



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Sudarshan Bhat	Project Number S1405
Project Title An Analysis of the Movement of E. coli through Spinach	
Abstract Objectives/Goals The U.S. Food and Drug Administration (FDA) reported an outbreak of E. coli O157:H7 in spinach plants in September of 2006. Two hundred and five illnesses and three deaths were linked to this incident. This project was designed to find out if and how much bacteria could make it to the leaves of a spinach plant during different periods of the plants growth cycle using bottom watering. I hypothesized the Escherichia coli would spread faster in the plants that are exposed later to the contaminated water than the plants exposed earlier in their growth cycles. Methods/Materials Five groups of plants were grown whose ages varied from one week to five weeks. These plants were then contaminated with E. coli through bottom watering. The amount of bacteria on the leaves was measured by blotting each leaf. The amount of bacteria on the surfaces of the leaves was determined by making an extract by using a mortar and pestle and growing the liquid in Agar. Grown on nutrient agar, the colonies were counted to obtain the raw data. ANOVA was used to see if the differences in the amounts of bacterial growth were statistically significant. Results The data collected from the extracts showed that the oldest plant had an average of 18 colonies, while the youngest had just one. Overall, the amount of bacteria found in the leaf increases as the plant got older. However, during the second week, the amount of bacteria increased slightly probably due to an increased demand for nutrients because of the more rapid growth when compared to the plants that were one week and three weeks old. In addition, the higher leaves tended to have fewer bacteria than the lower leaves because of the way the nutrients are carried through the leaf. I also found that inferior sides of the leaves had higher levels of contamination then on superior sides. This suggests that the inferior sides of the leaves should be more thoroughly cleaned before consumption. Conclusions/Discussion I found that my hypothesis was correct other than the slight increase in bacterial concentration during the second week probably due to the rise in growth rate during this time period. Though visible data shows that the amount of contamination varies as the age changes, the analysis of variance showed that there was no significant difference between the age groups. So no matter when the spinach is contaminated, there is bad news for spinach-lovers around the globe.	
Summary Statement This project explores the changes in bacterial content in Spinach plants exposed to water contaminated with E. coli at different periods of the plant's growth cycle.	
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