As we begin the new season I hope you had a great winter. This is first edition of The Blueberry Bulletin. The 2013 Commercial Blueberry Pest Control Recommendations for New Jersey may be picked up at any extension office or downloaded from the Rutgers NJAES web site at http://njaes.rutgers.edu/pubs/. Click on “All Fact Sheets & Bulletins” and scroll down to ID# E265.

Also, ‘AT A GLANCE…’ will continue, and is a summary of each week's information. I hope it is something you can and will use.

If you have a problem during the season, please call me.

Any comments, suggestions, constructive criticism about The Blueberry Bulletin newsletter would be greatly appreciated. Also if you have any specific problems which you feel should be addressed, please let me know.

Help me to serve you better.

Here's hoping for all a very successful 2013.

Sincerely,

Gary C. Pavlis, Ph.D.
Atlantic County Agricultural Agent
Cranberry Weevil

Life cycle: Adults move from wooded areas, where they overwinter, into the fields; however, adults occasionally overwinter inside blueberry fields if left unmanaged. The adults are small (1/16 inch long), dark reddish brown beetles, with few whitish bands on the wings, and a long snout (see Picture 1). Eggs are laid singly through the feeding holes into the flower. Larvae feed from egg hatch to pupation within the flower buds in which they were deposited as eggs. Pupation occurs within the infested flowers and adults emerge in late May. Infested flowers turn purplish, fail to open, and eventually fall to the ground.

Scouting and Control: To monitor adults, use a beating tray under each bush and hit the bush to dislodge weevils; repeat on both sides of the bush to obtain number of weevils per bush. Because weevils are abundant near the woods where they overwinter, sampling for weevils should be intensified along the edge rows near the woods. Adults are found on sunny days. Monitor at least 10 bushes per sample site. Spraying should be confined to these “hot” spots on edge rows. Treatment thresholds are 5 weevils per bush or 20% of blossom clusters with feeding injury (i.e., at least 1 injury/puncture per 5 clusters) (see Picture 2). Adjourn, Asana, Avaunt, Imidan, Lannate, Brigade, Hero, or Mustang Max are recommended for cranberry weevil control.

Current Research on Cranberry Weevil at Rutgers

The cranberry weevil is a key pest of highbush blueberries and cranberries in Massachusetts, Michigan, New Jersey, and Wisconsin. The economic injury is due to the larvae, which feed and develop inside the flower buds and prevent the formation of fruit. Management strategies for this pest are targeted against the mobile adults; thus, monitoring plays an important role in its control. Monitoring for cranberry weevil adults starts at bud swell and continues through bloom; for a total length of about two months. Because weevil populations tend to aggregate at field edges, monitoring efforts focus along these areas. In highbush blueberries, cranberry weevil adults are monitored using beating trays or by visually surveying buds and blossoms (action threshold is an average of 5 weevils per bush or 20% of blossom clusters with reported...
injury). However, clumped spatial distribution of adults makes the aforementioned monitoring techniques unreliable and expensive. A reliable monitoring tool that estimates cranberry weevil population occurrences and densities is essential for an effective IPM program.

Recently, we identified the main components of the cranberry weevil aggregation pheromone and, in field evaluations, we demonstrated that yellow sticky traps (Picture 3) baited with the blend of four aggregation pheromone components trapped significantly more cranberry weevil adults than eight other blends and unbaited controls in blueberry. The goal of our current project (funded by the USDA Pest Management Alternatives Program) is to optimize the lure and trap by testing different trap designs, placements, and blends of the cranberry weevil aggregation pheromone. The results will help in developing a pheromone-based lure for monitoring as well as an attractant that can be used in the development of a baited trap-plant control strategy similar to the one used against plum curculio in apples or attract-and-kill strategies. Development of spatially-precise management techniques may lead to significant reduction in the use of pesticides targeted against cranberry weevil in blueberries.

**Plum Curculio:** One adult was seen in a beating tray sample, indicating that adults became active during the warm temperatures we experienced last week. To see adults present before bloom as unusual. Adults were also captured in experimental attractant pyramid traps.

*Life Cycle.* In New Jersey, plum curculio completes a single generation a year in blueberries. This insect overwinters as an adult in leaf litter. Adults become active during bloom and feed on young fruit just after bloom, causing feeding scars. We have noticed that in the absence of fruit, adults feed on blueberry flowers (petals). Females lay eggs in the fruit causing crescent-shaped oviposition scars (see Picture 4). White maggot-like larvae develop inside the fruit (one larva per fruit). Feeding by the larvae causes fruit to develop prematurely and fall off the bush. Mature larvae exit the fruit to pupate in the ground, and become an adult in July and August. If berries are picked before picture}
they drop, larvae can contaminate harvested fruit.

