



General information	
Academic subject	Module of Agricultural acarology and nematology I.C. Agricultural acarology, nematology and weed management
Degree course	Master course in Plant Medicine (LM69)
Academic Year	2021-2022
European Credit Transfer and Accumulation System (ECTS)	6
Language	Italian
Academic calendar (starting and ending date)	first semester (27 September 2021 – 21 January 2022)
Attendance	Not mandatory but highly suggested

Professor/ Lecturer	
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Virtual headquarters	Teams code for tutoring: hpfrxfj
Tutoring (time and day)	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.

Syllabus	
Learning Objectives	To provide advanced knowledge and high-level skills' training professionals specialized in carrying out complex planning activities concerning the management and protection of crops and produce. These qualified scientists should be able to plan and manage Good Agricultural Practices and innovative methodologies with the goal of keeping plants and vegetables healthy and, thereby, ensuring the safety of the environment, operators, and consumers alike, food quality, as well as waste reduction. This would be done by considering both economics and ethics and facing the many challenging problems of sustainable plant protection.
Course prerequisites	General and applied biological and zoological knowledge
Contents	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. 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. ritzema-bosi</i> , <i>Pratylenchus</i> spp., <i>Tylenchulus semipenetrans</i> , nematodes transmitting viruses, <i>Xiphinema index</i> .



	<p>General acarology: morphology and anatomy, dimorphism and polymorphism, biology and behavior, 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>
<p>Books and bibliography</p>	<ul style="list-style-type: none"> • Notes of the lectures <p>Study schemes:</p> <ul style="list-style-type: none"> • presentations and other didactic material provided during the lessons <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 • Krantz G.W., Walter D.E., 2009 - A Manual of Acarology. Texas Tech University Press • Laffi F., Ponti I., 1997 - Acari dannosi alle piante. Schede fitopatologiche. Inf. Agr. ed. • Pellizzari Scaltriti G., 2002 - Parassitologia animale dei vegetali. CLEUP Editore. • Zhang Z.-Q., 2003 - Mites of greenhouses. Identification, biology and control. CABI Publishing, Wallingford, UK.
<p>Additional materials</p>	<p>Students can get a copy of all presentations utilized for lectures, including also those eventually needed for the practical activities, downloading them through the repository at the ATutor digital platform on the website http://tempus-it.agrif.bg.ac.rs/login.php.</p> <p>There is not a text in Italian language which treats all topics of the present discipline. Information is fragmented or too specialist on Italian and International Journals and books.</p>



Work schedule			
Total	Lectures	Hands on (Laboratory, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
Hours			
60	32	28	90
ECTS			
	4	2	
Teaching strategy		The subjects are provided by lectures with several examples and illustrations by means of Power Point presentations and movies. Understanding of student knowledge will be assisted by practical drills in the classroom and laboratory aimed at allowing the achievement of student own skills in investigations, observations, evaluations of samples and communication of the results of these practical drills.	
Expected learning outcomes			
Knowledge and understanding on:		<ul style="list-style-type: none"> ○ Knowledge and understanding of the morphological, bio-ethological and ecological aspects concerning phytophagous nematodes and mites, and their natural enemies ○ Knowledge and understanding of the basic aspects of the integrated plant and product protection from phytophagous nematodes and mites, and the national and international related norms 	
Applying knowledge and understanding on:		<ul style="list-style-type: none"> ○ Knowledge and understanding for the identification and characterization of phytophagous nematodes and mites, also based on the induced symptoms, and their natural enemies, by means conventional and advanced methods and techniques, included biotechnologies ○ Knowledge and understanding for the application of direct and indirect (based on the symptoms) monitoring plans of phytophagous nematodes and mites ○ Knowledge and understanding for planning and managing the IPM of the crops and their products from phytophagous nematodes and mites in order to improve the qualitative, quantitative and sanitary aspects of the products as well as their storing and marketing 	
Soft skills		<ul style="list-style-type: none"> ● <i>Making informed judgments and choices</i> <ul style="list-style-type: none"> ○ Ability of understanding biological, ethological and ecological phenomena which allow the success of these plant feeders ○ Ability of application of treatments able to limit the development of phytophagous nematodes and mites in the considered context ● <i>Communicating knowledge and understanding</i> <ul style="list-style-type: none"> ○ Ability of spreading knowledge on phytophagous nematodes and mites, their natural enemies, and the biological, ethological and ecological phenomena of these plant feeders in the considered context ● <i>Capacities to continue learning</i> <ul style="list-style-type: none"> ○ Ability of updating the own knowledge on phytophagous nematodes and mites, their natural enemies, and the biological, ethological and ecological phenomena involving these plant feeders in the considered context 	

