UMASS EXTENSION

Vegetable Notes

For Vegetable Farmers in Massachusetts

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CROP CONDITIONS

The weather continues to be mostly dry. This is a pleasant relief from excessive rain that we experienced for much of the summer. The fallout from that rain is still showing up in fields, some of which continue to be lost to Phytophthora crown and fruit rot, which spreads rapidly once it gets established in any part of the field. Getting any ripe fruit out of the field as soon as possible is a good idea at this point, particularly in fields where phytophthora may be present. As noted in last week's newsletter, downy mildew has arrived in MA – refer to the update in last week's newsletter for advice on dealing with this disease. Late blight continues to cause problems in tomato and potato fields. Despite these many difficulties, many crops are looking good and yielding well. Pumpkins and winter squash are starting to hit the market, Brassica crops are growing well, and we can all hope for a long and bountiful Indian Summer.

BRASSICAS: FALL INSECTS AND DISEASES

Fall with cooler temperatures and shorter days is the time when Brassica crops tend to look terrific. Fall is the easiest time to grow high quality broccoli. However, it's worth keeping a close eye on these crops, especially by looking underneath the leaves. As usual, that is where you will be able to notice problems early, and avoid having them sneak up on you.

Alternaria on Broccoli

Alternaria Leaf Spot (ALS) seems to be widespread this season. Desptie the current dry spell, it seems to have been encouraged by the heavy dews that kept leaves wet for long periods. At least three species of Alternaria can cause serious losses in cruciferous crops. It occurs on many Brassica crops, including Brassica oleracea types (eg broccoli, cabbage, collard) and Brassica rapa types (eg, bok choi, tatsoi, komatsuna) (see photos). These pathogens may be seed-borne, both as spores on the seed surface and as mycelium within the seed. However, the major source of inoculum is crop debris in soil.

Symptoms of ALS are circular, small, dark spots with concentric rings (target spots) on the upper surface of leaf. Older leaves are more susceptible to infection. When humidity is high, lesions can be covered with a sooty black mass of spores. The pathogen sporulates abundantly on foliar lesions and centers may fall out to give a 'shot-hole' appearance. Lesions can grow together leading to large necrotic areas and early leaf drop. Symptoms on cauliflower and broccoli heads begin as browning at the margins of individual flowers. ALS requires leaf wetness for 16 hours to initiate infection and at least 12 hours of continuous humidity at >90% RH to develop. Note that if ALS does not have the required amount of leaf wetness, it will appear as tiny black "sooty" dots (not as the characteristic target-spot lesions).

ALS can cause economical loss in storage if infection spreads into the upper frame leaves or head due to additional trim loss, the production of ethylene, and invasion by secondary fungi and bacteria. Fungicides are most effective if applied before disease gets established. Bravo, Amistar, Quadris and Maneb are control options.

Because inoculum carries over in crop residue, crop debris should be destroyed as soon as possible after harvest and a minimum 3- year rotation out of crucifers should be used. For rotation to be effective, cruciferous weeds need to be controlled during the rotational period. Buy seed from a reputable source or treat with hot water to eliminate Alternaria from seed. Eliminate cull piles. Avoid overhead irrigation during head development.

Powdery mildew of Brassicas. This disease is unusual in the US, but is reported to occur regularly in England, southern Ontario, among other locations, especially on rutabagas and turnips. Two occurrences, both from eastern Massachusetts, have come to our attention this week – one on collard, one on Lacinato and red Russian kale. Brussels sprouts, kale, Chinese cabbage, collards, broccoli, mustard and cauliflower are also reported to be hosts. Just as you would expect, the symptoms are white talcum-like growth on the upper leaf surface, starting as circular patches and expanding to cover the leaf. Leaves become pale green to yellow or tan, or if severely infected, curl and die. The plant is rarely killed, but growth can be stunted or defoliated, and of course is the leaves are sold, the disease would render them unmarketable. Note that this is a different species of powdery mildew than those that infect cucurbits, or tomato, or various ornamental crops.

