Peach and nectarine leaf curl, caused by the plant pathogenic fungus *Taphrina deformans*, is typically not a difficult disease to control in the eastern United States. However, if inoculum levels are high, environmental conditions favor infection, and/or control methods are sub-par, then severe defoliation and stunting can occur. This year, unusual weather patterns may also play an important role in leaf curl development.

**Infection.** *Taphrina deformans* principally overwinters as spores on the bark surface; the pathogen may also be found in old infected leaves. Initial infection occurs during bud swell in late winter when spores are disseminated by water to buds with loose scales. Additional infection can occur between bud-break and petal fall. Once the pathogen enters leaf tissue, it stimulates rapid cell division and enlargement, resulting in thickened, curled, and puckered leaves. These “tumor-like” areas on the leaves often have a red discoloration. Eventually, the leaves drop or sometimes remain attached, turning brown.

**Environment.** Recent research results from Italy have provided details on the effects of temperature and moisture on foliar infection (1). At near optimum temperatures, infection began after a minimum of 12 hours wetness and increased steadily until 48 hours of wetness. Longer durations of wetness did not increase disease levels.

In these studies, duration of surface wetness was the primary moisture determinant for infection. If the wetness period was caused by rainfall, the amount of precipitation did not influence the severity of infection. Wetness periods from dew or fog were often too short for infection.

Air temperature during the wetness period needed to be less than 61°F for foliar infection to occur. The amount of infection increased as temperatures decreased to 41°F. The maximum amount of shoot infection (45%) was observed at 41°F. Lower temperatures were not examined to determine at what point infection no longer occurred.

**Control.** A single fungicide spray in fall, after leaf drop, or in late winter just prior to bud-swell, will in most cases provide sufficient control. The recommended fungicides are ziram or chlorothalonil (Bravo, Echo, etc.). Both of these fungicides have provided near 100% control in studies on ‘Redgold’ nectarine at the RAREC; non-treated trees had 39% bud infection.

SEE PEACH LEAF CURL ON PAGE 2
Apple Scab Inoculum Potential: By the Numbers
Norman Lalancette, Ph.D., Specialist in Tree Fruit Pathology

Over the years, most growers have heard the warning from those of us in extension: “Control apple scab up front, during the primary scab season”. Intuitively, this advice made sense. The warning often continued “Control scab now so that you’re not battling the disease for the remainder of the summer”. Yes, everyone can agree that preventing scab from getting a “foothold” is the way to go. But did you ever think of why this is true and why it is so important? The answer lies “in the numbers”.

The Biology. The apple scab pathogen, Venturia inaequalis, overwinters in fallen leaves on the orchard floor. During late autumn, the fungus in leaf lesions begins to form fruiting bodies called pseudothecia (Fig. 1). Structures called asci begin to form within the pseudothecia during warm periods in the winter. These “sack-like” asci hold the ascospores that form within them. Both the asci and ascospores continue to develop and mature during late winter and spring.

During spring rains, the mature ascospores are discharged into the air and, with the help of wind currents, are transported to apple tissue where they initiate the season’s first infections. This primary ascospore inoculum is released over approximately a 5-9 week period beginning at bud-break. This is called the “primary scab period”.

The Numbers. As many as 50 to 100 asci can form within each pseudothecium (1). Each ascus holds exactly eight ascospores. Thus, each pseudothecium produces 400 to 800 ascospores that can each infect and form a lesion on foliage or fruit. Each of these lesions can produce on average 200,000 asexual spores called conidia (2).

If 100% of the ascospore inoculum is effective in producing lesions, then those lesions will produce a minimum of 400 x 200,000 = 80,000,000 conidia. But, of course, ascospore efficacy will not be 100% since the majority of them will not land on susceptible apple tissue. Let’s assume only 1% reach and successfully infect fruit or foliage. In that case, the resulting lesions will produce a minimum of 4 x 200,000 = 800,000 conidia. This is still a lot of secondary inoculum being produced, and all from just one pseudothecium! Most likely, there’s a lot more than one pseudothecium on your orchard floor.

