College of Tropical Agriculture and Human Resources
University of Hawaii at Manoa

Cover Cropping System & Compost Tea Treatment for Management of Nematodes, Whiteflies, and Pollinators

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Nematodes as Indicators of Soil Health?

Bacterivore Fungivore Herbivore Omnivore Predator

EI=Enrichment index

CI=Channel index

SI=Structure index

+ richness, diversity

Till in organic matters

Reduce tillage

Formal Soil Health Management Project: Strip-Till Cover Cropping (STCC)

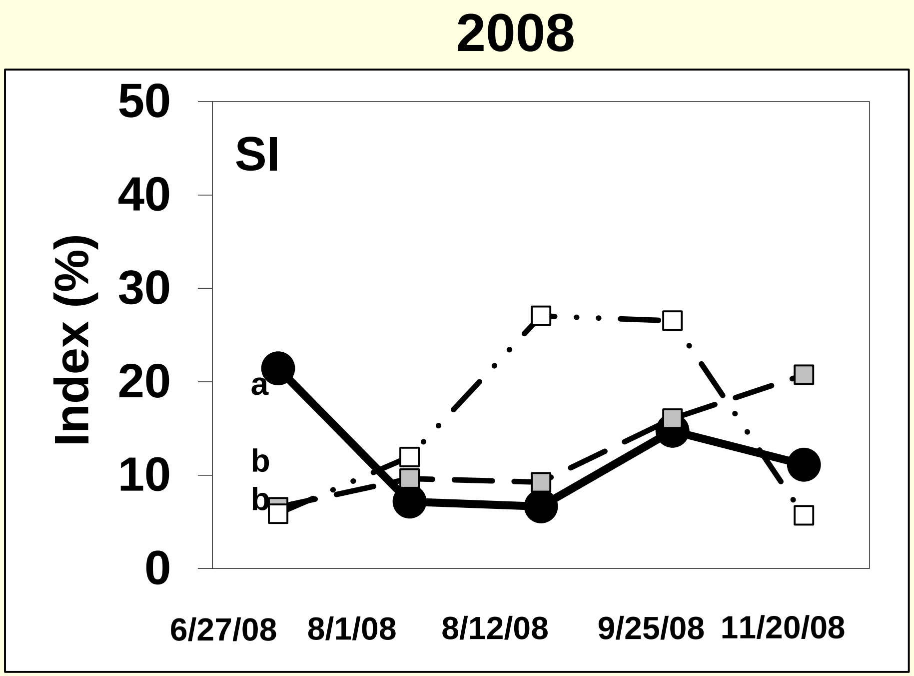
- Preplant Treatment:
  - ❑ Sunn hemp (SH): 40 lb seeds/acre
  - ❑ Marigold (MG): 2.6 lb seeds/acre
  - ❑ Bare ground (BG): fallow with weeds

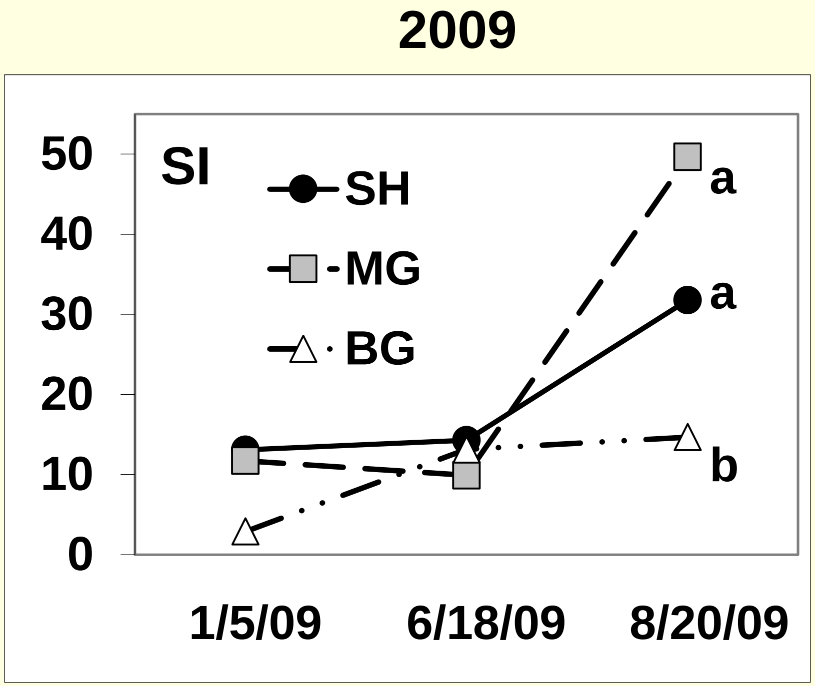
2008, 2009 Trials

- Advantage:
  - STCC reduced tillage.
  - Periodical clipping of the living mulch as surface mulch provide additional inputs of organic matter over time.

