Microtuber Propagation for Seed Potatoes

National Plant Board Meeting 3 August 2016
Overview

• Company Introduction
• Technology Overview
• North America
  – Operations
  – Facility
  – Certification
E Green Global Introduction

• Headquartered in Seoul
• Technology in development for 15 years
• Financed from Singapore, NY, Korea
• Commercial cultivation in China
• Significant footprint and partnerships established in China
• Expanding to North America, SE Asia (Sri Lanka)
E Green Americas Introduction

• Established 2015 to service North American, Europe and export market
• Clean room manufacturing facility in MN
• Business Model – Produce seed in lab, work with seed farmers to grow to field generation (FG) 2. – Sell FG2
• Strategic relationships with small number industry partners, seed farms
TECHNOLOGY OVERVIEW
Themes

• Same or better performance of minitubers, at lower cost
  – Robustness proven by multiple cultivations in Asia
• Enable reduction in generation(s) to get to commercial planting
  – Major benefits to industry
• Varietal independent
• Committed to Americas market – operations commenced
Seed Multiplication System by technology

EGG technology accelerates seed potato production, through its shorter production period, lower cost, and higher productivity.

EGA’s lower cost process enables reduction in growth cycles, bringing operational and monetary benefits to its partners.
EGG MCT Technology at a Glance

- Non-GMO
- Mass production at low cost
- Year round production
- Can be planted directly to soil

Existing seed potato (30g - 60g/unit)

EGG Micro Tuber (0.5 - 1g/unit)

Existing micro tubers (<0.3g/unit)
Planted in greenhouse

Existing micro tubers (≥0.5g/unit)

EGG Micro Tubers
Production Technologies of Virus Free Seed Potato

<table>
<thead>
<tr>
<th>Production Process</th>
<th>Stem Cutting</th>
<th>Hydroponics</th>
<th>Micro Tuber</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apical meristem culture</td>
<td>→ Tissue culture multiplication</td>
<td>→ Growing stems in hydroponics media bed</td>
<td>→ Incubation in dark room</td>
</tr>
<tr>
<td>→ Planting into Greenhouse</td>
<td>→ G0 Harvest 1-2 times a yr</td>
<td>→ G0 Harvest Year round</td>
<td></td>
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</tbody>
</table>

Stem multiplication

G0 production
## Example Results – Atlantic

<table>
<thead>
<tr>
<th>Cultivar &amp; type</th>
<th>Stems</th>
<th>Daughter tubers</th>
<th>Tubers/stem</th>
<th>Avg daughter tuber wt</th>
<th>Largest sized tuber</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlantic MCT 1</td>
<td>1.2 b</td>
<td>10.5 a(^1)</td>
<td>9.4 a</td>
<td>3.8 b</td>
<td>9.1 a</td>
</tr>
<tr>
<td>Atlantic MINI 1</td>
<td>2.2 a</td>
<td>7.7 b</td>
<td>4.5 b</td>
<td>5.0 a</td>
<td>8.4 a</td>
</tr>
</tbody>
</table>

\(^1\) Within columns means followed by the same letter are not significantly different according to Tukey pairwise comparison (P ≤ 0.05).
Production Facility

• 5 MM units
• Cleanroom plant culturing facility (former medical device production facility)
  – Class 100 clean benches, separate ventilation systems / control systems, positive pressure, etc...
• All supportive equipment, functions
  – Plant multiplication,
  – Potato dormancy,
  – Sprouting
• Process is trade secret
Sterility

• Whole facility is controlled
  – Limited access
  – Garment requirements

• Production rooms
  – Sterile controls,
  – separate ventilation systems, HEPA filters,
  – Positive pressure, ...

• Combined RO, DI water purification systems
Virus Testing IAW Requirements

• Onboarding (paperwork)
• Send incoming mother plants for testing
  – Cms, PVA, PVX, PVY, PVM, PVS, PLRV, PotLV, TSWV, Patro, Rs, PMTV, TRV and PSTVd
  – Same for yearly testing of mother plants
• 1% testing requirement for MCTs before shipping
  – Setting long term plan at the direction of MN Dept of Ag
2016

• Planted at 2 sites in MN
  – Seed Farm, University research site
• 4 varieties that were multiplied in our facility
• Certification in place for 2016
• Working collaboratively with MN authorities to set up long-term certification solution
Summary

• Market conditions favorable to technology introduction
• Technology proven in other regions, strong supportive data
• Operations replicate production and farming in other regions, with improvements of North American techniques
• EGA targeting major, positive impact on North American market and beyond
Thank you