Sustainable IPM Technologies for Mediterranean Fruit and Vegetable Crops

CIHEAM-Bari coordinator: Anna Maria D’Onghia
Sustainable IPM Technologies for Mediterranean Fruit and Vegetable Crops

**Aims:**

The programme has been designed to train graduate agronomists, biologists and biotechnologists in modern and sustainable integrated management of economically important pests affecting Mediterranean fruit and vegetable crops.

The programme is structured in 2 parts: the first part, the Master programme, is based on an intensive learning course and on the elaboration of an IPM project; the second part, the Master of Science programme (MSc), is dedicated to the acquisition of research methodologies and to the development of a scientific applied research work.

**Objectives:**

The main objective of the Master programme is to prepare experts able to apply and transfer the IPM approach by combining all appropriate and innovative techniques in a total management system and by minimizing the economic, health and environmental risks.

Students build capacity and develop skills in:

- basic IPM principles and methodologies;
- preventive IPM measures: plant quarantine, pest risk analysis, certified propagating material, resistant/tolerant cultivars or graft combinations, biodiversity protection;
- sustainable use of pesticides and relative regulations; applications of alternative non pesticidal management methods; food quality and safety;
- sound management of biotic and abiotic disorders of Mediterranean fruit and vegetable crops in pre and post-harvest.
- information technology applied in IPM programmes.
Two diploming courses are also organized in collaboration with the IPPC/FAO and the Middle East CropLife North Africa respectively, as integral part of the programme. Such courses are an opportunity for students to acquire a background information on plant quarantine, trade facilitation, International Standards for Phytosanitary Measures (ISPMs), guidance material on phytosanitary issues and also to acquire communication tools for transferring the IPM knowledge in the framework of extension programmes.

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**Part 1 - The Master programme**

The programme is organized in 9 **Units (60 ECTS)**

Duration: **8 months from October 2016 to May 2017**

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**3 Oct – 7 Oct 2016**

**UNIT 1 – INTRODUCTORY COURSES (2 ECTS)**

**Content:**

- Information and Communication Technologies (ICTS). Criteria for bibliographic research.
- English language.

**Learning outcomes:**

- Harmonization of student linguistic and technical background on general topics to support lectures understanding and scientific papers research.

**Evaluation procedure: written examination**
UNIT 2 - INTRODUCTION TO IPM (8 ECTS)

Content:
- IPM concepts.
- Basics principles of plant pests, pathogens, nematodes, physiological disorders and weeds.
- Disease diagnosis, pest and weeds identification, pathogen detection using classical and advanced detection methods.

Learning outcomes:
- Harmonization of student technical knowledge on the main biotic and abiotic disorders and their control, based on a modern and sustainable IPM approach.

Evaluation procedure: written examination

UNIT 3 - PEST/PATHOGEN CONTROL (8 ECTS)

Content:
- Breeding and biotech resistance
- Conventional and non-conventional control methods
- Regulated pesticides and bio pesticides.
- Chemical and non-chemical means of pest control.
- Natural enemies application.

Learning outcomes:
- Gaining knowledge on basics principles of modern plant breeding, including new quantitative and molecular tools, like genomics and genetic engineering in plant as an element of IPM strategy.
- Safe and sustainable use of agrochemicals and bio-rationales pesticides and relative regulations for food quality and safety in IPM; Efficient use of beneficial arthropods.

Evaluation procedure: written examination
UNIT 4 - INFORMATION TECHNOLOGIES IN IPM (5 ECTS)

Content:
✓ Innovative technologies for spatial pest/disease analyses.
✓ Forecasting and modelling.
✓ Decision Support Systems.

Learning outcomes:
✓ Providing students with concepts and applications of current technologies in precision crop protection.

Evaluation procedure: written examination

CROP LIFE DIPLOMING COURSE (1 ECTS)

Content:
✓ Training model; approaches to training.
✓ Key processing styles; brainpower; key learning styles.
✓ Facilitating rainbow; facilitating feedback.
✓ Body language; preparation to train; training administration.

Learning outcomes:
✓ Acquisition of communication tools for transferring the IPM knowledge in the framework of extension programmes.

Evaluation procedure: written and oral examination
30 Jan – 24 Feb 2017

UNIT 5 - IPM OF VEGETABLE CROPS IN PRE-HARVEST (8 ECTS)

Content:

✓ Morphological, ecological, epidemiological characteristics of key pests and pathogens of vegetable crops.
✓ Pest monitoring, identification/detection and IPM control in accordance with the specific regulations.

