Heat Tolerant Broccoli Variety Development and Plant Population Effects on Yield and Quality

Thomas Björkman, Cornell - Geneva

The Eastern Broccoli Project is developing new broccoli varieties that will tolerate eastern summer heat without deforming, and thereby making it a reasonable risk to produce this crop. This public-private partnership is identifying suitable germplasm at seed companies, and having seed companies incorporate superior eastern adaptations that have been developed by public breeding programs at Cornell University, USDA’s Vegetable Laboratory, and Oregon State University. The main issue is that eastern growers need varieties that make uniform buds on evenly domed heads even when summer nights remain warm. Such varieties should make it possible to extend the fall harvest season into August, and make spring production a reasonable proposition.

New heat tolerant varieties in the pipeline - In our trials of materials already in the seed companies’ pipeline, or not in current production, we identified several that perform as well as, or better than, the most popular lines in the East. Among these are DuraPak 16 and DuraPak 18 from Syngenta, and BC1691 (right) and Lieutenant from Seminis. Finding this incremental advance even in the first year is unexpectedly good progress.

For 2012, both seed companies and public breeders provided newly made crosses that are intended to fit eastern conditions better. We tested 39 lines at five locations across the East, and found that these first new crosses included many that exceeded the performance of the best eastern varieties. This result gives an indication that the project will result in substantial improvements in variety choice for eastern growers.

In order to be profitable with this very competitive crop, growers need to take full advantage of the high productivity of our soils. Our results suggest that growers can raise their yield goal and plant population to make the economics more attractive. Current eastern yields are often about 400 to 450 boxes per acre, using single rows with in-row spacing of about 12 inches. We tested the yield potential by using an excellent Honeoye soil, providing abundant water and fertilizer, and raising the plant population. Raising only fertility tends to cause thicker, faster-growing stems that are prone to become hollow. That defect can cause the crop to be rejected. A higher population keeps the stems thinner.
This publication contains pesticide recommendations. Changes in pesticide regulations occur constantly and human errors are possible. Some materials may no longer be available and some uses may no longer be legal. All pesticides distributed, sold or applied in NYS must be registered with the NYS Dept of Environmental Conservation (DEC). Questions concerning the legality and/or registration status for pesticide usage in NYS should be directed to the appropriate Cornell Cooperative Extension (CCE) specialist or your regional DEC office. CCE and its employees assume no liability for the effectiveness or results of any chemicals for pesticide usage. No endorsement of products or companies is made or implied. READ THE LABEL BEFORE APPLYING ANY PESTICIDE.
40,000 plants per acre yielded 600-800 boxes - We found that the optimal population for yield, quality, and number of cuts was 40,000 plants. In-row spacing of 8 inches worked well. Going down to 6 inches caused too many plants with no marketable head. A between-row spacing of 15 inches worked well in a 3-row bed. At this population yields were 600 to 800 boxes per acre. Generally, that yield difference with essentially the same growing cost would increase profit by several thousand dollars per acre.

22 days after transplanting

Figure 1. When provided good soil and abundant fertility and moisture, the optimal population for yield, quality, and number of cuts was 40,000 plants with 8 inch in-row spacing and 15 inch row spacing, which yielded 600 to 800 boxes per acre. Going down to 6 inches caused too many plants with no marketable head.

This project was presented at the Empire State Producers Expo in Syracuse, January 23, 2013.

Farm Service Agency Microloans for Small Farms

USDA Farm Service Agency (FSA)

The Farm Service Agency’s (FSA) Direct Farm Operating Loans are a valuable resource to establish, maintain and strengthen a farm or ranch. Microloans are direct farm operating loans with a shortened application process and reduced paperwork designed to meet the needs of smaller, non-traditional, and niche operations. Apprentice and mentorship programs, non-farm business experience, and farm labor experience are acceptable alternative solutions for helping to meet farm experience and managerial requirements. Operating loans may be used to purchase items such as:

- Farm equipment
- Fuel, farm chemicals, insurance, etc.
- Minor improvements or repairs to buildings
- Refinance certain farm-related debts, excluding real estate

There is no minimum loan amount. The maximum loan amount for a Microloan is $35,000. The maximum loan amount for a Direct Farm Operating Loan is $300,000. There is no down payment requirement.

Contact your local FSA office or USDA Service Center to learn more about programs offered and the information needed to complete an application. To locate your local FSA office go to: http://offices.sc.egov.usda.gov/locator/app?state=ny&agency=fsa or find a listing in the telephone directory under the US Dept. of Agriculture, Farm Service Agency.
FDA Proposed Food Safety Rules - Submit Comments by May 16

USDA AMS Fruit and Vegetable Program

(The proposed FDA food safety rules will affect all growers of vegetables and fruits. Currently only those growers whose buyers require third party certification of the farm’s compliance with a food safety plan, GAPs, etc., have been affected. C MacNeil, CVP)

On January 16, 2013 the Food and Drug Administration (FDA) published in the Federal Register for public comment the proposed rule: Standards for the Growing, Harvesting, Packing, and Holding of Produce for Human Consumption (FDA fact sheet at: http://www.fda.gov/Food/FoodSafety/FSMA/ucm334114.htm?source=govdelivery) This proposed rule is a key component of the 2011 FDA Food Safety Modernization Act.

The produce industry, other stakeholders and the general public are asked to review and submit comments to FDA at: http://www.regulations.gov by May 16, 2013. Your specific comments as to what works for you and what doesn’t work (and why) will help guide FDA as they draft final rules on produce safety and preventive controls. Standards for the Growing, Harvesting, Packing, and Holding of Produce for Human Consumption will become effective only after the final rules are published in the Federal Register along with established compliance dates.

Should you have questions about FDA’s proposed rules contact FDA at FSMA@fda.hhs.gov or Food and Drug Administration, 5100 Paint Branch Pkwy., Wiley Building, HFS-009, College Park, MD 20740, Attn: FSMA Outreach.

(The Produce Safety Alliance has very understandable information on the FDA’s proposed food safety rules. Check out their website, and monthly updates, at: http://producesafetyalliance.cornell.edu/psa.html)

Brian Nault: Go-to-Guy for Vegetable Insect Pests Earns IPM Award

Mary Woodsen, NYS IPM Program

When a virus epidemic hit New York’s 30,000 acres of snap beans, entomologist Brian Nault shifted into high gear. The virus wasn’t new, but an aphid that transmits it was. That aphid spells major trouble for the snap bean industry throughout NY and the Great Lakes region, not just for growers but for food processors and ultimately consumers as well.

As a go-to guy for nearly any vegetable with insect trouble, Nault, a professor at Cornell University, began looking at how the aphid dispersed and overwintered—not only among snap beans but in hedgerows or neighboring fields.

Nault’s goal—to find the least toxic, most effective means of taming this dread disease. Sometimes the results are surprising: as is the case with many viruses, spraying for aphids provides no benefit at all. Varietal testing of susceptibility of dozens of snap bean varieties to viruses led to growers using more virus-tolerant varieties. Results of Brian’s research led to recommendations to use these varieties after late June, when infection is more likely, and to avoid spraying insecticides for aphids.

Farmers like onion grower Matt Mortellaro have benefited not only from Nault’s expertise but from how accessible he is. "He’s always responsive to grower input," says Mortellaro, who participated in research to find solutions to thrips. Carefully timed sprays on research plots cut applications by up to 50 percent. "I’ve changed my practices because of Brian’s work," says Mortellaro. "His work in thrips management is particularly worthy of recognition."

Jeff Johnson at Seneca Foods Corporation says Nault’s research isn’t just about farmers. Saving on pesticide use climbs the economic food chain too. "Brian’s research has a major impact on the cost of controlling pests," Johnson says. "His work to help our industry stay competitive is an asset to us all."

For these projects, Nault received the Excellence in Integrated Pest Management (IPM) Award. Nault received his award on January 22 at the Empire State Fruit and Vegetable Expo Potato session in Syracuse, NY. Brian recently took on responsibility for potato insect pests, after the retirement of Professor Ward Tingey.

