The Veggie Vegetable Production System On The ISS: A Tool For Addressing Space Food Production Challenges

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NASA and URS Federal Services, Kennedy Space Center, FL, USA
Veggie on ISS
Crop Selection for VEG-01

- Reliable germination
- Rapid growth
- Attractiveness
- Low native microbial levels
- Palatability / acceptability
- Antioxidants

VEG-01 consisted of two sets of ‘Outredgeous’ lettuce and one set of ‘Profusion’ zinnia pillows
Key Points:

• Demonstrated plant growth in Veggie
• Identified watering challenges
• Samples returned and analyzed for food safety and nutrient content
• Gained approval for crew to grow and consume second crop
See metadata page for streaming video
Key Points:

• Better mitigation of water issues
• Tested produce sanitization
• Produce consumed by the crew
• Sub-samples returned and analyzed for food safety and nutrient content
VEG-01B Harvest (August 2015)

See metadata page for streaming video
Astronaut Comments

• Scott Kelly
  – the logistical complexity of having people live and work in space for long periods
  – the supply chain that is required
  – For Mars, need a space craft that is more self-sustainable with regards to its food supply

• Kjell Lindgren
  – benefit of eating the fresh food
  – contribution that plants have to the ISS ecosystem
  – psychological benefit - it’s really fun to see green growing things in the sterile environment of the ISS
Key Points:

• Flowering and seed formation tested in Veggie
• Long duration growth test
• Identified airflow challenges and issues with excess water
• Tested fungal mitigation techniques
• Demonstration of independent crew gardening
Water Issues / Consequences

Guttation and Leaf Curling

Fungal Development & Abnormal Growth
And they bloomed, and bloomed...
90 DAI: Harvest on February 14, 2016

See metadata page for streaming video
Valentine’s Day Bouquet on the ISS
Key Points:
• Cut-and-come-again repetitive harvesting tested
• ‘Tokyo Bekana’ Chinese cabbage tested
• Varietal response to elevated CO$_2$ identified
VEG-03C Cut-and-Come-Again
VEG-03C Cut-and-Come-Again
VEG-03 - D, E, and F
(September 2017-April 2018)

Key Points:

• Second Veggie unit installed
• Mixed crops growing simultaneously
• Additional new crops tested
• Staggered planting in two veggies for near-continuous harvest cycle
VEG-03 G, H, I - New Crops on Orbit

• Red Russian Kale
• *Dragoon Lettuce
• Wasabi Mustard
• *Extra Dwarf Pak Choy
• Outredgeous lettuce

Three sets will be grown in different combinations

*= Student Selected Crops!
VEG-03H – Wasabi and Pak
Thank you!

- Veggie and VEG teams at KSC and SNC-ORBITEC
- Astronauts Steve Swanson, Rick Mastracchio, Scott Kelly, Kjell Lindgren, Shane Kimbrough, Peggy Whitson, Jack Fischer, Joe Acaba, Scott Tingle, Serena Auñón-Chancellor, Alex Gerst
- Payload Operations and Integration Center
- NASA’s Space Biology Program, ISS Program, Human Research Program