Learning outcomes:

✓ Deepening students’ knowledge on the main phytosanitary problems affecting vegetable crops in pre-harvesting
✓ Providing to the students useful tools for a sustainable IPM approach.

Evaluation procedure: written examination

27 Feb – 20 Mar 2017

UNIT 6 - IPM OF FRUIT TREE CROPS IN PRE-HARVEST (6 ECTS)

Content:

✓ Morphological, ecological, epidemiological characteristics of key pests and pathogens of fruit tree crops.
✓ Pest monitoring, identification/detection and IPM control in accordance with the specific regulations.

Learning outcomes:

✓ Deepening students’ knowledge on the main phytosanitary problems affecting fruit tree crops in pre-harvesting
✓ Providing to the students useful tools for a sustainable IPM approach.

Evaluation procedure: written examination
UNIT 7 - IPM OF FRUITS AND VEGETABLES IN POST-HARVEST (4 ECTS)

Content:

✓ Pests/pathogens biology.
✓ Food contaminants and related regulations.
✓ Quality systems for certification in the agro-food sector (International Food Standards).
✓ Postharvest technology.

Learning outcomes:

✓ Deepening students’ knowledge on the main phytosanitary problems affecting the fruit and vegetable in post-harvest.
✓ Providing students with useful tools for pest identification and prevention, food detoxification and knowledge on legislation of toxic contaminants present on the food commodities.

Evaluation procedure: written examination

UNIT 8 - APPLICATION OF IPM PROCEDURES (4 ECTS)

Content:

✓ Good Agriculture Practices
✓ Certification in the global market.
✓ Field IPM guidelines in fruit tree and vegetable crops.
✓ Business planning and farm management.

Learning outcomes:

✓ Enhancing student’s ability in the application of IPM guidelines and GAP regulations in the international market.
✓ Developing a business planning and sustainable farm management.

Evaluation procedure: written examination
2 May – 12 May 2017

IPPC-FAO/CIHEAM Bari DIPLOMING COURSE (3 ECTS)

Content:

✓ Principles and international regulations on quarantine pests/pathogens.
✓ Pest/disease monitoring procedures.
✓ Production and use of certified propagating material and related regulation.
✓ International Plant Protection Convention (IPPC) and benefits.
✓ International Standards for Phytosanitary Measures (ISPMs).
✓ Phytosanitary capacity development.
✓ Implementation of Pest Risk Assessment activities.
✓ Implementation and organization of import verification and export
✓ Certification. Market access for plants and plant products.
✓ Establishment and management of NPPO

Learning outcomes:

✓ Upgrading students’ knowledge on the main principles and regulations on a proactive IPM approach, combining the monitoring and control of quarantine pests with the use of certified propagating materials.
✓ Providing students a background information on trade facilitation, International Standards for Phytosanitary Measures (ISPMs) and guidance material on phytosanitary issues (e.g., NPPO establishment and management, relations with stakeholders, import and export certification, surveillance).

Evaluation procedure: written and oral examination

Jan – May 2017

UNIT 9 – INDIVIDUAL PROJECT (7 ECTS)

Content:

✓ IPM case study:
✓ Evaluation and implementation of applied IPM procedures concerning a specific phytosanitary problem of a fruit/vegetable crop.

Learning outcomes:

✓ Enhancing the students’ ability to integrate course information in the application of sustainable IPM for specific crop.

Evaluation procedure: Written and oral examination

22 – 24 May 2017 | Final Exam
EXAMINATIONS

Participants take an examination at the end of each subunit. Examinations are in the form of oral or written exams (i.e. sets of questions, exercises, multiple-choice). Questions can also cover seminars topics, field lectures and technical visits. Evaluation is made by the lecturers or by the scientific tutor of the course.

Participants may retake failed exams once, and up to 8 ECTS.
At the end of the course, participants take a final comprehensive oral exam with an Examining Board.

Language of instruction: ENGLISH

ACADEMIC STAFF

In the Postgraduate specialization programme, lectures are given by MAIB scientific staff and international prestigious visiting professors (from universities, higher institutions, research centres, international organizations); field lectures are also given by IPM experts from the private sector.

In the Master of Science programme, student’s research theses are supervised by MAIB researchers or external professors in collaboration with MAIB staff.
The programme is organized in 2 parts: Preparatory research methodologies and Supervised research work: thesis and defence (60 ECTS)

**PREPARATORY RESEARCH METHODOLOGIES (10 ECTS)**

*Contents:*

Scientific English. Bibliographic research. Scientific writing. Safe laboratory practices. Statistical analysis. Dedicated courses on conventional and advanced laboratory/field techniques related to the research topic (sampling procedures; pest identification procedures; culturing, biological, serologic and molecular pathogen detection assays; bioinformatics; proximal and remote sensing technology; etc.).

