NK)	N20R-GT	I	152	18	13
Mean			189	18.3	11.7
TASeeds	TA501-161	II	183	21	11
Dairyland	ST-3195Q (RR)	II	172	20	10
DEKALB	DKC 46-07	II	206	20	9
DEKALB	DKC46-6	II	193	21	10
DEKALB	DKC49-94	II	181	21	12
DEKALB	DKC45-52	II	181	19	11
DEKALB	DKC48-37	II	183	20	11
Mean			185.6	20.3	10.6
TASeeds	TA788-13 (YGVT3)	III	164	23	13
Dairyland	ST- 9703Q	III	182	20	11
DEKALB	DKC 52-59 (VT3)	III	162	18	13
DEKALB	DKC 54-16 (VT3)	III	192	19	10
DEKALB	DKC 57-50 (VT3)	III	174	24	13
DEKALB	DKC 59-64	III	185	21	11
DEKALB	DKC 61-69	III	199	21	11
DEKALB	DKC 63-42	III	187	23	11
DEKALB	DKC 63-84	III	183	21	11
DEKALB	DKC 50-35	III	195	17	10
Mean			182	20	11
Overall Mean			185	19	11
CV(%)			15.2	7.9	8.6

*Grain yield was adjusted to 15.5% moisture

Fertilizing Bedding Plant Seedlings

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Fertility is an important factor in the production of high quality seedlings by the plug method or traditional row or broadcast methods. Recent research has shown that fertilization must begin shortly after germination and that abnormal seedling growth is often caused by nutrient disorders.

The success of a fertilizer program for bedding plant seedlings and transplants is determined by more than just the rate (ppm) of fertilizer applied. Other factors which are as important as rate include fertilizer type (NPK analysis, micronutrient package, proportion of ammonium (NH_4) vs. nitrate (NO_3), and pH effect), frequency of application, volume of fertilizer solution applied, and how much leaches from the container. Also the growth rate of the young plant as it is affected by light intensity and temperature influences the fertility requirement of the plants.

Fertilizing Seedlings and Plugs

Plug researchers have identified four stages of seedling growth and have developed guidelines for fertilizing each stage (Table 1). Fertility is not a critical factor for most species during Stage 1 because most seeds have enough stored nutrients to carry out germination. Also, many germination media have a starter charge of fertilizer which is effective at supplying nutrients as the root emerges and elongates. The most important factors for germination are temperature of the growth medium and a proper balance between moisture level and aeration. Beginning in Stage 2 a dilute fertilizer program is normally started and the rate of application is gradually increased as the seedlings grow larger and approach transplanting. The rates in Table 1 are general starting points and they can be fine-tuned by the individual grower.

Table 1. Fertilizing seedlings before transplanting.

Seedling or plug stage of development	Water-soluble fertilizer program
Stage 1: Germination and root emergence.	No fertilizer
Stage 2: Opening of the cotyledons.	25-50 ppm N
Stage 3: Development of 1st set of true leaves.	50-100 ppm N
Stage 4: 1st set of true leaves to transplant.	>100 ppm N

Seedling Disorders Related to Fertility

During Stages 2 and 3 several nutrient disorders may occur, they are: 1) shoot tip distortion or death, 2) misshapen cotyledons or true leaves, or 3) seedling chlorosis. Shoot tip and young leaf abnormalities have been linked to excess soluble salts and deficiencies of either calcium (Ca) or boron (B). Seedling chlorosis may indicate low overall nutrition or a deficiency of iron (Fe). It is important to remember that nonnutritional problems may cause similar symptoms. For example, temperatures below 65°F or chronic, prolonged periods (>4 hr) of water droplets standing on the growing points may cause shoot tip and young leaf abnormalities.

Fertilizer Program Affects Seedling Size

In Stages 3 and 4 the fertility program can have significant effects on seedling height and overall size. Levels of overall nutrition, NH_4 vs. NO_3 nutrition, and phosphorus (P) nutrition have the greatest effects on size.

Traditionally, many growers have slowed the growth of bedding plants by not fertilizing or using very low levels. This approach is very effective at reducing height and may improve root growth. However, the disadvantages of low nutrition are that the seedlings become chlorotic and may fall behind schedule. On the other hand high nutrition will prevent chlorosis and keep the plants on schedule, but the seedlings may become too large and the root systems may be small. A moderate level of nutrition (100-150 ppm N) is probably the best compromise.

Research has shown that seedlings and young plants of many bedding plant species grow taller and are greener with NH_4 compared to $N0_3$ nutrition. Taller plants result from using fertilizers supplying >50% NH_4 (e.g., 15-15-15, 15-16-17, 20-10-20) and shorter plants can be had by fertilizing with a high NO_3 fertilizer (e.g., 15-0-15, calcium and potassium nitrate, EXCEL fertilizers). These effects are somewhat complicated by the pH effects and the P levels of the fertilizers.

A mild deficiency of P can reduce height without causing nutrient deficiency symptoms or delay in plant development. The method has been used most successfully with petunias and tomatoes, but most bedding plants are probably responsive. Fertilizers to try are those with a P analysis is 0-2%. Very little P is required to satisfy the requirements of common bedding plants. In fact, the starter charge in many soilless media seems to be enough to carry marigolds and seed geraniums to flowering with little or no effect on height.

pH Requirements of Seedlings and Plugs

Growth medium pH is an important factor in seedling production. pH-related problems are common for plugs because of the very small volumes and limited pH buffering capacity of growth medium in plug trays. Many bedding plant species are tolerant of a wide range of pH levels. However, researchers at North Carolina State University have found that a number of bedding plants have very specific requirements (Table 2). These specific pH ranges are needed to prevent micronutrient toxicities or deficiencies of B, Ca, and Fe.

