

New Crop Testing Nutritional and Organoleptic Analysis

LaShelle E. Spencer^{1*}, Jess M. Bunchek² and Mathew W. Romeyn³

¹AECOM/LASSO, Kennedy Space Center, FL; ²SURA/LASSO, Kennedy Space Center, FL ³NASA, Kennedy Space Center, FL

*Presenter contact: lashelle.e.spencer@nasa.gov

Background

- Long-duration missions beyond low Earth orbit will encounter challenges in maintaining adequate nutrition and acceptability in the food system
- In situ production of fresh produce can supplement nutrients deficient in the stored diet
- Our goal is to increase the number of crops that meet nutritional requirements and crew acceptability which can be reliably grown in space under narrow band LEDs and elevated CO₂ (~3000 ppm)
- A variety of crop types are necessary to address known nutritional deficits (Vitamin C, Vitamin K, Potassium) in the stored astronaut diet, including leafy greens, which are discussed here



Figure 1



Figure 2

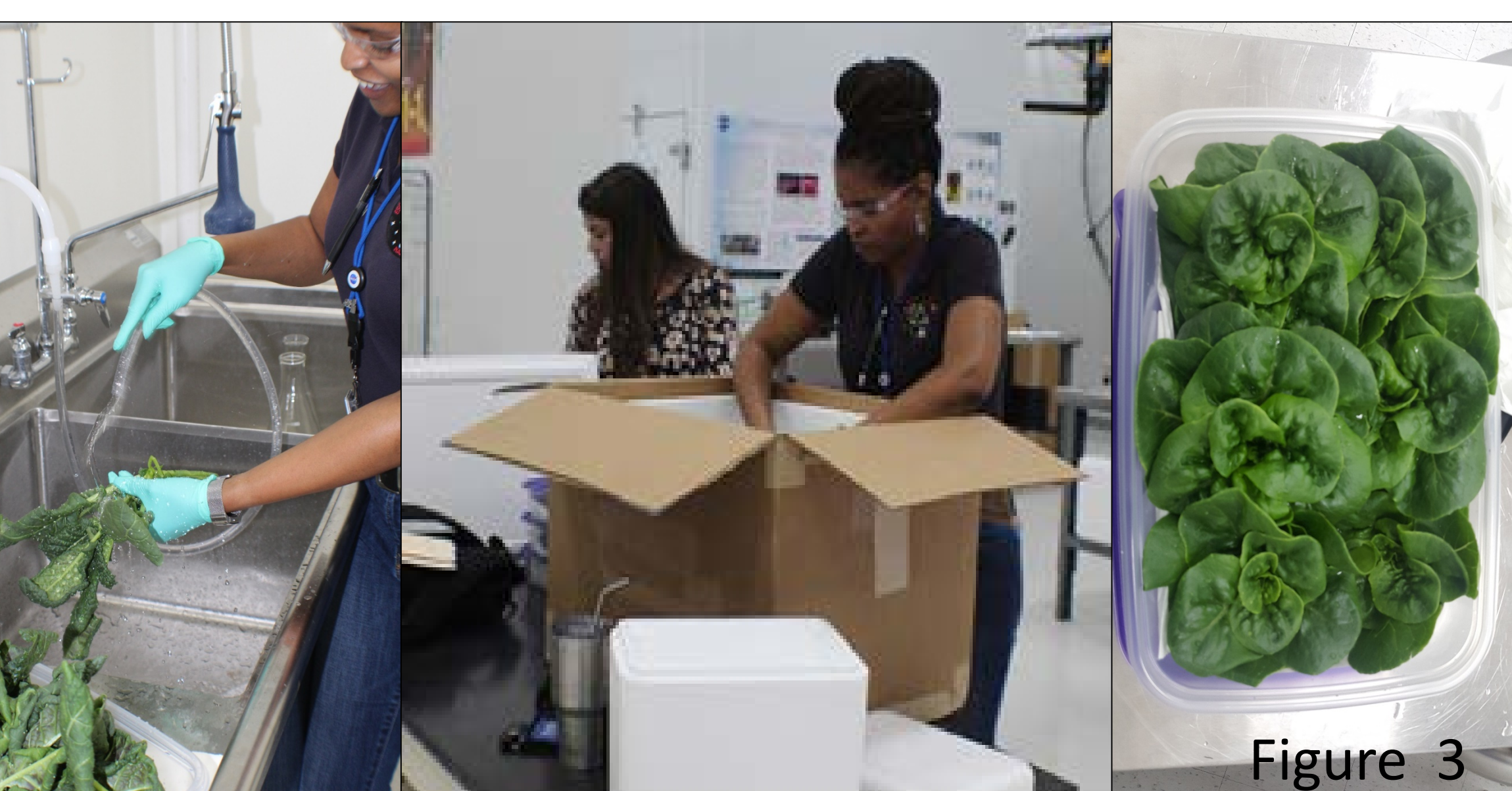


Figure 3

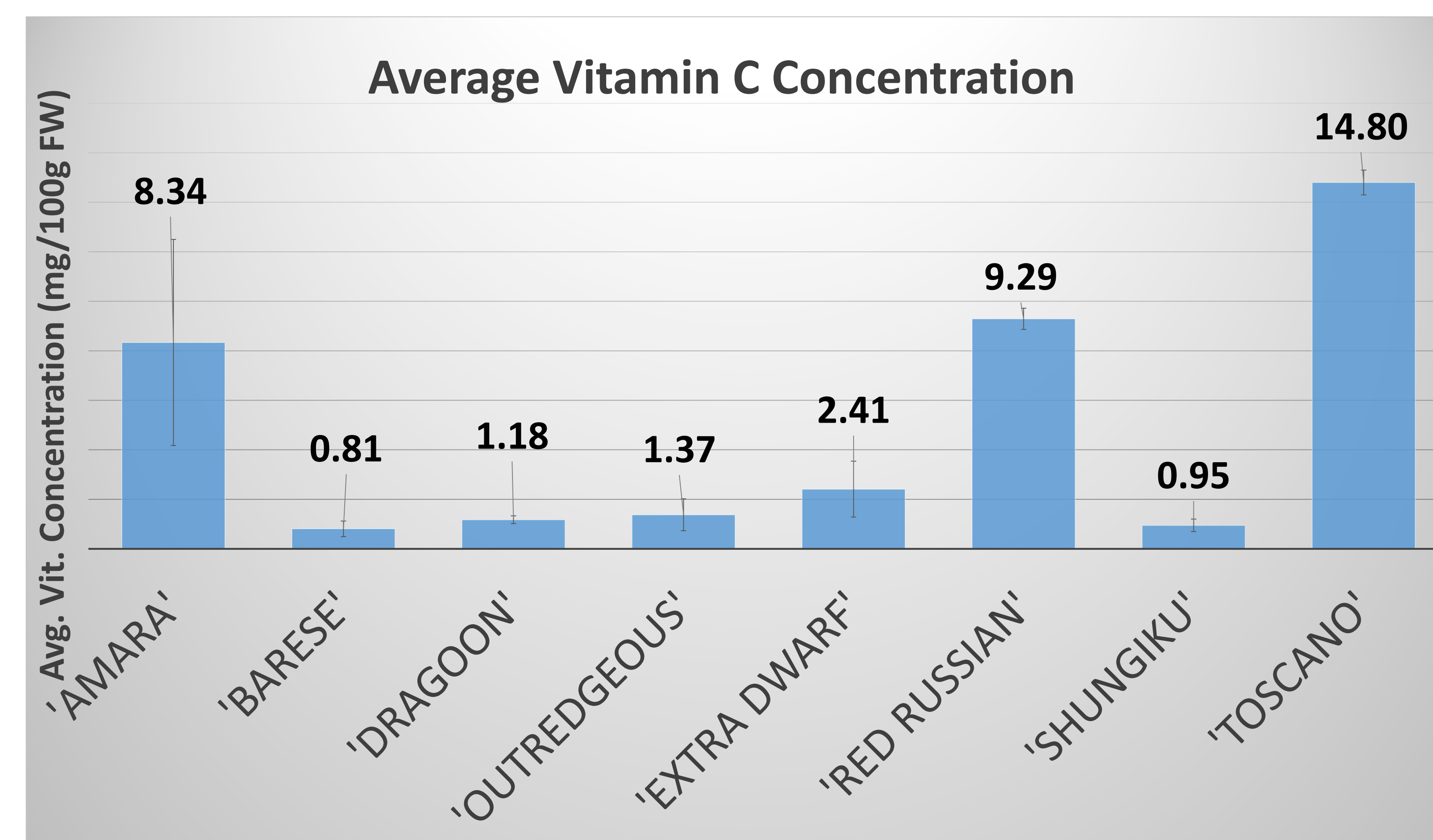
Materials and Methods

- Eight cultivars of leafy greens were tested: 'Toscano' Kale, 'Extra Dwarf' Pac Choi, 'Amara' Mustard, 'Dragoon' lettuce, 'Outredgeous' lettuce, 'Shungiku' Chrysanthemum, 'Red Russian' Kale, and 'Barese' Swiss Chard
