Importance of Pollinators to Blueberry Production
Rachael Winfree, Ph.D., Assistant Professor, Department of Entomology and Faye Benjamin, Ph.D. Candidate, Graduate Program in Ecology and Evolution

Highbush blueberry, like most flowering plants, requires pollination to achieve its maximum fruit production. Pollination is the transfer of pollen grains, which contain the male gametes of a plant, from the anther (male structure) to the stigma (part of the female structure) of a flower (Figure 1). The pollen then germinates (Figure 2) and fertilizes the ovules of the flower, which become the seeds. The wall of the ovary becomes the fruit. Pollination by pollinators such as honeybees is an essential step in obtaining maximum yield. However, blueberry can produce fruits without any pollination at all, and can also self-pollinate without pollinators. This article explains the relationship between pollination and fruit production in blueberry, with a focus on the value added by pollinators.

Blueberry production without pollination. Many varieties of highbush blueberry are at least moderately parthenocarpic, which means that even flowers that are never pollinated will still develop a small fruit with no seeds. Parthenocarpic ability varies between cultivars, and more recent cultivars have increased parthenocarpy. In one study of Northland, Patriot and Bluecrop, the researcher removed the anthers from flowers (emasculating) so that they could not self-pollinate, and also excluded pollinators so that the flowers couldn’t be cross-pollinated. These flowers set fruit only 26% of the time. In addition, parthenocarpic berries are smaller than pollinated ones and are less desirable. Thus even though blueberry can produce fruit without any pollination at all, production is poor.

Blueberry production with pollination, but without pollinators. Since blueberry flowers have both anthers and a stigma, self-pollination within the flower by gravity or wind can occur without the assistance of bees. However, such pollination usually only occurs at low levels because the receptive stigma surface faces down (Figure 1), such that pollen falling from anthers is unlikely to stick to the stigma. The extent of fruit production that occurs due to self-pollination that is unassisted by pollinators can be tested using flowers that are excluded from pollinators. The variety Jersey had 84% fruit set on pollinator-excluded flowers in one recent study. However, most other varieties don’t set this much fruit without pollinators, and for all varieties including Jersey,

Figure 1. (A) A blueberry flower, showing (B) the anther, which holds the pollen, and (C) the ovary, which develops into the fruit.
berry weight is reduced without pollinators. In summary, even for varieties that can achieve high fruit set through self-pollination in the absence of pollinators, yields are still low because berries are small.

**Blueberry production with pollinators.** Pollinators move pollen in several different ways, all of which benefit blueberry production: from the anthers to the stigma within a single flower (assisted self-pollination within the same flower), between flowers on the same bush, between bushes in a single-cultivar block, and between blocks of different cultivars (this last is called cross-pollination). All types of pollination provided by pollinators increase fruit set, increase fruit weight, and shorten ripening time.

**Fruit set increases with pollinators.** For most varieties fruit set increases strongly with pollination. For example, fruit set of Northland, Patriot and Bluecrop increased from 26% without pollinators to 79% with pollinators.

**Fruit weight increases with pollinators.** All varieties that have been studied show berry weight increases with pollinators. Here we report the main findings for the varieties that have been tested. Bluecrop, Patriot, and Northland increased berry weight by 70 – 180% when flowers were left open to pollinators, compared to pollinator-excluded controls. Similarly, a recent experiment with Jersey, Rubel, and Bluecrop found that berry weight increased by 100-400% for open pollinated flowers compared to pollinator-excluded controls. Even the Jersey cultivar, which achieves high fruit set without pollinators, roughly doubles in berry weight when pollinators are present. The reason pollination increases fruit weight is that pollination increases the number of seeds per berry. The developing seeds then secrete growth hormones that make the fruit larger. However the cultivars that are less dependent on pollination, such as Duke, can produce large fruits even when they set few seeds.

**Cross-pollination requires pollinators.** The only way to achieve pollen movement between varieties, or cross-pollination, is to use pollinators. Cross-pollination generally does not increase fruit set but it can increase fruit weight. Some varieties, such as Northland and Patriot, have 18-85% heavier berries with cross-pollination as compared with pollination by the same variety. In Bluecrop, berry weight can increase by as much as 25% when cross-pollinated with some cultivars. In contrast Duke has similar fruit weight and set with self and outcross pollen.

**How much pollen does blueberry need?**

It is difficult to measure exactly how much pollen a blueberry needs, because this requires counting microscopic pollen grains prior to applying them to the stigma. The only study to do this found that just 10 grains of pollen applied by hand was sufficient to stimulate maximum fruit set in Bluecrop. However, achieving maximum fruit weight required at least 125 grains of pollen. Based on our own research, we can translate 125 pollen grains into the number of bee visits required to fully pollinate one flower: roughly ten honeybee visits, or four bumblebee visits. In our next article in the Fruit edition of the Plant & Pest Advisory, we will report results of our studies of blueberry pollination in and around Hammonton, NJ, including our estimates of whether commercial blueberry fields in this region are receiving sufficient pollination.

