Article

Hydrilla Photosynthesis Process As Biochemical Reducing Agent

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Abstract: Photosynthesis is the process of synthesizing inorganic materials (CO2 and H2O) in pigmented plants with the help of solar energy. CO2 and H2O are substrates in photosynthesis reactions and with the help of sunlight and photosynthetic pigments consisting of chlorophyll and other pigments will produce iron and release oxygen. Basically, sequential reactions can be divided into two main parts, namely the light reaction (receives light) and the dark reaction (does not require light but requires carbon dioxide). Photosynthesis is influenced by many factors, both internal and external factors. Internal factors include the age of the leaves, the state of the stomata, and the type of plant. External factors include CO2 and O2, water availability, humidity and air temperature, light conditions. In the light reaction stage that occurs in the grana, light energy is shown to be energy consisting of NADPH2 and ATP. Then in the dark reaction stage, which is carried out in the stroma, NADPH2 and ATP are used as biochemical reducing agents to convert carbon dioxide into transport. Growing water releases oxygen into the air. The released oxygen will dissolve in the air and form dissolved oxygen. The photosynthesis practicum was carried out at the Microbiology and Molecular Biotechnology Laboratory, FPIK, Padjadjaran University. Performed on hydrilla plants.

Keywords: Hydrilla, Light Reaction, Photosynthesis,

1. Introduction

Green plants have a special characteristic, namely the ability to convert carbon from the air into organic matter. Higher plants are generally classified as autotrophs, that is, they can synthesize the organic compounds they need themselves. All living things require energy not only for growth and reproduction, but also for maintaining life itself. In this process radiant energy from the sun is converted into chemical energy in the form of ATP and NADPH+ H which will then be used to reduce CO2 to glucose. The standard organic compounds are carbon chains formed by green plants from the process of photosynthesis (Kimball 2002).

Photosynthesis is the process of synthesizing carbohydrates from inorganic materials (CO2 and H2O) in pigmented plants with the help of sunlight energy with the chemical reaction equation as follows:

$$6H2O + 6CO2 + light \rightarrow C6H12O6 \text{ (glucose)} + 6O2$$

Based on the photosynthetic reaction above, with the help of sunlight and photosynthetic pigments (in the form of chlorophyll and other pigments) it will produce carbohydrates and release oxygen (Sasmitamihardja and Siregar 1996).

According to Utomo (2007) the process of photosynthesis does not always require light, which is called the dark reaction which occurs when the product of the light reaction is used to form C-C covalent bonds from carbohydrates. In this process, atmospheric CO2 (or CO2 from water for aquatic/marine organisms) is captured and modified by adding hydrogen to form carbohydrates. Dark reactions can usually occur in the dark if carrier energy from the light process is available. This dark reaction takes place in the stroma of the chloroplast. The ATP and NADPH produced in the process of photosynthesis fuel

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various biochemical processes. In plants, the biochemical process triggered is the Calvin cycle, which binds carbon dioxide to formribulose (and then to sugars such as glucose) (Salisbury and Ross 1995). Photosynthesis is influenced by many factors, both internal and external factors. Internal factors include the age of the leaves, the state of the stomata, and the type of plant. External factors include CO2 and O2, water availability, humidity and air temperature, light conditions (Suyitno, 2010).

2. Materials and Methods

The method used in the practicum is to measure the DO present in water in the photosynthesis process which is carried out with two reactions, namely dark and light with control and hydrilla plants.

This practicum will be held online using Google Meet on Friday, 20 May 2022 at 15.00 WIB. The tools used in this Biochemistry lab are dark bottles as a tool to test the dark reaction, light bottles as a tool to test the light reaction, plastic wrap as a bottle cover, and DO meter as a tool to measure dissolved oxygen.

The materials used in this Biochemistry practicum were amazon plants as the tested sample, hydrilla plants as the tested sample as the tested sample and clean water as a growth medium.

The first procedure is to determine the initial DO, that is, prepare the aquatic plants according to the treatment, then put them in a dark bottle and a light bottle containing water that has been measured DO initially, cover the bottle with plastic wrap, cover the bottle again and homogenize it, then place the bottle in the sun. According to treatment.

The second is determining the final DO, that is, for bottles that have been dried in the sun, the DO level is measured again using a DO meter, and the change in the oxygen content value (ΔDO) is calculated.

3. Results

Table 1. Observations Table

From the photosynthesis practicum carried out by shift 1 the results were obtained.

Kelas	Kel	Sampel	Vol (mL)	Perlakuan	Lama penyinaran	Pengukuran DO		
						DO awal	DO akhir	ΔDO
A	1	Kontrol	500 ml	T	60 menit	7,8	7,9	0,1
				G			7,8	0
	2	Hydrilla		T			7,8	0
				G			7,7	0,1
	3	Hydrilla		T			7,9	0,1
				G			7,8	0
B	1	Kontrol	500ml	T	60 menit	7,8	7,9	0,1
				G			7,8	0
	2	Hydrila		T			7,9	0,1
				G			7,7	0,1

3	Hydrila	T	7,0	0
		G	7,9	0,1

This research was carried out at 13.00 WIB. If analyzed from the results of the treatment that the water plants that are put into the light bottles DO have more than the water plants that are put into the dark bottles. This proves that in the light reaction there is a reaction from light which can accelerate the speed of photosynthesis. There is also a dark reaction, but not as fast as a light reaction (Cahyono 2005). In the practicum shift 1 different volumes of water are used, this allows it to influence the value of oxygen levels. According to ODUM (1971) in the surface layer, oxygen levels will be higher, due to the diffusion process between water and free air and the process of photosynthesis. With increasing depth there will be a decrease in dissolved oxygen levels, because the process of photosynthesis decreases.

The amount of increase in oxygen levels from the results of photosynthesis is strongly influenced by the type of treatment of the samples, where samples in bright bottles always have higher oxygen levels than bottles covered with black duct tape which always have the lowest dissolved oxygen levels. The wider the leaf surface, the more absorption of sunlight and the rate of photosynthesis will run fast as well. Wide and thick leaf morphology results in greater use of oxygen (Soegiarto 1978). The factor that causes the results to be negative is because the water used when measuring the initial DO and the final DO is different, the second factor is the morphological shape of the leaves, the time factor also causes maximum photosynthesis to occur with the result of high dissolved oxygen levels (Mukramin et al., 2023). During the day the sun's rays get hotter, this causes plants not to absorb heat as well during the day, therefore the best time for plant photosynthesis is 08.00 to 10.00 WIB.

5. Conclusions

In the photosynthesis practicum, group 2 carried out a photosynthesis test, namely control or not including plants. The result is that in the light bottle the oxygen level obtained is 7.9 mg/L, and in the dark bottle it is 7.8 mg/L. the bright bottle always has a higher oxygen level than the bottle covered with black tape which always has the lowest dissolved oxygen level. And the process of photosynthesis is influenced by several factors such as leaf morphology, sunlight, time factor.

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