In April 2017, we planted a non-replicated field trial to evaluate the control of Lepidoptera pests in head cabbage on Maui to confirm what we learned from previous replicated, screen trials on Oahu. The trial was conducted in Kula, Maui at the agricultural park where natural field populations of Lepidoptera exist in moderate to high levels. We compared head cabbage grown under a Conley 1100 (commercial cold frame) unit covered in a mesh 17 screen to commercial growers’ standard practice. The industry standard variety, Scorpio was used for this trial.

A field layout of 20 feet x 60 feet was prepared inside and outside of the Conley unit. Row spacing was 4 feet with a length of 60 feet. There were seven rows located inside the Conley unit and 7 rows outside. There were 40 plants per row. Hobo sensors were used to monitor temperature and light intensity. A crop spacing of 16 inches was used. Seedlings were started under screen material to ensure minimal worms were transported into the screen unit. Normal
horticultural practices were followed for other insects, diseases and weeds. Both crops received the same fertilizer and watering treatments.

An economic threshold of 10% was used for pest populations which included *Lepidoptera* pest, aphids, thrips, etc. When thresholds were surpassed outside of the unit, a commercial rotation of crop protection chemicals (Entrust, Belt, Dipel, Pasada, Radiant and Xentari) was used in accordance with Maui’s diamond back moth (DBM) insecticide resistance program. When pest populations of *Lepidoptera* and small insect pest (aphids, thrips, etc) exceeded 10% within the unit, organic insecticides were used. Entrust was used for *Lepidoptera* pests. Crymax and or Dipel were selected as rotational chemicals for Entrust, but they were not needed due to low *Lepidoptera* pressure. M-Pede (2% v/v) and Pyganic 5% (17 fl.oz. / acre) were selected and used for aphid control. A total of 7 crop protection chemicals were used outside of the Conley house in comparison to 3 crop protection chemical applications used within the screened unit. Six conventional chemicals were used for *Lepidoptera* control outside of the unit compared to 1 Entrust application within the Conley screened structure.

Twenty plants per row were evaluated for *Lepidoptera* and aphid damage at harvest. We rated damage based on a modified Kemerait et. al. scale of 0=none, 1=trace to 5%, 2=6-15%, 3=16-35%, 4=36-67%, 5=68-100%. We also took data on total marketable yield from twenty plants. Data was analyzed using an independent T-test and Mood's Median. Averages inside and outside were statistically different for both Mood's Median and t-test.

![Marketable Yield / Head](image)

Figure 1. Average Marketable Yield per Head
Figure 2. Damage rated using a modified Kemerait et. al. scale of 0=none, 1=trace to 5%, 2=6-15%, 3=16-35%, 4=36-67%, 5=68-100%.

Figure 3. Damage rated based on a modified Kemerait et. al. scale of 0=none, 1=trace to 5%, 2=6-15%, 3=16-35%, 4=36-67%, 5=68-100%.
Crops grown under the screened unit had reduced *Lepidoptera* damage than crops grown outside under conventional culture. However, similar to field trials on Oahu, we found higher levels of damage inside of the unit due to small insects such as aphids than crops grown outside of the unit under conventional practices. The use of M-pede and Pyganics were not suffice to control aphid populations within the screened unit when pest populations exceeded economic threshold. Aphids multiply very quickly without the need to mate.

A subset of the total data was evaluated for horticultural differences. There were no horticultural differences between treatments such as core width, core height, core volume, diameter ratio and volume. Density was higher outside (27.4a lbs.) of the unit vs inside (25.3b lbs.). Similar to the overall data set, marketable weight was significantly higher inside (mean: 5.46a lbs.) vs outside (mean: 4.96b lbs.) the Conley unit.

Temperature and light intensity may have played a factor on yield and head density. Outside temperatures peaked at 122.076°F with the highest light intensity being 28672 lum/feet². Average temperatures outside the unit were 82.8° F. Inside temperatures
were lower with peak temperatures at 113.59°F and the highest light intensity at 21504 28672 lum/feet². Average temperatures inside the screen unit was 81.3°F.

**Conclusion:**
Field trials in Maui confirmed what we learned on Oahu, that the mesh 17 screen significantly reduces *Lepidoptera* pest damage and reduced the number of pesticide applications. However, use of the screen was not effective in reducing damage caused by small insects such as aphids, mites, white flies, etc. These pests are able to move in and out of the screen and cause economic damage. A weekly rotation of organic insecticides such as M-Pede and Pyganic 5% was not suffice to reduce aphid populations after the economic threshold was surpassed.

In Kula, we are currently evaluating new methodologies to improve the management of aphid pest under screen units by 1) increasing the frequency of organic insecticide applications and 2) evaluating different spray systems to achieve better spray coverage. The combination of screen with a systemic insecticide like Admire Pro, Silvanto and Movento may prove to be effective in reducing overall pesticide treatments. However, many of our growers are looking for organic alternatives.

In the trial currently in progress, we plan to apply organic insecticides at high label rates and reduce spray intervals at the onset of aphid detection. We anticipate finding an organic pest management solution for growers who choose to cultivate crops under mesh screen systems by combining short residual organic products with better spray tools such as the mist blower system.