The Difference. Based on the simple example above with one pseudothecium, there is a 1000-fold difference in inoculum potential between the primary inoculum (800 ascospores) and the secondary inoculum (800,000 conidia). Furthermore, to make matters worse, the conidia are located in the tree canopy, so their efficacy at inciting more lesions may well be greater than 1%! So, whether you plan to use a control program with site-specific fungicides or revert back to a protectant-only program, the reasoning behind the warning should be obvious: control scab during primary scab season when you have the numerical advantage.


Fig. 1. Cross section of apple leaf showing Venturia inaequalis overwintering fruiting body (pseudothecium). Pseudothecia contain 50-100 asci, and each ascus contains eight ascospores. (drawing by N. Lalancette).
Growing Season Likely Off to an Early Start

David Schmitt, Program Associate, Tree Fruit IPM

After an extremely mild winter this year we will likely see an early bloom in most tree fruit crops. A survey of orchards in Gloucester County in late February indicated that peach buds were still tight; apples looked to be nearing silver tip; cherry buds were swelling; and plums were showing some green tissue. So growers should start to think about early season sprays.

If no leaf curl spray was applied in the fall, applications can be made any time up until bud swell. Sprays can still be made shortly after but will not be 100% effective. Effective materials include Coppers, Ziram, and Choroanthonil formulations (e.g. Bravo). In addition to leaf curl control, Ziram may also supply some zinc to deficient orchards, but probably not enough to correct most levels of deficiency. Bravo sprays may help suppress constricted canker as well.

Copper applications should be made for bacterial canker control on plum and cherry, and for Fireblight suppression on pome fruit. Copper can be applied up to 1/4“ green on apples and delayed dormant on pears. Applications at 1/4“ green should be provide 7-10 days of early season scab protection. In orchards that had scab control failures last year, applications of 40# urea/ac can be made to the orchard floor before green tip. Urea will suppress spore production from overwintered lesions as well as speed decomposition of leaves.

Oil sprays for scale control can be safely applied up to pink on peach, as late as pink and popcorn on apples and pears respectively. Remember to adjust the rate downward the closer you are to bloom. Esteem applied in early sprays will improve scale control as well as provide rosy aphid and pear psylla control (see Peter Jentsch’s article and the New Jersey Commercial Tree Fruit Production Guide).

Early Season in Northern NJ

Win Cowgill, Agricultural Agent

This season is promising to be very early, probably a record breaker if the warm weather continues. Forecasts are for mid 60’s this Thursday and 50’s for the near future.

Asian pears at the Rutgers Snyder Farm are well advanced with bud swell, but no pear psylla activity yet.

From the look of peach and apple and the ornamental Bradford Callery pears in Hunterdon County, I anticipate we are running at least 3 weeks early. Be prepared to get the sprayer out early this season.

Steve Hoying, Hudson Valley Lab, Cornell University indicates that Hudson Valley orchards appear to be 3 weeks ahead as well.

Pear Psylla Management

David Schmitt, Program Associate, Tree Fruit IPM

As of February 23, Pear Psylla adults were active and laying eggs in Southern New Jersey. Growers should apply oil at their earliest opportunity to deter egg laying. See the accompanying article below for early season Psylla management options.

Strategies for Pear Psylla Management During the Pre-Bloom Period

Peter J. Jentsch, Entomology, Cornell University—NYS Agricultural Experiment Station

Reprinted from Scaffolds Fruit Journal, No. 3 April 4, 2011, Cornell University - NYS Agricultural Experiment Station

Pear psylla, Cacopsylla pyricola Foerster, is the primary insect pest driving pear management during the pre-bloom period in the Northeast. These insects have 3-4 generations per season, with nymphs undergoing 5 instars prior to becoming adults. Pear psylla adults overwinter along the woodland edge and within the orchard. Adults remain well hidden among the scales of trunk bark and branch canopy during cooler temperatures, visibly increasing in number on trees as temperatures rise, and migrating into blocks throughout the early part of the season. Adults will oviposit onto branches along the basal plates of buds throughout the month of April, allowing nymphs access to newly developing foliage.

Three traditional strategies have been used during the pre-bloom period. These include oil application(s) to delay egg laying that acts to synchronize the hatch of the nymph population and allow for migratory adults to enter the orchard. The second strategy is to target adults with insecticide(s) followed by a targeted application specifically for emerging nymphs.

