

Crop Profile for Peaches in New England

Revised: April, 2004

Note: This profile is a comprehensive list of pests that may be encountered by New England peach growers, and the approved pesticides that may be used to control them. Only a few pests actually require treatment on an individual farm in a single year. For each pest all of the available effective options are listed. If treatment is needed, only one of those options would be used per application. Some pests require multiple applications for control, others only require a single application.

General Production Information

Production Statistics

- **Region Rank:**23 (6 states considered as a state-like region)
- **% U.S. Production:**0.21%
- **Acres Planted:**921
- **Tons Harvested:**2300
- **Cash Value:**\$3,926,000
- **Yearly Production Costs:**NA
- **Production Regions:** Connecticut (407 Ac.), Massachusetts (378 Ac.), New Hampshire (76 Ac.), Maine (16 Ac.), Rhode Island (26 Ac.), Vermont (8 Ac.)
- **Commodity Destination(s):** Fresh Market ~100%

Cultural Practices

Peaches are best suited to well-drained soils on land that is elevated relative to surrounding sites, providing reduced frost risk. Most New England peaches are grown as a supporting crop on farms on which apples are the predominant crop. As such, pest control and cultural management are often relatively limited. The major cultivars grown in New England include Red Haven, Canadian Harmony, Ernie's Choice, Garnet Beauty, Cresthaven and Madison. Most orchards contain several cultivars that ripen from early through late season to meet fresh market demands.

Most peach trees are grafted on Halford or Lovell seedling rootstock. Tree spacing is typically 15 feet between trees in the row with rows 25 feet apart although more intensively managed orchards are set at 12 feet by 20 feet. Most growers employ open center training and pruning. Pruning is done annually, generally in late spring after bud swell. This later pruning offers growers a clear view of winter flower bud survival and an opportunity to adjust pruning severity and orchard fertilizer applications to match expected crop.

Orchard floor management consists of a system of sod middles with weed-free strips under tree. These weed-free strips are maintained with contact and/or soil active herbicides. Sod middles for new orchards are established using dwarfing grasses such as dwarf hard fescues, creeping red fescue, and Kentucky bluegrass. Row middles are mowed frequently to facilitate harvest and U-Pick customer access as well as to discourage vole populations.

Pruning in early spring, generally late March until early May, and hand thinning 3 to 7 weeks post fruit set are the primary labor requirements other than harvest. Prunings are generally mulched in place using flail mowers. Operations during the growing season include herbicide applications and mowing for ground cover management and insecticide and fungicide applications for orchard pest management. All of these operations are accomplished with equipment.

Worker Activities

Pruning

Used to maintain a balance between vegetative growth and fruit production that allows for adequate penetration of sunlight, chemical treatments, and air flow.

Most orchards are pruned once during each dormant season. For peach, this pruning generally occurs from late winter through the early pink bud stage for the crop. This means pruning usually doesn't begin until 4 or 5 months from the previous season's final pesticide application. Summer pruning, undertaken in late July and early August, is not widely used in peach. If used, it focuses primarily on unproductive vegetative sprouts blocking light from ripening fruit.

Summer pruning involves extensive contact with foliage. Wearing protective clothing can be problematic in summer heat, and heat stroke risk poses more immediate and severe health concerns than pesticide exposure.

While there is usually some flexibility for timing summer pesticide sprays, prolonged REIs create scheduling problems for summer pruning which must be done within a time window of a few weeks.

Training

The selection and development of a branching pattern on young peach trees to maximize the tree's structural strength and integrity and the production of high quality fruit. For peach, it is done primarily as part of the pruning process

Tree training involves little contact with bark and foliage. New plantings receive few pesticide sprays, so there are no major pesticide REI issues. Mature tree training is done at a time of year when trees

typically receive little pesticide exposure.

Irrigation

Becoming increasingly important for new orchard plantings in order to maximize early growth and returns. The need for irrigation is not always predictable.

At present, only a small portion of established New England orchards receive irrigation during summer drought conditions. Irrigation may begin early in the growing season and can extend into September.

Irrigation with portable overhead systems requires considerable set up work within the orchard but involves little contact with bark and foliage. Pesticide exposure is minimal.

While there is usually some flexibility for timing summer pesticide sprays, prolonged REIs create scheduling and maintenance problems to get this important work done.

Mowing

Important to conserve soil water and nutrients, reduce humidity in the orchard to discourage fungal diseases, maintain ground conditions for conducting summer pruning and harvest operations efficiently, and discouraging insect borers, voles and other pests.

Done four to six times per growing season depending on need.

Mowing involves very little contact with treated bark and foliage as mowing equipment operators are riding on the machines. There is potential for operators in an open cab to brush against overhanging foliage. Pesticide exposure is minimal.

Fertilization

Consists of ground applications of dry fertilizer for macro nutrients and lime, and foliar spray applications of micronutrients such as boron and magnesium to provide peach trees with replacement nutrients for those lost to harvested crops.

Applications may begin late in the dormant season and may continue up to shuck split for foliar nitrogen applications.

Distribution of ground applied materials involves very little contact with treated bark and foliage as equipment operators are riding on the machines. Pesticide exposure is minimal.

Foliar applications are typically made in combination with pesticide sprays where proper worker

protection measures should be in place to limit pesticide exposure.

