Effects of Seed Irradiation on “OutREDgeous” Red Romaine Lettuce

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With the renewed goal of manned Lunar explorations and future Mars exploration, continuous fresh food production during long duration deep space missions can be critical. Production of fresh foods would be a nutrient dense addition to the processed food system that would meet astronauts' nutritional requirements and provide potential psychological benefits for crew in the isolation and confinement of deep space. Through the development and implementation of the Vegetable Production System (VEGGIE) on the International Space Station (ISS), NASA is dedicated to investigating techniques that will optimize crop production, crop quality, and production efficiency to sustain astronaut health and nutrition and revolutionize crop production on Earth. One aspect of successfully growing food in space is understanding the effect of radiation on plant seeds; neutron irradiation of seeds has been shown to cause a decrease in seed germination rates, reproduction, and a restraint on growth. In this study, we used direct RNA sequencing and gene expression analysis to determine the effects of seed irradiation on "Outrageous" Red Romaine Lettuce, a Growing Beyond Earth (GBE) cultivar that has been successfully grown and harvested in the VEGGIE system. Additionally noted were the effects of seed irradiation on growth, morphological features, and production of phenolic compounds in this cultivar.

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