The Effect of Rate of Photosynthesis Using Different Cold Temperatures of Water

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Abstract:

Will different degrees of cold water temperature affect the rate of photosynthesis? The independent variable was the different degrees of water cooler than room temperature. The dependent variable was the number of spinach leaves that floated to the top per minute. The purpose of this experiment was to determine whether different water temperatures, which were cooler than room temperature, would affect the rate of photosynthesis. My results showed that as the water temperature got cooler as a different trial was conduced, the number of spinach leaves that floated to the top decreased. As showed in treatment D, there were 3 spinach leaves that floated to the top in ten minutes which originally started with 6 spinach leaves in ten minutes in treatment A. Explain which treatment is which—the goal of the abstract is to get an overview of your whole experiment without having to read anything else.

Introduction : Hypothesis

If the degrees temperature of water continuously got colder than room temperature degrees, then less leaves will float to the top because the enzymes that speed up the process of photosynthesis will have less energy if the temperature is too hot or too cold. The independent variable of this experiment was different types of cooler than room temperature water degrees. The dependent variable was the number of spinach leaves that floated per minute.

Introduction : Review of Literature

Photosynthesis occurs in the plant cells by taking place in the chloroplast. In order for plants to grow, you need light, water, and carbon dioxide. The equation for photosynthesis is light energy+ 6CO2+6H2O →C6 H12 O6 + 6O2). The inputs are carbon dioxide, water, and light energy. While the outputs are glucose and oxygen. Sunlight comes from the sun and it gets absorbed by chloroplast in the leaves. Water comes from the air ? and is absorbed through the soil, roots, and into the plants. Carbon dioxide is natural gas and is everywhere in the atmosphere so the plants can breathe. The glucose is made from carbon dioxide and light. Plants would release the oxygen and they would eat use the glucose for food.

The light dependent's location of the plant all occurs in the chlorophyll of the thylakoid of a chloroplast. The things that are needed for reactants reaction? to occur is NAODP, water, light, and ADP. The products of the reactants are oxygen, ATP, and NADPH (carries electron). The light independent occurs in the the stroma of the chloroplast in the plant cell. The items that are required for a reaction to occur are carbon dioxide, ATP (from light dependent), and NADPH (from light dependent). The products of the reaction is carbohydrates and carbon containing sugars. and carbon dioxide

Changing the type of water a plant receive impacts the rate of photosynthesis

because when temperature is higher, there will be a greater rate in photosynthesis. If the temperature gets too cold then the enzymes that help photosynthesis speed up, will start to slow down. If the temperature gets too hot, then the enzymes which are also proteins will start to break down and won't produce photosynthesis as great as warm temperature. Changing the amount of CO2 a plant receives impact the rate of photosynthesis because if there is an increase of the carbon dioxide concentration, then the rate of photosynthesis will go up. Changing the amount of light a plant receives impact the rate of photosynthesis because the brighter the light gets, the rate of photosynthesis increases.

Materials :

In order to test the hypothesis, we used one treatment every ten minutes which was timed using a timer. We used 1 baby spinach leaf, 1 cup, 1 hole puncher, 1 lamp, 1 light bulb, 1 outlet, 1 beaker, 0.3g baking soda, 1 syringe barrel, 1 drop of soap, 50mL of water, 1 graduated cylinder, 1 stir stick, 1 thermometer and 1 scale.

Procedure :

First, grab all the materials needed to start the experiment. Next, wash the washable materials and make sure it's clean of chemicals. First, measure out 50mL of water (that is 20°F less than the room temperature using the thermometer) How did you do this? using the graduated cylinder and pour it into the cup. Next, measure out 0.3g of baking soda on the scale and pour it into the cup containing the water. Add one drop of soap into the solution as well. Grab the stir stick and mix the solution until the baking soda has dissolved. If the solution has bubbles, dilute the solution with more baking soda solution. Get the hole puncher and baby spinach and punch out 10 spinach leaves which will represent the leaf disks. Get out the syringe barrel and pull out the plunger in order to put the 10 spinach leaves inside the syringe barrel. After the leaves are inside, push the syringe plunger until there is no more air. Then grab the plunger, put it in the solution, and pull a small amount of solution into the syringe. Tap the syringe to suspend the leaf disks in the solution and make sure there are no air bubbles. If there are air bubbles, slowly push them out with the plunger. If not, place a finger over the syringe for 10 seconds and draw back on the syringe to create a vacuum. While a finger is over the syringe, swirl around the leaf disks so they are in the solution. After 10 secs, remove the finger over the syringe and pull out the plunger of the solution making a “pop” noise. If you do not hear a “pop” noise, ask for help. After the leaf disks have sunk, empty the syringe into a cup and add 3 cm of water. Put the light bulb in the lamp, plug the lamp into an outlet and turn it on. Place the cup under a lamp and start the timer. Record the amount of disks that floated up to the top every minute until 10 minutes have gone up. Repeat the steps for the remaining treatments but going 20°F below room temperature every treatment. Make sure when doing the control that the room temperature is always the same. Did you also do a warm treatment?

Data and Results :

Number of disks floating at each minute

Treatment	1	2	3	4	5	6	7	8	9	10
A- Control Group 70°F	0	0	1	2	4	4	5	6	6	6
B- 50°F	0	0	0	1	1	2	4	5	5	5
C- 30°F	0	0	0	1	1	2	3	3	4	4
D- 10°F	0	0	0	0	0	1	1	2	2	2

Use degrees celcius.

Analysis :

In our experiment, the control group was the room temperature which was 70°F while we tested three other treatments that were 20°F less than the treatment before the one that is being tested. Every minute, we had to see how much leave disks were floating and record it in our data table. The data showed that as the temperature decreased the number of disks that floated also decreased. The data also shows that the colder the water was, the longer it took for leaves to float to the top because as temperature gets colder, the enzymes have less energy for photosynthesis to occur. Lastly, the number of floating disks stayed constant for all four temperatures from 9 -10 minutes which shows that if we conducted more experiments, there will be less leaves that will float to the top.

Conclusion :

The following data supported my hypothesis because it shows that as each treatment was conducted, the number of leave disks floating were decreasing as the water temperature got cooler. While using treatment B, which was 50°F water temperature, the number of leave disks floating were starting to increasing from 4 minutes to 10 minutes. By 10 minutes, the leave disk for treatment A was one less leave disk than in treatment A. In treatment C, which was 30°F water temperature, the number of leave disks floating were from 4 minutes to 10 minutes as well but the number of leave disks were decreasing as the minutes continued going. In treatment D, which was 10°F water temperature, the number of leave disks floating were from 6 minutes to 10 minutes but from 8 minutes to 10 minutes, the number of leave disks stayed constant. My results probably turned out the way it did because as the water temperature got cooler, the enzymes that speed up the process of photosynthesis was slowing down which didn't allow the leave disks to rise up as quickly as it did in treatment A which was the control group. Another reason was that photosynthesis occurs best when there are warm temperatures but in my experiment, I was testing out cold temperatures. The last reason why it probably turned out he way it did because we were rushing throughout our trials of our treatments because we were trying to get at least two done per day so the data might be a bit inaccurate. Three possible errors that could have affected my experiment was the water wasn't exactly at the correct degrees because sometimes it would be one degree off. Another possible error was because we added a bit too much baking soda during treatment A which helped

increase the concentration. Lastly, we lost track of time when conducting treatment B which is probably why the leave disks had a major change from treatment A to treatment B.