Candidate 2 evidence

FLOATING SPINACH DISCS

AIM

To see how temperature affects photosynthesis.

UNDERLYING SCIENCE

Photosynthesis is the process of converting light energy into chemical energy and is carried out by green plants.

The equation for photosynthesis is:

$$\text{carbon dioxide} + \text{water} \xrightarrow[chlorophyll]{light} \text{glucose} + \text{oxygen}$$

The rate of photosynthesis is affected by temperature, carbon dioxide and light intensity. My experiment focuses only on temperature.

The chemical reactions involved in photosynthesis are controlled by enzymes, and these are affected by temperature. At low temperatures the rate of photosynthesis is limited by the number of collisions between enzymes and substrate. As temperature increases the number of collisions increases, and the rate of photosynthesis increases too. At high temperatures, enzymes are denatured and this decreases the rate of photosynthesis.

METHOD

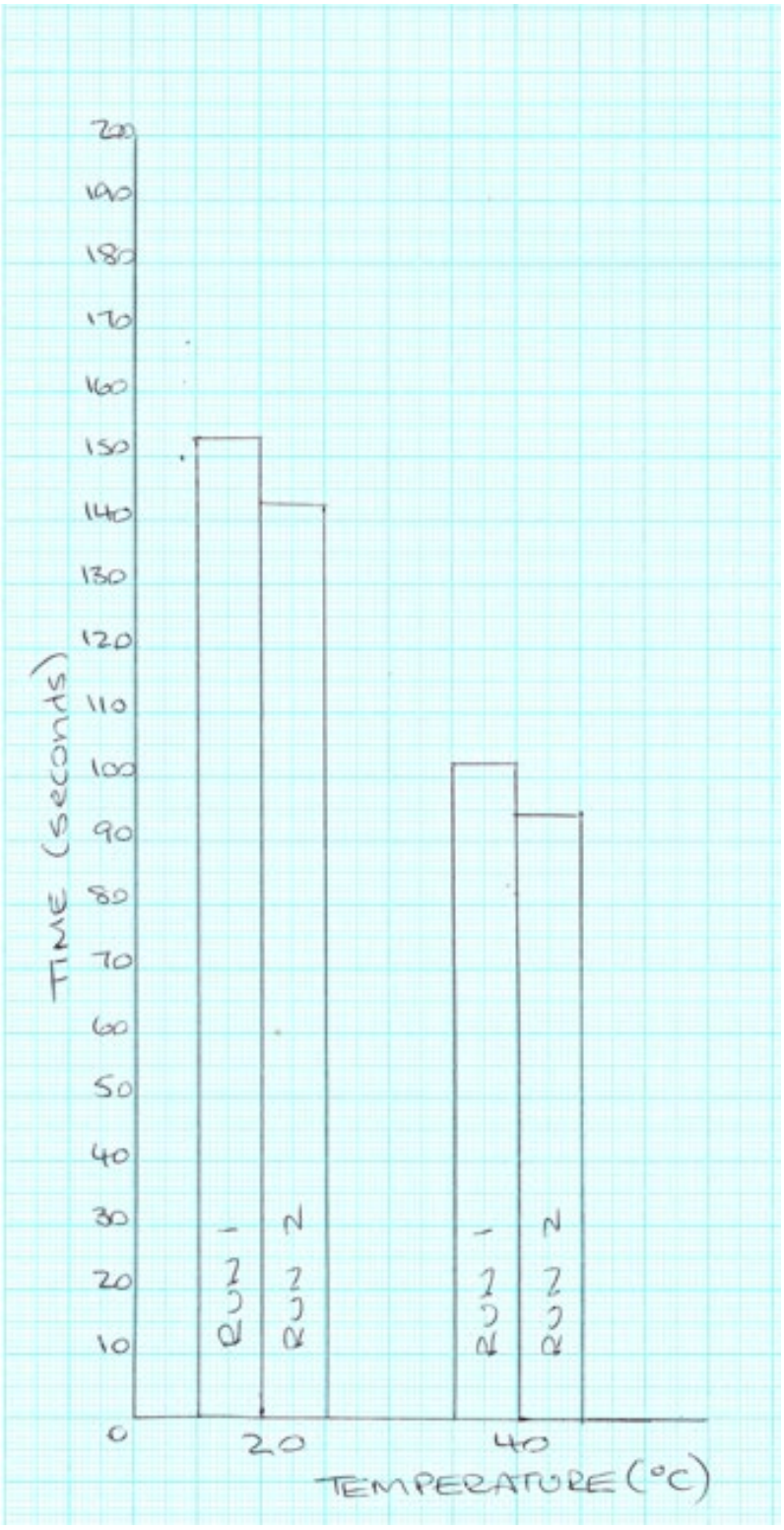
Five small discs of spinach were placed in tubes containing sodium hydrogen carbonate solution. One tube was placed it in a water bath set to 40°C, and the other was left on the bench at room temperature (20°C). The bottles were then placed under a light source and the time taken for the discs to float was recorded.

DATA

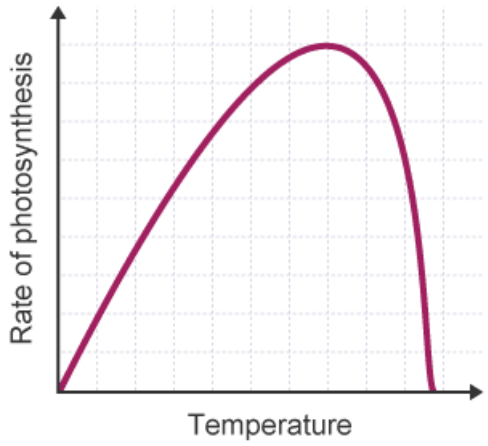
Two of us worked together. We repeated the experiment at both temperatures and calculated an average for each run.

Run	Temperature (°C)	Time (seconds)					Average
		1	2	3	4	5	
Run 1	20	120	145	155	172	175	153
Run 2	20	114	117	138	169	179	143
Run 1	40	92	102	103	105	109	102
Run 2	40	88	90	91	99	101	94

GRAPH


200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
TIME (seconds)
20
40
TEMPERATURE (°C)
- NO LIQUID
NO LIQUID
- NO LIQUID
NO LIQUID

Data from a second source: https://www.bbc.co.uk/bitesize/guides/z8c6gdm/revision/3



ANALYSIS

The data from our experiment shows that the rate of photosynthesis dropped as temperature increased. The enzymes must have started to denature by 40 °C.

CONCLUSION

My experiment shows that temperature does affect photosynthesis.

EVALUATION

During run 1 we were unsure whether we should have checked the timer when the discs first started to rise or wait until they reached the surface. To improve the accuracy of our results we should have decided on this before starting.

SOURCES

BBC what is photosynthesis https://www.bbc.co.uk/bitesize/guides/z8c6gdm/revision/3