ByPalma 2021

2nd World Confrence on Byproducts of Palms

Rediscovering Palm Byproducts

28 - 30 September 2021 | Online, Kuala Lumpur

Post Event Report

EVENT SUMMARY

CONFERENCE ORAGNIZERS

The main organizing institutions are the international Association for Palm Byproducts (ByPalma Assoc), and Universiti Putra Malaysia (UPM).

CONFERENCE CHAIRS

Mohammad Jawaid, Universiti Putra Malaysia, Malaysia (Chairman)

Hamed El-Mously, International Association for Palm Byproducts, Egypt (Co-chair)

Mohamad Midani, German University in Cairo, Egypt (Co-chair)

Aidah Jumahat, Universiti Teknologi MARA, Malaysia (Co-chair)

ORGANIZING COMMITTEE

Arno Fruehwald, University of Hamburg, Germany

Ramzi Khiari, Institut Supérieur des études Technologiques de Ksar-Hellal, Tunisia

Othman Alothman, King Saud University, Saudi Arabia

Navin K. Rastogi, Central Food Technological Research Institute, India

Sherif El-Sharabasy, Central Laboratory for Date Palm Research and Development, Egypt

Mahmoud Zakaria, Ain Shams University, Egypt

SPONSORS AND PARTNERS

- Springer Nature, Publishing Sponsor
- PalmwoodNet, Industry Partner
- Deutscher Akademischer Austauschdienst (DAAD) office in Cairo, Academic Sponsor
- Clusters of Scientific Innovation in the Middle East and North Africa (COSIMENA), Academic Sponsor
- Universiti Teknologi Mara, Malaysia, Academic Sponsor
- Ain-Shams University, Faculty of Engineering, Cairo, Egypt, Academic Sponsor
- University of Technology North Bangkok, Thailand, Academic Sponsor

VENUE

ByPalma 2021 took place online, directly streaming to computer or mobile. Attendees were able to watch the live talks and visit the poster sessions, ask questions about the research presented, chat with other attendees and follow up directly with the authors.

ByPalma 2021 online platform provided the means to connect with key researchers and even watch sessions on-demand (for those unable to join the live-conference). On-demand access included recordings of talks and access to posters from authors that have agreed for post event distribution.

NUMBER OF ATTENDEES

166+ attendees registered for the conference, from 14 research institutions, 53 universities, 12 companies, and 9 industry associations, representing more than 25 countries.

OVERVIEW

The Palmae family includes a wide variety of species and they are considered the main source of livelihood for significant proportion of the world population.

Unfortunately, their byproducts (secondary products) are often regarded as waste, despite that they represent a sustainable material base for a wide spectrum of industries ranging from compost, wood substitutes, pulp, up to fiber reinforcements for advanced composites.

ByPalma is the only conference solely focusing on the byproducts of palm plantation around the globe and their current and potential applications. This includes all Palmae family, such as Date palms, Coconut palms, Oil palms, Doum palms, sugar palm…etc.

This conference highlighted the great potential of the palm byproducts in the circular bioeconomy of the future!

- Bringing together leading academic scientists, researchers, artisans, entrepreneurs and industry professionals active in the area of palm byproducts R&D, manufacturing, and crafts from all around the globe to exchange recent developments, technologies, innovations, trends, concerns, challenges and opportunities.
- Rediscovering palm byproducts and maximizing their added-value and creating an economical resource that can help in the sustainable development of vast rural areas in different countries in the world.
- Establishing an international network of scientists, artisans, and industry professionals

ByPalma 2021 conference covered a wide range of trends on palm byproducts in wood substitutes, composite reinforcements, biotechnology, fertilizers, food, paper, textiles and bioenergy.

ByPalma 2021 is considered the main gathering for celebrating and rediscovering palm byproducts!

CONFERENCE FORMAT

The three-days conference comprised a welcome note, 17 parallel sessions taking place in 3 parallel rooms, 8 keynote talks, and a poster session. In addition to, 2 special sessions one on German-Malaysian OPT project, and the second on SATREPS-OPT research project.

