CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Samuel Z. Lang

Project Number
35492

Project Title
Camelia sinensis Extracts: Potent Alternative Snail/Slug Repellents

Abstract

Objectives/Goals
This is my 6th year of ongoing annelid and mollusc science experiments. I previously discovered that high concentrated tea waste leave (TWL) is a potent toxin to worms/snails/slugs; TWL is more effective than conventional metaldehyde/carbamate baits and metallic copper. I have been developing repellent trays for local application of TWL as an environmentally friendly repellent. This project involves: 1) A final comparison of TWL with coffee afterbrew, beer, Diatomacous Earth, (DE), NaCl to find the most effective repellent; 2) Identification of the most effective dilution of TWL for practical economic application: 3) A systematic breakdown of possible toxic molecules / colligative properties of tea, including pH, caffeine, saponins, and possibly tannins.

Methods/Materials
Part 1: Repellent Tray is used for island effect tests - inverted pest-plant-barrier scenario with pests in a safe haven encircled by repellent zone (filled with a thin layer of tested substance), surrounded by seedlings.
Part 2: Prepare various dilution of TWL, then test pests in direct contact(dc).
Part 3: Analogous concentrations prepared with water, diluted, and tested in dc. Repellent efficacy evaluated by pest mortality, escape rate, and damaged plant ratio.

Results
TWL had most mortalities, nearly no escapes or plant damage. While NaCl caused rapid dehydration, some pests escaped and damaged plants, and some salt-damaged pests were revived in water. Although fresh beer caused some deaths, it lost potency as it became stale, allowing pests to ecape beer easily. Both coffee and DE have mild repellent effect. Pests could escape coffee with ease, but struggled while passing DE.
Part 2: as TWL dilution increased, pest escape rate increased.
Part 3: testing thus far has found no correlation between pH and lethality. Analogue solutions w/high concentrations of caffeine caused paralysis, vastly different from TWL reaction. Saponin analogue solutions display similar effects to those observed with TWL.

Conclusions/Discussion
1) TWL (red & green) were the most effective tested molluscicides, with higher mortality and lower escape/plant damage rates than any other substance tested.
2) The most effective dilution of TWL seems to be the 1/2 high concentrated TWL, to avoid escape.
3) Both pH and caffeine lack correlation with TWL lethality.

Summary Statement
This project compares the Camelia sinensis extract to other alternative repellents/molluscicides, evaluates possible active ingredients, and determines the lowest effective dilution.

Help Received
Advice from Professor Yan Xu of CSU Ohio, used some lab equipment under supervision of Dr. Sandusky in CSUB Chemistry department, parents aided in purchasing some equipment for home testing and providing moral support.