(CSREES, Crop at Risk, 2006-2010)

STCC System took 2 years to improve Soil Food Web Structure and Crop Yield





Crop yield was lower in SH during 2008, but was increased by SH in 2009.

Overall Objective: Ecosystem Health

- Suppress plant-parasitic nematodes

Sunn hemp and chicken manure are known to be suppressive to PPN.

- Promoting cultural practices that can **speed up** the soil health enhancement process

drenching of CT,
no tilling is required

Compost tea (CT)

- Planting **companion plants** that reduce insect pests while enhancing provide habitats for pollinators

Experiment: Integrating STCC + Compost Tea

Main Plots

Sunn hemp (SH)

SH+CC

Crimson Clover (CC)

Bare ground (BG)

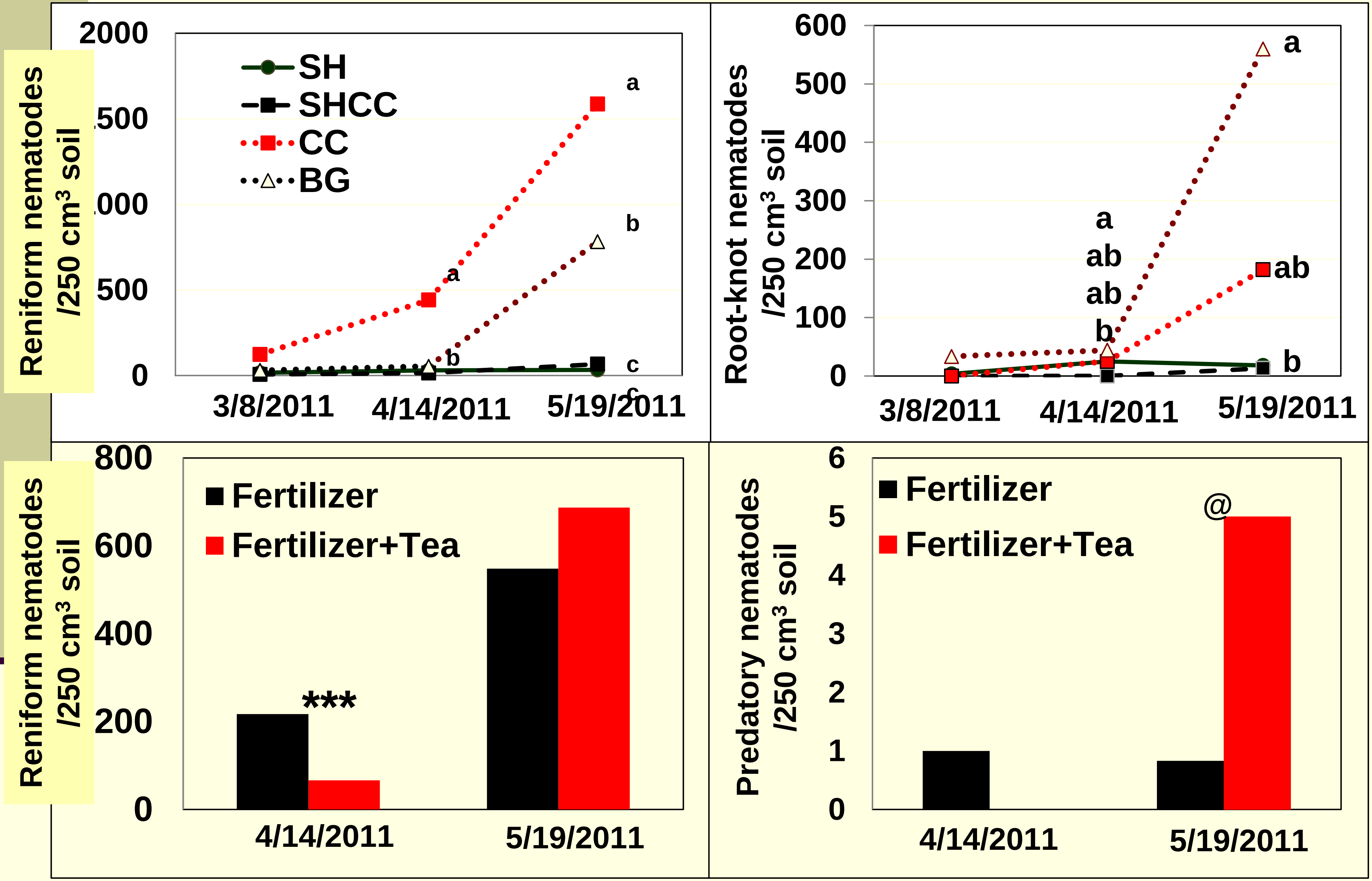
Subplots:

- Chicken pellets (F) =60lb N/acre
- Vermicompost tea (T) =200 gal/acre
- F+T
- None

