NEWSLETTER
Malaysian Society of Plant Physiology

(Inaugurated on 29 April 1989. Reg. No. 889 Wilayah Persekutuan)
Locked Bag No. 282, UPM Post Office, 43409 UPM, Serdang, Selangor D. E.

Website : http://www.mspp.org.my

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CONTENTS

Editor : Dr. Tsan Fui Ying
Co-editor : Mr. Ahmad Nazarudin Mohd. Roseli

Message from President……

First of all, allow me to thank the Exco members of 2007/2009 for their commitment in bringing the society forward and realizing the planned activities.

I wish all of you a "Blessed New Year". The year marks the end of 9th Malaysian Plan. The 9th Malaysian Plan had emphasized on improved productivity of agricultural crops and sustainable development. I believe many of the MSPP members have contributed to achieving the goals and aspirations of the 9th Malaysian Plan.

MSPP will be providing you the opportunity to share and publish your research findings through our annual conference planned for November 2010 and our Journal. Please visit our websites for the details.

MSPP also endeavors to improve the capacity of her members. Two workshops to be held in March and April 2010 respectively. These workshops aim at enhancing the knowledge of researchers and associates in instrumentation related to plant physiology activities. Look out for the details on our website.

The MSPP endeavors to improve her deliveries especially in the areas of dissemination of research findings. Therefore, the website is enhanced for better on-line communication and reporting. The Journal of Plant Physiology will be published on-line from 2009 onwards while all other publications will also be done soon. All manuscript submission could be done on-line through the website.

The work of the Society is done by a large group of volunteers. I am grateful for the willingness of the executive members and the various committees to make this a vital and vibrant society.

MSPP is a professional scientific body dedicated towards promoting Research and development in tropical plant biology

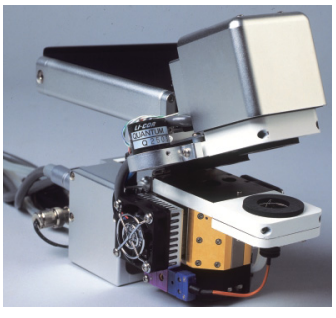
NEWS

MSPP workshops .....

Rapid advances in techniques and instrumentation have brought to introduction of sophisticated equipment in plant physiology studies. However, sufficient knowledge on the proper handling and use of such equipment is crucial for gaining the benefits of having these equipment and reliable research on plant physiology.

MSPP, hence, organizes training courses on handling equipment relevant to plant physiology studies for the year 2010, in addition to the annual event of MSPPC. These workshops are aimed to provide to researchers, post-graduate students and laboratory technicians hands-on trainings on using these equipment. They are also aimed at optimization of data handling with the equipment. Interpretation on the output obtained from the equipment is also included in the training courses.

Training on measurement of photosynthesis in plants is planned to be held in March this year. It will be jointly organized by MSPP and Elite Scientific Instruments Sdn. Bhd. and Universiti Putra Malaysia. The training course is aimed for better conduct of measurement of photosynthesis, transpiration, stomatal conductance and fluorescence by using portable LI-6400 System as an integrated system. It will be conducted by Mr. Richard L. Garcia, the Senior Applications Scientist from LI-COR Inc., Lincoln, Nebraska, U.S.A. He is an agronomist who has vast experiences in research on carbon assimilation in plants.



Measurement of photosynthesis of plants in the field (left) and leaf chamber fluorometer for measurement of fluorescence (right)

more on next page

NEWS

from previous page

The next training course planned is on the measurement of water conductance and water movement in plants. It is planned to be jointly organized by MSPP, Labquip (M) Sdn. Bhd. and Universiti Putra Malaysia in May 2010.

The second workshop is aimed to expose participants to the instrumentation related to water conductance in plant. Sap flow sensors are introduced in this workshop. Enhancing capability in data handling with such instrumentation will also be emphasized in the workshop. Such studies are important for detecting plant water stress and the requirements for irrigation. This workshop will be conducted by Mr. Michael Van Bavel, President of DYNAMAX, Inc. Houston, Texas. He is a member of Soil Science Society of America (SSSA) and is also the inventor of Dynagage sap flow sensors and the Flow4 Sap Flow Irrigation Control System. He has vast experience in sap flow sensing technology.

Hands-on activities and measurement are the main concern in these workshops. Participants are expected to bring along their related equipment for use in these activities if available. Participants are also welcomed to bring along their data collected in past measurements if they need further guide in interpretation of their data.

↑ Flow 32-1K will be used ….

