



Pennsylvania Pumpkin Pollination



Pumpkins Require Pollination



Pumpkins need bees to move pollen from male flowers to female flowers to set fruit. Individual flowers have a short pollination window; flowers are typically only open from dawn until noon. Therefore, **it's important to consider pollination strategies that ensure consistent fruit set.** Managed honey bees are brought in for pollination, but in many fields, wild bees such as bumble bees and squash bees are the most common pollinators. Like honey bees, these pollinators visit pumpkin flowers to collect pollen and nectar.

Integrated Crop Pollination: combining strategies to improve pollination

Pumpkin growers can benefit from using multiple pollination strategies. Research from the northeastern and mid-Atlantic United States found that **both honey bees and wild bees in the landscape contribute to pumpkin pollination**, with bumble bees and squash bees being especially important. In fact, many pumpkin fields receive enough pollination from wild bees that adding managed honey bees or bumble bees does not improve yield. Diverse landscapes tend to have higher wild bee visitation, and those with no-till agriculture tend to have higher squash bee populations.

Research from the southwestern US shows that **pumpkin pollinators can complement each other and ensure full pollination by visiting flowers at different times of the day.** For example, the wild squash bee emerges early in the morning, when pumpkin flowers first open, while honey bees are more active later in the morning.



Male squash bees in a female squash flower. Squash bees are wild pumpkin pollinators that nest in and around pumpkin, squash, and gourd fields. Photo: Katharina Ullmann.



Cover crops that flower in early summer can provide wild bumble bees with pollen and nectar to help colonies build up before pumpkin bloom. Photo: Emily May.

These studies suggest that combining different pollinator species can help growers ensure reliable pollination. Depending on where your farm is located, some pollination strategies may be more appropriate than others. **Pumpkin pollinators, particularly wild bumble bees, benefit from access to other floral resources, especially in early spring when bumble bee queens are first starting their nests.** These resources can be maintained in natural areas around the farm or added as flower plantings to field edges or as flowering cover crops within or next to fields.

Meet the Pollinators

Honey Bees (*Apis mellifera*) are social insects; on any given day, a 6-8 frame colony will have roughly 14,000 – 19,000 pollinating bees. Hives are typically placed in pumpkin fields at a rate of 0.5 to 1 hive/acre. While honey bees can fly up to 3 miles from their hive, most prefer to forage on nearby flowers. Honey bees are usually removed from fields as soon as bloom is complete.



Wild Bees live on and near pumpkin farms throughout the year. At least 30 different species of wild bees visit PA pumpkin flowers. However, two groups can be especially abundant and efficient pollinators: bumble bees and squash bees. Research on the relative contributions of these different groups to Pennsylvania pumpkin pollination is ongoing.



Bumble Bees (*Bombus* spp.) are highly efficient pumpkin pollinators. While there are seven species of bumble bees that have been found visiting PA pumpkins, of these, the common eastern bumble bee (*Bombus impatiens*) is the most frequent visitor. Bumble bees transition from a solitary overwintered queen, to a small social colony during the spring and summer, and then back to solitary status. A colony of bumble bees can have around 25-400 bees. Bumble bees establish nests in the spring, prior to pumpkin bloom. During this time it is essential that queens have access to flowering plants and nesting sites.



Squash Bees (*Peponapis pruinosa*) are ground-nesting solitary bees. They will nectar on a variety of flowering species, but depend on *Cucurbita* spp. (e.g. squash, pumpkin, and gourds) for pollen to feed their young. These bees are active when pumpkin flowers are open and males often spend the night in closed flowers. Squash bees emerge from their nests as adults in early July. They often nest in and around squash fields in tunnels roughly 5-9 inches deep. Given that squash bees only produce one generation a year and pumpkin is annually rotated, it is important to consider where pumpkin fields are placed in relation to the previous year's pumpkin fields.

Four Practices to Support Bees

- 1 Protect natural habitat around your farm and add additional flowering plants**

Natural areas, grasslands, and edge habitats provide flowering resources and nesting sites for bees. Flowers supply essential pollen and nectar for bees and can be planted on farms in wildflower meadows or flowering cover crops. In the early spring, flowering trees such as willows, maples, and red buds are especially important as bumble bee queens establish their nests. More diverse nutrition helps bees stay active and healthy.
- 2 Minimize pesticide risks to pollinators**

Use integrated pest management (IPM) to make targeted pest management decisions. Limit neonicotinoids to seed treatments, or at-planting applications, to minimize toxic residues in pollen and nectar. Avoid spraying during bloom. If sprays are needed, spray after blooms have closed, and avoid tank mixes. Whenever possible, select pesticides that are less toxic to bees.
- 3 Avoid deep tilling**

Squash bees nest within tilling zones, often below pumpkin vines. Deep tilling can kill some offspring. Avoid deep, frequent tilling in what was the previous year's pumpkin fields or consider only tilling part of the field.
- 4 Communicate with your beekeeper**

Set up a contract to define the expectations of both parties and notify your beekeeper if you'll be spraying near hives.

Additional Resources

Integrated Crop Pollination
<http://projecticp.org>

Center for Pollinator Research
<http://bit.do/pa-poll-research>

Pumpkin Pollinators
<http://bit.do/pumpkin-polls>

Cover Crops for Pollinators
<http://bit.do/pa-cover-crops>

Native Pollinator Videos
<http://bit.do/poll-videos>

Pollination of Pumpkin, Squash, and Zucchini
<http://bit.do/cucurbita-factsheet>

How to Reduce Bee Poisoning from Pesticides
<http://bit.do/reduce-risk>

Wildflower Meadows for Pollinators in Pennsylvania
<http://bit.do/pa-cons-cover>

OSU Factsheet: Biology and Behavior of the Squash Bee
<http://bit.do/osu-squash-bee>

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