ORGANIC AND SUSTAINABLE PEST MANAGEMENT OPTIONS

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SUSTAINABLE PEST MANAGEMENT

CRATE

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

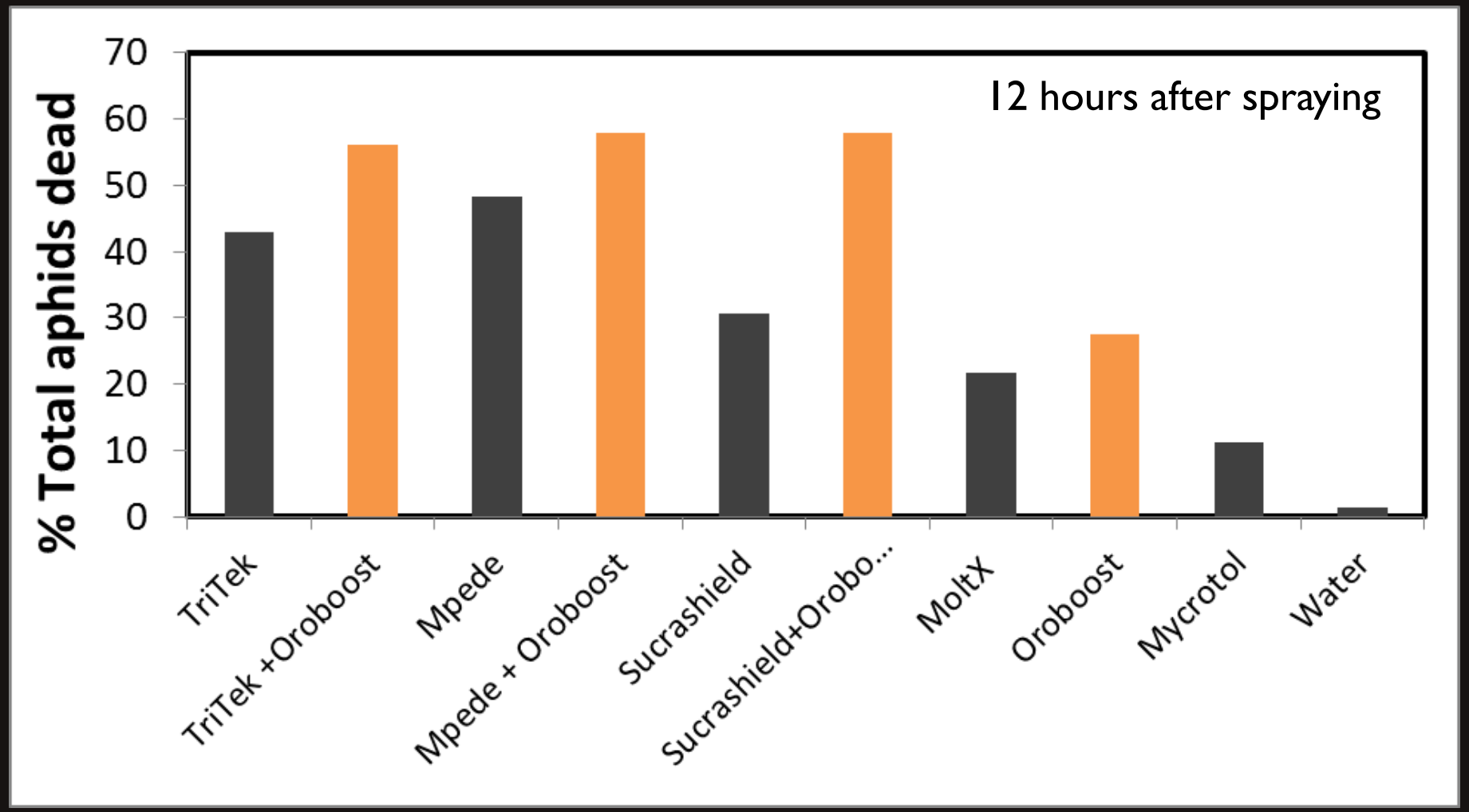
USDA

NRCS

Western SARE
Sustainable Agriculture Research & Education

USE INSECTICIDES AS THE LAST RESORT
AVOID RESISTANCE

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



Adding surfactants can decrease drift and increase efficiency of insecticides.

ENHANCE NATURAL ENEMIES OF TARGET PESTS

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.

Lady beetles on Aweoweo

Uhaloa attracts wasps and bees

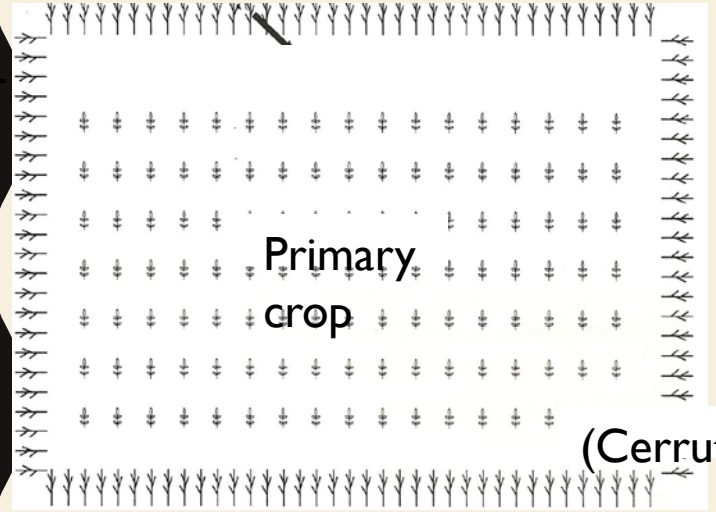
EXTRAFLORAL NECTARIES

- **Extrafloral Nectaries =** nectar glands not associated with flowers.
- Good for attracting beneficial insects when most flowers are not in bloom.

Partridge pea

HOW TO INTEGRATE INSECTARY PLANTS INTO FARMS

1. As border crop



(Cerruti Hooks)