- 2 × 4 factorial Expt.
- 3 replications
- Twin Bridges Farm, Waialua

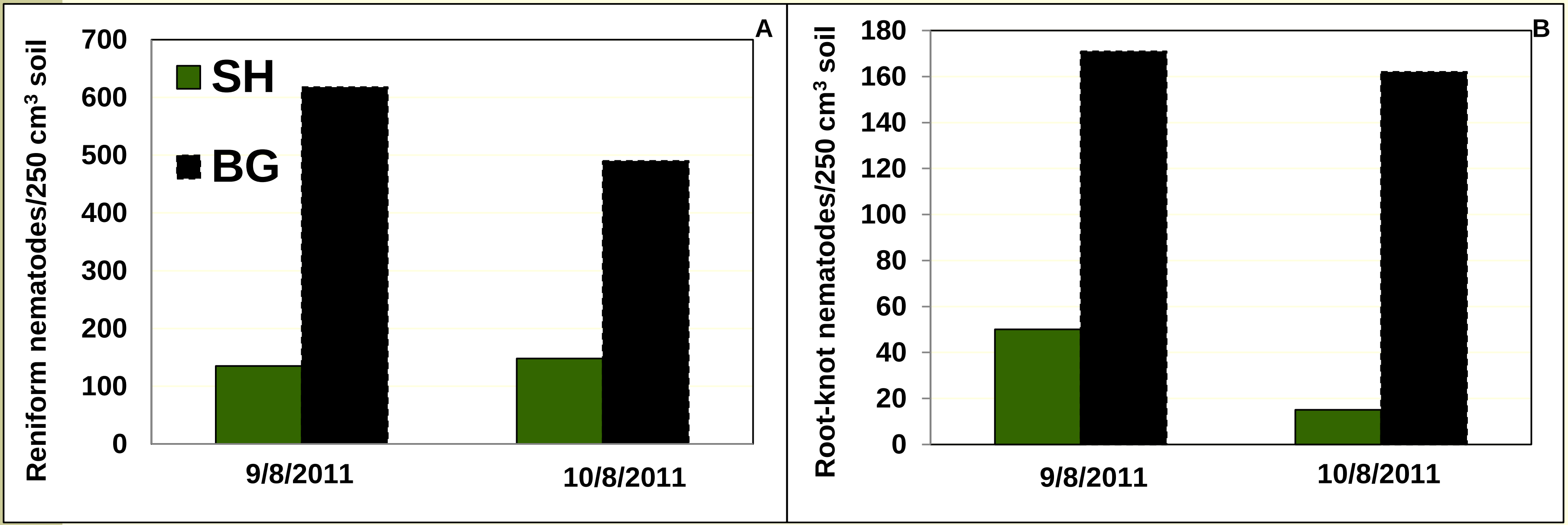
(NRCS, 2010-2012)

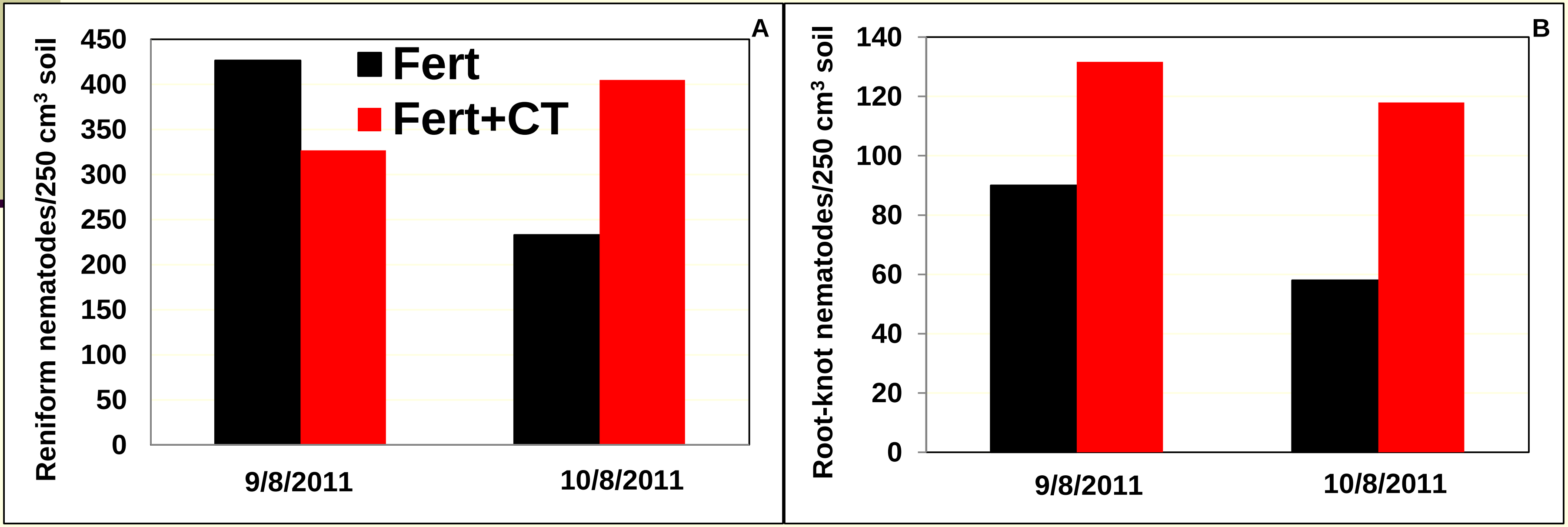
Trial I (Plant-parasitic Nematodes)



