

Promoting plant growth with Compost Teas

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Tea Time for the Garden

Water based extracts of compost (compost tea) have a relatively long history in agriculture. This is not surprising since they are simple to make by soaking compost in water and agitating by stirring, aeration or other methods. Scientific investigations of claims of the benefits of compost tea are much more recent. Study results have been variable, but there is considerable evidence that compost extracts can improve plant production by decreasing disease incidence, improving plant nutrient status and generally promoting plant growth (Arancon et al., 2007; Hargreaves et al., 2008; Ingham, 2005; Weltzien et al., 1990).

One of the reasons that growers use compost tea is that certain "stuff" in compost can be extracted and applied over a larger area than would be possible by incorporating the same amount of compost in the soil.

In other words, extraction can make a little go a long way. This is valuable because compost can be expensive to transport and apply in large quantity.

These water extractable components include:

- Active microorganisms, primarily bacteria, fungi and some protozoa
- Mineral nutrients
- Organic acids and other microbial by-products

Considerable variability in the efficacy of compost tea to promote plant growth has been reported. This suggests that the reasons for the beneficial effects are complex and depend on many factors, including plant species, compost quality, extraction method, and growing conditions. If the increasing number of growers who choose to use compost tea are to be as productive and profitable as possible, a better understanding of the reasons why (or why not) compost tea promotes plant growth is necessary.

Compost Tea in Hawai'i

Several growers and landscape managers have been early adopters of compost tea in Hawai'i. These growers vary in the types of equipment they use to extract the compost, the ratio of water to compost used and the type of compost they extract.



Figure 1. Early experiments indicated that spraying the plant canopy alone did not significantly affect yield.



In the last 5-10 years there has been a dramatic increase in the interest and use of compost tea, particularly by new growers. There are several assumptions that many growers make when extracting their compost:

1. High biological activity in the compost tea at the time of application is important.
2. Additives such as sugars, seaweed extracts and humic acid improve the biological quality and efficacy of tea.
3. Aeration during the extraction process is necessary to maximize biological activity and tea quality.
4. Vermicompost is the best material for producing compost tea.

The above assumptions have not been systematically tested in Hawai'i until recently. In 2007, the Western region Sustainable Agriculture Research and Education (WSARE) program of the USDA awarded funds to the University of Hawai'i at Mānoa and its industry partners and collaborating growers to help clarify some of the unknowns regarding compost tea (FMI). Early experiments indicated that spraying the plant canopy alone did not significantly affect yield (Figure 1). Subsequent work conducted in the greenhouse and laboratory has demonstrated that:

- Application of tea to the root zone can increase plant yield and root growth significantly using extraction ratios of 10:1 - 100:1 (water:compost) by volume, and the response to extraction ratio is generally linear.
- The compost tea effect on plant growth was found to be closely related to nitrogen status of the plant.
- Nutrient quality (e.g. carotenoids content, Figure 2) of vegetables is closely related to plant growth (Pant et al., 2009).
- Soil biological activity is increased with the use of compost tea (Figure 3).
- Compost quality is strongly correlated with tea quality (Figure 4).
- Multiple regression analysis has shown a positive relationship between plant growth and nitrate, gibberellic acid and humic acid concentrations in compost tea, with nitrate content being most important (Pant et al. unpublished data).

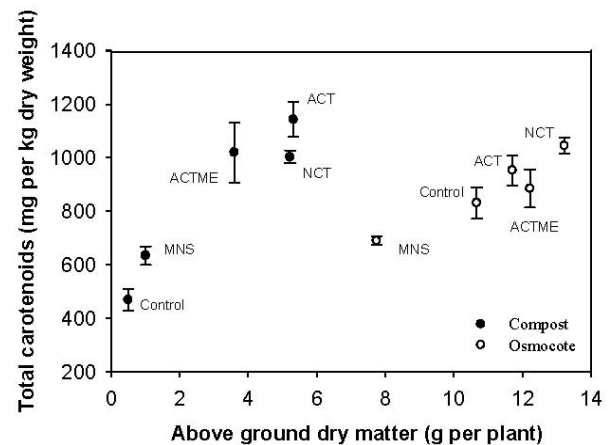


Figure 2. Total carotenoids relative to above ground plant dry weights in all of the growth media (n = 9). ACT = Aerated vermicompost tea, ACTME = Aerated vermicompost tea with microbial enhancer, NCT = Non-aerated vermicompost tea, MNS = Mineral nutrient solution.

