



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

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Project Title E. coli Promotion of Photosynthesis in Chloroplast: How Bacteria Benefit Farm Production	
Objectives/Goals Photosynthesis plays a crucial role in plant growth, which has an irreplaceable position in ecosystem. This process is controlled by chloroplast. Studies on regulating factors for chloroplast are very important in agriculture production. In natural environment, E. coli has various interactions with plants, such as through fertilizers. E. coli also share many essential life molecules with chloroplast. However, direct effects of E. coli on photosynthesis is not understood. Here, a study on how E. coli affects the photosynthesis of chloroplasts is conducted.	
Abstract Methods/Materials First, culture E. coli and make E. coli solutions. Then, extract chloroplasts from spinach leaves and make chloroplast suspension. Third, prepare six cuvetts and add appropriate components as shown in the results. Control solution has all the components except E. coli. Three experimental solutions were prepared, each contains different concentrations of E. coli. Then use spectrophotometer to measure their photosynthetic rate as indicated by the light transmittance percentage every three minutes.	
Results Experimental results demonstrate that there is a clearly higher percentage of relative transmittance in chloroplast suspensions in the presence of E. coli; higher the E. coli concentration, the more photosynthesis in chloroplasts. This result is seen in both fresh chloroplasts and chloroplasts with low photosynthetic efficiency.	
Conclusions/Discussion E. coli enhanced the photosynthesis in normal and malfunctioned spinach chloroplasts. These effects might be related to the sharing nutrients of E. coli with chloroplasts, and to the anti-phototoxic effects of E. coli components on the chloroplasts. This study highlights a possibility for further identification of the efficient components in the E. coli and the application of E. coli products to promote plant growth. This could result in increased agriculture production and improved the ecosystem in adverse environment, such as desert and drought areas.	
Summary Statement By activating chloroplasts, E. coli is able to promote photosynthesis in plants, which in turn may benefit agricultural production in future.	
Help Received I used lab equipments at Poly High School under the supervision of Mr. Sutton. My parents helped me to arrange the posting.	