



UMASS
EXTENSION



Vegetable Notes

For Vegetable Farmers in Massachusetts

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CROP CONDITIONS

January gives most growers time to plan, order seeds and supplies, attend meetings, spend time with family, travel, and enjoy a slower pace. For those who store and peel butternut, the peak holiday demand is over and much of the year's crop has been shipped out. For those who store and harvest for winter sales, the pace may be slower but there are still weekly demands to manage, harvest, pack, ship and sell. The deep cold and the litany of rain, snow, wind and ice can make these tasks both physically and mentally challenging. Above-ground storages have required supplemental heat this season. Greens in high tunnels are being challenged by lower temperatures than has been typical for this time of year. Sometimes crops recover from

nightly deep freeze much better than expected. In less than a month, longer days and higher solar angle will get things growing again in the winter tunnels. There are close to 40 winter farmers markets in the state, and growers report excellent sales volume at some of them while others are still building up their customer base. The number of farms offering Winter CSA shares has grown substantially.

The New England Vegetable and Fruit Conference was a great success with positive feedback on the information gained, old friends seen, new connections made, and the general tone of vibrant energy. This conference broke all past attendance records but meeting rooms were rarely too full – maybe because the trade show was such a busy place! From aspiring to retiring farmers and everything in between, our industry was well represented. The conference website (<http://newenglandvfc.org/>) will be posting powerpoints as well as proceedings.



Buried under snow and ice, crops wait to get growing again in low tunnels at Red Fire Farm in Montague, MA.

This is the season to pick up new ideas and you'll find a wide range of educational programs listed in this newsletter. Best wishes for a successful farming year in 2014!

PLEASE GIVE US YOUR FEEDBACK!

How have the programs and publications of the Vegetable and Fruit teams at UMass influenced your farm, and other farms in Massachusetts and around the region?

The last time that we asked that question in a systematic way was in 2010 – four years ago! Now we are asking for your feedback once again. Please give us a few minutes of your time to help us evaluate the impact of our programs and to guide our directions for the future. Your input also helps us to see how farms are changing across New England, and what new needs and concerns are emerging.

This information will assist us as we seek to fund new projects and continue our current pro-



Vegetable and fruit extension teams work together to assist growers in the field.

grams. Most of our work is funded through external grants and other revenues which enable us to engage with growers directly through farm visits, consultations, and on-farm programs -- and make it possible to put out our Vegetable Notes newsletter free of charge!

This survey will take about 15 minutes and is directed to all those who receive Vegetable Notes, Healthy Fruit or Berry Notes, or have participated in any of our fruit and vegetable programs.

Access the online survey here: <https://www.surveymonkey.com/s/NO567VJ>

If you would prefer to complete the survey on paper, you may download a pdf document from our website at <https://extension.umass.edu/vegetable> or email us at umassvegetable@umext.umass.edu and we will send you a hard copy.

Your input is important and we very much appreciate your time!!

--The UMass Extension Vegetable and Fruit Teams

START NOW FOR PEST MANAGEMENT IN VEGETABLE TRANSPLANTS

Pest management for vegetable transplant production is an integrated process and includes sanitation, sound cultural practices, the use of resistant cultivars (where possible) and finally, proper use of the correct pesticide. Your pest management program should be starting now in the greenhouse.

Begin the season with a clean, weed-free and disinfected greenhouse. This means clearing the growing area of any plant debris, weeds and any discarded flats or tools. After clean-up, wash and disinfect empty benches, potting areas, storage shelves, tools and leftover cell packs and flats that you plan to reuse. Your disinfecting solution can contain any of the sanitizing products such as Green-Shield®, Phyan 20™, Triathlon®, ZeroTol® or chlorine bleach (10% solution). Be sure to follow the manufacturer's directions when using any commercially prepared materials. If you are using a 1 to 9 bleach solution, remember that it requires a 30-minute soak in order to be effective. Also - while chlorine bleach is an effective sanitizer, please note that there will be a 50% reduction in strength of a chlorine solution after just two hours. Therefore, you should prepare a new solution each time you plan to sanitize. This includes a new solution after lunch if you started working in the morning.