Thinning

Removes excess fruit to insure optimum fruit size for the market. Thinning is also used to remove insect damaged fruits, reducing the number of insecticide applications needed to manage pests such as tarnished plant bug, stink bug, and oak-hickory bug.

Timing is critical for effective thinning and the available window is often a matter of days.

Chemical thinning agents often require follow-up hand thinning and visual crop inspection requiring worker access to the orchard and extensive contact with foliage.

Unfortunately, thinning is concurrent with timing for important pesticide applications for brown rot, plum curculio, plant bugs and other key pests.

Long REI on either the thinning agents, insecticides, miticides or fungicides needed at this time creates a major obstacle to effective and profitable crop management and raises the pesticide exposure risk factor.

Pest Management Overview

New England growers identified weeds in general as the most important pest category. Insect and disease problems were ranked in importance with those pests affecting fruit directly seen as the most problematic. Other pests including mites, borers, peach leaf curl and peach scab, X-disease, and vertebrates were identified as important peach orchard pests.

New England Growers rely most heavily on New England Extension Pest Management guides and twilight meetings for information on peach pest management. There is limited use of web sites for supporting information. Trade publications and pesticide dealers/field persons were identified as the least important sources of information for making pest management decisions.

New England peach growers cite product efficacy and risk of phytotoxic response as the most important characteristics considered when choosing a pesticide. Potential impacts on the environment and non-target species, human toxicity, and cost were next in importance. Safe packaging such as water soluble bags was identified as the least important characteristic growers consider when making pesticide choices.

Weeds such as deep-rooted perennials compete for soil moisture and nutrients in newly planted and mature orchard crops, while light can become limiting in newly planted crops. Weeds may host pests including plant viruses and can compete for pollinating bees in spring.

Excessive weedy vegetation in most orchards is controlled by mowing or flailing row middles and application of herbicides under tree. Repeated use of the same or similar weed control practice results in

a weed shift to species that tolerate these practices. Therefore, weeds that survive cultivation, mowing or flailing, specific herbicide treatments or other routine cultural practices must be eliminated before the tolerant species or biotypes become established. A combination of weed control practices or treatments, rotation practices and herbicides are utilized to prevent weed shifts.

Cultural weed controls: Native or planted grasses in many orchards often are managed in row middles by mowing or flailing. Sods reduce soil erosion, improve traffic conditions in wet weather, protect tree roots from cold temperature injury in open winters, and increase water infiltration and drainage.

Chemical weed controls: Post-emergence application of contact or translocated herbicides is the primary control method used to manage weeds under tree. Persistent, soil active herbicides may be applied during the dormant season or in late spring and activated with rain or sprinkler irrigation if dry conditions persist.

Insects and Mites

Group A – Insect and mite pests identified by survey as most important

Plum Curculio

Type of Pest: Insect

Frequency of Occurrence: Most commercial orchards are free of resident populations and are infested by adults moving in from hedgerows and woodlands. Injury is therefore heaviest close to these sites.

Damage Caused: The adults can injure the fruit in two ways during the early season: 1) feeding injury and 2) egg laying (oviposition) injury. Feeding punctures consist of small, round holes extending 1/8 inch (3 mm) into the fruit; egg punctures are distinguished by a characteristic crescent-shaped cut that partly surrounds the sunken egg. As the fruit matures both types of injury become corky in appearance. Slight feeding may occur on petals, buds, and blossoms, but there is little injury until the fruit is available. Early-blooming varieties are the first to provide suitable locations for feeding and egg laying. During the egg laying period, the female PC initially eats a small hole in the fruit, deposits an egg, and then makes a crescent-shaped slit just below the site with her snout. It is believed that the slit relieves pressure from the rapidly growing fruit and helps the hatching larva to become established. Egg laying scars appear on fruit at harvest as crescent-shaped corky areas resembling the letter "D." Adults which successfully emerge in mid-summer can again feed on fruit. This injury appears as small, soft, irregular holes, usually near the calyx of the fruit. The injury usually occurs in orchards that have high amounts of egg laying injury. Adults can average over 100 feeding and/or egg punctures during their normal life.

% Acres Affected: Potential 100%; actual <5%

Pest Life Cycles: The biology of PC is similar for most deciduous fruits, although the timing may be slightly different. The adults overwinter in the top few inches of leaf litter in nearby hedgerows, trashy fields and woods (especially on the south edge of an orchard). The adults initially appear in apple

orchards during bloom. Most beetle activity occurs during the first warm period after petal fall, when the maximum temperature is 70 ° F or higher. Periods of cool, rainy weather with maximum temperatures below 70 ° F are not suitable for adult activity. Adults can be found in orchards for 5 to 7 weeks. Egg laying activity starts once the fruit begins to form, with egg hatch occurring after 7 days. In successfully attacked hosts, the hatching larva burrows into the fruit's center, where it makes large irregular cavities. Fruit that are successfully attacked by larvae are prone to drop prematurely. After 14-16 days within the fruit the larvae exit and enter the soil where they form a pupation chamber for an additional 10-12 days before transforming into adults. New adults can appear in the orchards in mid- to late- July with emergence continuing until early September. In September and October adults begin seeking overwintering quarters.

Timing of Control: In the spring, control can be obtained with 1-3 insecticide applications, depending on the spray timing and severity of the problem. The first spray is applied at about petal fall.

