UMASS EXTENSION

Vegetable Notes

For Vegetable Farmers in Massachusetts

Volume 20, Number 3 , 2009

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COLD-HARDY GREENS PROJECT – SELECTING AND SAVING BRASSICA SEED

The UMass Cold-Hardy Greens Project is working with local farmers to select Brassica greens crops that are especially suited to thrive in cold climate New England. Of course, Brassica greens in general are generally cold-hardy. We are working on varieties that have a strong ability to recover well from minimal winter protection (an unheated hoop house, heavy row cover with wire hoops, or open field) and produce strong re-growth and marketable yield in early spring. This is a valuable harvest window for diversified growers who need early spring revenue. Often, overwintered greens bolt rapidly and become unmarketable before spring-planted crops are ready.

The seed we are working with was first selected by farmers Brett Grosgahl (Even'star Farm, MD), Brian O'Hara (Tobacco Road Farm , CT) and Dan Pratt (Astarte Farm, MA) over many seasons to survive extended cold periods with minimal protection from winter conditions. UMass has planted this seed for three winters at our research farm in South Deerfield, MA. We have selected for cold-hardiness, late bolting and good spring regrowth.

We have three species of cold-hardy greens including a mix of red and green mustard (Brassica juncea), a mustard tatsoi mix ('MTM') cross (Brassica rapa), and Siberian Kale (B. napus). Both the mustard and the Siberian kale produce leaves that can be harvested young for salad mix or at 8-12 inches for braising mix, and that can be harvested over several weeks before bolting. The Brassica rapa variety, like most B rapa greens, bolts rapidly and seems to provide a shorter harvest window. We have also noted that the where the Siberian kale is spring-planted, it will not bolt during the same season.

We have found that the spring growth on overwintered plants is less attractive to flea beetles compared to spring plantings of the same variety. This may provide an additional advantage for early spring harvests, because spring planted Brassicas are often devastated by flea beetles.

Several growers took advantage of our offer in late fall to send seed (0.5 oz each) and will have an opportunity to save seed for future use on their own farm. You may also have Brassica varieties of your own that show favorable characteristics. Below are some suggestions for how to select and save seed of these crops.

Mixed red and green mustard, braising mix size. Simple Gifts Farm, Amherst, MA

Brassica species have different mating characteristics. The three species do not cross with each other, so they can be planted near each other without intercrossing between species.

Brassica rapa is self-incompatible, which means individual flowers cannot self-fertilize and must cross to other individuals in the population in order to set seed. Thus it is certain that there will be outcrossing with other flowers and most likely with other plants in the population. Brassica juncea (red and green leafy mustard) is self-compatible, which means it is capable of self-

Siberian kale, spring regrowth in unheated hoop house.

fertilization. Diversity in color, shape and other traits among the plants in this population may be preserved in the seeds of those individual plants. There may also be cross-fertilization among plants, if bees or other insects visit the flowers. Brassica napus ('Siberian kale') is also self-compatible, capable of self-fertilization and cross-fertilization.

Seed-Selection Guidelines

- Plant the crop in well-spaced rows so you can evaluate each plant. Grow as many plants as possible to maintain a diverse pool of traits. Isolate species to prevent accidental cross-pollination, unless you are deliberately crossing to create new crop combinations. If plants are seeded closely, thin by selecting out less desirable plants.

- Screen out the weaker plants using your typical fertilization and irrigation with even field conditions and management for all plants. Don't baby the crop.

- For cross-pollinating crops of pre-flower green leaves such as Brassicas, evaluate, taste and rogue out the less desirable plants to sell or eat. Let only the best plants cross-pollinate. Remove or market the less desirable plants before flowering to prevent cross-pollination with the superior mother plants. Keep the whole plant in mind as you select so as not to unwittingly select out valuable traits, such as disease resistance or attractive appearance. Save the best plants for seed.

- If you allow wild native flowers to grow up around and intercropped in your fields, this may attract pollinators as well as predators or parasites of insect pests.

- Harvest the now-improved line, being careful to clean and process the seed to remove any smaller, lower quality seed. Air-dry and store. You may need to protect the seeds from birds as they approach harvest to avoid losing the seed.

-- Repeat your selection process year-by-year. Keep good records!! Make notes on seeding dates, spacing, growing conditions, harvest dates, and any growth characteristics that you observe. Label each seed lot carefully.

Seed-saving and crop improvement has been the responsibility of farmers since the dawn of agriculture. This work is an outgrowth of the Restore Our Seeds Project, led by Eli Kaufman, which has organized seed-saving workshops and seed exchanges throughout New England. We are hoping that this project will encourage growers to select and save seed when seed selection suits their needs and interests, and can improve certain crops to better meet their production conditions and markets.

