

VEGETABLE CROPS HOTLINE

A newsletter for commercial vegetable growers prepared by the Purdue University Cooperative Extension Service

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vegcropshotline.org

No. 578
February 20, 2014

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WELCOME to a new year of the *Vegetable Crops Hotline*, Purdue Extension's newsletter for people in the business of growing vegetables. Our goal is to provide timely information that will be useful for Indiana vegetable growers. If there is something you'd like to see included, please let us know.

Frequently we include links to web sites or publications available on line. If you aren't able to access these resources, please contact us, or a local Extension office, to request a hard copy of the information.

This first issue of the year is sent to all who subscribed in 2013 as well as new subscribers for 2014. To continue receiving future copies by US mail, renew your *Hotline* subscription or Indiana Vegetable Growers' Association (IVGA) membership for 2014 using one of the forms on pages 7- 8 of this issue. IVGA members receive the *Hotline* at no extra charge. When an issue is published we email an announcement to everyone who provides an email. A pdf version of the newsletter is available at vegcropshotline.org.



APPLICATION OF FUNGICIDES BY HAND SPRAYER - (Dan Egel, egel@purdue.edu, 812-886-0198) - Occasionally it becomes necessary to apply fungicides to an area too small for treatment with a tractor-mounted sprayer. Below, I share my thoughts on examples of equipment that might be used to treat small areas.

Let's consider an example where one wants to apply a fungicide for management of Botrytis gray mold on tomatoes in a greenhouse. First, make sure that the product is labeled for tomatoes, gray mold and the greenhouse. (Some labels have statements that prohibit pesticide applications in a greenhouse. In other cases, the label is silent on the matter of greenhouse applications. In the latter case, greenhouse applications may be made-with care! See page 40 of the 2014 version of the *Midwest Vegetable Production Guide for Commercial Growers* <mwveguide.org> for more information.) Make sure to read all the label statements for precautions such as worker protection clothing, Re-Entry Interval (REI) and Pre-Harvest Interval (PHI).

What type of sprayer should one use? Let's review a few different types of sprayers.

1. **The hand sprayer** - This is the type of sprayer that one would buy at the local garden center or hardware store (see Figure 1). Most have a capacity of 1-2 gallons. I like the hand sprayers that have a quick release valve on the side. After the application is complete, this valve can be used to release pressure prior to opening up the tank. The release of pressure makes it less likely that pesticide will escape out of the tank when the pump handle is unscrewed.



Figure 1. The common hand sprayer may be purchased at the local hardware or garden store. Note that this one has a quick release valve. (Photo by Dan Egel)

This type of hand sprayer is readily available, inexpensive and easy to use. However, using a hand sprayer to apply fungicide to a row of tomatoes, for example, can be difficult. Applications with a hand sprayer are often made with an up and down motion while moving across the row of plants. It can be difficult to apply the same amount of spray to every plant in this fashion. In addition, the nozzle of most hand sprayers is adjustable from a thin stream to a wide spray. The wide spray is more useful to fungicide applications; however adjustment of the nozzle may be inadvertently altered, thus changing how the spray is applied.

2. **Backpack sprayers** may be ordered through catalogues or online (see Figure 2). Many backpack sprayers may be pumped up by hand while applications are being made. Sprayers with a pressure gauge on the handle make it easier to apply fungicide with a consistent pressure/amount to each plant. Some backpack sprayers have a flat fan or hollow cone nozzle. These types of nozzles are made for fungicide/pesticide applications, unlike the adjustable nozzles described above which are multi-purpose (see Figure 3).



Figure 2. This backpack sprayer has a pressure gauge on the wand and a separate pump handle so that pressure can be maintained while spraying. (Photo by Dan Egel)



Figure 3. The top nozzle is a flat fan nozzle designed for pesticide applications. The bottom multi-purpose nozzle may be adjusted from a thin stream to a wide spray and may be changed accidentally during a pesticide application. (Photo by Dan Egel)

3. **CO₂ sprayers** can be purchased that are worn as a backpack (see Figure 4). Instead of pumping up these sprayers by hand, a CO₂ cylinder is used to propel the spray. This allows for a more consistent spray. Typically, these sprayers utilize a boom sprayer with hollow cone or flat fan nozzles. Using a boom with 3 or 4 hollow cone or flat fan nozzles makes it much easier to apply fungicide consistently to a large section of plants compared to applying the same product with a wand.



