11th German-Brazilian Symposium for Sustainable Development

Towards a Resilient and Safe Future

MARCH 20-23, 2024

UNIVERSITY OF TÜBINGEN - GERMANY

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

11º Simpósio Brasil-Alemanha de Desenvolvimento Sustentável

11. Deutsch-Brasilianisches Symposium zur nachhaltigen Entwicklung

Towards a Resilient and Safe Future

March 20 – 23, 2024 – University of Tübingen, Germany

Book of Abstracts

Organization Committee

University of Tübingen:
Prof. Dr. Stefan Laufer
Jr. Prof. Dr. Riccarda Flemmer
Baden-Württemberg Center for Brazil and Latin America at the University of Tübingen

University of Hohenheim:
Prof. Dr. Marcus Giese
Dr. Thomas Hilger
Dr. Birgit Hoinle

Leuphana University Lüneburg:
Prof. Dr. Vânia Zuin Zeidler

Federal University of Pará:
Prof. Dr. Armin Mathis

Baden-Württemberg Center for Brazil and Latin America

Dr. Martina Schulze
Dr. Júlia Galvez
Gisele Lenz
Ana Calegari
Esteban Morera Aparicio

Student Help

Akseli Ilmanen
Esteban Morera
Fabian Güvenc
Greg Fernandes
Luana Carvalho
Ronja Miller

Table of Contents

1 The Symposium

11th edition of the German-Brazilian Symposium for Sustainable Development

Towards a Resilient and Safe Future

Very often, the key components of sustainability such as climate, water, soil, biodiversity, agriculture and forestry, health, energy, green technology, societal actions and response, and (bio-)economics, are analyzed and managed separately.

The scope of the German-Brazilian Symposium for Sustainable Development is to unite researchers from the two countries with different experiences and with investigations from different areas, enhancing inter- and transdisciplinary approaches and, thus, maximizing the benefits of integrated concepts and solutions.

The 2024 edition of the Symposium will have a special focus on resilience, food security, and climate justice. Agri-food systems have been a topic of discussion in former editions and, yet again, stars in the 2024 one but with the addition of a new dimension with the focus on food security by urban-rural food networks.

The well-established section on Drug Development and Innovative Medical Treatments will explore various manifestations of resilience.

Innovation was introduced first in 2022 as a new thematic string, for it is an underrated factor in development strategies and policies. This time, the Innovation section will deal with Green Technologies and, again, Circular Economy.

The section on Human Resilience and Climate Justice will shed a new light on sustainability issues. Debates and workshops will prepare the floor for new interdisciplinary collaborations.

2 Program

March 20th, Wednesday

Opening Ceremony

Welcome and Opening Addresses
15:30 – 16:15

Prof. Dr. Peter Grathwohl (Vice president for research and innovation) - University of Tübingen)

Prof. Dr. Rui Oppermann (Director of International Relations) – Coordination for the Improvement of Higher Education Personnel – CAPES

Prof. Dr. Marco Antônio Zago (President) – São Paulo Research Foundation – FAPESP

Interlude

Round Table: Towards a Resilient and Safe Future
16:30 – 18:00

Prof. em. Dr. Georg Cadisch - University of Hohenheim

Dr. Bernardo Jurema - Research Institute for Sustainability, Potsdam

Prof. Dr. Flavia Guerra - University of Tübingen

Moderator: **Evelyn Araripe** - UFSCar/Leuphana

Reception: Greetings and Toast
18:15 – 20:30

Prof. Dr. Stefan Laufer - Baden-Württemberg Center for Brazil and Latin America

Márcio Weichert - German Center for Research and Innovation - DWIH São Paulo

Johannes Kärcher - Supervisory Board Alfred Kärcher SE & Co. KG and Honorary consul (Brasilien) in Stuttgart

March 21st, Thursday

Keynote A (Auditorium 36)
09.00 h – 10.00 h

Georgia Jordão (University of Brasília)

"Building Resilient Food Systems: The Role of Public Policies in Brazilian Ecological Transformation"

Keynote B (Auditorium 36)
10.00 h – 11.00 h

Klaus Kümmerer (Leuphana University of Lüneburg)

"A Resilient and Safe Future - the Role of Chemistry"

Break
11.00 h – 11.30 h

Session A: Resilience and Adaptation for Sustainable Agri-Food Systems
11.30 h – 13.00 h, Room 30

Moderators: Marcus Giese (University of Hohenheim)
Nátali Maidl (UEPG - State University of Ponta Grossa)

Session Introduction
11:30 – 11:35

Ricardo Vargas Carpinteiro (University of Hohenheim)
11.35 h – 12.15 h
"*Macaúba, a novel multipurpose palm in Brazil: exploring value web scenarios"*

Nátali Maidl (UEPG - State University of Ponta Grossa)
12.15 h – 12.50 h
"Lama/UEPG: What we have done for Brazilian peasant farming its resilient development to climate change?"

Session B1: Drug Development and Fighting
11.30 h – 13.00 h, Room 31

Moderators: Christa Müller (University of Bonn)
Flavio Emery (University of São Paulo)

Session Introduction
11.30 h – 11.35 h

Flávio Emery (University of São Paulo)
11.35 h – 12.00 h
"Advancing infectious diseases drug discovery in CRAFT"

Thales Kronenberger (University of Tübingen)
12.00 h – 12.35 h
"When Two Become One: Conformational Changes in FXR/RXR Heterodimers Bound to Steroidal Antagonists "

Christa Müller (University of Bonn)
12.35 h – 12.50 h
"Fit for the future: Educating early-stage pharma researchers in structured PhD programs at Bonn University"

Session C: Green Innovation and Circular Economy for Life and Food
11.30 h – 16.00 h, Room 32

Moderators: Sergiy Smetana (German Institute of Food Technologies)
Klaus Kümmerer (Leuphana University Lüneburg)

Session Introduction
11.30 h – 11.35 h

Mateus Gerolamo (University of São Paulo)
11.35 h – 12.00 h
"Managing Change and Innovation: Through the Lens of Circular Economy Transitions"

Sergiy Smetana (German Institute of Food Technologies)
12.00 h – 12.25 h
"Circularity and Alternative proteins - how do we target the future sustainability"

Oliver Schlüter (Leibniz Institute for Agricultural Engineering and Bioeconomy)
12.25 h – 12.50 h
Innovative concepts for future agri- food systems: Cultivation of alternative biomaterials and non- thermal processing

Session D1: Improving Resilience by Education and Culture: Pluralizing Knowledge
11.30 h – 13.00 h, Room 33

Moderators: Flavia Guerra (University of Tübingen)
Armin Mathis (Federal University of Pará)

Session Introduction
11.30 h – 11.35 h

Armin Mathis (Federal University of Pará)
11.35 h – 12.00 h
"Climate Justice in the Amazon - a political challenge"

Danilo Pereira Sato (University of São Paulo)
12.00 h - 12.25 h
"São Paulo Green Belt Biosphere Reserve and the Metropolis Water Security"

Beatrice Bonami (University of Tübingen)
12.25 h – 12.50 h
"Rivers as a common denominator between Climate and Tech Justice: an exploratory Study in the Brazilian Amazon Rainforest"

Lunch
13.00 h – 14.00 h

Special Session: Funding Organizations (Auditorium 36)
14.00 h – 15.30 h

Niels Olsen (FAPESP - São Paulo Research Foundation)

Dietrich Halm (DFG - German Research Foundation)

Rui Opperman (CAPES - Coordination for the Improvement of Higher Education Personnel)

Christiane Wasmann (AvH - Alexander von Humboldt Foundation)

Marcio Weichert (DWIH / DAAD - German Academic Exchange Service)

Júlia Galvez (University of Tübingen)

Break
15.30 h – 16.00 h

Session A1: Improving Resilience in Agricultural Production Systems – Integration, Innovation and Management
16.00 h – 17.30 h, Room 30

Moderators: Thomas Hilger (University of Hohenheim)
Evellyn Couto (UFV - Federal University of Viçosa)

Session Introduction
16.00 h – 16.05 h

Felix Büchele (KOB - Kompetenzzentrum Obstbau Bodensee)
16.05 h – 16.30 h
"Novel postharvest technologies to enhance the economic and environmental sustainability of long-term apple fruit storage"

Taiana She Mir Mui (National Industrial Learning Service São Paulo - SENAII)
16.30 h – 16.55 h
"*Impacts of Cold Plasma Treatment on Seeds"*

Adriana Riemenschneider (University of Hohenheim)
16.55 h – 17.20 h
"Potential for natural pest control in pesticide-free winter wheat compared to conventional and organic cropping systems"

Session B2 Innovative Medical Treatments Infections
16.00 h – 17.30 h, Room 31

Moderators: Matthias Schwab (IKP - Institute for Clinical Pharmacology)
Fernanda Bueno Morrone (PUC/RS - Pontifical Catholic University of Rio Grande do Sul)

Session Introduction
16.00 h – 16.05

Fernanda Bueno Morrone (PUC/RS)
16.05 h – 16.25

"Inhibition of p38/MAPK sensitizes human glioma cells to radiotherapy and promotes cell death"

Vinícius Maltarollo (Federal University of Minas Gerais)
16.25 h – 16.45
"From Algorithms to Antifungals: AI's impact on Drug Discovery"

Letícia Lotufo (University of São Paulo)
16:45 – 17:05
"Modulating key cancer proteins using natural products-based molecules"

Matthias Schwab (IKP - Institute for Clinical Pharmacology)
17:05 – 17:25
"Personalized Medicine and Pharmacogenomics"

Session C1 Circular Economy in Sustainable Food Systems

16.00 h – 17.30 h, Room 32

Moderators: Henriette Azeredo (EMBRAPA - Brazilian Agricultural Research Corporation)

Session Introduction
16.00 h – 16.05 h

Evelyn Araripe (Leuphana University Lüneburg)
16.05 h – 16.30 h
"Exploring the Sustainability and Socio- Environmental Impact of Meat Alternative Proteins"

Azam Rashidian (University of Tübingen)
16.30 h – 16.55 h
"Filling the blank space: Branched 4- nonylphenols isomers are responsible for robust constitutive androstane receptor (CAR) activation by nonylphenol"

Franciele Alba (Rottenburg University of Applied Forest Sciences)
16.55 h – 17.20 h
"Potential use of southern Brazilian forest species as material for a circular bioeconomy"

Session C2 Green Technologies for Sustainable Life
16.00 h – 17.30 h, Room 33

Moderators: Aymara Llanque Zonta (Leuphana University Lüneburg)
Antônio Augusto Fidalgo Neto (Embrapii - Brazilian Company for Industrial Research and Innovation)

Session Introduction
16.00 h – 16.05 h

Antônio Fidalgo Neto (Embrapii - Brazilian Company for Industrial Research and Innovation)
16.05 h – 16.30 h
"Sustainable Industry Innovation: EMBRAPII as a Catalyst for Innovation in Brazil"

Thiago Lima (UFF - Fluminense Federal University)
16.30 h – 16.55 h
"The use of urban residues for the production of sustainable aviation fuels precursors"

Ana Cristina C. de Araujo (KIT - Karlsruhe Institute of Technology)
16.55 h – 17.20 h
"Phase Equilibria Modelling of Fast Pyrolysis Bio-oil (FPBO) for Separation Processes"

Roundtable D: Human Resilience and Climate Justice
16.00 h – 17.30 h, Room 05

Moderators: Riccarda Flemmer (University of Tübingen)
Armin Mathis (Federal University of Pará)

March 22nd, Friday

Keynote C (Auditorium 36)
09.00 h – 10.00 h

Ricardo Abramovay (University of São Paulo)

Overcoming the monotony of the global agrifood system

Keynote D
10.00 h – 11.00 h

Angela Oels (University of Ausburg)

International climate politics after Dubai: The loss and damage fund as indicator of North-South relations

Break
11.00 h – 11. 30 h

Session A2: Sustainable Urban-Rural Food Networks – Policy Approaches for Food Justice and Security
11.30 h – 13.00 h, Room 30

Moderators: Birgit Hoinle (University of Hohenheim)
Geogria Jordão (University of Brasília)

Session Introduction
11.30 h – 11.35 h

Felipe Jardim (Rio de Janeiro State University)
11.35 h – 12.00 h
"Cultivating the Right to Food: Exploring Community Gardens in Berlin and Rio de Janeiro"

Jairo Guzman (UNU - United Nations University)
12.00 h – 12.25 h
"Vulnerability reduction in post-conflict areas through a Nexus approach to sustainable food production systems: a case study in Colombia"

Session B1: Drug Development and Fighting
11.30 h – 13.00 h, Room 31

Moderators: Christa Müller (University of Bonn)
Flavio Emery (University of São Paulo)

Session Introduction
11.30 h – 11.35 h

Célia R. S. Garcia (University of São Paulo)
11.35 h – 12.00 h
"BRET biosensors unravel that Plasmodium falciparum serpentine receptor 12 (SR12) can form homodimers and affect the surface expression of mammalian GPCRs in HEK293 cells"

Stephan Ludwig (University of Münster)
12.00 h – 12.25 h
"Towards a Novel Host-Targeted Anti- Infective Strategy Against COVID-19 and Other Acute Respiratory Viral Diseases"

Lars Zender (University of Tübingen)
12.25 h – 12.50 h
"From Bench to Bedside: Target Discovery and Academic Drug Development at the Tübingen Centre for Academic Drug Discovery and Development (TüCAD2)"

Open Debate C: Green Innovation and Circular Economy for Life and Food
11:30 – 12:50, Room 32

Moderators: Vânia Zuin Zeidler (Leuphana Univerity Lüneburg)
Ricardo Abramovay (University of São Paulo)

Session D1: Improving Resilience by Education and Culture: Pluralizing Knowledge
11.30 h – 13.00 h, Room 33

Moderators: Flavia Guerra (University of Tübingen)
Armin Mathis (University pf Pará)

Session Introducion
11.30 h – 11.35 h

Flavia Guerra (University of Tübingen)
11.35 h – 12.05 h
Ocean Thinking and the pluralization of the modern territorial imagination in International Relations

Lais Viera Trevisan (HAW- University of Applied Sciences Hamburg)
12.05 h – 12.50 h
Transformative organisational learning for sustainability in higher education: a literature review and an international multi-case study

Break
13.00 h – 14.00 h

Session A1 Improving Resilience in Agricultural Production Systems – Integration, Innovation and Management
14.00 h – 15.50 h, Room 30

Moderators: Thomas Hilger (University of Hohenheim)
Evelyn Couto (UFV - Federal University of Viçosa)

Session Introduction
14.00 – 14.05 h

Evellyn Couto (UFV - Federal University of Viçosa)
14.05 h – 14.25 h
New vistas for sustainable oil production through the use of local biodiversity: the Macauba (Acrocomia aculeata) palm

