The Role of Plant Hormones in the Appearance of Pseudonodules within Populus deltoides

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Using chemicals such as 2,4-D, scientists have been able to cause the formation of pseudonodules within non-nodulating plants. Since certain auxins were effective in producing pseudonodules, using the chemicals on poplar trees seemed valuable. By having trees form pseudonodules, bacteria could potentially be housed in the nodules, allowing the plant to fix nitrogen. This would reduce the need to fertilize these plants. Nitrogen fertilizers are harmful to the environment because the Haber-bosch process accounts for one percent of the world's carbon emissions. My hypothesis was that, if cuttings are exposed to different plant chemicals, then the 2,4-D group would have the shortest lateral root growth. By taking cuttings of poplar deltoides and applying 2,4-D, NAA, and NPA, I found that 2,4-D at a concentration of 3.75 x 10^-4 moles is the most effective in producing nodule-like structures and shortening lateral root growth. In fact, the average lateral root growth for the 2,4-D groups was 1.34 centimeters, while the average for the controls was 3.4 centimeters, which was nearly 3 times larger. Additionally, the 2,4-D 3.75 x 10^-4 group survived the three week experiment and grew pseudonodules. Overall, I found my hypothesis was supported, as the 2,4-D groups had a lateral growth that was the least and it was the only group to produce pseudonodules. With this in mind, the next step would be further testing to see if bacteria can be attracted to the nodules.

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