



Nematode Management: Pesticides, Cover Crops and etc

Koon-Hui Wang, Ph.D.

Philip Waisen, M.S.

Jensen Uyeda, M.S.

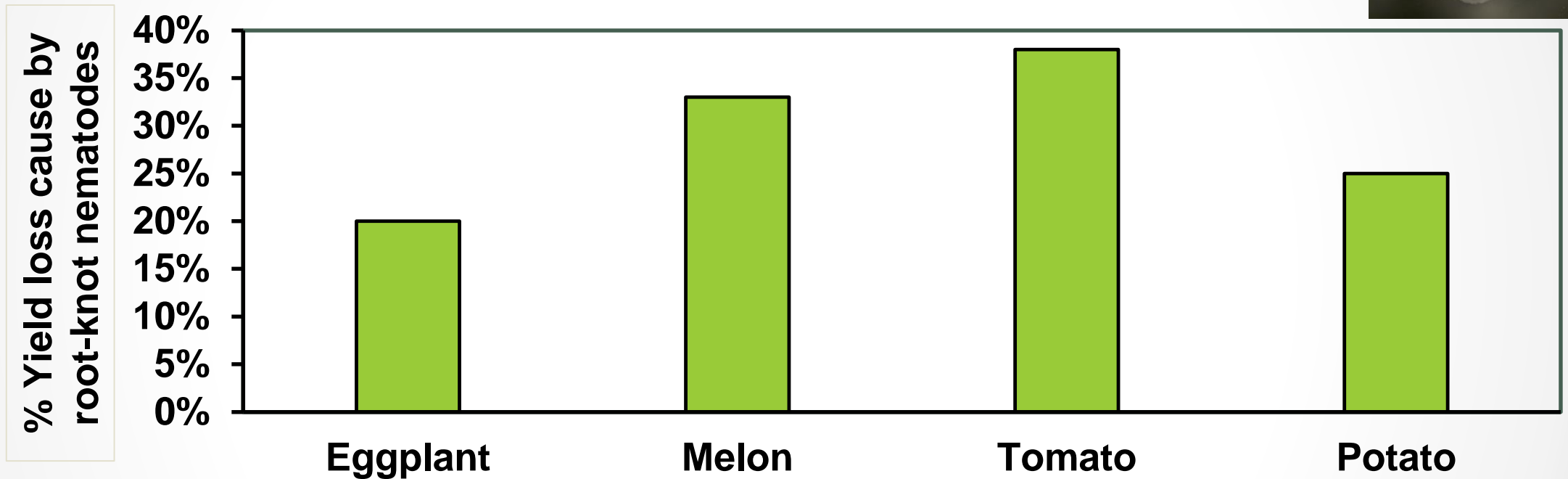
University of Hawaii



Sustainable Pest Management Lab

University of Hawai'i at Mānoa,
College of Tropical Agriculture and Human Resources

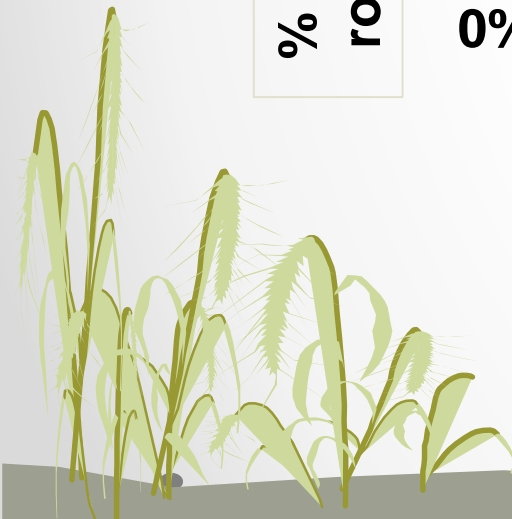
Damage by Tropical Root-knot nematodes (*Meloidogyne incognita* and *M. javanica*)







(Sikora and Fernandez, 2005)



