Bee pollinators are the main pollinators of cranberry and are thus critical to fruit production. Pollination is the transfer of pollen grains from the anthers (male part of the flower) to the stigma (female part of the flower). In cranberry, both anthers and stigma are contained within the same flower, but flowers rarely self-pollinate because the male and female parts are not active at the same time. Therefore, bees are required to move the pollen from anthers in one flower to the stigma in another.

Cranberry pollen is contained in tetrads—a grouping of four pollen grains stuck together into one package. A cranberry flower needs at least 2 tetrads to set fruit while 8 or more tetrads per flower will lead to the largest berries. Most cranberry flowers however do not produce berries. While individual uprights produce 2-7 flowers, usually only 1-3 of those flowers mature into berries. It is not well understood why the number of berries is less than the number of flowers. Recent experiments on the Stevens variety in Quebec suggests that this is not attributable solely to lack of bee pollination [1]. In this experiment, uprights were left open for pollination by bees. In half of these uprights scientists added pollen to all flowers thus mimicking a scenario of high bee pollination. Despite adding this extra pollen, these cranberry uprights produced virtually the same size and number of berries (an average of about 2 per upright) as uprights that received less pollen. This suggests that something other than pollination is limiting fruit production in cranberry.

Of all the flowers on an upright, the first few flowers on the stem are much more likely to produce berries. Even if the upper flowers are fully pollinated, they are not likely to set fruit. However, experimental removal of the lower berries does increase fruit set in the upper flowers [2]. These upper flowers may serve as an insurance policy for the cranberry upright in case the lower berries are lost to insects, disease, or receive insufficient pollination. The greater number of flowers as compared to berries is likely under genetic control and thus may be an important trait to target in breeding programs.

Despite the fact that only 40-50% of the flowers mature into berries, bee pollination is essential to cranberry fruit production. Flowers that are pollinated by bees are more likely to set fruit than those that are not.
that are not visited by bees rarely produce fruit. Numerous species of bee visit cranberry flowers and each bee species differs in its effectiveness of pollination. The pollination effectiveness for a given bee species results from its abundance (i.e., the number of flowers visited by that species of bee) times the number of pollen tetads the bee deposits on each visit. For example, on a per visit basis, bumblebees transfer more pollen tetads than honeybees. Cane and Schiffsauer [3] found that one bumblebee species transferred on average over 60 pollen tetads per visit while honeybees deposited an average 10.

Not only do bee species differ in their pollination effectiveness, but different behaviors within a species may also influence pollination. In particular, honeybee visitation behavior depends on whether they are foraging for nectar or pollen. Honeybees foraging for pollen transfer more pollen tetads than those foraging for nectar [4]. In addition, nectar foraging honeybees do not always touch the stigma and thus do not pollinate as effectively. Despite these behavioral variations, when honeybees are abundant on cranberry fields they will visit flowers multiple times and sufficiently pollinate the crop. The main advantage of honeybees is that they are relatively easy to manage. Hives can be quickly transported to bogs and each hive has thousands of pollinators. Management techniques that are able to produce similar numbers of wild bees are not available.

While honeybees are essential for cranberry fruit production, wild bees may also play an important role. A number of other wild species of bee in addition to a few wasps visit cranberry flowers as well. In New Jersey, there are over 20 known bee species that visit cranberry flowers and only about five of those are bumblebees. The effectiveness of pollination for these other wild bee species is not well understood. However, they visit cranberry flowers much less frequently than either honeybees or bumblebees. Bumblebees and other wild bees may be particularly important if weather conditions remain poor through much of the bloom or honeybees experience a reduction in number due to Colony Collapse Disorder (CCD) and other diseases.

The causes of CCD remain elusive and thus it is difficult to predict or mediate [5] the future impacts of CCD on the availability and cost of hives. The United States Agricultural Research Service reported that the overall losses of colonies were lower nationally in 2009 (29%) as compared to 2008 (36%) [6]. Furthermore, fewer colonies with symptoms of CCD were reported. However, the overall loss of colonies was still quite high, and the ARS report concludes that factors affecting honeybee health are of continued concern.


Notes:
❖ The American Cranberry Growers’ Association (ACGA) summer meeting will take place on Thursday August 20th at the Rutgers Blueberry/Cranberry Center in Chatsworth, NJ.
❖ There is no Weekly Weather Summary this week.
❖ This is the last issue of the Plant & Pest Advisory Cranberry edition for the 2009 season. Thank you for subscribing.

Gypsy Moth from page 3

ship saw a large decrease from 22,384 to 4,927 acres. The survey showed that gypsy moth populations have spread to certain areas of the state, due to natural and wind-borne movement. In high populations, gypsy moths can blow 15 miles during storms, spreading into untreated areas. Seven counties had increased defoliation from last year: Cumberland, Morris, Mercer, Bergen, Middlesex, Essex and Salem.

