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Annex 1

INTERNATIONAL JOINT PhD PROGRAM IN "PLANT HEALTH IN SUSTAINABLE AGRICULTURE" (PHiSA)

Learning outcomes of the PhD study programme

1. Demonstrate the mastery of skills to critically apply range of existing theories, methods and tools for ensuring plant health in sustainable agriculture

2. Demonstrate the ability to conceive, design and conduct research and publish the results in high-ranking journals with the aim of disseminating new knowledge and to apply new knowledge and skills

3. Critically analyze and evaluate the results of its own scientific research, interpret and argue against larger and more complex social groups and present the latest technical, technological and socio-economic knowledge in the field of plant health in sustainable agriculture

4. Actively participate in the preparation of studies, project proposals, strategic and operational documents in the field of plant health in sustainable agriculture

5. Create new proposals (individually and/or in teams) to solve the problem related to plant health following the principles of sustainability in changing and unknown environmental, productive, economic and socio-political conditions and circumstances

6. Individually suggest and take part in the adoption of measures for agricultural, environmental and rural development policies related to plant health.

7. Follow, synthesize and evaluate national and international scientific and professional literature and to evaluate the scientific and professional work in the field of plant health

Learning outcomes of the focus areas

Focus area 1: Diagnosis in plant health

- Apply various advanced diagnostic methods in plant prejudicial organism detection in relation to their reliability, cost and ease use
- Select, develop, set up and validate the appropriate methods of monitoring of plant materials and soil so as identification methods in order to determine the level of plant prejudicial organisms
- Analyze and identify the reasons for the appearance of certain pathogens and plant feeders

- Design and compare plant protection measures in conventional, integrated and organic agricultural production for their efficiency with regard to environmental impact, and operator and consumer safety

- Explain the principles and evaluate the potentiality of application of precision agriculture in IPM

- Create/design and conduct field and laboratory research in the area of IPM

Focus area 2: Sustainable use of pesticides

- Appraise and revise the most important pesticide properties, efficiency, safety of application, phytotoxicity, resistance, and environmental impact;

- Develop innovative methods in accordance with the comprehensive methods in phytopharmacy

- Predict of pests and disease appearance and assess of their harmfulness, as well as recommend of IPM strategy

- Compare and rate potential impacts and consequences of application of different group of PPPs on agro-ecosystem

- Generate and evaluate new ideas or tactics in system of sustainable use of pesticides.

Focus area 3: Plant feeders

- Judge the importance and analyze morphological and physiological characteristics of plant feeders

- Compare and assess the fundamental principles of plant feeders' phylogeny and systematics

- Discuss and distinguish biological and ecological characteristics of plant feeders

- Argue the molecular mechanisms by which DNA controls development, growth or morphological characteristics of plant feeders, and use of molecular data in pest and resistance management

- Employ, test and design advanced methods of monitoring, collection, identification and damage evaluation of economically important plant feeders

- Predict plant feeders' population size and dynamics based on phenology models

- Interpret the principles of plant feeders' specific adaptations and evaluate host plant resistance mechanisms.

- Assess and develop a pest and resistance management plan based on a modern and sustainable approach which implies a sustainability and preservation of biodiversity

- Formulate major pest damage thresholds, develop surveillance programs and risk maps for major pests and invasive species

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Focus area 4: Plant pathology

- Recognize & differentiate between plant pathogens
- Formulate scientific hypothesis on plant pathology for disease resistance and virulence
- Design disease resistance and pathogenicity experiments based on correct methodology
- Collect Experimental data from in planta experiments
- Rate & Evaluate disease resistance
- Manage and formulate raw data of pathogenicity experiments
- Interpret plant pathology and molecular biology data
- Conclude to scientific results

Focus area 5: Weed science

- Attach weed biology and ecology to sustainable weed management
- Explain weed-crop interaction in agriculture
- Predict weed emergence and develop new methods for weed monitoring and mapping
- Categorize advantages and disadvantages of each weed control method

Focus area 6: Mycotoxins and food safety

- Define the terms food safety, food poisoning, food hazard and mycotoxins
- Identify what might happen if mycotoxin hazards are not controlled
- Recognize the importance of reporting food safety hazards regarding mycotoxins and the importance of implementing procedures to control mycotoxins
- Identify and describe the present worldwide status on mycotoxin contamination in food and feed
- Define and describe the methodology of classical, molecular and chemical identification of mycotoxigenic fungi
- Define and describe mycotoxin risk assessment and the epidemiology of mycotoxigenic fungi at pre- and post-harvest level
- Design experiments based on the epidemiology of mycotoxigenic fungi
- Describe the classical and new methods on the identification of mycotoxins in food and feed
- Describe and analyze mycotoxin prediction modeling at pre- and post-harvest level of food production

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- Develop an integrated pest management approach to prevent mycotoxins
- Collect and analyze data from the experimentation on mycotoxins management strategies
- Identify the costs of poor food safety practices to a business

Focus area 7: General contents of transversal interest

- Categorize basic concepts of scientific research: set-up explicable hypothesis, determine the measurable research goals and design original research in the field of plant health for sustainable agriculture
- Critically analyze and evaluate the results of its own scientific research in sense of scientific writing,
- Evaluate bio-indicators of soil health to interpret interaction among soil organisms in order to value biodiversity
- Access appropriate ecological indices in sustainable agriculture
- Interpret and argue the latest technical, technological and socio-economic knowledge related to plant health in the field of sustainable agriculture
- Create and actively participate in the preparation of studies and project proposals in the field of plant health in sustainable agriculture. Value and analyze project calls to find appropriate call to apply for research funding.
- Organize and apply for patent protection at national and international level and manage the intellectual property rights