



THE ATHENS INSTITUTE FOR EDUCATION AND RESEARCH

# Abstract Book

**16<sup>th</sup> Annual International Symposium on  
Agricultural Research  
10-13 July 2023 Athens, Greece**

**Edited by  
Timothy M. Young & Olga Gkounta**

2023



Abstracts  
16<sup>th</sup> Annual International  
Symposium on Agricultural  
Research

10-13 July 2023, Athens, Greece

Edited by  
Timothy M. Young & Olga Gkounta

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## Preface

This book includes the abstracts of all the papers presented at the 16<sup>th</sup> Annual International Symposium on Agricultural Research (10-13 July 2023), organized by the Athens Institute for Education and Research (ATINER).

A full conference program can be found before the relevant abstracts. In accordance with ATINER's Publication Policy, the papers presented during this symposium will be considered for inclusion in one of ATINER's many publications only after a blind peer review process.

The purpose of this abstract book is to provide members of ATINER and other academics around the world with a resource through which they can discover colleagues and additional research relevant to their own work. This purpose is in congruence with the overall mission of the association. ATINER was established in 1995 as an independent academic organization with the mission to become a forum where academics and researchers from all over the world can meet to exchange ideas on their research and consider the future developments of their fields of study.

To facilitate the communication, a new references section includes all the abstract books published as part of this symposium (Table 1). I invite the readers to access these abstract books –these are available for free– and compare how the themes of the conference have evolved over the years. According to ATINER's mission, the presenters in these conferences are coming from many different countries, presenting various topics.

**Table 1.** *Publication of Books of Abstracts of Proceedings, 2010-2023*

Year	Papers	Countries	References
2023	35	23	Young and Gkounta (2023)
2022	34	23	<a href="#">Uddin and Gkounta (2022)</a>
2021	11	10	<a href="#">Papanikos (2021)</a>
2020	8	6	<a href="#">Papanikos (2020)</a>
2019	29	18	<a href="#">Papanikos (2019)</a>
2018	26	15	<a href="#">Papanikos (2018)</a>
2017	41	23	<a href="#">Papanikos (2017)</a>
2016	39	23	<a href="#">Papanikos (2016)</a>
2015	87	43	<a href="#">Papanikos (2015)</a>
2014	54	21	<a href="#">Papanikos (2014)</a>
2013	53	29	<a href="#">Papanikos (2013)</a>
2012	33	18	<a href="#">Papanikos (2012)</a>
2011	63	24	<a href="#">Papanikos (2011)</a>
2010	61	23	<a href="#">Papanikos (2010)</a>

It is our hope that through ATINER's conferences and publications, Athens will become a place where academics and researchers from all over the world can regularly meet to discuss the developments of their disciplines and present their work. Since 1995, ATINER has organized more than 400 international conferences and has published over 200 books. Academically, the institute is organized into 6 divisions and 37 units. Each unit organizes at least one annual conference and undertakes various small and large research projects.

For each of these events, the involvement of multiple parties is crucial. I would like to thank all the participants, the members of the organizing and academic committees, and most importantly the administration staff of ATINER for putting this symposium and its subsequent publications together.

**Gregory T. Papanikos**  
**President**

## **Editors' Note**

These abstracts provide a vital means to the dissemination of scholarly inquiry in the field of Agriculture. The breadth and depth of research approaches and topics represented in this book underscores the diversity of the symposium.

ATINER's mission is to bring together academics from all corners of the world in order to engage with each other, brainstorm, exchange ideas, be inspired by one another, and once they are back in their institutions and countries to implement what they have acquired. The 16th Annual International Symposium on Agricultural Research accomplished this goal by bringing together academics and scholars from 23 different countries (Brazil, Canada, China, Czech Republic, France, Germany, Guyana, India, Italy, Jordan, Mauritius, Mexico, Morocco, Poland, Portugal, Romania, Saudi Arabia, South Africa, Spain, Switzerland, Türkiye, UK, USA), which brought in the conference the perspectives of many different country approaches and realities in the field.

Publishing this book can help that spirit of engaged scholarship continue into the future. With our joint efforts, the next editions of this symposium will be even better. We hope that this abstract book as a whole will be both of interest and of value to the reading audience.

