Sunn Hemp and Its Allelopathic Compounds for Vegetable Production in Hawai‘i and Beyond

Koon-Hui Wang (Hawai‘i – Research & Education Grant)

Project Number: SW08-037

Title: Sunn Hemp and Its Allelopathic Compounds for Vegetable Production in Hawai‘i and Beyond

Principal Investigator:
Koon-Hui Wang
Assistant Nematologist
University of Hawai‘i at Mānoa
Department of PEPS
3050 Maile Way #310
Honolulu, HI 96822
(808) 956-2429
koonhui@hawaii.edu

Sunn hemp in flower.

Producers:

Albert de Jetley, Owner, Bennie’s Farm
Lāna‘i, (808) 565-9331

Khamphout Chandara, Owner, Khamphout Farm
O‘ahu, (808) 342-6965

Alec Sou, General Manager, Aloun Farm
O‘ahu, (808) 677-9516

Cooperators:

Co-PI: Cerruti Hooks, Asst. Prof., University of Maryland
Co-PI: Mark Wright, Assoc. Prof, University of Hawai‘i
Inga Zasada, Plant Pathologist, University of Hawai‘i
Ming Li Wang, USDA-ARS
Jari Sugano, Asst. Extension Agent, Kāne‘ohe
Steve Fukuda, County Extension Agent, Wahiawā
Alton S. Arakaki, Asst. Extension Agent, Moloka‘i
Naresh Chand Pradhan, Economist, University of Hawai‘i

Western SARE Grant: $156,105

Situation:

Plant-parasitic nematodes are serious pests of many cropping systems in Hawai‘i and the continental United States. Nematicides are expensive for resource-challenged growers, and several have been banned or are being scrutinized by the EPA because of human health and environmental concerns.

Sunn hemp (*Crotalaria juncea*) is known for its ability to improve soil nutrient status. However, when incorporated into the soil, it releases allelopathic compounds that are toxic to nematode pests. Further, when used in a strip-till cropping system, sunn hemp (SH) residues that remain on the soil as surface mulch can create a habitat favorable for natural enemies of insect pests and provide a physical barrier to weeds.

The main constraint of using non-chemical approaches for nematode management is their short-term effect (usually one cropping cycle) for pest control. However, because of limited land, many small- or intermediate-scale farmers in Hawai‘i tend to grow similar crops continuously in the same fields within the same rows. One goal of the project is to extend the pest-suppressive effect of sunn hemp cover cropping and soil solarization beyond one cropping cycle.

A more sustainable long-term approach is to alternate rows of sunn hemp and vegetables during each planting. Instead of planting the follow-up crop into the same row as the previous crop, the sunn hemp rows that remained during the initial crop planting would be strip-tilled under (green manure), and the second cash crop would be planted into the tilled strips.

Our approach is to use sunn hemp as an interplanted cover crop and green manure, solarization and a combination of sunn hemp with solarization within the same field.

Millipedes, isopods and many other soil arthropods that feed on decaying plant or animal material are commonly found under sunn hemp mulch, contributing indirectly to decomposition and soil nutrient cycling.

Objectives:

1. Evaluate the impact of using sunn hemp as an organic mulch and green manure, solarization and sunn hemp + solarization on nematode, insect and weed pests during two cropping cycles
2. Examine how SH and solarization impact soil health, pests and beneficial organisms
3. Identify compounds in sunn hemp that are toxic to nematodes
4. Determine the lethal dosage of SH residue required to suppress nematodes and whether solar heat can enhance its effectiveness

Planned Activities:

During the project, the ability to enhance the nematode suppressive capacity of sunn hemp in combination with solarization will be evaluated under laboratory, greenhouse and field conditions. To determine how to maximize sunn hemp’s pest-suppressive potential, nematicidal compounds in sunn hemp will be identified in different plant tissues at different stages of its growth.

The proposed cropping strategies, which can be adopted by a wide range of growers, will be tested on commercial farms of different sizes and crop diversities. We will test the most challenging crops listed by the grower participants (eggplant, bittermelon and Italian parsley) as model cropping systems.

Project findings will be publicized through field days and workshops, extension and journal publications, video and website postings

Alternate rows of sunn hemp are strip-tilled and planted with cucumber seedlings. Sunn hemp biomass is clipped and laid down as sunn hemp mulch.

Abundant biomass of sunn hemp is produced two months after planting. Alternate rows of sunn hemp are trimmed and ready to be tilled into the soil.

Soil is covered with clear plastic to perform solarization.

Potential Benefits:

The project will be evaluated by examining its impact on soil health, beneficial and pest organisms above and below the soil surface, nutrient enhancement, crop yields and profits.

Social impacts and direct impacts such as number of persons and acres impacted will also be obtained. Economic analysis will be used to assess the cost-effectiveness of this approach.

We anticipate that this project will increase the confidence that growers need to transition into a sustainable and economically viable production system.

Soil will be monitored for beneficial nematodes such as Mononchus, a predatory nematode that can prey on other nematodes.

Soil will also be monitored for bacteria-feeding nematodes.

A nematode-trapping fungus, *Arthropotrys dactyloides*, forming a constricting ring capturing a root-knot nematode.