- All test plants were grown 4 inch pots containing 70:30 Fafard 2B:Arcillite media, in controlled environmental chambers under the following conditions: 3000 ppm CO₂, 50% Relative Humidity, 23°C, and PPF ~300µmol m⁻² s⁻¹ (Fig. 1)
- Plants were automatically fertigated with 1200µS Peters 13-2-13 and harvested 28 days after planting (Fig. 2)
- Light source: Heliospectra RX30
 - Near UV (385nm) ~5 µmol m⁻² s⁻¹, 50% Red (630 and 660nm), 27% Green (530nm), and 23% Blue (450nm)
- Samples were nutritionally analyzed by outside lab (Eurofins, Des Moines, IA) for proximate analysis, Fe, Mg, P, K, S, Vit. B1, Vit. C and Vit. K1.
- Samples were washed, packaged and shipped to Johnson Space Center Food Laboratory for Organoleptic testing (Fig. 3)

Results

Nutritional

- Of the eight cultivars tested, 'Toscano' Kale tested most nutrient dense containing the highest levels of P, Mg, Ca, Vit. C and calories
- Vit. K1 (1.32-2.03 µg/g FW) and Potassium (0.40-0.77%) content tested similar among all cultivars
- Vitamin C varied the most between crop types



Organoleptic Testing

