Using Papaya Ground Seed to Induce Systemic Resistance Against Root-Knot Nematodes in Hawai‘i

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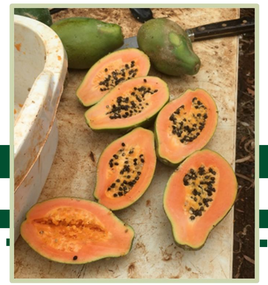
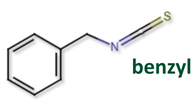


BACKGROUND

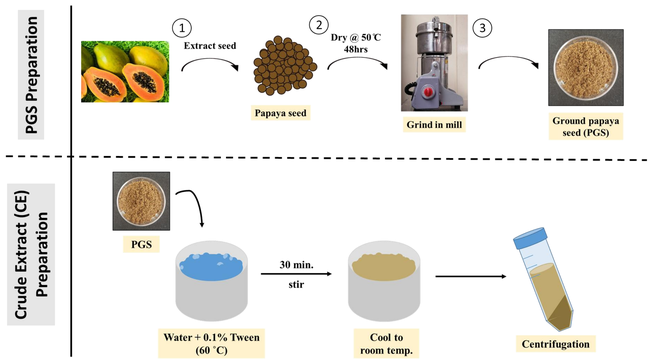
- In Hawai‘i, plant-parasitic nematodes (PPN), including root-knot nematodes (RKN; *Meloidogyne* spp.), cause pressure for growers all year round.
- Rising cost of agriculture production inputs is calling food producers in Hawai‘i to adopt sustainable pest management tactics using local resources.
- Papaya production is a major industry in Hawai‘i, but up to 50% of fruit produced is culled or wasted.
- Papaya seeds contain prerequisites for benzyl isothiocyanate (BITC) production, a volatile organic compound toxic to several soil-borne nematodes.

The objective of this study was to explore the induced systemic resistance (ISR) potential of ground papaya seed (PGS) against RKN infection, while maintaining soil health.



benzyl isothiocyanate (BITC)

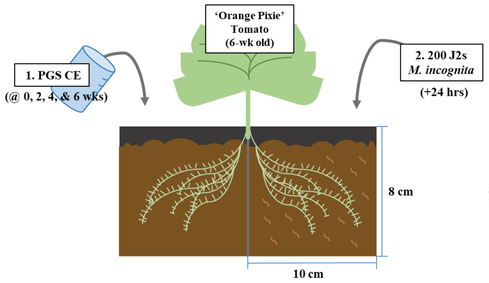
METHODS



SPLIT-ROOT EXPERIMENT

Treatments (x4 reps each)

1) ***0.5% CE*** = *crude extract at 0.5%*
2) ***1% CE*** = *crude extract at 1%*
3) ***NA*** = *not amended*
4) ***Auto*** = *not amended and autoclaved*



Terminate @ 8 wks after inoculation

FIELD POT EXPERIMENT

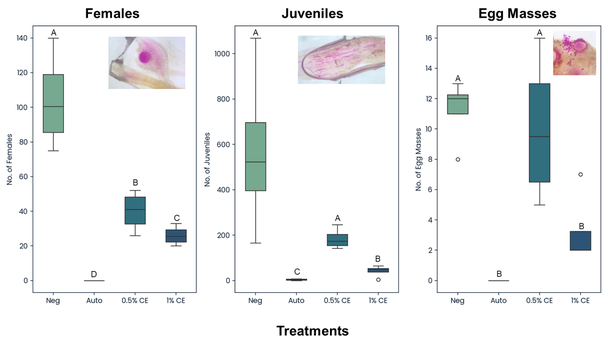
1) Drench every 2 wks starting at transplant
2) Soil sampling for nematode assaying @ transplanting, 6 wk, and 3 months (termination)

Treatments (x4 reps each)

1) ***0.5% CE*** = *crude extract at 0.5%*
2) ***1% CE*** = *crude extract at 1%*
3) ***NA*** = *not amended*

