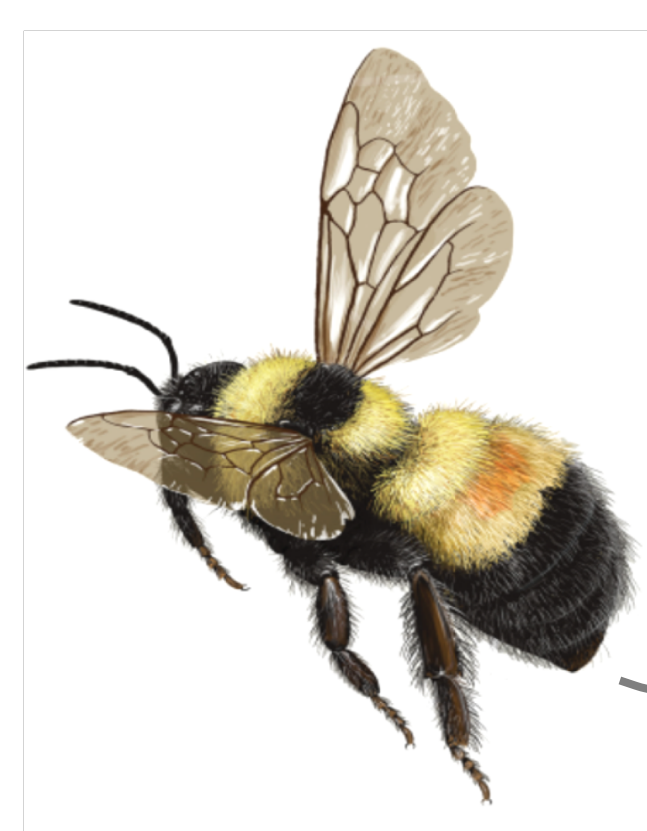


Are There Yield Benefits to Recruiting Wild Pollinators in a Strawberry Agroecosystem?

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INTRODUCTION

Over 35% of food crops depend on animal pollination, highlighting the ecological backbone on which agriculture is built.¹ As threats to honeybee colonies emerge, including colony collapse disorder², wild and native insect communities are becoming increasingly recognized for their important pollination services.³ Flower strips, and other pollinator farmscaping practices, are showing potential for integrating the ideals of both ecological conservation and crop yield in food production⁴, especially in organic systems.⁵

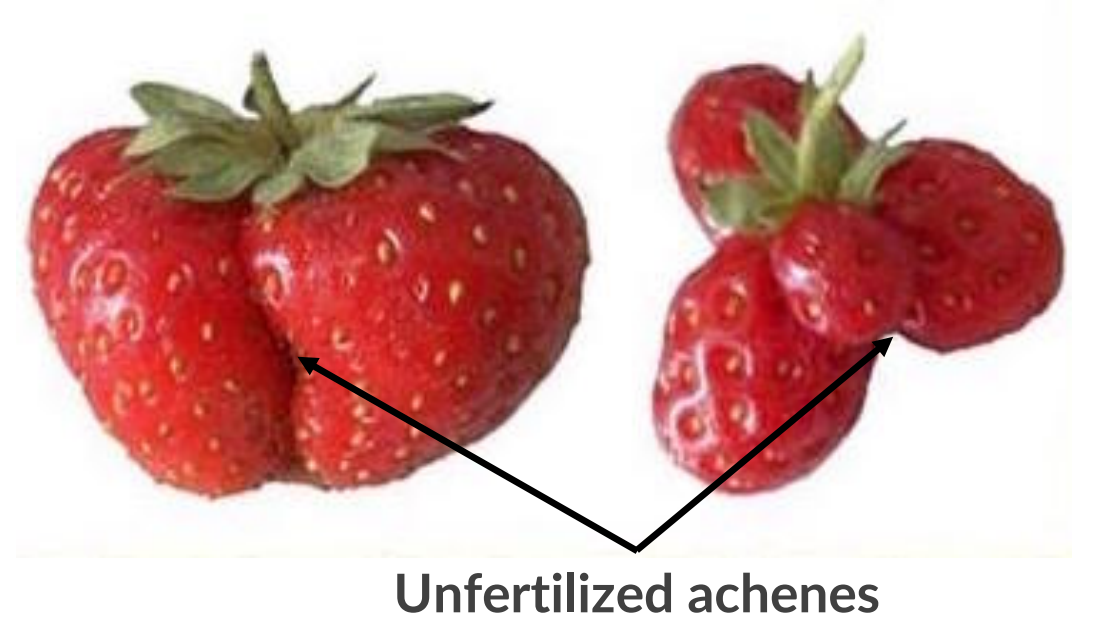
We integrated a flowering borage strip into an organic strawberry production system to examine the influence on strawberry harvest and pollination success.



