Researching native flies as pollinators of blueberries

Dr David Cook, Research Scientist, Department of Primary Industries and Regional Development, WA

A lack of insect pollinators during flowering is often the cause of poor berry formation and fewer marketable fruit in both strawberries and raspberries, and commercial blueberry production in Australia is virtually entirely dependent on the European honey bee (*Apis mellifera L.*) for pollination.

A national $5.74 million five-year project is examining the potential for using native flies to supplement bees as pollinators of horticultural crops. Funded by Hort Innovation, and with co-participants from across Australia, the research in WA is focused on examining the performance of native flies as pollinators in blueberry crops as well as avocados. Other national collaborators are also investigating avocados as well as mangoes, seed crops and several berry crops including strawberries, blueberries, raspberries, and blackberries.

Pollination is vital to the success of many fruit and vegetable crops, with pollination-dependant crops in Australia worth almost $6 billion annually. While bees are the most widely-used and well-known crop pollinator, there are many other insects that are natural crop pollinators, in particular flies. Flies offer multiple benefits as pollinators: they are present all year round, they regularly visit flowers to meet their high sugar demand for flying, they are big and hairy and often pick up pollen and move it from flower to flower, and they don't sting people. Australian flies being considered in this research include calliphorids, syrphids (hover flies) and rhiniids (snout-nosed flies).

Endemic to south-west WA, the western golden-haired fly (Calliphora albifrontalis, Figure 1) performed well in 2018 glasshouse trials on southern highbush blueberries. In the trial, which included nine bushes in each treatment, plants pollinated by the flies produced 43 percent more berries than the control where pollinators were excluded. Berries were also larger with adult C. albifrontalis present, 1.88 grams per berry verses 1.63 grams in the control.

Blueberries can self-pollinate to a certain degree, but the addition of a fly pollinator showed that yield between the two treatments began to differ 11 weeks after the flies were first released. Berry yield remained higher in the house with flies (11.29 kilograms from 6177 berries at 1.83 grams per berry) compared with those plants without flies (4.98 kilograms from 3427 berries at 1.45 grams per berry) (Figure 2). This is the first demonstration under controlled conditions of the ability of an Australian calliphorid blowfly to pollinate and increase yield of commercial blueberry bushes.

Figure 1. A *Calliphora albifrontalis* fly about to feed on a blueberry flower (L) resulting fruit set following pollination (R). Photo credit: Dr Sue Jaggar, DPIRD

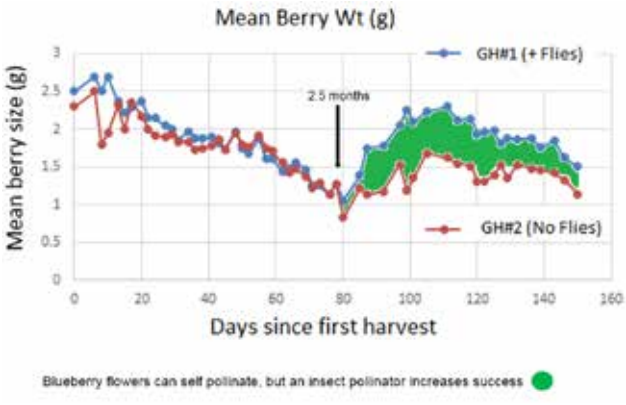

Figure 2. Yield of southern highbush blueberries over time since the first fly release. The area in green represents the time when blueberries that were harvested could have been pollinated by C. *albifrontalis* adult flies in GH1 versus bushes that self-pollinated (GH2).

A subsequent trial in 2019 showed that another native species of fly, found on the majority of the Australian mainland, *Calliphora dubia*, the western blue-bodied fly (Figure 3), produced even better results than C. *albifrontalis*. Pollination by C. dubia increased yield by more than thirty percent when compared with C. *albifrontalis* as well as producing bigger berries (Figure 4). This comparison between the two fly species is being repeated in 2020 to authenticate the results and provide increased confidence in the findings.

Figure 3. Calliphora dubia, the western blue-bodied fly, outperformed C. *albifrontalis* in 2019 glasshouse trials.
Photo credit: Dr Sue Jaggar, DPIRD

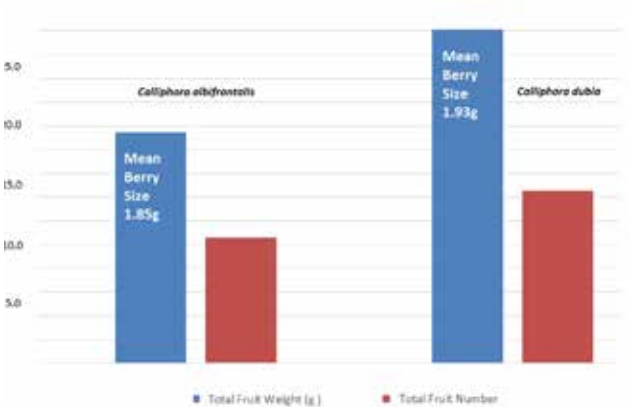

Figure 4. Total yield and mean berry size of blueberries when housed with either C. *albifrontalis* or C. *dubia* adult flies over 5 months.

This project is investigating the use of native flies in the pollination of horticultural crops as a 'pollination service package' – from identifying suitable flies for pollination, to suitability for mass rearing and release. The final two years of the project (2021-2023) will develop rearing techniques for mass production of the best candidate fly species. This will involve determining the dose of x-ray radiation required to render the flies sterile, so that they don't alter the balance of natural fly populations. The aim is to make the flies commercially available as a pollination service to future proof the industry by reducing reliance on honeybees as the sole pollinator.

For more information please contact:
Dr David Cook
Email: david.cook3@dpird.wa.gov.au
Phone: (08) 9368 3804

The Managing flies for crop pollination project is funded by the Hort Frontiers Pollination Fund, part of the Hort Frontiers strategic partnership initiative developed by Hort Innovation, with co-investment from Western Sydney University, The University of New England, The University of Western Australia and Seed Purity Pty Ltd (Tasmania) with contributions from the Australian Government.

Department of Primary Industries and Regional Development
GOVERNMENT OF WESTERN AUSTRALIA

hort frontiers Strategic partnership initiative | POLLINATION FUND