Buckwheat and zucchini

2. As intercrop

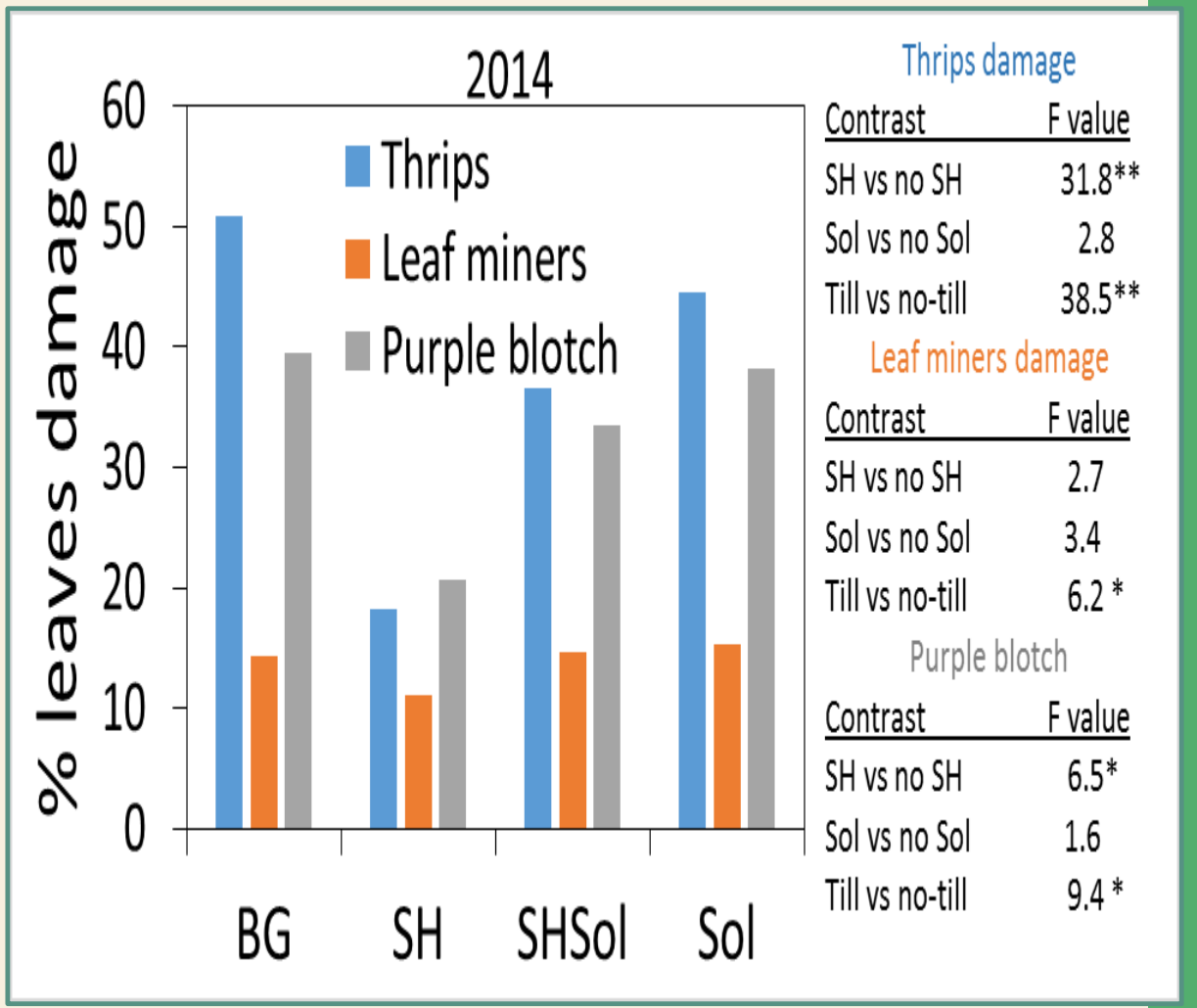
Sunn hemp and corn

Insectary plant corridors
(Nicholls, Parrella, and Altieri, 2000)

Sunn hemp no-till with insectary borders

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).

BG = bare ground, SH = Sunn hemp & insectary borders; Sol = bare ground & solarization