**Figure 2.** We took this photograph of a pollinated blueberry flower at 100X magnification through a compound microscope. It shows blueberry pollen tetrads (orange) with pollen tubes (blue-green) on the surface of a stigma. The bright spots are callose plugs in the developing pollen tubes. The pollen nuclei will travel through the pollen tubes to the ovary.

**Blueberry IPM from page 5**

samples over threshold. While the recent cooler temperatures have been helpful in reducing additional buildup of weevil, almost all of the sites that made up the initial 19% have been treated with a perimeter spray of Asana or Imidan. At this point the flowers are advanced enough (1st open flowers seen 4/2) that we do not expect much additional further buildup, although additional feeding is always possible.

✔ **Plum Curculio (PC):** With the cooler weather, less activity was seen this week than the previous week. No adults were seen in any beating tray samples.

✔ **Lep. Larvae, including Spanworms:** Low levels of spanworm were seen at only one site. No problems exist across our production area. Redbanded Leafroller adults are flying. The eggs which these moths are laying should be hatching soon, with larvae visible in a week or two. ❏
Peach

**Petal Fall Insect Complex (From the Week of 3/25):** An OFM biofix was set at the Rutgers Research Farm in Centerton on 3/21. OFM were captured at sustained rates in commercial orchards a few days later. Treatments for the first flight will be due at 170-200 degree days after first catch or “biofix.” This timing usually coincides with late petal fall to shuck split. Current forecasts indicate this will be on or about **4/6 to 4/10** in Gloucester and other southern counties. While organophosphates (Imidan, Diazinon), carbamates (Lannate, Sevin), and synthetic pyrethroids (Asana, Ambush/Pounce, Warrior, Baythroid) are rated for control of petal fall insect pests, experience has shown that the pyrethroids may be weak at lower rates against plum curculio (PC). If using any pyrethroids (Ambush, Asana, Baythroid, Danitol, Perm-Up, Pounce, Warrior, Lambda-Cy, or any of the other generics), use a high rate in order to control both OFM and PC. Endigo, a premix for stone fruit; contains the active ingredients for warrior and actara and is a good choice around shuck split for the entire insect complex. Rotate pyrethroids (IRAC group 3) and O.P.’s (IRAC group 1B) with different chemistries for resistance management (see IRAC groups below). The 3 primary arthropod targets at petal fall are **OFM, PC and various catfacing insects, primarily tarnished plant bug and stinkbugs.**

**Oriental Fruit Moth (OFM) (Week of 4/1):** With the cooler weather has come a slowing in insect development. About 7-10 days ago it looked like OFM egg laying and hatch would be well under way by the first week of April. Now we are looking at 4/10 to 13 as the ideal dates to spray. Treatments should be applied between 170 to 200 degree days base 45 after the first sustained catch (Biofix). We are currently at 122DD in southern counties. Skybit predictions are to reach 173 DD in southern counties by 4/10. Ideally this will be applied in a full cover application, alternate middle sprays applied just a few days apart will also work. A second insecticide cover should be applied between 350-375 DD. This is predicted to be on or about 4/30 to 5/2 in southern counties. Note that many blocks may still have considerable bloom. Since the biofix was set using a very high population at RAREC, and trap captures in commercial orchards are near zero, most growers should have no problem delaying the petal fall spray until all petals are off the tree. **Do not apply insecticides during bloom.** If using Imidan for OFM control, do not use less than 3#/ac. If the temperatures warm up, we could see increased plum curculio and catfacing insect activity. See above (week of 3/25) and the NJ Commercial tree Fruit Production guide for insecticide options. The first and second spray dates for southern, counties are as follows:

<table>
<thead>
<tr>
<th>County / Region</th>
<th>1st Spray Date</th>
<th>2nd Spray Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gloucester – Southern</td>
<td>4/10-4/13</td>
<td>4/30-5/2</td>
</tr>
<tr>
<td>Monmouth – Central</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hunterdon – Northern</td>
<td></td>
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</tr>
</tbody>
</table>

**Green Peach Aphids (GPA):** At this time of year, growers should not tolerate more than 2 colonies per tree on peach or 1 colony per tree on nectarines. While this is a very conservative estimate for peaches, aphid populations should definitely not be tolerated on nectarines, since they will directly damage and deform the fruit. Aphids should not be an issue where Esteem was applied at the delayed dormant stage. The neonicotinoids (Actara, Assail, Provado/Admire) and the premixes, Voliam Flexi and Leverage are the best materials to control aphids. Some of these have a wider spectrum of control than others. For example, Admire has only aphid activity at this time of year. Actara will control plum curculio, tarnished plant bug, and stink bugs (at a higher rate of 4.5 to 5.5 oz/A as opposed to 3-4 oz/A for aphids). Assail will control aphids, OFM, plant bugs and native stink bugs at the higher rate. Leverage (a premix of Admire + Baythroid), and Voliam Flexi (a premix of Actara + Altacor) are rated excellent for aphid control. Endigo (a premix of Actara + Warrior) should work well also. See the Tree Fruit Production Guide for further details. Lannate and Thionex will also suppress aphids, but not as effectively as the neonicotinoids. This is the last year for Thionex in peaches and nectarines, and this material is better left for early brown marmorated stink bug (BMSB) control if needed later, but still “early season”.