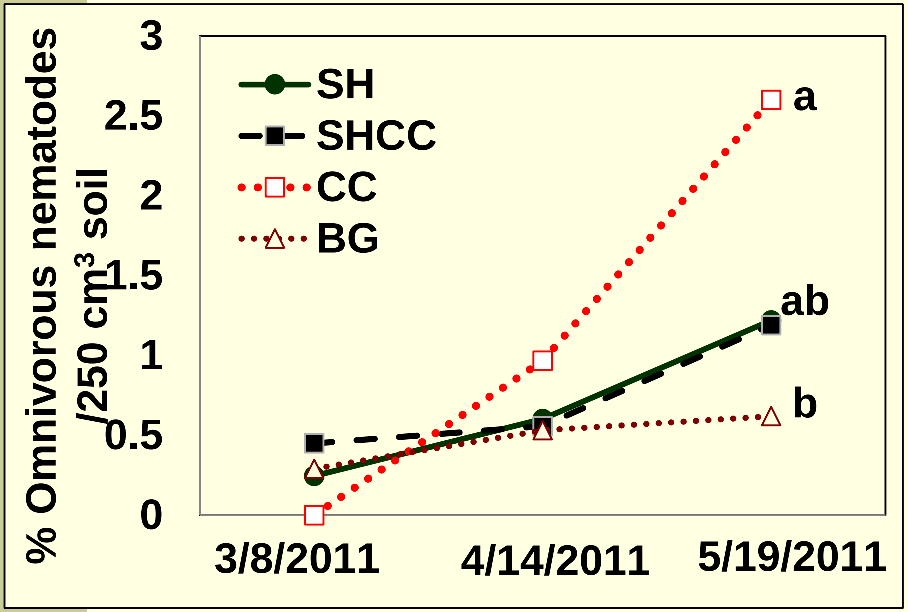
@ = significant difference between Fertilizer and Fertilizer + CT

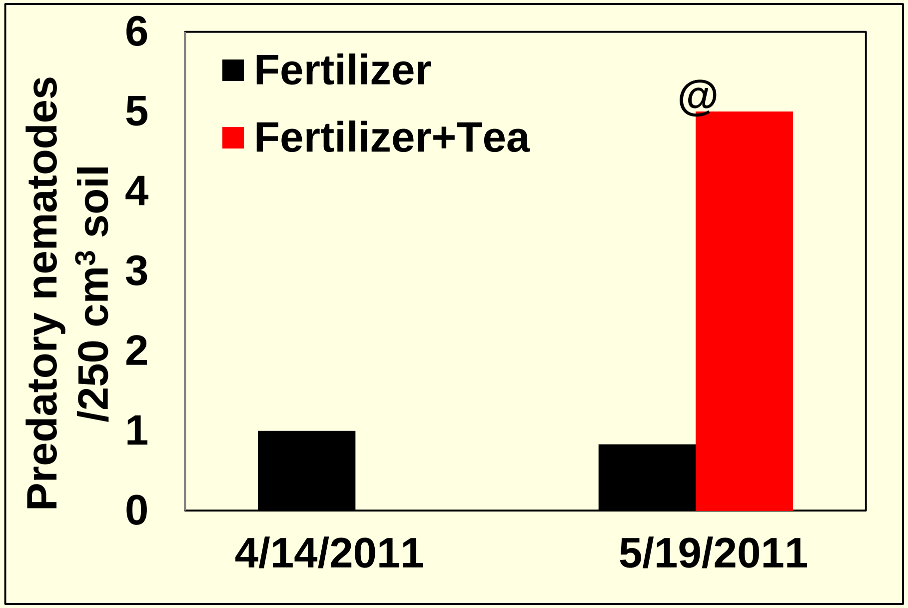
Trial II (Plant-parasitic Nematodes)