↑ Dynagage for measurement of sap flow

Have patience with all things, but first of all with yourself - St. Francis de Sales

Conductors of great symphony orchestras do not play every musical instrument; yet through leadership, the ultimate production is an expressive and unified combination of tones. - Thomas D. Bailey

You can live to be a hundred if you give up all the things that make you want to live to be a hundred. –Woody Allen

Not everything that can be counted counts, and not everything that counts can be counted. - Albert Einstein

NOTES FROM MEMBER 1

Biochar: the Way Forward in Sequestering Carbon in Soil and Mitigating Global Warming and Climate Change

Rosenani Abu Bakar

Department of Land Management, Faculty of Agriculture,
University Putra Malaysia, 43400 Serdang, Malaysia
e-mail: rosenani@agri.upm.edu.my

Currently, the potential threat of climate change due to greenhouse gas emissions represents one of the main environmental concerns worldwide. Soil organic matter (SOM) is the largest C stock of the continental biosphere with 1550 Pg and plays a key role in the reduction of GHG emissions derived from agriculture (Lal, 2004). Therefore, the use of organic wastes as soil amendments is a 'win-win' strategy, i.e. besides the direct reduction of GHG emissions associated with waste disposal, it also increases carbon (C) sequestration in soil in the form of SOM. However, in most tropical environments, sustainable agriculture faces large constraints due to low nutrient contents and accelerated mineralization of SOM (Zech et al. 1997). As a consequence, the cation exchange capacity (CEC) of tropical soils, which is often low due to their clay mineralogy, decreases further. Under such circumstances, the efficiency of applied chemical fertilizers is low due to leaching of nutrients such as nitrate and potassium from the topsoil, which is enhanced by high rainfall (Cahn et al. 1993). Application of biological charcoal or biochar, a form of stabilized C, as a soil amendment seems to be a promising option to maintain a maximum level of C in agricultural soils while enhancing crop production.

What is Biochar?

Biochar is a fine-grained charcoal-like material that is rich in carbon and produced from heating biomass at 300 - 600 °C under limited supply of oxygen (pyrolysis). Higher charring temperatures improve exchange properties and surface area of the charcoal. Many sources of feedstock or organic materials may be used, particularly, waste materials from urban sites, agricultural lands or forestry, such as, corn stover, rice husks, peanut hulls, wood chips, manures and sewage sludge, that may otherwise produce non- CO_2 greenhouse gases (Lehmann et al. 2006). Biochar is recalcitrant to microbial decomposition as compared to uncharred organic matter as charring significantly increases the stability of C against microbial decay (Baldock and Smernik 2002). Biochar was found earlier in the Amazonian Dark Earths which is known as Terra Preta (Black Soil) and formed through incorporation of black C in the soil by agricultural activities (slash and burn) 500 – 2500 years ago and acts as stored C in the soil.

Biochar as a soil amendment

The addition of biochar to agricultural soils has been attracting great interest globally due to the apparent benefits to soil fertility and plant growth, as well as the potential to store or sequester C in soil. Research has shown that it has the capacity to retain nutrients and reduce fertilizer requirement while increasing crop yields. The benefits of biochar as a soil amendment includes reduced leaching of nutrients into ground water, possible reduced emissions of nitrous oxide (a greenhouse gas), increased cation exchange capacity, moderating soil acidity, increased water retention and increased number of beneficial soil microbes. The additional bonus to biochar incorporation is that it can reduce greenhouse emissions (turning organic wastes into stable C and avoid emission of methane through anaerobic decomposition) and enhance long-term (hundreds to thousands of years) C storage or sequestration in soil (Lehmann

more on next page

from previous page

et al, 2006). Taking C out of the cycle and locking it in biochar would mean a net decrease of C in the atmosphere. It is accepted as a practical method of mitigating global warming.

A non-profit organization, ***the International Biochar Initiative (IBI)***, was formed in 2006 to promote the development of biochar systems that follow cradle-to-grave sustainability guidelines. IBI supports the generation, review and dissemination of information on all aspects of biochar production and utilization. IBI is also working to develop guidelines for effective and sustainable biochar systems and provides advice to project developers. Biochar may be utilized not only for field crop production but also in horticulture, such as in seedling production in the nursery and vegetable production in the field, and also in potting mix or media for ornamentals. However, more research needs to be undertaken as not all biochar is the same; depending on the feedstock materials and the pyrolysis process.