Yield Losses: Potentially 100% of the fruit in an untreated orchard if infested; actual <3%

Regional Differences: Somewhat less prevalent in extreme northern New England

Cultural Control Practices: None

Biological Control Practices: None

Post-Harvest Control Practices: NA

Other Issues: NA

Chemical Controls for Plum curculio:

Pesticide	% Trt.	Type of Appl.	Typical Rates	Timing	Efficacy	# of Appl.	PHI days	REI hour
Azinphos-methyl	60%	Cover	1 lb/A	Petal fall, 1 st & 2 nd covers	E	1-3	21 days if last application is =< 1 lb/A	14 days for hand thinning and harvest, 48 hours otherwise
Phosmet	35	Cover	2.1 lb/A	Petal fall, 1 st & 2 nd covers	G	1-3	14	24
Permethrin	5	Cover	0.15 lb/A	Petal fall	E	1	14	12

Tarnished Plant Bug

Type of Pest: Insect

Frequency of Occurrence: Found throughout North America.

Damage Caused: The tarnished plant bug causes injury to tree fruits when it feeds and lays eggs. Damage occurs primarily in the spring on flower buds, blossoms, and young fruit, although bleeding of sap may result from twig and shoot injury. The insect feeds first on buds and later on developing fruit. Small droplets of exudate may be present on the surface of injured buds. Within 1 or 2 weeks, the flower clusters may appear dried and the leaves distorted, with a distinct hole where the insect fed. Generally, later damage to developing fruit is more important than earlier feeding on flower buds. Damage early in the season tends to be near the calyx end of the fruit, and later injuries tend to be elsewhere. Cultivars differ in their susceptibility to damage, with depressions or scabs in some being less pronounced. Damage to mature trees is slight after June, but much damage can occur to nursery stock throughout the summer.

% Acres Affected: 10%

Pest Life Cycles: Adults: Adults are 6 to 6.5 mm (0.25 in.) long, oval, and somewhat flattened. They are greenish brown in color, with reddish brown markings on the wings. A distinguishing characteristic is a small but distinct yellow-tipped triangle in the center of the back, behind the head. Tarnished plant bugs overwinter as adults under leaf litter, stones, and tree bark and in other protected places. At the end of April, the adults become active and begin laying eggs in crop and weed hosts. The overwintering adult population peaks at about the pink stage of apple (ranging from early May in southern New England to late May in northern areas of the region). Two to four indistinct generations can occur annually, with development from egg to adult taking 25 to 40 days. Adults feed throughout the summer.

Eggs: Eggs are about 1 mm (0.04 in.) long, cream colored, and flask shaped. They are laid in plant tissue so that only the small anterior end is visible. Eggs can be laid on fruit crops, but are generally deposited on weeds and grasses. On apple trees, although some early oviposition may take place in the buds, most eggs are laid in the developing fruit starting at bloom.

Nymphs: Eggs hatch into nymphs about 7 days after being laid. Young nymphs are pale green and resemble aphids, except that their legs are more robust, their movements are more rapid, and they have no abdominal cornicles (backward-pointing structures that resemble short stems). Because the tarnished plant bug has incomplete metamorphosis, the nymphs resemble adults without wings. Newly-hatched nymphs are about 1 mm (0.04 in.) long and remain greenish throughout their five stages, or instars. Nymphs in later instars turn brown and develop wing pads. They have two black dots on their thorax, two between their developing wing pads, and one in the middle of their abdomen.

Timing of Control: Satisfactory chemical control is difficult because the frequently long bloom period prevents optimum timing of control sprays.

Yield Losses: Despite control efforts, a small amount of fruit injury is often inevitable.

Regional Differences: NA

Cultural Control Practices: NA

Biological Control Practices: Natural occurring enemies are true bugs, ladybird beetles, spiders and parasitic wasps. However, they are not able to control the pest effectively.

Post-Harvest Control Practices: NA

Other Issues: NA

Tarnished Plant Bug, Oak-hickory Bug, and Stink Bug are controlled as a group.

Chemical Controls for Tarnished plant bug:

Pesticide	% Trt.	Type of Appl.	Typical Rates	Timing	Efficacy	# of Appl.	PHI days	REI hour
Azinphos-methyl	60%	Cover	1 lb/A	Petal fall, 1 st & 2 nd covers	E	1-3	21 days if last application is =< 1 lb/A	14 days for hand thinning and harvest, 48 hours otherwise
Phosmet	35	Cover	2.1 lb/A	Petal fall, 1 st & 2 nd covers	G	1-3	14	24
esfenvalerate (Asana XL 0.66EC)	<1	Prebloom	2-5.8 oz/100 gal.	From green cluster to white bud	G	1	28	12
permethrin (Ambush 2EC/25WP)	<1	Prebloom	3.2-6.4 oz/100 gal.	From green cluster to white bud	E	1	14	12
permethrin (Pounce 3.2EC/25WP)	<1	Prebloom	2-4 oz/100 gal. 3.2-6.4 oz/100 gal.	From green cluster to white bud	E	1	14	12

Oriental Fruit Moth

Type of Pest: Insect

Frequency of Occurrence: Found throughout growing region of New England, but damage in New

Hampshire, Maine, and Vermont is limited.