**Timothy M. Young & Olga Gkounta**  
**Editors**

## **16<sup>th</sup> Annual International Symposium on Agricultural Research, 10-13 July 2023, Athens, Greece**

### **Organizing & Scientific Committee**

All ATINER's conferences are organized by the Academic Council. This conference has been organized with the assistance of the following academic members of ATINER, who contributed by reviewing the submitted abstracts and papers.

1. Gregory T. Papanikos, President, ATINER & Honorary Professor, University of Stirling, U.K.
2. Timothy M. Young, Head, Agriculture Unit, ATINER, Emeritus Professor, The University of Tennessee, USA & CEO and President, T.M. Young Institute, LLC, USA.

## FINAL CONFERENCE PROGRAM

16<sup>th</sup> Annual International Symposium on Agricultural Research, 10-13 July  
2023, Athens, Greece

### PROGRAM

08.30-09.15  
Registration

---

09:15-10:00

Opening and Welcoming Remarks:

- **Gregory T. Papanikos**, President, ATINER.

10:00-11:30 Session 1

**Moderator: Nadhir Al-Ansari**, Head, Environment Unit, ATINER & Professor, Lulea University of Technology, Sweden.

1. **Mona Ray**, Professor, Morehouse College, USA.  
*Title: Environmental (In)Justice for Women in Africa Caused by Climate Change.*
  2. **Xiaohong Xu**, Professor, University of Windsor, Canada.  
**Tianzhu Zhang**, Researcher, University of Windsor, Canada.  
**Yushan Su**, Senior Scientific Advisor, Ontario Ministry of the Environment, Conservation and Parks, Canada.  
*Title: Long-Term Trends of Ground-Level Ozone and Its Precursors in Windsor, Canada.*
  3. **Svitlana Prokhorova**, Visiting Researcher, Bern University of Applied Sciences, Switzerland.  
*Title: Prospects for Using Herbarium and Archival Data to Track the Relationship between Climate Change and Plant Morphological Parameters.*
  4. **Piyali Chowdhury**, Researcher, Centre for Environment, Fisheries and Aquaculture Science, UK.  
*Title: Data Driven Methods in Identifying Climate Change Induced Coastal Erosion around Local Beaches.*
- 

Discussion

11:30-13:00 Session 2

**Moderator: Xiaohong Xu**, Professor, University of Windsor, Canada.

1. **Roberto Alves Braga**, Professor, Federal University of Lavras, Brazil.  
*Title: Identification of Greenish Soybean Seeds Through Image Processing, Under Different Types of Lighting.*
2. **Juan Martinez Solis**, Assistant Professor, Chapingo Autonomus University, Mexico.  
**M. Gisela Pena Ortega**, Assistant Professor, Chapingo Autonomus University, Mexico.  
*Title: Radicle Protrusion: An Alternative to Predict Germination Percentage in Seed Certification Processes.*
3. **Priya Huzar Fatty Beejan**, Researcher, Food and Agricultural Research and Extension Institute, Mauritius.  
**Rita Nowbuth**, Researcher, Food and Agricultural Research and Extension Institute, Mauritius.  
*Title: Preliminary Studies on the Potential of Button Mushroom Production in Mauritius: Research Undertaken and the Future Production Prospects and Impact Food Security.*
4. **Ertan Yildirim**, Professor, Atatürk University, Turkiye.

**Melek Ekinci**, Professor, Atatürk University, Türkiye.  
**Metin Turan**, Professor, Yeditepe University, Türkiye.  
*Title: Effect of Amino Acid Application on Physiological and Biochemical Properties of Salt-Stressed Broccoli Seedlings.*

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**Discussion**

**13:00-14:30 Session 3**

**Moderator: Priya Huzar Fatty Beejan**, Researcher, Food and Agricultural Research and Extension Institute, Mauritius.

1. **Isaac Rampedi**, Associate Professor, University of Johannesburg, South Africa.  
*Title: Planning and Implementing an ISO 14 001 Environmental Management System in a High Technology Company in South Africa: A Case Study of Conceptualisation, Benefits and Challenges.*
2. **Olalekan Olatunji**, Researcher, Keele University, UK.  
*Title: Determination of Radiological Stressors in Petroleum Drilling, Bitumen Exploitation and Coal Mining Site in Southern Nigeria.*
3. **Melek Ekinci**, Professor, Atatürk University, Türkiye.  
**Ertan Yıldırım**, Professor, Atatürk University, Türkiye.  
**Metin Turan**, Professor, Yeditepe University, Türkiye.  
*Title: Effects of Microplastics in Plants.*

