Automated Pest Detection Program SOP (Western Flower Thrips)

Introduction

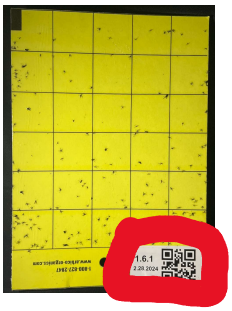
This program is intended for use at all Salk Institute plant growing spaces. After developing this program, the idea for its application is to function as a tool to enhance Western Flower Thrips (WFT) counting that is used for pest population monitoring. Better WFT population monitoring, in all Salk growing spaces, allows for more quantifiable thrip pressure monitoring and tracking of WFT population trends over time. This information enhances our abilities to study pest population cycles, pesticide effectiveness over time, better pesticide product selection, greater Integrated Pest Management implementation, lowered chemical control dependence from more targeted spray plans using pest monitoring data, and using WFT data to study environmental conditions' influence on WFT populations. Lastly, other than being used as a tool for better educated pest management and enhancing WFT control, this program can also be used for tracking individual projects plants being grown to see if the project owners are properly managing WFT populations.

Preparing Sticky Cards

- Create a 2"x1" label using the Brady Printer (see layout below)

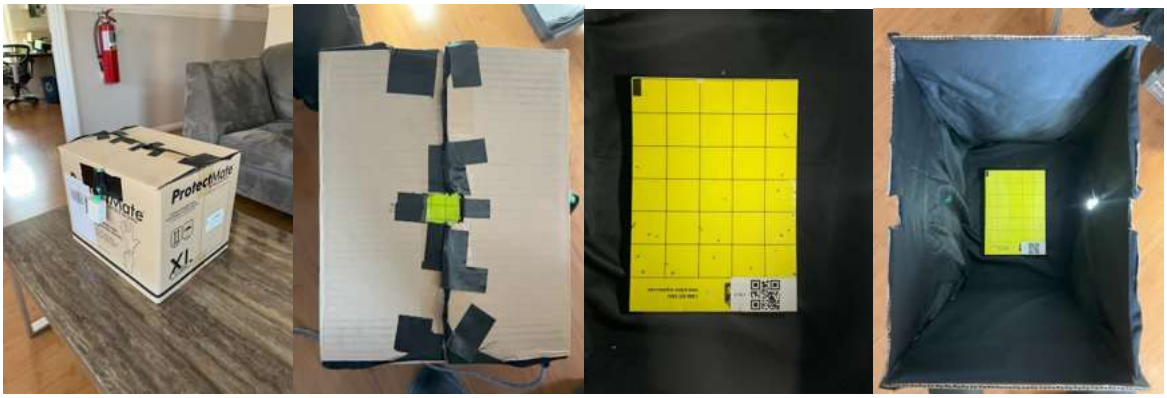
<table>
<tr><td>Table Number (X.X.1/2)</td><td rowspan="2">QR Code (Table #: X.X.1/2)</td></tr>
<tr><td>Date Card Placed (X/X/XXXX)</td></tr>
</table>

- Table Number: Bay Number. Table Number. Side of Card 1 or 2
    - Example Card: Table 3-4 Card Side 1 of 2: 3.4.1
- Date Card Placed: Put the date that the sticky card was set into the greenhouse
- QR Code: When making the label take the Table Number and place it on the label as a QR Code, this what the automated pest detection card will be reading to identify the thrip count to the correct card with the correlated table number Make sure to make labels for each side of every sticky card used for thrip monitoring
- Leave sticky cards out for 1-2 weeks before imaging cards to be processed for thrip counts



Imaging the Yellow Sticky Card

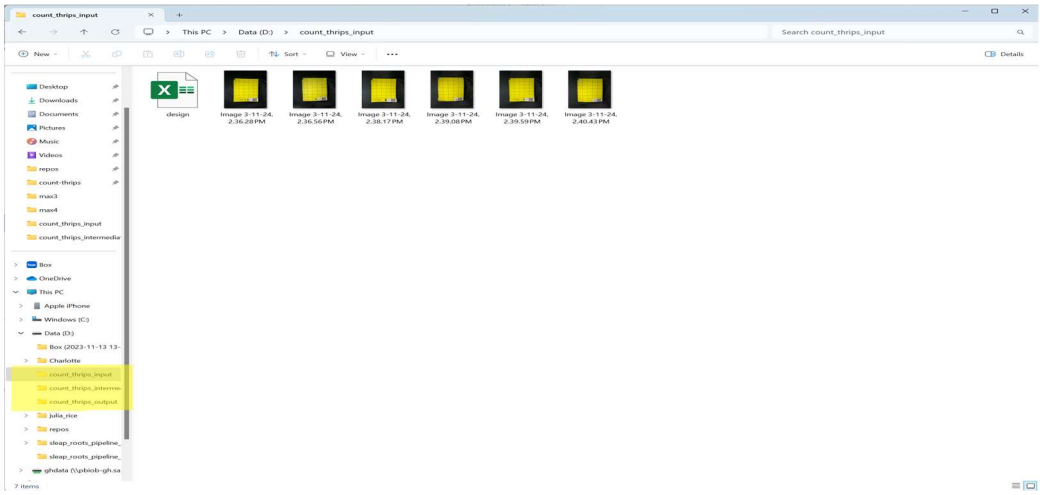
- Image cards using a mobile phone and imaging in the box app
- Open box app, create a new folder for the correct dates images, then in the pest cards folder select the option to take a photo
- Then image both sides of each card in the box app to properly upload the images
    - The pest detection program runs the photos taken through the box app, uploading photos another way may not work