Cathrine Meyer (University of Hohenheim)
14:25 – 14:45
Understanding the oilseed palm Acrocomia (Arecaceae): the flowering patterns of various ecotypes from Brazil

Gabriel Carvalho (UFC - Federal University of Ceará)
14.45 h – 15:05

Use of agrivoltaic systems to generate income in areas susceptible to desertification

Sergio Henrique de Toledo e Silva (IVV Fraunhofer Institute)
15:05 h – 15.25
New sustainable sources of proteins and dietary fibers from Brazilian raw materials

Open Debate B Strengthening Resilience by Drug Development and Innovative Medical Treatments
14.00 h – 15.50 h, Room 31

Moderators: Stefan Laufer (University of Tübingen)
Fernanda Bueno Morrone (PUC/RS - Pontifical Catholic University of Rio Grande do Sul)

Session C1 Circular Economy in Sustainable Food Systems
14:00 – 15:30, Room 32

Moderators: Sergiy Smetana (German Institute of Food Technologies)
Henriette Azeredo (EMBRAPA - Brazilian Agricultural Research Corporation)

Session Introduction
14.00 h – 14.05 h

Tuany Gabriela Hoffmann (ATB - Leibniz Institute for Agricultural Engineering and Bioeconomy)
14.05 h – 14.45 h
Integrating digital twin technology for sustainable management of fresh produce in postharvest facilities

Henriette Azeredo (EMBRAPA - Brazilian Agricultural Research Corporation)
14.45 h – 15. 20 h
From Peel to Seal: Turning Food By- Products into Bio-Packaging

Session D Human Resilience and Climate Justice
14.00 h – 15.50 h, Room 33

Moderators: Bernardo Jurema (RIFS Potsdam - Research Institute for Sustainability)

Session Introduction
14.00 h – 14.05 h

Klaus Ramalho von Behr (UnB – University of Brasília)
14.05 h – 14.45 h
Climate justice and conspiracy theories at the beginning of the Bolsonaro administration (2018- 2020)

Olga Huerta-Salinas (University of Hohenheim)
14.45 h – 15.20 h
The Climate Dilemma: Adaptation, Mitigation, and the Role of Individual Differences

Session C2 Green Technologies for Sustainable Life
14.00 h – 15.50 h, Room 05

Moderators: Aymara Llanque Zonta (Leuphana University Lüneburg)
Antônio Augusto Fidalgo Neto (Embrapii - Brazilian Company for Industrial Research and Innovation)

Session Introduction
14.00 h – 14.05 h

Jamil M. Guimaraes Junior (University of São Paulo)
14.05 h – 14.30 h
"3D printing for a sustainable and safe future: powder geometry and their influence using ti-13%nb-13%zr alloys as a green technology"

Aymara Llanque Zonta (UFZ and Leuphana University of Lüneburg- Helmholtz Centre for Environmental Research GmbH)
14.30 h – 14.55 h
"Agroextractivism in lowland Bolivia, patriarchy and alienation in monoculture expansion zones. Challenges of indigenous peoples towards agroecological transformative responses"

Lucca Guerra (UFC - Federal University of Ceará)
14.55 h – 15.20 h

“Technical and financial feasibility analysis of a green ammonia production plant in the state of Ceará”

Wrap Up sessions
15:25 – 15:50

Closing Remarks and Farewell Drinks
16.00 h – 17.00 h

3 Abstracts

3.1 Session A: Resilience and Adaptation for Sustainable Agri-Food Systems

Agri-food systems encompass value chains of food and non-food agricultural products originating from the crop, livestock, forestry, fisheries, or aquaculture. They include stakeholder activities related to the conservation of natural resources, cultivation and production, harvesting, transport, storage and processing to the marketing of agricultural products, their consumption and use.

Agri-food systems are exposed to various crises and shocks that threaten food security and nutrition as well as the environment and natural resources on which they depend. At the same time, the Agri-Food system contributes up to 30% to global greenhouse emissions and, thus, climate change. A transition towards sustainable agri-food systems involves several challenges and social justice issues: for instance, fair working conditions at farms or access to healthy food for local communities.

Promoting the adaptation and resilience of agri-food systems is, thus, of essential importance and demands integrative and holistic approaches based on an improved societal dialog and knowledge exchange between basic and applied science, education, extension, policy, and economy.

We welcome contributions targeting innovations, opportunities, and challenges on the pathway to adapted, resilient and healthy agri-food systems.

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

Macaúba, a novel multipurpose palm in Brazil: exploring value web scenarios

Vargas Carpintero, Ricardo

University of Hohenheim, Stuttgart, Germany

ABSTRACT

Novel perennial and multi-purpose crops offer enormous opportunities for the transformation of agri-food systems into multifunctional systems, able to provide novel biobased resources for the bioeconomy, while enhancing ecosystem services. This is the case of the macaúba palm (Acrocomia aculeata), a native plant to the neotropics widely adapted to adverse ecological conditions and used mainly by rural communities in traditional forms. This plant can deliver multiple functions simultaneously: oils from the fruits in high quantity — 2,5 to 5 tons of oils per hectare — and quality, residual fruit fractions for various applications, restoration of degraded landscapes and soils, carbon sequestration and biodiversity habitat. Scientific progress and a growing knowledge base have driven entrepreneurial activities towards the initial cultivation of macaúba in Brazil, indicating the semi-domesticated status of this palm. This is complemented by the continuous research on integrated processing concepts for macaúba fruits following a biorefinery approach. The introduction of macaúba as a novel crop in the agricultural sector in Brazil pulls the development of macaúba value chains. As these value chains are at the early stage of development, a systems approach is necessary to ensure their sustainable implementation and operation. This means in practice the integration of value chain processes and stakeholders, from the seed to advanced applications, considering context specific factors that influence these systems. Applying the value web concept and combining expert knowledge from academic and non-academic actors, we identify potential scenarios for the configurations of macaúba value chains in Minas Gerais. For this, we consider key parameters and their interactions in the specific context, which shape the configurations of macaúba value chains. Key parameters include planting material, cultivation system design, processing pathways, product portfolio and targeted markets. This work serves a baseline for the further multi-actor and multi-criteria assessment of macaúba value chain scenarios that contribute to the decision-making process for the sustainable design and development of these novel production systems in Brazil tailored to the specific context and region.

3.1.1 Session A1: *Improving Resilience in Agricultural Production Systems – Integration, Innovation and Management*

Novel postharvest technologies to enhance the economic and environmental sustainability of long-term apple fruit storage

Büchele, Felix; Neuwald, Daniel Alexandre

Lake of Constance Reserach Center for Fruit Cultivation

ABSTRACT

Long-term storage of apples for up to a year is a well-established practice to provide a continuous supply of locally-produced fruit to consumers and to adapt to current market trends for optimized profits. Temperature control is the cornerstone of postharvest conservation and apples are typically kept at temperatures from 0 to 3 °C. However, the energy-intensive process of the initial cool down and subsequent temperature maintenance requires a significant energy input. Given the recent increase in energy prices, this poses significant economic challenges as the German fruit market faces competition from imported wares, often produced under more favorable climates or cheaper conditions. Long-term storage also contributes to the carbon footprint of the fruit sector and consumers have increasingly become environmentally conscious. Higher storage temperatures could reduce cooling-related energy usage but also pose the risk of enhancing fruit ripening and quality loss. This work explores different postharvest technologies including 1-methylcyclopropene (1 MCP), ultra-low oxygen (ULO) and dynamic controlled atmosphere (DCA) which suppress the fruit ripening to a minimum and allow the storage at higher temperatures. These approaches are shown to significantly reduce cooling-related energy usage and can be implemented in existing storage facilities without the need for cost-intensive construction measures. Furthermore, higher storage temperatures are also proposed to reduce the occurrence of disorder symptoms or fungal diseases during storage, and thus limit food waste in the postharvest sector. The usage of these technologies is therefore suggested to improve the economic and environmental sustainability of local fruit production and storage.

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

Sustainable postharvest strategies to minimize fungal decay in apples

Lugaresi, Adriana[1,2]; de Camões Avenue, Luiz[2]; Büchele, Felix[2]; Neuwald, Daniel[2]

[1]*Santa Catarina State University (UDESC), Lages, Brazil2*

[2]*Lake of Constance Research Center for Fruit Cultivation, Ravensburg, Germany*

ABSTRACT

Storage rots are worldwide the major cause for postharvest losses in apples. Frequent preharvest applications of fungicides during the growing season are therefore essential to limit fungal infestation postharvest. However, the extensive use of synthetic fungicides is associated with detrimental impacts on the environment and can promote the development of resistant pathogens. This work discusses the potential of postharvest phytosanitary strategies: I) Fogging of the synthetic fungicide pyrimethanil in postharvest; II) as well as hot water treatments that align with regulations of organic fruit production. It could be demonstrated that a single postharvest fogging application of pyrimethanil provides an equivalent control of storage rots in 'Pinova' apples when compared to phytosanitary programs consisting of multiple sprays of different compounds in the 4 weeks preharvest. Given that the product was applied into the storage room on the harvested product, this method avoids adverse effects on soils, ground water or beneficial insects and prevents the occurrence of fungicide resistance developing. Furthermore, residue analyses show that the hot fogging method does exceed maximum residue levels defined by the EU. Dipping apples in hot water (~ 51 °C depending on variety) for two minutes was tested for organic 'Topaz' and 'Pinova' apples. Hot water treatments are proposed to stimulate apples natural defense mechanisms against infections of fungal pathogens. A high efficacy of this strategy in controlling rot incidences in apples during long term storage and a subsequent marketing period could be demonstrated, without negative effects on fruit quality. Duration and the set temperature ranges of the water were found to affect the effectiveness of the treatment. In conclusion, implementing postharvest phytosanitary technologies can contribute to mitigating environmental impacts while limiting food losses, thus improving the environmental sustainability of the fruit production.

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

Impacts of Cold Plasma Treatment on Seeds

Mir Mui, Taiana She[1]

[1]*SENAI SP, Caçapava, Brazil*

ABSTRACT

Considerable research efforts have been dedicated to the exploration of cold atmospheric plasmas, primarily driven by their operational advantages and cost-effectiveness. This inherent characteristic not only streamlines the creation of compact and economical plasma sources but also renders them versatile for a broad spectrum of applications spanning biomedicine, materials processing, decontamination, medicine, and agriculture. Atmospheric pressure plasma emerges as a promising and environmentally friendly technology within the realm of agricultural processes, exhibiting potential applications in the treatment of seeds, plants, and fruits. The discussion will delve into a comprehensive analysis, providing a detailed exposition of the multifaceted effects resulting from the application of plasma treatment on the intricate processes of germination and subsequent growth across different seeds varieties. It entails a comprehensive analysis of modifications, taking into account diverse parameters, reactors, sources, gases and intricacies associated with the physiological responses and morphological transformations observed in seeds subjected to the plasma treatment. Through such exploration, this study endeavors to contribute to a refined understanding of the interplay between plasma treatment methodologies, the biological processes governing germination, and alterations in seeds surface morphology.

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

Potential for natural pest control in pesticide-free winter wheat compared to conventional and organic cropping systems

Riemenschneider, Adriana S.[1]; Schurr, Frank; Pagel, Jörn[1]

[1]*University of Hohenheim, Stuttgart, Germany*

ABSTRACT

Insect biodiversity has been significantly declining for decades and much of it is linked to intensive agricultural management, particularly the use of pesticides. There is urgent need for more sustainable solutions in cropping systems that also address the gaps in conservation and yield between conventional and organic systems. Here, we present a study of natural pest control in a new cropping system that refrains from pesticides and employs optimized mineral fertilization (NOcsPS – Agriculture 4.0 without chemical-synthetic plant protection). To investigate whether NOcsPS could promote natural biological pest control, we study the dynamic interactions of common winter wheat pests (aphids and cereal leaf beetles) and their natural predators (ladybugs, hoverflies and lacewings) in four NOcsPS variants (varying crop rotations, seeding and fertilization), two conventional variants (varying crop rotations) and one organic. Specifically, we investigate whether NOcsPS will support (1) higher abundance and biomass of natural predators, (2) lower abundance and biomass of winter wheat pests, and (3) higher insect abundance, biomass and species richness than the conventional cropping systems. Thus, we collected arthropod samples in winter wheat plots in a cropping system experiment located at the University of Hohenheim, in Germany, in the summers of 2021 and 2022. Our results show higher aphid biomass in conventional systems than in either NOcsPS or organic systems, despite yearly insecticide applications. Also, the ratio of predator to aphid biomass, total arthropod biomass and taxa richness were higher in some NOcsPS variants than in conventional and organic systems. Conversely, we observed higher CLB biomass in NOcsPS than in conventional or organic. Our observations are likely due to the effects of insecticide applications in the conventional systems, of mineral Nitrogen fertilization affecting crop biomass and pest preference, and of higher arable weed cover in NOcsPS. Despite having the highest CLB biomass, the wheat grain yield in NOcsPS was comparable to conventional systems. Our results indicate that NOcsPS has the potential to be a viable sustainable alternative to organic and conventional systems. However, further work is necessary to investigate the natural predator-pest dynamics in field conditions and in variable agricultural landscapes.

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

New vistas for sustainable oil production through the use of local biodiversity: the Macauba (*Acrocomia aculeata*) palm

Couto, Evellyn G. O.[1]; Motoike, Sérgio Y.[1]; Montoya, Sebastian G.[1]; Kuki, Kacilda N.[1]

[1]*Federal University of Viçosa, Minas Gerais, Brazil*

ABSTRACT

Macauba is a non-domesticated, neotropical palm, attracting economic attention due to its high potential for oil production, which is comparable to that of the African oil palm *(Elaeis guineenses*). This palm produces annually, grows in a variety of environments and has a much longer production phase than the African oil palm. It can be grown in agro-silvopastoral systems with low negative environmental impact. Genetic improvements can increase oil and biofuel production and make this species more competitive. For this, different factors such as the productivity traits, oil content and characteristics, the genetic diversity in the populations studied and the genetic architecture of agronomic traits of interest need to be known. Studies have shown that macauba populations exhibit high genetic variability for different traits. There is clear evidence that this variability is related to geographic distribution and adaptations to different colonized environments. These results have shown that macauba has a high potential for genetic improvement, which means that superior genotypes can be selected to initiate artificial crosses that open a path to pre-breeding. Genomic association studies on traits of economic interest can provide valuable resources for the development of marker-assisted selection in Macauba with a view to their improvement and domestication.

