Physiological diseases in plants (YEAR I, SEMESTER I)
Credit value (ECTS) 7

Course category
Domain (Imposed)

Course holder:
Phd. Prof. Carmen Doina JITĂREANU

Discipline objectives (course and practical works)

The course aims to equip future specialists with a wealth of plant nutrition knowledge that will allow them to quickly diagnose the physiological diseases of plants through foliar diagnosis, to train students to recognize the symptoms caused by deficiency or excess of mineral elements in plants, to train students in fair skills and beliefs about the role of chemical analysis in the rational use of fertilizers for controlled production and in the protection and conservation of the environment.

The practical works aim to familiarize students with the work technique in plant physiology laboratories and to know the general notions regarding the knowledge of the absorption and circulation of mineral elements in plants, the knowledge of the physiological role of mineral elements in plant life, the knowledge of different nutritional peculiarities at plant species, knowledge of the main methods of foliar diagnosis of plant physiological diseases.

Contents (syllabus)

Course (chapters/subchapters)
The object of study, the history and the importance of foliar diagnosis.
Introduction 1.1. The importance of foliar diagnosis for determining the nutritional status of plants and the need for fertilizers. 1.2. Classification of mineral elements 1.3. The relationship between mineral nutrition and plant resistance to various biotic and abiotic stress
Absorption and circulation of mineral elements in the plant 2.1. The mechanism of ion uptake at the cellular level 2.2. The root as an absorption organ 2.3. Extraradicular absorption 2.4. Circulation of mineral elements in the plant
Physiological basis of mineral nutrition 3.1. The physiological role of macroelements 3.2. The physiological role of microelements 3.3. The physiological role of the beneficial elements

Causes, evolution and diagnosis of symptoms of deficiency or excess of mineral elements in plants 4.1. Diagnosis of excess and deficiency of macroelements: N, P, K, S, Ca, Mg 4.2. Diagnosis of excess and deficiency of trace elements: B, Mo, Cu, Fe, Mn, Zn, Cl 4.3. Diagnosis of excess and deficiency of beneficial elements: Al, Co, Na, Ni, Si, V, F 4.4. Diagnostic symptoms of the effect of heavy metals on plants
Physiological changes caused by osmotic stress and their manifestation
Difficulties in foliar diagnosis 6.1. Symptoms similar to the lack or excess of the elements and factors that make the diagnosis difficult 6.2. Multiple symptoms
Chemical analysis in foliar diagnosis

Practicum
I. Permeability of cell membranes: - permeable and semi-permeable membranes - turgescence and cellular plasmolysis - permeability to acids and bases - permeability for K + and Ca2 +
Foliar diagnosis of nutrient deficiency and excess in the main agricultural plants by cultivating them in nutrient solution
Preparation of nutrient solutions and plant material (seed germination).
Montarea experienţei în condiţii controlate de fitotron
Observations and determinations during the vegetation period of plants: photosynthetic activity, growth, onset of symptoms
Photographing symptoms, collecting samples and preparing plant material for chemical analysis
Nitrogen identification
Phosphorus identification
Identification of K, Ca, Mg, Na - by atomic absorption spectroscopy (AAS)
Identification of chlorine by potentiometric titration
Identification of heavy metals - by atomic absorption spectroscopy (AAS)
Final colloquium to verify knowledge.

References

1. Bergmann, W., 1992 - Nutritional disorders of plant. Ed Gustav Fischer, Jena
2. Marschner H., 1995 - Mineral nutrition of higer plants. Ed. Academic Press, New York
3. Schubert S., 2006 – Pflanzenernährung. Ed. Ulmer Stuttgart
4. Toma Liana Doina, Robu T., 2000 - Fiziologie vegetală. Edit. "Ion Ionescu de la Brad", Iaşi.
5. Toma Liana Doina, Jităreanu Carmenica Doina, 2000 – Fiziologia plantelor. Edit. "Ion Ionescu de la Brad", Iaşi.
6. Jităreanu Carmenica Doina, 2002 - Fiziologie vegetală. Edit. "Ion Ionescu de la Brad", Iaşi.
7. Toma Liana Doina, Jităreanu Carmenica Doina, 2007 – Fiziologie vegetală. Edit. "Ion Ionescu de la Brad", Iaşi.

8. Jităreanu Carmenica Doina, 2007 – Fiziologia plantelor. Edit. "Ion Ionescu de la Brad", Iaşi.
9. Jităreanu Carmenica Doina, Toma Liana-Doina, Slabu Cristina, Marta Alina Elena, 2011- Lucrări practice de Fiziologia plantelor - Edit. Ion Ionescu de la Brad, Iasi
10. Carmen Doina Jităreanu, Alina Elena Marta, 2018 – Fiziologie vegetală, Manual de studiu pentru studenți, Edit. Ion Ionescu de la Brad Iași, ISBN 978-973-147-302-4
11. Jităreanu Carmen Doina, Marta Alina Elena, 2020 – Lucrări practice de fiziologia plantelor, vol. I, Edit. "Ion Ionescu de la Brad", Iaşi, ISBN: 978-973-147-356-7.

Evaluation

Evaluation form	Evaluation Methods	Percentage of the final grade
Exam	Written examination	60%
Appreciation of the activity during the semester	Oral assessment during the semester, verification tests and final laboratory colloquium.	40%

Contact

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