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**Discussion**

**14:30-16:00 Discussion + Lunch**

**16:00-17:30 Session 4**

**Moderator: Olga Gkounta**, Researcher, ATINER.

1. **Gloria Marchetti**, Professor, University of Milan, Italy.  
*Title: The Changes in the Approach to Environmental Protection by the European Union and its Member States and the Regulatory Innovations in Italy.*
2. **António dos Santos Queirós**, Professor, Lisbon University, Portugal.  
*Title: Ecological Civilization, The Fourth Stage of Human Civilization.*
3. **Surinder Deswal**, Professor, National Institute of Technology Kurukshetra, India.  
**Shiyam Shubhanker Sahu**, PhD Student, National Institute of Technology Kurukshetra, India.  
*Title: Effectiveness of Sequential Batch Reactor in Treating Wastewater from a Residential Campus of Academic Institute.*
4. **Bianca Mihalache**, PhD Student, University of Bucharest, Romania.  
**Sabina Stefan**, Emeritus Professor, University of Bucharest, Romania.  
**Ana - Maria Rosianu**, PhD Student, University of Bucharest, Romania.  
**Gabriela Iorga**, Lecturer, University of Bucharest, Romania.  
*Title: Temporal Patterns and Trend Analysis of Trace Gases for Selected Sites in South-Eastern Romania.*

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**Discussion**

**17:30-19:00 Session 5**

**Moderator: Olga Gkounta**, Researcher, ATINER.

1. **Brij Tewari**, Professor, University of Guyana, Guyana.  
*Title: Phytochemical Microbial Fungal and Oxidant Properties of Syzygium Cumini Leaves Extract: Flora of Guyana.*
2. **Betty Cepeda-Salgado**, Graduate Student, Louisiana State University, USA.  
**Gyu S. Lee**, Director, Korea Rural Community Corporation, South Korea.  
**Seung I. Kam**, Professor, Louisiana State University, USA.  
*Title: Evaluation of Pilot-Scale Surfactant and Foam Remediation Processes for LNAPL Removal.*
3. **Dhanuska Wijesinghe**, Assistant Professor, James Madison University, USA.  
**Spencer Schmidt**, Undergraduate Student, University of Nebraska-Lincoln, Nebraska, USA.  
*Title: Influence of Soil Properties on the Variability of Sediment Transport Within Cave Systems – Owl Cave, Highland County Virginia, USA.*

**Discussion**

**20:30-22:30**

**Athenian Early Evening Symposium (includes in order of appearance: continuous academic discussions, dinner, wine/water, music and dance)**

**Tuesday 11 July 2023**

<p><b>10:00-11:30 Session 6</b> <b>Moderator: Ms. Celia Sakka (ATINER Administration)</b></p>	<p><b>07:30-10:30</b> <b>Old and New-An Educational Urban Walk</b></p>
<ol style="list-style-type: none"> <li>1. <b>Kamilia Mahdaoui</b>, PhD Student, Hassan II University of Casablanca, Morocco. <i>Title: Evaluation of Future Climate in the Bouregreg River Basin (Morocco) Under Climate Change.</i></li> <li>2. <b>Christoph Schattschneider</b>, PhD Student, Technical University of Applied Sciences Wildau, Germany. <b>Sina Piontek</b>, Student, Berliner Hochschule für Technik, Berlin, Germany. <b>Hannes Jacobs</b>, Scientific Assistant, Technical University of Applied Sciences Wildau, Germany. <b>Andreas Foitzik</b>, Professor, Technical University of Applied Sciences Wildau, Germany. <b>Giovanni la Rosa</b>, Scientific Assistant, University of Rome “Tor Vergata”, Italy. <i>Title: Proof of Principle of Wastewater Treatment Using Plasma Discharge to Reduce the Amount of Methylparaben.</i></li> </ol> <p><b>Discussion</b></p>	<p>The urban walk ticket is not included as part of your registration fee. It includes transportation costs and the cost to enter the Parthenon and the other monuments on the Acropolis Hill. The urban walk tour includes the broader area of Athens. Among other sites, it includes: Zappion, Syntagma Square, Temple of Olympian Zeus, Ancient Roman Agora and on Acropolis Hill: the Propylaea, the Temple of Athena Nike, the Erechtheion, and the Parthenon. The program of the tour may be adjusted, if there is a need beyond our control. This is a private event organized by ATINER exclusively for the conference participants.</p>

