

The dependence of photosynthetic rate on light intensity

Introduction

The existence of the animal kingdom, including humans, would be impossible without plants, which determines their specific role in the life of our planet. Of all the organisms only by plants and photosynthetic bacteria are able to accumulate the energy from the sun, creating it by means of organic matter from inorganic substances. By the plants' activity was created an atmosphere containing O₂, and by their existence it's maintained in a condition suitable for breathing.

Light plays an equally important role than soil moisture, air and heat in the normal course of vital activity of plants. Without any light higher plants can not exist. The only light source that is able to completely support the vital activities of plants, is the sun. Light of the moon, planets and stars, although useful, but not satisfied in this regard to all the needs of plants.

Thus, we have been interested in the question: "Does the light level is connected with the process of photosynthesis – one of the main functions of the plants?" And if yes – how and to what extent?

Research question

How the light level may affect the release rate of oxygen during photosynthesis?

Chemical studies of Lavoisier (1775, 1781) led to the conclusion that plants convert carbon dioxide into oxygen only in the presence of light.

Light in photosynthesis plays a role not only catalyst, but also one of the reactants. A significant portion of the light energy used by plants during photosynthesis is stored as chemical potential energy in the products of photosynthesis. For photosynthesis, coming with the release of oxygen, in one way or another is suitable any visible light from violet to medium red.

During photosynthesis with the help of light happens the process of water splitting, where oxygen is liberated and energy-rich forms compound. Thus, we may say that the light level is lower the process of water splitting is slower then oxygen liberating and energy-rich forms compounding is slower, so the light level is lower the photosynthesis is slower.

Variables

Independent variable: the fact that we can control the light level by using box and things places where the light level is low.

Dependent variable: our third group has been the number of leaves in the cup that stayed on the well-lit place – windowsill. Well, there are no doubt that the light level in the places where other cups have been staying have not changed but there is some risk that light level on the windowsill have been able to change. So, it means that our results with the third group may be not very correct.

Materials and Methods

Materials: puncher, cups, medical syringes with 10 ml cylinder, the leaves of plants

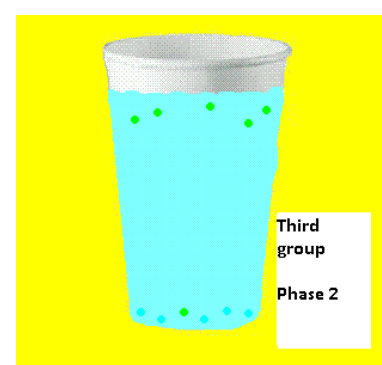
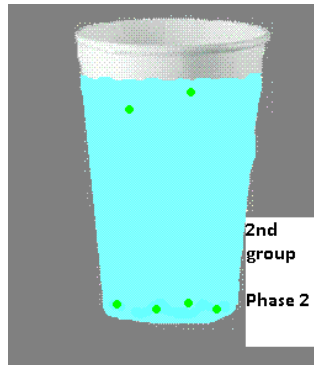
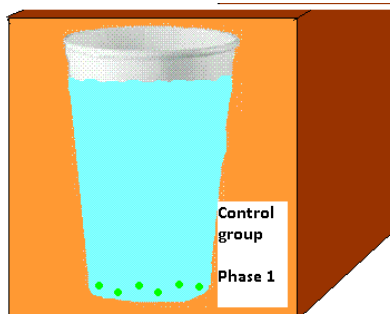
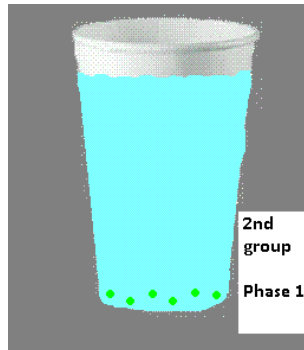
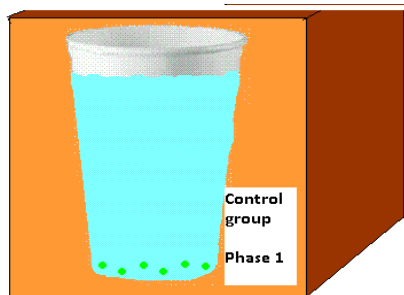
Method: We have made a few cuttings of the leaf by using the puncher and infiltrate them with water saturated with CO_2 . Infiltrated cuttings have been placed in the cups with water enriched CO_2 . One cup we have placed in the dark box (control group), second cup under the table where light level is low and third one on the windowsill where light level is high.