Thrips damage

Contrast	F value
SH vs no SH	31.8**
Sol vs no Sol	2.8
Till vs no-till	38.5**

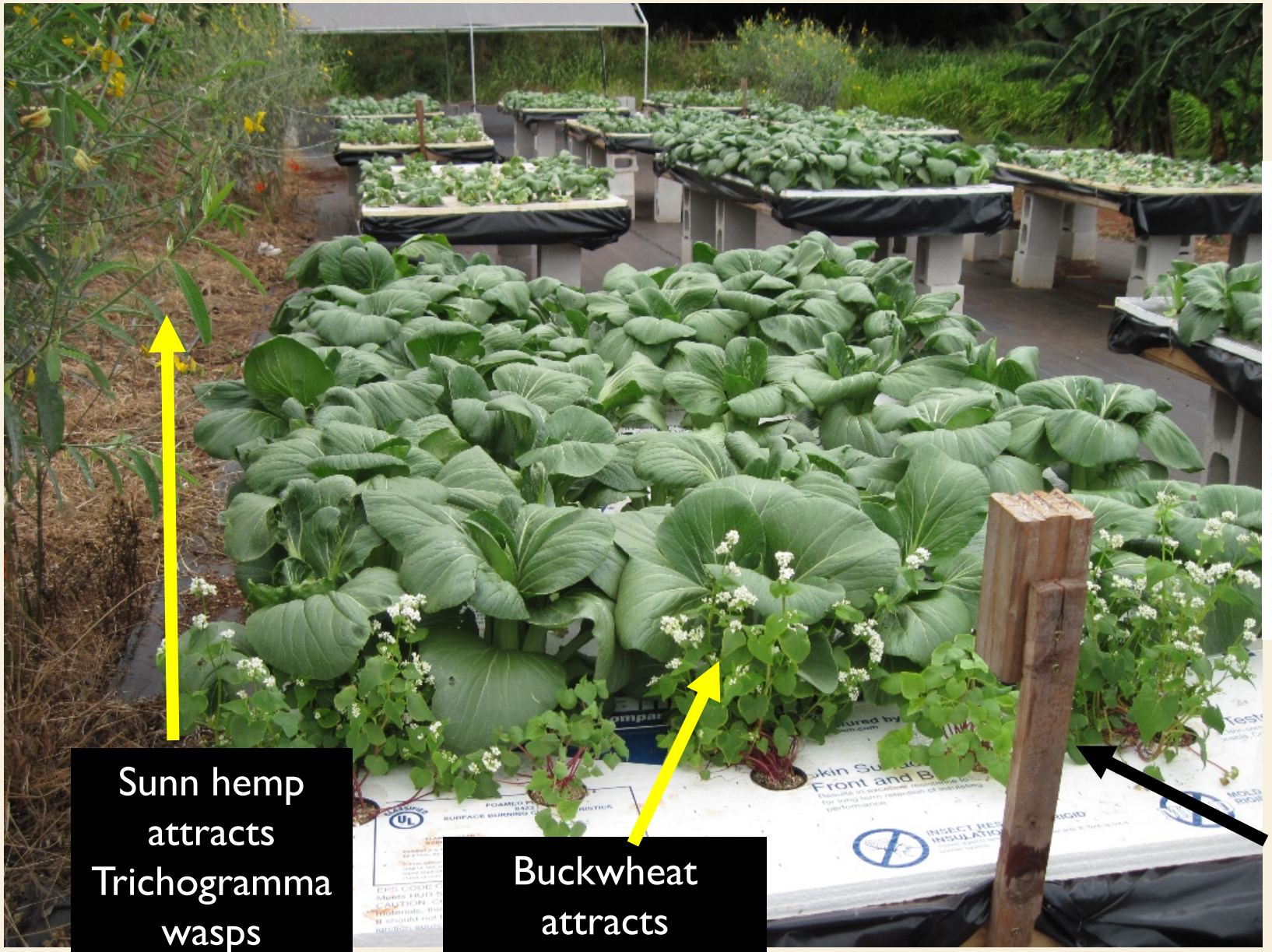
Leaf miners damage

Contrast	F value
SH vs no SH	2.7
Sol vs no Sol	3.4
Till vs no-till	6.2 *

Purple blotch

Contrast	F value
SH vs no SH	6.5*
Sol vs no Sol	1.6
Till vs no-till	9.4 *

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

Untreated wood

Predators

Key-hole Wasp

http://bugguide.net/node/view/241212

Aphid-collecting Wasp

COMPARING INSECTARY SETTINGS AND METALLIC REPELLANT FOR HYDROPONIC BRASSICA

Whiteflies

Aphids

Imported cabbage worm larva

Diamondback moth larva

