

Rewarding pollinators with sweet-talking blueberry flowers

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Introduction

Floral nectar is the main attractant to blueberry crops for honey bees, with the pollen ignored due to its low protein value compared with other pollens. Access to nectar resources, however, can be limited for honey bees in blueberry crops under covers, used to exclude birds and provide protection, since these covers form barriers that affect their flight path. Our research aims to better understand the attributes of nectar from blueberry flowers with a view to increasing the 'attractiveness' of this crop by developing new practices to manipulate nectar and ensure pollination success under protective covers.

One potential intervention to modify nectar production in blueberry flowers is through fertigation. Blueberry crops are often fertigated (irrigation containing fertiliser salts), and we hypothesised that adjusting fertigation strength has the potential to modify nectar production to suit the needs of pollinators.

Experiment set up

We conducted a glasshouse experiment at Wollongbar Primary Industries Institute with 30 mature blueberry plants (variety 11-11), growing in potted substrate, and applied 3 fertigation treatments of low, moderate and high concentrations of nutrient salts (electrical conductivities of 0.7, 0.9 and 1.2 dS/m), to 10 plants per treatment. Pollinators were excluded. During peak flowering, we extracted nectar with a pipette, from 6 flowers of the same age, per plant. The nectar samples were weighed and analysed for their sugar concentrations. Other measurements included plant canopy area, flower count per plant and temperature and relative humidity during the experiment. Following the experiment, data were statistically analysed.

Can fertigation modify nectar in blueberry flowers?

The total amount of sugars in nectar including sucrose, glucose and fructose ranged from 6 to 14 mg per flower with concentrations of between 34 and 86%. The temperature during nectar collection (18 - 23°C) was a major factor affecting the weight of nectar (12-23 mg per flower), with a trend of increasing weight from 18-22°C, and declining thereafter. However, the temperature and humidity did not relate well to the sugar concentration of nectar, in contrast to other studies.

Further, the fertigation treatments did not affect these nectar characteristics but their effects on the proportions of sugar types in nectar may prove otherwise, and data analysis of these is ongoing. Some studies suggest that honey bees prefer nectar with a high ratio of sucrose relative to glucose and fructose contents, so understanding the role of fertigation in the proportion of sugar types in nectar is of value here.

Following peak flowering, nectar was extracted from blueberry flowers for mineral analysis. Flowers and nectar were limited and only enough nectar was extracted for one sample each of the medium and high fertigation treatments. Nectar volumes were not sufficient to measure nitrogen, but potassium, calcium, manganese, copper and zinc were detected in these nectars, with the other elements being below levels of detection.

The potassium concentration in the nectar from the high fertigation treatment was higher than that for the moderate fertigation treatment, and we can speculate that this relates to the greater potassium amounts supplied to the plants in the high fertigation treatment. The potassium concentrations in nectar were low compared with reports for avocado and onion nectar, which can deter honey bees, but higher than those reported in citrus which is highly attractive.



A blueberry flower with nectar droplets visible on the stigma and inside the floral tube.

Photo credit: NSW DPI

As the fertigation strength increased from the low to high treatments, the number of flowers per plant increased, relative to the canopy area, suggesting that higher fertigation strength is a way of increasing the nectar available for pollinators. Although this appears to be promising, the plant needs to be able to support the development of the extra flowers into fruits following pollination, without limiting fruit size which can occur when resources are limited.

Acknowledgements:

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, Fisheries and Forestry Rural R & D for Profit Program, coordinated by Horticulture 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 pollination issues that limit the optimal production of some horticultural produce under cover.



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Leanne Davis, Technical Officer (NSW Department of Primary Industries) in the experiment at Wollongbar, NSW, where nectar from blueberry flowers was extracted for analysis of sugars, and chemical elements in some samples.

Photo credit: NSW DPI

This problem can be avoided by using practices that ensure crops are growing optimally, such as conducting leaf mineral analysis in summer after harvest, to evaluate the nutrient status of the crop.

This work has highlighted the important role that microclimate can play in nectar production but also the potential effect that fertiliser practices can have on crop floral resources. We look forward to updating you on the results of this project as it comes to completion.