Comparison of nutrient film and deep water production systems for hydroponic lettuce

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Hydroponics is the art of growing plants without soil, but in water enriched with nutrients and oxygen
Many hydroponic techniques exist

1. Nutrient Film Technique

2. Deep water hydroponics

3. Flood & Drain/Floating system sub-irrigation

4. Aeroponics

5. Aquaponics

**Nutrient film technique (NFT)** is a hydroponic technique wherein a very shallow stream of water containing all the dissolved nutrients required for plant growth is re-circulated past the roots of plants in a watertight gully, also known as channels.
Nutrient Film Technique Explained

Fertilizer solution is recycled during production
Channels: 6 to 12 inches apart, plants: 6 to 8 inches apart within a channel

What happened here?
Nutrients are recycled in hydroponic lettuce production. Target is to maintain EC but not fertilizer composition in the solution.

Maintaining target EC may not provide optimal nutrition

- N, P, K and Mn are rapidly taken from the solution while Ca and B are taken very slowly. Other elements have intermediate uptake rates (Bugbee, 2004)
- Elements like Ca, Mg, S and Na can accumulate in the recycled solution. These have high ionic conductivities and can significantly affect EC values
Maintaining target EC may not provide optimal nutrition

<table>
<thead>
<tr>
<th>Treatment</th>
<th>N</th>
<th>P</th>
<th>K</th>
<th>Mg</th>
<th>Ca</th>
<th>S</th>
<th>Na</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daily fresh</td>
<td>3.76 a</td>
<td>0.53 a</td>
<td>4.19 a</td>
<td>0.51 a</td>
<td>1.06 b</td>
<td>0.31 a</td>
<td>0.19 b</td>
</tr>
<tr>
<td>Recycled</td>
<td>2.43 b</td>
<td>0.26 b</td>
<td>2.53 b</td>
<td>0.52 a</td>
<td>1.10 b</td>
<td>0.30 a</td>
<td>0.32 a</td>
</tr>
</tbody>
</table>

Fresh weight under NFT was smaller under recycling conditions
Deep water culture

- Suitable for big size plants
- Better water temperature control
- Maintaining oxygen level in the water is critical

We tested differences between NFT and DWC under similar growth conditions

NFT

DWC
Plants grown under NFT produced lower fresh weight than DWC

Shoot fresh weight:
NFT : 28 g/plant
DWC: 21 g/plant

Plants grown under NFT showed more proportion of roots than DWC

Proportion of root weight to total weight:
NFT : 51%
DWC: 44%
Modified NFT?

Replacing recycled nutrient solution frequently and increasing the volume of nutrient solution supplied to roots can increase lettuce yields under NFT.