Imported cabbage web worm larva

Beneficial insects found in insectary treatment

Trichogramma wasp

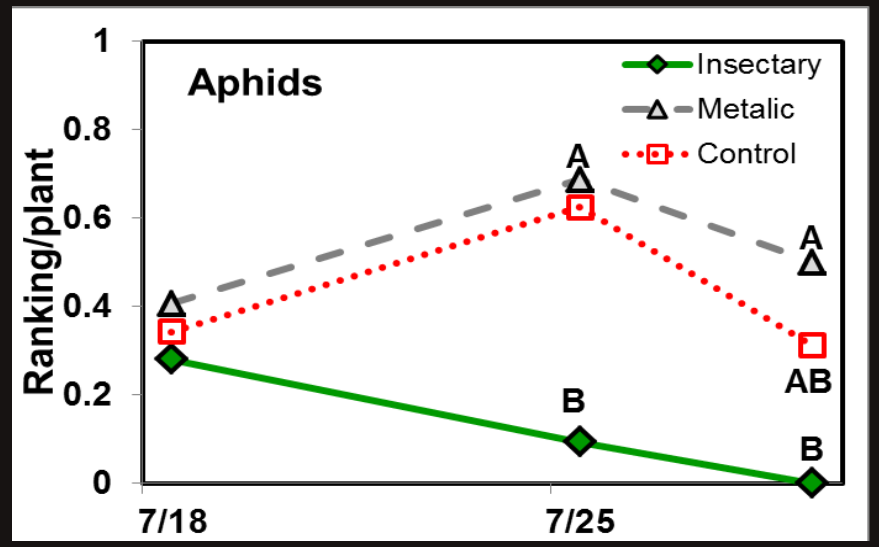
Parasitized aphids

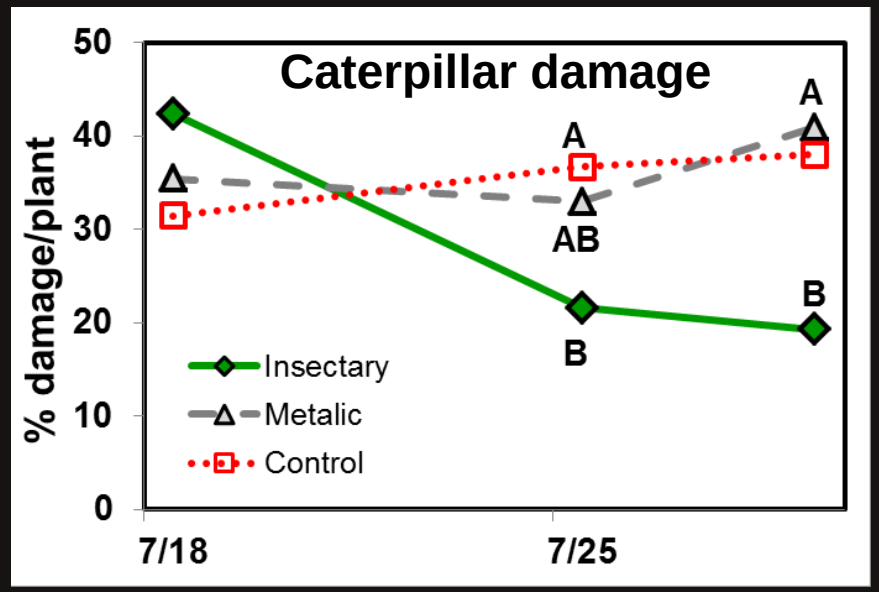
Hoverfly eggs among aphids

DBM pupae parasitized by parasitoid wasp

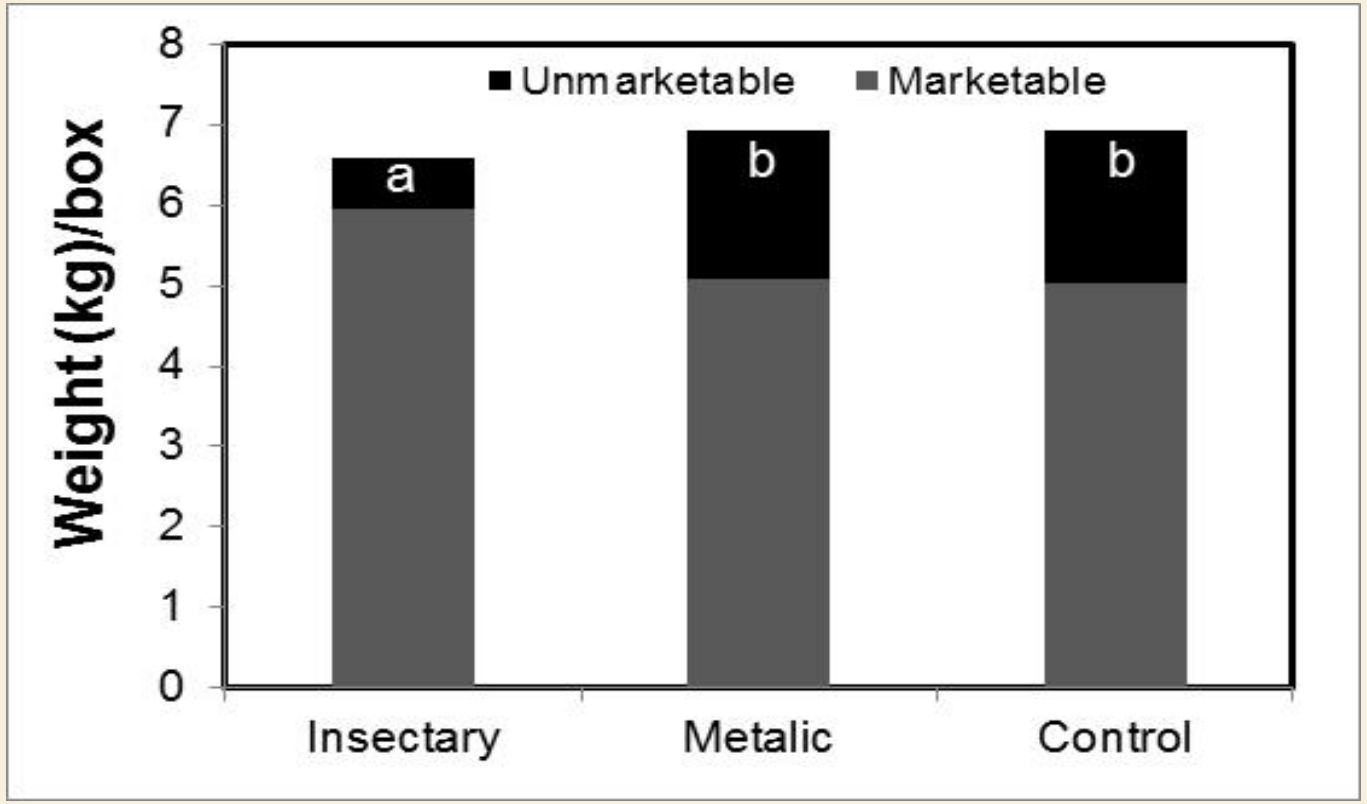
Hoverfly larvae eating an aphid

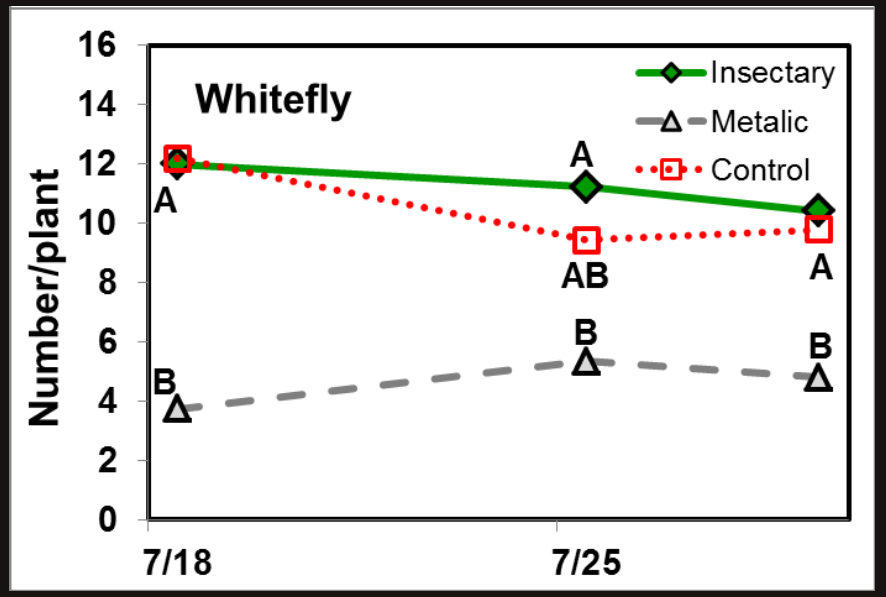
Insectary setting suppressed aphids and caterpillar damage

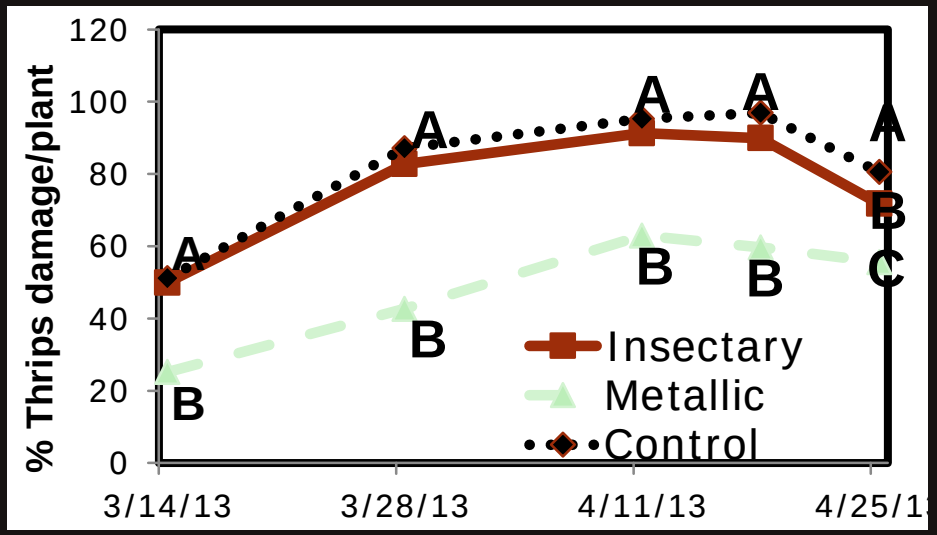




Insectary settings reduced unmarketable pak choi yield, but did not protect it against thrips and whiteflies

