MUSHROOM SCIENCE VIRTUAL 2020

7 OCTOBER 2020

2.00 pm – 5.00 pm

An event organised by the

Malaysian Society for Biochemistry and Molecular Biology – Special Interest Group: Mushroom Science

ABSTRACT BOOK

Abstracts presented at the

Mushroom Science Virtual 2020

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Special Interest Group: Mushroom Science

Contents

WELCOME MESSAGE FROM THE PRESIDENT OF MSBMB

Dear Distinguished Speakers and Participants,

On behalf of the Malaysian Society for Biochemistry and Molecular Biology (MSBMB), I would like to heartily welcome you to this exciting virtual scientific meeting to share significant research findings and exchange knowledge in the field of mushroom science.

This meeting will definitely be beneficial to all participants that are looking forward to obtaining the latest updates on research and development pertaining to mushrooms. The knowledge gained from this meeting will not only enhance the research outputs by researchers from this region; it will also help farmers and entrepreneurs to produce and market high quality mushrooms.

The success of this meeting is made possible with the strong commitment of the MSBMB-SIG Mushroom Science Organising Committee who brilliantly undertook the meeting preparations and making this meeting happen virtually in the midst of the current pandemic. I appreciate your team spirit and hard work.

Last but not least, I thank everyone for making this meaningful meeting a possibility. I wish you a fruitful meeting with inspiring research ideas, and to have a memorable and wonderful virtual experience.

Thank you.

Professor Ts. Dr. Lim Yang Mooi
President
Malaysian Society for Biochemistry and Molecular Biology (MSBMB)

FOREWORD FROM THE CHAIRPERSON OF MSV2020

Welcome to Mushroom Science Virtual (MSV) 2020!

In the midst of the current pandemic, we are delighted to be able to bring to you a new platform to communicate and come together to share and learn about a topic of common interest – mushrooms!

Every time researchers, cultivators and connoisseurs of mushroom meet, the challenge of advancing our knowledge in the art and science in this field is pushed further ahead; and we expect no less for this inaugural edition of MSV2020.

We want to thank our plenary speakers who have graciously accepted our invitation to share their knowledge and thoughts on their area of expertise. We also want to accord our appreciation to all participants for availing yourselves to meet and indulge in the new platform of conferencing.

The richness of mycology is ever expanding. Let us all continue to further its frontiers.

On behalf of MSBMB, I would like to thank all speakers and participants for making MSV2020 a successful event.

Assoc. Prof. Dr. Fung Shin Yee
Chairperson
Organizing Committee
Mushroom Science Virtual 2020 (MSV2020)
MSBMB:SIG-Mushroom Science

Program

TIME	EVENT
13.30 - 14.00	MSV2020 Meeting open for entry
14.00 - 14.10	Welcome address by: President, Malaysian Society of Biochemistry and Molecular Biology (MSBMB) **Professor Ts. Dr. Lim Yang Mooi** Chairperson, Mushroom Science Virtual 2020 **Associate Prof. Dr. Fung Shin Yee**
14.10 - 14.40	Plenary 1 - *The Current Status and Prospects of Medicinal Mushroom Research and Development in Thailand* **Prof. Dr. Anon Auetragul (Anon Biotech Institute, THAILAND)**
14.40 - 15.10	Plenary 2 - *The Conventional and Emerging Health Benefits of Mushroom Polysaccharides* **Prof. Dr. Peter C. K. Cheung (The Chinese University of Hong Kong, CHINA)**
15.10 - 15.22	Oral 1- *Dimitic Pleurotus (Pleurotaceae, Agaricales) from Northern Borneo, Malaysia* **Dr. Jaya Seelan Sathiya Seelan (Universiti Malaysia Sabah, MALAYSIA)**
15.22 - 15.34	Oral 2 - *Use of Pennisetum Purpureum for Cultivation of Pleurotus Pulmonarius* **AP. Dr. Geetha Subramaniam (INTI International University, MALAYSIA)**
15.34 - 15.46	Oral 3 - *Cultivation and Nutritional Profiling of Macrocybe Gigentea* **Dr. Sachin Gupta (Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu, INDIA)**
15.46 - 15.58	Oral 4 - *The Effect of Different Substrate on Nutritional Content in Grey Oyster Mushroom* **Dr. Laila Naher (Universiti Malaysia Kelantan, MALAYSIA)**
15.58 - 16.10	Oral 5 - *Bioactive and Nutritive Properties of Selected Wild Mushrooms in Southern United States* **Dr. Daniel A. Abugri (Tuskegee University, USA)**
16.10 - 16.22	Oral 6 – *Ophiocordyceps Sinensis Cold Water Extract Relaxes Rat Detrusor Muscle* **Ms. Li Yin Pang (University of Nottingham Malaysia, MALAYSIA)**
16.22 - 16.34	Oral 7 – *Immunomodulatory Properties of Water-Soluble Polysaccharides Extracted from the Fruiting Body of Ophiocordyceps Sinensis Cultivar OCS02®* **Mr. Alvin Yap (University of Malaya, MALAYSIA)**
16.34 - 16.46	Oral 8 - *Biodegradation of Organic Dye using King Oyster Mushroom (Pleurotus Eryngii)* **Dr. Evyan Yang Chia Yan (Nilai University , Malaysia)**
16.46 – 17.00	Closing Remarks

