



**CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY**

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Project Title The Effects of TMV on Pinto Bean Plants after the Initial Inoculation of a Weaker Strain	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The tobacco mosaic virus is a very common plant virus which infects more than 100 types of herbaceous, dicotyledonous plants including many vegetables, flowers, and weeds. The virus causes mottling of leaves, de-veining, and local lesions on the plant. The main goal of this project was to determine the effects of TMV on pinto bean plants after previous exposure to a weaker strain. If a weak strain of TMV is inoculated into a susceptible (or hypersensitive host) host, then the host will become more resistant to the common strain after inoculation. Due to naturally occurring cell-by-cell defenses within the plant, the host will develop immunity to the common strain after being exposed to an initial weaker strain.</p> <p>Methods/Materials To weaken the virus, the TMV was diluted to various concentrations and heated to different temperatures. First, plants were inoculated with the stock solution of TMV, various dilutions of TMV, and TMV that was heated to different temperatures. Then, for the plants that were inoculated with the diluted and heated strain of TMV, after exactly five days, the same plants were inoculated with the stock solution of TMV. The effects of TMV were measured by counting the number of local lesion per leaf.</p> <p>Results ANOVA and standard t-tests were used to determine the difference between the variables. The plants that were inoculated with an initial weaker strain had significantly less lesions than those inoculated with the stock solution of TMV. When the plant is exposed to an initial weaker strain of TMV, it develops resistance to the virus due to salicylic acid. Salicylic acid aids in plant defense by signaling pathogenesis related proteins, and is only synthesized by local lesions. Thus, the plant only developed resistance after exposure to an initial weaker strain.</p> <p>Conclusions/Discussion This experiment shows how plants, despite of a lacking a somatic immune system, can develop some immunity to a toxic virus. This means that if plants can use internal defense systems to protect themselves from viruses, they can probably also do similarly against bacteria and other pathogenic organisms.</p>	
Summary Statement An study on the effectiveness of TMV on pinto bean plants after the initial inoculation of a diluted or heated strain.	
Help Received I acknowledge my parents for their moral support. Also Ms. Loia and Mrs. Alonzo for being great advisors. Lastly, I would like to thank Mr. Bryce Falk (Plant Pathology Dept., UC Davis) who helped me obtain the TMV.	