What's the attraction of honey bees to blueberry flowers?

Sophie Parks, Melinda Simpson, Leanne Davis and Madlen Kratz - NSW Department of Primary Industries

The European honey bee (*Apis mellifera*) plays an important role in the pollination of blueberry flowers, required for the flowers to develop into fruits, but what has the flower got to offer this humble bee?

Furthermore, how can we protect or even enhance any bee-attractive properties that the crop may possess? These questions are being addressed as part of current research which aims to optimise pollination within berry crops.

We are particularly interested in berry crops grown under protective covers such as bird netting, hail netting and high tunnels as these structures can affect the flight path of honey bees and potentially limit pollination.

Pollination occurs when bees move through a flowering crop. A blueberry flower visit, such as in Figure 1, can result in pollen grains being released from the flower and attaching to the honey bee.

The pollen is then inadvertently transported by the bee on its visit to another blueberry flower where the pollen may attach to the stigma of the flower from the bee's legs, head or body (*Hoffman, Land and Rao, Pollinator Ecology and Management*, 47:1465-1470, 2018).

Once on the stigma (a female part of the flower), the pollen grain (a male part of the flower) then enters the ovary fertilising the ova (egg) which eventually will become a seed of the developed blueberry fruit.

Figure 1. A honey bee visiting a blueberry flower
Photo credit: Melinda Simpson

The attraction of honey bees to blueberry flowers is nectar. Unlike flowers of other species, the honey bees are less likely to be actively collecting pollen from blueberry flowers and more likely to be collecting the nectar present in the base of the flower where the nectar is produced.

Therefore, nectar-collecting honey bees are mostly responsible for the transfer of pollen among blueberry flowers. Honey bees consume nectar as their source of energy and excess amounts are stored as honey inside the colony.

Previous research shows that at least for highbush blueberry, honey bees have to go elsewhere to forage for pollen to meet their nutritional requirements (*Dogterom and Winston, The Canadian Entomologist*, 131:757-768, 1999).

Part of our research aims to evaluate some blueberry varieties used in Australia in terms of how likely they are to be pollinated by the activities of honey bees. One element of this work is assessing the morphology or the shape of blueberry flowers. It so happens that access to the nectar at the base of the flower can be limited by the shape of the flower.

Previous research with four blueberry varieties has shown that the one with the widest flower opening or throat, was more likely to be visited by bees (*Courcelles, Button and Elle, Journal of Applied Entomology*, 137:693-701, 2013). See Figure 2.

Potentially, pollination may be improved by the selection of varieties with flowers of larger throat size or improved by breeding varieties with this characteristic.

However, for the blueberry varieties used in Australia, the morphological characteristics of their flowers have not been evaluated, so this is the topic of current research. The way flower morphology is being assessed is shown in Figure 3.

Figure 2. Leanne Davis, NSW DPI collecting flowers for floral assessments. Photo credit: Melinda Simpson

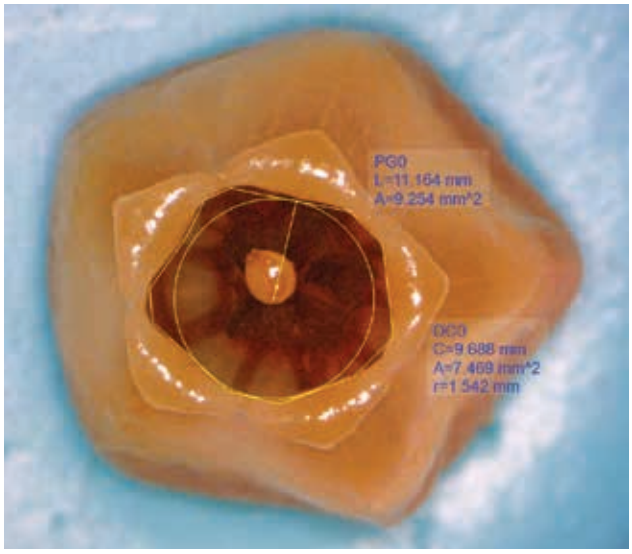

Figure 3. A preserved blueberry flower and its throat as viewed under the microscope. The top of the stigma can be seen at the centre of the flower throat. Digital measurements allow for the throat area to be calculated as an indication of how accessible the flower opening is to its base where the nectar is produced.
Photo credit: Leanne Davis, NSW DPI

In brief, the flowers are collected in the field and placed in a vial of preservative for later assessment. Each flower is mounted under a microscope to view the flower throat, and a digital program is used to calculate distances between the flower structures and to calculate the area of the throat. Up to 10 varieties will be assessed in this way.

Future work will assess the likelihood of honey bees visiting varieties that differ in flower shape. We will also investigate how varieties differ in terms of their pollen and nectar production, and how these factors may relate to bee activities within covered crops.

This work is part of the collaborative project *Novel technologies and practices for the optimisation of pollination within protected cropping environments* under the Australian Government Department of Agriculture and Water Resources' Rural R & D for Profit Programme, coordinated by Hort Innovation.

Partners include NSW Department of Primary Industries, Plant and Food Research Australia, the University of Adelaide, the University of New England, the University of Tasmania and other representatives including the beekeeping and netting industries, and several horticultural industries (Berry, Apple, Onion, Sweet Cherry). It addresses some pollination issues that limit the optimal production of some horticultural produce under cover.

NSW GOVERNMENT | Department of Primary Industries

Australian Government
Department of Agriculture