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

Understanding the oilseed palm Acrocomia (Arecaceae): the flowering patterns of various ecotypes from Brazil

Meyer, Catherine[1]; Magaton Campos, Claudio[2]; Hilger, Thomas[1]; Motoike, Sérgio[2]; Cadisch, Georg[1]

[1]University of Hohenheim, Stuttgart, Germany;

[2]Federal University of Viçosa, Viçosa, Brazil

ABSTRACT

Acrocomia, an oilseed palm species endemic to the subhumid and semiarid tropics of South and Central America, is feasible for the sustainable production of vegetable oil in areas where oil palm cultivation is limited. Acrocomia palms produce multiple inflorescences that flower sequentially from October to December. Since Acrocomia is monoecious and protogynous, cross-pollination is dominant. The wild populations of Acrocomia are morphologically and genetically diverse and can adapt to a wide range of soil and climate conditions. However, the knowledge of variations in flowering patterns is limited but crucial for a better understanding of mating opportunities and yield formation in plantations. Therefore, this study aimed to evaluate the flowering patterns, including the onset, midpoint, peak, and frequency of different Acrocomia ecotypes originating from various regions of Brazil. The study was carried out at the living germplasm collection BAG-Macaúba maintained by the Federal University of Viçosa, Brazil, and located in Araponga, MG, Brazil. The flowering onset and progress of six ecotypes (31 palms in total) were monitored from 2019 to 2021, and the number of inflorescences was determined for each palm. Furthermore, the fruit set was assessed for the years 2019 and 2020. In total, 382 inflorescences were documented over three years: 120, 166, and 96 in 2019, 2020, and 2021, respectively. Flowering generally started in September and continued until the end of January, with the peak in the second half of November. The ecotypes varied strongly in their number of inflorescences and flowering onset, ranging from mid-September to mid-November. Additionally, the individual palms showed high variability in their flowering frequency. Nevertheless, the flowering pattern of each ecotype remained similar between the years. However, albeit flowering occurred at the flowering peak with many potential cross-pollination opportunities, the resulting infructescences showed a high abortion rate (fruit set = 0%) and a generally low fruit set of 10% to 30%. In conclusion, Acrocomia ecotypes exhibit a wide variation in their flowering patterns, which could impact yield formation and cross-pollination opportunities, but the low fruit set suggests a need for further research into additional factors impacting pollination and a successful fruit set to improve the productivity of this oilseed palm.

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

Use Of Agrivoltaic Systems To Generate Income In Areas Susceptible To Desertification

Carvalho, Gabriel Antunes[1]; Linhares, Fernando[1]; Adão de Sousa, Antonio Nei[2]

[1]Universidade Federal Do Ceará, Ceará, Brazil
[2]Secretaria da Infraestrutura do Ceará, Ceará, Brazil

ABSTRACT

Solar photovoltaic energy has been growing in Brazil, especially in Ceará, driven by cost reduction and the interest of the agricultural and livestock sectors. Agrivoltaic systems combine agriculture and solar energy, bringing benefits such as additional income generation, reduction of CO2 emissions, and recovery of degraded areas susceptible to desertification. This approach integrates food production and renewable energy, contributing to a fair energy transition. The proposed Agrivoltaic system uses a crop adapted to the caatinga (cowpea), rainwater harvesting, and carbon emission reduction. Along with the system's implementation, it is suggested to implement a state program that will generate income to lift the beneficiaries out of poverty. The case study shows that it is feasible to generate over R$ 1,345 Brazilian reais monthly for a four-resident family located in Moraújo, Ceará, with an 88 kWp Agrivoltaic system. In an expanded program scenario, it is noted that it would be possible to carry out 494 projects of the same size with an initial investment of R$ 262.7 million.

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

An analysis on agriculture startups: bringing resilience and sustainability for agricultural production systems

Alves Justo Mendes, Jéssica[1]

[1]*University of São Paulo, São Paulo, Brazil*

ABSTRACT

Agricultural startups, known also as "agtechs" or "agritechs" startups are small and medium-sized businesses that seek to bring innovation and increased sustainability for the agricultural field. These startups can be vital in enhancing the resilience and sustainability of agricultural production systems by introducing innovative solutions that address the evolving challenges faced by agribusiness.

By integrating cutting-edge technologies, such as precision drones, data analytics, robots and remote sensing, these startups can empower farmers with real-time insights into crop health, resource utilization, and environmental conditions. It is the goal of agricultural startups to not only enhance the productivity and profitability of farms but also contribute to building a resilient and environmentally conscious foundation for future agricultural endeavors. Despite the high potential for technological startups to change and advance agriculture, academic literature on the theme started to grow only from 2014 onwards. In our search, no paper was found to systematically evaluate the critical success factors (in different dimensions) of these endeavors. Therefore, the goal of this paper is to fill this literature gap, by systematically reviewing the literature using the PRISMA protocol and content analysis (following the teachings of Bardin, 2016). The validation of our theoretical findings will be performed using machine learning and topic modeling (manly, latent dirichlet allocation) and the knowledge of specialists via the techniques Fuzzy Delphi and Best-Worst Method. Our results can bring light to the characteristics necessary for agriculture startups to succeed, which can be highly useful for entrepreneurs, stakeholders, and investors. Additionally, our research agenda can show many pathways researchers can take to better develop this theme in academia.

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

Understanding the oilseed palm Acrocomia (Arecaceae): the flowering patterns of various ecotypes from Brazil

Meyer, Catherine[1]; Magaton Campos, Claudio[2]; Hilger, Thomas[1]; Motoike, Sérgio[2]; Cadisch, Georg[2]

[1]University of Hohenheim, Stuttgart, Germany
[2]Federal University of Viçosa, Viçosa, Brazil

ABSTRACT (Poster)

Acrocomia, an oilseed palm species endemic to the subhumid and semiarid tropics of South and Central America, is feasible for the sustainable production of vegetable oil in areas where oil palm cultivation is limited. Acrocomia palms produce multiple inflorescences that flower sequentially from October to December. Since Acrocomia is monoecious and protogynous, cross-pollination is dominant. The wild populations of Acrocomia are morphologically and genetically diverse and can adapt to a wide range of soil and climate conditions. However, the knowledge of variations in flowering patterns is limited but crucial for a better understanding of mating opportunities and yield formation in plantations. Therefore, this study aimed to evaluate the flowering patterns, including the onset, midpoint, peak, and frequency of different Acrocomia ecotypes originating from various regions of Brazil. The study was carried out at the living germplasm collection BAG-Macaúba maintained by the Federal University of Viçosa, Brazil, and located in Araponga, MG, Brazil. The flowering onset and progress of six ecotypes (31 palms in total) were monitored from 2019 to 2021, and the number of inflorescences was determined for each palm. Furthermore, the fruit set was assessed for the years 2019 and 2020. In total, 382 inflorescences were documented over three years; 120, 166, and 96 in 2019, 2020, and 2021, respectively. Flowering generally started in September and continued until the end of January, with the peak in the second half of November. The ecotypes varied strongly in their number of inflorescences and flowering onset, ranging from mid-September to mid-November. Additionally, the individual palms showed high variability in their flowering frequency. Nevertheless, the flowering pattern of each ecotype remained similar between the years. However, albeit flowering occurred at the flowering peak with many potential cross-pollination opportunities, the resulting infructescences showed a high abortion rate (fruit set = 0%) and a generally low fruit set of 10% to 30%. In conclusion, Acrocomia ecotypes exhibit a wide variation in their flowering patterns, which could impact yield formation and cross-pollination opportunities, but the low fruit set suggests a need for further research into additional factors impacting pollination and a successful fruit set to improve the productivity of this oilseed palm.

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

Sustainable postharvest strategies to minimize fungal decay in apples

Lugaresi, Adriana[1]; de Camões Avenue, Luiz[2]; Büchele, Felix[2]; Neuwald, Daniel[2]

[1]Santa Catarina State University (UDESC), Lages, Brazil
[2]Lake of Constance Research Center for Fruit Cultivation, Ravensburg, Germany

ABSTRACT (Poster)

Storage rots are worldwide the major cause for postharvest losses in apples. Frequent preharvest applications of fungicides during the growing season are therefore essential to limit fungal infestation postharvest. However, the extensive use of synthetic fungicides is associated with detrimental impacts on the environment and can promote the development of resistant pathogens. This work discusses the potential of postharvest phytosanitary strategies: I) Fogging of the synthetic fungicide pyrimethanil in postharvest; II) as well as hot water treatments that align with regulations of organic fruit production. It could be demonstrated that a single postharvest fogging application of pyrimethanil provides an equivalent control of storage rots in 'Pinova' apples when compared to phytosanitary programs consisting of multiple sprays of different compounds in the 4 weeks preharvest. Given that the product was applied into the storage room on the harvested product, this method avoids adverse effects on soils, ground water or beneficial insects and prevents the occurrence of fungicide resistance developing. Furthermore, residue analyses show that the hot fogging method does exceed maximum residue levels defined by the EU. Dipping apples in hot water (~ 51 °C depending on variety) for two minutes was tested for organic 'Topaz' and 'Pinova' apples. Hot water treatments are proposed to stimulate apples natural defense mechanisms against infections of fungal pathogens. A high efficacy of this strategy in controlling rot incidences in apples during long term storage and a subsequent marketing period could be demonstrated, without negative effects on fruit quality. Duration and the set temperature ranges of the water were found to affect the effectiveness of the treatment. In conclusion, implementing postharvest phytosanitary technologies can contribute to mitigating environmental impacts while limiting food losses, thus improving the environmental sustainability of the fruit production.

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

3.1.2 Session A2: Sustainable Urban-Rural Food Networks – Policy Approaches for Food Justice and Security

Cultivating the Right to Food: Exploring Community Gardens in Berlin and Rio de Janeiro

Jardim, Felipe[1]

[1]*State University of Rio de Janeiro and Friedrich-Schiller University Jena*

ABSTRACT

This doctoral study addresses pressing urban challenges, focusing on the violation of the human right to adequate food and the issue of vacant land in urban areas. The right to food encompasses dimensions such as food availability, accessibility, cultural acceptability, and sustainability in production, distribution, and consumption. Vacant land contributes to social-spatial segregation, necessitating transformative actions to uphold rights, reduce inequalities, and ensure planetary sustainability. Global studies propose community gardens as a strategy to repurpose vacant land and realize the right to food. Despite this, a research gap exists in understanding the relationship between community gardens and urban food-sharing, especially in Berlin and Rio de Janeiro. The investigation aims to fill this gap by contrasting food-sharing practices in community gardens in both cities. The central question is how the principles of the right to food relate to food-sharing practices, exploring similarities and differences within and between Berlin and Rio de Janeiro. The hypothesis suggests that urban food-sharing in community gardens is linked to food availability, accessibility, acceptability, and sustainability, with variations based on unique socioeconomic contexts and urban challenges. The theoretical proposition posits that the right to food, urban commons, and community gardens address urban land and food crises. The study engaged in-depth empirical investigations, examining community gardens' profiles and interviewing 40 participants (20 from each city). Using a combined approach of case study and content analysis, the study confirmed the hypothesis. Similar food-sharing activities were observed in both cities, with motivations differing. Berlin emphasized socialization and environmental concerns, while Rio de Janeiro prioritized food security and ecological topics. Unexpectedly, Berlin gardeners highlighted employment opportunities and the economic dimension of food sustainability. In Rio de Janeiro, one community garden served as a tool for gender empowerment. Both cities shared the abandonment of chemical pesticides, indicating a step toward social-ecological transformation in urban food and land management. These findings contribute to the literature on urban agriculture, emphasizing the role of community gardens and advocating for their promotion and protection. The study underscores the need for policies supporting sustainable practices.

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

Vulnerability reduction in post-conflict areas through a Nexus approach to sustainable food production systems: a case study in Colombia

Guzman, Jairo[1]

[1]UNU – FLORES, Dresden, Germany

To increase the resilience of agroecosystems, and allow for sustainable economic reactivation, it is vital that the introduction of sustainable measures - particularly in agriculture – is advanced via an integrated management approach such as the Resource Nexus. An essential aspect of this approach is to optimise the efficiency of ecosystems and resources in conjunction with environmentally friendly economic growth. Colombia has experienced the impact of armed conflict over many years, while geographic regions have been shaped by environmental conflicts; resulting in vulnerable areas suffering from land and population inequalities that also translate into wicked planning for resilient food systems. This paper addresses a double challenge: the improvement of natural resources management and reducing the population's vulnerability in line with the principles of inclusion and gender equity. The paper developed a methodology to identify those productive regions that require improved management at the landscape level, which could benefit under the main framework of the water-energy-food Nexus. It also provides evidence of the value of the science-policy interface to ensure increased social equity, economic growth, and the conservation of resources. A geographic information system approach has been utilized to spatially evaluate the effects of land-use change, ecosystem services provision, and the impacts of climate change at the municipality scale of productive agricultural regions. The objectives of this research were to: (i) evaluate the impact of climate change and anthropogenic activities on natural resources, (ii) assess productive landscape fragmentation due to the overuse of resources, and (iii) consider ecosystem services planning as an operational methodology for municipality ecosystem-based management. The study results show a decrease in the natural Andean Forest, coupled with an increase in agricultural fields over the past 35 years, and a decrease in freshwater availability in the last decade. The expansion trend of the agricultural frontier into the protected areas is also highlighted.

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

Guia Para Formação Continuada Em Educação Ambiental Escolar Através Do Uso De Imagens

Coutinho, Éder[1]

[1]IFSul-iRograndense, Pelotas, Rio Grande do Sul, Brazil

ABSTRACT

The aim of this research was to analyze the potential of conversation circles with education professionals, using images to promote discussions and dialogues that enable environmental awareness actions in the school. The methodology used in this research is qualitative approach. The participants are a group of professionals from a peri-urban public school in a city in the interior of Rio Grande do Sul. The records of the conversations were made through a field diary that consists of a material later transcribed in digital format. The theoretical framework adopted was the theory of meaningful learning. From the results obtained, we noticed that the models made by the students, emerged from ideas ventilated in the conversation circles, constituted themselves as facilitators of progressive differentiation. The elements of the local landscape act as subsumers, which reach more abstract levels in terms of classification (lake, pond, pollution, polluted water, sanitation, etc.), thus generating an integrative reconciliation. The idea of creating gardens or flower beds, which also emerged in the conversation circles, proved to be interesting in the sense of generating a progressive differentiation of the concepts involved in environmental education. In this way, meaningful learning finds space in place of machine learning.

3.2 Session B: Strengthening Resilience by Drug Development and Innovative Medical Treatments

The COVID-19 pandemic was a historical hallmark that affected our lives in several ways, especially by showing the vulnerability of the global health system.

One of the critical lessons learned from the COVID-19 pandemic is the need for a more resilient global healthcare system. The pandemic exposed vulnerabilities in the supply chain for drugs, active pharmaceutical ingredients, medical devices, and equipment, primarily due to a heavy reliance on single-sourced suppliers and limited redundancy. To enhance the sustainability of the healthcare infrastructure, a comprehensive resilience strategy must be put in place.

