# SPECIAL Report — White Rot: a Returning Problem for Garlic in New York

*Crystal Stewart, CCE Eastern New York Commercial Horticulture Program and Frank Hay, Ph.D., Department of Integrated Plant Sciences, NYSAES, Geneva NY*

White rot is the most significant disease affecting allium production world-wide, and has resurfaced in the New York garlic industry after a long period of eradication. Positive samples were collected in 2016 from Eastern, Central and Western New York, indicating that the disease is widespread. As with other soilborne pathogen, white rot can be persistent and devastating. However, careful management can reduce inoculum, and because the pathogen is spread by seed and soil, it is also possible to prevent its spread into uninfested fields.

## WHAT IS WHITE ROT?

White Rot is caused by *Sclerotium cepivorum,* an ascomycete fungus which is related to white mold fungi (*Sclerotinia* family). The pathogen is spread through mycelia and sclerotia movement in the soil and on seed garlic, but not as airborne spores. Only 1 sclerotium per 10 liters of soil is enough to cause disease, and 10-20 sclerotia will cause upwards of 90% infestation. Generally these levels of sclerotia in the soil can be reached in 2-4 cropping cycles of alliums grown under favorable conditions (Crowe, 1980). One of the primary reasons this disease is of critical concern is that once sclerotia are in the soil, they can remain viable for up to 40 years (Schwartz and Mohan, 2008).

## THE DISEASE CYCLE OF WHITE ROT:

White rot sclerotia will remain dormant in the soil until a suitable host (an allium) is detected through sulfur compounds secreted by the plant. Soil temperature is the greatest factor contributing to the speed of disease movement; at 48° F germination is very slow; optimum at 57-64°F, and terminates at 70°F (Schwartz and Mohan, 2008). Ideal moisture levels for disease development are the same as for crop growth.

White rot damage is generally detected first as yellowing or wilting of the foliage just prior to scape emergence, though the infestation started much earlier. The above ground symptoms can correspond with underground symptoms including degradation of the roots and basal plate, formation of black sclerotia the size of poppy seeds, and briefly a white mycelial mat on the bulb extending up to the soil line.

## HOW DO I KNOW IT'S WHITE ROT?

Garlic can be affected by other pathogens right around scape emergence, including *Fusarium* and *Botrytis porri.* Fusarium does not form sclerotia, and is therefore easy to differentiate. Botrytis sclerotia are normally significantly larger than White Rot sclerotia (see right image on this page). However, if you are unsure about the cause of symptoms you are seeing, you can email your local extension specialist a picture or submit a sample to the diagnostic lab for identification.

## CONTROL MEASURES FOR WHITE ROT:

The best control for white rot is to not bring the pathogen onto the farm. As we see with many other diseases, transmission on seed is a serious concern. Limit introduction of new seed onto your farm if possible, and purchase seed from trusted sources. Discard any seed which is visually diseased. It is also important to limit the movement of soil onto your farm, e.g. through sharing uncleaned cultivation or harvesting equipment.

If white rot is found on your farm, there is no one best answer for control. Various options have been effective in different parts of the world and under a variety of environmental conditions. A management approach which involves multiple strategies will likely be most effective.

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White rot briefly forms a dense white mat of mycelia. This image was taken June 22. Image: Crystal Stewart

Poppy-seed sized sclerotia appear in June as the garlic sizes up. Image: Crystal Stewart

Botrytis sclerotia, by contrast, are generally significantly larger (see arrow). Image: Crystal Stewart

**Quarantine**: Ideally the infested field should be removed from cultivation through establishment of pasture or uncultivated perennial crop. This will prevent the movement of long-lived sclerotia into other parts of the farm. If this is not possible, the infested field (or part of the field) should be taken out of garlic/onion production. Allium spp. are the only hosts of the white rot fungus, so this strategy will prevent inoculum building up in soil. If the field remains in cultivation then considerable care will be required in terms of cleaning equipment in an isolated part of the farm after it is used in the infested field, to prevent further spread to other parts of the farm.

**Biofumigation:** Isothiocyanates released by incorporation into the soil of biofumigant brassica cover crops or dried commercial preparations of brassica material will kill a proportion of sclerotia. While unlikely to eradicate white rot, if utilized over a number of years, this strategy may be a means of reducing the number of viable sclerotia in the soil.

**Solarization**: In Mediterranean climates solarization has proven the most effective control for white rot (Melero-Vara et al, 2000). The technique commonly used is to cultivate and irrigate the soil, then cover it with a transparent polyethylene sheet for approximately one month. This technique could be effective during hot, sunny summers, but would likely be ineffective during cool summers. Viability of sclerotia is reduced in the laboratory by 95% if exposed to 1 day at 113°F or 8 days at 95°F (McLean et al 2001). However, in nature longer periods of fluctuating sublethal temperatures can also reduce viability. In New Zealand, periods of solarization of 1-2 months leading to a maximum soil temperature (4 inches depth) of 103-109°F and mean soil temperature of 77-84°F led to significant reductions in recovery and viability of sclerotia in the topsoil (Mclean et al. 2001).

**Biological controls:** The use of both *Trichoderma* and *Bacillus subtilis* have provided some control of white rot in some years. As with all biologicals, effectiveness varies depending on environmental conditions. Biologicals are a promising addition to a control program, but are not being recommended as a stand-alone control.

**Sclerotia Growth Stimulants**: Sclerotia of white rot germinate in the presence of exudates from garlic or onion plants. However, if they germinate and fail to find a host they will die. A synthetic allium compound called diallyl disulfide was developed to 'trick' sclerotia in the soil to germinate in the absence of a suitable host, resulting in 90 percent reductions of the number of viable sclerotia in a single season (Davis, 2007). Unfortunately, this compound is no longer commercially available. Garlic powder may similarly stimulate sclerotia germination. Garlic

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powder applied at 125-135 lb/A incorporated to 6 inches reduced sclerotial viability by >95% (Crowe et al. 2000). However, note that this treatment did not result in eradication of White Rot, and application must be made when soil temperatures and moisture are adequate for germination of sclerotia (i.e. 50-72°F) and in the absence of Allium host plants.


Biofumigant mustard cover crop. Image: Justin O'Dea, CCE Ulster

There has been some experimentation with using composted onion waste to stimulate germination of sclerotia as well (Coventry, 2002). This technique shows some promise, but should be combined with other control measures. If there is interest in trying this technique, please see the complete paper cited below for protocols, or contact your local garlic specialist.

## CONCLUSIONS

White rot is the most significant disease affecting allium production worldwide, and should be recognized and understood by commercial garlic growers. The best control technique is avoidance of the disease, followed by leaving infested fields and infected seed sources in favor of clean soil and seed. If these are not options, combining different control techniques may significantly reduce disease pressure. Any grower who has a history of white rot should not sell garlic for seed until moving to clean seed stock and soil.

## Sources:

Coventry E, Noble R, Mead A, and Whipps JA (2002) Control of *Allium* white rot (*Sclerotium cepivorum)* with composted onion waste. Soil Biology and Biochemistry 34: 1037-1045.

Crowe FJ, Hall DH, Greathead AS and Baghout KG (1980) Inoculum density of *Sclerotium cepivorum* and the incidence of white rot of onion and garlic. Phytopathology 70: 64-69.

Crowe F, Davis, M, Nunez J, Smith R, Darnell T, Parks R. Dehydrated garlic powder used to reduce *Sclerotium cepivorum* in Dield soil. http://oregonstate.edu/dept/coarc/sites/default/Dles/publication/00_sclerotium_garlic_powder.pdf

Davis RM, Hao JJ, and Romberg MK (2007) Efficacy of germination stimulants of sclerotia of *Sclerotium cepivorum* for management of white rot of garlic. Plant Disease 3 5: 648-208.

McLean KL, Swaminathan J, and Stewart A (2001) Increasing soil temperature to reduce sclerotial viability of Sclerotium cepivorum in New Zealand soils. Soil Biology and Biochemistry 33: 137-143.

Melero-Vara JM, Prados-Ligero AM, and Basallote-Ureba MJ (2000) Comparison of physical, chemical and biological methods of controlling garlic white rot. European Journal of Plant Pathology 106: 581-588

Schwartz H and Mohan SK (2008) Compendium of Onion and Garlic Diseases and Pests, Second Edition. APS Press: 22-25.

# Early Season Garlic Fertility

CRYSTAL STEWART, ENYCHP

The unseasonably warm weather we are having at the end of this winter is slowly increasing soil temperatures, and may mean that garlic will start to grow earlier than usual. The most important time to make nitrogen available to a garlic plant in order to increase yield is shortly after leaf emergence from the ground. Success in providing optimal nitrogen will depend on the nitrogen source you are using and some well-timed assistance from soil biology.

Many organic growers as well as some conventional growers mulching with straw are opting to put down all of their fertility in the fall, leaving the garlic's cover undisturbed in the spring. This is a fine approach as long as the behavior of your nitrogen source is taken into account. First, if making a fall application of N, make sure that the source is not a nitrate form (for example, ammonium nitrate is 51% nitrate nitrogen, while ammonium sulfate is 0% nitrate nitrogen). Waiting until soil temperatures are below 50 degrees to apply fall fertility will prevent most fall nitrification of both ammonium sulfate and organic nitrogen sources such as pelletized chicken manure. You want to keep your N in the ammonium form because it will not leach. Once it is converted to nitrate, nitrogen moves readily in water.

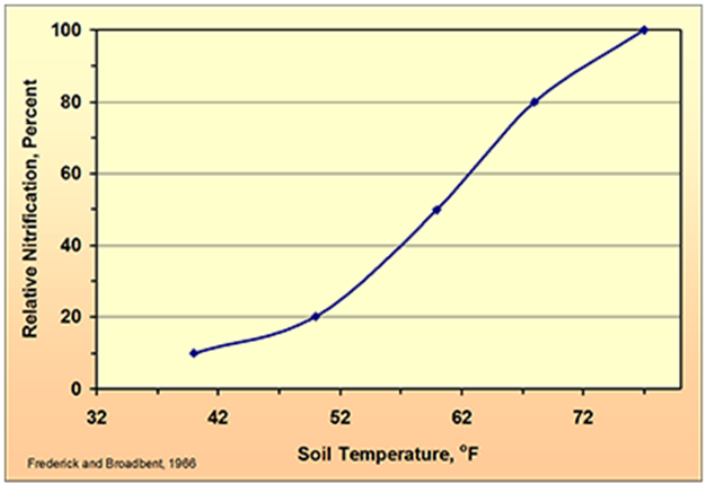


Figure 1: relationship of nitrification to soil temperature. As temperatures climb, nitrifying bacteria more quickly convert ammonia forms of N to nitrate forms, which are more plant available but also more prone to leaching.

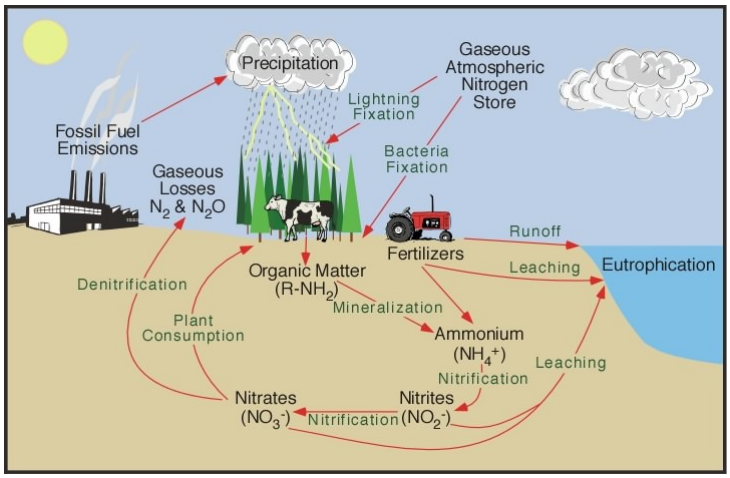


Figure 2: Nitrogen cycling, including organic and inorganic forms.

Second, remember that the nitrogen cycle is driven by biology, and biology is driven by temperature (and soil health!). Organic matter is decomposed partially into ammonium by a suite of microbes before nitrification (see Figure 1 for a handy visual). You want to make sure that your fall applied N source contains enough ammonium/urea nitrogen to provide adequate nutrition in the spring, because garlic starts growing and using N earlier than any other vegetable. As the soil warms, N that is bound in organic matter (slow release N) will be made available, and ammonium nitrogen will turn to nitrate nitrogen (Figure 2), which is easily taken up by plants.

Bare ground garlic growers can apply their nitrogen in the spring using a variety of sources including nitrate-nitrogen forms. Side-dressing as soon as the ground is dry enough to work with either all or half of the needed nitrogen is best. If using half, come back 2-3 weeks later to apply the rest. The recommendation created by Cornell recommends numerous applications, but research has not supported the need to divide the application into more than two (Figure 3).
Nitrogen applied later in the growing cycle of garlic (after approximately May 1st) has very little if any effect on the final bulb size. The good news is we can spend less time fertilizing and more time on weed control!

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Figure 3

| Garlic | Nitrogen (N) Lbs/A | Phosphorus (P2O5) Lbs/A | | | | | Potassium (K2O) Lbs/A | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Soil Test Results** | | **Very low <3lbs/A** | **Low 3-6** | **Medium 7-13** | **High 14-40** | **Very High >40** | **Very low <50** | **Low 51-100** | **Medium 101-200** | **High 201-300** | **Very High >300** |
| Incorporate at planting | 0 | 200 | 150 | 100 | 50 | 0 | 200 | 150 | 100 | 50 | 0 |
| Sidedress before emergence | 25-50 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sidedress 2-3 times, 3-4 weeks apart | 25-50 divided among sidedressings | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 50-100 | 150 | 100 | 75 | 50 | 0 | 150 | 100 | 75 | 50 | 0 |

Source: Cornell Recommendations for garlic, used by Agro-One Soil Lab. Based on use of a Morgan extract.

