ByPalma

World Conference

1st World Conference
on By-Products of
Palm Trees and
their Applications

Rediscover
Palm By-Products

Organizers

Main Sponsors

With the technical cooperation of the F.A.O

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WELCOME TO BYPALMA 2018

Dear Colleagues, Dear Friends,

It is with great pleasure that we welcome you to the marvelous city of Aswan for the 1st edition of the World Conference on By-Products of Palm Trees and their Applications, ByPalma 2018.

First, we would like to thank all of you for your participation at the conference. We are aware that many of you have had difficulties in obtaining funding, visas, travel tickets, and many have travelled a long way to reach us.

Thank you!

In the first edition of ByPalma we are proud to have an outstanding scientific program, representing the recent developments in the field of by-products of palms and their utilization in the form of 5 keynote talks, 45 oral presentations, a selection of 5 panel discussions, and a poster session.

In addition, the conference will host a photo gallery on the palm by-products utilization, innovation exhibition, and Zero "Agro"Waste competition. This, together with a very nice social program, and a Nile social gathering and with an optional day tour in Aswan.

All this has been possible thanks to your participation, to our partners contributions, to our sponsors support and to our helper involvement.

We do hope that you enjoy your attendance at ByPalma 2018!

Hamed El-Mously — Chairman
Mohamad Midani — Co-Chair

About ByPalma World Conference:

ByPalma is the first conference of its kind solely focusing on the by-products of palm plantations around the globe and their current and potential applications.

It will provide an interdisciplinary platform for leading academic scientists, researchers, artisans, entrepreneurs and industry professionals as well as palm growers.

Participants will exchange recent developments, technologies, innovations, trends, concerns, challenges, and opportunities, related to palm by-products R&D, manufacturing, and crafts.

The host country Egypt is home to more than 15 million date palms and is considered the world biggest producer of dates. Egypt has a long heritage of utilization of date palm by-products since ancient Egyptians.

The main organizing institution is the Faculty of Engineering – Ain Shams University, a world-renowned engineering school, and a leader in date palm by-products research and development.
On behalf of the organizing committee, we extend a warm welcome and hope to enjoy your stay in the marvelous city of Aswan – Egypt.

Topics include the utilization of palm by-products in the following applications:

Bio-Composites	**Bio-Fertilizers**
Food Applications	**Wood Alternatives and Panels**
Bio-Technology	**Fiber, Paper and Textile**
Design and Architecture	**Sustainable Energy Production**

Day 1 – Dec 15th

10:00 – 11:00	**Registration**
11:00 – 11:45	**Welcome Address** *National Anthem* Major General Ahmed Ibrahim - Governor of Aswan Dr. Hussein Gadin – FAO Representative in Egypt Prof. Dr. Ayman Ashour – Dean of Faculty of Engineering, Ain Shams University Prof. Dr. Abdelwahab Ezzat – President of Ain Shams University H. E. Eng. Amr Nassar - Minister of Trade and Industry H. E. Dr. Yasmine Foad - Minister of Environment
11:45 – 12:15	**Keynote 1** **Rediscovering Date Palm By-Products: An Opportunity for Sustainable Development** Chairman Dr. Hamed El-Mously, Ain Shams University, Egypt
12:15 – 12:30	**ByPalma Association** **Establishment of the International Association of Palm By-products (ByPalma Assn.)** Chairman Dr. Hamed El-Mously, Ain Shams University, Egypt
12:30 – 12:45	**FAO Contributions to the Bioeconomy** Dr. Irene Xiarchos, FAO regional office NENA
12:45 – 13:15	Coffee Break
Discussion Panel 1	
13:15 – 14:15	**Government Vision and Policies on the Utilization of Palm By-Products** **Moderator:** Amgad El-Kady, Food and Agro Industries Technology Center, Egypt Panelists: 1. General Ahmed Ibrahim, Governor of Aswan – 2. General Mohamed El-Zamlout, Governor of New-Valley – 3. Dr. Mamdouh Ghorab, Governor of Al-Sharqiyah – 4. General Hisham Amna, Governor of Beheira – 5. General Magdi Al-Gharabli, Governor of Matrouh - 6. Dr. Yasmine Foad, Minister of Environment.
Discussion Panel 2	
14:15 – 15:15	**Role of Design in Rediscovering Palm By-Products** **Moderator:** Alaa El-Anssary, The German University in Cairo, Egypt **Panelists:** 1. Sherif Khalil, Aly Khalil Furniture – 2. Mohamed S. Wahb, Ebony & Ivory – 3. Yousra Yassin, Room No.9 – 4. Ahmed Bedeir, Designer
15:15 – 16:15	Lunch and Gathering Photo
Session 1: ENERGY AND FERTILIZERS	
16:15 – 16:30	Chairpersons Dr. Mohamed Elansary and Dr. Sherif El-Sharabasy **Evaluating Egypt's Agricultural Residues for Sustainable Energy Production** Manas Puri Food and Agriculture Organization (FAO) of the United Nations, Italy.

16:30 – 16:45	**Scenarios of Palm-Oil Biodiesel in the Mexican Transportation Sector** J. Islas, G. Grande, F. Manzini.
16:45 – 17:00	**A Study of the Potentiality of use of Siwei Palm Midribs in Charcoal Production** H. El-Mously, M. Muhammad Ain Shams University, Egypt.
17:00 – 17:15	**Palm Secondary Products as a Source of Organic Material for Compost Production: Applied Examples from Egypt** M.M. Ahmed Agriculture Research Center, Egypt.
17:15 – 17:30	**Production of Biochar from Date Palm Fronds and its Effects on Soil Properties** M.A. Badawi Emirates Biofertilizers Factory, UAE.
17:30 – 17:45	**Application of Date Palm Trees Mulch as a Bedding Material for Dry Heifers in Saudi Arabia** A.O. Elashhab1, M.W. Sadik2, M.K. Zahran3 1: Ministry of Agriculture, Egypt 2: Cairo University, Egypt 3: Al Hofuf Stars Trading Est., Saudi Arabia.
17:45 – 18:00	Short Coffee Break
Session 2: BIO-COMPOSITES	
18:00 – 18:15	*Chairpersons Dr. Abel Olorunnisola* **Evaluation of Coconut (Cocos nucifera) Husk Fibre as a Potential Reinforcing Material for Bioplastic Production** O.A. Babalola, A.O. Olorunnisola University of Ibadan, Nigeria.
18:15 – 18:30	**A Review of Recent Devolvement in Date Palm Fiber Reinforced Polymer Composites** A.Y. Elnour1, M.S. Al-Otaibi1, O.Y. Alothman1,2, A.A. Alghyamah1 1: King Saud University, Saudi Arabia 2: Saudi Electronic University, Saudi Arabia.
18:30 – 18:45	**Effect of Layering Patterns on Mechanical Properties of Oil Palm EFB/Kevlar Hybrid Composites** M. T. Sultan Universiti Putra Malaysia, Malaysia.
18:45 – 19:00	**Synergy of Fiber Surface Treatment and MMT Nanoclay Hybrid on the Free Vibrational Behaviors of Palmyra Fruit Fiber Polyester Composites** I. Sankar1, I. Siva2, and D. Ravindran3 1: National Engineering College, India 2: Kalasalingam University, India 3: National Engineering College, India.
19:00 – 19:15	**Enhancement of the Mechanical Behavior of Starch-Palm Fiber Composites** H. Megahed1, M. Emara2, M. Farag3, A. Wifi1, M. El-Shazly4 1: German University in Cairo, Egypt 2: Canadian International College in Cairo, Egypt 3: The American University in Cairo, Egypt 4: The British University in Egypt.

Day 2 – Dec 16th

09:00 – 09:30	**Keynote 2** **A Glimpse on 65 Years of Passion-driven Work for Bamboo and Similarity to Palm By-Products** Dr. Walter Liese, University of Hamburg - Germany
09:30 – 10:00	**Keynote 3** **The Use of Oil Palm Trunks for Wood Products** Dr. Arno Frühwald, University of Hamburg - Germany
10:00 – 10:30	Coffee Break
Session 3: WOOD ALTERNATIVES AND PANELS	
10:30 – 10:45	*Chairpersons Dr. Edi S. Bakar and Dr. Paridah Tahir* **Wood, Bamboo and Palm Wood - Similarities and Differences in Research and Technology Development** Johannes Welling1; Walter Liese2 1: Thünen Institute of Wood Research, Germany 2: Hamburg University, Germany.
10:45 – 11:00	**How to Improve the Sustainability of Palm Oil by Using Wooden Products such as Furniture or Plywood from Oil Palm Trunks** G.A. Reinhardt Institute for Energy and Environmental Research Heidelberg, Germany
11:00 – 11:15	**Oil Palm Wood as Wood Alternative Material: Properties, Processing and Quality Enhancement** E.S. Bakar1, M. Soltani2, L.S. Hua1, Z. Ashaari1 1: Universiti Putra Malaysia, Malaysia 2: Islamic Azad University.
11:15 – 11:30	**Enhancing the Performance of Oil Palm Wood (Elaeis Guineensis) through Phenolic Compreg Technique** A. Zaidon, A.G. Aizat, S.H. Lee, M.T Paridah and E.S. Bakar Universiti Putra Malaysia, Malaysia
11:30 – 11:45	**Innovative Biocomposite Sandwich Panels Made of Coconut Bidirectional External Veneers and Balsa Lightweight Core as Alternative for Eco-Friendly and Structural Building Applications in High-Risk Seismic Regions** O.M. González1,2, N. Andino2, H.L. Barrigas2, A. García2 1: Griffith University, Australia 2: Universidad de las Fuerzas Armadas ESPE, Ecuador
11:45 – 12:00	**Plywood from Oil Palm Trunk: Manufacturing Process and Development of Standards** P.M. Tahir1, L.Y. Feng2, S.A. Rashad1 and Y.B. Hong2 1: Universiti Putra Malaysia, Malaysia 2: Malaysian Timber Industry Board, Malaysia
12:00 – 12:15	**Medium Density Fiberboards from the Date Palm Residues: A strategic Industry in The Arab World** H. El-Mously, M. Saber Ain Shams University, Egypt
12:15 – 12:30	Evaluation of Date Palm Fiber Components as Alternative Lignocellulosic Material for Medium Density Fiberboard Manufacturing A.A. Adam1, A.H. Basta2 and H. El-Saied2 1: Nag-Hamady Fiberboard Company, Egypt 2: National Research Center, Egypt
12:30 – 13:00	Coffee Break
Discussion Panel 3	
13:00 – 13:45	Inclusive Innovation in Agro Waste Management: Focus on Palms Moderator: Heba Gaber, Research and Innovation Officer, EU Delegation Panelists: TBA
Session 4: BIOMEDECINE AND BIOTECHNOLOGY	
13:45 – 14:00	Chairpersons Dr. Maiada El-Dawayatiy and Dr. Zainab Zayed

	The Date Palm Research Center of Excellence: Achievements and Contributions to the Date Palm Industry Mohamed R. Al-Hajhoj The Date Palm Research Center of Excellence, King Faisal University, KSA
14:00 – 14:10	**Effect of Some Micro-Elements on Steroids Production from Embryogenic Callus of In Vitro Date Palm Sakkoty and Bartamuda Cultivar** Abdel-Aal W.B.1, S.F. El-sharabasy1, H.A. Bosila2, B.M. Mansour2 and A.A. Bana1 1: Agriculture Research Center, Egypt 2: Al-Azhar University, Egypt
14:10 – 14:20	**Steroids Production of Embryogenic Callus Cultures of Date Palm Under the Effect of Vitamins (Pyridoxine Hydrochloride, Nicotinic Acid) Thiamine Hydrochloride and Myo- Inositol** S.F. El-sharabasy1, Abdel-Aal W.B.1, H.A . Bosila2, B.M. Mansour2 and A.A. Bana1 1: Agriculture Research Center, Egypt 2: Al-Azhar University, Egypt
14:20 – 14:30	**Effect of Murashige and Skoog Salts Strength Medium (MS) on Steroids Production and Total Amino Acids Content of Date Palm Embryonic Callus (Sakkoty And Bartamuda Cultivar)** H.A. Bosila2, S.F. El-sharabasy1, Abdel-Aal W.B.1, B.M. Mansour2 and A.A. Bana1 1: Agriculture Research Center, Egypt. 2: Al-Azhar University, Egypt.
14:30 – 14:45	**Some Heavy Metals as a Precursor of Steroids Production from Date Palm Callus** Z.E. Zayed, M.M. El-Dawayati, S.F. El-sharabasy Agriculture Research Center, Egypt
14:45 – 15:00	**The Biological Effect of Light Intensity on Steroids Production of Developed Callus Cultures of Date Palm Hayani CV** M. El-Dawayati, and S.F. El-sharabasy Agriculture Research Center, Egypt
15:00 – 15:15	**Effect of Natural Additives as Coconut Milk on the Shooting and Rooting Media of In-vitro Barhi Date Palm** H.S. Ghazzawy1 and S. Elsharabasy2 1: King Faisal University, Saudi Arabia 2: Agriculture Research Center, Egypt
15:15 – 16:30	Lunch
Discussion Panel 4	
16:30 – 17:30	**Present Status and Future Prospects of Date Palm By-products Utilization** **Moderator:** Mohamad Midani, The German University in Cairo, Egypt Panelists: 1. Hamed El-Mously, Ain Shams University – 2. Othman Alothman, King Saud University – 3. Amgad El-Kady, Food and Agro-Industries Technology Center – 4. Sherif Elsharabasy, ARC – 5. Salah Elnefeidi, Elnefeidi Group.
17:30 – 19:30	Nile Social Gathering

Day 3 – Dec 17th

09:00 – 09:30	**Keynote 4** **Oil Palm Biomass and its Composites: Potential Applications in Automotive, Constructions, Aerospace and Packaging Industries** Dr. Mohammad Jawaid, Universiti Putra Malaysia - Malaysia
09:30 – 10:00	**Keynote 5** **A Tough Nut to Crack! Integrated Considerations in Developing a Successful By-product Value Chain; Lessons from Coir Fiber.** Dr. Dilip Tambyrajah, International Natural Fiber Organization, Netherlands
10:00 – 10:15	**Date Palm Secondary Products: Types and Economic Significance** S.A. Al-Balahy and R.A. Abu-Aianna Saleh Abdulaziz Al Rajhi Endowment Management, Saudi Arabia
10:15 – 10:45	**Coffee Break**
	Session 5: FIBER, PAPER AND TEXTILE
10:45 – 11:00	*Chairpersons Dr. Ahmed Hassanin and Dr. Tamer Hamouda* **Optimizing the Extraction Process of a Novel Long Fibrillated Fibers from the Midribs of Date Palm (Phoenix Dactylifera L.)** M. Midani[1], L.A. Elseify[1], A. Hassanin[2], T. Hamouda[3] 1: German University in Cairo, Egypt 2: Alexandria University, Egypt 3: National Research Center, Egypt
11:00 – 11:15	**Investigations on the Effects of Cement Replacement and Calcium Chloride Addition on Selected Properties of Coconut Husk Fibre-Reinforced Roofing Tiles** A.O. Olorunnisola, A.O. Adeniji University of Ibadan, Nigeria
11:15 – 11:30	**Production of Cellulose Fibres for Papermaking Applications from Date Palm** R. Khiari[1,2], E. Mauret[2] and M.N. Belgacem[2] 1: University of Monastir, Tunisia 2: University Grenoble Alpes, France
11:30 – 11:45	**Textile Palm Fibers from Amazon Biome** I.M. Cattani[1], L.G.A. Pennas[1], A.M. Seyam[2], M. Midani[2,3], A.S. Monteiro[1], J. Baruque-Ramos[1] 1: University of Sao Paulo, Brazil 2: North Carolina State University, USA. 3: The German University in Cairo, Egypt.
11:45 – 12:00	**Review on Date Palm (phoenix Dactylifera L.) Fibers and Their Applications** L.A. Elseify, M. Midani, and L.A. Shihata The German University in Cairo, Egypt
12:00 – 12:15	**Adsorption of Methylene Blue onto Chemically Prepared Activated Carbon from Date Palm Pits: Kinetics and Thermodynamics** A. M. Youssef [1], H. EL-Didamony[2], S.F. EL- Sharabasy[3], M. Sobhy[1,3] 1: Mansoura University, Egypt 2: Zagazig University, Egypt 3: Agricultural Research Center, Egypt
12:15 – 12:30	**Date Palm Fiber Wastes as a Novel Source of Natural Colorant for Textile Materials** N. Baaka[1], R. Khiari[1,2,3] 1: University of Monastir, Tunisia. 2: University Grenoble Alpes, France. 3: CNRS, France.
12:30 – 13:00	**Coffee Break and Poster Session**
13:00 – 13:30	POSTER SESSION

Day 3 – Dec 17th

Session 6: FOOD APPLICATIONS	
13:30 – 13:45	*Chairpersons Dr. Mohamed Al-Farsi* **New Technologies for Value Added Products from Coconut Residue** N.K. Rastogi Central Food Technological Research Institute, India
13:45 – 14:00	**Production of Single Cell Protein from Date Waste** M. Al-Farsi1, A. Al Bakir2, H. Al Marzouqi3 and R. Thomas2 1: Ministry of Regional Municipalities & Water Resources, Oman 2: Al Foah Company, UAE 3: Abu Dhabi Food Control Authority, UAE
14:00 – 14:15	**Post-Harvest Technology of Palmyrah in India (Borassus Flabellifer L.)- Present Status and Scope** P. C. Vengaiah, All India Coordinated Research Project on Palms, Horticultural Research Station, India
14:15 – 14:30	**Maximize the Benefit from Date Pits for Production of Activated Carbon and using it for Removing Peroxides from Fried Oils** A.M. Basuny1 and S.M. Arafat2 1: Beni-Suef University, Egypt 2: Agriculture Research Center, Egypt
Session 7: DESIGN AND ARCHITECTURE	
14:30 – 14:45	*Chairperson Dr. Julia Ramos* **Design for Enhancing Material Appreciation: An Application on the Palm Tree Midribs** A. El-Anssary and N. Lotfi The German University in Cairo, Egypt
14:45 – 15:00	**The Technical Heritage of Date Palm Leaves Utilization in Traditional Handicrafts and Architecture in Egypt & the Middle East** E.A. Darwish, Y. Mansour, H. El-mously, and A. Abdelrahman Ain Shams University, Egypt
15:00 – 16:00	Lunch
Discussion Panel 5	
16:00 – 17:00	**Present Status and Future Prospects of Oil Palm By-products Utilization** Moderator: Mohammad Jawaid, Universiti Putra Malaysia, Malaysia Panelists: 1. Arno Fruehwald, Hamburg University – 2. Johannes Welling, Thünen Instutute of Wood Research – 3. Zaidon Ashaari, Universiti Putra Malaysia.
Discussion Panel 6	
17:00 – 18:00	**Palm By-Product Development: Social and Economic Opportunities** Moderator: Mohamed Yacoub, FAO, Egypt Panelists: 1. Irene Xiarchos, FAO - 2. Annachiara Scandone, UNIDO – 3. Sosal Art Center – 4. Napata – 5. Jereed
	Closing Ceremony **Announcing the winners of Zero Agro"Waste" Competition** Conclusions and Recommendations Dr. Hamed El-Mously, Conference Chairman Dr. Mohamad Midani, Conference Co-Chair

Day 4 – Dec 18th (Optional)

Full Day Tour in Aswan - 70 USD
Philae temple, high dam, unfinished obelisk and Nubian Village in Aswan

Philae Temples

One of Nubia's most important monument sites, the Temples of Philae was an ancient pilgrimage center for the cult of Isis and dazzled travelers with its power for centuries.

Nubian Village

Visit a Nubian community on Sohail Island from a boat ride and enjoy a special lunch made up of authentic Nubian dishes. Discover Nubian culture, thought to be one of the earliest civilizations located anywhere on Earth.

El Nabatat Island

El Nabatat Island is one of two major islands on the Nile in vicinity of Aswan, The island, as a whole, constitutes the Aswan Botanical Garden. One can view the many types of subtropical, exotic, and rare plantings and trees such as the Royal Palm tree and the Sabal Palm tree

River Nile Cruise

A Nile Cruise trip is a very enjoyable experience that any visitor must do when he visit Egypt. The Nile Cruise Trip combines the History with the pleasant atmosphere which makes it an unforgettable Trip.

Concurrent Events: Dec 15th – Dec 17th

POSTER PRESENTATIONS

Dedicated Poster Session Day 3, Dec 17th 13:00 – 13:30

Exploiting the Form Flexibility of Date Palm Midribs in the Design of Modern Shade Structures
E. A. Darwish
Ain Shams University, Egypt

Chemical Composition and Pulping of Tunisian Almond and Fig Stems – A comparison with Tunisian Date Palm Rachis
I. Moussa1, R. Khiari1, 2, A. Moussa1, and M.F. Mhenni1
1: The university of Monastir, Tunisia. 2: The university of Grenoble Alpes, France.

Using Printed Palm Leaflets in Modern Crafts According the International Fashion Trends
H. O. Elsayegh
Benha University, Egypt

Poultry Battery Made of Palm-Leaf Stalks
A.H. Abd El-Megeed
ARC, Ministry of Agriculture, Egypt

Characterization of Volatile Compounds in Roasted Dates (Phoenix dactylifera) Seeds in Comparison to Coffee Been (Coffea Arabica) using GC-MS and Consumer Study
K. AlShoaily
Ministry of Agriculture, Oman

Plant Design for the Conversion of 2 ton/hr Date Palm Waste into Syn Gas
A. Alharthi, and I. Ali
King Abdulaziz University, Saudi Arabia

Effect of Vitamins (Pyridoxine and Nicotinic Acid), Thiamine and Myo-Inositol at Different Concentrations on Free Amino Acids and Indoles Content of Embryogeinic Callus of In Vitro Date Palm (Sakkoty And Bartamuda Cultivar)
S.F. El-sharabasy1, Abdel-Aal W.B.1, H.A . Bosila2, B.M. Mansour2 and A.A. Bana1
1: Agriculture Research Center, Egypt 2: Al-Azhar University, Egypt

The Effect of Some Micro-elements on Free Amino Acids, Indols and Total Phenols Production from Embryogenic Callus of Two Date Palm Cultivars (Sakkoty And Bartamuda)
S.F. El-sharabasy1, Abdel-Aal W.B.1, H.A . Bosila2, B.M. Mansour2 and A.A. Bana1
1: Agriculture Research Center, Egypt 2: Al-Azhar University, Egypt

Producing Sustainable Energy and Green Construction Materials Using Recycled Palm Tree Mid-Rib Wastes
A. Sharkawi, A. Bakry, A. Albastawisi and K. Rabie
Tanta University, Egypt

Keynote Speakers

Dr. Hamed El-Mously
Ain Shams University, Egypt

The Legendary Professor Dr. Hamed El-Mously, is the conference chairman and Emeritus Professor at the Faculty of Engineering – Ain Shams University, Egypt.

Dr. El-Mously is recognized as the founding father of Date Palm by-products research and development, and one of the warriors of sustainable development of local communities. He received numerous prestigious awards for his work, such as Khalifa International Award for Date Palm and Agriculture Innovation 2013.

El-Mously has been working in projects aiming at developing local communities in all villages of Egypt, by applying developing projects using their local resources since 1995. Projects include production of blockboard, parquet, and arabesque from palm midribs, production of non-traditional animal feed from agricultural residues, production of organic fertilizers from pruning-products of date palms, doum palms, and mango trees, and production of fig jam.

El-Mously contributed in the foundation of several research and societies:

- Small Industries and Local Technology Development Center.
- The Egyptian Society for Endogenous Development of Local Communities.
- Network of Fiber-Plastic Composites, Tree-Free Wood Innovation.
- Network, Foundation for Renewable materials Research, Technology and Applications.

He is a member in several strategic consulting and scientific committees', Ain Shams University. He obtained the Ph.D. from Metal Cutting Machine Tools Institute, Moscow.

"**Rediscovering Date Palm By-Products: An Opportunity for Sustainable Development**" is the title of Dr. Elmously's keynote talk at ByPalma 2018.

Dr. Walter Liese

University of Hamburg, Germany

A Glimpse on 65 Years of Passion-driven Work for Bamboo and Similarity to Palm ByProducts" is the title of Dr. Walter Liese speech in ByPalma World Conference.

Dr. Liese is recognized as the father of bamboo, for his significant contributions in this field. He grew up in Eberswalde and studied forestry at the University of Freiburg and the University of Göttingen. He obtained his PhD under Herbert Zycha.

In April 1951, Walter Liese had started working as a research scientist at the Forest Research Institute in Lintorf, near Düsseldorf. Dr Franz Erich Eidmann, then Head of the Institute, kindled Liese's interest in bamboo. The discussion centered on the suitability of culms as pit props in coal mines. Liese, motivated by Dr Eidmann's enthusiasm, carried out a series of experiments on the properties of bamboo for its use in mines.

In 1963 Liese became Professor at the University of Hamburg. He searched about the wood and bark anatomy, wood quality, Bamboo and many other subjects in over 500 publications. In 1991 he became an Emeritus and He was the co-editor of many scientific journals.

Dr. Mohammad Jawaid
Putra University Malaysia

Dr. Mohammad Jawaid, PhD is currently working as Fellow Researcher (Associate Professor), at Biocomposite Technology Laboratory, Institute of Tropical Forestry and Forest Products (INTROP), Universiti Putra Malaysia, Serdang, Selangor, Malaysia and also Visiting Professor at Department of Chemical Engineering, College of Engineering, King Saud University, Riyadh, Saudi Arabia since June 2013. Previously he worked as Visiting Lecturer, Faculty of Chemical Engineering, Universiti Teknologi Malaysia (UTM) and also worked as Expatriate Lecturer under UNDP project with Ministry of Education of Ethiopia at Adama University, Ethiopia.

He received his Ph.D. from Universiti Sains Malaysia, Malaysia. He has more than 10 years of experience in teaching, research, and industries. His area of research interests includes Hybrid Reinforced/Filled Polymer Composites, Advance Materials: Graphene/Nanoclay/Fire Retardant, Lignocellulosic Reinforced/Filled Polymer Composites, Modification and Treatment of Lignocellulosic Fibres and Solid Wood, Nano Composites and Nanocellulose fibres, Polymer blends. So far he has published 15 book, 27 book chapters, and more than 235 International journal papers and 5 Published review paper under Top 25 hot articles in science direct during 2014-2016. He is a reviewer of several high impact ISI journals.

He is working in the composite field since 2008 and having 10 years of experience in teaching, research in the field of composites. His area of research interests includes Hybrid Reinforced/Filled Polymer Composites, Advanced Materials.

Wait for his amazing speech in ByPalma World Conference about "**Oil palm biomass and its composites: potential applications in automotive, constructions, aerospace and packaging industries**"

Dr. Arno Fruehwald
University of Hamburg, Germany

"The use of oil palm trunks for wood products" is the title of Dr. Arno's speech in ByPalma World Conference.

Dr. Arno has a huge background in furniture making, mechanical engineering, chemical industry, Wood Science, Technology, Forestry, and Forest Products.

He studied engineering (Wood Industry) at the University of Applied Sciences Rosenheim/Germany, Wood Science and Technology as well as Economics, at the University of Hamburg/Germany, and he has PhD in Wood Science and Technology, University of Hamburg.

Dr. Arno was Dean Faculty of Biology and Faculty of Mathematics, Informatics and the Natural Sciences University of Hamburg, and he was Professor for Wood Science and Technology, University of Hamburg/Germany (since 1977),

1996 to 2010 Director Institute for Wood Physics and Technology, Federal Research Center for Forestry and Forest Products Hamburg

Dilip Tambyrajah

International Natural Fiber Organization, Netherlands

Mr. Dilip Tambyrajah is the initiator and founding member (present Secretary General) of the International Natural Fiber Organization (INFO), representing more than 85% of the volume of the world's production of hard fibers. Dilip is an active member of the UN FAO Inter-Governmental Group on Hard Fibers.

He is the elected liaison person acting between the member states and the FAO. Dilip was also a member of the UN-FAO international steering committee responsible for the UN general assembly declared, International Year of Natural Fibers 2009.

Over the years has developed and marketed several natural coir fiber products, including business experience in the European automotive industry for use of coir in car seat production. At present developing Natural Fiber Composites (NFC) for a wide range of applications.

Don't miss the chance to Meet Mr. Dilip in his great speech about "A Tough Nut to Crack! Integrated Considerations in Developing a Successful By-product Value Chain; Lessons from Coir Fiber"

Partners & Sponsors

Sponsors

Official Sponsors:

Arab republic of Egypt Ministry of Environment

In June 1997, the responsibility of Egypt's first full time Minister for Environmental Affairs was assigned as stated in the Presidential Decree no.275/1997. From thereon, the new ministry has focused, in close collaboration with the national and international development partners, on defining environmental policies, setting priorities and implementing initiatives within a context of sustainable development.

Arab Republic of Egypt
Ministry of Environment

According to the Law 4/1994 for the Protection of the Environment, the Egyptian Environmental Affairs Agency (EEAA) was restructured with the new mandate to substitute the institution initially established in 1982. At the central level, EEAA represents the executive arm of the Ministry.