Conditions that favor this disease seem to be low relative humidity with cool temperatures, water stress of the crop, and the availability of a thin film of moisture in which spores can germinate. The white powdery growth includes mycelium and spores (conidia), which can be dispersed quite long distances by wind. Spores overwinter "with difficulty"; however, survival of the fungus is better when live plant material carries over through the winter, which enables the fungus to produce new spores in the spring. It seems possible that one reason that we are seeing some occurrence of this disease is the milder winter last year, which allowed survival of brassicas, and also that more growers are overwintering Brassica plants through protection with row covers. If you see this in fall, don't ovewinter those Brassicas!

Fungicides which are labeled for fungal diseases of Brassicas, especially those which also work against powdery mildew in other crops, should provide control of the disease. Apply at first indication of disease. Put crop residue under as soon as possible after harvest, control Brassica weeds which could also harbor the disease.

Downy mildew of crucifers. This disease, caused by the fungus Peronospora parasitca, should not be confused with downy mildew of cucurbits (caused by Pseudoperonosproa cubensis), which is related but does not infect brassica crops. Downy mildews tend to be specific to a certain plant family or even species within a plant family. They are in the same group of fungi (Oomycetes or 'water molds') that cause late blight of potato and tomato and blue mold of tobacco.

Downy mildew is an important disease of broccoli, collards, kale, cabbage, cauliflower and Brussels sprouts. It can also infect rutabaga, turnip and radish. It is encouraged by cool, moist conditions (from rain, heavy dew or fog), which are more typical in late August, September and October in our region. Infection can occur at any stage of growth. Severe infections can kill seedlings, but stem, leaf and flower/head infections can cause crop injury and loss at later stages.

The most distinctive symptom is grayish white, fluffy growth on the undersides of leaves. Irregular, angular yellow to brown spots develop on both top and bottom of the leaf. In the floral parts of broccoli or cauliflower, dark brown areas develop internally in curds or floral buds of the head. Stems and stalks of the flower head may be darkened or have black streaks, and this may be the first sign of infection in broccoli. In cabbage, internal darkening and purplish spots appear in the inner layers of the head or move upward in the head from stem infections. Secondary infection with soft rot bacteria (always smelly!) may follow the downy mildew. In cabbage, systemic invasion of the stem may occur after infection of the lower leaves. The fungus may then invade the head leaves and sporulate after the cabbage has been stored.

The fungus survives from season to season as thick-walled resting spores, called Oospores. These sexual spores can survive in the soil for extended periods and produce sporangia when conditions are moist and cool, especially at night. Disease development is favored by abundant moisture on leaves provided by dew, drizzling rain, or heavy fog. Sporulation, germination, and reinfection can occur in four to five days. The fungus may also survive in a latent state within systemically infected plants. Oospores and mycelium can be carried in and upon seed. Sporangia are carried on air currents and on wind-blown rain and when conditions are right, will germinate on leaves and produce new infections.

Cultural controls for downy mildew: Rotation out of brassicas for at least two years; removal of crop residues which contain Oospores (may not be practical!); adequate crop spacing to encourage drying of leaves. Control in the seed-bed is very important and includes the use of clean growing medium, good drainage, and an avoidance of overhead irrigation. Resistant or tolerant varieties of broccoli have been developed; our sources list Marathon and Arcadia among these.

Fungicides for downy mildew include Prophyt, Alliette, Ridomil or Ridomil/Bravo. Preventive spraying of protectant foliar fungicides may be necessary if environmental conditions favor disease development.

Phoma leaf spot and stem canker (Blackleg) caused by Phoma lingam has been observed on broccoli in one field this year. Blackleg attacks many cruciferous crops, especially cauliflower, broccoli, and turnip. Rutabaga, radish, and mustard cultivars are only slightly susceptible. This disease can spread rapidly within a field. Though it is favored by wet conditions, it was widespread in a dry, sandy field. It may have spread on seedlings in the greenhouse.