LITERATURE REVIEW

Strawberry Pollination

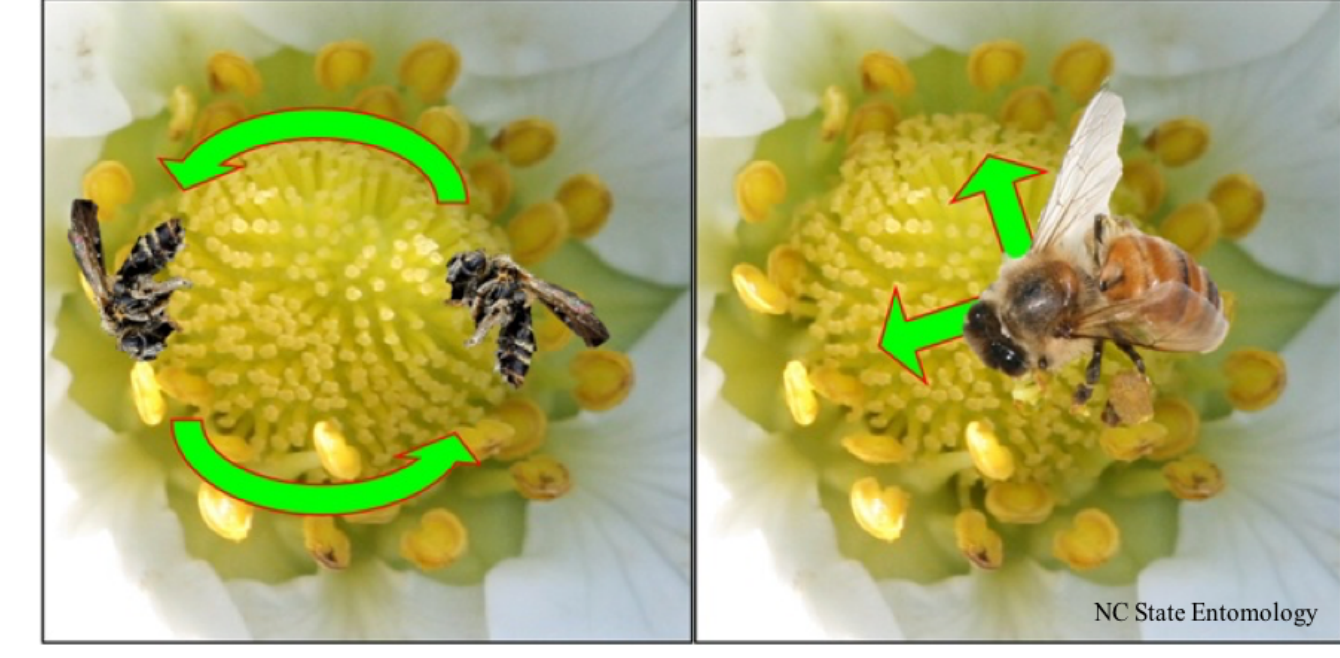
Poor pollination success (unfertilized achenes) can lead to poor fruit set, strawberry malformations, and a reduction in commercial grade.⁶



Unfertilized achenes

Insect Pollination in Strawberries

Compared to self and wind pollination, bee pollination can improve fruit set, quality, shelf-life, and yield of strawberries.⁷ Supporting a diversity of pollinating insects, including flies (Diptera), may improve fruit set through complimentary pollination (right).⁸ In fact, recruiting wild/native bees on strawberry farms may be desirable.⁹



Bee foraging behavior differs by species, offering complimentary pollination services for strawberries.