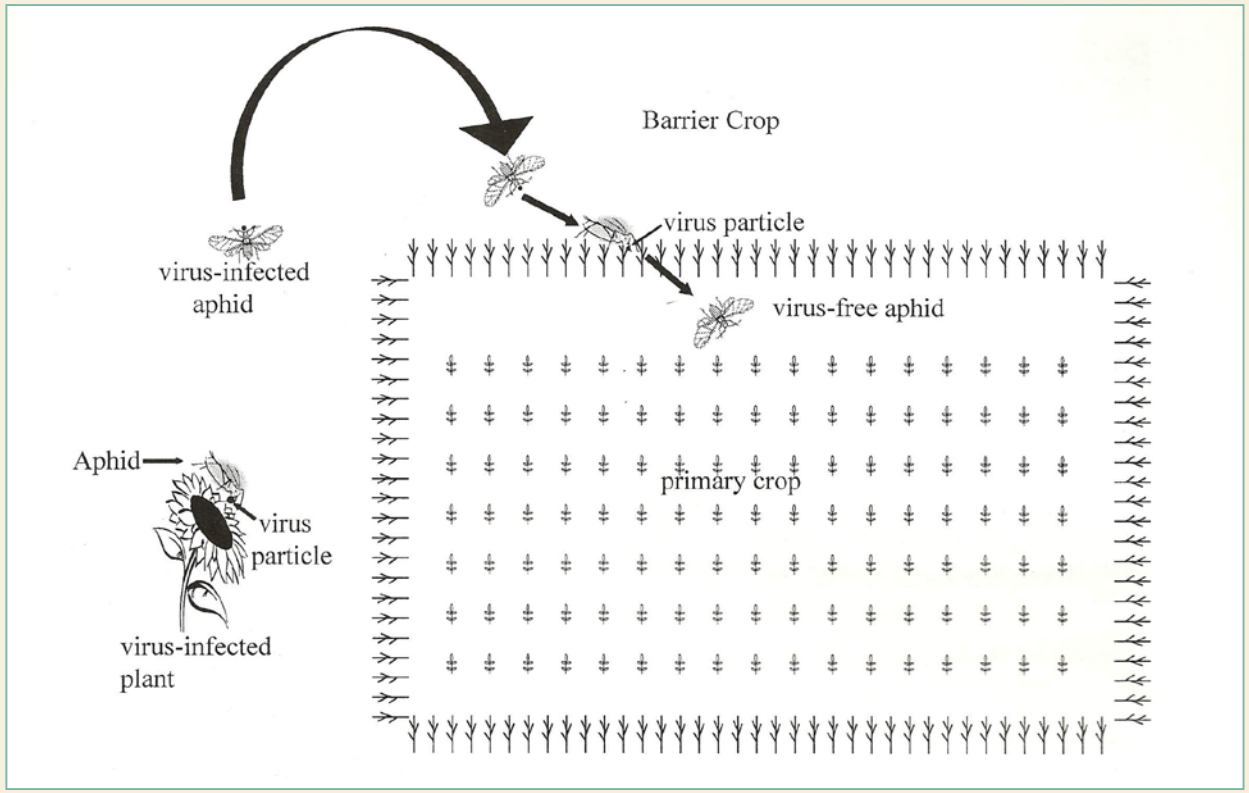






SUNN HEMP AS A TRAP CROP FOR WHITEFLIES, REDUCING SILVERLEAF SYMPTOMS

Trap crop / virus sink theory



Zucchini in bare ground showing silver leaf symptom

Zucchini intercropped with sunn hemp

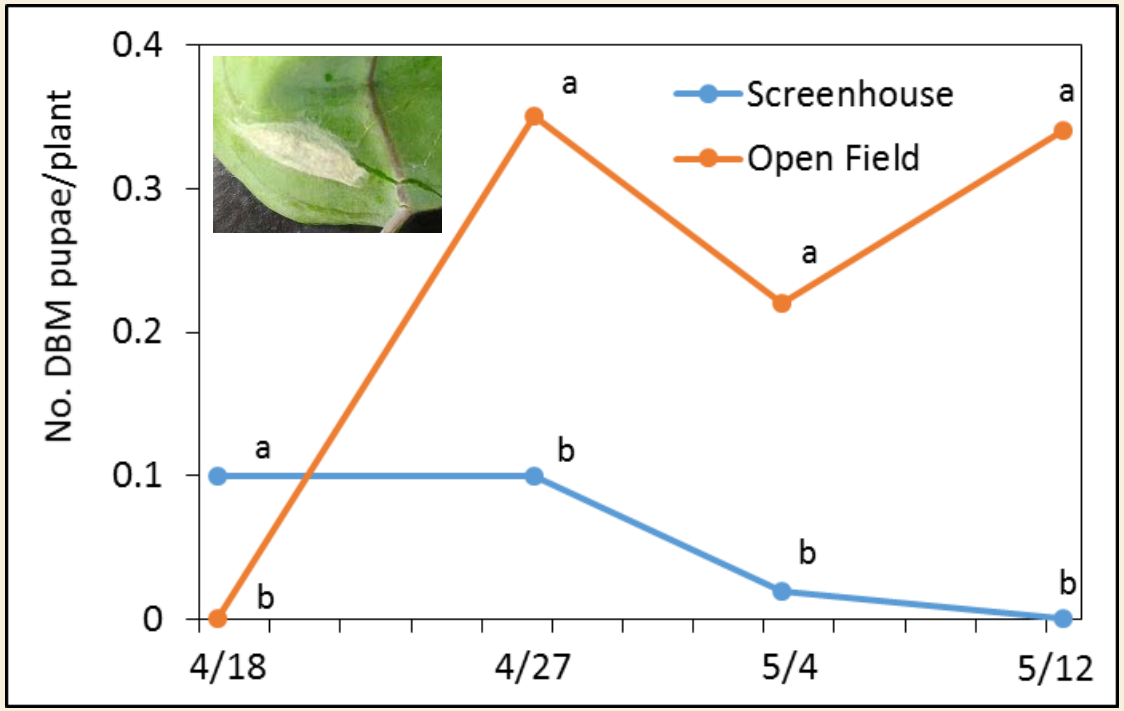
INTEGRATE WITH PHYSICAL BARRIER

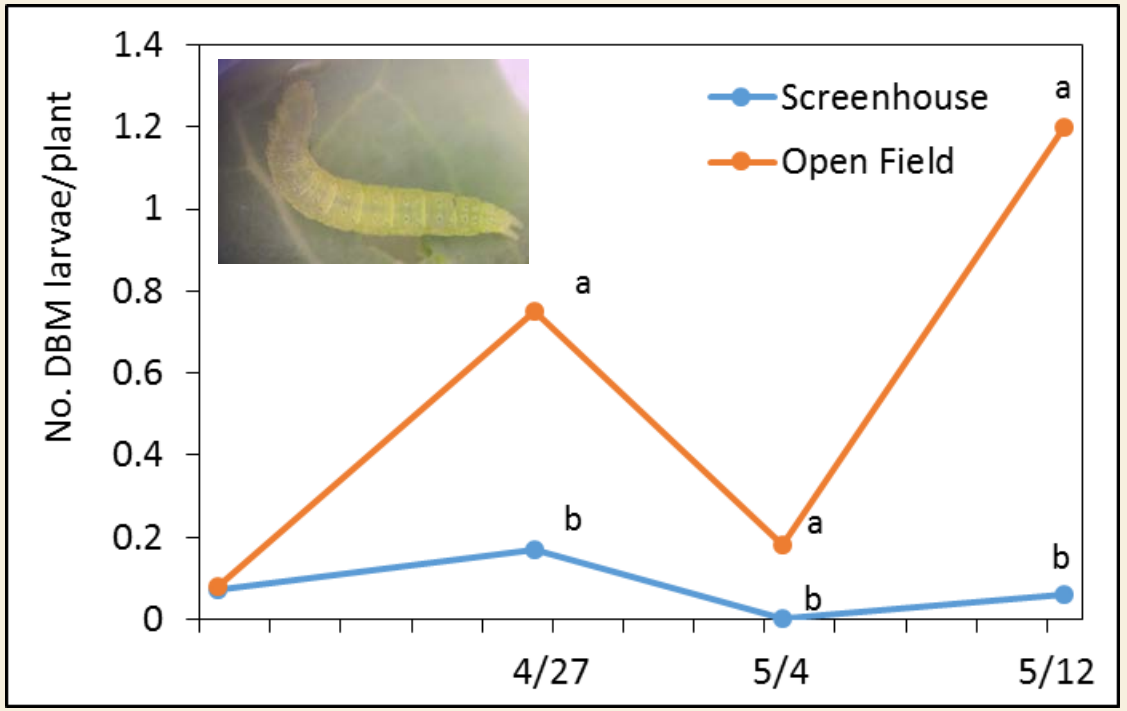
INSECT EXCLUSIVE NET SCREENHOUSE PRODUCTION

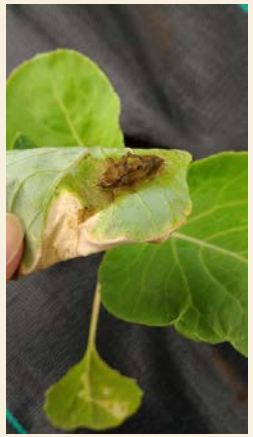
SCREENHOUSE PRODUCTION FOR KALE

- 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.

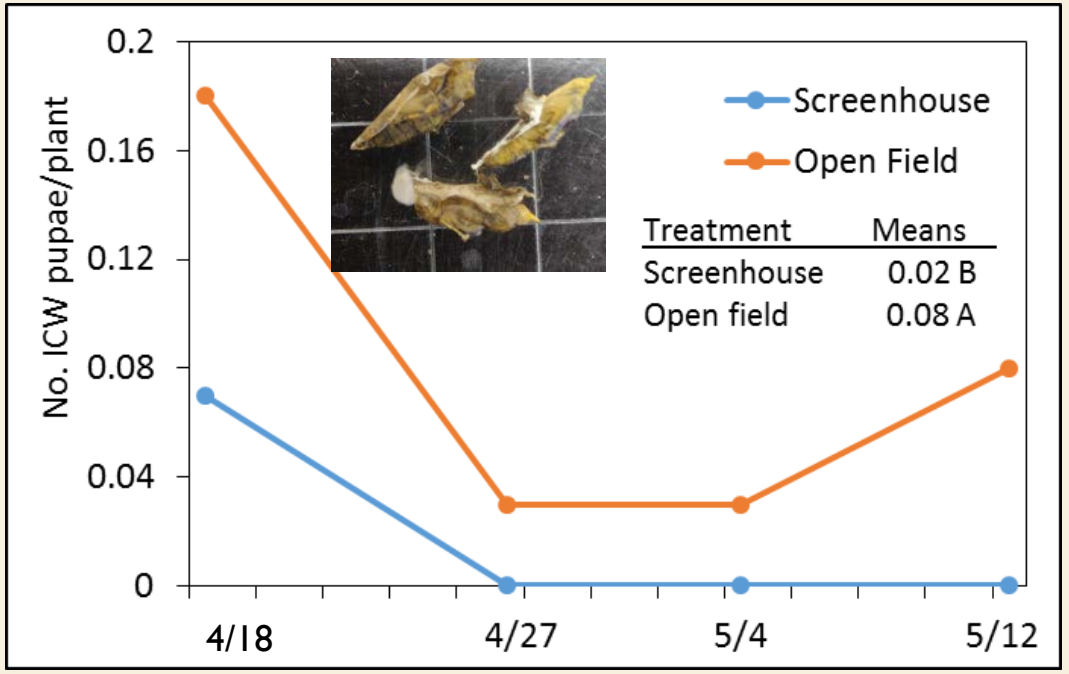
SCREENHOUSE REDUCED DIAMOND BACK MOTH (DBM)