Plants can become infected at the seedling stage or at any stage in the field. The initial source is probably infected seed. The disease has become less important in cruciferous crops because of successful disease management strategies in seed production. Once present on the farm, management should focus on avoiding spread of the disease, and rotating out of the infected field for four years to eliminate the inoculum. Rogue diseased plants from seedbeds. Improve soil drainage and air circulation. Control cruciferous weeds. Incorporate crop debris promptly after harvest to hasten decay. Avoid working in the fields when wet.

Symptoms of the pathogen start as slight lesions on stems at cotyledon stage which elongate, turn brown with a black to purplish border, and become sunken. The lesion extends up and down the stem, the stem becomes girdled and blackened, with many fruiting bodies (pycnidia) embedded in the tissue. Lesions may extend below the soil and attack roots. Diseased plants often wilt, lodge, and die. On root crops, symptoms occur in the form of cankers on the fleshy roots and a dry rot may appear in storage. Phoma lingam can survive for up to four years in seed and three years in infected crop debris. The pathogen infects seedlings, forms pycnidia, and produces abundant amounts of spores which exude from the pycnidia in long coils and are splashed to nearby plants to initiate new infections. The disease is favored by wet, rainy weather. Start with seed certified as disease-free or treat seeds with hot water.

Chemical recommendations: For organic growers: potassium bicarbonate (Armicarb 100): 2.5 to 5.0 lb/100 gal (0 dh, REI 4h).Start application at the first sign of disease and continue at 7-14 day intervals while conditions remain favorable for disease development.

Non-pathogenic disorders of broccoli. Brown bead, heat injury, hollow stem of Broccoli. As part of the Brassica project, we are working to gain a better understanding of these disorders. Each can be caused by a combination of factors – heat stress during head initiation, excessive water especially after a dry period, excessive nitrogen, rapid growth during head formation, deficiency of boron, and cultivar susceptibility. Heat injury is most often manifest as unevenness of the crown and uneven bud size on the head, as well as small head size. Brown bead appears as heads approach maturity and is usually associated with rapid growth during periods of high temperature followed by abundant rainfall. Floral buds turn tan or brown and become easily detached. These may then become infected with soft rot bacteria, Erwinia species. Boron deficiency, which shows up as hollow stem of broccoli or cauliflower, brown discoloration of turnip or rutabaga roots, or internal discoloration of cauliflower, can be more severe if plants are water stressed or pH is greater than 7. Adequate supplies of soil organic matter, consistent and adequate water levels in the soil, and supplemental boron applied before planting if boron levels are low can all help in avoiding these problems.

Cabbage aphid. Cabbage aphids tend to build up in fall Brassicas, and we have observed small colonies starting up in our fall broccoli plots. These are gray-green aphids with a waxy coating that makes them appear whitish gray. Colonies tend to form in younger, upper leaves, in cabbage heads, between cauliflower curds, or in long-season Brassicas such as Brussels sprouts. Numbers tend to build in the fall. Winged aphids arrive, and produce colonies of wingless nymphs that also reproduce. Large colonies can stunt plants or cause curled leaves, and will contaminate harvested parts.

Biocontrols (predators and parasites, and a fungal pathogen) often keep colonies under control; however, if numbers are building, insecticides may be needed. University of Connecticut recommends a threshold of 10% infested plants in cabbage, broccoli, cauliflower and Brussels sprouts after heads or sprouts begin to form.

There is a range of chemistries available among insecticides labeled for this pest: including pyrethroids and organophosphates, neonicotinoids (Provado), pymetorzine (Fulfill), and insecticidal soap (MPede). Note plant back limitations or limits on which Brassicas are allowed. Always uses a spreader sticker to obtain better coverage and more insecticide persistence. Insecticidal soaps are capable of reducing cabbage aphid and are relatively easy on natural enemies. Soaps (eg MPede) are quite effective as long as the material contacts the pest at the time of application, but they have no residual activity once they have dried. Ensure good coverage of the undersides of leaves. Several applications may be needed.

