

Internship Goals

- Perform Integrated Pest Management (IPM) studies regarding the ecological impact of apple netting, used to control codling moth damage.
- Learn the principles and practices of IPM.
- Overview and learn the specific pest challenges of specialty and commodity crops in Western Colorado.
- Learn about and tour the Tri-River Area with mentors and peers.

Internship Activities

- My primary focus was the Apple Insect Diversity and Abundance project. I also helped prepare for WCRC-RM's squash bug project for next year. I collected data on the three life stages of squash bugs for five weeks. I counted the number of egg clutches, young/nymphs, and adults. I got to help look for corn earworm eggs in a local farmer's field, for a project my advisor, Mel, was working on.
- When I was not working on my projects or helping with other projects, I was helping with farm work.
- I went to several local farms and helped set up various insect traps, and I visited the Extension office in Grand Junction, the Western CSU Campus, and the USDA Insectary.
- I attended a weeder demonstration at the WCRC-Grand Valley and multiple workshops hosted at WCRC-RM.
- I learned problem-solving and critical-thinking skills.



Fig 1. Counting the life stages of squash bugs on the winter squash plants at WCRC-RM



Fig. 2 Setting up the Multigard AM – yellow sticky traps in the unnetted 'cameo' trees

Why IPM is relevant to my future

As a senior majoring in horticulture with a concentration in food crop production, I've learned the importance of mastering IPM practices and insect identification through my CSU Extension internship. These skills are essential for sustainable crop management and ecological balance in agriculture. Proper IPM application effectively suppresses pests while minimizing chemical pesticide use and reducing pesticide resistance. Identifying an insect population aids in early pest detection and accurate threat diagnosis, which will benefit me in any agricultural field I pursue after graduation.

Project Introduction

Apple farming has been central to Colorado agriculture since the late 1800s, but acreage declined in the mid-1900s due to Codling Moth (*Cydia pomonella*) damage. This pest remains a challenge, particularly for organic growers, as its larvae can render up to 70% of apples unmarketable. While IPM methods help, recent use of protective netting, originally designed to prevent hail damage, has reduced Codling Moth damage in some Western Colorado orchards from 43% to less than 5%. However, further research is needed to educate growers on effective netting use, especially regarding timing and impacts on insect populations. This project aims to provide data on how netting affects insect abundance and biodiversity.

Methods

Two different methods were used to collect data on the insect biodiversity and abundance. Research was conducted at the CSU Western Colorado Research Center - Rogers Mesa. The study orchard consisted of five, 300-ft, rows of 25-year-old 'Cameo' apple trees at 5-ft spacing in-row. Two rows were netted after flower petal fall, and three were left un-netted for the growing season. Two different methods were used to collect data on the effect of netting on apple tree insect biodiversity and abundance. First, samples were taken every Monday morning using a sweep net, to collect insects. Three hundred total sweeps were taken. Fifty on the ground surrounding the un-netted trees. Then, two samples of fifty sweeps each were taken from within the canopy of the un-netted trees, from two different locations within the row. This process was repeated in the netted trees. The samples were transferred from the net to a labeled Ziploc bag, placed in a freezer for a couple of hours, identified by order, and counted, and then the data was recorded in Excel.

Eight Multigard AM- yellow sticky insect traps were set out in the trees every Monday. Four were placed in the un-netted trees and four in the netted. The traps were evenly distributed within the rows. New traps replaced the previous ones in the same location every week. The traps were wrapped in plastic wrap, once collected. The insects were then identified by order, counted, and recorded in an Excel workbook