PLENARY 1

THE CURRENT STATUS AND PROSPECTS OF MEDICINAL MUSHROOM RESEARCH AND DEVELOPMENT IN THAILAND

ANON AUETRAGUL

AnonBiotec Institute, Talad Thai, Klongsong, Klongluang, Patumthani 12120. Department of Biotech, The North Chiangmai University, Chiangmai, Thailand

Indigenous medicinal mushrooms have historically been utilized for centuries in Thailand. Various R&D research in medicinal mushrooms from many research institutes in Thailand have been made prominent achievement. Meanwhile, dozens of medicinal mushrooms have been developed into Thai Traditional pharmaceutical products. In this document, the author would like to introduce these Thai medicinal mushroom pharmaceutical concoctions with their indications and usages, the concoctions are not single compound but combinations of several individual compounds from mushrooms and herb that together contribute to the overall medicinal effect of the product. The following formulae given have been documented by the Ministry of Public Health in Thailand written by Prof. Dr. Anon Auetragul Former International Mushroom Expert in Asia and Africa during 1981-2003, concoction for energy booster, potency, diabetes, cancer, rheumatoid, autoimmune disorders, hypertension, etc.

Keywords*: Indigenous medicinal mushroom, Thai traditional pharmaceutical concoctions for energy booster, potency, diabetes, cancer, rheumatoid, autoimmune disorders, hypertension*

PLENARY 2

THE CONVENTIONAL AND EMERGING HEALTH BENEFITS OF MUSHROOM POLYSACCHARIDES

PETER CHI-KEUNG CHEUNG

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Edible mushrooms are ideal health foods that are high in carbohydrates, proteins and micronutrients but low in fats. Among these nutrients, mushroom carbohydrates contain sugars (trehalose), sugar alcohols (xylitol, mannitol, and sorbitol), energy-storage polysaccharides (glycogen), cell wall structural polysaccharides (mainly beta-glucans, heteroglycans and chitin) and polysaccharide-protein complexes (PSPCs) such as mannoproteins. Mushroom polysaccharides can be isolated from the fruiting bodies, mycelia and culture medium (as exopolysaccharides). Among these carbohydrates, mushroom cell wall polysaccharides and PSPCs are well-known for their multi-functions to human health. Traditionally, mushroom beta-glucans (MBGs) and PSPCs are particularly best known for their health benefits as biological response modifiers (BMRs) while MBGs and chitin can function as dietary fibre (DF). As BMRs, MBGs and PSPCs can stimulate or modulate the immune response in humans to fight against diseases like cancer and other infections. As DF, MBGs and chitin can attenuate human blood cholesterol and glucose levels that have health implications to cardiovascular heart diseases and diabetes. Recently, emerging evidences have shown that mushroom polysaccharides, especially MBGs have neurotrophic and antioxidant functions as well as prebiotic property to selectively promote the growth of probiotics in the human gastrointestinal tract. Therefore, mushroom polysaccharides have significant biological functions to human health and are valuable functional ingredients for the health food industry. This talk will give an overview of both the conventional and emerging health benefits of mushroom polysaccharides to human health and diseases and their application as functional food ingredients.