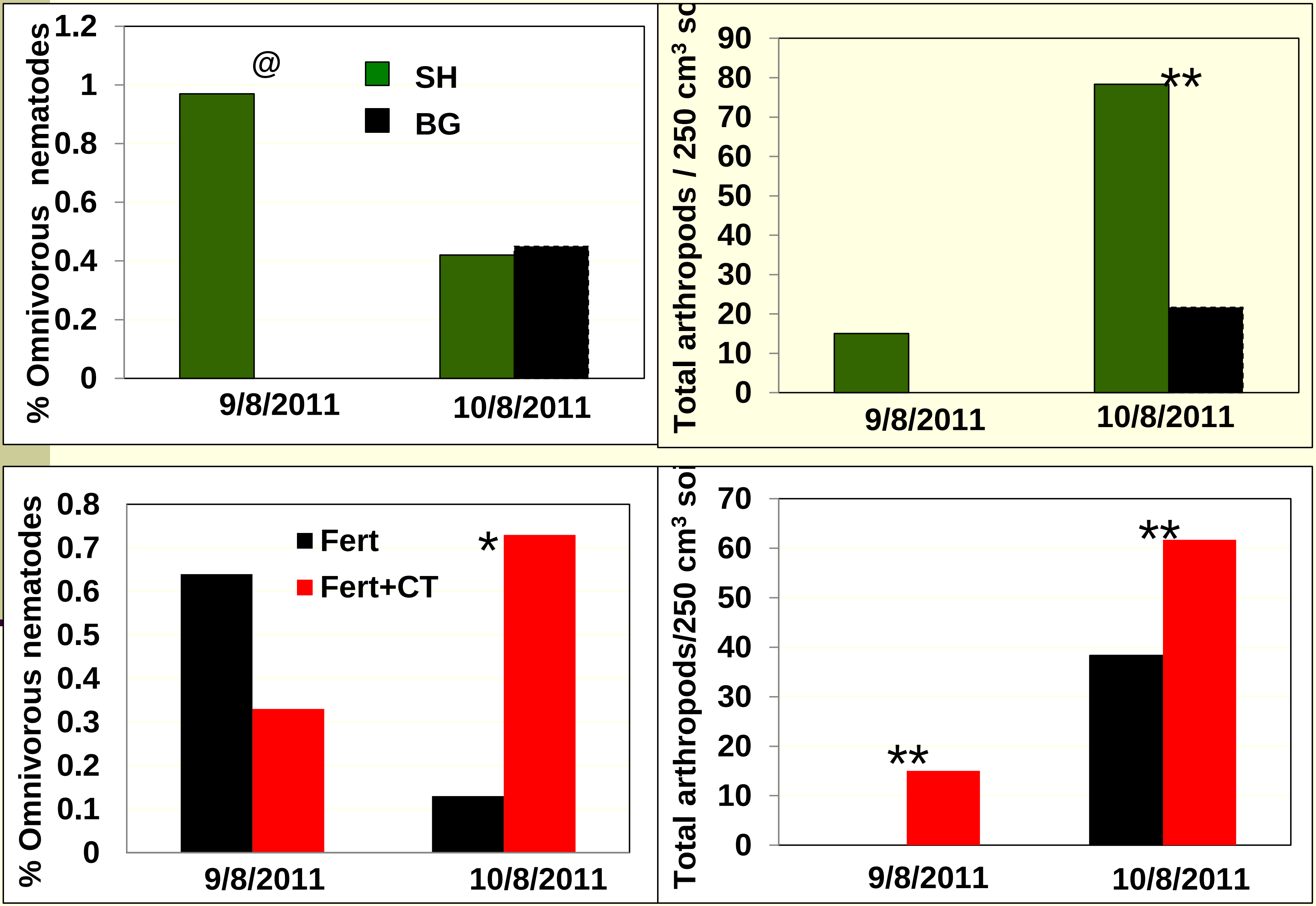
Trial I (Omnivorous and PredatoryNematodes)





- SH only slightly increased ($P > 0.10$), but CC did increased % omnivorous nematodes.
- CT increased ($P < 0.10$) predatory nematodes at zucchini harvest.

Trial II (Fauna in higher hierarchy of Soil Food Web)



Summary

- ✓ SH suppress plant-parasitic nematodes throughout zucchini crop, but CT only suppressed PPN initially after zucchini planting.
- ✓ CT always enhanced either predatory or omnivorous nematode within one zucchini cropping cycle, thus it **speed up** the soil health enhancement process vs SH.