A resilient healthcare system should be built on a systematic framework that incorporates key criteria such as redundancy, decentralized sourcing, reliability, and an emphasis on quality over cost.

By adopting a more rounded approach to face these problems, healthcare research and industry can be better prepared to face future global health crises. Concerning Brazil and Germany, we share many concerns about the resilience of medical drug discovery, development, production, and supply. Joining forces here, both academic and industrial, would be of major benefit to all. The goal of the thematic session is to shed light on these general health issues and obstacles, as well as show new strategies for overcoming these matters, which have been proposed and developed in these two partner countries.

3.2.1 Strengthening Resilience by Drug Development and Innovative Medical Treatments

Efficient and Scalable Synthetic Optimization Towards RMS-07, the First-In-Class Covalent TTK/MPS1 inhibitor

Massarico Serafim, Ricardo Augusto[1]

[1]University of Tübingen, Tübingen, Germany

ABSTRACT (Poster)

The development of covalent drugs has garnered increased value during the last decade in drug discovery [1] and chemical biology [2]. The so-called Targeted Covalent Inhibitors (TCIs), which are often rationally designed by structure-based approach, frequently demonstrate advantages over the classical non-covalent inhibitors such as strong and prolonged target engagement as well as high degree of selectivity [3]. In 2022, our research group has developed the acrylamide-based RMS-07 [4], a First-in-Class covalent inhibitor for the protein kinase MPS1/TTK, targeting the non-conserved Cys604 at the kinase middle hinge region (GK+2). RMS-07 was able to potently suppress cancer proliferation in vitro in different cell types [4]. However, while scaling-up the synthesis of the RMS-07 scaffold [5] for SAR exploration, restrictions were imposed due to the high price and limited availability of the key reagent (1-(ethoxycarbonyl)cyclopropyl) triphenylphosphonium tetrafluoroborate, which is essential to build up the tricyclic core scaffold. Furthermore, a previous report [6] describing the synthesis of this key reagent lacks detailed information of the experimental procedure, and was irreproducible hampering the scaling-up of the RMS-07 tricyclic scaffold. Herein, we will present an efficient, reproducible and scalable synthetic protocol to enable the access of the key reagent (1-(ethoxycarbonyl)cyclopropyl) triphenylphosphonium tetrafluoroborate in a decigram scale, required for the synthesis of covalent MPS1 inhibitor RMS-07.

References:

[1] Singh J. et al. Nat. Rev. Drug Discov. 2011, 10, 307-317.

[2] Serafim R.A.M. Curr. Res. Chem. Biol. 2023, 3, 100040.

[3] Gehringer M., Laufer S.A. J. Med. Chem. 2019, 62, 5673-5724

[4] Serafim R.A.M. et al. J. Med. Chem. 2022, 65, 3173-3192.

[5] De Roos et al. Patent WO2016/166255A1, 2016. [6] Fuchs P.L. J. Am. Chem. Soc. 1974, 96, 1607-1609.

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

Synthesis, in silico and in vitro studies of N benzyl piperidine derivatives as inhibitors of cholinesterases and BACE1 for Alzheimer's disease

Alves da Conceição, Raissa[1]

[1]Federal University of Rio de Janeiro (UFRJ), Rio de Janeiro, Brazil

ABSTRACT (Poster)

Introduction: Alzheimer's disease (AD) is a progressive neurodegenerative disease and the main type of dementia worldwide. The current pharmacotherapy available is based on symptomatic cognitive-enhancing drugs. Thus, more effective therapies are necessary to delay the onset of AD or slow its progression1. In this context, the goal of this project was the design of novel N-benzyl-piperidine derivatives, followed by computational studies and enzymatic inhibition evaluation aiming at the identification of multitarget drug candidates useful in the treatment of AD. Results: For the structural design, a molecular hybridization strategy was employed starting from the structures of the AChE inhibitor donepezil and the BACE1 inhibitor verubecestat. The designed derivatives (3a-d) had their physicochemical and pharmacokinetic parameters and their interaction with the cholinesterase and BACE1 enzymes evaluated by in silico methods. The designed derivatives showed adequate oral bioavailability and blood-brain barrier permeation predictions and formed stable complexes with the target enzymes. Then, these derivatives were evaluated for their inhibitory activity against AChE and BuChE in vitro and brain cell viability. Derivatives 3a and 3d were the most potent and had their synthesis stablished together with novel structural analogs (3e-m). The synthesized compounds had their chemical structures and purity confirmed by traditional analytical methods (1D and 2D NMR, HRMS and HPLC). The new analogs were also evaluated for their inhibitory activity against cholinesterases, and the results demonstrated that, for this class of derivatives, substitutions on position 2 of the heterocycle are favorable for an inhibitory potency lower than 10 μM. Moreover, bulky substituents at position 4 also favor the inhibition and a nitrile substituent increases selectivity for AChE inhibition. The selected cholinesterase inhibitors are currently under evaluation as BACE1 inhibitors, aiming at the identification of multitarget bioactive agents for brain action in AD management. Conclusion: Among the designed and synthetized N-benzyl-piperidine derivatives, two dual cholinesterase inhibitors were initially identified, corroborating the in-silico studies for their interaction with these enzymes. Additionally, these N-benzyl-piperidines have demonstrated drug likeness profiles and a putative interaction with BACE1 enzyme by in silico methods. References: 1Conceição et al. J. Cell. BioChem., 2023

3.2.2 Session B1: Drug Development and Fighting Infections

When Two Become One: Conformational Changes in FXR/RXR Heterodimers Bound to Steroidal Antagonists

Kronenberger, Thales[1]

[1]University of Tübingen, Tübingen, Germany

ABSTRACT

Farnesoid X receptor (FXR) is a nuclear receptor with an essential role in regulating bile acid synthesis and cholesterol homeostasis. FXR activation by agonists is explained by an αAF-2-trapping mechanism; however, antagonism mechanisms are diverse. We discuss microsecond molecular dynamics (MD) simulations investigating our recently reported FXR antagonists 2a and 2 h. We study the antagonist-induced conformational changes in the FXR ligand-binding domain, when compared to the synthetic (GW4064) or steroidal (chenodeoxycholic acid, CDCA) FXR agonists in the FXR monomer or FXR/RXR heterodimer r, and in the presence and absence of the coactivator. Our MD data suggest ligand-specific influence on conformations of different FXR-LBD regions, including the α5/α6 region, αAF-2, and α9-11. Changes in the heterodimerization interface induced by antagonists seem to be associated with αAF-2 destabilization, which prevents both co-activator and co-repressor recruitment. Our results provide new insights into the conformational behavior of FXR, suggesting that FXR antagonism/agonism shift requires a deeper assessment than originally proposed by crystal structures.

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

Fit for the future: Educating early stage pharma researchers in structured PhD programs at Bonn University

Müller, Christa E.[1]

[1]*University of Bonn, Pharmaceutical Institute & PharmaCenter Bonn, Bonn, Germany*

ABSTRACT

The University of Bonn belongs to the German Universities of Excellence. Structured PhD programs have a long tradition at Bonn University. The Bonn International Graduate School (BIGS) system comprises graduate schools in various disciplines, including economics, developmental research, clinical & population sciences, mathematics, oriental & Asian studies, physics & astronomy, land & food, neuroscience, immunosciences & infection, life & medical science, chemistry, and drug sciences. **BIGS DrugS**[1] focuses on **Drug S**ciences and constitutes an umbrella program for all PhD students working in the field of drug research, either at the Faculty of Science or at the Faculty of Medicine. In addition, there are structured PhD programs of excellence for top students. Such a recently established program, funded by the German Research Foundation (DFG), is the Research Training Group (RTG) GRK 2873[2] which focuses on *Tools and Drugs of the Future – Innovative Methods and New Modalities in Medicinal Chemistry*, and is headed by the Department of Pharmaceutical & Medicinal Chemistry, Pharmaceutical Institute, University of Bonn. Structured PhD programs are highly beneficial for early career researchers and are paving the way for success.

[1]https://www.bigs-drugs.uni-bonn.de/en

[2]https://www.grk2873.uni-bonn.de/en/home?set_language=en

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

BRET biosensors unravel that *Plasmodium falciparum* serpentine receptor 12 (SR12) can form homodimers and affect the surface expression of mammalian GPCRs in HEK293 cells

Pereira, Pedro H. S. [1,2]; Ahrar,i Sajjad [2]; Kiyan, Camila L. [2]; Moraes, Miriam S. [1]; Bouvier, Michel[2]; Garcia, Celia R. S. [1]

[1] Department of Clinical and Toxicological Analyses, University of São Paulo, São Paulo, Brazil

[2] Institute for research in immunology and cancer & Department of Biochemistry and Molecular Medicine, Université de Montréal, Canada.

ABSTRACT

Plasmodium falciparum, a pathogen responsible for malaria, remains a significant global public health concern. The increasing resistance to conventional antimalarial drugs emphasizes the urgent need to explore innovative drugs and targets.

Our research covers various cellular and molecular aspects of malaria parasites, including a comprehensive screening of compound libraries for identifying potential targets and antimalarials. We searched the parasite genome and identified *the falciparum* E- NTPDase and showed its relevance to the parasite's Red Blood Cell (RBC) life cycle, as inhibiting this enzyme impairs *P. falciparum* development. More recently, our investigations focused on the nuclear protein PfMORC, revealing its crucial role in gene expression regulation during the parasite's asexual proliferation in humans. PfMORC interacts with epigenetic and transcription factors, significantly influencing chromatin structure and plasmodial gene expression.

We identified the serpentine receptor 12 (SR12) as an innovative target for combating the disease. Utilizing Bioluminescence and Bioluminescence Resonance Energy Transfer (BRET) biosensors in heterologous assays, we highlighted the signaling activity of SR12. Employing Obelin/Ca^{2+}-based biosensors, we uncovered a thrombin-induced, SR12- dependent increase in cytosolic Ca^{2+} in HEK293-SL cells, aligning with the Gq/PLC/IP3 signaling pathway. BRET-based biosensors further detected diacylglycerol (DAG) formation and protein kinase C (PKC) activation. We confirmed the involvement of Gq family proteins in this signaling pathway by employing Gq/11 knockout HEK293-SL cells and the Gq-selective inhibitor YM254890.

Interestingly, SR12 was identified not as a direct thrombin receptor but as a chaperone of increased cell surface expression of endogenous mammalian GPCRs (M3R and PAR) when co-transfected with SR12, thereby amplifying downstream signaling. AlphaFold2 analysis of SR12's sequence revealed structural similarities with orphan GPCRs in the LUSTR (Lung 7TM receptors) group, GPR180, GPR107, GPR108, involved in the trafficking of protein cargo, consistent with its subcellular expression and its role in promoting signaling by other GPCRs.

The data from our study unveil crucial findings, representing a significant advancement in understanding parasite biology. Moreover, it potentially impacts new strategies for combating malaria.

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

Combining in silico techniques and NMR to investigate interactions between ABL kinase and antileukemic compounds

Fernandes, Philipe[1]

[1]*Universidade Federal de Minas Gerais, Belo Horizonte, Brazil*

ABSTRACT (Poster)

Introduction: ABL kinase is responsible for catalyzing tyrosine phosphorylation of peptides/proteins. The fusion of ABL and BCR genes produces a hyperactive ABL kinase, which is the primary cause of chronic Myeloid Leukemia (CML). Indole-based and structurally similar heterocyclic compounds interact with ABL kinase, triggering a biological response in cellular assays (Med Chem Res 2019, 28(5), 633). In this work, we investigated the interaction of ABL kinase, using in silico and NMR spectroscopy with indole derivatives, synthesized in-house and actives against K562 cells. Materials and Methods: Flexible molecular docking studies were carried out using Autodock Vina 1.2 software. The docking protocols were validated by analyzing root mean square deviation values in redocking and crossdocking with nilotinib and imatinib, respectively. The analysis of the indole derivatives docking simulations comprised a visual inspection of the binding mode, the formation enthalpy (ΔH_f°) for the ligand-ABL complex and the identification of the compound's interaction profile. The ΔH_f° was calculated with the software MOPAC using the PM7 semi-empirical method. In parallel, ABL containing the regularities and kinase domains, was expressed in E. coli BL21DE3 cells and purified by affinity and size exclusion chromatography; ABL kinase fold was inspected by 1H 1D NMR experiments and the indole derivatives interaction with ABL kinase was monitored by 1H 1D saturation transfer difference NMR experiments (STD-NMR). Results: The indoles were placed in the same region of the pyridine and pyrimidine rings of nilotinib, forming hydrogen bonds with ABL residues GLU266 and ASP361. The calculated ΔH_f° values of simulated complexes indicated thermodynamically favorable ligand-ABL binding. STD-NMR experiments confirmed the interactions of indole derivatives with the ABL kinase with a dissociation constant (Kd) within the micro to millimolar range. For two compounds the interaction with ABL was just seen in 1H 1D NMR spectra, indicating sub-micromolar Kd. Additional NMR experiments will be performed to identify ligand binding sites on the ABL kinase structure. Conclusion: The findings suggest a potential ABL inhibition of these indole-based compounds and might contribute to the development of optimized inhibitor candidates by optimization strategies based on structural information of the ABL kinase.This work was supported by CNPq, FAPEMIG, and CAPES.

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

Synthesis of quinoline anti-fungal derivatives from a naturally sourced material

Gentz, Caroline[1]

1University of Tübingen, Tübingen, Germany

ABSTRACT (Poster)

The global COVID-19 pandemic has underscored the pressing need for innovative antimicrobial therapies and environmentally sustainable methods for their production. The 8-hydroxyquinoline nucleus, a natural product abundantly and sustainably extracted from Centaurea diffusa [1-4], has been the focus of previous studies in our research group. Our investigations into 8-hydroxyquinoline-5-triazole derivatives revealed a significant MIC range of 0,25 – 64 µg/mL against Candida spp. strains [5]. Through an 8-step synthesis route, the triazole nucleus was synthesized using a click-chemistry synthetic approach. This environmentally friendly method employs water and mild temperatures, yielding regiospecific products. To diversify substitution in the triazole ring, alkynes were synthesized without the need for a strong and toxic base, such as butyllithium. This green-synthetic approach resulted in the synthesis of 10 new derivatives. Among them, compound 8c stands out for its MIC values ranging from 1-2 µg/mL against Candida species. Mechanism of action studies were conducted to investigate how compound 8c affects fungal cells. The sorbitol protective assay indicated a potential impact on the fungal cell wall, as MIC values increased in the presence of sorbitol for Candida strains. Subsequent analysis using a Scanning Electronic Microscope (SEM) and Confocal Laser Scanning Fluorescence Microscopy (CLSFM) on Candida albicans revealed significant morphological changes, including irregularity, roughness, and grooves in the cell wall. Additionally, a distinct fluorescent pattern of the compound was identified at the edge of the fungal cell, suggesting that the compound could be acting in the cell wall. In conclusion, while 8-hydroxyquinoline is a well-established antifungal moiety, its mechanism of action remains incompletely understood. This study contributes to a deeper understanding of cell wall damage within this compound class, shedding light on its potential applications in antifungal therapy.