# Is Your Farm's On-Line Presence Hurting Your Business?

ELIZABETH HIGGINS, ENYCHP

I have been spending a lot of time looking at farm websites, Facebook pages and other social media and on-line advertising and it is very clear to me that a lot of farms in our region are far overdue for a tune up on their on-line presence. Are you one of them? Here are five things that you should fix right now.

**1. Out of date content on websites.** Are you still advertising shares for your 2016 summer CSA? Now is the time when people are shopping for 2017 shares. Get old content off your site. When you have dated information, some customers will think that you might not be in business this year or will select a farm who has current sales information available. Yes, they could call you, but many won't. Best practice for websites – limit the amount of time dated information that is on your site and make that what is there is up to date and current.

**2. Calendar of events with no events.** This is related to #1. If you aren't going to keep a calendar updated, or you don't actually have many events, don't put a calendar of events on your website. Just don't.

**3. Orphan listings** – I see a lot of farms that have joined on-line marketing channels, like Local Harvest, USDA's CSA list or Market Maker but have never gone back and updated their information. I have a lot more confidence that a farm that updated their site in 2017 is actively in business than a farm that last updated its information in 2008. Make it a point to annually go and update all of your listings.

**4. Abandoned Facebook sites and farm blogs.** There seem to be a lot of farms out there that thought they *should* be on Facebook or have a blog, but their heart just isn't in it. If your last posting on the site was two years ago, either post stuff or take the site down. It just looks lonely. You are better off with a simple website that has good, clear information. If you don't know how to put the site out of its misery email me (emh56@cornell.edu) and I will walk you through it.

**5. Your webpage is not "mobile friendly".** Increasingly people are using phones to find information. It is very important that your web content is easy to read on a cell phone. If you have an older site, this might not be the case, and it may be time for an upgrade. Fortunately, there are some really good services, Wix, Weebly, and Squarespace – are three examples – that will allow you to very easily create a modern, mobile friendly website, even if you do not have a background in web design.

If you are really pressed for time, and don't have a lot of time or interest in social media – focus on having a clear, professional, mobile friendly webpage. Keep your content current and update your on-line listings so people know you are still in business. Also check out the Capital District's Direct Marketing Conference on March 16, 2017 in Troy, which will feature presentations on using social media effectively on your farm. To find out more and register for this program, see their website https://blogs.cornell.edu/capitalareaagandhortprogram/2016/12/16/capital-district-direct-marketing-conference/.

http://www.greenhouse.cornell.edu/crops/factsheets/pHGreenhouseCrops.pdf

**Temperature**

Reducing the day-night temperature difference, or reversing it, can greatly reduce stem elongation. In most heating programs, a greenhouse will be much warmer in the daytime than nighttime. The greater this difference, the more potential for stretch.

http://agdev.anr.udel.edu/weeklycropupdate/?p=2671

**Light**

Most vegetable seeds germinate in light or dark conditions (lettuce needs light), to avoid stretching of seedlings and "leggy" transplants provide higher intensity light right after germination. After germination, stretching can occur if seeds are left in dark or low intensity light. Be careful if moving seedlings from germination chambers to high intensity light situations you may need to provide some shading for a few days while seedlings adjust.

http://content.ces.ncsu.edu/starting-plants-from-seeds.pdf

**Other resources on transplant production**

The UGA extension publication "Commercial Production of Vegetable Transplants **(B 1144)"** contains lots of useful information especially for those who are relatively new to transplant production. **You can download the PDF of this publication at** http://extension.uga.edu/publications/detail.cfm?number=B1144#

Below is a link to a power point by Dr. Ajay Nair, from Iowa State, it's almost 20 MB, so it will take a bit to download, but it has useful information and visuals.

http://www.ifvga.org/documents/filelibrary/ifvga_2013_powerpoint_presentations/Ajay_Nair__Transplant_production_IF_8B3476E62446C.pdf

# Effects of Growing Techniques on Yield, Grade, and Fusarium Infestation Levels in Garlic

CRYSTAL STEWART, ENYCHP & ROBERT HADAD, CORNELL VEGETABLE PROGRAM

**Background:** Almost every garlic grower struggles to a greater or lesser extent with Fusarium diseases, which are naturally found in most soils. Two primary Fusarium diseases historically concern garlic growers: Fusarium Bulb Rot, caused by *F. proliferatum* , causes brown to reddish sunken lesions on the bulb surface; and Fusarium Basal Rot, caused by organisms *F. culmorum,* causes the basal plate and gradually the entire bulb to break down. Because the diseases are nearly almost always present, the focus for growers and researchers alike is on management rather than eradication.

Fusarium diseases tend to be worse in fields with poor drainage, but we were unsure of the impact that other techniques such as the use of straw mulch or black plastic might have on Fusarium levels.

We decided to trial different common and novel techniques growers use to cultivate garlic and track both the levels of Fusarium and the quality of the garlic in each approach. We separated the work into two sets of trials: one focusing on cultural changes such as variety selection, raised beds and mulches; and another focusing on inputs that growers can use to affect disease levels such as fertility and organic soil or bulb treatments. The trial including raised beds and mulches was located in the Hudson Valley and replicated in western New York, while the trial looking at inputs was located on Long Island and replicated in western New York.

*Fusarium basal rot in June*
*Image: Crystal Stewart*

Fusarium Bulb Rot
Image: Crystal Stewart

During the growing season, each of the treatments was monitored for disease development as the garlic grew. Diseased garlic was

sent to a Cornell lab in Geneva, NY where the Fusarium was genetically tested to see if the disease is always the same, or if there are different species or pathovars of Fusarium in different locations or situations.

In July the garlic was harvested in all four sites and brought to high tunnels to be dried. When it was dry, all the garlic was cleaned, roots and tops were trimmed, and it was graded into small (less than 1.5 inches in diameter), medium (1.5 to two inch diameter) and large (greater than two inch diameter) categories.

Samples of each treatment were kept in storage and are being assessed during the winter of 2017/18 to determine if Fusarium severity varied by treatment. Ten randomly selected cloves from ten different bulbs were rated for percent of total surface area infested with Fusarium.

This report will focus on the techniques and results used in the cultural controls trials. The results of the nitrogen fertility and organic controls will be discussed in a separate report.

**Trial Overview:** the cultural controls trial included 9 different treatments, which are listed below. Two of the treatments, raised beds and flat ground, were blocked (not randomized) because of the difficulty of switching between raised beds and flat ground in one row. One row of the trial was a 4-inch raised bed, the other was flat ground. The other seven treatments were randomly replicated three times within the rows. Each treatment was twenty feet long, with a small buffer between treatments.

Fall planted garlic was planted in Mid-October, and spring planted garlic was planted in April. All garlic was harvested in mid July. Many of the treatments were also chosen for their excellent weed control. The bare ground treatments were regularly hand weeded so that weed pressure would not interfere with the results of the trial.

**Bare Ground** cultivation of garlic is common because it allows for mechanical weed control as well as side-dressing nitrogen in the spring. Mechanical weed control is very time sensitive, so growers need to be quite attentive to keep weeds from competing with the crop. In a field with high weed pressure, up to 6 cultivations may be necessary for weed control.

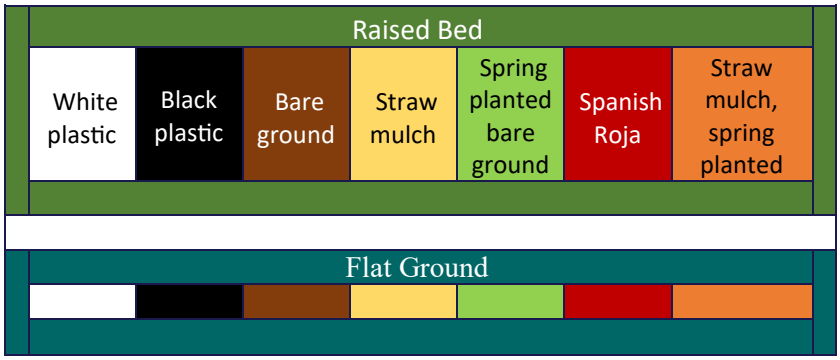
An additional consideration in growing garlic in a bare ground system is that the soil becomes more compacted

than in a system with straw or plastic mulch.

**Straw Mulch** is commonly used in organic garlic production where all fertility is applied in the fall, at planting. Straw mulch can help protect garlic from freezing and thawing in the winter and spring, can moderate soil moisture and temperature, and can suppress annual weed growth. It also reduces soil compaction and contributes to soil organic matter and soil health.

Concerns about using straw mulch focus on two main issues: the potential for mulch to hold too much moisture in wet years and contribute to fungal disease issues (Fusarium ); and weed control failures, which can lead to increased labor weeding compared to bare ground

Map of the first of three replications of the garlic treatments. Following replications in the same row were randomized.



**Black Plastic** is used as another option for weed control. Moisture levels under black plastic tend to stay relatively constant, because not much rainfall makes it under the plastic and because evaporation is minimized. Black plastic also warms the soil more quickly in the spring, encouraging earlier top growth than straw mulch or bare ground systems.

There are two primary concerns that growers have about black plastic. The primary concern is that it can actually get too hot under black plastic during the growing season, restricting garlic sizing in late June and early July. The second concern is that plastic can shed snow during the winter, leaving garlic more exposed to winter injury than in other growing systems. A third concern is that in very dry years, it may be necessary to irrigate garlic under plastic, which necessitates the use of drip tape.

**White plastic** has similar properties to black plastic related to weed control and moisture moderation. However, because it reflects light rather than absorbing it, it keeps the soil cooler rather than warming it. This reflective property might also provide more light to the garlic. White plastic has typically been used in brassica production during parts of the growing season, but has not traditionally been used in garlic production.

White plastic may shed snow during the winter similarly to black plastic, which was a concern with this treatment as well. The effect that temperature moderation would have on early growth was a question mark with this treatment, as was the cooler soil temperature during the summer.

**Variety selection** plays a role in disease susceptibility and adaptability to various environments. For this trial, we selected two varieties grown by the majority of garlic growers: a Porcelain variety (German White) as our primary, and a Rocambole (Spanish Roja) as a treatment for comparison.

Porcelain varieties are very vigorous and perform well under most growing conditions; Rocambole varieties are often considered to have better flavor but seem more susceptible to disease under many conditions.

**Spring planting** of garlic is something that growers tend to avoid if possible, but occasionally we are asked if it is possible to do. We also wanted to know if winter injury is contributing to Fusarium levels on garlic. For this trial we cracked seed at planting time and then stored it in a standard refrigerator at 40 degrees F over the winter. As soon as the ground was thawed in the spring, we planted garlic into bare ground and straw mulch.

**Cultural Control Trial Results:**

After harvest, garlic from both the Hudson Valley and Western NY trials was dried at the Hudson Valley Farm Hub, in high tunnels. Each of the plots was kept in enough separate bags to allow for good airflow for optimum drying. All treatments had their tops clipped in the field at approximately 4 inches. When the garlic was dried, determined by the innermost wrapper leaf being dry to the touch, the marketable bulb and cull counts and weights were recorded by plot. Data analysis was based on the average weight per bulb, as well as by the size distribution. The average weight per bulb was used rather than weight per plot because some of the plots were damaged by factors not considered part of the trial, such as crows picking garlic from the mulched sections. This damage changed bulb number per plot.

The average weight per bulb metric showed black plastic providing the highest yield, followed by white plastic, bare ground, and then straw. Not surprisingly, spring planted garlic had the lowest yields.

While there are numerical differences between the treatments, only the black flat ground treatment was significantly different. White plastic (raised and flat), bare ground, and black raised were all statistically indistinguishable, and straw mulch and Spanish Roja were statistically indistinguishable from white plastic and bare ground. Only spring planted garlic was significantly smaller than all other treatments.

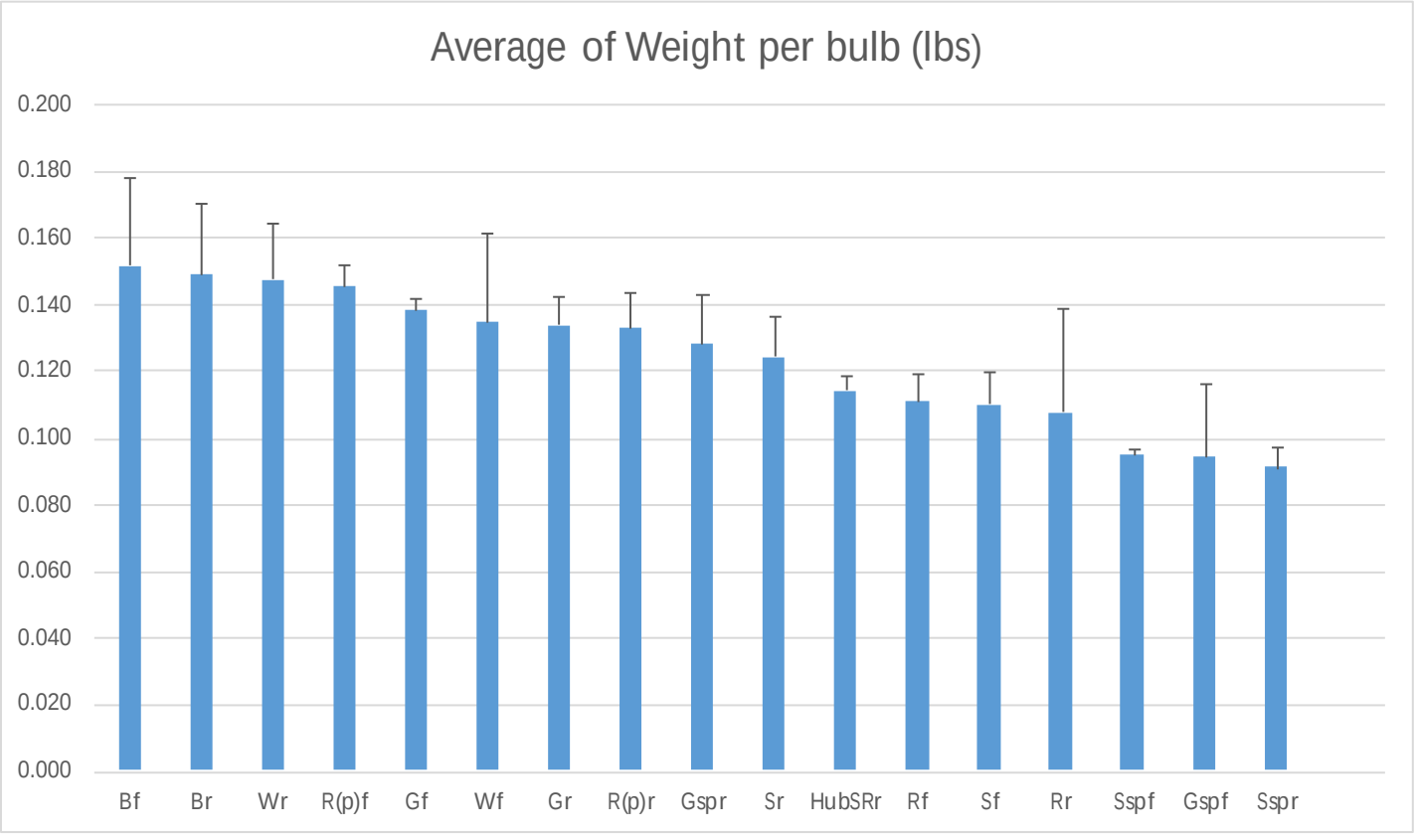
Besides total yield, we also examined the distribution of small, medium and large bulbs.

