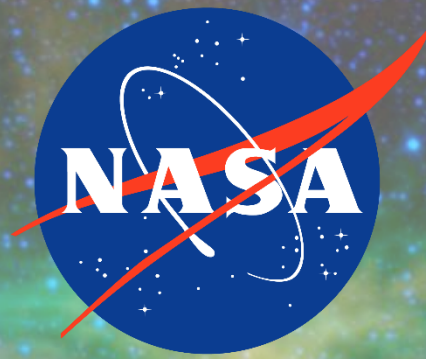


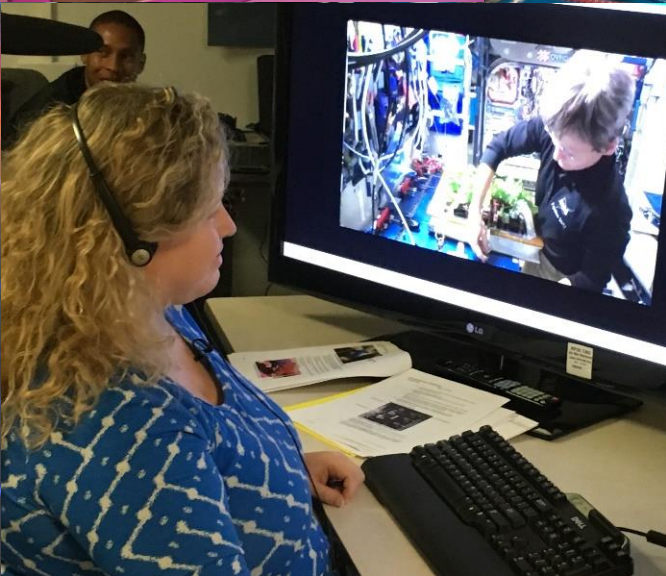
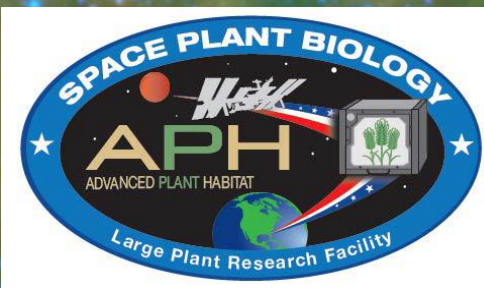


MICROGREENS AS CANDIDATE CROPS FOR SPACEFLIGHT

CHRISTINA M. JOHNSON

Fellow, NASA Postdoctoral Program

NPP Site Visits - 2020



Microgreens



Efficiency of Microgreens

1.6 g
seeds

40cm²

=>
yields

76 g
Edible
Biomass



Nutrition and Microgreens

Table 1: Mean macroelement (Mg, K), microelement (Fe), and carotenoids (β -Carotene, Violaxanthin, and Lutein/Zeaxanthin) concentrations in commercially grown microgreens. Table compiled from Xiao et al., 2012 and Xiao et al., 2016.

	Magnesium (mg/100g FW)	Potassium (mg/100g FW)	Iron (mg/100g FW)	β -carotene (mg/100g FW)	Lutein/ Zeaxanthin (mg/100g FW)	Violaxanthin (mg/100 g FW)
Arugula	41 $\pm$ 1	343 $\pm$ 13	0.71 $\pm$ 0.01	7.5 $\pm$ 0.4	5.4 $\pm$ 0.2	2.6 $\pm$ 0.1
China rose radish	48 $\pm$ 2	270 $\pm$ 7	0.62 $\pm$ 0.03	5.4 $\pm$ 0.5	4.9 $\pm$ 0.4	1.9 $\pm$ 0.1
Daikon radish	60 $\pm$ 3	176 $\pm$ 10	0.57 $\pm$ 0.02	6.1 $\pm$ 0.1	4.5 $\pm$ 0.1	1.7 $\pm$ 0.0
Mizuna	29 $\pm$ 0	354 $\pm$ 7	0.57 $\pm$ 0.02	7.6 $\pm$ 0.4	5.2 $\pm$ 0.3	2.4 $\pm$ 0.1
Peppercress	33 $\pm$ 2	320 $\pm$ 26	0.48 $\pm$ 0.03	11.1 $\pm$ 0.6	7.7 $\pm$ 0.4	3.1 $\pm$ 0.2
Purple kohlrabi	55 $\pm$ 2	342 $\pm$ 7	0.75 $\pm$ 0.03	5.7 $\pm$ 0.2	4.0 $\pm$ 0.1	1.5 $\pm$ 0.0
Red cabbage	39 $\pm$ 0	240 $\pm$ 2	0.62 $\pm$ 0.01	11.5 $\pm$ 1.2	8.6 $\pm$ 1.0	2.9 $\pm$ 0.3
Red mustard	28 $\pm$ 1	289 $\pm$ 5	0.62 $\pm$ 0.07	6.5 $\pm$ 0.4	4.9 $\pm$ 0.3	1.7 $\pm$ 0.1
Wasabi	41 $\pm$ 1	387 $\pm$ 9	0.65 $\pm$ 0.05	8.5 $\pm$ 0.2	6.6 $\pm$ 0.3	2.2 $\pm$ 0.2

Spaceflight-like Conditions

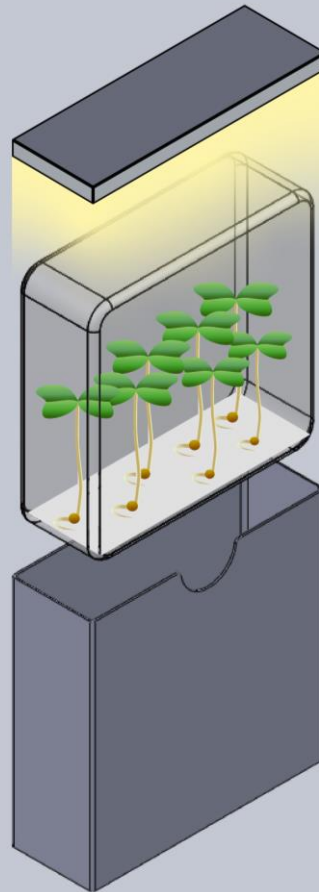


Grown in elevated CO_2



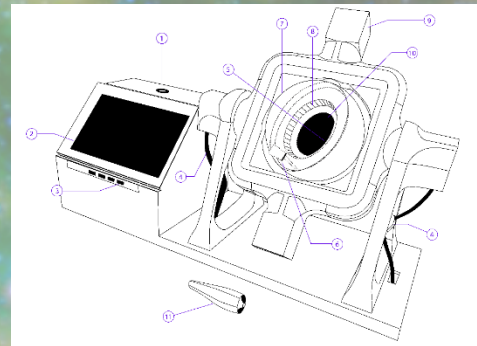
Simulated Microgravity

Grown on a clinostat to simulate microgravity.



Planned Experiments

- Comparing growth morphology of seedlings grown in different microgravity simulation units at the MSSF including 2D clinostat, 3D clinostat, and Random Positioning Machine.



- Further develop hardware to grow microgreens on a clinostat with a growth form that looks more like a crop and less like a research specimen.



Microgreens in the APH?

