CROP PROFILE FOR PEACHES IN DELAWARE

Revised: July, 2006
Revised: July, 2008

General Production Information

- In 1996, the last year for which production figures are available, Delaware was the 21st state in production of peaches with 2.1 million pounds. The national production was 2,104.6 million pounds (1).
- The value of utilized production for peaches in Delaware for 1996 was $893,000 (2).

Production Regions (3)

- In 2008 Delaware had five peach growers. One in New Castle County, one in Kent County and three in Sussex County. The largest orchard has 200 acres. (4)

Cultural Practices (3)

Trees should be planted in full sun and on well-drained soils. Trees are subject to winter injury and late spring frosts.

Varieties:

Yellow Peaches - Jerseydawn, Redhaven, Norman, Loring, Redskin, Cresthaven, Jerseyglo, Jim Dandee

White Peaches - Early Red Free, Raritan Rose, Belle of Georgia, and White Hale

Site and Soil

Trees should be planted where there is good air circulation to reduce the chance of frost damage. Trees should not be planted where water will stand for three or more days after a rain. Irrigation is not needed except during prolonged dry periods. Water is needed most during the fruit-sizing stage. Normally, no water is needed during the ripening stage unless there is a drought. Trees will occupy a space 15 by 20 feet if kept pruned. Dwarfing rootstock trees are short-lived.

Training and Pruning

After planting an unbranched tree or one with no branches between 20 and 30 inches, the top should be cut to a bud that is 26 to 30 inches off the ground. On a well-branched tree, limbs should be cut below 18 inches. Three to 4 limbs should be selected that come off the main trunk at a 60 to 90 degree angle. The limbs

must point in different directions. They should be cut back by 50 percent to a bud that faces outward. During summer, shoots that grow into the center of the tree should be pinched off. Pruning should be done annually in late March or early April to reduce winter injury. Painting the trunks white reduces winterkill while the trees are young. The white wash or white latex paint should be applied in the fall every year until the tree is seven years old.

Lime and Fertilizer

A soil test is required to develop the nutrient program. The pH needs to be between 6.0 and 6.8. Trees planted in a properly fertilized lawn don't need additional fertilizer if the ground around the tree is kept bare. In absence of a soil test, apply pound of 10-10-10 per tree after a rain settles the ground. Broadcast the fertilizer in a 3-square-foot area under the tree.

The next year in spring, apply pound 10-10-10 per inch of trunk diameter up to a maximum of 2-1/2 pounds per tree. Most gardeners will never have to apply more then 1-1/2 pounds. If new growth is more then 2 feet a year, you're using too much fertilizer. Don't fertilize in years the fruit is lost to frost. Organic fertilizers can be used.

Thinning

Fruit trees often will set more fruit than the limbs can support. In June, when undeveloped fruit drops, thin out the remaining fruit. Spacing the fruit about 8 inches apart will result in larger fruit and less tree damage.

INSECT PESTS

The insect and mite pest complex attacking peaches in Delaware cause either direct and/or indirect damage. Most growers utilize integrated pest management to combine chemical and non-chemical tactics to manage these pests. Insecticides are generally applied by ground equipment.

Oriental Fruit Moth

The primary insect pest attacking peaches in Delaware is the Oriental fruit moth. This species completes three or four generations per year in the state, although a partial fifth generation has been observed in years with high degree-day accumulations. It overwinters as mature larvae inside tightly woven cocoons in protected places on the tree or in the trash near the base of the tree. Pupation takes place inside the cocoon in early spring; adults begin to emerge in late March or April. These adults deposit eggs on newly emerged shoots. Most larvae of the first generation complete their development in terminal growth. Later generation larvae feed in both terminals and in peaches. Entries into the peach can be very hard to detect.

Non-chemical controls: One alternative to insecticide control of Oriental fruit moth is the use of mating disruption. Insecticides are applied to control hatching larvae of the first generation and then mating disruption dispensers are hung just before any surviving moths emerge. The dispensers release pheromone to prevent mating in the treatment area for the remainder of the season. However, high injury can occur when mated moths immigrate from a nearby untreated peach orchards. Therefore, this practice has not been adopted by producers in Delaware.