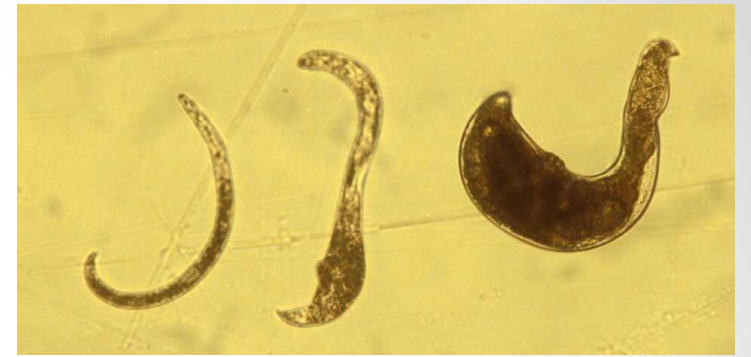
Basil roots with root-knot nematodes



Nematode Damage on Tomato & Zucchini in Hawaii

	Healthy roots	Infected by root-knot nematodes	Yield loss (%)
Tomato (Komohana, root-knot resistant var)	 A photograph of a tomato root system showing a dense network of thin, light-brown roots that are relatively uniform in thickness and spread out across the surface.	 A photograph of a tomato root system showing significant damage. The roots are thickened, distorted, and have a dark, necrotic appearance, particularly at the base of the main taproot.	53
Zucchini	 A photograph of a zucchini root system showing a central taproot with several smaller, fibrous roots extending outwards. The roots are light brown and appear healthy.	 A photograph of a zucchini root system showing severe damage. The roots are severely thickened, knotted, and distorted, with a dark, necrotic appearance, indicating advanced root-knot disease.	72

Damage by *Reniform nematode*



Pineapple



Healthy Sweet potato



Reniform infected sweet potato



Papaya



Cowpea



Potato

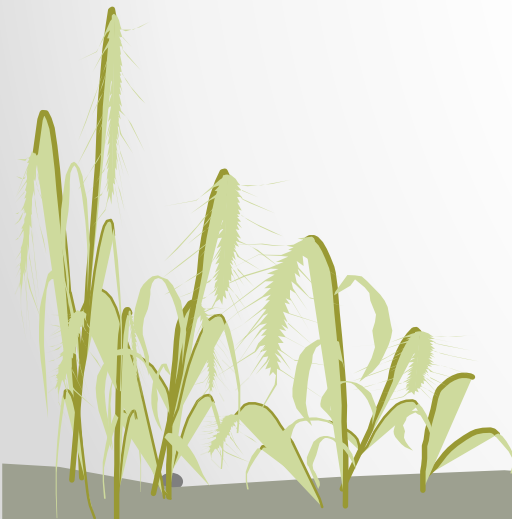
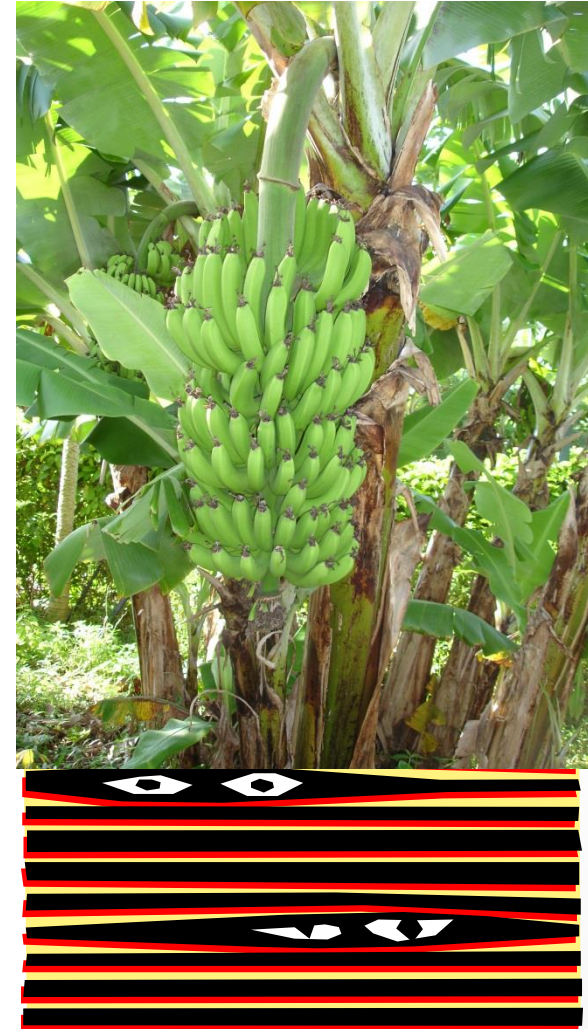


Nematode Damage on Banana

Crop losses of banana due to plant-parasitic nematodes:

Costa Rica	30-50%
Panama	30-50%
India	30-60%
Ghana	56%
Uganda	58%
Nigeria	90%

(Speijer and Fogain, 1999)



Nematode Management Options

- Crop rotation with cover crops
 - Sunn hemp
- Biofumigation
 - Brown mustard
- None-restricted nematicides
 - Velum (fluopyrum)
 - Neem extract (azadirachtin)



