



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

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Project Title Artificial Hormones Disrupt Non-Competitive Root Growth Patterns In Sibling Plants	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals In our science fair project last year we learned that sibling morning glory seeds when in close proximity to each other, restrain their outward root growth to avoid competing with one another. This year, we did further research regarding signaling, and decided to see if adding artificial hormones to the plant's water would interfere with kinship recognition. We found a commercially available source for plant hormones: Nitrozyme, a plant growth regulator, which provides cytokinins, which occur in plant roots and stimulate plant growth. Our investigative question was, "Does the amount of Nitrozyme in their water effect the outwards root growth in centimeters of nearby related and unrelated morning glory seeds?"</p> <p>Methods/Materials We tested this hypothesis by adding 3 different concentrations of Nitrozyme to both related and unrelated pairs of plants. We picked, scored, and soaked one batch of seeds from our morning glory plant and one batch from a neighbor's plant. The plants were grown in 2 sets, related and unrelated, with three rows each. One row was watered without Nitrozyme, another with a .6% concentration, and the last with a 1.3% concentration. For the first month we grew them without Nitrozyme, giving them time to germinate. Then, for the second month, we watered them with their allotted amount of water and Nitrozyme. After 8 weeks we uprooted all of the plants and measured their downward and outward root growth as well as their height.</p> <p>Results We found that while Nitrozyme did not affect the unrelated plants' root growth, related plants had greater outwards root growth, and less downward root growth. On the whole, the more Nitrozyme we gave the related plants, the lower the ratio of downward to outward root growth. This showed that Nitrozyme does not override kinship signaling by inducing plant growth in all directions as we had predicted it would. Instead, it changed the root growth patterns of the related plants.</p> <p>Conclusions/Discussion We concluded that Nitrozyme caused the plants to grow competitively, acting like unrelated plants, rather than simply growing bigger. This means that Nitrozyme made the morning glories that were related behave as if unrelated. Overall, our project demonstrates that adding chemical hormones, might not just cause plants to grow faster, but might also make them less able to respond to their environment.</p>	
Summary Statement Artificial plant growth hormones interfere with kin recognition in nearby morning glory plants, causing sibling plants to grow their roots more competitively.	
Help Received Our parents helped with the purchase of Nitrozyme and plastic cups. And our teacher helped us by giving us guidelines on how to organize our project.	