Keywords: *biological response modifiers, energy-storage polysaccharides, cell wall structural polysaccharides, polysaccharide-protein complexes, mushroom beta-glucans*

ORAL 1

DIMITIC *PLEUROTUS* (PLEUROTACEAE, AGARICALES) FROM NORTHERN BORNEO, MALAYSIA

JAYA SEELAN SATHIYA SEELAN[1*], FOO SHE FUI[1], TANG PUI LING[1] & DAVID HIBBETT[2]

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The present study emphasizes the diversity and phylogenetic relationships of indigenous dimitic *Pleurotus* species in Peninsular Malaysia and Borneo. Fifty four new Internal Transcribed Spacer (ITS) sequences were generated: 19 for *P. tuberregium* sensu lato, 12 for *P. giganteus* sensu lato, and 23 from the *P. djamor* complex. Phylogenetic analysis of 299 *Pleurotus* ITS sequences suggested that there have been multiple transitions between monomitic and dimitic hyphal systems within this genus. We focused on three clades containing all Malaysian dimitic species. Clade I contains *P. tuberregium* sensu lato and *P. dryinus*. Clade II contains *P. giganteus* sensu lato and *P. levis*. Clade III contains the *P. djamor* complex and several other "*djamor*" varieties, with *P. agaves* and *P. opuntiae* as the sister group to the remaining species. We propose *P. hamidii* as new species within the *P. djamor* complex. This species presents an entirely white pileus, central stipe, abundant wooly scales and is distributed in Sabah, Northern Borneo, Malaysia.

Keywords: *Pleurotus, dimitic hyphal system, ITS phylogeny, taxonomy*

ORAL 2

USE OF *PENNISETUM PURPUREUM* FOR CULTIVATION OF *PLEUROTUS PULMONARIUS*

GEETHA SUBRAMANIAM[1], CHEW WEI YIN[1], NABIL SANUSI[2], CHENG WAN HEE[1] & WONG LING SHING[1*]

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Sawdust is a conventional substrate for mushroom cultivation. However, environmental impact caused by burning and disposal of spent sawdust is a major concern of mushroom farmers. Therefore, alternative medium which can be used to replace sawdust for mushroom cultivation is needed. *Pennisetum purpureum*, also known as Napier grass, is widely available in environment and is used as cattle feed. This project was conducted to determine the potential of Napier grass as an alternative substrate for mushroom cultivation. Different sizes of Napier grass supplemented with and without corn bran were used to cultivate *Pleurotus pulmonarius* to determine the mycelium growth. The results showed that the average growth rate of *P. pulmonarius* mycelium cultivated on large size of Napier grass supplemented with and without corn bran were 0.95 and 0.85 cm/day respectively, while the growth of mycelium on sawdust supplemented with and without corn bran were 0.81 and 0.80 cm/day respectively. The supplementation of corn bran increased the mycelium growth because it helped balance the C/N ratio. Furthermore, the bigger size Napier grass was observed to have less compaction between grass pieces which allowed better aeration. From the experiment, the result indicated large Napier grass pieces was a promising alternative substrate to replace sawdust for the growth of *P. pulmonarius*.

Keywords: *Pennisetum purpureum, Pleurotus pulmonarius, alternative substrate, mushroom cultivation*

ORAL 3

CULTIVATION AND NUTRITIONAL PROFILING OF *MACROCYBE GIGENTEA*

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Six substrates were investigated to compare their effects on the growth, characteristics of fruiting bodies, yield and biological efficiency of *Macrocybe. gigantea* during the cropping periods (March to June, May to July and July to September). Significant difference in total colonization, yield and biological efficiency of *M. gigantea* was observed during the cropping periods. The results revealed that minimum days for full spawn run, pin initiation, first, second and third flushes were observed on wheat straw in the cropping period of July to September. Average weight, diameter of pileus and stipe length was statistically at par in all the substrates tested during the cropping periods. Maximum yield was obtained on wheat straw (1303.75g /2 kg of dry substrate) in the cropping period of July to September

Proximate analysis of fruit bodies of *Macrocybe gigantea* grown on different substrates. indicated that maximum total protein content (17.30 g/100g), ash content (6.73%), crude fat content (1.49%) and crude fibre (12.91%) were observed in fruit bodies grown on paddy. *Macrocybe gigantea* was found to possess potent enzymatic activities. Maximum activity for laccase and tyrosinase were observed in mature stage (50.76 U/ml) and over mature stages (2.28 U/ml) respectively and the minimum laccase and tyrosinase activity was observed in over mature stage (34.52) and pin head stage (1.02) respectively.