(edited by C. MacNeil, CVP)
For the first time in New York, the farm gate value of a single vegetable, cabbage, exceeded $100 million (Table 1). The farm gate value of NY vegetables was the highest ever, with an estimate of close to $530 million. Acreage of fresh market vegetables held steady in 2012 and the increase in value was due to both a relatively large increase in average yield for most crops along with prices that were slightly higher than 2011 (Table 2). 2012 was for the most part hot and dry and growers were forced to irrigate through much of the season. Though adding to costs, growers that could irrigate saw the benefit in terms of gate through much of the season.

On the processing side (Table 3), planted acres and value increased compared to 2011. Although values are still lower than 2010, the trend seems to be heading in the right direction and we expect to see steady increases for 2013. 2012 was the first year that Bonduelle North America grew for processing in New York, joining Seneca Foods as one of the two major processors in the state. Unfortunately, we can only get individual statistics for processing snap beans. One addition to the crops being grown for processing in 2012 was lima beans, and acreage of this crop is expected to increase in 2013.

In addition to the crops listed to the right, there are another dozen “minor crops” grown in NY for which no statistics are kept. These include carrots (both fresh market and processing), lettuce, melons, radishes, broccoli, asparagus, Chinese cabbage, garlic, and herbs. These crops would likely add at least another 6,000 acres and $30 million to the industry totals.

### Table 1. Value and planted acreage of NYS fresh market vegetables, 2010-2012. (NYS Ag Statistics).

<table>
<thead>
<tr>
<th>Crop</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>% Change</th>
<th>Average Price ($/cwt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cabbage</td>
<td>106.0</td>
<td>10,900</td>
<td>81.9</td>
<td>10,900</td>
<td>88.0</td>
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<tr>
<td>Sweet Corn</td>
<td>68.4</td>
<td>21,700</td>
<td>53.6</td>
<td>23,300</td>
<td>71.1</td>
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<tr>
<td>Squash</td>
<td>41.2</td>
<td>4,600</td>
<td>42.9</td>
<td>4,900</td>
<td>36.8</td>
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<tr>
<td>Tomatoes</td>
<td>47.1</td>
<td>2,900</td>
<td>36.6</td>
<td>3,000</td>
<td>28.5</td>
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<tr>
<td>Onions</td>
<td>46.0</td>
<td>40.0</td>
<td>26.7</td>
<td>8,100</td>
<td>53.7</td>
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<tr>
<td>Snap Beans</td>
<td>33.5</td>
<td>5,400</td>
<td>31.0</td>
<td>5,600</td>
<td>39.2</td>
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<tr>
<td>Pumpkins</td>
<td>33.0</td>
<td>6,400</td>
<td>23.6</td>
<td>6,800</td>
<td>35.1</td>
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<tr>
<td>Cucumbers</td>
<td>25.8</td>
<td>3,000</td>
<td>18.6</td>
<td>3,000</td>
<td>18.5</td>
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<tr>
<td>Cauliflower</td>
<td>4.3</td>
<td>500</td>
<td>2.4</td>
<td>400</td>
<td>3.4</td>
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<tr>
<td>TOTALS</td>
<td>404.5</td>
<td>65,600</td>
<td>317.3</td>
<td>66,080</td>
<td>374.3</td>
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<td>Peppers, Bell</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>9.9</td>
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<td>Eggplant</td>
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<td>*</td>
<td>*</td>
<td>4.0</td>
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<tr>
<td>Endive/Escarole</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>2.0</td>
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<tr>
<td>Spinach</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>1.0</td>
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<tr>
<td>TOTALS</td>
<td>421.3</td>
<td>67,700</td>
<td>333.3</td>
<td>68,180</td>
<td>391.2</td>
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</table>

### Table 2. Average yield and marketing year average price for fresh market vegetables in 2010-2012. (NYS Ag Statistics).

<table>
<thead>
<tr>
<th>CROP</th>
<th>Average Yield (cwt/Acre)</th>
<th>% Change</th>
<th>Average Price ($/cwt)</th>
<th>% Change</th>
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<tbody>
<tr>
<td>Cabbage</td>
<td>430</td>
<td>440</td>
<td>420</td>
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<tr>
<td>Potatoes</td>
<td>320</td>
<td>250</td>
<td>285</td>
<td>14.0</td>
</tr>
<tr>
<td>Sweet Corn</td>
<td>120</td>
<td>95</td>
<td>110</td>
<td>15.8</td>
</tr>
<tr>
<td>Squash</td>
<td>195</td>
<td>190</td>
<td>190</td>
<td>0.0</td>
</tr>
<tr>
<td>Tomatoes</td>
<td>140</td>
<td>160</td>
<td>195</td>
<td>21.9</td>
</tr>
<tr>
<td>Onions</td>
<td>315</td>
<td>305</td>
<td>310</td>
<td>1.6</td>
</tr>
<tr>
<td>Snap Beans</td>
<td>70</td>
<td>61</td>
<td>65</td>
<td>6.6</td>
</tr>
<tr>
<td>Pumpkins</td>
<td>215</td>
<td>110</td>
<td>170</td>
<td>54.5</td>
</tr>
<tr>
<td>Cucumbers</td>
<td>170</td>
<td>160</td>
<td>210</td>
<td>31.3</td>
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<tr>
<td>Cauliflower</td>
<td>145</td>
<td>115</td>
<td>140</td>
<td>21.7</td>
</tr>
</tbody>
</table>

### Table 3. Value and acreage of New York processed vegetables, 2010-2012. (NYS Ag Statistics).

<table>
<thead>
<tr>
<th>Crop</th>
<th>Value (Million $)</th>
<th>Planted Acres</th>
<th>Value (Million $)</th>
<th>Planted Acres</th>
<th>Value (Million $)</th>
<th>Planted Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Snap Beans</td>
<td>18.8</td>
<td>19,700</td>
<td>15.2</td>
<td>15,100</td>
<td>21.6</td>
<td>25,600</td>
</tr>
<tr>
<td>Peas, Corn, Beets, Kraut, Carrots, Lima beans</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>Na</td>
<td>na</td>
<td>na</td>
</tr>
<tr>
<td>TOTAL, Processing</td>
<td>44.9</td>
<td>32,700</td>
<td>27.0</td>
<td>25,200</td>
<td>47.6</td>
<td>58,600</td>
</tr>
<tr>
<td>TOTAL, Fresh</td>
<td>483.3</td>
<td>84,500</td>
<td>394.9</td>
<td>84,680</td>
<td>460.3</td>
<td>88,340</td>
</tr>
<tr>
<td>TOTAL, All</td>
<td>528.2</td>
<td>117,200</td>
<td>421.9</td>
<td>109,880</td>
<td>507.9</td>
<td>146,940</td>
</tr>
</tbody>
</table>

* Statistics not available until later this year

na - Not published to avoid disclosure of individual operations
2012 Vegetable Grafting Update

Judson Reid, Kathryn Klotzbach, and Nelson Hoover, CCE Cornell Vegetable Program

In 2012 the Cornell Vegetable Program conducted trials of grafted cucumbers and tomatoes. We grafted 2 tomato scions (Panzer and Big Dena) onto 3 different rootstocks (Arnold, Colossus and Maxifort) - see Figure 1. For cucumbers we tried 3 different scions (Diva, Tamzalua and Presidio) onto 1 rootstock (Strongtosa). In each case we also grew out ungrafted control plots for comparison. Tomatoes were grafted using the ‘tube-graft’ method and cucumbers were grafted via the ‘single-cotyledon’ method. Detailed information on our materials and methods can be found on our website: http://cvp.cce.cornell.edu/

Results and Discussion

Survival of grafted tomato plants was an average of 84% with some difference between the rootstocks. Cucumbers continue to be a challenge, with our highest average survival reaching 76%. The benefits of grafting on tomatoes also continues to be greater than with cucumbers. Both tomato scions gained around 5 lbs per plant, comparing the highest combination with ungrafted control plots (Table 1). However for cucumbers, yield was not significantly different from control plots (Table 2).

Don’t forget yield is not the only advantage of grafting! We would also like to confer cold hardiness and disease resistance to the crop. The Cornell Vegetable Program was recently awarded a Specialty Crops Research Initiative grant to continue this research for NY vegetable growers.