**Thrips (From the Week of 3/25):** Thrips overwinter as adults in leaf litter and other protected places. Flower thrips and western flower thrips can start moving into orchards sometime during the bloom to petal fall period and can be troublesome on nectarines in some years. While it is impossible to predict insect activity over the long term, we have had a very mild winter and relatively dry conditions. This may favor thrips survival and lead to higher populations than normal. Make sure to check your flowers and early developing fruit. Lannate, and Delegate are effective for thrips control at petal fall to shuck split. Carzol may be used up to petal fall. Entrust can be purchased if you want the slightly more active ingredient that was in Spintor. Actara can provide suppression. Thrips monitoring can be accomplished by collecting a sample of blossoms; opening the shucks and examining the inside with a hand lens. See fig. 1. If thrips are present inside the shucks, treatment with an effective insecticide is suggested. As of 4/3 thrips ac-
tivity has not been observed in nectarine flowers, however if temperatures climb into the 80’s thrips could become active. Although early thrips injury is sometimes seen on both peaches and nectarines at harvest, they are generally considered more damaging to nectarines.

http://www.caf.wvu.edu/Kearneysville/pest_descriptions/visualkey/ph1-112.jpg

✔ **Bacterial Spot:** Treatments using copper formulations or terramycin should start at petal fall. Oxytetracycline (a specific type of terramycin – Mycoshield and FireLine) formulations have limited residual activity, and are thought to have as much as 24 hours “back-action”. Mycoshield/FireLine works best when applied as dilute as possible and under slow drying conditions up to 4 days prior to a rain event. Bacterial spot could be an issue this season if our current windy weather pattern continues. Fruit will be very susceptible at shuck split. See the production guide for recommended materials and rates. Coppers (Champ, Copper-Count-N, Cuprofix, Kocide, and Nu-Cop) can also be started at late petal to shuck split. Watch your rates, since these can all be phytotoxic, and ironically the same conditions (cooler weather with slow drying conditions) that make antibiotics more effective because of increased uptake, also provide better conditions for more phytotoxicity.

✔ **Rusty Spot:** Rally should be included at petal fall on rusty spot sensitive varieties. Apply at 2.5 – 5 ozs./acre. Gem alone should be adequate for all diseases, including Rusty Spot when applied at higher rates.

✔ **Brown Rot (From the Week of 3/25):** Trees in southern counties are entering petal fall, but much bloom is present in southern, central and northern counties. Blossom infections from the brown rot fungus can occur whenever pistils are exposed and favorable conditions exist. Infections can occur during any wetting period when temperatures are between 41 and 86 °F, with **optimum conditions** occurring with **wetting and temperatures in the mid 70’s.** If we have prolonged wetting periods, growers are advised to maintain cover sprays as outlined in Norm Lalancette’s article in an earlier newsletter. A key paragraph about control options is reprinted here:

“The recommended fungicides for blossom blight applications consist of the protectants Captan or chlorothalonil (Bravo, Echo, etc.), the site-specific fungicides Vanguard or Rovral, or some combination of these two fungicide types. Topsin-M or Topsin-M + Captan could also be used for one of the applications. **If peach scab and/or rusty spot** are problematic in a block, then Gem or Abound at the highest label rate should be used for the petal fall spray; these materials will control all three diseases at this timing. As a fungicide resistance management strategy, it is highly recommended that DMIs not be used during bloom, but be “saved” for preharvest brown rot control. The DMIs, belonging to FRAC group 3, are listed in Table 6.4 on p. 88 of the 2012 NJ Commercial Tree Fruit Production Guide.”

✔ **Peach Scab (From the Week of 3/25):** Scab has become more prevalent and widespread in recent years. As petal fall becomes shuck split, scab becomes an important disease to control. In blocks that had scab last season, increased levels of overwintered scab inoculum are present on last year’s wood, and as rain occurs, spores are splashed onto the fruit during rainy periods from shuck split through the following six weeks. The lesions appear from 40 to 70 days after infection. They first appear as small (1-2 mm) green spots, but enlarge to 2-3 mm and become black as spores are produced. Most lesions are found on the shoulders of the fruit where spores were splashed down from the twig. They do not appear until about redhaven season, but by then the damage has already occurred. Since conidia begin forming around petal fall, the first scab sprays should begin then. Gem, Bravo, Adament, Pristine, or a Captan/Topsin-M combination are all very effective scab fungicides. These materials are also very effective for blossom blight control. Adament (a premix of trifloxystrobin (Gem) and a very low rate of tebuconazole (Elite)), Gem, and Topsin should be applied at full rates during petal fall to get suppression of lesions. Solid applications are preferable.