For growers who might be interested in evaluating the selected varieties described above, please feel free to contact Amanda Brown (aduphily@ent.umass.edu) or Ruth Hazzard (rhazzard@umext.umass.edu); phone 413-545-3696.

MEXICAN BEAN BEETLE: PLAN AHEAD FOR EFFECTIVE BIOLOGICAL CONTROL

Snap beans aren't even planted yet, but it is not too soon to plan for your management of Mexican bean beetles. If they have historically been a problem on your farm, you will very likely see them again this year. They may be pests on snap beans, soybeans, and lima beans. While they are not a pest on every farm, some farms report significant damage from these pests and have to take action to prevent crop loss. Using biological control can reduce the need for insecticides.

Mexican bean beetle (MBB) adults are coppery brown with black spots. They look very much like large ladybeetles and in fact are closely related – but unlike lady beetles they feed on leaves, not other insects. Adults lay yellow-orange egg masses on the underside of bean leaves. These hatch into bright yellow, spiny oval larvae, which feed, molt several times

as they grow, and pupate on the underside of leaves. Feeding damage from adults and larvae can reduce yield and injure pods if numbers are high. There are several generations per season, often increasing in numbers.

Mexican Bean Beetle adults, larvae, and eggs

Pediobius foveolatus is a commercially available biological control agent for Mexican bean beetle control and has a good track record in the mid-Atlantic states and among New England growers who have tried it. (Pediobius is pronounced "pee-dee-OH-bee-us"). It is mass-reared and sold by the New Jersey Dept of Agriculture and is also available from other beneficial insect suppliers. This small (1-3 mm), non-stinging parasitic wasp lays its eggs in Mexican bean beetle larvae. Wasp larvae feed inside the MBB larva, kill it, and pupate inside it, forming a brownish case or 'mummy'. About twenty five adult wasps emerge from one mummy. Control continues and in fact gets better as the season progresses and successive generations of the wasp emerge and search out new bean beetle larvae. Planning 2-3 releases at 7-10 day intervals will help ensure good timing. and coverage on several plantings. This makes it well suited to our succession-planted snap bean crops. After a release in the first plants, it is advisable to leave that planting intact for a while, until the new generation of wasps has emerged from their mummies.

As with any biological control, make releases as soon as the pest is present – not after it has built up to damaging numbers. The New Jersey Dept of Agriculture Beneficial Insect Rearing Laboratory recommends two releases, two weeks in a row, coinciding with the beginning of Mexican bean beetle egg hatch. Wasps will lay their eggs in larvae of any size, but it is best to target the newly-hatched young MBB larvae. This will give control before damage has been done. Thus, timing is important. Watch for eggs and time the shipment for the first hatch of eggs into larvae. If in doubt about the timing of the hatch, release as soon as you see the eggs – if you wait for the larvae you may be playing catch-up.

The release rate should be at least 2000 adult wasps per field for less than an acre, or 3,000 per acre for fields of one acre or more. The 2009 cost from NJDA is $40 plus shipping for 1000 adults, or $20 for 20 mummies (pupal parasites inside dead MBB larvae) from which about 500 adults will emerge. Order adults if you already have MBB larvae in the field. Ship for overnight delivery. Instructions for handling and release will come with the wasps.

Wasps reproduce in the field and will still be around when the second generation of MBB hatches out. Thus, it should not be necessary to make more than two releases. Like beans, Pediobius wasps are killed by frost.

Plan ahead by contacting a supplier to inform them of your expected release dates and acreage. Contact information for New Jersey source: Tom Dorsey, 609-530-4192; address; NJDA, Phillip Alampi Insect Lab, State Police Drive, W. Trenton, NJ 08628. http://nj.gov/agriculture/divisions/pi/prog/beneficialinsect.html. You'll also get advice on how to use the wasps from this office.

Pediobius is also available from the following suppliers: Green Spot Ltd., NH., www.greenmethods.com 603-942-8925; IPM Laboratories, NY 315-497-2063; ARBICO, 800 -827-2847 (AZ), http://www.arbico.com/; Network (TN), 615-370-4301, http://www.biconet.com/.

--R. Hazzard

SEEDCORN MAGGOT AND WIREWORM IN SEEDS AND SEEDLINGS

Over the past two weeks we have seen or had reports of seedcorn maggot and wireworm damage in early seeded crops like peas as well as crops transplanted into plastic. Cold or wet conditions tend to inhibit crop growth but favor these pests. In the field if you find wilting, stunted plants or poor emergence and no clues of insect feeding or diseases on the above-ground parts, then dig up the plant and check for maggots and wireworms inside the seeds and stems.