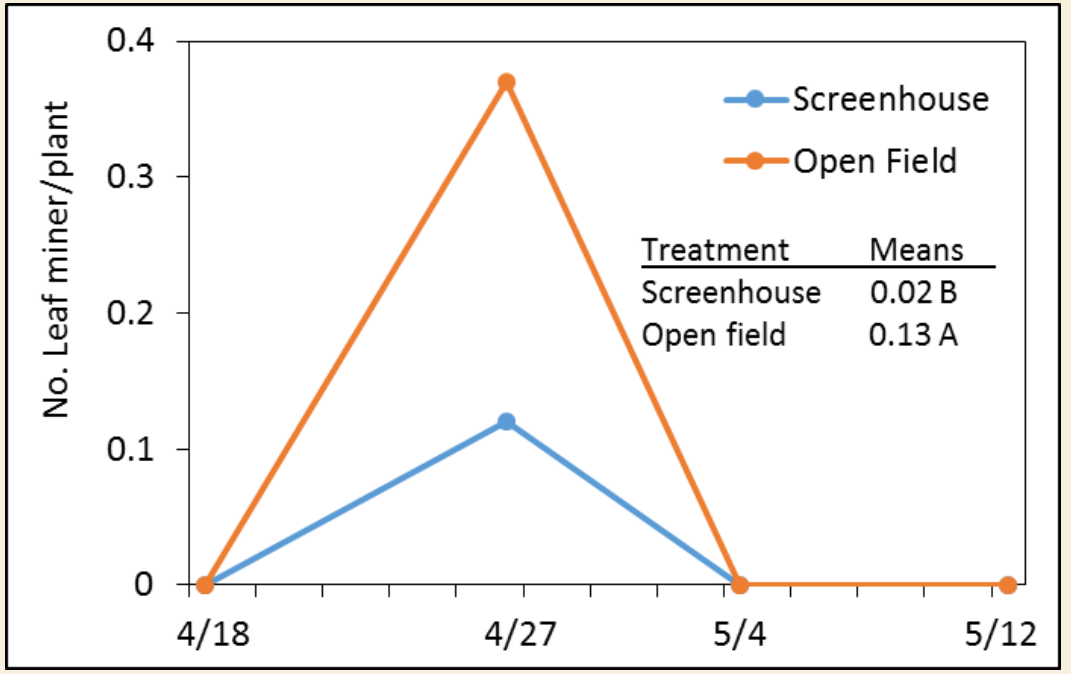






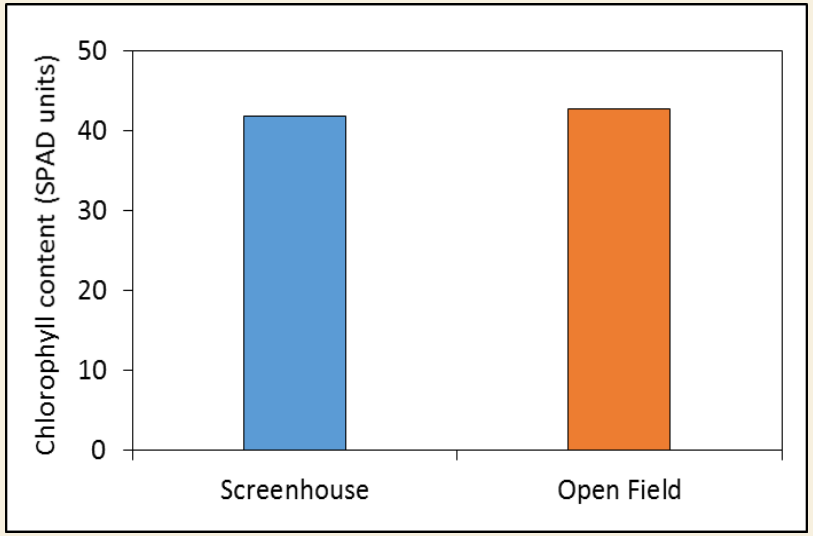
SCREENHOUSE REDUCED IMPORTED CABBAGE WEBWORMS (ICW) & LEAF MINERS

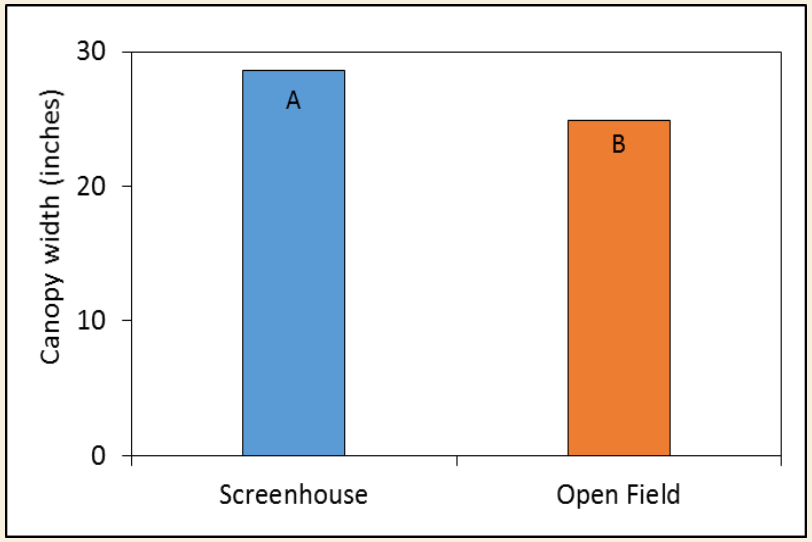




KALE GROWTH PARAMETERS

1 month after transplanting

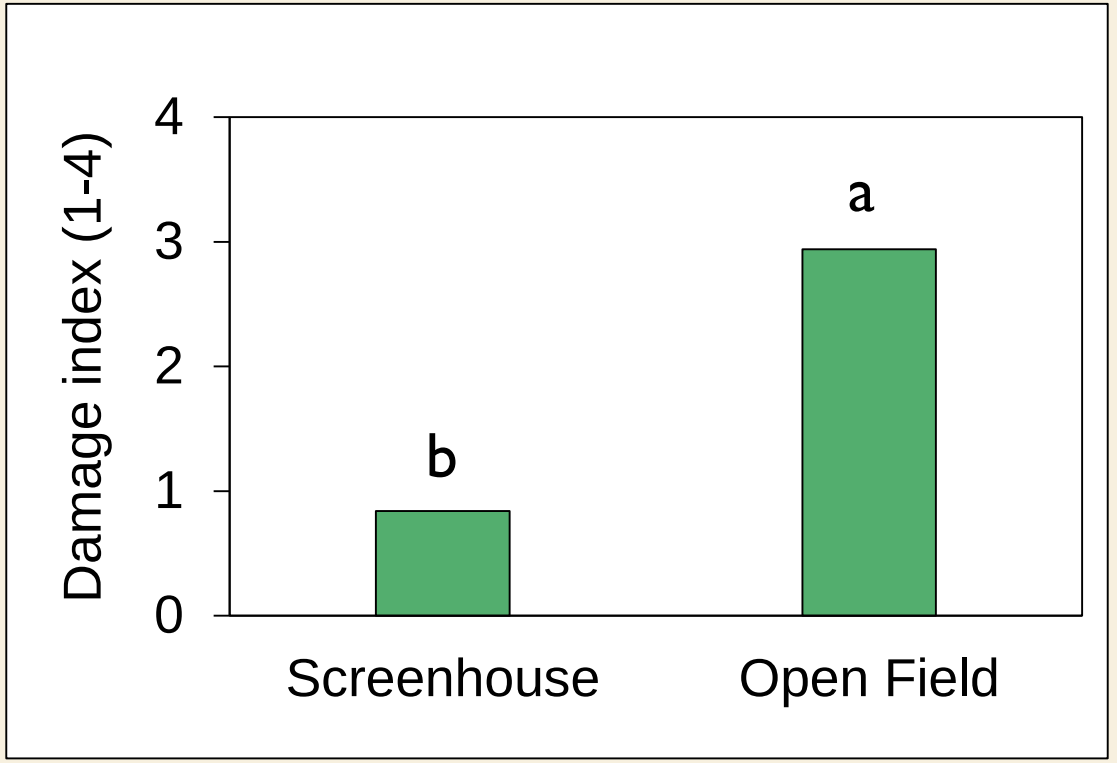




- Based on the 12 varieties monitored, screenhouse did not affect kale photosynthesis rate and resulted in wider kale canopy ($P < 0.05$).

