CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
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Project Number
J0419

Project Title
GMO Detection through Visual Selection: Year II

Abstract

Objectives/Goals
Last year, I tried to develop a nontoxic, visual selection method for identifying transgenic organisms using a reporter gene assay. I was able to accomplish this with moderate success. This year, my goal was to identify the optimal amount of X-gal in the media that would allow gene activity to be easily detected in Drosophila melanogaster. I also crossbred transgenic and wild-type fruit flies to see if I could apply my assay method to monitor for the presence of the transgenic Lac Operon in the F2 generation.

Methods/Materials
The Lac Z gene produces the enzyme Beta-Galactosidase. In the presence of a substrate X-gal, a blue color is formed when B-galactosidase is produced. In fruit flies, the organism has to be killed and stained with X-gal to determine if there was gene activity. This prevents in-vivo research. I found that the in-vivo larval stage of Drosophila could be used to detect blue color in transgenics through my method. I observed over 300 fruit flies. Lac z positive and wild-type fruit flies were raised with varying concentrations of X-gal in their diet (2ppm-4ppm). Two generations of flies (F1 and F2) were observed for gene activity. Wild type flies (WW) and Lac Z positive P784 (l+l+) flies were crossed to verify which of the offspring was homozygous for the transgenic trait.

Results
Wild type flies (WW) were devoid of the beta gal gene, and so had no blue larvae. The F1 generation of wild type flies crossed with the Lac z (l+l+) positive genotype also did not show blue colored larvae due to the dominance of the wild type allele. However, the F2 generation showed an almost Mendellian pattern of inheritance with approximately 20% of the offspring showing signs of blue color. When I mated the Lac z (l+l+) pairs, all of the surviving larvae in F1 generation were beta gal positive, but some did not make it through the later stages. The P784 (l+l+) flies did not breed well. The mortality rate of larvae was high, but all were positive for blue color.

Conclusions/Discussion
Using my methods, the live transgenic larvae could be selected through visual means. The larvae (first instar stage) were ideal for detection of Lac z activity, as the body is translucent and enables one to see the blue color. By using my new assay, I was able to detect which of the offspring were Lac Z positive.

Summary Statement
The goals of my project were to discover the optimal amount of X-Gal necessary to visually identify in-vivo transgenic gene activity in D. melanogaster, and to apply my assay method to detect transgenics among hybrids in the F2 generation.

Help Received
Thanks to my family for their support. Thanks to the Dpt. of Developmental and Cell Biology/UC Irvine for providing me with the transgenic fruit flies. Thanks to my science teacher for her guidance.