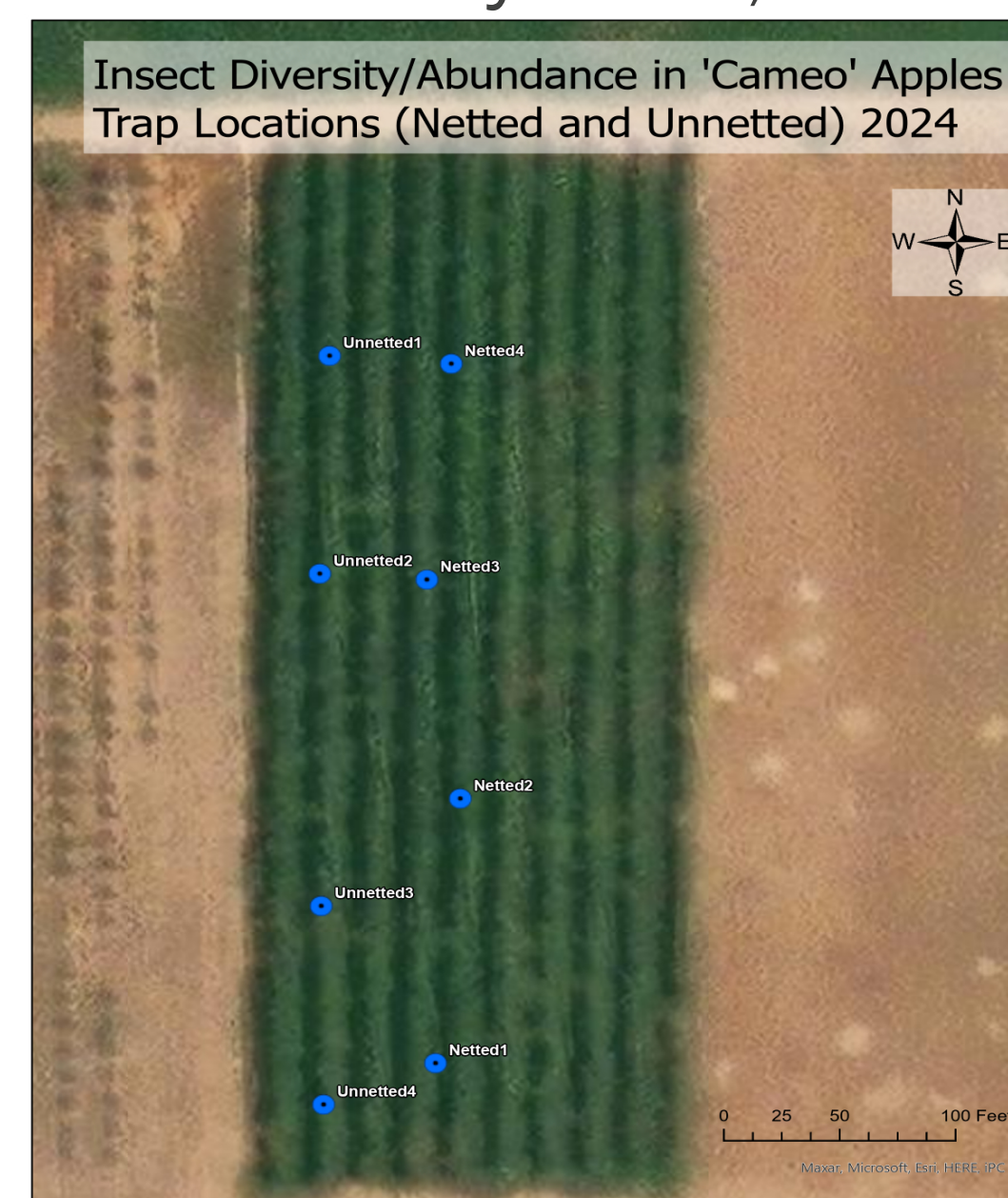


Fig 3. Map of apple diversity/abundance in 'Cameo' apples



Fig 4. A codling moth resting on a netted 'Cameo' apple tree



Fig 5. A Multigard AM – yellow sticky trap in the un-netted trees

Results

Multigard AM – Yellow Sticky Traps

- The nets affected insect diversity and abundance.
- Orders excluded: **Dermaptera**, **Raphidoptera**, and **Trichoptera**
- Note: The range of the Y-axis is much larger in **Figure 6**.
- Top 3 orders – Un-netted: **Hemiptera**, **Thysanoptera**, and **Diptera**
- Top 3 orders – Netted: **Hemiptera**, **Thysanoptera**, and **Coleoptera**
- Total insects found in the unnetted trees: 8490
- Total insects found in the netted trees: 3345

Sweep Net

- The nets affected insect diversity and abundance
- Orders excluded: **Raphidoptera** and **Trichoptera**
- **Hemiptera**, **Coleoptera**, and **Diptera** were found in the greatest abundance in the un-netted and netted trees
- Total insects found in the un-netted trees: 336
- Total insects found in the netted trees: 221