Chemical controls:

- Proaxis 0.5CS (gammacyhalothrin)
- Warrior 1CS (lambdacyhalothrin)
- Asana XL.66EC (esfenvalerate)
- Pounce 25WP (permethrin)
- Aza-Direct 1.2L (Azadirachtin)
- Baythroid XL 1L (cyfluthrin)
- Neemix 4.5L (Azadirachtin)
- Sevin 80WS, 80S or Sevin XLR Plus 4EC or Sevin 4F (carbaryl)
- Imidan 70WP
- Surround 95WP
- Pheromone Disruption:
    - 3M Sprayable Pheromone for OFM
    - Checkmate OFM-F
    - Isomate-M 100
    - Isomate-LPTB

Borers, Peachtree and Lesser Peachtree

Two species of clearwing moth borers can be found damaging peach trees throughout the state. Populations build-up in neglected orchards leading to tree decline and death. Peachtree borer is the larger of the two species. It has one generation per year. Eggs hatch through much of the summer. Larvae damage the trunk just above and below the soil line and can kill young peach trees. Healthy older trees are largely resistant to borer injury. Lesser peachtree borer is a smaller species with two generations per year. Eggs hatch in June and August. Larvae invade cankers and other wounds in the above- ground portions of the peach trees and can girdle limbs.

Non-chemical controls: Although mating disruption is being tested for both species, it is not being used on a commercial scale in Delaware.

Chemical controls: Growers are encouraged to scout to determine whether the borers are above threshold densities.

- Lorsban 4EC or 75WG or 50WS (chlorpyrifos)

- Proaxis 0.5CS (gammacyhalothrin)
- Thionex 50WP or 3EC (endosulfan)
- Warrior 1CS (lambdacyhalothrin)
- Asana XL.66EC (esfenvalerate)
- Ambush 25WP (permethrin)
- Pounce 25 WP (permethrin)

Most growers rely on annual applications of chlorpyrifos (Lorsban 4E) to prevent infestations. Growers generally use one application of Lorsban 4E at 1.5 quarts per 100 gallons applied with a handgun in the late summer to the trunk and scaffold limbs to control both species. Approximately 80% of the acreage is treated with Lorsban.

True Bugs

Several species of true bugs, including tarnished plant bug, brown stinkbug, and green stinkbug feed on peach in Delaware. These pests are not usually considered major problems, but they can be if neighboring fields contain crops that are hosts or if the orchard floor contains numerous broadleaf weeds. Damage by true bugs can be either to the tips of growing shoots, which can cause them to die, or to the fruit, which can cause sap to exude and the fruit to become misshapen. Fruit damage is sporadic and does not occur every year; however, severe economic losses can occur in some years. In general, true bug populations are highest in years where there is loss of lush vegetation growing in and around the orchard.

Non-chemical controls: Cover crop manipulation is important in true bug management. Because legume hosts are common orchard weeds, a weed-free orchard floor in lieu of a cover crop aids in reducing peach injury by these pests.

Chemical controls: Growers first target these pests with insecticides applied at the pink bud stage. Pyrethroids are particularly active against these bugs. Growers apply esfenvalerate (Asana XL) an average of 2 times per year and a seasonal rate of 0.03 lbs active ingredient per crop year. Later in the season, insecticides used for Oriental fruit moth, also can reduce true bug injury.

- Proaxis 0.5CS (gammacyhalothrin)
- Warrior 1CS (lambdacyhalothrin)
- Asana XL.66EC (esfenvalerate)
- Ambush 25WP (permethrin)
- Pounce 25 WP (permethrin)
- Baythroid XL 1L (cyfluthrin)

Spider Mites

European red mites and two-spotted spider mites are the most common pest mites in Delaware. These two species of spider mites have different life histories. European red mites over-winter as eggs and spend their whole lives in the trees. The two-spotted spider mites over-winter as adult females in protected places on the tree or in the litter, trash, and weeds on the orchard floor and move from weeds into the trees during the season. Both species are favored by hot, dry conditions. Mite feeding causes a mottling of the leaves, and under severe conditions can cause heavy leaf drop. If defoliation happens early in the season, fruit fails to size properly and limbs and fruit may be exposed to sunburn.

