Elite Scientific Instruments Sdn. Bhd.,
A-LG-03, Block A , Section 1, Serdang Perdana Selatan
43300 Seri Kembangan,
Selangor Darul Ehsan
Tel : ( 603 ) 8945 6100 Fax : ( 603 ) 8945 7100

| | | | | | |
|---|---|---|---|---|---|
| Course Title | : | **Measurement of Chlorophyll Fluorescence** | Course Duration | : | **2 day (s)** |
| Course Code | : | **FLRi** | Course Venue | : | **TBA** |
| Course Category: | | **Plant Physiology Program** | | | |
| Course Level | : | **Refresher** | Course Fee | : | **RM 500 per person** |

- **Objective of Training**

  At the end of the course, the participants will be expected to:

  1) Conduct discussion and overview on the technical matter related to photosynthesis processes.
  2) Deliberate and share information on integrated analyses of gas exchange and chlorophyll fluorescence

- **Background facilities**

  The training workshop will be completed in two sessions, Theory Session on Day 1 and Practical Session on Day 2 to ensure all participants have a good comprehension regarding the subject matter. The venue for the training course will be announced **one month** before the scheduled date of the workshop.

- **Background of Speaker**

  This course will be given by our Plant Science Consultant, **Dr Muhammad Nazmin bin Yaapar** who has a wide knowledge and experience in general plant physiology and rice science research. Dr Muhammad Nazmin Yaapar is affiliated to the Department of Crop Science, Universiti Putra Malaysia, where he is currently working as a Senior Lecturer. He has experience in teaching various plant science subjects at university level including agriculture botany, weed science, crop nutrition, rice production and crop physiology. He has authored and co-authored several national and international publications and also working as a reviewer for reputed professional journals. Moreover, he is having an active association with a photosynthesis research team in the United Kingdom. He has been regularly recognised by the local media as the reference scientist particularly in rice cultivation and crop improvement.

- **Introduction**

  Fluorescence techniques have been developed to quantify the absorption and conversion of solar energy into the chemical energy used by the $CO_2$assimilatory reactions. Combining information from these independent measurements can provide critical information about how: 1) the $CO_2$ and light absorption reactions are coupled; 2) plants tolerate various biological and environmental stresses; 3) light capture is regulated at the leaf level; and 4) all of these processes are impacted by genetic manipulation, a process that has resulted in increased yield of various species over the past several decades. The LI-6400XT and LI-6800 Portable Photosynthesis Systems combined with the Leaf Chamber Fluorometers allow the user to take simultaneous measurement of gas exchange and fluorescence over the same leaf area. The fluorometers are pulse-amplitude modulated (PAM) and can be used to take measurements on both dark- and light-adapted samples

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- **Target Group**

This training is designed especially for students, technicians and researchers in the field of plant physiology and crop improvement. Those who are dealing with photosynthesis and stress responses in plants.

- **Course Outline**

***Slot 1: What is light?***
- Electromagnetic waves.
- Model of light
- Light as a wave and particle

***Slot 2: The Basic of Photosynthesis***
- Electromagnetic spectrum and visible Light
- Cyclic and noncyclic photophosphorylation
- Light-dependent and independent reactions
- Photosystem I& II
- Chlorophyll and accessory pigments

***Slot 3: Fluorescence Theory***
- Photobiology
- Photosynthesis and Fluorescence
- Photoacclimation /-adaptation
- Photoprotection
- Measured parameters: Fo, Fm, F, Fm', and Fo',
- Calculated parameters: Fv, Fv/Fm, dF/Fm, qP, qN, NPQ, and ETR.
- Extra: Mesophyll conductance ($g_m$)

***Slot 4: Measuring Chlorophyll Fluorescence***
- LI-6800 components and setting-up
- Components of equipment and functions
- Fluorometers
- Pulse-Amplitude-Modulated Fluorometers
- Plants preparations and dark acclimation

***Slot 5: Field Demonstration***
- Demonstration of making fluorescence measurements using dark-adapted and light adapted plants

***Slot 6: Data Interpretation and Analysis of Result***
- Data output and networking
- Review data on the console
- Download files to computer for further analysis

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- **Tentative program**

| Date & Time | Activities | Venue |
|---|---|---|
| **Day 1** | | |
| 8:00 AM | Registration | |
| 9:00 AM | **Slot 1: What is Light?** | |
| 10:30 AM | Break | |
| 11:00 AM | **Slot 2: The Basic of Photosynthesis** | TBA |
| 12:30 PM | Lunch break | |
| 2:00 PM | **Slot 3: Fluorescence Theory** | |
| 3:30 PM | **Slot 4: Measuring Chlorophyll Fluorescence** | |
| 5:00 PM | Dismiss | |
| **Day 2** | | |
| 7:30 AM | **Slot 5 *Field Demonstration*** | |
| 9:30 AM | Break | |
| 10:00 AM | **Slot 6: Data interpretation and analysis of the result** | TBA |
| 12:00 PM | Closing ceremony / Photo session/ Lunch break/ Dismiss | |