Blanket flowers increase arthropod predators and pollinators in citrus groves

By Angela Chuang and Lauren Diepenbrock

While many arthropod predator and pollinator activities benefit crop quality and yields, traditional farming environments may not be ideal habitats to support their survival year-round. For example, wild bees or flies that pollinate citrus may need other sources of nectar and pollen when citrus is not flowering. Planting wildflowers near crop fields to improve the habitats and increase available floral resources attracts pollinators and predators, which can increase their beneficial activities.

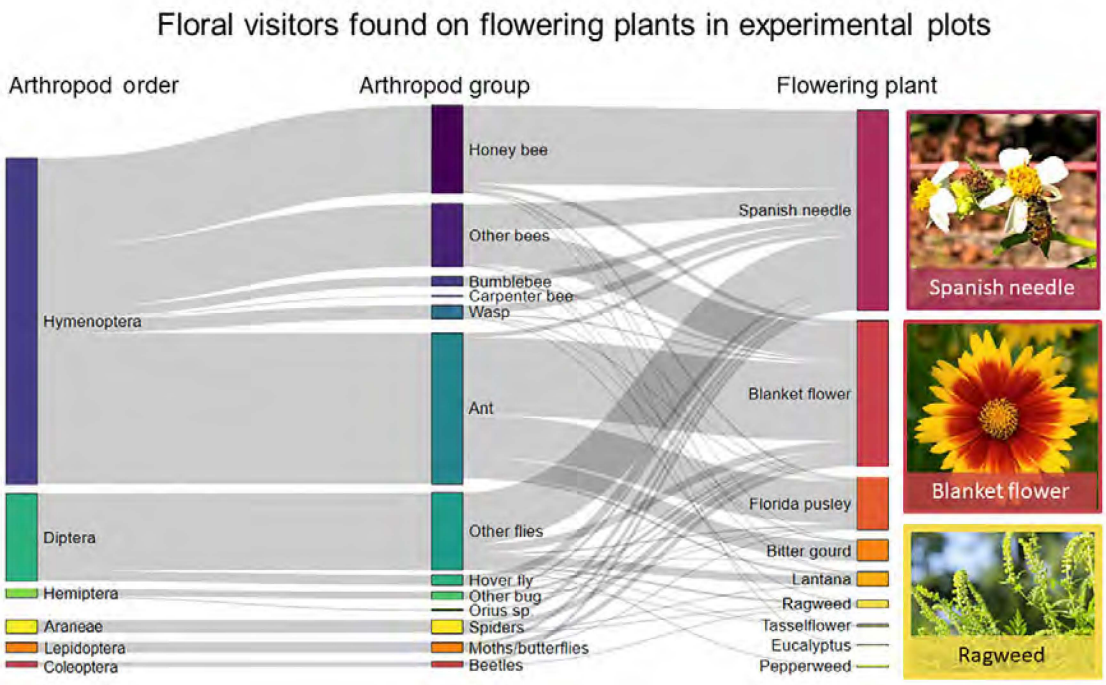
Ragweed in association with blanket flowers in treatment plots

STUDY SETUP

Researchers from the University of Florida Institute of Food and Agricultural Sciences (UF/IFAS) tested whether growing native Florida wildflowers next to citrus grove windbreaks would lead to more diversity in pollinators and predators. This study was conducted in Central Florida (Lake Alfred, Polk County) and North Florida (Monticello, Jefferson County). Each location had a grove with differing combinations of three flowering species and another one with no wildflower plantings.

The three native flowering species were buttonbush (*Cephalanthus occidentalis*), coral honeysuckle (*Lonicera sempervirens*) and common blanket flower (*Gaillardia pulchella*). These species represent bush, vine and herbaceous species, respectively. Plants with differing growth structures were purposefully chosen to create diverse habitats for arthropods. These were planted in late 2020 on one windbreak edge (eucalyptus) of each treatment grove, approximately 25 feet from the nearest citrus tree.

Since April 2021, researchers have sampled arthropods in these groves every month. Arthropods in the flowering plots were sampled to determine what insects were visiting the flowers. Arthropods within the citrus rows were sampled to infer if arthropod increases at the edges would diffuse into the grove. Since the grove edges naturally



Arthropod associations with dominant blooming flowers

had other vegetation, including weedy flowering plants, these flowers were also included in the study to determine the types of insect visitors they attracted. The researchers chose not to remove the weedy plants from the plots to see how the three native plants would fare against naturally occurring plants.