Day-Neutral Strawberries (*Fragaria x ananassa*)

Day-neutral strawberries can extend the Midwest strawberry season,¹³ but pollination requirements for these cultivars are not well known.



Borage (*Borago officinalis*)

Borage is considered a companion plant for strawberries, though there is, as yet, no scientific literature to support this. This flowering herb is highly attractive to bees, can host beneficial insects, and is edible.¹²

Flowers for Pollinator Farmscaping

Wildflower strips planted adjacent to strawberry tunnels can increase within-row pollinator visitation.¹⁰ However, there is evidence that bees may benefit more from flower plantings with clumps of single species rather than heterogeneous mixtures, such as wildflower mixes.¹¹



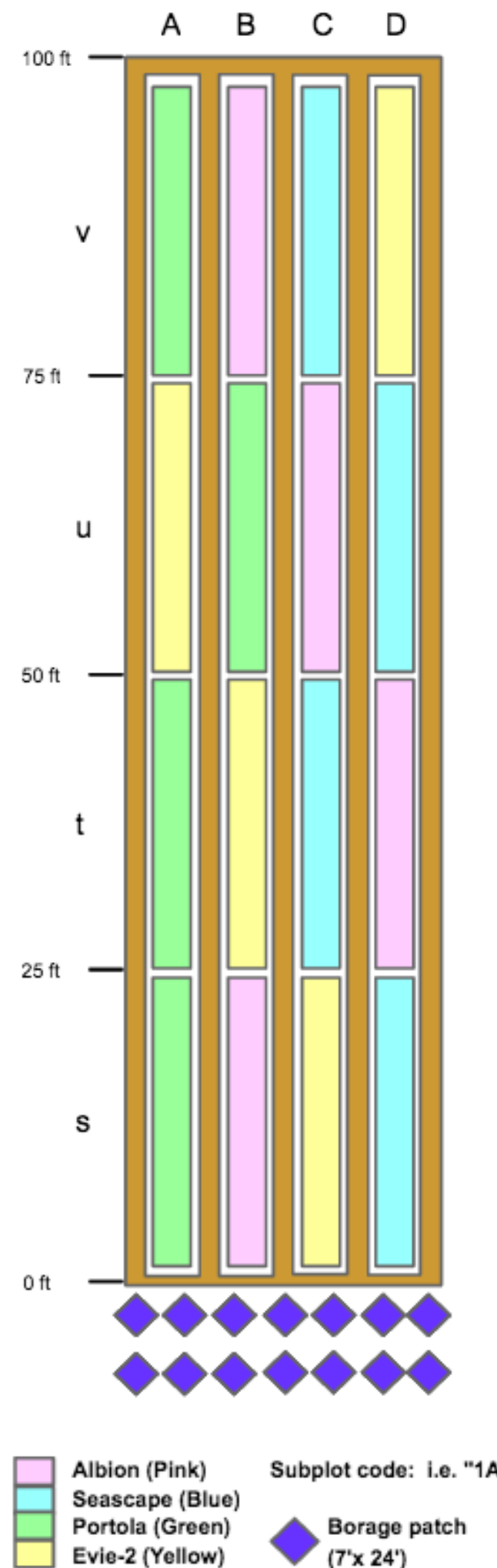
METHODS

Experimental Design

Three blocks of 100-ft strawberry rows (right) were established at the West Central Research and Outreach Center (WCROC) in Morris, MN. Four day-neutral strawberry cultivars (Albion, Seascape, Portola, Evie-2) were randomized and blocked in 25ft distance ranges (s-v) from a flowering borage strip (below).



