To Grow or Not to Grow: Plant It Mars

Annie Strange, April Beal, Kayla Andis, Nick Pine, Barbra Sobhani
Red Rocks Community College, Science Department, Lakewood, Colorado, USA

Abstract

Research shows that plants that undergo more stress have different priorities in growth and produce different fruits than plants that do not undergo stress. These differences have been determined by observing plants growing in different environments. The harsher the environment the more the plant tends to focus on the production of its fruit than the reproduction of the plant overall. Yet this difference of harsh versus ideal environments has yet to be tested on the seed itself undergoing different exposure conditions. High altitude balloon launches can help researchers expose seeds to near space conditions, similar to conditions on Mars, including extremely low temperatures, high levels of UV irradiation and low pressure. The effects of exposure on each seed can be studied by observing the growth and germination process of seed types that don't need pollination.

Simulating Martian Environment Exposure

The technique being used in this study is the comparison between a control seed and a flown seed exposed to all conditions in the stratosphere for multiple plant species. A low-cost, uniquely designed payload provided a platform to expose a variety of seeds during a series of high altitude balloon flights and monitor the environmental exposure conditions. Seeds were placed in mesh panels attached to a spherical frame, with the environmental sensors suspended in the center. Repetition of this technique can better conclude accurate data from each plant type. Using opportunities, such as, the eclipse on August 21st 2017, variables such as change in radiation exposure can also be tested as a contributing factor during exposure. With the many similarities to Mars a control and a flown seed can also be planted in both Earth soil and simulated Martian soil to determine if these seeds could thrive on Mars.

Plant growth experiment

Monitoring subsequent germination, plant height, fruit production and the number of leaves produced provides evidence of the growth process each seed is undergoing and the response to environmental stress. The hypothesis of this experiment is that the seeds will undergo more damage during regular stratospheric conditions than during the event of a solar eclipse, so growth parameters are measured. A secondary hypothesis is that seed germination and plant growth will differ in simulated Martian soil versus Earth soil due to the difference in nutrient density and response to stress. Following each flight, the control and exposed seeds were planted in both soil types, placed in a controlled greenhouse environment, watered, monitored and measured.

Conclusions

From this experiment and its results, it can be determined whether exposure to the Martian environment alters plant life, as well as, what types of plants will be best for fruit production. The trend seen in the first two growth cycles indicates that the seeds exposed to Mars-like conditions germinate and fruit more quickly than the control seeds. Not all species are equally successful; the radishes, beans and carrots are the most hardy. The eclipse launch seeds growth cycle differs from the previous two cycles, indicating the effect of potential exposure differences. The seeds grown in Martian soil focus growth on fruit versus leaf production.

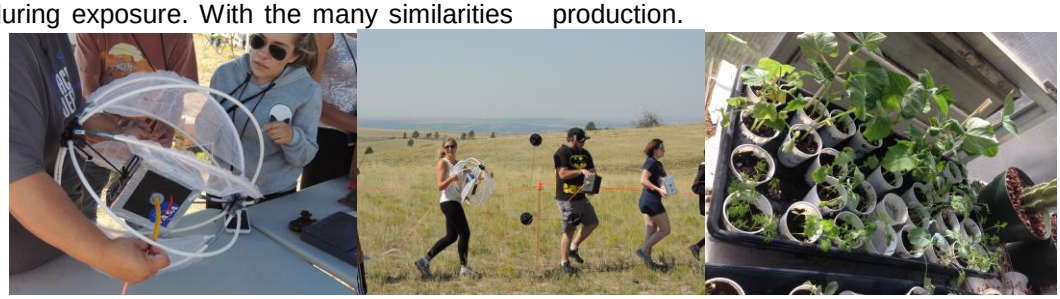

Figure Insert: *Left to right:* Payload flight preparation (April Beal), Payload ready to launch prior to the solar eclipse (Annie Strange), Plants from eclipse launch in Earth soil.