

SECTION 2

**TRAINING PROGRAMME FOR
PROTECTION AGAINST SOUTH AMERICAN
LEAF BLIGHT OF RUBBER IN ASIA AND
THE PACIFIC REGION**

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1. BACKGROUND

South American leaf blight (SALB) is the most serious disease of *Hevea* rubber. The disease is confined to Central and South America. SALB threatens the rubber growing industry in Asia and Pacific region. In 1956, the Asia and Pacific Plant Protection Commission (APPPC) was established and the body established the APPPC Agreement and protection of the rubber growing countries in the Asia and the Pacific region was included in the agreement. Various phytosanitary measures were introduced to reduce the risk of introducing SALB. The success of these measures is dependent on knowledgeable and competent personnel. The purpose of this training programme is to ensure the availability of competent and knowledgeable personnel to implement the various phytosanitary measures.

2. INTRODUCTION TO THE TRAINING PROGRAMME

The Training Programme consists of lectures, demonstrations and laboratory sessions. The programme is divided into three modules. Module 1 is on the biology of the host plant *Hevea* rubber, the biology and economics of SALB and *M. ulei* and other diseases of rubber plant. Module 2 will cover on the risks of SALB and the quarantine measures to reduce the risks of introduction of SALB. Module 3 covers measures to eradicate an outbreak of SALB.

3. TRAINING PROGRAMMES

3.1 Module 1: The biology of *Hevea* and South American leaf blight (SALB) and the causal pathogen, *Microcyclus ulei*.

3.1.1 Participants: Plant pathologists, quarantine officers, quarantine inspectors, crop protection officers and extension officers. The relevancy of each topic/lecture to a particular participant is indicated in Appendix 1.

3.1.2 Duration: 7 days

3.1.3 Lecture topics

- (i) Lecture 1: The economics importance of rubber and South American leaf blight (SALB).
 - The history of the introduction of rubber from Brazil into Asia by Wickham and other subsequent introductions;
 - The importance of natural rubber to human kind;
 - Rubber production by rubber producing countries and the importance of rubber to the economy of these countries;
 - The importance of rubber to the income of the major growers of rubber i.e. the smallholders;
 - The destruction of earlier plantations in South America by SALB;
 - SALB endemic countries;
 - SALB is still the main hindrance to a vibrant rubber growing industry in Brazil and other Central and South American countries;
 - The effects of SALB on the tree and latex production.
- (ii) Lecture 2: The biology of rubber plant, its cultivation and propagation methods.
 - Species of *Hevea*;
 - Common clones cultivated in different countries;
 - Propagation methods by seeds, budded stumps and stump buddings;

- Preparation of planting material;
 - Rubber planting systems;
 - Improving tree productivity by breeding and selection;
 - The need for new genetic resources to improve productivity and secondary characteristics;
 - The importance of germplasm.
- (iii) Lecture 3: Identification of *M. ulei*
- Methods for isolation and culturing.
 - Isolation methods;
 - Sterilisation methods;
 - Media: isolation media, growth media and media for spore production;
 - Induction of spore production.
 - Diagnosis
 - Morphology of spores;
 - Molecular methods;
- (iv) Lecture 4: The biology and epidemiology of SALB and *M. ulei*.
- The symptoms of SALB;
 - The lifecycle of SALB: asexual and sexual stages;
 - Morphology of spores;
 - Physiological races of *M. ulei* and how to differentiate them;
 - Spore dispersal: agents and relative to rainfall;
 - Effect of weather conditions on disease severity;
 - Viability of spores under different conditions;
 - Suitability of weather condition in Asia and the Pacific region for SALB.
- (v) Lecture 5: Management of SALB of rubber
- Chemical control: effective fungicides, application methods, costs, occurrence of fungicide resistant strains;
 - Resistant clones: horizontal resistance vs vertical resistance, mechanism of disease resistance;
 - Crown budding;
 - Biological and integrated control;
 - Polyploidy.
- (vi) Lecture 6: Important diseases of *Hevea* rubber.
- Leaf diseases: Colletotrichum leaf fall, Oidium leaf fall, Phytophthora abnormal leaf fall, Corynespora leaf fall, Fusicoccum leaf blight, Birds eye spot;
 - Stem diseases: pink disease, Ustulina rot;
 - Panel diseases: Black stripe, Mouldy rot;
 - Root diseases: White root disease, red root disease, brown root disease;
 - The symptoms, biology and methods to control these diseases will be covered;
- (vii) Lecture 7: Other quarantine pests and diseases of *Hevea*.
- Catacauma leaf blight, target leaf spot, mandarova (*Erinyis ello*), white moth (mosca do renda) of rubber.