Figure 4. Here the use of a backpack CO₂ sprayer is demonstrated. Advantages of this sprayer are the CO₂ propellant that allows a consistent spray and a boom of 4 nozzles that makes applications easier and more effective. (Photo by Dan Egel)

Choosing the right piece of equipment is just a part of the battle. Next, the sprayer needs to be calibrated. While most growers understand how to calibrate a tractor mounted sprayer, it may not be obvious how to calibrate a sprayer that is powered by a human. In a future *Hotline* article, I will describe one method in which hand sprayers of the sort described here can be calibrated to deliver the right amount of fungicide to the plant.

A more detailed article on this subject can be found at veggiediseasesblog.com.



MIDWEST VEGETABLE PRODUCTION GUIDE - (Dan Egel, egel@purdue.edu, 812-886-0198) The 2014 version of the *Midwest Vegetable Production Guide* is available in hard copy and on-line, and comes free with IVGA membership. Purchase your hard copy from your County Educator or from the Purdue Education Store the-education-store.com In addition to the purchase of a hard copy of the *Guide* for \$10, the *Guide* is available free online at mwvguide.org. The online version is updated whenever changes are made throughout the year (See

below for this year's updates).

Every year, the ID-56, as the *Guide* is known in Indiana, has recommendations for fertility, varieties and pest control for crops from asparagus to zucchini. You may have a *Guide* from a previous year, but I urge you to purchase or download a new one since the *Guide* changes every year. Below, I have listed a taste of the larger changes that are listed in the *Guide* for 2014.

Disease Management

- The watermelon variety resistance to Fusarium wilt table has been updated with new varieties -see Cucurbit Crops chapter.
- A new table (pollenizer watermelon resistance to anthracnose) was added to the Cucurbit Crops chapter.
- Luna Privilege® has been labeled for several diseases of watermelon - see Cucurbit Crops chapter.

Weed Management

- Prowl H2O® is now labeled for use between rows of melons (see the Cucurbit Crops chapter) and green onions (see the Dry Bulb and Green Bunching Onion, Garlic, and Leek chapter).
- Dual Magnum® was added for several crops.
- Anthem® and Anthem ATZ® are now labeled for pre-emergence and postemergence weed control in sweet corn. Both herbicides provide preemergence control of many grass and broadleaf weeds and postemergence control of many broadleaves. Anthem® is a mixture of pyroxasulfone (Zidua®) and fluthiacet (Cadet®). Anthem ATZ® is a mixture of atrazine, pyroxasulfone (Zidua®), and fluthiacet (Cadet®). These herbicides have an 18-month replant restriction for all other crops except corn.

Insect Management

- Closer® was added to the recommendations for control of aphids, whiteflies, and plant bugs on several crop groups.
- Blackhawk® was added to the recommendations for control of caterpillars and Colorado potato beetles on several crop groups.
- The threat from the invasive brown marmorated stink bug was specifically addressed for several crop groups.

Updates to the 2014 version of the *Guide* have already been made. These updates include:

Changes to the watermelon variety resistance table on page 97.

Proline® was added as a fungicide for the management of Fusarium wilt of watermelon.

The rate of Fontelis® was updated for Botrytis grey mold and early blight/Septoria leaf blight of tomato.

If additional updates are made to the *Guide*, these will be announced here in the *Hotline*.



MIDWEST VEGETABLE TRIAL REPORT FOR 2013 - (Liz Maynard, emaynard@purdue.edu, 219-531-4200) - Find reports of vegetable variety trials from eight states in

the Midwest Vegetable Trial Report for 2013. Hard copies may be purchased from the Education Store the-education-store.com (tip: enter 16-18 in the Store Search) or by calling 888-398-4636. The entire publication or individual reports may be downloaded at no charge from ag.purdue.edu/hla/fruitveg/Pages/MVVTRB.aspx.

