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SPACE NUTRIENTS DEVELOPMENT IN HYPER GRAVITY FOR SPACE TRAVELERS

Abstract

Background: Most of the ongoing scientific theories and physical phenomena to our agricultural growth phases are all related to earth gravity environment. Understanding the effect of simulated hypergravity on seeds is vital, not only to understand the different growth phases, but also to determine whether to advance agriculture by using a centrifuge device on earth or space.

Methods: Moth Bean (Vigna aconitifolia), Black Chana (Cicer arietinum), and Fenugreek (Trigonella foenum-graecum) seeds were tested in a centrifuge reaching +7 Gz simulated hypergravity. The seeds were planted in plastic cups containing soil. Each seed species had a total of 32 cups, with 16 as control. Four experimental protocols were tested. The seeds grew inside with an average temperature of 22 C, humidity of 50%, and illuminance of 600 lux. For 15 days, germination, cotyledon, and foliage of each seed were recorded. The data will be analyzed by two-way ANOVA.

Results: Compared to control, the average germination of Moth Bean was 42.5% higher for the seeds in hypergravity for 24 hours protocol and also 25.5% higher for seeds in hypergravity for 4 days protocol. After 14 days, the Moth Bean experimental groups had a higher production of cotyledon than the control. Black Chana seeds had the highest germination with the control group and the seeds in hypergravity for the 8 hours protocol. Cotyledon production of Black Chana seeds was 11.5% higher for those under hypergravity for 8 hours. Whereas, the seeds under hypergravity intermittently had 49.4% less cotyledon production than the control. Black Chana foliage stage was highest for the control group. Fenugreek seeds had the highest germination in the control group and the seeds in hypergravity 4 days intermittently. However, cotyledon production was highest with the seeds in hypergravity for 24 hours and the seeds in hypergravity 4 days intermittently.

Conclusion: There are variations in seed germination and growth responses to hypergravity simulation. These variations must be analyzed statistically. The result suggest the need for further research in this area, including gene expression on plants under hypergravity simulation to understand effects of altered gravity on plants at molecular level.