UMASS EXTENSION

Vegetable Notes

For Vegetable Farmers in Massachusetts

Volume 16, Number 9 June 30, 2005

CROP CONDITIONS

This past week has seen quite a change in crop conditions. Last weekend's very hot conditions were not very helpful, but this week's warm and humid weather has pushed all fruiting vegetables along. Some growers have started harvesting summer squash and zucchini, and peppers have begun to branch and expand fruit. Rainfall has been adequate to plentiful for many growers as well. Cool season crops such as greens, lettuce, and brassicas are continuing to grow, and some growers are nearing the end of their spring production season. Sweet corn is finally growing well and the prospect of a productive summer looks brighter all the time. Hopefully the Canadian dollar will remain strong and prices for our produce will be higher as a result.

SWEET CORN UPDATE

The weekend of the fourth of July is upon us and yes there will be a few growers harvesting this week! For the rest of you, keep an eye on all corn which is still in tassel. The European corn borer larvae that are out there are still busy feeding in the tassels and will move down stalks and into the sides of the ears if not controlled. If you see feeding damage in more than 15% of the field you will want to spray. To ensure good coverage and control, put your tractor in a lower gear and calibrate your sprayer to produce high pressure so you can saturate the tassels when heavily infested. Check fields 3-4 days after spraying and make another assessment of damage. Often two sprays 5-7 days apart are needed to bring down populations in heavily infested areas.

Corn earworm traps should be put up in silking corn this week. Although the flight has not fully started yet, we want to be prepared! There have been a few moths captured around the state to let us know they are on their way. If you have caught any corn earworm moths refer to the table below for thresholds.

--A.Duphily, University of Massachusetts Extension

SWEET CORN TRAP COUNTS 6-24 TO 6-30

LOCATION	DATE	ECB ZI	ECB EII	Total ECB	
Berkshires, W. MA/ Champlain Valley					
Westeminster, VT	6-29	0	0	0	-
Pittsfield	6-29	0	0	0	-
CT River Valley					
S. Deerfield	6-29	4	11	15	-
Old Deerfield	6-30	12	17	29	-
Hatfield	6-29	9	3	12	-
Hadley	6-29	37	17	54	-
N. Hadley	6-29	15	4	19	-
Feeding Hills	6-28	24	3	27	3
C.& E. MA					
Dracut	6-29	26	44	70	0
Dighton	6-29	12	2	14	2
Dighton (2)	6-29	9	5	14	-
Still River	6-24	5	6	11	-
Concord	6-27	12	10	22	1
Lancaster	6-29	7	4	11	0
Tyngsboro	6-27	4	10	14	0
Leicester	6-29	8	2	10	0
Monson	6-29	4	3	7	0
R.I.					
Coventry	6-29	6	2	8	-

CORN EARWORM THRESHOLDS

Moths/Night	Moths/Week	Spray Interval
0 - 0.2	0 - 1.4	no spray
0.2 -0.5	1.4 - 3.5	6 days
0.5 - 1 days	3.5 – 7	5 days
1.0 - 13.0	7 – 91	4 days
Over 13	Over 91	3 days

BRASSICAS: CATERPILLARS AND FLEA BEETLES

Its not news that **diamondback moths** (DBM) and **imported cabbage worms** (ICW) are active in brassica fields. Growers should be scouting for these pests. **Cabbage loopers** (CL) have not been reported yet but could also be present. When scouting for 'worms', be sure to look

beneath the leaves and on the inner most portions of the plants. Look for feeding damage as well as for caterpillars. Tiny feeding holes are often easier to spot than small green caterpillars. Apply controls when thresholds are reached, and direct materials at the undersides of leaves as much as possible. Use at least 50 gal/A of water to achieve better spray coverage, and use a spreader-sticker.

A **threshold of 15%-infested plants** (an 'infested' plant has at least one caterpillar of any species) is recommended for any heading cabbage, broccoli, and all leafy greens. Before the cupping stage, in cabbage and broccoli, use a threshold of 35% plants infested. These thresholds provide a clean crop at harvest. Cauliflower use a 10% threshold.

An excellent comparison of "worm" insects at various life stages can be found at the following website (click on images to enlarge) *http://www.ces.ncsu.edu/depts/ent/notes/Vegetables/veg012e/cwcompho.htm.*

Imported Cabbageworm: The larva is a slow-moving, velvety-green caterpillar, which grows through a series of five stages, or instars, to a length of 1 1/4 inches. Larger caterpillars have a delicate yellow line that runs lengthwise down the center of their bodies. Small larvae feed on the undersides of outer leaves after hatching. Larger larvae are more mobile and are often found in the florets of broccoli or feeding on the heads of cabbage. Larvae may also move to neighboring plants.