An Environmental Protection Fund (EPF) will in accordance with the Environment Act of 1994 (amended by Law 9/2009) be set up. The Fund will receive the amount specifically allocated to it in the General State Budget by way of support, donations and grants presented by national and foreign organizations concerned with environmental protection, fines and compensation awarded by courts of law or via out-of-court settlements for damage caused to the environment, as well as revenues from the protectorates fund.

Ministry of Trade & Industry

Ministry of Trade & Industry is the engine of sustainable and inclusive economic development in Egypt, which meet domestic demand and enhance exports growth, for Egypt to become a key player in the global economy and capable of adjusting to international developments.

Ministry of Trade & Industry

Our mission; Provide an adequate environment for sustainable inclusive economy based on enhancing competitiveness, diversity, knowledge, innovation and generating decent and productive job opportunities.

Golden Sponsors

Misr El Kheir Foundation

Misr El Kheir Foundation (MEK) is a non-profit development institution established in 2007 with the objective of developing the Egyptian individual in a comprehensive manner.

Misr El Kheir Foundation

Five key areas have been selected for human development namely: Health, Education, Scientific Research, Social Solidarity and Aspects of Life. Our vision is: to become a pioneering sustainable development organization to be heeded internationally; our mission is to contribute to the development of individuals and to serve them in the hope of eliminating unemployment, illiteracy, poverty, and disease.

The European Union

(EU) is a political and economic union of 28 member states that are located primarily in Europe. It has an area of 4,475,757 km² (1,728,099 sq. mi) and an estimated population of about 513 million.

The EU has developed an internal single market through a standardized system of laws that apply in all member states in those matters, and only those matters, where members have agreed to act as one.

Co-financed by the Connecting Europe Facility of the European Union

EU policies aim to ensure the free movement of people, goods, services and capital within the internal market, enact legislation in justice and home affairs and maintain common policies on trade, agriculture, fisheries and regional development. For travel within the Schengen Area, passport controls have been abolished. A monetary union was established in 1999 and came into full force in 2002 and is composed of 19 EU member states which use the euro currency.

Technical Partner

FAO "Food and Agriculture Organization of the United Nations"
The conference is organized with technical cooperation of the F.A.O

The Food and Agriculture Organization of the United Nations is a specialized agency of the United Nations that leads international efforts to defeat hunger.
Serving both developed and developing countries, FAO acts as a neutral forum where all nations meet as equals to negotiate arguments and debate policy.

FAO is also a source of knowledge and information, and helps developing countries in transition modernize and improve agriculture, forestry and fisheries practices, ensuring good nutrition and food security for all.

Academic Partners and Sponsors:

The Academy of Scientific Research & Technology

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ASRT adopts a comprehensive plan for developing Egyptian S&T to support relevant national ministries and research institutions in creating an integrated system of scientific research together for increasing the number of trained scientists in Egypt, and giving science a leading role in the country's development and knowledge based economy. ASRT also promotes and encourages female and youth participation in S&T and scientific leadership.

Deutscher Akademischer Austauschdienst (DAAD)

The DAAD provides young people with the opportunity to gain international academic and research experience in Germany as well as worldwide. Most foreign DAAD scholarship recipients are Master's students or doctoral candidates. Only very few scholarships are awarded at Bachelor's level (to top students at German schools abroad).

The reason for this funding priority is that graduate students will have already proven their academic ability by completing their first degree, hence are more likely to benefit from a scholarship.

COSIMENA

Common global challenges, such as climate change, population growth or water scarcity, call for innovative scientific ideas and interdisciplinary and intersectoral solutions. Addressing those crucial issues, the DAAD Office Cairo successfully launched COSIMENA (Clusters of Scientific Innovation in the Middle East and North Africa) setting up various issue driven clusters in the fields of water, energy, health, agriculture, economy, urbanism and cultural heritage.

The aim of the project is to intensify scientific collaboration and increase the visibility of networks between researchers and universities in Germany and countries of the Middle East and North Africa. To build on existing partnerships, COSIMENA is harnessing synergies between DAAD funded projects, alumni and partner institutions that can be expanded to the whole MENA region.

Universiti Putra Malaysia

UPM, a leading research university in Malaysia is located in Serdang, next to Malaysia's administrative capital city; Putrajaya. As a world renowned centre of learning and research, UPM has attracted students and staff from all around the world making it a well- respected global entity.

Community Partner

PalmWoodNet

PalmwoodNet, an international network of experts, researches the sustainable use of oil palm wood for high-value-added products under technical, economic, environmental and social aspects. The network owners (Jowat, Leitz, Minda, Möhringer and Palmwood R + D) are working closely together in a project funded by the BMZ (Federal Ministry for Economic Cooperation and Development).

Egyptian Export Council for Handicrafts (EECH)

EGYPTIAN EXPORT COUNCIL FOR HANDICRAFTS EECH was established by a ministerial decree no. 760 on 18 November 2013, to promote, support, protect, maintain and increase the exports of modern, well-finished and high quality.

The Federation of Egyptian Industries (FEI)

FEI is one of the country's largest employers' associations, with 20 industrial chambers as members, representing over 60,000 industrial enterprises out of which more than 90% belong to the private sector; accounting for more than 7 million workers and 20% of the national economy.

Since its inception The Federation of Egyptian Industries [FEI] has been carrying out its responsibilities towards defending and supporting Egyptian industries, firmly believing in industry as the pillar of the sustainable development of the country and as the tool to alleviate poverty and attain prosperity.

Therefore, FEI effectively advocates the common interests of its members and defends their positions towards governmental and legislative bodies, as well as other local and international associations.

IDDC

The International Dryland Development Commission (IDDC) is an autonomous nongovernmental nonprofit organization established in 1978 by the individuals and institutions interested in sustainable development of dry areas. The commission promotes all aspects of dryland studies by fostering cooperation, collaboration and networking between various international, regional and national organizations.

One of the important modus operandi of the networking of IDDC has been to hold a major scientific conference every two to three years to provide opportunity to participants from around the world to exchange research results and experiences in dryland development and combating desertification. To date, the Commission has organized twelve international conferences in different parts of the world where the dry lands predominate (Egypt, China, Iran, Mexico, USA,).

Organizing Partners

Faculty of Engineering – Ain Shams University (FASHAMS)

The main organizing institution is the Faculty of Engineering – Ain Shams University (FASHAMS), one of the oldest (1839) and most prestigious colleges offering Engineering Education in Egypt and the Middle East. The college is composed of 13 departments covering basic and advanced engineering disciplines.

FASHAMS is a leader in Date palm by-products research and development; in 1989 the college began to direct its research activities to rediscover the products of pruning of the date palm as a sustainable material base for the establishment of SMEs, especially in villages having extensive palm plantations. The research efforts were first aiming at characterizing the physical and mechanical properties of date palm midribs and benchmarking them against other known wood species. The research continued towards the study of the potential use of the date palm midribs as a core material in block boards, as well as using it for making particle boards and medium density fiberboards (MDF). The research further extended to the use of palm midribs in the production of lumber- like products, as well as the production of strands and Nano-particles for the reinforcement of polymeric composites.

The Egyptian Society for Endogenous Development (EGYCOM)

The conference society partner is EGYCOM, a very active society involved with exploring and rediscovering new capacities, potentials, and ways to utilize the neglected local resources and raw materials to help local communities rediscover their latent capabilities in productive work, cultural revival, and technological innovation.

Through scientific experimentation and technological innovation, EGYCOM builds up new linkages between these local resources and the most up-to-date basic needs. This "interface of innovation" produces new methods and techniques to handle and manufacture these traditional materials into modern forms and images, well-adjusted to meet the needs of our modern life.

Media Partner

SciDev.Net

Is a not-for-profit organization dedicated to providing reliable and authoritative information about science and technology for the developing world? Through our website **scidev.net** we give policymakers, researchers, the media, and the interested public information and a platform to explore how science and technology can reduce poverty, improve health and raise standards of living around the world.

We also build developing countries' capacity for communicating science and technology by mentoring journalists, producing practical guides and supporting specialist workshops. Our main office is based in London but we have a worldwide network of registered users, advisors, consultants and freelance journalists, predominantly from developing countries, who drive our activities and vision.

Scientific Arab

Scientific Arab is a scientific platform aimed at the Arab youth and helps in spreading the scientific culture by publishing the latest and most important news and articles related to all branches of science and technology and presenting them to the Arab reader in a simplified and accurate manner.

"Science in Arabic" is the translation we have chosen for the term "Scientific Arab", although it does not represent the literal translation of the original term, but it expresses the goal we seek to become a reliable source of scientific culture and knowledge in Arabic by supplying our readers from the ocean to the Gulf The most important developments in science and technology.

The Arab Science and Technology Academy (ASARP) is the platform's partner in Egypt. We are also proud to launch our platform in partnership with Science and Development Network (CEDIF), our media partner in the Middle East and North Africa.

Committees

Chairman

Professor Dr. Hamed El-Mously, Emeritus Professor at the Faculty of Engineering – Ain Shams University, Egypt

Co-Chair

Dr. Mohamad Midani, Assistant Professor in the Materials Engineering Department at the German University in Cairo.

Organizing Committee

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Food and Agro Industries Technology Center, Egypt

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

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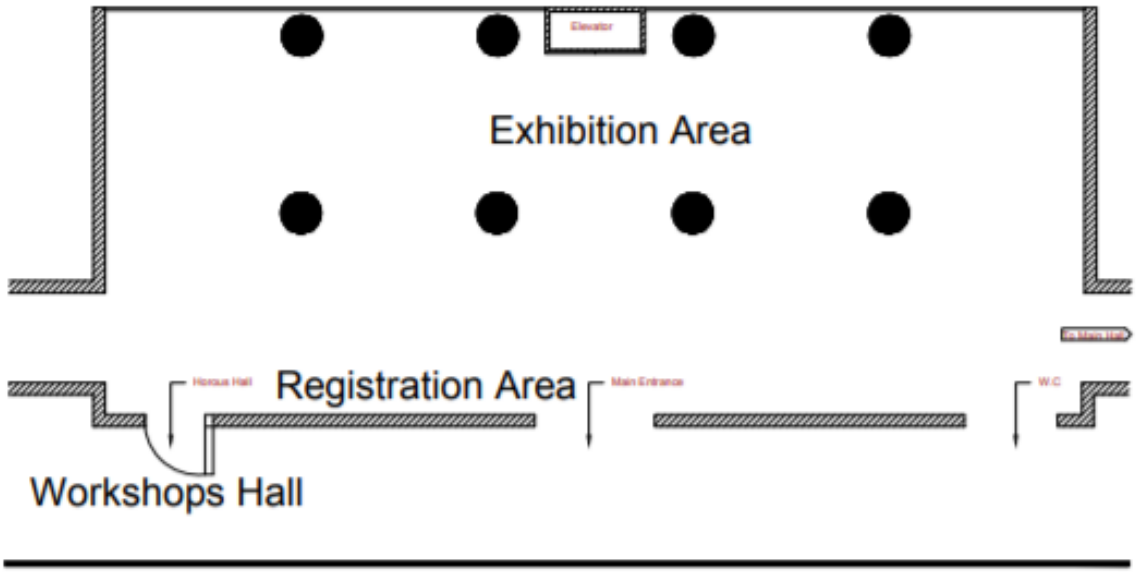
Venue Map


Exhibition Area
Registration Area
Workshops Hall

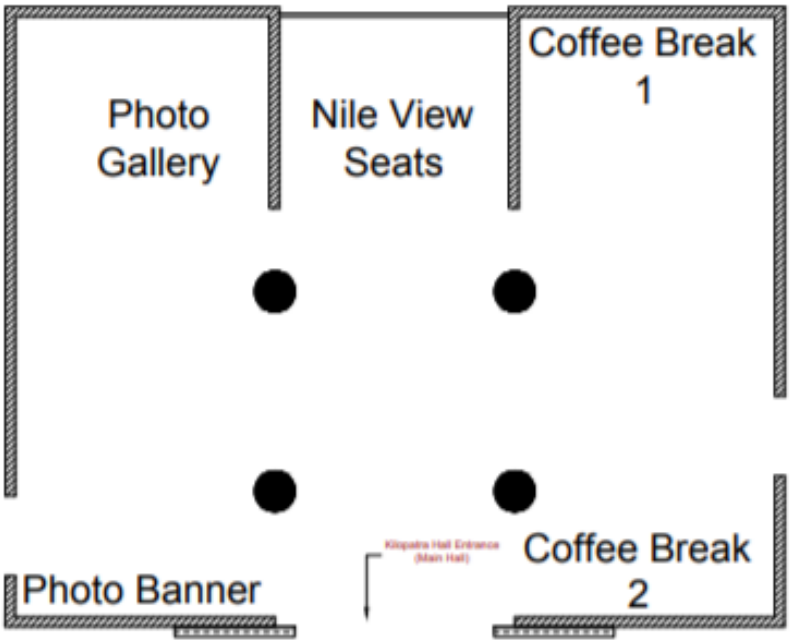


Photo Gallery
Nile View Seats
Coffee Break 1
Photo Banner
Coffee Break 2

Exhibition

This year's exhibition will gather a collection of Graduation Projects and Startups that are working on empowering the Environment ecosystem in Egypt and the MENA region with the help of our partners in Egypt.

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NAPATA "Re-discovery of palm residues"

Aswan Governorate has the largest proportion of "date palm cultivation", which produces very large waste. Therefore, the project of plants depends on the conversion of waste from the palm to different products, such as bags, for example by passing on a range of treatments.

نباتا
NAPATA
HANDMADE PRODUCTS

Jereed

JEREED manufactures wood substitute boards utilizing palm midribs, producing a line of furniture and accessories that promote quality, beauty and eco-friendliness, and that satisfy local, national, and international demands for green products. Additionally, JEREED's inclusive business model empowers communities as it works directly within the village ecosystem, enabling employment for both male and female members of the community and providing them a steady income source.

JEREED

Sosal

Handicraft Products from the Oases of Egypt, contemporary products made of palm tree based on ethnic and traditional art.

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ECARU "Waste recycling"

Egyptian Company for solid Waste Recycling, "ECARU" was established in 1997, "ECARU" is a sister company to Engineering Tasks Group,"ENTAG".

"ECARU" is the largest Solid Waste Management service provider in the Middle East and Africa providing the

Following Businesses:
Biomass Business, "ECARU" provides Collecting, transporting, Processing of all types of agricultural residues as "ECARU" collects and processes approximately 1.5.M ton /year of the Agricultural residues. We produce various types of products such as Alternative solid fuel for the industrial sector & Organic Compost, Animal Feed for Agricultural sector & we are currently processing our Biomasses to produce an Alternative solid Fuel for Cement kilns (500,000-700,000 ton/year).

Zero AgroWaste Competition Showcase

GreenVendora

GreenVendora is an online platform (mobile app and website) for trading products based on agroWaste. The platform open new opportunities and market for these nature products as an alternative for similar. Products prevent the burn and disposing agro-waste in harmful way for health and environment and helping to achieve sustainable development for the whole world.

The main Platform purpose: It will link between small and micro-enterprises that produce products from agro- waste and end users who want to acquire products manufactured by hand, furniture, fertilizer, feed, food industries and other different products offered on the website.

Dubal

Dubal is a plant specialized in the production of organic fertilizers manufactured from agricultural waste through the acquisition of solid residues from green and land crops and animal manure for fermentation, drying, sterilization and packaging for the production of organic fertilizers manufactured to be complying with international standards and measurements for the production of fertilizers and plant growth regulators, The importance of our project is complemented by the reduction of land damage resulting from the excessive use of chemical fertilizers. Although chemical fertilizers supply the land with quantities of nitrogen, potassium, phosphorus, sulfur, iron and manganese as needed, but they inhibit the growth of bacteria and bacteria that contribute to the fragmentation of organic matter in the earth and convert it into mineral materials. Clearly Dubal is an Environmentally friendly project with excellent satisfactory returns, Organic waste has a high economic return all we do in our business is transferring the waste from a large burden and unhealthy phenomenon to the environment to a material of high economic value, moreover our product is a continuous lifecycle, it is not only a natural fertilizer obtained from recycling it's life, it is a positive feeling we will add, to our future customers.

EcoMDF

One palm tree produces about 23 kg of secondary wastes each year. The governorate of El-Beheira in Egypt has more than 200,000 palm trees with a total waste of 345 tons per year. Therefore, these wastes can be used to produce MDF and medium-density composites.

The "EcoMDF" team produces modified MDF panels using palm secondary wastes to compete with imported high quality and high-cost products and local poor quality and average cost products

MDF panels are used in many applications. They are used in exterior walls for protection against wind and internal lining because they are sound and electricity isolated. Finally, they are used in industrial applications and final products such as doors and furniture. The "EcoMDF" team produces molded pans, which are formed and pressed under pressure and heat up to 250 ° C, characterized by heat and electrical insulation.

BioPlastic

The main idea of our project is to produce bioplastic of eco-friendly and healthy properties from agricultural wastes represented mainly by palm date by products as available in continuous raw materials in Egypt.

Due to the rising awareness against environmental and health hazards posted by traditional plastic materials, there has been an unprecedented growth in the demand for bioplastics. Bioplastics are plastics derived from renewable biomass sources including all the agricultural by-products. Bioplastics based on cellulose acetate (CA) are introduced as ecofriendly and recyclable materials of amazing properties as mechanical strength, impact resistance, transparency, colorability, fabricating versatility, moldability, and di-electric strength. Based on the previous analysis for date palm components, they composed mainly of cellulose, hemicellulose and lignin. Thus, this work aims to use such types of agricultural wastes for the preparation of bioplastic products in different forms. The produced bioplastics can be used for disposable items, such as food (catering products, disposable containers ...), packaging, crockery, containers, cutlery, pots, bowls, and straws, textile industry, medicine (prostheses, sutures ...) and toys. It was expected that the total demand of bioplastic will increase to represent 40% of the plastic market with total investment of about 324 billion dollar by 2030.

Rima Dates

Rima Dates is a small company working on date's transformation with a concept of making our products with the traditional recipes but with introducing the modern technics. Rima Dates concept is using transformation to give better value for bad evaluated dates in market; so by consequence it is a long positive impact starting from the farmers families which earn more incomes, until the last consumer who receive a healthy product totally nature friendly without any chemical additives; beside the fact that we use all parts and qualities of dates so there is no waste at all.

Electromagnetic shielding palm composite board

Recently, deficit of wood supply has pushed the manufacturer to seek for an alternative raw material. In regard to the matter, utilization of palm wood as an alternative wood material would be very promising owing to its abundances in the country. Planted Oil palm plantation covered approximately 1 million hectares of the area in Thailand. Replanting is needed as the economic life span for oil palm trees is 25 to 30 years. An estimation of 4% of the total plantation area is anticipated to be replanted annually. Based on a rough estimation, 1 hectare of plantation land consists of around 140 oil palm trees; each standing tree represents 1.5 m3volume of log. Therefore, an estimation of 8.4 mil m3 of oil palm stems could be harvested during the replanting practice annually. The figure could be higher due to the replanting practice in some harvest-ready plantation area was delayed.

Nopana Pro

Developing diverse communities interested in Nubian handicrafts and creating jobs to help and empower women and youth in Aswan villages through direct work in crafts production and marketing through the project.

In order to implement this plan, we need the support of the private parties interested in handicrafts to enable us to implement this plan on the ground through the establishment of several training in different regions through which we train a number of women to provide the largest number of products and marketing locally and internationally through internal and international exhibitions to preserve them Of extinction

Photo Gallery

ByPalma World Conference has a PHOTO GALLERY which will display photos showcasing variations in date palm trees' usage and importance through the eras, from archaic till nowadays contemporary applications. Also clarifying palm tree anatomy and some of its common byproducts.

Traditional Products:

Modern Furniture:

Abstracts

Rediscovering Date Palm By-Products: An Opportunity for Sustainable Development

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Keywords: Date palm, palm midrib, endogenous development, rediscovery of local resources, palm by-products, bioeconomy, date waste, lignocellulosic by-products.

Abstract

The date palm was the pivot of cultural, social and economic life for long centuries in rural areas in the Arab region. The basic needs of millions of people in rural areas were being satisfied relying on the by-products of date palms. With the drastic change of the style of life most of these byproducts became redundant leading to the neglect of pruning of date palms, and thus becoming a direct cause of fire accidents and infestation by dangerous insects. This situation represents a real challenge to those concerned with development. How to compose a new vision to palm by-products transcending the traditional forms of utilization of these by-products being treated as waste? The path of rediscovery of these by-products is paramount. How to develop new forms of utilization of palm by-products to satisfy modern demands on the local, national and international levels? An approach has been suggested for the industrial utilization of date palm by-products.

The research conducted at the premises of the Faculty of Engineering, Ain Shams University has proven that the date palm midribs enjoy mechanical properties similar to those for imported wood species. It was also proven that the date palm midrib can be used as a core layer for the manufacture of blockboards competing with those manufactured from wood. Lumber-like blocks have been successfully made from palm midribs. The palm midribs were successfully used for the production of Mashrabiah (Arabesque) products as a substitute for beech wood. Particleboards and MDF boards satisfying the international standards have been also manufactured from palm midribs. Poultry and livestock feed, as well as compost have been produced using the date palm midribs. Space trusses and claddings have been successfully made from palm midribs. New machines have been successfully designed and manufactured for the conversion of palm midribs into strips of regular cross-section. There are wide future prospects for the use of date palm by-products us a substitute for wood, for paper manufacture and for the reinforcement of polymers. Within the framework of bioeconomy there are high potentialities for the use of the date waste, as well as the ligne-cellulosic by-products in a wide spectrum of bio-industries. To guarantee the continuation of endeavors to support the use of palm by-products on the international level it is necessary to establish The International Association For Palm By-Products as a forum for all parties interested and involved in the use of palm by-products.

FAO's Contribution to the Bioeconomy

Irene M. Xiarchos, F.A.O NENA
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Abstract

Achieving food security for all is at the heart of FAO's efforts - to make sure people have regular access to enough high-quality food to lead active, healthy lives. Agricultural by-products are useful items generated during processing of the primary product, such as coir fiber from the coconut and mesocarp press-cake remaining after extracting seed oil. They can be utilized not only as foods but also as for animal feeds, fertilizers/compost, and consumer products such as pharmaceutical products, cosmetics, handicrafts, furniture, and resource for energy. The agricultural by-products also contributes to reduction of Food Loss and Waste (FL&W), while FL&W reduction is the most feasible and quick win approach to increasing food availability and security.

Bioeconomy is crosscutting and comprises the parts of the economy that use renewable biological resources to replace fossil fuels, and produce food, animal feed, and other biobased products.

Given that a sustainable bioeconomy can unlock new opportunities for reducing unemployment and expanding access to energy and the country's inclusion in international trade, FAO has been contributing to the world's bioeconomy through participation to international platforms, support to national bioeconomy strategies, and to by-product projects, as well as the publication of reports and guides on by-products.

This presentation will introduce FAO's recent contributions to bioeconomy through utilizing agricultural by-products as feed, fertilizers, other consumer products and bioenergy. Particularly, our report "Value Chain Analysis of Essential Oil of Myrtle in Tunisia" will provide a good example of utilizing a Non-Wood Forestry Product as other consumer products. The potential of the byproduct of oil palm trees (OPT) will be also discussed, because the massive waste production by the industry have recently been criticized while the demand of edible oil from OPT is rapidly growing. Technology development is a key for harnessing the full potential of such byproducts. Finally, recent and on-going projects by FAO for palm production in NENA region will also be introduced to the audience.

Evaluation of Coconut (Cocos nucifera) Husk Fibre as a Potential Reinforcing Material for Bioplastic Production

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2: Dept. of Wood Products Engineering, University of Ibadan, Nigeria
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Keywords: Coconut husk; Bioplastic; Cassava starch; Biodegradable Material

Abstract

In this study the potential use of coconut husk (Cocos nucifera) husk fibre for the reinforcement of bio-plastic produced with cassava (Manihot utilissima) starch was investigated. Five compositions of the bioplastics were formulated containing 0% (control), 5%. 10%, 15% and 20% of coconut husk fibre. The tensile strength, modulus of elasticity, impact energy, biodegradability, and water absorption of the fibre-reinforced bioplastic samples were then determined in accordance with standard methods. Results obtained showed that the tensile strength values ranged from 0.36 to 0.68MPa; while the modulus of elasticity values ranged from 2.7 x10^6 to 4.9 x10^6 N/m^2. The impact energy range was 1.73 - 3.7 J. Analysis of variance showed that coconut husk fibre volume had a significant effect on the tensile strength. The impact energy increased with an increase in fibre content up to 15%. Also, water absorption (27.3 - 42.9%) increased with an increase in fibre content. The bioplastics were biodegraded within one month of grave yard test. The best bioplastic composition in terms of impact energy, water absorption, and tensile strength was that with 15% coconut husk fibre reinforcement.

Introduction

Waste generation increases with population expansion and economic development which poses risk to human health due to improper management. The organic component of municipal solid waste may not be too much of a problem since it is biodegradable. However, the non-biodegradable constituents of the waste stream are quite problematic. Despite the non-biodegradability of plastics, their use in the Nigerian and many other African societies has significantly replaced leaves, glasses and metals in packaging. Unfortunately. the current management of plastic wastes is not environmentally friendly in many of these countries (Yu et al, 2009, Soffar, 2015). There is, therefore, a renewed interest in compostable plastic materials. Among the natural polymers, cassava starch is of interest as a candidate for developing bioplastics, owing to its complete biodegradability, low cost and renewability (Teramoto et al, 2003, Stepto, 2006). Felix (2012) showed that reinforcement of a biocomposite with a natural fibre may enhance the tensile strength. A potential reinforcement material in Nigeria is coconut (Cocus nucifera) husk fibre, available in abundant quantities but largely treated as a waste material (Olorunnisola 2006). Previous studies have shown that coconut fibres have relatively high tensile strength (Filho et al, 1990, Savastano Jr., 1990). The aim of this study was to investigate the effects of coconut fibre reinforcement on selected properties of a cassava starch-based bioplastic

Preliminary Results

Bioplastics were produced with cassava starch and varied coconut husk fibre contents of 0, 5, 10, 15 and 20% (by weight). The fibres were cut into 2 mm length followed by chemical treatment to reduce lignin and hemi-celluloses contents involving soaking in 1 molar solution of NaOH at 50oC for 4 hours. The fibres were then mixed with the starch polymer in predetermined proportions

before moulding for tensile strength (Figure 1) and other property test purposes conducted in accordance with ASTM D638 and ISO 6603-1 standards. Biodegradability of the biocomposites was determined using the grave yard test. Results showed significant increases ($p<0.05$) in tensile strength (0.36 to 0.68MPa) elastic modulus (2.7 $x10^6$ - 4.9 $x10^6$ N/m^2) and impact energy (1.73 - 3.7 J) with an increase in coconut husk fibre content. Water absorption after 24 hour-immersion in water (27.2 – 42.9%) also increased due to the hydrophilic nature of the fibre. A complete degradation of all the bioplastic samples was observed after one month burial. It was concluded that an inclusion of up to 10 % of coconut husk fibre in a cassava starch-based bioplastic could result in about 80 % improvement in the tensile strength and elasticity.

Fig. 1. Tensile samples.

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Tensile Properties of Date Palm/Natural Rubber Composites

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Keywords: Composites; Natural rubber; Tensile strength, Date palm fibers

Abstract

Date Palm fibers DPF were mixed with Natural Rubber NR with different percentages (i.e. 10, 20, 30, 40% by weight). Brabender mixer was used to mix the fibers with the rubber at 75°C for 9min. Zinc oxide (ZnO) and stearic acid (SA) were used as activators. Sulfur was added in the vulcanization process. The effect of fiber content on tensile strength and modulus were studied. It was found that by increasing fiber content tensile strength was decreasing; while modulus was increasing.

Introduction

Production of ecofriendly alternative materials is a global demand nowadays. Arab Peninsula most famous tree is Date Palm (Phoenix dactylifera). Besides its adorable fruits; its fibers are also valuable which can be used to reinforce various polymers. Saudi Arabia alone has around 23 million date palm trees. Each date palm tree produces around 35 kg of waste yearly [1]. Natural Rubber was reinforced with many natural fibers such as oil palm, coconut shell, rice husk, rattan, bamboo, coir, hemp, bagasse, sisal, jute, and cotton fibers. In this research the effect of fiber content on tensile properties of Date Palm fibers reinforced Natural Rubber composites were studied.

Preliminary Results

Producing different fiber content of date palm fibers natural fiber composite was successful using Brabender mixer followed by suffer addition between two rollers; ended by compression molding. Fig. 1. shows four sheets of the composites and pure rubber sheet which was produced following the same steps. different fiber. Results showed decreasing trend of tensile strength by increasing fiber content. This result is attributed to the poor fiber/matrix interfacial bonding. It was found that tensile modulus increased with increase of fiber content. This is normal due to the role of mixture whereas fibers are more rigid than rubber which normally results in increase in the modulus.

