Yield and Quality of Aquaponic Pakchoi

Aquaponics in the Classroom
Windward Community College
10/13/12

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Initial work at WCC, 2010-11

• Initial work at WCC focused on using local materials to ameliorate nutrient deficiency symptoms.

• Compost extracts added to the water did not work.

• Addition of small amounts of vermicompost (<0.5g) to seedlings prior to transplanting adequately addressed the problem in cinder beds.

• Larger applications of vermicompost (up to 50% by volume in media) were needed in floating raft systems.
Replacing Oasis with Media

- Oasis only
- Oasis + Vermi
- Vermi + Plug
Impact of seedling media on aquaponic pak choi yield (WCC 2010-11)
Pakchoi variety trials at Waimānalo

- 3 week old seedlings of seven Pakchoi varieties were transplanted 7/26/12 at the Waimānalo Research Station.

- 4 reps, 6 plants per rep with 8 inch spacing between and within rows.

- Effluent from 350 fish in a 650 gallon tank was recirculated through 4'x48' beds with black cinder media.

- Head weights were recorded on 3 plants from each rep 28 days after transplanting. The 4th leaf from the center was collected for mineral and phytonutrients analyses.
Yield

- Yield was greatest in the white stem varieties.

- However there is a strong market for the green stem varieties.

- Yield was not significantly different between varieties within the different types.

- Head sizes of both type were comparable to store bought samples purchased on day of harvest.

- The novelty varieties 'Shiro' and 'Red Choi' are perhaps best suited for the baby greens market.
Average weight (lbs) of pak choi heads harvested 8/22/12, 28 days after transplanting at the Waimanalo aquaponics facility. Each value is a mean of 3 subsamples from 4 replications (N=12). Values with same letter are not significantly different from each other.

<table>
<thead>
<tr>
<th>Variety</th>
<th>Mean (lbs)</th>
<th>Stdev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winwin</td>
<td>0.55a</td>
<td>0.06</td>
</tr>
<tr>
<td>Joichoi</td>
<td>0.49ab</td>
<td>0.11</td>
</tr>
<tr>
<td>Meiqing</td>
<td>0.34b</td>
<td>0.09</td>
</tr>
<tr>
<td>Blacksummer</td>
<td>0.26bc</td>
<td>0.08</td>
</tr>
<tr>
<td>Shiro</td>
<td>0.23bc</td>
<td>0.04</td>
</tr>
<tr>
<td>Bonsai</td>
<td>0.23bc</td>
<td>0.03</td>
</tr>
<tr>
<td>Redchoi</td>
<td>0.16c</td>
<td>0.06</td>
</tr>
</tbody>
</table>
Phytonutrient quality

- There were significant differences in total glucosinolate and phenolic compounds among the varieties.

- These pytonutrients are important antioxidant, anti-carcinogenic and flavor compounds.

- In this trial, ‘WinWin’ and ‘Black Summer’ were the most phytonutrient dense of the white- and green-stem varieties respectively.

- There were no significant difference among the varieties in total carotenoids.
Glucosinolate content

Total Glucosinolates (mmol*kg^{-1} dry weight)

- **Novelty**
  - Shiro Red choi: d
  - Winwin Joicho: a
  - Store bought white: bc

- **White Stem**
  - Winwin Joicho: a
  - Store bought white: bc

- **Green Stem**
  - Meiqing Black summer: cd
  - Store bought green: ab bc cd
Total Phenolic content

<table>
<thead>
<tr>
<th>Total Phenolics (mg/kg dry weight)</th>
<th>Novelty</th>
<th>White Stem</th>
<th>Green Stem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shiro Red Choi</td>
<td>bcd</td>
<td>d</td>
<td>d</td>
</tr>
<tr>
<td>Winwin Joichoi Store bought white</td>
<td>d</td>
<td>d</td>
<td>bc b b</td>
</tr>
<tr>
<td>Meiqing Black summer Bonsai Store bought green</td>
<td>d</td>
<td>b</td>
<td>b</td>
</tr>
</tbody>
</table>

- Shiro Red Choi
- Winwin Joichoi Store bought white
- Meiqing Black summer Bonsai Store bought green
Preliminary conclusions

• Aquaponic pakchoi yield and phytonutrient content are acceptable for commercial production.

• Variety selection is an important, underutilized tool to maximize quality and yield in aquaponic vegetable production.

• Yield and quality should be evaluated throughout the year, because of the influence air temperature and other factors have on quality.

• Aquaponics is an effective tool for STEM skill development.
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