3.1.4 Demonstration, laboratory sessions and site visit.

- (i) Species of *Hevea* and various planting materials (seeds, budded stumps and budwood) and budding techniques;
- (ii) Observation of preserved specimen of SALB and *M. ulei* spores;
- (iii) Isolation and culturing of common *Hevea* diseases of rubber;
- (iv) Symptoms of other diseases of rubber plant;
- (v) Demonstration on pesticide application techniques.

3.2 Module 2: Risks of introduction of SALB into the APPPC region and risk management measures.

3.2.1 Lecture topics

- (i) Lecture 1: The historical development on quarantine of South American leaf blight.
 - The establishment of the APPPC Agreement in 1955;
 - Article IV and Appendix B;
 - Revision of the APPPC Agreement;
 - ANRPC SALB Agreement;
 - Activities of ANRPC and IRRDB on SALB.
- (ii) Lecture 2: Pest Risk Analysis (PRA) of *M. ulei* with emphasis on entry pathways and import requirements.
 - What is PRA?
 - ISPMs
 - The need for a pest risk analysis of SALB;
 - The pathways and vectors of SALB,
 - The probability of entry, establishment, spread and the level of risks associated with various pathways;
 - Recommended risk management options.
- (iii) Lecture 3: Guidelines for importation of *Hevea* planting materials from SALB endemic countries.
 - Import requirement for host and non host materials;
 - Point of entry inspection system: procedures for inspection, procedures for clearance, inspection of documents, disinfection or destruction procedures;
 - Field and laboratory diagnostic systems: recognizing the symptoms of SALB and the spores of *M. ulei*;
 - SALB surveillance system: detection survey, delimiting survey, and monitoring survey;
 - Eradication and quarantine programme.

3.2.2 Demonstration and field visit

- (i) Disinfection treatments of rubber planting materials
- (ii) Quarantine inspection at entry points

3.3 Module 3: Surveillance and eradication programme

Lecture 1: Contingency plan

Lecture 2: Detection surveys, delimiting surveys, monitoring surveys

Lecture 3: Eradication procedures

3.4 Module 4: Workshop on SALB in Brazil

Objectives:

- To ensure the availability of SALB diagnostician
- To familiarize participants on SALB
- To train the trainers

Participants:

Pathologists, NPPO officials, plant breeders

Duration:

>4 days (actual training time)

Programme Leader:

Malaysia (leader of working group on SALB)

Role of Programme Leader:

- To liaise with NPPO Brazil and other relevant authorities (IRRDB)
- To coordinate sources of funding
- To draft training programmes
- To prepare criteria for participating countries to identify and select participants to be funded by FAO (Appendix)
- Each country can nominate participants under their own expenses.

Note: Lecturers and logistic arrangements to be provided by NPPO Brazil

TENTATIVE PROGRAMME:

LECTURES:

- Welcoming address By Organizer.
- Research activities on SALB in Brazil.
- Distribution, economic and significance of SALB.
- Rubber breeding programme against SALB by Institute Agronomy Campinas.
- The pathogen and the disease, SALB of *Hevea*.
- Variability and physiological races of *M. ulai*.
- Field visit to rubber nursery and Germplasm garden.
- The epidemiology of SALB.
- Management of SALB – Integrated control of SALB.
- Production and Evaluation of SALB Resistant Clones.
- Importance of Plant Quarantine and its Role in Preventing the SALB of Rubber.
- Plant Protection Agreement for Asia & Pacific Region.
- Pest Risk Analysis on SALB.
- Genetics of resistance.
- Country Report on Prevention of SALB by member Countries (Presentation).

LABORATORY SESSIONS

(a) Disease symptoms

- Observe using naked eye and under the binocular microscope:
 - The conidial lesions on young leaves
 - The pycnidial stage
 - The perithecial stage
 - Spore morphology

(b) Pathogenicity

- Inoculation of young leaves in Petri dishes
- Inoculation *in vivo* of young leaves on plants
- Observe symptoms and evaluate different parameters of infection (latent period, incubation period, lesion diameter, sporulation intensity).

