WHAT CAN YOU DO TO IMPROVE CRANBERRY POLLINATION?

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When your cranberries are in bloom, do you observe bees gathering nectar and pollen from the blossoms? If you don't see an average of 3-4 honey bees or 1-2 bumblebees per 100 sq.ft of cranberries, you may need to rent some bee colonies to enhance pollination**.**

Cranberries require insect (primarily bee) pollination to set fruit. Bees transfer pollen from the anthers of one flower to the stigmas of another flower. Multiple bee visits to many flowers ensure cross-pollination, which increase the size of the fruit, the number of seeds, and the consistency in the shape of the fruit.

Honey Bees and Bumblebees as Pollinators of Cranberry

Honey bees are the most effective pollinators of cranberries, but bumblebees are the most efficient. The difference is that honey bee colonies have 40,000 – 50,000 female workers while bumblebees have 200 - 300 female workers, so there are considerably more honey bees available for pollination per colony (from 25-50% of the workers in each kind of colony may actually be foraging on a nice day). In addition, honey bees have a effective communication system to recruit their nestmates to foraging sites. Bumblebees do not have a means to recruit other foraging nestmates. However, bumblebees are more efficient foragers than honey bees on cranberry flowers because they are capable of buzz-pollination. Bumblebees hang on to the flower and buzz it by vibrating their muscles that control flight. The pollen in the flower is actively shaken loose and released onto the bee, and the bee then grooms the pollen grains onto her hind legs. After visiting many flowers to collect pollen, she will have accumulated a large ball of pollen on each hind leg, and will have cross-pollinated the flowers along the way. Honey bees are not able to buzz pollinate. They gather pollen passively by rubbing up against the anthers as they visit the flowers. They also collect large balls of pollen on each hind leg as they cross-pollinate, but they are not nearly as efficient in collecting the pollen from each flower as are bumblebees.

Both honey bees and bumblebees must visit flowers to obtain significant quantities of pollen to sustain the nutritional needs of the colony. Pollen is the sole source of protein for bees, and their bodies are covered with fine hairs that help catch and hold the pollen. In addition, bees require carbohydrates which they obtain from nectar. Nectar is a sugary solution that some flowering plants secrete to attract pollinators. Nectar is produced in nectaries located deep within the plant so the pollinator is forced to brush up against the pollen-bearing anthers to reach the carbohydrate reward. Some bees forage exclusively for nectar, others for pollen, and some bees forage for both. Even if bees are foraging for nectar, they transfer some pollen from flower to flower as they go. Honey bees gather huge quantities of nectar and convert it to honey within the colony. They require large amounts of honey (75-100 lbs in northern climates) to survive the winter months. Bumblebees collect nectar and store it as honey, but because the colony does not survive the winter, they do not need to store surplus quantities. They store the honey in small wax pots and usually only have enough to survive through short periods of dearth.

A honey bee colony is perennial; it survives the winter as a colony and may produce a new queen and colony in early summer through the process of swarming. A bumblebee colony is annual; only newly mated queens that are produced in late summer survive the winter hibernating alone in the ground. In late spring, the surviving queens emerge and initiate a new nest.

There is only one species of honey bee in the United States, *Apis mellifera*, and it is not native. All honey bees originated from Europe and Asia, and were introduced into the US in the 1600's. There are at least 19 species of bumblebees in Minnesota and Wisconsin, all within the genus *Bombus.* Bumblebees are native to the US, as are cranberries, so they were the original pollinator of this plant.

Our dependence on honey bee pollination has increased because the number of native bees (bumblebees, orchard mason bees, sweat bees, etc.) has been reduced due to the use of pesticides and the destruction of nesting sites by modern agricultural technology. There are still a number of bumblebees in areas that are wooded (e.g., surrounding some cranberry properties), but in areas that have been cleared for development or for crop production, their presence may be scarce. In the past, introduced honey bees established wild populations in trees and were prevalent for pollination. However, in the last decade, the number of honey bee colonies has diminished due to the introduction of two, highly destructive parasitic mites specific to honey bees. Many home gardeners and growers of large commercial crops have noticed the lack of bee pollinators and have taken an interest in renting or purchasing bee colonies to increase pollination.

Pollination Requirement – Honey Bees

Cranberries require 2-3 honey bee colonies per acre for adequate pollination. Colonies can be rented from a reputable commercial beekeeper who will truck the bees in and out of the property. It is strongly recommended that the grower and beekeeper draw up a pollination contract before the bees are brought into the property. The contract will ensure that the beekeeper will bring in strong, healthy colonies at the desired time and to the desired location, and that the grower will pay the beekeeper a specified amount and will either not spray toxic pesticides while bees are on the property. A sample pollination contract is supplied below.

With recent funding from the WI Cranberry Board, Dr. Gordon Waller, graduate student Elaine Evans, and I are investigating if there is an optimal time during cranberry bloom to bring in and take out honey bee colonies from a cranberry property. However, the following are some common sense rules of thumb. Honey bees prefer to forage on clover, alfalfa, and some other wildflowers because they produce more nectar than cranberries. If the cranberry property is in a wooded area where clover and other flowers are not abundant, the honey bee colonies will forage predominantly on cranberries and can be introduced before 10% bloom. If the property is located where bees have access to large amounts of other flowers, it may be best to wait to introduce the bees until there is at least 10% bloom. That way, the honey bees will not learn the location of and recruit other bees to flowers off the property before the cranberries bloom.

Honey bees may gather small crop of cranberry honey in some locations and in some years, which the beekeeper can harvest. Cranberry honey is very delicious and unique. However, by bringing honey bee colonies in for cranberry pollination, the beekeeper sacrifices the larger crop and potential income he/she could obtain by moving bees into clover and alfalfa fields. It is important to come up with a pollination fee that is equitable for the beekeeper and the grower. Without bee pollination, the cranberry grower may have very low yield, so the grower must consider the value of the bees relative to the value of the entire cranberry crop.

Pollination Requirement – Bumblebees

Some estimates indicate that 4 bumblebee colonies per acre are needed to pollinate cranberries. The number of colonies needed will vary depending on the number of feral bumblebees present and whether or not honey bees colonies are also being used for pollination. Honey bees and bumblebees seem to be compatible for use together. Bumblebee colonies can be placed in the bogs at or before the first flowering. Since bumblebees do not communicate with each other about foraging, most of them will not leave the cranberries in search of better rewards.

Bumblebee colonies can be rented for a minimum of $75 each. The reason bumblebee colonies are so expensive is that there are only a few companies with the knowledge of how to rear them on a large scale. The species of bumblebee that is reared commercially in the Midwest is *Bombus impatiens*. Other bumblebee species are more difficult (if not impossible) to rear. We are investigating methods of rearing this species of bumblebee and hope to publish a small how-to manual in the near future.

Setting out nest boxes around a cranberry property in the hope of attracting bumblebee queens in the spring is not a reliable way to obtain bee pollinators. The success rate of this method is very low. The best way to encourage native pollinators is to conserve native prairies and woodlands.

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For further information on pollination requirements or on how to keep bees, contact:

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