### Apple

✔ **Diseases:** Apple Scab, Powdery Mildew, Cedar Apple Rust, are diseases of concern at this time. Primary apple scab spores are being released during any substantial wetting and infection period. Make sure you are well covered. Please see the Rosenberger/Cox article in an earlier newsletter. Cedar apple rust infections can occur anytime between pink and 3rd cover. The sterol inhibitors (Si’s) Rally, Procure, Vintage, and Indar are standard mildew materials, especially when combined with an EBDC. See page 152 of the Tree Fruit Production Guide for more details. We know that ascospores are maturing and will infect leaves anytime infection periods occur, and Pennsylvania researchers are reporting higher than normal ascospore activity. All this points out the Importance of Modeling and Predicting Scab Infection Periods. We would like to draw your attention to the NEWA (Network for Environment and Weather Applications) site for pest modeling, http://newa.cornell.edu This web site is run by Cornell University and the New York State Integrated Pest Management Program. NJAES has contributed funding toward the site and as a result, placed many New Jersey weather stations in the system. The models are so reliable in predicting scab infections, that New York researches no longer rely on using laboratory spore release counts to help predict the severity of those infection periods.

The enclosed map from the NEWA site (on page 5) illustrates the many NJ sites that are now online and included

See NEWA Map on page 5
in the system. Other diseases for both apples and grapes as well as insect models are included.

✔ Fire Blight: From a calendar perspective, blossom sprays using Streptomycin should be applied on a 3-7 day schedule or anytime temperatures are 65° F or above and the relative humidity is 60% or above. Mycoshield now has a supplemental label allowing use on apples. Rotations of Streptomycin and Oxytetracycline will help manage resistance. However, from a more accurate and economical modeling perspective, using the NEWA site, little fire blight activity is expected over the next 6 days in both the Upper Deerfield or Pittstown areas.

Given the fact that bloom is not present yet, the modeling still tailors disease conditions for your area.

Wine Grapes

✔ Flea Beetles: Flea Beetle activity was observed Friday March 30 in a southern county vineyard. Scout vineyards edges especially near wooded areas for injury. See photo of the adult and recently fed on bud. Adults overwinter in the woods around vineyards, and emerge when the weather warms and buds emerge. Adults feed on and hollow out the buds, especially on border plants. Prolonged cooler weather can prolong the time when this injury occurs. Adults will lay eggs which will hatch into small green larvae that will feed on the foliage. Economic damage is rare over an entire planting, but may be locally high on the borders.

Scouting Calendar

The following table is intended as an aid for orchard scouting. It should not be used to time pesticide applications. Median dates for pest events and crop phenology are displayed. These dates are compiled from observations made since 1995 in Gloucester County. Events in northern New Jersey should occur 7-10 days later.

<table>
<thead>
<tr>
<th>Pest Event or Growth Stage</th>
<th>Approximate Date</th>
<th>2012 Observed Date</th>
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<tbody>
<tr>
<td>1/4” Green Tip Red Delicious</td>
<td>March 27 +/- 10 Days</td>
<td>March 19</td>
</tr>
<tr>
<td>Tight Cluster Red Delicious</td>
<td>April 8 +/- 10 Days</td>
<td>March 26</td>
</tr>
<tr>
<td>Oriental Fruit Moth Biofix</td>
<td>April 8 +/- 10 Days</td>
<td>March 20</td>
</tr>
<tr>
<td>Pink Peach (Redhaven)</td>
<td>April 10 +/- 9 Days</td>
<td>March 19</td>
</tr>
<tr>
<td>Pink Apple (Red Delicious)</td>
<td>April 13 +/- 11 Days</td>
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</tr>
<tr>
<td>Full Bloom Peach (Redhaven)</td>
<td>April 16 +/- 7 Days</td>
<td>March 26</td>
</tr>
<tr>
<td>Green Peach Aphid Observed</td>
<td>April 16 +/- 16 Days</td>
<td>Not yet observed</td>
</tr>
<tr>
<td>Oriental Fruit Moth – 175 DD target</td>
<td>April 19 +/- 12 Days</td>
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</tr>
<tr>
<td>Full Bloom Apple (Red Delicious)</td>
<td>April 20 +/- 9 Days</td>
<td>Not yet observed</td>
</tr>
<tr>
<td>Petal Fall (Redhaven)</td>
<td>April 21 +/- 9 Days</td>
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</tr>
<tr>
<td>Petal Fall (Red Delicious)</td>
<td>April 22 +/- 13 Days</td>
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</tr>
<tr>
<td>Shuck Split (Redhaven)</td>
<td>April 29 +/- 7 Days</td>
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</tr>
<tr>
<td>Tufted Apple Bud Moth Biofix</td>
<td>May 4 +/- 10 Days</td>
<td>Not yet observed</td>
</tr>
<tr>
<td>Plum Curculio Oviposition Begins</td>
<td>May 5 +/- 16 Days</td>
<td>Not yet observed</td>
</tr>
<tr>
<td>Oriental Fruit Moth – 375 DD target</td>
<td>May 10 +/- 10 Days</td>
<td>Current Forecast – May 1</td>
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<tr>
<td>Codling Moth Biofix</td>
<td>May 14 +/- 16 Days</td>
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Trap Counts – Southern Counties