(c) Culturing of *M. ulei*

- Isolation using an agar block
- Isolation using a wet needle
- Observation of cultures of *M. ulei*

(d) Spore survival period

- Different temperatures
- On different substances

(e) Effectiveness of fungicides

(f) Plant protection equipment

FIELD VISITS

(a) Rubber Nursery

- Observe symptoms of SALB on young leaves of various ages from bud burst (purple red), 7-day-old leaves (copper brown), and 14-day-old leaves (pale green). Examine both upper and lower leaf surfaces of the lesions
- Observe the necrotic lesions and black powdery conidia
- Observe if other organisms (mycoparasites) are growing on the lesions of *M. ulei*. Take note the size of lesions on different rubber clones
- Examine the newly mature green leaves; observe both the upper and lower leaf surfaces. Observe the pycnidia which produce the pycnospores. Note the location of the pycnidia on the upper leaf surface with respect to the location of the lesion on the lower leaf surface
- Examine the hardened old dark green leaves. Feel the protruding black masses i.e. the stromata on the upper surface of the leaves. Stroma contains perithecia, which borne in them asci and each ascus contains eight ascospores

(b) Mature rubber area

- Observe the canopy density and the health state of the trees. Note for the low density of the canopy and the occurrence of dead branches and trees
- Examine fallen leaves, note the lesions and the fruiting bodies on the leaves

- Note the age and the size of the trees. Enquire about the latex productivity of various clones
- Note various canopy densities of various clones (resistant and tolerant clones and species)
- Visit a crown budded rubber area
- Observe differences of canopy density and disease severity between the top and the bottom of a hill planted with FX 3864
- Demonstration of spray equipment

4. RESOURCES

- a. Personnel
- b. Reference materials
 - i. Poster
 - ii. A note on South American leaf blight
 - iii. Bibliography
 - iv. Leaflet on South American leaf blight
 - v. Pamphlet on South American leaf blight
 - vi. PowerPoint presentations

**CRITERIA FOR SELECTION OF PARTICIPANTS
FOR TRAINING IN BRAZIL**

- The selected participants will be responsible for training others in the country or region.
- The selected participants must have knowledge on relevant ISPM
- The selected participants must be willing to work together with NPPO
- The selected participants must take photographs to be deposited with the programme leader for distribution to member countries
- The selected participants have to come up with a report on their return

1. Pathologists

- Must have at least 5 years working experience
- Must be a practicing pathologist

Training table Relevance

Relevance of training topics to target groups

Module	Module and Relevant Topics				
	1	2	3	4	5
Target group	Plant Quarantine Officers, Plant Pathologists, Crop Protection Officers	Extension Officers	Quarantine Officers at entry point	Technical/ diagnostic officers, Lab Technicians	Officers from other agency
Topics					
Topic 1: The biology of <i>Hevea</i> and South American leaf blight (SALB) and the causal pathogen, <i>Microcyclus ulei</i>.					
Lecture topics:					
(i) Lecture 1: The economic importance of rubber and South American leaf blight (SALB).	/	/	/	/	/
(ii) Lecture 2: The biology of rubber plant and its cultivation and propagation methods.	/	/	/	–	–
(iii) Lecture 3: South American leaf blight: The symptoms of SALB, the spores of <i>M. ulei</i> , distribution, dispersal and epidemiology.	/	/	/	/	/ (basic – not detail)
(iv) Lecture 3: Management of SALB of rubber.	/	/	/	–	–
(v) Lecture 4: Methods for isolation and culturing of <i>M. ulei</i> .	/	–	–	/	–
(vi) Lecture 5: Other quarantine pest and diseases of <i>Hevea</i> .	/	/	/	–	–
Demonstration and laboratory sessions					
(i) Species of <i>Hevea</i> and various planting materials (seeds, budded stumps and budwood) and budding techniques	/	/	/	–	–
(ii) Observation of preserved specimen of SALB and <i>M. ulei</i> spores	/	/	/	/	–

Module		Module and Relevant Topics				
		1	2	3	4	5
Topics	Target group	Plant Quarantine Officers, Plant Pathologists, Crop Protection Officers	Extension Officers	Quarantine Officers at entry point	Technical/ diagnostic officers, Lab Technicians	Officers from other agency
(iii)	Isolation and culturing of common <i>Hevea</i> diseases of rubber	/	–	–	/	–
(iv)	Symptoms of other diseases of rubber plant	/	/	/	/	–
(v)	Demonstration on pesticide application techniques	/	/	–	–	–
Topic 2: Risks of introduction of SALB into the APPPC region and risk management measures.						
Lecture topics:						
(i)	Lecture 1: The historical development on quarantine of South American leaf blight	/	/	/	–	–
(ii)	Lecture 2: Pest Risk Analysis (PRA) of <i>M. ullei</i> with emphasis on entry pathways and import requirements	/	–	/	–	–
(iii)	Lecture 3: Procedures for importation of <i>Hevea</i> planting materials from SALB endemic countries	/	–	/	–	–
(iv)	Lecture 4: Procedures for inspection, diagnostics and disinfection of planting materials.	/	–	/	/	–
Topic 3: Surveillance and eradication programme.						
Lecture topics:						
(i)	Contingency plan: Detection surveys and eradication procedures.	/	/	/	–	–
(ii)	Public relation: Creation of public awareness	/	/	/	–	/