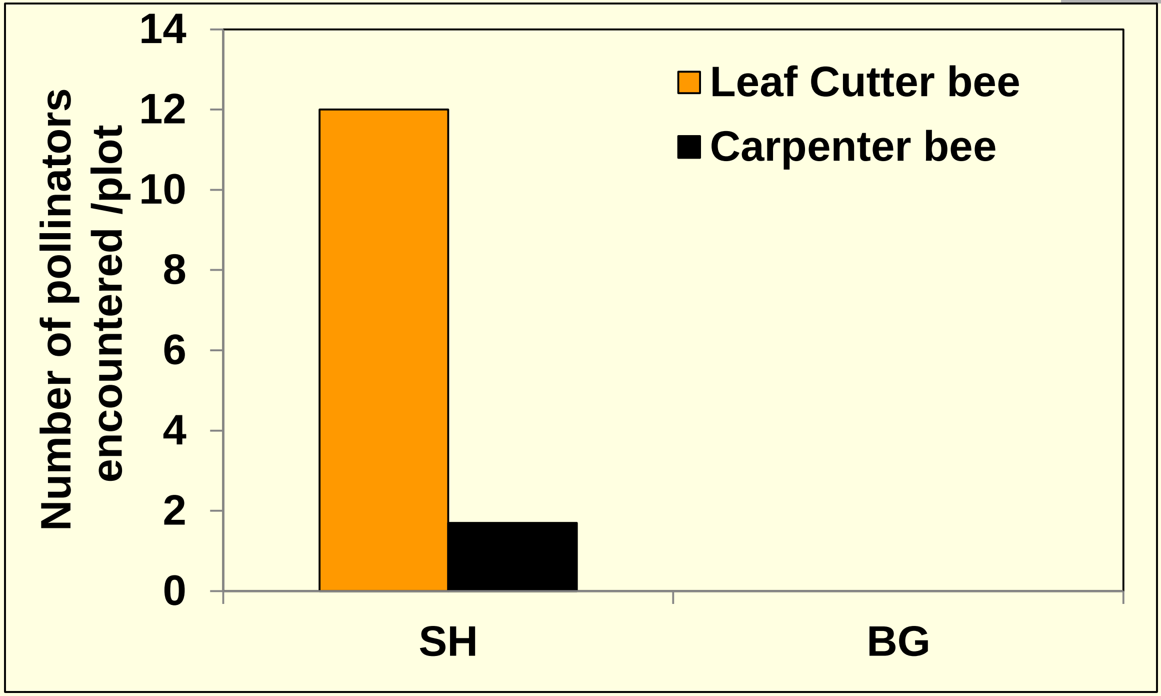
- Planting **companion plants** that can suppress insect pests while provide habitats for pollinators

Sunn hemp living mulch serve as companion plants that attract many alternative pollinators

Sunn hemp (SH)

Bare ground (BG)

Pollinators (Trial II)



Sweat bee

Green bee

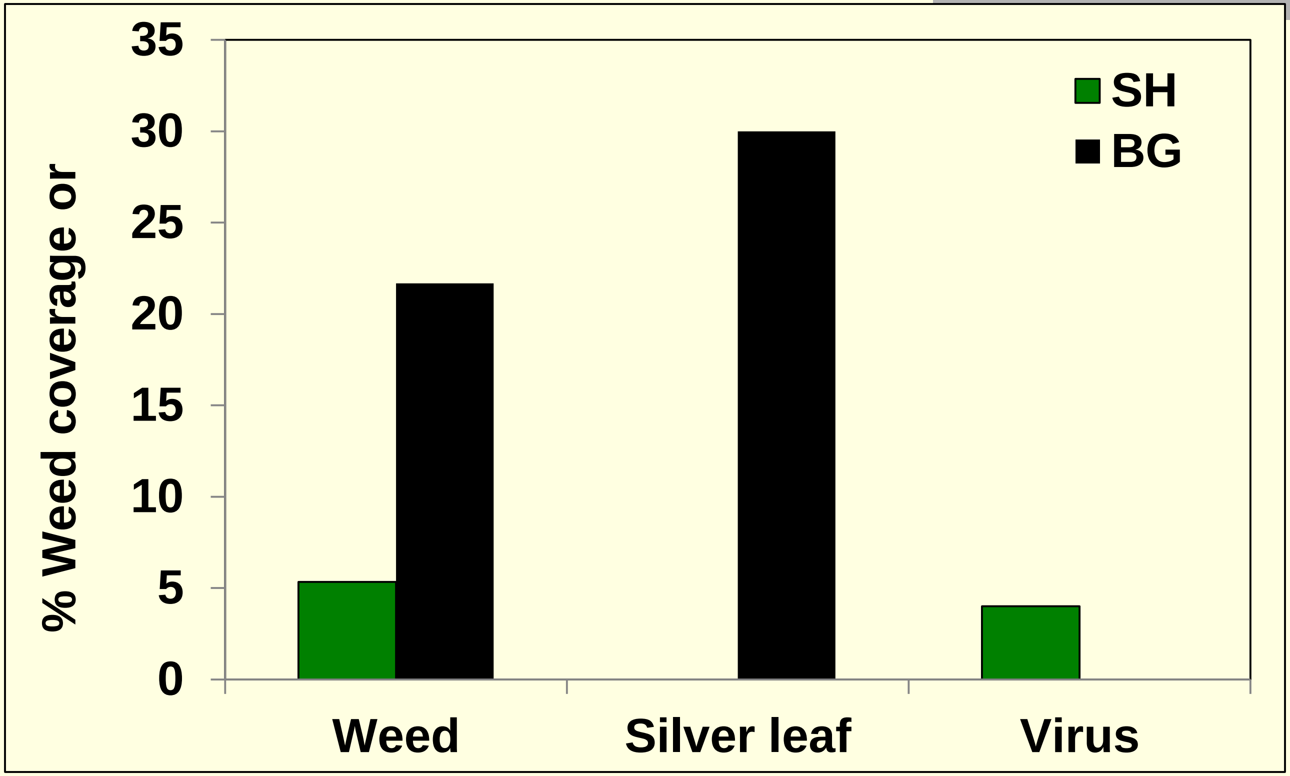
Leaf cutter bee & Honey bee

Carpenter bee

Other Benefits of SH Living/Surface mulch

Sunn hemp (SH)

Bare ground (BG)



- Clipping of SH as surface mulch provided weed suppressive effect.
- SH living mulch served as a trap crop to lure away whiteflies from zucchini crop, thus lower silver leaf symptomatic plants on SH plots.
- But SH living mulch did not reduce aphid transmitted virus diseases.

