

COURSE OF STUDY *Master course in Plant Medicine (LM69)*

ACADEMIC YEAR 2023-2024

ACADEMIC SUBJECT *Agricultural acarology and nematology*

General information	
Year of the course	I year
Academic calendar	I semester (25.09.2023 – 19.01.2024)
Credits (ETCS):	6
SSD	General and applied entomology - AGR/11
Language	Italian
Mode of attendance	Not mandatory but highly suggested

Professor/ Lecturer	
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Virtual room	Teams code for tutoring: hpfrxfj
Office Hours	Wednesday, Thursday and Friday from 11.30 am to 1.30 pm, after a request of appointment by mail or phone. Tutoring could be also made through the most common applications.

Work schedule			
Hours			
Total	Lectures	Hands-on (laboratory, workshops, working groups, seminars, field trips)	Out-of-class study hours/Self-study hours
150	32	28	90
ETCS			
E6	4	2	

Learning Objectives	To provide advanced knowledge and train specialized professional skills appropriate for carrying out complex planning and management activities for the protection of food and no-food crops and plant products (Integrated Crop Management, ICM; Integrated Pest management, IPM). The qualified educated students should be able to plan and manage Good Agricultural Practice (GAP) and innovative methodologies capable of ensuring the safety of the environment, operators and consumers, the quality, wholesomeness and food safety of plant-derived products and the reduction of waste, combining economics, ethics and sustainability.
Course prerequisites	General and applied biological and zoological knowledge

Teaching strategie	The teaching topics will be delivered by face-to-face teaching by offering numerous examples and using Power Point presentations and videos. Students will be accompanied in the acquisition of knowledge with the performance of classroom and laboratory exercise activities with the aim of having them achieve their own autonomy of investigation, observation, evaluation of the material examined and communication of the outcomes of these exercise activities.
Expected learning outcomes in terms of	

<p>Knowledge and understanding on:</p>	<ul style="list-style-type: none"> ○ knowledge and skills necessary for understanding the morphology, bio-ethology and ecology of plant nematodes and mites, induced symptomatology as well as their antagonists ○ knowledge and skills necessary for understanding the principles of integrated and biological control of crops and vegetable products from plant nematodes and mites, and related national and international regulations
<p>Applying knowledge and understanding on:</p>	<ul style="list-style-type: none"> ○ knowledge and skills necessary for the identification and characterization of plant nematodes and mites, also on the basis of induced symptoms, as well as their antagonists using traditional and advanced methods and techniques, including biotechnology ○ knowledge and skills necessary for the implementation of direct and indirect (symptom-based) monitoring programs of plant nematodes and mites ○ knowledge and skills needed for the innovative design and management of integrated protection of crops and plant products from plant nematodes and mites to improve the quality, quantity, and sanitation aspects of crop production, storability and marketing
<p>Soft skills</p>	<ul style="list-style-type: none"> • <i>Making informed judgments and choices</i> <ul style="list-style-type: none"> ○ ability to understand the biological, ethological and ecological phenomena that determine the success of plant nematodes and mites ○ ability to apply corrective interventions that limit the success of plant nematodes and mites in new production contexts • <i>Communicating knowledge and understanding</i> <ul style="list-style-type: none"> ○ ability to transfer knowledge about plant nematodes and mites, their antagonists, and the biological, ethological and ecological phenomena that determine their success • <i>Capacities to continue learning</i> <ul style="list-style-type: none"> ○ ability to deepen and update their knowledge regarding plant nematodes and mites, their antagonists, biological, ethological and ecological phenomena involving them in the context under consideration.
<p>Syllabus</p>	
<p>Content knowledge</p>	<p>General nematology with particular regard to the plant feeders: morphology and anatomy, dimorphism; biology and behaviour, life history and reproductive strategies, biological strains, resistance stages, dispersion; population dynamics; interactions between phytophagous nematodes and abiotic and biotic factors; symptoms and injuries (morphological, biochemical and physiological alterations induced by nematodes on their host plants); relationships between plant nematodes and plant pathogens; defence mechanisms of plants against nematodes; agronomic, physical, natural, biological and chemical control and its problems.</p> <p>Main plant nematodes: <i>Meloidogyne</i> spp., <i>Globodera rostochiensis</i>, <i>G. pallida</i>, <i>Heterodera schachtii</i>, <i>H. avenae</i>, <i>H. carotae</i>, <i>H. goettingiana</i>, <i>Ditylenchus dipsaci</i>, <i>Aphelenchoides fragariae</i>, <i>A. ritzemabosi</i>, <i>Pratylenchus</i> spp., <i>Tylenchulus semipenetrans</i>, nematodes transmitting viruses, <i>Xiphinema index</i>.</p> <p>General acarology: morphology and anatomy, dimorphism and polymorphism, biology and behaviour, life history and reproductive strategies, diapause and quiescence, dispersion, trophic habit; mutualistic symbiosis; infochemicals; population dynamics; interactions between phytophagous mites and abiotic and biotic factors; symptoms and injuries (morphological, biochemical and physiological alterations induced by nematodes on their host plants); defence mechanisms of plants against mites; agronomic, physical, biological and chemical control and its problems.</p>