This year's bulletin includes trials on tomatoes and bell peppers in high tunnels in Kansas. Hot peppers, specialty peppers, and bell peppers were also evaluated in field trials in Michigan, Missouri, and Kentucky. There were also two field trials of tomatoes under organic practices, one in New York evaluating late blight resistant varieties, and one in Indiana evaluating heirloom varieties. A conventional fresh market tomato trial was reported from Ohio.

From Kentucky, two reports of on-farm demonstrations of vegetable production include a breakdown of expenses and expected sales. For beginning growers, these reports could provide an idea of what to expect, and highlight the variation among farms in costs of production.

Sweet corn trials from three states are included in the report: Indiana, Ohio, and W. Virginia. Information from multiple locations makes it easier to identify varieties that consistently perform well.

In addition to these crops, the bulletin also contains reports on asparagus, spring red and savoy cabbage, lettuce in a hoop-house (originally published online in 2012) and in the field, cantaloupe, onion, pumpkin, and watermelon.

The reports include much useful information about variety performance, but it is important to recognize that most of them represent results of one year at one location. Consider also results from other years, locations, and sources to improve understanding of varieties.

Previous bulletins in this series are also available online. For some years, CD's or hard copies may be available. Contact Liz Maynard to inquire.



INDIANA FARM TO SCHOOL NETWORK - (Katie Clayton, katie-clayton@purdue.edu, 765-494-3726) - The Indiana Farm to School Network (IFSN) was established in 2012 as a means of connecting school children to healthy, locally grown food, and to provide a consistent market outlet for local produce. We have a steering committee composed of producers, educators, extension specialists, food service directors, distributors and representatives from Indiana state departments of Agriculture, Education and Health. In 2014, with fund-

ing from an ISDA Specialty Crop Block Grant, we are connecting schools interested in Farm to School with local farmers and producers. We will begin meeting with school district food service directors in all regions of the state between March and June of this year; by the end of year we would like to have a list of producers interested in working with these schools.

We are asking all producers to fill out the Qualtrics survey at purdue.qualtrics.com/SE/?SID=SV_09usSna2HMrhzv.



WINTER TEMPERATURES IN A HIGH TUNNEL - (Liz Maynard, emaynard@purdue.edu, 219-531-4200) -Producers are successfully harvesting vegetables crops through the winter from unheated and minimally heated high tunnels in Indiana and elsewhere. Understanding the environment in the structures is important for predicting how crops perform. This article discusses temperatures measured in an unheated structure at the Pinney Purdue Ag Center this winter. Anyone who has spent time in a greenhouse (heated or not) will be familiar with the trends reported.

The structure at Pinney is a 30 ft. X 48 ft. Rimol Rolling Thunder with 4 ft. sidewalls (see Figure 5). The long axis of the structure is oriented east-west. Inside the tunnel row cover is supported about 18 inches above the soil on a framework of conduit (see Figure 6). Temperature and light inside the tunnel are measured underneath the row cover, which has been in place most of the winter this year. Temperature and light outside the tunnel are measured by the Purdue Automated Weather system a few hundreds yards from the tunnel, and data are obtained from iclimat.org.



Figure 5. February 8 view of high tunnel where temperatures reported in this article were measured. West end wall and south side wall are visible. (Photo by Liz Maynard)



Figure 6. Row cover inside a high tunnel provides added protection from cold temperatures. (Photo by Liz Maynard)

Figure 7a-c shows the average (mean), max, and minimum daily temperature in and outside the tunnel from Dec. 1 to Feb. 7. The ups and downs in temperature inside and out follow a similar pattern over time, but with warmer temperatures inside. During this period, average, maximum, and minimum temperatures outside were 19°F, 58°F, and -16°F, respectively. Inside the tunnel, average, maximum, and minimum temperatures were 31°F, 77°F, and 3.5°F, respectively. So, on average, inside the tunnel under the row cover was 12°F warmer than outside. But on some days the difference was much more, and some days much less: the difference between the average temperature inside and outside varied from as much as 27°F to less than 1°F.