Once you have the growing area and equipment sanitized, be sure to avoid recontamination. Dirty hose nozzles or tools can contaminate potting soil and the general growing area. Be sure that everything brought into the sanitized area is also clean! The floor or soil in the growing area is a good source of insects and diseases. Do not stand on the benches after they have been cleaned, as you can easily move diseases up from the floor with your shoes. Use hooks to keep your hose nozzle off the floor. Ideally, grow your transplants off the floor as well, either on benches or pallets. The floor in your greenhouse should be well drained and cleaned before plants are started there. Some growers have taken to covering the entire floor with black fiber cloth to both prevent weed growth and make clean up easier after transplant production. Once dry, plant and soil residues are easily swept-up and removed.

Does your growing area have good air movement? Circulating air not only distributes heat more evenly but can also reduce condensation in the greenhouse. Consider installing a horizontal airflow (HAF) system in your transplant production area.

I've heard growers ask if allowing the greenhouse to 'freeze' for several days in cold weather means that insect pests will be killed; and the answer is no. Heat can be more effective than freezing for pest destruction. For example, heat has been shown to be more effective for the control of thrips, according to Leanne Pundt of the University of Connecticut. In one study, high temperature (104°F) combined with very low humidity (less than 10%) for three to four days killed most adult



Now is the time to get your greenhouse cleaned up and ready to grow healthy transplants this spring!

thrips. However, your greenhouse must be completely weed-free for this method to work. If you have constant thrips problems, this control method might be something to try this summer.

Finally, always use disease-free media for transplant production. If using soil, be sure it is pasteurized before you bring it into the growing area. Successful soil pasteurization requires 30 minutes at 180°F. Be sure to frequently sanitize and maintain clean areas where soil is mixed and pots are filled.

If you are producing both vegetable transplants and ornamentals, I strongly recommend that you have separate growing areas for each group of plants. Bringing cuttings of flowering plants into the vegetable area can introduce pests, such as thrips, and diseases, such as tobacco spotted wilt virus (TSWV). Look at your available space(s) and plan accordingly.

Take some time to prepare your vegetable transplant greenhouse now to reduce disease and insect problems later this season. Waiting until seeding time to start this chore may not leave enough time to do the job thoroughly. This could result in a great deal of time and money spent later to control a disease or insect infestation that could have been prevented.

--Timothy Elkner, Regional Horticulture Educator, Penn State Cooperative Extension

BRASSICA DISEASE RESEARCH TRIAL RESULTS

Those who have grown brassicas are probably familiar with the following diseases—*Alternaria* leaf spot (ALS) and black rot (BR). These two diseases can be yield-limiting, especially in long season crops like Brussels sprouts or in fall successions when the weather is most conducive to disease. These diseases were the focus of a fungicide efficacy trial we conducted at the UMass Crops Research & Education Farm in South Deerfield, MA last fall. The objective of this study was to evaluate the efficacy of two copper formulations, several biological fungicides (OMRI approved) and one synthetic plant defense activator in controlling these diseases under natural pressure. These treatments were compared to an untreated control and to Quadris, a conventional standard for control of ALS.

Experiment Design. A randomized complete block design was used, with each treatment replicated four times in 25-ft blocks. There were 5-ft buffers planted between blocks as well as around the perimeter of the experimental area. A one-row transplanter with a water wheel was used to plant collards (var. ‘Champion’, Johnny’s Selected Seeds, ME) seedlings at 15-in. spacing into rows with 6-ft centers on 31 July. Fertilizer amendments were made based on UMass Soil Testing Lab recommendations and control of early flea beetles, mid-summer caterpillars and flea beetles, and weeds was achieved using Admire 2F (20 fl oz/A), Entrust WDG (2.5 oz/A), and Treflan (1.5 pt/A), respectively.



Sue calibrating her sprayer (with water) at the UMass Research and Education Farm in S. Deerfield, MA.

Spray treatments were applied on approximately a 10-day spray interval beginning on 14 Aug and a total of five applications were made using a CO₂ pressurized backpack sprayer equipped with a hand-held boom with drop nozzles. An adjuvant (NuFilm P) at a rate of 1 pt/100 gal was used in all spray mixes to improve coverage and increase spray efficacy. Disease severity was assessed by visually estimating the percentage of leaf area affected by each disease on ten plants at the center of each replicate plot. Both *Alternaria* leaf spot and black rot were observed on 06 Sept. but were slow to develop due to dry fall weather.

