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| [Abstract](http://docs.google.com/abstract.html)  [Introduction](http://docs.google.com/intro.html)  [Hypothesis/Prediction](http://docs.google.com/hypo.html)  [Materials](http://docs.google.com/material.html)  [Protocol](http://docs.google.com/protocol.html)  [Literature Review](http://docs.google.com/lit.html)  [Data](http://docs.google.com/data.html)  [Statistical Analysis](http://docs.google.com/stats.html)  [Graphs](http://docs.google.com/graphs.html)  [Images](http://docs.google.com/images.html)  [Conclusion](http://docs.google.com/conc.html)  [Works Cited](http://docs.google.com/works.html)  [Recommendations](http://docs.google.com/recc.html)  [Acknowledgements](http://docs.google.com/ack.html)  [Biology Updates](http://docs.google.com/updates.html)  [Home](http://docs.google.com/home.html) | **Protocol**  Procedure/Experimental Design for Basic Experiment:  Eight Control Groups:  Each of the following pH�s on germinating Ryegrass seeds and soil and already 25 day old grown Ryegrass.  5.6 pH water-Natural uncontaminated Rain Water  4.4 pH NO2  4.4 pH SO2  4.4 SO2 +NO2  Experimental Groups:   |  |  | | --- | --- | | Already 25-day-old grown Ryegrass-SO2  3.5pH  3.0pH  2.5pH  2.0pH | Germinating Ryegrass Seeds-NO2  3.5pH  3.0pH  2.5pH  2.0pH | | Germinating Ryegrass Seeds-SO2  3.5pH  3.0pH  2.5pH  2.0pH | Already 25day old Grown Ryegrass-SO2+NO2  3.5pH  3.0pH  2.5pH  2.0pH | | Already 25-day-old Grown Ryegrass-NO2  3.5pH  3.0pH  2.5pH  2.0pH | Germinating Ryegrass Seeds-SO2+NO2  3.5pH  3.0pH  2.5pH  2.0pH |   Growing Procedure: 28 flats  1. Take four plastic flat cups fill 3/4 of the way with basic garden soil  2. Place 1/8 teaspoon of Ryegrass seed evenly over each of the four flat cups  3. Fill the four flat cups the rest of the way, to the brim of the cup with basic garden soil  4. Water each with 100ml of specified solution  5. Lay tray in cleat plastic painters sheet and create a closed system. Thus creating an artificial Biodome.  6. Follow procedure with all the "Grow from germination experiments"  7. Reopen the Biodome after thirty days of growing days to see the effects of the different Ph�s on the growing Ryegrass.  With Already Growing Experiments Follow the Procedure Below:  1. Follow steps 1-3 of the procedure listed above  2. Pour 25ml of 5.4pH water in each of the four cups. Jest enough water to allow for growth of Ryegrass  3. Place in clear plastic painters sheet and create a closed system  4. Re-open after 25 days of growth and then add 75ml of the designated solution into each of the four containers.  5. Re-seal the clear plastic painter sheet and allow the closed system to grow for another 5 days. Observing the changes carefully over those growing days.  6. Re-open after those 5days and measure all results  For Both Experiments:  1. Measure the Stem and Roots in Cm  2. Evaluate the color of the grass blades and roots  3. Take an average of 25 grass blades in each of the four containers of every pH in every experiment.  Further Experiment:  1. Test the pH of the soil of every container and record differences in Ph from what it was originally to what it was after 30 days of growing time.  2. Now plant the second generation of ryegrass following similar procedures from above.  3. Use 1/8 teaspoon of Ryegrass seed spread evenly over every container, 1/4 the way down the container.  4. Re-seal the plastic sheet to continue the closed biodome. Do not add extra water, want to test the ability for ryegrass to decontaminate soil effected by Acid Rain of various pH levels.  5. After 30 days of growing time re-open biodome and measure all the variables examined above.  6. Test the pH of both the soil and the water droplets surrounding each of the four containers.  Procedure for Making Various Levels of NO2 and SO2:  Downsized Trail and Error method.  1 Molarity of NO2  4.4 pH (Control) 4500microliters of distilled water to 10microliters of NO2  3.5 pH 3500microliters of distilled water to 10microliters of NO2  3.0 pH 2500microliters of distilled water to 10microliters of NO2  2.5 pH 1500microliters of distilled water to 10microliters of NO2  2.0 pH 1000microliters of distilled water to 10microliters of NO2  Up scaled keeping proper proportion to create 100ml total: (Distilled Water, NO2)  4.4 pH .01(x)+4.5(x)=100ml 22.172 (99.765ml, 0.2217ml)  3.5 pH .01(x)+3.5(x)=100ml 28.49 (99.715ml, 0.2849ml)  3.0 pH .01(x)+2.5(x)=100ml 39.84 (99.6 ml, 0.3984ml)  2.5 pH .01(x)+1.5(x)=100ml 66.225 (99.34ml, 0.66225ml)  2.0 pH .01(x)+1.0(x)=100ml 99.0099 (99.01ml, 0.99ml)  1Molarity of SO2  4.4 pH (Control) 9000microliters of distilled water to 10microliters of SO2  3.5 pH 6500microliters of distilled water to 10microliters of SO2  3.0 pH 5500microliters of distilled water to 10microliters of SO2  2.5 pH 3500microliters of distilled water to 10microliters of SO2  2.0 pH 3000microliters of distilled water to 10microliters of SO2  Upscaled keeping proper proportion to create 100ml total: (Distilled Water, SO2)  4.4 pH .01(x)+9.0(x)=100ml 11.098 (99.748ml, 0.2493ml)  3.5 pH .01(x)+6.5(x)=100ml 15.36 (99.846ml, 0.1536ml)  3.0 pH .01(x)+5.5(x)=100ml 18.14 (99.77ml, 0.1818ml)  2.5 pH .01(x)+3.5(x)=100ml 28.49 (99.715ml, 0.2849ml)  2.0 pH .01(x)+3.0(x)=100ml 33.22 (99.66ml, 0.3322ml)  Procedure for Further Study:  1. Retrieve Samples from different parks (Vintage Hills and Kottinger Park, Pleasanton, CA)  2. Separate 25 specimens of each kind and measure stem size, leaf size, root size, and root rating, plant age rating. This will be the control  3. Separate specimens into six different plastic plant flats  4. Label with:   |  |  | | --- | --- | | NO2:  3.0 pH  2.5 pH  2.0 pH | SO2:  3.0 pH  2.5 pH  2.0 pH |   5. Place 100ml of designated pH solution into the designated plant flats  6. Place flats in clear plastic painter sheet. Make a closed system Biodome  7. Re-open after five days and measure 25 samples from each flat with the same ratings and measurements done for control group  8. Test the pH of the soil and water droplets around the plants  9. Compare results between control and experimental and between this experiment with the Ryegrass experiment. |