Cabbage root maggot can cause root injury in fall turnips, daikon, and rutabagas. Timing of controls is more difficult than in spring crops, and root crops are more sensitive to injury since the root is marketed. The adult flies are active in early September, but the precise flight period is not well known and not easy to detect. The only labeled chemical control is Lorsban, which may be directed to the base of the plant and has a 30 days to harvest interval. Use of a banded application at planting, or before eggs hatch can prevent injury. Non-chemical controls are in short supply. In 2005, two growers in the UMass Brassica Project evaluated row cover to exclude maggot flies from fall root crops and found the cover reduced yield (and enhanced aphids).

Imported Cabbage Worm Larvae

Caterpillars. There are three key caterpillars pests of Brassica crops. Cabbage looper usually does not appear until mid July or August, especially when other migratory moths are also arriving on storm fronts. Loopers, along with imported cabbageworm and diamondback moth – generally known as 'worms in cabbage' – are more attracted to the waxy crops such as cabbage, broccoli, cauliflower, and collard than to the 'glossy' leaved Brassicas such as Bok choi and Chinese cabbage – but they can be found in all of these. Diamondback moth and imported cabbageworm have several reproductive cycles each year, and you may see new flushes of moths or butterflies, eggs, and then caterpillars, in a single crop.

Cabbage Looper Larvae

Quick ID Cues:

Diamondback moth caterpillar: very wiggly when poked, pointed on both ends, not fuzzy, only grows to about ½ inch. You may find white silken cocoons, with a green full-grown catperillar or a brown pupa inside.

Imported cabbageworm: gray-green, slightly fuzzy, and sluggish. Grows to > 1 inch and favors the center of the head as it gets larger. Leaves wet green frass (droppings). Eggs single, light green or yellow.

Cabbage looper: light green, smooth, 'loops' up like an inchworm as it moves, grows 1 ½ to 2 inches. Eats big holes in leaves.

Scout undersides of leaves to look for fresh damage and to catch the caterpillars when they are small and damage is slight. Check heading brassicas as soon as heads start to form. Greens such as collards, kale, and Chinese cabbage should be scouted at all growth stages. The following thresholds are based on checking 25 plants. If you find one caterpillar per plant, it's considered "infested".

Action thresholds for caterpillars in Brassicas

Crop & Stage	**% Infested Plants**
Cabbage & Broccoli, Cauliflower	
pre-cupping (before head formation begins)	35%
Cabbage, & Broccoli head formation to maturity	15%
Cauliflower After heading (before tying)	10%
Kale, Collards & other greens	10-15%

Diamondback Moth Larvae

See 2008-2009 New England Vegetable Management Guide for insecticides. There are many effective options! Use selective products to maintain the natural enemies that keep aphids in check!

Flea beetles. Seedlings and salad greens can suffer severe damage from adult feeding. This will dwindle as September advances and beetles leave the fields for overwintering sites, but the key time for control is when plants are young. As temperature cool, it is safer to use mid-weight row covers to protect crops.

-R Hazzard, Bess Dicklow, A. Cavanagh. .

SWEET CORN & PEPPER REPORT

ECB counts are down this week to almost nothing throughout the Pioneer Valley, except one field in Sunderland that caught 13 ECB this week.

Corn earworm trap counts have risen this week. This tells us there is still a high potential for infestations. Each female CEW has the ability to lay as many as 1000 eggs. Eggs are usually laid on the silks and can hatch in 2-6 days depending on temperature. Once the eggs hatch they will travel down the silk channel and bore their way into the ears. Once they get into the ears there is no effective control. This is what makes the CEW the most destructive of all the sweet corn pests. Chemical controls work best if you have the right timing and equipment. Late summer infestations are keeping a lot of growers out there on a short interval spray schedule, mostly due to CEW pressure. If using chemical controls try and configure what control method at what stage will be best to cover all of your pest problems in one spray. Again, due to lower temperatures this week, in the mid forties at night, egg laying activity is slowed and development of eggs will take longer, allowing growers to stretch spray schedules a day. If you think you are too late to control CEW that has already entered below the silks, do a selective harvest. Because damage is usually found in the tips of the ears you may still be able to salvage infested corn depending on your consumer preference. Organic growers can usually get away with a little more!

