

## **Effective Pollination in Pumpkins**

H. Chris Wien, Department of Horticulture,  
Cornell University, Ithaca, NY 14853  
hcw2@cornell.edu

Pollination of pumpkins was never a subject of great concern among growers in the Northeast, but weather conditions in recent years, and the threat of low honeybee populations due to bee diseases and predators have encouraged us to pay attention to a neglected topic.

Pumpkins are members of the cucurbit family of crops, and have separate male and female flowers. In order for fruit to be set, pollen from the male flowers must be transferred to the female flower. This is usually done by bees, either the common honeybee, or by several other species such as bumblebees or the native squash bee. Honeybee hives may be placed in or near the pumpkin fields during the flowering period, or the grower may depend on wild or feral colonies nesting in hollow trees or old buildings. If bee hives are used:

- Make sure that the colonies are vigorous and active
- Place hives in the sun, off the ground
- Face hives south or east
- Use one hive for every one to three acres

In observations on Long Island, and parts of upstate New York, we have had strong indications that squash bees and bumblebees are more important pollinators of pumpkin than honeybees. We compared fields furnished with hives and others without honeybee hives in the Capital District of New York in the mid-1990's, and could find no difference in fruit set between them. This was during a period when bee diseases and bee mites had sharply reduced the number of wild bee colonies.

The native squash bee is very prevalent in the Northeast, and can commonly be found visiting pumpkin flowers during the growing season. It has a life style quite different from the honeybee, in that it is solitary, and nests in the ground in tunnels from 3 to 24 in. deep. The new adults emerge from their nests in mid-July, at a time that the pumpkin is starting to flower. Both male and female squash bees visit the flowers to gather nectar and pollen, and thus bring about pollination. By late August to early September, the current squash bee population dies, but the new brood is developing in the ground nests, nourished by the pollen and nectar furnished by the adults.

The squash bee nests can be found in or near pumpkin fields, and the bees should be protected from damage by these simple measures:

- Spray pumpkins and adjacent fields only in late afternoon or later, after the flowers have closed, and the squash bees are in the nests
- Plant pumpkins or squash every year so that the squash bees have a source of food
- Protect the nest sites from deep plowing and from flooding

More information on the habits and management of squash bees can be found in the Pumpkin Production Manual, recently published by NRAES (see <http://www.nraes.org/publications/nraes123.html>).

Pumpkin flowers typically open early in the morning, and close by noon, so bee activity must occur in the morning to be effective. Generally, the squash bee tends to be active early, before the honeybee starts flying.

The pollen grains of pumpkin and squash are relatively large and sticky, requiring several visits to the flowers to transfer enough pollen for successful fruit set. Our studies indicate that about 1500 to 2000 pollen grains are needed for good fruit set. Since individual bees carry about 250 pollen grains per visit on average, at least 6 to 8 visits will be needed for each female flower.

During the hot summers of 1999, 2001 and 2002, another problem appeared that may have adverse effects on pumpkin production. During hot weather (high's in the 90's F, with night temperatures in the 70's lasting nearly a week), the flower buds that will form female flowers turn yellow, shrivel and die. We first became aware of this problem in a grower's field of 'Howden' in 1994, but have duplicated the disorder in the greenhouse and in variety trials in Maryland and Florida since then (Table 1).

Table 1. Small-plot variety trials of pumpkin varieties grown during summer in three locations in 1996.

Variety	Yield, Tons/Acre		
	Ithaca, NY	Queenstown, MD	Bradenton, FL
Howden	34	20	4
Wizard	23	19	6
Rocket	38	29	18
Appalachian	31	24	16
Prizewinner	49	49	44

The female flowers don't open, and the plants continue to produce leaves and male flowers, but the formation of fruit is much delayed. In the case of the Bradenton planting, in which temperatures averaged 82 F during most of the growing season, normal female flower production and fruit set was delayed until cooler fall conditions, but too late to produce marketable yield for the Halloween season. Although there were differences among varieties in the response, additional work is needed to identify superior lines with heat resistance.

In the wet summer of 2003, growers reported poor fruitset, especially during periods of rainy weather. We suspect that if the inside of pumpkin flowers get wet, fruitset may be inhibited. We have started some greenhouse experiments in fall, 2003, to check this out, and hope to report preliminary results by the time of the meeting.

*I want to thankfully acknowledge that the findings reported above includes the work of the following colleagues: Roberta Glatz, Suzanne Stapleton, Maria Vidal, Dale Riggs, Marzena Masierowska, Don Maynard and Charles McClurg.*

