In March 2017, we planted a replicated field trial to evaluate the control of webworm in pak choy on Oahu. The trial was conducted at the Waimanalo Research Station where natural field populations of webworm pests exist in moderate to high levels. We compared pak choy cabbage grown under different screen systems (with a hoop for structure) to commonly used organic insecticides.

In a previous field trial using daikon (available online: https://gms.ctahr.hawaii.edu/gs/handler/getmedia.ashx?moid=3687&dt=3&g=1), we found that the mesh 17 screen provided improved Lepidoptera control over the untreated control. Mesh 17 screen also provided equivalent webworm control to the organic insecticides Entrust & Crymax as well as the conventionally used insecticide, Coragen.

In this trial we wanted to see if Mesh 40, a finer mesh, would provide similar Lepidoptera control as previous trials. We also wanted to evaluate the impact of this screen on smaller pest types such as aphids and thrips. Mesh 40 is slightly more expensive than the Mesh 17. We
aimed to determine if this mesh could minimize small insect damage and provide another non-chemical option for organic producers.

Row spacing was 2.5 feet with a total length of 60 feet. A plant spacing of 12 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 the crop’s nutritional and irrigation needs.

We evaluated two screen types (mesh 17 and mesh 40) and two organic chemicals for Lepidoptera control. Twelve plants were planted within each treatment. The treatments were replicated 3 times within the area. Hoops were used to hold the screen systems above the crop. Screened units received no crop protection chemical treatments.
Preventative weekly sprays were used to control pest populations outside of the screened units which included *Lepidoptera* pests, thrips and aphids. Entrust SC (6 oz/acre) and Neemix 4.5 (10 ounces/acre) were selected for this trial and applied for 4 weeks. The surfactant, Latron 1956 was used for the first three weeks and Liberate (penetrating surfactant) was used for the last application. Four applications of crop protection chemicals were used to provide comparable control to the different mesh screen systems.

Ten plants were sampled per treatment and assessed for pest 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 the 10 plants per replication.
Figure 1. 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 (Mesh 17 & 40) had reduced *Lepidoptera* damage than the control and comparable control to crops grown outside under organic insecticide foliar spray applications.

However, similar to previous field trials, we found high levels of damage inside of the screened unit due to small insects such as aphids and thrips. The weekly use of Neemix and Entrust in this trial was not suffice to control aphid and thrips populations within the screened unit.

Aphids and thrips multiply very quickly without the need to mate.
On March 25, 2017, the Bagrada bug (Bagrada hilaris (Burmeister)) returned to Waimanalo. It was originally detected in March 2016 at the Waimanalo Research Station and then went undetected for over a year. Due to the presence of the Bagrada bug in this trial, we collected data between the different treatments. For this pest, we shook each head and counted the number of bagrada bugs within each head of pak choy. Overall, there were more Bagrada bugs...
in the control treatment (number of bugs / head) but there were no significant differences when the data was run through the statistical package.

Figure 4. Average Bagrada counts per head of pak choy

Conclusion:
Mesh 17 & 40 screen significantly reduced Lepidoptera pest damage and reduced the number of overall pesticide applications. However, use of the finer mesh screen (Mesh 40) was not effective in reducing damage caused by small insects such as aphids, mites, white flies, etc. These results were consistent with our previous field trials evaluating different mesh screens effect on zucchini (available online: https://gms.ctahr.hawaii.edu/gs/handler/getmedia.ashx?moid=2972&dt=3&g=12).
Small insect pests are able to move in and out of the screen and/or are transported into the screened units at transplant. In this trial, we evaluated the efficacy of Entrust SC and Neemix 4.5 on managing pest by way of a CO2 powered back pack sprayer. In a subsequent trial, we found that a weekly rotation of organic insecticides such as M-Pede and Pyganic 5% was not suffice in keeping aphid populations under economic injury levels in Maui.

Therefore, we are currently evaluating new methodologies to improve the control of aphids on crops grown under screened culture by 1) increasing the frequency of organic insecticide applications and 2) evaluating different spray systems to achieve better spray coverage. Ultimately, we anticipate creating an organic & integrated pest management (IPM) system for growers who choose to cultivate crops under screened systems. To do so, we will maximize the benefits of the non-chemical screen system and integrate field tested, organic chemistries and better spray technologies into the overall IPM program.