PROTECTED CULTURE: Maximizing Screenhouse Systems For Pest Control
University of Hawaii at Manoa
College of Tropical Agriculture and Human Resources
FIELD DAY HANDBOUT

Non-Chemical Physical Control
- Excellent Pest Control
  - Birds
  - Fruit flies
  - Chinese rose beetles
  - Lepidoptera (worm type pest)
  - Diamond Back Moth (DBM)
  - Pickleworm

Started in 2007 - Shade

Benefits
- Non-Chemical, Physical Barrier to Pest Control
  - Lepidoptera
  - Birds
  - Fruit flies
  - Chinese rose beetles
- Do It Yourself or Commercial Kit Systems
- USDA NRCS cost share program
- Reduction of light intensity

Disadvantages
- Small Insect Pest Control
- Use resistant varieties
- Protect & treat seedlings before they enter the screened units
- Reduction of light intensity
- Seasonal use
- Machinery access

Waimanalo Conley 1100
2018 USDA NRCS High Tunnel Systems

<table>
<thead>
<tr>
<th>Practice</th>
<th>Component</th>
<th>Unit</th>
<th>2017 Unit Cost</th>
<th>2018 Unit Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Tunnel System</td>
<td>Gothic style high tunnel with shade cloth</td>
<td>sq ft</td>
<td>$2.77</td>
<td>$2.86</td>
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<tr>
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<td>High Gothic style high tunnel with shade cloth</td>
<td>sq ft</td>
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<tr>
<td>High Tunnel System</td>
<td>Quonset style high tunnel with shade cloth</td>
<td>sq ft</td>
<td>$2.20</td>
<td>$2.25</td>
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<td>High Tunnel System</td>
<td>High Quonset style high tunnel with shade cloth</td>
<td>sq ft</td>
<td>$3.20</td>
<td>$3.25</td>
</tr>
</tbody>
</table>

Initially there was a 6 mil plastic requirement. No longer needs to be 6 mil plastic on top (2016)
Replicated Webworm Trial (2016)
Effectiveness of Screen Against Chemical Options

Waimanalo, 2017

A
B
C
CD
DE
EF
F

Damage Rating

Control Row Cover Pyganic 5% Neemix 4.5 Crymax WDG
Screen Entrust SC Coragen

Damage were 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%

Trial Design

- We evaluated two screen types (mesh 17 and mesh 40) and two organic chemicals for Lepidoptera control.
- Replicated treatments 3 times
- 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 oz/acre)
- Four applications of crop protection treatments 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.

Replicated Field Trial Evaluate Mesh 17 & 40 Screen:
Caterpillar Damage

Efficacy of Screen

Average Damage/Plant

Cabbage Webworm: Organic Insecticide Trial- March 2016
Aphid Damage were 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%.

Mesh 40: Aphids shouldn’t fit, but if they are allowed to enter the screen they can’t escape.

Aphids are females that:
- Do not need to reproduce
- Give birth to live offspring
- Develop wings and fly

Female Thrips DO NOT Need to Breed to Reproduce

Bagrada Damage were rated on average of bagrada bugs per head of pak choi.
Mesh 17 & 40

- Our research has shown that Mesh 17 can exclude birds, fruit flies and worm type of insects.
- Mesh 40 may reduce small insect penetration into the screened area, but we suspect insects such as aphids, thrips, mites, etc. enter the area during transplant. Differences were not significant between mesh 17 & 40.
- Match the screen with the crop and utilize resistant varieties for added virus protection.
- Screen does not keep out aphids, thrips, white flies or mites.
- Treat for small insects.

Maui Trial Design

- Compared Mesh 17 screen against conventional pest management practices.
- Set an economic threshold of 10% for pest populations which included Lepidoptera pest, aphids, thrips, etc.
- Outside Unit:
  - A commercial rotation of crop protection chemicals
    - Entrust, Belt, Dipel, Pasado, Radiant and Xentari-used in accordance with Maui’s Diamond Back Moth (DBM) Insecticide Resistance Program.
  - Inside Screen-
    - An organo-organic rotation of crop protection chemicals
      - Entrust, Crymax or Dipel, M-Pede (2% v/v) and Pyganic 5% (17 fl.oz / acre)
Maui Trial Summary

- Higher marketable yields inside screen system
- Excellent Lepidoptera control
- Reduction in chemicals used for Lepidoptera control:
  - Seven crop protection chemicals were used outside of the Conley
  - Three crop protection chemical applications used within the screened unit.
  - Six conventional chemicals were used for Lepidoptera control outside of the unit.
  - One Entrust application within the Conley screened structure.

Future Work

- Resistant varieties help to reduce vector transmitted viruses
- Future work includes developing a small insect IPM program for screen systems
  - Small insect pests were able to move in and out of the screen and/or were transported into the screened units at transplant.
  - Biological insects can not easily predate on pest within screened systems easily.
  - Weekly use of products such as M-pede, Pyganics, Entrust, Neemix were not sufficient to control small insect pest populations within the screened unit when pest populations exceeded the economic threshold.