



# Sustainable IPM Technologies for Mediterranean Fruit and Vegetable Crops

Course Coordinator: Anna Maria D'Onghia

## ○ 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 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;
- proactive and active pest control methods;
- 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.

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## Part 1 - The Master Programme

The programme is organized in **9 Units (72 ECTS)**

Duration: **9 months, from October 2018 to June 2019**

**1 – 5 October 2018**

### **UNIT 1 - INTRODUCTORY COURSES (3ECTS)**

**Content:**

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

**Learning outcomes:**

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

**Evaluation procedure:** written examination

**8 October – 16 November 2018**

### **UNIT 2 - INTRODUCTION TO IPM (11 ECTS)**

**Content:**

- ✓ Basic principles of plant pests, pathogens, nematodes, physiological disorders and weeds
- ✓ Disease diagnosis, pest and weed identification, pathogen detection using classical and advanced diagnostic methods
- ✓ IPM concepts

**Learning outcomes:**

Harmonization of students' background on biotic and abiotic disorders and their control based on a modern and sustainable IPM approach.

**Evaluation procedure:** written examination

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**19 November 2018 – 18 January 2019**

## **UNIT 3 - PEST/PATHOGEN CONTROL (15 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 basic principles of modern plant breeding (e.g. 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

**21 January – 15 February 2019**

## **UNIT 4 - INFORMATION TECHNOLOGIES IN IPM (7 ECTS)**

### **Content:**

- ✓ Innovative technologies for spatial pest/disease analyses
- ✓ Forecasting and modelling
- ✓ Statistical Analyses
- ✓ Decision Support Systems

### **Learning outcomes:**

- ✓ Providing concepts and applications of current technologies in precision crop protection for a sustainable IPM approach

**Evaluation procedure:** written examination

**18 February – 22 March 2019**

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

### **Content:**

- ✓ Morphological, ecological, epidemiological characteristics of key pests and pathogens of vegetable crops

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- ✓ Pest monitoring, identification/detection and IPM in accordance with EU Regulations

## **Learning outcomes:**

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

**Evaluation procedure:** written examination

## **4-8 March 2019 Technical Tour**

**25 March – 19 April 2019**

### **UNIT 6 - IPM OF FRUIT TREE CROPS IN PRE-HARVEST (8 ECTS)**

#### **Content:**

- ✓ Morphological, ecological, epidemiological characteristics of key pests and pathogens of fruit tree crops
- ✓ Pest monitoring, identification/detection and IPM in accordance with EU Regulations

#### **Learning outcomes:**

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

**Evaluation procedure:** written examination

**23 April – 4 May 2019**

### **UNIT 7 - IPM OF FRUITS & VEGETABLES IN POST- HARVEST (4 ECTS)**

#### **Contents:**

- ✓ 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 knowledge on the main phytosanitary problems affecting fruits and vegetables in post-harvest

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- ✓ Providing useful tools for pest identification and prevention, food detoxification
- ✓ Gaining knowledge on legislation of toxic contaminants present on the food commodities

**Evaluation procedure:** written examination

**6 - 28 May 2019**

## **UNIT 8 - COMMUNICATION, ENTREPRENEURSHIP, GLOBAL MARKET & PROJECT (10ECTS)**

**Content:**

- ✓ Good Agriculture Practices
- ✓ Certification in the global market
- ✓ Communication skills: training model and approaches to training; key processing and learning styles; facilitating rainbow and feedback; body language
- ✓ Social innovation and entrepreneurship ideas
- ✓ Project presentation of an IPM case study

**Learning outcomes:**

- ✓ Enhancing ability in the field application of IPM guidelines and GAP regulations in the international market
- ✓ Acquisition of communication skills for transferring the IPM knowledge in the framework of extension programmes and technical events
- ✓ Enhancing ability to integrate course information in the application of the IPM to specific crops
- ✓ Developing an entrepreneurship project

**Evaluation procedure:** written and oral examination

**29 May- 11 June 2019**

## **UNIT 9 - IPPC-FAO/CIHEAM Bari SHORT-COURSE ON DEVELOPING PHYTOSANITARY CAPACITY (6 ECTS)**

**Content:**

- ✓ Principles and international regulations on quarantine pests/pathogens
- ✓ Pest Risk Analysis. Pest/disease monitoring procedures
- ✓ Production and use of certified propagating material and related regulation

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- ✓ 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:

- ✓ Plant quarantine principles and EPPO standards. Upgrading knowledge on a proactive IPM approach, combining the monitoring and control of quarantine pests with the use of certified propagating materials
- ✓ Providing 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

