**Background**

- The Veggie system on the International Space Station (ISS) intermittently supplements the crew diet with fresh, leafy green crops.
- For 120 days, Sustained Veggie assessed the potential of continuous on-orbit crop production.
- Crops grown in Veggie have been grown concurrently, but Sustained Veggie staggered plant initiation and harvest to provide more constantly available produce.
- The objective of this preliminary study was to compare two growth schemes to determine the methodology for required inputs, optimal yield, food safety, and crew considerations.

**Materials & Methods**

- 2 Veggie facilities: single-harvest (28 days after initiation; DAI) treatment in one facility vs multiple “cut-and-come-again” harvest (28, 42, 56 DAI) in second facility
- Crops selected from prior or planned Veggie on-orbit studies
- 2 crops grown for first 56 days
  - A: ‘Amara’ mustard
  - B: ‘Red Russian’ kale
- Rotated in 2 other crops for latter experiment half
  - A: ‘Shungiku’ Asian green
  - B: ‘Extra dwarf’ pak choi
- Staggered plant growth for continuous production: 1A/B plant pillows initiated in each facility on 0 DAI, 2A/B initiated 7 DAI, and 3A/B initiated 14 DAI (Figure 1)
- Data collected: plant yield and health metrics, microbial analysis for food safety
- Statistics (i.e. analysis of variance) conducted in R Version 3.5.1

**Results**

- **REQUIRED INPUTS**
  - Single harvest: 24 pillows (including 2 failed pillows)
  - Multiple harvest: 13 pillows (including 1 failed pillow)
- **OPTIMAL YIELD**
  - Average per plant fresh edible biomass higher in multiple-harvest than single harvest for all crops but shungiku (Figure 2), but no harvest by crop interaction (P > 0.05)
- **FOOD SAFETY**
  - Microbial load was more dependent on system age rather than plant age.
  - Aerobic plate counts from ‘Amara’ and ‘Red Russian’ kale samples were lower than ‘Shungiku’ and ‘Extra Dwarf’ pak choi samples across both harvest methods.
- **CREW CONSIDERATIONS**
  - Continuous production schemes aimed for weekly harvests.
  - 1 week without yield in multiple-harvest treatment vs. 5 weeks in single-harvest

**Future Research & Acknowledgements**

- Repeat study for microbiology, and test new crops and other layouts that could potentially reduce shading and plant competition (Figure 3)
- Mitigate plant stress and nutrient deficiencies (Figure 4)
- Develop protocol for crop failures and periodic root mat cleaning (Figure 5)
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