The traditional pre-bloom oil application can be made as the first egg is observed in a 3-minute observation of pear buds. In the Hudson Valley, we observed oviposition on 28 March (3/100 buds from 4 Bartlett trees) with no increase in egg numbers this week from this morning’s observations (0/100 buds from 4 Bartlett trees).

A pre-bloom oil application to delay and reduce adult oviposition forces the female adults to synchronize egg deposition, delaying nymph hatch and allowing for a more effective application of insecticides to target a more uniform and susceptible developmental stage.

A dormant application of 3% oil should be made if only one oil application is planned. This rate will also reduce overwintering populations of San Jose scale, European red mite, pear leaf blister mite, and Comstock mealybug. A second approach would be the use of 2% oil at 7- to 14-day applications, allowing for somewhat longer inhibition of egg laying.

New, diverse insecticides with different modes of action are available in New York State, allowing for further

See Pear Psylla on page 4
Pear Psylla from page 3

pre-bloom options. One such option for ovipositional deterrence is through the use of Surround WP, a kaolin clay product, at 50 lb/A, made at first egg observation. In recent trials conducted at Cornell’s Hudson Valley lab and in a regional grower orchard, Surround WP gave significantly better control of pear psylla adult egg laying than 2% oil at the same timing in a single spring application, even with considerable rainfall. Multiple applications of Surround WP used at the 50 lb/A rate, beginning at delayed dormant followed by a white bud and a petal fall application, gave us excellent control of 1st generation psylla, the Lepidoptera complex, European apple sawfly, and plum curculio in field trials. It is somewhat weak on San Jose scale and the plant bug complex. I would recommend a <2.5 mph tractor speed and >100 GPA to obtain the highest degree of efficacy with this product.

The second approach is the use of an insect growth regulator such as Esteem 35WP at 4–5 oz/acre or Centaur 0.7WDG at 34.5–46.0 oz/A, used during the pre-bloom period to decrease egg hatch and reduce the viability of eggs laid by treated adults. It should be applied with 0.25% v/v horticultural spray oil prior to sustained egg-laying (mid-April in the Hudson Valley). Esteem may be applied once at pre-bloom or once pre-bloom and once at petal fall as a tactic for both psylla reduction and as a resistance management strategy to alternate yearly with Agri-Mek. Remember, its mode of action is as an ovicide and to control early instar nymph development, so it will not directly reduce the adult or nymph population.

Using oil is a pre-requisite to at least two follow-up strategies. One option after oil is the use of an adulticide, to kill the adults after they have completed migration into pear orchards, and before significant eggs have been laid. In the Hudson Valley, oil is generally applied during the first week of April and migration is completed in late April. If the season just starting continues in a similar manner, the cooler temperatures may prolong migration.

Adulticides would be employed in mid- to late April to reduce the adult population. The choices for managing adult psylla include Thionex 3EC (3.33 qts/A); the neonicotinoids Actara 25WDG (5.5 oz./acre), Assail 30SG (4.0–8.0 oz/acre), and Calypso 4F at 4–8 oz./A. The use of 1 quart of oil per 100 gal of finish spray (0.25% v/v) has been found to increase the neonicotinoids’ effectiveness, but is not required by the label. The NY label allows a total of 11.0 oz/A (0.172 lb a.i./A) of Actara (or 0.172 lb a.i. of thiamethoxam-containing products such as Endigo ZC per acre) per growing season. Multiple applications of Actara require the applicator to have the most recent Special Local Need (SLN) label.

Pyrethroid adulticides control options include Ambush 25WP at 12.8–25.6 oz/acre, Asana (9.6–19.12 fl oz/A), Pounce 25WP at 12.8–25.6 oz/A, Proaxis 0.5CS at 2.6–5.1 fl oz/A, Warrior II at 1.28–2.56 fl oz/A, and Danitol 2.4EC at 16–21.3 fl oz/A. In general, researchers have found the pyrethroids to be less effective at higher temperatures on many different insect species and, as such, pyrethroid use should be considered primarily during the cooler pre-bloom periods. There is also evidence that pyrethroids can cause a resurgence in Comstock mealybug populations in pome fruit.