Results. It is important to note that disease severity never got above 25% at any point during the season for either disease and therefore, differences between treatments were small. Consequently, no significant differences were observed at the first two time-points but significant differences were observed at the final disease rating on 25 Oct. No treatment significantly reduced *Alternaria* (ALS) severity relative to the untreated control at any time-point, likely due to low disease pressure. For black rot (BR) control, Double Nickel 55 and Badge X2 DF significantly reduced BR severity compared to the untreated control. (Note that in the table below, numbers in the same column followed by the same letter are not significantly different.)

Discussion. You can see from these results that one copper product worked well in controlling the bacterial disease, black rot. Copper works best on bacterial diseases and on oomycetes like downy mildews and *Phytophthora* spp. While it does

have efficacy against some true fungi, it does not work on everything so be sure to get an accurate diagnosis and choose pesticides based on the pathogen biology. Actigard works by enabling the plant to respond more quickly to pathogen attack by activating a defense signaling pathway that causes infected plant cells to self-destruct in order to halt spread of the pathogen. This works for some organisms but not others, depending largely on the pathogen lifestyle. Some pathogens, like *Alternaria* spp., actually consume dead tissue (necrotrophy) while others, like most pathogenic bacteria, survive and grow in living tissue (biotrophy). Thus, plant defense activators may actually make things worse in the case of diseases caused by necrotrophic fungi.

The other materials tested (except Quadris) are all biocontrol organisms that work by: out-competing pathogens for nutrients, space, and iron; inhibiting the pathogen by producing antimicrobial compounds; directly parasitizing pathogens; degrading toxins produced by the pathogen; and by inducing a second defense signaling pathway. The relative importance of each of these mechanisms varies depending on the biocontrol organism, but it is believed that multiple mechanisms work simultaneously to provide plant protection. Because of their complex modes of action, these materials can be used to suppress a wide range of diseases, though some products may work better on certain diseases than others. Efficacy data on these materials is hard to find and is not required by the EPA in order to label a pesticide for a particular disease, and this is the primary reason that these products were chosen for this study. In this study, only one biopesticide, Double Nickel 55, significantly reduced disease severity. This trial was only replicated once but we hope to repeat something similar next year and hopefully we will get stronger treatment effects next time!

Treatment and Rate (/A)^x	Active Ingredient	ALS Severity^y (%)	BR Severity^z (%)
Untreated Control.....	De-Ionized Water	1.4 ab	3.1 b
Quadris, 15 fl oz.....	Azoxystrobin	0.1 a	1.8 ab
Actigard 50WG, 1 oz.....	Acibenzolar-S-methyl	2.0 ab	1.5 ab
Serenade Optimum, 20 oz.....	<i>Bacillus subtilis</i>	1.0 ab	2.3 ab
Sonata, 4 qt.....	<i>Bacillus pumilus</i>	1.0 ab	1.6 ab
Double Nickel 55, 6 qt.....	<i>Bacillus amyloliquefaciens</i>	0.5 a	0.6 a
Actinovate AG, 12 oz.....	<i>Streptomyces lydicus</i>	2.3 ab	1.5 ab
Badge X2 DF, 0.75 lb.....	Copper hydroxide + copper oxychloride	2.5 ab	0.6 a
Basic Copper 53, 3 lb.....	Basic copper sulfate	4.8 b	1.6 ab
Taegro, 5.2 oz.....	<i>Bacillus subtilis</i> var. <i>amyloliquefaciens</i>	1.0 ab	1.4 ab
p-value		0.0233	0.0472

^xTreatments were mixed with NuFilm at 1 pt/100 gallons and applied to foliage on 20 Aug, 30 Aug, 11 Sep, 23 Sep, 03 Oct.
^yPercentage of foliage affected by *Alternaria* leaf spot at the final disease rating on 25 Oct. Numbers in each column followed by the same letter are not significantly different from each other (Tukey's HSD, P=0.05).
^zPercentage of foliage affected by black rot at the final disease rating on 25 Oct. Numbers in each column followed by the same letter are not significantly different from each other (Tukey's HSD, P=0.05).