*Scouting and Control.* To monitor plum curculio populations, scout for the semi-circular scars on the fruit. Sampling should be biased towards field edges or infields that border woods and hedgerows. Plum curculio infestations are more common in weedy fields and those with sod middles. This pest is more of a problem on early maturing varieties. No threshold has been established, so treatment is mainly based on past history and an estimate of damage to fruit. Control methods target the immature and adult stages. Rimon can be used before bloom to prevent fruit infestation. Rimon affects female oviposition behavior and egg and larval development. Chemical controls targeting the adults should be applied soon after bees are removed. Post-bloom control options include Avaunt, Danitol, Brigade, Mustang Max, and Imidan.

**Frequently Asked Questions on Plum Curculio**

*Why is Plum Curculio a problem now?*

Plum curculio has historically been considered an occasional pest in blueberries in New Jersey. Over the past 10-15 years more early varieties have been planted. Long term trends seem to be to plant more Duke. Duke is likely to have more infested fruit than later varieties (Bluecrop and Elliot). It thus becomes a contamination risk for early varieties.

*Why is Plum Curculio a problem during bloom?*

Plum curculio is active before bloom (right now!) and populations peak during bloom. Different blueberry varieties bloom at different times, which extend the bloom period to several weeks. Females oviposit on young berries while blossoms are still open and other fruit is still setting. Early varieties like Duke are often picked while the larvae are still developing inside the fruit, and before the fruit drops. Later varieties are picked after any infested fruit drop to the ground with matured larvae.

*Why is this not a problem in other crops?*

While plum curculio is a pest on other crops, such as apples, other crops do not have this long, extended bloom period. This makes blueberries unique when managing this pest.

*Can I control this pest during bloom?*

We do not have good control measures for Plum Curculio that are not harmful to bees and that can be used during bloom. Thus, for now, avoid any treatments during bloom.

*What can I do to prevent berries to get infested?*

We have tested a *preventive control using Rimon (novaluron) pre-bloom.* Rimon is a chitin inhibitor. It affects larval development but also has transovarial activity. Thus, eggs can

Blueberry Bulletin, Vol. XXIV, No. 1
become sterile when adults ingest Rimon-treated plants. Rimon does not control adults. Thus, we might still need a post-bloom application.

**When should I use Rimon?**

Rimon needs to be ingested by adults. It needs to be applied right before bloom.

**Can Rimon harm the bees?**

Rimon does not have direct toxicity to adult bees but if it gets on pollen it can be carried to the hive and affect the brood.

**What Rimon rate/volume works best?**

Based on our data, 25 oz/A of Rimon at 25 gal/A works best.

**Any phytotoxicity concerns?**

Rimon applied to young foliage causes **phytotoxicity**. Based on our observations plants grow out of this but growers should be aware of these effects.

**Chart of Insecticide Efficacy against different Plum Curculio developmental stages**

<table>
<thead>
<tr>
<th></th>
<th>Rimon</th>
<th>Imidan</th>
<th>Avaunt</th>
<th>Assail</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Adulticidal Activity</strong></td>
<td>Low</td>
<td>High</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td><strong>Larvicidal Activity</strong></td>
<td>High (egg-young larvae)</td>
<td>High</td>
<td>Low (old larvae)</td>
<td>High</td>
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</tbody>
</table>
### Activity Periods of Blueberry Insect Pests in New Jersey

<table>
<thead>
<tr>
<th>Scale</th>
<th>Cranberry weevil</th>
<th>Leaf rollers</th>
<th>Spanworms</th>
<th>Gypsy moth</th>
<th>Thrips</th>
<th>Gall midge</th>
<th>Plum curculio</th>
<th>Cranberry fruitworm</th>
<th>Aphids</th>
<th>Leaf rollers</th>
<th>Spanworms</th>
<th>Gypsy moth</th>
<th>Sloan's plant bug</th>
<th>Spotted wing drosophila</th>
<th>Japanese beetle</th>
<th>BB bud mite</th>
</tr>
</thead>
</table>