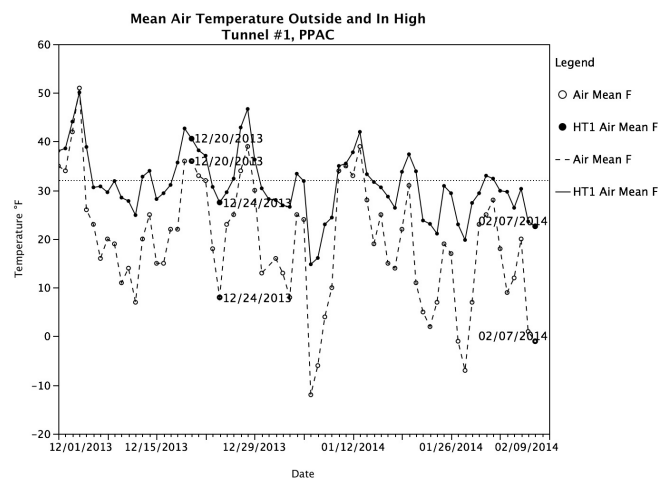


Figure 7. Temperatures outside and inside an unheated high tunnel in Wanatah, Indiana. Outside temperature recorded by the Purdue Automated Weather Station at Pinney Purdue Ag Center and obtained from iclimat.org. Inside temperature measured 12 inches above soil under a row cover. a. Daily mean temperature.

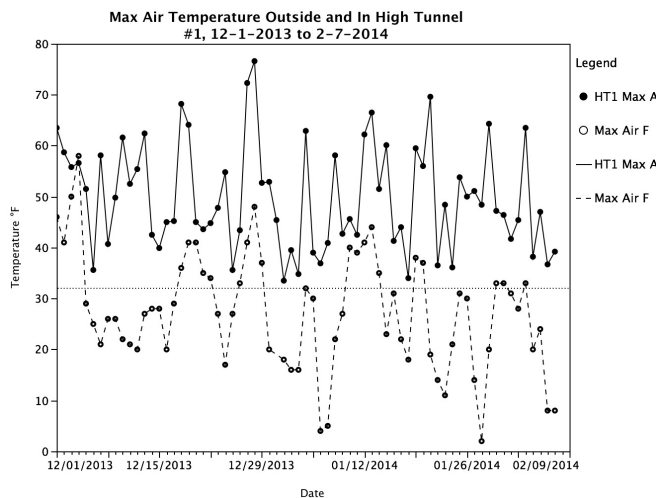


Figure 7b. Daily maximum temperature.

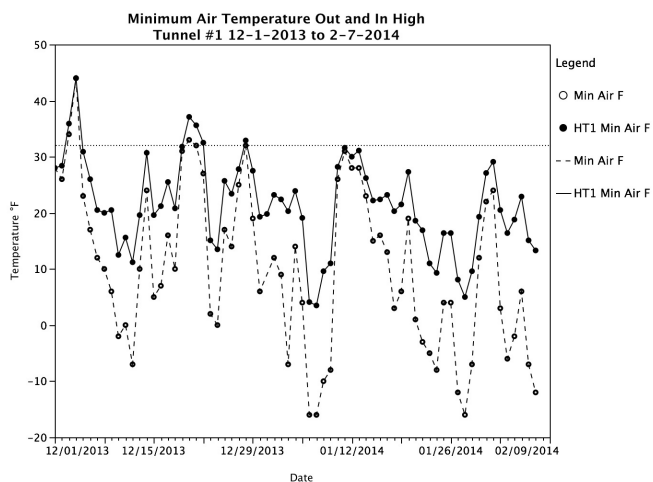


Figure 7c. Daily minimum temperature.

Figure 8 shows the difference between average inside temperature and outside temperature versus the amount of solar radiation measured at the automated weather station. Solar radiation is a measure of the energy from sunlight. Few hours of sunlight and cloudy days lead to low levels; long, sunny days lead to high levels. The graph shows pretty clearly that when there is little solar radiation, the difference between inside and outside temperature is small. See, for example the point for 12/20/2013 marked in Figs. 7a and 8. And when there is more solar radiation, it is much warmer inside than outside, as occurred on 2/7/2014. No surprise here: when the sun is out, it gets hot in the greenhouse.

Keeping records like this will help us understand the patterns and range of conditions to expect in a high tunnel. We have excellent historical records of outside conditions, and to the extent that we can predict conditions inside the tunnel from those outside, it will be possible to use past outside records to predict the range of conditions to expect in the tunnel, and from that, predict

crop performance.