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<th>OFM-A</th>
<th>DWB</th>
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Trap Counts – Northern Counties

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<th>TABM-A</th>
<th>AM</th>
<th>DWB</th>
<th>OBLR</th>
<th>OFM-P</th>
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<th>LPTB</th>
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</tr>
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</table>

Blueberry

✔ Cranberry Weevil (CBW): Our beating tray samples are showing that 41% have been positive for any presence of CBW. Only 3% of samples were above threshold of 5/bush. During the previous week we saw 19% of

See Blueberry IPM on page 2
In Northern New Jersey, apple bloom is running exactly 22 days ahead of a normal year. It is hard to believe we are approaching pink bud in Northern NJ. Normal bloom apples in Hunterdon County/Snyder Farm is May 5-10 at Snyder so we will be significantly earlier than normal. What is normal anymore?!

Cold and Freeze Injury: growers in Hunterdon, Morris, Sussex Counties have reported some apple injury from the cold event on Monday March 26, primarily losing the king flower. This still leaves the side flowers that will need to be thinned. Sevin XLR with or without NAA at PF will be your best choice in this situation. You will need to get some of the side fruitlets off. If the king flower bud is gone you will not have the flower bud size difference to count on at the 8-12 MM window. It will be essential then to get some thinner on at PF.

**Apple Chemical Thinning**

It is time to begin our chemical apple thinning strategies for 2012. No single practice in apple production will have a greater impact on the bottom line than the utilization of plant growth regulators (PGR's) for chemical thinning and return bloom.

Bloom and petal fall thinning are becoming increasingly popular with apple growers. Thinning at these early stages allows us to make one or two additional applications if needed.

Chemical thinning stabilizes annual crop production and improves size, color and quality of fruit. Research has shown that fruit size is directly related to how early fruits are thinned. Thinning that reduces the clustering of fruit will improve fruit color and quality. Adequate chemical thinning will promote return bloom, and promote consistent annual production of crops.

No single thinning program is applicable to all orchards because of the many variables. Past experience combined with detailed records of materials, rates, crop performance, crop management practices, yield and weather conditions are your best guide.

Below are some of the factors followed by a discussion of timing windows for application, the materials available and some general recommendations.

**Climatic conditions** cannot be controlled but can greatly affect the strength of fruit set and the effectiveness of chemical thinning materials. A combination of temperature, humidity, wind and elevation will all affect chemical activity. Thinners, when applied during poor drying conditions, will generally increase activity. Dew or light rain following treatment may re-suspend the chemical and cause additional uptake.

**Cloudy conditions** cause shading and reduce the carbohydrate levels in young fruits, causing poor fruit retention. Applying thinners just before, during, or just after a three-day cloudy period, especially when temperatures are above 65°F would likely increase the thinning response.

Note For 2012 Sevin XLR is still the workhorse and cornerstone of our apple thinning programs. Growers should consider applying Sevin XLR at petal fall on all varieties.

**Warming Trend** - Thinning activity is related to temperature, with more thinning activity when materials are applied in a warming trend. This approach is gaining momentum around the country. That is, targeting our PGR thinning activity when we have a warmer weather trend predicted to follow application and the two days following.

What does the above mean to you the grower? It means rates; materials and timing must be adjusted based on the season's current weather conditions.

**Windows of Application for Thinning Apples**

**Bloom Thinning Apple** – Across North America apple growers are thinning earlier and earlier to maximize fruit size. Bloom thinning enhances fruit size. The earlier we thin the larger the fruit size that can be obtained. Additional thinning applications will be needed in most years. NAA does not have a memory and therefore repeat applications are not cumulative and can be made. Cornell recommends Ammonium Thiosulfate (ATS) on hard-to-thin varieties at 50% bloom. Their rate is 2 gallons of ATS per 100 gallons based on a full dilute TRV application.

**Petal Fall Window (PF up to 6MM size)** - All labeled thinning materials are effective at this time including NAA, NAD, ACCCELL™ Vydate, and Sevin. Thinning early gives greater fruit size, but usually at PF we do not take enough fruit off and must come back again with another application.

**Early Fruit Set Window (8mm up to 12mm)** - This is the traditional time for chemically thinning apples. All labeled thinning materials are effective at this time including NAA, Maxcel, Vydate, Sevin, ethephon.