A 7x24ft borage strip (foreground) was planted on one end of four, 100ft strawberry rows (background) in each block.



Pollinator Collection

Insects were collected on open flowers and preserved for later processing and identification.



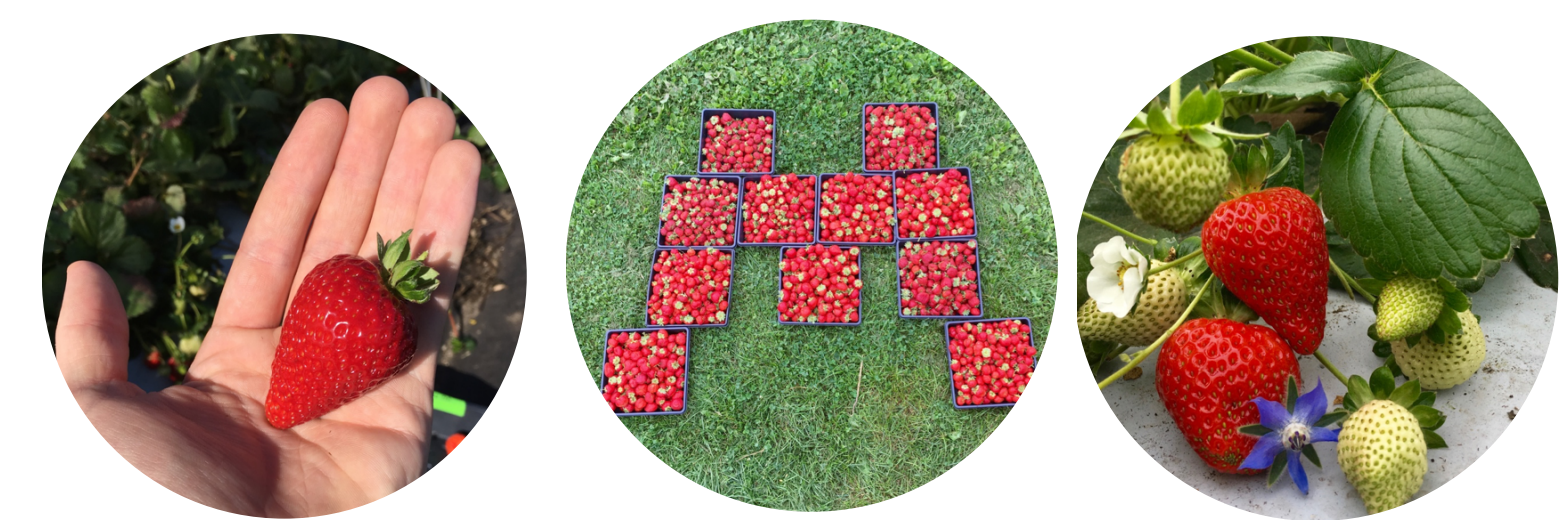
Strawberry Yield

Strawberries were harvested bi-weekly and total weight, berry number, and berry weight were recorded.