Including 88 oral presenters, 7 poster presenters, and 8 keynote speakers.

The conference was structured to foster discussion between participants around the core themes of the conference which is “Rediscovering Palm Byproducts”. This was achieved by the discussions after each talk. Moreover, 3 WhatsApp groups were created to allow participants to continue their discussions after each session.

OPENING

The opening of the conference started by brief recitation of the holy Quran, followed by a welcome message by the conference chair Prof Dr. Mohammad Jawaid. Afterwards, the chairman invited the conference organizers and partners to give an opening message.

CONFERENCE TOPICS

The 17 parallel sessions were classified based on the different palm species (oil palm, date palm, coconut palm, sugar palm) in different applications of their byproducts as follow.

- Wood Alternatives and Panels
- Bio-Medicine and Bio-Technology
- Bio-Fertilizers
- Bio-Composites
- Fiber, Paper and Textiles
- Food Applications
- Design and Architecture
- Sustainable Energy

REGISTRATION

Registration for the conference was open to academics, researchers, students, industry professionals, artisans, designers, government officials, and palm growers from around the world. Registration was opened online on bypalma.com through bank transfer, and online payment.

A number of complimentary free registrations were offered to the organizing committee members, scientific committee members, sponsors, keynote speakers and VIP guests. Discounted special registration rates were offered to participants from Malaysia as well as participating students.

German Academic Exchange Service (DAAD) and its lighthouse project COSIMENA were supporting ByPalma conference as academic partners and covered the participation fees of 6 expert speakers from the MENA region under the framework of the COSIMENA project. The supported presentations are listed below:

1. Utilization of Date (Phoenix dactylifera L.) pits as a source of bioactive components – Egypt
2. Potential of date palm frond waste for particleboard industry – Iran
3. Innovative modern furniture inspired by Egyptian identity made from palm fronds and digital printing trendy Upholstery designs – Egypt
4. Evaluation of Environmental Impact of Palm-fiber based Geotextile using a Life Cycle Method – Morocco
5. Biorefinery concept of fiber extraction and biogas production using common date cultivar biomass (Phoenix dactylifera L.) – Tunisia
6. Activated carbon from date palm rachis for continuous column adsorption of O-Cresol - Tunisia

BEST PRESENTATIONS AND YOUNG SCHOLARS AWARD

Springer Nature Technology and Publishing Solutions Singapore sponsored the best presentations and young scholars award including 13 book prizes.

Best Presentation Awards

Day 1:

- ID 21, Lena Heister, Germany, GLT FROM OIL PALM WOOD – BUILD-UP, PRODUCTION AND ELASTOMECHANICAL PROPERTIES
- ID 87, Basim Abu-Jdayil, United Arab Emirates - DATE PALM SURFACE FIBERS AS A GREEN THERMAL INSULATOR
- ID 39, Nur Amirah Khairina Binti Khairil Anwar, Malaysia - LARGE SCALE BIO-SUCCINIC ACID PRODUCTION FROM INORGANIC SALTS PRETREATED OIL PALM EMPTY FRUIT BUNCH USING ACTINOBACILLUS SUCCINOGENES

Day 2:

- ID 58, Thiruchelvi Pulingam, Malaysia, THE EFFECTS OF OIL PALM TRUNK FIBERS ON PLANT GROWTH AND SOIL MICROBIAL COMMUNITY
- ID 77, U. Johnson Alengaram, Malaysia, IMPACT AND BLAST RESISTANCE BEHAVIOUR OF OIL PALM SHELL CONCRETE AND COMPARISON WITH NORMAL WEIGHT CONCRETE
- ID 03 - Thakshila Dayananda, United States, COCONUT COIR PITH LIGNIN BASED FERTILIZER MATRIX FOR CONTROLLED RELEASE OF UREA

Day 3:

- ID 94, Arno Fruehwald, Germany - COCONUT WOOD: PROPERTIES, PROCESSING AND PRODUCTS
- ID 107, M.Y. Nor Yuziah, Malaysia - PROCESSING AND ALKALI TREATMENT IMPACT TOWARDS OIL PALM FROND FIBERS BULK DENSITY AND WOOD-PLASTIC COMPOSITE PERFORMANCE
- ID 44, Laila Laasri, Morocco - EVALUATION OF ENVIRONMENTAL IMPACT OF PALM-FIBER BASED GEOTEXTILE USING A LIFE CYCLE METHOD

Best Poster Award

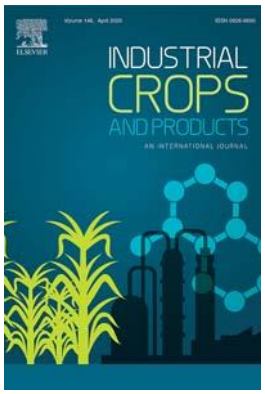
- ID 70, Hanane Chakhtouna, Morocco - BIOCHAR COMPOSITE DERIVED FROM DATE PALM FIBERS FOR POLLUTANTS REMOVAL FROM WASTEWATER

Young Scholars Awards

- ID 29, Chiraz Ben Sassi, Tunisia - DATE PALM PIT POLYPHENOLS LOADED GUM ARABIC MICROPARTICLES: INFLUENCE OF EGG YOLK PROTEINS ON THE PHYSICAL PROPERTIES
- ID 79, Lobna A. Elseify, Egypt - COMPARATIVE STUDY OF DATE PALM MIDRIB AND SPADIX FIBERS WITH OTHER LEAF FIBERS AND THEIR COMPOSITES
- ID 72, Arif Nuryawan, Indonesia - UTILIZATION OF OIL-PALM LEAVES FOR MAKING INNOVATIVE PRODUCTS

PUBLISHED PROCEEDINGS

Abstracts were published online in a book of abstract and distributed among all conference attendees. Moreover, selected full papers will be published in special issues of Industrial Crops and Products Journal (Elsevier, Scopus, IF 4.19), Applied Science and Engineering Progress Journal (Scopus), Moroccan Journal of Chemistry (ISI, Scopus, IF 0.48), and Materials Science Forum (Scopus, Google Scholar, IF 0.55).



Industrial Crops and Products Journal (Elsevier, Scopus, IF 5.65)

Applied Science and Engineering Progress Journal (Scopus)

Moroccan Journal of Chemistry (ISI, Scopus, IF 0.48)

Materials Science Forum Journal (Scopus, Google Scholar, IF 0.55)

Springer Proceedings in Materials (Springer)

Composites Science and Technology Book Series (Springer)

CONFERENCE RECOMMENDATIONS

The major recommendations of the conference are:

- To organize the 3rd round of ByPalma after 2 years in 2023, we have already received expression of interest to host in Saudi Arabia, but we are still evaluating other offers!
- Activate the role of the International Association for Palm Byproducts as a professional society with membership packages for personal, institutional, and industrial membership, with subject groups on wood, composites, textiles, biotechnology and others
- Prepare the membership forms and email to participants of ByPalma 2021 for free membership
- Bring Small and big industries as joint partners to do product development from palm byproducts
- Organize group meetings and workshops for specific subjects related to palm byproducts
- Initiate a scientific journal with a proposed titled “Palm Byproducts Valorization"

ByPalma Online Conference

28 – 30 September 2021

Overview

ByPalma is the only conference solely focusing on the byproducts of palm plantations around the globe and their current and potential applications. This includes all Palmae family, such as Oil palms, Coconut palms, Date palms, Doum palms, Sugar palms…etc.

Theme

"Rediscovering palm byproducts as resources for the circular bioeconomy"

Objectives

- Exchange and disseminate knowledge, research results and experience, associated with the utilization of palm byproducts for sustainable development.
- Inspire and create a dialogue among concerned entities and stakeholders, associated with different palm species worldwide on best practices in managing and processing palm byproducts.
- Change the prevailing look to the palm byproducts as a waste and propagate a new culture of looking positively to the palm byproducts as a wealth of renewable resources and a sustainable material base for a wide spectrum of industries.