Of course, temperature is not the only environmental factor that determines crop performance. Light levels are critical; soil moisture is also important. We are measuring light in the tunnel and a future article will report on those measurements.

So what about the crop in this tunnel? Spinach, kale, and lettuce were seeded outside in mid-September and mid-October, 2013, and the tunnel moved over them in the last half of October. (The tunnel is on rails so it can be moved to cover different areas.) Note that the crops in these photos are not planted at the high density commonly used for harvest of young salad greens. Figure 9 shows a view under the row cover on Feb. 8, 2014. The following observations are from that date, but aren't based on a rigorous assessment. The spinach is in reasonable shape. The older kale is wilted, and shows some injury; the younger kale shows serious injury in some areas but elsewhere is just wilted. Most of the lettuce shows some injury and it appears worse on the older plants. Soil moisture has been very low since the fall and I suspect that some of the injury is related to that.

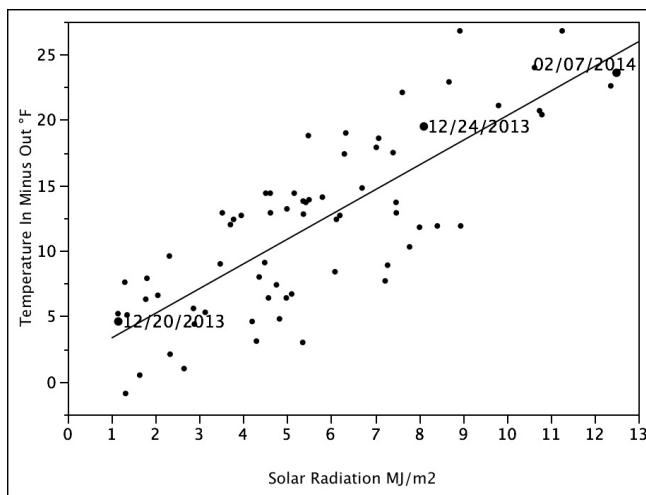
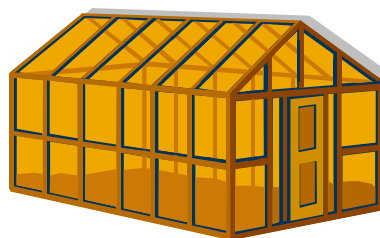


Figure 8. Difference between daily mean temperature inside and outside an unheated high tunnel versus daily solar radiation in Wanatah, Indiana. Outside temperature and solar radiation recorded by the Purdue Automated Weather Station at Pinney Purdue Ag Center and obtained from iclimate.org. Inside temperature measured 12 inches above soil under a row cover.



Planted mid-September 2013



Spinach Lettuce Kale

Planted mid-October 2013



Feb. 8, 2014

Figure 9. Spinach, lettuce, and kale planted Sept. 14 and Oct. 15, 2013 and grown in an unheated high tunnel at Pinney Purdue Ag Center, Wanatah, Indiana. Photo taken February 8, 2014. (Photo by Liz Maynard)

UPCOMING EVENTS

Illiana Vegetable Growers Symposium. Tuesday, March 4, 2014. (Rescheduled from January) Teibel's Restaurant, Schererville, IN. Registration flyer under events at ag.purdue.edu/hla/fruitveg/ Contact: Liz Maynard at 219-531-4200 ext. 4206 or emaynard@purdue.edu.

Using Contans (*Coniothyrium minitans*) for White Mold Management on Organic Farms Webinar from eOrganic. Tuesday, March 4, 2014, 2:00 P.M. – 3:00 P.M. EST. Register at www1.gotomeeting.com/register/330583648.

Southwest Indiana Melon and Vegetable Growers Association Annual Meeting. March 7, 2014. French Lick Resort & Casino 8670 W. State Rd. 56 French Lick, IN. Registration starts at 8:45 A.M. EST. Subjects to be discussed at the meeting include hollow heart of watermelon, foliar fertilizers, and pest updates. PARP and CCH credit have been applied for. For more information contact Dan Egel or Sara Hoke at 812-886-0198.

EXTENSION SPECIALISTS - Below find a list of Purdue University Extension specialists with expertise in vegetable production, food safety, or marketing. Please keep this list for future reference.