**Small Bulbs:** 1.5 inches or smaller

**Medium Bulbs:** 1.5-2 inches

**Large Bulbs**: 2 inches or larger

White plastic mulch yielded the highest percentage of large bulbs on both flat ground and raised beds. Spanish Roja had the most even distribution of small, medium and large bulbs. Black plastic, raised beds, and straw mulched garlic all yielded more medium bulbs than the white plastic. Not surprisingly, the spring planted garlic yielded the most small bulbs.

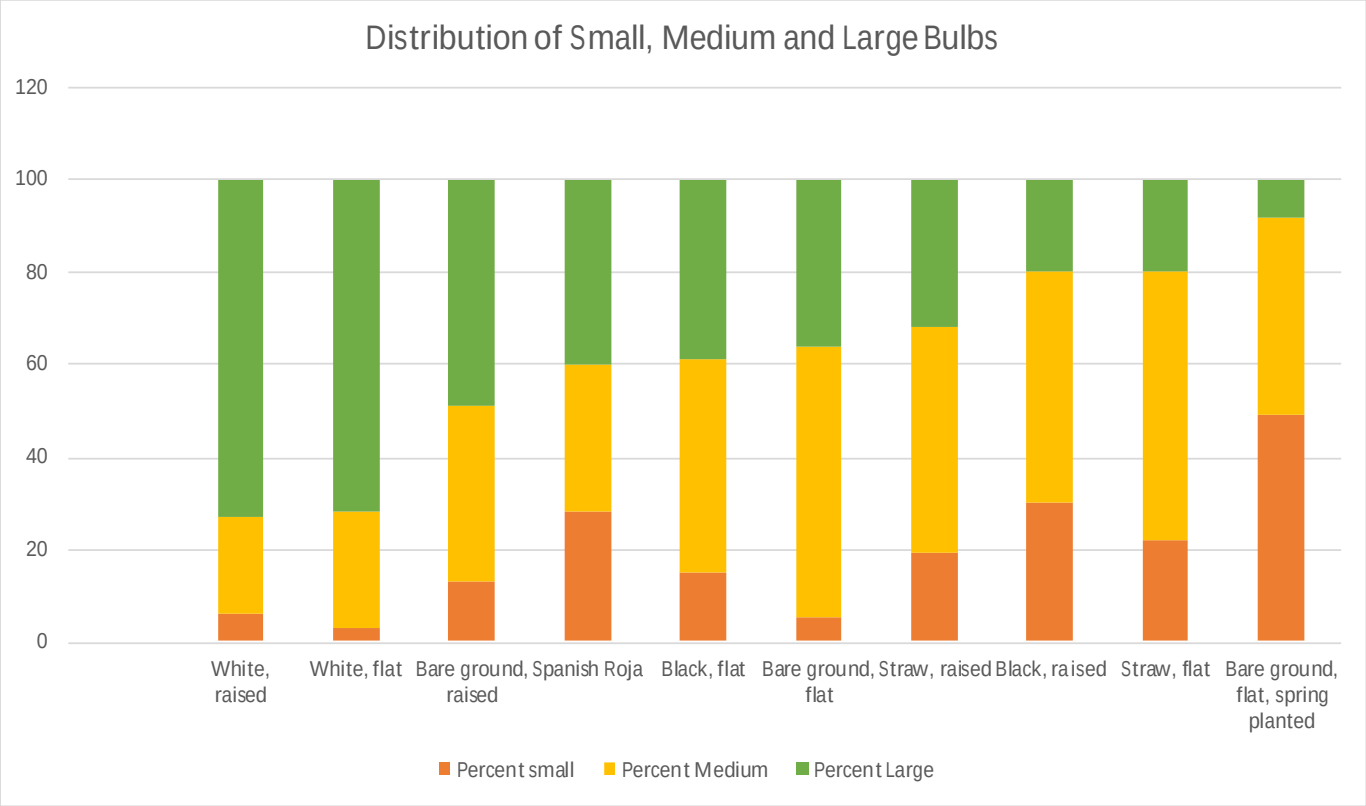


**Next Steps in 2018…**

The final pieces of data to analyze from this trial are the Fusarium ratings, which are happening now. This information will be available on the website and in the newsletter by the end of February.

The trial is being replicated in 2018 in Eastern and Western New York. We have eliminated the spring planted garlic due to the obvious yield suppression of spring planting. This year we are paying close attention to the effects of winter on garlic quality, and have begun qualitative assessments of field conditions of garlic as it sprouts. We are documenting winter injury, field conditions which may negatively affect garlic such as winter flooding, and winter predation/disease pressure.

After data is collected this summer we will compare results across the two years and two locations, and verify or adjust the information reported during 2017.




# Chilean Nitrate: The Monster Energy Drink of N Sources

CRYSTAL STEWART, ENYCHP

All of us need a pick me up sometimes, and likely all of us also know that when we choose the quick fix, it's followed by a crash (yes, I'm coming down from my third cup of coffee today, stop judging me). Soluble forms of nitrogen are for plants what Monster™ Energy Drinks are for people—a serious pick me up when nothing else is working, but not conducive to long-term health. Some of you might already be creating a counter argument that because Chilean Nitrogen is organic, it can't be compared to Monster™ Energy Drinks. I entertained that idea when crafting my analogy until Googling a little and finding….wait for it….Rockstar ORGANIC™ energy drink!


With organic caffeine, organic refined sugar, and organic regretful feelings during the inevitable organic crash.

Chilean Nitrate is remarkably similar to its synthetic soluble nitrogen cousins in many important ways. Some of them make it extremely useful. For example, because it is a salt (Sodium nitrate), it is entirely soluble and can be run through drip systems with ease. The nitrate part of the molecule becomes immediately available to the plant when dissolved in water, unlike sources of N derived from organic matter which need to go through a biological process of mineralization before being available. This is a particular boon to winter

## Spring Injury of Garlic

*Crystal Stewart, ENYCHP*

Garlic seemed to make it through the winter looking really good this year, despite often putting on at least a few inches of growth during our very long, warm fall and with scant snow cover over the winter. As the weather warmed rapidly in March, garlic quickly resumed growth. Warm weather in March always makes farmers with perennial and winter annual crops nervous, since it often pushes crops into stages of maturity which are not able withstand the cold temperatures of April. However, I've never seen this pattern cause any real damage to garlic. Generally a cold snap in April will lay the garlic down, but it rebounds as soon as the temperatures warm without noticeable damage. This spring we learned that the 10-13° F range, which is where most of the region landed immediately prior to our April snow storm, will in fact lead to lasting damage.

This was the first time that even the most seasoned garlic growers I work with experienced this level of spring injury. Inspections throughout the region are showing that the damage is not to the growing point of the garlic, so new growth should continue normally as long as we don't have another serious cold snap, but the loss of parts or all of the first few leaves could set the plants back slightly and has increased potential for infection by pathogens. It's important at this point to provide the best conditions possible for your garlic so that you do not further limit its yield potential. Make sure spring N is applied as quickly as possible, and make sure you are prepared to provide excellent season-long weed control. It's also important to scout your garlic regularly (once a week is a good goal) looking for unusual growth which may be a sign of disease.

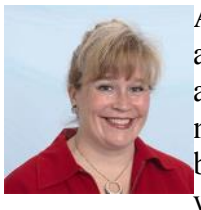
If you see something new, send me a picture (text at 518-775-0018 or email at cls263@cornell.edu) or give me a call to set up a visit.

Garlic emerging from the snow following the April cold snap shows permanent injury to lower leaves. CLS

**How does freezing injury work?** When leaves become quickly water-soaked after a cold event, as we see in the image above, we know that ice has formed within the cells and damaged the cell walls, leading to leakage and cell death. This is a common form of damage to plants in the spring, when the primary method that hardy but growing plants have to protect themselves from cold is to move water out of the cells and into the space between the cells so that pure water freezes and expands without damaging the cells and the materials inside the cell are filled with solutes and have a much lower freezing temperature. This can protect tissues down to around 20 degrees, depending on the species. But below that temperature, other safeguards which are only in place over winter are generally used. Since these safeguards are gone, water in the cell will eventually freeze and cause damage to the membranes.

## Onions and the Cold in Orange County

*Maire Ulrich, ENYCHP*



A few acres of onion transplants were already out on the black dirt when Orange got its cold nights. What does this mean for them? I strongly suspect bolting, but that has a lot to do with whether they had started actively growing or not because we certainly had prolonged periods of less than 45F which will trigger seed production.

As for seed I do not expect any damage from the cold because they were not far enough along in growth. However, there were some fields that suffered wind damage, uncovering the seed.

Right now is a bit of a "wait-and-see" but if you would like help making an assessment, feel free to call Maire at 845-344-1234

## ENYCHP Canada Bus Tour

**Date**: Tuesday, June 28, 2016

**Departure:** Leaving Albany at 6:00 am, with pick-ups along the Northway (Saratoga, Queensbury, Plattsburgh)

**Return:** Arrive in Albany at 9:00 pm.

*Details are being finalized but we plan to visit at least 2 large vegetable operations, 1 on muck soil, the other a greenhouse operation as well as an equipment manufacturer, all south of Montreal.*

More information to follow

Save the Date!

Cornell University Cooperative Extension

Eastern NY Commercial Horticulture Program

Vol. 4, Issue 9
June 22, 2016

# Vegetable News

## First Signs of Brown Leaf Mold in Tunnel Tomatoes

*Amy Ivy, ENYCHP*

Brown leaf mold, a fungus disease primarily seen only in tunnels and greenhouses, is just beginning to show up. The first clues are distinct yellow spots on the surface of tomato leaves (left). Turn the leaf over to find brown, often fuzzy patches directly under the yellow spots (right) to confirm this disease.


(photo: A. Ivy)


(photo: L. Fessler, Cornell summer intern '16)

Sprays are not very effective and good coverage of the underside of the leaf is important but difficult to achieve. Make plans to include disease resistant varieties in next year's crop.
For more information about this disease and some resistant varieties see our fact sheet, Leaf Mold in Tomatoes.

http://enych.cce.cornell.edu/submission.php?id=233&crumb=greenhouse_and_tunnels|greenhouse_tunnels

Be careful to not confuse very common Mg (magnesium) deficiency with early brown leaf mold symptoms. With Mg deficiency, there is much more yellowing between the veins, rather than in spots, and there is no brown, fuzzy sporulation on the underside of the yellow patches. Also, Mg deficiency is usually on the lowest leaves only while brown leaf mold usually first appears higher up, more in the center of the plant.

## June Garlic Update

*Crystal Stewart, ENYCHP*

Overall, the garlic crop is looking pretty good throughout Eastern New York. This is the time when issues really start to show up though, so stay vigilant. We are seeing some isolated incidents of Garlic Bloat Nematode again, so please examine your culls, looking for asymmetrical damage to the roots with health roots beside them (Image 1). We are also seeing numerous suspected White Rot incidents (see article below for more on this). As usual, fusarium is also making an appearance., primarily as basal rot at this point.

Many growers choose to scout/cull during the scaping process, since each bulb is being handled anyway. This is a good strategy. Given the low tolerance we have for GBN, fusarium, etc, culling aggressively is advised, especially with seed garlic. Take a look at the damage you are seeing, and if it looks familiar, you can always send me a picture (text or email is great, just let me know who you are) or I can stop and inspect.

**Testing for Problems:**

**Bloat Nematode:** You can have your garlic tested for bloat nematode, and if you are seeing symptoms which are suspicious (primarily the absence of many roots, while those that remain are healthy) I would recommend it even if you have tested clean in the past. Remember, when selecting 10 bulbs from a field you are getting an idea of whether your garlic is clean, not a definitive answer. It's

*contined on next page*

### In this issue of Vegetable News:

Image 1: Garlic Bloat Nematode damage

better to keep testing and stay as informed as possible than to ignore potential problems and have them become unmanageable. The submission form is located on our website here: http://rvpadmin.cce.cornell.edu/uploads/doc_325.pdf, and the cost is $40 per sample.