Cover Crops with Allelopathic Compounds against PPN



Sunn hemp
Crotalaria juncea
-- monocrotarine

T. erecta and *T. polynema* are resistant to root-knot but very susceptible to reniform nematodes.



French Marigold
Tagetes patula
'Nemagone'
-- α -terthinyll



Rapeseed (Canola)
-- glucosinolate



Sorghum-sudangrass
-- Dhurrin

Effects of Sunn Hemp against Root-knot (RKN) and Reniform nematodes



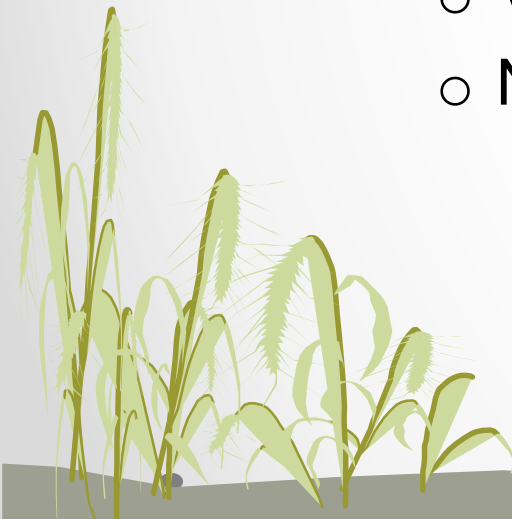
- Allelopathic compound (monocrotaline) is nematostatic (paralyze plant-parasitic nematodes), no effects against egg hatching.
- Leaf tissue has the most toxicity.
- Soil amendment at 0.5% (2.5 tons/acre) paralyzed > 75% of juveniles of *M. incognita* if SH is 2-3 months old, or 100% suppression at 5 tons/acre.
- 2.5 tons/acre of dry biomass is easily achievable in 2 months in soil pH > 5.5.

(Wang et al., 2012)

<http://www.ctahr.hawaii.edu/sustainag/news/articles/V12-Wang-Allelopathic.pdf>

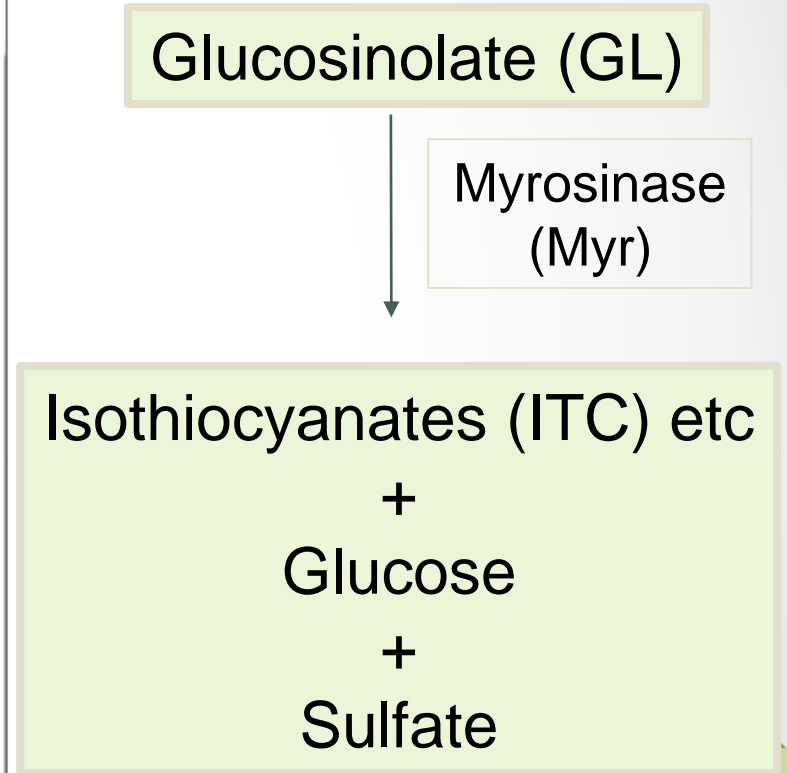
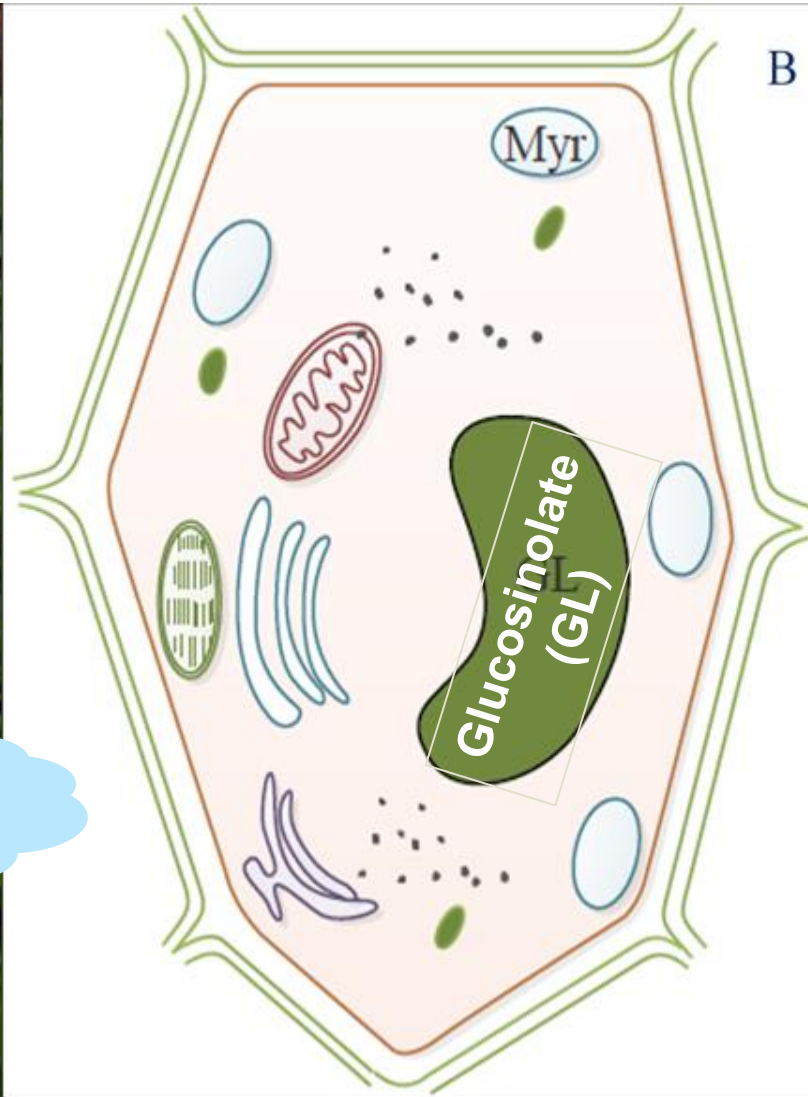
Nematode Management Options