An aerial tree mortality survey conducted last year by the Department of Agriculture and the New Jersey Department of Environmental Protection’s Division of Parks and Forestry observed a total of 30,902 trees killed by repeated defoliations by gypsy moth caterpillars since 2006.

Two to three consecutive years of significant defoliation (defined as 75 percent or more) can kill an otherwise healthy tree. However, any gypsy moth defoliation can make trees more susceptible to other damage that can lead to the death of the tree. Oak trees are the preferred host for gypsy moths, but the caterpillars can be found feeding on almost any tree in the vicinity.
Insect Update
Cesar Rodriguez-Saona, Ph.D., Specialist in Entomology

Most cranberry growers have completed their insecticide sprays for this year. We have seen fruit infested by Sparganothis fruitworm, spotted fireworm, and mostly low levels of cranberry fruitworm. Managing insects at this time for caterpillars is difficult because most of these larvae are in the older instars and may spend their time inside berries or have already completed development.

✔ Sparganothis fruitworm - Larvae will feed on the fruit surface, inside berries, and on foliage. One larva may feed on several berries. A second adult flight is expected to start in mid-August and to continue through September, these adults will lay eggs, and the newly hatched first instars will overwinter. This insect has 2 generations a year.

✔ Spotted fireworm – High numbers of spotted fireworm larvae were seen only in cranberry beds where weeds were present in high density. The second adult flight will start in early August, eggs from the second generation will begin to hatch by mid-August, and these larvae will feed on berries and overwinter as second instars. This insect has 2 generations a year.

✔ Cranberry fruitworm – Few berries we inspected for insect damage had cranberry fruitworm larvae. At this time the larvae are inside the berries and insecticide sprays will not control them. Cranberry fruitworm, unlike Sparganothis fruitworm and spotted fireworm, has only one generation a year. The fully developed larvae will soon drop from the fruit and overwinter inside a hibernaculum. One larva can consume several berries to complete its development. In New Jersey, cranberry fruitworm has not been considered a major problem in cranberries. This insect however is a major pest in blueberries here in New Jersey and in cranberries in Massachusetts and Wisconsin. The reason why in New Jersey cranberry fruitworm is a pest in blueberries and not in cranberries is not fully understood, but we want to ensure this insect stays away from cranberries. This insect is very difficult to control because insecticide applications require very precise timing and intensive scouting. Eggs are laid on the calyx end of fruit. After eggs hatch, early instars move to the stem to enter the fruit. This is the most susceptible stage for insecticide application because the larvae have not yet penetrated the fruit. If you observed high numbers of infested fruit this year you will have to wait until next year to monitor for adult moth populations using pheromone traps. Adult flight will help you time your insecticide application(s).

This is the last Cranberry Edition of the Plant & Pest Advisory for 2009. As in previous years, I present the highlights of this cranberry season:
- Three new insecticides became registered in cranberries: Avaunt, Assail, and Delegate. Growers who used Avaunt and Delegate as a pre-bloom treatment (particularly for gypsy moth) had good control.
- Early in the season, we observed fewer gypsy moths compared to previous years.
- Besides gypsy moth, some growers had high levels of Sparganothis fruitworm and blackheaded fireworm.
- Lastly, we need to be aware and stay on top of several insects currently considered secondary pests in NJ cranberries, such as cranberry fruitworm and bunt-nosed leafhoppers, to prevent them from reaching major pest status. We conducted several trials with new insecticides this year for the control of blunt-nosed leafhoppers. The data will be presented at upcoming growers’ meetings.

NJDA Gypsy Moth Suppression Program Results in Significant Reduction in Tree Damage in 2009

The amount of tree damage caused by gypsy moth caterpillars this spring decreased for the first time since 2003. The New Jersey Department of Agriculture’s annual gypsy moth aerial defoliation survey showed 91,890 acres of trees experienced some level of leaf loss in the state this year, as compared with 339,240 acres last year. “The gypsy moth population reached its peak in 2008 and through a combination of regular life cycle drop-off, beneficial fungus and natural predator increases combined with our aggressive spray program, we are pleased to see a downturn,” said Secretary of Agriculture Doug Fisher.

Most of this year’s damage was moderate to heavy, or between 25 and 75 percent of a tree’s leaves were eaten by the bug. Unlike past years, there was less severe damage due to effective treatments and more activity by the beneficial fungus Entomaphaga maimaiga. Wet weather in May caused the fungus to thrive, killing the caterpillars before they became large. In addition, there were increased established parasite levels, which are helping the gypsy moth population to collapse. Those beneficial parasites were released by the Department decades ago to fight the gypsy moth.

A total of 184 municipalities in 19 counties experienced defoliation this year. Although that was an increase over last year’s total of 134 towns and 17 counties, most counties had significant decreases in the amount of tree damage.

Although Ocean County experienced the most acres of trees defoliated this year, with 16,293 acres, it still had a substantial decrease from 2008, when gypsy moth caterpillars damaged 44,205 acres of trees. Jackson Town-
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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