Location	Z1	EII	Total	CEW	FAW
Bershires/Champlain Valley					
Pittsfield	0	0	0	2	-
CT Valley					
South Deerfield	1	1	2	-	-
Sunderland (1)	1	0	1	21	1
Sunderland (2)	3	10	13	23	-
Whatley	0	1	1	14	-
Hadley (1)	1	2	3	-	10
Hadley (2)	0	0	0	14	0
Amherst (1)	0	0	0	7.5	2
Amherst (2)	0	2	2	0	0
Granby	0	1	-	-	0
Easthampton	0	0	0	5	0
Central & Eastern MA					
Still River	0	0	0	13.5	0
Concord	1	2	3	21	1
Leicester/Spencer	8	1	9	15	0
Northbridge	2	2	4	41	7
Tyngsboro	16	4	20	1	0
Lancaster	2	4	6	6	0
NH					
Litchfield, NH	0	15	15	54	-
Hollis, NH	0	7	7	9	-
Mason, NH	1	6	7	2	-

Fall Armyworm trap captures have been low this summer but growers are still finding damage in the field. This week, a high of 10 moths was caught in Hadley. Most growers are more worried about infestations of CEW at this point; the recommended spray intervals for CEW should be adequate for ECB and FAW control. But if you are not controlling for CEW, you may want to use Entrust to control FAW damage. In silk stage, 3 or more moths captures per trap per week requires 5-7 day spray interval.

Corn Earworm Threshold		
Moths/Night	Moths/Week	Spray Interval
0-0.2	0-1.4	no spray
0.3-0.5	1.5-3.5	every 6 days
0.6-1	3.6-7	every 5 days
1.1-13.0	7.1-91	every 4 days
Over 13	Over 91	every 3 days

Peppers

Growers are still doing regular harvests of peppers and finding very little damage to fruit in both spray and no-spray blocks. This week ECB trap counts are declining across the board and growers who were above threshold and spraying

earlier in the season are now able to stop their spray schedules.

-C. Huffman

Location	Z1	EII	Total ECB
CT Valley			
Granby	0	1	1
Sunderland (1)	3	3	6
Amherst	1	2	3
Hadley (2)	1	2	3

ONIONS: HARVEST AND CURING TIPS FOR BEST QUALITY:

Editor's Note: the following article from CCE talks about the technology used by large-scale onion growers, but the crop needs are the same on small farms – except that growers often have to improvise to achieve the best conditions. A relative humidity sensor and maximum-minimum thermometer would be useful tools for growers aiming for good curing and long term storage of onions or other root crops.

Harvest Tips for Best Quality

1) Be sure onions are well dried and necks tight (i.e. the tissue does not slide when you roll your neck between your fingers) before harvesting/topping. Bacterial diseases and Botrytis Neck rot can move through green tissue into the bulbs. These diseases do not move in dry tissue.

2) Leave 2-3 inches of neck on the bulb. This increases the distance from the cut surface to the bulb for these pathogens to travel.

3) Minimize mechanical injury during harvesting by adjusting the chain speed to make sure the chain is always full. This will help reduce rolling and bumping of the bulbs. Reduce drops to 6" and pad sharp surfaces. Bruises provide direct entry points for diseases to get started.

4) Grade out damaged onions before putting them into storage. Damaged bulbs give off moisture, which is favorable for development of diseases in storage.

Curing Onions for Maximum Quality: Temperature

Quick curing can be done with outside air, which is heated to approximately 77ºF. Higher temperatures, up to 90ºF can be used if onions are of high quality with several layers of good skins. Higher temperatures are favorable for development of bacterial diseases. Black mold is more likely to develop when temperatures exceed 82ºF. A lower temperature, down to 68ºF should be used if onions are poorly skinned or if they have been touched by frost. Best skin color develops at 75-90ºF. Relative humidity - should not fall below 65% or exceed 80%. RH going into the boxes should ideally be 50%. Air-flow - should be no less than 3 cubic feet per minute per cubic foot of product. Be aware that when bulb size is down, air circulation through the boxes is reduced (onions pack tighter with smaller air spaces in between). An empty bushel crate can be placed into the onion boxes while filling to increase air circulation. Dryer Volume - the wetter/greener the onions going into a dryer, the fewer should be put into it. Stack no more than 3 boxes away from the plenum. Check Conditions – RH and temperature of the air going into and out of the boxes should be monitored and adjustments made accordingly. Check air flow. Air will take the path of least resistance. Use a smoke test to show you where and how the air is moving.