Diamondback Moth larvae grow through four instars to a length of 1/3-inch. They are light green; tapering to points on both ends and appearing scalloped or segmented along the edges of their bodies. During the first two instars, the larvae have black heads, which later lighten to match their green bodies. They can be distinguished from other caterpillar pests by their habit of wiggling frantically when touched or disturbed. They may also drop from the plant and suspend themselves on a silken thread until the disturbance passes. The larval stage lasts from two to four weeks, depending upon temperatures. Pupae are found attached to the undersides of crop foliage and appear to be thinly veiled under a fine, net-like silken cocoon.

The **cabbage looper** caterpillar is light green, with wavy white or light yellow lines down the back and sides. Full-grown larvae reach 1 ½ to 2 inches. At rest or when disturbed, cabbage loopers of any size will raise the middle of their body in a characteristic "loop" shape. Eggs are round, light green or yellow, and laid underneath the foliage. Feeding tends to create ragged, large holes in foliage, on both frame leaves and heads. Moths arrive in New England on migratory flights from the South, like corn earworm.

Insecticides for Caterpillars: In the area of caterpillar control there are many products available. Spinosad (SpinTor 2SC, Entrust), Avaunt (indoxycarb), Confirm 2F (Tebufenozide) and Proclaim (Emamectin benzoate) are relatively new. Both Bt *aizawi* (eg Xentari, Agree) and Bt *kurstaki* (eg Dipel, Krymax, Biobit) products work well; Bt *aizawi* is recommended when diamondback moth is the dominant species. Several Bt's are registered for organic production, including Dipel and Xentari; Entrust is also approved for organic. It is possible to get excellent control of the three major caterpillar pests using low-risk products that are safe to handle and conserve beneficial insects (which do have an impact in suppressing aphids and caterpillars). It is also easier now to rotate among different types of products, to prevent selecting for resistance to any single product. There are also a number of synthetic pyrethroids and carbamates (see ***2004-2005 New England Vegetable Management Guide*** for details, p 72) which are effective.

Flea beetle numbers have gone down – it is likely that we are between adult generations – pupae and larvae are in the soil, near the roots of early brassicas. We are starting to see an increase in numbers of striped flea beetles, which emerge a bit earlier. Planting fall broccoli or greens? Think twice before you put them close to your spring plantings – especially if you had a significant number of flea beetles. Those new adult beetles that will be emerging in late July and early August will be very hungry. If your fall brassicas are close by, feeding damage will be heavy. Try to rotate fall brassicas to a field that did not have spring brassicas.

-R. Hazzard

SQUASH BUGS IN VINE CROPS

Squash bugs have for many years been considered a minor pest in vine crops in New England. For many years when I scouted butternut and pumpkin I would see occasional adults and eggs, but numbers rarely built up. However in recent years some growers have found high numbers and resulting crop damage; in addition, there is a disease that is vectored by squash bugs, which is now showing up in New England. Growers certainly don't need to try to get rid of every squash bug, but it is important to be aware of what risks might exist.

Adults squash bugs are flat, gray-brown, and usually found on the underside of leaves or in cracks in the soil. Squash bug eggs are laid in tidy clusters (usually on undersides of leaves in the notch between leaf veins) and change color from yellow to bronze shortly before hatching. Nymphs are light gray with black legs and go through 5 molts as they grow to adults. There is one generation per year. Adults spend the winter in crop residues and protected sites in or near the field.

Squash bug nymphs

Squash bugs can cause direct injury to leaves and fruit injury when high numbers of bugs are feeding on a plant. Feeding, which is done by piercing the plant tissues with stylets, interrupts xylem transport and causes wilting in leaves, stems, and vines that are beyond the feeding site. The injury may appear as light-colored areas that later turn brown and die. These symptoms are similar to bacterial wilt symptoms. If you see symptoms and are not sure of the cause, look for presence of squash bugs, and also contact the Disease Diagnostic Lab (413-545-1945) to send a sample for diagnosis. This is especially important because of possible risk of the newly arrived Cucurbit Yellow Vine Disease.

Adult squash bug

Cultural practices may influence squash bug numbers. We have observed higher numbers in fields with hay or straw mulch and in low-till or no-till situations where cover crop residues are high. The tendency of squash bugs hide and congregate in protected locations can be used, in small plantings, for trapping purposes. Place some boards on the ground and check underneath them in the morning; destroy bugs found underneath.