**Fusarium:** For the next two years I have funding to test fusarium in garlic extensively, and to conduct some trials on different management strategies. This means that for the next two years you will be able to submit garlic for fusarium testing for free. We are asking everyone to fill out a survey with some grower information when you submit, and we'll ask you to fill it out again at the end of the project to see what changes you made. The goal is that by the end of this project we will understand where fusarium is coming from (seed versus soil), whether there is much variation among the fusaria present, and which management strategies work the best to control the disease. Your samples are very much appreciated! Again, the submission form is on our website.

**No Need to Test:**

**Botrytis Scape Blight:** in the category of "it looks scarier than it is" is Botrytis scape blight. It causes an orange lesion on the scape which often weakens it enough that it falls over. Cull those scapes, and the bulb should be fine.

**Weird looking garlic:** every year a few growers have garlic that doesn't expand properly, instead seeming to tangle up. It can be straightened manually, or left to grow as-is. This issue seems to disappear after a year, only to reappear on other farms the next year. We have tested samples for virus and never recover any of the usual suspects. It also goes into the "try to not worry about it" category, for now.

**Weeding Garlic**

You should weed your garlic. You really should. I know it's tempting to let it go after scaping, but this is a critical period in the development of a nice big bulb. Weeds won't be competing for nutrients so much at this point as they will be competing for water. More water means bigger garlic, plain and simple. So along this same line of thinking, make sure to irrigate if you can when we enter prolonged dry spells. Garlic has a deep, robust root system, so rarely shows water stress, but that doesn't mean that the garlic is getting enough water to optimize bulb size during dry spells. A target of one inch of rain per week is good

Scape Blight. *Image courtesy of a grower.*

Tangled leaves on otherwise healthy garlic. *Image: Crystal*

## White Rot Update

*Crystal Stewart, ENYCHP*


Earlier in June I sent a garlic sample to the diagnostic lab hoping that I was wrong. The sample was covered in small black sclerotia, the size of poppy seeds, and white fungal hyphae crept up the stem. The results, unfortunately, matched the field diagnosis: White Rot. Within a couple days additional calls came from up and down the Hudson Valley as well as one in Western NY with similar suspicions. These samples have also gone to the lab for verification, but it looks like the latest pest to move back into the state is this nasty fungus.

White Rot, *Sclerotium cepivorum,* decimated the onion industry in New York in the 1930's before being eradicated through careful management. More recently, in 2003, it infected 10,000 acres of garlic in California, leading to the abandonment of some garlic fields and adoption of strict containment rules. White rot has been confirmed in Northeastern states over the last decade as well, with New York being one of the last to discover the disease.

The primary reason that White Rot is such a concern is because the sclerotia, or reproductive structures, can remain dormant in the soil for up to 40 years, attacking any allium crop planted into the soil under favorable conditions. This spring was ideal for infection due to the period of cool, moist weather we had. Optimal temperature for infection is 60-65 degrees F, but infection can occur anywhere from 50-75 degrees F.

Once garlic has white rot, it generally declines rapidly. Leaves will yellow and the plant will wilt, not unlike a severe fusarium infection. However, unlike with fusarium, white rot infected bulbs are covered in black sclerotia and

white fungus. To add to the confusion, another disease CAN look similar. Botrytis also causes black sclerotia and white fungal growth. However, Botrytis sclerotia are quite large, often larger than a pencil eraser.

Botrytis has large, black sclerotia that look like masses of peppercorns (or boogies). CLS

So, what do we do now? We're still working on long-term management strategies, but the most important steps to take now are vigilance when culling (look at the plants you are pulling for symptoms like you see in this article, and if they are present, call us to take a sample and have the disease verified) and, if you see anything suspicious, reduction of movement of inoculum. The main ways diseases get moved around are by dumping culls (compost, field edges, etc) and my moving soil on equipment. Throw away your culls, and wash equipment that may have come in contact with suspicious garlic or the soil it is growing in. Everything from cultivation equipment to harvest bins should be cleaned.

We will keep learning about this disease and will keep sending out information, particularly to help you make decisions about what to sell and buy. **For now, remember that the west coast has learned to manage the disease, and we will too.**

White rot has tiny black sclerotia, soil often sticks to the bulb, and white fungi may be present on the bulb or neck. *CLS*

## Sweet Corn Update

*Teresa Rusinek, ENYCHP*

The earliest sweet corn in the lower Hudson Valley is in tassel now ranging from 10% to almost full tassel. European Corn Borer (ECB) Moth trap counts have been very low over the past two weeks in the region but still in some fields, there is enough damage from ECB in early corn to warrant sprays. Early fields are especially attractive to the moths. In fields I've scouted, I see some heavy ECB feeding particularly along field edges. This underscores the fact that you need to scout your fields for presence of ECB, do not rely on trap catches alone. Some Armyworm damage has been noted as well. Scout your fields regularly and apply sprays as tassels emerge if ECB is present at high enough population to warrant a spray. Note that pyrethroids are less effective and give a shortened window of control when applied during hot temperatures. Choosing other classes of insecticides under hot conditions should give better results. -TR


*From Rutgers Cooperative Extension, Plant & Pest Advisory:* European corn borer (ECB) is one of the three major caterpillar pests of sweet corn. ECB has two to three generations per year. Adult moths emerge in late April and May, mate and begin laying eggs on the undersides of corn plants. Typically, eggs are laid on whorl stage plants. Damage occurs as larvae hatch and bore through the leaves to get to the center of the stalk where the tassel is forming. As the plant progresses to the pre-tassel stage, ECB larvae may be found feeding in the newly emerged tassels. Once the tassel spreads and begins to shed pollen, larvae migrate down the stalk and bore back into the stalk at leaf axils or into the developing ears. The latter event results in unmarketable ears. While sweet corn plants can tolerate significant injury when in the vegetative stages, ECB must be controlled prior to the development of ears or that marketable portion of the crop will be lost.

The first generation of the year, when larval damage peaks in mid-June is typically the most difficult to manage. It is often not possible to eliminate the threat with one insecticide application; however the most critical application is one timed for the plant's transition from pre-tassel to full tassel. This is when there is maximum exposure of the larvae to the spray material. If the number of plants infested is above 12% at any time prior to full silk, an insecticide application should be considered. After the planting is in full silk, the majority of ECB larvae still alive will have bored back into stalks or ears and will be unreachable by sprays.

# Making the Case for Field Grading at Harvest (and Timing the Harvest)

*Crystal Stewart, ENYCHP*

Garlic harvest will be starting this week in some areas of eastern NY, and the amount of disease present has been slowly increasing over the last few weeks. The increased pressure makes it more important than ever to field grade garlic. Field grading is not just about choosing what garlic will stay in the field—it is also about deciding what garlic is food grade and what garlic is seed grade. A lot of the garlic that I have been pulling this week has enough Fusarium, for example, to cause it to flag early, but not so much to keep it from making a marketable bulb. After these bulbs are cured and cleaned, it will be a challenging to tell there was an issue at all, especially if the basal plate gets shaved and cleaned. As a quick example, the top image to the right is of a garlic plant which was dying much faster than others in the field, and which showed some fusarium basal rot symptoms when I pulled it out. A quick cleaning of the bulb yielded what you see in the second picture.

**Why bother?**

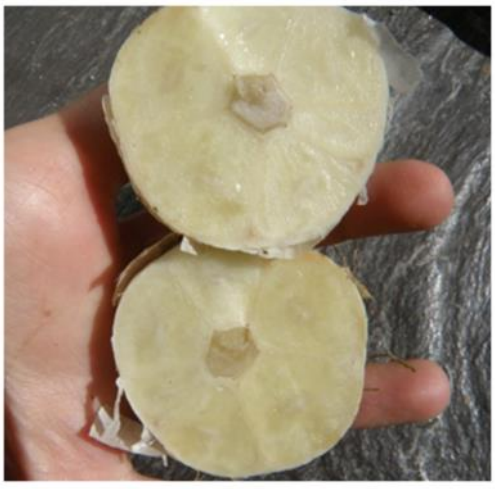
If the garlic was healthy enough to make a decent bulb, why not assume it's healthy enough to plant? The primary reason is that you know that you are going to be planting disease inoculum along with the bulb in the fall if you plant seed that stared out diseased. You may be able to reduce inoculum level with sanitizing dips, but chances are low that you will eliminate disease altogether. By visually selecting the healthiest bulbs for seed stock, and then possibly also following with a sanitizing dip at planting, you can compound your disease reduction efforts.

**Timing the Harvest:**

As we near harvest, how should a grower decide if the garlic is ready? The best answer is to pull a few plants, cut through the head sideways (so you cut through all the cloves), and see how well developed the cloves are. You can use the leaves as a guide to decide when to do this (lowest third or half of the leaves yellowing and dying is a good mark to start with, though this has been challenging this year because of the tip burn), but looking at the cloves is the best way to know if the garlic is ready. Cloves should fill the wrappers—if they seem a little loose, the garlic has a little ways to grow. On hardnecks, this filling will pull the inner cloves away from the scape (see below). A little of the very outer wrapper leaves may have started to decay at this point. That is okay—it's a normal part of the maturation process. The key is to harvest before the bulbs pop, which can happen relatively quickly, especially if we have another wet year. If you don't think you will be able to get out and harvest for a period of time, it's better to harvest bulbs a little too early than a little too late.

Knowing when to harvest garlic can be tricky. Use the leaves as a first indicator, but also feel and look at the bulb. You want the bulb to be very firm in its skins, and when you cut it in half perpendicular to the scape you want to see a small gap around the scape. The garlic on the bottom isn't quite ready; the garlic on the top is.

*Photos by CLS*



## Post harvest Considerations for Garlic

*Crystal Stewart, ENYCHP*

There are many places to successfully dry garlic, but most of them share some common qualities that each contribute to maintaining the quality of the crop. These factors include relative humidity, temperature, air movement, and time.

This drying area at Sky Meadow Garlic Farm demonstrates optimum temperature, relative humidity, air movement, and light infiltration.

**Temperature:** The warmer you dry garlic, the faster the process is completed, up to 120 degrees F. If the environment is allowed to get hotter than this, garlic develops a physiological condition called waxy breakdown, which ruins the quality of the bulbs. Many growers using high tunnels or warm spaces such as hay mows shoot for 100-110 degrees F, which dries garlic effectively without causing anxiety about damaging the bulbs. Cooler spaces, such as garages and empty walk-in coolers, dry garlic days to weeks slowly, creating a longer window in which secondary diseases can form on moist tissue.

**Relative Humidity:** During the drying process, striving for the lowest RH possible is advised. An often-overlooked time to consider RH is at night. High tunnels especially have low RH during the day, but at night it can creep back to near 100%, and garlic may slightly rehydrate. Closing up the structure and running dehumidifiers can help maintain drying progress. Another way to manipulate the relative humidity of the drying space is to bring in less moisture. An effective way to do this is to cut the tops and leave them in the field. Mowing tops has not been shown to reduce the yield or quality of garlic, but can dramatically improve the drying environment, reducing losses.

**Air Movement:** Air movement helps to even out temperature and relative humidity. Running fans to circulate air and to move moist air out of the drying area is very important to maintaining quality. It is also important to set up your system to facilitate air movement. Hanging garlic in bunches can create very moist microenvironments with little to no air movement. The system in the image above maximizes air movement by placing garlic in a nearly single layer on wire mesh benches. Fans are located at one end of the structure and the sides can also be rolled up to move additional air through the tunnel, particularly on warm days.

**Sunlight and Garlic:** Garlic exposed to direct sunlight may suffer from sunscald, which causes depressions in affected cloves. However, drying in tunnels protects garlic from the most damaging aspects of sunlight, and we do not see sunscald in this environment. Many growers still choose to put a layer of shade cloth on high tunnels. This also helps moderate temperatures. Sunlight does not cause garlic to turn green. This is caused by high nitrogen fertility.

For more information on post-harvest handling of garlic, please visit our website and find the study report: http://enych.cce.cornell.edu/crop.php?id=14
And please, if you find samples you suspect have fusarium, find the sample submission form also on the website, and send in a sample!
Stay tuned next week for information on what to do with your garlic once it is fully dry (besides sell it all or plant it!)

## Managing Bacterial Diseases in Onions

*Crystal Stewart, ENYCHP*

The onion crop is generally looking pretty good despite some thrips pressure, particularly the irrigated plasticulture plantings. Surprisingly, given the dry weather, we are seeing some bacterial issues here and there, particularly on the sweet onions. Bacterial issues can be detected during the growing season often by looking for just one or two flagging leaves, often more towards the center of the plant. These leaves will die right into the bulb, either leaving one scale dead or spreading and causing soft rot of the bulb. Christy Hoepting and Dr. Steve Beer wrote a nice article a few years ago detailing the IPM strategies for combatting bacterial diseases and reducing their spread:

1. Choose less susceptible cultivars.
2. Limit amount of pre-plant applied nitrogen fertilizer. Many feel that 100 pounds or less N per acre is appropriate.
3. Use water free of bacterial pathogens for spraying or sprinkler irrigation.
4. Avoid sprinkler irrigation, especially late in the season.
5. **Maintain effective control of thrips, especially late in the season.**
6. Pull/undercut onions when at least 50% of the leaves are down and during dry weather.
7. Do not top onions until neck tissue is completely dry (not green).
8. Harvest during dry conditions.

# Garlic Update

Crystal Stewart -ENYCHP

One of the keys to success in garlic production is aggressive field-culling of poorly performing plants. There are a few critical times to complete this activity: as the garlic concludes its reliance on the original clove for nutrients (right about now); at scaping, and at or just prior to harvest. In order to field cull, give each garlic plant a moment of your attention. Remove and dispose of plants which are stunted and yellow, misshapen, or otherwise different from the rest of the stand. Do not compost or discard these plants in the field—either bury them in an unfarmed area or place them in the garbage.

