The Effect of Elevated CO2 and Nitrogen Deposition on Constitutive and Induced Phenolic Levels in Pole Bean (Phaseolus vulgaris)

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Atmospheric carbon dioxide (CO2) levels are on the rise due primarily to the burning of fossil fuels. A previous study by Karowe & Grubb (2011) found, when grown under elevated CO2, Brassica rapa, a non-legume C3 plant, lost the ability to induce phenolics, a type of chemical defense. It was hypothesized that the nitrogen deficiency of B. rapa grown under elevated CO2 caused the reduction in inducibility. In this current study, we asked whether a legume, Phaseolus vulgaris (pole bean), by virtue of its mutualistic association with nitrogen-fixing bacteria, would not experience a decrease in the inducibility of phenolics. Furthermore, we asked whether phenolic inducibility would not be affected by future increases in atmospheric nitrogen deposition, due to fossil fuel burning. I analyzed the project data using multiple ANOVA statistical tests to determine the significance of our tested variables. The inducibility of phenolics was confirmed for Phaseolus vulgaris. However, in contrast to the non-legume B. rapa, pole bean was able to induce phenolics at both ambient and elevated CO2. Nitrogen deposition also did not affect the inducibility of phenolics for Phaseolus vulgaris, suggesting that pole bean, and possibly legumes in general, will still be able to defend themselves with phenolics as effectively in the future.

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