**Notes and Suggestions for Apple Thinning in 2012**

- In general, early applications of good rates thin aggressively. Moderate and mild thinning occurs at lower rates and/or at later timings.
- Rates of individual thinners and/or combinations should be based on past grower experience with individual cultivars in each fruit block or use variety and rate guidelines as outlined in our 2012 NJ Commercial Tree Fruit Manual (E-002). [http://njaes.rutgers.edu/pubs/publication.asp?pid=E002]

**Thoughts on NAA**: many researchers have been indicating that NAA thins fruit and helps with return bloom, but have found NAA does not increase fruit size. In addition, in up to a third of the cases, NAA may reduce fruit size if applied after 8MM in size. Hence the move toward Sevin XLR or Sevin and NAA combinations applied early.

*See Thinning on page 7*
As you can see there are a lot of ways to go. Try some bloom and petal fall sprays, use multiple applications. Keep detailed records including weather two days before and two days after application. Always be sure to leave some check trees. Experiment slowly on portions of your acreage cultivar by cultivar.

If you still have too much fruit after petal fall and 8-10 MM applications, consider the use of Ethephon or Ethephon combinations when fruit size is greater than 18MM.

A Review of Chemical Choice for Apple Thinning

NAA - is one of our oldest and most reliable thinners. It can be applied from petal fall to 16MM fruit size at rates of 5ppm to 20ppm per 100 gallons. Adjust the rate based on timing and cultivar.

Caution Notes: on red delicious do not apply concentrations more than 5 ppm to avoid pygmy fruits. Do not use NAA or NAD on any trees that are to be treated with Maxcell, Promalin or Provide this year! Pygmy fruits may result. Do not use NAA on Fuji for the same reason.

NAD - is a mild form of NAA and is used at PF and early fruit set only! It is very effective on summer varieties such as PaulaRed, Jerseymac, Macintosh cultivars and Macoun. It is usually applied at 40-50 ppm per 100 gallons at PF-5MM. However it is not available in NJ anymore, growers have been able to get it from CPS in NY State.

6-BA-Maxcell or Excellis - is best used in combination with Sevin at 50-to 100 ppm. It also works best in a warming trend over 65F and works best between 8-12 MM. Caution should be used if temperatures approach 85F or higher.

Caution Notes: 6-BA and Sevin can be a very aggressive combination on Gala especially under the right weather conditions (cloudy days following application can cause over thinning).

Sevin is a carbamate insecticide that is a standard thinner for apples. Only Sevin XLR-Plus should be used. It has been reported to be safer on bees and to have less toxicity to mite predators. It has the same concentration of active ingredient as Sevin 50W and thins the same way. Sevin is a mild thinner at the full rate of 1 quart/acre. It can be used at PF till 20 mm and is best used in combination with other thinners (NAA or 6-BA) with most varieties. When used alone it may underthin some cultivars in NJ. (Do not use Vydate in combination with Sevin.

Vydate L is a carbamate insecticide that works the same way as Sevin. Vydate has had a state label in NJ since 1996 based on our research trials in North Jersey. It too is a mild thinner like Sevin and should be used in combination with another thinner for best results (NAA or Accell). At 1-2 pints per 100 gallons it should be applied dilute between PF/5MM and 20MM. Up to
Wine Grape Information for the Region

Mark L. Chien, Viticulture Educator, Penn State Cooperative Extension

Source: Electronic newsletter, Penn State Extension, March 29, 2012

It’s time to get ready for an early vintage. Please read Here We Go Again 2012 at http://www.pawingrape.com/uploads/PDF%20files/Documents/Vintages/Here%20%20Go%20Again%202012%20v1.1.pdf for what you should be doing now.

Frost: I had the first report of bud break in Chardonnay in SE PA last week, which I normally expect in the 2nd-3rd week of April and frost season usually extends to May 10-15 in SE PA. Early can mean a lot of things, probably of greatest concern to growers now is frost, but if we dodge that bullet, we might have an early harvest and beat the hurricanes. Unfortunately, there is not a whole lot that growers without active protection measures can do, short. The best protection is a good site that sheds air. The best information about frost and frost management on the internet:

Dr. Tony Wolf, Virginia Tech. Situation Update 3-26-12. Frost/Freeze potential.


University of California Biometeorology Program http://biomet.ucdavis.edu/frost-protection.html

Zabadal (Michigan State CE) et al. Winter Injury to Grapes and Methods of Protection (2007): it’s the bible on anatomy, physiology and reality of frost and freeze in vineyards

Management note: Flea beetle (also called steely beetle) and climbing cutworm are being reported around the region as a result of the warm weather and early bud break. If the cooler weather continues and bud break stalls, extended buds will be susceptible to damage. Growers should scout for them and if necessary, implement control measures. Remember 2012? It began late, cool and wet and there was plenty of disease (phomopsis, downy, early botrytis, etc.), and it finished warm and wet (lots of downy, fruit rots, etc.). It sets us up for another difficult disease year if conditions are favorable, so it is important to apply the right fungicides at the right time, calibrate your sprayer correctly, read Andrew Lander’s Effective Vineyard Spraying http://www.effectivespraying.com and start early, and if necessary, at tighter intervals, with particular care through the critical pre-bloom through post-bloom period. Up front investments in IPM will pay dividends around harvest. And don’t forget cultural practices, not the least vineyard sanitation, that promote healthy leaves and fruit.

