



CALIFORNIA STATE SCIENCE FAIR  
2017 PROJECT SUMMARY

<b>Name(s)</b> Emma R. Schaefer-Whittall	<b>Project Number</b> <b>S0521</b>
<b>Project Title</b> Maximizing the Concentration of Anti-Cancer Alkaloids in Vinca major	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The purpose of my project is to identify and quantify anti-cancer alkaloids in the invasive periwinkle, Vinca major. I tested if the habitat, presence of herbivory, or anatomical part of the plant increases the alkaloid concentration. I also compared the alkaloids present in V. major with those previously reported from the close relative, C. roseus.</p> <p><b>Methods/Materials</b> Approximately 10 plants were collected from nine populations representing wild and cultivated habitats. Alkaloids were extracted from dried flowers, leaves, stems, and roots using methanol. Total alkaloids were quantified following the reaction with Dragendorff's reagent (bismuth nitrate, hydrochloric acid, and potassium iodide) using a spectrophotometer. Alkaloids were identified by comparison to standards using an HPLC.</p> <p><b>Results</b> Across all populations, plants from wild habitats had a higher average alkaloid concentration than cultivated plants. Also, flowers had consistently high alkaloid concentrations. In the first experiment (three populations), roots had the highest alkaloid concentration (119 ug/mL/g). Leaves with herbivory had a higher alkaloid concentration than leaves without herbivory. In a second experiment (six populations), roots had the lowest alkaloid concentration (198 ug/mL/g). Variegated leaves from a cultivated habitat had an average alkaloid concentration 5.8x higher than the concentration of normal leaves. Using HPLC, I identified vincamine and vindesine in leaves, but there were several novel compounds that did not match known standards.</p> <p><b>Conclusions/Discussion</b> The highest concentration of alkaloids would be found in flowers from a wild habitat. Herbivory did not dramatically affect the alkaloid concentration. The two alkaloids identified by HPLC have been previously reported from C. roseus.</p>	
<b>Summary Statement</b> I successfully identified two anti-cancer alkaloids and found the factors that maximize the total alkaloid concentration in V. major, suggesting that V. major should be considered as another source of chemicals for chemotherapy.	
<b>Help Received</b> Dr. Amelia Fuller and Dr. Justen Whittall of Santa Clara University helped provide the HPLC analysis and necessary equipment.	