IMPROVE SEEDLING QUALITY WITH LOCALLY MADE LIQUID NUTRIENT SOLUTION

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INTRODUCTION:

Fertigation can be a successful method to apply plant available nutrient to crops, especially under organic farming. The need for affordable soluble fertilizers derived from local resources is crucial for agricultural sustainability and growers' profitability. Hawai'i vegetable farmers commonly produce vegetable seedlings in celled trays for later transplant into the field as opposed to direct seeding. Planting seedlings can improve crop establishment and yield by reducing early plant loss due to pests, birds, and diseases. They can be produced more uniformly than field-grown plants. Seedling growth can be controlled more easily through fertility and water management and they can be held longer and harvested when needed.

Other potential benefits include earlier harvest, rapid crop turnover, and reduced cost for weed, pest, and disease management. Seedling quality has two main aspects. The first aspect is the genetic quality or the source of the seed. The second aspect of seedling quality is its physical condition at transplanting time. Improving on the genetic quality of seedlings requires a long term strategy of seed selection and plant breeding, while improving the physical quality can be done easily through improving seedling media quality and nutrition. The objective of this study was to evaluate the effect of the liquid organic fertilizer on seedling quality and compare it to synthetic and water only under peat moss media.

Materials & Methods:

A recipe to produce liquid organic fertilizer with high nitrate (NO_3-N) content was developed locally in Hawai'i through a Western Sustainable Agriculture Research & Education (SARE) funded project (SW14-026) and Hawai'i Department of Agriculture (Contract# 64569). The recipe was used to improve the seedling quality of five crops (chili peppers, tomato, kai choy, and papaya). Seeds were planted in 50 cell trays filled with Sunshine potting mix. Each crop was planted in 3 trays (replicates) in a complete randomized design (CRD).

How to prepare the liquid organic fertilizer using tankage and vermicompost:

- Mix 1.5 lbs of tankage with an ounce (1 oz) of vermicompost.
- Add the mix into a bucket with 10 gallon water.
- Using air pump, brew the mix for 12 to 24 hours.
- Strain the aqueous solution and fertigate (fertilizer + irrigation) the seedlings.

The recipe, its field application, and vegetable crop growth and yield responses are described in detail by Ahmad Et al (2016). The liquid organic fertilizer was compared with two controls (liquid synthetic fertilizer and water only). Fertigation treatments were applied weekly, beginning one week after seed germination. Kai choy seedlings were transplanted 4-weeks after germination, chili pepper and tomato seedlings were transplanted 8-weeks after germination, while the papaya seedlings were transplanted 12-weeks after germination.

RESULTS & DISCUSSION:

The liquid organic fertilizer showed highly significant ($P < 0.01$) results for all measured parameters, compared to synthetic and water only. Also, liquid synthetic fertilizer showed significant ($P < 0.05$) results compared to water only treatment. Percent increase in fresh and dry weight for the four crops between liquid organic/liquid synthetic, liquid organic/water only, and liquid synthetic/water treatments varied between 12-49%, 40-79%, and 27-58%, respectively. Improving the quality of seedlings is expected to lead to uniform field growth, earlier harvests, higher yields, and may allow for more harvests from the same field.

