Strawberry Growth Chamber Container: A Collaborative, Innovative Approach to Strawberry Entomological Research

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Summary

In 2020 California Polytechnic State University, BioResource and Agricultural Engineering Department (BRAE) partnered with my lab to create a growth chamber container for doing strawberry entomological research. This unit would allow for programable field-like conditions so year-round strawberry rearing and pest experimentation could be conducted. In particular, these greenhouse-like conditions would allow for proof-of-concept projects that will not fit into the lab space, and projects when fieldwork is not possible. The unit will serve not only as an excellent research area but also a showcase of agricultural technology at Cal Poly.

Goals

We met our goal of creating a well-outfitted automated entomology research facility. The unit was already on-site at Cal Poly (purchased and moved by BRAE) (Figure 1) and needed to be retrofitted for our entomology needs. This technological innovation and design implementation were accomplished by BRAE scientists Sara Kuwahara and Peter Livingston, and several of their undergraduate students, working weekly during the summer session. Together we planned how to use the space optimally, allow for the greatest amount of climate control and automation, while still being a great space to train both BRAE and the Plant Science students at Cal Poly (Figure 2). It was challenging to do all of this in one shipping container and with supply chain issues during COVID but the outcome (Figure 3) was worth the wait. It will be utilized fully starting September 30, 2021.

Figure 1. The entomology growth container current setup (before modifications for entomology).

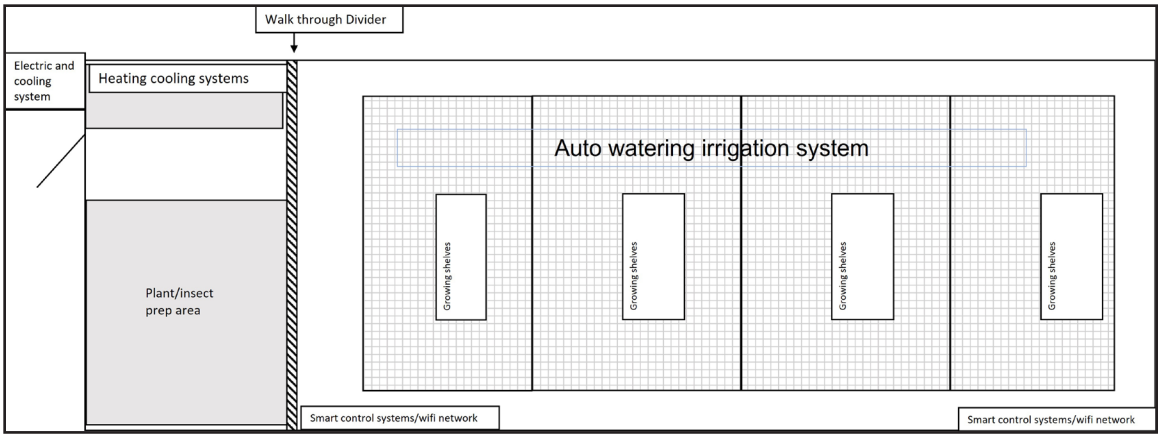

Figure 2. Schematic of the interior of the new entomology growth container.

Figure 3. The inside setup, before placing insect tents and strawberry plants.

Accomplishments

The container is a 40 ft insulated container that is lined with stainless steel, and we rebuilt the HVAC and electrical system to suit our needs. This setup is akin to an indoor vertical growing setup with 4 large shelving units, a new water system, and an array of electrical sensors that project the climatic conditions via Wi-Fi to my lab members in real-time. The lighting arrays are efficient greenhouse lighting with low heat generation and low electrical use. The added value to the commission's investment is $96,500 with its current market value of $120,000 ($60,000 Cal Poly facility donation +$23,500 CSC and BRAE labor partnerships).

Future Plans

Since the entomology program does not have greenhouse space, which is essential to conducting strawberry research year-round, this container will become our new multiuse high-efficiency greenhouse. We plan to move plants in immediately and will begin the process of turning our daylight into night and vice versa, so we can conduct behavioral experiments with lygus, mites, whiteflies, thrips, etc., during the day for my lab members, but it will be simulated nighttime for the plants and insects. Some of the questions we will be working on immediately include data collection on feeding, mating, and movement behaviors and how these change with particular field level stimulants like insecticides, UVC, climate, biocontrol organisms, tractors (bug vac), etc.