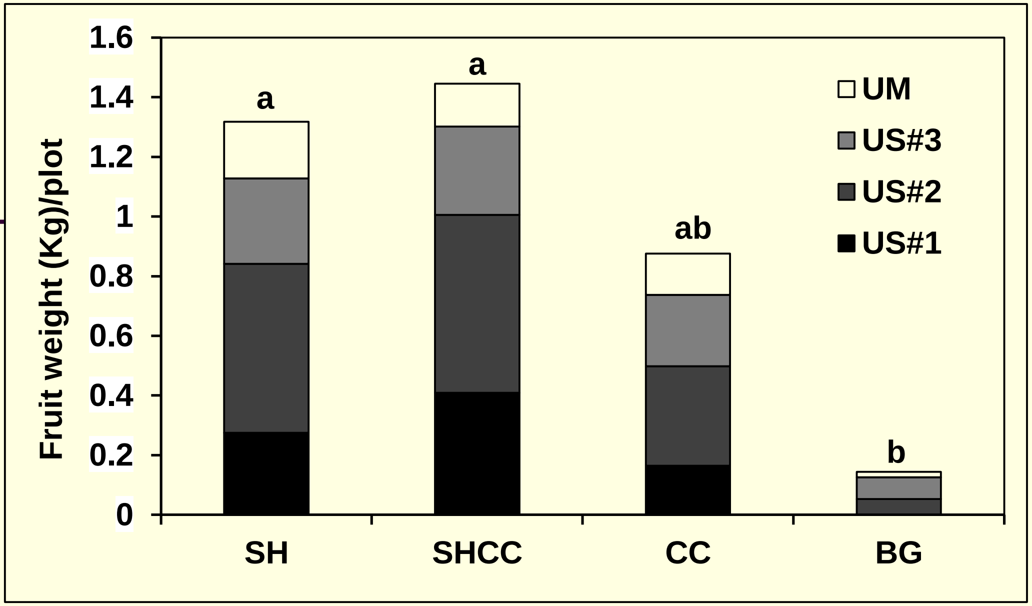
Sunn hemp as surface mulch provided a barrier for weed growth

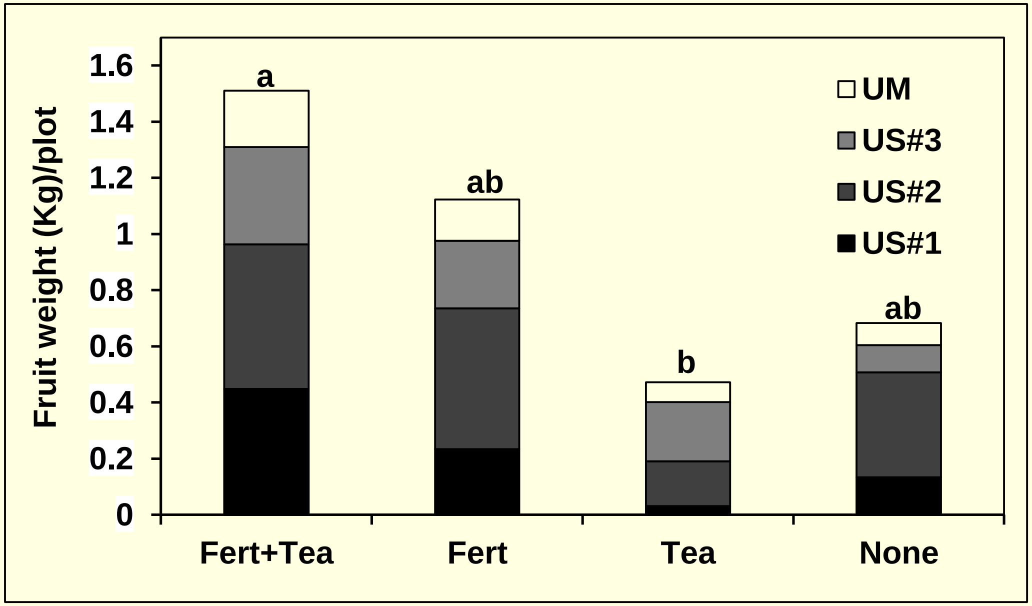
Sunn hemp plot

Bare ground plot

Zucchini Yield (Trial I)

- Zucchini crop produced higher yield in SH planted plots than in BG.
- Adding compost tea to chicken pellets fertilizers slightly increased crop yield vs chicken pellets alone.

