CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
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Project Number
J2321

Project Title
What Makes Acid Rain Lethal? Effect of Acid Rain and Its Components on Seed Germination

Abstract

Objectives/Goals
The objective if this experiment is to examine the effect of Acid Rain and its components on seed germination, and compare it with the effect of untreated water.
My hypotheses are: (1)Acid Rain will have a harmful effect on seed germination, and (2) SO2 and NO will be the most harmful parts of Acid Rain followed by the CO2

Methods/Materials
Methods--# Put seeds of one kind in 5 Petri dishes filled with water.
Repeat this for all the other types of seed to form 5 sets of each kind.
Leave one set be as the control. Put 1ppm SO2 in one set, .2ppm NO in another, and the industrial carbonated water in another. In the last set, combine the Industrial Carbonated Water, with the NO, and SO2 solutions in a 1:1:1 ratio.
Put all the seeds in the incubator. Set the temperature at 10 o Celsius for the peas and beans. Put everything else at 181/3o Celsius.
Calculate the germination percent (GP=seeds germinated/total seeds * 100) and gather Qualitative data daily. Also replace the water.
Materials--Dishes: Silver Steel Caps,Capsules,Beakers,60ml plastic syringes,1ml syringe,Plastic bottle caps,Syringe needles (with lock)& Petri Dishes; Chemicals: NaNO3,Iron Sulphate,25% Sulfuric Acid,NaOH,Silicone Oil Lubricant,Sodium Bicarbonate,Vinegar,Industrial Carbonated Water &Water; Seeds: Organic Lemon Cucumber,Organic Sweet Corn,Organic Lentil,Organic Salinas 88 Lettuce and Organic Radish; Other Equipment: Crimper,Digital Ph Meter,Magnetic Stirrer,Digital Weighing Scale,Lab Coat,Gloves and Goggles.

Results
Acid Rain was more harmful than the water in seed germination. However, NO was the most harmful component of Acid Rain followed by SO2 and CO2.

Conclusions/Discussion
My first hypothesis is correct. Acid Rain is very lethal. In my experiment Acid Rain treated seeds had a 43% lower rate of germination and 53% lower rate of sprouting compared to ordinary water (control environment).
However my second hypothesis is incorrect. NO is the most lethal component of acid rain. It lowered the germination rate by more than 50%. SO2 is the next worst component. CO2 did not greatly reduce germination or sprouting, and in one case (radish) actually caused a better germination rate than water.

Summary Statement
My project is about finding out the effect of air pollution on water (acid rain) and subsequent seed germination.

Help Received
Dr. Mona Othman (USDA researcher) helped me by letting me use her lab and giving me ideas on how to carry out my experiment.