



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) Anshul Narain	Project Number S2210
Project Title Investigating Pesticides' Effects on Plant Defenses and Development	
Abstract Objectives/Goals To determine whether pesticides have an impact on a plant's ability to express physical and chemical defenses. Methods/Materials Chemical and physical defenses were induced in the Brassica rapa plant through application of; 3 different pesticides (Actinovate, CITation, M-Pede), Jasmonic Acid, and Ethanol. Height measured with ruler. Leaf surface area measured with pictures that were analyzed using Fiji software application (Also used for counting number of trichomes). Toughness measured with 3D printed penetrometer. Wet and dry mass measured with analytical balance. Carbon: Nitrogen (C:N) analysis done with elemental analyzer. Results Toughness tests indicate that pesticides reduce a plant's ability to express physical defenses as seen through the reduced ability to withstand impact. The C:N analysis also indicates that pesticides hinder a plant's ability to express chemical defenses as seen through the reduced ability to sequester nitrogen away from the leaves. Conclusions/Discussion Pesticides potentially have an impact on some of the plant's physical and chemical defenses. This means that even as pesticides are trying to reduce the threat of some herbivores, they potentially increase the threat from those herbivores they are not designed to protect against.	
Summary Statement I measured the impacts of pesticides on a plant's ability to express its physical and chemical defenses (through phenotypical and chemical analyses) to see if they hindered plant development.	
Help Received I designed the setup of the project and the methods used with some assistance from two lab partners while working in a lab at UC Santa Cruz. I was mentored by Ms. Julie Herman (a PhD Candidate) and worked under Professor Kathleen Kay in the department of Ecology and Evolutionary Biology at UCSC.	