Enhancing Phyto-nutrient Content, Yield and Quality of Vegetables with Compost Tea in the Tropics

Theodore Radovich (Hawai'i – Research & Education Grant)

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Title: Enhancing Phyto-nutrient Content, Yield and Quality of Vegetables with Compost Tea in the Tropics

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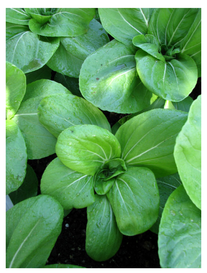
Thermal-produced compost.

Worm-produced compost, also known as vermicompost.



Pak choi, or Chinese cabbage.

Situation:

Compost teas, defined for this project as aerated, aqueous extracts of compost, have been shown to improve crop yield and nutritive quality by:

- Inducing the production of plant defense compounds that have beneficial bioactivity in humans
- Improving mineral nutrient status of plants
- Enhancing beneficial microbial communities in the plant environment

The ability to effectively employ compost teas to full advantage has been limited by poor understanding of interactions among compost type, crop physiology and environmental factors. This project proposes to address these deficiencies by engaging farmers, researchers and industry professionals in a series of on-farm trials and educational activities.

Objectives:

1. Quantify the independent and interactive effects of compost quality and vegetable type under synthetic and organic fertilization on yield and phyto-nutrient content of model root, fruit and leaf vegetables

2. Determine, at the whole-farm level, the effect of compost tea applications on yield, phyto-nutrient content and profitability with commercial vegetable operations on three islands of Hawai'i

3. Build and enhance the capacity of at least 300 growers to effectively employ compost tea to increase vegetable yield and phyto-nutrient content on their farms

Actions:

Objective 1

With numerous variables and unknowns, it is important to conduct studies to answer several questions regarding compost and compost tea quality. These experiments looked at a single crop, pak choi, an Asian cabbage. Having identified optimal compost types and brewing methods, multiple crop types, including root and fruit vegetables in the field, will be assessed.

Actions to date:

1. Composts were screened to identify those with the most potential for high quality compost tea. Dozens of samples of thermal and worm-produced compost have been analyzed for chemical composition, including total nitrogen and carbon, nitrate composition and C:N ratios.

2. Compost tea can be produced in several ways including aerated or passive brewing and brewing with or without various additives to enhance microbial populations. Graduate research assistant Archana Pandey conducted meticulous greenhouse work to determine the potential impact of these factors and their potential interaction with fertilizer type.

Objective 2

Two farmer cooperators are running experiments on their farms concurrently.

1. Sweet corn at Kūpa'a Farm, certified organic and a farm-wide user of compost tea. Treatments are with or without compost tea.

2. Pak choi (Chinese cabbage, *Brassica rapa*) at Adaptations Farm, also organic and a user of compost tea. Treatments will look at the effect of removing tea from the system.

Objective 3

Research results to date will be shared at the annual conference of the Hawaii Organic Farmers Association in November 2008.

Compost tea is applied to pak choi at various stages of growth.

Results:

Objective 1

Vermicompost texture has been identified as being superior to thermal compost for compost tea because of:

- its finer texture
- higher total N content (0.8-1% in thermal vs. 1.5-2% in vermicompost)
- generally lower C:N ratio (often <15 in vermicompost)
- higher levels of plant available nitrogen (ammonium and nitrate)

That means a potential for greater nitrogen contribution to plants using tea brewed from vermicompost. Curing vermicompost (letting it sit) for months after removal from the bins dramatically increases the levels of nitrate in the vermicompost.

All compost teas improved plant growth, and improvement was greater under organic fertilization than synthetic. This may have been because of lower N availability in the organically fertilized.

Phyto-chemical analysis of plant tissue is under way.

Passive brewing (no aeration) without the use of additives enhanced plant growth generally the same as aerated teas with additives. This suggests that costs can be reduced through the use of passive brewing if longer brew times are acceptable (8 days vs. 12-20 hours).

Objective 2 - In progress.

Objective 3 - In progress.

Two-week-old corn at Kūpa'a Farm on Maui.

The corn at one month at Kūpa'a Farm.

Potential Benefits:

The potential benefits are substantial and particularly relevant to tropical island agriculture. Among the benefits are:

- Reduced reliance on off-island inputs
- Employment of natural biological cycles to mitigate year-round pest pressure
- Sound waste management that protects watersheds and reefs
- Improved profits for small- and mid-size farms

The project results will be documented and distributed through several venues:

- A 25-page color resource manual that consolidates information on the making and use of compost tea for the tropical Pacific region
- Extension fact sheets, including economic evaluation of compost teas at the whole-system level
- Online database on compost tea hosted at www.ctahr.hawaii.edu/organic
- Three on-farm workshops
- Refereed journal articles