### Recommendations of OP alternatives and reduced-risk insect management practices for blueberries

<table>
<thead>
<tr>
<th>Timing</th>
<th>Target Pest</th>
<th>Broad-spectrum</th>
<th>OP alternatives/Reduced-risk Insecticides</th>
</tr>
</thead>
<tbody>
<tr>
<td>Budbreak-Prebloom</td>
<td>Cranberry weevil</td>
<td>Asana</td>
<td>Avaunt</td>
</tr>
<tr>
<td></td>
<td>Leaf rollers</td>
<td>Lannate</td>
<td>Intrepid, Altacor, or Delegate</td>
</tr>
<tr>
<td></td>
<td>Plum curculio</td>
<td></td>
<td>Rimon</td>
</tr>
<tr>
<td>Bloom</td>
<td>Leaf rollers, Spanworms</td>
<td><em>B.t. products or Intrepid</em></td>
<td><em>B.t. products or Intrepid</em></td>
</tr>
<tr>
<td></td>
<td>Thrips</td>
<td>Delegate (dusk)</td>
<td>Delegate (dusk)</td>
</tr>
<tr>
<td>Post-Pollination</td>
<td>Cranberry fruitworm</td>
<td>Diazinon, Danitol, or Lannate</td>
<td>Intrepid, Delegate, Altacor, Esteem, or Assail</td>
</tr>
<tr>
<td></td>
<td>Plum curculio</td>
<td>Diazinon, Danitol, or Guthion</td>
<td>Avaunt</td>
</tr>
<tr>
<td></td>
<td>Aphids, Leaf rollers</td>
<td>Lannate or Admire Pro</td>
<td>Assail, Admire Pro, or Actara</td>
</tr>
<tr>
<td></td>
<td>Thrips</td>
<td>Admire Pro or Delegate</td>
<td>Assail, Admire Pro, or Delegate</td>
</tr>
<tr>
<td>Fruit Maturation</td>
<td>Spotted wing drosophila</td>
<td>Malathion, Imidan, Lannate, Brigade/Bifenture, Danitol, Mustang Max, Hero</td>
<td>Delegate or Entrust (organic)</td>
</tr>
<tr>
<td></td>
<td>Blueberry maggot</td>
<td>Malathion, Imidan, Sevin, Danitol, or Lannate</td>
<td>Assail or Admire Pro</td>
</tr>
<tr>
<td></td>
<td>Japanese Beetle</td>
<td>Sevin or Danitol</td>
<td>Assail or Admire Pro</td>
</tr>
<tr>
<td></td>
<td>Oriental Beetle</td>
<td>Admire Pro</td>
<td>Admire Pro or mating disruption</td>
</tr>
<tr>
<td>Post-harvest</td>
<td>Blueberry maggot</td>
<td>Malathion, Imidan, or Lannate</td>
<td>Assail or Admire Pro</td>
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<td></td>
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<tr>
<td></td>
<td>Oriental beetle</td>
<td>Admire Pro</td>
<td>Admire Pro</td>
</tr>
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</table>
The program for the control of annual weeds in blueberries should consider the weed free strip under the row and the middles, sod or tilled, separately. The “Weed Control Season” in blueberries starts in late fall. The program implemented in the spring depends on what herbicides were applied the previous fall.

If herbicides were applied in late fall, applications may be able to be delayed until later in the spring. Residual herbicides should be applied before bud break in late winter or early spring after the soil is no longer frozen if no late fall treatment was applied.

Annual weeds are weed species that live for less than one year. Winter annual germinate in the fall or late winter, flower in the spring or early summer, then die. Summer annuals germinate in the spring and early summer, flower, and die in late summer or fall. Perennial weeds are weed species that live for more than two years. Control of these weeds must be considered separately.

Emerged annual weeds under the row are controlled with a postemergence herbicide. Annual weeds that germinate throughout the remainder of the season are controlled with residual herbicides. Two applications of postemergence herbicide plus residual herbicides are recommended annually in the weed free strip under the row. The first application should be applied in late fall, after the blueberries are dormant, but before the soil freezes, or in late winter before the buds break in the spring. This application targets the control of winter annuals and provides early season control of summer annual weeds. The fall can be a less busy time to apply herbicides to the fields, usually after Thanksgiving in New Jersey. In March, growers find themselves scrambling to apply insecticides and fungicides, and prune. Pruned branches must be removed or chopped before weed spraying can be accomplished after pruning.

The second application of residual herbicides should be applied before bloom or later spring, depending on the herbicides to be applied, while the late fall application controls early season summer annual weeds. A postemergence herbicide may not be needed to control annual weeds in the spring if residual herbicides were applied in late fall, however, a postemergence herbicide may be included to control certain perennial weeds such as yellow nutsedge, Canada thistle, goldenrod species, or aster species. Most residual herbicides primarily control annual grasses or annual broadleaf weeds (BLWs). A combination of an annual grass herbicide and an annual BLW herbicide is usually recommended. Rate ranges are recommended for most residual herbicides. Use the lower rates in fields with coarse textured (sandy) soil low in organic matter, and the higher rate when soils are fine textured (silt and clay) and have higher organic matter.