CATERPILLAR DAMAGE

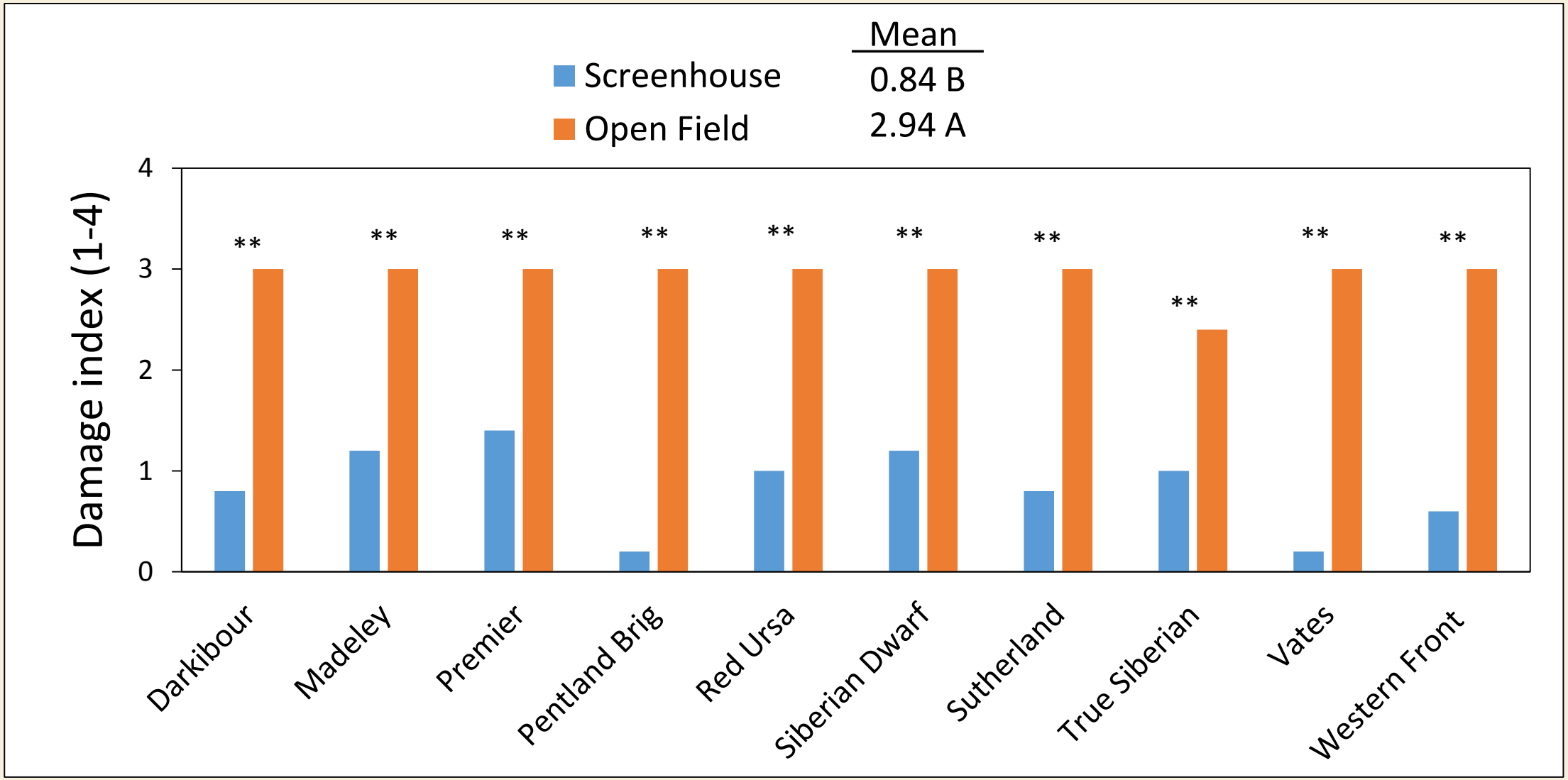
Screenhouse



Some varieties are less preferred by the caterpillars present.

Open Field

DIFFERENCE IN KALE VARIETIES TO CATERPILLAR DAMAGE

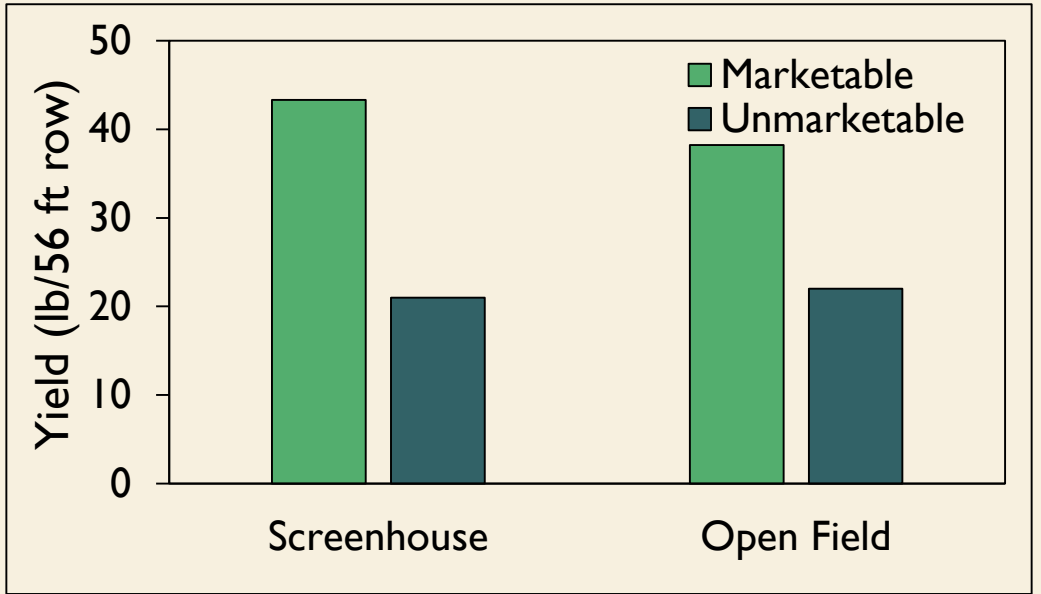


0 = 0 damage, 1 ≤ 25% leaves w/ damage, 2 (26-50% leaves w/ damage), 3 (51-75% leaves w/ damage), 4 (75-100% damage)

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.