Damage Caused: OFM attacks both stone and pome fruit. There are normally three generations of this insect each year. First generation larvae bore into succulent twigs usually about the time when shucks split. Second generation moths appear in mid to late July and second generation larvae attack fruit as well as twigs. Most of the third generation larvae attack fruits, causing gum to flow from entry wounds. About 50% of late season injury occurs when a newly hatched larva enters a peach stem and tunnels into the fruit without ever piercing the peach skin. At harvest, the stem remains on the tree and the larva is undetectable.

Monitoring is accomplished using pheromone traps that capture adult moths, and/or by inspecting growing tips to look for signs of feeding.

Chemical Controls for Oriental Fruit Moth:

Pesticide	% Trt.	Type of Appl.	Typical Rates	Timing	Efficacy	# of Appl.	PHI days	REI hour
Pheromone Disruption Ties (Isomate-M 100)	<1	NA	100-150 ties/A	Bloom	G	1	NA	NA
Azinphos-methyl (Guthion)	60%	Cover	0.75 lb A.I./A	Petal fall	E	1	21	14 days
(Lannate)	5%	Cover	0.9 lb AI/A	Petal Fall	E	1	4	96
Phosmet (Imidan)	35	Cover	1.7-2.0 lb A.I./A	Petal fall	G	1	14	24
Methomyl (Lannate)	<1	Cover	0.75-1.25 lb A.I./A	Petal fall	E	1	14	12

Group B – Insect and mite pests identified by survey as significant problems in some years

Lesser Peach Tree Borer

Type of pest: Insect

Frequency of Occurrence: Found throughout growing region of New England

Damage Caused: Peach and nectarine are the preferred hosts of LPTB. This borer attacks weak and injured trees, winter-damaged orchards, and diseased trees. Adult borers (moths) are attracted to injured trees and deposit eggs in wounds from May through early July and again in September. Insecticide protection is recommended primarily for the control of the second brood in early September, and slightly later in northern counties.

Chemical Controls for Lesser Peach Tree Borer:

Pesticide	% Trt.	Type of Appl.	Typical Rates	Timing	Efficacy	# of Appl.	PHI days	REI hour
Chlorpyrifos (Lorsban, 4E)	60%	Directed, coarse spray, lower trunk and limbs	3 qt/100 gal	2 nd cover (1 application per season)	E	1	14	96
esfenvalerate (Asana XL 0.66EC)	<1	Directed, coarse spray, lower trunk and limbs	0.025-0.075 lb AI/A	2 nd cover, early August	G	2	14	12
permethrin (Ambush 2EC/25WP, Pounce 3.2 EC/25WP)	<1	Cover	0.1-0.3 lab AI/A	2 nd cover, early August	E	2	14	12

Peach Tree Borer

Type of pest: Insect

Frequency of Occurrence: Found throughout growing region of New England

Damage Caused: Peach tree borer larvae overwinter on or near tree bark below ground level. When temperatures rise above 50° F, larvae begin to feed actively on tree cambium. Larvae are creamy white,

with heads that are yellow brown to dark brown. Size ranges from 2mm (1/16") after hatching to 38 mm (1.5") when fully grown. Feeding occurs on the tree trunk from a few inches above to 6" below the soil line. Young trees may be killed; older trees loose vigor.

Pheromone traps can be used to monitor adult male emergence and peak activity. Larval feeding that occurs above ground can be detected through resultant light brown frass (excrement) and sap bleeding from the trunk. To confirm borer identity, use a wire or screwdriver to dig out the borer if such bleeding is seen.

Chemical Controls for Peach Tree Borer:

Pesticide	% Trt.	Type of Appl.	Typical Rates	Timing	Efficacy	# of Appl.	PHI days	REI hour
Chlorpyrifos (Lorsban, 4E)	60%	Directed, coarse spray, lower trunk and limbs	3 qt/100 gal	Post harvest (1 application per season)	E	1	14	96
esfenvalerate (Asana XL 0.66EC)	<1	Directed, coarse spray, lower trunk and limbs	0.025-0.075 lb AI/A	Post harvest (1 application per season)	G	1	14	12
permethrin (Ambush 2EC/25WP, Pounce 3.2 EC/25WP)	<1	Cover	0.1-0.3 lab AI/A	Post harvest (1 application per season)	E	1	14	12

European Red Mite (and Rust Mite)

Type of Pest: Mite

Frequency of Occurrence: Established in most deciduous fruit growing areas. Considered the most important mite species attacking tree fruits in North America.

Damage Caused: Although a pest of all tree fruits, apple and plum suffer most severely. Injury is caused by the feeding of all stages on the foliage. The lower leaf surface is preferred. Under high populations both surfaces are fed upon. The injury is caused by the piercing of the cell walls by the bristle-like mouth parts and the ingestion of their contents, including the chlorophyll. The injury results in off-color foliage which in severe cases becomes bronzed. The leaf efficiency and productivity is directly affected. Heavy mite feeding early in the season (late June and early July) not only can reduce tree growth and yield but also drastically affect fruit bud formation, and thereby reduce yields the following year. Additionally, mite injured leaves will not respond to growth regulators applied to delay harvest drop.

