



**CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY**

Name(s) Samuel Z. Lang	Project Number S2109
Project Title Camelia sinensis/ Tea Waste Liquid: Potent Alternative Snail/Slug Repellents	
Objectives/Goals This is my 6th year of ongoing annelid and mollusc science experiments. I previously discovered that high concentrated tea waste liquid (TWL) is a potent toxin to worms/snails/slugs; 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 current project involves: 1) A final comparison of high concentrated TWL (HC-TWL) with coffee afterbrew, beer, Diatomaceous Earth (DE), NaCl to find the most effective repellent; 2) Identification of the most effective dilution of HC-TWL for practical economic application: 3) investigating how tea kills. A systematic breakdown of possible toxic molecules / colligative properties of tea, including pH, caffeine, saponins, and possibly tannins, investigating the morphology changes among healthy vs. freshly deceased pests in TLW/ saponin, at gross and histological levels.	
Abstract	
Methods/Materials 1) Use both island effect and direct contact methods, each test runs for 8 hours. Repellent Tray is used for an inverted pest-plant-barrier scenario. 2) Prepare various dilutions of HC-TWL, test pests in direct contact. 3) Analogous concentrations prepared with water, diluted, and tested in direct contact. Repellent efficacy evaluated by pest mortality, escape rate, and damaged plant ratio.	
Results 1) HC-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 death, it lost potency as it became stale, allowing pests to escape beer easily. Both coffee and DE have mild repellent effect. Pests could escape coffee with ease, but struggled while passing DE. 2) as HC-TWL dilution increased, pest escape rate increased. 3) testing thus far has found no correlation between pH and lethality. Saturated caffeine analogue solution caused paralysis, vastly different from pests' reaction to TWL. Saponin analogue solutions displayed similar effects to those shown in TWL.	
Conclusions/Discussion 1) HC-TWL (red & green) were the most effective molluscicides among all tested repellents. 2) The most effective dilution of TWL seems to be the 1/2 strength HC-TWL, to minimize escape. 3) Both pH and caffeine lack correlation with TWL toxicity.	
Summary Statement This project confirmed that high concentrated Tea Waste Liquid is the most potent snail / slug repellent among all commercial baits / copper tape and other household materials tested; it also identified the most effective dilution of TWL and investigated how tea kills (finding the primary active toxic ingredient in	
Help Received Professor Yan Xu at CSU Ohio provides professional critique and advice; Dr. Sandusky provides supervision for using some lab equipment in the CSUB Chemistry Department; Pathologist Dr Adam Lang provides supervision for morphology study; parents aid in purchasing some equipment and material	