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

Design and synthesis of new potential JAK3 and HDAC6 hybrid inhibitors for cancer treatment

Waitman, Karoline B.[1]

[1]*University of São Paulo, São Paulo, Brazil*

ABSTRACT (Poster)

Hybrid inhibitors have the potential to overcome cancer resistance, by blocking multiple signaling pathways at once. Both JAK3 (Janus kinase) and HDAC6 (histone deacetylase 6) are commonly mutated on tumors, and their inhibition has been shown to be beneficial for treatment. To construct hybrid JAK3/HDAC6 inhibitors, pharmacophores of known inhibitors bearing anilino-purines, benzyl-hydroxamates, and benzyl-benzamides (idelalisib, nexturastat A, and chidamide) have been connected through a linker and hybridized into a single entity. The hybrids were synthesized and characterized by 1H, 13C NMR, and cancer cell cytotoxicity. Compounds 6a-d were the most promising in cytotoxicity assay, with IC50 < 50nM in hematological cancer cells, which was linked to HDAC inhibition (HDAC6 IC50= 341 nM) and activity kinases (IC50 JAK3 = 2.58 μM), while not being toxic to non-tumorigenic cells (IC50 = 16.3 μM). The DMPK assays indicated good stability and no significant inhibition of CYP enzymes. Their activity was rationalized by docking and molecular dynamics (MD) simulations, where modifications to optimize the selectivity profile of the hybrid scaffold were proposed

3.2.3 Session B2: Innovative Medical Treatments

Modulating key cancer proteins using natural products-based compounds

Costa-Lotufo, Leticia V.[1]

[1]*Department of Pharmacology, Institute of Biomedical Science, University of São Paulo, Brazil*

ABSTRACT

Despite the advances in cancer therapy, the incidence and mortality numbers associated with this disease represent an enormous challenge to science, especially in poor and developing countries, where approximately 70% of cancer-related deaths occur. Our research group has been dedicated to studying new therapeutic alternatives based on marine natural products combining target-oriented and phenotypic approaches. As a promising result, we will discuss the eKects of the natural product seriniquinone in melanoma-type cancers. Seriniquinone targets dermicidin, a unique antimicrobial peptide, related to cancer survival, migration, and invasion. Seriniquinone and derivatives were tested in a panel of melanoma cells to describe the molecular mechanisms involved in its action. The compounds reduced cell viability, triggering autophagy and apoptosis. In a second set of experiments using a reconstructed human skin model containing tumor cells, there was no toxicity signals against healthy (non-tumor) *in vitro* skin; however, tumor cells of both mutant cell lines showed a slight reduction in size, and for the resistant cell line, an apparent decrease in dermis invasion. In a transcriptomic analysis, we identified that seriniquinone exposure mostly induced alterations of genes associated with endoplasmic reticulum stress in naïve cells, while processes related to antimicrobial response and chromosomal segregation were downregulated in resistant cells. To overcome the low solubility of the compound and allow *in vivo* testing, we used two diKerent strategies: synthesis of diKerent analogs with improved solubility and encapsulation into biocompatible and biodegradable poly (D,L-lactide-co-glycolide) nanoparticles (PLGA- NPs). So far, encapsulation seemed a better solution to improve seriniquinone solubility while maintaining its eKectiveness, enabling *in vivo* administration. Funding: FAPESP and CNPQ

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

From Algorithms to Antifungals: AI's impact on Drug Discovery

Maltarollo, Vinicius[1]

[1]*Federal University of Minas Gerais, Brazil*

ABSTRACT

Opportunistic fungal infections represent a global health problem, mainly for immunocompromised individuals. New therapeutical options are needed since several fungal strains show resistance to clinically available antifungal agents. 2-Thiazolylhydrazones are well-known as potent compounds against Candida and Cryptococcus species. A scaffold-focused drug design using machine learning models was established to optimize the 2-thiazolylhydrazone skeleton and obtain novel compounds with higher potency, better solubility in water, and enhanced absorption. Twenty-nine novel compounds were obtained and most showed low micromolar MIC values against different species of Candida and Cryptococcus spp., including Candida auris, an emerging multidrug-resistant yeast. Among the synthesized compounds, 2-thiazolylhydrazone namely compound 28 (MIC value ranging from 0.8 to 52.17 μM) was selected for further studies: cytotoxicity evaluation, permeability study in Caco-2 cell model, and in vivo efficacy against Cryptococcus neoformans in an invertebrate infection model. All results obtained indicate the great potential of 28 as a novel antifungal agent.

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

Assessing the impact of skepinone on the p38/MAPK pathway during in vitro growth of gliomas

Mendonça Diz, Fernando[1]

[1]*Catholic University of Rio Grande do Sul (PUCRS), Porto Alegre, Brazil*

ABSTRACT (Poster)

Gliomas constitute a heterogeneous group of central nervous system (CNS) tumors, being the most aggressive and lethal among primary tumors. Glioblastoma multiforme (GBM), the most common subtype in adults, has a poor prognosis due to the tumor's high recurrence rates, as well as its resistance to conventional treatments such as chemotherapy and radiotherapy. Although they are still not fully understood, it is known that mutations in important regulatory networks are related to the appearance of gliomas. One of the most important pathways regulating the genesis and progression of gliomas is the mitogen-activated protein kinases (MAPKs) pathway. Among these, the p38/MAPK pathway is implicated in antagonistic effects such as cell proliferation and survival. In view of these findings, as well as the need to seek new therapeutic targets for gliomas, this study aimed to investigate the role of the p38/MAPK pathway in the growth of gliomas in vitro. For this, glioma cell lines were used. These were treated with the selective inhibitor of the pathway, skepinone-L (0.25 to 5.0 μM), and/or the alkylating agent temozolamide (TMZ) (100 μM) and subsequently irradiated (2 Gy). The effects on cell viability and proliferation, colony formation and cell cycle and death at different times (24, 48, and 72 h) were evaluated. The results showed that the skepinone-L inhibitor at different concentrations, in single or combined treatment, decreased cell viability and proliferation, and reduced the potential for colony formation in the studied glioma cells. This effect, however, was not able to sensitize the cells when treated in association with TMZ. There were also alterations in the cell cycle, with a delay in the S and G2 phases, and an increase in the percentage of cells in late apoptosis/necrosis compared to the treatments used. Results with the p38 inhibitor ML3403 showed a reduction in cell proliferation, it sensitized radioresistant cells when treated in combination with irradiation, altered cell cycle progression, and increased apoptosis in glioma cell lines. Thus, in view of the results obtained regarding the reduction in the growth of the studied cells, the inhibition of the p38/MAPK pathway appears as a potential target for the treatment of gliomas. Further studies are needed to better understand its role in the glioblastoma tumor microenvironment.

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

Sustainable Audiological Care in Brazil: A Low-Threshold Approach to Locally Manufactured and Custom-Fitted Hearing Aid Solutions

Schlesinger, Anton[1]

[1]*Leuphana University of Lüneburg, Lüneburg, Germany*

ABSTRACT (Poster)

In Brazil, the proportion of the elderly population is growing. By 2045, it is predicted that 90 million Brazilians will be over 49 years old. More than 1/10 of this age group is affected by an age-related hearing loss. Age-related hearing loss mainly manifests itself in reduced speech intelligibility in noisy circumstances, which can have a strong social impact. Today's hearing aid solutions allow to understand even in difficult acoustic situations. However, these high-end devices are expensive and rely on a network of manufacturer-trained audiologists.

In this contribution we present the concept of a hearing aid, which abandons the classical development aim of miniaturization and relies on cheaper and physically effective techniques for directional hearing. Microphones arranged along the expansion of a shirt-attached hearing aid allow the exploitation of time differences between microphones and achieve a stable intelligibility gain in noise. Furthermore, the intended usage of individual headphones renders the custom production of expensive ear molds unnecessary. The technical approach shall be embedded in local production, fitting and distribution in order to effectively bring it to the point of care with the qualities of collaborative work.

In the initial hypothetical phase of this contribution, the establishment of pioneering workshops and stores is envisioned to assemble, tailor, sell, and service the devices locally. The concept builds upon an examination of the Brazilian market and the existing healthcare and hearing aid distribution systems. Analogous initiatives, such as the 'Good Vision for All People' project, are evaluated. Technical specifications and the degree of standardization necessary for fitting a hearing aid are discussed. Finally, part of the study will focus on the use of 3d printers for the processing of recycled materials in order to reduce the proportion of non-regional dependencies on products, improve local skills as well as local branding and reduce waste.

To summarise, the study aims to restore the hearing of people with age-related hearing loss in noisy situations by proposing an affordable and efficient hearing aid that is manufactured, fitted and distributed locally. Successful implementation would not only enable a large group of older people to participate in society, but also promote a shift towards sustainable communities with a regional infrastructure of audiological units and audiological expertise.

3.3 Session C: Green Innovation and Circular Economy for Life and Food

Modern circularity thinking includes product design with adapted lifetime, reusability, repairability, and recyclability, all made with renewable resources. These criteria aim to address Earth's resource and waste challenges and contribute to sustainable development. However, greater success will have to come from changes at the product-design level (Kümmerer, Clark, Zuin, 2020). In fact, designing, developing and implementing green, diverse, healthy, and resilient systems is a prerequisite to foster more sustainable processes, materials, and business models. In agro-industry and other related sectors of food production, consumption and security should aim for the sustainable use of bio-based resources. As it is known, food loss and waste are some of the major issues affecting the food supply chain, resulting in socio-environmental deterioration, such as the increase in hunger, especially in emerging economies.

This session emphasizes the intersection of innovation, constitution, dynamics, structures, and cooperation modes, including traditional knowledge, such as the ones from Indigenous peoples, of healthier and more regenerative systems, their efficiency, resilience, and sustainability. Regarding the Circular Economy in Sustainable Food Systems, the need to decarbonize the agricultural and energy sectors to achieve climate change goals is compounded with considerations of resource efficiency, and an increasing interest in green chemicals, green growth, and circular economy (EU, 2022). Regarding Green Technologies for Sustainable Life, the reduction and simplification of total substance, material, and product flows from local to global levels, rather than only focusing on the synthesis of a molecule (as a drug or pesticide) will be taken into account based mainly on a concept known as Benign by Design (Zuin & Kümmerer, 2022).

To summarise some of the main topics of this session, research and innovation addressing low-carbon, short-chain, and circular delivery systems for innovative bio- based applications, using a systematic thinking approach for the provision of greener and more sustainable products based mainly on biomass for all uses, whilst preserving the delivery of ecosystem services, will be the main focus of the final roundtable on Green Innovation and Circular Economy.

3.3.1 Session C1: Circular Economy in Sustainable Food Systems

From peel to seal: Turning Food By-Products into Bio-Packaging

Azeredo, Henriette M. C. [1]

[1]*EMBRAPA - Brazilian Agricultural Research Corporation, Brazil*

ABSTRACT

Food losses, originating from production and processing, and food waste, stemming from commercialization and consumer behavior, have significant socio-economic and environmental impacts. When prevention of food losses and waste isn't feasible, they can be repurposed into valuable products such as bioplastic materials within the framework of a food biorefinery. Three primary approaches to bioplastic production from food by-products are discussed. The first involves extracting molecules suitable for bioplastics and utilizing them in the material's formation. The second utilizes by-products as a nutrient source for microorganisms capable of producing film-forming macromolecules (e.g., bacterial cellulose) used in bioplastic production. Lastly, the third approach employs bulk by-products directly in material production. These approaches will be explored along with relevant examples.

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

Circularity and Alternative proteins - how do we target the future sustainability

Smetana, Sergiy [1,2]

[1]*DIL e.V. - German Institute of Food Technologies, Quakenbrück, Germany*
[2]*Institute of Food Quality and Food Safety, University of Vet. Medicine Hannover, Hannover, Germany*

ABSTRACT

Direct food recycling is a complex process, complicated due to the potential legal, safety and ethical issues. However, biotransformation of food waste is foreseen as a viable alternative. Among the most promising biotransformers of food waste are plants, insects, microalgae and other single cell-proteins. They are different in nutrient transformation efficiency and associated environmental and economic costs. There are a few scientific projects aimed to assess the environmental impact of alternative proteins circularity potential. They rely on an original circularity index and known methods of Life Cycle Assessment or economic feasibility. It was identified that even though the reduction of environmental impact for the agri-food chains reaches the level of 4-15% (depending on the type of food waste and waste treatment technology substituted), the nutrient recycling potential ranges from 10-15% for the nutrients returned into soils to 30-38% for the nutrients returned in form of food products (shortest chains). The overall efficiency of nutrient recycling with biotransformation technologies therefore reaches the level of those available for other recycling materials (glass, plastic, etc.) and can be recommended for further utilization.

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

Exploring the Sustainability and Socio-Environmental Impact of Meat Alternative Proteins

Araripe, Evelyn[1,2]; Zuin Zeidler, Vania[1]

[1]Institute of Sustainable Chemistry, Leuphana University Lüneburg, 21335 Lüneburg, Germany;
[2]Postgraduate Program in Education, Federal University of São Carlos, São Carlos 13565-905, Brazil

ABSTRACT

In the quest for sustainable food systems, meat alternatives have emerged as a key innovation, particularly in addressing climate change and environmental degradation. This study explores the multifaceted aspects of meat alternative proteins, in particular plant-based options, and assesses their sustainability and socio-environmental impacts, from protein extraction methods to traceability and transparency in the production, distribution and consumption chain of the products.

Our research, based on a case study of plant-based burgers, reveals the complex balance between environmental benefits and challenges. We sought to examine the full life cycle of plant-based proteins from soy production in Brazil, highlighting the environmental impacts of soy cultivation, including deforestation and pesticide use, and the complex industrial processing involved in turning soy into palatable meat alternatives.

We also look at the concept of 'eatertainment' in food consumption and examine how plant-based burgers fit into this trend, taking into account their nutritional value and environmental footprint. Using Life Cycle Assessment (LCA), we compare the carbon footprint and water use of meat-based and plant-based burgers, revealing the nuanced environmental impacts of these alternatives.

Significantly, our research extends beyond the environmental aspects to include social impacts. We examine the socio-economic dimensions of soy farming in Brazil, considering both the potential for economic development and the risk of exacerbating wealth inequalities in producing regions.