Seed corn maggot attacks seeds -- especially larger seeds like corn, beans and peas – as well as seedlings of a wide variety of plants. The fly is nearly identical to cabbage and onion maggot flies, but it seems to become active somewhat earlier. Eggs are laid on soil surface near sprouting or decaying seeds, organic plant residue, or organic soil amendments such as

Seedcorn maggot fly and eggs

manure or seed meals. Decay from soil pathogens or previous insect feeding makes seeds or seedlings more attractive to seedcorn maggot. Moist, freshly turned soil is preferred over dry or saturated soil. Eggs hatch in 2-9 days depending on temperature, and maggots burrow down to find food. The mag¬got is yellowish-white, legless, with a pointed head and is about ¼ inch long when fully grown. Damage may be to the seed itself or to roots, stems or cotyledons.

The wireworm is slender, jointed, usually hard-shelled, with three pairs of legs, and tan brown in color. This is the immature stage of the click beetle, which deposit eggs on soil during May and June. Grasses, sod and sorghum-sudangrass are favorite egg-laying sites. Eggs hatch to become wireworms that feed below-ground on seeds, roots, tubers and other plant tissue. Wireworms feed for several years before pupating and emerging as adults. Thus, a wireworm problem in the spring probably means there was an attractive grass crop present sometime in the past 3-5 years. Wireworms also prefer wet soils and moderate temperatures; they migrate up to reach warmer soils, but down to avoid excessive cold, heat, or drought.

Unfortunately, practices that enhance organic matter in the soil may actually worsen seedcorn maggot and wireworm problems. For example, one field where both seedcorn maggot and wireworm caused significant damage to early peas had been rotated through two years of rye cover crop to build organic matter. Another instance occurred after a thick winter cover of vetch and rye. Conditions that cause slow seed emergence (cold, wet soils) favor seedcorn damage, while those that favor faster crop growth (warmer soils, moderate moisture) help the crop get established before damage occurs. Where possible, delay planting for several weeks after a cover crop is incorporated to help reduce seedcorn maggot problems.

Often growers use floating row cover over early crops in order to exclude insect pests, only to find that these seedling pests cause trouble right underneath the cover. Both pests overwinter in soil, especially where there is a lush cover crop, and they will seek out food and egg-laying sites as soon as they become active in spring. That includes your prized transplants!

If you discover after planting that a field is infested with seedcorn maggot or wireworm, not much can be done to cure the problem except to wait and replant. Timing for replanting should be made based on assessing the size of the maggots infesting the field. If the maggots not full grown (smaller than ¼ inch long), wait 10 days to replant; if they are full grown, replant after 5 days. If wireworms are found, wait to replant until soil temperatures are above 70 degrees F, which forces them deeper into the soil.

Soil insecticide application for control of seedcorn maggot and wireworm is most effective when made prior to planting or laying plastic; however registered products are limited – see 2008-2009 New England Vegetable Management Guide and read the label. Insecticide seed treatments, applied commercially to the seed, also target these pests and reduce damage. Using transplants avoids these pests EXCEPT where plants are set under row cover or in areas that are already heavily infested.

--R. Hazzard.

CABBAGE AND ONION MAGGOT FLIES

Early-transplanted cole crops and onions are the most likely to suffer damage from these pests. A good indicator of the start of cabbage root maggot flight is blooming of the common roadside weed, yellow rocket. This weed has been blossoming since late April in western Massachusetts. Onion maggot (Delia antiqua) and cabbage maggot (Delia radicum) flies look nearly identical but are likely to be found only on or near their host crop. Cabbage root maggot attacks on all types of Brassica crops, while onion maggots are highly specific for the onion family including onions, garlic, leeks, chives, and shallots.

Blooming yellow rocket is a good indicator of maggot fly flight

Life cycle.

Onion and cabbage maggot flies spend the winter as small brown pupae in the soil. Adults emerge in spring and adults can travel considerable distance in search of host plants (1/2 to 1 mile). Cabbage root maggot flies are rather delicate, hump-backed gray-brown flies, about 5-7 mm long. Onion maggot flies are very similar. Female flies seek out their host crop to lay eggs at the base of the stem. Cool, moist soil conditions favor survival of the eggs, and soil temperatures over 95 F kill them. By mid June, the soil temperatures in the upper ½ to 1 inch are usually so high (>100 degrees F) that soil temperature itself provides control.