Delegate 25WG used at 4.5–7.0 oz/A is another good alternative for use against the 1st generation pear psylla nymph population during the pre-bloom period. However, an ideal timing for this product would be during the early hatch of obliquebanded leafroller, which usually coincides with the end of the 2nd generation and onset of the 3rd generation psylla (mid-June). To add to the discussion of early pest management for psylla, we would be remiss not to mention that the use of postbloom Agri-Mek has been the standard method of psylla management in New York since 1996. Although we have not seen an outright failure or loss of efficacy with Agri-Mek in NYS, it appears to be losing control when applied 7–10 days post petal fall at the high rate, in two applications 21-days apart. To maintain effectiveness, a rotational program of Agri-Mek with other effective materials should be considered for resistance management purposes.

Agri-Mek SC is now available as a more concentrated formulation with 8% active in a suspension concentrate formulation. It can be used from 10 days to about 4 weeks post-PF, but its efficacy decreases as the foliage hardens off. It requires the use of a minimum 0.25% v/v horticultural spray oil to penetrate the foliar waxy cuticle and achieve translocation within the leaf for optimum nymph feeding uptake. Agri-Mek SC can be used in multiple applications of 2.25–4.25 oz./A beginning at 7 to 14 days after petal fall, with a follow-up application 21 days post-PF as per label requirements, totaling no more than 2 applications or 8.5 oz/season, and no later than 28 days prior to harvest. The 2nd application targets newly developed foliage preferred by psylla nymph populations.

An alternative to Agri-Mek is the use of Actara 25WDG at 5.5 oz/A. Actara is in the neonicotinoid class of insecticides, and is effective against both nymph and adult populations. We have found it has slightly better efficacy when used with a 0.25% v/v horticultural spray oil. It will also effectively control plum curculio and Comstock mealybug when applied at petal fall. Not registered for use in Nassau or Suffolk Counties.
Pruning Blueberries
Gary C. Pavlis, Ph. D., Atlantic County Agricul-
tural Agent

New Jersey has approximately eight thousand acres of blueberries under cultivation and this is the primary crop for which I have extension responsibilities. Pruning continues to be little understood and poorly executed throughout the industry. In fact, it is rare to find two growers who prune the same. I would like to clear up a few misconceptions and try to outline a simple method of pruning blueberries. The first place to start would be to discuss the importance of pruning. Growers often feel that pruning is of little value because the effects of the practice are not immediately apparent or dramatic. It should be noted that a well known blueberry researcher, Phil Marucci stated many years ago that there were a few factors which have greatly influenced the lack of increase in blueberry yield on a per acre basis over the last 30 years and pruning was the most significant factor.

More recent research has revealed that young canes are more efficient fruit producers than old canes. In fact, canes, which are 3 to 10 years old, allocate greater than 50% of applied water and fertilizer to fruit production. By the time a cane reaches 20 years of age, only 25% are allocated to fruit. (Water and fertilizer costs the grower money and there is no profit in the production of blueberry leaves.) Additional research compared three pruning types on yield and fruit size. Plants were 1) regularly pruned in a moderate manner such that one out of every six canes per cut out, 2) heavily pruned by removing 40% of all canes out every five years and 3) not pruned at all. The result was that the regular moderate pruning had the highest yield on the least number of canes. Research has also shown that as pruning increases, new cane production increases.

These studies show us that young canes out-produce old canes, the removal of one out of six canes produces the right number of new canes and the highest yield and fruit weight is produced with regular moderate pruning.

It is also important to understand how a blueberry plant grows. Each year, canes are initiated from the base of the plant. Each succeeding year, the cane produces laterals, laterals produce laterals and so on. Each year the lateral production on any individual cane decreases in diameter, or put in other words, the wood becomes progressively twiggy. It should be realized that as wood becomes smaller, fruit size decreases. This is why we detail prune to increase fruit size.

With this information under our belts we can address how to prune. There are really 5 basic steps to keep in mind when approaching a bush to be pruned. 1.) Assess the plant’s overall vigor; is cane production adequate? 2.) Prune out all dead wood. 3.) Locate the oldest canes and prune out one of every six canes; thus if the plant has twelve canes, remove two of the oldest. 4.) Prune out all low branches, which will never be picked and are a source for disease. 5.) Detail prune, i.e. remove as much twiggy wood as time allows.