In conclusion, while plant-based proteins have been introduced as a promising route to a more sustainable food system, their true impact is complex and multifaceted. This research highlights the need for a holistic approach to assessing the sustainability of meat alternatives, considering not only environmental but also social and economic dimensions. Our findings aim to contribute to the discourse on green innovation and circular economy, particularly in the context of sustainable food choices and practices.

Acknowledgements: This project is supported by Capes (Brazil) and Alexander von Humboldt Foundation (Germany)

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

Filling the blank space: Branched 4-nonylphenols isomers are responsible for robust constitutive androstane receptor (CAR) activation by nonylphenol

Rashidian, Azam[1]; Dusek, Jan[2]; Kronenberger, Thales[3]; Pavek, Petr [4]

[1]Department of Internal Medicine VIII, University Hospital of Tübingen, Tübingen, Germany

[2] [a]Department of Pharmacology and Toxicology, Faculty of Pharmacy in Hradec Kralove, Charles University, Hradec Kralove, Czech Republic

[b] Department of Physiology, Medical Faculty in Hradec Kralove, Charles University

[3] [a]School of Pharmacy, Faculty of Health Sciences, University of Eastern Finland, Kuopio, Finland

[b]Department of Pharmaceutical and Medicinal Chemistry, Institute of Pharmaceutical Sciences, Eberhard-Karls-Universität, Tübingen, Auf der Morgenst

[4]Department of Pharmacology and Toxicology, Faculty of Pharmacy in Hradec Kralove, Charles University, Akademika Heyrovskeho, Hradec Kralove, Czech Republic

ABSTRACT

4-Nonylphenol (4-NP), a para-substituted phenolic compounds comprising a straight or branched carbon chain, is a widespread ubiquitous environmental pollutant and food contaminant. 4-NP, particularly the branched form, has been identified as an endocrine disruptor with potent activities on estrogen nuclear receptors. Constitutive Androstane Receptor (CAR, NR1I3) is another crucial nuclear receptor that regulates hepatic lipid, glucose, and steroid metabolism and is involved in endocrine disruption mechanism. The nonylphenol mixture has been described as an extremely potent activator of both human and rodent CAR. However, detailed mechanistic aspects of CAR activation by 4-NP are enigmatic and it is not known if 4-NP can directly interact with the CAR ligand binding domain (LBD).

Here we examined interactions of individual branched (22NP, 33NP, and 353NP) and linear 4-NPs with CAR and its variants using molecular dynamics (MD) simulations, cellular experiments with various CAR expression constructs, recombinant CAR LBD in TR-FRET assay, or differentiated HepaRG hepatocyte cellular model.

Our results demonstrate that branched 4-NPs display more stable poses to activate both wild-type CAR1 as well as CAR3 variant LBDs in MD simulations. Consistently, branched 4-NPs activated CAR3 and CAR1 LBD more efficiently than linear 4-NP. Furthermore, in HepaRG cells, we observed that all 4-NPs up-regulated CYP2B6 mRNA in HepaRG cells, a relevant hallmark for CAR activation. This is the first study to provide detailed insights into the direct interaction between individual 4-NPs and the human CAR-LBD, as well as its dominant variant CAR3. The work could contribute to the safer use of individual 4-NPs in many areas of industry.

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

Potential Use Of Southern Brazilian Forest Species As Material For A Circular Bio-Economy

Alba, Franciele[1]; Rickli, Milayne[1]; Pelz, Stefan[1]; Figueiredo Afonso[1]; Henkel, Karina[1]

University of Applied Forest Sciences Rottenburg, Rottenburg, Germany

ABSTRACT

The most important forest typology in south of Brazil is the mixed ombrophilous forest (FOM), popularly known as Araucaria forests. This forest was heavily exploited in the past through timber extraction and the expansion of agricultural and forest plantation borders. As a result, the FOM is subject to various restrictions of use by law, but this mechanism does not work well to preserve the forest. Considering the implications of these scenarios, it is worthwhile to pursue innovative forest management alternatives that seek to integrate conservation, social, and economic factors. Sustainable management schemes result in forest products as base for an energetic and material Utilization path, which generates income for forest producers, crucial for a general appreciation towards the forest. One species that should be controlled and utilized is Hovenia dulcis because it is exotic and invasive and is a threat to native FOM species due to competition for resources and negatively influences tree regeneration through allelopathic effects as well. In addition, naturally occurring forest residues, i.e. tree branch losses, is another source of biomass especially for energy and biochar production. The main species of the FOM is *Araucaria angustifolia* (Bertol.) and the branches have a high calorific value due to a high density and share of extractives. The crowns of adult Araucaria are a quantitatively significant component of the forest, with around 25 % of the species above ground biomass coming from branches and leafy twigs. The branches of Araucaria naturally detach from the tree and fall to the forest floor, if they become physiologically inefficient due to increasing shading. Moreover, another interesting biomass source the branches of *Ilex paraguariensis* St., which is also a species native to FOM and are a by-product of the yerba mate harvest. These branches have suitable energetic and physical properties for different utilization purposes. Finally, the management and utilization of those natural forest-based products can contribute to protect and develop this important forest type FOM and is perfectly in tune with green solutions that aim to make economic and social development compatible with the environmental and forest conservation

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

Integrating digital twin technology for sustainable management of fresh produce in postharvest facilities

Hoffmann, Tuany Gabriela [1]; Sonawane, Akshay [1]; Dr. Jedermann, Reiner [2]; Dr. Neuwald, Daniel Alexandre [3]; Büchele, Felix [3]; Dr. Praeger, Ulrike [1]; Linke, Manfred [1]; Barkov, Viacheslav [4]; Prof. Dr. Atzmueller, Martin [4]; Prof. Dr. Sturm, Barbara [5]; Dr. Mahajan, Pramod[1]

[1] *Leibniz Institute for Agricultural Engineering and Bioeconomy (ATB); Potsdam, Germany*

[2] *University Bremen; Bremen, Germany*

[3] *Lake of Constance Research Center for Fruit Cultivation (KOB); Constance, Germany*

[4] *Osnabrück University, Osnabrück, Germany*

[5] *Humboldt Universität zu Berlin, Berlin, Germany*

ABSTRACT

A critical aspect of food supply chain is the postharvest management of fruits and vegetables in cold storage. Fruit and vegetables, even after being harvested, continue to respire and transpire, consuming oxygen, releasing carbon dioxide, heat and water. To address this challenge and extend the shelf life of these agricultural products, refrigeration is commonly employed. However, the current cold storage facilities face a significant issue, because they are often oversized and operate at partial load, resulting in substantial energy waste. To alleviate those concerns, a digital twin can be constructed. A digital twin is a virtual representation of a physical object or system modeling its real-world behavior. Accordingly, the digital twin can be used for smart control and process monitoring, as well as for getting insights into and enhancing the understanding of the complex underlying processes, in order to achieve sustainable energy and quality management in industry. By integrating the digital twin technology into the management of cold storage facilities for fruits and vegetables, it is possible to revolutionize the way that the cold facilities operate. The aim of the current research is to develop a system that dynamically adjusts cooling based on real-time data. A detailed set of sensors for air speed, temperature, humidity, and direct condensation measurement on apple surfaces will be distributed in the volume of the test bin and later inside a full cool storage room. Models for spatial temperature distribution, condensation and fruit mass loss will be adjusted and tuned according to the test data. Finally, the models will be implemented in a digital twin, which processes real-time data from a reduced set of sensors in order to predict the current condensation and fruit quality status and to adjust cooling parameters accordingly. This information can provide substantial insights for a decision-making analysis, which can ensure the refrigeration is precisely adjusted to the needs of the fresh produce. This not only has the potential to enhance the quality and freshness of the stored items but can also significantly reduce energy consumption. The integration of digital twin technology into cold storage facilities offers a promising avenue for transforming postharvest management of fruits and vegetables by data-driven adjustments, contributing to a more sustainable and efficient food supply chain

.

3.3.2 Session C2: Green Technologies for Sustainable Life

3D Printing For A Sustainable And Safe Future: Powder Geometry And Their Influence Using TI-13%NB-13%ZR Alloys As A Green Technology

Guimaraes Junior, Martins[1]

[1]University of São Paulo, Brazil

ABSTRACT

The world is becoming always contaminated by global industries. Renewable energies are becoming more and more important, and new fabrication processes are a vital point to help the world to be free of pollution. Additive manufacturing, or 3D printing is a new alternative for the environment, once the powder can be used many times, depending on some precautions during the process. Powder morphology can be decisive during the manufacture of products by L-PBF (Laser Powder Bed Fusion), one kind of 3D printing process. For this reason, this work investigated the influence of spherical and irregular powders in the additive manufacturing of parts using different laser powers, since the research of low environment impact can avoid future damage for the world. HDH samples showed a slight increase on the number of spatters (superficial defects) comparing to the PA samples. A microscopic analysis shows that the metal roughness is associated to oblique lines called “ripples” on the surface. It´s possible to conclude that bigger laser powers result in more parallel ripples, hiding part of themselves by the neighboring tracks.

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

Fast pyrolysis and pyrolytic lignin extraction of piassava biomass for value-added products

Mello José, Alvaro Henrique1
[1]*University of São Paulo; São Paulo, Brazil*

ABSTRACT

Lignin stands out as the principal natural source of phenolic compounds. Piassava, characterized by its high lignin content ranging from 35 to 45 wt.%, represents a lignocellulosic biomass with significant potential in the biorefinery industry. In this context, thermochemical conversion routes, particularly fast pyrolysis (FP), provide a means to transform such biomass into valuable bioproducts. The FP process unfolds in three distinct products: a liquid phase referred to as fast pyrolysis bio-oil (FPBO), a solid phase known as biochar, and a gaseous phase. FPBO, a mixture of lignocellulosic derivatives, encompasses approximately 25 wt.% of pyrolytic lignin. The pyrolytic lignin, PyL (the oligomeric fraction of FPBO), rich in phenolic compounds, can be efficiently extracted through cold water precipitation. Further fractionation of the PyL into low molecular weight (LMW) and high molecular weight (HMW) fractions is achievable via solvent precipitation. In our study, piassava biomass underwent fast pyrolysis treatment at 550 °C within the Phyton Unit at the Institute of Catalysis Research and Technology (IKFT), resulting in the production of FPBO. Subsequent cold-water precipitation at approximately 0 °C facilitated the separation of PyL, which was further fractionated into HMW and LMW fractions using dichloromethane solvent at the same temperature. Post-fast pyrolysis, 47 wt.% of the material was recovered as FPBO, with 25 wt.% precipitated as PyL, appearing as a dark brown dust. A notable 33% reduction in the O/C ratio of the PyL compared to FPBO was observed, attributed to the absence of oxygenated carbohydrate derivatives in the solid precipitate. The LMW fraction, constituting approximately 46 wt.% of the PyL, exhibited a viscous liquid state with a modest weight average molecular weight (Mw) of 3696 g mol-1, making it a viable candidate for direct applications in the adhesive industry and various value-added products. Conversely, the HMW fraction, constituting about 54 wt.% of the PyL, manifested as a dark brown powder with a higher Mw of 16931 g mol-1. This fraction holds promise for direct applications in civil construction, biodegradable composites, and other diverse fields. Consequently, the thermochemical conversion route emerges as a promising avenue for valorizing high-lignin-content biomass, exemplified by piassava, with the potential to generate pivotal bioproducts supporting the goals of biorefineries.

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

Phase Equilibria Modelling of Fast Pyrolysis Bio-oil (FPBO) for Separation Processes

Correa de Araújo, Ana Cristina[1]

[1]KIT - Karlsruhe Institute of Technology, Karlsruhe, Germany

ABSTRACT

Fast pyrolysis is a thermochemical conversion process used for the conversion of biomass into an energy dense and economically transportable intermediate. The process is characterized by high heating rates, short vapor residence times, and fast condensation systems to recover produced liquid phases. It aims at maximizing the liquid product, the so-called fast pyrolysis bio-oil (FPBO). FPBO are complex mixtures composed by many different molecules with a wide range of molecular weight, these include both volatile and non-volatile compounds and viscous oligomers that cannot be identified via standard analytical methods. Due to this complexity, an efficient fractionation of the oil may be a better strategy for producing fuels and chemicals than treating the whole oil. Possible applications for different fractions range from upgrading to biofuels, fermentation/sugar chemistry, extraction of pyrolytic lignin and others. For an efficient design and/or optimization of the fractionation process, a thermodynamic model able to describe the bio-oil and its properties is important to make predictions about pressure, temperature and composition of the phases. However, little research exists on this topic due to challenges faced regarding the composition of the oil, which contain many unknown molecules, and the lack of available property data for some of the molecules. Against this background, a thermodynamic model was used to describe vapor-liquid equilibrium (VLE) in condensation and distillation of FPBO. The model was based on the UNIFAC-DMD activity coefficient model, a group contribution model that only depends on the structure of the molecules to derive results. A surrogate mixture was used to describe the FPBO, it was based on experimental data of the bio-oil used in the condensation and distillation experiments combined with information from the literature. For the volatile compounds, the ones able to be identified and quantified via standard analytical methods, values from GC-MS and GC-FID results were used. Regarding the non-volatile/high molecular weight part of the oil, an extensive literature research on the topic guided us into choosing and testing different surrogate molecules to represent this fraction. Results of the model were compared to experimental data and surrogate molecules were evaluated to find which molecules best represents the FPBO behavior and properties in phase equilibria.

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

Technical And Financial Feasability Analysis Of A Green Ammonia Production Plant In The State Of Ceará

Lemos Costa Guerra, Lucca[1]

[1]*Federal University of Ceará, Ceará, Brazil*

ABSTRACT

The energy transition has been one of the main topics discussed in the electrical sector. In this view, the green hydrogen is deemed as primary input to support the reduction of carbon dioxide emissions into the atmosphere. Brazil could be one of the most important players on the hydrogen international market due to its renewable energy generation. The state of Ceará stands out as a result of its strategical location and natural resources being suitable for renewable energy generation and transportation worldwide. This study shows an economic analysis of a solar photovoltaic plant (500 MW) located in the state of Ceará, which will feed a set of electrolyzers for the production of green hydrogen (123.2 MW of installed capacity, due to the energy consumption of the equipment and the losses in the processes). This work also details the sizing of a green ammonia production and its financial assessment of feasibility. The resource produced will be destined for sale. The energy will be purchased via a Power Purchase Agreement (PPA). Once the location for the photovoltaic power plant is defined, it is conducted a simulation via PVsyst in order to evaluate the amount of energy to be sold to the hydrogen plant. In this way, the energy produced is the constraining factor in the resource production (H2). Therefore, the energy consumption of each process in the proposed plant (electrolysis, Haber-Bosch, water treatment, air separation unit) will be determined.