Non-chemical controls: Cultural practices and biological control are generally relied upon for mite management. Well-irrigated orchards, with roads treated to keep dust to a minimum, help to slow mite buildups. Proper pruning and adequate amounts of fertilizer to maintain tree vigor will also minimize the impact of two-spotted and European red mites. The ladybird beetle, *Stethorus punctum,* is the major mite predator in Delaware. The beetles have a relatively high degree of resistance to the low rates of organophosphate insecticides used against other pests such as Oriental fruit moth.

Chemical controls: Narrow range oil can be applied during the dormant period or clofentezine (Apollo) during the growing season. Clofentezine is most effective when mites are first observed. Growers generally restrict usage of this product to no more than once per year to delay the development of resistance.

- Acramite 50WS (bifenazate)
- Apollo 4SC (clofentezine)
- Savey DF (hexythiazox)
- Vendex 50WP (fenbutatin-oxide
- Nexter 75 WS

WEEDS

Portions of this section were adapted from the Virginia and North Carolina crop profiles for peaches and the *New Jersey Commercial Tree Fruit Production Guide.*

Weed management is an important issue in peaches. There is a direct relationship between tree growth and the level of weed control. The use of herbicides for controlling weeds has resulted in effective weed control and consequently increased tree growth and/or yield. Weed control is important in newly planted as well as established orchards. Weed control in juvenile peach orchards in those years prior to commercial production has resulted in increased fruit production. Larger trees have initially greater fruit producing capacity. Weeds result in economic losses in peaches in several ways, including: 1) reducing yield

due to competition for water, nutrients, and light; 2) increasing production costs or reducing yields by interfering with harvest; 3) reduction of effectiveness of insect and disease control measures due to weed interference; 4) reduction in yield due to crop injury resulting from weed control measures; and 5) serve as refuge for insects, nematodes, and pathogens. Winter annual weeds are known to harbor catfacing insects. These insects can distort fruit shape and lower quality. Controlling winter annual weeds is part of an integrated approach to managing catfacing insects.

The best method of controlling weeds involves the establishment and maintenance of continuous weed-free zones beneath the tree canopy alternating with permanent grass sod in the alleyways

An integrated approach, including a combination of cultural and mechanical methods and herbicides, provides the most economical and effective weed management in peaches. This integrated approach focuses on proper herbicide selection and optimal timing of application in combination with cultural practices.

Frequency of Occurrence: Annually.

% Acres Affected: 100%

Pest Life Cycles: A wide range of annual and perennial weed species is present in peach orchards in DE. Furthermore, both grass and broadleaf weeds need to be controlled. Some of the more problematic weeds in orchards are: Canada thistle, camphorweed, dandelion, goldenrod species, horsenettle, horseweed (marestail), morningglory species, plantain species, poison ivy, Virginia creeper, white heath aster, quackgrass, and bermudatgrass.

Timing of Control: Pre-emerge and postemergence to the weed. Late fall, late spring and summer are times of year for control.

Yield Losses: Difficult to document. Poor weed control in the juvenile stage can result in reduced productivity in future years.

Regional Differences: Weed spectra can vary regionally.

Cultural Control Practices: In some orchards, both the grass alleyways and the vegetation beneath the tree canopy are maintained solely by mowing; other orchards mow *and* have an effective herbicide program. Physical removal, by mechanical means, is used to control weeds in some production regions, but can have undesirable effects on the trees. Clean cultivation has been shown to eliminate surface rooting of peach trees. However, eliminating vegetation by maintaining an herbicide strip in the tree row promotes surface rooting. Cultivation may result in increased erosion in areas of rolling terrain and soils with low infiltration rates.

Biological Control Practices: None available.

