Fiscal Year:	FY 2024	**Task Last Updated:**	FY 03/21/2024
PI Name:	Goyer, Aymeric Ph.D.		
Project Title:	Growth, Physiology and Nutrition Dynamics of Potato Plants Grown on Lunar Regolith Simulant Medium		
Division Name:	Space Biology		
Program/Discipline:			
Program/Discipline--Element/Subdiscipline:			
Joint Agency Name:		**TechPort:**	No
Human Research Program Elements:	None		
Human Research Program Risks:	None		
Space Biology Element:	(1) Cell & Molecular Biology (2) Plant Biology		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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Zip Code:	97331-8646	**Congressional District:**	4
Comments:			
Project Type:	Ground	**Solicitation / Funding Source:**	2022 Space Biology NNH22ZDA001N-SBR: E.9 Space Biology Research Studies
Start Date:	04/01/2024	**End Date:**	03/31/2026
No. of Post Docs:	1	**No. of PhD Degrees:**	
No. of PhD Candidates:		**No. of Master' Degrees:**	
No. of Master's Candidates:		**No. of Bachelor's Degrees:**	
No. of Bachelor's Candidates:		**Monitoring Center:**	NASA KSC
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Flight Program:			
Flight Assignment:			
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Jaiswal, Pankaj Ph.D. (Oregon State University)		
Grant/Contract No.:	80NSSC24K0755		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	This project will characterize the responses of potato to exposure to lunar regolith simulants at the growth, developmental, physiological and molecular levels. It is directly relevant to the scope of the E.9 Research Studies program element of Space Biology “for ground-based plant studies (and/or their associated microbes) that will characterize the responses of these organisms to conditions that recapitulate the stressors encountered in space exploration, specifically, exposure to lunar regolith (simulant)”. Potato (Solanum tuberosum L.) is an ideal clonally propagated food crop for space exploration because it provides more calories per land area than many other crops, grows on a wide variety of soil media, and it is nutritious and has a high satiety index. Potato is also a good model organism for plants that produce underground tubers because its genome has been sequenced and many large-scale omic datasets are publicly available. It also has a large untapped genetic diversity that makes it amenable to genetic studies and trait improvement. However, we currently do not know how potato might respond to lunar regolith simulant as a growth substrate, and whether there are potato genotypes that perform better than others on such substrate. It follows that we have no knowledge about the adaptability of potato to grow on lunar regolith simulant and the underlying mechanisms of acclimation. We have no knowledge either of the chemistry of potato tubers produced on lunar regolith simulant and whether these are safe for consumption by space exploration crews. By combining phenotypic, physiological and molecular characterization of a genetically diverse set of potato genotypes, this project will advance our knowledge of how potato responds to lunar regolith simulant and how it regulates and sustains growth and metabolism. The objective of this proposal is to characterize and compare the responses of potato to exposure to Lunar Highlands and Lunar Mare regolith simulants. Specifically, this project will: Aim 1. Characterize and compare the growth, physiology, leaf gene expression and leaf and tuber metabolism of the reference potato genotype ‘Modoc’ grown on Lunar Highlands regolith simulants OPRH4W30 and LHS-1E, Lunar Mare regolith simulants JSC-1A and EJSC-1A, and Earth Quincy Series Soil; Aim 2. Assess the genetic potential of potato to grow on Lunar Highlands and Lunar Mare regolith simulants LHS-1E and EJSC-1A by characterizing the performance of ten potato genotypes. This project will pinpoint potentially impaired physiological/biological processes that hinder the full growth potential of potato and inform on physiological and molecular mechanisms of adaption to growth on lunar regolith simulants.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	The research provides the foundations for growth optimization on lunar regolith for a major food crop, potato that is clonally propagated.
Task Progress:	New Project for FY2024
Bibliography Type:	Description: (Last Updated:)