Link to the conference website:

https://bypalma.com/

YouTube link:

https://www.youtube.com/channel/UCEVcgYOE50QWoblv6cQFWcg/videos

PARTICIPANTS AND ABSTRACTS

FUTURE PROSPECTS FOR OIL PALM BIOMASS UTILIZATION LED BY SATREPS OPT PROJECT

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Keywords: Oil Palm, Oil palm trunk, Value-added products, Reactive oxygen species (ROS) scavenging ability, SATREPS.

ABSTRACT

Palm oil plays a decisive role in the lives of almost every one of us. Palm oil is an incredibly efficient crop, producing more oil per land area than any other equivalent vegetable oil crop. On the other hand, the development of oil palm plantations becomes a major environmental issue, such as deforestation of tropical rainforests and biodiversity loss. To avoid the problems, sustainable land reuse of plantation areas should be encouraged through replantation. Oil palm trees are generally replanted at 25 years intervals due to declining fruit production. So far, a massive amount of logged oil palm trunks (OPT) is usually abandoned in plantation areas and becomes troublesome wastes. Recent research has revealed that OPT is a bioresource with the potential to produce high value-added products. This new SATREPS project (SATREPS OPT project) [1] aims to resolve the environmental problems associated with oil palm replantation by developing efficient technologies by utilizing OPT as biomass resources to realize sustainable oil palm plantation farming the creation of new industries. The SATREPS OPT project is composed of four main research topics towards sustainable plantation farming systems. This session mainly introduces practical value-added products such as fuel pellets and materials from OPT and EFB through our knowledge and technologies among collaborating partners. In addition, we recently discovered the presence of highly reactive oxygen species (ROS) scavenging ability in OPT by employing the electron spin resonance (ESR) spin trapping method. OPT's high ROS scavenging ability also becomes a good source to produce pharmaceutical, cosmetic, and chemicals. This finding is expected to promote the utilization of palm biomass. This research project will play a role as an engine for realizing sustainable oil palm plantation farming and strengthening the partnership and cooperation between Japan and Malaysia.

YouTube link: https://www.youtube.com/watch?v=UjLSb9aSCEM

PROCESS DEVELOPMENT FOR IHI OPT & EFB FUEL PELLET PRODUCTION

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Keywords: Palm Biomass, EFB, OPT, POME, Methane Fermentation

ABSTRACT

IHI has developed total process to make biomass fuel pellet with OPT and EFB by zero emission process using a advanced methane fermentation process which has been used for industrial waste water treatment. Through the total process, because fiber of EFB and OPT are cleaned by two step dipping system, alkaline content like potassium and sodium become lower than 500ppm. This low level is very suitable to use not only for biomass fuel boiler like CFB but also for mixed combustion boiler by industrial big boiler. And because dipping wastewater is treated by an advanced type of methane fermentation reactor called IC reactor and generated biogas is used for heat and power which are necessary to pellet mill, sustainability of those biomass fuel become much higher than normal biomass pellet which is manufactured by existing normal process. The level of this sustainability is meaning that all heat and power are supplied by using biogas which is carbon neutral energy. And this system has been finally developed for processing not only EFB, OPT but also OPF and MCF. If this system will be applied to normal scale mill, EFB, MCF and POME in a palm mill will treated with together OPT and OPF which are collected near the mill by one process and profit of mill will become 1.3 times bigger and total GHG reduction amount from all palm plantation and palm mill will be as same level as GHG emission which Japan discharged in 2013. This system will be able to provide big economical advantage and big environmental recovery to palm industry.