% Acres Affected: Potential 100%; actual 20%

Pest Life Cycles: Adults: There are 4-9 generations of the ERM a year, depending on the locality and the length of the growing season. The sexes of the adults are readily differentiated. The female has a globular body which ranges in length from 0.38-0.40 mm, is velvety brown to brick red, and has 4 rows of dorsal setae or spines borne on raised white tubercles. The body color and setal pattern distinguish this species from all other plant feeding mites. The male is smaller, 0.26-0.28 mm in length, lighter in color and has a pointed abdomen and proportionately longer legs. The rate of development is temperature dependent, being slower in the spring and fall, and more rapid during the hot summer months. The first generation generally requires about 3 weeks to develop, while summer generations may develop in 10 to 14 days. Reproduction can be both sexual and parthenogenetic. Unfertilized eggs give rise to males only, while mated females produce both sexes. The average preoviposition period of females is about 2 1/2 days. Although some females in insectary studies have lived 39 days, the average life span is 18 days. The oviposition period averages 12.5 days with 18.8 eggs produced per female. Eggs: The ERM overwinters as fertilized eggs. The environmental factors triggering winter egg production are diminishing food supply, temperature and photoperiod. The bulk of winter egg deposition occurs from mid to late August, but may continue until late September. Overwintering eggs are deposited in groups, on roughened bark areas, especially around the base of buds and fruit spurs. These eggs may be so numerous that the infested areas take on a reddish cast. Egg hatch is closely correlated with bud development and first occurs when apple buds are in the tight cluster stage; hatch is better than 50% complete at the pink stage for apple, and virtually 100% complete by the end of apple bloom. The first summer eggs as a rule can be found at petal fall or at latest by fruit set. The summer eggs are globular and somewhat flattened (onion shaped). They are bright red to dark orange, and average 0.13 mm in diameter. The overwintering egg is deeper red and slightly larger, averaging 0.14 mm. The egg surface is ridged with the grooves running toward the top center from which a slender tapering stalk (0.1 mm) arises. The average incubation period of the summer eggs for each generation varies from 6.7 to 14.4 days, the shortest period being in mid-summer.

Larvae and nymphs: The ERM passes through 3 stages between egg hatch and adulthood. They are called the larva, protonymph and deutonymph. A resting period precedes each molt to the following stage. The hatching larva is about 0.2 mm in length, light orange in color and six-legged. All subsequent stages have 8 legs. With the exceptions of an increase in size and the ability to differentiate sexes in the deutonymphal stage, there are no conspicuous changes in structure or color between the nymphal instars. The average developmental time from eclosion to adulthood ranges from 5.5-15 days, depending on the generation.

Timing of Control: The most effective treatments for European Red Mite are those applied after new

growth has appeared but ahead of bloom.

Yield Losses: Potentially 20% but with current control measures <1%

Regional Differences: None

Cultural Control Practices: NA

Biological Control Practices: Mite predators are generally distributed in commercial plantings and contribute to the control of the ERM.

Post-Harvest Control Practices: NA

Other Issues: NA

Chemical Controls for European red mite:

Pesticide	% Trt.	Type of Appl.	Typical Rates	Timing	# of Appl.	PHI days	REI hour
oil	80	Delayed dormant	1-3 gal/100 gal.	Before eggs hatch in spring	1	NA	4
clofentezine (Apollo 4SC)	<1	Cover	2-8 oz/A	When mites first appear	1-2	21	12
fenbutatin-oxide (Vendex 50WP)	<1	Cover	6-8 oz/100 gal.	When mites first appear	2	14	48
formetanate hydrochloride (Carzol 92SP)	5	Cover	4-8 oz/100 gal.	Before petal fall only	1	NA	16 days
pyridaben (Pyramite 60WS)	<1	Cover	2.2-3.3 oz/100 gal.	As needed	1	7	12

Group C – Insect pests identified by survey as infrequent problems

Twospotted Spider Mite

Type of Pest: Mite**Frequency of Occurrence:** Sporadic problem in orchards, especially under hot, dry conditions.

Economically damaging populations generally develop during the latter part of the season.

Damage Caused: During spring, the mite feeds on vegetation, especially vetch and other legumes underneath the trees. As orchard floors dry out with hot weather, two-spotted spider mites move into the trees.**% Acres Affected:** 25%**Pest Life Cycles:** The adult female mite's summer color pattern varies, but most are greenish yellow with a prominent dark spot on each side near the middle of the body. These spots may enlarge to cover most of each side of the body as the mite feeds. The body is somewhat egg shaped and broadest toward the head region. The eggs are spherically shaped and shiny; their color varies from light or clear to pale green. Two-spotted spider mites over-winter as orange-colored females. In orchards the over-wintering females congregate under debris on the orchard floor or bark scales at the base of trees. During the spring the two-spotted spider mite feeds on vegetation, especially vetch and other legumes underneath the trees. As these orchard floor hosts dry out with the arrival of hot weather, two-spotted spider mites move into trees. Hot, dry weather is favorable to population increases of this mite. The two-spotted spider mite passes through the same developmental stages as does the European red mite.**Timing of Control:** Chemicals should be chosen for effectiveness, selective toxicity, and lowest toxicity to natural enemies. Also important is alternation of materials, application of the minimum effective dosage of chemicals, and proper timing of sprays as needed throughout summer.**Yield Losses:** Potentially 20% but with current control measures <5%**Regional Differences:** NA**Cultural Control Practices:** Mite management emphasizes orchard floor management, scouting of pest and beneficial populations, and consideration of other stresses on the trees.**Biological Control Practices:** Natural enemies of plant-feeding mites are very important in the management of these mite populations. Commonly, two predatory mites, *Amblyseius fallacis* and *Zetzellia mali*, and the predaceous lady beetle feed on plant-feeding mites. *T. pyri* is native and more important in New England apples than the other two but it is not known if the same is true for peaches.