Biochar in Malaysia

In Malaysia, burnt or charred rice husk (CRH) is a type of biochar produced at rice mills as a by-product. Rice husk is burnt under reduced oxygen to produce heat for drying rice at the mills. The CRH may be a good biochar that can be utilized as a soil amendment, not only to improve soil productivity in crop production and increase C sequestration in acidic and infertile Malaysian soils but also as a waste recycling and management option. Currently, very little work has been carried out to investigate the characteristics and potentials of the local CRH as a biochar. More recently, a pilot carbonator has been built to produce oil palm empty fruit bunch (EFB) biochar. It is still in its R&D stage and would be working in a full scale production in the near future. This means that the oil palm waste may be more sustainably managed to produce a tremendous amount of EFB biochar yearly to be utilized as a soil amendment in Malaysia and sequestering C in soil.

To create awareness and interest in biochar R&D in Malaysia, 'Biochar Malaysia Workshop 2009: Climate Change and Carbon Sequestration' was organized by Universiti Putra Malaysia in collaboration with Nasmech Technology Sdn Bhd on 14 December 2009, with Dr. Johannes Lehmann, Chairman of IBI as the keynote speaker. It is also anticipated that an organization in Malaysia, similar to IBI, i.e. BIOCHAR MALAYSIA would be formed in the near future to promote biochar R&D and utilization in Malaysian agriculture. Currently, research on CRH as an amendment in highly weathered soils has been initiated at the Faculty of Agriculture, UPM and we hope to include EFB biochar in our projects soon. Converting organic wastes into biochar may be a method of great potential in organic waste management in Malaysia while at the same time contributing towards mitigation of global warming and climate change.

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A carbonator (left) built by a company to convert oil palm empty fruit bunches (EFB) into EFB biochar (centre left) and application of rice husk biochar at 20 tonne/ha as a soil amendment showed better plant growth (right) than that without biochar amendment (centre right)

NOTES FROM MEMBER 2

Callus Induction and Triterpenes Contents of *Hedyotis corymbosa*

by:

Norrizah, J.S., Yaseer, S.M., Rohaya, A. and Nik Roslan, N.A.R.
Biology Department, Faculty of Applied Science, Universiti Teknologi MARA Malaysia

Introduction

Plant tissue culture techniques can be manipulated as potential tools for the production of valuable phytochemicals in plants. Many plant species from genus *Hedyotis* have long been recognized as medicinal herbs in the traditional art of healing. The rich assortment of secondary metabolites in plants from genus *Hedyotis* has created a considerable interest in the research community for their production in cell or tissue culture. *Hedyotis corymbosa* is traditionally used to treat ulcers and inflammation (Figure 1). Research done by Rohaya et al. (2004) showed that *H. corymbosa* extract exhibited antioxidant activity. This study revealed that triterpenes is the major secondary metabolite in the *H. corymbosa* callus culture.

Figure 1. *Hedyotis corymbosa* plant

Materials and Methods

Initiation and induction of callus

The sterile explants sized 5 mm x 5 mm were aseptically cultured into a Murashige and Skoog with vitamins (MS) (1962) medium supplemented with different concentrations of 2,4–dichlorophenoxyacetic acid (2,4-D), 3% (*w/v*) sucrose and 0.25% (*w/v*) gelrite at pH 5.7. The cultures were incubated at 25 ± 2ºC under the dark condition. The experiment was conducted in 3 replicates and monitored daily.

Extraction process

Three weeks old harvested calli were oven dried for 48 hours at 50ºC until the dry weight was constant prior to grinding using mortar and pestle. Two grams of pooled powder from each treatment were extracted and the contents of triterpenes were analysed. Each analysis was repeated thrice.

Analysis of triterpene content

The triterpene analysis was done according to Masa et al. (2008) with some modifications. The dried extract was dissolved in 1.0 ml analytical grade methanol. The solution was filtered through a 0.45 µm filter and the clear filtrate was used for GCMS analysis.

more on next page

from previous page

Results and discussion

Callus induction

Initiation of primary callus started after five days of incubation in the dark; four cell lines had been established. Calli appeared as soft white tissue or small globes with yellow pigment (Figure 2). The study showed that callus was successfully induced in the presence of 2,4-D alone. Generally, auxins stimulate callus formation and cell growth (Torres, 1989). Among the three different 2,4-D concentrations tested, 1.0 mg l^{-1} 2,4-D was found to give higher callus induction percentage (CIP). No callus was produced in the MSO (control). The 2,4-D hormone at 1.0 mg l^{-1} showed a higher CIP at 87.6% while 0.5 and 2.0 mg l^{-1} 2,4-D gave lower CIP of 72.8% and 76.2%. The exposure of leaf tissues to a high level of 2,4-D in the medium enhanced callus formation.

