Effects of Near-Space Environmental Conditions on Vigna Radiata Seeds

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Introduction

One of the many challenges facing manned missions to other planets is ensuring adequate and reproducible nutrition. Food must be resistant to extreme conditions such as radiation and very low temperatures. Research shows that seeds exposed to radiation tend to exhibit lower germination and growth rates.

In this project, we tested the effects of a near-space environment on Vigna radiata (mung bean) seeds, which were chosen for their resilience, rapid germination, and nutritional value. Seeds were divided into control and experimental groups and launched into the upper stratosphere on a weather balloon, and the seeds were exposed to X-ray, infrared, and ultraviolet radiation. The balloon was equipped with sensors to collect radiation, methane, temperature, and pressure data. Seeds were then grown and analyzed to determine any effects on germination, growth, and development.

Conclusion

Internal pressure seeds began sprouting mid-flight, showing that atmospheric radiation does not immediately affect growth negatively. Exposure to environmental and atmospheric conditions drastically decreased post-flight growth.

Internal seeds grew, on average, only 21.3% of the length of control seeds. Additionally, the flight seeds grew almost 7 times more slowly than the control seeds.

Dry seeds are significantly more robust than presoaked seeds when exposed to various stratospheric conditions. Exposure to radiation, methane, temperature, and pressure causes adverse effects in seed germination and growth.

Future Research

We hope that other teams may be able to use our findings as a foundation to further advance knowledge regarding the effects of radiation on seeds. Future projects may incorporate:

- Other forms of radiation measurement
- Different varieties of seeds or seedlings
- Testing the impact of isolated variables
- Studying the impact on nutritional value of seeds

References


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