Bottom Line: No treatments had significant effects on *Alternaria* leaf spot severity. Cultural controls including 3 year rotations, timely disking and plowing of crop residues after harvest, and manipulating the plant environment to reduce leaf wetness are critical, and possibly the only effective tools for organic growers at this time. Conventional growers have a number of pesticides in their toolbox that work well in controlling ALS which are listed in the NE Vegetable Management Guide. Coppers are recommended to control black rot in both conventional and organic cropping systems. In this study, the formulation Badge X2 that combines copper hydroxide and copper oxychloride, slightly outperformed copper sulfate. The biofungicide Double Nickel also shows promise against BR. Prevention is key so always use certified or hot water treated seed where bacterial diseases are an issue and, if you have a history of BR on your farm, begin your spray program early.

--Susan B. Scheufele, UMass Extension Vegetable Program

NEWS

[Extension Twitter Feed for Home Gardeners](#)

UMass Extension's Agriculture and Landscape Program has a new twitter feed! Follow them @UMassGardenClip for home gardening tips, event updates and other musings on growing fruit, vegetables, lawns, and ornamental trees, shrubs and perennials. Invite your customers to sign up too!

[New Greenhouse Pest Guide Web App From the UMass Extension Floriculture Program!](#)

A new mobile-optimized website app that contains options for biocontrol and pesticides for commercial greenhouse production is now available. This app was developed by UMass Extension Floriculture Specialist Tina Smith and Leanne Pundt from UConn Extension.

[The FDA Heard Your Input on FSMA!](#)

The FDA has responded to the wave of comments submitted by farmers and other concerned citizens on the proposed produce safety and preventative controls rules of the Food Safety Modernization Act (FSMA). In a statement released on December 19, 2013 they acknowledge that key provisions of the rules as written will need to be changed in order to meet the food safety goals of the legislation without unduly burdening producers. These include those parts of the rules related to water testing, the use of raw manure and compost, shared-use facilities, and decisions regarding exemptions. The FDA plans to revise and publish the rules by early summer 2014, and again seek comment from the public. Congratulations to all who have participated in this process to help create meaningful and sensible food safety regulations. Now get your pens (and laptops) ready for round 2!

[Sign-up for USDA-NRCS conservation programs by Jan. 17th](#)

The deadline for applications for the Massachusetts Natural Resources Conservation Service (USDA-NRCS) conservation programs, including the [Environmental Quality Incentives Program \(EQIP\)](#) is January 17th. Applications are being accepted at all USDA Service Centers. EQIP is a voluntary program that helps growers address critical environmental concerns with NRCS financial and technical assistance for more than 80 basic conservation practices, including Integrated Pest Management (IPM).

IPM Conservation Activity Plans (CAPs) and Herbicide Resistance IPM CAPs are also now available nationwide. These options provide a one-time financial assistance payment to growers to work with qualified Technical Service Providers (TSP) to design an IPM plan to address key natural resource concerns.

NRCS accepts applications for EQIP on a continuous basis, but producers must file applications by the deadlines below to be considered in these initial ranking periods. Applications filed after the deadlines will be considered in the next ranking period if funds remain available. More information is available from NRCS in your state: <http://www.nrcs.usda.gov/wps/portal/nrcs/sitenav/national/states/>.

[USDA Value-Added Producer Grants](#)

Grants are available to help agricultural producers create new products, expand marketing opportunities, support further processing of existing products or goods, or to develop specialty and niche products. They may be used for working capital and planning activities. The maximum working capital grant is \$200,000; the maximum planning grant is \$75,000. Eligible applicants include independent producers, farmer and rancher cooperatives, and agricultural producer groups. Funding priority is given to socially disadvantaged and beginning farmers or ranchers, and to small-to medium-size family farms, or farmer/rancher cooperatives. **Deadline to apply: February 24, 2014.**

UPCOMING EVENTS

[27th Annual NOFA/Mass Winter Conference](#)

Where: Worcester State University, 486 Chandler Street, Worcester, Massachusetts

When: January 11, 2014

This year's Winter Conference will offer a diverse line-up of more than 60 workshops, exhibits by numerous regional vendors, an all-day seminar (see seminar details below) and keynote and all-day seminar by Mark Shepard, perennial agriculture and permaculture design expert and author of Restoration Agriculture. The children's conference (for ages 3-12) provides a lively, interactive way for your kids to get educated. Also in 2014, the NOFA/Mass Organic Land Care program will hold their annual Lawn and Turf Course at the Winter Conference. Veteran instructors Chip Osborne and Bernadette Giblin - along with a host of others - will offer practical, applicable information about organic lawn and turf management techniques.