Several factors interact to determine pH of a growth medium: materials used to formulate the mix and the amount of limestone added, irrigation water alkalinity, use of acidic or basic fertilizer, and plant species. Most soilless growth media are very acidic to begin with and

Table 2. pH ranges for bedding plant seedlings.

Plant	**pH**	**Why?**
Most bedding plants	5.4-6.8	pH tolerant
Celosia	6.0-6.8	Prevent Fe/Mn toxicity
Dianthus	6.0-6.8	Prevent Ca deficiency and NH_4 toxicity
American marigolds	6.0-6.8	Prevent Fe/Mn toxicity
Geranium	6.0-6.8	Prevent Fe/Mn toxicity
Pansy	5.4-5.8	Prevent B & Fe deficiency
Petunia	5.4-5.8	Prevent B & Fe deficiency
Salvia	5.4-5.8	Prevent B deficiency
Snapdragon	5.4-5.8	Prevent B & Fe deficiency
Vinca	5.4-5.8	Prevent B & Fe deficiency

[z]North Carolina State University Plug Research Group

a portion of the acidity must be neutralized with limestone in order for the starting pH to fall in the range of 5.4 to 6.8.

The remaining factors come into play once the mix is in use for growing seedlings and plants. High alkalinity water (i.e., water with pH >7-8 and bicarbonates above 100 mg/liter) causes growth medium pH to go up. The increase in pH can be detrimental to those species in Table 2 needing pH 5.4-5.8. Where alkaline water is a problem, growers can inject dilute acid to lower pH and counteract alkalinity. Keep in mind that alkalinity (level of bicarbonates) is more important than pH. High pH water with low alkalinity is much less a concern than water with both factors high.

Some growers use nitrogen fertilizers to manipulate pH. Fertilizers supplying >50% NH_4 (e.g., 15-15-15, 15-16-17, 20-10-20) are acidic fertilizers and high NO_3 fertilizers (e.g., 15-0-15, calcium and potassium nitrate, EXCEL fertilizers) are basic fertilizers. Continued use of NH_4 fertilizers tends to make the pH go down while continued use of NO_3 fertilizers makes the pH go up. Generally these changes are not very large (0.5-1 pH unit) and they occur slowly. However, these fertilizers can be very useful in offsetting alkalinity or stabilizing pH in a desired range.

Plants themselves can have an influence on growth medium pH. Many growers in Massachusetts have reported sudden drops in pH in soilless media growing geraniums. Oddly the low pH conditions which can develop as the geranium grows are the opposite of what geranium needs! In a North Carolina research project pansy, begonia, celosia, dianthus, and tomato caused the pH to drop while marigold, annual vinca, and zinnia caused the pH to increase. Sometimes these changes are large enough to cause a nutrient deficiency or toxicity.

Fertilizing After Transplanting

Bedding plants are commonly fertilized on a constant basis at 200-250 ppm N from one of the following fertilizers: 15-15-15, 15-16-17, 20-10-20, or EXCEL Cal-Mag 15-5-15. These types of fertilizers are available from several different manufacturers. "Triple 15" has lower levels of micro nutrients than the others and EXCEL supplies calcium and magnesium.

A common fertilizer strategy is to begin fertilizing vigorous types shortly after transplanting. Small, slow growing types should receive lower rates (100-150 ppm N) or less frequent applications until they are well-established. To increase shelf-life it may be beneficial to cut the rate (ppm) in half at visible bud or about 2-3 weeks before sale. To avoid creating a nutrient deficiency, do a soil test before making a rate reduction.

Botrytis Disease on Greenhouse Crops

Cloudy, rainy weather is favorable for Botrytis infections on crops in greenhouses.

Generally, Botrytis spore germination and infection of the crop is dependent on a film of moisture for 8-12 hours, relative humidity 93% or greater, and temperatures between 55-75°F. Regulation of temperature, humidity and leaf wetness duration can prevent disease development.

On poinsettias, Botrytis can cause leaf blights and then move from the leaf petiole into the stem, causing a stem canker. Avoid night temperatures below 60°F when reducing temperatures as plants mature. Later in the season, tender bracts are also prone to infection.

Proper plant spacing, good sanitation practices (removing plant debris and placing this debris in a covered garbage can) help prevent Botrytis blight. Proper environmental management by using horizontal air flow (HAF) fans to promote air circulation and minimize cold spots is critical to managing this disease. Be sure to water early in the day and heat and vent as needed to reduce humidity levels. Some poinsettia varieties, especially those with white colored bracts, are more prone to Botrytis infections, so these should be placed in less humid houses.

Many fungicide sprays will injure or discolor sensitive bracts. Read fungicide labels carefully before application for information on plant safety. If unsure, contact the technical representative from the company for more information. Apply fungicides (such as Decree with Capsil to help minimize visible residue or Phyton 27) only under good drying conditions, early in the morning, preferably on clear days. Even overhead applications of plain water, can injure the sensitive bracts!

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