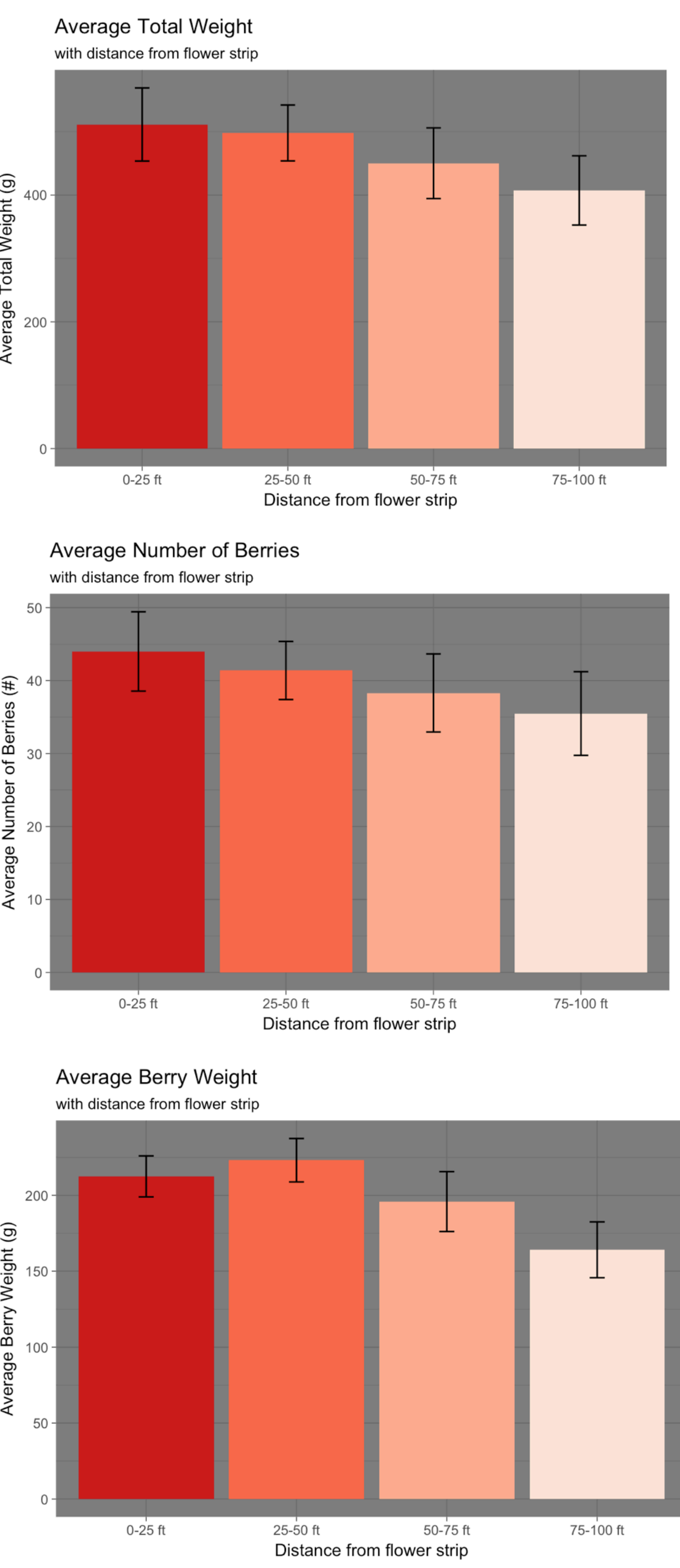
RESULTS & DISCUSSION

Strawberry Yield

Yield, including total weight, total number, and berry weight are averaged across cultivars and 19 harvest dates. Yield is compared as a function of distance from the borage strip in 25 ft. intervals.