RESEARCH RESULTS

Overall, this study found that the treatment grove had a higher abundance and diversity of generalist predators that feed on Asian citrus psyllid nymphs. These arthropod predatory groups include (in order of most to least common): spiders, ladybugs, minute pirate bugs, lacewings, syrphids and praying mantis. Predatory long-legged fly abundances did not differ between the treatment and control groves. Despite consistently finding more predatory arthropods in the treatment grove, researchers found no difference in pest pressure between groves. This is likely due to higher standing pest pressure in the treatment grove compared to the control grove because of unrelated higher flush density.

As expected, the treatment grove also had a higher abundance and diversity of pollinators compared to the control groves. This difference was specifically due to more insects found on blanket flowers, which were abundant throughout the year. Blanket flower was the main flowering species that thrived along the edges of the sandy grove habitat. Some plants grew to about 2 feet wide after the first year. Many flowered continuously, providing nectar and pollen to insects year-round.

Although the three selected flowering species were Florida natives, not all of them proved suitable for the grove lifestyle. Buttonbush did not tolerate the sandy grove soils and the dry spring in 2021. It was replaced with American beautyberry (*Callicarpa americana*) in 2022. American beautyberry flowered briefly and fruited. It was slow to grow, especially in areas where it received direct sunlight. As an understory species, this shrub can be planted closer to windbreak trees to benefit from more shade. It attracts butterflies and some birds, but bees were not commonly observed on the shrubs.

Due to grower concerns that planting a vine could lead to rapid spread across citrus tree canopies, as bitter melon and passionflower can do, researchers used coral honeysuckle. This is a Florida native species that does not grow quickly. Vines were planted alongside a system of stakes with ropes to provide a structure to grow on. True to their nature, most of the vines planted in these groves stayed modest in size. They had trumpet-like flowers that bloomed from spring to fall that resulted in red berries. These flowers are known to attract butterflies and be particularly valuable to bumblebees, although the latter was not observed in this study.

Researchers tracked over a dozen other flowering weedy species occurring in and around the groves. Two were common enough to also have an observable effect on pollinators. Common ragweed (*Ambrosia artemisiifolia*) is abundant from spring to summer, peaking around July. Although honey bees (*Apis mellifera*) are known to forage from the abundant pollen produced by this plant, researchers in this study noted a specific lack of honey bees and any other insects on ragweed from both treatment and control groves. This is despite honey bees being the most common floral visitor seen in observations, and the proximity of the experimental groves to commercial hives.

Statistical analyses showed ragweed abundance had a slightly negative association with pollinator abundance. This is possibly because it peaks at the height of summer when insect activity is lower. It could also be because ragweed competes with other flowering plants (e.g., blanket flower and Spanish needle) that pollinators in this region are attracted to.

Commercial honey bees were attracted to both blanket flower and Spanish needle (*Bidens alba*), a weedy native flower. Spanish needle is an annual herbaceous plant with quarter-sized flowers and white petals. Blooming from February to late

October, it is common in citrus groves. It was the second most abundant species found in the groves used for this study, after common ragweed.

Most honey bees in the plots were observed on Spanish needles, possibly because it is more efficient to forage on the highly abundant flowers. Although this species is often considered a weed because its needle-like seeds readily stick to clothing, its resilience to agricultural practices and conditions may mean it is a naturally occurring resource capable of supporting a variety of beneficial arthropods, especially commercial honey bees, when citrus is not blooming.

Notably, blanket flower attracted many native bees observed in this study, including numerous species of sweat bees and leafcutter bees. Attracting and conserving not just commercial honey bees but also wild bees is important because they are an independent source of pollination and responsible for an increased fruit set and crop yield in many systems.

In this study, as many native bees were found on blanket flower as Spanish needle, even though blanket flowers were only a sixth as abundant as Spanish needles. Blanket flowers might be attractive to native bees because they provide twice to triple the amount of nectar on average compared to Spanish needle flowers. Plots without blanket flowers often had conspicuously few to zero native wild bees, which may suggest that blanket flowers actively attract wild native bees into groves that would not otherwise be there.

This study is ongoing, but the current data suggest that planting blanket flowers is associated with increases in predatory groups and pollinators. That this effect was detectable after the first year of planting is promising. The beneficial impacts associated with diversified habitat, increased shelter and additional food resources may improve over time as the plants get bigger and naturally spread along grove margins.

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