Data

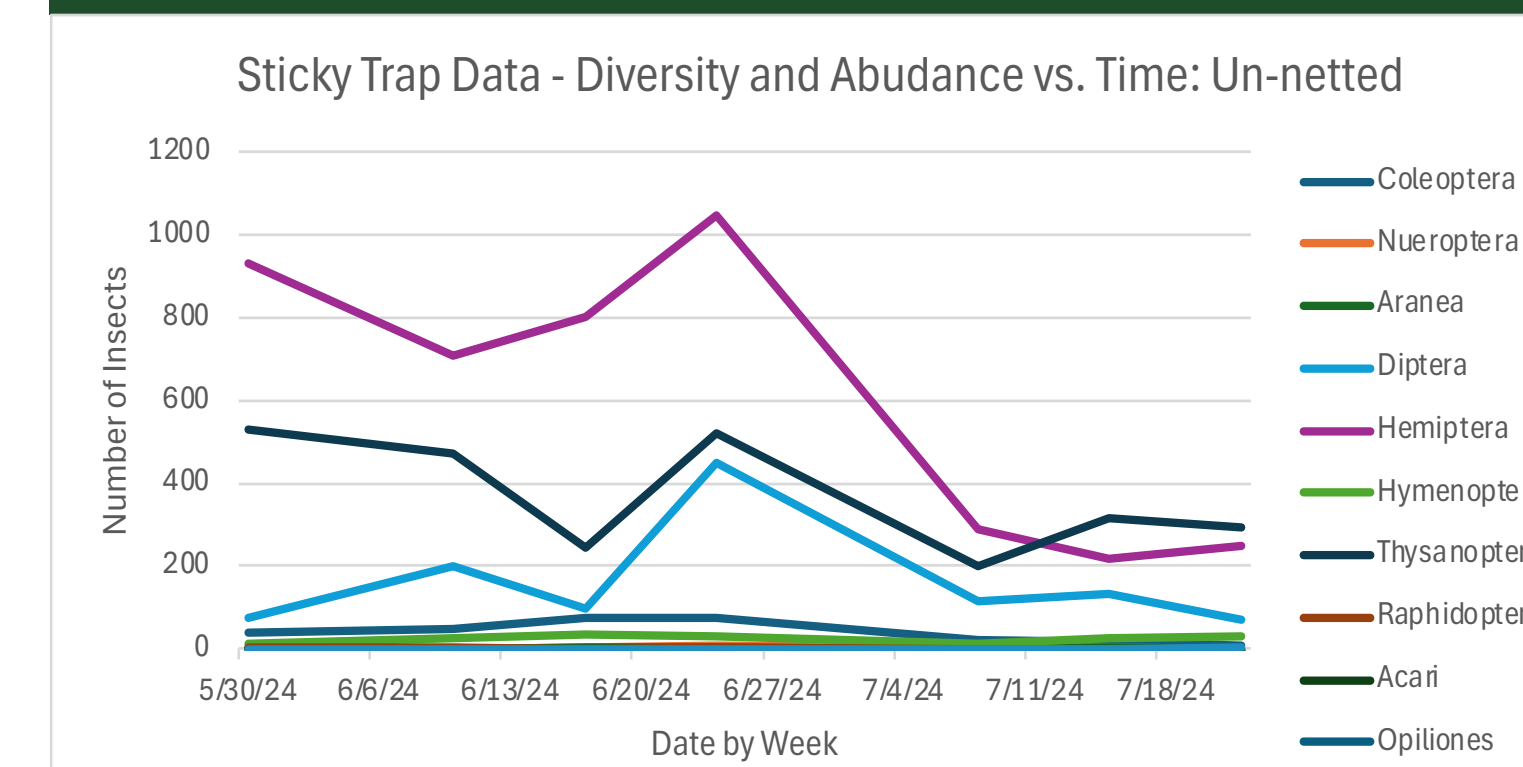


Fig 6. Multigard-AM Yellow Sticky trap data, tracking insect abundance and diversity amongst the un-netted 'Cameo' apple trees over eight weeks.