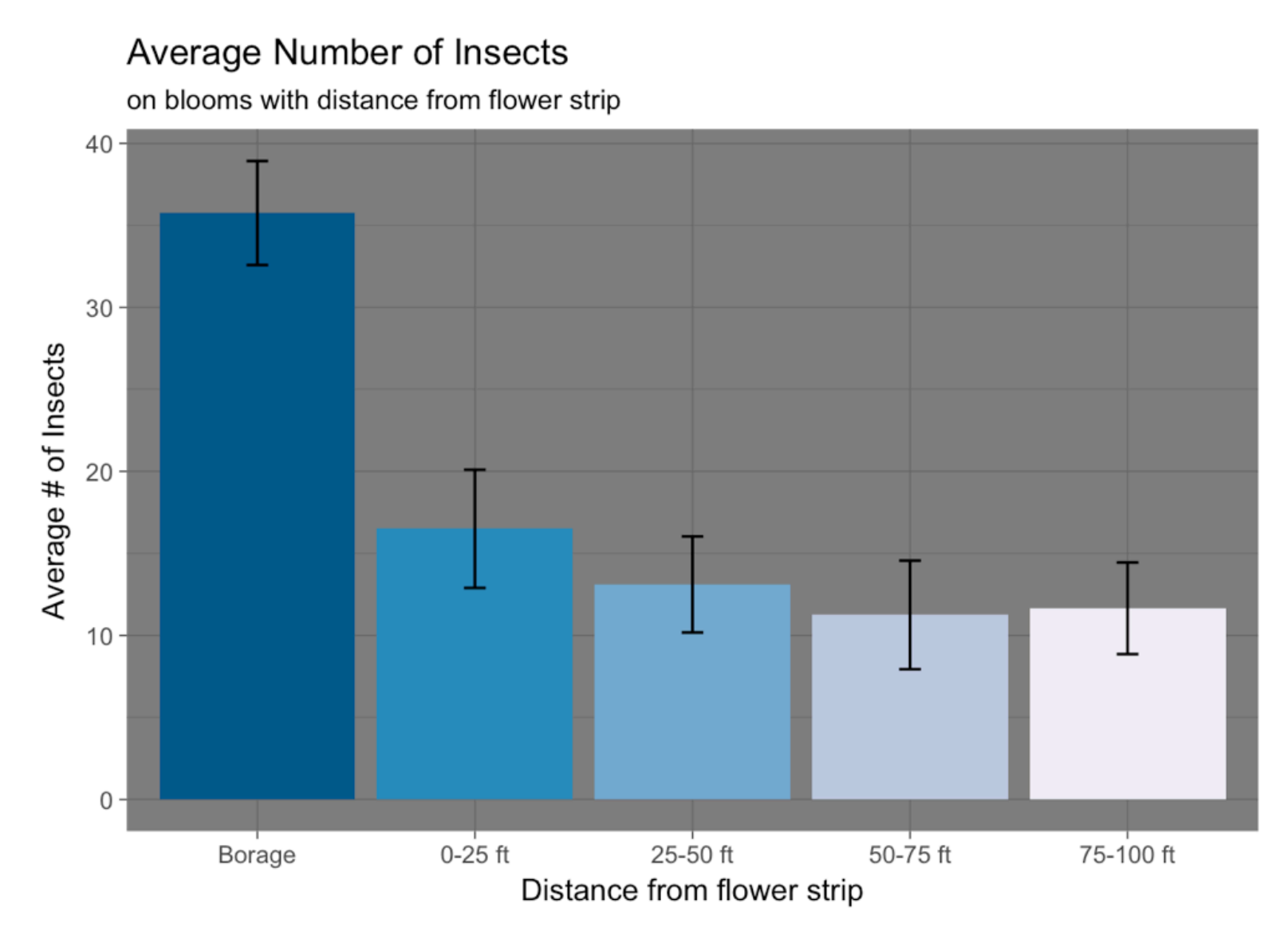


In the Midwest, day-neutral strawberries can be grown in an organic production system from July until October.



Pollinator Abundance

The borage strip hosted a higher number of insects compared to the strawberry flowers. The number of insects collected on open strawberry flowers generally decreased with distance from the borage strip, but there are no significant differences.



Pollinator Diversity

The borage strip hosted a large diversity of insects, including honey bees, bumble bees, and hover flies. Insects collected on strawberry flowers were primarily flies (Diptera), such as hover flies (*Syrphid spp.*), and various wild bee species, such as sweat bees (*Halictidae spp.*). Honey bees and bumble bees were rarely found on strawberry flowers.



Honey bees (*Apis spp.*)
 Bumble bees (*Bombus spp.*)
 Hover flies (*Syrphid spp.*)
 Wild bees (*Halictidae, Andrenidae, etc.*)

SUMMARY

- Berry weight may benefit within 50ft of a pollinator farmscaping flower strip.
- Strawberry pollination could rely more on Diptera species and small wild bees than on larger pollinators such as honey bees or bumble bees.
- Flowering borage strips may help facilitate pollination and support day-neutral strawberry production in an organic system.
- Pollinator behavior is complex and influenced by many factors, including landscape, weather, and natural areas. Pollinator farmscaping strategies must be designed for local contexts.

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