Armed with these basics, we can now deal with the different plant situations that arise. First, pruning young plantings has primarily the objective of establishing the plant to obtain full production as soon as possible. Thus, the first two years the procedure is to remove flower buds. Some growers cut off as much as the top half of the plant. This is really quite drastic. Rubbing off lower buds would be sufficient, however in a big operation it is usually less labor intensive to cut the top 3-5 inches off each cane which will remove most flower buds. Any weak twiggy growth should also be removed.

In year three, a small crop is possible but not the expense of stunting the plant. Usually 1-2 pints/bush is the optimum and fruit should only be on strong wood.

The fourth and fifth year twiggy growth must again be removed as well as any lateral canes which have developed. Fruit production can be increased but the amount is dependent on the number of new canes which were produced the preceding years; 3-5 canes/yr. is optimum.

The blueberry planting should be in full production by the sixth year though there are numerous variables which will influence this timing. The most important of these being proper pH and nutrition, water management and the crop to cane production balance.

I have found it is also helpful to growers to discuss blueberry pruning strategies based on plant status. I do not believe there is a strategy for each variety though any one variety may fall into one of the following categories most of the time. For example, the variety Blueroay often has a spreading or open habit in which canes tend to bend down to the ground. Plants of this type must be thinned to the 1 of 6 rule however canes that are bent over also tend to produce an upright shoot. These canes should be pruned just above this upright shoot to produce a more erect plant. Other varieties that often fit into this category are Berkeley, Bluetta, Coville, Weymouth and Patriot.

Varieties such as Bluecrop, Collins, Darrow, Earliblue, Herbert, Jersey, Lateblue and Elliot often fall into the erect plant category. These plants become overly dense in the center which decrease’s fruit bud initiation. The pruning strategy for this category is to remove older central canes before all others.

When plants are overly vigorous, the primary strategy is to remove entire canes rather than spend time on detail pruning. This is done at least until the proper fruit to cane production balance can be established through nutrition and fruit production management. Varieties that are prone to this situation are Earliblue, Collins,
Tree Fruit Weed Control
Brad Majek, Ph.D, Specialist in Weed Management

Sod Row Middles
Managed sod row middles have many advantages, and have been adopted by many tree fruit growers. They provide a firm drive path for spring spraying of insecticides and fungicides, prevent or reduce soil erosion, and improve soil tilth by increasing soil organic matter.

Good sod management practices will help suppress weeds, including white clover, which can be difficult to control. Use herbicides with good management practices to maintain the sod free of weeds. Manage fertilizer applications to favor grass rather than the clover. Nitrogen fertilizer stimulates grass growth, and phosphorus and potassium stimulate clover growth in a mixed grass and legume sod. Do not apply fertilizer containing phosphorous or potassium to sod if clover control is a problem. Rather, apply fertilizer for tree growth in the vegetation free strip. Mowing height also influences the composition of a mixed grass and clover sod. Close mowing favors the clover. Taller sod will favor the grass. Mow no closer than four inches if clover control is a problem in the sod.

Weed control in the sod should be completed in early spring. Weeds are most susceptible to 2,4-D when they are growing vigorously, not under stress, and before flower buds appear. The herbicide must be applied BEFORE dandelions begin to bloom in early April for maximum effectiveness. Apply Prowl H2O at 1 to 1.5 quarts per acre to control summer annual grasses that can weaken the sod, including crabgrass species, foxtail species, and others.

**WARNING:** Use only 2,4-D formulation(s) labeled for use in orchards. Lower cost 2,4-D formulations are available but may be more likely to drift, may not contain a “low drift” agent in the formulation, are not labeled, and should not be used! **BEWARE of herbicide drift!**

Grapes, many flowers, and vegetables are extremely sensitive to 2,4-D. Injury may occur in adjacent fields if sprayed when unfavorable conditions prevail.