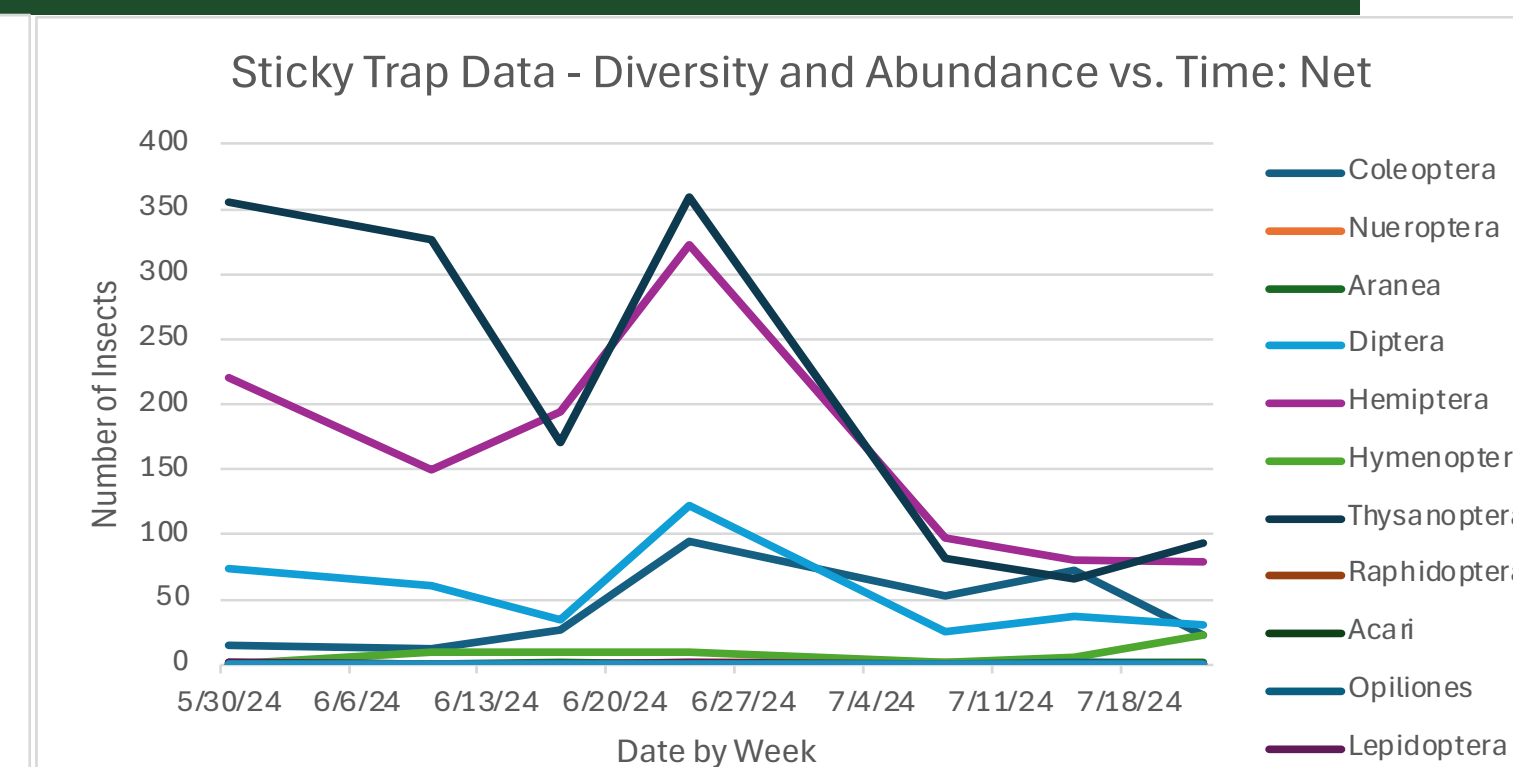


Fig 7. Multigard-AM Yellow Sticky trap data, tracking insect abundance and diversity amongst the netted 'Cameo' apple trees over eight weeks.