--reprinted from PestMinder 12.19 1, A publication of the Cornell Cooperative Extension Vegetable Program

PUMPKIN AND WINTER SQUASH HARVEST AND STORAGE

Although there are many fields with immature fruit, pumpkins in some fields are orange. Sugar pumpkins, especially, are ready early. Butternut in some fields is showing the dull, waxy look and tawny skin that characterizes mature fruit. Assessing maturity is complex in some winter squash that turns dark green before it is mature (see Brent Loy's article in last weeks Vegetable Notes).

.Winter squash and pumpkin fruit sitting in the field face a daunting list of diseases and insects – not to mention possible passing hurricanes -- that could threaten fruit quality. Early harvest and careful storage is often preferable to leaving fruit in the field. This is especially true if you know that your pumpkins or squash are in fields that are infected with Phytoph-

thora blight.

Since the pumpkin market lasts from Labor Day to Halloween, pumpkins may need to be held for several weeks before they can be marketed. When is it best to bring then in, and when to leave them in the field? If the vines are in good condition, the foliage can protect the fruit from sunscald. If foliage is going down from powdery mildew or downy mildew, this may help with ripening and make harvesting easier, but also increases the risk of sunscald or injury to pumpkin handles There can be extra work involved in bringing fruit in early, especially for growers who normally have pick-your-own harvest, but we recommend that growers harvest as soon as crops are mature and store under proper conditions, if it is feasible. Attention to curing and handling will go a long way toward improving the life of winter squash and pumpkin fruit. If you need to hold fruit in the field for pick your own or any other reason, using a protectant fungicide (eg chlorothalonil) can help protect from black rot, powdery mildew and some of the other fruit rots.

What about pumpkin stems, ie, handles? In some cases, it's the handle that sells the pumpkin. Pumpkins may not be marketable if the handle is broken off or dried up. Ideally, if the timing is right, pumpkins would be cut one to two weeks prior to marketing. However, if they are harvested now they may sit much longer before being sold. The discussion of how early to cut handles is an old one with many different opinions. One view is that it is advisable to cut the handles from the vine to save them from advancing powdery mildew and reduce shrinkage. Whether or not handles shrink and shrivel after cutting is affected by plant stress, genetics (variety), moisture and temperature conditions, and disease. There are many diseases that can affect handles, including Plectosporium, Fusarium, Black Rot, and Alternaria. Again, proper curing and storage conditions are key.

Ideally, pumpkins should be harvested when fully mature, with a deep orange color and hardened rind. However, as long as pumpkins have started to turn color, they will ripen off the vine if held under the proper conditions. While not ideal, this may be preferable to leaving them in the field if conditions are not favorable. If necessary, pumpkins can be ripened in a well-ventilated barn or greenhouse. The best temperatures for ripening are 80-85 degrees Fahrenheit with a relative humidity of 80-85%. Night temperatures should not drop below the sixties. Even if pumpkins are ripe, a period of curing can improve storage life. The curing period should be about 10 days. During this process, the fruit skin hardens, wounds heal and immature fruit ripens – all of which prolongs the storage life.

Pumpkins should be stored in a cool, dry place. Ideal temperatures are between 50° and 60° F and relative humidity of 50 - 70%. Higher humidity allows condensation on the fruit with risk of disease, and lower humidity can cause dehydration. Higher temperatures increase respiration and can cause weight loss. Temperatures lower than 50 F cause chilling injury (see squash, below). In a greenhouse, temperature can be managed with ventilation on sunny days. Unless it is quite cool, heat is not likely to be needed if the house is closed up at night.

