ORGANIC AND SUSTAINABLE PEST MANAGEMENT OPTIONS

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SUSTAINABLE PEST MANAGEMENT

CRATE

Soil Health

IPM

Sustainable and Organic Agriculture Program
College of Tropical Agriculture and Human Resources - University of Hawai‘i at Mānoa

LIFE Local & Immigrant Farmer Education
University of Hawai‘i at Mānoa
College of Tropical Agriculture & Human Resources

USDA NRCS

Western SARE
Laboratory test on OMRI certified insecticides on viability of aphids on lettuce leaf disks

Adding surfactants can decrease drift and increase efficiency of insecticides.
INSECTARY PLANTS

Plants that attract insects, either produce flowers with pollen and nectar for beneficial insects, or lure insect pests away from the cash crop.

Hoverflies on buckwheat and cilantro

Sunn hemp flowers attracts Lycaenidae butterflies that drawn Trichogramma wasps to lay eggs on the Lepidopteran eggs.

Uhaloa attracts wasps and bees

Lady beetles on Aweoweo
EXTRAFLORAL NECTARIES

• **Extrafloral Nectaries** = nectar glands not associated with flowers.

• Good for attracting beneficial insects when most flowers are not in bloom.

[Images of partridge pea and nectary]
HOW TO INTEGRATE INSECTARY PLANTS INTO FARMS

1. As border crop
   - Sunn hemp and corn
   - Buckwheat and zucchini
   - Insectary plant corridors

2. As intercrop

(Cerruti Hooks)

(Roshan Manandhar)

(Nicholls, Parrella, and Altieri, 2000)
Cowpea and buckwheat as insectary borders, and sunn hemp organic mulch harbor natural enemies or parasites against insect pests (thrips, leaf miners) and fungal disease (purple blotch).
INSECTARY PLANTS FOR HYDROPONIC PRODUCTION

- Sunn hemp attracts Trichogramma wasps
- Buckwheat attracts hoverflies
- Wasp nesting block attracts keyhole wasps
WASP NESTING BLOCK

Pollinators
- Leaf cutter bee
- Hylaeus bee

Predators
- Key-hole Wasp
- Aphid-collecting Wasp

Predators
- Untreated wood

http://bugguide.net/node/view/241212
COMPARING INSECTARY SETTINGS AND METALLIC REPELLANT FOR HYDROPONIC BRASSICA

Insectary

Metalic board

Imported cabbage worm larva

Imported cabbage web worm larva

Diamondback moth larva

Whiteflies

Aphids
Beneficial insects found in insectary treatment

- Parasitized aphids
- Hoverfly eggs among aphids
- DBM pupae parasitized by parasitoid wasp
- Hoverfly larvae eating an aphid

Trichogramma wasp

Insectary setting suppressed aphids and caterpillar damage

Aphids

<table>
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<th>7/18</th>
<th>7/25</th>
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<tr>
<td>B</td>
<td>A</td>
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% damage/plant

<table>
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<th>7/25</th>
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Insectary settings reduced unmarketable pak choi yield, but did not protect it against thrips and whiteflies.
SUNN HEMP AS A TRAP CROP FOR WHITEFLIES, REDUCING SILVERLEAF SYMPTOMS

Trap crop / virus sink theory

Zucchini intercropped with sunn hemp

Zucchini in bare ground showing silver leaf symptom
INSECT EXCLUSIVE NET SCREENHOUSE PRODUCTION
SCREENHOUSE PRODUCTION FOR KALE

- 15 Varieties of kale were planted inside and outside of a screenhouse.
- 5 plants from 12 varieties were monitored for insect pests weekly from 4/18-5/12/16.
SCREENHOUSE REDUCED DIAMOND BACK MOTH (DBM)
SCREENHOUSE REDUCED IMPORTED CABBAGE WEBWORMS (ICW) & LEAF MINERS

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<tr>
<th>Treatment</th>
<th>Means</th>
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<tbody>
<tr>
<td>Screenhouse</td>
<td>0.02 B</td>
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<tr>
<td>Open field</td>
<td>0.08 A</td>
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<td>0.13 A</td>
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KALE GROWTH PARAMETERS

1 month after transplanting

- Based on the 12 varieties monitored, screenhouse did not affect kale photosynthesis rate and resulted in wider kale canopy ($P < 0.05$).
Some varieties are less preferred by the caterpillars present.
DIFFERENCE IN KALE VARIETIES TO CATERPILLAR DAMAGE

<table>
<thead>
<tr>
<th>Variety</th>
<th>Screenhouse</th>
<th>Open Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>0.84 B</td>
<td>2.94 A</td>
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Damage index (1-4): 0 = 0 damage, 1 ≤ 25% leaves w/ damage, 2 (26-50% leaves w/ damage), 3 (51-75% leaves w/ damage), 4 (75-100% damage)
PARTICIPATING FARMER: ANTHONY DELUZE

Screenhouse did not protect peach tomatoes from *Tomato yellow leaf curl virus* transmitted by whiteflies.

‘Nyagous’ is resistant to TYLC virus, yield inside the screenhouse was higher than that in the open field.

Most unmarketable is from fruit cracking due to blossom end rot (fluctuating weather and insufficient Ca) and bird damage.
FARMER’S TESTIMONY

• “I think the screenhouse has been an awesome tool and love the design. The soil outside of the screenhouse was much richer in nutrients to begin with, under different circumstances, tomatoes inside the screenhouse would yield much higher.”

Anthony Deluze

• “I'm trying to figure out as soon as possible how to fund another screenhouse in my farm. I think the screen is the most expensive part. That’s the one we got to find a way to get more cost efficient.”
SCREENHOUSE FOR CUCURBIT CROPS

Hand pollinated pumpkin

But plants die prematurely from severe infection of root-knot nematodes that cause the plant to wilt.

16-mesh screen can block bigger insects such as

Pickle worm moth is nocturnal

But plants die prematurely from severe infection of root-knot nematodes that cause the plant to wilt.

Melon fly / fruit fly females only oviposit on cucurbit fruits in the evening.

Minimal damage from pickle worm or fruit flies
FUTURE WORK: SCREENHOUSE THAT CAN ADOPT POLLINATORS AND BENEFICIALS

Roll up the wall in the day for pollinators and predators to come in. Roll down the wall in the afternoon to block pickle worms and fruit flies adults from getting in.

Parthenocarpic zucchini and cucumber seeds are available, but are expensive.
Luring and Trapping

**Rose Beetle Light Trap**
https://vimeo.com/166306170

**Fruit Flies Methyl Eugenol/Cue Lure Traps**

**Pin Worm Nomate**
Heat Treatment

**Propane tankless water heater (EccoTemp®)**

Treat spider mites on tea *(Camellia senensis)*

**LETHAL TEMPERATURE**

= 45-50°C (113-122°F)
Drenching VCT prepared from uncured vermicompost on tea root systems weekly reduced spider mite damage on tea leaves.
ACKNOWLEDGEMENT

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Uyeda’s Video collection related to SPM

• https://youtu.be/cBP52egYG9s
• https://vimeo.com/166306088
• https://vimeo.com/166306170

Websites

http://www.ctahr.hawaii.edu/WangKH/CRATE.html
http://www.ctahr.hawaii.edu/WangKH/insectary.html
http://www.ctahr.hawaii.edu/WangKH/sustainable-pest.html
Questions?