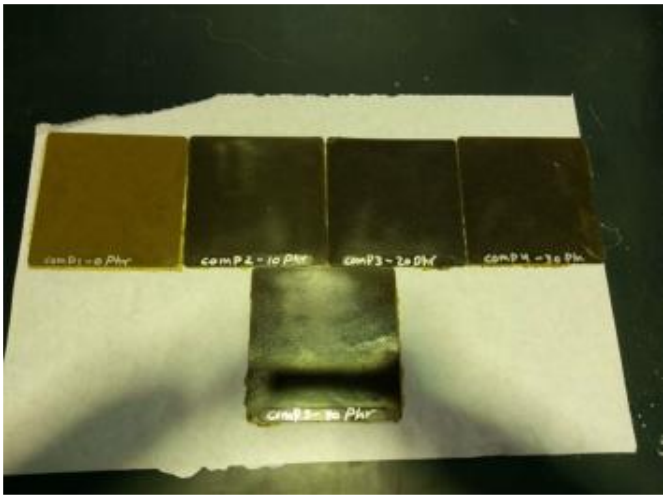

Fig. 1. Pure and different fiber content composites of date palm fiber/natural rubber composites.

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Synergy of Fiber Surface Treatment and MMT Nanoclay Hybrid on the Free Vibrational Behaviors of Palmyra Fruit Fiber Polyester Composites

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Keywords: Palmyra fruit fiber; Unsaturated polyester; MMT nano clay; Fiber chemical treatment; Vibrational behaviours

Abstract

In this research work, we prepared Palmyra fruit fiber (PFF) reinforced polyester composites with and without the inclusion of Montmorilonite nano clay. In both cases, the Palmyra fruit fiber is used in raw form and chemically surface treated form. The fiber chemistry and topographical changes caused by various surface treatments are analyzed through Fourier Transform-Infra Red Spectroscopy and Scanning Electron Microscopy respectively. The composite samples are tested in order to investigate the effect of Palmyra fruit fiber reinforcement, combined effect of fiber surface treatment and nano-clay inclusion in the free vibrational behaviours such as natural frequency and damping factor and the results are reported.

Introduction

The utility of natural fibers found more than thousands of years as reinforcing media in amorphous bulk covering materials. [1]. However, the hydrophilic nature of the natural fibers pulled down their compatibility in the polymer matrix. This compatibility issues can be resolved up to maximum extent by treating the natural fibers with suitable chemical agents before using them in composite fabrication [2]. Fibers extracted from Palmyra fruit were proved for their potential as reinforcement in the polymer matrix through various mechanical tests. In addition, the fiber chemistry modifications were carried out through alkali and silane treatments and allied effects were also studied. Based on the test results, the chemical treatments on the Palmyra fruit fiber were having maximum positive influence on the mechanical and tribological properties of the resulting composites [3]. Apart from fiber surface treatment, the nano particle inclusion in the polymer matrix composites enhanced the composite properties [4]. In addition to static mechanical and tribological properties, the dynamic mechanical properties of natural fiber composites were also enhanced through chemical treatments [5].

Preliminary Results

This section may include a clear but brief description of the purpose, methods, results and main conclusions of your research. It may include one Fig.1. The research work is carried out to evaluate the free vibrational behaviours of untreated and chemically surface treated Palmyra fruit fibers reinforced polyester composites. In each case, the composite samples are prepared with and without the inclusion of MMT nano clay. Compression moulding technique is followed to fabricate the composites. Two kinds of alkali treatments are optimally performed and one silane coating is also considered to modify the PFF surface. Alkali treatments, particularly NaOH treatment on fiber increases the fiber-matrix mechanical interlocking. The strong mechanical interlocking obtained by NaOH treatment results in increased stiffness of the composites, hence the natural frequency of the composites also significantly increased by treating PFF with NaOH before fabrication of composites. In addition to the fiber surface treatments, the MMT nanoclay inclusion also supports to increase the stiffness of the resulting composites and the same causes more increment in natural frequency of the hybrid samples when compared to non-hybrid samples. The surface chemical treatments on the fiber cause the increase in crystalline nature of the PFF and simultaneously the loss in the spongy nature of the fiber. These attributes reduced damping of the surface treated fiber composites in both hybrid and non-hybrid categories. In addition to vibrational test results, the effect chemical treatment on fiber surface is examined through SEM images Fig.1 and FT-IR analysis.

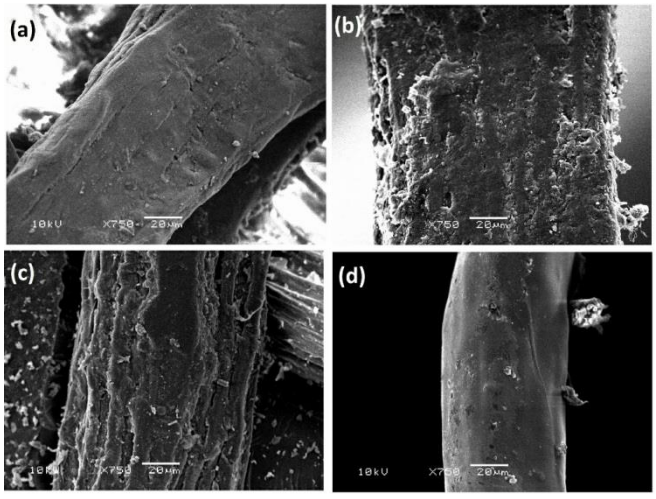

Fig. 1. Surface topography of single fiber, (a) untreated, (b) NaOH treated, (c) $Ca(OH)_2$ treated and (d) Silane treated.

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Effect of Addition of Date Palm Fiber on Polypropylene Matrix

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Keywords: Date Palm; Fiber; Polymer; Polypropylene; Plastic

Abstract

Due to environmental and economic reasons, great attention has been paid towards producing new eco-friendly materials (or at least have minimal impact on the environment). From this point, many academic and industrial researchers dedicated their researches to study products that contain biodegradable ingredients.

This research investigated the effect of loading of date palm fibers on polypropylene matrices properties. The experimental part of this study included compounding polypropylene with different loading ratio of raw date palm fibers by melt blending technique through extrusion process.

In addition to that the synthesized composites have been tested for mechanical properties.

The mechanical results of the prepared composites showed an enhancement in the tensile modulus and reduction in the tensile strength.

Introduction

Since a long time, the humans have been searching for their permanent dream to reach the ideal city which is the city that sustainable and environmentally friendly. Producing biodegradable products is one of the crucial steps toward this dream achievement since it is a long-term solution to landfill pollution that can significantly help in protecting the natural environment.

Utilization of natural resources for industrial applications will enhance the biodegradability of many daily disposable products beside that it will

physical and thermal properties. Example of natural resources utilization is the natural fiber reinforced polymer composites which existed since the early 1900's but has not received much attention until late in the 1980's.

Recently, the natural fiber reinforced polymer composites became a valuable alternative material type for wide range of applications because of several advantages over the traditional types of materials like the inexpensive costs and low density as well as acceptable specific strength and modulus.

In Arab countries date palm fibers are one of the most abundant natural fiber types. Over two-thirds of the date palm trees are existing in Arab lands. Every year there are huge quantities of date palm biomass wastes accumulated without useful utilization. These wastes can be utilized to play a significant role in the industrial sustainability by producing biodegradable and low-cost materials.

Preliminary Results

The main objective of this research is to investigate the impact of addition of date palm fiber on polypropylene matrix in terms of the mechanical properties.

The main materials which have been used in this research are homopolymer polypropylene supplied by TASNEE Saudi Arabia (Melt Flow Index (MFI): 12 g/10.

DPF supplied by Al-Nojoom Factory in Al-Kharj city, Saudi Arabia was used as a filler in the compounding process to produce the composite. The

fiber content in the PP/DPF composite was selected as 5, 10 and 15 wt.%.

Exxelor supplied by ExxonMobil have been used as a coupling agent by 3% loading percentage to enhance the compatibility between the fibers and PP matrix

The compounding process was carried out on micro-compounder twin screw extruder. The residence time in the extruder was 1 min for each sample and the screw speed was 100 rpm. Tensile test specimens were prepared using Xplore micro injection molder.

Mechanical results of DPF/PP composites showed enhanced composites stiffness compared to neat PP at all DPF loading ratios. On the contrary, the composites strength decreased after the incorporation of the fibers. Nonetheless, both mechanical properties (stiffness and strength) were highly correlated with the loading percentage.

Finally, it has been concluded that utilization of Date palm fiber in the plastic industry is possible and it could positively enhance some mechanical property.

Effect of Layering Patterns on Mechanical Properties of Oil Palm Efb/Kevlar Hybrid Composites
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Keywords: Mechanical properties; Layering pattern; Hybrid composites

Abstract

The aim of this studies is to deal about effect of layering patterns on mechanical properties of oil palm EFB/Kevlar reinforced epoxy hybrid composites. In this study, two types of layering pattern were used to fabricate hybrid composites; Kevlar as the exterior while oil palm EFB fiber as the interior and oil palm EFB fiber as the core material while Kevlar as the skin. The hybrid composites were fabricated by using hand lay-up techniques. The mechanical testing (tensile, flexural and compression) were conducted on universal testing machine to evaluate the performance of the composites with different layering sequence. The tensile, flexural and compressive strength were 27.7 MPa, 35.4 MPa and 12.3 MPa respectively for Kevlar/oil palm EFB/Kevlar (K/OP/K) layering sequence. The tensile, flexural and compressive strength for oil palm EFB/Kevlar/oil palm EFB (OP/K/OP) layering sequence were 18.7 MPa, 19.2 MPa and 40.8 MPa respectively. The tensile and flexural showed that the pattern with oil palm EFB fiber as the core material have better strength as compared to Kevlar as the core material. However, for compressive strength the layering pattern of Kevlar as the interior and oil palm EFB fiber as the exterior showed higher strength than Kevlar as the core of the hybrid. From the results, it can be concluded that the best mechanical performance for oil palm EFB/Kevlar hybrid composites is with Kevlar/oil palm EFB/Kevlar layering pattern. This hybrid composites would be applied in the automotive industry.

Introduction

Oil palm EFB natural fibre are waste from palm oil industry. Malaysia, being the world second largest exporter of palm oil after Indonesia, this situation has generated abundance of waste from the industry due to insufficiently unutilized. This scenario raises environmental concern and problems in replanting operations. It is reported that in year 2015, the oil palm plantation area in Malaysia has increased to 4.8 million hectares where Sabah plantation area is 1.3 million hectares and Sawarak with 1.1 million hectares and the rest come from peninsular Malaysia [1].

In overcoming the environmental issues, many efforts have been done to overcome the problems such as turning the oil palm industry waste to food packaging, briquette, composites and as the fuel for biomass energy production. The oil palm EFB has gain interest to the researches in producing composites made from the oil palm EFB [2] especially in hybridising the oil palm EFB with different fibers. Using oil palm EFB fibers alone as the reinforcing material to the composite may not provide good tensile strength. Hence, adding Kevlar to the oil palm EFB as the reinforcement in producing the hybrid composites will improve the tensile strength [3]. Since oil palm EFB/Kevlar is a new hybrid, hence the study on the mechanical properties when the layering sequence changes is important to determine the performance of the material when layering pattern changes.

Preliminary Results

This work studies the mechanical properties involving tensile, flexural and compression of oil palm EFB/Kevlar hybrid composites with different layering pattern. The hybrid composites were fabricated using hand lay-up method. Epoxy were used as the matrix for the composites. Different layering pattern were fabricated; oil palm EFB/Kevlar/oil palm EFB and Kevlar/oil palm EFB/Kevlar as shown in Fig. 1. Mechanical properties

Results on the mechanical test are tabulated in Table 1. The results showed that layering pattern of for tensile and flexural testing, the layering pattern with oil palm EFB as the core material have better strength than Kevlar as the core material. Layering pattern of oil palm EFB/Kevlar/oil palm EFB have better compressive strength than layering pattern oil palm EFB as core material. From the results, it can be concluded that the layering pattern Kevlar/oil palm EFB/Kevlar shows the best mechanical performance.

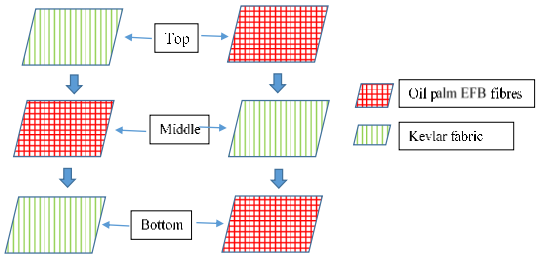

Fig. 1. Layering pattern.

Table 1. Mechanical properties of oil palm EFB/Kevlar hybrid composites.

Layering Pattern	Mechanical Testing Tensile (MPa)	Flexural (MPa)	Compression (MPa)
Kevlar/oil palm EFB/Kevlar	27.7	35.4	12.3
Oil palm EFB/Kevlar/Oil palm EFB	18.7	19.2	40.8

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Enhancement the Mechanical Behavior of Starch-Palm Fiber Composites

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Keywords: Hybrid composites; Date Palm fiber; Mechanical properties; Polymer-matrix composites

Abstract

The study is mainly oriented on fabrication of starch based hybrid composite reinforced with chopped randomly oriented flax, sisal, date palm fibers. Fibers tensile properties, before and after chemical treatment, as well as fibers morphology are evaluated. The hybrid composites are fabricated using hot compaction technique at 5MPa and 160°C for 30min. Fracture surfaces investigations using field emission scanning microscopy showed a good adhesion between fibers and matrix. The fracture reveals the presence of matrix micro cracks as well as fibers fracture and fibers pullout. Apparently, the hybrid composites containing 20v_f % sisal, and 5v_f % flax at 25v_f% date palm as well as 35v_f % sisal, and 5v_f % flax at 10v_f % date palm have the optimum mechanical properties and consequently can serve as competitive eco-friendly candidate for various applications. A finite element (FE) approach is developed to simplify the treatment of random orientation of chopped fibers and predicts elastic modulus using embedded element technique. Analyses based on rule of hybrid composite (ROHM), COX rule, and Lowenstein rule are presented to validate both experimental and FE numerical results. The FE results are found to be compared favorably with the experimental results.

Introduction

Starch is one of polysaccharide matrices. Owing to its low cost, availability as a renewable resource, biodegradable and nontoxic degradation products, it is one of the important raw materials used for packaging, biomedical applications, and in the automotive over the past few decades. Starch has some drawbacks such as poor melting process ability, high water solubility, and difficulty of processing and brittleness. Gelatinization process converts starch to thermoplastic starch (TPS) and improves those draw backs [1, 2].

Chemical treatment improves mechanical properties of natural lignocelluloses fibers. The construction of natural fiber bio-composite may have very good implications in the automotive and transportation industry such as car door panels which save up to 45% from door panel carrier weight, bio-based cushions, the driver's seat back rest, etc. Moreover, reduced costs of this composite will be more desirable to industrial requirement for economic development [3].

The main objective of this work is to study the behavior of starch based hybrid composites containing three types of fibers: Flax, Sisal, and Date palm fibers and compare mechanical properties to flax/date palm hybrid composite at 1:1 matrix/ fiber volumetric ratio.

Preliminary Results

The composite fabrication is focusing on changing flax and sisal volume fractions at 25v_f % and 10v_f % date palm fiber to enhance flax/date palm hybrid composite mechanical property. Chemical treatment of fibers using 5% concentration NaOH enhances the reinforcement performance and reduces the moisture absorption tendency by the fibers leading to better bonding.

Ibrahim et al. studied the hybrid composites of date palm and flax fibers with 50v_f % each and reported strengths values of 31 MPa and Modulus of 2.8 GPa. In this study, increasing sisal fiber up to 35v_f % at 5v_f % flax and 10v_f % date palm fiber increases the average static tensile strength to 18.56MPa and modulus to 4.5GPA. Starch matrix has been found to have the highest water uptake rate and biodegradability. Increasing flax fiber volume fractional percentage decreases the water uptake rate. Increase of sisal volume fractional percentage increases the ultimate tensile strength and Elastic modulus. The fracture surface investigation using SEM has revealed good adhesion across composite and three types of fracture which are: fibers brittle fracture, fiber pull out, and matrix brittle fracture.

Mixed FE approaches with ROHM, Leowenstein, and Cox are developed to predict the Elastic Modulus of the hybrid composites. A modified FE model based on Cox approach is suggested in which fibers RVE in model is 1/3 from actual volume fractional. This model results seem to be successful in closely predicting the experimental result of Elastic Modulus for randomly oriented hybrid composites.

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Scenarios of Palm-Oil Biodiesel in the Mexican Transportation Sector

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Keywords: Biodiesel; Palm oil; Scenarios, Mexican transportation sector

Abstract

This work analyses the environmental and economic feasibility of producing palm oil-based biodiesel in Mexico in order to substitute of diesel fuel consumption using B5 first and B10 then from 2016 to 2031 in the transportation sector. Two scenarios were created by projecting demand and costs for biodiesel as well as greenhouse gases emissions reduction. In the environmental section, avoided emissions of Particulate matter, Total Hydrocarbons, Carbon Monoxide, Sulphur Dioxide, and Carbon Dioxide as well as the increase in Nitrous Oxide emissions were estimated for each scenario. In the economic section, a cost-benefit analysis of biodiesel substitution was implemented, and mitigation costs of Carbon Dioxide were estimated.

Introduction

Biofuel production has generated interest in several countries due to decreasing fossil fuel reserves, volatility of oil prices, climate change concerns, air pollution as well as an increasing demand for fuel in the transportation sector.

Mexico is not exempt from the problem of declining proven oil reserves; and official sources estimated them in 9.2 years [1]. As of year 2016, Mexico emitted 389.41 million tons of CO_2 (Mt CO_2), of which 32% were generated by the road transportation sector —7% corresponds to diesel vehicles [2].

The use of palm oil in Mexico as B5 and B10 can help reduce CO_2 emissions into the atmosphere and reduce dependence on fossil fuels in the transportation sector. Given that the main raw material is vegetable oil, biodiesel is becoming a notable factor for promoting regional development in Mexico.

In this work, we develop scenarios to use B5 and B10 in the Mexican transportation sector and we evaluate these scenarios in terms of a cost-benefit analysis, the amount of pollutants reduced (Carbon Dioxide CO_2, Carbon Monoxide CO, Total Hydrocarbons THC, Nitrous Oxide NO_x, Sulphur Dioxide SO_2, and Particulate Matter PM) and the area cultivated with oil palm. Likewise, CO_2 mitigation costs were estimated, and the impact of tax incentives on the economic feasibility of biodiesel was analyzed.

Preliminary Results

Our results show that in terms of fuel substitution, biodiesel is expected to replace 7.8% of diesel fuel consumption in 2031. In order to meet this demand, it is necessary the construction of 113 biodiesel small plants that represent and investment costs of $765 million. Fig. 1 shows resource

requirements in thousand cultivated hectares as well as the corresponding annual energy content of oil palm production in PJ.

Reduction of Particulate matter would be 26 Mkg, which accounts for cumulative reductions of 3.4% for the alternative scenario. Reduction of Total Hydrocarbons would account for 5% (479 Mkg). With regard to SO_2 emissions, it can be observed an important reduction reaching approximately 380 Mkg (7.6%). On the contrary, NO_x emissions would be increased by 220 Mkg that means an increase of 0.7% of these emissions. Finally, the most important reduction was found for CO_2 emissions that account for 8.9% in relation to those emissions of trend scenario in 2031.

Our economic calculations show that biodiesel use —when compared with the producer price of diesel fuel— would represent overall costs of 2.2 thousand million dollars. Furthermore, mitigation costs would total $54 per ton of equivalent carbon. Nevertheless, we found that if diesel price and biodiesel prices, this last one exempting the Special Tax on Production and Services (IEPS), are compared, the massive use of biodiesel would lead to benefits of 1.2 thousand million dollars in the alternative scenario and has no mitigation costs.

As our main conclusion is that the implementation of biodiesel with palm oil-based would be feasible in the Mexican transportation sector, especially when that biodiesel could be exempted from the Special Tax on Production and Services (IEPS), or in other words, if the Mexican government grants a fiscal incentive for biodiesel [3].

[1] This figure represents the national emissions derived from fuel combustion. The total GHG emissions were 681 Mt CO_2 equivalent that include emissions from: fuel combustion, fugitive emissions, agriculture, waste, industrial process and others [2].

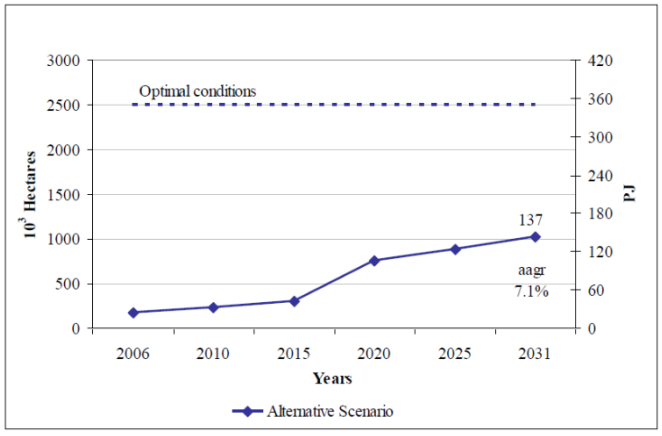

Fig. 1. Area requirements for oil palm production in Mexico.

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A Study of the Potentiality of use of Siwei Palm Midribs in Charcoal Production

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Keywords: Charcoal production; Biochar production; Palm midrib charcoal; Production of charcoal from agriculture residues

Abstract

The objective of this study is to utilize the residues of Siwei palm midrib to produce charcoal with satisfactory environmental, medical, and industrial applications. The study was achieved by passing with some steps. The first step prepared the samples, where divided the palm midrib into five parts (top, middle, base, knee, and end). The second step is to design and manufactures a pyrolysis reactor (test rig) to produce charcoal. The third step is carbonization cycle process for the samples of Siwei palm midrib five parts with quantity for all part, where the carbonization cycle process steps according to food and agriculture organization (FAO) standards. The four-step is experimental analysis for ten samples of palm midrib five parts (row material), and palm midrib five parts (after carbonization) in labs according to American society for testing and materials (ASTM) standards. The experimental analysis divided into proximate analysis such as (moisture content, ash content, volatility matter content, and fixed carbon content), ultimate analysis such as sulfur, and calorific value. Finally, after comparing the results of the experimental analysis for Siwei palm midrib parts (after carbonization) to FAO standard values. The potentiality of production of charcoal from Siwei palm midrib with satisfactory properties has been proven. The procedure charcoal is suitable for environmental, medical, and industrial applications. According to FAO, the best samples are the top part of palm midrib in Siwei, followed by the base, middle, knee, and end. The whole Siwei palm midrib could be utilized realizing the calorific value 88% of the FAO standard. The designed reactor in this work could serve as a model for the production of charcoal from palm midribs in the village conditions.

Introduction

The charcoal is the black carbon and ash residues, which come from animal or vegetation substances by removing water and volatile matter during slow heating in the absence of oxygen by pyrolysis process. The charcoal applications are environmental, medical and industrial. The environmental applications are using the charcoal in increases the carbon concentration in soil and reduces the emissions of green carbon gases. The medical applications with activated carbon mean that the carbon structure of the charcoal has a pore in low volume to do absorption of chemical substances. It acts as filters and has excellent health and medical benefits. The industrial applications have required the sulfur at low levels as much as possible to avoid environmental effects, the ash content at high to realize the most significant energy consumption, the stable pore structure, and chemical compatibility. Almost smokeless, because of its low ash content and chemical stability.

Preliminary Results

The purpose was a study of the use of Siwei palm midrib in charcoal production. The materials of the palm midrib specimens were investigated of Siwei palm midribs parts were obtained from Al-Qayat Village, Menia governorate, Egypt. The Siwei palm midrib are divided into five parts (top, middle, base, knee, and end). By pyrolysis process and slow heating rate around 5-7 °C/min. until reaching 400-500 °C, and indirect heating method. Where the carbonization cycle process includes the following stages, at temperatures between 100–120 °C, drying of the input material and moisture goes out. At around 275 °C gases like N2, CO, and CO2, go out. Also, methanol is distilled. Around between temperatures of 280-350 °C, exothermic chemical reactions. At more than 350 °C biochar remains, H2 reacts with CO and goes out in the form of tar. And the design and manufacture of the test rig (pyrolysis reactor) are considered the step to produce the charcoal. The pyrolysis reactor is consisting of three main assemblies, pyrolysis reactor assembly, control system, and condensing unit. The results of the carbonization process were relationship between temperature and time, which is the main indicator of pyrolysis process control. According to ASTM standards the experimental analysis were to Siwei palm midrib parts (raw material), and the palm midrib parts (after carbonization). This experimental analysis determines the charcoal quality and suitability to be used in environmental, medical, and industrial applications. The

tests were carried out, proximity analysis, ultimate analysis, and specific energy analysis. The results were the potentiality of production of charcoal from Siwei palm midribs with satisfactory properties has been proven. The calorific value of charcoal product from Siwei specimens is 88.39% of the FAO. Best samples are the top part of palm midrib in Siwei, followed by the base, middle, knee and end. All palm mid rib parts could to be utilized to produce charcoal, where the specimens are achieve the FAO standard ratio. The designed reactor in this paper could serve as a model for the production of charcoal from palm midribs in the village conditions

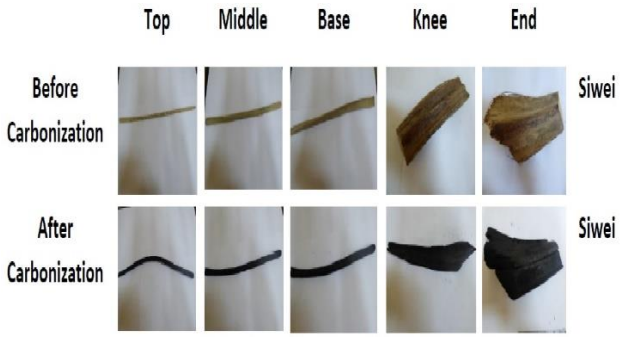

Fig. 1. The pictures of the samples raw material and charcoal procedure for Siwei palm midrib parts.

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Palm Secondary Products as a Source of Organic Material for Compost Production: Applied Examples from Egypt

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Keywords: Pruning products; Composting, Date Palm Residues, Doum residues

Abstract

The increasing amounts of fruit pruning wastes in local societies of Egypt cause environmental problems closely related to human health. Its utilization as renewable materials has received a great attention in our present days and encouraged the use of it as an organic fertilizer. Composting these wastes not only reduces their weight and volume but also produces high-value-added products (compost). Manure is the most common organic and natural fertilizer form in our Egyptian rural Village. Due to the high cost of chemical fertilizers and the increase of organic fertilizers demand, it is necessary to use the local crop residues, "Palm Secondary Products" (PSP) as a basic (raw) material which contains 92.99% organic matter. Compost manufacturing provides successfully produce an organic fertilizer from available waste in each region which serves as both fertilizers and soil conditioners. In this study, we present Egyptian examples of the recycling of date palm pruning products mixed with other organic wastes in small scale (Faris rural village, Kom-Ombo, Aswan Governorate and Mandisha village, Baheria oases, Giza Governorate) and in large scale (Al-Kharga, New Valley Governorate).

Introduction

The total world number of date palms is about 120 million trees, distributed in 30 countries and producing nearly 7.5 million tons of fruit per year [1]. Arab countries account for 70% of the world's date palms number and are responsible for 67% of the global production of date palm [2]. The total number of palm tree planted in Egypt is 16 million including 12 million fruiting tree [3]. Mohamed [4] reported that the significant annual increase of fruit dates was about 298.9 thousand palm trees, equivalent to 2.75% of the average number of fruitful dates during the period (1997 - 2012). Due to its adaptation to various stress condition, its plantation is nowadays spread out all over Egypt including the new reclaimed land in the desert and in saline-affected areas. The utilization of by-products of date palm as raw material source for industrial activities gave a promising issues. Some studies have reported that Egypt alone generates more than 300,000 tons of date palm biomass each year [5]. Although date palm residues (DPR) consist of hardly decomposed elements (Cellulose, hemicelluloses, lignin and other compounds) they could be composted with microbiological process instead of burning in farms and causing serious threat to environment [6]. Many researchers reported about compost production from date palm by products [7, 8, 9, 10, and 11]. Recycling palm residues could reduce chemical fertilizers as well as the impact of drought and desertification and pesticides. Moreover, social, economic and environmental benefits could be obtained from the Recycling palm residues including increasing agricultures production in quantity and quality.

Preliminary Results

There are 3 experiments of DPR composting; two of them were conducted in small scale in compost units in different Egyptian village (Faris village Kom-Ombo – Aswan and Mandisha village, Baheria Oasis – Giza Governorate) and the other experiment was made in large scale in sustainable integrated system in (Al-Kharga, New Valley Governorate).

Experiment 1: The amount of compost produced at pilot stage in faris village is equivalent to 70% of the total waste of palm trees. This is in addition to 20% Mango residues and 10% Doum residues. The quantity of compost produced during the pilot stage was sold through the Zahra local society to the farmers of the village. Results of the pilot fields on onion cultivation showed that the use of faris compost increased the average onion yield by 10.22% compared to the use of they own organic manure (fig., 1).