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

Promoter effect of manganese on iron-supported on niobia in the Fischer-Tropsch Synthesis (FTS)

da Silva, H.S.T. [1,2*], Silva, G.G.[1]; da Silva D. P. S.[1]; Silva, A. G. M[1].; Soares, R.R,[1]; Raffelt, K.[2]; Dahmen, D.[2]

[1]Faculty of Chemical Engineering – Federal University of Uberlandia, Minas Gerais, Brazil

[2]Karlsruhe Institute of Technology, Karlsruhe, Baden-Württemberg, Germany

ABSTRACT (Poster)

The search for sustainable resources, aiming to reduce the use of fossil resources, symbolizes one of the great challenges of the last centuries. Thus, the sustainable catalytic conversion of renewable substrates emerges as a promising low-cost alternative. The Fischer-Tropsch Synthesis appears as an effective option, as it consists of transforming a gaseous mixture of CO and H_2, known as synthesis gas, into liquid fuels. The most used catalysts are cobalt, iron, and ruthenium supported on irreducible oxides such as Al_2O_3, and SiO_2 and reducible oxides such as TiO_2 and Nb_2O_5. The latter has been extensively studied by Brazilian groups due to its abundance in the region and the high selectivity demonstrated for forming long-chain hydrocarbons. Manganese is a metal that has been studied as a structural and electronic promoter of the iron catalyst, leading to the selective formation of long-chain olefins, and preventing the formation of methane. Promotes the formation of olefins. However, in this work is reported on this in catalysts containing Nb_2O_5.Therefore, the main objective of this work is to evaluate the performance of iron catalysts supported on niobium promoted with different concentrations of manganese to produce liquid hydrocarbons through the Fischer-Tropsch reaction, as well as to investigate the influence of the reaction conditions on the performance of the catalysts. in the FTS. The results showed that the addition of manganese to iron catalysts applied in FTS had clear effects in reducing the formation of CH_4 and CO_2, increasing selectivity for C5+, product distribution and increasing the olefin/paraffin ratio. Thus, this work opens space for future studies aimed at the isomerization of these products for the production of biokerosene from more selective catalysts/industrial routes.

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

The use of urban residues for the production of sustainable aviation fuels precursors

Lima, Thiago[1]

[1]*Universidade Federal Fluminense, Rio de Janeiro, Brazil*

ABSTRACT (Poster)

In a context where the construction of a more sustainable future is sought, producing biofuels from biomass becomes increasingly relevant in the scientific scenario. From it, it is possible to make platform molecules, such as furfural, which can be converted into larger molecules through aldol condensation reactions. In this study, typical lignocellulosic biomass from Brazil -RJ (water hyacinth and Syngonium) were studied for their conversion in a mixture of sugars and platform molecules. The platform molecules, such as Furfural, were converted by aldol condensation to sustainable biofuel precursors using biochar (also obtained from Syngonium) as a basic catalyst.

In this regard, in this study we produced an eco-friendly catalyst from the Syngonium Podophyllum plant. The biochar was obtained by calcining the leaves and stem of the plant at 350 °C for 2 hours in a static air atmosphere. The characterizations by X-ray Diffraction and X-ray Fluorescence revealed that the structure contains phases related to calcium carbonate and oxide, indicating the presence of basic sites. Additionally, the biocarbon was evaluated by Scanning Electron Microscopy, showing a mixed structure containing various inorganic oxides deposited on an organic structure.

The basicity of this material was assessed through titration, according to the method established in the literature, demonstrating a value of (2.02 ± 0.08) mmol/g, indicating the presence of high-concentration basic sites. The catalytic conversion (obtained by GC-MS) demonstrated the formation of sustainable aviation biofuel precursors with a conversion of 80.2% and selectivity above 99%, showing the catalyst's efficiency in obtaining this product, which is relevant for the biofuel composition. As a perspective, further assessments will be made on reuse cycles and a more robust characterization of this material.

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

Water and energy nexus in the maintenance of solar panels

Carvalho, Débora[1]

[1]*University of São Paulo (USP), São Paulo, Brazil*

ABSTRACT (Poster)

The water and energy nexus are a factor that really needs to be explored. In the context of renewable energy, it is important to understand how the production of electrical energy from photovoltaic sources interrelates with the pressure on other natural resources, such as water resources. In this context, photovoltaic panels need maintenance to increase their efficiency and produce maximum energy. In addition to mechanical maintenance and electrical maintenance, it is necessary to use water to wash the photovoltaic panels with water in order to remove deposits of particulate materials and salts that settle on the plates during operation to increase efficiency. Wastewater from washing photovoltaic panels cannot be returned to nature without adequate treatment. Water is also used to cool the photovoltaic panels, which also increases the production of electrical energy. Despite the large areas that photovoltaic plants occupy in the territory, they can interfere with the hydrogeological cycle, more specifically with the water infiltration and evapotranspiration processes in the region. Photovoltaic electrical energy production is often located in remote locations, which do not have access to public water supply, and therefore the pressure on underground water resources is relevant for the production of photovoltaic electrical energy. Understanding the quantities of water to increase the efficiency of energy production, understanding the interference and reduction in supply and increase in demand for water in sites that receive photovoltaic plants is a key factor in increasing the sustainability of photovoltaic electrical energy production reducing the water footprint.

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

Optimization of the bio-oil stabilization process to minimize hydrogen consumption

Meyer, Denis[1]

[1]*Instituo de Pesquisas Tecnológicas, São Paulo, Brazil*

ABSTRACT (Poster)

Sugarcane bagasse (SCB) is widely explored in alternative processes for generating steam and electrical energy [1]. The aim is to apply it in innovative solutions capable of converting it into new products that contribute to circular delivery systems. SCB fast pyrolysis bio-oil (FPBO) enhanced by catalytic hydrogenation (HDO) appears as one of the alternative intermediate products to produce biofuels [2]. However, to avoid unwanted reactions, as polymerization, a preview stabilization step (SS) at mild HDO reaction conditions of the bio-oil is proposed [3]. This work aimed to optimize the stabilization of FPBO and HDO reactions using two noble metal catalysts. The FPBO was produced using a Brazilian SCB and the pyrolysis was carried out in the fast pyrolysis unit, located at IKFT. The upgrading reaction were conducted in a lab scale autoclave. Key parameters to determine HDO reaction were conducted as follow: H2 consumption was estimated after the HDO reactions, calculated by the pressure and gas composition differences. Elemental analysis, water content, and higher heating value (HHV) were determined for the upgraded FPBO. The degree of deoxygenation (DOD) was computed under the assumption that the samples exclusively consisted of carbon, H2, nitrogen, and oxygen. The optimal catalyst combination identified consisted of Pd/C during the FPBO stabilization stage and Ru/C for the HDO stage of the stabilized oil. The HDO results for the stabilized oil revealed a significant reduction of 53.4 wt.% in oxygen content in comparison to the initial FPBO and H2 consumption of 78.3 vol.%. Nevertheless, additional upgrading steps are deemed necessary to further mitigate the remaining oxygenate content.

3.4 Session D: Human Resilience and Climate Justice

Calls for Climate Justice have a double focus on material and ideational aspects. The rising pressure of climate change affects societies in the Global South and in the Global North, augments environmental inequalities, and increasingly turns into violence (Martínez-Alier & Walter, 2016). Recent examples of conflicts over resource extraction in Latin America show that Indigenous peoples are among the most vulnerable to these pressures and are the most affected. For example, water contamination damages communities' resources but also affects rivers as 'living beings' in their worlds (de la Cadena 2015; Escobar 2015). At the same time, classical "fenced" conservation models are challenged by critiques of Indigenous peoples denouncing scandals involving the violation of rights. Consequently, current global initiatives to halt biodiversity loss increasingly acknowledge that local communities have proven to be more successful in sustaining ecosystems.

This session on resilience and climate justice is organized along two lines: The first focuses on education and culture, including Indigenous knowledge and alternative views on human-nature relations, such as the Rights of Nature (RoN) denoting nature's inherent right to exist and flourish. The second line focuses on the material aspects of fair distribution and access to water, land, and trade by zooming in on conflicts over resources as well as measures to improve environmental and social standards, such as supply chain laws. Finally, the session culminates in a workshop about bottom-up Climate Justice in the Global South and North to explore the potential to build resilience and yield legal and institutional models for more sustainable and just human–
nature relations.

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

Climate justice and conspiracy theories at the beginning of the Bolsonaro administration (2018- 2020)

von Behr, Ramalho; Toni[1], Fabiano; Sayago, Doris[1]

[1]Center of Sustainable Center of Sustainable Development University of Brasília, Brasilia, Brazil

ABSTRACT

In our presentation, we intend to answer two questions: what is the climate justice conception of the Bolsonaro government? And how has this conception fueled an authoritarian populist ideology – that is, the idea that there is a moral struggle between the 'good people' versus 'corrupt elites,' and that the populist leader is the only legitimate representative of the people because he represents their superior moral values (Müller, 2016; Mudde, Kaltwasser, 2017)?

To investigate the Bolsonaro government's idea of climate justice, we opted for an analysis of conspiratorial discourses surrounding the climate and Amazon issue. We believe that conspiracy theory is a good way to capture this climate justice idea because it is a discourse based on strong moralism and the sense of threat that powerful groups act covertly for their own benefit and against the common good (Uscinski, 2020).

Therefore, we conducted a qualitative content analysis (Júnior, 2005) of 36 conspiratorial discourses covering the climate and Amazonian theme propagated by 5 influential actors of the Bolsonaro government (Jair Bolsonaro, Eduardo Bolsonaro, Ernesto Araújo, Filipe Martins, and Olavo de Carvalho) between 2018 and 2020 – the electoral year and the first two years of the government. We used the data software Atlas.ti to assist in this content analysis.

The results obtained showed that the government's climate justice revolves around two main ideas: (1) truth against falsehood: the idea that the reality of climate change and Amazon fires does not occur as the epistemological authorities (researchers, media, etc.) propagate; and (2) sovereignty against colonialism: the idea that international pressure from developed countries on Brazil's environmental policy is a smokescreen to (a) prevent the country's development through the exploitation of Amazon resources and (b) to preserve the region for the future exploitation by those countries.

In the face of this conception of climate justice – situated in the struggle between truth and the resources of the Amazon against global, technocratic, and epistemological elites – Bolsonaro is presented as a patriotic leader who defends the interests of the people and the nation's development.

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

The Climate Dilemma: Adaptation, Mitigation, and the Role of Individual Differences

Zabel, Sarah; Huerta-Salinas[1], Olga; Otto, Siegmar[1]

[1]*University of Hohenheim, Stuttgart, Germany*

ABSTRACT

In the realm of climate change, individuals and governments repeatedly face a social dilemma: maximize personal benefits, eventually at the expense of the environment, or actively contribute to climate protection, thereby potentially foregoing personal advantages. This dilemma is even more immanent in the choice between mitigation (aimed at long-term climate protection, e.g., reducing greenhouse gas emissions) and adaptation strategies ("protecting" oneself from threatening climate impacts, e.g., by buying an air condition). On the societal level, this dilemma scales up to climate justice even globally (i.e., global north vs. south). Therefore, starting to explore the influence of individual difference variables, such as values or attitudes, on the choice between mitigation and adaptation could offer valuable insights into the underlying motivations for cooperative behavior in the context of climate change.

In this study, we investigated how individuals' environmental motivation and social value orientation influence the choice between individual mitigation and adaptation strategies within a modified public goods game. A total of 204 participants engaged in a 10-round experiment, where they were given the choice to invest in either private (adaptation) or public goods (mitigation). Notably, investments in public goods were donated to a climate protection organization, thus bearing no immediate personal profit.

Results showed that both environmental motivation and social value orientation significantly influenced participants' decisions. Participants with higher environmental motivation and a prosocial value orientation were more inclined towards mitigation (i.e., an investment in the public good). Despite no direct personal benefits from public goods investments, average contributions resembled those in conventional public goods games. This suggests an inherent recognition of the need for climate protection among participants. However, a notable portion of the sample exhibited a preference for adaptation over mitigation strategies.

Our study sheds light on the interplay between individual difference variables and decision-making in the context of climate change. This holds valuable implications for the pursuit of climate justice, suggesting that fostering prosocial values and environmental motivation among individuals can lead to increased adoption of climate protection actions and thus a more equitable distribution of efforts for the collective good.

3.4.1 Session D1: Improving Resilience by Education and Culture: Pluralizing Knowledge

São Paulo Green Belt Biosphere Reserve and the Metropolis Water Security

Pereira Sato, Danilo[1]

[1]University of São Paulo, São Paulo, Brazil

ABSTRACT

Biosphere Reserves (BR) are environmental protected areas recognized by UNESCO, and their three main goals are to promote conservation, socio-culturally and sustainable development, and logistic support for research and education. Since the Biosphere Reserves Sevilla Congress (1995) and the following congresses, the Biosphere Reserves has to be a Model Region for Sustainable Development engaging the local communities and civil society. The São Paulo Green Belt Biosphere Reserve has around 25 million people in 78 municipalities, most of it in the two metropolises in which one has a megacity (São Paulo) with 12 million people. Among the ecosystem services analyzed by the BR, the water supply is crucial, since the Metropolitan Area of São Paulo (RMSP) has 20 million people and is in a critical water stress situation. In this scenario, the BR comprises all the water supply reservoirs and produces 88,6% of the water consumed by the population. The total water surface had diminished from 76,674 ha (4,06%) in 1985 to 56,867 ha (3,47%) in 2021 according to the MapBiomas spatial data. The RMSP also had a water supply crisis during 2013 and 2015 when the Cantareira Reservoir (50,5% of the metropolis water supply) reached the dead storage capacity, and the government responded with water transposition projects from the other water basins. This crisis and other impacts like water shortages, flooding, and heatwaves will be more frequent in the region because of Climate Change and will affect the most vulnerable population. In this context, the BR contributed to the action plan for Climate Change and identified crucial areas to direct public policies. The research uses spatial analysis to analyze the BR ecosystem service map, the land use of the water source protection areas, and reforestation projects areas, and it also looks into the water management plans and their relation to the BRs.