- Crop rotation with cover crops
 - Sunn hemp
- ✓ • Biofumigation
 - Brown mustard
- None-restricted nematicides
 - Velum (fluopyrum)
 - Neem extract (azadirachtin)



Biofumigation

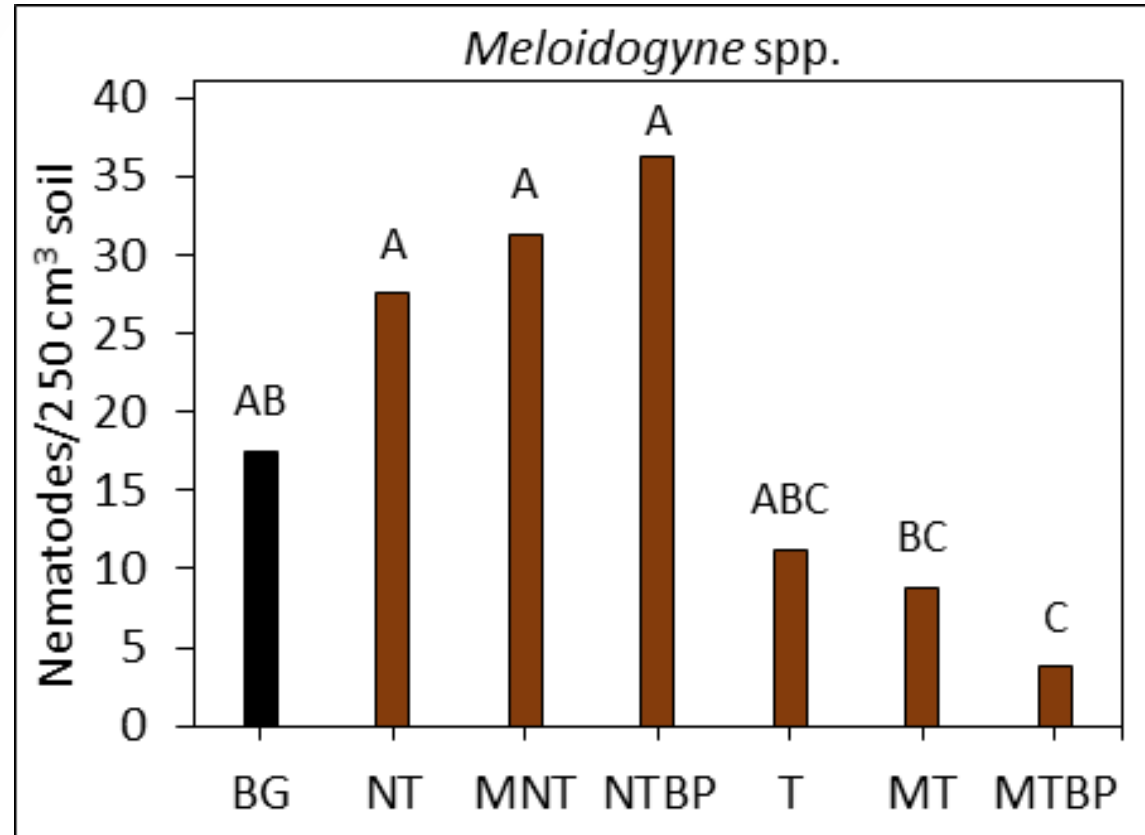
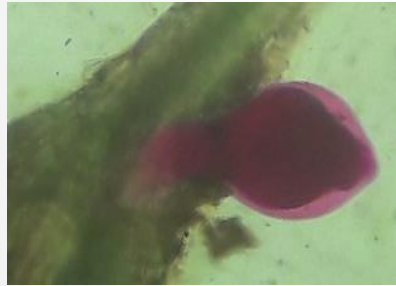
Fumigation using plant-based volatile allelopathic compounds.