Post-Harvest Control Practices: Fall application of herbicides can improve long-term control of perennial weed species.

Other Issues: Crop safety is an issue with some of the labeled herbicides due to the sandy soil in DE. The coarse-textured soils allow herbicides to move rapidly into the root zone and injury the trees. Other herbicides can cause injury if applied at the inappropriate time of year (i.e. 2,4-D) or if spray is applied to tree foliage or bark (i.e. glyphosate or sulfosate).

Chemical Controls

Herbicide selection is primarily based on the type of problem weeds present and the stage of tree growth. Factors such as soil characteristics may also be important in determining pre-emergence herbicide rates based on movement of a particular chemical through the soil profile. Initial rainfall is necessary for activation; however, frequent rainfall may cause the herbicide to leach away from the zone of seed germination, rendering it ineffective. Post-emergence herbicide treatments may occasionally be needed to control broadleaf weeds in the grass sod or non-planted strips within the orchard.

Herbicide Options:

Pesticide	**% Acres Treated**	**Weeds[1]**	**Typical Rates** **lbs ai/acre**	**Timing[2]** (weed/ peaches)	**# of Appl.**	**PHI** **days**	**REI** **hours**
Preemergence herbicides, tankmixing maybe necessary for control of emerged weeds							
diuron *(Karmex)*		Grass Brdlvs	1-3	Late fall Spring/ E	1	0	12
napropamide *(Devrinol)*		Grass	2-4	Late fall Early	2	0	12

			spring/ NP - E			
norflurazon *(Solicam)*	Grass	2-4	Late fall Spring/ NP-E	1	0	12
oryzalin *(Surflan)*	Grass	2-4	Late fall Early spring/ NP-E	2	0	12
oxyflurfen *(Goal)*	Brdlvs	2	Early spring (dormant)/ NP-E	1	0	24
pendimethalin *(Prowl)*	Grass Brdlvs/ss	2-4	Late fall Early spring/ NP	2	0	12-24
pronamide *(Kerb)*	Grass Brdlvs/ss	1-2	Fall/ E	1	0	24
simazine *(Princep)*	Brdlvs	2-4	Late fall Spring/ E	1	0	12
terbacil *(Sinbar)*	Grass Brdlvs	1-3	Spring/ E	1	0	12
Postemergence						
2,4-D	Brdlvs	1	Early spring Fall/ E	2	40	12-48

fluazifop *(Fusilade DX)*	Grass	0.18-0.38	Spring Summer/ NP-E	2	14	12
sethoxydim *(Poast)*	Grass	0.2-0.5	Early spring Summer/ NP-E	2	14	12-24
Non-selective						
glyphosate *(Roundup)*	Annual Perennial	0.75-4.0	Fall Spring Summer/ NP-E	2	17	4-12
paraquat *(Gramoxone Extra)*	Annual	0.5	Fall Spring Summer/ NP-E	2		12

1. Weeds: Grass= annual grasses; Brdlvs= annual broadleaf weeds; Brdlvs/ss= small-seeded broadleaf weeds (i.e. pigweed); Perennial= perennial species (grass, broadleaf, or sedges).

2. Timing of application: POST= postemergence; PRE= preemergence / NP= newly planted trees; E= established trees.

In addition to the above products, Stinger (clopyralid) is also registered in Delaware for use in peaches. It is an effective treatment for clover, vetch, and composite species.

Use in IPM Programs: Use of herbicides in conjunction with cultural practices is consistent with IPM recommendations.

Use in Resistance Management Programs: Herbicide-resistant weeds have been identified in the region, although none reported in orchards. A number of these herbicides have long residual activity that increases the likelihood of

developing resistance. It is critical to have an array of herbicides with differing modes of action to prevent additional resistance problems.

Efficacy Issues: Most herbicides are designed with a relatively narrow spectrum of weed control in order to minimize crop injury. Therefore, producers need a range of available herbicides for flexibility in managing weeds.

Rotational Concerns: Rotational restrictions with some of these herbicides are as long as two years after application. This can severely limit use of the orchard after trees have been cleared.