	<p>Main phytophagous mites with particular regard to the plant feeders: Laelapidae (<i>Hypoaspis aculeifer</i>), Phytoseiidae (<i>Phytoseiulus persimilis</i>, <i>Amblyseius swirskii</i>), Pyemotidae (<i>Pyemotes</i> spp.), Siteroptidae (<i>Siteroptes</i> spp.), Pygmephoridae (<i>Pediculaster mesembrinae</i>), Tarsonemidae (<i>Steneotarsonemus pallidus</i>, <i>Polyphagotarsonemus latus</i>), Penthaleidae (<i>Penthaleus major</i>), Tenuipalpidae (<i>Brevipalpus lewisi</i>), Tetranychidae (<i>Eotetranychus carpini vitis</i>, <i>Tetranychus urticae</i>, <i>Panonychus ulmi</i>, <i>P. citri</i>), Eriophyoidea (<i>Phytoptus avellanae</i>, <i>Colomerus vitis</i>, <i>Calepitrimerus vitis</i>, <i>Aculops lycopersici</i>, <i>Aculus fockeui</i>), Acaridae (<i>Tyrophagus putrescentiae</i>, <i>T. similis</i>, <i>Rhizoglyphus robini</i>).</p> <p>Literature search, on line keys; support material (book, journals, on line sources). Microscopy and tools. Monitoring and sampling procedures; nematode and mite extraction; storing methods. Nematode and mite preparation for microscopical studies. Identification of nematodes, mites and the related symptoms. Rearing of some species. Efficacy indexes.</p>
Texts and readings	<p>- Lecture notes from lectures and lecturer's handout Study outlines: presentations and other lecture materials distributed during the course of lectures</p> <p>Additional readings:</p> <ul style="list-style-type: none"> • AA.VV., 2014 - Nematologia Agraria generale e applicate. SIN • Baccetti B., Barbagallo S., Suss L., Tremblay E., 2000 - Manuale di Zoologia agraria. A. Delfino Ed., Roma. • Hoy M.A., 2011 - Agricultural Acarology: Introduction to Integrated Mite Management. CRC Press Inc, 430 pages • Pellizzari Scaltriti G., 2002 - Parassitologia animale dei vegetali. CLEUP Editore. <p>Zhang Z.-Q., 2003 - Mites of greenhouses. Identification, biology and control. CABI Publishing, Wallingford, UK.</p>
Notes, additional materials	<p>WARNINGS: The student is advised that an Italian-language text that covers all course topics together in a thoughtful manner is not suggested since notions about the various aspects of teaching can be found in a fragmentary or specialized way in Italian and foreign journals.</p>
Repository	<p>Students can obtain copies of the handout and presentations used during lectures, including lab application protocols, by accessing the MSTeams platform.</p>

Assessment	
Assessment methods	<p>The teaching includes a midterm learning verification (not compulsory and concerning only students enrolled in the first year of the course), completion of the exam at the end of the teaching (only for students who have successfully taken the midterm), and the profit exam (for all students who have not taken a midterm). The mid-term verification will cover the topics covered up to half of the teaching (agricultural nematology or acarology) while the completion of the verification will cover the remaining topics. The final assessment will be given by the average of the grades. The verification will be carried out in the form of an interview regarding the topics developed during the theoretical and theoretical-practical lectures in the classroom and laboratory, as stated in the Didactic Regulations of the Master of Science Degree Course in Plant Medicine (Art. 9) and in the study plan (Annex A), proportionate to the number of ECTS assessed.</p> <p>A minimum of four questions will be asked of which two on the general part and two on the special part of nematology and acarology.</p>

	<p>The evaluation of the student's preparation is based on predetermined criteria as detailed in Annex A of the Didactic Regulations of the Master of Science in Plant Medicine Degree Course.</p> <p>The sufficiency will be achieved when the student demonstrates knowledge of the morphology and bio-ethology of a mite and a nematode, distinguishing the taxon to which they belong and the ecological class, performing a context analysis by proposing the most appropriate integrated and biological management practices for the protection of phytophagous organisms and biodiversity conservation practices for species that have significance in natural and biological control.</p>
<p>Assessment criteria</p>	<ul style="list-style-type: none"> • <i>Knowledge and understanding</i> <ul style="list-style-type: none"> ○ describe the morphological, biological, ecological and ethological characteristics of plant nematodes and mites as well as their antagonists ○ describe and evaluate the principles of integrated protection of crops and plant products from plant nematodes and mites and related national and international regulations • <i>Applying knowledge and understanding</i> <ul style="list-style-type: none"> ○ be able to identify plant nematodes and mites as well as their antagonists, including on the induced symptoms ○ be able to prepare a monitoring plan for plant nematodes and mites ○ be able to design and execute a plan for integrated protection of crops and plant products from plant nematodes and mites to improve the quality, quantity and sanitation aspects of plant production, storability and marketing • <i>Autonomy of judgment</i> <ul style="list-style-type: none"> ○ express reasonable hypotheses for intervening on factors that may induce plant nematode and mite success ○ evaluate the design and implementation of remedial interventions that limit the success of plant nematodes and mites in production settings • <i>Communicating knowledge and understanding</i> <ul style="list-style-type: none"> ○ comprehensively describe and illustrate, with appropriateness in terms, with rich examples and with connections the aspects that characterize the success of plant nematodes and mites • <i>Communication skills</i> <ul style="list-style-type: none"> ○ ability to organize acquired knowledge in the form of presentation and articulation of discourse for didactic-educational purposes • <i>Capacities to continue learning</i> <ul style="list-style-type: none"> ○ adapt the basic cognitive tools acquired during the course of education to explain and solve multiple application problems and diverse case studies
<p>Final exam and grading criteria</p>	<p>The evaluation of the midterm/final verification and profit examination is expressed in 30ies, and the examination is considered passed when the grade is greater than or equal to 18. Successful completion of the midterm examination is valid for the academic year.</p> <p>The final grade will be formulated on the basis of the knowledge acquired by the student, the ability to analyze and process possible field situations as well as the potential actions required by the situations addressed during the interview. To achieve a high final grade, the student must have developed autonomy of judgment, adequate argumentation and exposition skills. Honors will be granted in case of clarity and comprehensiveness of exposition, accompanied by a manifest ability to go into depth.</p>



Further information