RESULTS

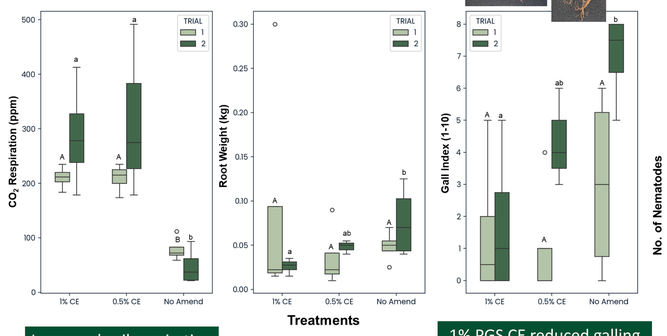
GREENHOUSE



Females were significantly reduced in both 0.5% and 1% CE treated groups

FIELD POTS

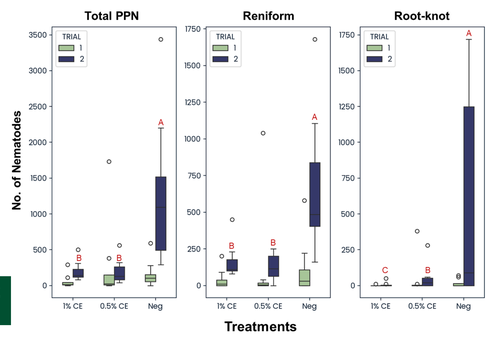
Root weight decreased when using 1% CE compared to No Amend

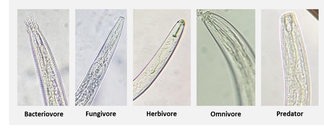


Increased soil respiration in both 0.5% and 1% CE

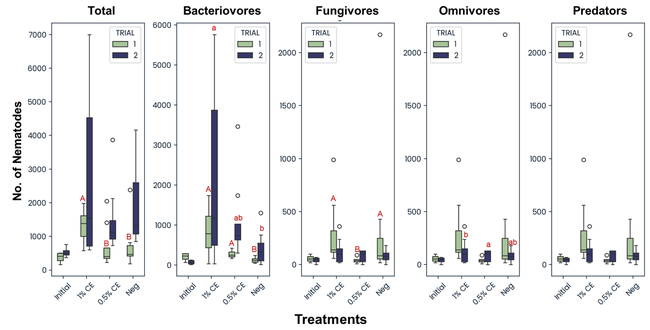
1% PGS CE reduced galling compared to No Amend

In Trial 2, Reniform, RKN, and total PPN abundance was reduced in 0.5% and 1% CE treated reps





- Increase in bacteriovores in 1% CE treatment for both trials
- In Trial 1, 1% CE increased total and fungivore abundance
- Minimal differences in omnivores and predators



CONCLUSIONS

- Due to a lower starting population in infested field soil, Trial 1 had less overall galling and PPN populations. However, mean values still followed similar trends to those in Trial 2.
- Induced systemic resistance (ISR) triggered by PGS CE was successfully demonstrated in the greenhouse through the use of a split-pot experiment.
- While both 0.5% and 1% CE were effective, 1% CE was the most consistently effective in reducing RKN infection across all experiments and parameters measured.
- PGS CE drenching not only helped prevent RKN infection in tomato plants, but also enriched the soil while having minimal off-target effects on higher trophic level nematodes (i.e. omnivores and predators).

NEXT STEPS

- RT-qPCR amplification of ISR-associated genes to confirm through molecular means that ISR is the mechanism responsible for observed results.
- Conduct additional greenhouse split-pot assay

ACKNOWLEDGEMENTS

This project is supported by WSARE GW22-233, CTAHR Hatch, Multistate (NE2140), Plan of Work (HAW 9048-H, 9034-R, and POW 16-964). Special thanks to Roshan Paudel, Angelina Johnson, Kekoa Larger, Ben Wiseman, Wei Wen Su, and Shelby Ingle for their assistance at various points in this project.