



OPIS PREDMETA / SUBJECT SPECIFICATION

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| Predmet: | Izbor iz fiziološke ekologije rastlin |
| Subject Title: | Selection in Physiological Plant Ecology |

| Študijski program Study programme | Študijska smer Study field | Letnik Year | Semester Semester |
|---|-------------------------------|--------------------------|----------------------------|
| Doktorski študij Ekološke znanosti / Doctoral Study Ecological Sciences | | Izbirni 1 ali 2 ali 3 | 2 ali 3 ali 4 ali 5 |

Univerzitetna koda predmeta / University subject code:

| Predavanja Lectures | Seminar Seminar | Sem. vaje Tutorial | Lab. vaje Lab. work | Teren. vaje Field work | Samost. delo Individ. work | ECTS |
|------------------------|--------------------|-----------------------|------------------------|---------------------------|-------------------------------------|------|
| 5 | | | 5 | | 140 | 5 |

Nosilec predmeta / Lecturer:

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|------------------------|-----------------------|-----------------------|
| Jeziki / Languages: | Predavanja / Lecture: | slovenski / Slovenian |
| | Vaje / Tutorial: | slovenski / Slovenian |

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Poznavanje fiziološke ekologije rastlin na ravni univerzitetnega programa

Prerequisites:

Knowledge of physiological plant ecology at graduate level

Vsebina:

V predmetu so podrobno obravnavana izbrana poglavja iz vpliva naravnih in antropogenih stresnih dejavnikov na fiziološke procese v rastlini iz naslednjih sklopov. Pomanjkanje in prekomerna svetloba. UV žarčenje. Pomanjkanja in prebitek vode. Ekstremne temperature. Pomanjkanje in problem prekomernih koncentracij soli. Mehanske poškodbe. Onesnaževanje z atmosferskimi oksidanti in ksenobiotiki. Vpliv radioaktivnosti v okolju na rastline.

- Funkcijske motnje celičnega metabolizma
 - Toksični efekti kisika na rastline
Tvorba prostih kisikovih radikalov, reakcije v celici
 - Motnje v metabolizmu ogljika
Vplivi okoljskih dejavnikov na fotosintezo, fotorespiracijo, dihanje ter pretok in porabo ogljikovih hidratov v rastlini
 - Motnje v mineralni prehrani
Vpliv okolja na presnovo mineralov; motnje v preskrbi; vpliv na simbiozo z rizosfernimi mikroorganizmi; podrobneje so izpostavljene motnje v privzemu, asimilaciji ter transportu žvepla, amonija in nitrata ter vgradnja v ogljikove spojine
 - Odzivi rastlin na stresne dejavnike
Obrambni in reparaturni mehanizmi, detoksifikacija prostih kisikovih radikalov z antioksidanti in encimi; aktualna dognanja o

Contents (Syllabus outline):

The lecture focuses on selected chapters on the impact of natural and anthropogenic stress factors on physiological processes in plants. The following chapters are discussed: Deficiency and excess of light. UV radiation. Deficiency and excess of water. Extreme temperatures. Deficiency and high concentrations of minerals. Mechanical effects. Pollution with atmospheric oxidants and xenobiotics. The impacts of environmental radioactivity on plants.

- Functional disturbances of cell metabolism
 - Toxic effects of oxygen on plants
Formation of reactive oxygen species and reactions in the cell
 - Disturbances in carbon metabolism
The influence of external factors on photosynthesis, photorespiration, respiration, the translocation and utilization of photosynthates in plants
 - Disturbances in mineral nutrition
Habitat-related aspects of mineral metabolism; the disturbances in supply; the impact on symbiosis with the microorganisms in rhizosphere; the chapter focuses on the disturbances in the uptake, assimilation and transport of sulphur, ammonium ions and nitrate and their incorporation into carbon compounds
 - The response of plants to stress factors

vlogi glutationa, askorbinske kisline, tokoferola in karotinooidov v obrambi pred oksidativnim stresom

- Bioindikacija onesnaževanja okolja
Reakcijski in akumulacijski indikatorji, kazalci in testni organizmi, metode biomonitoringa

Defense and reparatory mechanisms, detoxification of reactive oxygen species with antioxidants and enzymes; recent advances in the role of glutathione, ascorbate, tocoferol and carotinooides in defense against oxidative stress

- Bioindication of pollution impacts
Response and accumulation indicators, indicators and test organisms, biomonitoring methods

Temeljni študijski viri / Textbooks:

- Brunold, Ch., A. Rügsegger, R. Brändle, 1996: Stress bei Pflanzen. Verlag Paul Haupt, Stuttgart.
- Grill, D., M. Tausz, L. J. De Kok, 2001: Significance of glutathione to plant adaptation to the environment. Kluwer academic publishers, Dordrecht.
- Inzé, D., M. Van Montagu, 2002: Oxidative stress in plants. Taylor & Francis, Inc., New York.
- Larcher, W., 1991: Physiological Plant Ecology. Springer, Heidelberg.
- Taiz, L., E. Zeiger, 2002: Plant Physiology. Sinauer Associates, Inc., Publishers, Sunderland, Massachusetts.
- Varma, A., R. P. Beckett, I. Kranner, 2002: Protocols in Lichenology: Culturing, Biochemistry, Ecophysiology, and Use in Biomonitoring. Springer, Heidelberg.

Cilji:

- Posebna pozornost je posvečena izbranim odzivom rastlin na izbrane okoljske dejavnike
- Obravnava izbranih toksičnih učinkov kisika
- Obravnava funkcijskih motenj celičnega metabolizma
- Obravnava izbranih simptomov poškodb na nivoju celic in celega organizma
- Obravnava v izbrane obrambne in reparaturne mehanizme
- Obravnava z izbrano rastlinsko bioindikacijo onesnaževanja okolja
- Obravnava izbranih analitičnih metod v ekofiziologiji in stresni fiziologiji rastlin

Objectives:

- Special attention is paid to the selected responses of plants to stress factors
- Illustration of selected toxic effects of oxygen
- Discussin selected functional disturbances in cell metabolism
- Illustration of selected injury patterns and symptoms on cell and whole plant level
- Discussing selected defense and reparatory mechanisms
- Discussin selected plant bioindication of pollution
- Discussin selected analytical measurements in ecophysiology and stress physiology of plants

Predvideni študijski rezultati:

Znanje in razumevanje:

- Vrhunsko znanje in razumevanje odziva rastlin na izbrane okoljske dejavnike
- Vrhunsko razumevanje toksičnih učinkov kisika
- Vrhunsko poznavanje stresnih faktorjev, prepoznavanje simptomov poškodb in osnovnih obrambnih in reparaturnih mehanizmov
- Usvojitev izbranih metod bioindikacije onesnaževanja okolja z rastlinami

Prenesljive/ključne spretnosti in drugi atributi:

- Pridobitev vrhunskega znanja o principih in metodah v ekofiziologiji in stresni fiziologiji rastlin ter uporaba le tega v praksi

Intended learning outcomes:

Knowledge and Understanding:

- Top-level knowledge and understanding of the response of plants to stress factors
- Top-level understanding of toxic effects of oxygen
- Top-level knowledge of stress factors, identification of injury patterns and symptoms, understanding the basic defense and reparatory mechanisms
- Top-level qualification of selected bioindication of pollution impacts with plants

Transferable/Key Skills and other attributes:

- Achieving Top-level knowledge about the principles and methods in ecophysiology and stress physiology for good practice

Metode poučevanja in učenja:

- Predavanja
- Izbrane fitofiziološke raziskave z uporabo biokemičnih in fizioloških metod v laboratoriju in na terenu s poudarkom na morfologiji in funkciji rastlin pod vplivom okolja
- Samostojno delo

Learning and teaching methods:

- Lectures
- Selected phytophysiological research using biochemical and physiological methods in laboratory and in field with special attention to environmental impacts to plant morphology and functions
- Independent work

Načini ocenjevanja:

- Seminarska naloga in njena predstavitev
- Laboratorijski dnevnik
- Pisni izpit

Delež (v %) /
Weight (in %)30 %
20 %
50 %**Assessment:**

- Seminar essay and its defense
- Diary of laboratory results
- Written exam

Materialni pogoji za izvedbo predmeta :

- *Multimedijska predavalnica*
- *Laboratorij za izvedbo laboratorijskih vaj z ustrezno opremo (svetlobni mikroskop, spektrofotometer, pH-meter, centrifuga, tehnica, steklovina, kemikalije)*

Material conditions for subject realization

- *Lecture hall for multimedia presentations*
- *Laboratory with appropriate equipment (light microscope, spectrophotometer, pH-meter, centrifuge, scale, laboratory glassware, chemicals)*

Obveznosti študentov:*(pisni, ustni izpit, naloge, projekti)*

- Seminarska naloga in njena predstavitev
- Laboratorijski dnevnik
- Pisni izpit

Students' commitments:*(written, oral examination, coursework, projects):*

- Seminar essay and its defense
- Diary of laboratory results
- Written exam