YouTube link: https://www.youtube.com/watch?v=CxFGWdN9y-0

RESEARCH AND DEVELOPMENT OF OIL PALM BIOMASS UTILIZATION TECHNOLOGIES FROM KLUANG PILOT PLANT

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Keywords: Oil Palm Trunk, Oil Palm Biomass, Research and Development, Circular Economy, Zero Waste Technology

ABSTRACT

OPTEraz Sdn. Bhd. is a research and development (R&D) pilot plant established in Kluang, Johor, Malaysia in 2014 via the collaborative efforts between IHI and JIRCAS (Japan) and USM and Kang Sem Enviro (Malaysia). This facility occupies a land area of about half acre with a fully equipped open shade factory capable of handling various processes such as chip and fiber preparation, chip and fiber washing, grinding, press drying, drying, pelletizing and water treatment. An office building beside this factory houses the R&D laboratory. Our facility is built to accommodate not just one but various oil palm biomasses such as oil palm trunk (OPT), oil palm frond (OPF), empty fruit bunch (EFB), mesocarp fiber (MCF) and palm oil mill effluent (POME). The primary objective for the establishment of this R&D pilot plant is to develop efficient processes for the conversion of various oil palm biomass into high value-added products. The first stage of R&D works began in the plant from 2014 until 2018. During this period, we have successfully demonstrated the conversion of OPT and OPF into pellet fuels which are bio-based and renewable alternatives for coal-fired power plants. Besides, due to the nature of OPT which is unsuitable for use as timber, it can instead be utilized as a sustainable resource for pellet fuel. This reduces the concern of having to use timber woods to produce the pellet fuels. Beginning 2019, the plant has been serving the SATREPS project. The aim of this project which is to promote sustainable replantation of oil palm by adding value to the OPT via scientific and technological innovation resonates well with the objective of this plant. Therefore, a lot of R&D work which focuses on the utilization of OPT has been collectively conducted in this plant. While the production of pellet fuel is continued under this project, many other projects such as those that are related to the fermentable sugar rich OPT sap, mineral rich treated effluents, biogas production and water recycling are currently being studied. This plant is expected to become a model for the oil palm industry which successfully demonstrates the implementation of circular economy and zero waste technology post-SATREPS project. The pilot plant can be used as a R&D and reference center by government and plantation developers interested in adapting this technology in future to enhance the sustainability of the oil palm industry.

YouTube link: https://www.youtube.com/watch?v=RaEmfPvaZuM

STRATEGY OF OIL PALM BIOMASS UTILIZATION FROM TEXA

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Keywords: Bio-composites, Oil palm, Empty fruit bunch fibres, Injection molding, Texchem

ABSTRACT

Oil palm's empty fruit bunch, EFB fibres are non-wood waste that are available in abundance annually in Malaysia. Texchem Polymers has successfully transformed EFB fibres into valuable products to enhance its eco efficiency beside helping to alleviate methane gas generation if these EFB are left to rot in the plantations as of current practice. TEXa® , which is the United States Department of Agriculture (USDA) certified polypropylene, PP based bio-composites consists of 51 wt% of EFB fibres. TEXa® bio-composites can be used for injection moulding in applications such as automotive, furniture, household product, home appliances, oral care product, tableware, etc. There is an increasing demand of bio-composite for the past ten years for injection molding applications in contrast with the stagnant global market demand for profile extrusion and compression moulding applications which have limitations in product design. There are however technical challenges like the high outgassing, low thermal stability, low flowability of the EFB fibres that need to be overcome to enable the use of EFB reinforced PP bio-composites for injection molding. EFB/PP bio-composites with a balance of flow and functional performance have been successfully developed and produced via Texchem's inhouse biomass pre-treatment process as well as its patented compounding technology. The physical, mechanical and functional performance of the EFB/ PP bio-composites in relation to its processability have been investigated and optimized to meet the demanding requirements in various injection moulding applications.