**11:30-13:00 Session 7**

**Moderator:** Ertan Yıldırım, Professor, Atatürk University, Türkiye.

1. **Zbyněk Sokol**, Researcher, Institute of Atmospheric Physics, Czech Academy of Sciences, Czech Republic.  
*Title: Utilization of Satellite-Derived Cloud Cover in the Model of Road Surface Conditions.*
2. **Ikhlas Alhejoj**, Associate Professor, The University of Jordan, Jordan.  
*Title: Invertebrate Assemblages as an Indicator of Aquatic Environmental status in the Eastern Side Wadis of Wadi Araba.*
3. **Dikeledi Petunia Malatji**, Senior Lecturer, University of South Africa, South Africa.  
*Title: 16srRNA-Based Bacterial Community Profiling of Ascaridia Galli Positive and Negative Village Chickens Using Next Generation Sequencing.*

**Discussion**

**13:00-15:00 Session 8**

**Moderator:** Ikhlas Alhejoj, Associate Professor, The University of Jordan, Jordan.

1. **Ahmed Alsagan**, Professor, King Abdulaziz City for Science and Technology, Saudi Arabia.  
**Khalid Abdoun**, Professor, King Saud University, Saudi Arabia.  
**Osman Altahir**, Professor, Naif Arab University for Security Sciences, Saudi Arabia.  
**Mohamed Alsaiady**, Professor, Arabian Agricultural Services Company, Saudi Arabia.  
**Ahmed Al-Haidary**, Professor, King Saud University, Saudi Arabia.  
*Title: Effects of Irrigation Frequency and Organic Selenium Fertilization on the Chemical Composition of Moringa Oleifera and Moringa M. Peregrina.*
2. **Recep Ozkan**, Senior Micropaleontologist, Turkish Petroleum Co., Türkiye.  
**Demir Altiner**, Professor, Middle East Technical University, Türkiye.  
*Title: Stratigraphy, Micropaleontology (Benthic Foraminifer) and Sedimentology of the Cretaceous Carbonate Sequence on the Northern Arabian Plate (Southeast Turkey).*
3. **Jagannatha Venkataramaiah**, PhD Student, JAIN (Deemed-to-be-University, India), India.  
**Shobha Jagannath**, Former Professor, Mysore University, India.  
**Sahana Jagannath**, Former Scientific Assistant, MSS 11 International Space University, France.  
**Spanadana Jagannatha**, Resident Surgeon, SGSSH & RI Lucknow, People Science Forum, KRVP, India.  
**Sadhana Jagannatha**, Research Fellow, University of Stirling, UK.  
*Title: Space Eco Literacy as a Public Good for Enabling Communities.*
4. **Zhen Wang**, Senior Engineer, Research Institute of Petroleum Exploration & Development, China.  
*Title: Tectonic and Sedimentary Evolution of the Precaspian Basin during Late Paleozoic Period.*
5. **Jaroslav Milewski**, Professor, Warsaw University of Technology, Poland.  
*Title: Multi-modal Porous Microstructure for High Temperature Fuel Cell Application.*

**Discussion**

**15:00-16:00 Discussion + Lunch**

**16:00-17:30 Session 9**

**Moderator:** Olga Gkounta, Researcher, ATINER.

1. **Hongqi Liu**, Director, Southwest Petroleum University, China.  
*Title: Study on Electrical Characteristics and Formation Mechanism of Micro-Ion- Capacitor in Shale Pore and Fracture Structure.*
2. **Diana Olah**, Assistant Professor, University of Agronomic Sciences and Veterinary



Medicine of Bucharest, Romania.  
*Title: Changes in Stress Levels Influence the Non-Specific Antimicrobial Protection in Angora Goats during Acclimatization.*

