

by six (conservative estimate of the number of hours per day that bees forage on brambles). For instance the index of visitation for bumble bees on 7/24 (from Table 6) was 1.9 in the morning and 1.4 in the early afternoon. The average visitation per hour was 1.7 visits x 6 (hrs. of foraging per day) = 10.2 visits/flower/day by bumble bees. This can be done for individual bee groups, such as bumble bees or for two or more bee groups combined. Published rates for adequate pollination of raspberries by honey bees recommended 5-15 visits/flower over 3 days.

Conclusions

In central PA, wild brambles flower at the end of May- beginning of June. At this time there are a number of active, native (and a few introduced) bee pollinators including those that specialize on Rosaceous plants, particularly in the genus *Osmia* (mason bees). However raspberry growers in this project routinely cut back red raspberry canes in spring to delay flowering and fruit production) until July (through frost). Some of the wild solitary pollinators specialize on Rosaceous, such as *Osmia spp.*, have completed their adult lives and are no longer active by the time these domestic brambles are blooming. Consequently, the effective pollinators of domestic brambles appeared to be somewhat different from wild brambles. The absence of these wild pollinators that normally specialize on Rosaceous plants has the potential to cause pollination problems for bramble growers, especially since wild honey bees are no longer common.

However, both cooperating farms appeared to have good bee visitation. The Village Acres Farm had four colonies of honey bee colonies which appeared to be critical given the lack of bumble bees and other native pollinators found visiting raspberry flowers. Without the addition of honey bee pollinators this farm would have most likely suffered a loss in fruit quality and yield. The New Morning Farm did not have honey bee colonies and very few honey bees were seen visiting raspberry flowers indicating a lack of wild colonies. However, the high numbers and kinds of pollinators, especially bumble bees, resulted in higher bee visitation rates than occurred at the Village Acres Farm. Given this scenario, if New Morning Farm had opted to rent honey bee colonies for raspberry pollination, the expense would have been money wasted .

We propose that observing the visitation rate to raspberry flowers holds the potential to make a conservative estimate of the adequacy of pollination by honey bees, bumble bees, or solitary bees individually or in combination. This method combines published honey bee pollination rates with the current observations, and allows the grower to make immediate adjustments if needed. Some additional testing is required to confirm this potential and with the help of SARE we hope to complete another 2 years of study making this a practical tool for growers.

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