CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Monique C. Iuster

Project Number
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Project Title
Befuddled Bean Seeds: The Effects of Gravity and Centrifugal Forces on the Gravitropism and Growth of Bean Seeds

Abstract

Objectives/Goals
The objective of this experiment is to demonstrate and show the effects of centrifugal force and gravitational pull on the rate and the angle of root growth in relation to the vertical.

Methods/Materials
20 seeds were sandwiched between glass slides with moist cotton and rubber bands holding them in. All seeds were placed with the same orientation onto the slides. 2 wheels were constructed, 1 spinning horizontally and one spinning vertically. Also 1 horizontal and vertical stationary controls were used. 5 slide sandwiches were attached each to the spinning wheels and the controls. The two spinning wheels were spun using small electrical motors and a dc regulated power supply at 3 rpm. All of the seeds grew for five days in a completely dark room, then were taken off the apparatus and traced with a sharpie. The slides were put on polar graph paper, photo copied, the line of best fit was drawn and the angle from the vertical was measured. The seeds were taken out of the slides and the root length was measured with a ruler. The experiment was repeated twice.

Results
The seeds spinning in a vertical plane grew longer and deviated more then the seeds spinning in a horizontal plane or either the vertical or the horizontal stationary controls. The length difference was about 30% while the deviation difference was about 90 degrees.

Conclusions/Discussion
My conclusion is that by spinning seeds and rotating the axis in which they grow, makes their roots grow longer. This is because seeds have a sensor in their root cap that helps them sense the direction of gravity. By constantly changing the orientation of the root cap, it senses the direction of the gravitational pull constantly changing and that gets the sensor disoriented.

Summary Statement
My project determined that by spinning sprouting bush bean seeds in a vertical plane increased the average length of the root in relation to stationary grown beans due to the effects of simulated lack of gravitational force.

Help Received
My dad helped me construct the turntables, my mom bought all the components, Professor Bill Purves helped me understand the principles of how seeds react to centrifugal force and simulated weightlessness.