It's certainly easiest to pull these plants out by their tops, but it's worth taking some time to dig a few up and inspect the nature of the damage or disease. If you only pull the garlic and then inspect, much of the damaged or infested material will stay in the ground, and you get an incomplete picture of the issue. Dig 5-10 plants out, and carefully remove the soil around the plant. Notice whether there is fungal growth, what color the growth is, and whether any insects are present. Here are some examples of symptoms you might see, along with their cause:

**Fusarium**: Cloves which either had or developed severe *fusarium* infestations prior to spring growth may give rise to small, weak plants, often with poorly developed and dying root systems. The roots will be missing from parts of the basal plate, and rotting in others (image). Decaying material may have a pinkish color.

*Garlic sampled in late April as the original clove was disappearing. This could just be fusarium or fusarium and bloat nematode. The only way to know for sure it to test.*

This year we are again offering free testing for *fusarium* and will gladly accept samples. If you would like to send in ten bulbs for testing, please print the form at https://rvpadmin.cce.cornell.edu/uploads/doc_460.pdf and send it with the garlic. Or you can have Crystal or another vegetable specialist help you pull samples.

**White rot:** The good news is that scouting this year has not recovered any obvious white rot. However, we still want to scout for the disease as the garlic develops, because we are not entirely sure when symptoms develop. Look for the outside of the clove or newly forming bulb to start rotting and sloughing off. Either tiny (poppy seed sized) sclerotia or white mycelia right below the soil level may be present. Roots may rot, but will not be pink.

**Garlic bloat nematode:** Damage also shows up on the basal plate with this pest, but roots which remain intact will generally not be decaying. The best way to determine if you have bloat nematode is still do test for it. The grant subsidizing testing has expired, so samples are now run through the diagnostic clinic at the standard rate of $50 per sample or can be sent to Frank Hay at Geneva and processed for $40.

The reason it is important to identify any issues your garlic may have is that future management strategies differ. Fusarium is managed by culling and changing the environment if needed. White rot infested garlic, on the other hand, should only be sold for food and even during this season you would want to take care not to move soil and plant materials to other part of the farm. Management is similar for bloat nematode.

As always, if you have any questions about any of these issues, you can call or email Crystal at cls263@cornell.edu or 518-775-0018 or reach out to any of the other vegetable specialists.

# Asparagus Beetles

Crystal Stewart & Amy Ivy-ENYCHP

As you harvest asparagus take a close look at the spears for signs of asparagus beetle feeding injury. The larvae are out in some areas now but are mostly tucked away out of sight. Look for the their characteristic feeding injury to the spears (photo bottom) and check for any lurking larvae in the clusters of developing fronds (photo top).

The larval stage is the most vulnerable, so a well-timed spray could help knock back the population. Conventional options include Sevin XLR Plus, Lannate and Ambush. The organic options are Pyganic and Entrust. Pyganic can be used up to the day of harvest, but you need to wait for the ferns to open to use Entrust as opposed to using it on the spears.

Asparagus beetle pressure is cumulative from year to year, so it is important to control this pest even during frond development to prevent worsening problems year after year.

**Resource: Chapter 12, Cornell Pest Management Guidelines for Commercial Vegetable Production.**

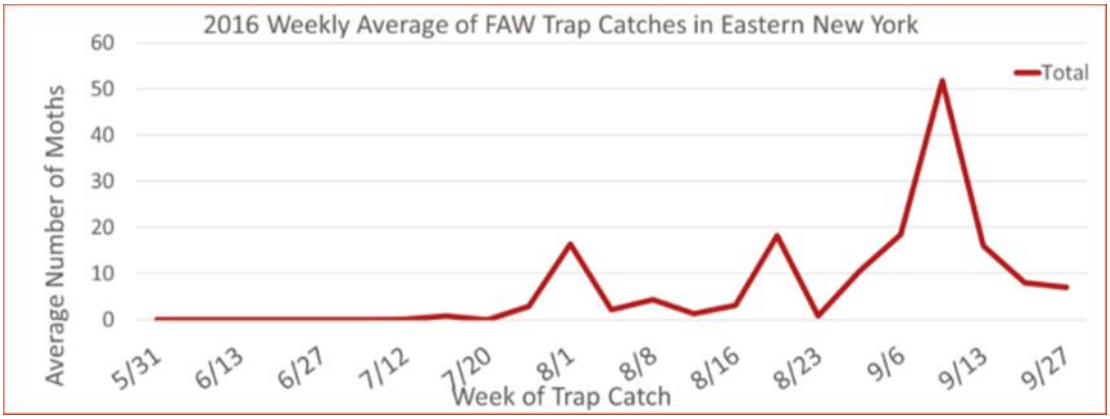
Lurking Larvae

Asparagus Beetle Feeding Damage

# What Happens if Garlic is Spring Planted?

Crystal Stewart -ENYCHP

Sometimes all that is needed to answer a question is a picture. This year, as part of the fusarium management trails, I spring planted garlic next to fall planted garlic. The garlic was held in a refrigerator over the winter at about 37 degrees F. It was planted out as soon as I could get into the ground. While this picture doesn't tell us the final yield or fusarium severity, it does show that plants are quite behind after a spring planting. Based on the stem size, which is a direct indicator of final bulb size, the spring planted garlic will be small.




**Fall Armyworm:** Trap catches are useful as a backup to scouting for these insects. If you scout a field and find it's under threshold, and the trap counts are low, you can feel pretty sure that a spray is not needed. If trap catches are high and you're not finding anything, maybe you need a scouting refresher course to be sure you're able to see egg masses and damage. Damage may be caused by larvae hatching earlier in the season when trap catches were high, even though they are not currently high. We've observed that in hot, dry seasons moths may not lay as many eggs as you would expect because they don't have access to water and high trap catches are not always an indicator of what's happening in the field.—Marion Zuefle

*For additional life cycle information:* http://entnemdept.ufl.edu/creatures/field/fall_armyworm.htm

# Yellow Tips on Garlic

Crystal Stewart, ENYCHP

Every year growers across the region call wondering whether the yellow tips on their garlic are a problem, and why they are like that. We haven't really gotten a sense as to why garlic tips turn yellow sometimes. It might be environmental, it might be a calcium deficiency. What we do know is that the yellowing doesn't affect bulb size or quality, and that it doesn't signal a nitrogen deficiency.

Garlic with yellow tips do not indicate a disease issue.
Image: Amy Ivy

Speaking of nitrogen deficiencies, now is the time to stop worry about them! Fertilizer applications to garlic at this point in the season are not helpful. Now your focus should be on weed control and delivering at least one inch of water per week, especially as the garlic starts to head up. It is important to also keep scouting, rogueing any plants which are looking unhealthy and discarding them. During each cultivation pass and at scaping, take the time to look at each plant and rogue carfeully,

Cornell University
Cooperative Extension
Eastern New York Commercial Horticulture

## Winter protection for garlic makes a difference!

Amy Ivy, ENYCHP

This grower flame weeds so he cannot use straw as a winter mulch in his garlic. In this photo the garlic to right of the yellow line had rowcover laid over the rows for the winter, but the garlic to the left of the line had no cover at all. Everything else was the same: same variety, timing, etc. Note the stunted growth of the uncovered section. Providing some kind of winter cover can make a difference in garlic yield!

## Welcome Cameron Fuhr: CCE Summer Intern

Cameron is a rising senior at Cornell University. He is majoring in Biological Sciences, with a focus on ecology and evolution. He's also a Communications major. This summer, he is working with Peter Jentsch, Teresa Rusinek, and Laura McDermott at the Hudson Valley Research Laboratory on several projects that use a complex of entomopathogenic) nematodes to control damage to vegetable and fruit crops. He is interested in agriculture, as he is a member of Alpha Zeta agriculture fraternity at Cornell. He will also be using his communications and media background to document the nematode project through video.

## Farm Vehicle Guidelines

Maire Ulrich- ENYCHP

As Eastern New York become less rural and the law enforcement personnel are less in-tune with agricultural practices and the law exemptions specific to ag, it's good to get a copy of New York Farm Bureau's *Farmer's Guide to Truck & Farm Implement Laws & Regulations*, 4th Ed.

New York Farm Bureau's publication *Farmer's Guide to Truck & Farm Implement Laws & Regulations,* 4th Ed., commonly known as the "Truck Book," is a resource tool prepared to assist farmers in understanding the myriad state and federal transportation laws and guidelines that affect their farm business. This fourth edition guide includes updated regulations on cell phones, texting, SMV symbols, convex mirrors, lights and reflectors, and many more things important to our members.

This books is available to members ($30) and non-members ($60) of NY Farm Bureau. All prices include tax, shipping and handling. To get your copy contact: New York Farm Bureau, Legal Affairs Department, P.O. Box 5330, Albany, New York 12205 or call: 1-800-342-4143.

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at deterring adult thrips from colonizing onion plants, but it is ineffective during overcast weather. Some research has shown moderate suppression from two different biopesticides, Mycotrol (*Beauvaria bassiana*) and Met52 (*Metarhizium anisopliae*) when applied under ideal conditions and when mixed with labelled diatomaceous earth products. Pyganic and labelled azadirachtin formulations have shown some thrips suppression, but Entrust remains the most effective option. Dr. Brian Nault has found that using M-Pede or JMS Stylet Oil (both NOP compliant) at a 0.5-1% dilution in a tank mix has increased the efficacy of most thrips-management insecticides.

Regardless of what you spray, applications must be made with moderate pressure, lots of water (minimum 40 gallons per acre), a good surfactant/penetrant, and using a nozzle configuration that maximizes canopy coverage (like twin flat-fans). More of Dr. Nault's research on thrips management can be found at http://www.hort.cornell.edu/expo/proceedings/2012/Onions/onion%20Nault.pdf.

## Telling apart your Garlic Funks

Crystal Stewart—ENYCHP

There are quite a few different diseases and pests affecting garlic now. It's important to understand which funk your garlic is facing so that you can manage both this and future crops appropriately. Here is a rundown of two of the diseases we are seeing right now, and how to tell the difference between them. Next week I'll feature garlic bloat nematode vs. fusarium.

**White Rot vs Botrytis Neck Rot:**

There are two diseases causing garlic to flag above ground and to rot with accompanying black sclerotia below ground. The above ground symptoms may be identical (and are also identical to fusarium and bloat nematode). However, the below ground symptoms are different. White rot has sclerotia the size of poppy seeds (image1), and botrytis has sclerotia the size of peppercorns or larger (image 2). Botrytis makes a greyish fungal fuzz at or slightly above the soil surface (also image 1), while white mold makes a white mat of fungus below the soil surface (also image 2). In both diseases, the fungal growth may or may not be present. If you are unsure about which disease you have, please call one of us and we will make a visit.

If you have white rot, the current recommendation is to rotate out of that field (we are not sure how long is needed, but up white rot has survived for up to 20 years in other locations), do not sell any of that crop for seed (healthy bulbs can still be sold as food), and replace all planting stock with clean seed in the following year.

If you have botrytis, you can re-plant healthy seed but a surface sterilization such as a 10% bleach solution or an OxiDate dip is recommended. A standard 3-4 year rotation is also recommended.

Image 1: White rot with poppy-seed sized sclerotia (yellow circle).

Image 2: Botrytis with peppercorn sized sclerotia (yellow circles) and fuzzy grey fungal growth (orange circle)

# Harvesting Garlic– Timing is Key!

Crystal Stewart– ENYCHP

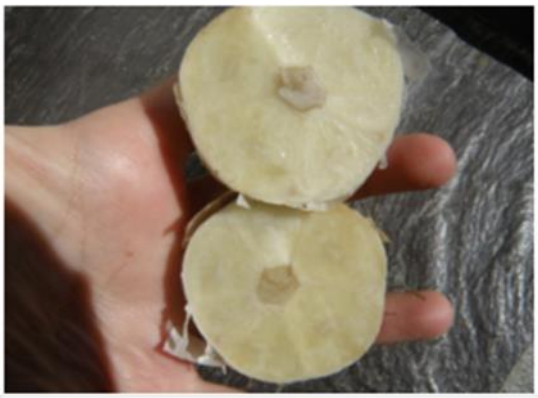
Everyone knows the balancing act that is garlic harvesting—too early and the cloves are small and don't store well, too late and the head pops, making it unmarketable and more susceptible to diseases. So, as we near harvest, how should a grower decide if the garlic is ready? The best answer is to pull a few plants, cut through the head sideways (so you cut through all the cloves), and see how well developed the cloves are. You can use the leaves as a guide to decide when to do this (lowest third or half of the leaves yellowing and dying is a good mark to start with), but looking at the cloves is the best way to know if the garlic is ready. Cloves should fill the wrappers—if they seem a little loose, the garlic has a little ways to grow. A little of the very outer wrapper may have started to decay at this point. That is okay—it's a normal part of the maturation process. The key is to harvest before the bulbs pop, which can happen relatively quickly, especially if we have another wet year. If you don't think you will be able to get out and harvest for a period of time, it's better to harvest bulbs a little too early than a little too late.

**Cutting the tops in the field:** If you find that you do not have space to bring whole plants into the drying area and maintain good air circulation, cutting the tops off the garlic is a good solution. Cutting the tops has the added benefit of leaving significant amounts of moisture in the fields rather than bringing all that lush, green growth into the drying area. Tops can be cut as close to ground level as you can get if using a sickle bar mower, or you can cut them by hand at 1.5" to 6" long. Our trials have shown that there is no increase in disease incidence even when cutting the garlic down to its final length as you bring it into the drying area.