[Growing Spring Crops in Greenhouses](#)

Where: Cranberry Experiment Station, 1 State Bog Rd., East Wareham, Massachusetts

When: Wednesday, January 15, 2014 - 10:00am to 3:00pm

University of Massachusetts Extension specialists will present information on managing plant height, plant nutrition and managing pests for spring crops being grown in commercial greenhouses.

[Connecticut Vegetable & Small Fruit Growers' Conference](#)

When: Thursday, January 16, 2014

Where: Maneeley's Conference Center, 65 Rye Street, S. Windsor, CT 06074

Sponsored by: UConn Extension, UConn Department of Plant Science and Landscape Architecture, The Connecticut Agricultural Experiment Station, USDA. Includes trade show, continental breakfast, coffee, lunch. Must pre-register to be guaranteed lunch. Registration after Jan 7th or at the door: \$50.

[Empire State Producers Expo](#)

Where: Oncenter Convention Center in Syracuse, NY

When: Jan. 21-23, 2014

This show combines the major fruit, flower, vegetable, and direct marketing associations of New York State in order to provide a comprehensive trade show and educational conference for the fruit and vegetable growers of this state, as well as the surrounding states and Eastern Canada. At this time, the pre-registration process is closed. However, walk-in registrations are always welcome at the door!

[Harmonized Good Agricultural Practices \(GAP\) Training Program](#)

Where: Massachusetts Farm Bureau Federation Office, 249 Lakeside Drive (Rtes. 20 and 495), Marlboro, MA 01752

When: Wednesday January 22, 2014, 10am to 4pm

For growers and other fresh produce handlers to learn more about: the costs and impact of diseases and outbreaks caused by food-borne pathogens; strategies for controlling potential microbial food safety hazards before planting and throughout all phases of production - planting, production, harvesting and postharvest handling; changes to the USDA GAP Program to reflect the Harmonized Audit; the Third Party Audit process; the MA Commonwealth Quality Program; and the status of FDA draft regulations to implement the Food Safety Modernization Act of 2010. Attendees will receive a manual filled with GAP resources, and a memory stick loaded with both the GAP Manual and customizable templates for maintaining records to verify USDA.

[NOFA-NY Winter Conference: Preserving the Past, Seeding the Future](#)

Where: Saratoga Hilton and City Center, Saratoga Springs, NY

When: Jan. 24-26, 2014

Three days of technical sessions and intensive workshops on organic production practices and issues as well as a trade-show. Keynote will be given by Gary Paul Nabhan, an internationally-celebrated nature writer and food and farm-

ing activist. NOFA-NY farmer-of-the-year Brian Bennett is a full-time farmer at Bittersweet Farm in Heuvelton, NY, and produces a diversity of vegetable crops and livestock. In addition, Brian works as a mentor to new farmers and teaches hands-on sustainability to area students and volunteers.

[Mid-Atlantic Fruit and Vegetable Convention](#)

Where: Hershey Lodge and Convention Center in Hershey, PA.

When: Jan 28-30, 2014

This conference combines three days of six or more concurrent educational sessions with a large industry trade show and numerous networking opportunities - all designed to enable fruit, vegetable and berry growers as well as direct marketers to stay on the cutting edge of their industries. About 2,200 persons from throughout the mid-Atlantic region and beyond gather each year at the Hershey Lodge and Convention Center for the Convention. Registration is open to all interested commercial fruit, vegetable and berry growers, direct marketers and allied industry personnel.

[Winter Flower Growers Program](#)

Where: Mahoney's Garden Center, 242 Cambridge St., Winchester, MA

When: January 29, 2014, 9:30 am - 3:45 pm

Full day education program hosted by Mass Flower Growers Association and UMass Extension, featuring Judy Sharp-ton, Growing Places Marketing, Brian Krug, University of New Hampshire and Fred Hulme, Everris.

[New England Vegetable & Berry Growers Association February Meeting](#)

When: Saturday, February 1, 2014

Where: Hudson Lodge of Elks, 99 Park St., Hudson, MA

This will be the Association's 586th meeting! It will feature updates on the new Vegetable Management Guide from UMass extension specialists, and talks on real-time monitoring sensors, soil health for strawberries, and updates on the new food safety rules from Rich Bonanno.