Certain weeds, including clover species, wild onion and garlic can be suppressed or controlled with 2,4-D, but good results require additional effort. The leaves of clover are densely covered by fine hairs and wild onion leaves are waxy and vertical. Both weeds retain spray poorly. Add nonionic surfactant to increase wetting and spray retention to improve control. Add the surfactant in units of 1 quart per 100 gallons of spray solution. Check for improved wetting after adding each quart of surfactant. The amount of surfactant needed will depend on the characteristics of the water used. Use the amount needed to improve wetting. Too much or too little surfactant will reduce control. Splitting the application by applying half the 2,4-D rate twice, about seven to fourteen days apart, will further improve the suppression or control of clover and wild onion. Use 2,4-D in conjunction with good fertilization and mowing practices to suppress clover on sites where the weed is well adapted.

In peaches and other stone fruits, add 3 to 4 fluid ounces of Stinger 3A per acre to dramatically improve the control of white clover.

In apples, add 0.7 to 1.0 pints of Starane Ultra per acre to improve the suppression or control of white clover.

Consult the Commercial Production Recommendations for rates and additional information.
Calendar of Events

March 7, 2012 all day - North Jersey Fruit Meeting, Warren Grange #10, 102 Asbury Broadway Road County Route 643, Asbury, NJ 08802 (Warren County). Contact Win Cowgill, coordinator at cowgill@aesop.rutgers.edu or 908-788-1339.


March 13, 2012  9:00 am – 4:00 pm, Blueberry Open House - Kerri Brooke Caterers, 755 South White Horse Pike, Hammonton, NJ. Contact Gary C. Pavlis – 609-625-0056

March 20, 2012  9:30 am – 3:00 pm, Blueberry Food Safety Training – Philip E. Marucci Center for Blueberry & Cranberry Research & Ext., 125a Lake Oswego, Chatsworth, NJ. Contact Robin Yerkes – 609-726-1590


April 11, 2012, 5:30-8:30 - 1st North Jersey Twilight Fruit Meeting. Rutgers Snyder Farm 140 Locust Grove Rd Pittstown, NJ. Contact Win Cowgill <cowgill@njaes.rutgers.edu or 908-788-1339.

Blueberry Food Safety Training
Tuesday, March 20, 2012, 9:30 a.m. – 3:00 p.m.
Philip E. Marucci Center for Blueberry & Cranberry Research and Extension
125a Lake Oswego Rd.
Chatsworth, NJ 08019

Topics Covered:
● Pathogens & Produce: What You Should Know
● Food Safety Modernization Act
● Worker Hygiene
● Harmonized Food Safety Standards
● Where Growers are Losing Points on the Harmonized GAP's Audit
● Water Disinfection Systems for Irrigation
● USDA Verification Audit

This session is supported in part by NJDA/USDA 2012 Specialty Crop Block Grant #12-25-B-1243

2012 New Jersey Agricultural Water Summit
March 21, 2012, 9:00 A.M. to Noon
Rutgers Cooperative Extension of Burlington County
2 Academy Drive
Westampton, NJ 08060

All New Jersey farmers are invited to the Second Annual Agricultural Water Summit, developed to answer all questions regarding permitting, use of I maps, what constitutes good quality irrigation water, how nurseries can safely use run-off, proper pond management and much more.

Ask yourself these questions:
● Did you know that as an agricultural water user, you must now obtain a special permit when spraying near or in the wetlands? (Virtually all New Jersey farms have wetlands)
● Do you know if your farm is located in a critical water area that has restrictions?
● Do you have questions when you file your Water Use Certifications or fill out your Annual Water Use Reports?
● These are just a few of the questions answered and explained for farmers who irrigate in New Jersey.

No registration is required
Due to the critical nature of the subject matter addressed, all growers in New Jersey are strongly encouraged to attend. I hope to see all you at this crucial special meeting.

For more information, call 609-265-5050 or go to: http://www.njaes.rutgers.edu/county/quickinfo.asp?Burlington for directions.
PLANT & PEST ADVISORY

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Pesticide User Responsibility: Use pesticides safely and follow instructions on labels. The pesticide user is responsible for proper use, storage and disposal, residues on crops, and damage caused by drift. For specific labels, special local-needs label 24(c) registration, or section 18 exemption, contact RCE in your County.

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