Course Unit Descriptor

Study Programme: Phytomedicine

Course Unit Title: Basics of herbicide resistance and atiresistance strategies

Course Unit Code: 19.AGR158

Name of Lecturer(s): Full professor Maja Meseldžija

Type and Level of Studies: Doctoral academic study

Course Status (compulsory/elective): elective

Semester (winter/summer):summer

Language of instruction: English

Mode of course unit delivery (face-to-face/distance learning): Face-to-face

Number of ECTS Allocated:7

Prerequisites: Basis of Phytopharmacy, Herbicides

Course Aims:

Introducing students to the causes and mechanisms underlying the development of herbicide resistance, with the aim of enabling them to apply herbicides rationally and to implement chemical and alternative weed control measures within the concept of integrated pest management. The focus is on selecting appropriate herbicides according to their mode of action that can be incorporated into modern sustainable agriculture programs, as well as on implementing anti-resistance strategies to prevent the emergence of resistance and prolong the effectiveness of herbicides.

Learning Outcomes:

Developing competence in new methods for detecting resistance, understanding the issues related to the development and mechanisms of resistance, and implementing chemical, biological, and alternative agents in accordance with the principles of anti-resistance strategies. The knowledge provided in this course builds upon previously acquired foundations in the field of phytopharmacy, with the aim of achieving more effective and improved protection of agricultural products.

Syllabus:

Theory

The concept and historical development of herbicide resistance. Biological bases of resistance. Physiological aspects of resistance (enhanced metabolism, herbicide detoxification, changes in the target site). Genetic changes as the basis of resistance and inheritance patterns. Factors influencing the development of resistance. Determination of resistance (biological, biochemical, and molecular methods). Resistance to PSII inhibitor herbicides. Resistance to ALS-inhibiting herbicides. Resistance to mitosis inhibitors. Resistance to ACCase inhibitors. Glyphosate resistance. Cross-resistance. Multiple resistance. Current status and geographical distribution of resistance. GM crops – global socio-economic and environmental impacts. Glyphosate-resistant crops: history, status, and future prospects. Herbicide-tolerant crops. Gene transfer from tolerant crops to wild relatives within weed populations. Impact of resistance on weed control and crop rotation. Anti-resistance strategy.

Research

Analysis of existing herbicide application models in weed control; development of original herbicide application models as part of weed management practices in accordance with the principles of anti-resistance strategies.

Required Reading: Janjić, V. (2018): Rezistentnost korovskih biljaka na herbicide. Akademija nauka i umjetnosti Republike Srpske, Herbološko Društvo Srbije, Banja Luka-Beograd.
Nandula, V. K., & Beffa, R. (Eds.). (2025). Resistance in Weeds from Herbicide Metabolism. John Wiley & Sons.

Weekly Contact Hours:6	**Lectures:4**	**Practical work:2**

Teaching Methods:

Visual - didactic methods with the use of modern teaching aids and laboratory equipment. Practical classes - individual work of students and demonstrative - illustrative methods

Knowledge Assessment (maximum of 100 points):			
Pre-exam obligations	points	**Final exam**	points
Active class participation	10	written exam	20
Practical work		oral exam	50
Preliminary exam(s)	20	…….	
Seminar(s)			
The methods of knowledge assessment may differ; the table presents only some of the options: written exam, oral exam, project presentation, seminars, etc.			