CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

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Project Number

S1717

Project Title

The Effect of Cardiac Glycosides on the Heart Rate of Daphnia

Abstract

Objectives/Goals

The objective of this project is to determine whether oleandrin and neriin, the two cardiac glycosides in nerium oleander, can be as effective as digitoxin, the cardiac glycoside in digitalis purpurea, in the treatment of CHF (Congestive Heart Failure) by comparing the effects of the two toxic plants on the heart rate of daphnia. If they are as effective then the heart rate of the daphnia should slow down steadily for when exposed to both plants.

Methods/Materials

The materials used are: Foxglove (Digitalis Purpurea), Oleander (Nerium Oleander), Daphnia (35), Microscopes, Petri dishes, Water, Beakers, Grinders, Pipettes, Nets, and Scissors. Each of the daphnia were observed for 3 minutes under the microscope under 7 conditions (Plain Water, Foxglove Leaf, Foxglove Stem, Foxglove Root, Oleander Leaf, Oleander Stem, Oleander Root). Data was collected at 1-minute increments, and consequently, analyzed.

Results

Arrhythmia was observed in the Oleander Stem group. One daphnia in the Oleander root group died immediately. Only the Oleander Stem group had a significant p-value of .03 when compared with the control group. The rest of the groups had non-significant p-values > 0.06. The Foxglove groups showed a steady decrease in heart rate. This trend does not mean much without significant p-values. With significant p-values, this would mean that Oleander causes irregular heartbeats, whereas Foxglove causes a steady decrease in heart rate.

Conclusions/Discussion

We do not have sufficient evidence to support our hypothesis that oleandrin, neriin, and digitoxin reduce heart rate steadily. It remains inconclusive without significant p-values whether or not any of these toxins are eligible to treat CHF. This data suggests that we repeat the experiment with improvements. These include: larger sample size, buffer period before observation, longer observation period, video evidence of daphnia's heartbeats for accurate counting, and isolated toxins for treatment instead of ground plants.

Summary Statement

This project is about whether cardiac glycosides other than digitoxin can be used to effectively treat CHF (Congestive Heart Failure).

Help Received

No help received.