There is also a parasite of squash bug that may be visible in the field. It is a tachinid fly, *Trichopoda pennipes*, which has a colorful bright orange abdomen and dark wings. Eggs are laid on the abdomen of the adult squash bug; Parasitism may be as high as 80%, but unfortunately, the adult squash bugs are not killed before they feed and lay eggs on plants.

No specific economic threshold has been developed for squash bugs in New England. The economic threshold for squash bugs that is recommended by Cornell Cooperative Extension is an average of one egg mass per plant. The easiest stage to kill with insecticides is the nymph stage; if you find eggs masses at above threshold levels, target sprays to control nymphs as soon as they hatch.

Cucurbit Yellow Vine Disease *(CYVD), caused by Serratia marcescens Photo: Jude Boucher*

The synthetic pyrethroids and other contact insecticides available are most effective against young nymphs. Adult squash bugs and older nymphs are more difficult to control because they develop a hard exoskeleton as they mature. In addition, since squash bugs are secretive, they can be difficult to reach with insecticides. I don't have any specific organic materials to recommend as being effective against this pest.

However, there is new twist in the management of squash bugs. Squash bugs also vector a disease known as Cucurbit Yellow Vine Disease. This disease is a recent arrival in New England, and was first reported in Massachusetts in 1999. Additional cases were found in Connecticut more recently including on several farms in 2004. Hence – we need to watch out for it! Cucurbit Yellow Vine Disease is caused by the bacteria, *Serratia marcescens*. The bacteria survives the winter in squash bugs and is spread to the young plants in the spring when the bugs colonize and feed on cucurbit crops. Young seedlings in the first true leaf stage of development are more susceptible to disease transmission than older seedlings. Thus, if squash bugs are infected, it is critical to control early-season adult squash bugs as they colonize the field to successfully manage this disease. Insecticide applications should target young seedlings (< 3-5 true leaves) as soon as squash bugs are present on the plants. Unfortunately, we do not know whether there is any significant level of infection present in squash bugs in Massachusetts.

To control adults, the new generation synthetic pyrethroids (i.e. Capture) tend to work better than most other materials to control the squash bug. Spraying seedlings with synthetic pyrethroids should also control cucumber beetles and bacterial wilt. Sevin is no longer effective for squash bug control in CT (though it is very effective against striped cucumber beetle). Since most fruit is not affected, fruit from infected pumpkins, winter squash, cantaloupe, or muskmelon vines should be harvested and marketed early to avoid crop loss. For more details on this disease, see:

http://www.hort.uconn.edu/ipm/veg/htms/cucrbinct.htm

--R Hazzard, UMass Extension Vegetable Program
with excerpts from T. Jude Boucher,
Cucurbit Yellow Vine Disease (CYVD) In Connecticut

GUIDELINES FOR MANAGING CUCURBIT POWDERY MILDEW WITH FUNGICIDES IN 2005

Application of fungicides continues to be the principal practice for managing powdery mildew in cucurbit crops, but successful control is challenged by development of

resistance to key fungicides. While there are varieties with genetic resistant to this disease, an integrated program is recommended to reduce selection pressure for pathogen strains able to overcome the genetic resistance in the plant as well as fungicide resistance. Powdery mildew is the most common disease occurring every year throughout the US. The pathogen develops best on the lower surface (underside) of leaves, thus a successful management program necessitates controlling the pathogen on the lower as well as the upper surface to avoid premature death of leaves. It is difficult to directly deliver fungicide to the lower surface, even with new nozzle types and air assist sprayers. Consequently, an important component of fungicide programs has been fungicides able to move to the lower leaf surface. Most of these fungicides are systemic (e.g. Topsin M, Nova) or have translaminar activity (e.g. Flint, Amistar, Cabrio). Some, notably the new fungicide Quintec, have high volatility enabling redistribution from upper to lower leaf surfaces.