Would you like to learn more about grafting? Please see the meeting announcement (page 9) for more details on a March 14 workshop in Belmont, NY. Participants in this workshop will graft their own tomato plants! Contact Lynn Bliven at 585-268-7644 ext. 18 for more details.

| Table 1. Yield measures of two tomato varieties ungrafted, and grafted to three different rootstock. |
|---------------------------------|-----------------|-----------------|-----------------|
|                               | Mean Fruit Weight (lbs) | Total Fruit per Plant | Mean Plant Yield (lbs) |
| Big Dena                      | 0.64 bc            | 38.31 c          | 24.54 cd         |
| Big Dena x Maxifort           | 0.70 a             | 43.69 ab         | 30.60 a          |
| Big Dena x Colossus           | 0.68 ab            | 39.69 bc         | 26.80 bcd        |
| Big Dena x Arnold             | 0.72 a             | 37.56 c          | 26.85 bc         |
| Panzer                        | 0.55 e             | 44.58 a          | 24.42 d          |
| Panzer x Maxifort             | 0.62 cd            | 47.19 a          | 29.16 ab         |
| Panzer x Colossus             | 0.60 cde           | 47.00 a          | 28.11 b          |
| Panzer x Arnold               | 0.58 de            | 47.88 a          | 27.61 b          |
| * p-Value                     | 0.0000             | 0.0001           | 0.0003           |

* Means with different letters (grouping) differ significantly according to Fisher’s Protected LSD (P<0.05).

| Table 2. Yields of 3 cucumber scions, ungrafted and grafted to Strongtosa rootstock. |
|---------------------------------|-----------------|-----------------|-----------------|
|                               | Average Fruit Weight (lbs) | Total Fruit per Plant | Plant Yield (lbs) |
| Presidio                       | 0.39 bc          | 23.89 a          | 9.45            |
| Presidio Grafted               | 0.37 c           | 21.99 ab         | 8.20            |
| Tamazula                       | 0.41 b           | 23.17 a          | 9.69            |
| Tamazula Grafted               | 0.42 b           | 23.61 a          | 9.90            |
| Diva                           | 0.52 a           | 14.12 c          | 7.37            |
| Diva Grafted                   | 0.53 a           | 16.51 bc         | 8.66            |
| * p-Value                      | 0.0000           | 0.0164           | NS              |
I-9 Audits and Compliance

Sandy Buxton, CCE - Capital Area Agriculture & Horticulture Program

One of the most common places a business have a problem with the federal Department of Labor is in a required piece of paperwork for every employee – the I-9. Employers can be compelled to provide these documents with short notice for review by authorities. This form is used to document the eligibility of a person to work in the U.S. It must be completed when an employee starts work. Employers must hold it for 3 years after date of hire or 1 year after the date employment ends, whichever is later.

The process of filling out an I-9 is twofold. The employee must complete the first part filling in their personal information and sign the form. If a translator/third party participates in completing the document, a middle section must be filled out.

Finally, the employer or representative must re-verify documents presented by the employee, describe the document and sign the form. If the employee presents a document which will expire, it is the employer’s responsibility to document that a new version of the document has been presented before the expiration date. Also, a name change due to marriage or divorce must also be documented and dated.

Frequently I-9 audits will turn up inconsistencies such as where Column B or C documents are listed in the wrong spot, signatures in the wrong place or forms not being dated. Maintaining a standard method of completing the form is one of the best procedures. Attendees at a recent Labor Issues meeting shared it was best to have a single person be responsible for processing all I-9 paperwork and new employee hires.

Finally, many employers copy the documents presented. The I-9 does not direct you to copy and hold the documents. If you choose to copy the documents then it must be done for ALL employees. You can just record the documents you have (type of document, number, issuer, expiration, date, etc) and purge the files each year of out-dated material. Note: The Department of Homeland Security does tell employers a file should contain copies of employees’ documents.

Work Agreements and H2-A Employees

Sandy Buxton, CCE - Capital Area Agriculture & Horticulture Program

Each employee who arrives and works on an H2-A visa has an ETA-790 form which can serve as a work agreement documenting the overall contract of work skills, hours, employer and employee info in the employee’s first language, according to the Department of Labor (NYS DOL). However, this form does NOT meet the requirements for the pay notice information which now must be renewed every year documenting pay rate, pay dates, etc.

The solution from NYS DOL is to attach an additional form with this pay info to the ETA-790 in both the employee’s language and the employer’s. This needs to be signed and copies shared between both parties to meet the regulation. In addition, beyond a form for each individual employee, there must be a general form posted in all applicable languages for review by all employees.

Reminder: Use of NYS DOL templates at http://labor.ny.gov/formsdocs/wp/ellsformsandpublications.shtm offer “automatic” compliance. They have posted a variety of forms to facilitate providing information.
# Upcoming Meetings

## Farmers Market Manager Training Conference: The Science of Farmers Markets

- **March 5 - 7, 2013**
- La Tourelle Resort and August Moon Spa, Ithaca

Topics: food safety, crisis management, working with volunteers, understanding consumers, and working with a board of directors. Includes a discussion with experienced managers.


Questions? Contact the Federation office at 315-637-4690; deggert@nyfarmersmarket.com. *Hosted by the Ithaca Farmers Market*

## Funding Sources for Agricultural Producers and Beginning Farmers

- **Wednesday, March 6, 2013**
  - 12:45 - 5:00 pm
  - CCE Erie County
  - 21 S. Grove Street, East Aurora 14052

Updates on funding through Farm Service Agency, Natural Resource Conservation Service, Erie County Soil & Water, NYS Dept. of Agricultural and Markets, Crop Insurance, Northeast SARE - programs for beginning farmers, local micro loans, etc.

FREE!

Contact Sharon Bachman at 716-652-5400 x150 or sin2@cornell.edu for more information.

## Farm Food Safety Training with GAPs

- **March 6 - 7, 2013**
- 8:30 am Registration & Refreshments;
- 9:00 am - 3:30 pm Training
- CCE Yates County
- 417 Liberty Street, Penn Yan 14527

This two day training, including the new “Harmonized” GAPs, will teach you about good ag practices to reduce the risk of microbial food-borne illness. You will develop a food safety plan for your farm. **Laptops are required for the second day.** If you need a loaner check the box on your mail-in registration, or contact Angela Parr at aep63@cornell.edu or 585-394-3977 x426. (General info on trainings, Craig Kahlke: cjk37@cornell.edu or 585-735-5448. For the National GAPs Program go to: [http://www.gaps.cornell.edu/eventscalendar.html](http://www.gaps.cornell.edu/eventscalendar.html))

Cost: $60 per person, includes lunch; $10 more for each additional farm member.

**Pre-register by March 4** by visiting [http://cvp.cce.cornell.edu/event.php?id=68](http://cvp.cce.cornell.edu/event.php?id=68) or call Angela Parr at 585-394-3977 x426. Payment is due in advance of the event.

*Sponsored by Genesee Valley Regional Market Authority, Cornell Cooperative Extension, Cornell University, Produce Safety Alliance and NYS Dept. of Ag & Markets.*

## Lower Hudson Valley Vegetable School

- **Friday, March 8, 2013**
- 9:00 am - 4:00 pm
- CCE Ulster County
- 10 Westbrook Lane, Kingston 12401

Cost: $60 per person after March 1.

For more info: 845-340-3990 x315 or tr28@cornell.edu or visit: [http://counties.cce.cornell.edu/orange/Vegetable_School_13.pdf](http://counties.cce.cornell.edu/orange/Vegetable_School_13.pdf)

## Filling Your Crop Needs

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<thead>
<tr>
<th>Location</th>
<th>Contact Person</th>
<th>Phone Numbers</th>
<th>Services Provided</th>
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<tbody>
<tr>
<td>Elba Muck</td>
<td>Doug Rathke</td>
<td>716.474.0500</td>
<td>Chemicals, fertilizer, seed, custom application, airflow spreading &amp; seeding</td>
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<tr>
<td></td>
<td>cell; 585.757.6642</td>
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<tr>
<td>Batavia</td>
<td>Mike Hammond</td>
<td>585.343.4622</td>
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<tr>
<td>Knowlesville</td>
<td>Kirk Zinkevich</td>
<td>585.798.3350</td>
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<tr>
<td>Gainesville</td>
<td>Larry Dumbleton</td>
<td>585.322.7273</td>
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<tr>
<td>Caledonia</td>
<td>Dale Bartholomew</td>
<td>585.538.6836</td>
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<tr>
<td>Agronomist</td>
<td>Don Jones</td>
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*GROWMARK FS*
Penn State's Extension Vegetable & Small Fruit Program Team presents a series of webinars to keep you informed on critical production issues.

