CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

Brian S. Elder

Project Number

33132

Project Title

The Effects of Hypergravity on the Germination and Development of Brassica rapa

Abstract

Objectives/Goals

The purpose of this experiment was to observe the effects hypergravity has on the germination, growth, and development of Brassica rapa. My hypothesis was that hypergravity has an adverse effect on plant development, and will slow the development of Brassica rapa.

Methods/Materials

In order to simulate a hypergravity environment, a centrifuge was built out of various materials, and the plants were attached to several locations on the centrifuge wheel. Plant group A was placed at a 10 inch radius, in three locations, simulating a hypergravity environment equal to 400% of Earth#s gravity. Plant group B was placed at a 5 inch radius, in three locations, simulating a hypergravity environment equal to 200% of Earth#s gravity. The hypergravity in each location was achieved by spinning the centrifuge at a rate of 180 RPM. Plant group C was designated the control group, and experienced normal conditions. Soil was kept damp and the lights were kept on.

Results

After 10 days, plants were taken out of the centrifuge, and measurements were taken. The plants in the hypergravity environments, groups A and B, experienced adverse effects from the hypergravity environment. Compared to the control, Group A had 68% germinated seeds, 21% height, 53% length, and 50% of the developed leaves. Compared to the control, Group B had 100% germinated seeds, 75% height, 84% length, and 50% of the developed leaves. Compared to Group B, Group A had 68% germinated seeds, 28% height, 63% length, and 100% of the developed leaves.

Conclusions/Discussion

All plants must overcome the effects of terrestrial gravity when they grow. NASA has experimented with growing plants in microgravity and hypergravity conditions. The findings from such experiments could lead to some important information on how plant species would react to being grown in an environment with a different gravity than Earth#s. In conclusion, hypergravity stunts the growth and development of Brassica rapa, and presumably, other plant species as well. The seed germination, height and length of stems and leaf development were all effected by hypergravity, but some more than others. The variable least affected was seed germination, and the variable most affected was the height of the stems. Overall growth wasn#t as affected by hypergravity than vertical growth. Trends in the data further indicate that there is a correlation between hypergravity and slowed plant development.

Summary Statement

The central focus was to measure the effect hypergravity has on the germination, stem growth, and leaf development of Brassica rapa.

Help Received

Mr. Snow suggested that I use Brassica rapa; My father supervised construction of the centrifuge; Dr. Smith helped me brainstorm a solution to a problem with the belt.

Preliminary