SZKOŁA GŁÓWNA GOSPODARSTWA WIEJSKIEGO

Plant resistance to harmful arthropods - yesterday, today, tomorrow

Educational subject description sheet

Basic information

Field of study Biotechnology	**Didactic cycle** 2024/25
Speciality -	**Subject code** BBTBTjS_D.320K.01629.24
Organizational unit Faculty of Biology and Biotechnology	**Lecture languages** english
Study level first cycle (engineering degree)	**Mandatory** Elective subjects
Study form full-time studies	**Block** Major subjects
Education profile General academic	**Disciplines** Biological sciences

Coordinator	Małgorzata Kiełkiewicz-Szaniawska
Teacher	Małgorzata Kiełkiewicz-Szaniawska

Period	**Examination**	**Number of ECTS points**
Semester 6	Pass with grade **Activities and hours** Lecture: 10 Laboratory exercises: 5	1

Goals

Code	Goal
C1	Teaching the phenomenon of plant resistance to herbivorous invertebrates (e.g. pests) and its classification (mechanisms/ categories/ types); Extending the knowledge related to factors determining constitutive plant resistance to pests; Discussing the conditions for induced plant resistance, including different signaling pathways, the involvement of effectors and elicitors, as well as the priming phenomenon; Indicating the phenomenon of indirect plant resistance and the conditions necessary for it to emerge, as well as presenting the effectiveness of this phenomenon in the reduction of pest population density; Indicating the sources of plant pest resistance and the possibilities of using transgenic plants; Discussing the importance of plant pest resistance in integrated crop protection based on case studies.

Entry requirements

Basic knowledge on invertebrate animals and plant biochemistry.

Subject's learning outcomes

Code	Outcomes in terms of	Effects	Examination methods
Knowledge – Student knows and understands:			
W1	the mechanisms of plant resistance against invertebrate herbivores	BTj_K3_W09	Report, Test (written or computer based), Assessment of activity during classes
W2	the methods and technics used to assess plant resistance against pests	BTj_K3_W10, BTj_K3_W13_inz	Report, Test (written or computer based), Assessment of activity during classes
Skills – Student can:			
U1	choose the proper method to assess plant resistance against a pest	BTj_K3_U11_inz	Report, Assessment of activity during classes
U2	collect, analyze and explain the results, as well as use internet and library databases to interpret them	BTj_K3_U21, BTj_K3_U22	Report, Assessment of activity during classes
Social competences – Student is ready to:			
K1	prepare and use new methods/ technologies to increase the quality of crop production	BTj_K3_K01	Report, Assessment of activity during classes
K2	work individually and in a team	BTj_K3_K02	Report, Assessment of activity during classes
K3	take the responsibility for the quality of crop production and the natural and agricultural environments	BTj_K3_K04	Report, Assessment of activity during classes

Study content

No.	Course content	Subject's learning outcomes	Activities
1.	The current vs. the historical definitions of plant resistance against pests – categories vs types of resistance. Mechanisms of constitutive resistance – antixenosis, anibiosis, tolerance. Induced resistance and the conditions necessary for it to emerge – signaling pathways, priming phenomenon, effectors and elicitors. Indirect resistance – definitions, the necessary conditions for it to emerge and its effectiveness in decreasing pest population density. Sources of plant resistance against pests. The relevance of plant resistance against pests (constitutive, induced, indirect) in integrated pest management systems.	W1, W2	Lecture
2.	Practical assessment of constitutive and induced pest resistance in various plant species. Individual and team work on the development and distribution of chosen insect/ mite species on a variety of plant species/ cultivars. Identification of plant injuries caused by a given pest feeding. Discussion of results and preparation of individual reports.	U1, U2, K1, K2, K3	Laboratory exercises

Course advanced

Activities	Methods of conducting classes
Lecture	Lecture, Problem lecture
Laboratory exercises	Case study, Teamwork, Individual work, Laboratory (experiment), learning by experiment

Activities	Examination method	Percentage
Lecture	Test (written or computer based)	70%
Laboratory exercises	Report	25%
Laboratory exercises	Assessment of activity during classes	5%

Activities	Credit conditions
Lecture	To pass the student must receive at least 51% of the total points
Laboratory exercises	To pass the student must receive at least 51% of the points

Literature

Obligatory

1. Smith M.C. 2005. Plant Resistance to Arthropods. Molecular and Conventional Approaches. Springer. The Netherlands

Optional

1. Stout M. 2013. Reevaluating the conceptual framework for applied research on host-plant resistance. Insect Sci. 20(3):263-72. doi: 10.1111/1744-7917.12011
2. Schaller A. 2008. Induced Plant Resistance to Herbivory
3. Stenberg J.A., Muola A. 2017. How should plant resistance to herbivores be measured?. Front. Plant Sci. 8: 863
4. Mitchell C, Brennan RM, Graham J, Karley AJ. 2016. Plant Defense against Herbivorous Pests: Exploiting Resistance and Tolerance Traits for Sustainable Crop Protection. Front Plant Sci. 29;7:1132. doi: 10.3389/fpls.2016.01132

Calculation of ECTS points

Activity form	**Activity hours***
Lecture	10
Laboratory exercises	5
Preparation for the exam	8
Preparing a report	2
Student workload	**Hours** 25
Number of ECTS points	**ECTS** 1

* hour means 45 minutes

Effects

Code	Content
BTj_K3_K01	The graduate is ready to proper storage of data, updating and extending knowledge on topics related to biotechnology and the related sciences;
BTj_K3_K02	The graduate is ready to development and application of one’s skills in practice (including communication, teamwork), which enable effective lifelong learning with respect to biological sciences;
BTj_K3_K04	The graduate is ready to initiating and actively participating in the development and implementation of research and social projects;
BTj_K3_U11_inz	The graduate can able to assess the usefulness of the available methods or devices and propose potentially the best solution when solving a practical problem related to the technological utilisation of biological material;
BTj_K3_U21	The graduate can coping with understanding, planning and analysing; being able to interpret and report biological data acquired while working individually and in a group;
BTj_K3_U22	The graduate can find and assess information from various sources, including from original research, and present in a well organised manner (e.g. essays, reports and laboratory reports);
BTj_K3_W09	The graduate knows and understands living organisms and their place in the natural environment, and how they can be used for the good of humanity;
BTj_K3_W10	The graduate knows and understands terms, principles and theories related to processes and mechanisms which have shaped the world of nature, knowing how they can be used efficiently;
BTj_K3_W13_inz	The graduate knows and understands the importance of processes necessary to asses and initiate research in the field of biotechnology;