Experiment 2: A pilot experiment of compost production was conducted in the village of Mandisha. About 3 ton compost was produced from 8 ton DPR+8 m3 poultry manure). A part of the project demonstrates a study on compost production in large scale in the Baheria oases reveal that there are a great possibilities to provide a

compost facility with 100 ton PSP each day with a total of 30,000 ton of PSP annually to produce 60-70 ton compost daily. So, it's suggested to establishing compost facility utilized half of the PSP in Baheria oasis and the remained quantity could be used in another industry activity for Medium density fiberboard (MDF) production.

Experiment 3: Experimental pilot attempts produce about 170 ton compost with high quality value sold by 36524 LE (Official Records at the Directorate of Agriculture, Markaz El Waadi El Gadid Governorate, 2011). The main additive materials in composting process was Farmyard manure (FYM) as common by product of cattle Husbandry as organic activator.

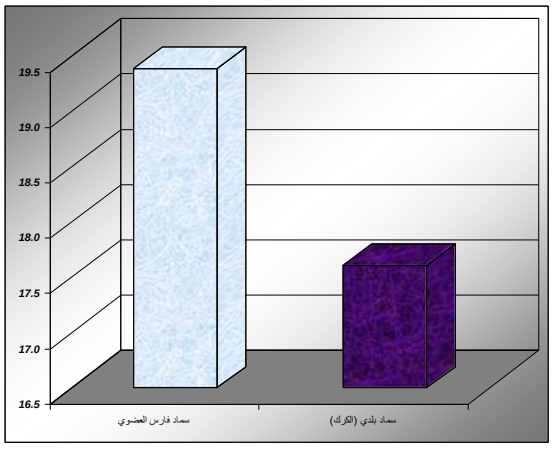

Fig. 1. A graph showing the productivity of onion crop by using faris compost (19.4ton/fed.) compared to the use of Farmyard manure (17.6 ton/fed.).

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Production of Biochar from Date Palm Fronds and its Effects on Soil Properties

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Keywords: Biochar; date palm wastes; Soil conditioning; Soil fertility

Abstract

UAE has the largest number of date palm trees in the Arab world, there are about 40 million date palm trees. Each tree generates about 15 kg of waste biomass annually. Converting date palm waste into biochar can reduce carbon dioxide (CO_2) and methane (CH_4) emissions. The United Arab Emirates has sandy soil with very low water and nutrient holding capacities, using biochar improved its soil WHC, and biological activities.

Biochar is one of the most stable biologically produced carbon sources that can be added to soil. It processes agricultural waste into a soil enhancer that improves soil fertility, saves water, helps to mitigate greenhouse gas (GHG) emissions and fight global warming. In this paper we did several trials to evaluate the produced biochar from date palm tree green wastes as a soil conditioner in sandy soil. Research has been undertaken in a pilot plant of 200 liter capacity. The produced biochar (25% w/w) was used as a soil conditioner for sandy soil. The soil physical, chemical and biological properties were tested in pot experiment for six months with different mixing ratios and the results showed improvements in soil properties.

Introduction

The United Arab Emirates (UAE) has sandy soil with very low water and nutrient holding capacities. In these conditions, date palm is considered one of the most resilient crops in the region. Over the years, with rising temperatures and scarce precipitation, there have been calls for new ways to conserve water, improve soil properties and prevent nutrient loss to achieve future food and nutrition security.

Biochar is a solid product produced from thermal conversion of unstable carbon-enriched materials into stable carbon-enriched charred materials that can be incorporated into the soils as a mean for agronomic or environmental management [1]. During the charring process, the carbon is converted into aromatic structure that are more difficult to break down when compared to the raw material. Biochar is a form of charcoal that can be used as a soil conditioner and as a means to sequester carbon. It is produced by the pyrolysis of biomass, i.e. by heating biomass in an oxygen-free or low-oxygen environment so that it does not (or only partially does) undergo combustion.

Preliminary Results

It is very clear from the data presented in Table 1 that physical, chemical and biological properties of the sandy soil are improved compared to control treatment.

Table1. Effects of incorporating biochar into the sandy soils under UAE climate.

Treatments	Soil properties		
	*WHC (%)	Organic C (%)	**TPC (log No.)
Control	32.0	0.12	3.0
1% biochar	53.0	0.51	5.8
2% biochar	61.0	0.66	6.4
3% biochar	68.0	0.73	7.1

* WHC, water holding capacity

** TPC, total plate count of microorganisms.

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Pilot Scale Biochar and Biofertiliser Production from Palm By-products

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Keywords: Oil palm biomass; Palm oil; Milling and refining; Soil conditioner

Abstract

A milling byproduct, palm kernel shells (PKS), and a refinery waste, spent bleaching earth (SBE) are amongst the most abundantly available oil palm biomass generated along the palm oil supply chain in Malaysia. While PKS is commonly used in palm oil mills as boiler fuel to generate steam and electricity, the SBE remains unused and is usually discarded at landfill. In order to diversify and add value to these by-products, both can be converted into good quality biochar and biofertilizer, respectively, and used collectively or individually as a soil amendment. This paper discusses the technologies required and the bioproducts' characteristics deriving from PKS and SBE for potential use in agriculture. PKS carbonized under allothermal conditions for 30-60 min at 400°C-600°C using the biochar experimenter kit (BEK) shows promising char yield and physicochemical properties. Specifically, the volatile matter/fixed carbon, VM/FC of 0.25 to 0.60, and O/C (0.12 – 0.23) ratios suggest that PKS biochar is an effective carbon sink with a half-life in soil >100 years. The SBE, co-composted with milling residues and then pelletized into a bio organic fertilizer, has positive impact on soil physical attributes for plant growth, with >50% increase in biomass productivity.

Introduction

The palm oil industry, on average, produces ~5 million t of PKS at palm oil mills [1] and ~240,000 t/yr SBE at palm oil refinery [2]. Of these, about 0.16 t PKS/ t crude palm oil (CPO) is commonly used in palm oil mills as boiler fuel to generate steam and electricity, while the remaining unused 0.20 t PKS/t CPO are often sold to other industry as a fuel [3]. PKS can be directly used as a fuel or be converted into a solid biofuel in the form of palm pellets or briquettes [4] via different thermal conversion means. Wheatear or not PKS can be a premium fuel is dependent on the fuel's quality which in turn is relied on type of technologies employed. The SBE, a by-product generated during the bleaching process in palm oil refinery, in its untreated form is widely disposed of directly at landfills, and is undesirable as possibly causing environmental problems. These by-products generated need to be fully utilized to establish a circular economy in sustaining palm oil production.

Preliminary Results

The product distribution of PKS from a multi-mode manual pyrolysis machine, BEK (Fig. 1), at different temperature (400°C to 600°C) and residence time (30 and 60 min) was as follows: biochar, 33 - 52 wt.% (dwb); bio-oil, 1 - 5 wt.% (dwb) and pyrogases, 43 - 64 wt.% (dwb). The biochar yield decreased with increasing of temperature and residence time. Comparing the lignocelluloses in different oil palm biomass, the lignin of PKS (44-50 wt.%) contributed the greatest to the high biochar formation. Compared to its raw form, the PKS biochar exhibited much higher fixed carbon (FC), ash and carbon contents, and lesser content of volatile matter (VM). The VM/FC ratio of <1.0 and O/C ratio between 0.12 and 0.23, both were indicative of PKS biochar as a carbon sink with good stability in the soil for >100 years. The N (0.77 wt.%) was relatively low while C (74.2 wt.%) was high, making the derived C/N ratio too high for adequate microbial soil function. Overall, results showed great potential of PKS biochar as an amendment for degraded soils.

The composted SBE-based bio organic fertilizer has the following characteristics: organic carbon content, 16.5%; cation exchange capacity, 33.8 cmol/kg; water-holding capacity, 16.5 ml/100 g and C:N ratio, 9–21; much better improvised than its original counterpart [5]. Besides rejuvenating degraded soil, its efficient water/nutrients

biomass growth and productivity for a wide range of crops.

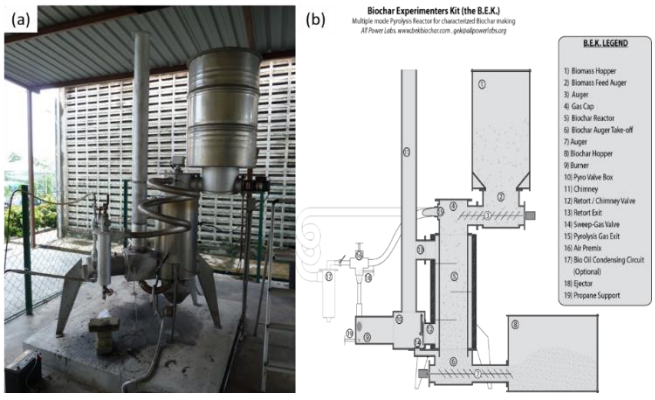

Fig. 1. The Biochar Experimenter Kit (BEK).

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A Glimpse on 65 Years of Passion-driven Work for Bamboo

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Keywords: Bamboo; Structures; Utilization

Abstract

My first contact with bamboo was in 1951 when the shortage of timber for the coal mining industry led to the idea to use bamboo as pit props. Culms imported from Indonesia failed because the internodes split under axial pressure. In 1952 I pioneered the use of electron-microscopy to explore the unknown fine structure of wood and tried also bamboo to reveal its structural details. These photos became useful much later, when in 1956 an Indian wood preservation expert visited me at University Freiburg. Having seen the photos he became excited, since knowledge of bamboo structure could help to treat bamboo culms against deterioration. 1957 I travelled to India as an FAO expert for 4.5 months for improving bamboo preservation. At that time, I had not seen real bamboo, and relevant literature was unavailable. This first mission was followed by many consultancies in about 25 countries for GTZ, FAO, INBAR, ITTO, EU, SES and others. My last projects were conducted 2009 in Thailand and 2010 in Korea. These activities were strongly supported by intensive laboratory research in collaboration with colleagues, thesis students and guests from various countries. About 110 bamboo-related scientific papers and 6 books were published with me as author or co-author. The last book in 2016 was a monograph on structures, properties and uses of bamboo. At the age of 92 I am still enjoying the close contact with international colleagues all over the world and the possibility to give advice.

The Use of Oil Palm Trunks for Wood Products

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Keywords: Oil Palm Trunks; Palm wood; Processing; Products from palmwood

Abstract

Worldwide Oil Palms cover an area of nearly 25 million ha of which more than 75% are located in Asia. After 25 years of age the palms are replaced due to declining oil production. Average annual total volume of trunks from planation clearing amounts to more than 100 million m^3. Like all other biomass the trunks remain on the plantation site for nutrient recycling. But insect and fungi population increase which causes problems for the new palm generation. Oil palm growing regions suffer from declining timber harvests in their tropical forests. A quite large project was set up with partners from R+D and industry to study the possibility to improve the use of oil palm trunks for the manufacture of marketable timber products. The consortium consists of some 20 partners mainly from Germany, Malaysia and Thailand. Areas of development are: harvesting and storage of trunks, sawmilling, drying, processing into various products like solid wood based panels (block-board), multi-layer crosswise laminated timber (CLT), flash doors, furniture elements as well as CLT and glue-lam for the building sector. The achievements are remarkable in all sectors. The presentation will give more insight into areas of development and achievements.

Introduction

The oil palm plantation area has grown remarkably during the last 25 years to almost 25 million ha worldwide. Indonesia covers some 13 million ha, Malaysia 5.5, Nigeria 3.2, Thailand 1.0 and some 15 more countries the remaining area. When replanting after 25 years some 130-150 palms are felled per ha having a timber volume of 160-200 m^3/ha. With today 500.000 ha (long-term 1 million ha) of replanting 80 to 100 million m^3 (up to 200 million) of trunks are available every year. Former research has shown possibilities of manufacturing products (like furniture) from this material. Due to un-sufficient material- and process-oriented product design and major difficulties in processing (sawing, drying, planning, profiling, gluing) the use of OPT for products never came to a break-through. After three years of basic R+D work a group of five German engineering companies in 2015 started a large joint development project which today includes some 20 partners mainly from Germany, Malaysia and Thailand. The aim is to develop appropriate product design, optimize processes under material, quality and cost aspects and look for potential markets worldwide.

Preliminary Results

The volume of trunks from plantation clearing is huge compared to timber volumes harvested nowadays in the respective countries. Therefore, the economic potential to use OPT is high. The present use for nutrients recycling has been studied and was found less important as anticipated. Timber processing in the palm growing countries has a high socio-economic effect for jobs, income and export earnings. Timber products generally have a high positive ecological relevance as they are truly sustainable and have a positive impact on the CO2-balance.

The density of the wood in the trunks varies quite much which leads to the necessity of special processing strategies (sawing, drying, gluing, secondary processing) and in the design and use of products. Dry density varies between 0.2 and 0.7 g/cm^3. The moisture content in the trunk is high (100 to 500 % on dry basis) as well as the sugar content is which is a challenge for harvesting, storage and drying. Hard fibers and silica are a challenge for processing. The consortium developed new or improved solutions for all process steps. Major processes are sawing according to density, grading of green and dry lumber, drying with high recovery rates and high drying quality of the lumber, tool development for high quality of processed surfaces and long life time of tools, gluing with newly developed glues. In addition to processing the products which are rated with a high market potential were re-designed to meet the material properties and the process technology under optimal technical and economic aspects. Also, socio-economic aspects were studied, ecological relevance was analysed using LCA method and the potential for replacement of tropical timber was evaluated. The results show a high potential of using OPT for timber based products.

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Wood, Bamboo and Palm Wood: Similarities and Differences in Research and Technology Development

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Keywords: Palm wood; Wood; Bamboo; Technology development; Fundamental knowledge; Renewable resources

Abstract

Wood science has a history of at least 200 years, bamboo research started in the midst of the last century and palm wood research is even younger. Consequently, there must be considerable differences not only in depth and width of knowledge, but also in state of the art of conversion technologies and utilisation options. While huge wood resources exist all over the world, bamboo and palm resources are only available in certain regions. Similarities and differences in research and technology development related to the three raw materials will be examined and expected future developments will be discussed. Technological progress needs time for a) development based on fundamental knowledge and practical experience, b) for diffusion into industry, and last but not least c) for consumer acceptance and commercial breakthrough. Policy interaction may accelerate development and diffusion of knowledge, but, eventually, may also impede or hinder the utilisation of a raw material resource. While wood research and technology can be considered mature, research on bamboo and bamboo utilisation is progressing rapidly, but research on palm wood and, especially, the processing of palm wood and the utilisation of palm wood products are still in its infancy. Palm wood researchers can learn from wood and bamboo scientists and, by doing so, will speed up the development of palm wood utilisation.

How to Improve the Sustainability of Palm Oil by Using Co-Products Especially Phytonutrients and Several from Oil Palm Trunks

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Keywords: LCA; Sustainability assessment; Palm oil trunks; Carotinoids; Phytonutrients; Co-products

Abstract

Oil palm production has been discussed controversial since more than 20 years: it generates fairly significant amounts of valuable palm oil and palm kernel oil but it is also made responsible for cutting down tropical rain forests and displacement of people – just to name a few benefits and pitfalls.

Sustainability assessments based on life cycle methodologies such as LCA for environmental implications and LCC and sLCA for economic and social implications have given a lot of results in the last 10 years. Also, certification standards came in place such as from RSPO. Today, the main question is, how to improve the sustainability of existing oil palm plantations and its products as well as upcoming new oil palm establishments.

Recent sustainability assessments prove, that there is a significant potential to improve the sustainability of palm oil by additional use of certain co-products. Especially the use of oil palm trunks e.g. for furniture or plywood is promising. Also, phytonutrients derived through palm oil processing can play a certain role.

Introduction

In the last 10 years, a few life cycle assessments have been performed to address the implications associated with using co-products of oil palms such as oil palm trunks after the end of life of the plantations. Still, most of the publications have been performed either by institutions linked to palm oil industry or universities working on basic research but not towards decision makers.

Our institute, ifeu – Institute for Energy and Environmental Research Heidelberg, Germany, performed expertises on how to improve the sustainability of palm oil since more than 15 years for the whole diversity of palm oil stake-holders such as the United Nations subdivisions FAO, UNEP and UNIDO, the European Commission, palm oil industry such as MPOC in Malaysia or NGOs such as World Wide Fund for Nature (WWF): means, we are one of the very few groups worldwide working for these different clients [1].

We use life cycle methodologies to calculate a comprehensive sustainability assessment: the full environmental assessments by life cycle assessment (LCA) and life cycle environmental assessment (LC-EIA), the economic implica-tions by LCC (life cycle costing) and their social counter-parts by social life cycle assessment (sLCA). Finally, all results are merged into the co-called integrated life cycle sustainability assessment (ILCSA) [2], performed more than 10 years successfully in hundreds of applications.

Preliminary Results

LCA and ILCSA have been performed to address the potential on the sustainability improvements of palm oil production and use by using co-products of oil palm production [1].

Significant potentials exist to save greenhouse gases and other environmental impacts, when oil palm trunks are used to produce furniture, plywood or other commodities. Also, phytonutrients derived through palm oil processing can have impacts on the sustainability of palm oil products. Dozens of individual results are available. They have to be discussed and concluded upon to draw a conclusive picture.

The talk will include following issues:

- Introduction to describe the overall potential of co-products of palm oil production and use.
- Give a short overview about the methodologies to be used to perform a full integrated life cycle sustainability assessment.
- Give detailed results of several co-products to show how to improve the sustainability of palm oil production.
- Draw conclusions on all levels.
- Draw recommendations for policy, industry, science, decision makers and the public.

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Oil Palm Wood as Wood Alternative Material: Properties, Processing and Quality Enhancement

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Keywords: Oil palm wood; "Compreg" Oil palm wood; Polygon sawing; Super-fast drying method; Wood alternative

Abstract

Oil palm wood (OPW) from matured oil palm trunk (OPT) has been seen as a strategic alternative for the dwindling forest wood. Having unique stem characteristics, very high moisture content, and inferior wood quality, OPW need to be processed and treated properly before it can be used satisfactorily. Sawing, drying and quality improvement has been the main issues that need be solved, but not many studies address these problems thoroughly. After series of studies, we found and patented some efficient methods for sawing, drying and quality improvement for OPW, successfully producing high performance "Compreg" OPW. With these efficient technologies, abundantly available but low quality OPW from OPT waste can be now processed into high performance material suitable for high-end applications. We believe that these technologies could also be applied to date palm wood (DPW) that has high similarity with OPW in term of wood structure.

Introduction

Having a huge area of oil palm plantation (5.7 million ha in 2017, the second largest after Indonesia), huge amount of oil palm biomass are generated in Malaysia. After reaching the age of 25 years old, the plant must be replanted with young trees and the replanting activities produce a huge amount of trunk. With an assumption of 4% annual replanting rate, there should be 268,000 replanting hectares annually. It was reported that the population of matured oil palm is 130-140 trees/ha and each tree have volume of 1.5m^3 frond-free trunk. Therefore, 54 million m^3 OPT could be easily produced annually. Most of the OPTs are still considered waste and left to rot in the field. At the same time, timber production in Malaysia continues to diminish and makes timber industries face critical raw material supply problems. The utilization of OPW from the replanting activities has been seen as a strategic wood alternative to replenish the industry. Unfortunately, the nature of OPW is unique and compare to less 100% for the other wood species. On top of that, OPW has some inferior properties and therefore the material should be sawn and dried differently and being treated properly before it can be used as wood alternative [1-3].

Preliminary Results

Basically, OPW has been identified with four imperfections. It is very low in strength, very poor in durability and dimensional stability, and very rough in machining characteristics. The MC is very high (>200%), and the variation of MC between wood from the outer part and inner part of trunk are very high. The same goes for density where 350-400kg/m^3 and 250-300 kg/m^3 were recorded from the outer and inner parts of trunk, respectively [1]. Contradictory to other wood species, OPT has better wood portions located at the outer part of trunk, therefore the sawing pattern for OPT should be made differently. The standard sawing patterns such as life sawing, sawing around or quarter sawing cannot be used for OPT. The Polygon sawing has been developed and found as the most suitable pattern for OPT [2]. Due to its very high MC, OPW cannot be dried by a conventional kiln drying method since the drying time is very long, and only the outer part OPW can be dried accompanied by a high rate the drying defects. A super-fast drying method that is capable to dry all parts of OPW with almost free of defect in just 3 hours has been introduced and patented [4]. As for quality enhancement, two methods (the 5-step and the 6-step processing methods) have been also developed and patented. The methods are able to solve the aforementioned OPW imperfections, producing high performance „compreg" OPW [5-6]. With these efficient technologies, abundantly available but low quality OPW from unutilized OPT waste can be now processed into high performance material. This is a step forward for producing alternative

wood materials for high-end applications. OPW have close similarity with other palm wood, especially DPW. Anatomical structure and properties of OPW are very similar to DPW. Had some adjustments been taken, we believe that these technologies could also be applied to DPW in this region.

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Enhancing the Performance of Oil Palm Wood (Elaeis guineensis) Through Phenolic Compreg Technique

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Keywords: Oil palm wood; Phenol formaldehyde; Compreg; Polymer loading

Abstract

The aim of this study was to assess the performance of oil palm (Elaeis guineensis) wood (OPW) which had been treated through phenolic compreg technique. Green OPW strips were soaked in 30% low molecular weight phenol formaldehyde (LmwPF), followed by diffusion process. After pre-curing, the pre-cured strips were assembled parallel to each other to form three-layer laminated compreg OPW, followed by compressing them under a hot press to the compression ratios (CR) of 55%, 70% and 80%. Laminated untreated OPW bonded with commercial PF resin served as control. The study showed that polymer loading of the compreg was significantly affected by diffusion and compression processes. It was also found that density, anti-swelling efficiency (ASE) and mechanical properties of laminated compreg OPW were positively correlated with polymer loading, whilst water absorption and thickness swelling were negatively correlated with polymer loading. Compared to the laminated untreated OPW, the compreg product had superior properties. Meanwhile, formaldehyde emission of the laminated compreg was relatively higher compared to the global threshold limit.

Introduction

OPW from the trunk of oil palm tree (Elaeis guineensis) has potential to be used for various applications. However, due to the inferior properties, the oil palm trunk is left underutilized in plantation as compose for replanting. It has been reported that that OPW has at least four imperfections: low strength, low dimensional stability, low durability and poor machining characteristics [1]. Nonetheless, treating OPW using phenolic compreg technique can practically solve all the imperfections of OPW. This treatment has been found to significantly improve the performance of OPW, making them more usable in assessing the shortfall of wood supplies.

Factors such as molecular weight of phenol formaldehyde (PF) resin, concentration of PF resin, thickness of the material and compression level [2] need to molecular weight (Mw) of 290-480 is able to penetrate into the cell wall and significantly reduce swelling [3]. However, PF resin with Mw 820 remains in the cell lumen without resulting in any significant stability. A deep penetration of PF resin can be achieved by treating thin pieces of wood with LmwPF resin, followed by laminating and compressing them in a hot press to form three-layer compreg laminates. In an earlier study, it was reported that 12-mm thick three-layer compreg laminates of light hardwood had density gains of two to three times higher than that of the control samples [4]. The shear stress at the bonding line was slightly lower or comparable to, while hardness, strength and stiffness were significantly higher than untreated control samples. The anti-swelling efficiency (ASE) of the samples ranged between 60-70%. It is anticipated that the treatment of green OPW with LmwPF, using a combination of soaking and diffusion processes, would yield higher polymer loading and complete penetration in the treated material.

Preliminary Results

Diffusion and compression processes significantly affect the polymer loading of laminated compreg OPW treated with 30% low molecular weight phenol formaldehyde. Within the parameters of the study, the highest polymer loading was achieved by the samples which had undergone 6 days of diffusion process and 55% CR. The results (Table 1) also showed that density, ASE and modulus of elasticity (MOE), modulus of rupture (MOR) in static bending, shear of laminated compreg oil palm wood were positively correlated with polymer loading (as indicated by WPG), whilst water absorption (WA) and thickness swelling (TS) were negatively correlated with polymer loading. At the same CR, the laminated compreg OPW had significantly higher density, dimensional stability, strength, stiffness and bonding quality compared to the laminated untreated oil palm wood bonded with commercial grade PF resin. Formaldehyde emission of the laminated compreg was relatively higher compared to global threshold limit, which is 0.16- 2 mg/l.

Table 1. Mean properties of laminated compreg OPW

DT (days)	CR (%)	WPG (%)	Density (kg/m^3)	WA (%)	TS (%)	ASE (%)	MOE (N/mm^2)	MOR (N/mm^2)	Shear (N/mm^2)
2	55	48.26	854	34.07	9.02	60.44	9214	130	3.25
2	67	37.07	810	36.04	9.07	52.81	8115	76.1	1.79
2	80	37.06	758	38.32	12.71	44.92	6982	67.0	1.31
4	55	56.42	1076	29.4	5.86	64.73	14685	131	3.78
4	67	56.20	1047	29.91	8.50	58.87	9376	94.4	1.86
4	80	53.96	953	33.31	8.66	60.68	7075	82.7	1.28
6	55	73.18	1153	23.97	5.21	73.93	16723	168	7.02
6	67	70.7	1118	27.48	5.43	70.49	12716	124	2.60
6	80	61.4	1081	30.51	6.44	67.70	11334	94.4	1.47
Control	80	-	624	74.66	22.41	-	1034	54.6	1.00

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Innovative Biocomposite Sandwich Panels Made of Coconut Bidirectional External Veneers and Balsa Lightweight Core as Alternative for Eco-Friendly and Structural Building Applications in High-Risk Seismic Regions

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Keywords: Engineered wood products; Biomaterial mechanical characterization; Mechanical efficiency; Cocos nucifera L; Ochroma pyramidale

Abstract

The research that constitutes this paper is based on a series of publications that aimed at understanding, from an engineering perspective, the optimised mechanical efficiency of senile coconut palm stem-tissues as foundation for non-traditional building applications. Particularly, this study aims at determining, evaluating and analysing the mechanical properties of lightweight bidirectional sandwich-like structure wall panels made of balsa core material and coconut external veneers. To achieve these objectives, 20 test specimens cut from prototype panels (1.2 m high, 0.6 m wide and 0.074 m total thick) and 20 test specimens cut from prototype panels (1.2 m high, 0.6 m wide and 0.123 m total thick) were investigated under mechanical and seismic behaviours in accordance to the current ASTM building standards. Preliminary results show that the proposed wall panels are up to two and three times more efficient, in terms of mechanical high-performance, than equivalent sections of brick walls and cement block walls, respectively. Therefore, the innovative panels constitute a feasible alternative to reduce/replace typical construction materials (e.g. steel, concrete and bricks) with a significant positive environmental impact that fully address current engineering requirements. These biopanels are meant to be used as important non-traditional elements of the rebuilding process of low-rise and mid-rise residential buildings that were dramatically affected during the 2016 Ecuador earthquake.

Introduction

earthquake injuries and fatalities. The catastrophic Ecuador earthquake in April, 2016, left approximately 35,300 affected dwellings, out of which about 19,500 resulted totally destroyed or demolished. Tragic result of it, around 670 people died and 6,300 individuals were injured. Despite some advantages (e.g. fire resistance and durability) offered by traditional building structures made of typical materials (e.g. steel, concrete, bricks), their partial failure or total collapse during extreme seismic events can lead to critical consequences as hereinabove mentioned. It has been estimated that during the 2016 Ecuador earthquake, many casualties occurred, not only by the structural framing collapse effect, but greatly by the overbalance masonry effect as shown in Fig. 1. Moreover, typical manufactured structural materials all involve very substantial use of energy during their production process, which in turn involves high generation of CO_2 to the atmosphere. Indeed, building with steel or concrete is 20 and 9 times, respectively, more CO_2 emissions intensive (i.e. compared on mass basis) than structural timber [1].

Unfortunately, part of the Ecuadorian area affected by the earthquake is being currently rebuilt using the same traditional building methods and materials. The curious aspect of the rebuilding process is that huge amounts of concrete and steel are daily transported to the construction project sites whereas massive plantations of biomaterials (e.g. coconut palms and balsa trees) surrounding the zone are totally disregarded. These observations were the driven force behind the work in this investigation, which aims at addressing the hereinabove stated problems by proposing innovative bio-composite structural wall panels as alternative for masonry construction that makes the most of both fundamentals: (1) the enhanced performance of engineering wood products, cross laminated timbers, specifically, and (2) the optimal mechanical efficiency, in terms of mechanical performance (i.e. high strength versus moderate stiffness) per unit mass; the optimal mechanical efficiency that is best represented in biomaterials by either a sandwich-like structure (e.g. coconut stem tissues) or a tubular-like structure (e.g. bamboo culms) [3, 4].