Name	Expertise	Phone	Email	Office Location
Jennifer Dennis	Marketing	765-494-1352	jhdennis@purdue.edu	Purdue, W. Lafayette
Dan Egel	Vegetable Diseases	812-886-0198	egel@purdue.edu	SWPAC, Vincennes
Rick Foster	Vegetable Insects	765-494-9572	rfoster@purdue.edu	Purdue, W. Lafayette
Lyndon Kelley	Irrigation	269-467-5511	kelleyl@msu.edu	Centerville, MI
Liz Maynard	Vegetables, Weed Management	219-531-4200 219-508-1429	emaynard@purdue.edu	Purdue, Valparaiso
Manpreet Singh	Food Safety	765-494-0823	manpreet@purdue.edu	Purdue, W. Lafayette
Steve Weller	Weed Management	765-494-1333	weller@purdue.edu	Purdue, W. Lafayette
Fred Whitford	Pesticide Education and Regulations	765-494-1284	fwhitford@purdue.edu	Purdue, W. Lafayette

Main Purdue Extension Switchboard: 888-398-4636 (888-EXT-INFO)

Other Useful Phone Numbers and Websites

Office of the Indiana State Chemist 765-494-1587, www.isco.purdue.edu

Food Safety for Fruit and Vegetable Farms ag.purdue.edu/hla/foodsafety

Plant and Pest Diagnostic Laboratory 765-494-4641 www.ppdl.purdue.edu/PPDL

Purdue Fruit and Vegetable Connection ag.purdue.edu/hla/fruitveg

Southwest Purdue Ag Program ag.purdue.edu/arp/swpap

Vegetable Pathology at Purdue ag.purdue.edu/btny/Extension/Pages/VegetablePathology.aspx

Vegetable Insects and Their Management – Commercial Site extension.entm.purdue.edu/veg/commercial/index.html

Veggie Diseases Blog ag.purdue.edu/arp/swpap/VeggieDiseasesBlog/default.aspx

Purdue Small Farm and Sustainable Ag ag.purdue.edu/smallfarms/Pages/default.aspx

The Education Store the-education-store.com

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Indiana Vegetable Growers Association

Membership Renewal/Application

Benefits of IVGA Membership:

- Midwest Vegetable Production Guide for Commercial Growers, (ID-56) (new edition usually available in Jan.)
- Vegetable Crops Hotline subscription
- Listing in IVGA Directory of Wholesale Vegetable Producers (optional)
- Your web site linked on www.ivga.org
- Corporate members: logo included on corporate members page at www.ivga.org
- Network with other vegetable growers
- Support education and research to improve vegetable production and marketing in Indiana

To renew or join, correct or fill out the form below and send in with your check payable to IVGA. Memberships run January - December. If you have already renewed for the current year, but haven't provided the information requested below, please check here , and complete and return this form so we have your current information.

Your contact information below will be printed in the membership directory that is sent to members only. It will also be used to mail you the Vegetable Crops Hotline, to fax or e-mail the Hotline Bulletin, and for IVGA correspondence.

Name: _____

Company: _____

Address: _____

City, State, Zip: _____

Tel: _____ Fax: _____

Email: _____

Web: _____

ID-56 Delivery: Where will you pick up your copy of the ID-56 or should we mail it to you?

- IHC (Indiana Hort Congress),
- IVGS (Illiana Veg Growers Symposium)
- SW Ind. Melon and Veg. Meeting
- Starlight Veg Meeting
- Please send by mail
- I do not want a copy of the ID-56

Would you like to receive **free subscriptions** to trade magazines that may be offered to IVGA members?

Yes No

Check here if you want to receive the **Vegetable Crops Hotline by Email ONLY** (no hard copy)

Membership Type:

- Regular, \$40.00/year
- Industry/Corporate, \$80.00/year

Make check payable to:

Indiana Vegetable Growers Association (IVGA).
Return to:
Indiana Vegetable Growers Association c/o Maynard
PO Box 1321
Valparaiso, IN 46384-1321

The IVGA Directory of Wholesale Vegetable Producers will be updated periodically.

Check here to be included in the directory.

Check here if information has not changed since previous year OR provide information below.