Casoron, applied in late fall, followed by a spring application of a residual annual grass herbicide is the most effective residual weed control program recommended. More different species of weeds are controlled than any other residual herbicide combination available. Apply 4.0 lb active ingredient Casoron CS (2.7 gallons per acre) or 4.0 to 6.0 lb active ingredient Casoron 4G (100 to 150 lb per acre) in late fall when soil and air temperatures will remain below 50 degrees Fahrenheit until rainfall moves the herbicide into the soil. The active ingredient in the granular formulation can be lost to volatilization in warm weather. The Casoron CS formulation is encapsulated, which prevents loss due to volatilization. Casoron provides annual broadleaf weed control until fall and annual grass control until early summer the next year. Certain herbaceous perennials, including goldenrod species, aster species, and yellow nutsedge will also be controlled or suppressed by Casoron applied in late fall. Late winter applications provide less consistent winter annual and perennial weed control. Apply an additional residual annual grass herbicide in early or late spring to provide late summer annual grass control following the late fall application of Casoron.

If Casoron is not applied in late fall, choose your residual annual grass herbicide for the coming season before the late fall or late winter herbicide application. Options include Devrinol, Surflan, or Solicam. All three residual annual grass herbicides can be used at the rate of 4.0 lb active ingredient per acre per year. Apply half the yearly labeled rate, 2.0 lb active ingredient per acre, in the late fall, and the second half, an additional 2.0 lb active ingredient per acre, in the spring, or the full rate in early spring, in no late fall application was applied.

Your residual BLW herbicides should be chosen considering crop safety, effectiveness, and price. For many years Princep (simazine) was recommended at 1.0 to 2.0 lb active ingredient per acre in the late fall, and Karmex (diuron) was recommended at 1.0 to 2.0 lb active ingredient per acre in the spring. Both
herbicides have been safe, reliable, and cost effective choices for many years, and continue to good options where their use provides good weed control. Both Princep (simazine) and Karmex (diuron) share the same mode of action, inhibition of the light reaction of in photosynthesis. Unfortunately, triazine resistant weeds, with cross resistance to urea herbicides, including Karmex, are present at some sites. Where a triazine resistant weed has become established, switch to a BLW herbicide(s) with a different mode of action. Use Chateau at 0.19 to 0.38 lb of active ingredient per acre or Callisto at 0.094 to 0.19 lb of active ingredient per acre in late fall or late winter. Chateau and Callisto must be applied before bud break in early spring to avoid crop injury. Chateau can cause speckling and crinkling the crop’s foliage if spray drift occurs. The activity of Chateau occurs at the soil surface as sensitive BLW seedlings emerge. Do not disk, till or otherwise mechanically mix Chateau into the soil after application, or the effectiveness of the herbicide will be reduced or eliminated. Callisto bleaches foliage white. Horseweed, also called marestail or stickweed, and common lambsquarter are very sensitive to Callisto both pre and postemergence. Chateau and Callisto can be used in combination, or either herbicide can be tank- mixed with Princep (simazine) and Karmex (diuron) to improve BLW control.

Sandea controls BLWs and yellow nutsedge in blueberries, and has postemergence and residual activity. Sandea is an ALS inhibitor. Herbicides with this mode of action rely on a single site of action in susceptible weeds, putting herbicides with this mode of action at high risk for weed resistance development. Weed resistance to ALS inhibitor herbicides is already present in the New Jersey and the surrounding mid Atlantic region. Due to resistance management concerns, Sandea is usually recommended for yellow nutsedge control later in the spring, but not for annual weed control. Stinger is a growth regulator herbicide with postemergence and residual activity labeled in New Jersey for use in blueberries to control annual and perennial weeds in the legume and composite plant families. Legume weeds found in blueberries include vetch and clover species. Composite weeds targeted include horseweed (also called marestail or stickweed), dandelion, aster species, goldenrod species, Canada thistle, and mugwort (also called wild chrysanthemum). Stinger rates and application timing depend on the weed targeted.

When annual weeds have emerged before residual herbicides are applied, a postemergence herbicide should be included in the tank. Use Gramoxone or other labeled generic paraquat formulations at 0.6 to 1.0 lb active ingredient per acre plus nonionic surfactant to be 0.25% of the spray solution. Roundup and other labeled generic glyphosate products can also be used to control emerged weeds as a spot treatment, and can be especially useful where susceptible perennial weeds are a problem. Take great care when spot treating with Roundup or other glyphosate formulations to never contact the blueberry bush, or serious crop injury could occur. The rate depends on the perennial weed targeted and the glyphosate product used.

**Consult the Commercial Production Recommendations for rates and additional information.**
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BLUEBERRY BULLETIN

If you have any comments about this newsletter, please make them in the space below and mail to:
Dr. Gary C. Pavlis, County Agricultural Agent
Rutgers Cooperative Extension of Atlantic County
6260 Old Harding Highway, Mays Landing, NJ 08330

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Comment: __________________________________________________________________
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