Introduction to Botany. Lecture 8

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Outline

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Questions and answers

Quiz

Final question (1 point)

Explain the role of $NADP^+$

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- In the light stage of photosynthesis, with the help of Photosystem I (P_{700}) it takes hydrogen (protons from water and electrons from chlorophyll) and removes them from the space outside of membrane
- Hydrogen used lately
- Accumulated OH^- (hydroxide ion) makes the gradient and then the electrical flow through ATPase

Photosynthesis

Enzymatic stage: fixation of carbon dioxide

Participants of enzymatic stage

1. Carbon dioxide (CO_2)
2. Hydrogen carrier with hydrogen (NADPH)
3. Source of energy (ATP)
4. Ribulose biphosphate (RuBP, five-C-hydrocarbonate, "C_5")
5. *Rubisco* and other enzymes

Place: in the matrix (stroma) of chloroplast

Main events of enzymatic stage

1. $CO_2 + C_5$ (RuBP, ribulose biphosphate) $\xrightarrow{\text{rubisco}} C_6$
2. $C_6 \longrightarrow 2C_3$ (PGA, phosphoglyceric acid)
3. $C_3 + NADPH + ATP \longrightarrow C_6H_{12}O_6$ (or other organic molecules) + $C_5 + NADP^+ + ADP + P_i$ (inorganic phosphate)
   - Organic molecules are synthesized from C_3 (PGA) through energy-rich **PGAL** (phosphoglyceric aldehyde)

Final question (2 points)

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Explain the role of NADPH in the enzymatic stage.

Summary

- **Photosynthesis** is a sum of light-dependent (photo-) and light-independent (auto-) reactions
- **Light stage** of photosynthesis results in accumulation of energy and hydrogen, and release of oxygen
- **Enzymatic stage** of photosynthesis results in assimilation of the CO_2 and synthesis of organic molecules

For Further Reading

A. Shipunov.
Introduction to Botany [Electronic resource].
2016.
Mode of access:
http://ashipunov.info/shipunov/school/biol_154