Green Approach to Taro Pests

Western SARE

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Situation

Taro (*Colocasia esculenta*) is a tropical root crop grown primarily for its starchy underground stem, or corm. Corms are good sources of carbohydrates with easily digestible starch.

Taro can be grown under flooded or dryland (non-flooded) conditions. Crop losses from root-knot nematode can reach 90%, and those from Pythium sp. or other fungal pathogens can average 24-36%.

It may be possible to increase dryland taro production in Hawai'i by developing and demonstrating a green manure cropping system to control root-knot nematode (*Meloidogyne javanica*) and Pythium. sp.

Research & Education Grant

Title: Cropping Systems to Control Tropical Soil-Borne Pests in Dryland-Grown Taro

Project Number: SW03-003

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Taro grown in weed mat treatment (left) compared to those grown in plots that had 2.5 month-old 'Sordan 79' (right).

Objectives

1. Determine resistance/tolerance of newly introduced taro germplasm against root-knot nematodes
2. Evaluate biomass potential of green manure crops, resistance to root-knot nematodes and Phythium and nematicidal or fungicidal activities of decomposition products
3. Determine the best management practices for green manure crops
4. Assess the impact of green manure crops on soil bacterial, fungal and nematode communities in the field
5. Conduct effective education outreach to disseminate project information to taro growers

Corm and roots of taro cv. Kuye 373 affected severely by *Meloidogyne javanica* in taro germplasm evaluation in the greenhouse.

Results and Discussion

Fifty-five taro (*Colocasia esculenta*) cultivars were evaluated for resistance to the root-knot nematode *Meloidogyne javanica*. All cultivars were hosts, although significant differences in the reproductive success of *M. javanica* were found within the taro germplasm.

Twenty-two green manure species were evaluated in the greenhouse for biomass growth and resistance to *M. javanica* and taro pathogen *Pythium aphanidermatum*. Sorghum x sudangrass hybrids (*Sorghum* × *drummondii* 'Sordan 79' or 'Graze-all MST') appeared to be among the best green manure species, because they were very poor hosts to *M. javanica,* produced copious amounts of biomass, and grew well when inoculated with *M. javanica* and *P. aphanidermatum*.

In a preliminary field trial,

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sunn hemp (*Crotalaria juncea*) was found to be another promising green manure crop, because it fixes nitrogen, has a low-host status for reniform nematodes (*Rotylenchulus reniformis*) and produces good biomass accumulation.

Demonstration of flail mower (left) to cut down green manure crops on island of Moloka'i prior to plowing and tilling (right).

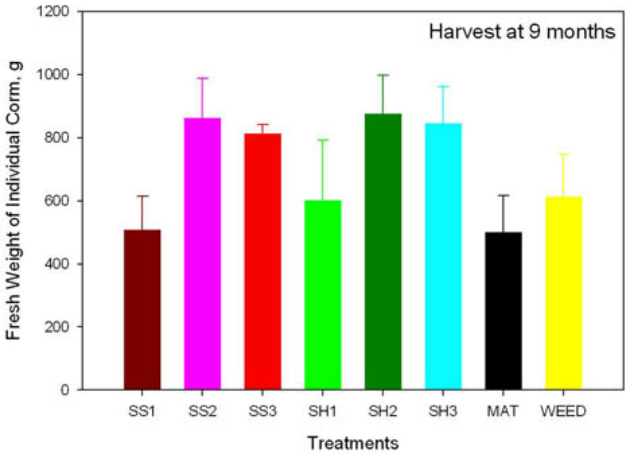
Five field trials were conducted on four islands in Hawai'i to evaluate management practices for green manure crops. Overall, initial populations of root-knot nematodes were low and barely at the level of detection in several field trials, particularly on the islands of Molokai and Maui. No significant differences due to green manure treatments were found for subsequent taro yields in two field trials on Molokai and O'ahu.

In contrast, on Maui, taro grown after nematode-susceptible buckwheat (*Fagopyrum esculentum*) had smaller corms in comparison with taro grown after nematode non-host sunn hemp.

On the island of Hawai'i, when root-knot nematodes were present in the soil at the start of the field trial, growth of green manures for 2.5 or 4 months had a beneficial effect on the individual fresh corm weight of the subsequent crop of taro. This beneficial effect could be due to: a) lower initial numbers of root-knot nematodes; b) lower numbers of reniform nematodes; and/or c) to greater exchangeable potassium (K) in both soil and taro leaves, perhaps caused by slow release of nutrients during decomposition of green manure crops.

Conventional tillage of sorghum x sudangrass hybrid 'Sordan 79' on island of Hawai'i. Delayed tillage of 'Sordan 79' is shown in foreground.

Based on analysis of the soil microbial community, the beneficial effects of green manures probably were not caused by changes in bacterial community diversity or population density.



Fresh weight of individual taro corms as affected by previous treatments of sorghum x sudangrass cv. Sordan 79 (SS) grown for 1, 2.5, and 4 months, sunn hemp (SH) grown for 1, 2.5, and 4 months, weed mat (MAT), and weedy (WEED) control.

Outreach

A Field Day was held on Moloka'i to demonstrate the growth of various green manure crops and management techniques such as flail mowing of green manures and treatment of vegetative propagating materials of taro to minimize spread of nematodes.

A five-minute video showing the highlights of growing green manure crops was produced and is available for viewing at the Sustainable Agriculture Research and Education (SARE) web site of the College of Tropical Agriculture and Human Resources, University of Hawai'i.

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