The prototype wall panels shown in Fig. 2 resemble a complex sandwich-like structure that is made of two different biomaterials: (1) Ecuadorian balsa hardwood (Ochroma pyramidale) as core material, and (2) Ecuadorian coconut palmwood (Cocos Nucifera L) veneers as external boards. The 0.04m thick sandwich panel core (i.e. balsawood) is used in the form of the BALTEK® SB.100 product due to its high level of stiffness to weight ratio (i.e. Avg. compressive MOE perpendicular to the plane of 2,526 MPa for an equivalent basic density of 148 kg/m^3 at an Avg. moisture content of 12.6%). Each 0.018 m thick external board (i.e. one board per external panel side as shown in Fig. 2) comprises three coconut veneers glued bidirectionally following the same principle of cross laminated timbers (CLTs) that are used for wall building purposes. Coconut veneers were obtained by peeling process of the peripheral section (Avg. compressive MOE of 8,920 MPa for an equivalent basic density of 900 kg/m^3 at an Avg. moisture content of 12.6%) of three mature coconut palm stems.

Preliminary Results

Significant findings have been achieved so far that show the bio-composite structural wall panels fully address current engineering and environmental requirements like high structural performance, sustainability, design flexibility, low construction costs, short construction timelines, efficient and low embodied energy, durability, light weight, readily availability, easy transport and assembly, and minimum environmental impacts that maximise green star ratings. Preliminary results thereof show that the proposed wall panels are up to two and three times more efficient, in terms of mechanical high-performance, than equivalent sections of brick walls and cement block walls, respectively. Moreover, the optimal cocowood mechanical efficiency (i.e. high strength versus moderate stiffness per unit mass) mimicked into these wall panels, makes them suitable to be used in building projects located in high-risk seismic regions as its remarkable ductility (i.e. material's ability to undergo significant plastic deformation before failure), shown in Fig. 3, could significantly reduce the overbalance masonry effect (typical for conventional construction wall materials) during high-intensity seismic events.

Fig. 1. Overbalanced brick masonry recorded during the 2016 Ecuador earthquake. Adapted from [2].

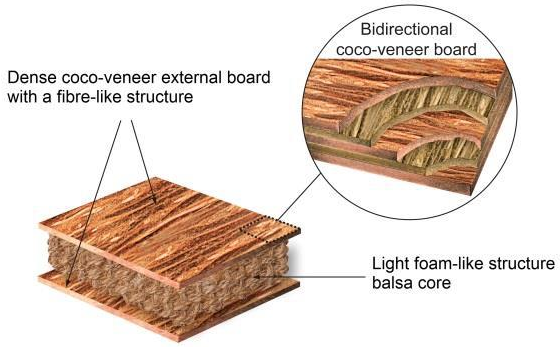

Fig. 1. Sandwich-like structure wall panel made of Ecuadorian balsa lightweight core and coconut bidirectional external veneers.

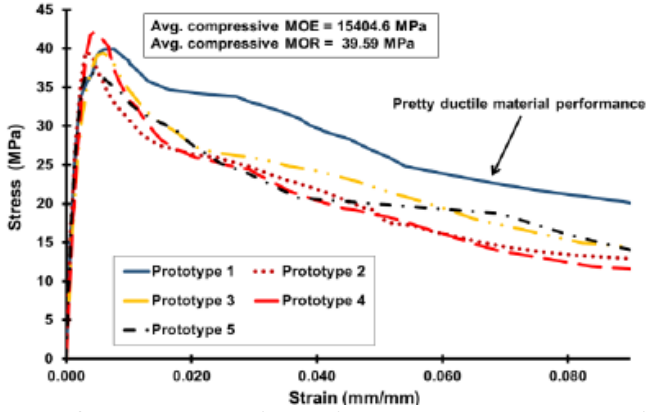

Fig. 1. Stress – strain relationship for five specimens tested under compression mode and cut from a prototype bio-composite sandwich-like structure wall panel.

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Plywood from Oil Palm Trunk: Manufacturing Process and Development of Standards

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Keywords: Nanomaterials; Processing; Microstructure; Microfluidics

Abstract

The area of greatest potential in the optimal utilisation of oil palm tree residues lies in the production of wood-based products. These abundant and readily available fibre materials make excellent alternative sources of lignocellulosic materials in the manufacturing of particleboard, Medium Density Fibreboard (MDF), plywood, sawn lumber and pulp & paper. While empty fruit bunch (EFB) has been used in bioenergy production, particleboard and MDF, oil palm trunk (OPT) is more suitable for plywood manufacturing. Nevertheless, inherent features in OPT such as high moisture content, high density variation and diverse anatomical structure along the stem make it less attractive for further processing. This paper reviews the manufacturing process of plywood from OPT, its properties and standards for palm plywood.

The Oil Palm Trunk: Opportunities and Challenges for the Malaysian Timber-Based Industries

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Keywords: Oil palm trunk; Plywood; Timber; Furniture

Abstract

The Malaysian timber industry is an important income generator for the Malaysian's economy. In 2017, the export revenue of timber and timber products was valued an excess of RM22 billion. The supply of raw material is central in order to further develop this thriving industry towards continuous growth. With natural forests being kept safe via sustainable forest management practices and with heightened awareness in conservation and green practices, the timber industry is looking at alternative raw material. There are 5.7 million hectares of oil palm plantations in Malaysia. After 25 years, the oil palm trees will begin yielding less fruit and need to give way for replanting of new young trees. This presents a boon to the timber industry as the felled oil palm trunk (OPT) is a renewable source of alternative raw material. It is expected close to 11 million OPT logs will be felled to make way for replanting every year. This alternative material has come at the right time for timber industry. With tough competition in the global marketplace, rising costs and tight supply of timber, the timber industry has been looking for a revival. The solution appears to be in OPT which is able to be processed into plywood and timber. Initiative that carried out by Malaysian Timber Industry Board (MTIB) and the timber industry, both in the past and present, has enabled OPT to become a new and an important source of raw material for conversion into veneer, plywood and other timber products. To date, MTIB has encouraged and promoted a number of activities particularly in the processing of OPT into value-added downstream products for further utilization in both construction and furniture industries. There are fundamental differences between OPT and natural forest logs in the area of density, moisture content and mechanical properties. These attributes require modified equipment and processing methods for peeling, sawing, drying, chemical treatment, gluing and finishing. These differences pose challenges to the existing plywood and timber factories that have to research and identify the best operational techniques to process OPT. There are many challenges in processing OPT. More research work would be needed especially in the process of transforming OPT into plywood and other timber products. Good quality products can be made, however the ultimate test is how well the market can accept them. The emergence of plywood and sawn timber made from OPT should present an attractive proposition to importing countries as it is environmentally friendly and sustainable. This is also in line with rising demands for environmentally friendly and sustainably managed timber products in the developed countries. With this in mind, many initiatives have to be undertaken to introduce these timber products to the global market.

Medium Density Fiberboards from the Date Palm Residues: A Strategic Industry in the Arab World

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Abstract

The success of the environmental movements world - wide has led to the decrease of wood availability in the world market , and hence the soaring of wood prices .This in turn has led to the increase of the burden on the balance of payment of the Arab countries , relying on the importation of wood to satisfy the needs of theirs populations in shelter , furniture, etc. Meanwhile, the Arab World includes the palm belt extending from Morocco in the far West to Iraq in the far East. Therefore, it makes sense to look to the date palm residues, mainly resulting from the palm pruning, as a sustainable renewable material base to locally manufacture wood substitute as, for the example, the composition panels including the medium density fiber boards (MDF), particle boards, block boards, etc. Within a research project , conducted by the Faculty of Engineering , Ain Shams University with the collaboration of the ministry of environment, samples of the date palm secondary products have been collected in proportion with the available products of palm pruning(palm midribs , leaflets ,spadix stems and coir) , threshed and sent to the laboratory of Deshna MDF factory in Kena governorate .The result of tests confirm that the MDF samples, manufactured from the date palm secondary products, satisfy the mechanical and physical requirements of international standards ,of MDF boards . A technical and economic feasibility study has been conducted on a suggested industrial project to manufacture MDF boards in EL- Bahariah oases .The results of this study show that the profitability indicators of this project are high :the return rate on invested capital is (39.4%), the revenue : cost rate is (1.43:1), the payback period is 3.6 years and the internal rate of return is 36.2%

Evaluation of Date Palm Fiber Components as Alternative Lignocellulosic Material for Medium Density Fiberboard Manufacturing

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Keywords: Medium density fiber-board; Date palm components; Defibration process; Thermal behavior; UF-fibers interaction; Strength properties; Water resistance property

Abstract

This work deals with assessing the date palm component wastes as alternative lignocellulosic material for production of Medium density fiberboards (MDF), in order to establish economic and balance between production/consumer ratio at different provinces rather than Upper Egypt. Palm leaves and palm frond was used as MDF precursors. Different urea formaldehyde (UF) levels (10-14%/fiber) and pressing pressure (25-35 bar) were applied in this evaluation. The acceptable interaction of palm fibers component with UF was optimized by characterizing its DSC & TGA, in comparison with commercial used sugarcane bagasse fibers. The promising MDF Panel is obtained from palm frond fibers and its mechanical and water resistance properties fulfill the ANSI standard for high grade MDF wood products, especially on applying UF level 12-14%, and pressing pressure, 35 bar. It is interesting to note that, applying higher pressing pressure together with 12% UF level provided palm frond-based MDF with static bending properties, higher than commercial Bagasse-based MDF. The insignificant effect of pressing pressure was noticed on water swelling property and free-HCHO of MDF panels. Where, both type of fibers have the same water swelling property (reached ~ 10%), and free-HCHO (~ 27 mg/100g board).

Analytical profile of Lignin extracted from fronds woods of Iraqi Date Palm Phoenix Dactylifera Trees

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Keywords: Analytical profile, Date palm, Lignin, Iraqi Phoenix dactylifera, Trees

Abstract

Date palms Phoenix dactylifera trees have played an important role in IRAQ. Thousand tons of date palm pruning wastes are discarded daily. Thus, there is an urgent need to find analytical data base for Iraqi phoenix date palm pruning words which open the door to suitable application for this waste. Extraction and purification of lignin for five types of Iraqi date palm samples (Phoenix - Gibgab, Phoenix- Bint-Swelih, Phoenix - Mtawag, Phoenix-Ohm-Al-Blales, Phoenix- Hillawi) using Klason lignin method has been done. Weight of extracted lignin ranged from (0.4430g – 0.6411g), and lignin % ranged from (22.15– 32.05). (Waxes, oils, resin, and proteins of wood gums) % ranged from (17.35– 30.30). FT– IR Characterization showed that the (-OH) phenolic group appear in Ohm-Al-Blales and Hillawi lignin's structures and dis appear in other lignin types, while the Aromatic ether aryl (4-O-5 inter monomeric lignin linkage dis appear in Bint-Swelih lignin structure and appear in other lignin types. Also, Alkyl substituted ether (O - CH3 or O – CH2 stretch) appear in Gibgab and Ohm-Al-Blales lignin's structures and dis appear in other lignin types, while Vinyl ether (in phase C- O - C stretch) appear in Bint-Swelih and Hillawi lignin's structures and dis appear in other lignin types. UV – Vis. Characterization showed that the lowest absorption maximum (228nm) corresponds to Gibgab and Bint-Swelih lignin's structures, while the highest absorption maximum (274nm) corresponds to Gibgab lignin structure.

Effect of Vitamins (Pyridoxine and Nicotinic Acid), Thiamine and Myo-Inositol at Different Concentrations on Free Amino Acids and Indoles Content of Embryogenic Callus of In Vitro Date Palm (Sakkoty and Bartamuda cultivar)

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Keywords: Vitamins; Amino acid, Indoles; Embryogenic callus; Tissue culture; Date palm

Abstract

This study was conducted to investigate the effect of vitamins (pyridoxine and nicotinic acid), thiamine and myo-inositol at different concentrations (0.5, 1.0 & 2.0 mg/l) supplemented in MS basal nutrient medium of embryogenic callus of date palm on the production of secondary metabolites of amino acids and indoles. Two Egyptian cultivars (Sakkoty and Bartamuda cultivar) of date palm were used. Recorded data showed that, pyridoxine concentration at (0.5mg/l) was the most effective concentration in the production of amino acids and indoles from embryonic callus of the tow studied cultivars of date palm. Nicotinic acid at (0.5mg/l) showed also the best results of production of amino acids and indoles from embryogenic callus of tow cultivars. According to thiamine at (2.0mg/l) concentration was the most effective in inducing the highest significant value of amino acids and indoles from embryonic callus of tow cultivars of date palm. Addition of myo-inositol concentration at (25mg/l) produced the highest significant value of amino acids and indoles.

Effect of natural additives as Coconut Milk on the shooting and rooting media of in vitro Barhi Date Palm (Phoenix dactylifera L.)

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Keywords: Natural additives, Barhi, Casein Hydrolysate, Coconut Milk, Yeast Extract

Abstract

The objective of the research study was to determine the effect of addition of different concentrations of three types of natural additives on Date Palm cv. Barhi: (1.25g/l, 2.5g/l, 5.0g/l for Casein Hydrolysate and 10%,20%, 30% for Coconut Milk and Yeast Extract), in addition to the control (0.05 BA mg/l mg/l) for shooting stage and (0.1 NAA mg/l, 3 g/l AC) for rooting stage. The results show that the use of 30% Coconut Milk achieved a high number of shoots and the highest shoot length was recorded with 10% Coconut Milk. In the date palm rooting stage, the results show that the use of 30% Coconut Milk increased the number of roots, shoot thickness and rooting percentage. However, root length was increased with 10% Coconut Milk. The lowest values were recorded with using Yeast Extract in this stage.

The Biological Effect of Light Intensity on Steroids Production of Developed Callus Cultures of Date Palm Hayani Cv.

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Keywords: Callus cultures; Date palm; Elicitors; Light intensity; Plants secondary metabolites; Steroids

Abstract

Biotechnological approaches by plant tissue cultures have a special advantage in the industrial production of bioactive plant metabolites such as desirable medicinal compounds, food additive… etc. Physiological and morphological responses of in vitro plant cells to microbial, physical or chemical factors which are known as 'elicitors', were studied to enhance secondary metabolites in various plants possess important bioactive metabolism compound. The object of this study is to determine whether the light intensity was sufficient to induce a biological effect on in vitro callus cultures growth and on the accumulation of steroid content of date palm. Cultures of developed callus explants of date palm Hayani cv. have been incubated under different light intensity (dark condition, med light intensity (1000 lux) or high light intensity (3000 lux)). Data showed clearly that different light intensity has various physiological effects on (browning degree, the increasing in callus mass and new somatic embryos differentiation) of developed callus cultures. Steroids content accumulation was accelerated significantly by incubation under high light intensity (3000 lux).

Some Heavy Metals as a Precursor of Steroids Production from Date Palm Callus

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Keywords: Date Palm; Biotechnological applications; Secondary metabolites; Heavy metal; Cadmium chloride; Aluminum chloride; Steroids

Abstract

Date palm is considered one of the most important commercial crops in the Arab worlds. Biotechnological applications of plant cell cultures present the most updated reviews on current techniques in plant culture in the field, rapid propagation of date palm through tissue culture is the most promising technique for production of sufficient planting materials (off shoots) and obtaining high quality In vitro plant cell cultures have potential for commercial production of secondary metabolites. Date palm tissues produced steroids which have important medicinal value. There are some studies about the precursors which can be used to enhance and increased the production of ate palm plant cell of these important secondary metabolites. This study was conducted to stimulate steroid production from date palm callus by adding two types of heavy metals, Cadmium chloride and Aluminum chloride to growth nutrient medium during callus production stage. It has been tested two concentrations for each type from heavy metals under investigation, these concentrations are 250 and 500 µM to encourage and increase steroids production from callus. Callus weight (g) and total steroids were determined after three months from its treated. Data showed that, 250 µM $AlCl_3$ and 500 µM $CdCl_2$ recorded the highest values of callus weight and total steroids (mg/g dry weight). In recent years, secondary metabolites of date palm have received special attention given their health-benefit claims and potential use in the booming industries of functional foods and nutraceuticals. A number of studies are under way to unveil more properties and in establishing procedures and protocols to economically and efficiently incorporate these date-derived products in the diet.

Effect of Some Micro-Elements on Steroids Production From Embryogenic Callus of In Vitro Date Palm Sakkoty and Bartamuda Cultivar

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Keywords: Micro-elements; Steroids; Embryogenic callus; Manganese sulfate; Zinc sulfate; Cupric sulfate; Date palm cultivars

Abstract

Some microelements such as, manganese sulfate ($MnSO_4 2H_2O$), zinc sulfate ($ZnSO_4 7H_2O$) and cupric sulfate ($CuSO_4 5H_2O$) were used as precursor to produce steroids from embryonic callus tow date palm dry cvs. In this study, embryogenic callus explants were cultured on MS nutrient medium supplemented with different concentrations of $MnSO_4$ (22.3, 44.6 and 66.9 mg/l), $ZnSO_4 7H_2O$ (8.6, 17.2 and 25.8 mg/l) and $CuSO_4$ (0.025, 0.050, 0.075 mg/l). The highest significant value of total steroids(0.94 mg/g dry weight) was recorded when embryogenic callus of Sakkoty cv. was cultured on medium contained (22.3mg/l) $MnSO_4 4H_2O$. Where embryogenic callus of Bartamuda cv. cultured on nutrient medium supplemented at (17.2 mg/l) $ZnSO_4 4H$ gave the highest significant value of total steroid (0.92 mg/g dry weight).

Steroids Production of Embryogenic Callus Cultures of Date Palm Under the Effect of Vitamins (Pyridoxine Hydrochloride, Nicotinic Acid) Thiamine Hydrochloride and Myo-Inositol

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Keywords: Steroids; Vitamins; Pyridoxine hydrochloride; Nicotinic acid; Thiamine hydrochloride; Myo-inositol; Embryogenic callus; Tissue culture; Date palm

Abstract

Steroids production in embryogenic callus stage of in vitro date palm (Sakkoty and Bartamuda cultivar) was studied with the effect of addition of vitamins Pyridoxine hydrochloride, Nicotinic acid Thiamine hydrochloride at (0.5, 1.0, 2.0 mg/l) and Myo- inositol (25, 50, 100 mg/l) to MS nutrient medium. The pyridoxine concentration (0.5mg/l) was the most effective as it resulted in the highest significant value of mean (0.78 mg/g dry weight of embryonic callus of Sakkoty cv. and the highest significant value (0.80 mg/g dry weight) embryonic callus of Bartamuda cv. According to vitamin of nicotinic acid data showed that concentration at (0.5mg/l) was the most effective as it induced the highest significant value of steroid content (0.82 mg/g dry weight) of embryonic callus of Bartamoda and the highest significant value of steroid content (0.91 mg/g dry weight) of embryonic callus of Sakkoty cv. On other hand data showed that thiamine concentration at (2.0mg/l) was the most effective in inducing steroid content in embryonic callus of Sakkoty cv. (0.83 mg/g dry weight) and Bartamuda cv. (0.87 mg/g dry weight).Results indicated also that The myo-inositol concentration at (25mg/l) gave the highest significant value of steroid content (0.71 mg/g dry weight) of embryonic callus of Bartamoda and the highest significant value of steroid content (0.80 mg/g dry weight) of embryonic callus of Sakkoty cv.

Design for Enhancing Material Appreciation: An Application on the Palm Tree Midribs

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Keywords: Palm tree midribs; Material appreciation; Emotional design; User perception

Abstract

Despite academic and professional efforts to extend Palm midribs' uses in production, there is lack of user appreciation or interest in the end product. Most studies focus on the Palm's technical characteristics to compete with standard wood, disregarding emotional factors essential in product promotion. Recent applications eliminate material naturalness, creating artificial substitutes and confusing users who prefer material genuineness. The study aims to integrate Palm midribs into local products by demonstrating visual and tactile attributes. The research highlights designer involvement in product development. Due to the material's nature, engineers and designers must collaborate to develop products technically and emotionally. Two experimental design methods supported by interviews were conducted with participants from each group concerned with developing the material. Participants evaluated the material's surface from their perspectives in terms of visual and composition. Results revealed that diverse feelings of tactile attributes create sentiments and intellectual curiosities, evoking value and appreciation for the material. Although both groups perceive and communicate differently they have similar objectives: successful material implementation. To enhance designer-engineer cooperation, a multidisciplinary platform was developed enabling material features to be integrated in product development. By focusing on Palm by-product naturalness designers and engineers can create meaningful and delightful user experiences.

The Technical Heritage of Date Palm Leaves Utilization in Traditional Handicrafts and Architecture in Egypt and the Middle East

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Keywords: Date Palm Midribs; Technical Heritage; Architecture; Handicrafts

Abstract

Date Palm Trees enjoy a recognized stature in Egypt since the ancient times. The abundance of Date Palm Trees and their distribution over the Nile valley, Delta, Oases and Sinai in Egypt granted them familiarity with the people that remains until the present. This familiarity is represented in the survival of various traditional techniques in the utilization of Date Palm Trees pruning residues in the fields of handicrafts and construction in rural Egypt. On the top of those pruning residues are the leaves, which rank the highest in the annual quantities. Date Palm Leaves are still widely used in traditional handicrafts and building in the poor rural areas in Egypt due their renewable availability and low cost. This paper aims to analyze the technical heritage behind those traditional utilization fields in order to identify the dominant techniques used. Those techniques, including Bundling, Rope Stacking and friction based assembly, can be introduced as the basis on which the development of those techniques for modern and contemporary uses of date palm leaves should be based in order make use of the surviving skills to sustain the familiarity needed to guarantee the success of the developed uses.

Introduction

Date palm tree acquires great importance historically, economically and socially in Egypt. The pruning residues of Date Palm are utilized in many traditional industries and construction by the cultivators and craftsmen in Egypt; thus playing a huge role in sustaining the rural societies against the immigration to urban cities, as those date palm related industries support over one million families in Egypt [1].

Date Palm Leaves, representing 52.9% of the annual date palm pruning quantities [2], are used in various fields historically. The palm leaves were fundamental in Egypt and Nubia. The roofs were constructed by split palm trunks and leaves and the interior walls were covered by palm leaves ornaments [3]. Palm midribs and trunks have used for roofing in a fashion that still survives in Siwa Oasis [4].

Those ancient evidences prove the adaptability of date Palm leaves to our environment. This high adaptability, besides flexibility and low cost, qualified the material to gain popularity and the trust of the rural craftsman in Egypt, which opens the door to exploit the potentials of this materials in contemporary uses as promising fields for small projects. Those new uses ought to originate from that technical heritage in order to help those surviving skills to flourish and make use of the craftsman with that irreplaceable know-how. However, most of the previous researches have not introduced an integrated analysis of that heritage and the detailed processes of the traditional techniques that are still surviving.

Preliminary Results

Two of the basic elements of sustaining the industrial development of a local material are to benefit from the current craftsman skills in order to attract them to participate in the development, plus saving and expanding the base of the artisans that practice traditional techniques that can be reinforced and developed.

Accordingly, the industrial development of date palm leaves should be based on the traditional techniques in order to obtain a solid ground to guarantee its continuance. Therefore, the paper aims to identify the dominant traditional techniques that are most qualified to be the basis of the industrial development of date palm leaves.

This aim is fulfilled by analysis of the traditional techniques of the utilization of date palm midribs in handicrafts and construction. This analysis depends highly on the investigation of those traditional manufacturing

processes. The analyzed handicrafts are crates, bird cages and handmade furniture. The analyzed uses of date palm leaves in architecture are wickerwork, simple post and beam structures with mats, bundles or lattices, and fencing. Then, a comparison between those uses is conducted in order to define the basic concepts and the main techniques used.

The most dominant techniques that are identified from the comparison are bundling, rope stacking, weaving and friction-based assembly. It can be concluded that the techniques that are most qualified for further development are more present in the traditional huts in the poor rural areas.

This means that although most of the previous startups and small projects depending on date palm midribs are more concerned with furniture, the development of the utilization of date palm midribs in architecture is a promising field for researchers and artisans. The challenge this development needs to face is the need to produce sophisticated architecture that meets the modern lifestyle that the rural youth pursue in Egypt.

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Optimizing the Extraction Process of a Novel Long Fibrillated Fibers from the Midribs of Date Palm (Phoenix Dactylifera L.)

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Keywords: Date palm fibers; Fiber extraction; Fiber chemical treatment; Natural fibers

Abstract

Date palm (DP) is considered one of the large sources of natural cellulosic fibers. Long fibrillated date palm fibers, which could be used in many different applications, were extracted from the midribs using chemical treatment followed by mechanical separation process. DP midribs were chemically treated using NaOH under varying conditions; NaOH concentration, treatment duration, and temperature. A total of 27 samples were prepared in addition to an untreated sample (control). Different characterization techniques were applied on the 28 samples to determine the optimum treatment conditions. The fibers physical properties were obtained by measuring their density, cross-sectional area, and fibers' length. Also, the fibers' surface morphology was observed using SEM. Moreover, single fiber tensile test (SFTT) was used to determine the fibers' mechanical properties. Finally, by analyzing the results the optimum treatment condition was selected based on cost, environmental impact and fiber quality.

Introduction

Natural fibers (NF) are fibers obtained from natural sources. There are two types of NF; protein fibers which are obtained from living creatures, such as, silk, wool and hair, and cellulosic fibers which are obtained from plants, such as, flax, jute, date palm and cotton [1]. Cellulosic natural fibers, which are also referred to as lignocellulosic fibers, consist of three major organic constituents; cellulose, hemicellulose, and, lignin. The cellulose is embedded in a lignin matrix as shown in Fig. 1 [2]. In general, properties of NF are affected by many factors; some of which are controlled and the others are uncontrolled. The controlled factors are cultivation factors, extraction process parameters and fiber treatment conditions. Whereas, the uncontrolled factors are all that can't be changed like the microfibril angle or natural defects [1]. Date palm is considered one of the largely existing sources of cellulose fibers. DP fibers could be extracted from four different parts, namely, midribs, spadix stems, leaflets, and mesh. The research on DP fibers is of high interest to the scientific community, due to their good mechanical, physical, and thermal properties, in addition to, their versatility, low cost, and abundance.

Preliminary Results

The aim of this research work is to extract long fibrillated fibers from the midribs of date palm (DP) using two sequential processes; chemical treatment and mechanical separation. The chemical treatment was achieved by using NaOH. The chemical treatment factors are NaOH concentration, treatment duration, and treatment temperature. Each of the previously mentioned factors had three levels. A full factorial design of experiment was used to determine the optimum treatment conditions. Therefore, 27 samples were extracted and treated in addition to an untreated sample (control). The levels of each factor were selected taking into consideration economic feasibility in addition to suitability for use on an industrial scale. The midribs used in this experimental work were all obtained from the same date palm tree which was a Barhi cultivar located in Sharqia governorate, Egypt. Moreover, the midribs were all obtained during the same period of time and had the same level of maturity. This selection criterion was adopted to ensure consistency amongst midribs and to eliminate any of the cultivation factors from the experiment.

The sample preparation is divided into three steps; chemical treatment, mechanical separation, and neutralization. The chemical treatment is performed by immersing slices of midribs of equal sizes in a NaOH

solution at different conditions. Whereas, the mechanical separation is performed by passing the treated slices between 2 squeezing rollers to separate the swollen lignin from the cellulose fibers. Finally, the neutralization is performed by immersing the fibers in 5% acetic acid solution to neutralize the fibers' pH.

The physical properties of the extracted fibers were determined by measuring the fibers' density, length, and cross-sectional area. The mechanical properties were obtained by performing SFTT. Finally the fibers' surface morphology was observed using SEM. The tests results were analyzed by comparing the findings and by statistical analysis to determine the best treatment conditions.

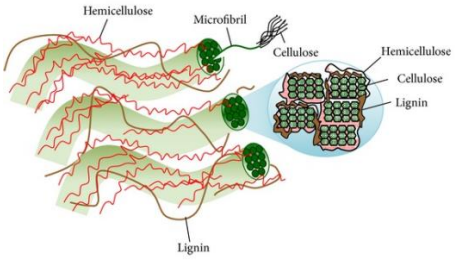

Fig. 1. Microstructure of natural cellulosic fibers [3].

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Investigations on the Effects of Cement Replacement and Calcium Chloride Addition on Selected Properties of Coconut Husk Fibre-Reinforced Roofing Tiles

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Keywords: Coconut husk; Rice Husk Ash; Lime; Cement-bonded composite

Abstract

Provision of adequate and affordable housing is one of the continuing challenges posed by unprecedented urbanization in Nigeria and many other African countries. It is evident that one of the solutions to this chronic problem is the development of non-conventional low cost building materials from recyclable agro-industrial wastes. This study was conducted to investigate the effects of $CaCl_2$ addition and partial replacement of cement on the density, water resistance and impact strength of cement-bonded composite roofing tiles reinforced with coconut husk (Cocos nucifera) fibres. Results indicated that $CaCl_2$ enhanced impact strength and dimensional stability, i.e., Water absorption (WA) thickness swelling (TS) of the composite samples, while RHA and lime lowered the impact strength of the roofing tiles.

