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The Blueberry Bulletin

A Weekly Update to Growers

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- *Visit the Blueberry Bulletin webpage at njaes.rutgers.edu/blueberry-bulletin*
- *The 2022 Commercial Blueberry Pest Control Recommendations for New Jersey is available on njaes.rutgers.edu*
- *The Blueberry Bulletin will now be emailed to those who request it. We will no longer be mailing hard copies out. If you are not on our current list and would like to receive a copy, please call the office at (609) 625-0056.*

BLUEBERRY CULTURE

Dr. Gary C. Pavlis, Ph.D
Atlantic County Agriculture Agent

Pollination: Pollination is an important factor in production of the highbush blueberry. Lack of adequate pollination causes reduced yield, small berry size, and a delay in berry maturity. It is chiefly the honey bee which performs this task. While bumble bees are efficient and diligent pollinators (even under more adverse weather condition), their numbers are steadily decreasing. According to MSU Entomologist, Dr. Roger Hoopingarner, "Historically, feral (wild) honey bee colonies have provided more than half of the pollination in Michigan." Wild bee populations are declining. This is due to changes in our own blueberry production practices which remove bee forage and suitable habitat.

What does this mean for blueberry producers? What happens when we lose the free pollination service provided by wild bees? You probably already know - more honey bees.

Blueberries have a tremendous number of blossoms per acre. A single bush may have 2,000 to 3,000 blossoms. At a planting density of 870 bushes per acre, that's 1.75 to 2.6 million flowers! Large-block single-variety plantings make it essential that high numbers of pollinators be available at one time. The number of colonies needed per acre is determined by weather during the bloom period, colony size, variety, and blossom density per acre.

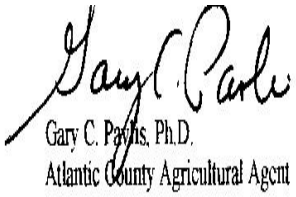
Weather during blossom time affects the honey bee's foraging efficiency. Honey bee activity increases as the temperature increases from 50 to 95°F. Sunshine also increases foraging, especially at lower temperatures.

Cold, wet, windy weather decreases foraging activity. Temperatures above 95°F will also reduce foraging as the bees spend their time cooling the hive.

As a general rule, over-wintered colonies are stronger than package bees. A three pound package may have 12,000 bees, while an over-wintered colony may contain two to three times as many. Honey bee colonies will be smaller in an early bloom year. In essence, the crop has developed faster than the development rate of the forager bees. Are honey bees the answer? Many of you have seen your bees fly out of the hive, past your 'Duke' bushes, and over to your neighbor's 'Bluecrop' field. This preference for one variety over another is not fully understood. It may be related to the quantity of nectar, pollen, sugar concentration, or flower color. At this time, honey bees are the best bet. For the long term, we need to learn to cultivate the wild pollinators.

The recommended concentration of hives per acre to use is tabulated below: Remember that the number of hives needed per acre depends on the variety you have.

Sincerely,



VERY ATTRACTIVE TO BEES:
1 Hive/2 Acres:
Rancocas
June
Rubel
GN-87

MODERATELY ATTRACTIVE:
1 Hive/Acre:
Weymouth
Bluetta
Blueray
Pemberton
Darrow
Bluecrop*
Duke

POOR ATTRACTIVE:
2 Hives/Acre:
Stanley
Concord
Berkeley
Coville
1316-A
Elliott
Jersey*
Earliblue*

* **Efficiency of pollination poor, add 1/2 hive more per acre.**

PEST MANAGEMENT

Dr. Cesar Rodriguez-Saona, Extension Specialist in Blueberry Entomology, Rutgers University
Ms. Carrie Mansue, Senior Program Coordinator

Cranberry Weevil
This past week, weevil counts averaged 0.36 adults per bush, with a high of 3.6. Weevils should no longer be of a concern.

Honey Bee Colony Strength, Behavior & Health

Ms. Chelsea Abegg, Soils & Plant Technician – Department of Agriculture & Natural Resources
Dr. Cesar Rodriguez-Saona, Extension Specialist in Blueberry Entomology, Rutgers University
Dr. Beth Ferguson, Postdoctoral Researcher – Department of Entomology

Blueberries have begun to bloom and honey bee colonies have arrived at many of your farms (Figure 1). An adequately sized colony will have young adults guarding their hive at the entrance and older actively pollinating foragers moving in and out of the hive on a warm sunny day. However, flight muscles don't function properly in cold weather; therefore, honey bees are typically not present at the hive entrance after sundown, on a rainy day, or when the outside temperature is below 50˚F. Given that the internal temperature and humidity must be maintained, especially on colder days, honey bees cluster in a tight ball and vibrate their wing muscles to produce heat to retain their ideal temperature. Honey bees must also deal with rain and wet honey bees will cause an increase of the moisture level in a colony. Too much moisture will trigger a fungal bloom on the wax inside their colony and, although relatively non-toxic to humans, it can consume the wax that honey bees need to store their food and raise their young. To decrease moisture levels inside the hive, bees will fan their wings near the entrance of the hive; however, this is not effective if the humidity outside the hive is higher than inside the hive. When that happens, you may see a large cluster, or "beard" of bees at the entrance of a hive to help regulate internal humidity as well as high temperatures (Figure 2).