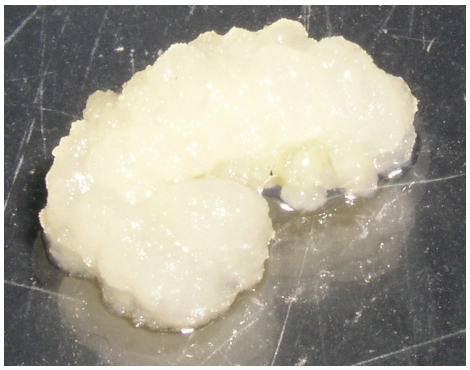

Figure 2. Callus from leaf explants on MS + 1.0 mg l^{-1} 2,4-D

Growth and triterpene (ursolic acid, UA and oleonolic acid, OA) content in leaf derived callus

Extraction from callus cultured in the MS media supplemented with 1.0 mg l^{-1} 2,4-D showed a higher content of both; UA (0.7 µg L^{-1}) and OA (0.54 µg L^{-1}) in the forth week of cultivation period. Callus grown in the MS media supplemented with 0.5 mg l^{-1} of 2,4– D showed the lowest content of UA (0.55 µg L^{-1}) and moderate content of OA (0.43 µg L^{-1}). In contrast to the callus grown in the MS media supplemented with 0.5 mg l^{-1} of 2,4 – D, callus cultured in the MS media supplemented with 2.0 mg l^{-1} of 2,4 – D showed a moderate content of UA (0.58 µg L^{-1}) and lowest content of OA (0.41 µg L^{-1}). However, there was no significant difference between 0.5 and 2.0 mg l^{-1} of 2,4 – D treatment in synthesis of UA and OA.

Conclusion

Studies revealed that callus can be grown better in MS media supplemented with 1.0 mg l^{-1} of 2,4 – D alone and establish high percentage of callus (CIP). Among the leaf derived callus, callus grown in the 1.0 mg l^{-1} of 2,4 – D showed the highest biomass growth and total triterpene contents.

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I am only one; but still I am one. I cannot do everything, but still I can do something; I will not refuse to do something I can do. - Helen Keller

Conductors of great symphony orchestras do not play every musical instrument; yet through leadership the ultimate production is an expressive and unified combination of tones. - Thomas D. Bailey

Not everything that can be counted counts, and not everything that counts can be counted. - Albert Einstein (1879-1955)

MSPP Worshop

Workshop on Portable Photosynthesis System

Tentative Date : March 2010
Venue : Universiti Putra Malaysia, Serdang, Selangor

Registration fee : RM500

Contact : Mr. Hassim Mohd. Isa
Elite Scientific Instriments Sdn. Bhd.
019-2416031

Other forthcoming events :

7-10 January 2010
19th Western Photosynthesis Conference
California, USA.
E-mail: kevin.redding@asu.edu

12-14 January 2010
Canada's 37th International Horticultural, Lawn and Garden Trade Show and Conference
Toronto, Canada.
website: www.gardenexpo.ca

23-26 February 2010
23rd Conference of Molecular Biology of Plants
Dabringhausen, Germany.
E-mail: biochem@uni-goettingen.de

4-6 March 2010
International Conference on Medicinal Plants and Herbal Drugs
Theme: Challenges and Opportunities in Cultivation and Sustainable Utilization and Consrvation
Chennai, India.
E-mail: tsekar_bot@yahoo.com

18-22 April 2010
5th EPSO Conference
Theme : Plants for Life
Olos Polar Center, Finland.
website: www.epsoweb.org

19-23 April 2010
United Nations Cocoa Conference, 2010
Geneva.
website: www.unctad.org

3-7 May 2010
18th European Biomass Conference and Exhibition
Theme : From Research to Industry and Markets
Lyon, France..
website: www.conference-biomass.com

23-25 May 2010
International Palm Oil Sustainability Conference
Sabah, Malaysia.
E-mail: hassan@mpoc.org.my

16-22 June 2010
29th ISTA Congress 2010
Cologne, Germany.
website: www.aseanrubberconference.com

6-10 June 2010
21st International Conference on Arabidopsis Research
Theme : 2010 and Beyond
Yokohama, Japan.
website: arabidopsis2010.psc.riken.jp/

17-19 June 2010
ASEAN Rubber Conference 2010
Theme : Gearing Up the Rubber Industry: New Directions and Strategies
Kuala Lumpur, Malaysia.
website: www.aseanrubberconference.com

20-23 June 2010
2nd International Symposium on Chloroplast Genomics and Genetic Engineering
Maynooth, Ireland.
E-mail: twas09@utar.edu.my

Address all communications to :
The Editor, Newsletter of Malaysian Society of Plant Physiology
e-mail : tsanfuiying@salam.uitm.edu.my