Biofumigation Effects of *B. juncea* against RKN

RKN over 2 months of zucchini crop (n = 12)

5 weeks
Trap
Crop



- Tissue maceration
- Soil incorporation
- Mulching with Black plastic tarp

BG = bare ground fallow;

NT = sickle + weed mat;

MNT = maceration + no-till;

NTBP = maceration + no-till + black plastic ;

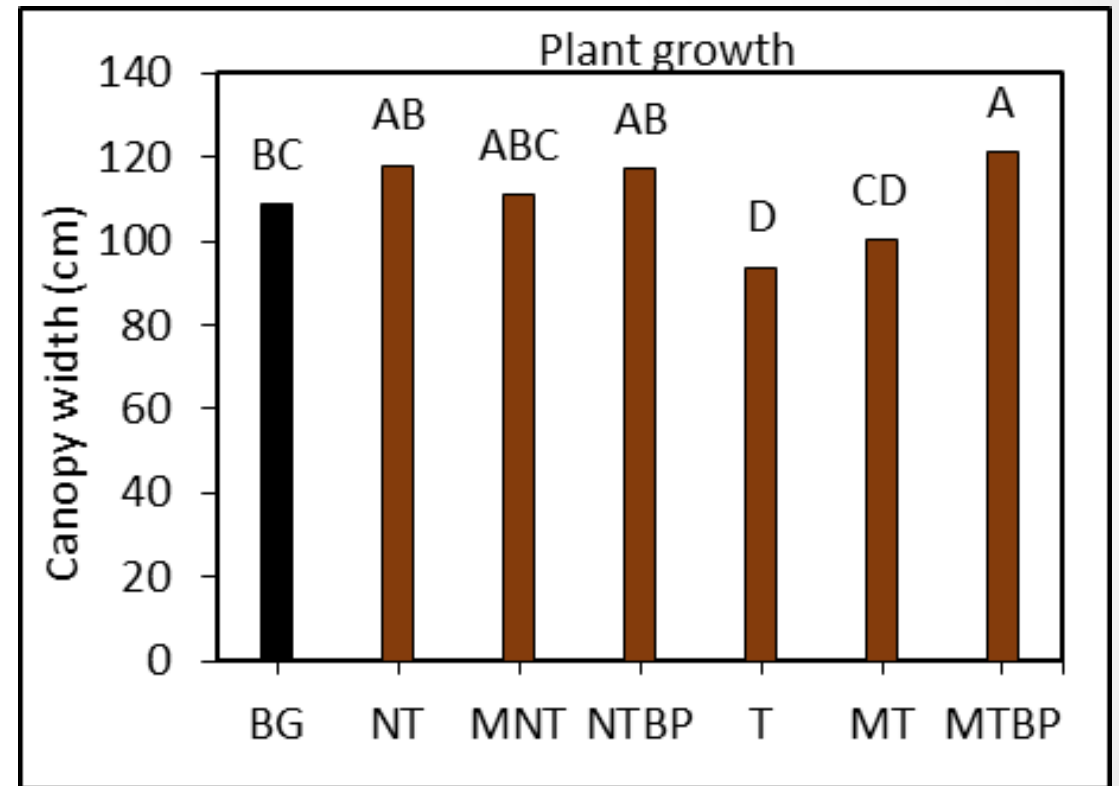
T = till without maceration;