Grape IPM: Highlights from the grape IPM workshop: Following on the research by Stan Howell (Michigan) and Stefano Poni (Italy), his early leaf removal research may, according to my understanding, offer important potential benefits to grape and wine quality: 1. It’s less expensive to remove leaves pre-bloom that post fruit-set, 2. Compact clusters are loosened by varying amounts according to conditions, variety and site, 3. Yields are reduced (may or may not be a desired outcome), which can save costs on green thinning later on in the season, 4. With looser clusters, bunch rot diseases are reduced, in some trials very significantly, 5. Higher harvest brix may occur due to an increase in the leaves to fruit ratio, 6. There may also be a higher skin to juice ratio, which can boost color in red varieties, 7. No measurable effect on grape acidity (this may or may not be desirable). And, yes, with an Avidor or Collard pulsed-air leaf remover, the pre-bloom leaf removal can be done quickly, safely and effectively. Dr. Noemi Halbrendt talked about new fungicide materials available for downy mildew and powdery mildew. Given the cost of developing new pesticides, it’s remarkable that companies are still cranking out new products, it is our good fortune All grape growers should be intimately familiar with FRAC (fungicide resistance action committee) codes, which classify pesticides according to their chemistry and ability to develop resistance from overuse. Basically, for resistance sensitive strobilurin products, growers have 15-25 applications of any single product before resistance develops. Noemi explained that Pristine became effectively unusable in the FREC research vineyard in 2011, so great care must be taken to rotate between classes of fungicides, which is more easily done with a wider range of materials available. It is also important to keep up with new products, which is why grape growers should consult the 2012 NY-PA Pest Management Guidelines for Grapes http://ipmguidelines.org/grapes and Dr. Wayne Wilcox’s (Cornell University) 2012 Disease Updates. Finally, I’ll mention the talk on vineyard weed control given by my colleague in Bucks County, Scott Guiser. Grape growers do not like to use herbicides yet with the weed pressure in vineyards due to our wet climate, they are an essential tool, especially in young vineyards. I recommend that vineyards be kept relatively weed-free through the early years with proper herbicide use and then a blended approach using post-emergence herbicides and mechanical (grape hoe) can be used successfully to manage weeds. As Scott explained, there are plenty of tools for growers to use. One of the keys to success is the proper calibration of the herbicide sprayer. There are lots of materials to explain how to do this on-line and in the NY-PA manual. The Ontario Grape IPM website that OMAFRA developed is an outstanding resource for wine growers in Eastern US.

Water and Berries: Last fall as berries burst, opening the door to sour rot and botrytis there was discus-

See Wine Grape on page 9
sion about the relationship between water and berries. In Oregon, we assumed that rain water was taken up by the roots and transported to berries which diluted flavors and sugars. Very bad for wine quality. The work by Dr. Markus Keller in Washington State (WSU Wine and Grape Newsletter, 18:1, pg 10) explains that that the xylem connection to the berry is terminated around veraison and that water is mainly absorbed across the berry skin. Recently, work by Becker and Knoche (AJEV 62-3, 2011) indicates that water intrusion is through an as yet undetermined site in the vicinity of the cap stem. It appears that the roots are no longer implicated but many growers I talk to doubt this. Bibiana Guerra, has summarized the work by Becker and Tobias in Water Movement through the Berry Surface - food for thought as we consider how to prevent berry dilution and cracking in wet vintages like 2011.

Upcoming Meetings: The Northern Wine Project hosts monthly meetings (second Tuesday) on a variety of grape growing and wine making topics of interest to producers in cold climates (but they often apply to warm ones, too). The next webinar is on April 12 at Noon EDT and will be about grape diseases, with a focus on anthracnose, which appears in very wet seasons (like 2009 and 2011). Dr. Wayne Wilcox from Cornell will address other grape diseases. Pre-registration is requested. You can access past webinars from the NWP website. Please mark your calendars for the Penn State V&E Research Summit on Wednesday, May 23rd at the Penn State Food Science Building. Invited speakers include Dr. Tony Wolf, Dr. Tim Martinson, Dr. Anna Katherine Mansfield, and members of the Penn State V&E research team.

Enology: Denise Gardner, the Penn State extension enologist has two winemaking meetings coming up: the winery sanitation workshop in cooperation with Cornell at CLEREL in western New York on April 11th, and the Pennsylvania WQI Level II: sensory attributes being held in Lancaster, Erie, Westmoreland and Wyoming counties in April and May.


Submitted by Jerry Frecon, Agricultural Agent.