**Field grading:** Hopefully you have been removing sick and damaged plants each time you weeded the garlic, so there won't be many left. Harvest is one last chance to clean up your crop before you bring it into tight quarters where disease can spread like wildfire. Remove any garlic that doesn't look great and set it aside rather than bringing it in and finding it later. You might also consider selecting your seed garlic at the same time. Save out the best garlic as your own seed to maximize next year's crop. You also don't need to clean your own seed of dirt or remove roots, which will save you labor if you set it aside now.

**To wash or not to wash?** Generally, you want to clean your garlic in the most gentle way possible. Most of the time this can be done dry. You can gently rub most of the dirt off of the garlic while harvesting, then remove a little more as you transfer from the wagon to your drying area. The one exception to this rule might be if you have to harvest garlic from muddy soils. In that case, washing may be warranted, but do it right away while the dirt is still mud on the bulbs, not after it has dried on them. You want to avoid wetting and drying the garlic over and over. Regardless of method, do not bang heads to remove dirt, gently remove excess by hand. The more garlic is banged during the process, the more it will bruise and the worse it will store.

Move your garlic from the field into the drying area relatively quickly—most people harvest during the morning and have garlic in the barn, high-tunnel, or shed by mid-day. Garlic can be dried in a variety of ways, as long as a few fundamental ideas are followed. First, you want to have good airflow over the garlic to move moisture away. This means not having garlic packed too tightly into the drying area. Each layer of garlic should have good air movement, whether hanging in rafters or sitting on benches. If there are parts of the drying area that are stagnant and wet, you need to remove some top growth and throw it away, reduce density of plants in the area, or increase air movement. Next, you want to choose an area that gets hot, but not too hot. Garlic will dry well at 110 degrees, but we try not to go much above that because at 120 degrees waxy breakdown, a physiological disorder, starts to occur. This temperature can be reached in a barn, shed, or high tunnel. Make sure you have the temperature in your drying area well controlled, so that you do not overshoot that target.



Knowing when to harvest garlic can be tricky. Use the leaves as a first indicator, but also feel and look at the bulb. You want the bulb to be very firm in its skins, and when you cut it in half perpendicular to the scape you want to see a small gap around the scape. The garlic on the left isn't quite ready; the garlic on the right is. *Photos by CLS*

# Garlic Research Update

Crystal Stewart, ENYCHP

This morning when I pulled my laundry out of the washing machine it still smelled like garlic, so perhaps everyone who has seen (smelled) me over the last few weeks already knows what I've been up to. For those of you who have been fortunate enough to miss this experience, I've spent most of the last few weeks in garlic fields, checking out maturity and disease pressure but also harvesting some pretty exciting research trials. I have two trials examining cultural controls of *fusarium* including the use of raised beds, a variety of mulches, and planting timing; and two trials looking at organic controls including Oxidate as a seed dip and TerraClean as a bi-weekly soil drench followed by a package of biologicals. We are also examining the role that nitrogen levels and the disease level of seed garlic have on *fusarium* levels.

So far some anecdotal observations are that garlic seems to perform extremely well on white plastic, yielding very even, large bulbs; garlic is a heck of a lot easier to dig from mulched ground than bare ground (and so far the yields look better from all mulch types compared to bare ground); and that clean seed yields bigger bulbs than infested seed, even when the next generation doesn't grow up to be *fusarium* infested.

All of this work will need to be looked at carefully over the next few months, and will include progressive disease ratings and a statistical analysis of yield differences between treatments. Stay tuned for more information! And remember to dry your garlic as quickly as possible and get it into a nice cool, dry storage area as soon as it's done drying.

*Images*: Garlic harvest at the Long Island Horticulture Research and Education Center (left), and at the Hudson Valley Farm Hub (right).

# Sweet Corn Update

Charles Bornt- ENYCHP

On Friday of last week we caught some significant numbers of Corn Earworms in several traps around the Capital District. I suspect they traveled up on some of those storm fronts that have been occurring the last couple weeks. However, trap catches this week were low with only a couple found at the same locations where they were found last week and fields have been treated with Coragen. Western Bean Cutworm has also appeared this week so be on the lookout for continued damage to whorls and tassels that resembles European Corn Borer—there is a good chance you might be finding both of them in some tassels.

I also received word that sap beetles, or picnic beetles as they are sometimes called, were being found in the tips of sweet corn that exhibited no other injury such as worm or bird feeding damage which is very unusual. Upon further discussion, it was determined that the sap beetles were not the ordinary picnic beetles (*Glischrochilus quadrisignatus*) which have the 4 yellow spots on their back, but rather were Dusty sap beetles (*Carpophilus lugubris),* which are slightly smaller, gray in color and lack the spots on their backs. Most of the time these beetles are attracted to corn that has been damaged by some other insect like Corn Earworm or birds. However, this corn had no evidence of any of this damage yet the beetles were being found in the tips of the ears. Upon doing some research on this pest, I found out that the Dusty sap beetle prefers to lay its eggs just under the husk or between developing kernels of corn. According

# We Weren't Kidding! Tomato Hornworm Damage

Amy Ivy, ENYCHP

Two weeks ago we ran a warning to be on the lookout for tomato hornworms. We have seen them cause considerable damage to high tunnel grown tomatoes, feeding on both the leaves and unripe fruit.

To the right is a photo of a high tunnel pepper, or what's left of the pepper, after a visit by a couple of hornworms. They are pretty easy to spot once the plant becomes this damaged, but it sure would be nice to catch them before it got this bad!

Tomato fruitworm is the same as corn earworm, for which we have traps in sweet corn plots throughout our region. Keep an eye on the trap catches on the last page of the newsletter each week and if the numbers go up, give your tomatoes a close look.

# August Garlic Update

Crystal Stewart—ENYCHP

Most of the garlic which was harvested this year is dry or nearly dry, and is headed for longer term storage. You know that garlic is dry when the innermost leaf is completely dry and will not slip at all against the scape. At this point, if you are drying your garlic somewhere warm like a high tunnel, it's important to move to a location which is a bit cooler (75 degrees F or cooler) and has relative humidity at or below 75% consistently. This change in storage will prevent garlic from overdrying while also preventing the development of diseases like aspergillus or embelissia.


In storage, there are a variety of diseases to look for, including fusarium, surface molds, penicillium, and in a few places white rot. It is important to also check for sun scald and waxy breakdown, two abiotic diseases caused by exposure to sun and heat. Here's a bit about each of the issues you might see:

**Fusarium** diseases can cause basal rots and bulb rots. Postharvest symptoms include lesions on individual cloves or throughout the bulb. The lesions may have a pink halo, but sometimes this symptom is absent. Symptoms usually start near the basal plate, and may leave the roots and wrapper leaves unaffected.

If selling or using garlic for seed, you want to eliminate bulbs with visible fusarium. Garlic to be sold as food can have a small amount of fusarium on the base, but if the leaves are separating from the base or the base is cracking, the garlic will not store well and should be discarded.

**Botrytis** causes neck rot in garlic, and can cause significant losses in storage. Disease moves down the stem and into the innermost cloves, causing softening and decomposition. Look for grey or white fungal growth in



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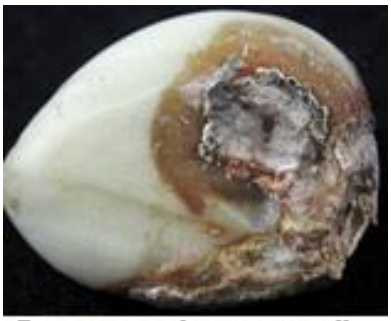

Botrytis on the inner wall of a garlic clove. Image: Oregonstate.edu

the neck and black sclerotia in advanced infections. Any garlic with these symptoms should be discarded as soon as possible.

**Emerging issue:** ***Colletotrichum sp:*** For the last couple years we have been seeing symptoms on the garlic scape that we believe are caused by garlic anthracnose, or Colletotrichum. The infected scapes get an orange lesion and then fall over. This year is the first in which we have seen these symptoms travel down the scape to the wrapper leaves. We are watching samples to see if any further disease development occurs—at this point, no clove damage has been detected.

**Scary, but not a problem:** We saw numerous locations with bright red spots on the wrapper leaves at harvest time. So far the red spots have remained confined to the wrapper leaves, often just the first two layers or so. We suspect that there might have been some mircoorganisms living against the garlic which stained it red, but which did not affect the bulbs.

**Waxy breakdown:** In cases where the garlic was allowed to get over 120 degrees F, we see waxy breakdown. This is an environmental issue exclusively- no disease is involved. Cloves become soft, yellowish, and sticky. Garlic with waxy breakdown won't store and should be thrown away. Care should always be taken to dry garlic without heating it excessively.

**Sunscald:** We don't see this too often, but if garlic is allowed to lay in the sun too long at harvest time, it will burn on the side facing the sun. This results in a (very difficult to photograph) white, firm, sunken area across the affected cloves. The garlic might hold up in storage, though it will be susceptible to secondary inefctions.

## Battered Onions

Amy Ivy, ENYCHP

Onions can become pretty battered by mid August from a variety of fungal diseases, insect pressure and/or the pounding from wind, rain or hail. Here's a review of what you might be seeing right now. If your crop is close to Harvest, but has been hit hard by one or more of these problems this year, it might be best to harvest the crop a little early to stop the progression.

Christy Hoepting from the Cornell Vegetable Program has put together this handy chart of fungicides registered for onion leaf diseases in NYS in 2017: https://rvpadmin.cce.cornell.edu/uploads/doc_583.pdf

**Onion downy mildew -** ***Peronospora descructor*** **(photo credit A. Ivy)**

The most serious problem in this list is downy mildew of onions (which is **not** the same species that affects cucurbits, basil or other non-allium crops). It starts as a subtle hazy patch on older onion leaves but quickly spreads through the planting. It is favored by the cool, wet weather we've been having and can really take off once it reaches your farm.

It has not been found in Orange County yet, but all growers should keep an eye out for this disease. This is



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take place early when larvae are small; once larvae become large they are difficult to control. Keep an eye on our corn lep pest counts in our weekly newsletters to get a sense if moths are flying in your area. Pay extra attention to scouting when neighboring corn fields are drying down.

## Pre-Planting Garlic Considerations

Crystal Stewart, ENYCHP

This year there is quite a lot of disease showing up in garlic in storage. This is going to add some extra work for affected growers at planting, but fortunately that extra work should pay off by largely taking care of the problem for next year's crop (weather depending, of course). Here are some things to consider once you get cracking:

**Taking the time to identify any problems is always a good idea**

Do you have botrytis neck rot? Mites? Fusarium? Rather than simply tossing soft garlic into the garbage, take the time to open up a bulb now and then and examine the symptoms. Botrytis enters the bulb through the neck, and rots the bulbs from the center outward. Fusarium may attack the basal plate or may cause lesions on the bulb itself. Fusarium is present on almost all garlic at low levels, but can be increased by poor growing conditions (excessive water, poor fertility or poor soil biology), poor post-harvest handling (bruising), and poor storage conditions (too warm and moist can increase disease dramatically). I have included an entire article on mites, which can explode under even ideal storage conditions, but thrive in warm, dry environments.

Depending on the disease, management in the future may vary. If you are dealing with Botrytis, culling seed stock hard to eliminate infested bulbs is the most important step. A surface sterilizer at planting such as Oxidate or Sanitate as a dip can kill any spores which were present in storage and might infest garlic in the coming year. If dealing with Fusarium, try to cull any garlic with symptoms you can feel, but more importantly create an optimal growing environment. Garlic that is in wet fields will benefit from raised beds, and we have found that both plastic and straw mulches can improve the garlic crop (look for research results on this study in an upcoming Produce Pages). Dips will not help with Fusarium because this disease is systemic.

**Create an ideal growing environment now for better garlic next year**

We are about a month ahead of planting now, and this is a great time to assess your future garlic location and make any needed changes. How is the **drainage** in this field? Are you going to need to make raised beds? If planting on plastic, you might want to consider making raised beds well ahead of time in order to ensure that you can finish this task when soil moisture is optimal. Every year I watch growers struggle with bed formation as the fall gets wetter and wetter. This is a slightly riskier proposition for bare raised beds that will remain so or will be straw mulched, but it might end up being worth considering.

Consider the **weed complex** in the area you are planting into. Did you control perennial weeds (I'm looking at you, quackgrass)? Do you know what annual weeds are going to pose the biggest problem, and do you have a plan for control? Winter annuals plague some growers; for others crabgrass or lambsquarter are the main issue. Know when you will need to have strategies in place, and do anything you can at planting.

**Fertility** may be applied entirely in the fall if using organic, slow-release amendments; growers using mobile sources of N should only apply P and K at planting. Optimize P and K using a soil test, and aim for 50-100 lbs of available N early in the spring for the garlic. Nitrogen is tricky in garlic because soil temperatures dramatically affect availability. Many growers are tempted to put much more than 100 lbs/A down to overcome this issue. It's an understandable strategy, but chances are very good that much of this N is wasted. We are still researching this question, and will have more answers in the coming year. Or maybe we will just have more questions. Either way, we will share!

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businesses. Currently, 62 applicants have received research permits for the 2018 growing season with additional research partners in the approval process. In addition, 18 New York companies have registered to process industrial hemp, which is key to advancing market research and supporting a growing demand for industrial hemp products nationwide.

To continue advancing the pilot program in the Southern Tier and throughout the state, applications for future food and fiber research proposals are now being accepted on a rolling basis and are not subject to a deadline. The application is available on the NYS Department of Agriculture and Markets website.

This year, with the addition of the new research partners, approximately 3,500 acres of New York farmland are approved for industrial hemp research trials, compared to 2,000 acres in 2017. Research projects will focus on utilizing industrial hemp as a source of food, fiber and grain for the production of animal bedding, insulation, pellets for heating and many other consumer products.

Researchers will also explore the potential cosmetic and wellness benefits of CBDs. They will also conduct biotechnology work and study indoor plant breeding and cloning methods as a possible source of transplantable plant stock for growers. Expanding the Industrial Hemp Agricultural Research Pilot Program will allow for more comprehensive studies on a wide range of topics and help New York secure its position as a national leader in the emerging industrial hemp industry.

