

Pollination Issues in Blueberry Production

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Growers can prune, fertilize, irrigate, control pests and otherwise care well for their blueberry plantations, but without proper pollination their efforts would be in vain. Highbush blueberries are capable of setting fruit on 100 percent of the flowers produced by the bushes, although 80 percent set is considered a full crop. Once set, some fruit may succumb to injury from insects, birds, diseases or environmental conditions. But, the high initial set of fruit is key to the profitability of the crop. Understanding the anatomy of blueberry flowers and the behavior of some of the pollinating agents will help the grower make good decisions that promote optimal conditions for pollination. This presentation will cover the information growers will need in order to make good pollination decisions.

The Blueberry Flower - Blueberry flowers are 'perfect' and 'complete'. That is, they have calyx, corolla, stamen and one or more pistils (complete). And they have actively functioning organs of both sexes (perfect). The male parts are the anthers and filaments, which comprise the stamen and the female parts are the stigma, style and ovary, which comprise the pistil. This means that blueberry flowers are theoretically capable of being self-fertile. However, the structure of the flowers is such that the pollen will not make contact with the stigma without active pollination by insects. Thus, pollinating insects are a must for attaining the high level of fruit-set growers expect. This is accomplished by insects visiting blueberry flowers foraging for nectar and pollen. Pollen adheres to their bodies and is carried with them as they move from flower to flower. Then when bees probe for nectar inside another flower, they brush against the stigma and unwittingly leave behind some of the pollen they are carrying.

Pollinators - There are many species of pollinating insects, both wild and domesticated. In the wild the wide variety of pollinators includes bumble bees (*Bombus* spp.), mason bees (*Osmia* spp.), leafcutting bees (*Megachile* spp.), and feral, or wild, honey bees (*Apis mellifera*). Another species of wild bees can be found foraging in blueberry plantings, but does little to promote pollination is carpenter bees (*Xylocopa* spp.). Commercially, there are two types of pollinator available, domesticated honey bees (*A. mellifera*) and domesticated bumble bees (*Bombus impatiens*). Other pollinators (e.g., mason and leafcutter bees) are also commercially available, but are less common.

Domesticated honey bees have, by far, been the most important pollinators of highbush blueberries for decades. However, with the decline in availability of commercial hives following the epidemic of parasitic mite infestations and disease problems, growers are turning to conservation of wild pollinators and alternative domesticated pollinators.

Pollination Needs - Whether or not a grower will need to import domesticated pollinators into a blueberry planting as well as the number of colonies needed, will depend on several factors:

- 1) the number of surviving wild pollinators in the area of the planting in a given year
- 2) the number of other plants that compete for the attention of the pollinating insects during the bloom period
- 3) flower-set in a given year
- 4) attractiveness of individual cultivars to the pollinators.

5) the weather conditions during the bloom period

It has long been observed that bees work different cultivars preferentially. That is, they like some cultivars more than others. Some suggest that this is because some cultivars produce more nectar or pollen. Others have observed differences in the size or shape of the corollas in different cultivars making it easier or harder for pollinators to reach the nectaries of the flowers. Yet others have observed the tendency in some cultivars (e.g., ‘Stanley’ and ‘Bluecrop’) to have the corollas separate slightly from the ovaries allowing bees to gain access to the nectar from the base of the corolla, bypassing the pollen altogether.

Blueberry flowers are open and receptive to pollen for 5-8 days. However, research shows that if a blueberry flower is not pollinated within 2-3 days after opening, it is unlikely to set fruit. So, another benefit of high numbers of pollinators is that the most attractive flowers are pollinated first and drop off, thus forcing the pollinators to work the less attractive flowers and increasing the overall level of pollination.

Cross Pollination - Blueberry flowers, while ‘perfect’ and ‘complete’ as described above, frequently have pollen that is self-sterile. Many cultivars are parthenocarpic, or capable of forming fruit without pollination. However, parthenocarpic fruit is distinctly smaller and ripens later with less flavor. The use of gibberellic acid can increase fruit size of parthenocarpic fruit, but is reported by growers to be unreliable. It is, therefore, very important for the formation of fully sized, ripe, flavorful fruit, that cultivars be cross-pollinated with pollen from other cultivars. For this reason blueberries should not be planted in large uniform block of one cultivar, but broken up into smaller sections with a mix of 2 or more cultivars.

How Many Pollinators Are Enough? - How can a grower tell if pollinators (domestic or wild) are doing an adequate job? One method is to assess the “buzz” level in the field. During sunny warm periods of the day during bloom (>60°F), there should be an audible “buzz” in the field. Another rule of thumb is that 4 - 8 bees should be foraging on each blueberry plant at any one time during the warmest part of the day during bloom. When wild pollinators are not abundant, domesticated honeybees can be introduced.

Once pollinated, the corolla separates from the ovary of the blossom and is easily knocked off the plant. One indication of good pollination is a carpet of white corollas lying beneath the blueberry bush. If in doubt, a grower may gently shake a few branches and observe whether or not the corollas fall to the ground. Brown corollas on the plant or on the ground usually indicate frost damage.

Protecting Your Pollinators - Pollinating insects have a host of natural enemies. Hives are an irresistible attraction for some mammals, especially bear. Electric fencing is often required to protect honey bee hives from predation by mammals who go after both brood and honey. Nesting shelters for solitary bees may need protection from mammals (see Figure 3). There are also some parasitic insects and colonies should be closely monitored for infestations. More importantly though, is conserving pollinators, both wild and domestic, by taking great care with the use of pesticides in and around the blueberry planting, especially during bloom. Always protect the water supply from contact with pesticides. If contaminated, replace the water with water from a clean source. Insecticides should never be used during the bloom period unless absolutely necessary to avoid major losses. If needed, insecticide sprays should always be made

at night when pollinators are not active and materials should be chosen that have the lowest bee toxicity. Charts with this information are usually found in spray guides and recommendations. Always have hives moved out of the planting before resuming the use of insecticides.