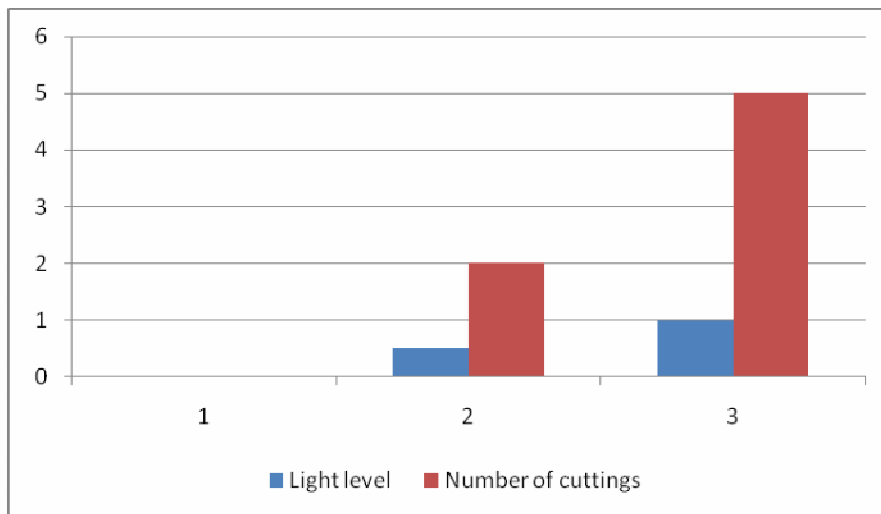
Well, in the end of the experiment the cuttings have had to float but in different cups in different time. So, as a result of accumulation in the intercellular spaces of the oxygen formed during photosynthesis, all the cuttings placed in the third cup that have stayed on the windowsill have had to float but the cuttings placed in the cup that have stayed in the dark box have not had to float at all.

Results

Well, our results have justified the main theory .

- As I have said the group of cuttings that have been placed in the dark box have been control group. After 45 minutes of the experiment no one cutting has not floated.
- Cup with cuttings that have been placed under the table where light level is low have been second group. After 45 minutes of the experiment only 2 cuttings have floated.
- But in the cup that have been place on the windowsill and have been our control group justified the theory. After 45 minutes of the experiment 5 of 6 cuttings have floated.





Discussion

Analysis and Conclusions

So, all the results show us how the light level may affect the release rate of oxygen during photosynthesis. On the concrete example we have seen that the rate of photosynthesis depends on the light level. Namely, than light level is higher the rate of photosynthesis is higher and then light level is lower the rate of photosynthesis is lower.

In summary, I can say that our assumptions and theories were justified and proved. As we supposed, in control group no one cutting didn't float due the whole darkness that brakes photosynthesis. In the second group, as we thought, floated only 2 cuttings due higher light level that is necessary for photosynthesis. But there is only thing that is not so as we supposed – the number of floated cuttings in the third group that stayed on the windowsill. We were sure that every cutting had have to float on this period of time. I think that if we stayed it for a long time, every cutting would float.

Evaluation

Well, such as other experiments this experiment cannot be ideal. Surely there are some limitations and weaknesses here. First, it's some weaknesses in internal validity that I describe before. The level of sunlight might change not once on this period of time, so it could make a strong influence on our experiment. Probably due this 6th cutting didn't float. Besides, the concentration of soda might be not 0.5% but more or less, so it could made strong influence on the results of the experiment too. Besides, it could change the results in all cups. So, these mistakes jeopardize all of the results of the experiment but anyway I suppose that our experiment have been successful because we have justified the theory.

Suggestion for improving investigation

As for me, the only things that we can really change is to be much careful with making a soda concentration and probably use the light bulb instead sunlight. First, the concentration of soda plays an important role in this experiment and thus we need to use a special equipment to make right concentration. Then the sunlight is not the best light source for this experiment, as I said before, because it's really fickle, so I would be better to use the light bulb in this experiment.

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