Introduction

The need to improve housing supply in developing countries is great. So also are the needs to manage agro-industrial wastes in a sustainable manner and reduce the use of cement in building construction. Accumulation of unmanaged wastes in many developing countries has resulted in an increasing environmental pollution. Recycling of such wastes, particularly agro-industrial wastes, as sustainable building construction materials appears to be viable solution not only to pollution problems but also to the problem of economic design of buildings. Cement-bonded composites (CBCs) represent an important class of engineered construction materials in which some agro-industrial wastes could be used as partial replacement of cement, while others could serve as reinforcement materials.

There are about three million coconut (Cocos nucifera Linn) palm trees producing approximately 70 million coconuts annually in Nigeria (Badmus 2009). The average mature coconut weighs 680 g about 42% of which is made up of the husk (Badmus et al., 2007). The husk fibres, largely treated as waste, are a candidate material for CBC reinforcement. Potential agro-industrial waste products for partial replacement of cement in the country include welder's used carbide waste (lime) derived from ethyne (C_2H_2) gas, by the action of cold water on calcium carbide and plant ashes that have relatively high silica content and are therefore suitable as a pozzolana, including, RHA. The aim of this study was to evaluate the effects of $CaCl_2$ addition and partial replacement of cement on selected properties of coconut husk fibre-reinforced composite roofing tiles.

Preliminary Results

Coconut fibres removed from the husk, were separated into individual strands and cut into 25 mm. Rice husk was air-dried for five days, charred and incinerated at 700°C into white ash. Welder's used carbide waste (lime) obtained from a mechanical workshop was air-dried, pulverized and sieved. The fibre (2 %) was mixed with Portland cement, river sand, water and colouring material (Iron II Oxide), using a pre-determined water -cement ratio (control). For set I of the experimental samples, $CaCl_2$ was added at 2, 3 and 4% levels. For sets II and III, cement was partially replaced with RHA and lime respectively at 5, 10 and 15%. All percentages were based on the mass of cement. Triplicate samples of 600 (L) x 300 (B) x 6 (T) mm corrugated roofing tiles were produced with each mixture, cured for 28 days and tested using standard methods Analysis of variance was conducted at 5% level of significance.

Samples of the red-coloured coconut husk fibre-reinforced composite roofing tiles produced are shown in Fig.1. The average density ranged between 1.3 and 1.6 g/cm^3 at an acceptable moisture content range of 2.5 – 5.5% (dry basis). Neither the addition of $CaCl_2$ nor partial replacement of cement with RHA and lime had significant effect on density, though the densities of samples in which cement was partially replaced were generally lower.

The average water absorption (1.3 and 3.9%) and thickness swelling (0.9 -1.3%) after 24 hour-immersion in cold water were relatively low. While $CaCl_2$ at the three levels of application had no significant effect on the WA,

while partial replacement of cement with both RHA and lime led to significant increase in WA, the effect on TS was not significant. The average impact energy absorption capacity of the roofing tiles ranged between 0.31 and 0.53 J. Neither the addition of $CaCl_2$ nor partial replacement of cement had significant effect on the impact energy.

It was concluded that the use of $CaCl_2$ in the production of coconut husk fibre-reinforced roofing tiles would be beneficial in improving dimensional stability. Also, partial replacement of cement with RHA and lime up to 15% would help in reducing the weight (and perhaps cost of production) without having any deleterious effects on the water and impact energy absorption by the roofing tiles.

Fig. 1. Samples of coconut husk fibre-reinforced roofing tiles.

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The Importance of Date Palm Trees Surface Fibers as a Thermal Insulating and Sound Absorbing Materials for Buildings

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Keywords: Insulating fibers, Thermal conductivity of natural fibers, Microstructure of natural fibers

Abstract

The importance of using Date Palm Trees Surface fibers (DPSF) as a natural thermal insulating material will be presented. Thermal conductivity measurements, thermal analyses tests such as Thermogravimetric Analysis and microstructure of the fibers will be presented. The effect of using cornstarch as a binder for the fibers will be discussed. The preliminary results have shown that the average thermal conductivity of the fiber is obtained between minimum and maximum values 0.0475 and 0.0697 W/m-K, respectively. The Scanning Electron Microscopy (SEM) analysis of the fiber diameter shows the average range of the diameter is 12- 580 μm. Thermogravimetric Analysis (TGA and DTGA) indicates that the degradation and decomposition of the fibers starts at 232oC where the sample loses only about 8.5% of its original mass. The proposed natural material is comparable to conventional insulation material with the advantages of being safe to human beings as well as utilizes waste material.

Introduction

Natural fibers are very promising and have great potential as eco-friendly raw materials to be used especially in thermal insulation [1]. Furthermore, natural fibers are biodegradable and have a low environmental impact. Natural fiber composites were likely to be environmentally superior to glass fiber composites in most cases for several reasons such as lower environment impacts compared to glass fiber production, higher fiber content for equivalent performance, end of life incineration of natural fibers resulted in recovered energy and carbon credits [2]. The market for insulation materials is competitive both on performance and on cost. Natural insulation materials are a niche market today. It should be noted that hemp is currently used as a natural insulation material. The environmental performance of hemp based natural fiber has been reported by [3] where they have quantified carbon storage potential and CO_2 emission as well as compared their results with fiber glass composites. Their results showed that hemp-based mat thermoplastic has compatible or even better strength properties as compared to conventional flax based thermoplastics. Structural panels and unit beams have been manufactured out of soybean oil based resin and natural fibers (flax, cellulose, pulp, recycled paper, chicken feathers) using vacuum assisted resin transfer molding technology [4].

Preliminary Results

Four samples of different densities are prepared from palm tree surface fibers. Cornstarch solution with different concentration is used for binding the fibers. The size of the samples are 30 x 30 x H cm^3 where H is the thickness of the sample between 1.5 to 3 cm. Thermal conductivity of the four specimens specified by different densities are obtained at different temperatures as shown in Fig. 1. The thermal conductivity increases with temperature linearly especially at the low density samples. The SEM analysis of the fiber diameters shows that the minimum and maximum diameters of the fiber are 12- 580 μm respectively. Thermogravimetric Analysis (TGA) indicates that the fiber decomposed by a two-step thermal degradation pathway. T50% degradation temperature is found to be at 364°C. Furthermore, the char yield of the fiber is 22% at 1192°C and the initial degradation of the sample starts around 232°C. The DTGA analysis reveals that the major degradation of the fiber occurs in the temperature range 232°C to 475°C. Differential Scanning Calorimetry (DSC) indicates that the melting point of the fiber is about 369°C. Thermal analyses tests and other tests of the fibers indicate that fiber to can be used as a thermal insulation material since they are biodegradable and have positive environmental and economical impacts.

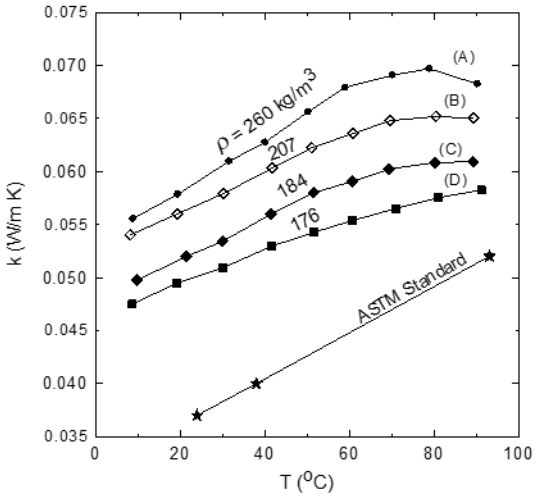

Fig. 1. Thermal conductivity profiles for different density specimens compared to the ASTM standard.

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Production of Cellulose Fibres for Papermaking Applications from Date Palm

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Keywords: Date palm rachis; Cellulose; Paper; Physical properties; Refining

Abstract

Important quantities of rachis date palm are accumulated every year on the agricultural lands in Tunisia. The rational valorisation of these available renewable resources fits very well with the recent sustainable approach, commonly established everywhere. This work aims at ascertaining the chemical composition of this agricultural residue and establishing the optimal cooking conditions leading to pulps production for papermaking. Thus, the resulting pulps were then refined using a PFI mills refiner to, 0, 500, 1500 and 3000 revolutions. The disintegrated and refined pulps were screened through a sieve of 0.15 mesh size. The screened pulps suspensions, from rachis date palm, were used to produce hand sheet paper samples, which were characterised in terms of physical and mechanical properties, according to commonly used standards. As expected, the characterisation of the materials under investigation showed that increasing the number of revolutions (refining level) improved the mechanical properties the obtained papers and that an agricultural residue (rachis date palm) can be considered as an alternative source for papermaking application

Introduction

In recent years, pulp production has continuously increased, mainly because of a drastic increase of paper consumption in emerging countries. In this context, many research works devoted to the study of new raw materials leading to the preparation of cellulosic fibres have been reported, particularly those dealing with various agricultural crops and residues (Portugal [1-3], India [4, 5], Malaysia [6, 7], Iran [8] or Tunisia [9]). Date palm rachis is one of the most cultivated plants in Tunisia with more than 4 millions palms occupying about 32 thousands ha, as reported from the Tunisian Ministry of Agriculture statistics. This culture produces a huge amount of date palm rachis, which is left to biodegrade and to fertilise the agricultural lands.

The present work deals with the study of this abundant renewable resource, namely: (i) its chemical composition; (ii) its soda-anthraquinone cooking; and (iii) the characterisation of the pulp, as obtained and after refining at several levels. For each refining level, handsheets are prepared and characterised in terms of physical properties.

Preliminary Results

Chemical composition

The chemical composition of date palm rachis is summarized in Table 1, which shows that the amounts of extractives in water (cold, hot) are in the range of 4-8%, which is slightly higher when compared with wood. Extractions carried out under alkaline conditions yielded a very high content, i.e. 20%, which is probably oligosaccharide and lignin-rich materials. Whereas ethanol-toluene extractives, ashes, holocellulose and α-cellulose contents are comparable to those of other annual plants or agricultural crops [1-3, 5-8], Klason lignin was found to be relatively high (around 27%). The polysaccharide content is close to that associated with woody materials, which justifies the cooking of date palm rachis.

Pulp and paper properties

The main pulps' properties are summarized in Table 2. The unscreened cooking yield was around 45%, which is a consistent value considering the chemical composition of the raw material (Table 1). Screening yield (performed just after refining), Shopper Riegler degree and WRV are determined for each refining level. As expected, these parameters increase with refining level (see Table 2). More precisely, screening yields were close to 100%, whatever the refining level, which denotes adequate cooking conditions. Drainability is characterised by a low value of Shopper Riegler degree until 1500 revolutions, but dramatically decreases for 3000 revolutions. Finally, WRV for both unrefined and refined pulps were quite high which can be partially explained by the fact that never-dried pulps are tested. This behaviour may also be attributed to the chemical composition (hemicellulose content) of the

pulp, as well as its fine element content. These properties are not presented here. Figures 1 and 2 represent the evolution of the burst and tear indexes, as a function of the PFI revolution numbers. Burst index rises significantly when the number of revolutions increases from 0 to 1500. A plateau value seems to be reached for 3000 revolutions. Moreover, it is worth noting that tear index undergoes a slight decrease only for a refining level of 3000 revolutions. For lower refining levels, this treatment induced a very positive effect on this property.

Table 1. Chemical composition of date palm rachis.

	Content (%)
Ethanol - toluene solubility	6.30
Klason lignin	27.2
Ash	7.60
Holocellulose	74.8
α-cellulose	62.1
Hot water solubility	8.10
1% sodium hydroxide solubility	20. 8
Cold water solubility	4.96

Table 1. Chemical composition of date palm rachis.

PFI revolutions	Screening yield%	Drainability (°SR)	WRV (%)
0	94	14	138
500	96	20.5	164
1500	99	26.2	175
3000	100	51.5	197

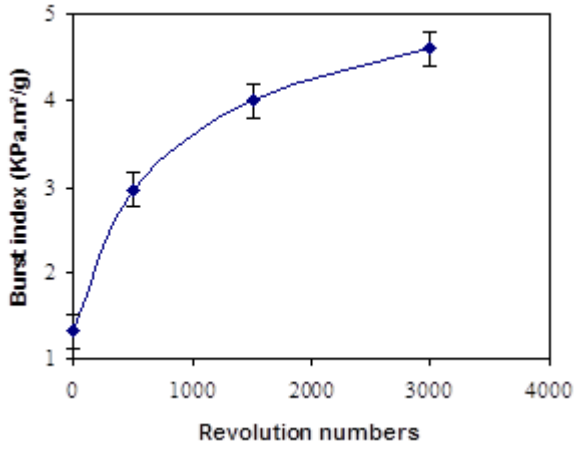

Fig. 1. Evolution of the burst index versus PFI revolution numbers.

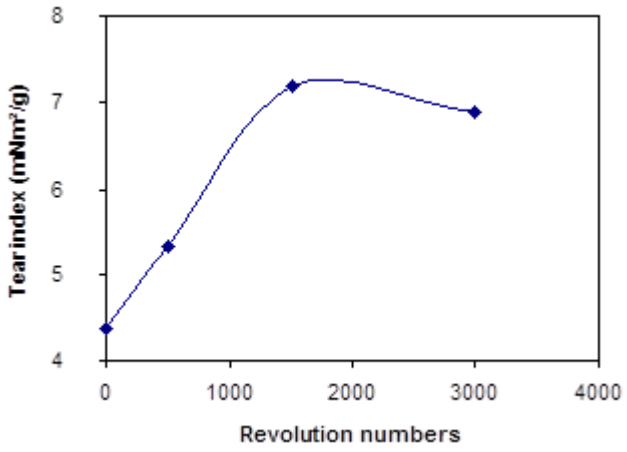

Fig. 2. Evolution of tear index versus PFI revolution numbers.

Acknowledgments

This work was financially supported by the "PHC Utique" program of the French Ministry of Foreign Affairs and Ministry of higher education and research and the Tunisian Ministry of higher education and scientific research in the CMCU project number 18G1132.

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Chemical Composition and Pulping of Tunisian Almond and Fig Stems – a Comparison with Tunisian Date Palm Rachis

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Keywords: Date palm rachis; Almond stem; Fig stems; Cellulose fiber; Characterization

Abstract

In the present paper, the main objectives of this paper are the characterization of two Tunisian cellulosic by-products (almond stems and fig stems). The first part of this work is devoted to the determination of the chemical composition. Their chemical composition was showed that they present amounts of holocellulose, lignin and cellulose similar to those encountered in date palm rachis. Then, soda-anthraquinone cooking, which is considered as the most suitable process for pulping annual plants, is tested. The ensuing pulps are characterised in terms of degree of polymerisation, fiber length and fibre width. These properties were compared to the properties of a Tunisian date palm rachis that was also fully characterized by Khiari et al. (2010). Finally, the results of this work clearly demonstrated that almond and fig stems can be considered as a possible alternative source of fibres for cellulose derivatives and/or as lignocellulosic fibres for fibre-reinforced composite materials or papermaking application.

Introduction

The increase in fibres demand will be met by increased forestry production, which will give growth to global deforestation, with unsafe results to the environment. However, owing to the increasing fibre concerns and the potential increases in wood expenses, non-wood materials like annual plants have received more attention to produce pulp and/or paper and/or cellulose derivatives and/or composites. Lignocellulosic wastes are used as animal feed or burn in the soil or left to decompose. The utilization of these cheap and widely disposable wastes does not resolve just the environment pollution but also makes additional value. The valorization of isolated fibers from Tunisian date palm rachis have been investigated by Khiari et al. (2010) for the making of paper, green composites and cellulose derivatives [1]. Date palm waste is widely available agricultural crops in Tunisia, which has more than four million dates palm trees occupying 33 thousand hectares. In our paper, two lignocellulosic materials were studied, largely disposable in Tunisia, as a source of cellulosic fibers, namely: almond and fig stems. Almond and fig stems are by-products that has no proven use. They were incinerated or dumped. According to the Food and Agricultural Organization (FAO), Tunisia is ranked as the 8th producing country of almond with about 3.8% of the total world production [2]. To the best of our knowledge, there are no results reported in the literature on the chemical, morphological properties of almond and fig stems of Tunisia and its pulping potential.

Preliminary Results

Chemical composition

The chemical composition of date palm rachis is summarized in Table 1, which shows that the amounts of extractives in water (cold, hot) are in the range of 5-8%, which is slightly lower when compared with almond shells and stems. Whereas ethanol-toluene extractives, 1% NaOH extractives, and ashes are comparable to those of our annual agricultural crops, holocellulose was found to be relatively high (around 74%).

The Tunisian almond and fig stems wastes are characterized by large amounts of cellulose. The cellulose content of fig stems (47%) was higher than date palm rachis.

Morphological investigation

It can be noticed that the fibres of almond and fig stems present the same morphological in terms their length and diameter. To conclude finally, that the both wastes can be considered as a potential source of cellulose for the production of cellulose derivatives and/or lignocellulosic fibres for fibre-reinforced and/or applications papermaking composite materials.

Table 1. Characterization of almond and fig stems.

Components	*Fig stems*	*Almond stems*	*Date palm rachis* [1]
Cold water extractives (%)	9.24	12.17	5
Hot water extractives (%)	12.70	16.70	8.1
Ethanol–toluene extractives (%)	4.18	7.02	6.3
1% NaOH extractives (%)	21.57	29.01	20.8
Ash (%)	5.10	3.39	5
Klason Lignin (%)	19.64	34.35	27.2
Holocellulose (%)	60.11	50.66	74.8
Cellulose (%)	47.06	31.41	45
DP	1563	1571	1203
Fibre length (mm)	0.516	0.518	0.89
Fiber width (μm)	22.4	19.6	22.3

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Textile Palm Fibers from Amazon Biome

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Keywords: Textile palm fibers; Amazonia; Buriti; Tucum; Tururi; Composite materials

Abstract

There are several species of Amazon palm trees from which can be obtained: food and oils (fruits and seeds), medicinal products, construction material (logs and leaves), handicraft, textiles, etc. Taking in account textile fibers, three palm origins stand out: buriti (Mauritia flexuosa Mart.), tucum (Astrocaryum chambira Burret) and tururi (Manicaria saccifera Gaertn.). Buriti presents multiple uses, especially for handicraft products. A soft fiber ("linen") and another harder and rougher ("draff") are removed from the new leaves of the buriti palm, both being used. Tucum fibers, obtained from leaves, are used in the manufacture of fabrics, handicrafts, nets, yarns and fishing nets. Tururi is the sac that wraps the fruits of the Ubuçu palm tree. The material is constantly used by the Amazonian riverside population and by artisans for handicrafts, fashion items and other products for tourism. Recently, in a joint project of the University of São Paulo (Brazil) and North Carolina State University (USA), multilayer composite materials were developed and characterized in 3D structure with quite promising results in terms of resistance and aesthetic finish similar to wood. Thus, the traditional and innovative uses of native vegetable fibers are ways of valuing the regional product and preserving their respective ecosystems.

Introduction

The Amazon biome comprises an area of 410 million hectares and is formed by three types of forests: dry land, wet land and flooded area. It encompasses extensive areas of “cerrados” (kind of savannas) and meadows. The Amazon biome develops around the Amazon basin and is present in eight countries of South America [1]. There are several species of palm trees from the Amazon biome, from which can be obtained: food or oils (fruits and seeds), biodiesel, medicinal and cosmetic uses, construction material (logs and leaves), handicraft material, including fibers for textile purposes, etc. Some examples are [2]: Açai (Euterpe precatoria); Cocao (Attalea tessmanii); (Phytelephas macrocarpa); Murmuru (Astrocaryum murumuru); Paxiubao (Iriartea deltoidea); Paxiubinha (Socratea exorrhiza); and Pataua (Oenocarpus bataua). The incentive for the employment of native vegetable fibers as an alternative textile material can increase local productivity and improving the income of the populations. Another point is that there is enormous creative potential. Aiming at technology, there is growing international interest in the use of these vegetable fibers, especially as non-conventional materials for the manufacture of composites instead of those made with wood or synthetic materials [3]. Taking in account the obtainment of textile fibers, three palm origins stand out: buriti, tucum and tururi. In the present work their main applications and physical-chemical characteristics were determined and for tururi also composite structures were produced.

Preliminary Results

The main results for 'linen' (Fig. 1a) and 'draff' of buriti were respectively: 28.4±5.5 and 18.0±6.3 cN/tex tenacity; 8.3±0.5 and 5.0±0.8 % elongation; 6.1±0.8 and 6.0±1.6 N/tex Young's modulus. The values of regain were 8.5% and 9%. Cross microscopy 8.5 μm and 7.2 μm cell diameters. FTIR tests indicate a strong similarity between the chemical characteristics of ‘linen’ and ‘draff’ of buriti [1]. For tucum fiber (Fig. 1b), as partial results were determined: 90±12 cm fiber length; 5.9 μm cell diameter; 12.7±0.5 % regain; FTIR spectrum, comparison and respective assignments; TGA and DTG profiles with estimated values of hemicellulose (2.9 %), □-cellulose (45.3 %), total cellulose (48.1%) and lignin (22.6 %), and index of crystallinity by XRD (80.3 %) [4]. The tensile results of fibers withdrawn from the tururi sacs were 10.5±2% elongation, 18±3.2 cN/tex tenacity and 3.4±0.5 N/tex Young’s modulus. Regain of 12.0±0.5%. The results related to the strips were 5.9±1% elongation, 17.6±7.8 MPa strength and 552±288 MPa Young’s modulus. There was no significant statistical variation between the tensile

condition and after discoloration [3]. Multilayer composite materials were developed with tururi with quite promising results in terms of resistance and aesthetic finish similar to wood (Fig. 1c). It was found that increasing the % stretch of the Tururi sac, and using an angle-ply stacking arrangement significantly reduced the anisotropy of the produced composite, and resulted in a quasiisotropic material [5]. Increasing the number of layers significantly increased the impact resistance up to a limit after which the resin penetration is impaired; moreover, stretching the preform significantly reduced the fiber volume fraction, and hence the impact properties [6].

Fig. 1. (a) Buriti "linen" mat (weaving) [1]; (b) Tucum fiber [4]; (c) Tururi multilayer composite [5].

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Adsorption of Methylene Blue onto Chemically Prepared Activated Carbon from Date Palm Pits: Kinetics and Thermodynamics

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Keywords: Date palm pits; Activated carbon; Methylene blue; Kinetics; Thermodynamics

Abstract

Three activated carbons were prepared using phosphoric acid (P) as an activating agent from date palm pits (DPP) as a precursor via thermal pretreatment producing (CP212, CP214 and CP124) samples, where the ratio of raw material to phosphoric acid is (2:1and 1:2) respectively at curing time two days for first sample and four days for the second and third sample, the activating temperature was 550°C for three sample, the precursor was washed with distilled water, dried, crushed, and then sieved. In order to study the effect of phosphoric acid modification, the characteristics of the activated carbon produced were determined before and after acid modification and subsequently compared. These characteristics include surface morphology, surface functional groups, surface area, average pore diameter and pore volume. Characterization results showed that modification of date palm pits with phosphoric acid enhanced the surface area of the activated carbon from 427.8 to 620.3 m^2/g. The average pore diameter was also enhanced from 1.14 to 1.82 nm. SEM analysis confirmed the improvement in surface area and pore development resulting from the phosphoric acid modification while FTIR analysis revealed the existence of phosphorous-oxy-containing functional groups on the surface of the phosphoric acid modified activated carbon

Introduction

MB is synthetic thiazine dye of an amorphous nature with a molecular formula $C16H18ClN3S.xH_2O$. Methylene blue is a common dye mostly used by industries involve in textile, rubber, paper, plastics, leather, pharmaceutical cosmetics, and food industries. Effluents discharged from such industries contain residues of dyes. Consequently, the presence of very low concentrations in effluent is highly visible [1, 2]. Discharge of colored wastewater without proper treatment can results in numerous problems such as chemical oxygen demand (COD) by the water body, and an increase in toxicity. Activated carbon has been extensively used in wastewater treatment, chemical recovery and catalytic support industries primarily due to large surface area and presence of different pore sizes. Date palm pits are considered one of the most useful and abundant renewable agricultural wastes, about 14% of the fruit are waste material, in the form of seeds. Date stones represent about 10% of the date weight. Date palm pits is not consumable by humans in any form; it has a high content of crude fiber (around 19%) that may cause digestibility problems in ruminant animals as well. The main objective of this research is to prepare phosphoric acid (H_3PO_4)-activated carbons from date palm pits.

Preliminary Results

The investigated carbon samples were thermally characterized to determine the weight loss, ash content. The surface area, pore size and total pore volume were determined by using the adsorption- desorption isotherm of nitrogen at boiling point (-196). The porosity of the investigated carbons was characterized by using scanning electron microscopy. Also, chemical characterization was applied by determination the pH of sulury, point of zero charge and FT-IR spectra. The adsorption of methylene blue was followed by using uv/ vis spectrophotometer. In case of using phosphoric acid as activating agent as in CP212 and CP214 it can be observed that S_{BET}, S_{ROU}, V_μ and V_P increased by about 10, 11.2, 12.9 and 9.4 %, respectively. This is due to the increase of impregnation time by 100 % (2-4 days). Raising % of activating agent from 33.0 to 66.0 % H_3PO_4 in CP214 and CP124 accompanied by increase in S_{BET}, S_{ROU}, V_P and ŕ by 31, 10, 113 and 60 %, respectively, while V_μ decreases by about 14 % . This increase of surface area is due to increase the impregnation ratio and washing which lead to the removal of unorganized carbon or residual tars materials at low temperatures thereby opening the closed pores or the elimination of soluble phosphates formed from

the reaction of phosphoric acid and ash deposited into pores.

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Date Palm Fiber Wastes as a Novel Source of Natural Colorant for Textile Materials

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Keywords: Natural dyes; Date palm fibers; Dyeing

Abstract (200 words or less)

With the increasing awareness of sustainability development and public health in the modern society, environmentally-friendly coloration process draws tremendous attention in the textile industry.

The purpose of this work envisages developing an eco-friendly technology by the application of renewable biomaterials as a source of natural colorants for dyeing textile substrates. In this study, natural dyeing extracts for textile fibres were obtained from date palm fiber wastes. The textile materials were dyed with different extracts. Obtained extracts gave various shades.

The fastnesses properties of dyed samples were found to be within the range of 4 to 5 means fairly good to very good level.

Introduction

Natural organic colorants mainly come from plants in the nature. They are believed to be eco-friendly with the characteristics of non-toxicity and biodegradability [1]. In the field of textiles, natural colorants are more likely to be used as an alternative to synthetic colorants because of the allergenic and toxic risks from synthetic colorants [2].

Agriculture, food industry, and timber industry produces large volumes of wastes, both solids and liquids, resulting from their cycle of production. These wastes pose increasing disposal and potentially severe pollution problems [3] and represent a loss of valuable biomass and nutrients.

In the other hand, these wastes have attracted the attention of researchers as a source of natural textile dyes due to their abundance and availability at minimal costs.

The date palm is one of the most cultivated palms in the world. It is found in the Afro-Asiatic dry-band, which stretches from North Africa to the Middle East. In the Maghreb countries, and particularly in Tunisia, the oases cover about 40 000 ha. Date palms have a fibrous structure, with four types of fibers: baste fibers in the and surface fibers around the trunk [4]. After annually trimming operations, huge quantities of palm fiber wastes are thrown away.

In this work, palm fiber wastes were used to obtain colouring extracts to be used as dyeing baths for textile fabrics. The wool fabrics were dyed with different extracts. Greenish and brownish shades were obtained.

Preliminary Results

Total phenolic contents (TPC) and total flavonoid contents (TFC) of the obtained extracts have been measured. The TPC and the TFC were respectively about 100 (mg GA/g of date palm fiber powder) and 78 (mg catechin/g of date palm fiber powder).

Textile fabrics were dyed with different extracts. The obtained shades for different dyed fabrics were presented in Fig. 1.

In this study, textile fabrics were dyed with the natural dyes extracted from date palm fiber powders. The effect of dye bath pH, dyeing time and temperature were studied. The optimal condition for dyeing fabrics with date palm fiber powders dye were carried on 90 °C for 60 min at pH 4 using.

The wash and rubbing fastnesses of dyed wool samples were found to be within the range of 4 to 5 means fairly good to very good level.

Fig. 1. Dyed wool fabric with different palm fiber wastes.

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New Technologies for Value Added Products from Coconut Residue

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Keywords: Coconut palm; Wet processing; By-products utilization; Microfluidics

Abstract

This paper deals with the technologies developed in the field of coconut research at CFTRI in the last three decades including process for desiccated coconut, technology development for the production of spray dried coconut milk powder, wet processing of coconut, vinegar generation from coconut water, virgin coconut oil, tender coconut based beverage, coconut spread etc. CFTRI is in forefront in developing technologies for coconut-based products. Some of these technologies have been successfully transferred and most of the produce is being exported. Our current research efforts are focused on production of low fat dietary fiber from coconut residue after the milk extraction, concentration of coconut water by membrane processing, preservation of coconut water by emerging technologies such as dense phase carbon dioxide and high pressure will also be discussed.