Often it is not feasible to harvest pumpkins early and store them until they can be marketed, and so they must be 'stored' in the field. If vines and fruit are healthy, storage in the field can be successful for a few weeks. If the vines die back, damage to the fruit from sun, disease and insects is more likely. In any case, it is important to scout for insects feeding on the fruit and handles, which may include squash bug nymphs or adults, or striped cucumber beetle. Control them if damage is evident. In fields that have a history of Phytophthora blight, Fusarium fruit rot, or black rot, field storage may increase the incidence of these problems, particularly if we have a period of wet weather or a major storm while fruit is sitting in the field. This has been one of the causes of significant losses in recent years, and one reason that we recommend bringing fruit in as soon as it is mature.

Growers often plan to store winter squash for much longer than eight weeks. Fruit that are free from disease and haven't been subject to much chilling (below 50°F) should be selected for long-term storage. Fruit from fields where Phythophthora is present are not the best choice for storage.

Storage life depends on the condition of the crop when it comes in and your ability to provide careful handling and a proper storage environment. All fruit placed in storage should be free of disease, decay, insects, and unhealed wounds. When harvesting squash and pumpkins, it is important to handle the fruit with care to avoid bruising or cutting the skin. Despite its tough appearance, squash and pumpkin fruit are easily damaged. The rind is the fruit's only source of protection. Once that rind is bruised or punctured, decay organisms will invade and quickly break it down. Place fruit gently in containers and move bins on pallets. Use gloves to protect both the fruit and the workers. Removal of the stem from squash (butternut, Hubbard, etc.) will also decrease the amount of fruit spoilage because the stems frequently puncture

adjacent fruit, facilitating infection.

A period of curing after harvest can help extend storage life of squash. This may be done in windrows in the field -- especially with a series of warm, dry days -- or by placing squash in a warm dry atmosphere (70-80°F) with good air circulation, such as a greenhouse, for up to two weeks. This pre-storage treatment permits rapid drying of the outer cell layers, and when combined with a dry atmosphere for storage inhibits infections that can take place at this time. Any clean cuts during harvest a likely to heal over and are no longer a source for injury or infection.

Take care to avoid subjecting squash to chilling injury. Chilling hours accumulate when squash or pumpkin is exposed to temperatures below 50°F in the field or in storage. Injury increases as temperature decreases and/or length of chilling time increases. Chilling injury is of particular concern with squash intended for storage because it increases the likelihood of breakdown. If squash has been exposed to chilling injury it should be marketed first and not selected for long-term storage. Remove squash from the field if temperatures likely to drop below fifty degrees for any length of time.

After curing, move squash or pumpkins to a dry, well-ventilated storage area. Pressure bruises can also reduce storage life, so avoid rough handling, tight packing, or piling fruit too high. Fruit temperature should be kept as close to the temperature of the air as possible to avoid condensation, which can lead to rot. Ideally, the storage environment should be kept at 55-60°F with a relative humidity of 50-70%. Lower relative humidity increases water loss, resulting in reduced weight, and if excessive, shriveling of fruit. High relative humidity provides a favorable environment for fungal and bacterial decay organisms. Under ideal conditions, disease-free pumpkins should have a storage life of 8-12 weeks and butternut squash up to three or four months. Even if it is difficult to provide the ideal conditions, storage in a shady, dry location, with fruit off the ground or the floor, is preferable to leaving fruit out in the field.

As you plan for storage and marketing, keep in mind that the market for pumpkins seems to get earlier every year. Fall decorative displays include pumpkins, and those displays begin showing up as Labor Day approaches. One of the best solutions to early-maturing pumpkins may be finding an early market.

--R. Hazzard; many thanks to the following sources: J. Howell, A. Carter, and Robert Wick. University of Massachusetts; Dale Riggs & Robert Rouse, Pumpkin Production Guide, NRAES; Maurice Ogutu, University of Illinois Extension, in Vegetable Growers News, August 2004; and Liz Maynard, Purdue University; Andy Wyendandt, Rutgers Univ.

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