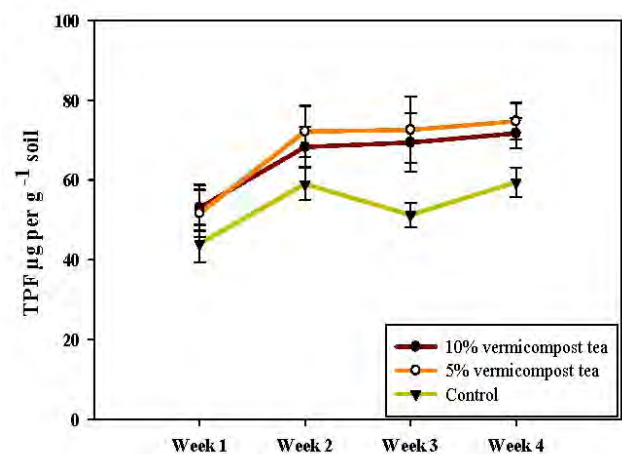


Figure 3. Effect of vermicompost tea on dehydrogenase activity (DHA) in soil across the fertilizer regimes over time. DHA is an indicator of total biological activity. Each point represents the average of 4 replications.

- No significant relationship was found between plant growth and total biological activity in the tea (Pant et al. unpublished data).

The next phase of work is focused on optimizing the cost effectiveness of applying compost tea in field trials. Preliminary trials have demonstrated that grower-produced compost can be used at relatively low rates of compost to produce a tea that can be injected through the drip lines. Although initial yield increases have been modest, this method shows promise to help improve profitability on small farms. [Click here for more information.](#)

Preliminary conclusions and recommendations for compost tea use in Hawai'i:

1. Application to the root zone is preferable to spraying leaf surfaces in order to maximize efficacy and reduce risk of microbial contamination of leafy greens.
2. Short-term compost tea effects are most apparent when plant nutrient, especially nitrogen, availability is low to moderate.
3. Compost quality is the most important factor affecting tea quality and plant growth promotion.
4. Vermicomposts produced in Hawai'i have been determined to be of consistently high quality. Other composts may be used, but should have C:N ratio <20:1 and be relatively high in nitrate (e.g. >600 ppm NO₃⁻) (Hanai'Ai, 2009); Pant et al., unpublished data).
5. Aeration is not necessary for the extraction of compost tea, but can speed up the process. (Pant et al, 2009)
6. Evidence from Hawai'i research suggests that biological activity during the composting process is more important than biological activity in the tea at the time of application (Pant et al., unpublished data).
7. Extraction ratios of 10:1 - 100:1 (water:compost) by volume are recommended.

References

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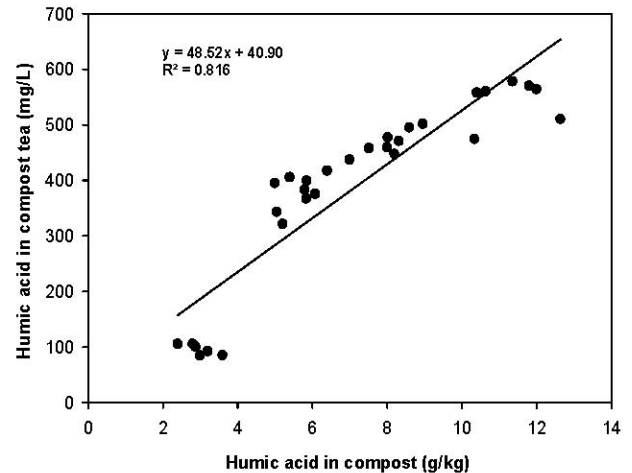


Figure 4. Humic acid concentration in compost tea as affected by humic acid present in compost (n=30).