Use of sandponics for cost effective sweetpotato seed production: current recommendations.

May 21
2020

Reuben Ssali,
Srini Rajendran,
Phabian Makhoka
Margaret McEwan

C I P – S w e e t G A I N S p r o j e c t
Sandponics

- Sweetpotato production constrained by shortage of quality planting materials in most of sub-Saharan African (SSA).
  - High virus pressure & prolonged droughts

- Adequate pre-basic seed to drive multiplication of quality planting material of new and improved varieties by trained farmer multipliers.
- *in-vivo* production in screen houses, is expensive
  - forest soil
  - labour
  - steam sterilization-diesel/firewood
- Low willingness to pay for planting material

Can we produce low cost high quality planting materials?

Steam sterilization using either diesel or firewood
The sandponic system

- Replace soil with sand
  Sand
  - Locally available
  - Chemically inert
  - Can be sterilized at a reasonable cost with sodium hypochlorite (a common household bleach)
  - Re-usable across seasons

- Sand sterilization
  10% sodium hypochlorite solution
- Rinse to remove the sodium hypochlorite
The sandponic system

Raised tank

Screenhouse

PE or PVC distribution pipes and fittings

Trellising the sweetpotato vines
Optimized the nutrient media for sweetpotato vine multiplication using sandponics

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Optimal application rate (ppm)</th>
<th>Nutrient deficiency symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen</td>
<td>200</td>
<td>Stunted plants, minimal leaf area expansion, reddening of basal leaf edges advancing to younger growing leaves</td>
</tr>
<tr>
<td>Calcium</td>
<td>200</td>
<td>Chlorosis, cupping, curling and distortion of younger growing apical leaves, root rot</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>60</td>
<td>Yellowing of older leaves spreading from discrete interveinal patches</td>
</tr>
<tr>
<td>Sulfur</td>
<td>120</td>
<td>Yellowing of middle growing leaves succeeded with entire yellowing of the whole plant</td>
</tr>
<tr>
<td>Boron</td>
<td>0.3</td>
<td>Chlorosis in the apical leaves spreading to the basal foliage in the later stages of growth. Necrosis in the symptomatic leaves at advanced stage, death of severely affected leaves leading to premature plant senescence</td>
</tr>
</tbody>
</table>
Alternative sources of Nutrient media

- Areas where fertilizers are not readily available
- Pig manure can be a good source of nutrients
Cost effectiveness analysis of using sandponics system

Average value for the cost (KSH) of producing one sweetpotato node in sandponics compared to conventional after 6 harvests (ratoons) for the four sweetpotato genotypes:

- Cost of producing one sweetpotato node with the sandponic system is lower by 0.9 KSH (0.009 USD)
- Cost effectiveness is better for some genotypes
- Higher multiplication rate 21.8% with sandponics

<table>
<thead>
<tr>
<th>Genotype</th>
<th>Sandponics system</th>
<th>Conventional soil substrate method</th>
<th>Difference</th>
<th>p value</th>
<th>Bartlett’s test</th>
<th>Kruskal-Wallis equality-of-populations rank test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irene</td>
<td>2.449</td>
<td>3.141</td>
<td>-0.692</td>
<td>&lt;.0001**</td>
<td>0.845</td>
<td>-</td>
</tr>
<tr>
<td>Kabode</td>
<td>3.949</td>
<td>4.997</td>
<td>-1.048</td>
<td>&lt;.0001**</td>
<td>0.299</td>
<td>-</td>
</tr>
<tr>
<td>Ejumula</td>
<td>3.284</td>
<td>4.465</td>
<td>-1.181</td>
<td>&lt;.0001**</td>
<td>0.020**</td>
<td>0.0001**</td>
</tr>
<tr>
<td>Gweri</td>
<td>4.37</td>
<td>5.049</td>
<td>-0.679</td>
<td>0.0002**</td>
<td>0.175</td>
<td>-</td>
</tr>
<tr>
<td>Overall (all genotypes)</td>
<td>3.513</td>
<td>4.413</td>
<td>-0.9</td>
<td>&lt;.0001**</td>
<td>0.331</td>
<td>&lt;.0001</td>
</tr>
</tbody>
</table>

Exchange rate 1 USD = 100 KSH in the year 2019

* indicates 5% & 1% level significant, respectively.
Manual with a detailed explanation on

- set-up,
- costs of establishment,
- nutrient mix,
- irrigation regimes,
- crop management practices
- harvesting regimes for sweetpotato business enterprises.

https://www.sweetpotatoknowledge.org/?s=sandponics
CIP is a research-for-development organization with a focus on potato, sweetpotato and Andean roots and tubers. It delivers innovative science-based solutions to enhance access to affordable nutritious food, foster inclusive sustainable business and employment growth, and drive the climate resilience of root and tuber agri-food systems. Headquartered in Lima, Peru, CIP has a research presence in more than 20 countries in Africa, Asia and Latin America.

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This work was undertaken as part of the CGIAR Research Program on Roots, Tubers and Bananas (RTB). Funding support for this work was provided by BMGF (through SweetGAINS) and the CGIAR Trust Fund Contributors.