



CALIFORNIA STATE SCIENCE FAIR 2014 PROJECT SUMMARY

Name(s) Margot L. Mafra Spencer	Project Number S2209
Project Title Insect Identification Using Laser and Wing Beat Frequency	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective was to determine whether it is possible to identify flying insects using a photoelectric device and wing beat frequencies (WBFs). If an automated trap can be used to identify pests in a field using WBF, control measures can be targeted to where and when a pest is present. A library of WBFs can be generated to help growers monitor all the insects present in their fields.</p> <p>Methods/Materials Method: Approximately one hundred fifty individual insects of three different species (one mosquito species and two fruit fly species) were placed into separate photo transmitter cages and monitored with recording devices for 2-3 days in a temperature controlled room. Recorded wing beat frequency (WBF) data was analyzed and graphed using specialized software. Materials (partial list): live insects - <i>A. aegypti</i> (common mosquito), <i>D. melanogaster</i> (benign fruit fly), <i>D. suzukii</i> (pest fruit fly) photo-electric device (laser, electronic board, AA batteries, recorder) insect cages software to analyze WBF</p> <p>Results The wing beat frequencies of the three insect species observed were determined. <i>A. aegypti</i> = 433 Hz, <i>D. melanogaster</i> = 223 Hz, and <i>D. suzukii</i> = 226 Hz. We were able to easily distinguish the <i>A. aegypti</i> from the <i>Drosophila</i>, however, within the <i>Drosophila</i> genus, it was nearly impossible to differentiate the <i>D. melanogaster</i> from the <i>D. suzukii</i>.</p> <p>Conclusions/Discussion <i>D. suzukii</i> has invaded crops across the United States by using its serrated ovipositor to cut through fresh fruit to lay eggs, harming the growers' business. The common fruit fly, <i>D. melanogaster</i>, lays its eggs into fruit that is already damaged and rotten, so farmers would discard that fruit anyway. Both <i>Drosophila</i> species look similar, causing confusion as to whether they have the fruit fly pests or the benign fruit fly in their fields. If the fruit fly pest could be identified using an automated trap, farmers can be notified and treat their crops accordingly. Although it does not seem possible to distinguish between the two <i>Drosophila</i> using WBF alone, there were differences observed in circadian rhythms, so that it might be possible to use other flight characteristics in combination with WBF to distinguish between similar species.</p>	
Summary Statement Can we identify flying insect pests using a laser and wing beat frequency?	
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