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

Rivers as a common denominator between Climate and Tech Justice: an exploratory Study in the Brazilian Amazon Rainforest

Dr. Bonami, Beatrice[1]

[1]*University of Tübingen, Tübingen, Germany*

ABSTRACT

Climate and tech justice are fields with overlapping opportunities. While tech justice refers to fairness, equity, and ethics in technology, climate justice emphasizes the dimensions of climate change on society. As we dive into the prelude years of 2030, these fields become even more intertwined, especially when looking into international resolutions such as the Agenda 2030 (UNDP, 2015) and realizing how much is still left to be accomplished in Tech and Climate response-ability (Haraway, 2016). In order to propose a merge between these two fields, the project "Exploring digital transformation in the Amazon Rainforest" (University of Amsterdam and Federal University of Amazon), investigated how indigenous, riverside, rural, and urban assemblages (Deleuze, Guattari, 1987) appropriate digital technologies and debate environmental sustainability. Aware of its own positioning within a Western context (Haraway 1988), our effort to learn with interlocutors was an opportunity to practice cosmopolitical ethnography (Stengers, 2011) as we (i) co-author research papers with local stakeholders, (ii) co-design workshops and exhibitions and (iii) co-create community materials (digital resources, pamphlets, curricula) on how to leverage technology for water preservation.

Despite differences between involved communities, in the course of the field research, water preservation proved to be a common denominator among them. Although our primary focus was on tech & society, all communities demonstrated concerns about rivers, facing the drought along the Amazon Rainforest in 2023, one of the most severe in history. Based on this, a collaboration with the project Rios Online in Brazil inspired further learning about quality assessment technology and river sustainability, which, thus, became central topics in our work as a link between the communities. This common driver (Bonami, 2022) enabled us to discuss shared solutions, which is summarized in joint materials for how to leverage digital and language technology to foster water quality and fluvial preservation across the Lower Amazon. In the Symposium, we will report on our main findings and on the community, materials created, aligning with thematic focus D1, spotlighting indigenous and rural knowledge. As remote communities - the most impacted by climate change - offer valuable insights into sustainable coexistence with nature, they hold creative solutions for the intersection between preservation and development.

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

Transformative organizational learning for sustainability in higher education: a literature review and an international multi-case study

Viera Trevisan, Laís[1]

University of Applied Sciences Hamburg HAW, Hamburg, Germany

ABSTRACT

Higher Education Institutions (HEIs) play a critical role in the 2030 Agenda for sustainable development. However, this contribution requires a significant transformation in HEIs towards a sustainability-focused approach, encompassing all dimensions of their practice through a whole-institution approach. Therefore, this study aims to understand the learning processes, paths, and practices contributing to this transformation, particularly in the highest-ranking sustainable HEIs in the UI GreenMetric ranking. Specifically, we seek to investigate: (1) what the literature states on transformative and organizational learning for sustainability in higher education; (2) how top sustainable HEIs are embedding sustainability into their activities; and (3) the role of transformative and organizational learning for sustainability in higher education. For that, we combined a bibliometric review of relevant literature on the topic with fifteen case studies from thirteen cities of six different countries, conducted through observation techniques, in-depth interviews, and document analysis. The findings provide a comprehensive view of the literature on transformative and organizational learning for sustainability in higher education and several insights into how top sustainable HEIs are embedding sustainability in their different activities – teaching, research, outreach, facilities, and governance. Moreover, the results are analyzed through the lens of the transformative and organizational learning theories, providing an understanding of their role in HEIs' path towards sustainability, which culminates into a framework of transformative and organizational learning for sustainability in higher education.

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

Strengthening resilience by medical education and access to Brazilian population to ophthalmic public health

Rocha Teixeira Netto, Alice[1]

[1]*Brazilian Institute of Assistance and Research, São Paulo, Brazil*

ABSTRACT (Poster)

Introduction: According to the Brazilian Institute of Geography and Statistics the state of Rio de Janeiro has a population of 16.055.174. Brazil has a unified public health system (SUS), but patient access to ophthalmology consultations in the state of Rio de Janeiro is still limited. The Brazilian Institute of Assistance and Research (IBAP), located at Niterói, Rio de Janeiro, is a philanthropic institution that assists patients of the SUS through ophthalmologic consultations. Furthermore, IBAP is an ophthalmology school that trains residents in ophthalmology and its subspecialties. The institute has had an innovative exchange program with the University of Tübingen since 2016, in which around 10 doctors from all over Brazil take part in it each year. The aim of this research was to analyze the number of consultations, surgeries and exams carried out by the IBAP in 2023. Furthermore, evaluations were performed among doctors participating in the International Program in Ophthalmology (IPO).

Material and methods: The number of appointments, exams and surgeries scheduled at IBAP from January to November 2023 was calculated, as well as the absenteeism rate. In addition, the type of care per subspecialty and the type of surgery performed were defined

Evaluations of reaction and efficacy were carried out among doctors participating in the IPO.

Results: At IBAP, it has been made 25054 ophthalmology appointments, 8343 exams and 2100 surgeries, more than half of which were cataract surgeries. The absenteeism rate was 10.31% for ophthalmology appointments, 16.62% for exams and 12.59% for surgeries.

Regarding the IPO, the participants affirmed that it had a grate positive impact for their professional careers, both in terms knowledge of innovative diagnostic technologies and of contact to academic environment of excellence, and the expansion of their respective networks, both in Brazil and in Germany.

Conclusion: IBAP has 23 residents in training and per year 4 residents graduate as ophthalmologists. The high volume of appointments contributes both to facilitate the population's access to ophthalmic care and to allow the teaching of residents. The IPO had five editions so far and the doctors had the opportunity to attend lectures and to make clinical visits at the University of Tübingen, which is an innovative model of exchange and teaching, as well as allowing doctors to learn about new treatments in ophthalmology and apply them to their practice.

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

Advancing Collaborative Networks for Sustainable Development: Initiatives from ESSSR, IUSDRP, and GERBRAS-SCIENCENET

Vieira Trevisan, Lais[1]; Schoproni Bichueti, Roberto[1]

[1]*Federal University of Santa Maria, Rio Grande do Sul, Brazil*

ABSTRACT (Poster)

This abstract introduces three networks focused on collaborative efforts in sustainability science, sustainable development research, and science and technology cooperation. The three networks were first established in collaboration between the Hamburg University of Applied Sciences (Germany) and Manchester Metropolitan University (United Kingdom), and currently, have several higher education institutions as partners around the world. The European School of Sustainability Science and Research (ESSSR) aims to enhance teaching and research in sustainability science across European universities. It promotes joint programmes, research projects, and PhD training to address the goals of the 2030 Agenda for Sustainable Development. The Inter-University Sustainable Development Research Programme (IUSDRP) aims to strengthen institutional capacities and promote joint initiatives in sustainable development research. For that, it provides a platform for member universities to conduct research on sustainable development. It facilitates interdisciplinary teams, international cooperation, and the publication of high-quality research outputs. The German-Brazilian Science and Technology Network (GERBRAS-SCIENCENET) is a strategic partnership between Brazil and Germany to enhance cooperation in science and technology. It aims to approximate researchers, institutions, and industries in both countries, addressing issues ranging from energy and environment to human rights and social affairs.

3.4.2 Session D2: From Water Justice to Fair Climate Policies

Identification Of Urban Surface Heat Islands As A Tool For Urban Environmental Planning

Jahara Lobosco, Raquel[1]

[1]Federal University of Rio de Janeiro (UFRJ), Rio de Janeiro, Brazil

ABSTRACT (Poster)

This research aims to identify urban heat islands and use georeferenced data to conduct a Fluid Dynamics Analysis of urban climate conditions. The objective is to understand the phenomenon and propose a strategic tool for urban climate planning to prevent and mitigate heat islands. This analysis requires the consideration of a wide range of climatological, environmental, and urban parameters to understand the dynamics of the physical phenomenon, solving the Mass, Momentum, and Energy Conservation Equations. It was possible to compare maps with data from certain urban areas, and the study identified the influence of urban transformations on surface temperatures, as well as an understanding of the city's formation. The research revealed that the reduction of green areas, such as vegetation cover and water resources, significantly influenced the formation of heat islands. This study aims to promote a tool to support urban planning based on environmental and urban climate strategies, as well as the utilization of machine learning algorithms to assist in planning decisions.

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

Social cartography of water in the Brazilian semi-arid region: strategies for a civic pedagogy

Alves de Albuquerque, Mariana Zerbone[1]

1Federal Rural University of Pernambuco, Recife, Brazil

ABSTRACT (Poster)

Sertânia is a municipality in the Brazilian Semiarid Region, located in the state of Pernambuco, which has historically suffered from difficult access to water. This municipality is connected by the Moxotó River, which is intermittent, and has an average annual rainfall of 600 mm. In 2018, Sertânia became part of the São Francisco River integration project, and with this came the hope of access to water for the population. Sertânia has around 36,050 inhabitants distributed over 2,421,527 km, considering households with monthly income of up to half the minimum wage per person, it had 49.4% of the population in these conditions. 43.7% of households without adequate sanitation, and only 10.1% of urban households on public roads with adequate urbanization. Even with the construction of canals that cut through Sertânia, the municipality still suffers from difficult access to water due to political and infrastructure reasons. In this way, in order to contribute to combating climate change, and to dialogue with the population about forms of climate justice and access to water, this project, called Esperançar, was created to reduce social inequalities, with the aim of presenting instruments for fighting for access to water and the use of water resources in semi-arid areas. Therefore, this research aims to develop a citizen pedagogy that allows the population to carry out a territorial analysis to contribute to the management of water resources within communities in areas of potential socio-environmental vulnerability, observing natural and anthropic factors in perspective of possible scenarios in the face of adaptation to climate change. For this, the methodology used was the social cartography of water, in order to understand the uses and conflicts with water in the region. Social cartography workshops were held with students and teachers from a public school in Sertânia. The choice of school as a space for the activity is based on the importance of this space in modifying actions and ways of seeing the world. A socio-environmental reading was carried out through citizen pedagogy to establish strategies for coping with risks and vulnerabilities in the face of difficulties in accessing water. A booklet was prepared with guidelines based on SDG 6, which addresses the topic of clean water and sanitation, specially thre goal 6B, to support and strengthen the participation of local communities in improving water and sanitation management.

11th German-Brazilian Symposium
for Sustainable Development
Towards a Resilient and Safe Future
University of Tübingen - Germany | March 20-23, 2024

Ecovillages as Nature-Based Solutions (NbS): A Case Study in Cafuringa - Federal District, Brazil

Carneiro Marques, Lara Oberdá[1]

[1]*Universidade de Brasília (UnB), Brasilia, Brazil*

ABSTRACT (Poster)

The study of socio-environmental resilience focuses on how socio-ecological systems adapt and absorb impacts, crucial in the face of climate change. The latest IPCC report (2023) attributes a 1.1°C global warming to human activity, leading to intensified extreme weather events worldwide, impacting food, water, health, economies, and ecosystems.

The Multilevel Perspective emphasizes the need for changes beyond technology to achieve sustainability (Geels, 2010). Grassroots social innovations from civil society address unmet social and environmental needs, showing efficacy where centralized strategies lack (Roysen & Mertens, 2016). In this study, ecovillages are seen as vital for experimenting with land use strategies and community governance at a local level, employing alternative ways of understanding the human-nature relationship. They encompass effective mitigation and adaptation strategies tailored to local contexts, offering broader benefits, particularly in addressing climate change.

An ecovillage is a type of intentional, traditional, or urban community that consciously plans its path based on local social, cultural, ecological, and economic principles, integrating these concepts into a complete systems design (GEN, 2023). Intentional communities and ecovillages employing ecosystem-based methods to tackle social challenges and benefit both nature and human systems align with Nature-Based Solutions (NBS), which are defined as "actions that address environmental, social, and economic challenges, maximizing the benefits provided by nature (...) inspired, supported, or copied from nature" (EC, 2015).

The Cafuringa Intentional Community Network, located in Federal District - Brazil, consists of 10 independently created communities covering circa 500 ha. There are roughly 100 families living in the communities, settled in a land which was once covered by conventional farms that replaced the original native vegetation of Cerrado. Through remote sensing analysis and qualitative methods, there has been a noticeable restoration process of native vegetation, accompanied by the resurgence of various springs and improvements of local rivers. In addition to prioritizing reforestation, the communities, in general, have chosen to use bioconstruction techniques and, regarding environmental sanitation, they have implemented 34 evapotranspiration tanks. Some community's dwellers also have Agroforestry Systems in their plots, providing food and income for their community.

4 Excursions

4.1 Guided city tour

Mar 23, Saturday
Departure: 9:30 am – 12.00 pm

The tourist attraction of Tübingen is its historic center, where the best-preserved half-timbered houses in the country are located. This is because the city was preserved during the Second World War, as it wasn't a city with a lot of commerce.
The group visited the Marktplatz, the main square where the town hall (Rathaus), built in 1435, is located. This is where the city's main events take place, as well as fruit and vegetable markets. The participants visit the Stiftskirche, which was one of the first churches to be converted to Protestantism.
As well as the Castle (Schloss Hohentübingen), which has Renaissance architecture and is now part of the University. Great scientists have passed through here, and in 1869 Friedrich Miescher discovered deoxyribonucleic acid (DNA).
Finally, the group left the old town and walk across the Neckar Island, an island created by the bifurcation of the Neckar and home to many centuries-old trees.
A walk through Tübingen is worthwhile.



4.2 Technical Excursion to Hohenheim

Mar 23, Saturday
8.00 am – 5.30 pm

The Hohenheim excursion was scheduled for March 23rd, running from approximately 8:00 am to 5:30 pm. Participants had the opportunity to explore several notable attractions, including the University of Hohenheim's greenhouse, a brief tour of the castle, and a visit to the Agriculture Museum.

The Phytotechnikum research greenhouse is a state-of-the-art facility equipped with advanced climate control systems, automated irrigation, a mobile fertilization machine,
and more. Meanwhile, the Agriculture Museum offers insights into the history of farming, food processing, motorization, and rural life.

Organizers

Eberhard Karls Universität Tübingen

Baden-Württembergisches Brasilien- und Lateinamerika-Zentrum

LEUPHANA Universität Lüneburg

Universität Hohenheim

Funding partners

DWIH São Paulo
Land der Ideen

FAPESP
Fundação de Amparo à Pesquisa do Estado de São Paulo

CAPES

Sponsor

KÄRCHER

STIHL

Universitätsbund Tübingen e. V.

Contacts

Contact of the Symposium:
Dr. Martina Schulze und Dr. Júlia Galvez

Baden-Württembergisches Brasilien- und Lateinamerika-Zentrum der Universität Tübingen
Nauklerstr. 35
72074 Tübingen

Phone: +49(0)7071-29 74823

E-Mail: symposium@bralat.uni-tuebingen.de

Press relations:
Ana Calegari

Baden-Württembergisches Brasilien- und Lateinamerika-Zentrum der Universität Tübingen
Nauklerstr. 35 - Raum 1.07
72074 Tübingen

Phone: +49(0) 7071-29 74823

E-Mail: news@bralat.uni-tuebingen.de

https://uni-tuebingen.de/de/253541

https://www.linkedin.com/company/gbsymposium2024/