



Training Workshop on Diagnostics of Leafminers of Agricultural Importance

29 February - 11 March, 2016

Research Center for Biology, Indonesian Institute of Science (LIPI),
Cibinong, Bogor, Indonesia

Organized by:



Museum Zoologicum Bogoriense, LIPI

In Collaboration with:



ASEAN Network on Taxonomy

2016

WORKSHOP OF DIAGNOSTIC TRAINING ON LEAFMINERS OF AGRICULTURE IMPORTANCE

29 February - 11 March, 2016

**Research Center for Biology, Indonesian Institute of Science,
Cibinong, Bogor, Indonesia**

- I. Project Title:** Training on Diagnostics of Leafminers of Agriculture Importance
- II. Project Duration:** Two weeks, from 29 February to 11 March 2016
- III. Training Outline**

A. Background

Leafminers are an insect group larvae of which feed on leaf tissues within leaves during a part or the whole of their larval stage, including Coleoptera (beetles), Diptera (flies), Hymenoptera (sawflies) and Lepidoptera (moths). Leafminers of agriculture importance are found mainly in Diptera and Lepidoptera. Of them, dipteran leafminers of the genera *Liriomyza*, *Phytomyza* and *Agromyza* (Agromyzidae) are the most serious pests of crops, ornamentals and vegetables throughout the world. Lepidopteran leafminers often cause serious damage to fruit trees. Larvae of *Phyllocnistiscitrea* (Gracillariidae) mine leaves of citrus plants and inflict a heavy damage on the plants. Apple blotch leafminers (*Phyllonorycter* spp., Gracillariidae), the horse chestnut leafminer (*Camerariaohridella*, Gracillariidae) and the tea leaf-roller (*Caloptiliatheivora*, Gracillariidae; its larvae mine leaves during the first three instar stages) are famous as lepidopteran pest leafminers.

Damage by some leafminers on horticultural plants is conspicuous also in South-East Asia. Particularly, several species of *Liriomyza* have invaded since 1990' and become major pests of vegetable crops such as tomatoes, cucumbers, egg plants, lettuce, spinach and legumes. Accordingly, the management of these pests is a central issue in the field of horticulture and applied entomology. However, it is difficult to identify the species of *Liriomyza* leafminers, because they are polyphagous and their mines are very similar to each other, to say nothing of larvae. This can delay an effective management of the concerned leafminer. Similar problems can occur in other leafminers.

In this workshop, we aim to teach the participants how important it is to study taxonomy and ecology of leafminers from the viewpoint of pest management and instruct them in taxonomic skills at identifying the species of leafminers by morphological characters and DNA barcoding.

B. Course Description

This workshop is coordinated by Research Center for Biology, Indonesian Institute of Science through the ASEAN PlantHealth Cooperation Network (APHCN) of ASEANET project on "Taxonomic capacity building to support market access for agricultural trade in the ASEAN region." This project is funded by the Japan-ASEAN Integration Fund that will be implemented for 2015-16 covering several activities related to training and attachment programs.

This workshop aims to provide participants with basic and practical understanding of the concept of leafminers, identification of important pest leafminers, and management practices for them. To do this, the training course covers the following topics: basic taxonomy and ecology of major species, genera and families of pest leafminers, collecting and preparation of specimens, identification of mines, immatures and adults based on morphological characters and DNA barcoding, natural enemies, especially, parasitoids, impacts of leafminers on major agricultural crops in South-East Asia, and available options of pest leafminer management in reducing the loss of crop yield. Thereby, participants will be able to design effective plans for controlling pest leafminers.

C. General Objectives

Lecture: At the end of the training, the participants will acquire knowledge about the concept of leafminers, how seriously they damage horticultural crops, and how to control them appropriately.

Laboratory: At the end of the training, the participants will acquire taxonomic skills in identifying the species, genera and families of major pest leafminers on the basis of external characters and DNA barcoding, collecting, preparing and labelling specimens, and making slide preparations of genitalia.

D. Specific Objectives

Lecture:

1. To acquire taxonomic and ecological knowledge of pest leafminers and their related species.
2. To be aware of how seriously leafminers damage crops.
3. To be aware that major pest leafminers have been invaded from other regions.
4. To learn how to protect crops from leafminers through integrated pest management.
5. To gain knowledge of parasitoids attacking pest leafminers and their application to biological control.

Laboratory:

1. To detect crop leaves mined by a diversity of leafmining larvae.
2. To learn basic techniques for collecting in the field and rearing leafminers in the laboratory.