## Early Season Garlic Fertility

Crystal Stewart, CCE ENYCHP

The most important time to make nitrogen available to a garlic plant in order to increase yield is shortly after leaf emergence from the ground. Success in providing optimal nitrogen will depend on the nitrogen source you are using and some well-timed assistance from soil biology.

Remember that the nitrogen cycle is driven by biology, and biology is driven by temperature (and soil health!). Organic matter is decomposed partially into ammonium by a suite of microbes before nitrification (see Figure 1 for a handy visual). As the soil warms, N that is bound in organic matter (slow release N) will be made available, and ammonium nitrogen will turn to nitrate nitrogen (Figure 2), which is easily taken up by plants.

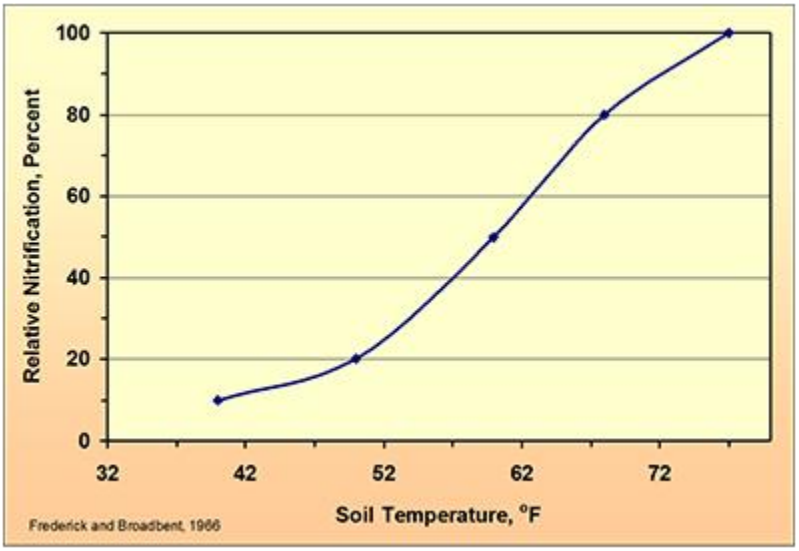


*Figure 2: relationship of nitrification to soil temperature. As temperatures climb, nitrifying bacteria more quickly convert ammonia forms of N to nitrate forms, which are more plant available but also more prone to leaching.*

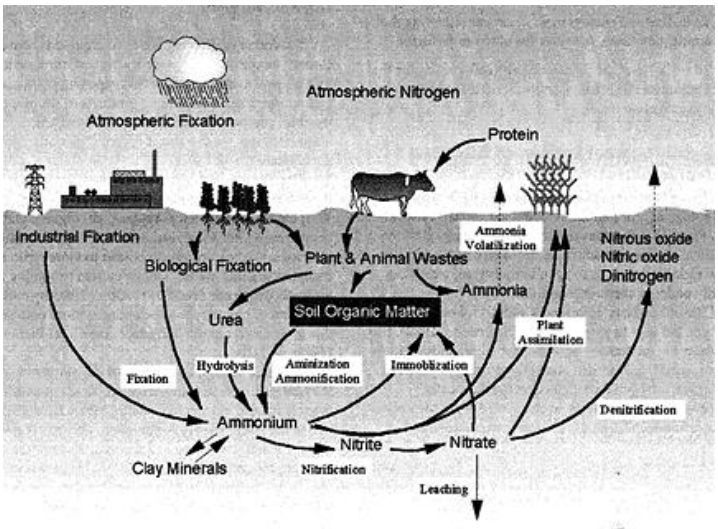


*Figure 1: Nitrogen cycling, including organic and inorganic forms.*

Bare ground garlic growers can apply their nitrogen in the spring using a variety of sources including very soluble nitrate-nitrogen forms, because the plant will take up the fertilizer readily now. **Our latest research is showing that garlic needs no more than 50 lbs/A of N applied in a spring sidedressing.**

Nitrogen applied later in the growing cycle of garlic has very little if any effect on the final bulb size. So if you haven't applied your N yet, now is the time!

| County | European Corn Borer - Z | European Corn Borer - E | Fall Armyworm | Western Bean Cutworm | Corn Earworm |
|---|---|---|---|---|---|
| Albany | 2 | 1 | 0 | 0 | 0 |
| Columbia | 4 | 0 | 0 | 0 | 0 |
| Ulster 1 | 10 | 14 | 0 | 0 | 4 |
| Greene | 4 | 3 | x | x | x |
| Clinton 1 | 0 | 0 | 0 | 0 | 0 |
| Clinton 2 | 1 | 0 | 0 | 0 | 0 |
| Rensselaer | 3 | 0 | 0 | 0 | 0 |
| Washington | 0 | 0 | 0 | 0 | 0 |
| Fulton | 0 | 1 | 0 | 0 | 0 |
| Schoharie | 1 | 0 | 0 | 0 | 0 |
| Orange | 0 | 0 | 0 | 0 | 5 |
| Dutchess | 3 | 4 | 0 | 0 | 0 |
| Ulster 2 | 0 | 0 | 0 | 0 | 0 |
| Ulster 3 | 2 | 23 | 0 | 0 | 0 |

## Scout and Rogue Garlic Now for Botrytis Neck Rot and White Rot

Ethan Grundberg, CCE ENYCHP

Hardneck garlic in the lower Hudson Valley has been producing scapes for a couple of weeks already and, especially with the hot and dry weather, upper leaves have begun to dry down naturally from the tips. This is an excellent time to scout fields for two nasty fungal pathogens of garlic: botrytis neck rot (*Botrytis porri*) and white rot (*Sclerotium cepivorum*).

***Botrytis neck rot mycelial growth***

***White rot mycelial growth***

***White rot sclerotia: note the small, black, poppy seed sized balls along the middle of the forming shoulder of the bulb***

Look for garlic plants that, instead of having gradual leaf dieback from the tip, have turned completely yellow. Carry a trowel or small spade with you to carefully dig the suspect bulb and surrounding soil. Under high soil moisture conditions and the right temperature, you may actually see the mycelial growth of the pathogens.

Botrytis neck rot mycelia are grayish, whereas white rot mycelia create a fluffy white marshmallowy mat that can extend below the bulb into the root zone (see images). If there isn't much soil clinging to the rotting bulb, you may also see small dark balls sticking to the affected plant tissue. These balls are called sclerotia and



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allow both pathogens to survive in the soil without a host crop for many years.

If the right environmental conditions have passed and neither sclerotia nor mycelial growth are visible, often necks detach from the bulb when pulled by hand around the soil level. Whether or not sclerotia and mycelia are visible, affected plants should be carefully removed from the field and destroyed. Do NOT add infested plants to compost or cull piles.

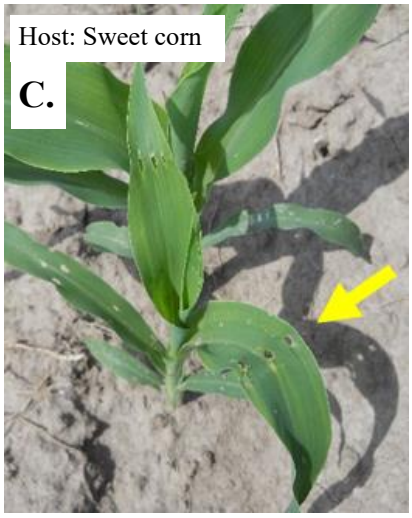
For more information on botrytis neck rot management, see Dr. Meg McGrath's blog at http://blogs.cornell.edu/livegpath/gallery/garlic/botrytis-neck-rot-aka-dry-rot-on-garlic/. To read more about white rot, see the fact sheet developed by Crystal Stewart at https://rvpadmin.cce.cornell.edu/uploads/doc_480.pdf.

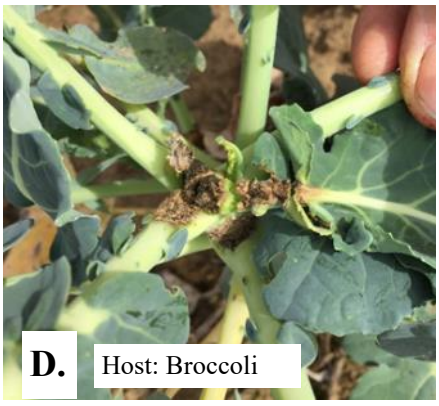
## Who Did That??

Amy Ivy, CCE ENYCHP

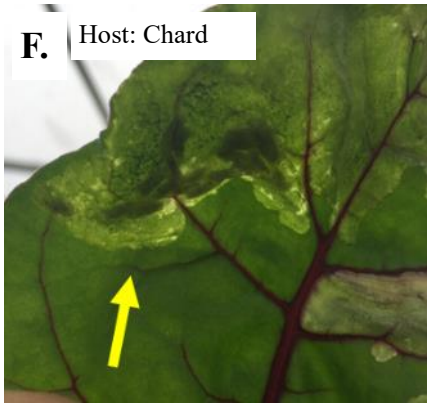
Some pests cause characteristic damage which you're likely to notice before you see the culprit. Learning to recognize their damage will help you find infestations. How many can you identify here? Some are a review of pests we've talked about already this season. Answers and comments at bottom of page.





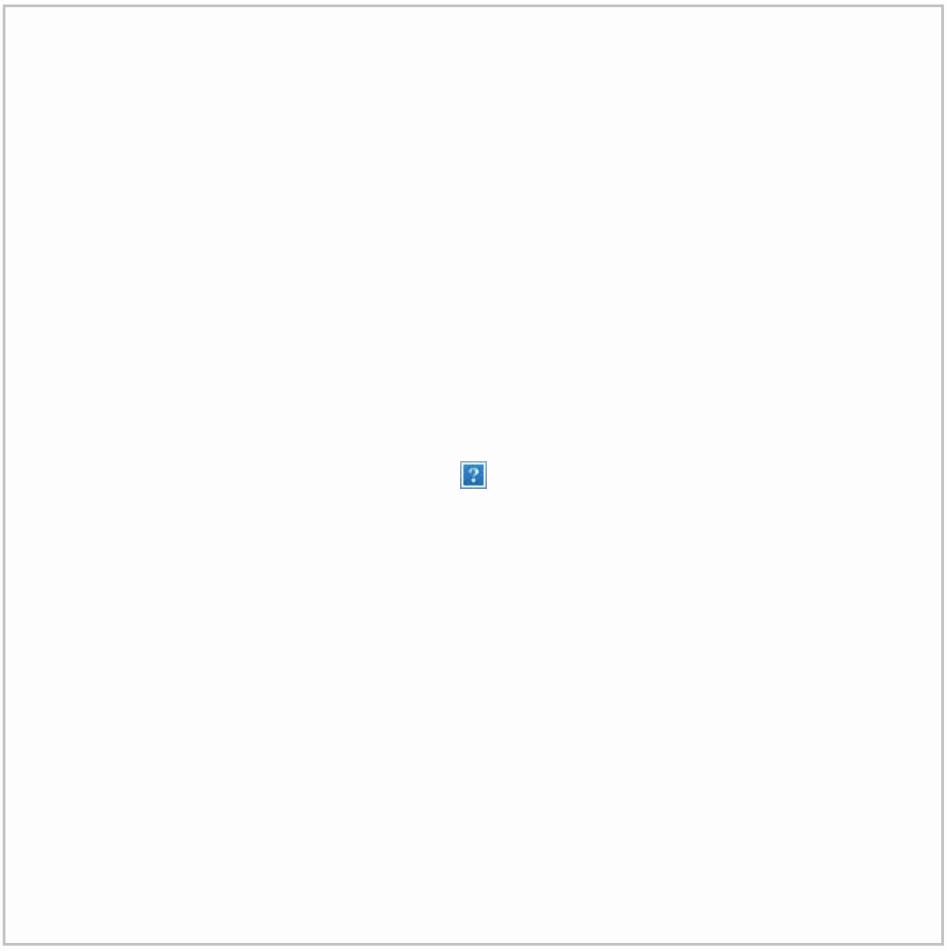








*A: Leek moth. Look for long white windowpanes, split leaf open to find debris, frass and sometimes the caterpillar. The second generation will be showing up on onions soon.*
*B: Onion thrips. Smaller white markings on leaves than with leek moth. Check out Crystal's video from last week for tips on how to find the tiny thrips that can do so much damage.*
*C: European corn borer. At pre-tassel, older corn borer caterpillars (worms) will tunnel through leaves while still rolled up. Later, when leaves expand you can see a row of holes from the one tunnel! Younger larvae can't burrow all the way through and cause window pane damage by chewing only partly through leaf tissue, leaving a window pane of tissue behind.*
*D. Swede midge. Where's the broccoli? A blind head like this with healthy older leaves is a classic symptom of swede midge feeding on the growing point, the future head of broccoli. Distorted leaves and scarred tissue at the center of the plant are other clues.*
*E. Leafhopper. Tiny insects are hard to see but they cause this classic 'hopper burn'. Also found on beans and eggplant and other crops as well. By the time you see just this much damage, crop yield is already reduced.*
*F. Spinach leaf miner. Also feeds on chard and beets. Featured in our May 30 issue of Veg News.*

**From:** CCE Eastern New York Commercial Horticulture Program
**To:** Natasha Field
**Subject:** Vegetable E-Alert: July 4, 2018
**Date:** Wednesday, July 4, 2018 8:57:05 AM



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## Scouting reports from the Eastern NY Commercial Horticulture Program Team

**Hi everyone, and happy Independence Day! This week we are offering a quick rundown of the pests rather than a full newsletter. Of course the topic on everyone's minds is the heat. Keeping crops and people hydrated and cool enough to function is a huge task. Unfortunately the heat is pushing development of a lot of insects, but it's also keeping many of the fungi at bay. Look for this to change as the weather does—there are some important updates about Late Blight and Cucurbit Downy Mildew one state away. Have a great day, and we will see you in the field.**

### Late Blight Confirmed in South Central PA

There have been no additional confirmations of late blight on tomato or potato in New York since the report outside of Syracuse. However, there was a confirmation of late blight on tomato in York County, Pennsylvania (west of Lancaster) last week. With thunderstorms and lower temperatures forecast for much of the region later this week,

be sure to keep scouting tomatoes and potatoes. Check out **http://blogs.cornell.edu/livegpath/gallery/tomato/tomato-late-blight/** for more images and information on the pathogen.