MT = macerate + till

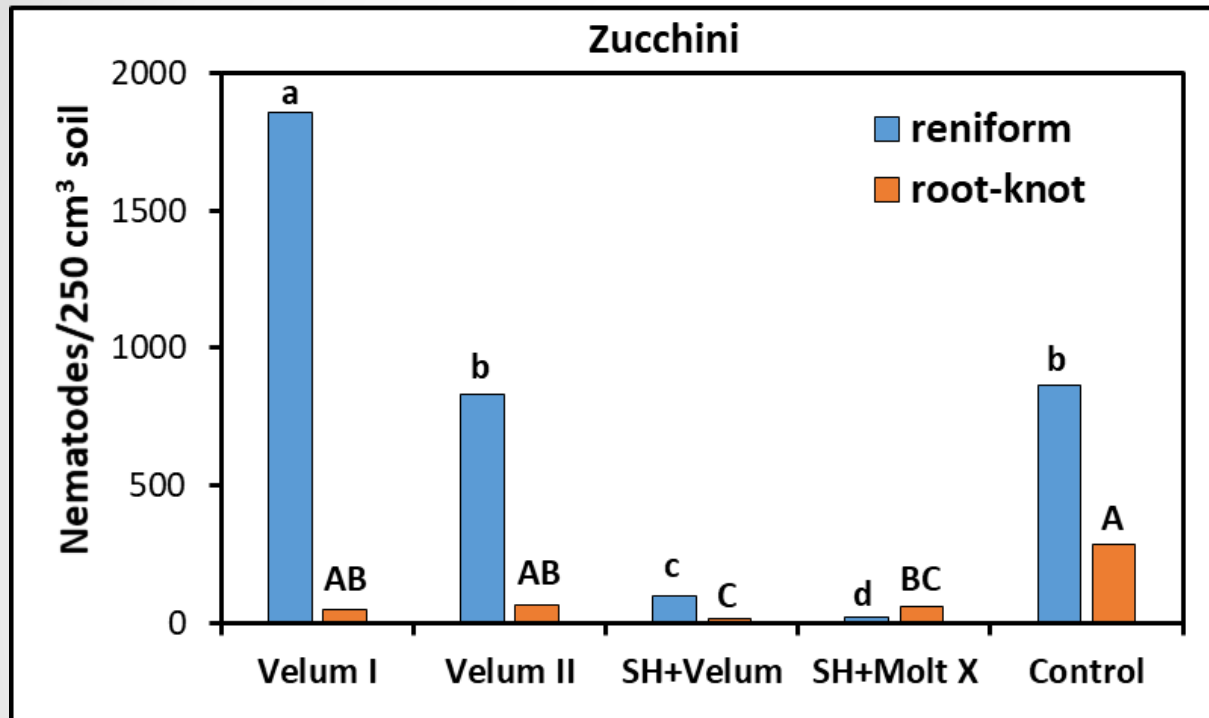
MTBP = maceration + till + black plastic

