Survival of Taro: Agronomic and Pathological Research for Sustainable Production

Janice Uchida (Hawai'i – Research & Education Grant)

Project Number: SW99-005

Title: Survival of Taro: Agronomic and Pathological Research for Sustainable Production

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Janice Uchida and James Silva inspect a plot with Charles Reppun of Reppun Farms on Oahu, at right.

Participants:

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Michael Fitzgerald, Fitzgerald Farm, Hanalei, Kauai
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Wayne Tanji, Tanji Farm, Hanalei, Kauai
Charles and Paul Reppun, Reppun Farms, Oahu
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Situation:

Taro growers in Hawai'i have suffered large losses from diseases from known and unknown organisms. Most recently, a corm rot characterized by the formation of cavities – pocket rot – has cut harvests by 30 to 70%.

Taro (Colocasia esculenta) has long been grown in Asia and the Pacific, but little is known about its fertility requirements in aquatic and wetland systems. Studies have been conducted on common taro diseases, like Phytophthora leaf blight and Pythium root rots, but not on most disease pathogens.

Without research into fertility and diseases, the frequent and devastating crops losses in Hawai'i and elsewhere cannot be systematically controlled.

Control plot at harvest.

Objectives:

1. Determine the cause or causes of taro pocket rot and the influence of leaf blight on corm rots and develop control measures for these disease complexes
2. Determine the effect of fallow type and period on disease severity of the following crop
3. Develop nitrogen fertilizer recommendations that maximize growers' economic resources and protect the environment from movement of excess nitrogen
4. Educate growers, discuss results and implement use of research findings

Fallowed plot at harvest.

Water is transferred from paddy to paddy to maximize use.

Actions:

The project team tested the impact of individual fungi and secondary pathogens on taro plants and cultured the new Phytophthora isolated from pocket rots on various media in attempt to detail its characteristics.

Fallow treatments – with no crops and with legumes – were conducted at the Kaala Educational Program in the Waianae Valley and on farmers' fields in Haleiwa and Waihole.

Unexpected difficulties arose in nitrogen tests at the Maui site, so the experiment on nitrogen rates and timing was conducted at an existing experimental site in Haleiwa.

Results:

While several characteristics of the new homothallic Phytophthora species isolated from pocket rots of taro have been described, such as growth in a temperature range, attempts to characterize this undescribed species are continuing.

At the Kaala Educational Center, fallow with sunn hemp had high survival rates of planted taro huli (young plants), but yields were poor, possibly from blood meal added to increase nitrogen. However, the land retained residual nutrients after the original taro crop was harvested, which stimulated the following crop to high yield.

While the Kaala project was beset with several challenges, including weather and changes in on-farm plots, a positive result was the building of trust and partnerships between the Waianae community and the University of Hawai'i.

Leaf analysis of plants treated at varying rates of nitrogen showed no significant differences in yield, suggesting that lower rates may warrant consideration.

Potential Benefits:

Growers have learned that spacing of 24 inches yields nearly the same as 18-inch spacing at a lower cost for plants and labor. Over the last two years of the project, most growers adopted 24-inch spacing.

Growers have also learned that planting young plants with any blemish (small rot) decreases plant survival.

And many have reduced nitrogen use to 350 pounds from 700 pounds per acre, and they are testing soil before planting to determine nutrient status and how it must be corrected.

Presentations by project team members on the causes of pocket rots and related host responses have helped growers understand the pathology and to use this knowledge to create ways to reduce pocket rots. One plan, independently developed by two growers, reduced water levels during periods of heavy blight.

During high leaf blight, leaf reduction impedes photosynthesis. Growers have learned that this translates to less sugar and, therefore, less starch to increase the size of the corm, and that it is reasonable to reduce chemical use during such times.

The project's finding that pocket rots are initiated at the base of the petiole, has helped growers learn to reduce the water level in the field, keeping the base of the petiole drier and reducing infections when the plant is highly susceptible. The change in practice requires more labor, but, having created the plan for themselves, growers are willing to do it.

Members of the project team harvesting at Kaenae, Maui, from left, Chad Koide, Raymond Uchida, Robin Shimabuku, Isaac Kanoa, Robert Paia and Kyle Yoshioka

Project participant Jonathan Deenik assists with planting.