Introduction

The tree of coconut is called as kalptaru, because all the parts of it are useful in one form or the other. Specially, the kernel of matured coconut is most valuable and is used for edible purpose as such or in dehydrated form. The dried kernel known as 'copra' and is the richest source of vegetable oil and the coconut oil cake is a valuable feed for livestock and a source of protein. The coconut shell is mainly used as a fuel, for making decorative items, shell powder, shell charcoal and biodegradable containers etc. The husk yields fiber, which is converted into coir and its products. The coir pith obtained during the defibring process is used as an ideal soil conditioner. The coconut water is one of the valuable by-products of the coconut processing industries, which can be utilized as a refreshing drink or it can be subjected to fermentation to produce vinegar. The economy of the coconut-processing sector is mainly dependent on the copra and coconut oil, and on desiccated coconut to a less extent. About 60% of the total coconut production is used for edible purpose, 3.5% as tender coconut, 35% as milling copra for oil extraction and balance is processed into products like desiccated coconut. Coconut oil contributes about 6% of the total edible oil

Preliminary Results

1. Desiccated Coconut Powder

The process includes removal of shell and paring, disintegration of white endosperm, final drying in the drier and then packaging.

2. Spray Dried Coconut Milk Powder

Coconut milk is a white milky product extracted from the endosperm of coconut and constitutes into an emulsion stabilized by proteins and probably by some ions found in oil water interface. It is valued mainly for its characteristic nutty flavor and also for its nutritional values. Under ambient conditions coconut milk shows poor stability and the emulsion separates into two distinct phases due to its high content of fat, moisture and other organic components which quickly deteriorate upon exposure to microorganism, light, oxygen and high temperature. The coconut emulsion was stabilized and spray dried to obtain coconut milk power [1].

3. Virgin Coconut Oil by Wet Processing

The white endosperm portion of coconut is disintegrated and squeezed in screw press to recover coconut milk, which is filtered, and cream is separated by centrifugation. The cream is stirred vigorously to get the virgin coconut oil by a process called phase inversion [2]. The oil thus obtained is very clear, nutritious and has got a longer shelf life. The residual coconut cake can be dried and sold as medium/low fat desiccated coconut, which may find application in bakery and formulation of low calorie foods. The skim milk obtained from centrifugation can be concentrated and spray dried. The value-added by-products renders the whole process quite economical one.

4. Mature Coconut Water

Coconut water (yield~28%) is a very important by-product from coconut processing industries, as it contains about 2.5-3.0% sugar, which can be utilized as a fermentation substrate for the production of vinegar. Vinegar is the product of two-stage fermentation process consisting of conversion of sugars into ethyl alcohol by the action of yeast (Saccharomyces cerevisiae) and then bacteria (Acetobector) oxidizes ethyl alcohol to acetic acid. The value-added by-products are recovered, besides

solving the pollution problems. Coconut water is used to produce a sweet dessert dish called Nata-de-coco which is also popular as a component of fruit salad, ice-creams, fruit salads and fruit cocktails.

5. Dietary Fiber

During the wet processing of coconut, fresh coconuts, after shelling and paring, are disintegrated and ex-pressed to extract coconut milk, which is either used for the preparation of virgin coconut oil or can be converted to spray dried coconut milk powder. The grinding of coconut residue after the fat extraction led to the rupture of the honey comb physical structure (matrix) resulting in a flat ribbon type structure, thereby providing an increase in surface area for water and fat absorption, which can be utilized as dietary fiber [3].

6. Coconut Water Concentrate

The water from the tender coconut can be concentrated using hybrid membrane processing involving reverse and forwarded osmosis [4]. Tender coconut water concentrate is a rich source of proteins and micro-nutrients, besides, preserving the flavor, color and nutrition. Similarly the water from the mature coconuts that comes during processing is currently let to the drain due to non-availability of suitable technology. The use of coconut water adds favorably to the economics of the existing coconut industries.

Other technologies available are canned coconut chunk in brine, canning of coconut cream and process for canning of tender coconut water, coconut beverage from tender coconut and coconut spread.

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Production of Single Cell Protein from Date Waste

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Keywords: Single cell protein; Date's waste; Fungal strains; Amino acids

Abstract

This study aimed to utilize the waste of date's industry to produce single cell protein. Five fungal strains were evaluated, and the production conditions were optimized. A. oryzae was selected as the optimum strain due to its vigorous growth and high protein production. Ammonium sulfate at 0.8% was the best source of nitrogen for the selected strain, pH at 5.5 and the medium ratio of 75 g in 250 ml flask were the best for growth. The single cell protein produced has a good source of nutrition, as the ratio of essential to the total amino acids was 46%. These results benefit establishing large-scale production to produce single cell protein from date's waste which creates a source of income to this sector and prevent pollution from such waste.

Introduction

Single cell protein (SCP) is dried cell of microorganisms, which used as protein supplement in human foods and animal feeds. The SCP is cheap and competes well with other source of protein and may provide good nutritive value. Besides high protein content (60-82%), SCP contains fat, carbohydrates, vitamins and minerals [1, 2]. SCP also rich in essential amino acids like lysine, methionine which are limiting in most plant and animal foods [3]. With increase in population and worldwide protein shortage, the use of SCP as a food and feed is more needed [4]. A number of agricultural and agro-industrial waste products have been used for production of SCP, including orange waste, mango waste, cotton stalks, kinnow-mandarin waste, barley straw, corn cops, rice straw, corn straw, onion juice and sugar cane bagasse [5], cassava starch [6], wheat straw [7], banana waste [8], capsicum powder [9] and coconut water [10].

Date syrup production end with waste consist of date fiber and seed. For instance, Al Foah Company in Al Ain, UAE produces annually about 1000 tons of waste from syrup production line. Al Farsi et al [11] reported the composition of the syrup waste for three varieties, their and carbohydrates between 81.9-83.3%. The usage of such wastes as a sole carbon and nitrogen source for production of SCP by microorganisms could be simply attributed to their presence in nature on large scale and their cheap cost. Also, utilization of such waste prevents pollution problems and sanitary hazard as well as creating another source of income to this sector.

Preliminary Results

The DWA medium which used as a medium for fungal growth was simple to prepare and has clear economic potential in large scale part of the project. No hydrolyses treatment been used for this media, as the date fiber macerated from dates syrup processing. The presence of sugar in date fibers along with complex lignocelluloses components has induction effect on the production of essential carbohydrate hydrolyses. It's clearly shows the vigorous growth of A. oryzae compares to other fungi, also the protein content produced by A. oryzae was significantly higher than others. Based on the obtained results (vigorous growth and high protein) A. oryzae was selected as the optimum strain for DWA and used for optimal production condition. Jin et al [16] found A. oryzae as the best option to produce SCP from starch waste water. This study could be the first research on utilizing dates waste to produce SCP, as no other studies found in this area.

In order to select the optimum nitrogen source for maximum fungal growth, three nitrogen sources, ammonium chloride, ammonium sulfate and urea were used. It observed that ammonium sulfate was the best source among these nitrogen sources. Rao et al [17] also found ammonium sulfate is the best nitrogen source for fungi strain Penicillium janthinellum to produce SCP from gagasse. The possible reason may be that ammonium sulfate has some additional growth factors such as some amino acids, mineral, certain vitamins, which gave better growth results compare to other nitrogen sources [12]. This source is rather inexpensive and easy to mix with the media. Therefore, ammonium sulfate was selected as the

optimal nitrogen source for A. oryzae growth on DWA medium. However, Mondal et al [3] found inorganic nitrogen supplementation had suppressive effect by decreasing SCP produced by yeast.

The selected ammonium sulfate was used in different concentration to determine the optimum concentration for A. oryzae growth on DWA medium. The protein content increase with increase of ammonium sulfate to reach to maximum content when using 1% ammonium sulfate. However, the difference between 0.8 and 1.0% concentration was insignificant, therefore, 0.8% ammonium sulfate was selected as the optimum concentration for growth medium. These results supported by Ahangi et al [18], they found that lower glucose level and higher nitrogen level in fungi medium resulted higher protein production.

The initial pH of the DWA medium was sensitive to the growth of A. oryzae. Different initial pH values were used to check the optimum pH value for maximum yield of the biomass. The results of present study showed that yield of biomass increased from pH 4 and optimum production was observed at 5.5 yielding 16.25 % of crude protein. This pH (5.5) is close range of natural date fibers pH (5.3). Further increase in initial medium pH leads to decline in protein production. These results supported by several studies; Ravinder et al [19] found the optimal growth of A. oryzae in rice bran was in pH range of 5-7. Jin et al [16] found pH 4.5-5.5 was the optimum pH for A. oryzae in starch waste water. Also, Yousufi [20] reported pH 5.0 as the optimum pH for production of SCP from soymilk using A. oryzae.

Post-Harvest Technology of Palmyrah in India (*Borassus Flabellifer* L.)- Present Status and Scope

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Abstract

Palmyrah is a very important palm in the family Arecaceae playing an important role in the day-to-day life of poor and landless farmers. Palmyrah palm adorns the dry landscape of the semi arid tropics of Tamil Nadu, Andhra Pradesh, Orissa, West Bengal, Karnataka and Maharastra. India nearly 130 million palms. Due to its multifarious uses, the palm is equated to the "Kalpa Vriksha"in the mythology. Like the coconut, palmyrah is regarded as a total palm as each and every part of the palm right from fruit to root is having many fold economic uses. Though growing of this important palm has an immense potential, no determined effort has been made to bring the palm under cultivation. Palmyrah referred as tree of life with nearly 800 uses including food, beverage, fibre, fodder, medicinal and timber. Among the various edible uses of the palm, the sweet sap tapped from the inflorescence for making palm sugar is of prime importance. The endosperm of the young fruit, like tender coconut, is a delicacy in summer. The petiole fiber and leaf blade are used to make products such as brushes and handicrafts. The tree serves as a source of raw material for several cottage industries.

The palm is a slow grower compared to the coconut, which is cultivated in areas with good irrigation. The research has taken up for germplasm collection, growth and development studies along with value added products.

Edible products obtained from palm tree

Haustorium: is formed during germination of seed nut is spongy, sweet and delicacy.

Apocolon: Mature tuber is brittle and breaks off easily which is rich source of Carbohydrates. Optimum time for harvesting of tuber is 135 days after sowing.

Endosperm: Jelly like endosperm of young fruit of 60 – 70 days old is called nungu which is a summer delicacy. It is very nutritive.

Fruit : Fruit gives sweet aroma with fleshy mesocarp. Fruit is roasted and consumed or mixed with flour and baked in to flakes.

Neera : Neera is the top most economic produce of palmyrah. It is good source of minerals like calcium, phosphorus and iron. Vitamins like A. citric acid, Niacin, Thiamin and Riboflavin are present in neera. Neera acts as laxative and diuretic.

Value added food products from Palmyrah

Palm jaggery: It is also called as palm gur. Jaggery is made by boiling neera. About 8 liters of neera is required to get 1 kg of jaggery. Jaggery contains good nutritive and medicinal values. Major problem of jaggery storage is blackening of colour in short period which needs to be corrected

Palm candy: Neera free from debris boiled in an alloy vessel after uniform boiling the liquid is allowed to cool. Sugar crystals start forming after 45-60 days.

Palm honey: Neera is heated for 2 hours to obtain the honey like consistency. Sugar chrystalises on the sutures of tamarind and the fruits become delicious.

Non edible products obtained from palm tree

Leaf: Matured leaves are cured and are primarily used for thatching houses and for of making mats. In addition, they are also used for making of several value added utility articles which are in high demand. Leaves have been used for writing scripts since time immemorial.

Petiole: Tough and long fiber extracted from Petiole is used for making of ropes used in building of houses and boats. Apart from this it is also used in making several kinds of utility and fancy articles which are in good demand. Dried up leaf petioles are also in use for making of trellies for use as fence and it further serves as a fire wood.

Matured fruit: Mesocarp of the matured fruit also yields small quantities of fiber. Fleshy pulp is removed from the fruit and it is dried to expose the fiber adhering to the

stone. This fiber is used for making of fancy items and toys.

Stem: Palmyrah trunks are used either as live poles in construction of thatch sheds, or as a timber in replacement of wooden poles.

Scientifically evaluated all products and developed protocol for the same.

The Nutritional Evaluation of Date Palm (Phoenix Dactylifera)

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Keywords: Nutrition; dried flesh; seed; phytochemicals and date palm

Abstract

The Flesh and Seed of Phoenix dactylifera was analyzed. The proximateanalysis, mineral composition, phytochemical constituents and amino acid of the flesh and seed were evaluated. The flesh contained; 3.50±0.06g/100g moisture content, 17.15±0.15g/100g crude protein, 0.52±0.01g/100g crude lipid and below detection limit for crude fiber, 1.50±0.07g/100g Ash content, 75.85±0.18g/100g Available carbohydrate and 337.7±9.70kj/100g calorific value. These parameters were also analyzed for the seed respectively. Mineral composition and vitamin C content for the samples were investigated. They are very good sources of mineral element such as;k ,Na, Ca, Mg, Zn ,Fe and P respectively. Result showed that they both contain essential and non-essential amino acids. The phytochemical analysis revealed the presence of flavonoids, tannins, saponins, cardiac glycosides and steroids respectively. Results compares well with those of other edible fruits.

Introduction

Fruit constitutes an important part of a balanced diet as they are natural source of food nutrient needed by human and animals, such food nutrient include protein, carbohydrate, minerals and dietary fiber. With the global focuses on increased food production and emphasis on provision of nutritive food for the world population [1], it is very important to consider our locally available fruits and to determine their food nutrient composition for the purpose of increasing the production of such fruits. The plant under investigation is phoenix dactylifera commonly known as Dabino by the Hausa tribe and belong to tree palm family Arecaceae. They are found mostly in canary islands, northern Africa and west-Africa especially in Nigeria [2]. The fruit of date palms are consume throughout the world and are important part of the diet in the Middle East [3]. Dates are being consumed in modern cultures for the pleasant flavour, odour, and their biting texture in addition to their use for show that the dates palm is dioecious, having separate male and female plants [22,23]. They can be easily be grown from seed (http://www. en.wikipedia.org/wiki/phoenix-dactylifera).

Phytochemical screening showed that dried date palm pollen contain sterols, triterpenes, saponins , proteins ,carbohydrates , and glycosides and lack volatile substances [5,19].

It is the intention of this research to investigate the fruit of phoenix dactylifera (Dabino) commonly found in Sokoto, Jigawa, Kebbi state in the North-western Nigeria. In this study, the proximate composition and the mineral content of the flesh and seeds were determined. Also the Ascorbic acid, Amino acid and phytochemical constituents were determined in order to authenticate the level of toxic substances in the fruit.

Preliminary Results

The methods recommended by the Association of Official Analytical Chemist (6) were used to determine moisture content. Ash content crude lipid, crude fiber, and nitrogen content, crude protein was also estimated by multiplying the value obtained for percentage nitrogen content by a factor of 6.35 to determine moisture content, 2g of fresh fruit were weighed in Petri dishes and dried in an oven at 105oC for 24 hours, cooled in a dessicator and then weighed. The percentage loss in weight was expressed as percentage moisture content (6, 7). Residual moisture content was determined on 2g of the flesh and seed. Ash content was determine by the incineration of two grams of each powder sample in a muffle furnance (Lenton furnaces, England) at 600oC for 2 hours the residue weight was expressed as percentage ash content (19).

Available carbohydrate was estimated by difference by subtracting the total sum of percentage crude protein, crude lipid, crude protein, crude fibre and ash content from 100% dry weight of each sample (6). The energy value was determined using formula below.

Energy = (g protein x 2.44) + (g lipid x carbohydrate x 8.37 x 3.57)

All analyses were carried out in triplicate and reported as mean ± standard deviation on dry weight (DW). Mineral analysis was carried out after wet digestion of two grams of each powder sample (flesh and seed) with nutric/perchloric/sulphric acid in ratio (9:2:1) mixture, while phosphorus was determine colorimetrically with a Jenway 6100 spectrophotometer using phosphorus vanadomolybdate method (7). Calcium and Magnesium was determined by EDTA methods (7). Sodium and potassium was analysed with a corning 400 flame photometer. Zinc and Iron was analysed using Atomic Absorption spectroscopy (AAS) with standard air-acetylene flame (7). The extracted sample was air dried in the Laboratory and crushed using wooden pestle and mortar. The crushed sample were sieved through 20-mesh sieve to obtained a fine powder and 50grams of the powder flesh and seed were extracted using percolation process in 250ml distilled water at 35oC overnight. The extract was filtered and filtrate was evaporated to dryness with the help of rotary evaporator. The filtrate was used to carryout phytochemical analysis in order to determine the following phytochemicals; saponins, alkaloids, flavonoids, cardiac glycosides, volatile oil using standard procedures (8,9).

3g of each sample was dissolved in 2 ml of 10% glacial acetic acid and blended for 10minutes and filtered. The residue was further washed with 5ml portion of 10% glacial acetic acid. 60 ml of 0.3m H2SO4 ¬ was added and followed by the additional of 2g solid potassium iodide and 25 ml of 0.01m potassium iodate with 25 ml of the filtrate was titrated with 0.07M sodium Thiosulphate solution (10). Amino acids determination was analyzed by automatic amino acid analyzer. The sample of 100g was hydrolyzed with 10ml of 6M HCL in a sealed tube at 110ºC in an oven for 24hrs. After hydrolysis, the acid was evaporated in a vacuum evaporator under reduced pressure at 78oC. The HCl free residue was dissolved in 4ml of loading buffer (0.2M, pH 2.4) to inject into apparatus(11).

Table 1.0 Proximate composition of *Phoenix dactylifera*

Parameter g/100g	Flesh	Seed
Moisture content	3.50±0.05[a]	4.03±0.06[b]
Crude protein	17.15±0.15[a]	12.6±0.13[a]
Crude lipid	1.52±0.07[a]	4.50±0.09[b]
Crude fiber	0.5	1.50±0.00[a]
Ash content	1.50±0.17[a]	2.00±0.10[b]
Carbohydrate	75.85±0.18[a]	79.50±0.19[b]
Energy kj/100g	337.7±8.82[a]	344.05±9.70[b]
Vitamin C mg/100	100.26±1.12[a]	100.32±1.01[b]

Mean ± standard deviation with different (s) letters in the same row are significantly differed at P< 0.05.

Table 2.0 Mineral composition of *Phoenix dactylifera*

Element (mg/100g)	Flesh	Seed
Na	88.9±3.00[a]	77.23±1.91[b]
K	121.5±4.02[a]	106.2±3.52[b]
Ca	105.2±3.52[a]	54.67±2.52[a]
Mg	85.00±4.00[a]	9.36±0.55[b]
Fe	47.5±1.11	49.33±1.09
Zn	50.24±1.21	42.80±1.01
P	25.87±0.81[a]	8.23±0.25[b]

The mean ± standard deviation (SD) of triplicate analysis, mean with different superscript (a*b*) are significantly different at P< 0.05

Table 3.0: Photochemical Constituents of the Water extracts of flesh and seed of *Phoenix dactylifera*

Phytochemical	Dried flesh	Seed
Flavonoids	+	+
Alkaloids	-	-
Tannins	+	+
Saponins	+	+
Glycosides	+	+
Cardiac Glycoside	+	+
Volatile Oil	-	-
Steroids	+	+

The result of the proximate composition of the flesh and seed of *Phoenix dactylifera* are shown in table 1. The moisture content are relatively low and are compared with edible fruits reported for chrysophyllum albidium pulp/seed (18.3-25g %) (12). The crude protein content are corresponding low

and comparable with values of pulp of Dialium guineense (52.9g/kg) (13) and seed of Deterium microcarpum (7.2±0.14g/100g) (14, 15). The protein content used in animal feed stuff. The crude lipid for the flesh is low but the seed has value (4.50±0.09g/100g) which is within the range of values of edible seed as reported in some seeds of wild plant (10.00±0.61- 12.91±0.07g/100g) (15). The ash content which is an index of mineral in most edible fruit, is lower in the flesh (1.5±0.07g/100g) while the seed values ranges between (2.0±0.08g/100g) is within the range of values of edible fruits, dialium guineense (20g/kg) (13). The available carbohydrate is very high (75.85±0.18 and 79.5±0.19g/100g) and compared with the seed of some wild plants (25.00±0.13-66.01±0.31g/100g) (14). The vitamin c content ranges between 100.26±1.12 to 100.±1.01ug/100g. And the calorific value ranges between 337.7±8.82 to 344.5±9.7 kj/100g.

Maximize the Benefit from Date Pits for Production Activated Carbon and using it for Removing Peroxides from Fried Oils

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Abstract

The present study was aimed at improving the quality of fried sunflower oil. Synthetic (Magnesol XL) natural (agriculture wastes of date industry) were used to absorb the oxidation products of fried sunflower oil. The mineral (Si, Mg, Ca, Fe, Al, Mn, and Cu) of the aforementioned substances were determined. The physico-chemical properties of non-fried, fried and fried-treated sunflower oil were determined. The frying process was carried out at 180ºC ± 5ºC for 16h, 4h heating per day for four consecutive days. The fried sunflower oil was treated with synthetic, natural and activated carbon of date pits at level 2%. A set of nutritional experiments was conducted in which rats administrated standard diets were containing non-fried, fried and fried–treated oils with adsorbent materials. The safety limits of the fried-treated oils were determined by measuring the activities of alanine aminotransferase (ALT), aspartate aminotransferase (AST) and alkaline phosphatatse (AP), and levels of total lipids, total cholesterol, HDL-cholesterol and LDL-cholesterol of rat sera. The results indicated that Magnesol XL, diatomaceous earth and activated carbon of date pits contained Si + Mg + Si + Mn + Ca and Si +Mg + Ca as the basic metals, respectively. Frying of sunflower oil led to significant increase in physico-chemical properties. Treatments of fried sunflower oil with the aforementioned substances greatly improve the quality of fried oil. Also, the results highlight the potential effect of Magnesol XL, diatomaceous earth and activated carbon of date pits in improved rat liver (AST, ALT and AP) and levels of sera constituents were similar to those of rats given non-fried oils.

Review on Date Palm (phoenix Dactylifera L.) Fibers and Their Applications

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Keywords: Cellulose; Date palm fibers; Fibers treatment; Fiber extraction

Abstract

The increasing demand for a more sustainable and renewable materials, has increased the interest in natural fibers (NF). NF are not only environmental friendly, but they also have high specific properties, due to their light weight. Date palms (DP) (Phoenix Dactylifera L.) are considered one of the sources of NF. Fibers could be extracted from different part of the DP, namely, the midribs, spadix stems, leaflets, and mesh. The high population of DP results in a huge amount of by-products of annual pruning, which makes it one of the most available sources of NF on earth. To obtain high-performance fibers from DP, the extraction process and processing parameters have to be optimized and chosen clearly. The literature contains many implicit information that needs to be clarified. Moreover, there hasn't been any published review on DPF. Therefore, a thorough review of prior and current literature was made to cover all information related to DPF.

Introduction

The lucidity of the need to find alternative to synthetic fibers has attracted researchers and engineers to use NF in many different applications one of which is composites reinforcement. This is due to their wide availability, good properties and low cost [1]. NF are obtained from natural sources and can be classified into protein and cellulosic fibers. Cellulosic fibers are classified according the plant's part from which they are extracted. They consist chemically of three main constituents; cellulose, hemicellulose, and, lignin. However, further processing and treatments are essential to extract cellulose microfibrils [2]. The products of annual pruning of DP are considered a rich source of cellulosic fibers [3]. The total number of date palm trees cultivated in Arab countries, according to a statistic made by El-Juhany in 2007, was nearly 85,346,080 trees [4]. Moreover, according to a study made by El Mously in 1995, it was found that a single female date palm tree produces annually 9.75 kg of of mesh [5]. This large quantity of annual production gives DP an advantage over other cellulose sources. Many studies have been made to investigate DPF properties extracted from the previously mentioned parts especially in the Middle East. Fibers' length, aspect ratio, mechanical separation, surface treatment, and, orientation have been discussed and studied in the literature due to their effect on the mechanical properties of the produced fibers and composites [3].

Preliminary Results

From the literature review, one can find many unclear information and terminologies, which are sometimes contradicting. Main confusing terminologies are related to the names of the parts from which the fibers are extracted, in addition to unclear methods of fiber extraction and treatment. This review aims at resolving any ambiguity and establishing a clear source of information for all researchers interested in DPF. Different extraction and processing techniques will be discussed and their effect on the mechanical, thermal, and, physical properties. Moreover, the morphology of fibers will be compared to each other based on different surface treatments.

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A Review of Recent Devolvement in Date Palm Fiber Reinforced Polymer Composites

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Keywords: Date palm; Natural fibers; Polymers; Composites; Natural fiber composites

Abstract

In recent decades, the application of natural fibers in polymer composites is emerging as a potential alternative to substitute their counterpart traditional synthetic fibers, due to their abundance, cost-effective, eco-friendly, and biodegradable characteristics.

Several kinds of natural fibers such as: sisal, jute, kenaf, flax, hemp and others have been widely investigated for the reinforcement of different polymeric materials. Amongst these natural fibers, date palm (Phoenix dactylifera) fibers was found to be one the most promising candidates for the production of lightweight composite structures. Date palm is deemed as one of the most ancient cultivated tree in the world with an estimated number of 140 million trees, which produce more that 4.8 million tons of dry agricultural residues annually.

Introduction

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Preliminary Results

This article aimed to review the most recent literature published by researchers up to date related to the development and application of date palm derived residues for the reinforcement of various polymeric resins. In this paper, an attempt is made to highlight and collect information presented in previous literature works to provide a comprehensive understanding for researchers to pave the way in their further studies.

Application of date palm trees mulch as a bedding material for dry heifers in Saudi Arabia

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Keywords: Date palm trees mulch; Bedding material; Cow manure

Abstract

A study was conducted to determine the safety of using Saudi date palm trees mulch as a bedding material for dry heifers. Date palm trees mulch was used as bedding material for 10 days. Final Composite regulated elements (N, P, K, Na, Ca, and Mg), NDF, ADF, pH, moisture, and EC were improved by use of date palm trees mulch as a bedding material especially in concrete area (1.85%, 0.50%, 1.42%, 0.59%, 2.56%, 0.26%, 60.00%, 49.40%, 7.53, 30%, 16.88 for N, P, K, Na, Ca. Mg, NDF, ADF, pH, Moisture and Electrical conductivity, respectively). On a dry matter basis, highly enriched element fresh manure was collected from the concrete section bedded with date palm trees mulch. Both Concrete area bedded with date palm trees mulch and Sand area bedded with date palm trees mulch were free of salmonella after 10 days. Date palm trees mulch was unsuitable medium for pathogenic bacteria especially Escherichia coli O157:H7. Total viable bacterial counts failed to increase with the incubation time (104). Date palm tree mulch was unsuitable medium for flies and minimizes density of house flies. Date palm trees mulch seemed to be a safe, comfortable and effective bedding material for cow's feedlots.

Introduction

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Preliminary Results

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Wood Alternatives for Hospitality Products

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Keywords: Modern Design; Hospitality; Materials; Youth

Abstract

This project aims to find alternative material for wood in charge to be local and sustainable also to be used in attractive designs that could be appealing for the target group as it is an introduction for new material which is palm trees wood because it is 100% local. The challenge was it is only could be used in the form of flat surfaces. After viewing the material, I started the interviews with the target group and their expectation for palm trees wood were that they preferred natural wood as long as they are both the same price, they were afraid of it because it is a kind of waste. I needed to keep customs and tradition which are hospitality and generosity but in a modern way to suit nowadays lifestyle rhythm. Designing phase was like combining all the information from previous steps and creating outcome. After research, interviews, focus groups and observations the design had been initiated to be a complete set that ease the hospitality process. After finishing the production, I tested the product and what was surprising that my target group was amazed by the material and was asking about it and how it is done and they gave it value that I could not imagine that they will do.

Introduction

The main focus is how to be ecological and developing more sustainable products to save our planet. This project will explain the lifestyle of the consumers and the pattern of consumption and mindset starting from designing phase until purchasing decision. The main purpose from this project is to minimize the use of natural wood resources and reduce waste which also fulfills the basic needs in purpose of providing better quality of living. In Egypt there is a huge market of furniture using imported wood which became expensive and also it is not the best choice of material because it is not sustainable. Despite Egypt has workers with good experiences and there are the workshops which are not expensive in Egypt. For reducing the cost and also reducing the use of imported wood could be replaced by local material that has the same properties hospitality. The targeted group will be the youth and people who like to change things frequently. Youth needs minimal products because of the modern designs of apartments and looking for good quality with reasonable cost. For choosing the alternative material for wood will be based on its life cycle, durability, quality and the relationship between production and consumption. Satisfaction of needs in minimal way is the main concept to be fulfilled and achieved perfectly to suit the concept of minimalism, modern design and to represent the ease of the hospitality and not to feel the host tiredness in hospitality as a guest. This project is also aiming to be minimal in effort and to save time for the host to have more of quality time with his/her guests.