Contact information for Wholesale Directory, if different from elsewhere on this form:

Name: _____

Company: _____

Address: _____

City, State, Zip: _____

Tel: _____ Fax: _____

Email: _____

The wholesale directory is available to anyone who requests it and will be posted on the web. Indicate quantity of each item: S=small quantities; X=wholesale quantities; T=semi truckload quantities.

- | | |
|---|--|
| <input type="checkbox"/> apples | <input type="checkbox"/> onions, bulb |
| <input type="checkbox"/> asparagus | <input type="checkbox"/> onions, green |
| <input type="checkbox"/> beet | <input type="checkbox"/> peaches |
| <input type="checkbox"/> black- or raspberries | <input type="checkbox"/> peppers, bell |
| <input type="checkbox"/> broccoli | <input type="checkbox"/> peppers, hot |
| <input type="checkbox"/> cabbage | <input type="checkbox"/> potatoes |
| <input type="checkbox"/> cantaloupe | <input type="checkbox"/> pumpkin |
| <input type="checkbox"/> carrot | <input type="checkbox"/> pumpkin, mini |
| <input type="checkbox"/> cauliflower | <input type="checkbox"/> radishes |
| <input type="checkbox"/> chrysanthemums | <input type="checkbox"/> snap_bean |
| <input type="checkbox"/> daylilies | <input type="checkbox"/> spinach or chard |
| <input type="checkbox"/> greens (collards, mustard, turnip) | <input type="checkbox"/> squash, summer |
| <input type="checkbox"/> corn, stalks | <input type="checkbox"/> squash, winter |
| <input type="checkbox"/> corn, ornamental | <input type="checkbox"/> strawberries |
| <input type="checkbox"/> cucumber | <input type="checkbox"/> sweet corn, bicolor |
| <input type="checkbox"/> eggplant | <input type="checkbox"/> sweet corn, white |
| <input type="checkbox"/> gourds, ornamental | <input type="checkbox"/> sweet corn, yellow |
| <input type="checkbox"/> herbs | <input type="checkbox"/> tomatillo |
| <input type="checkbox"/> kale | <input type="checkbox"/> tomato |
| <input type="checkbox"/> lettuce | <input type="checkbox"/> turnips |
| | <input type="checkbox"/> watermelon |

Office Use Only: Check no. _____ Check Date _____ Date Rec'd. _____ Rec'd. by _____

2014 Vegetable Crops Hotline Subscription Form

The *Vegetable Crops Hotline* newsletter provides the commercial vegetable grower with timely information about disease, insect and weed pests, fertility practices, post-harvest problems, pesticide label changes, meetings and much more. Each year, the Hotline is published 12 times during the growing season (April - September) with off-season issues in February, March and November.

Again this year, in addition to receiving the regularly scheduled *Hotline* issues, subscribers may also receive the *Vegetable Crops Hotline - Bulletin* either by email or FAX. This will require that subscribers to the 2014 *Hotline* indicate how they want to receive the bulletins. The *BULLETIN* articles will also appear in the next regularly scheduled *Hotline* issue along with other pertinent articles written by the Purdue staff.

To subscribe, please fill in your name and address below, and send this form and a check for \$15.00 made payable to Purdue University to:

Vegetable Crops Hotline Subscription
Southwest Purdue Agricultural Program
4369 N. Purdue Rd.
Vincennes, IN 47591

Indiana Vegetable Growers Association members are automatically signed up for the *Vegetable Crops Hotline* at no additional charge.

____ Yes, I would like to subscribe to the 2014 *Vegetable Crops Hotline*. Enclosed is a \$15 check made payable to Purdue University.

Mail to: Vegetable Crops Hotline Subscription,
SWPAP, 4369 North Purdue Road
Vincennes, IN 47591

*******(Please complete the following)*******

Name: _____

Address: _____

City: _____ State: _____ Zip Code: _____

Phone: _____ (home) and/or _____ (work)

If you would like to receive email notification when *Vegetable Crops Hotline Issues AND Bulletins* are published, please give us your email address or visit lists.purdue.edu/mailman/listinfo/vch to sign up:

email address: _____

If you want the occasional *Hotline Bulletins* by fax, please include your FAX number (with area code): _____