**March 13**  
Recognizing & Protecting Pollinators for Vegetables & Small Fruit

**March 27**  
Cucurbit Pest Management: Organic, Biorational & Conventional

Register at:  
http://agsci.psu.edu/vegetable-production-webinars  
Or call 724-627-3745. When you register you’ll get instructions for accessing the webinar(s).

Cost: $10 per webinar, payable by check or credit card.

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Penn State's Extension Vegetable & Small Fruit Program Team presents a series of webinars to keep you informed on critical production issues.

**March 13**  
Recognizing & Protecting Pollinators for Vegetables & Small Fruit

**March 27**  
Cucurbit Pest Management: Organic, Biorational & Conventional

Register at: http://agsci.psu.edu/vegetable-production-webinars. Or call 724-627-3745. When you register you’ll get instructions for accessing the webinar(s).

Cost: $10 per webinar, payable by check or credit card.

---

Learn about the latest Cornell Vegetable Program on-farm research projects. The use of winter grains to control weeds in summer vegetables was researched in 2012. Can this work as an alternative to herbicides? What is the effect on tomatoes or onions? The advantages and techniques of grafting will also be presented. Participants will graft their own tomatoes and take them home to make comparison with non-grafted plants. HarvestNY is a new CCE initiative to connect growers with consumers. Cheryl Thayer will give a program update.

Cost: $10/person. For more info and to register, contact Lynn Bliven at 585-268-7644 x18 or visit http://cvp.cce.cornell.edu/event.php?id=80.

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These workshops are designed to bring B&B innkeepers together with farmers with products for sale. Organized by the Empire State B&B Assoc., the NYS Small Scale Food Processors, and NOFA-NY. Register online at the web links below, or contact Karen Baase at 315-684-3001 or kab21@cornell.edu a week before the workshop. 

**March 18**, 9:00 am – Noon, New York Wine & Culinary Ctr., 800 S. Main St., Canandaigua. Register online at: https://reg.cce.cornell.edu/BandBCanandaigua_225

**March 25**, 1:30 - 4:30 pm, Cornell Cooperative Extension - Erie County, 21 S. Grove St, East Aurora. Register online at: https://reg.cce.cornell.edu/BandBEAurora_225

**April 3**, 1:00 - 4:00 pm, The Farmers’ Museum, 5775 State Route 80, Cooperstown. Register online at: https://reg.cce.cornell.edu/BandBCooperstown_225

**April 9**, 1:00 - 4:00 pm, CCE - Warren Co, 377 Schroon River Rd, Warrensburg. Register online at: https://reg.cce.cornell.edu/BandBWarrensburg_225
## Upcoming Meetings (continued)

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
<th>Time</th>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tomato/Potato Late Blight - Using an Advanced Forecast Tool</strong></td>
<td>Tuesday, March 19, 2013</td>
<td>1:00 - 4:00 pm</td>
<td>CCE Monroe County 249 Highland Ave, Rochester 14620</td>
<td>Learn how to use this new late blight forecast tool on your farm. The email/text spray alerts and broad base of fungicide info makes the LB DSS easier to use and more helpful than ever before. It provides scientific information to help make better fungicide spray decisions and, in some cases, safely stretch spray schedule during the hot, dry weather. <strong>A laptop is required.</strong> Contact Angela if you need a loaner. Participation is FREE but <strong>pre-registration is required by Monday, March 11.</strong> To register, contact <a href="mailto:aep63@cornell.edu">Angela Parr</a> at 585-394-3977 x426 or <a href="mailto:aep63@cornell.edu">aep63@cornell.edu</a>. Online registration is available at <a href="http://cvp.cce.cornell.edu/event.php?id=78">http://cvp.cce.cornell.edu/event.php?id=78</a>. Questions about the workshop or the LB DSS, contact <a href="mailto:crm6@cornell.edu">Carol MacNeil</a> at 585-394-3977 x406 or <a href="mailto:crm6@cornell.edu">crm6@cornell.edu</a>. DEC and CCA credits will be available. In the email/text spray alerts and broad base of fungicide info makes the LB DSS easier to use and more helpful than ever before. It provides scientific information to help make better fungicide spray decisions and, in some cases, safely stretch spray schedule during the hot, dry weather. <strong>A laptop is required.</strong> Contact Angela if you need a loaner. Participation is FREE but <strong>pre-registration is required by Monday, March 11.</strong> To register, contact <a href="mailto:aep63@cornell.edu">Angela Parr</a> at 585-394-3977 x426 or <a href="mailto:aep63@cornell.edu">aep63@cornell.edu</a>. Online registration is available at <a href="http://cvp.cce.cornell.edu/event.php?id=78">http://cvp.cce.cornell.edu/event.php?id=78</a>. Questions about the workshop or the LB DSS, contact <a href="mailto:crm6@cornell.edu">Carol MacNeil</a> at 585-394-3977 x406 or <a href="mailto:crm6@cornell.edu">crm6@cornell.edu</a>. DEC and CCA credits will be available.</td>
</tr>
<tr>
<td><strong>Capital District Garlic School</strong></td>
<td>Tuesday, March 19, 2013</td>
<td>10:00 am - 2:00 pm, includes lunch</td>
<td>CCE Albany County 24 Martin Rd, Voorheesville 12186</td>
<td>The focus is on soil health and how it affects garlic health - cover crops, rotation, fertility management and soil-borne diseases. Cost: $20 for CDVSFP enrollees; $25 for non-enrollees. For more information or to register, contact Marcie Vohnoutka at 518-272-4210 or <a href="mailto:mmp74@cornell.edu">mmp74@cornell.edu</a> or visit <a href="http://cdvsfp.cce.cornell.edu/event.php?id=76">http://cdvsfp.cce.cornell.edu/event.php?id=76</a>.</td>
</tr>
<tr>
<td><strong>Identification, Assessment &amp; Management of Soilborne Plant Pathogens in Vegetables</strong></td>
<td>Wednesday, March 20, 2013</td>
<td>8:30 am - 4:15 pm</td>
<td>NYS Ag Experiment Station, Jordan Hall, 630 W. North St., Geneva</td>
<td>Topics: Understanding pathogen biology; How to identify soilborne diseases on vegetable crops in the Northeast; Methods for assessing soil pathogen levels and crop loss; and, Disease management. Cost: $20, includes lunch 4.5 DEC credits and CCA credits will be available <strong>Pre-registration required by March 12.</strong> Contact Angela Parr, Cornell Vegetable Program: <a href="mailto:aep63@cornell.edu">aep63@cornell.edu</a> or (585) 394 – 3977 x426. Make checks payable to: <a href="mailto:aep63@cornell.edu">Cornell Vegetable Program</a>, memo: “3/20 Veg Disease Workshop”. Or register and pay online at: <a href="http://cvp.cce.cornell.edu/event.php?id=63">http://cvp.cce.cornell.edu/event.php?id=63</a>.</td>
</tr>
<tr>
<td><strong>Geneva Garlic School</strong></td>
<td>Thursday, March 21, 2013</td>
<td>10:00 am - 2:00 pm</td>
<td>NYS Agricultural Experiment Station, Jordan Hall, 614 W. North St., Geneva</td>
<td>The focus is on soil health and how it affects garlic health - cover crops, rotation, fertility management and soil borne diseases. Cost: $20 for CVP enrollees; $25 for non-enrollees For more information or to register, contact Robert Hadad at 585-739-4065 or <a href="mailto:rgh26@cornell.edu">rgh26@cornell.edu</a>.</td>
</tr>
<tr>
<td><strong>TRAC Software Workshop</strong></td>
<td>Wednesday, March 27, 2013</td>
<td>9:00 am - 12:00 pm</td>
<td>CCE Rensselaer County 61 State Street, Troy 12180</td>
<td>Setting up your farm info, fields, pesticide inventory, and how to enter your records. Learn to generate reports, spray material costs, and fertilizer and harvest records. Trac is developed for tree fruit, berries and grapes. Cost: $15 per person. Contact Marcie Vohnoutka to register at 518-272-4210 or <a href="mailto:mmp74@cornell.edu">mmp74@cornell.edu</a>.</td>
</tr>
<tr>
<td><strong>Greenhouse Transplant Production for Sales and Farm Use</strong></td>
<td>Thursday, April 25, 2013</td>
<td>4:30 - 7:00 pm</td>
<td>Blue Heron Farm, 1641 Shaw Rd, Lodi</td>
<td>Robin Ostfeld of Blue Heron Farm will teach participants how to anticipate one's market and plan accordingly. To register go to: <a href="https://netforum.avectra.com/eWeb/DynamicPage.aspx?Site=NOFANY&amp;WebCode=EventDetail&amp;evt_key=6b0d1f8b-94e1-4ebd-9dd0-93d04cac82e0">https://netforum.avectra.com/eWeb/DynamicPage.aspx?Site=NOFANY&amp;WebCode=EventDetail&amp;evt_key=6b0d1f8b-94e1-4ebd-9dd0-93d04cac82e0</a> or call 585-271-1979 x511. This program is supported by the Beginning Farmer and Rancher Development Program of the National Institute for Food and Agriculture, USDA. Cost: $5 per person; $10 for two or more people from same farm.</td>
</tr>
</tbody>
</table>
# Pesticide Classes

