CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
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Project Number
S1713

Project Title
The Adaptive Significance of Insectivory in the Venus Flytrap (Dionaea muscipula)

Abstract

Objectives/Goals
Insectivory in plants has been thought to be an adaptation for obtaining nutrients in the nutrient-poor environments where insectivorous plants typically occur. There have been few tests of this hypothesis, and none for the Venus flytrap, which has the most complex trapping mechanisms of any insectivorous species. My objective was to determine whether insect trapping in the Venus flytrap (Dionaea muscipula), leads to increased fitness, as measured through greater growth, nutrition,and reproduction.

Methods/Materials
Five of ten Venus flytraps were randomly chosen for feeding. These plants were fed two cricket each week. Every month, the plants' trap length and petiole width were measured. When the plants flowered, the height and number of inflorescences and the number of flowers per inflorescence were measured. At the end of the experiment, samples from each plant and the cricket were analyzed by an isotope ratio mass spectrometer for delta carbon-13 values and delta nitrogen-15 values, the percent N and percent C, and the C:N ratio. The delta carbon-13 and delta nitrogen-15 values were used to calculate the percent of nitrogen and carbon (by weight) that came from the crickets.

Results
Plants that were fed had larger traps and wider petioles, more flowers per inflorescence, higher percent nitrogen and percent carbon by weight, and a lower C:N ratio. Based on the stable isotope measurements, sixty-seven percent of the nitrogen and seven percent of the carbon in the plants that were fed came from the crickets. In the first flowering cycle after feeding, plants that were fed did not have significantly more inflorescences or significantly taller inflorescences, but they did have more flowers per inflorescence. In the second flowering cycle, a year after termination of feeding, fed plants had significantly more inflorescences than the control group.

Conclusions/Discussion
My conclusion is that Venus flytraps benefit in growth and reproduction from supplemental feeding. These results suggest that insectivory evolved as an adaptation for obtaining nutrients in nutrient-poor environments.

Summary Statement
The potential adaptive significance of insectivory in the Venus flytrap was investigated by comparing fitness in plants that were supplementally fed insects to an unfed control group.

Help Received
My father helped with the statistical functions in Excel, and my mother showed me how to use Sigmaplot and Google Scholar. Dr. Diane Pataki at the University of California at Irvine ran the samples for the stable isotope analysis on her isotope ratio mass spectrometer.