CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

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Project Number

36518

Project Title

Effects of Glyphosate Toxicity on Caenorhabditis elegans with the Application of the Matrix Projection Model

Abstract

Objectives/Goals

In 2015, WHO (World Health Organization) classified glyphosate as a "probable human carcinogen." The possible increased risk and common use of glyphosate are a global concern. In this study, an experiment was designed to measure the toxicity of glyphosate and its surfactant, polyethoxylated tallow amine (POEA), in a commercial product called Roundup on Caenorhabditis elegans by calculating the survival rate and frequency of basic body movements per minute. The Matrix Projection Model was used to predict whether a population will increase or decline.

Methods/Materials

Continuous Exposure: C. elegans share 60% of their DNA with humans. A control was created along with four groups: 6 ppm, 40 ppm, 100 ppm, and 200 ppm. A C. elegans' life cycle consists of six stages (Larvae 1-4, young adult, mature adult). To measure the survival rate, the number of dead or unresponsive C. elegans was recorded after each stage. Acute Shock: C. elegans were exposed to 0, 0.01, and 0.001% glyphosate concentrations for 30 mins, washed with M9, and then placed in a microfluidic to be observed and videotaped. Endpoints of head thrashing, body bend, and Omega/U-turn were chosen to evaluate the locomotive behavioral deficiencies.

Results

The survival rate decreased as the concentration of glyphosate increased. According to the matrix projection model, the lambda is greater than one for the control, 6 ppm, 40 ppm, and the 100 ppm groups, and less than one for the 200 ppm group. The 200 ppm group becomes extinct by 55 hours. The populations that are 100 ppm and less will increase over 200 hours. Behavioral Analysis: at 0.01% glyphosate concentration, the frequency of basic movements per minute was about 50% less than the control and the 0.001% concentration.

Conclusions/Discussion

This study increases our understanding of glyphosate's toxicity on C. elegans. Glyphosate may have a neurodegenerative effect on C. elegans. The matrix model shows that the greater the glyphosate concentration, the slower the population will increase. Since increasing the concentration of glyphosate decreases the survival rate and number of basic movements of C. elegans, the findings supports the statement from WHO that glyphosate may be toxic to humans.

*To understand more about glyphosate#s effect, experiments studying lifespan and chemotaxis behavior will be incorporated into this project by May 19, 2016.

Summary Statement

Studied the effects of glyphosate and POEA on the survival rate and behavior of C. elegans using the Matrix Projection Model.

Help Received

This work was financially supported by my parents and was done in their hobby plant tissue culture lab.