**Onion Report**

Stemphylium leaf blight (SLB) is showing up in more fields as the earliest transplanted onions begin to lodge and the seeded crop pushes quick growth with these warm temperatures. Make sure that you are using fungicides in FRAC groups 2, 3, 7, and 9 for best SLB protection. Chlorothalonil, mancozeb, and azoxystrobin DO NOT provide protection from SLB. More information on onion fungicide efficacy is available on Christy Hoepting's "cheat sheet" at **https://rvpadmin.cce.cornell.edu/uploads/doc_583.pdf**.

Onion thrips populations have been low this week in Orange County following the heavy rains last week. However, in the Hudson Valley, numbers are creeping up in the heat. No matter where your numbers were last week, scout now because thrips can reproduce very quickly at high temperatures and adults are beginning to migrate out of maturing grain crops and into onion fields. Remember that the action threshold is an average of **one thrips per leaf**. For more information on insecticide options and sequences for onion thrips management, please see **https://enych.cce.cornell.edu/submission.php?id=584&crumb=crops|crops|onions|crop*20**.

**Cucurbit Downy Mildew in NJ**

There have been no reports of cucurbit downy mildew (CDM) in New York State yet this year. However, CDM was confirmed on cucumbers earlier this week in Salem County, New Jersey (near Pedricktown). It is possible that a storm moving south to north could carry spores to us, so while risk is currently low, keep a close eye on the weather and protect your crops before movement occurs. For more information on variety selection for CDM resistance and effective fungicide programs for CDM protection, check out **http://vegetablemdonline.ppath.cornell.edu/NewsArticles/Cucurbit%20Downy%20Mildew%20MGT%202018-NY.pdf**. To track the spread of CDM in the region, refer to **http://cdm.ipmpipe.org/**.

**Garlic Update:**

Garlic is a week or two from harvest in most locations. For size to me maximized, it's important that garlic is receiving enough moisture as it nears maturation. If you can keep garlic soils moist until a week or so before harvest, the size and weight will continue to increase. If you can't irrigate, quality will not drop, you just don't gain as much weight as you would with optimal moisture.

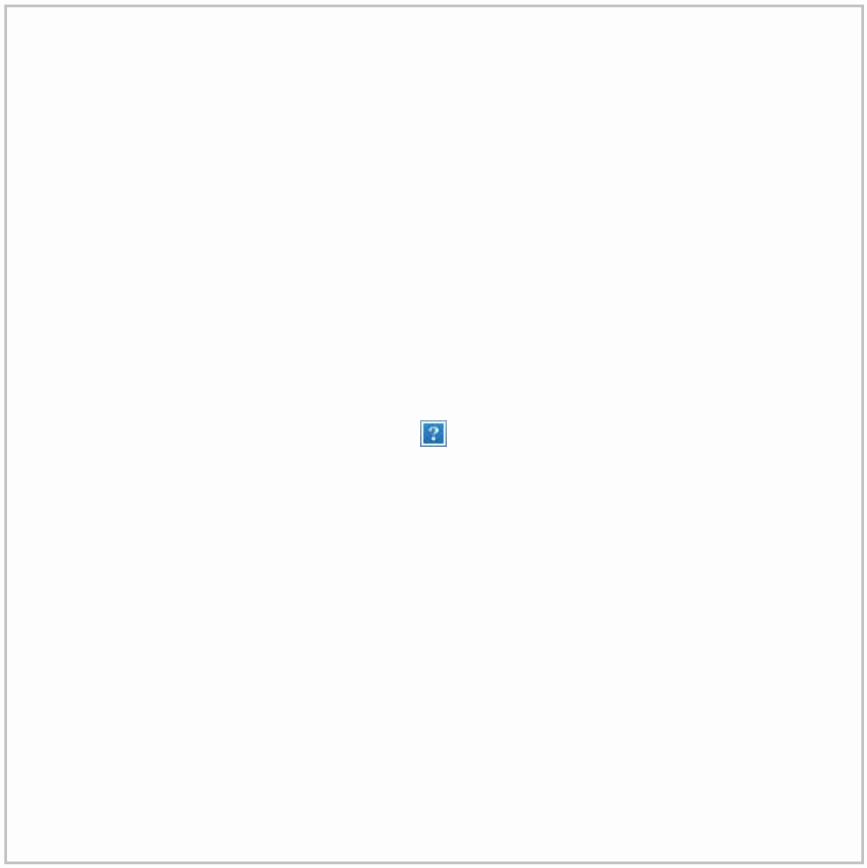
This is a great time to do a final field culling of the garlic. Remove any plants which are exceptionally stressed. We are seeing a fair amount of Fusarium basal rot in some areas, and in others we are seeing above average levels of botrytis neck rot. By pulling these plants now, you make it easier to cruise through harvest and, later, sorting.

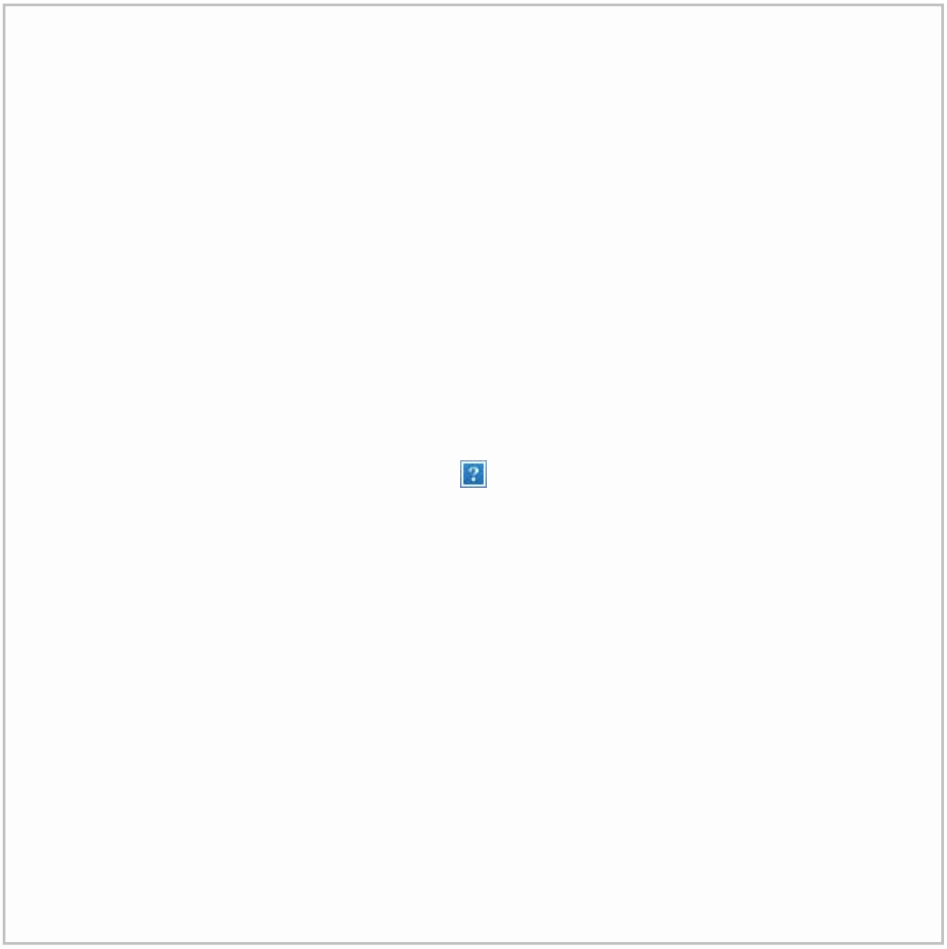
**Potato Leaf Hopper** numbers are finally ramping up in some areas, and hopper burn is being observed. The hot, dry weather will speed up the maturation of pests and also make stress from feeding more obvious. As a reminder, the threshold for action on PLH is 1 adult per sweep or 15 nymphs per 50 leaves. For organic growers, timing and coverage of the plant is essential for control. Pyganic plus a sticker like M-Pede (which acts as a sticker but also has some activity itself), applied late in the evening will work for a quick knockdown but should be followed up within a couple days with another application. Alternate with a product containing Azadirachtin such as Ecozin Plus, Aza-Direct or AzaMax.. For conventional growers Dimethoate 400 (dimethoate) has been the go - to material but many products are effective including many of the pyrethroids (Warrior II, Pounce etc.).

**Tarnished plant bug** (TPB) has been observed in eggplant, peppers and celery this past week but they have a wide host range so it's likely they are in other crops like tomato, lettuce, even cauliflower. It doesn't take too many TPBs to cause significant injury, so check crops before the damage is done! TPB prefer to fed on buds, flowers

and young developing fruit. They feed by sucking sap from plants and inject a toxic substance that breaks down plant tissue. TPB feeding causes abortion of young fruit and buds. Fruit feeding causes blemishes and dimples and deformed vegetative growth. TPB may move into crops from weedy borders as well as neighboring alfalfa fields especially at cutting. Some materials labeled for TPB are Baythriod XL, Hero, Sevin XLR, and Warrior II w/Zeon. For Organic Production Pyrethrum and Neem based products have been shown to give limited control. Important: When using pyrethrins, it is recommended that the final spray mix be buffered to a pH of 5.5-7.0. Outside of this range pyrethrins can degrade and the product will lose effectiveness. Carefully read labels for rates, labeled crops as well as other important application directions.

**Sweet Corn:** Pest numbers are still low!





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8:30am- 4:30pm

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|---|---|
| Once your sweet potatoes are cured, store as close to 55 - 60°F as possible, but no lower, and maintain a high humidity. If done properly, sweet potatoes should easily store into February and even into April if conditions are right. | After this healing period they can be moved into storage and cooled slowly to 40 F maintaining a high relative humidity of about 90 – 95%. This should help reduce the shrinking that happens in storage. |
| Do not wash potatoes before putting them into storage, but rather wash what you need as you need them. **Do not put warm potatoes into wash water that is 10 degrees colder as this will increase bacterial breakdown.** For that matter, you should follow this rule for all produce that is washed! | |
| Don't dig and plan on storing tubers from wet areas of a field. If possible keep them separate and plan to market those immediately to reduce the chance of brining disease into the storage. | |
| Cull hard! Do not put any potatoes that do not look healthy into your storage, and when it doubt, don't put it in! | |

# Pre-Planting Garlic Considerations

Crystal Stewart, CCE ENYCHP

**Step one: Gaze lovingly at your garlic**

I think this is pretty self-explanatory.

**Step two: mercilessly cull any cloves which are soft**

Taking the time to go through seed garlic carefully and culling any cloves which are soft or excessively light will go a long way towards making a healthy, uniform stand possible. But don't stop there--rather than simply tossing soft garlic into the garbage, take the time to open up a bulb now and then and examine the symptoms. Botrytis enters the bulb through the neck, and rots the bulbs from the center outward. Fusarium may attack the basal plate or may cause lesions on the bulb itself. Fusarium is present on almost all garlic at low levels, but can be increased by poor growing conditions (excessive water, poor fertility or poor soil biology), poor post-harvest handling (bruising), and poor storage conditions (too warm and moist can increase disease dramatically). Surface molds like black mold (aspergillus) can be intimidating, but if the garlic underneath is firm, they are likely not to be an issue for the seed. Know what diseases you have, and how to minimize their growth in the coming year.

**Step three: Create an ideal growing environment now for better garlic next year**

Real talk: creating the right environment for garlic actually starts years in advance, with optimization of rotation to include a three year break from alliums, cover crops to either enhance soil nitrogen or reduce weed pressure, and addition of major soil amendments like lime (if necessary) in previous seasons. The following recommendations are the short-term steps you can take to care for your garlic.

How is the **drainage** in this field? Are you going to need to make raised beds? If planting on plastic, you might want to consider making raised beds well ahead of time in order to ensure that you can finish this task when soil moisture is optimal. Every year I watch growers struggle with bed formation as the fall gets wetter and wetter. Raised beds are a slightly riskier proposition for bare soil that will remain so or will be straw mulched, but it might end up being worth considering.

Consider the **weed complex** in the area you are planting into. Did you control perennial weeds (I'm looking at you, quackgrass)? Do you know what annual weeds are going to pose the biggest problem, and do you have a plan for control? Winter annuals plague some growers; for others crabgrass or lambsquarters are the main issue. Know when you will need to have strategies in place, and do anything you can at planting.

When creating a fertility plan the goal is to make sure adequate nutrients are available to the garlic when it needs them. Nitrogen is tricky in garlic because soil temperatures dramatically affect availability. Many growers are tempted to put much more than 100 lbs/A down to overcome the issue of cold spring soils. It's an understandable strategy, but chances are very good that much of this N is wasted. So far, we are maintaining the recommendation of 100 lbs of N, with slow release forms such as compost applied in the fall at planting, and quick release forms like Ammonium Nitrate or Chilean Nitrate (no more than 30% of total N is recommended in this form) applied as garlic emerges in the spring. **Our trials have not shown a yield boost with soluble forms above 50 lbs/A of spring applied soluble N**. If you apply only soluble forms, consider trying this lower rate. Phosphorus and potassium are still recommended applied in the fall at the rates recommended by the soil test.