Student's Name

Professor

Course

Date

Photosynthesis

Research Question

How does carbon (IV) oxide concentration affect the rate of photosynthesis?

Background

The biological process through which green plants make food is called photosynthesis. For photosynthesis to occur, three factors must be present; light, carbon (IV) oxide, and water. During photosynthesis, carbon (IV) oxide molecule is broken into carbon and oxygen atoms. The end product of photosynthesis is glucose and oxygen gas. The process depends on light to produce energy (Dogutan et al. 3183). The process of photosynthesis can be summarised by the following chemical equation below;

$$6CO_2 + 6H_2O \xrightarrow{\text{Energy}} C_6H_{12}O_6 + 6O_2$$

From the above equation, six molecules of carbon (IV) oxide and water in the presence of light produce a single molecule of glucose and six molecules of oxygen. There is a positive association between carbon (IV) oxide concentration and the rate of photosynthesis. Increasing carbon (IV) oxide concentration will increase the rate of photosynthesis, and thus more oxygen gas will be produced. In this experiment, the production of bubbles (oxygen) will be assumed to represent the rate of photosynthesis.

Procedure

1) Launch the simulator using the link below; https://scratch.mit.edu/projects/133475453/embed

2) Adjust the brightness to 20 k/Lux and set the color of light to white by pressing writer (W) as shown by the image below;

3) Adjust the carbon (IV) oxide concentration to 300 ppm and record the number of bubbles produced at 60 seconds.

4) Repeat step 3 above two more times and record the data.

5) Repeat step 3-4 two using various concentration of carbon (IV) oxide.

Data

Table 1: raw data table

Carbon (IV) oxide concentration (ppm)	**Number of bubbles**		
	Trial 1	**Trial 2**	**Trial 3**
300	8	8	8
400	18	17	18

550	20	21	20
700	22	22	22
900	24	24	24
1000	26	26	26
1300	28	28	28

The average number of bubbles

$$The\ average\ number\ of\ bubbles\ = \frac{Trial\ 1 + Trial\ 1 + Trial\ 1}{3}$$

$$Average\ current\ (300\ ppm) = \frac{8+8+8}{3} = 8$$

I used some processes to calculate the average bubbles produced, as recorded in table 2 below;

Table 2: Processed data table

Carbon (IV) oxide concentration (ppm)	**The average number of bubbles**
300	8
400	18
550	20
700	22
900	24

Analysis

Based on the data from table 2 above, it is clear that as the carbon (IV) oxide concentration increases, the process of photosynthesis (number of bubbles) also increases. When the carbon

(IV) oxide concentration was 400 ppm, the average number of bubbles was 18. As the carbon (IV) oxide concentration increased to 900, the average number of bubbles was 24.

The data above can be plotted as shown by the graph below;

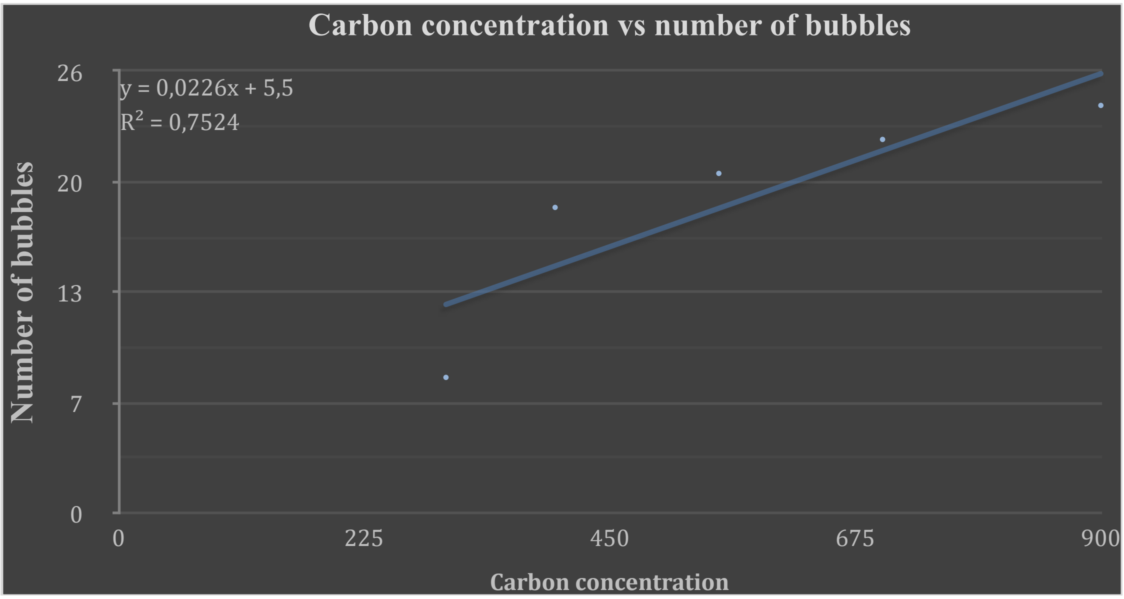

Figure 1: Graph of carbon concentration vs. number of bubbles

Based on the graph above, there is a direct relationship between carbon concentration and the process of photosynthesis (number of bubbles). As the concentration increases, the rate of photosynthesis (the number of bubbles) increases. The co-efficient of the above graph;

$$R^2 = 0.7524$$

$$R = \sqrt{0.7524}$$

$$R = 0.86$$

The R-value is 0.86, confirming the strong positive association between carbon (IV) oxide concentration and the process of photosynthesis.

Conclusion

From this experiment, it can be concluded that there is a strong association between carbon (IV) oxide concentration (ppm) and the rate of photosynthesis (bubbles produced). As the process of photosynthesis continues, oxygen will be released as bubbles. As the concentration of carbon (IV) oxide increases, more oxygen gas (bubbles) will be produced as a by-product of photosynthesis.

Works Cited

Dogutan, Dilek K., and Daniel G. Nocera. "Artificial photosynthesis at efficiencies greatly exceeding that of natural photosynthesis." *Accounts of Chemical Research* 52.11 (2019): 3143-3148.