Sod Weed Control

Weeds in the sod may require more frequent mowing. These weeds need to be controlled because they can harbor pest insects as previously noted and some species can compete for pollinating insects with the peach crop. 2,4-D is often used to control broadleaf weeds in the sod. Fertility management can assist in suppressing some weedy species such as clovers.

DISEASES

Bacterial Spot

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.

Cankers are visible in early spring as slightly raised, blister-like areas along the twig. If the terminal bud region becomes infected, the shoot tip becomes a blackened canker that may extend downward along the shoot for about an inch. In this case, the terminal bud is killed. Fruit symptoms are first observable three to five weeks after petal fall, and later appear as depressed, brownish lesions, sometimes accompanied by pits, cracks, or exuding gum. Up to 39% of fruit can be infected by bacterial spot.

Chemical Control:

The two to four week period immediately after petal fall is critical for both early foliage and fruit infection. Thus, to properly control fruit infection, sprays should be applied from petal fall until 15 days before harvest. Mycoshield 17WP - 1-1,5 lb/acre in the Shuck-Split, First, Second, Third, Fourth, Fifth, and Sixth Cover provide satisfactory disease control.

- Mycoshield 17WP (calcium oxytetracycline)
- Kocide 2000 (copper hydroxide)
- Flameout 17WP (tetracycline)
- Tenn-Cop 5E (copper)

In addition to the protective sprays mentioned above, there is some evidence that early applications just before bud-swell and prior to bloom can help to reduce the overwintering epiphytic inoculum on tree surfaces. These sprays lower the bacterial population, thereby decreasing the likelihood of infection of newly emerging leaves and fruit. Also, autumn applications during leaf drop may be beneficial in preventing canker formation. Fixed copper materials can be used at both these times.

Brown Rot

Infection caused by *Monilinia fructicola* occurs at bloom or during the preharvest period. Bloom infection results in blossom blight a necrosis of flowers. Once a flower is infected, the fungus can also proceed into the stem and cause a canker. A spore produced on these flowers and cankers then becomes the inoculum for subsequent infection during the preharvest fruit rot phase.

Chemical Control:

- Bravo Ultrex 82.5 WDG (chlorothalonil)
- Captan 50WP, 4L (captan)
- Echo 6F, 90DF (tetrachloroisophthalonitrile)
- Elevate 50WDG (fenhexamid)
- Elite (tebuconazole)
- Indar (fenbuconazole)
- Orbit (propriconazole)
- Rovral 50WP, 4F (iprodione)
- Sulfur 95WP (sulfur)
- Vangard 75WG (cyprodinil)
- Scala 600SC (pyrimethanil)
- Pristine 38WDG (sodium hypoclorite)

Normally, two sprays are applied during the bloom period, the first at 5-10% bloom and the second at full bloom. The most effective fungicides are: Bravo WS - 3-4 pt/acre, Captan 50WP - 4 lbs/acre, Elite 45DF - 5 oz/acre, Indar 75WSP - 2 oz/acre, Orbit 3.6EC - 4 oz/acre, Rovral 50WP - 1-2 lbs/acre, Sulfur, actual - 10-12 lbs/acre, and Vangard WG - 5 oz/acre. If the weather is very dry, only one spray may be needed. Conversely, if much rainy weather is encountered, a third spray at petal fall may be desirable.

As the fruit softens during the ripening process, it becomes more susceptible to brown rot. Fungicides are applied at regular intervals during this period. The first spray is applied at 14-21 days preharvest, or at first color. Usually, only two sprays at 7-14 days apart are needed, but a third spray may be necessary in the event of very wet weather. A final application of a systemic material just before harvest is also a good practice to protect fruit during shipping and packing operations. Fungicides differ in spray and preharvest intervals.

Insect feeding injury increases brown rot infection; therefore, adequate insecticide protection helps suppress injury. Also, experiments indicate that brown rot is most difficult to control where peach trees make excessive growth. In such orchards, nitrogen-containing fertilizers should be used sparingly. Special attention to brown rot control is required where trees are planted closely or where orchards are surrounded by woods. Such conditions reduce air drainage, and dew or rain evaporates more slowly from blossoms and fruit than where air drainage is better.