Pesticide	% Trt.	Type of Appl.	Typical Rates	Timing	# of Appl.	PHI days	REI hour
clofentezine (Apollo 4SC)	<1	Cover	2-8 oz/A	When mites first appear	1-2	21	12
fenbutatin-oxide (Vendex 50WP)	<1	Cover	6-8 oz/100 gal.	When mites first appear	2	14	48

formetanate hydrochloride (Carzol 92SP)	5	Cover	4-8 oz/100 gal.	Before petal fall only	1	NA	16 days
pyridaben (Pyramite 60WS)	<1	Cover	8.8-13.2 oz/A	As needed	1	7	12

Green Peach Aphid

Type of pest: Insect

Frequency of Occurrence: Found throughout growing region of New England

Damage Caused: It is a common pest of peach and nectarine throughout New England. Large numbers of aphids suck the plant juice from the leaves causing them to become stunted, curled, and discolored (yellow) by June. High numbers affect fruit quality. Aphids normally disperse to other host plants by mid-June.

Pesticide	% Trt.	Type of Appl.	Typical Rates	Timing	# of Appl.	PHI days	REI hour
oil	80	Delayed dormant	1-1.5 gal/100 gal.	Before eggs hatch in spring	1	NA	4
Methomyl) (Lannate)	10	Cover	1 lb/A	When aphids appear	1-2	4	96

Japanese Beetle

Type of pest: Insect

Frequency of Occurrence: Found throughout growing region of New England

Damage Caused: Larvae feed on roots of grass, herbaceous plants, and nursery stock, while adults feed on foliage and fruits. Fruit feeding is most common injury to stone fruits, particularly to varieties ripening during the JB flight period.

Chemical Controls for Japanese Beetle:

Pesticide	% Trt.	Type of Appl.	Typical Rates	Timing	Efficacy	# of Appl.	PHI days	REI hour
Phosmet (Imidan)	30	Cover	2.12- 4.25 lb/ A	When adults are present	E	1-3	14	24
Carbaryl (Sevin)	30	Cover	2 – 3 lb AI/A	When adults are present	E	1-3	3	12

Diseases

Group A – Diseases identified by survey as most important

Brown Rot

Type of pest: Fungus

Frequency of Occurrence: Found throughout growing region of New England

Damage Caused: Brown rot is the most common and most destructive disease problem on peach in New England. This disease is caused by the fungus *Monilinia fructicola* that over-winters on the tree or in mummified fruits. In the spring, coinciding with tree growth, the fungus begins to grow and produces two types of spores – conidia and ascospores. Conidia are produced abundantly from old infections on the tree, and ascospores are produced in the mummified fruit. Surface moisture on plant tissue allows infections to occur. Flowers are especially susceptible. The fungus invades and kills the flowers, or may grow down the flower and eventually girdle and kill the twig. Brown rot can remain dormant until fruit ripens, causing infections and resultant fruit rot to develop. Mature fruit may also be infected directly by the fungus. Generally, the disease develops in two phases – the blossom blight phase and the fruit rot phase.

Removing sources of infections such as over-wintering cankers and mummified fruit reduces primary inoculum, decreasing disease pressure. Generally, fungicides are applied on a protective basis since the fungus needs only 3-7 hours of tissue wetness to be able to cause infection. These sprays are generally applied at early bloom, full bloom, and petal fall if disease pressure is high. Protective fungicides may be required up to pit hardening and again beginning about 3 weeks after pit hardening.

Chemical Controls for Brown Rot

Pesticide	% Trt.	Type of Appl.	Typical Rates	Timing	# of Appl.	PHI days	REI hour
Chlorothalonil (Bravo)	10	Cover	4.5-8 pts/A	From early bloom through petal fall	2-3	NA	48
Captan	50	Cover	4 lb AI/A	From early bloom until just before harvest	2-3	1	96
Fenbuconazole (Indar)	20	Cover	2 oz/A	From early bloom through petal fall	2-3	1	12
Myclobutanil (Nova)	30	Cover	2.5-6 oz/A	From early bloom through petal fall	2-3	0	24
Thiophanate-methyl (Topsin-M)	50	Cover	1-1.5 lb/A	From early bloom until just before harvest	2-4	0	12

Chlorothalonil (Bravo)	50	Cover	6 pts/A	Post leaf abscission in fall or pre bud swell in spring	1	NA	48
Ferbam	10	Cover	4.5 lb/A	Post leaf abscission in fall and/or pre bud swell in spring	1-2	21	24
Copper hydroxide (Copper Flowable)	30	Cover	0.67 – 2.67 gal/A	Post leaf abscission in fall or pre bud swell in spring	1	NA	24
Lime Sulfur	<2	Cover	20-24 gal/A	Post leaf abscission in fall or pre bud swell in spring	1	NA	48
Ziram 76W	<1	Cover	8-10 lb/A	Post leaf abscission in fall	1-3	30	24

Peach Scab

Type of pest: Fungus

Frequency of Occurrence: Found throughout growing region of New England

Damage Caused: Peach Scab is caused by the fungus **Cladosporium carpophilum**. It over-winters in twig cankers produced on current season's twigs. Spores are released around shuck split and for the remainder of the season.