Unfortunately, these fungicides effective on lower leaf surfaces have been prone to resistance development due to their single-site mode of action. Additionally, the cucurbit powdery mildew fungus has demonstrated ability to evolve new strains resistant to these fungicides. Presence of resistant strains has been associated with control failure. With some fungicides, including MBC (methyl benzimidazole carbamate) fungicides aka benzimidazoles (e.g. Topsin M) and QoI (quinone outside inhibiting) fungicides aka strobilurins (e.g. Flint, Cabrio, Amistar), this change renders the pathogen strain completely resistant to the fungicide (qualitative resistance). With other fungicides, including the DMI (demethylation inhibiting) fungicides (Bayleton, Nova, and Procure), pathogen strains exhibit a range in fungicide sensitivity depending on the number of genetic changes they possess that affect the fungicide's ability to function (quantitative resistance). Level of DMI resistance currently is such that the first DMI fungicide registered, Bayleton (triadimefon), is no longer effective and thus no longer registered, while Nova and Procure (myclobutanil) are still effective at high rates.

Managing resistance is therefore an important consideration when selecting a fungicide program for powdery mildew of cucurbits. It is important to realize that the primary goal of resistance management is to delay its development rather than just to manage resistant strains after they have been selected; therefore, a management program needs to be implemented before resistance develops to have the greatest benefit. An important component of a resistance management program is to reduce the need for fungicides that have high risk for developing resistance. This can be accomplished for cucurbit powdery mildew by growing varieties with genetic resistant to mildew and separating main-season from spring plantings. Several resistant varieties of pumpkin and winter squash have recently been commercialized.

The general fungicide program being recommended for resistance management consists of an alternation among effective high-risk fungicides in at least 2 chemical classes applied on a 7-day schedule, with a protectant fungicide included in every application. The first application needs to be made as soon as possible after reaching the threshold of 1 leaf with symptoms out of 50 older leaves examined. It is especially important to examine the lower leaf surface when scouting. Another important component of resistance management is assessing control by routinely monitoring mildew severity on the lower surface of leaves. When control is poor on lower surfaces but good on upper surfaces, stop using high-risk fungicides and contact local extension specialists promptly so that samples of the fungus can be collected for testing. A high-risk fungicide should be tank-mixed with a protectant fungicide because the latter has multi-site activity and thus low resistance risk. It will control pathogen strains resistant to the high-risk fungicide. For more information on protectants, see the article entitled '**Protectant Fungicides for Managing Powdery Mildew in Cucurbits: How do They Stack Up**?' at: *http://vegetablemdonline.ppath.cornell.edu/NewsArticles/Cuc_Cntct_Fcides.htm*

Current recommendation for 2005 is to apply Pristine plus a protectant fungicide on odd weeks and a DMI fungicide plus protectant fungicide on even weeks for at least 4 weeks, then apply protectant fungicides alone for the remainder of the season unless another disease controllable with QoI fungicides has developed. Pristine is recommended because it contains a new systemic active ingredient, boscalid, as well as the QoI pyraclostrobin. QoI resistance appears to be sufficiently common and widespread that control with QoI fungicides (Amistar, Cabrio, Flint) likely will be compromised wherever these are used. Pristine is labeled at 12.5–18.5 oz/A, which will cost about $28.49-$42.16/A. It has a season maximum of 4 applications. The DMI fungicide should be applied at the highest labeled rate to avoid selection of isolates able to tolerate lower rates. Using Procure at 8 oz/A, which provides 4 oz/A of active ingredient, will control any strains of the pathogen present that have a level of resistance such that they are uncontrollable by Nova at 5 oz/A, which provides only 2 oz/A of active ingredient. Procure at 8 oz/A will cost about $26/A.

As a result of QoI and DMI resistance, the cost of controlling powdery mildew with fungicides has increased greatly. If the cucurbit powdery mildew fungus was fully sensitive to fungicides and there was no risk of resistance, it would be possible to manage powdery mildew and obtain control of several other diseases by alternating between Nova at the lowest labeled rate of 2.5 oz/A, costing about $9.86/A, and Cabrio at 12-14 oz/A, costing about $19.13-

$22.31. Due to resistance, Nova needs to be applied at 5 oz/A ($19.71/A) and using Procure at 6-8 oz/A is preferred ($19.50-$26/A). Also Pristine ($28.49-$42.16) needs to be substituted for Cabrio. In addition, a protectant fungicide is needed at each application to further manage resistance and minimize the impact on control should resistance develop. A highly effective inexpensive product is sulfur* (Microthiol Disperss at 4 lb/A costs about $2.64/A). The cost of a fungicide program for controlling powdery mildew if resistance was not an issue is $97/A for 3 sprays of Nova (2.5 oz/A) alternated with 3 of Cabrio (14 oz/A). And the cost of a similar program for managing powdery mildew where QoI and DMI resistance occurs is $193/A for 3 sprays of Procure (8 oz/A) alternated with 3 of Pristine (14.5 oz/A), plus Microthiol Disperss (4 lb/A) included with each application.