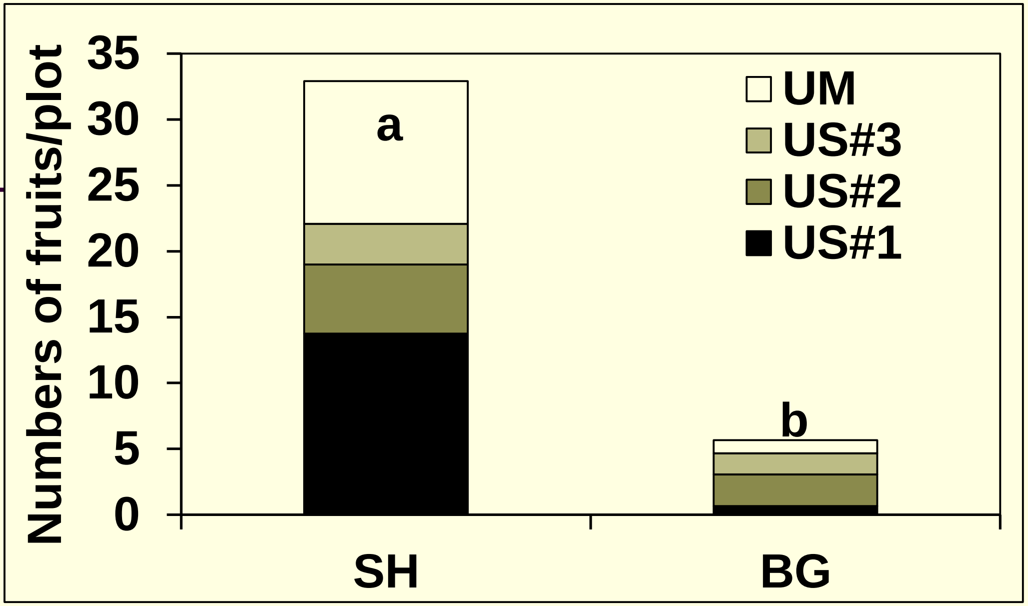


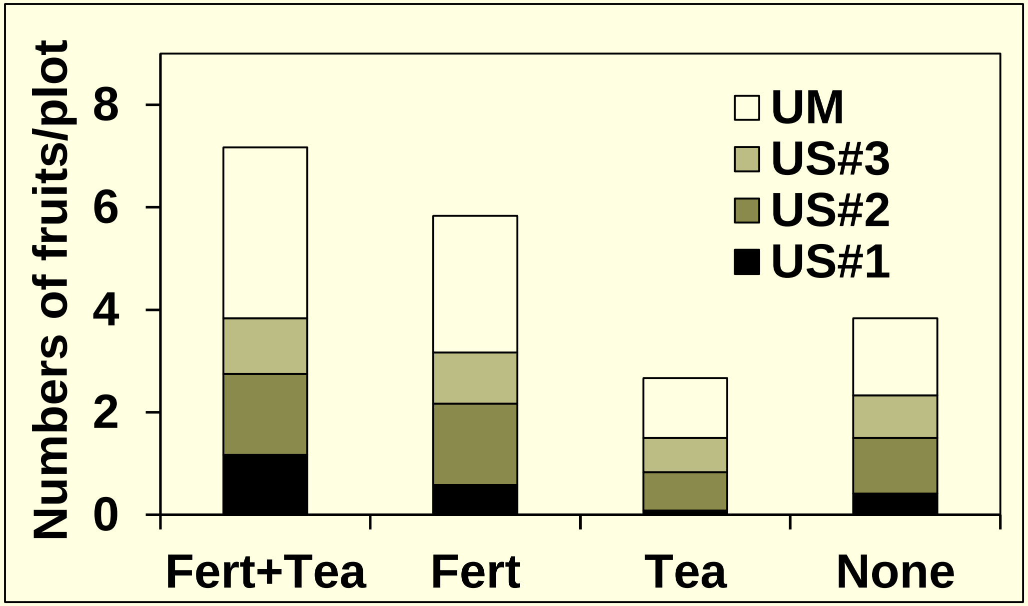


US#1 = firm, no damage; US#2 = firm, no major damage;
US#3 = off shape, multiple damages; UM = unmarketable, serious damage.

Zucchini Yield (Trial II)

- Similar yield results were observed in Trial II.
- Compost Tea effect was not significant.





Summary

- SH suppress plant-parasitic nematodes throughout zucchini crop, but CT only suppressed PPN initially after zucchini planting.
- CT always enhanced either predatory or omnivorous nematode within one zucchini cropping cycle, thus it **speed up** the soil health enhancement process vs SH.
- Planting SH as **companion plants** did provide habitats for several species of alternative pollinators, reduced silver leaf symptomatic plants, and suppressed weeds, but it did not reduce aphid transmitted virus diseases.

Acknowledgement

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