The infection process begins each year from spores produced in cankers formed on last year's growth.

The spores are not readily released into the air until they become wetted. The period between infection and visual appearance of the disease on the fruit is very long, from 40 to 70 days. Because of the long period between infection and visual symptoms of the disease, early maturing varieties may be harvested before the fruit spots are visible to the naked eye. Infections can occur on the fruit, green twigs, and leaves.

Cankers formed on current season twigs are light brown, diffuse, small (1/16 to 1/8 inches in diameter) initially, and later increase in size, becoming circular in outline and turning a darker brown color. A slightly raised bark callus surrounds the margin of the lesion. In the spring, velvety-textured, olive-colored spots appear within the lesion.

On the fruit, the tiny spots appear around third cover (early July in southern counties) when the fruit are about one-half their final size. The spots develop quickly into very dark, olive-colored, circular spots. Later the spots appear almost black in color. The spots do not "break" the skin, as do the fruit spots caused by bacterial spot. However, the skin frequently cracks open in the areas where numerous infected spots occur, and the Brown Rot or Rhizopus Rot fungus then attacks the flesh of the fruit. The spots are invariably more numerous on the stem end of the fruit. This is the result of where the spores land most frequently on the fruit and to the generally higher wetness and humidity, which occurs at the stem end of the fruit. Damage to peaches caused by scab can range 30-45%.

Chemical controls:

Pesticide	% Trt.	Type of Appl.	Typical Rates	Timing	# of Appl.	PHI days	REI hour
Captan	50	Cover	4 lb AI/A	Shuck Split, 2-3 cover sprays	2-3	1	96
Fenbuconazole (Indar)	20	Cover	2 oz/A	Shuck Split, 2-3 cover sprays	2-3	1	12
Thiophanate-methyl (Topsin-M)	50	Cover	1-1.5 lb/A	Shuck Split, 2-3 cover sprays	2-4	0	12

Azoxystrobin (Abound)	<1	Cover	11.1- 15.4 oz/ A	Shuck Split, 2- 3 cover sprays	1-3	0	4
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Group C – Disease pests identified by New England Growers to be occasional pest problems

X-Disease

Type of pest: Mycoplasma-like organism (MLO)

Frequency of Occurrence: Found throughout growing region of New England

Damage Caused: Once an infection has occurred, this disease cannot be eradicated. Injections of antibiotics may, however, prolong the lives of mature trees if the disease is not too severe. If symptoms are severe – showing on all major limbs – the infected tree should be removed.

X-disease appears first in the limb that was initially attacked – where the insect carrier of the organism first fed. Symptoms of infection usually do not occur until early to late June when chlorotic or necrotic spots appear on leaves. The infected leaf tissue falls from the leaves, giving a "shot hole" appearance. Whole leaves may fall from the tree. Usually a small cluster of leaves regrows at the ends of infected branches, resulting in the symptomatic tufting appearance to diseased trees. Fruit on infected trees is scarce, small, and tasteless.

The key to controlling X-disease is prevention. Remove all chokecherry trees within and around the peach orchard as these trees harbor the inoculum. Infected chokecherry plants develop yellow and red fall-like leaf color in late July and August and are easily identified at this time for eradication.

Chemical control: none

Bacterial Spot

Type of pest: Bacteria

Frequency of Occurrence: Found throughout growing region of New England

Damage Caused: Bacterial Spot is caused by the plant pathogenic bacterium *Xanthomonas campestris* pv. *pruni*. Bacterial spot infections occur anytime from petal fall until after harvest. This bacterium can attack leaves, twigs, and fruit. Foliar infection results in angular, grayish lesions about 1/8 inch in diameter. As lesions age, they become purple and necrotic, and sometimes abscise, leaving a shot-hole appearance. Multiple lesions result in leaf chlorosis (yellowing) and defoliation.

oxyfluorfen (Goal 1.6E)	<1	Foliar	1.2-2.0 lb/A	Dormant. Apply as soon as soil has settled and no cracks are present.	1.5-2	0	24
napropamide (Devrinol 50WP)	<1	Surface	4 lb/A	Apply as soon as soil has settled and no cracks are present.	1.5-2	35	12
pendimethalin (Prowl 4E)	25	Banded, Foliar	4 lb/A	Apply as soon as soil has settled and no cracks are present. Non- bearing trees only.	1.5-2	365	12
oryzalin (Surflan AS)	<1	Banded	3-6 lb/A	Apply as soon as soil has settled and no cracks are present.	1.5-2	0	12
paraquat (Gromoxone Extra)	25	Banded, Foliar; Shielded	> 0.625- 0.9375 lb/A	Apply to emerged weeds as needed	1.5-2	0	48