CELLULOSE FROM OIL PALM TRUNK AND ITS CONVERSION TO CARBOXYMETHYL CELLULOSE (CMC)

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Keywords: carboxymethyl cellulose (CMC), cellulose, oil palm trunk (OPT)

ABSTRACT

Lignocellulosic biomass is a natural resource made up primarily of cellulose, hemicellulose, and lignin polymers. α-Cellulose was extracted from OPT fibre using ASTM standard and ecofriendly processes. The eco-friendly cellulose extraction method employed an environmentally friendly multistep procedure that included alkaline treatment and chlorine-free bleaching. The purified cellulose was analyzed using Fourier transfer infrared spectroscopy (FTIR) and found to be comparable to standard commercial cellulose derived from cotton linters (Sigma-Aldrich). Subsequently, α-Cellulose extracted from oil palm trunk (OPT) was used as raw material for producing carboxymethyl cellulose (CMC). For the conversion into carboxymethyl cellulose, the α-cellulose was subjected to an etherification process, using sodium hydroxide and monochloroacetic acid (MCAA), with isopropanol as a supportive medium. The calculated CMC yield from cellulose ranged from 115.43% to 160.06%. The developed CMC had varying viscosities dependent upon the cellulose extraction methods employed. CMC produced from cellulose extracted using ASTM method has high viscosity (2319.4-2706.1 cP), whereas CMC produced from eco-friendly processes in the category of low viscosity which is less than 400 cP at 2% dilution in distilled water. These materials have a wide range of possible uses either in food or non-food industries, according to the findings of this work.

YouTube link: https://www.youtube.com/watch?v=pBaXyL3ueiE

SUSTAINABILITY CONSIDERATIONS IN PRODUCING CHEMICAL CELLULOSE FROM THE VASCULAR BUNDLE OF OIL PALM TRUNK (OPT)

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Keywords: Chemical cellulose, Oil Palm Trunk (OPT), Alpha-cellulose, sustainable process

ABSTRACT

The utilization of renewable biomass resources in producing value-added products plays a vital role in developing the bio-based economy1 . To align with sustainable development, the processes and chemicals applied in converting this biomass into biobased products must encompass economic, social, and environmental sustainability considerations2 . As the biggest vegetable oil contributor, which accounted for 31.4% of total global oils, the palm oil industry also generates massive biomasses in various forms3 . One of residual biomass is the oil palm trunk (OPT), which is obtained during the replantation of the oil palm trees. The vascular bundle (VBOPT) of OPT is rich in cellulose (ca. 69 % over holocellulose content)4 and was isolated from the parenchymal cells after the sugar-rich sap extraction, high-pressure screw press, and drying processes. Due to the chemical composition advantage, VBOPT is a high potential sustainable resource to produce chemical cellulose. This study applied a simple water prehydrolysis followed by soda pulping with 25 % sodium hydroxide (based on the oven-dry weight of biomass). This process produced a pulp that met the chemical cellulose quality, with the alpha-cellulose content approaching 95 %. Besides, the hemicellulose (gamma-cellulose) content and kappa number of the unbleached pulp were below 3 % and 7, respectively. These findings indicated that the employment of the simple water pre-hydrolysis-soda pulping process could effectively improve the dissolubility of both hemicellulose and lignin while preserved the cellulose from degradation. The unbleached chemical cellulose was further bleached with chlorine-free bleaching (a modified hydrogen peroxide bleaching) to increase its purity and hydrolysability to produce nanocellulose. The results showed that applying simple treatments on VBOPT is feasible to achieve the targeted research objectives without the employment of costly and/or environmentally incompatible chemicals.