When eggs hatch, larvae feed on roots and can cause complete destruction of the root system. In Brassica root crops such as turnips, radishes and daikon, feeding tunnels make the root unmarketable. In crops such as broccoli or cauliflower the first sign of a problem is wilting of the plant on sunny days and yellowing of outer leaves. Later, plants collapse, wilt down, and die. If you pull one up you will see that the reason it is wilting is the roots are gone. You may find the legless white maggots feeding, or the small brown, oblong pupae.

In onions, newly hatched larvae crawl behind the leaf sheath and enter the bulb, and feed on the roots, stem, and developing bulb. Feeding damage also encourages entry of soft rot pathogens.

Avoiding damage by later planting. The first flight and egg-laying period ends toward the end of May or early June, depending on accumulated growing degree days – thus, it will vary with the season and location. After the first flight is over, and as soils heat up, fewer eggs are laid and those that are laid are less likely to survive. In the Connecticut Valley, we have observed in some years that Brassica transplants set out after May 15 did not suffer damaging infestations of cabbage maggots. In cooler areas of the state, scouting has sometimes found damaging levels into June. It would be difficult to state a consistent and reliable date after which it is safe to plant onions or cole crops, but late May into June will likely be safer than the first half of May.

Monitoring. Flies are attracted to bright yellow color. Yellow sticky cards (3X5 inches) are inexpensive and easy to use; attach them with small wire stakes and place near the soil. Check and change traps twice weekly to record changes in fly activity.

Using Growing Degree Days. The beginning and peak activity of each fly generation can be forecasted using degree day accumulations. Most degree day information is based on a base temperature of 50 F, but maggot flies are active at a lower base temperature. This means that the regionally available GDD data (eg UMass Landscape and Nursery Message, http://www.umassgreeninfo.org/landscape_message/landscape_message.html) may not be helpful for forecasting this pest. However, you could collect maximum and minimum temperatures on your own farm. Begin accumulating degree days when the ground thaws in the spring. For onion maggot, a base temperature of 40 degrees F is used. Add together the daily high and low temperatures and divide by two to determine the average daily temperature. Then subtract the base temperature (40). Keep a total of degree days to date and each day, add the daily heat accumulation. The first three generations are expected when totals of 680, 1950 and 3230 day degrees, respectively, have been reached. For cabbage maggot, use a base temperature of 43 F. The daily formula to use is: (Max. temperature + min. ambient temperature/2) - 43 F. Peak emergence of the first three generations of cabbage maggot will occur when 300, 1475, and 2650 degree-days have accumulated, respectively.

Monitoring cabbage for eggs. Note that if you have transplants hardening off in a cold frame or outdoors, flies may find them and lay eggs in the flats. To check for eggs in the field or in flats, look for the 1/8-inch long, torpedo-shaped white eggs that are laid along the stem, or on the soil next to the stem of young transplants. Often eggs are laid in neat rows, or inserted into the soil. They may be under a small clod of dirt near the stem. A pencil point helps stir the soil to look for them. A reliable field scouting method is to check 25 or more plants, in groups of 2-5 plants, scattered around the field. If you find more than an average of 1 egg/stem, it is likely to be a damaging population and a banded soil drench is recom-

Maggot eggs at the base of a plant

mended. Eggs may be more abundant in wetter areas of the field. Egg numbers may build up rapidly after the first eggs are seen.

Soil Drench. Target the seed furrow or the base of the plants after transplanting, and use at least 200 gallons of water per acre to help the insecticide penetrate to the root zone. At present, chlorpyrifos products (Lorsban 4E, 75 WG, or 15G) are the only option. This material does not move readily in soil after the application is made, so it is important to provide adequate water so that the material penetrates several inches into the soil when it is applied. Under dry soil conditions, additional water may be needed to penetrate the soil. See the 2008-2009 New England Vegetable Management Guide for more details. This is also available online at www.nevegetable.org. If you make several plantings, scout each planting (it takes about 15 minutes) shortly after transplanting to determine if there is need for a soil drench.

There is no organically allowed insecticide that has proven effective for this pest.

Floating row covers provide an effective barrier against this pest. Place the cover as soon as the transplants are set. Use in a rotated field, as flies overwinter in soil after late season crucifers and could emerge under the cover if the same field has spring brassicas. Replace cover after weeding operations. As soil temperatures rise, the first flight ends (late May to mid June) and crops grow large, covers can be safely removed. Note that seed corn maggot may emerge under row covers in any field where cover crops were grown or organic matter was incorporated the previous fall or in the spring.

Cultural practices and natural controls. Crop rotation contributes to keeping populations low; greater distances are more effective. Fall tillage to bury crop residues and to expose over-wintering pupae is also important. For onions, bury or haul away onion cull piles. In cole crops, if there is healthy growth of the crop, cultivation that brings soil up around the stem may help encourage formation of adventitious roots from the stem, which can help compensate for root loss even if maggots are present.