[Engineering Storage Facilities for Winter Vegetable Crops](#)

When: Thursday, February 13, 2014

Where: Connecticut Farm Bureau Association, Windsor, CT

A full-day program covering topics in produce storage facility construction and use with presentations from Luke Doody and Ben Weil of UMass Building Sciences and Ruth Hazzard of UMass Extension, as well as farmers Rob Johanson from Goranson Farm in Dresden, ME and Laura Tangerini from Tangerini farm in Millis, MA.

[Ethnic Greens and Herbs Research Data Workshop](#)

When: Monday, March 3, 2014

Where: Valley Forge, PA.

Co-hosted by Rutgers University, The Pennsylvania State University, University of Massachusetts, and University of Florida. A mix of topics will be presented including: dissemination of research results, stakeholders describing their experiences with growing, sourcing, and marketing ethnic greens and herbs, and a presentation describing changes in U.S. consumer demographics. Registration will open soon!

Winter Vegetable Production, Storage, and Sales

When: Thursday, March 6, 2014

Where: Sturbridge Publick House, Sturbridge, MA

Co-hosted by UMass and UNH Extensions and funded by NE-SARE, this all-day program will cover how to manage products for winter markets, including washing, packing, and storage, as well as the season extension production systems being used. Topics will be covered in short presentations with plenty of time for facilitated farmer-to-farmer discussions. More details and registration information coming soon!

[Greenhouse Plant Disease Diagnostic Workshop](#)

When: Wednesday, March 19, 9:00 am – 1:00 pm

Where: Fernald Hall, UMass Amherst campus.

Presented by UMass Extension, this program for commercial growers of greenhouse crops will include a lecture to review the basics of diagnostic plant pathology followed by a hands-on workshop using diagnostic test kits for viruses and root diseases of greenhouse crops. We will also use microscopes to view fungal root pathogens such as Thielaviopsis, Rhizoctonia and Pythium and foliar pathogens such as Downy mildew and Botrytis that were covered in the lecture. 4 pesticide contact hours. Cost: \$70. Limited to 25 attendees.

COURSES AND WEBINARS

Vermont New Farmer Project Webinars

Vermont New Farmer Project webinars are generally about an hour long. All webinars are recorded and made available for viewing within a few days.

Farm-Scale Permaculture: Techniques, practices and philosophies for permanent agricultural systems.

When: January 16, 2014, Noon-1 pm

Presented by Keith Morris, permaculture farmer, consultant and founder of Prospect Rock Permaculture.

Introduction to Shiitake Mushroom Production.

When: February 20, 2014, Noon-1 pm EST

Presented by Ben Waterman, mushroom grower and coordinator for the Northeast Sustainable Agriculture Research & Education funded project, "Cultivation of shiitake mushrooms as an agroforestry crop for New England."

Getting Started Growing Small-Grains in New England.

When: March 20, 2014, Noon-1 pm EST

Presented by Heather Darby, Agronomic and Soils Specialist for the University of Vermont Extension and lead researcher on small grain production systems in Vermont.

Exploring the Small Farm Dream - 5-Session Evening Courses

When: Wednesdays, February 5, 12, 19, 26, and March 5

Where: Amherst, MA

or

When: Tuesdays, February 4, 11, 18, 25, and March 4

Where: Marlborough, MA

The Explorer Program is intended for those who are considering farming as a (small) business. Its purpose is to help pre-venture, aspiring farmers learn what it will take to start and manage their own agricultural enterprise. Explorer makes use of four guided group sessions and a farmer panel of those who have already done what you are contemplating. It is based on an acclaimed workbook and is presented by instructors experienced in starting ag businesses. Explorer was created to help you articulate the clear vision and goals you will need to guide a new agricultural venture. The registration cost of \$125 includes instruction, materials, guest speakers and a session of Q&A with a panel of varied-stage farmers.

For a Registration Form, please visit the [agricultural business training \(ABTP\) website](#) or contact: Rick Chandler, MDAR, 101 University Drive, Suite C-4, Amherst, MA 01002, Rick.Chandler@state.ma.us.

Vegetable Notes. Ruth Hazzard, Katie Campbell-Nelson, Lisa McKeag, Susan Scheufele, co-editors. Vegetable Notes is published weekly from May to September and monthly during the off-season, and includes contributions from the faculty and staff of the UMass Extension Vegetable Program, other universities and USDA agencies, growers, and private IPM consultants. Authors of articles are noted.

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