## Certified Pesticide Applicator Training and Test

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wednesday, March 13</td>
<td>1:00 - 4:00 pm</td>
<td>CCE Wayne Co.</td>
</tr>
<tr>
<td>Monday, March 18, 2013</td>
<td>1:00 - 4:00 pm</td>
<td>1581 Rt. 88 North, Newark</td>
</tr>
</tbody>
</table>

EXAM: Friday, March 22, 2013 12:30 - 5:00 pm

Participants must have experience working with pesticides to become certified. Training classes cost: $50 (additional cost for manuals).

**Pre-registration for the training classes is required.** Call 315-331-8415. Be sure to order the manuals you’ll need. This training is only for those with experience and does not qualify for the 30-hour pre-test training.

To register for the exam or for questions regarding the Certification Process, contact Chris Wainwright at the Avon DEC office at 607-776-2165 x23.

Exam cost: $100 payable to DEC on the day of the exam.

## Erie County Pesticide Recertification Course

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wednesday, March 20</td>
<td>8:15 am - 12:15 pm</td>
<td>CCE Erie County</td>
</tr>
<tr>
<td></td>
<td>8:15 am - 12:15 pm</td>
<td>21 S. Grove Street, East Aurora 14052</td>
</tr>
</tbody>
</table>

Includes a review of Ag Environmental Management practices related to pesticides
Free for CCE - Erie County Ag Enrollees; Others - $20
For info and to register, Sharon Bachman at 716-652-5400 x150 or sin2@cornell.edu.

## Capital District Pesticide Applicator’s Recertification Day

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Friday, March 22, 2013</td>
<td>7:30 am - 4:00 pm</td>
<td>Century House, 997 New Loudon Rd, Latham 12110</td>
</tr>
</tbody>
</table>

Morning - 3 Core Credits; Afternoon – credits in categories 1a, 3a or 7a
$75 half day, $95 full day
To register, call Gale at 518-765-3500.

## DEC Special Permit Training Class for Non-Certified Applicators and Handlers of Federally Restricted-Use Pesticides

<table>
<thead>
<tr>
<th>Wayne County</th>
<th>Tuesday, April 9, 2013 9:00 am - 12:00 pm</th>
<th>Registration: 8:30 am (English) and at 12:30 pm (Spanish)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCE Wayne County</td>
<td>1581 Rt. 88N, Newark</td>
<td>CCE Wayne County</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Orleans County</th>
<th>Wednesday, April 10, 2013 9:00 am - 12:30 pm</th>
<th>Registration: 8:30 am</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orleans County</td>
<td>Cooperative Extension</td>
<td>- Orleans County Cooperative Extension</td>
</tr>
<tr>
<td></td>
<td>Fairgrounds Trolley Bldg. Rte. 31, Knowlesville</td>
<td>(between Albion and Medina)</td>
</tr>
</tbody>
</table>

Certified Supervisors are required to attend the first 30 minutes of training! In Wayne County, supervisors who attend the first 30 minutes of training in the English session do not need to repeat the training in the Spanish session

DEC Special Permit allows non-certified workers to apply and handle federally restricted use pesticides: The Special Permit does not relieve the responsibility of the certified applicator who supervises these employees, but it does relieve the requirement of “on-site, within voice contact” supervision while these pesticides are being applied.

**What are federally restricted-use pesticides?** There are several reasons why pesticides may be federally restricted including avian, fish or aquatic toxicity, acute human oral/inhalation/dermal toxicity (poison), ground and surface water concerns, reproductive effects or tumor causing. Several of the pyrethroid, organophosphorous and carbamate insecticides such as Warrior, Capture, Diazinon, Lorsban and Lannate, and a few herbicides such as Gramoxone and Atrazine, are federally restricted-use materials.

DEC Special Permit training - At Special Permit trainings, we review with non-certified applicators Worker Protection Safety (WPS) handler training and for each federally restricted-use pesticide the potential hazards to non-target species and the environment, and how to prevent the risk of exposure. Trainees also receive a packet with summaries of this information. A DEC Special Permit is valid for one year and must be renewed every year unless the pesticide applicator becomes certified.

$20 per DEC Special Permit. To register, contact Kim Hazel at 585-798-4265 x26 or krh5@cornell.edu. Please register by April 5.
Movento® Receives Emergency Exemption for Thrips Control on Onions

**Information from the US Environmental Protection Agency (EPA)**

The EPA recently issued a section 18 emergency exemption for the use of spirotetramat, formulated as Movento, to control thrips on dry bulb onions in NYS from 3/15/13 to 9/15/13. Movento (22.4% spirotetramat, EPA Reg. No. 264-1050), Bayer CropScience. All directions, restrictions, and Worker Protection Standard requirements, on the Section 18 label as well as on the Section 3 label, must be followed. The official Section 18 label must be in possession of the user at the time of pesticide application.

Movento may be applied at 5.0 fluid ounces/acre on onions for onion thrips control, no more than twice, by air or ground equipment. Local beekeepers should be notified prior to applying this chemical, if possible. Treatment must be made before a damaging population becomes established. Best results will be obtained when two applications are made on a 7-10 day interval, incorporated into a seasonal program where effective products with different modes of action are used in rotation.

(See Brian Nault’s article on rotation of insecticides for onion thrips control in the December 2012 Veg Edge.)

**MOVENTO must be tank-mixed with a spray adjuvant having spreading and penetrating properties to maximize leaf uptake of the active ingredient.**

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New York Potato Production Up

**USDA National Ag Statistics Service, New York Office, January 2013**

New York production of fall potatoes for 2012 is estimated at 4.7 million hundred-weight (cwt.), up 16% from a year ago. Area harvested, at 16,500 acres, is 300 acres more than last year. The average yield was 285 cwt per acre. U.S. production of fall potatoes for 2012 is estimated at 423 million cwt, up 8% from last year. Area harvested, at 989,600 acres, is 5% higher than last year. The average yield is estimated at 427 cwt per acre, up 11 cwt from last year.

Potato stocks, held for all purposes on December 1, 2012 by New York growers, dealers, and processors totaled 2.70 million hundredweight (cwt.), up from the 2.10 million cwt. held a year ago. Storage accounted for 57% of the 2012 potato crop. The 13 major potato States held 280 million cwt of potatoes in storage December 1, 2012, up 4% from a year ago. Potatoes in storage accounted for 68% of the 2012 fall storage States' production.