3. **Marco Giampaolletti**, Research Fellow, Sapienza University of Rome, Italy.  
**Fabrizio Tucci**, Full Professor, Sapienza University of Rome, Italy.  
*Title: Reforestation of Urban Districts in Mediterranean Climate: New Decarbonization Models for Cities.*

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#### Discussion

#### 17:30-19:00 Session 10

**Moderator: Olga Gkounta**, Researcher, ATINER.

1. **Arturo F. Castellanos-Ruelas**, Professor & Researcher, Autonomous University of Yucatan, Mexico.  
**Alan Garcia-Lira**, Professor & Researcher, Autonomous University of Yucatan, Mexico.  
**David A. Betancur-Ancona**, Professor & Researcher, Autonomous University of Yucatan, Mexico.  
**Luis A. Chel-Guerrero**, Professor & Researcher, Autonomous University of Yucatan, Mexico.  
*Title: Feasibility of the Use of Bioactive Compounds in Pet Food.*
2. **Silvia Salustiano**, Professor, Federal Institute of Education, Brazil.  
**Jesiel Souza Silva**, Professor, Federal Institute of Education, Brazil.  
**Tânia Marcia Freitas**, Researcher, Federal Institute of Education, Brazil.  
**Pedro Abel Vieira Junior**, Researcher, Brazilian Agricultural Research Corporation (EMBRAPA), Brazil.  
**Durval Dourado Neto**, Professor, Superior School of Agriculture "Luiz de Queiroz" - ESALQ/ University of São Paulo - USP, Brazil.  
*Title: Sustainable Rural Development: Mapping and Multidisciplinary Analysis.*
3. **Dante Arturo Rodríguez-Trejo**, Professor, Chapingo Autonomous University, Mexico.  
*Title: Logistic Probability of Mortality Models to Estimate Adaptation to Fire in Three Mexican Tree Species.*
4. **Jose Manuel Castillo Lopez**, Professor, University of Granada, Spain.  
*Title: Myths, Fallacies, Paradoxes, Mistakes and Virtual Water in the Mediterranean.*

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#### Discussion

#### 19:00-20:30

**Ancient Athenian Dinner** (includes in order of appearance: continuous academic discussions, dinner with recipes from ancient Athens, wine/water)

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**Wednesday 12 July 2023**  
**An Educational Visit to Selected Islands**  
**or**  
**Mycenae Visit**

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**Thursday 13 July 2023**  
**Visiting the Oracle of Delphi**

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**Friday 14 July 2023**  
**Visiting the Ancient Corinth and Cape Sounio**

**Ikhlas Alhejoj**

Associate Professor, The University of Jordan, Jordan

## **Invertebrate Assemblages as an Indicator of Aquatic Environmental Status in the Eastern Side Wadis of Wadi Araba**

In this article aquatic organisms in the eastern side wadis of Wadi Araba are studied on their potential use as environmental indicators. Aquatic invertebrate animals are found in almost all streams having different environmental conditions. The presence or absence of aquatic organisms can provide important clues about the environmental health of the aquatic system. Contrary to chemical and physical water analyses macro-organisms provide a very rapid method to check changes in the water quality. Several species of aquatic animals are observed in the studied wadis including Ephemeroptera (Mayflies), Odonata (Dragonflies & Damselflies), Hemiptera (True Bugs), Trichoptera (Caddisflies), Gastropods (Physa), Annelida (Oligochaetes tubifex, leeches) Coleoptera (Beetle), Diptera (black fly Simuliidae, Chironomid midge)

This study results classify the aquatic communities into three groups as follows:

- ✓ **Organic pollution-tolerant group:** Faunal species of sludge worms (tubifex Annelida: Oligochaeta), leeches (Annelida: Hirudinea), *Simulium sp*, black fly (Diptera: Simuliidae), *blood worms of Chironomus dorsalis* (Diptera: Chironomidae), *Physa acuta* (Mollusca: Gastropoda) and *Baetis monnerati* (Ephemeroptera) which indicate polluted water with very low oxygen content.
- ✓ **Moderately organic pollution-tolerant group:** *Platycnemis sp* (Odonata: Damselfly), *Libellulidae* (Odonata: Dragonflies), *Cheumatopsychesp* (Hydropsychidae caddisfly), *Physa acuta* (Mollusca: Gastropoda) and *Baetis monnerati* (Ephemeroptera) which indicate moderately polluted water with low oxygen content.
- ✓ **Intolerant organic pollution group:** Macro invertebrate animals, especially those belonging to aquatic *oxygen-dependent organism such as most species of mayfly (e.g., choroterpes ortali and Nigrobaetis vuatazi), gastropods (Melanopsis buccinoidea and Theodoxus sp.)*

which indicate good quality water with high oxygen content and free or very low organic chemicals' contents.