*Learning outcomes:*

Basics and technical knowledge on bibliographic research, field and laboratory methodologies to support the supervised research work.

**PROJECT (50 ECTS)**

*Content*

Elaboration of an original thesis, related to pests/pathogens of great social and economic interest for the Mediterranean fruit or vegetable crops. The MSc thesis is mainly carried out at MAIB or at research Institutions of the student's country of origin. Topics of MSc theses will be chosen among the following IPM research lines:

*Learning outcomes:*

- Acquiring knowledge and ability in the development and application of the most innovative techniques for: - the rapid detection of harmful quarantine and quality pests in order to prevent their entrance and spread in a specific area; - the enhancement and conservation of native germplasm; - the preservation of food quality in post-harvest.
- Updating information on the sanitary status of fruit and vegetable crops in the Mediterranean countries.
- Development of validated technical protocols for pest monitoring, diagnosis, identification, detection and control before their application on a large scale.
- Application of remote sensing technology for pest monitoring and spatial analyses at farm and territorial scales.
 ✓ Preparation of a scientific paper to announce at National and International Conferences and/or published in scientific journals.

**Research activities: topics generally available for Master of Science theses**

 ✓ Sampling methodologies;
 ✓ Pests monitoring, identification and management;
 ✓ Pathogen detection, characterization and control;
 ✓ Pest/pathogen epidemiology:
 ✓ Remote sensing applications and forecasting models;
 ✓ Assessment of damages and losses:
 ✓ Detection and control of mycotoxins and pesticide residues

**Indicative master theses realized within the area**

I.

 ✓ Title: “Investigation of viral diseases in an Apulian fig germplasm collection (2015)”
 ✓ Author: Jihene Kheder (Tunisia).
 ✓ Place of realization: IAM-Bari, Italy.
 ✓ Thesis directors: Toufik El Beaino, Michele Digiaro.

II.

 ✓ Title: Development of LAMP-PCR methodology for Monilinia spp. detection and the correlation with environmental parameters (2014).
 ✓ Author: Melissa Si Ammour (Algeria).
 ✓ Place of realization: IAM-Bari, Italy.
 ✓ Thesis directors: Thaer Yaseen, Franco Santoro.

III.

 ✓ Title: Ecological and biological studies of the African fig fly Zaprionus indianus (Diptera: Drosophilidae) in Jordan (2013).
 ✓ Author: Mahmoud Amani Alawamleh (Jordan).
 ✓ Place of realization: IAM-Bari, Italy – University of Amman, Jordan
 ✓ Thesis directors: Ahmad Katbeh-Bader, Nayem Hassan.

IV.

 ✓ Title: Assessment of the sanitary status of Pome fruit crops in Kosovo, with particular emphasis on virus, viroid and bacterial diseases (2012).
 ✓ Author: Naim Krasniqi (Kosovo).
 ✓ Place of realization: IAM-Bari, Italy
 ✓ Thesis directors: Khaled Djelouah, Franco Valentini

V
Title: Validation of remote sensing application to large scale detection of Citrus tristeza virus (CTV) and spectral discrimination of CTV with Phytophthora spp. Infections in citrus (2011).
Author: Hanan Rafik (Morocco).
Place of realization: IAM-Bari, Italy
Thesis directors: Anna Maria D’Onghia, Stefania Gualano

Title: Molecular identification of black Aspergilli and occurrence of Ochratoxin A in table grapes. (2010).
Author: Houda Fraiha (Morocco).
Place of realization: IAM-Bari, Italy - CNR Roma, Italy
Thesis directors: Alessandra Ricelli, Thaer Yaseen

Title: Inventory of insects in the oases of Ziban, Biskra- Algeria (2009).
Author: Nassima Deghiche-Diab (Algeria).
Place of realization: University of Bari-IAM-Bari, Italy- ITDAS Biskra, Algeria
Thesis directors: Francesco Porcelli, Mohamed Belhamra

Title: An Integrated molecular and morphological study to design a DNA barcode discrimination protocol for Fusarium species involved in dry root rot disease of citrus (2008).
Author: Bachir Balech (Lebanon).
Place of realization: CNR, Bari - IAM-Bari, Italy.
Thesis directors: Cecilia Saccone, Anna Maria D’Onghia

Further detailed information is available at http://www.iamb.it