**Potato disappearance, at 132 million cwt, was 2% above December 1, 2011. Processors in the 9 major States have used 73.2 million cwt of potatoes this season, down 4% from the same period last year.**

This report, in addition to many others, is available free of charge at: [www.nass.usda.gov/ny/](http://www.nass.usda.gov/ny/)

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2013 Cornell Guidelines Available

The 2013 editions of the Cornell Guidelines for Commercial Vegetable Production, Greenhouse Vegetable and Herb Production, and Berry Crops, are now available. These annual publications provide up-to-date crop production information for New York State. They have been designed as practical guides for producers, crop consultants, and ag suppliers. You can order (or may already have ordered) these publications through local Cornell Cooperative Extension county offices. Or you can call 607-255-7282, send an email to pator-order@cornell.edu, or order on-line at: [https://psep.cce.cornell.edu/store/Guidelines/](https://psep.cce.cornell.edu/store/Guidelines/)

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**Contact George Dobson for the highest quality seed and service.**
585-734-7214
1-800-263-7233
www.StokeSeeds.com
High Phosphorus Levels in Streams in the CVP Region

Carol MacNeil, CCE Cornell Vegetable Program, with info from George Thomas, Center for Environmental Initiatives, Rochester, www.ceinfo.org

In recent years testing of streams flowing into Lake Ontario has revealed, in some cases, high to very high levels of phosphorus (Fig. 1). Phosphorus is a limiting nutrient in the growth of algae in aquatic environments. The phosphorus enters the shoreline waters from streams that discharge into it. The phosphorus in those streams comes from a variety of sources including: septic systems, wastewater treatment plants, cropland fertilization, industrial effluents and farm animal waste. This high phosphorus load is causing excess weed and algae growth downstream, which affects fish and the smaller organisms on which they feed. There is special concern about water quality in the Great Lakes because they provide drinking water to so many people, as well as providing fishing and recreational activity with high economic value. Algae is a major cause of beach closings along the Lake Ontario coast.

![Figure 1. Total phosphorus in Lake Ontario tributaries, with the range of the water quality standard (red lines).](image)

Soil test phosphorus levels on many fields on vegetable farms in the Cornell Vegetable Program region are high to very high. The amount of phosphorus in some fields is like “money in the bank!” Generally this is due to repeated, high application rates of fertilizer, compost and/or manure. Vegetable growers have an opportunity to both save money and reduce phosphorus levels in nearby streams by limiting phosphorus fertilizer rates to recommended rates based on a recent soil test. Soils should be tested at least once every three years. By crediting the phosphorus in added compost and manure, phosphorus fertilizer rates may be able to be reduced further. For vegetable crops on many fields this means that rates of phosphorus fertilizer could safely be reduced to 20 – 50 lbs/acre. In most cases this means that fertilizer analyses will need to change.

If you don’t have recent soil test results and recommendations for all your fields, now is the time to plan to collect those soil samples and send them in for testing. It’s likely you’ll find an occasional field with low soil phosphorus levels that you’ve been under-fertilizing! Apply the recommended rate this year and your crop yield could improve.

Agro-One Agronomy Lab Services, through Dairy One, uses Cornell approved extraction techniques and provides Cornell recommendations based on NYS conditions and research, when the Commercial Vegetable (NY) Input Sheet V is used. Cost is $12/sample at the time of submission. Many Cooperative Extension offices have soil sample boxes and input sheets, or you can order boxes and print off input sheets at: [http://www.dairyone.com/AgroOne/soil testing/Form%20V.pdf](http://www.dairyone.com/AgroOne/soil testing/Form%20V.pdf). If you have questions call 800-496-3344 or 607-257-1272.
Cover Crops and Strip Tillage Show Big Benefits

*Beth Stuever, GREEEN News, Michigan State University*

For those interested in reduced tillage and/or cover cropping in vegetable systems contact Carol MacNeil in the Cornell Vegetable Program area at crm6@cornell.edu or 585-394-3977 x406, or Chuck Bornt in the Eastern NY Horticulture Program area at cdb13@cornell.edu or 518-272-4210 x125.

Using a strip tillage system in combination with cover crops benefits vegetable farmers as well as the land, according to research by Dan Brainard, Michigan State University (MSU). Brainard’s research shows that strip tillage in combination with cover crops has big benefits over traditional tillage, including improved soil quality, and reduced wind and water erosion. It also conserves soil moisture, protects beneficial insects and reduces costs for the grower.

With funding from Project GREEEN (Generating Research and Extension to meet Economic and Environmental Needs), Brainard was able to look at the costs and benefits of adopting a strip tillage and cover cropping system. Specifically, his team of scientists examined the effects of this type of system on land planted with sweet corn and cabbage crops. “We’re experimenting with various cover crops to see which ones have the highest benefits for sweet corn and cabbage,” he says. “So far, winter rye and hairy vetch seem to be working best.” Brainard says that weed management is the biggest challenge in strip till and cover cropping systems but that researchers are seeing improvements. (With reduced tillage, the weed control program needs to deal with the perennial weeds that build up, and to come up with alternatives to incorporated herbicides, in addition to learning the best materials, rates and timing for burning down cover crops and weeds. ed. C. MacNeil, CVP)

“The benefits most definitely outweigh the costs,” he said. “It’s all about reducing costs to the farmer, and in the long run, this system really does the job.” Using this type of system over time, Brainard’s team has seen a significant improvement in soil quality, which, in turn, improves yields and crop quality. Cover cropping and strip tilling also reduce irrigation and fertilization costs by buffering erosion, improving water-holding capacity, and helping to keep soil-applied fertilizers and pesticides in place. Less tillage also means fewer tractor trips across the fields and reduced fuel costs. “We’re only looking to help growers save money by encouraging soil conservation, and that has proven benefits that can’t be ignored.”

Vegetable Research Technician Position Available in WNY

The Cornell Vegetable Program seeks an individual to assist in research trial implementation, data collection and harvest. Work in field and greenhouses throughout Western, NY. Full-time with benefits. Minimum 6 months training beyond HS diploma or Associate’s degree. For more information and application instructions, see our website [http://cvp.cce.cornell.edu](http://cvp.cce.cornell.edu).

Approved 2013 Dry Bean Research & Promotion Funding

The following proposals for 2013 dry bean research and promotion were approved by the NYS Dry Bean Industry Advisory Committee at their meeting December 14, 2012, in LeRoy.

<table>
<thead>
<tr>
<th>Researchers</th>
<th>Department</th>
<th>Title</th>
<th>2013-2014 Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hamlin</td>
<td>NY Coalition for Healthy School Food</td>
<td>Promoting Plant Based Foods in New York Schools</td>
<td>$2,000</td>
</tr>
<tr>
<td>Bellinder</td>
<td>Horticulture (I)</td>
<td>Evaluating Weed Management Programs in Zone-Till Dry Beans and New Herbicide Evaluations</td>
<td>$3,984</td>
</tr>
<tr>
<td>Griffiths, Halseth, Sandsted</td>
<td>Horticulture (G)</td>
<td>Breeding, evaluation and development of dry bean varieties that are highly adapted to NYS growing environments and markets</td>
<td>$18,947</td>
</tr>
<tr>
<td>MacNeil, Waldron</td>
<td>CCE / IPM</td>
<td>Determining the magnitude and distribution of Western Bean Cutworm, and the Risk to Dry Beans, in the Major Production Area in NY</td>
<td>$2,997</td>
</tr>
<tr>
<td>Don Halseth</td>
<td>Horticulture (I)</td>
<td>NYS Industry Trials</td>
<td>$1,620</td>
</tr>
<tr>
<td>Total Funded</td>
<td></td>
<td></td>
<td>$29,548</td>
</tr>
</tbody>
</table>
Vegetable growers often wish for crops to grow that are undemanding in their requirements, and that provide reliable yields no matter when and how they are grown. Onions and their allies, known as the Alliums, are the fussiest of crops, demanding exact conditions of daylength and temperature for best performance. Here follows a short primer on what makes them tick. The two major important processes in these crops are the formation of bulbs, or bulbing, and the formation of flowers, known as bolting. Both these processes stop the vegetative growth of the plant, so once bulbing or bolting starts, the plant’s bulb or number of flower stalks will be proportional to the size of the plant at that time. We will cover these processes separately, and then explain how the plants react to a “typical” growing season.

**Bulbing**

Bulbing is the formation of an enlarged storage structure at the base of the leaves, composed of leaf bases and bulb scales. Bulbs are resting structures that provide food for the plant when it resumes growth after long periods of drought or cold. Since they are the harvested product for which the crop is grown, the factors influencing bulb formation are important to know. In Table 1, those factors are listed, and their influence explained for the main Allium crops.