A groups of aquatic animals which are sensitive to water pollution and their presence indicate very good, clean fresh water have not been observed in the studied wadis although they were documented from other water bodies in Jordan such as Flatworms (*Turbellaria*), larvae of *Stoneflies* (*Plecoptera*) and Amphipod.

In the study area, the most commonly occurring mayfly species, is *Baetis monnerati* (Ephemeroptera) except in mineralized thermal water where they disappeared. While *choroterpes ortali* with gastropods (*Pseudamnicola*) are present. Also, *Baetis monnerati* which is more tolerant to organic waste pollution than *choroterpes ortali*, *Nigrobaetis vuatazi* and *Caenis sp.* can be found in not polluted flowing freshwater. *Nigrobaetis vuatazi* and *Caenis sp.* occur rarely in the study area probably as a result of high aridity.

The study result will enable comparison with any future changes in the natural habitat expected to take place as a result of planned developments. Knowing that bio-indicator methodologies are fast and trustful ways of indicating changes taking place in the water and environmental quality and have proven themselves in Jordan during the last decade.

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**Effects of Irrigation Frequency and Organic Selenium Fertilization on the Chemical Composition of *Moringa Oleifera* and *Moringa M. Peregrina***

**Objective:** This study was conducted to determine the combined effect of irrigation frequency and selenium (Se) fertilizer levels on the chemical composition of *Moringa oleifera* and *Moringa peregrina*, with the ultimate goal of incorporating *Moringa oleifera* and *Moringa peregrina* in sheep and poultry feed.

**Methodology:** The combined effect of irrigation frequency and selenium (Se) fertilizer levels were studied in a completely randomized split plot design with three replicates at Al-Badraniya farm in Al-Ghat district of Saudi Arabia, during the summer season of 2021. The experiment included two plant species (*M. oleifera* and *M. peregrina*), four irrigation frequencies (7, 10, 15, and 20 days), and three Se levels (0.0, 12.5 and 25 mg/L foliar spray). The selenium treatments were obtained by foliar spray of organic amino selenium fertilizer 2.5% (Organic Standards Fertilizer Production Company, Riyadh, KSA). Drip irrigation together with the standard field practices adopted in the region were practiced during this trial.

**Results:** The results of the study indicated that the irrigation frequency and the foliar spray with organic amino selenium fertilizer significantly affected proximate analysis (crude protein, ether extract, crude fiber and ash contents), as well as the minerals contents (N, P, K, Ca, Mg and Se) of the dried leaves and upper fine stems of *M. oleifera* and *M. peregrina* in the different cutting periods. The results of this study showed that the Se contents of Moringa vegetative plant parts depend not only on the level of organic amino selenium fertilizer application, but also on the stage of plant growth during which the

fertilizer was applied. It has been confirmed that the most effective method of organic amino selenium fertilizer application is the foliar spray during the maximum vegetative growth rate.

**Conclusion:** The effect of organic amino selenium fertilizer application and irrigation frequency on all studied traits allowed the classification of *M. oleifera* and *M. peregrina* vegetative plant parts as suitable for livestock feeding. Selenium foliar spray can be considered as a safe method to increase the selenium content of both *M. oleifera* and *M. peregrina* vegetative parts, which may contribute to increasing the functional feeding quality of these plants.

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## **Identification of Greenish Soybean Seeds through Image Processing, Under Different Types of Lighting**

A high occurrence of greenish soybean seeds in crops is an issue, these types of seeds have low physiological quality, which can generate seedlings with anomalies, if destined for processing in industries, the presence of chlorophyll is undesirable, requiring additional processes for its removal. This work aimed to evaluate the differentiation of mature and greenish soybean seeds, illuminated with red laser, green laser, red LED, and fluorescent lamp, using image processing. Images of mature and greenish soybean seeds were captured at a resolution of 340x480 pixels, illuminated with red laser, green laser, red LED, and fluorescent lamp. Subsequently, the averages of the gray levels of each image were obtained in the red, green, blue channels and in images converted to grayscale 8-bit. The data were submitted to tests of variance, Principal Component Analysis, Multiple Factor Analysis, and gray level calculation for image classification. From the results, there was greater efficiency of lighting with red laser, red LED, and fluorescent lamp in the separation of images, reaching a hit rate above 90% in the red channel.