Nematode Management Options

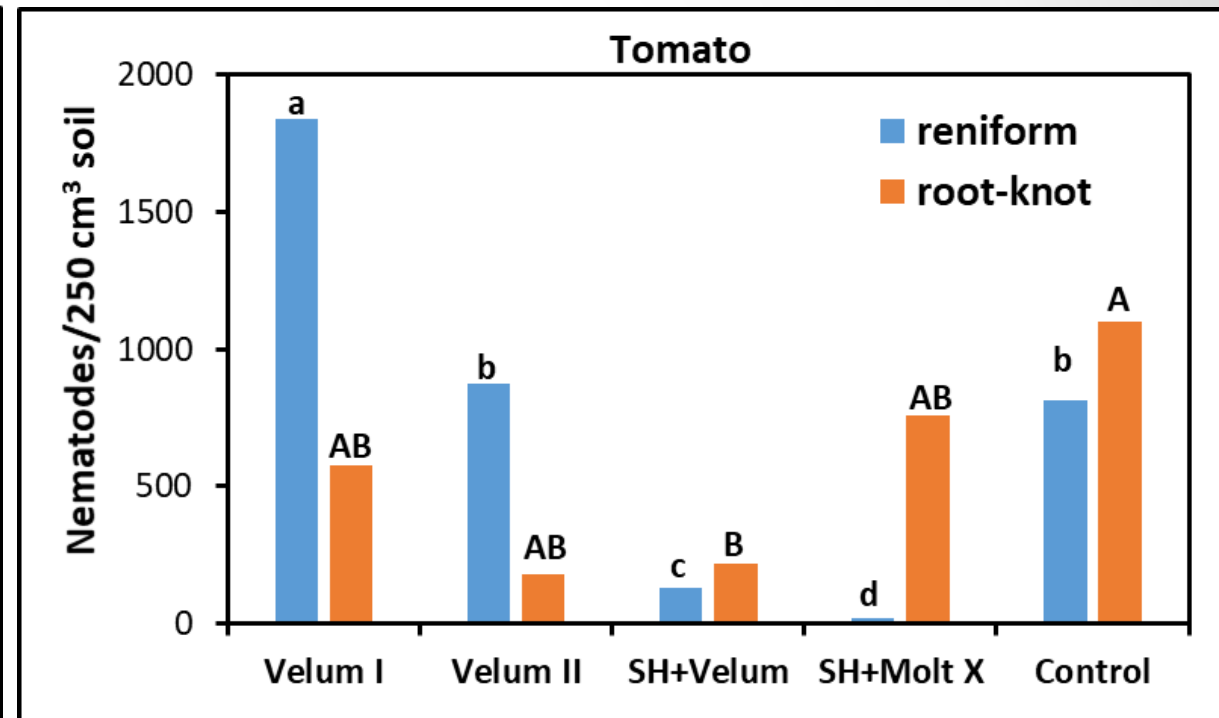
- Crop rotation with cover crops
- Biofumigation
- None-restricted nematicides
 - ✓ Velum (fluopyrum) – not available in HI yet
 - Molt-X: Neem oil extract (azadirachtin)