In all the crops that form bulbs, the major stimulating factor is daylength. Under the long daylengths of late spring and summer, bulb formation is initiated. For bulb formation to be continued, daylength needs to continue to be long enough, otherwise the process stops and goes in reverse, showing up as a thick-necked bulb that does not mature properly. Bulbing is fostered by temperatures that are optimum for growth of the crop in onions and shallots. In garlic, the long days of spring and summer stimulate bulbing, but cold temperatures of winter are essential for bulbs to be formed. That is why garlic is planted in fall; if planting is delayed until spring, no bulbs will form if the cloves that are planted were stored in warm conditions.

In all bulb-forming crops, the choice of variety makes a big difference when bulb formation starts, and what size of bulb is formed. In each major onion-producing area of the country, varieties have been selected to maximize productivity under their specific growing periods. Here in New York, our adapted onion varieties start bulbing at close to the longest day of the year (June 21).

<table>
<thead>
<tr>
<th>Crop</th>
<th>Daylength</th>
<th>Temperature</th>
<th>Variety</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onion</td>
<td>Major</td>
<td>Moderate</td>
<td>Major</td>
</tr>
<tr>
<td>Shallot</td>
<td>Major</td>
<td>Moderate</td>
<td>Major</td>
</tr>
<tr>
<td>Garlic</td>
<td>Moderate</td>
<td>Major</td>
<td>Major</td>
</tr>
<tr>
<td>Leek</td>
<td>No bulbs formed</td>
<td>No bulbs formed</td>
<td></td>
</tr>
<tr>
<td>Bunching onion</td>
<td>No bulbs formed</td>
<td>No bulbs formed</td>
<td></td>
</tr>
</tbody>
</table>

**Bolting**

The formation of a flowering stalk and flowers in onions and their relatives is defined as bolting. A bolting plant will not form bulbs, so it is important to prevent flower induction if the purpose of the planting is to produce bulbs. The major trigger for this process is cold temperature (Table 2). The temperature range most effective for flower stalk formation is between 40° and 50°F, but longer periods near freezing can also be effective. Again, the choice of variety makes a big difference in the ease by which an onion can be induced to bolt.

In Texas, on the other hand, varieties have been selected to start bulbing under the shorter daylengths of spring, because they have had all winter to make vegetative growth, and growers want to market an early crop. If such Texas varieties are grown in New York, they would not make much growth before the bulbing process would start, and thus only small bulbs would be formed.

<table>
<thead>
<tr>
<th>Crop</th>
<th>Daylength</th>
<th>Temperature</th>
<th>Variety</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onion</td>
<td>Slight</td>
<td>Major</td>
<td>Major</td>
</tr>
<tr>
<td>Shallot</td>
<td>Slight</td>
<td>Major</td>
<td>Major</td>
</tr>
<tr>
<td>Garlic</td>
<td>Slight</td>
<td>Major</td>
<td>Major</td>
</tr>
<tr>
<td>Leek</td>
<td>Slight</td>
<td>Moderate</td>
<td>Major</td>
</tr>
<tr>
<td>Bunching onion</td>
<td>Slight</td>
<td>Major</td>
<td>Major</td>
</tr>
</tbody>
</table>

In New York, the crop is overwintered, the crop should not be planted too early in fall, to prevent it from reaching the adult state as the cold period arrives. In general, onion varieties that were selected to mature in winter, such as Texas, will be more bolting resistant than those grown in the Northeast.

The formation of a seedstalk in garlic is primarily controlled by the variety in this crop. Generally the garlic varieties grown in the Northeast form stalks of varying heights, while those grown in California do not, even if they survive the winter here. According to work in England, prolonged cold conditions stimulate bolting and seedstalk formation.
Late blight has been occurring routinely during the past few years. Change in occurrence of late blight is at least partly due to the fact there are new genotypes (strains) of the pathogen. Many are more aggressive on tomato and more tolerant of warm temperatures than genotypes like US-8 that previously were dominant. Left unmanaged, late blight is much more likely than other diseases to completely destroy a crop and also to have devastating impact on other tomato fields in a region due to the quantity of pathogen spores that can be produced and easily dispersed by wind.

A replicated experiment was conducted at the Long Island Horticultural Research and Extension Center in 2012 to evaluate new tomato varieties and experimental hybrids that have resistance to late blight. Mt Fresh Plus was included as the industry standard. All named varieties tested are commercially available. Experimentals from the Cornell Breeding Program also have resistance to early blight and Septoria leaf spot.

The trial was conducted in a field dedicated to research on organically-produced crops since 2001. Plants were staked and trellised. Fungicides approved for organic production were applied to all plots to suppress late blight after finding symptoms in the plots. The copper fungicide Badge X2 was applied with Actinovate AG on 14 and 22 August, and with Regalia on 17 August, 31 August and 7 September. Sonata ASO was also applied on 7 September. All applications were made using a tractor-mounted boom sprayer. Leaves were examined for disease symptoms from 31 July to 12 October. Ripe fruit were harvested on 11, 18, and 27 September and 3 October. Fruit quality was evaluated by project staff and by 10 public groups, which included growers and gardeners.

**Results and Discussion:** Very good resistance to foliar symptoms of late blight was exhibited through mid-season by all tomato varieties and experimental hybrids evaluated that have the Ph2 and/or Ph3 genes for resistance. These were Plum Regal, JTO-545, Legend OP, Matt’s Wild Cherry, Jasper, and Defiant PHR, Mountain Magic, Mountain Merit, and three experimentals from Cornell Plant Breeding (NC123S x CU-TR5, NC123S x CU-TR3, and Brandywine x CU-TR3) (Table 1). The named resistant varieties are available from Johnny’s Selected Seeds and Seedway.

In conclusion, best suppression of the US-23 late blight genotype was achieved with tomato possessing both the Ph2 and Ph3 resistance genes, including Matt’s Wild cherry, Jasper, Defiant PHR, Mountain Magic, Mountain Merit and the three Cornell experimentals. Only a few fruit with symptoms of late blight were observed on these entries.

Mountain Magic, Jasper, and Matt’s Wild Cherry were the three resistant varieties receiving the highest overall taste and appearance rating in the 10 evaluations conducted by public groups.
Table 1. Fruit descriptions and assessments for, 2012

<table>
<thead>
<tr>
<th>Fruit</th>
<th>Description</th>
<th>Assessment (Rated 1 - 5) with 5 Best</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mountain Fresh Plus</td>
<td>Orange to red, small, round fruit. Some radial cracking. Flesh was bright red, juicy but acidic and not as sweet.</td>
<td>Taste rating of 3 and overall satisfaction 4.</td>
</tr>
<tr>
<td>Mountain Merit</td>
<td>Medium to large, round red fruit. Flesh was sweet but mealy and soft.</td>
<td>Both taste and overall satisfaction rated 3.9.</td>
</tr>
<tr>
<td>Defiant PHR</td>
<td>Round, small to medium red fruit. Yellow shoulder on most fruit and some zippering. Flesh was light red to red, soft, sweet, juicy, with good flavor. Lots of seeds.</td>
<td>Taste rated 3.5 and overall satisfaction 3.8.</td>
</tr>
<tr>
<td>NC123S x CU-TR5</td>
<td>Medium to large, round fruit has orange to red skin. Some zippering. Flesh was bright red, sweet, and had a good flavor.</td>
<td>Taste rating of 4.3 and overall satisfaction 4.6.</td>
</tr>
<tr>
<td>NC123S x CU-TR3</td>
<td>Large, orange to red round fruit. Fruit had a white core and red flesh. Slightly chewy skin. Flesh had good flavor and taste but was somewhat mealy.</td>
<td>Taste rating of 3.4 and overall satisfaction 3.9.</td>
</tr>
<tr>
<td>Brandywine x CU-TR3</td>
<td>Fruit were round, red and medium in size. Slight yellow shoulder on fruit. Fruit lacked flavor, not sweet. Skin was thick.</td>
<td>Taste rating of 2.5 and overall appearance 2.8.</td>
</tr>
<tr>
<td>Plum Regal</td>
<td>Plum type with orange to red skin. Fruit were medium to big. Flesh was mealy and lacking flavor.</td>
<td>Taste 2.5 and overall satisfaction 3.3.</td>
</tr>
<tr>
<td>JTO- 545</td>
<td>Plum tomato, medium in size and red in color. Deep red flesh was meaty, slightly acidic with a slightly mealy texture. Semi-sweet.</td>
<td>Taste rating of 3 and overall appearance of 3.5.</td>
</tr>
<tr>
<td>Mountain Magic</td>
<td>Small, round red fruit. Campari size. Some skin cracking. Flesh was light red, sweet and juicy.</td>
<td>Taste rating of 4.6 and overall satisfaction 4.8.</td>
</tr>
<tr>
<td>Jasper</td>
<td>Very small, round, red cherry. Lots of seeds. Sweet fruit with good flavor.</td>
<td>Taste rated 4.6 and overall appearance 4.8.</td>
</tr>
<tr>
<td>Matt's Wild Cherry</td>
<td>Small red cherry. Slightly chewy skin but delicious and super sweet.</td>
<td>Taste rating of 4.7 5 and overall appearance 4.8.</td>
</tr>
</tbody>
</table>

A longer report with additional data and photographs is available upon request to mtm3@cornell.edu. Funded by the Ag and Food Research Initiative Program, USDA National Institute of Food and Agriculture.