3. To learn how to make slide preparations of genitalia.
4. To identify the taxon (species, genus, family and order) of leafminers on the basis of morphology and DNA barcoding.
5. To learn DNA barcoding and its application.

E. Training Methodology

The training will be conducted by a combination of interactive lectures, laboratory practices and field visits. Field observation and sampling will be carried out not only in crop fields but also in semi-natural fields.

F. Training Contents

Please see the next section and attached sheets "Schedule of Activities"

G. Training Course Outline

SESSION 1. OPENING AND INTRODUCTION

- Welcome/opening program
- Introduction and overview of the training course
- Introduction of participants, trainers and training team
- Group photograph

SESSION 2. LEAFMINER BIOLOGY INTRODUCTION

- Lecture: Biology and ecology of leafminers
- Lecture: Economic importance of leafminers
- Lecture: Basic classification of leafminers—Diptera
- Lecture: Basic classification of leafminers—Lepidoptera

SESSION 3. PREPARATION OF DIPTERAN LEAFMINER SPECIMENS COLLECTED IN THE FIELD

- Practice: Demonstration

SESSION 4. DISSECTION AND SLIDE PREPARATION OF DIPTERAN LEAFMINER GENITALIA

- Practice: Demonstration
- Practice: Hands-on work

SESSION 5. IDENTIFICATION OF DIPTERAN LEAFMINERS

- Lecture: Morphology and terminology
- Practice: Identification of specimens using CSIRO fly CD and paper keys

SESSION 6. DIPTERAN LEAFMINER RESOURCES ON THE WEB

- Lecture and practice: Dampewolf website, Joshi's website, Parella's biology of leafminers, and EU diagnostic protocols.

SESSION 7. CABI CROP PROTECTION COMPENDIUM

- Lecture and demonstration: Use of CABI CPC for data on pest biology, distribution,

images and risk analysis

SESSION 8. FIELD TRIP FOR SAMPLING LEAFMINERS IN SEMI-NATURAL AREAS

- Preparation for field trip (Venue: Agatho Farm, Cisarua)
- Practice: Field observation and sampling
- Practice: Preparation and identification of specimens

SESSION 9. DISSECTION AND PREPARATION OF LEPIDOPTERAN LEAFMINER GENITALIA

- Lecture: Rearing methods
- Lecture: Morphology and terminology
- Practice: Demonstration
- Practice: Hands-on work

SESSION 10. PREPARATION OF WINGS AND LARVAE

- Practice: Demonstration
- Practice: Hands-on work

SESSION 11. IDENTIFICATION OF LEPIDOPTERAN LEAFMINERS

- Practice: Identification of specimens using keys

SESSION 12. PARASITIDS ASSOCIATED WITH LEPIDOPTERAN LEAFMINERS

- Lecture: Biology of parasitoids associated with Lepidopteran leafminers

SESSION 13. DNA BARCODING

- Lecture: DNA barcoding and its application to pest leafminers
- Practice: Extraction of DNA from leafminers
- Practice: Detection of DNA
- Practice: Sequencing and identification of DNA