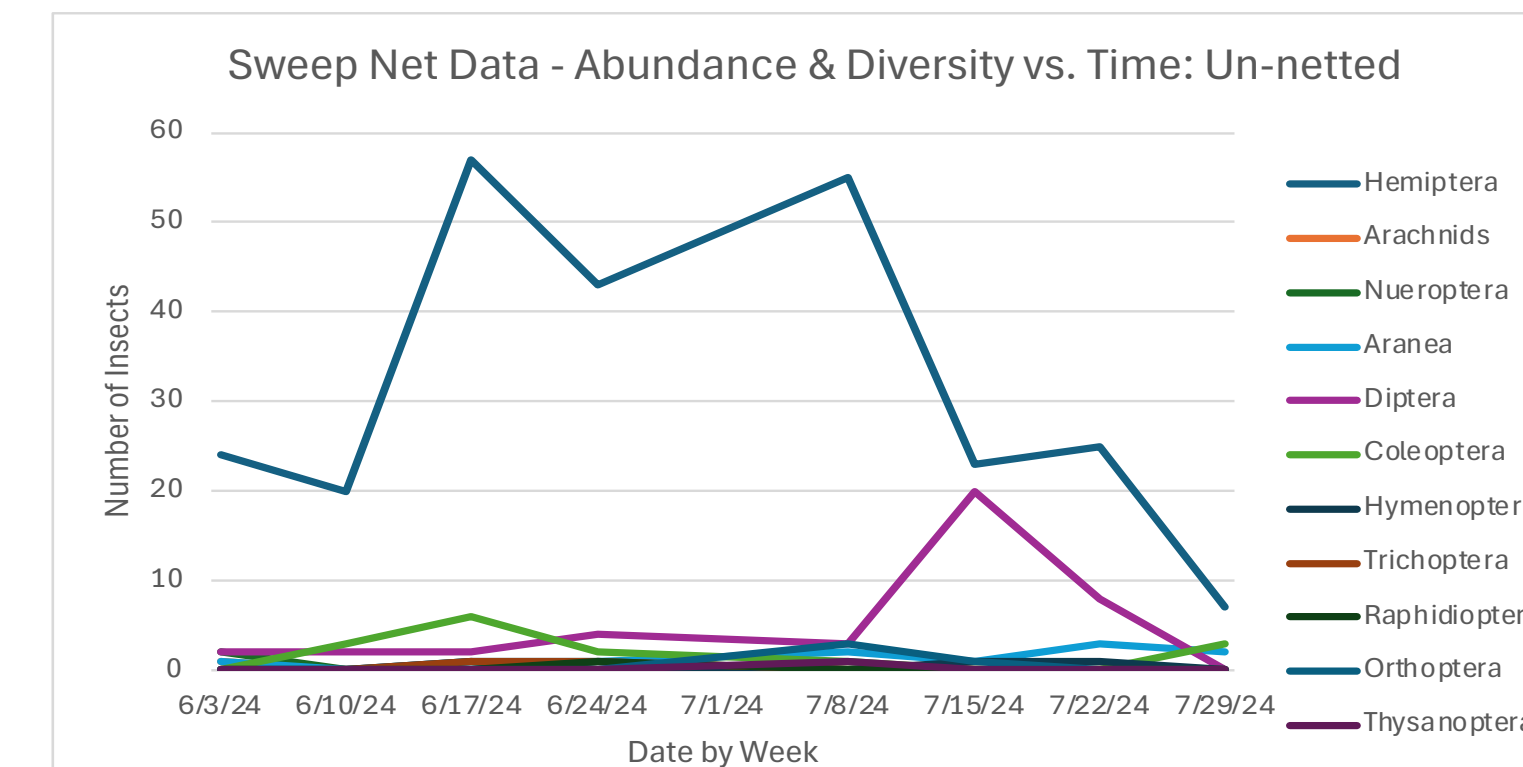


Fig 8. Sweep net data, tracking insect abundance and diversity amongst the un-netted 'Cameo' apple trees over nine weeks.

