



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Jonathan J. Crowther	Project Number J1708
Project Title Mutualism: It's All About the Teamwork	
Objectives/Goals My objective is to demonstrate the benefit of the presence of earthworms to plants. I believe that plants exposed to earthworms will grow better than plants without earthworms.	
Abstract Methods/Materials Two variegated ivy plants were planted in clear pots made from 2-Liter bottles. Soil was cleaned of earthworms and mixed with an equal volume of potting soil, a source of dead plant material for the worms. Layers of cornstarch were added to show worm activity. Six earthworms were placed in one plant (named Plant A). Plant B had no earthworms. Black paper was used to limit light exposure. I tested weekly for the number of stems, stem length (from the soil surface), and number of leaves for 65 days after planting. Additional materials used include a decking screw, a screen box with 1.3 cm squares, digging spade, bucket, garden cultivator, two plastic TV dinner trays, scissors, a 178 cm ³ (3/4 Cup) measuring cup, a 14.8 cm ³ (1 tablespoon) measuring spoon, cm ruler, measuring cup, black pen, black Sharpie, notebook, digital camera, Scotch tape, black paper, and butter tub.	
Results My hypothesis was proven, but not by the quantitative growth indicators, which showed that both plants grew about the same, and Plant B actually grew more leaves. However, the qualitative data that I collected indicated that the plant with earthworms had healthier roots, stronger stems, and larger leaves.	
Conclusions/Discussion Qualitative evaluation of the plants showed that with earthworms, Plant A's root hairs were more numerous and durable, roots were thicker, leaves larger, stems sturdier and more upright. Growth was more balanced across the stems than Plant B. The overall appearance was healthier than Plant B. The earthworms acted like mini-rototillers to stir up the soil and keep it fluffy giving the roots more air and less resistance to root growth. Most of Plant B's growth was on the three longest stems (was it trying to escape from poor soil conditions and root out somewhere else?).	
Summary Statement Determine if mutualism exists between earthworms and plants by observing effects of the presence or absence of earthworms on plant growth.	
Help Received My Dad assisted with set-up and data collection. He took pictures. He taught me how to use Microsoft Excel, and advised me on my report. My Mom provided me with writing tips and motivation.	