Sunn hemp + Nematicide Fertigation



2-month crop

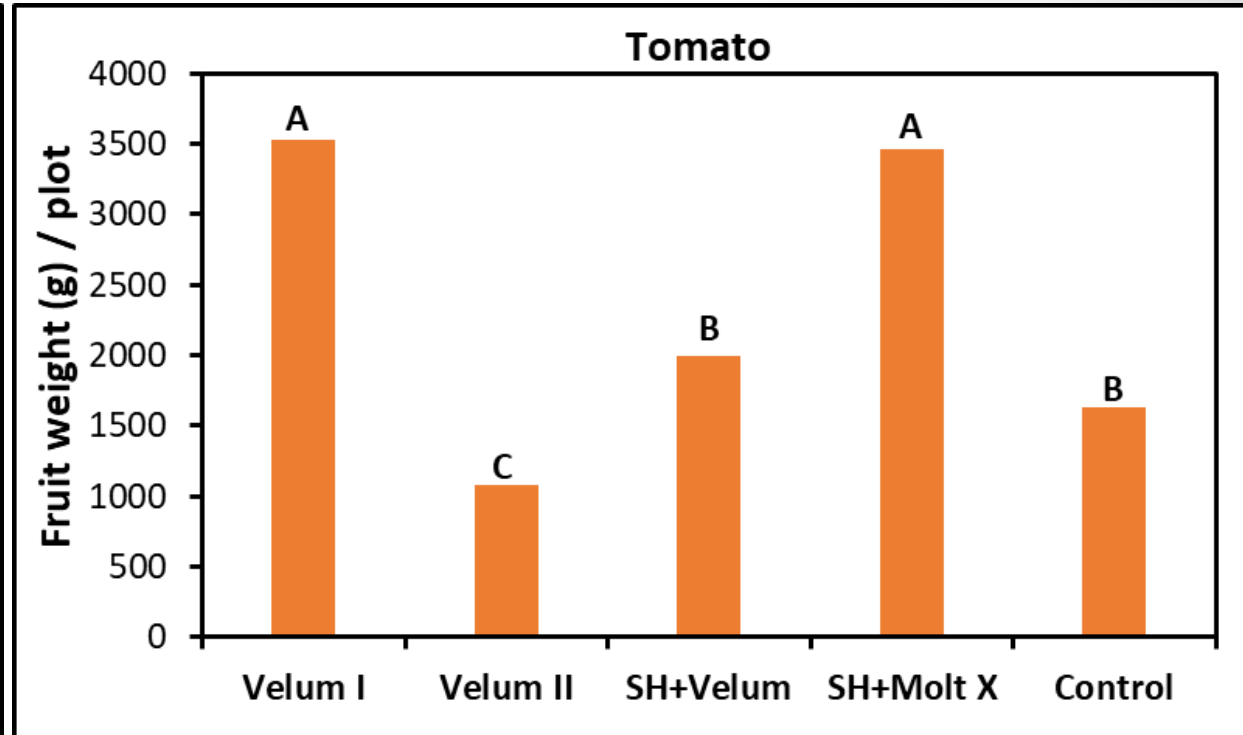
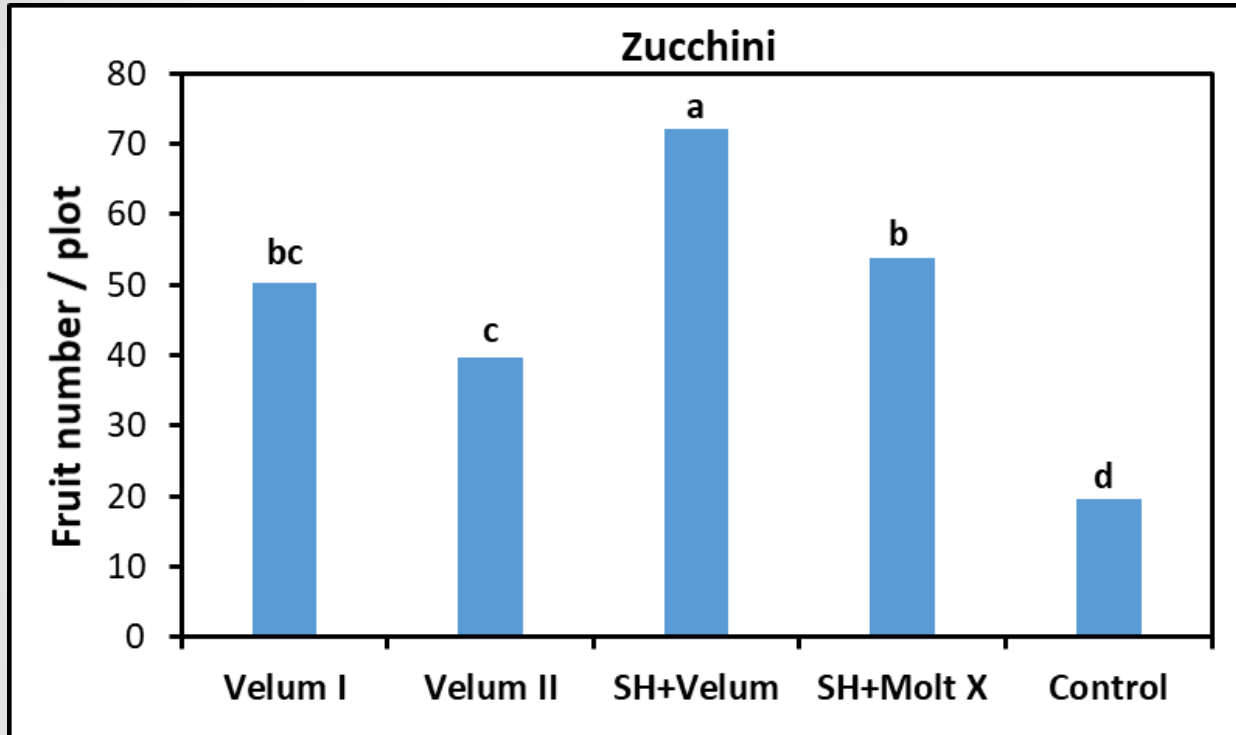


3-month crop

- Velum I = Velum One 6.5 fl oz/acre at crop planting
- Velum II = Velum One 6.5 fl oz/acre at crop planting and 2 weeks later
- SH + Velum = Sunn hemp 2 months, Velum One at 2 weeks after planting
- SH +Molt-X = Molt-X 10 fl oz/acre, a.i. azaractin, fertigate monthly for 2 months)
- Control

SH + Velum or SH + Molt-X reduced soil population of root-knot and reniform nematodes.

Effects of Sunn hemp + Nematicide Fertigation on Yield



- SH + Velum or SH +Molt-X resulted in lowest yield loss from infection of reniform or root-knot nematodes.
- Velum injected at planting out performed Velum at 2 weeks after transplanting, suggested some phytotoxic at 2 weeks after planting.
- Untreated control resulted in 72 % and 53 % yield loss on zucchini and cherry tomato, respectively.



Websites

<https://cms.ctahr.hawaii.edu/wangkh/>

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CRATE



Sustainable Agriculture
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