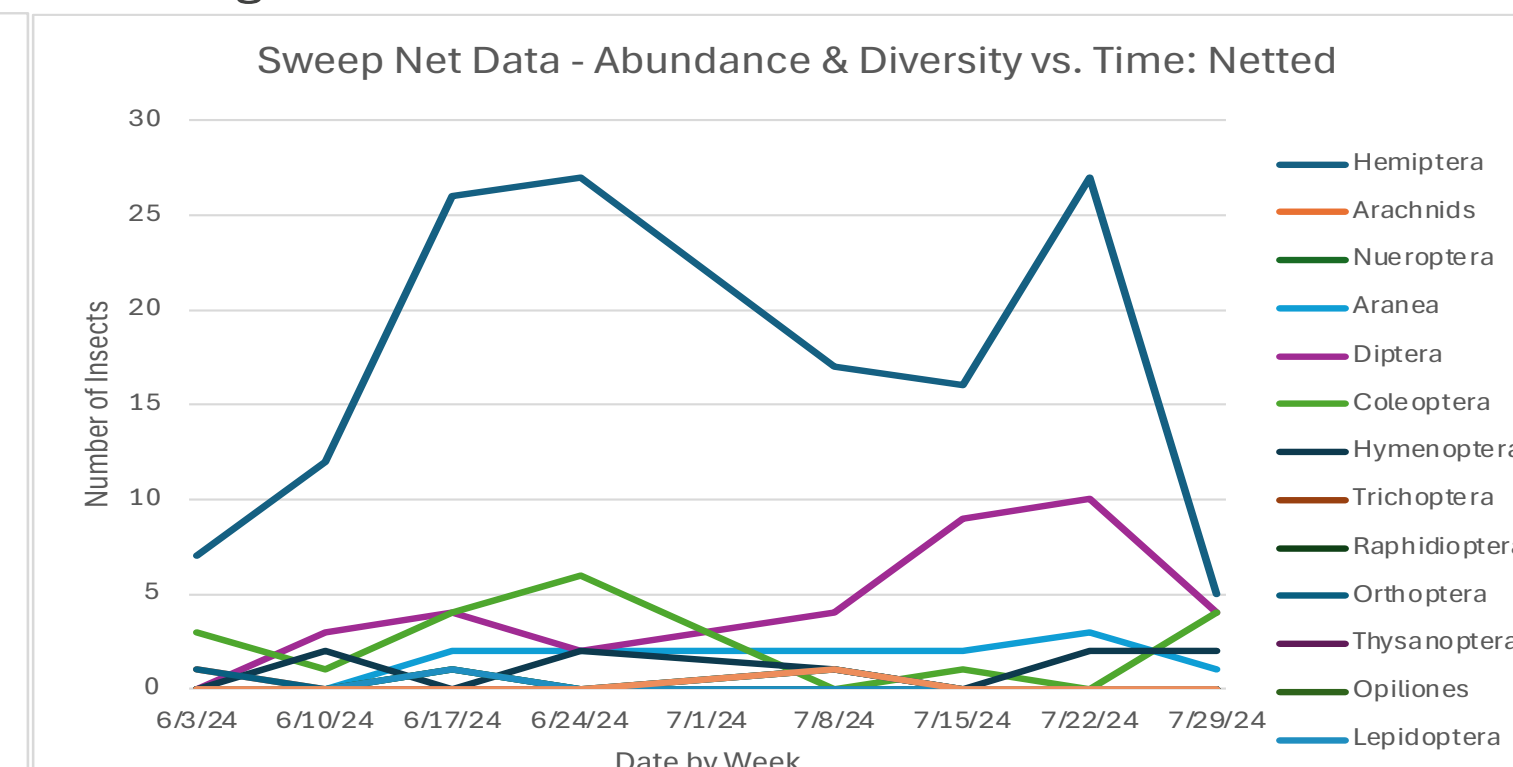


Fig 9. Sweep net data, tracking insect abundance and diversity amongst the netted 'Cameo' apple trees over nine weeks.

Takeaways

- Before starting this internship, I had minimal knowledge regarding the research side of agriculture. Not only have I seen various projects in action, but I got to work on two of my own and aid in many others.
- I have learned how to identify insects by order name and now have better knowledge of the proper application of IPM practices.
- I have learned how intertwined everything in agriculture is. There is value in every person and every job.
- I have learned several new farm skills – apple and peach thinning, tomato pruning, placing the codling moth nets on trees, and more.
- Extension and research are essential in educating and connecting the community.