A **B**

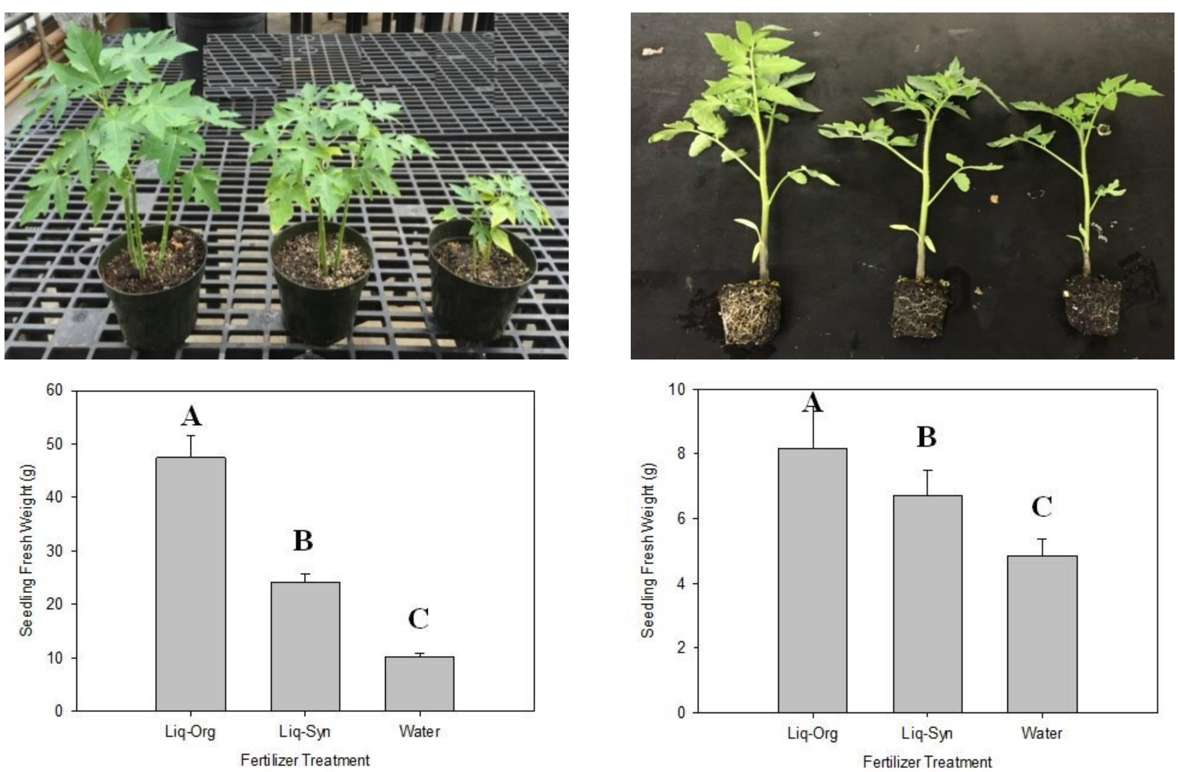

Figure 1: A) Papaya and B) Tomato seedling growth response to the application of liquid organic, liquid synthetic, and water only application under peat moss media, respectively.

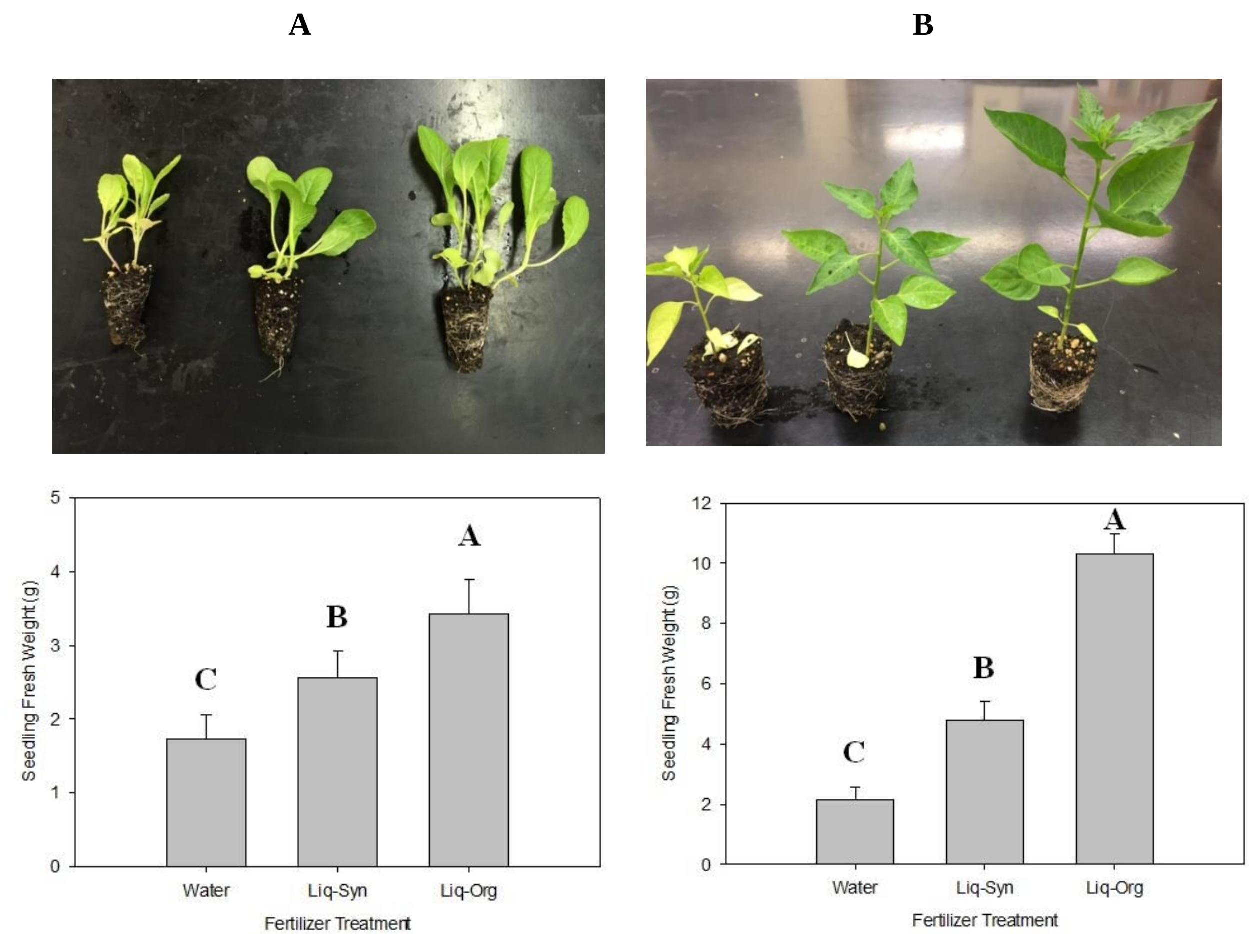

Figure 2: A) Kai Choy and B) Chili Pepper seedling growth response to the application of water, liquid synthetic, and liquid organic application under peat moss media, respectively.

Both liquid organic and synthetic fertilizers were applied at the same total (~ 50 ppm) nitrate (NO_3-N) content, but the results showed a significant response to the liquid organic fertilizer application. The significant response in seedling growth under organic liquid fertilizer compared to the synthetic liquid fertilizer and water treatment might be related to the fact that the liquid organic fertilizer, from the chemical analysis, contains all macro- and micro-nutrients compared to synthetic liquid fertilizer and the liquid organic fertilizer, which contain higher ammonium (NH_4-N) compared to the synthetic liquid fertilizer.

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