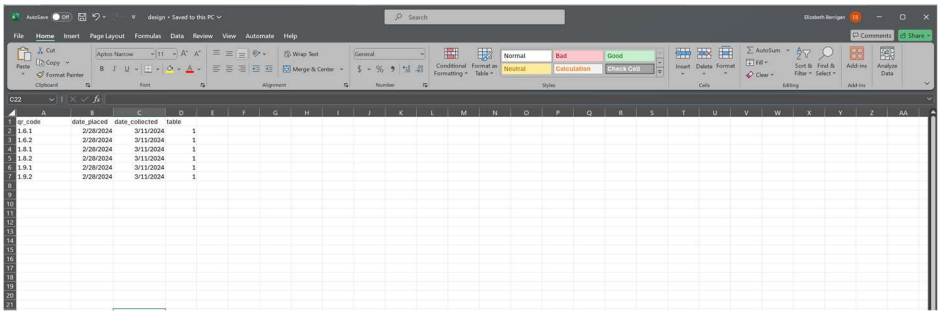
SOP- Automated Pest Detection – Western Flower Thrips Card Count

GitHub Repository (Detailed Description of Program): https://gitlab.com/salk-tm/count-thrips

1. Login to “Lil’ beastie” computer PBIOB-GH-04 in the Hive at the Encinitas Greenhouse
2. Open “Docker Desktop” by typing in the name into the windows search bar
3. Once the Docker Desktop is open, and does not say it is paused or stopped you can start to upload images and card data
4. Open File Explorer and go to “Data (D:)" where you will locate three folders titled “count_thrips_input , count_thrips_intermediate , count_thrips_output”
    a. These folders are the code script directories where the raw images and basic QR code information is inputted



5. Go into the count_thrips_input and delete all photo files (photos from last script run) **except for the excel file labeled "design"**
6. Delete all files in the "count_thrips_intermediate" and "count_thrips_output" folders
7. Before running the new batch of photos, you need to open the "design" excel file in the count_thrips_input folder and clear the previous data except for the top row
    a. In the Excel File: you need to fill the QR codes (from the GitHub directions is referring to each sticky cards number ((“QR code”; example: 1.4.1)), date placed, date collected, and table number **(This is the bay number but is incorrectly labeled "table number", do not change the name of the column and input bay # for each column)** For the batch of photos you are processing.



qr_code	date_placed	date_collected	table
1.6.1	2/28/2024	3/11/2024	1
1.6.2	2/28/2024	3/11/2024	1
1.8.1	2/28/2024	3/11/2024	1
1.8.2	2/28/2024	3/11/2024	1
1.9.1	2/28/2024	3/11/2024	1
1.9.2	2/28/2024	3/11/2024	1

8. Uploading photos
    a. Open Box and download the photos you want to analyze
    b. Open the zip file and select "extract all" for the folder of photos to be analyzed
    c. Then from the extracted folder take all the photos and drag or copy them into the "count_thrips_input" folder located in "Data (D:)" in the file explorer
9. Open Ubuntu using Windows search bar.
10. Change directories to location of run script: Do this by typing in (see below item "i"):
        i. cd /mnt/d/repos/count-thrips
11. Run the script with input, intermediate and output directories by copying and pasting the GitHub directory definitions by entering (see below item "a")

    a. ./run_pipeline.sh /mnt/d/count_thrips_input /mnt/d/count_thrips_intermediate /mnt/d/count_thrips_output
12. Copy the excel file labeled “thrips_counts” in the “count_thrips_output” folder to a secure location.
13. Clean input, intermediate and output directories once your data is saved elsewhere.
14. Use the completed thrip counts to track thrip populations over time, in specific growing locations, and the trends in population change over time from chemical controls and environmental growing conditions.

Please Contact the Encinitas Greenhouse Operations Team for clarification or any questions regarding the use of this program.