INSIGHTS INTO THE PRODUCTION OF MICROBIAL-BASED BIOPLASTICS USING OIL PALM TRUNK SAP

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Keywords: Oil Palm Trunk, Oil Palm Trunk Sap, Polyhydroxyalkanoate, Cupriavidus necator NSDG-GG ΔB1/pBPP

ABSTRACT

Felled old oil palm trunks (OPT) in common plantation practices are chipped, pulverized and spread onto the plantation lands for nutrient recycling. However, the OPTs have many hidden potentials to be converted into value-added products. One of the by-products from the OPT is sap which is obtained by pressing the inner region of the trunk. It has been reported that OPT sap is rich in fermentable sugars, amino acids, vitamins and minerals which makes it a highly valuable medium for bioproducts such as bioethanol and lactic acid. Similarly, OPT sap can also be potentially used as a carbon feedstock or a cultivation medium in whole to produce microbial bioplastics. These bioplastics, or better known as polyhydroxyalkanoate (PHA) is accumulated in bacterial cells as insoluble polyester inclusions. The bacterial cells in stressed conditions such as in nitrogen depleted environment with excess carbon source converts the carbon feedstocks into the biopolyester inclusions as an energy storage. The carbon feedstock ranges from various oils and sugars. Owing to the potential of these biopolyesters to become an alternative to the petroleum-based plastics, OPT sap which are rich in fermentable sugars can become an economical choice for the production of PHA. In this study we have evaluated a mutant PHA producing bacterium Cupriavidus necator NSDG-GG ΔB1/pBPP in utilizing OPT sap with various sugar concentrations to produce poly(3-hydroxybutyrate) [P(3HB)] polymer. It was found that by supplementing OPT sap with a total sugar concentration of 20 g/L as the sole carbon source, this bacterial strain was able to accumulate up 26 wt% PHA in the cells. By adjusting the nitrogen feed to 0.34 g/L whilst maintaining 20 g/L of OPT sap, the strain was able to accumulate up to 43 wt% of PHA. Utilizing undiluted OPT sap as a cultivation medium in whole could only produce up to 25 wt% of PHA in the bacterial cells. This showed that a right balance between the carbon to nitrogen ratio is needed in order to produce PHA using OPT sap as a sole carbon source. On the other hand, the effects of various sterilization methods were tested out parallelly to determine the most effective one that can be used to sterilize OPT sap without compromising the potential for cellular growth and PHA production. It was observed that filter sterilization and autoclaving in mild conditions (110 °C, 15 min) gave similar results compared to the standard autoclaving conditions (121 °C, 20 min) which greatly reduced the cellular growth. In summary, this study has successfully shown that OPT sap can indeed be used as a carbon feedstock or whole medium for the production of PHA. By fine tuning the cultivation parameters, OPT sap can be potentially used even for large scale PHA productions in future.

YouTube link: https://www.youtube.com/watch?v=p-T_Vn8xeO8

THE EFFECTS OF OIL PALM TRUNK FIBERS ON PLANT GROWTH AND SOIL MICROBIAL COMMUNITY

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Keywords: Oil Palm Trunk, Lignocellulose, Soil Microflora, Metagenomic Analysis

ABSTRACT

The application of oil palm biomass such as felled oil palm trunk (OPT) as a nutrient source for oil palm replantation is in line with sustainable agricultural practice. Long term decomposition of OPT fiber residues by soil microorganisms can liberate carbon and nutrients from them and increase soil fertility. Hence, understanding the effects of OPT fibers on plant growth and soil microorganisms that constitute a large proportion of total biodiversity will enable responsible management of OPT waste, which is crucial to ensuring the sustainability of oil palm plantations. In this study, we investigated the enrichment of soil with OPT fibers and other lignocellulosic biomass that differ in cellulose/hemicellulose content and composition, namely bagasse and cellulose. Plants grown on lignocellulose-enriched soil, particularly using OPT fibers, exhibited reduced height, chlorophyll content and overall biomass in comparison with those grown on untreated soil. These results suggest possible changes in the soil microbial community and activity contributing to the consumption of these compounds. Metagenomic analysis revealed differences in the microflora of untreated soil relative to soil mixed with OPT fibers, bagasse and cellulose. Further studies are therefore necessary to improve understanding on the nutrient requirements of oil palms to enable efficient application of felled OPT for optimal supplementation of nutrients, in order to ensure healthy plant growth and good economic yields.

YouTube link: https://www.youtube.com/watch?v=bf54zjVgXXM