SESSION 15. LEPIDOPTERAN LEAFMINER RESOURCES ON THE WEB

- Practice: Browsing of web sites concerning with lepidopteran leafminers

SESSION 16: EVALUATION AND CLOSING PROGRAM

- Post-test evaluation
- Closing program

H. TENTATIVE PROGRAM OF THE TRAINING WORKSHOP

DATE/VENUE/TIME	TOPIC/ ACTIVITY	RESOURCE PERSON(S)/FACILITATORS
Sunday, 28 February 2016		
	Arrival and billeting at AMARIS Pakuan Hotel, Bogor	Dr. Soetikno S.S., ASEANET
WEEK 1		
Monday, 29 February 2016		
Venue: Seminar Room	SESSION 1. OPENING AND INTRODUCTION	
08:45 - 9:00	Registration	Ms. Gina (RCB-LIPI)
09:00 - 9:30	Welcome address	Dr. Hari Sutrisno Research Center for Biology, LIPI
	Opening Remark 1	Dr. Lum Keng Yeang Project Manager & Chairperson ASEANET
	Opening Remark 2	Dr. Witjaksono Director of Research Center for Biology, LIPI
09:30 - 9:40	Workshop context and overview	Dr. Hari Sutrisno RCB-LIPI
09:40 - 10:00	Introduction of participants, trainers and training team	Ms. Vany, RCB-LIPI
10:00 - 10:15	Group photograph	Mr. Arid, RCB-LIPI
10:15 - 10:30	Tea/coffee break	
10:30-10:45	Pre Test	Dr. Hari Sutrisno
Venue: Seminar Room	SESSION 2. LEAFMINER BIOLOGY INTRODUCTION	
10:45 - 12:00	Lecture: Biology and ecology of leafminers	Dr. Hiroaki Sato Nara Women's University
12:00 - 13:00	Lunch break	
13:00 - 14:30	Lecture: Economic importance of leafminers	Dr. M.B. Malipatil La Trobe University
14:30 - 15:00	Lecture: Basic classification of leafminers—Diptera	Dr. M.B. Malipatil La Trobe University
15:00 - 15:15	Tea/coffee break	
Venue: Seminar Room	SESSION 3. DIPTERAN LEAFMINER RESOURCES ON THE WEB	
15:15 - 16:00	Lecture and practice: Dampewolf website, Joshi's website, Parella's biology of leafminers, and EU diagnostic protocols	Dr. M.B. Malipatil
16:00 - 17:00	SESSION 4. CABI CROP PROTECTION COMPENDIUM Lecture and demonstration: Use of CABI CPC for data on pest biology, distribution, images and risk analysis Reserve	Dr. M. B. Malipatil
17:00- 18.00		
18:00 - 20:30	DINNER RECEPTION Front Hall Widayasatwaloka Building	All participants Resource Persons

Tuesday, 1 March 2016		
Venue: Hotel 07.00 am	FIELD TRIP to Agatho Farm Cisarua-West Java	Dr. Hari Sutrisno + 3-4 Entomology staff, Dr. Hiroaki Sato All participants Resource Persons
Wednesday, 2 March 2016		
Venue: Seminar Room	SESSION 5. PREPARATION OF DIPTERAN LEAFMINER SPECIMENS COLLECTED IN THE FIELD	
08:30 - 10:00	Practical & Demonstration	Dr. M.B. Malipatil
10:00 - 10:30	Tea/coffee break	
Venue: Seminar Room	SESSION 6. DISSECTION AND SLIDE PREPARATION OF DIPTERAN LEAFMINER GENITALIA	
10:30 - 12:00	Practical & Demonstration	Dr. M.B. Malipatil
12:00 - 13:00	Lunch break	
13:00 - 15:30	Hands-on work	Dr. M.B. Malipatil
15:00 - 15:30	Tea/coffee break	
15:30-17:00	Hands-on work	Dr. M.B. Malipatil
Thursday, 3 March 2016		
Venue: Seminar Room	SESSION 7. IDENTIFICATION OF DIPTERAN LEAFMINERS	
08:30 - 10:00	Lecture: Morphology and terminology	Dr. M.B. Malipatil
10:00 - 10:30	Tea/coffee break	
10:30 - 12:00	Practical: Identification of specimens using CSIRO fly CD and paper keys	Dr. M.B. Malipatil
12:00 - 13:00	Lunch break	
13:00 - 14:30	Practical: Identification of specimens using keys	Dr. M.B. Malipatil
15:00 - 15:30	Tea/coffee break	
15:30 - 17:00	Practical: Identification of specimens using keys	Dr. M.B. Malipatil
Friday, 4 March 2016		
Venue: Seminar Room	SESSION 8. LEAFMINER BIOLOGY INTRODUCTION	
8.30-.9:00	Review	Dr. M. B. Malipatil
Venue: Seminar Room	SESSION 9. PARASITIDS ASSOCIATED WITH DIPTERAN LEAFMINERS	
9.00-10:00	Lecture: Biology of parasitoids associated with Diptera leafminers	Dr. Rosichon Ubaidillah RCB - LIPI
10:00-10:15	Tea Break	
10:15-11:30	Lecture: Biology of parasitoids associated with Diptera leafminers	Dr. Rosichon Ubaidillah
11:30-13.30	Lunch break & Friday prayer	
13:30-14:30	Lecture: Basic classification of leafminers—Lepidoptera	Dr. Hiroaki Sato
14:30 – 15:30	Tea Break	
Venue: Seminar room	SESSION 10. DISSECTION AND PREPARATION OF LEPIDOPTERAN LEAFMINER GENITALIA	
15:30 – 17:00	Lecture: Morphology and Terminology Lecture: Rearing methods	Dr. Hiroaki Sato