- All crops passed overall acceptability with a average score of 6 or higher
- 'Dragoon' Lettuce tested the highest with an average score of 7.6

Overall Organoleptic Acceptability		
	Average Score (Scale = 1-9)	Selected Taster Comments
'Amara' Mustard	6.6	Interesting sample. Aftertaste is similar to eating green beans.
'Barese' Swiss Chard	6.2	Fine if you're expecting to eat it raw...though I prefer to eat it cooked.
'Dragoon' Lettuce	7.6	I like this one quite a lot. It's not too bitter,...would go well on a sandwich or maybe [used as a] wrap.
'Outredgeous' Lettuce	6.6	I like the color and texture. There isn't much aroma and flavor, but that's what I expect from lettuce.
'Extra Dwarf' Pak Choi	6.8	Good texture with some crunchiness, flavor is ok with some bitterness/earthiness
'Red Russian' Kale	6.7	I really liked the vivid green color with the purple. It has a strong taste.
'Shungiku'	6.2	Nice parsley-like flavor.
'Toscano' Kale	6.6	Very good texture and appearance. A little bitter.
	All crops passing.	

Acknowledgments: This work was funded by NASA's Human Research Program. Many thanks to KSC's Space Crop Production team, including the legions of interns (Fig. 2) that made this project possible.