**14 - 15 June 2019**

**FINAL EXAM**

**13 - 20 June 2019**

**DIPLOMING COURSE**

**From a business idea to its project design: the enterprise culture in the innovation process management (5 ECTS)**

**Content:**

- ✓ Project cycle management: methods and tools for an innovative idea design
- ✓ Lean Business Model Canvas: tools to analyse and evaluate the economic sustainability of the entrepreneurial idea
- ✓ Web and communication tools: how to improve and strengthen web usage to develop and communicate the entrepreneurial idea

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## **Learning outcomes:**

- ✓ Knowledge and basic skills to create, develop and communicate an innovative entrepreneurial idea.
- ✓ Development of an innovative entrepreneurial idea proposal

**Evaluation procedure:** oral presentation of the project proposal

## **Master Course organization**

### **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 seminar topics, field lectures and technical visits. Evaluation is made by lecturers or by the scientific tutor of the course. Participants may retake failed exams only once and up to 8 ECTS.

At the end of the course, participants have to pass a final comprehensive oral exam before an Examination Board.

### **WORKING LANGUAGE: English**

### **ACADEMIC STAFF**

Master courses 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.

### **TOURIST TRIP**

A tourist trip is organized for first-year classes. The aim of the trip is to make students discover some interesting places in Italy and get familiar with its historical and cultural heritage. Furthermore, the trip is a great opportunity to socialize in a context other than the Campus.

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## Part 2 - The Master of Science Programme

The programme is organized in 2 parts: Preparatory research methodologies and Supervised research thesis and defence (60 ECTS)

### **PREPARATORY RESEARCH METHODOLOGIES (10 ECTS)**

#### **Content:**

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.

#### **Learning outcomes:**

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

### **RESEARCH WORK (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:

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

#### **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



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- ✓ Development of validated technical protocols for pest monitoring, diagnosis, identification, detection and control before their application on a large scale
- ✓ Application of remote sensing, information technology and forecasting models for precise pest monitoring and spatial analyses at farm and territorial scales
- ✓ Preparation of a scientific paper to announce at National and International Conferences and/or publish in scientific journals

## Indicative Master of Science theses realized within the area

### I

- ✓ Title: Direct and indirect responses of *Viciafaba* to oviposition and feeding by the Brown Marmorated Stink Bug, *Halyomorpha halys* (Heteroptera: Pentatomidae) (2016)
- ✓ Author: Robert Malek (Lebanon)
- ✓ Place of realization: University of Perugia, Italy
- ✓ Thesis supervisor: Eric Conti

### II

- ✓ Title: Study of the effect of ozone on the expression of genes related to plant defence mechanisms in citrus fruits (2016)
- ✓ Author: Ait Mohamed Mohamed (Algeria)
- ✓ Place of realization: IAM-Bari, Italy
- ✓ Thesis supervisor: Thaer Yaseen

### III

- ✓ Title: Assessment of trees suspected to show Olive Quick decline Symptoms from photointerpretation of high resolution aerial images of a Xylella-free area (2016)
- ✓ Author: Asmae Jilal (Morocco)
- ✓ Place of realization: IAM-Bari, Italy
- ✓ Thesis supervisors: Franco Santoro, Franco Valentini

### IV

- ✓ Title: Survey and molecular characterization of *Pepino mosaic virus* (PepMV) infecting tomato crops in Morocco (2016)
- ✓ Author: Imane Bibi (Morocco)
- ✓ Place of realization: IAM-Bari, Italy & INRA Morocco
- ✓ Thesis supervisors: Mohamed Afechtal, Khaled Djelouah

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V

- ✓ Title: Host plant volatile compounds for the management of *Bagrada hilaris* Burmeister (Heteroptera: Pentatomidae)(2016)
- ✓ Author: Abdulsattar Arif Mokhtar (Iraq)
- ✓ Place of realization: University of Palermo, Italy & IAM-Bari, Italy
- ✓ Thesis supervisor: Stefano Colazza

## Master of Science Course organization

### EXAMINATIONS

Students present the progress of their research work before a Supervising Team twice during the academic year:

- **1<sup>st</sup> Seminar:** bibliographic search; project proposal (objectives, materials and methods) and related written draft;
- **2<sup>nd</sup> Seminar:** presentation and scientific value of the research work (laboratory or field activity) and related written draft.

At the end of the course, they defend their thesis and pass a final comprehensive oral exam before an international Examination Board.

**WORKING LANGUAGE: English**

### ACADEMIC STAFF

In the Master of Science Programme, students' research theses are supervised by MAIB researchers and/or external professors in collaboration with MAIB staff.

**Further detailed information is available on: [www.iamb.ciheam.org](http://www.iamb.ciheam.org)**