glyphosate (Roundup)	25	Wiper only	1-3 lb/A	Apply to emerged weeds as needed	1.5-2	14	12
fluazifop (Fusilade 2000)	<1	Banded, Foliar, Spot	> 0.25- 0.375 lb/A	Apply when grass is 2- 8 inches tall; Repeat in 2-3 weeks	1.5-2	365	12
sethoxydim (Poast)	<1	Band, Broadcast, Spot	> 0.28- 0.47 lb/ A	Apply to actively growing grass before tillering or seedhead formation; non bearing trees only	1.5-2	14	12
simazine (Princep 4L, 80WP)	25	Banded, Drench, Foliar	1-2 lb/A	Apply early spring before weeds emerge; established trees only	1.5-2	0	12
simazine (Caliber 90WDG)	25	Banded, Drench, Foliar	1-2 lb/A	Apply early spring before weeds emerge; established trees only	1.5-2	0	12

norflurazon (Solicam 80DF)	<1	Banded	> 2.0- 2.4 lb/A	Apply early spring before weeds emerge; established trees only	1.5-2	0	12
diuron (Karmex 80DF)	<1	Banded, Foliar	> 1-2 lb/A	Apply early spring before weeds emerge; established trees only	1.5-2	0	
diclobenil (Casoron 4G/50W)	<1	Broadcast	> 4-6 lb/A	November to March when soil temp. is below 45° F	1.5-2	0	12

Chemical Controls for Broadleaf Weeds

Pesticide	% Trt.	Type of Appl.	Typical Rates	Timing	# of Appl.	PHI days	REI hour
oxyfluorfen (Goal 1.6E)	<1	Foliar	1.2-2.0 lb/A	Dormant. Apply as soon as soil has settled and no cracks are present.	1.5-2	0	24

napropamide (Devrinol 50WP)	<1	Surface	4 lb/A	Apply as soon as soil has settled and no cracks are present.	1.5-2	35	12
pendimethalin (Prowl 4E)	25	Banded, Foliar	4 lb/A	Apply as soon as soil has settled and no cracks are present. Non-bearing trees only.	1.5-2	365	12
oryzalin (Surflan AS)	<1	Banded	3-6 lb/A	Apply as soon as soil has settled and no cracks are present.	1.5-2	0	12
paraquat (Gromoxone Extra)	25	Banded, Foliar; Shielded	> 0.625- 0.9375 lb/A	Apply to emerged weeds as needed	1.5-2	0	48
glyphosate (Roundup)	25	Wiper only	1-3 lb/A	Apply to emerged weeds as needed	1.5-2	14	12

simazine (Princep 4L, 80WP)	25	Banded, Drench, Foliar	1-2 lb/A	Apply early spring before weeds emerge; established trees only	1.5-2	0	12
simazine (Caliber 90WDG)	25	Banded, Drench, Foliar	1-2 lb/A	Apply early spring before weeds emerge established trees only;	1.5-2	0	12
norflurazone (Solicam 80DF)	<1	Banded	2.0-2.4 lb/A	Apply early spring before weeds emerge.	1.5-2	0	12
diuron (Karmex 80DF)	<1	Banded, Foliar	1-2 lb/A	Apply early spring before weeds emerge; established trees only	1.5-2	0	
dichlobenil (Casoron 4G/50W)	<1	Broadcast	4-6 lb/A	November to March when soil temp. is below 45° F.	1.5-2	0	12

Chemical Controls for Perennial Grasses

Pesticide	% Trt.	Type of Appl.	Typical Rates	Timing	# of Appl.	PHI days	REI hour
fluazifop (Fusilade 2000)	<1	Banded, Foliar, Spot	0.25- 0.375 lb/A	Apply when grass is 2- 8 inches tall. Repeat in 2-3 weeks.	1.5-2	365	12
sethoxydim (Poast)	<1	Band, Foliar, Spot	0.28- 0.47 lb/ A	Apply to actively growing grass before tillering or seedhead formation; non bearing trees only	1.5-2	14	12
pronamide (Kerb 50WP)	<1	Band, Foliar, Spot	2-4 lb/A	Apply late fall before soil freezes; trees over 1 year old only	1.5-2	0	12
glyphosate (Roundup)	90	Wiper only	2-4 lb/A	Varies with weed type	1.5-2	14	12

Chemical Controls for Woody Brush and Vines

Pesticide	% Trt.	Type of Appl.	Typical Rates	Timing	# of Appl.	PHI days	REI hour
glyphosate (Roundup)	90	Wiper only	2-4 lb/A	Varies with weed type.	1.5-2	14	12

Vertebrate Pests

Two species of voles cause injury to New England orchards, the meadow vole and the pine vole. Determining which vole is present is very important since the treatment for each is different. By trapping some voles it is easy to tell the difference between the two.

The pine vole has an extremely short tail, about the length of their back foot. Meadow voles have a slightly longer tail about twice the size of the back foot. The meadow vole lives primarily above ground, doing most of its damage in the winter as they chew on bark.

Hardware cloth trunk guards embedded in the ground and extending upwards higher than snow level are usually effective. Baiting is also effective but can harm domestic pets and other wildlife. Zinc phosphide on steam-rolled oats is the most commonly used bait in New England. Broadcast baiting is most effective against meadow voles right after mowing and before a stretch of sunny weather, hopefully knocking the population down before winter. Hand baiting bait stations in predetermined areas is also effective.

Pine voles spend most of their time underground but will go above ground if there is enough cover. They feed on bark below the soil line. One technique for baiting for pine voles involves using a mechanical trail builder that lays the poison 2-4 inches underground in artificial trails.

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