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For more information contact:
Gale Drake, Western & Central NY
Gale.Drake@usa.dupont.com
585.447.7305

Megan Patterson, Eastern NY & New England
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207.890.1645

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For more information contact:
Gale Drake, Western & Central NY
Gale.Drake@usa.dupont.com
585.447.7305

Megan Patterson, Eastern NY & New England
Megan.Patterson@dupont.com
207.890.1645

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USDA’s Risk Management Agency (RMA) reminds New York farmers that the final date to apply for crop insurance on most insurable spring-planted crops for this crop year is March 15, 2013. Current policyholders also have until March 15 to make any changes to their existing contracts. Crop insurance provides protection against losses due to natural perils, such as drought, hail, wind, and excessive moisture.

March 15 is the Sales Closing Date for spring barley, cabbage, corn, dry beans, forage seeding, fresh market beans, fresh market sweet corn, green peas, spring oats, potatoes, processing beans, processing sweet corn, processing tomatoes, and soybeans. Producers are strongly urged to contact a local crop insurance agent as soon as possible for premium quotes and more details. For a list of crop insurance agents in your area, contact the local USDA Farm Service Agency office or go to: [http://www3.rma.usda.gov/tools/agents/](http://www3.rma.usda.gov/tools/agents/).
Contact the Cornell Vegetable Program

Cornell Vegetable Program (CVP) Specialists

Robert Hadad
Extension Specialist
Food safety; Western region fresh market vegetables; marketing; organic
Phone: (716) 433-8839 x228
Cell: (585) 739-4065
Email: rgh26@cornell.edu

Julie Kikkert*
Extension Specialist
Processing crops: sweet corn, snap beans, peas, beets and carrots
Phone: (585) 394-3977 x404
Cell: (585) 313-8160
Email: jrk2@cornell.edu

Judson Reid
Extension Specialist
Greenhouse production; small farming operations; Eastern region fresh market vegetables
Phone: (315) 536-5123
Cell: (585) 313-8912
Email: jer11@cornell.edu

Christy Hoepting
Extension Specialist
Onions, cabbage, field research and pesticide training
Phone: (585) 798-4265 x38
Cell: (585) 721-6953
Email: cah59@cornell.edu

Carol MacNeil
Extension Specialist
Potatoes, dry beans and soil health; Editor of Veg Edge
Phone: (585) 394-3977 x406
Cell: (585) 313-8796
Email: crm6@cornell.edu

Megan Fenton
Regional Ag Economic Development Specialist, Harvest New York
Cell: (315) 694-1306
Email: mef46@cornell.edu

Elizabeth Buck, Field Technician
Phone: (607) 425-3494
Email: emb273@cornell.edu

John Gibbons, Field Technician
Phone: (585) 394-3977 x405
Email: jg10@cornell.edu

CVP Administration

Mark Giles*, Regional Ag Team Leader
Cornell University
Phone: (607) 255-6619
Email: fmg4@cornell.edu

Angela Parr, Administrative Assistant
Veg Edge, Enrollment, & Sponsorships
Phone: (585) 394-3977 x426
Email: apep6@cornell.edu

Steve Reiners*, Co-Team Leader
Cornell University
Phone: (315) 787-2311
Email: sr43@cornell.edu

* Member of the Cornell Vegetable Program Administrative Management Team

Cornell Cooperative Extension Offices of the CVP

Allegany County CCE
Phone: (585) 268-7644

Cattaraugus County CCE
Phone: (716) 699-2377

Erie County CCE
Phone: (716) 652-5400

Genesee County CCE
Phone: (585) 343-3040

Monroe County CCE
Phone: (585) 461-1000

Niagara County CCE
Phone: (716) 433-8839

Ontario County CCE
Phone: (585) 394-3977

Orleans County CCE
Phone: (585) 798-4265

Seneca County CCE
Phone: (315) 539-9251

Wayne County CCE
Phone: (315) 331-8415

Yates County CCE
Phone: (315) 536-5123

Visit our website at http://cvp.cce.cornell.edu

CVP Region Berry Program

Deborah Breth, Lake Ontario Fruit Program Team Leader
Monroe, Niagara, Onondaga, Orleans, Oswego & Wayne Co.
Phone: (585) 798-4265 x36
Email: dib1@cornell.edu
Website: http://lof.cce.cornell.edu

Cathy Heidenreich, Berry Extension Support Specialist
 Allegany/Cattaraugus, Erie, Genesee, Ontario, Seneca & Yates Co.
Phone: (315) 787-2367
Email: mcm4@cornell.edu
Website: www.fruit.cornell.edu/berry.html
Contact the Capital District Vegetable & Small Fruit Program

**Capital District Vegetable and Small Fruit Program (CDVSFP) Specialists**

**Chuck Bornt**, Team Leader  
Extension Specialist  
Vine crops, sweet corn, potatoes, tomatoes and reduced tillage

Office: (518) 272-4210 ext 125  
Cell: (518) 859-6213  
Email: cdbs13@cornell.edu  
Address: 61 State Street  
Troy, NY 12180

**Laura McDermott**, Extension Specialist  
Small fruits, leafy greens, labor, high tunnels, and food safety

Office: (518) 746-2562  
Cell: (518) 791-5038  
Email: lmg4@cornell.edu  
Address: 415 Lower Main Street  
Hudson Falls, NY 12839

**Crystal Stewart**, Extension Specialist  
Small and beginning farms, organic, root crops, brassicas, and garlic

Cell: (518) 775-0018  
Email: cls263@cornell.edu  
Address: 141 Fonclair Terrace  
Johnstown, NY 12095

**Abigail Foster**, Field Technician  
Email: aef225@cornell.edu

---

**CDVSFP Administration**

**Mark Giles**, Regional Ag Team Leader  
Cornell University  
Phone: (607) 255-6619  
Email: fmg4@cornell.edu

**Steve Reiners**, Co-Team Leader  
Cornell University  
Phone: (315) 787-2311  
Email: sr43@cornell.edu

---

**Cornell Cooperative Extension Offices of the CDVSFP**

**Albany County CCE**  
William Rice Jr. Extension Center  
24 Martin Road  
Voohreesville, NY  
Phone: (518) 765-3500

**Schenectady County CCE**  
Schaffer Heights  
107 Nott Terrace, Suite 301  
Schenectady, NY 12308  
Phone: (518) 372-1622

**Greene County CCE**  
Agroforestry Resource Center  
6055 Route 23  
Acra, NY 12405  
Phone: (518) 622-9820

**Rensselaer County CCE**  
61 State Street  
Troy, NY 12180  
Phone: (518) 272-4210

**Saratoga County CCE**  
50 West High Street  
Ballston Spa, NY 12020  
Phone: (518) 885-8995

---

**Advisory Members**

**Albany**: Tim Albright and Tim Stanton  
**Columbia**: John Altobelli, Bryan Samascott, Jody Bolluyt (organic)  
**Fulton**: Eric and Stephanie Grey  
**Greene**: Pete Kavakos, Jr. and Jim Story  
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