Vydate L from page 7

two applications can be made per season. Vydate may be less toxic to mite predators than Sevin and at the 1-2 pint /100 rate has activity on spotted tentiform leafminers if present and white apple leafhopper at the thinning timing.

Ethephon 2 or Ethrel are both labeled for apple thinning. Manufactured by Microflow and Bayer respectively, their labels are slightly different. Ethephon is used extensively throughout Europe to help bring non-bearing apples into production as well. This use is outlined on both labels. More on the use of Ethrel in future newsletters. [http://extension.umass.edu/fruitadvisor/fact-sheets/late-season-rescue-thinning-ethephon](http://extension.umass.edu/fruitadvisor/fact-sheets/late-season-rescue-thinning-ethephon).

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Calendar of Events

April 11, 2012 5:30 pm – 8:45 pm, 1st North Jersey Twilight Fruit Meeting for Commercial Fruit Growers – Rutgers Snyder Farm, Pittstown, NJ. Sponsored by Rutgers Coop. Ext. NJAES. For Commercial FruitGrowers only. Pesticide Credits will be issued.

April 12, 2012 5:30 pm – 8:00 pm, Twilight Fruit Growers Meeting – Adams/Franklin Counties- Bream & Bear Mtn. Cold Storage, 685 Carlisle Rd., Bigler, PA. Contact Tara Baugher, tab36@psu.edu. 717-334-6271.

April 18, 2012 7:15 pm – 9:30 pm, Evening Fruit Meeting - Gloucester County Office of Government Services-Auditorium, 1200 North Delsea Drive, Clayton, NJ. Sponsored by NJAES, 856-307-6450. Ext. 1. Pesticide Credits will be issued.

April 24, 2012 Blueberry Twilight Meeting – Atlantic Blueberry Company, 7201 Weymouth Rd. Hammonton, NJ. For commercial growers only. Sponsored by Rutgers Coop. Ext. NJAES. Contact Gary Pavlis, 609-625-0056.

April 28, 2012 10:00 am – 4:00 pm, Ag Field Day at Rutgers Day – George H. Cook Campus, New Brunswick, NJ. For more information: [http://agfieldday.rutgers.edu](http://agfieldday.rutgers.edu).

May 8, 2012 1:00 pm, Twilight Meeting for Fruit Growers, Lancaster/York Counties – Lancaster/York Co. Contact Tim Elkner, 717-394-6851, fax: 717-394-3962, tee2@psu.edu.

May 9, 2012 3:00 pm – 5:00 pm, Twilight Meeting for Fruit Growers, Adams County- McCleaf’s Orchard, 104 W. Guernsey Rd. Biglerville, PA. Contact Tara Baugher 717-334-6271, tab36@psu.edu.

May 24, 2012 Twilight Meeting for Fruit Growers, Southeastern, PA., Contact Rick Kaufmann, 610-378-1327, fax: 610-378-1327, rsk5@psu.edu.

May 29, 2012 Blueberry Twilight Meeting – Philip E. Marucci Center for Blueberry & Cranberry Research, 125a Lake Oswego, Chatsworth, NJ. Sponsored by Rutgers Coop. Ext. NJAES. Contact Gary Pavlis, 609-625-0056.

June 5, 2012 6:30 pm – 8:30 pm, Twilight Meeting for Fruit Growers, Catoctin Mt. Orchard, Thurmont, MD. Contact Tara Baugher 717-334-6271, tab36@psu.edu.
PLANT & PEST ADVISORY

FRUIT EDITION - CONTRIBUTORS

Rutgers NJAES Cooperative Extension Specialists
George Hamilton, Ph.D., Pest Management
Norman Lalancette, Ph.D., Tree Fruit Pathology
Bradley A. Majek, Ph.D., Weed Science
Peter Oudemans, Ph.D., Small Fruit Plant Pathology
Cesar Rodriguez-Saona, Ph.D., Cranberry/Blueberry Entomology
Daniel Ward, Ph.D., Pomology

Rutgers NJAES
Joseph Goffreda, Ph.D., Breeding

Rutgers NJAES - CE Agricultural Agents and Program Associates
Atlantic County, Gary C. Pavlis, Ph.D. (609-625-0056)
Gloucester County, Jerome L. Frecon (856-307-6450)
Hunterdon County, Winfred P. Cowgill, Jr. (908-788-1338)
Morris County, Peter J. Nitzsche (973-285-8300)
Passaic, Elaine Fogerty, Agric. Assistant (973-305-5740)
Warren County, (908-475-6505)
Fruit IPM, Dean Polk (609-758-7311)
Atanas Atanassov, Ph.D., Program Associate (908-788-1338)
Gene Rizio, Program Associate (856-566-2900)
David Schmitt, Program Associate (856-307-6450)

Newsletter Production
Jack Rabin, Associate Director for Farm Services, NJAES
Cindy Rovins, Agricultural Communications Editor

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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