***note that sulfur can be phytotoxic on melons, especially if applied when temperatures are hot.**

Monitoring Resistance in 2003 and 2004. Fungicide resistance was monitored on Long Island during the 2003 and 2004 growing season using a seedling bioassay. Squash seedlings were treated with fungicide, then placed with non-treated seedlings in a production field with powdery mildew for up to a day. The seedlings were kept in a greenhouse until symptoms appeared. For the first assay, seedlings were placed during late July in spring plantings of squash and in pumpkin fields that had not been sprayed with high-risk fungicides. Additional assays were conducted in pumpkin fields in August and September.

2003 Results. Resistance to QoIs was detected in 1 of 5 fields where the bioassay was conducted in July. Moderate resistance to DMIs was common in all fields. A second assay was conducted at the end of August in pumpkin fields where high-risk fungicides had been used. DMI and protectant fungicides had been used in all 7 fields; QoIs also were used in 6 fields. Resistance to QoIs was detected in all fields. Several QoI-treated seedlings had as much powdery mildew as non-treated plants indicating a very high frequency of resistance. Seedlings treated with a DMI fungicide had less powdery mildew, indicating a lower percentage of isolates with reduced sensitivity to this fungicide group. Powdery mildew did not appear to be suppressed very well on the underside of leaves in these fields. Resistant strains were also detected during a third assay conducted in organic and conventionally-managed fields that had not been sprayed with high-risk fungicides.

2004 Results. Resistance to QoIs was found, often at a high level, in all 8 fields where the bioassay was conducted in July. Moderate resistance to DMIs and resistance to benzimidazoles was also common.

Evaluation of Fungicide Programs in 2004. Flint (2 oz/A) tank-mixed with sulfur (4 lb/A Microthiol Disperss) and applied in alternation with Procure (8 oz/A) plus sulfur on a weekly schedule effectively controlled powdery mildew on pumpkin through the end of August. By the September 13 assessment, control on the underside of leaves had dropped to 69% compared to 93% where a similar program was used with Quintec substituted for Flint and 98% where Quintec was applied alone on the same dates. Quintec will never be recommended as a stand-alone product because it is at-risk for resistance development. It was tested alone to assess its efficacy. Control at that time was 87% with Pristine (14.5 oz/A) plus sulfur applied in alternation with Nova (5 oz/A) plus sulfur. This degree of control was not significantly different from that obtained with Procure and Quintec. In contrast, control observed in several commercial pumpkin fields on Long Island in 2004 was very poor on lower leaf surfaces despite the fact growers had used Nova as well as Quintec under a 24c crisis exemption. Since control was excellent on upper leaf surfaces, application timing was good. Poor control was at least partly due to a delay in the first application of Quintec as product was not available when powdery mildew was first observed. Excellent control was reported elsewhere in NY. Powdery mildew cannot be effectively controlled when fungicide applications are started after the disease is established. Based on AUDPC values, which summarize severity over the entire season, control on the underside of leaves was significantly more effective when block applications of Procure and Quintec were used than when a strict alternation was used (88% versus 98%). The block application schedule was Procure + sulfur (week 1, 4, 5), Quintec + S (week 2,3), and sulfur alone (week 6). A highly effective protectant fungicide is an important element of a fungicide program for managing fungicide resistance and powdery mildew. Protectant fungicides are needed because they control pathogen strains resistant to high-risk fungicides and, since they have low resistance risk, they will reduce the impact on control when resistance develops to other fungicides being used. There are numerous products available to choose from. Six products with a plant oil as the active ingredient and a hydrogen dioxide product were evaluated in another experiment conducted in 2004. GC-3 organic fungicide (cottonseed oil, corn oil, and garlic extract), Organocide (sesame oil) and Eco E-Rase (jojoba oil) were as effective as Microthiol Disperss, JMS Stylet-oil (mineral oil), and Bravo Ultrex. The copper hydroxide product Champion provided excellent control in another experiment with pumpkin conducted in 2004.

Please Note: The specific directions on fungicide labels must be adhered to -- they supersede these recommendations, if there is a conflict. Any reference to commercial products, trade or brand names is for information only; no endorsement is intended.