Figure 1: Honey bee pollinating blueberries.

Figure 2: Cluster or "beard" of bees regulating the hive temperature and humidity.

When it comes to colony strength, sometimes less is more. Large colonies are more likely to swarm, resulting in a much weaker colony left behind and a "tornado" of bees looking for a new home in sometimes undesirable locations. When looking inside the hive, you should see 8–10 frames within a box. A very strong colony will have bees completely covering every frame in the box. In a good-sized hive, 4–5 of those frames should be covered in bees (Figure 3). If a colony has less than 4 frames covered in bees in an 8–10 framed box, the colony is considered small and can be more vulnerable to bad weather, pathogens, and pests such as the *Varroa destructor* mite.

Figure 3: Examples of what a good-sized colony looks like inside the hive, with 4 (left image) and 5 (right image) frames covered in bees.

Identifying colony health declines can be tricky. Overall, a colony in April/May should be increasing in size (through brood production) and weight (via honey and pollen collection). Brood refers to honey bee eggs, larvae, and pupae. It is impacted daily by the weather (queens do not like to lay eggs in bad weather), the food brought into the hive (honey and pollen used to rear the young), and the health of the queen (older and sick queens do not produce as many eggs as a younger healthier queens). Brood can also be negatively impacted by contaminated food. When foragers transport food from flower to larvae, pesticide exposure, through direct application spray, residuals left on flowers, and runoff (bees drink water) can contaminate their food. This exposure can result in sublethal effects typically seen later in the bee's life such as shortened lifespan and inability to forager or even death. Brood should be localized within a hive and present a uniform pattern of young and maturing larvae to pupae on any given frame (left image in Figure 4). Healthy larvae are white with a glossy appearance while pupae are covered by a waxy protection cap. Sick brood can display a range of one to many symptoms at one time. These symptoms include off-white or brown coloration, shrunken body size, spotty brood clusters (where dead larvae have been removed by honey bee workers), and perforated wax caps (typically has dead or dying pupae inside) (center and right image in Figure 4).

Figure 4: A healthy frame of brood (left image), a spotty brood cluster (center image), and a frame with multiple bad symptoms such as discolored and shrunken larvae and perforated wax caps on pupae (right image).

The easiest way to tell if a colony is growing in strength is to monitor the weight of a hive. If a colony is strong and successfully producing brood, the colony is expected to gain a significant amount of weight when food (pollen and nectar) is available throughout the season. If the colony gains weight initially, then rapidly loses weight, something has negatively impacted the hive and it is very difficult to help a colony come back once that has occurred. These negative impacts could be lack of food (due to inadequate food resources or bad weather), a failing queen (due to age or food contamination), or pesticide exposure.

The following list of questions can be used to strike a meaningful discussion with your beekeeper to improve pollinator health and fruit-set:

1. Did the colonies gain weight while pollinating this year? If not,
    a. Was there good weather and open flowers to feed the number of bees that you had?
    b. Is there a way to mitigate this next year?
2. Did brood production increase while pollinating this year? If not,
    a. Were there enough good weather and open flowers to feed a growing colony?
    b. Is there a way to mitigate this next year?
3. Were there any negative brood symptoms in the hives? If yes,
    a. Were there a lot?
    b. Could they have been due to an unintended pesticide exposure?
    c. Is there a way to mitigate this next year?
4. Was there a lot of queen failure after pollinating blueberries this year? If yes,
    a. Were they old queens?
    b. Could they have been exposed to a harmful pesticide?
    c. Is there a way to mitigate this next year?

SOIL

Joseph Heckman, Extension Specialist Soil Fertility

New Jersey Blueberry Soils Sometimes Need Liming

Blueberry crops grow best in acid soils with a pH near 4.8. Soil tests performed on sites used for blueberry production sometimes find soil pH values well below 4.8 and in some cases even below 4.0. Applying limestone to blueberry soils is not common practice but it is recommended for soils that are strongly acid.

Fertilizers used for blueberry production typically contain nitrogen in the form of ammonium or urea. This nitrogen is in the chemical form of ammonium or in the case of urea readily converts to ammonium. This is the type of nitrogen that is preferred by the blueberry plant. However, repeated applications of ammonium type fertilizers lead to soil acidification. It can eventually drive soil pH levels below the desired pH 4.8.

New Jersey soil textures commonly used for blueberry production are sands or sandy loams. They include soils from the Sassafras, Berryland, Atsion, Downer, or Pocomoke series. In a laboratory study these soils were incubated for 70 days with different application rates of limestone to determine how much is needed to raise a low soil pH up to the target pH of 4.8.

Based on the findings of that study, 100 pounds of limestone (calcium carbonate equivalent or CCE) is recommended for each tenth of a soil pH increase that is needed to reach the target of 4.8. For example, if the soil test pH is found to be 4.0, the liming recommendation calls for 800 pounds of limestone.

For blueberry soils, be careful to never apply too much limestone, but when soil pH levels fall well below 4.8, modest application rates of limestone are recommended.

Reference: Heckman, J.R., G.C. Pavlis, and W.L. Anastasia. 2002. Lime Requirements of New Jersey Blueberry Producing Soils. HortTechnology. 12:220-222.