CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Shadman M. Chowdhury

Project Number
S1704

Project Title
An Innovative Method of Measuring Respiration in Germinating Seeds

Abstract

Objectives/Goals
The goal of this experiment was to test a simple innovative method that measures the respiration rate in seeds.

Methods/Materials
Four kinds of germinating seeds were used to measure respiration rates: Cucumber seeds, Pea seeds, Pumpkin seeds, and Squash seeds. All four seeds were chosen because they all have fast germination rates. A dormant version of each seed was used as the control. Two seeds of each kind were placed into a pipette containing a cotton ball with 1% NaOH solution. The pipettes were placed over petri dishes filled with water. When the germinating seeds respire, they produce carbon dioxide. Carbon dioxide is trapped with NaOH resulting in water moving up the pipette. The movement of water up the pipette was recorded in centimeters, giving an idea of the amount of respiration going on amongst the seeds. Using the method described above ten pipettes containing germinating seeds and ten pipettes containing the control dormant seeds were set up for each seed type tested. Therefore, for each seed type tested 80 pipettes (forty of which served as the control) were used. The experiment was then repeated twice, resulting in experimental data from a total of two hundred and forty pipettes (one hundred twenty of those serving as the control). This data was then compared to the data obtained using Carbon Dioxide Probes.

Results
At the end of a 12-hour period the average rise of water in the pipettes in the experimental group containing the germinating seeds were Pumpkin (3.2 cm), Pea (2.9 cm), Squash (2.6 cm), and Cucumber (2.2 cm). This data was significantly different compared to the control groups of dormant seeds of each kind (0.5 cm). Using the Carbon Dioxide probe resulted in similar results. Germinating Pumpkin seeds produced the highest amount of carbon dioxide (1912 ppm), followed by Pea seed (1586 ppm), Squash seeds (1219 ppm) and Cucumber seeds (863 ppm) respectively.

Conclusions/Discussion
The results show that this simple innovative method can be used to measure the respiration rate in seeds. The results of this method was further supported by the data using the carbon dioxide probes. Germinating seeds have an increased respiration rate when compared to the dormant seeds. This inexpensive and innovative method could be very useful for agriculturalists. It would help them to determine whether a seed is dormant or dead without the use of expensive equipment.

Summary Statement
This project was about testing a simple innovative method that measures respiration in seeds, and backing up the method by measuring the respiration of the seeds by using carbon dioxide probes to see if both types of results were similar.

Help Received
Mother bought seeds. Father took pictures of me during various stages of my experiment. Dr. Pal supplied pipettes and 1% Sodium Hydroxide.