Saturday, 5 March 2016		
Venue: Hotel	FIELD TRIP to Fruit Garden Mekarsari-Cileungsi	Dr. Hari Sutrisno + 3-4 Entomology staff, Dr. Hiroaki Sato All participants Resource Persons
Sunday, 6 March 2016		
REST DAY		
WEEK II		
Monday, 7 March 2016		
Venue: Seminar room	SESSION 10. DISSECTION AND PREPARATION OF LEPIDOPTERAN LEAFMINER GENITALIA	
08:30 - 10:00	Practical & Demonstration	Dr. Hiroaki Sato
10:00 - 10:30	Tea break	
10:30 – 12:00	Practical & Demonstration Hands-on work	Dr. Hiroaki Sato
12:00 - 13:00	Lunch break	
13:00 - 14:30	Practical: Hands-on work	Dr. Hiroaki Sato
15:00 - 15:30	Tea/coffee break	
15:30 - 17:00	Practical: Hands-on work	Dr. Hiroaki Sato
Tuesday, 8 March 2016		
Venue: Seminar room	SESSION 11. PREPARATION OF WINGS AND LARVAE	
08:30 - 10:00	Practical & Demonstration	Dr. Hiroaki Sato
10:00 - 10:30	Tea/coffee break	
10.30 – 12.00	Practical: Hands-on work	Dr. Hiroaki Sato
12:00 - 13:00	Lunch break	
Venue: Seminar room	SESSION 12. IDENTIFICATION OF LEPIDOPTERAN LEAFMINERS	
13:00 – 15.00	Practical: Identification of specimens using keys	Dr. Hiroaki Sato
15.00 - 15.30	Tea/coffee break	
Venue: Seminar room	SESSION 13. PARASITIDS OF LEPIDOPTERAN	
15:30 – 17.00	Parasitoids of lepidopteran	Dr. Rosichon Ubaidillah
Wednesday, 9 March 2015		
Venue : Seminar room	SESSION 14. DNA BARCODING	
08.30 -10.00	Lecture: Extraction of DNA from leafminers	Dr.Hari Sutrisno
10.00 – 10.30	Tea/coffee break	
10.30 - 12.00	Lecture: Extraction of DNA from leafminers	Dr.Hari Sutrisno
12.00 – 13.00	Lunch break	
13.00 – 15.00	Lecture: Detection of DNA	Dr.Hari Sutrisno
15.00 - 15.30	Tea/coffee break	
15.30 – 17.00	Lecture: Sequencing and identification of DNA	Dr.Hari Sutrisno
Thursday, 10 March 2016		
Venue: Genetic Lab	SESSION 14. DNA BARCODING (continued)	
8:30 - 10:00	Practice: Extraction of DNA from leafminers	Dr.Hari Sutrisno/ Mr.Zein and Genetic lab team
10:00 - 10:30	Tea/coffee break	

10:30 - 12:00	Practice: Detection of DNA	Dr.Hari Sutrisno/ Mr.Zein and Genetic lab team
12:00 - 13:00	Lunch break	
13:00 - 15:00	Practical: Sequencing and identification of DNA	Dr.Hari Sutrisno/ Mr.Zein and Genetic lab team
Venue: Seminar room	SESSION 15. LEPIDOPTERAN LEAFMINER RESOURCES ON THE WEB	
15:30 - 17:00	Practice: Browsing of web sites concerning with lepidopteran leafminers	Dr. Hiroaki Sato
Friday, 11 March 2016		
Venue: Seminar room	SESSION 16: EVALUATION AND CLOSING PROGRAM	
08:30 – 09:30	Post-evaluation	Dr.Hari Sutrisno
09:30 – 10:00	Information on the Attachment Program in Japan	Dr. Soetikno S.S
10:00 - 10:30	Tea/coffee break	
10:30 – 11.30	Closing remarks related to Workshop Closing address Official Closing Presentation of certificates	Dr. Hiroaki Sato Dr.Hari Sutrisno Dr.Witjaksono Dr.Hari Sutrisno Dr. Rosichon Ubaidillah Dr. Hiroaki Sato
	Response from participants	Participant
12:00 - 13:00	Lunch break	
Saturday, 12 March 2016		
DEPARTURE OF PARTICIPANTS & RESOURCE PERSONS		

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**JAIF FUNDED PROJECT -
TRAINING WORKSHOP ON LEAFMINERS OF AGRICULTURAL
IMPORTANT**

LIPI, Cibinong, Indonesia
29th February to 11th March 2016

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