'Nyagous' tomato

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

Minimal damage from pickle worm or fruit flies

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

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

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.

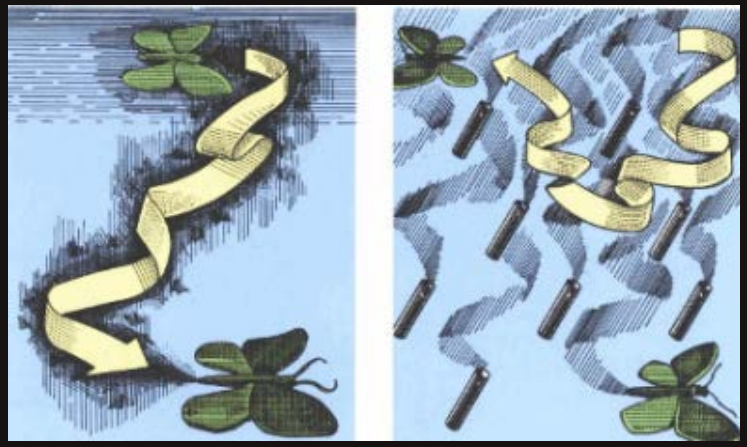
Luring and Trapping

ROSE BEETLE LIGHT TRAP

https://vimeo.com/166306170

FRUIT FLIES METHYL EUGENOL/ CUE-LURE TRAPS

PIN WORM NOMATE

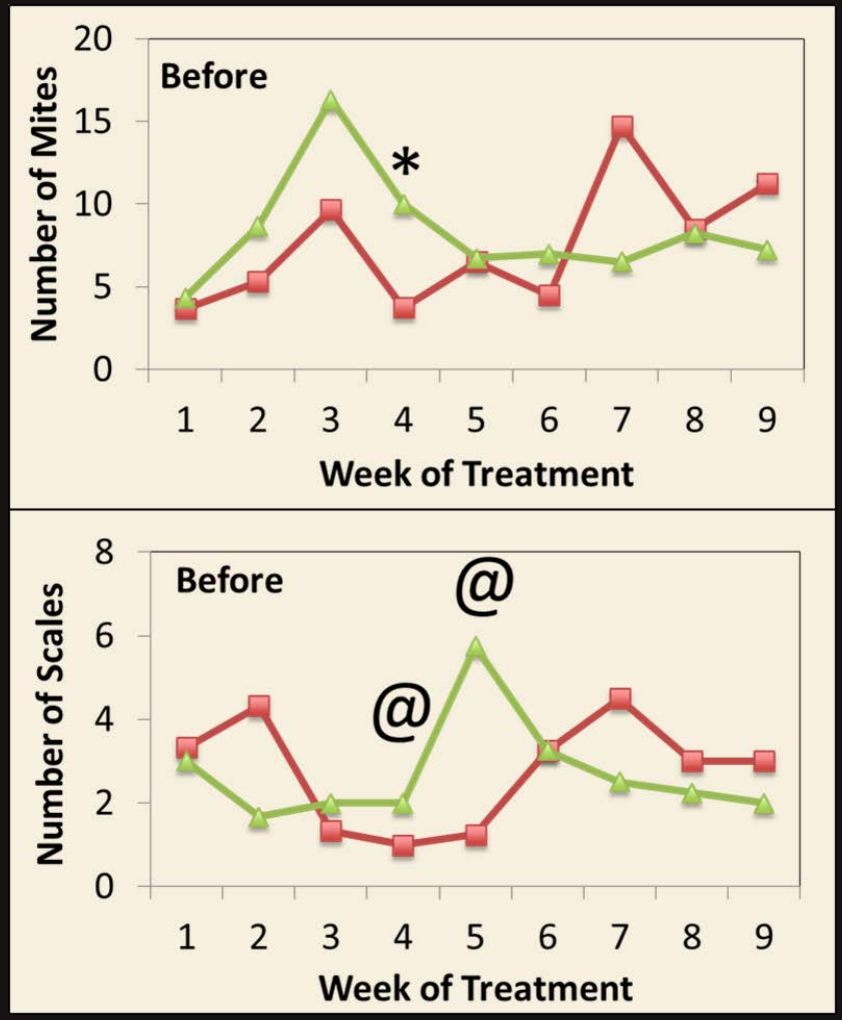


Heat Treatment

Propane tankless water heater (EccoTemp®)

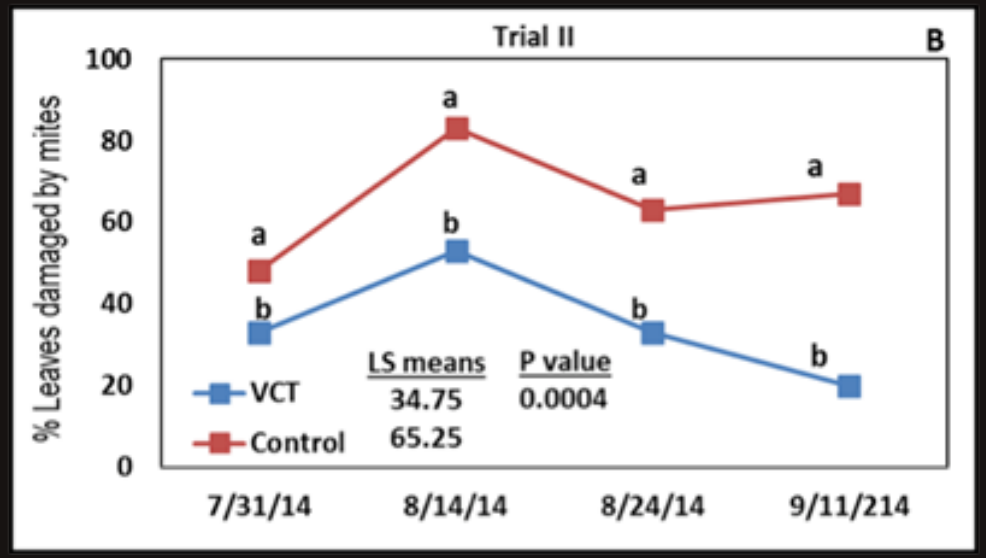
Treat spider mites on tea (*Camellia senensis*)

LETHAL TEMPERATURE = 45-50°C(113-122°F)



Western IPM Center

Induce Host Plant Resistance



Drenching VCT prepared from uncured vermicompost on tea root systems weekly reduced spider mite damage on tea leaves.

ACKNOWLEDGEMENT

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OW15-019

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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?

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