--Margaret Tuttle McGrath
Associate Professor, Department of Plant Pathology,
Long Island Horticultural Research and Extension Center,
Cornell University 3059 Sound Avenue, Riverhead, NY 11901

CHOOSING THE RIGHT COVER CROP

Cover crops can provide multiple valuable benefits to cropping systems. While typically used in the Northeast to protect the soil against winter erosion, or to add biologically fixed nitrogen, other uses include improvement of overall soil quality, weed management, late-season nutrient capture and even enhancement of biological control agents in the system, such as beneficial organisms. A key to successful use of cover crops is to choose the appropriate species to fit the specific goals of their intended use in the cropping system. As such, a grower should first identify a primary goal or use for the cover crop, characterize the conditions under which it will be grown, then use this information to describe the ideal species before matching the description with the best available cover crop species.

-Erosion control: These species need to be able to quickly develop an extensive below - and above-ground biomass, often during cold and inhospitable weather in the fall. In general, cool-season small grains are the best options. Cereal rye (Secale cereale) is the best choice for most Northeastern cropping systems because of its ability to germinate and grow late in the fall when other species have effectively shut down growth for the year.

-N-fixation: Legumes used as cover crops have a relationship with a bacteria in their roots that allows them to utilize N from the air and convert it to a plant nutrient. The plants can then be turned into the soil as a "green manure," thus enriching the soil with N for use by the following crop. Typically, legumes used for this purpose are winter annuals, occupying the niche between summer crops. Hairy vetch (Vicia villosa) is the most cold-tolerant of the winter annuals and so has been used frequently in Northeastern cropping systems. Growers who are willing to dedicate longer periods to the green manure crop have expanded options, such as Biennial Sweetclover (Melitotus officianalis) or the short-lived perennial Red Clover (Trifolium pratense).

-Soil Improvement: Nearly any cover crop will bring about improvement of some soil biological, chemical or physical characteristics. Covers with lower N contents, such as grasses, may lead to longer-term buildup of stable soil organic matter, but legumes can also lead to improved soil conditions, particularly short-term improvement in soil aggregation and water infiltration.

-Weed Control: The use of cover crops for weed management involves manipulation of several principles: competition for light, water and nutrients, physical smothering by residues and phytotoxic effects, or allelopathy. Any cover crop that grows vigorously at a time when weed species would otherwise be germinating and emerging can be used to out compete weeds. Those with thick and decay-resistant residue may be able to act as a mulch, which smother germinating seeds. Cool-season grains, particularly Cereal Rye, has been used successfully in the Northeast as a killed surface mulch in no-till vegetable systems for weed suppression. Generally, the grain can be killed by mowing and left in place once it has initiated flowering. Several cover crop species are noted for the release of chemicals during decomposition that may inhibit the germination of small-seed weeds in the surface soils. Cereal Rye has the most notable allelopathic effect, but many members of the Cabbage Family, such as Mustard, Forage Kale and Oilseed Radish have exhibited some effect in this regard. It should be noted that cover crops rarely offer acceptable weed control through allelopathic effects alone.

-Selection of Cover Crops to Fit the Rotation: As noted above, most growers in the Northeast prefer to establish cover crops during the fall through spring period when the field is otherwise not utilized by economic crops. Winter annual cover crops, including an array of grasses, legumes and brassicas, can be planted in the fall, but vary in their ability to overwinter in the Northeast. The most cold-tolerant winter annual species include Cereal Rye and Hairy Vetch, but several others, such as Crimson Clover (*T. incarnatum*), Winter Wheat (*Triticum aestivum*) and several forage-type brassicas will fairly consistently overwinter in Hardiness zones 6 and above.Those who choose to keep the cover crop in the field through at least one year will find that Red Clover, White Clover (*T. repens*) and Biennial Sweetclover are all sufficiently hardy to withstand most winters in the Northeast. Other options for cover cropping include some non-traditional time periods, such as Summer Fallow, when heat-tolerant species such as Cowpeas (*Vigna unguiculata*), Buckwheat (*Fagopyron esculentum*), or Sudan Grass hybrids can be grown for weed control and soil improvement. In choosing an appropriate cover crop and its place in the rotation, the ability of the species to grow and survive in the crop environment at the time of seeding, the equipment available for seeding, the cover crop's ability to withstand field traffic, the cost of the seed, and the anticipated method for cover crop demise at the end of its functional life cycle, as well as a number of other things, must be taken into account.

-Marianne Sarrantonio, University of Maine

***Vegetable Notes**, Ruth Hazzard, editor and Ben Hunsdorfer, Assistant Editor.*
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.*

Where trade names or commercial products are used, no company or product endorsement is implied or intended. Always read the label before using any pesticide. The label is the legal document for product use. Disregard any information in this newsletter if it is in conflict with the label.