



# CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

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<b>Project Title</b>  <b>Essential Oils: Impact on Reproductive Timing and Health in Daphnia magna</b>
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<b>Abstract</b>																				
<p><b>Objectives</b> Recent studies have shown that puberty is occurring earlier in both boys and girls for unknown reasons. Some studies suggest essential oils may disrupt the hormonal system, triggering early puberty. This project investigates whether essential oils affect the reproductive timing and fecundity in Daphnia magna. My hypothesis is that the Daphnia magna exposed to essential oils will reproduce earlier with normal brood sizes compared to the non-exposed Daphnia magna.</p> <p><b>Methods</b> The tested Daphnia magna groups were: control, lavender, orchid and gardenia essential oils. Ten Daphnia magna were tested per group. One newborn Daphnia magna was placed in each container. On the 2nd day of life, a 1:500 diluted drop of essential oil was applied to each container of its respective group. Plankton served as food. Daily observations of each container were made to determine when offspring were born as well as the number produced. Secondly, I noted how long each parent Daphnia lived.</p> <p><b>Results</b></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Essential Oil</th> <th style="text-align: left;">Age (days) of Daphnia when 1st offspring born</th> <th style="text-align: left;">Average number offspring born</th> <th style="text-align: left;">Lifespan (days)</th> </tr> </thead> <tbody> <tr> <td>Control (no oil)</td> <td>12.5 +/- 1.6</td> <td>4.4 +/- 1.2</td> <td>24.1 +/- 9.8</td> </tr> <tr> <td>Lavender</td> <td>*9.7 +/- 1.9*</td> <td>*1.9 +/- 0.8*</td> <td>23.9 +/- 7.6</td> </tr> <tr> <td>Orchid</td> <td>10.9 +/- 1.8</td> <td>4.1 +/- 1.2</td> <td>22.8 +/- 9.4</td> </tr> <tr> <td>Gardenia</td> <td>14.3 +/- 1.5</td> <td>3.6 +/- 1.0</td> <td>22.9 +/- 9.1</td> </tr> </tbody> </table> <p>*statistically significant compared to controls</p> <p><b>Conclusions</b> Compared to the controls, the parent Daphnia magna exposed to lavender oil produced offspring significantly earlier, but surprisingly with significantly less offspring. Therefore, my hypothesis was partially supported. Both the orchid and gardenia groups showed a trend toward significant difference in the timing of reproduction with delayed reproduction for the gardenia group. The data shows lavender oil predisposes Daphnia to early reproduction with a decreased brood size, which suggests some essential oils trigger early puberty and negatively impact future reproductive fertility.</p>	Essential Oil	Age (days) of Daphnia when 1st offspring born	Average number offspring born	Lifespan (days)	Control (no oil)	12.5 +/- 1.6	4.4 +/- 1.2	24.1 +/- 9.8	Lavender	*9.7 +/- 1.9*	*1.9 +/- 0.8*	23.9 +/- 7.6	Orchid	10.9 +/- 1.8	4.1 +/- 1.2	22.8 +/- 9.4	Gardenia	14.3 +/- 1.5	3.6 +/- 1.0	22.9 +/- 9.1
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<b>Summary Statement</b>  I found essential oils like lavender lead to significantly earlier reproduction of offspring and decreased offspring numbers in Daphnia magna.
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<b>Help Received</b>  My parents helped problem solve issues that arose during my project and Dr. Eugene Furnace provided me with several excellent articles and discussion on my research study.
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