ЦЕНТЪР ЗА ОБУЧЕНИЕ – БАН

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Basic Information:

Course Title: PHOTOPROCESSES IN BIOLOGICAL MEMBRANES

Lecturer: Prof. Emilia Lyubomirova Apostolova, PhD
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Total Teaching Hours: 20 hours of lectures and 10 hours of laboratory exercises

Annotation (up to 150 words)

Molecular mechanisms of the photosynthetic process are the subject of continuing interest. The optimum activity of the photosynthetic apparatus depends on the efficient absorption of the light and the regulation of energy transfer to reaction centers, which is performed by light harvesting complexes. Research of the photosynthetic membranes in recent years shows their dynamic features, including changes in structure, composition, and functions of the photosynthetic apparatus under the influence of environmental conditions.

Course content (brief description by topics or modules)

Topic / Module 1: Photosynthetic membranes. Composition, physical properties, and organization.

Topic / Module 2: Primary processes of photosynthesis. Components of the photosynthetic electron transport chain. Mechanisms of photosynthetic oxygen evolution and photophosphorylation. Relationship between the structural organization of the photosynthetic apparatus and its functional activity.

Topic / Module 3: Changes in the photosynthetic apparatus under various abiotic stress factors. Molecular mechanisms of plant adaptation to environmental changes.

Topic / Module 4: Laboratory exercises: fractionation of subcellular structures; absorption and fluorescence spectroscopy; polarographic method for determining the photochemical activity of the electron transport chain; determination of oxygen yields under flash and continuous illumination.

Teaching and assessment methods

Lectures and exercises

Evaluation after interview with the doctoral student.

Competencies acquired as a result of training (3–5 points):

- Study of the organization and processes occurring in photosynthetic membranes, along with a discussion of how environmental changes influence their structure and functional activity.
- Introduction to some biophysical methods for studying the functional activity of the photosynthetic apparatus.
- Introduction to methods for isolating the components of the photosynthetic apparatus.
- Influence of abiotic environmental stress factors on the structure and functional activity of the photosynthetic apparatus.

Literature:

- Staehelin, L.A., van der Staay, G.W.M. (1996). Structure, Composition, Functional Organization and Dynamic Properties of Thylakoid Membranes. In: Ort, D.R., Yocum, C.F., Heichel, I.F. (eds) Oxygenic Photosynthesis: The Light Reactions. Advances in Photosynthesis and Respiration, vol 4. Springer, Dordrecht. https://doi.org/10.1007/0-306-48127-8_2
- https://www.britannica.com/science/photosynthesis/The-light-reactions
- J.Chauhan , M.D. Prathibha, P. Singh et al. (2023) Plant photosynthesis under abiotic stresses: Damages, adaptive, and signaling mechanisms, Plant Stress, 10, 100296
- W. F.J .Vermaas, Photosynthesis and Respiration in Cyanobacteria, ENCYCLOPEDIA OF LIFE SCIENCES © 2001, John Wiley & Sons, Ltd. www.els.net

Additional information:

The lecture course and laboratory exercises are suitable for doctoral students in biophysics, biology, plant physiology, and biotechnology