Naturally-occurring fungus diseases occasionally will reduce onion maggot numbers significantly, particularly when flies are abundant and relative humidity is high. During a fungal epidemic dead, diseased flies, can be seen clinging to the highest parts of plants along field edges. Predaceous ground beetles, which eat onion maggot eggs, larvae and pupae, can also be important in reducing maggot numbers. Because these soil-inhabiting beetles are susceptible to insecticides, broadcast soil insecticide treatments should be avoided whenever possible.

Nematodes for biological control. One alternative method that has shown promise but has not been widely field-tested is soil application of entomopathogenic nematodes, especially Steinernema spp. Steinernema feltiae has been found to be more effective compared to other Steinernema or Heterorhabditis species in attaching to and penetrating cabbage root maggot larvae at low temperatures (10C) which is an important trait for use in spring when soils are cold. Common application methods include suspension of nematodes (infective juveniles) in water and application of water to transplants prior to setting in the field (as a spray or soaking drench), in transplant water used in the water wheel transplanter, as a drench after transplanting, or a combination of pre-plant and post-plant applications. Rates of 100,000 to 125,000 infective juveniles per transplant have been shown to be needed to achieve reduction in damage.

--R Hazzard. References: Univ of Wisconsin-Minnesota Degree Day Calcuator (http://www.soils.wisc.edu/asigServlets/asos/SelectDailyGridDD.jsp); Ontario Ministry of Agriculture, Food and Rural Affairs online fact sheet ; Schroeder et al 1996, Journal of Economic Entomology 89:1109-1115; Chen et al, 2003, BioControl 48: 713–724

NEW PUBLICATION: USING ORGANIC NUTRIENT SOURCES

The publication 'Using Organic Nutrient Sources' is now available through Penn State Cooperative Extension. The publication is intended to help growers interpret soil test recommendations for using organic nutrient sources. Topics included are:

- USDA National Organic Standards Summary on Soil Fertility Management
- National Organic Standards Summary for Fertilizers and Soil Amendments Use
- When Nutrient Levels Exceed Crop Needs
- Balance and Imbalance of Nutrients in Organic Nutrient Sources
- Nutrient Availability from Organic Nutrient Sources
- Increasing Soil pH, Calcium, Magnesium Levels Decreasing Soil pH
- Recommendations for Nitrogen, Phosphate, and Potash
- Soil Organic Matter Content
- Mineralization
- Using Compost
- Using Manure
- Additional Sources for Information

The publication can be ordered through:

The Publications Distribution Center
College of Agricultural Sciences
The Pennsylvania State University
112 Agricultural Administration Building
University Park, PA 16802-2602
Phone: 814-865-6713
Fax: 814-863-5560
Internet: http://pubs.cas.psu.edu/Publications.asp

E-mail: AgPubsDist@psu.edu.

It is also available as a pdf at http://pubs.cas.psu.edu/FreePubs/pdfs/uj256.pdf.

UPCOMING MEETINGS AND EVENTS

Machinery Demonstrations for Field Crops at the University of Massachusetts Crops Research and Education Center in South Deerfield.

Wednesday May 20, 11am-4pm.

- round-bale haying demonstration
- Unverferth 3-row zone builder demonstration – see this reduced tillage tool perform in a range of soil covers and residue. This piece of equipment may be of particular interest to vegetable growers who are interested in reduced or zone tillage systems.

Lunch provided. Please RSVP to Kyle Bostrom at kbostrom@nre.umass.edu or 413-658-4105.

Pleasant Valley Farm Twilight Meeting, Methuen.

Tuesday June 23 5pm.

Topics will include: Phytophthora capsici management, drip irrigation systems, GAP, chipilin and mixixe, all-season lettuce production.

University of Massachusetts Crops Research and Education Center Field Day, South Deerfield.

NEW DATE: Thursday July 16, 4-8 pm

Topics and demonstrations will include: Zone tillage in sweet corn, organic beetle management in cucurbits and eggplant, and specialty ethnic crops. Dinner will be provided.

If you would like to become a Vegetable notes sponsor, please contact Jessica Dizek at jdizek@outreach.umass.edu or 413 545 1445

Vegetable Notes. Ruth Hazzard, editor and Amanda Brown and Andrew Cavanagh, assistant editors. Vegetable Notes is published weekly from May to September and at intervals during the off-season, and includes contributions from the faculty and staff of the UMass Extension Vegetable Program, other universities and USDA agencies, growers, and private IPM consultants. Authors of articles are noted; author and photographer is R. Hazzard if none is cited.