Keywords: *Macrocybe gigentea, substrate, cropping period, protein content*

ORAL 4

THE EFFECT OF DIFFERENT SUBSTRATE ON NUTRITIONAL CONTENT IN GREY OYSTER MUSHROOM

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Edible mushroom is an excellent nutritional food that has been well documented; nevertheless, the substrate of mushroom cultivation may affect the nutritional value in which information is limited. Thus, a study was carried out to analyze the nutritional and mineral content of P. sajor-caju mushroom that was cultivated on different combinations of the available agricultural substrate, which are rice straw (RS), sawdust (SD) and palm pressed fiber (PPF). Proximate analysis has been used in this research to obtain the percentage of every nutrition parameters of protein, fat, moisture, ash, and carbohydrate in Pleurotus sajor-caju. Meanwhile, traceable minerals such as sodium, potassium, calcium, iron, and zinc were determined using Atomic Absorption Spectrometry (AAS). The results showed that different substrates formula gave a significant difference in nutritional composition and mineral content in grey oyster mushroom. Mushroom fruiting body cultivated on PPF substrate gave the highest amount of protein (26%) and ash (1.89%) in 100 g sample while moisture was high in SD substrate treated mushroom fruiting body. The second highest protein amount gave in mushroom fruiting body cultivated on the RS substrate while the same substrate carbohydrate composition was highest compared to PPF and SD. The results of mineral contents of Na, K, Zn, Fe, and Ca gave a moderate significance difference between the substrates except for K, which was highly highest 12.8 mg/g in SD and second-highest 8 mg/g in FFP treated substrate.

Keywords: *Grey oyster mushroom, nutritional content, substrates*

ORAL 5

BIOACTIVE AND NUTRITIVE PROPERTIES OF SELECTED WILD MUSHROOMS IN SOUTHERN UNITED STATES

JASMINE PEYTON[1], HADASSAH ASHLEY [2], RICHARD WHITTINGTON[1], FREDERICK LAFAYETTE[1], ALBERT E. RUSSELL[2], FRANK MREMA[3], & **DANIEL A. ABUGRI1 [2]***

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Wild mushrooms research and consumption have increased because of their health benefits such as the source of rich nutritive nutrients, and an excellent source of medicinal bioactive nutraceuticals for improving human and animal health. Here, a comparative study was carried out to determine the fatty acid profile(s), phytochemicals, minerals, antioxidants and free radicals scavenging properties in selected wild and cultivated mushrooms species in Alabama, USA. The total lipids were determined using chloroform-methanol (2:1), and transesterified with boron-trifluoride in 14% methanol to obtained fatty acid methyl esters, followed by analysis using gas-liquid chromatography-flame ionization detector (GLC-FID). Bounded and unbounded phytochemicals content and identification were determined by a spectrophotometer and electron spray ionization-mass spectrometry (ESI-MS) respectively. In general, there were more polyunsaturated fatty acids than saturated fatty acid, and the most predominant fatty acids were palmitic acid (C16:0), stearic acid (C18:0), oleic acid (C18:1n9), linoleic acid (C18:2n6) and linolenic acid (C18:3n3). We also observed high phenolic contents in the wild mushrooms than the cultivated type known in the literature. The wild mushrooms also presented high DPPH scavenging activity in unbound mushrooms extracts ranging from 49.9% to 76.7%, whiles in the bounded extracts the activity was calculated to range from 15.55% to 92.80% than what was observed in the cultivated mushroom. These findings are the first of its kind in these types of mushrooms species in the area and therefore, will have chemotaxonomic, nutritional, health, economic and nutraceuticals benefits.