Powdery Mildew

The fungus *Sphaerotheca pannosa* causes powdery mildew of peach and nectarine. This is the same pathogen that causes mildew on roses. Sporulating colonies of this fungus have been observed on multiflora roses growing wild along woods adjacent to orchards.

Chemical Control:

Since the fruit becomes resistant to infection shortly before pit hardening, infections generally occur between pink-bud and third cover sprays. However, once lesions are established, they will continue to expand in size. Sulfur - 4 lbs/acre applied when needed, provides reasonably good control.

Rusty Spot

The fungus that causes this disease is believed to be the apple powdery mildew pathogen, *Podosphaerea leucotricha*. Consequently, the disease can be anticipated in blocks adjacent to mildew susceptible apple blocks. Fruit infections can occur throughout the growing season, but are most common at shuck-split and shuck-off. Fruit not protected at these critical times may become 100% infected, even if a good spray program is employed during the remainder of the year. The varieties most susceptible to the disease are Rio-So-Gem, Jefferson, Jerseyqueen, Biscoe, Loring, Early Loring, Redskin, Jerseyglo, and Garnet Beauty. Since it is a powdery mildew disease, dry weather favors sporulation and spread of the mildew spores. Periods of heavy or frequent rainfall are less favorable. Also, moderate winters favor overwintering of the fungus on apple, thus providing higher inoculum levels for rusty spot in neighboring peach blocks. Rusty spot damage levels can exceed 23% of fruit infected at harvest.

Chemical Control:

Nova 40W - 2.5-6 oz/acre applied when needed is considered the best material for disease control. Sulfur 95 WP is also recommended.

Scab

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 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 Control:

- Bravo Ultrex 82.5 WDG (chlorothalonil)
- Captan 50WP, 4L (captan)
- Echo 6F, 90DF (tetrachloroisophthalonitrile)
- Indar (fenbuconazole)
- Sulfur 95WP (sulfur)
- Pristine 38WDG (sodium hypoclorite)
- Gem 500SC (trifloxystrobin)
- Topsin M 70WSB (thiophanate-methyl)

Topsin-M (0.5 lb/100 gal), when applied at petal fall, has resulted in "burn out" of many of the overwintering lesions on the twigs. Thus, disease pressure can be measurably reduced as a result of a lower inoculum level. Fruit infections are most common from shuck-split through third cover. Foliar sprays with Bravo WS - 3-4 pt/acre, Captan 50WP - 4lbs/acre, and Topsin-M 70WP plus Captan 50WP - 2 lbs/acre at Scuck-Split, First, Second, Third, and Fourth Cover are effective in protecting the fruit from infection, and a single fungicide spray applied around first cover will provide reasonably good control of twig infections in non-bearing blocks.

The disease is troublesome in commercial blocks when the trees did not receive a regular spray program in the preceding year. Where the disease is troublesome, half rates of Topsin-M in combination with Sulfur or Captan give good control. Bravo is also a very effective material and has good retention capabilities. Sprays should be applied from shuck-split through third cover.

Post Harvest Control Practices

To prevent fruit rot development during storage and in marketing channels, postharvest fungicide treatment is conducted. Hydrocooling fruit before placing in cold storage with Agclor 310 (12.5%) - 0.75 gal for 1000 ppm, household bleach (5.25%) - 1.8 gal for 1000 ppm, or HTH Chlorine (65%) - 1.33 lb for 1000 ppm has proven to be one of the best controls.

To avoid postharvest peach skin discoloration (inking), hydrocoolers and dumptanks should be kept as clean as possible, with the pH of water in hydrocoolers and dumptanks between 6.5 and 7.0. Equipment should be check for loss of ammonia, since leaks in the refrigeration system can also stimulate inking. In reduction of discoloration, chlorine levels of 120 ppm have shown excellent results.