Assessment and feedback



<p>Methods of assessment</p>	<p>Only the students enrolled in the academic year during which this module is offered can have an intermediary exam during the teaching period of this module. The result of this intermediary exam concurs to the final evaluation of the student. The intermediary exam will be given on the subjects treated during the lessons (Nematology or Acrology) and the practical activities as reported in the Didactic Regulation in Plant Medicine (art. 9) and syllabus (annex A) and which is correlated to the actual teaching period. At the end of the module teaching period, the students, who passed positively the intermediary exam, can give the final exam concerning on the subjects treated during the lessons and the practical activities since the intermediary exam, as reported in the Didactic Regulation in Plant Medicine (art. 9) and syllabus (annex A) and which is correlated to the actual teaching period.</p> <p>Students who did not pass or give the intermediary exam will be examined on the whole subjects treated during the lessons and the practical activities as reported in the Didactic Regulation in Plant Medicine (art. 9) and syllabus (annex A) and which is correlated to the actual teaching period.</p> <p>A minimum of four oral questions will be proposed to the student; two questions will regard general aspects of acarology and nematology, two of them will regard topics treated in the special parts of nematology and acarology.</p> <p>The evaluation of the student is based on criteria previously fixed such as reported in the Annex A of the Didactic Regulation in Plant Medicine.</p> <p>The exam for foreign students can be given in English according to the above reported modalities.</p> <p>The exam will be considered passed when the student will be able to demonstrate to know the morphology and the bio-ethology of mites and nematodes, distinguishing the taxon and the ecological class, making the context analysis and proposing the best practices of the integrated and biological management for plant protection, taking care to preserve biodiversity of the natural enemies of plant feeders.</p>
<p>Evaluation criteria</p>	<ul style="list-style-type: none"> • <i>Knowledge and understanding</i> <ul style="list-style-type: none"> ○ Description of the basic morphological, biological, ecological and ethological characteristics of the phytophagous nematodes and mites, and their natural enemies ○ Description and evaluation of the basic aspects of the integrated plant and product protection from phytophagous nematodes and mites, and the national and international related norms • <i>Applying knowledge and understanding</i> <ul style="list-style-type: none"> ○ identification phytophagous nematodes and mites, and their natural enemies, also on the basis of the symptoms ○ planning the monitoring of phytophagous nematodes and mites ○ planning an integrated protection strategy of crop and products from phytophagous nematodes and mites in order to improve the qualitative, quantitative and sanitary aspects of the products, as well as their storing and marketing • <i>Autonomy of judgment</i> <ul style="list-style-type: none"> ○ formulation of potential treatments on the factors favouring the success of phytophagous nematodes and mites ○ evaluation of the planning and corrective treatments able to limit the success of phytophagous nematodes and mites • <i>Communicating knowledge and understanding</i>



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	<ul style="list-style-type: none"> ○ exhaustive description and illustration, with appropriateness of terms, richness of examples and correlation of the basic aspects which favour the success of phytophagous nematodes and mites ○ ability to organize the acquired knowledge in form of didactic presentation and to articulate it for didactic purposes ● <i>Capacities to continue learning</i> <ul style="list-style-type: none"> ○ adaptation of the basic cognitive tools acquired during the module to explain and solve numerous applied problems and diversified case of study
<p>Criteria for assessment and attribution of the final mark</p>	<p>The evaluation of the intermediate / final exam is expressed in thirties and the exam is passed when the grade is greater than or equal to 18. The positive outcome of the intermediate exam is valid for the academic year.</p> <p>The final grade will be formulated based on the knowledge acquired by the student, the ability to analyse and elaborate possible field situations as well as the potential actions required by the situations faced during the interview. To achieve a high final evaluation, the student must have developed independent judgment, adequate argumentation, and presentation skills. Honours will be granted in the event of clarity and completeness of the exposition, accompanied by a clear capacity for in-depth analysis.</p>
<p>Additional information</p>	