Keywords: *Mushroom fatty acids, phenolics, flavonoids, phospholipids, protein*

ORAL 6

OPHIOCORDYCEPS SINENSIS COLD WATER EXTRACT RELAXES RAT DETRUSOR MUSCLE

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Overactive bladder is characterised by urinary urgency, frequency and nocturia due to involuntary contraction of the detrusor muscle. The search for alternative therapeutic agents is rising as antimuscarinic, the first line treatment for this condition comes with many unpleasant side effects. In China, *Ophiocordyceps sinensis* is used traditionally to alleviate nocturia and urinary frequency. The present study aimed to investigate the effect of this medicinal mushroom on rat detrusor muscle. The effect of *O. sinensis* cultivar cold water extract (OCS02-CWE) was studied using organ bath technique. Bladders were isolated from adult male Sprague-Dawley rats and cut into longitudinal strips of 2 x 8 mm. OCS02-CWE was added non-cumulatively to the bladder strips pre-contracted with carbachol, a muscarinic agonist or under resting tension. OCS02-CWE was devoid of any effect at resting tension ($p > 0.05$). However, in pre-contracted tissues, a biphasic response involving an initial transient contraction followed by a sustained relaxation was observed. At 5 mg/ml, a largest relaxation response was recorded (54.49 ± 4.66%; $p < 0.0001$). Pre-incubation of bladder strips with 5mg/ml OCS02-CWE significantly suppressed the maximum contraction induced by carbachol control responses (218.4 ± 14.9%, n = 5 vs 103.2 ± 9.27 %, n = 6; $p = 0.0003$). This effect is comparable to oxybutynin 1µM (70.33 ± 18.45%, n = 5; $p < 0.0001$). To our knowledge, this is the first report of the relaxation effect of *O. sinensis* on rat detrusor muscle. The therapeutic potential of this mushroom for alleviating overactive bladder should be further investigated.

Keywords: *Ophiocordyceps sinensis, medicinal mushroom, overactive bladder, detrusor muscle*

ORAL 7

IMMUNOMODULATORY PROPERTIES OF WATER-SOLUBLE POLYSACCHARIDES EXTRACTED FROM THE FRUITING BODY OF *Ophiocordyceps sinensis* CULTIVAR OCS02®

ALVIN YAP CHEE SUM[1], XIAOJIE LI[2,8], YEANNIE YAP HUI YENG[3], MUHAMMAD FAZRIL MOHAMAD RAZIF[1], AMIRA HAJIRAH ABD JAMIL[4], NG SZU TING[5], TAN CHON SENG[5], PETER CHI KEUNG CHEUNG [2] & FUNG SHIN YEE[1, 6, 7, *]

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Ophiocordyceps sinensis (formerly known as *Cordyceps sinensis* and caterpillar fungus) is known for its various medicinal properties. In this study, the fruiting body of *O. sinensis* cultivar OCS02® was investigated for its chemical composition, monosaccharide profile and associated immunomodulatory potential. Cold water extract (CWE) obtained from the fruiting body was fractionated into high- (HMW), medium- (MMW), and low- (LMW) molecular weight fractions. The polysaccharides identified were primarily heteroglycans, containing mostly glucose and mannose with small amounts of galactose, fucose, arabinose and xylose. The immunomodulatory potential of these heteroglycans was evaluated by induction of cytokine/chemokine secretion using murine macrophage RAW 264.7. All treatments showed significant modulation of IL-6, IL-9, MIP-2, and TIMP-1, especially for CWE, HMW and MMW. Further investigations on the structure-function relationship of these fruiting body

polysaccharide fractions are needed to delineate the underlying mechanism of their immunomodulatory effect both *in vitro* and *in vivo*.

Keywords: *Ophiocordyceps sinensis, immunomodulation, cytokines, medicinal mushroom, polysaccharide*

ORAL 9

BIODEGRADATION OF ORGANIC DYE USING KING OYSTER MUSHROOM (*PLEUROTUS ERYNGII*)

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King oyster mushroom or its scientific name *Pleurotus eryngii* is an edible mushroom and it is widely available at local market. The study is transforming expired mushroom which is considered as waste products into beneficial products for the purpose of dye-degradation. The potential of the expired King oyster mushroom as an alternative low-cost biodegradation adsorbent for the removal of textile dyes in industrial effluents is explored. Adsorption technique is used to optimize and evaluate the biodegradation kinetics of Bromophenol Blue and Congo Red by the King oyster mushroom. The outcome of this study concludes that the effects of different operational parameters namely; water holding capacity (degree of hydration), contact time, the pH of the dye solution, the adsorbent dosage, and adsorption kinetics governed the overall degradation process. It is noted that both degradation processes fit pseudo-first order kinetics.

Keywords: *Biodegradation, King oyster mushroom, kinetic study, adsorption*

Organizing Committee MSV2020

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