Nematodes

Nematodes are microscopic roundworms that live mainly in soil and plant tissue. Plant parasitic nematodes feed on plants by puncturing and sucking the cell contents with a stylet mouthpart. They can reduce the vigor and yield of trees, and as well as transfer virus diseases like tomato ringspot virus (TmRSV) that debilitates and kills trees. Plant-parasitic nematodes are always a problem where peaches follow peaches. Where nematodes are troublesome, trees do not grow as vigorously. Nematode feeding increases the incidence of peach decline, and it can increase the incidence of stem pitting.

Chemical Control:

Preplant nematicides Basamid - 222-265 lbs/acre, Nemacur - 2.5 gal/acre, Telone II - 36-48 gal/acre, Telone C-17 - 30-40 gal/acre, Vapam 50-100 gal/acre,

and Vydate L - 3-4 gal/acre are used to promote tree vigor and to prevent the replant problem. Postplant treatments with Nemacur - 2.5 gal/acre and Vydate L - 2 pt/acre reduce tree loss from peach decline and stem pitting. All nematicides are fumigants except Nemacur and Vydate. Rates are for light, sandy soils. Heavier soils require higher rates.

Nematodes build up and reach damaging levels by the end of the second growing season when fumigant-type nematicides are used. The nematode buildup may occur at the end of the first growing season with nonfumigant-type nematicides. When sufficient nematode populations are present, postplant nematicide treatments are needed yearly to prevent tree loss.

Soil fumigants can be applied any time the soil temperature is at least 55° F at the 12-inch depth. During mid-summer, soil temperature may become too high for successful treatment (90° F). After making the application, soil should be shallow cultivated and irrigated with a half-inch of water.

Nonfumigant types of nematicides are formulated as sprayable materials. Sprayable soil-applied nematicides can be applied with a properly calibrated weed sprayer, and they have been successfully used in combination with all of the herbicides commonly used on tree fruit. To prevent injury to nontarget organisms, all of the soil-applied nematicides should be shallow incorporated shallowly in the soil immediately after application. They must enter the soil water and contact the nematode to effect control. As nonfumigants, soil temperature and soil moisture are not so critical for satisfactory control. Satisfactory control has been obtained with applications any time between mid-March and late November when the ground is not frozen. The nonfumigant nematicides presently cleared for use on tree fruit all possess some systemic activity. Consequently, when they are applied to soils, the ground should be weed-free for maximum control.

Authors:
Derby Walker - Production Information
Joanne Whalen - INSECTS
Mark VanGessel - WEEDS

Susan Whitney King
swhitney@udel.edu
302-831-8886(voice); 302-831-8889 (fax);
Department of Entomology and Wildlife Ecology,
University of Delaware Cooperative Extension, Newark, DE 19716-2160.

Subject matter contacts at the University of Delaware College of Agriculture and Natural Resources:
Tracy Wootten

Joanne Whalen - Insects
jwhalen@UDel.Edu
302-831-2526 (voice); 302-831-8889 (fax);
Department of Entomology and Wildlife Ecology,
University of Delaware, Newark DE 19716-2160

Bob Mulrooney - Plant Diseases
bobmul@udel.edu
302-831-4865 (voice)
Department of Plant and Soil Science,
University of Delaware, Newark DE 19717

Mark Van Gessel - Weeds
mjv@UDel.Edu
301-856-7303 (voice)
UD Research and Education Center,
Georgetown, DE 1947

REFERENCES

1. Delaware Agricultural Statistics Summary. Peaches: Production and Value, Delaware 1980 to 1996. http://www.nass.usda.gov/de/p1797.htm
2. USDA-NASS Agricultural Statistics 1999. Fruits, tree nuts, and horticultural specialties. http://www.usda.gov/nass/pubs/agr99/acro99.htm

3. Walker, Derby. 1996. PEACHES AND NECTARINES. HG-03. University of Delaware Cooperative Extension. http://bluehen.ags.udel.edu/deces/hg/hg-03.htm
4. Gordon Johnson, Kent County Agricultural Agent, as quoted in the Wilmington News Journal 7/27/2008