Preliminary Results

Hospitality set idea came from the palm tree itself which dates come from it. Dates are very important in Arabic culture as it is essential side food in every occasion Ramadan, both feasts, hospitality food and beside coffee. As dates and hospitality are extravagant in Arabic culture as the hospitality means generosity and dates represents Arabic atmosphere and the nature of the Arabic counties. As the palm trees is a symbol for hospitality I decided to use its wood to serve food and fulfilling the guests needs and providing quality time for the host without worrying about food. It is like all in one place/station to give more quality time for the host and let the guests enjoy the warmth of welcome and both guests and host enjoy the food together without going to the kitchen and return back the seating area. In conclusion after long process of initiating and fulfilling a lot of details, observations, interviews and designing; the testing of the set was successful and the target group loved it as it revived the traditions and they remembered the generosity and welcoming spirit that they experienced it in their parents and grandparents' homes. The target group appreciated the idea because it has a link between the traditions, childhood memories and modern life style which is everything is going very fast. After testing the most repeated comment is that hospitality is now easier and

takes less effort than before. For the material aspect mixing materials was a successful idea because it suits many home styles and it suits different consumers taste. This set has a coffee table which has also a slidable side table. The console is to represent food on it which has extra seats under it in purpose of everyone is having a seat without getting the dining chairs. Cheese platter represents the idea of representing food with the concept of levels to be clear and visible. Tea keeper is like self-service product to give the host the chance to have more quality time with his/her guests. Mixing materials gave palm trees wood more value as palm trees represents the warmth of the hospitality, metal represents the strength of the relationship and acrylic represents the clarity between the host and guests.

Fig. 1. This photo represents the whole hospitality set which contains: (coffee table, tea keeper and its tray, console, extra seats and cheese platter).

Exploiting the Form Flexibility of Date Palm Midribs in the Design of Modern Shade Structures

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Keywords: Date Palm Midribs, shade structures, wide-span, Tri-Arched Space Truss

Abstract (200 words or less)

Date Palm Midribs enjoy a surviving heritage in the manufacturing of handicrafts such as crates and cages, and rural huts in Egypt. This surviving technical heritage proves their structural durability and integrity. Although Date Palm Midribs are familiar to a wide base of builders and artisans in rural Egypt, their potentials ought to be exploited in order to match the contemporary needs of the youth. Those needs include simplicity of construction, high flexibility and modern form that match the contemporary style of the youth in the rural communities in Egypt, retaining the trust in the local building materials.

Therefore, the main aim is to demonstrate the undiscovered potentials and the diversiform Date Palm Midribs in a modern construction example that attracts the youth while honoring traditions and nature of material. The Tri-Arched Space Truss, published in the author's previous papers [1] and [2] mentioned in the references section, is a 12m- span primary structure that was designed to merge the traditional bundling technique, the arched nature of the midribs and the light wide-span structure system of space trusses. This primary structural concept is developed and modeled via a scaled physical model in preparation for the further studies.

Introduction (250 words or less)

Date palm midribs represent 52.9% of the annual date palm trees pruning residues [3]. The abundance of date palm midribs qualified them to be a major part of the life of the people in rural areas in Egypt and the Middle East. Date palm midribs have been a key element in various handcrafts such as crates, bird cages and handmade furniture [4], in addition to low-cost roofing and simple kiosks sheathing. Those utilization fields still survive till the present days in many poor rural areas in Egypt and the Middle East [1].

However, the understanding of date palm midribs as a building material remains unexploited. The simple and low-cost spontaneous methods of date palm midribs sheathing associated the material to only match the poor and the obsolete, with no intention to match the ambition of modernism. This superficial evaluation of date palm midribs, along with most of the local building materials, led to the steady increase of the dependence on the conventional and imported building material such as steel state of the agricultural environment in Egypt.

Therefore, a new understanding of the full construction potentials of date palm midribs ought to be presented in order to restore the faith in the local building materials for durable, flexible and sophisticated architecture.

Preliminary Results (300 words or less)

This poster represents the undergoing process of the development of a structural system that demonstrates the unexplored potentials of date palm midribs as a local building material for the rural communities in Egypt. The case study on which the potentials of date palm midribs are to be exploited is a primary 12m monumental shade structure, that was suggested and published earlier,

As means of achieving the contemporary thinking, that primary monumental shade structure undergoes the following processes of enhancement in 3 sequential fields: standardization for mass production: by the design of the inclination of the arches to achieve the maximum number unified lengths of the members and to facilitate and increase the flexibility of the design, prefabrication and assembly processes, reinforcing structural integrity: by stabilizing the structure and increasing the stiffness of the members, and respecting the architectural aesthetics: by adhering to the visual design basics of unity, emphasis, rhythm and balance in order to please the eye searching for modern sophistication and beauty.

Finally, a 1:20 scaled physical model (Fig.1) is built using date palm midribs to illustrate the suggested system as a light wide-span shade that acts as a monumental shade structure that show the youth that date palm midribs can be the material of today.

Fig. 1. 1:20 Physical Model of Tri-Arched Space Truss Shade

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Using Printed Palm Leaflets in Modern Crafts According the International Fashion Trends

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Keywords: Printed leaflets; Modern crafts; Fashion trends; Dyed palm leaflets; Textile dyes; Textile printing

Abstract

Egypt is one of the most important & oldest countries in the world concerning with producing dates because the palm dates trees are also present in all the cultivated areas of Egypt. Because of that we should concern in Egypt with by-product palm and the palmae family such as (date palms, palm leaflets ……), so this paper outlines the utilization resulting from palm like (palm leaflets) in making modern crafts with a creativity way (out of box). This utilization can make a lot of benefits like achieving great economic value added in two sides. First, in modern crafts and making it more trendy and fashionable and also this help in achieving zero waste from palmae family. Also, we can mix and match palm leaflets with fabrics and leather waste according the idea of the design. By using techniques of printing and dyeing which can be applied in the palm leaves (leaflets) and also applied in the fabrics, we can achieve added value to these palm leaves and create a variety of innovated designs can be applied in modern crafts according the international fashion trends, so we can improve fashion industry with new blood and creative ideas out of box. Also, we can mix and match palm leaflets with fabrics and leather waste to make very unique products in modern crafts and accessories fashion industry.

Introduction

Egypt has more than 15 million date palm trees and is considered the world biggest producer of dates. Egypt has a long heritage of utilization of date palm by product since ancient Egyptian. The palm leaves has been collected from the palm trees and dried with the traditional way then we wave it as palm leaves floding , so we can use it after that in many things like creating & making new ideas in modern crafts (bags, accessories, ……), making furniture and tables sets and many other creative industries . These creative industries may have done in traditional way or in modern way with a unique & different concept according the international fashion trends.

Preliminary Results

Purpose of the research

- Making a unique & different modern crafts (bags, accessories, etc.) from palm leaflets according the international fashion trends.
- Using dyed and printing palm leaflets mixed with fabrics and leather waste in creating modern crafts, like bags to achieve Zero waste and up cycling these materials.

Methods of the research

- The research uses mixture of experimental and analytical methods.
- Experimental method in using (printing & dyeing) methods and applying these methods in many kinds of palm leaflets weaving according the design of the (bag, accessories, etc.)
- Analytical method to the result and choose the best result

For both design and performance requirements.

Results and main conclusions

As shown in Fig.1 which include the brief steps of dying the palm leaflets with dyestuffs and printing according each required design. Also, possibility of using waste of (dyed & printing fabrics) and waste of leather to mix and match modern crafts designs like shown in pictures.

So, we can achieve zero waste from (dyed fabrics & leather) and use palm leaflets to create new ideas in modern crafts like bags and up cycling these materials.

Fig. 1. Steps of dyeing and printing palm leaflets and mix it with leather & fabrics in making modern crafts fashionable designs.

Poultry Battery Made of Palm Leaf-Stalks

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Keywords: Battery; Date palm; leaf-stalks; poultry; eggs; meat

Abstract

There is no doubt that one of the crucial problems the world is facing now is the shortage of food. The problem is becoming severer day after day, particularly with the growing rate of population, especially in Africa that suffers from drought, epidemics and famine. While the poultry industry can solve a large part of this problem, the considerable rise in the prices of lands is a basic obstacle to such industry that needs large areas of lands. The solution is found in designing certain batteries that make use of every space of the land, and at the same time reduce mortality and enhance the nutritional efficiency of eggs and meat.These batteries are made of extremely cheap raw materials that are found everywhere. The system of raising poultry in batteries has become common and spread worldwide, whether for the production of meat or eggs. The basic aim for using such batteries is to make use of every space of the land by breeding larger numbers of poultry therein, due to the price hikes of lands.

Characterization of volatile compounds in roasted dates (Phoenix dactylifera) seeds in comparison to coffee been (Coffea Arabica) using GC-MS and consumer study

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Keywords: Dates' seeds; Roasted; Coffee; Sensory, Discrimination

Abstract

The oil extracted from roasted dates (Phoenix dactylifera) seeds' oil and roasted coffee bean (Coffea Arabica) by rotary evaporator was analysed for their volatile profile. GC MS was used to determine the volatile content of extracted oil samples and revealed similarities in some compounds detected in both coffee bean and roasted dates' seeds including Nonanal, hexadecadienoic acid, methyl ester, n-Hexadecanoic acid, tetradecanoic acid, and Dodecanoic acid, and.

Discrimination test performed by potential consumers revealed that 30% of participants (n=60) could not distinguish coffee from roasted dates' seeds beverage, while in a separate tasting session (n=35), 49% of panelists preferred the roasted date seeds over coffee bean beverage.

Plant Design for the Conversion of 2 Ton/hr Date Waste Into Syn Gas

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Keywords: Date palm waste; Syn gas; Plant design; Cost analysis

Abstract

A plant design for the synthesis of 1800 kg/h of syngas via 2000 kg/h of date waste using gasification was realized. Process Flow Diagram (PFD) was elaborated, mass and heat balance were performed and main equipment were designed. For the economic feasibility, a preliminary plant design cost analysis was carried out. Date palm waste is a valuable resource which can be converted into syn gas. Syn gas being the usual raw material for many other valuable chemicals which is obtained otherwise from fossil fuels and called as petrochemical.

Introduction

Energy relationship in global politics has become a vital determinant. Biomass especially the date waste is a very potent source of energy, which can be utilized in a number of ways. Saudi Arabia is well known for date production. According to an estimate that the Kingdom has about 30 million palm trees that can produce about 950 thousand tons of dates per year [1]. Being a huge date palm industry, the waste generated is tremendous. This waste is highly valuable as it contains an untapped source of carbohydrates, hemicelluloses, celluloses, and lignin. The dead date palm leaves can cause environmental problems such as bait for insects, diseases, and fire. The solid waste generated from the leaves, stem, and stones are generally not treated and used in landfills. This waste potentially can be utilized in various ways which are more useful. Gasification is an economic process to recover chemicals from the solid waste by heating using steam. It can generate good amounts of more useful gases, ash, and slag.

The main goal of this project is to design a production unit to convert 2 tons/hr of date palm waste into syngas. The byproducts from the gasification include ash and slag.

- To develop Process Flow Diagram (PFD).
- To preform mass and heat balance and main equipment design.
- To make a preliminary plant design and to cost analysis for the economic feasibility.

Preliminary Results

As a vision 2030, the kingdom can reduce its reliance on the fuel-based economy and focus can be shifted to the renewable and sustainable precursor such as date palm waste. The amount of solid waste collected in the Jeddah (a metropolitan city of Saudi Arabia) per day is shown in Table 1.

Fig.1. shows the realized plant layout with mass balance indicated on various streams.

- Developed the Process Flow Diagram (PFD).
- Preformed mass and heat balance and main equipment design [2-4].
- Carried out preliminary plant design and to cost analysis for the economic feasibility [3].
- Date palm waste can be converted into syn gas.
- Syn gas can be converted into many valuable chemicals which otherwise are obtained from fossil fuels and called as petrochemical.

As a vision 2030, the kingdom can reduce its reliance on the fuel-based economy and focus can be shifted to the renewable and sustainable precursor such as date palm waste.

Fig. 1. Daily solid waste collected in Jeddah.

Sr. No.		Quantity (tons)
1	Avg. quantity of waste in daily basis	15000
2	Avg. home waste daily	7100
3	Avg. commercial waste	1300
4	Avg. organic waste	1100
5	Avg. tires waste	35
6	Avg. demolition and construction waste	6000

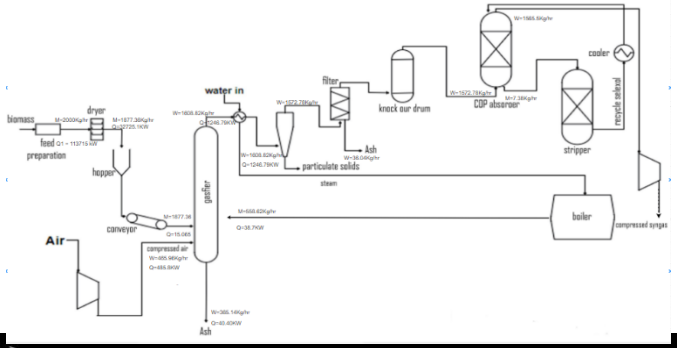

Fig. 1. Plant layout.

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Effect of Vitamins (Pyridoxine and Nicotinic Acid), Thiamine and Myo-Inositol at Different Concentrations on Free Amino Acids and Indoles Content of Embryogenic Callus of In Vitro Date Palm (Sakkoty and Bartamuda cultivar)

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Keywords: Vitamins; Amino acid, Indoles; Embryogenic callus; Tissue culture; Date palm

Abstract

This study was conducted to investigate the effect of vitamins (pyridoxine and nicotinic acid), thiamine and myo-inositol at different concentrations (0.5, 1.0 & 2.0 mg/l) supplemented in MS basal nutrient medium of embryogenic callus of date palm on the production of secondary metabolites of amino acids and indoles. Two Egyptian cultivars (Sakkoty and Bartamuda cultivar) of date palm were used. Recorded data showed that, pyridoxine concentration at (0.5mg/l) was the most effective concentration in the production of amino acids and indoles from embryonic callus of the tow studied cultivars of date palm. Nicotinic acid at (0.5mg/l) showed also the best results of production of amino acids and indoles from embryogenic callus of tow cultivars. According to thiamine at (2.0mg/l) concentration was the most effective in inducing the highest significant value of amino acids and indoles from embryonic callus of tow cultivars of date palm. Addition of myo-inositol concentration at (25mg/l) produced the highest significant value of amino acids and indoles.

Introduction

a

Preliminary Results

a

Effect of Murashige and Skoog Salts Strength Medium (Ms) on Steroids Production and Total Amino Acids Content of Date Palm Embryonic Callus (Sakkoty and Bartamuda Cultivar)

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Keywords: MS, Steroids, Amino acid, Embryogenic callus, Date palm

Abstract

This study was conducted to investigate the effect of MS salt strength on steroids production and total amino acids content in embryonic callus cultures of two cultivars of date palm (Sakkoty and Bartamuda). embryonic callus explants were cultured on MS (Full), ¾ MS, ½ MS and ¼ MS), date was recorded every 6 weeks for three subculture. It obviously displays the superiority full MS over the three other investigated levels (¾ MS, ½ MS and ¼ MS) of steroids production (0.55, 0.38, 0.32 and 0.44 45mg/g dry weight respectively). Also the full MS level was the most effective of amino acids content (0.95 mg/g fresh weight). Bartamuda cv. was the superior of steroids production (0.45 mg/g dry weight) and amino acid content (1.13 mg/g fresh weight) compared with Sakkoty cv.

Producing Sustainable Energy and Green Construction Materials Using Recycled Palm Tree Mid-Rib Wastes

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Keywords: Syngas, Pozzolanic materials, Palm tree mid-rib wastes, gasification, chemical properties, cement mortar/paste

Abstract

Open air burning of agricultural wastes is a major environmental problem in Egypt. The large amount of this lignocelluloses bio waste has resulted in an extensive search for its utilization. One such usage of this waste is to produce energy by different technologies, such as gasification. In this paper, experimental investigation was implemented to study the feasibility of producing energy out of palm tree mid-rib wastes by gasification technique. On the other hand, pozzolanic quality of gasification ashes was also investigated. During this experimental work, producing syngas by gasification of the palm tree rib's wastes showed feasible results. Ashes of the gasification process can also be used as fly ash for partial replacement of ordinary Portland cement (OPC). Cement mortar/paste specimens were made of varied dosages of partial replacement for OPC with ashes. The properties evaluation was conducted based on the standard physical and chemical requirements of ASTM C311"standard test methods for sampling and testing fly ash or natural Pozzolans for use in Portland-cement concrete". It was observed that 10% partial replacement of cement weight with palm tree rib's gasified ashes, provided reduction of 20% less than the control sample. Toasting the bi-product ashes - using part of the produced syngas- remarkably enhances the ashes' pozzolanic activity. Such technique provides both sustainable energy and green construction material to be used for rural areas where palm tree mid-rib waste is usually available.

Aswan Landmarks

Aswan
Located about 899 km south from Cairo, Aswan is a serene Nile Valley destination where the Nile is more majestic than anywhere else, flowing through granite rocks, and round emerald islands covered in palm groves and tropical plants. It is considered as an all-time favorites winter destination. Moreover, you'll be surprised to see how many monuments and sites 333333333332.0. this small city has to offer. Consider sailing to the temple of Philae, seeing the Agha Khan Mausoleum and taking an excursion to St. Simeon Monastery. Egypt's sunniest southern city is the perfect destination to stroll and relax in a magical cultural setting: wander down the broad walkway, locally known as the corniche, to watch feluccas slowly sailing the Nile then stop at one of the floating restaurants to enjoy Nubian music and freshly caught fish.

Aswan offers a splendid view of the Nile and is a great starting point for a Nile cruise. Aswan also offers a rich cultural experience; you will get to know Nubian culture and shop for spices, henna tattoos, souvenirs and African handmade goods at the Aswan souk. The word Aswan derives in fact from the Ancient Egyptian word Soun meaning souk or trade. It has earned its name thanks to the city strategic position, on the trade route linking the North of Egypt to its South. Since Ancient times, Aswan has also been known for its environmental therapy: burying the aching parts of your body in Aswan sand gives valuable results and can help relieving you from stubborn ailments such as rheumatism, arthritis, joint edema and skin inflammation. The town climate is also known to have great relaxing and rejuvenating properties. The best times to visit Aswan are May and September, summers are scorching, and winter temperatures have been known to reach 27 during the day, with cold nights.

Winter (DEC - FEB)	**Spring** (MAR - MAY)	**Summer** (JUN - AUG)	**Fall** (SEP - NOV)
17°C	**27°C**	**33°C**	**27°C**

History of Aswan:

Aswan is Egypt's southernmost City and has a population of 150,000. In Ancient Egypt, it was a frontier town just above the 1st Cataract between Egypt and Nubia. It has a fine museum, Nubian Museum ,which opened in 1998 and is partially sponsored by UNESCO.

One of the famous landmarks at Aswan is the Mausoleum of the Aga Khan. It was modeled on the Fatimid tombs in Cairo, it has an open court which culminates in a Carrara marble Mihrab and sarcophagus, enshrining Aga Khan III - the 48th Imam of the Isma'ili sect of the Shi'te Muslims. The

Aga Khan was, for his diamond jubilee in 1945, weighed in jewels. After his death in 1957 pilgrims flocked to Aswan, their camps posed such a health hazard the Egyptian government had to ban the mass pilgrimages. The Aga Khan was attracted to Aswan because of the climate and hot sands, which eased his rheumatism.

The area now known as Nubia extends along the Nile from south of Aswan to Dabba near the 4th Cataract. Nubia's name is first mentioned in Strabo's Geographia. He was a Greek who is thought to have visited Egypt in 29 BC. The name Nubia's origin is not certain but many agree that it originates from the Ancient Egyptian word nbu, meaning Gold - Nubia had many gold mines which Egypt depended on for its wealth. However, the name does not appear in any Ancient Egyptian text, which refers to Nubia as Ta-Seti, meaning "Land of the Bow."

Ancient Egyptians always distinguished Lower Nubia between the 1st and 2nd cataracts (which they named wawat) from the area south of the 2nd cataract which they named Kush. The Nubians settled and lived along the Nile and were distinct from the semi-nomadic tribes who lived in the eastern desert (between the Nile and the Red Sea).

Main Attractions

- **Unfinished Obelisk 'Historic landmark in Aswan, Egypt'**
  The missing obelisk is a pink granite obelisk in Aswan, Egypt. It is located in the northern part of the quarry there, located near Aswan on the eastern shore of the Nile and about 1 km east of the Nile River. The height of the obelisk will reach about 7 and 41 meters, and the rib section at the base of 2 and 4 meters in 2 and 4 meters, and the weight when completed about 1168 tons.
- **Elephant Island**
  Elephant Island is one of Egypt's Nile islands located in the city of Aswan, with an area of about 1500 meters long and 500 meters wide, mostly Nubians. It has the Mövenpick Hotel, mostly palm-sized agricultural areas, the Aswan Museum, and remains of stone temples from various eras.
- **Plant Island**
  Plant Island is one of the most important tourist attractions in Aswan, one of the oldest gardens in the world. The Aswan Botanical Garden is located on an entire island.
- **Mosque of Tabiya**
  Al-Tabiya Mosque is a mosque in Aswan, Egypt. It is built on a high hill surrounded by landscaped gardens with rare trees.
- **Nubian Village**
  Visit a Nubian community on Sohail Island from a boat ride and enjoy a special lunch made up of authentic Nubian dishes. Discover Nubian culture, thought to be one of the earliest civilizations located anywhere on Earth.
- **High Dam**
  An engineering miracle built in 1960 protecting Egypt from annual flood from the Nile and it has had a significant effect on the economy and culture of Egypt.
- **Philae Temples**
  One of Nubia's most important monument sites, the Temples of Philae was an ancient pilgrimage center for the cult of Isis and dazzled travelers with its power for centuries.
- **Kom Ombo Temples**
  The Temple of Kom Ombo is located in Kom Ombo, Aswan Governorate, south of Egypt. The Temple was built during the reign of Ptolemy VI for the worship of Subic goddesses and Horus. Renovations

- **The Shrine of Aga Khan**

  The Aga Khan Shrine is the burial place of Aga Khan III, who died in 1957, and is located on the banks of the Nile in the Egyptian city of Aswan. This shrine is inspired by the design of Egyptian Fatimid tombs. The tomb was built of pink limestone in the style of the Fatimid tombs in Cairo, while the tomb itself was built of white Marmara marble.

- **Suhail Island**

  Suhail is one of the Nile islands of Egypt. It is located south of the city of Aswan. It has a typical Nubian village which is a tourist attraction to learn about Nubian culture. It was originally a quarry from which the ancient Egyptians extracted the Aswan granite. The island has a population of 4180 people.

and renovation of the temple area have recently taken place.

- **Fatimid tombs**

  Fatimid tombs in Aswan The Fatimid cemeteries in southern Egypt are divided into two parts: the tribal cowardice and the sea cowardice. The tribal cemetery is located in Aswan on the Aswan reservoir road next to the Nuba Museum. The sea cemetery is located in the Anani area. The domes in the Fatimid tombs Eight facing the dome from the outside

- **Abu-Simbel Temples**

  One of the world's most breathtaking monuments, and Egypt's second most visited touristic site. The big temple is dedicated to Ramses II and the smaller one to his wife Nefertari.

- **Aswan Dam**

  Aswan reservoir or Aswan Dam is different from the High Dam. Work began on its construction in the city of Aswan in southern Egypt between 1899 and 1906. The foundation stone of Khedive Abbas Helmy II was opened in his reign. The Aswan reservoir is 946 kilometers from the Delta archipelago known as the Qanatir Charity.

Travel Info

Cairo's Traditional Taxi (Black & White) & Aswan's Traditional Taxi (White & Blue):

They're very rundown and almost out of service in Cairo (Black & White) but they do exist a lot in Aswan (white & Blue). These almost always have no meter, air-conditioning and the price of the trip is usually this known fact by everyone.
This has many factors that affect rates such as traffic, number of passengers, luggage, time of day, remoteness of destination. However, please note that the majority of taxi drivers are polite, shy and satisfied with what they get, providing the fare offered is close to reasonable.

The White Taxi (Cairo Only)

These are the revamped versions of the black ones. Some of them have air conditioning, all have a meter (make sure the driver sets it when you get in though) and all are newer safer cars. It's not uncommon to tip the drivers of those taxis. It's recommended to use the White Taxi in case you are in a hurry or don't want to wait to a ride hailing service.

Uber and Careem are Egypt's most common Ride Hailing apps. Uber is very much known internationally. Careem is the MENA region most infiltrating ride hailing service; so you could find Careem in areas where Uber isn't operating in. Both accept Credit Cards via the app as usual but here in Egypt they also accept Cash payment and the change gets to be added to your App Wallet (Make sure to ask the Captain to add it though, if you don't they could think you are tipping them). Careem is somewhat more expensive than Uber especially in long between cities travels as they use a flat median fare in this case, but both almost always are close to their lower estimate than their upper estimate that is shown to you before you book your ride. Both are integrated with Google Maps Ride Hailing Section, if you want to make a quick comparison before opening either of them just make the directions. Please download both on your smartphone before you get to Egypt.

https://www.careem.com/
https://www.uber.com/eg/en/

Basic taxi talk

I want to go to … = ana ayiz aruuh …
Do you know …? = inta arif …?
Straight = ala tuul
Turn/go left = khosh shemalak
Turn/go right = khosh yemeenak
OK = Mashi
Stop here (here is fine) = hena kwayyis
Please = min fadlak
Thank-you = shukran
To the Airport = lil mataar

Transportation in Aswan

Nile River Valley Transport Corporation

In the shopping arcade next to the Marhaba Palace Hotel, Every Sunday and Wednesday there is a 3pm sailing from Aswan High Dam to Wadi Halfa in Sudan, and it's advised to be there around 10am. The trip takes 18 hour.

Aswan Bus Station

The bus station is 3.5km north of Aswan train station. There are buses to the Red Sea and along the Nile to Luxor and Cairo. There are also buses to Abu Simbel and several companies run buses to Sudan.

Aswan Airport

Aswan International Airport is located 16km southwest of Aswan. There is no public transport into town, and a taxi will cost LE100 to LE150.

Ferry Landing on Garb Aswan

The ferry landing on Garb Aswan for boats to the dock near the train station in Aswan

Aswan Train Station

The railway station is in the centre of town, at the entrance of Sharia As Souq. There are daily trains to Cairo and Luxor.

Ferry to Gharb Aswan & Tombs of the Nobles

Ferry landing for ferry to Gharb Aswan and the Tombs of the Nobles.

Aswan Museum Ferry Dock

This is where the ferry stops from the dock opposite the EgyptAir office.

Hotels

Sorted according to distance from venue by a car:

Hotel Name	Distance- ETA	Google Rate
Helnan Aswan Hotel Address: Corniche El Nil, Corniche, Aswan Department, Aswan Tell: +20 97 2328828	0 km -0 time	5 ★★★★★
Pyramisa Isis Island Resort Aswan Address: The Nile Corniche, just 5 minutes' drive from the center of Aswan Tell: 0972454100 – 300 – 404 Email: isiscorniche@pyramisaegypt.com	4.6km -11 Min	4.0 ★★★★
City Max Hotel Address: Corniche El Nil, Beside CIB Bank, Aswan, EGY Tell: +20 106 649 8755 Fax: +20 972 492 027	2.3 km – 8 Min	4.0 ★★★★
Marhaba Address: Corniche El Nil St. ‹DOWNTOWN ‹ Qism Aswan, Aswan Governorate Tell: +20 97 2440102	1.5 km – 4 Min	3.0 ★★★
Nile Hotel Address: 15 El Corniche, El Zawia El Hamra Country, Aswan, Cairo Governorate Tell: 097/2314222 Fax: 097/2332600	1.4 km – 5 Min	0.2 ★★

Presentation of The Book (Date Palms By-products.. Their Types and Economic Importance)

S. A. Albalhi; R. A. Aboaiana

- The Agricultural Management of Saleh Al Rajhi Endowments Management, Al Qassim (Saudi Arabia)
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Abstract

In 2017, Saleh Abdulaziz Al Rajhi Endowments Management, Kingdom of Saudi Arabia issued a new book entitled "Date palm trees by-products ... their types and economic importance", 226 pages authored by Mr. Saud bin Abdulkarim AlFadda the manager of the Agriculture Department, Saleh Al Rajhi Endowment management and Prof. Dr. Ramzy Abdul Rahim Aboaiana, head of Technical Affairs, the Agricultural Department.

This book presents the main products of date palm which considered as the first book to this subject in some detail in Arabic. This book includes four main chapters. **The first chapter** shows the estimation of date palm by- products locally and in the world according to the statistics and studies adopted, where **the second chapter** is devoted to presenting the characteristics of date palm pruning products and their uses. While the most important of these characteristics is that they are compatible with the desires of consumers, the relative stability of the prices of locally produced raw materials and their availability throughout the year, and their contribution to raising the added value of local industrial and agricultural production**.** **The third chapter** explain The six by-products of date palms are date seeds, pollen, offshoots, aerial offshoots, palm pruning residues, where estimating the annual production of these products and their medical, industrial and agricultural uses.

The fourth chapter present of Saleh Al Rajhi endowments management vision, mission and goals which include the various aspects of charity.

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