



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) Anthony J. Castillo	Project Number S1904
Project Title The Effect of Plant-Derived Aerosol Smoke Priming on Gene Expression and Seedling Vigor of Traditional Yemeni Watermelon	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Current research on plant-derived smoke shows that it functions similar to plant growth hormones. The objective was to test the response of traditional Yemeni watermelon to plant-derived aerosol smoke and measure its effect on seedling vigor and gene expression.</p> <p>Methods/Materials Watermelon seeds were separated into replicates of 25 per treatment and control for six replications. Seeds were placed on screens in a smoke chamber and primed with aerosol smoke for 16, 32, 48, and 64 minutes. Smoke generated in a homemade smoker filled with straw briquettes was funneled through a heater hose into the smoke chamber. Seeds were sown in cups filled with peat moss and grown in an artificial green house. After six weeks, four randomly selected control and treatment seedlings from each replication were used for gene expression analysis using qPCR with three replicates per seedling per gene. Remaining seedlings were dried and metrics recorded to calculate seedling vigor.</p> <p>Results Seedling Vigor tests showed 32 minute treatment rendered the most viable seedlings while control and 16 minutes of treatment rendered the most non-viable. Gene expression was measured as a fold change compared to control gene cla004472. The expression of growth genes cla018893 and cla014050 were measured; an overall decrease in the expression of cla018893 was observed. The expression pattern for cla014050 showed that the 32 minute treatment had the highest expression, and the lowest expression in 64 minutes and the control group. Stress genes cla011165 and cla007751 demonstrated a significant decrease in all treatment groups compared to control.</p> <p>Conclusions/Discussion Results showed aerosol smoke treatment leads to vigorous and more viable plants. There is a clear trend that the longer treatment promoted growth. Effective treatment time ranged from 32-64 minutes. Gene expression data favored 32 minutes for some genes as an optimal treatment time compared to longer treatment times, while others appeared to have a negative response to any smoke treatment.</p>	
Summary Statement I found that priming seeds with aerosol smoke could provide traditional farmers a low cost alternative to fertilizers, which many farmers need to sustain their living.	
Help Received I designed this experiment by myself. Seeds were provided by Mohamed A. Al Jumai. Dr. KC Vavra supervised work done at The Lab and taught me how to analyze gene expression data.	