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## **Feasibility of the Use of Bioactive Compounds in Pet Food**

### *Introduction*

Obesity affects 25% of the population of dogs and cats in the western world. Obesity in these pets, just as it happens in humans, induces a series of diseases: diabetes, arterial hypertension, dyslipidemia, cholesterolemia, among others.

For both humans and pets, there is another series of diseases associated with obesity in adulthood, such as the presence of cancer-inducing free radicals, diabetes, which in both cases predispose to a fatal condition.

These conditions can be controlled by pharmacological means, through dietary management or using Protein Hydrolyzates (PH) with specific bioactivity.

Obtaining PH is not new. They have been investigated for more than 20 years. Results obtained in laboratory animals are definitive. Widespread use to help improve men's health is nearby in time. Then, or simultaneously, it will be the turn to use them in pets. With no doubt, more research in dogs and cats is necessary.

Pet foods have come a long way, technologically speaking, in the last 60 years. In the 60's, animals were fed with table scraps (Pet Feeding); now a day, the food is of high quality and aimed at maintaining health (Pet Parenting). This market has grown enormously. Only in the period from 2018 to 2021 an increase in the consumption of Pet Food in Mexico went from 1,094 to 1,299 thousand tons, that is, an increase of 18.6%.

Recovered data show that there is a sharp tendency in the industry to develop even better nutritionally design pet food, called Super Premium. This modern and dynamic industry will find in the near future that the incorporation of PH will be a logical step to produce better quality food.

### *Objectives*

Analyze of the information published in scientific journals on metabolic disorders in pets and evaluate the possibility of the use of PH with bioactivity as alternative to improve quality of life to both, animals and human owners.

### *Results*

The incidence of metabolic diseases is increasing in pets.

The scientific literature indicates that bioactivity has been found in PH of proteins from fish, milk, legumes, eggs, etc. The reported bioactivity is highly variable: antihypertensive, anticholesterolemic, antidiabetic, antimicrobial, antioxidant, antithrombotic, etc. There are new food resources that guarantee a reliable supply of proteins required by the Chemical Industry to obtain PH; for example, Chia seeds, tropical legumes, etc.

There are companies that use phytogetic as food additives to help counteract some of the aforementioned syndromes, but now a days none use PH. Surely this type of companies will be the first interested in PH.

### *Discussion*

People hope that pets will live for many, many, years but the fact is that the average life expectancy is 10-12 years for dogs and 10-14 years for cats. Older pets have very specific needs and are particularly susceptible in later years to cancer and other diseases.

Combining the safe supply of protein resources to obtain hydrolysates, having a dynamic industry for obtaining them, and having a growing market that requires ensuring the well-being of pets, without a doubt, the incorporation of PH in pet food will take place in the near future.

### *Conclusion*

In a near time horizon, PH will be incorporated into the diet of pets, improving and prolonging their quality of life. This will be also of great benefit for the owner



**Jose Manuel Castillo Lopez**  
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## **Myths, Fallacies, Paradoxes, Mistakes and Virtual Water in the Mediterranean**

It would not be true to say that everything remains the same between us in terms of inland waters after the course of the last three decades. Indeed, after the 1995 drought or perhaps coinciding with it, the social movements and a very important part of the scientists and even numerous members of the administrations themselves have dealt profusely with the issue of continental waters. As a result of the numerous books, articles in scientific journals, congresses, etc. the so-called New Water Culture, demand management, water quality, etc. Today they are expressions widely disseminated among academics and managers, in such a way that we either consider ourselves co-religionists with these new trends in water policy or, at least, few dare to speak out publicly against them.

But, in reality, have the aforementioned changes and others that have occurred substantially affected the principles that inspire water policy in Mediterranean Europe? Or, on the contrary, every time there is less rainy seasons, “the old ghosts” appear?

In this paper I am going to analyze some aspects of the water situation in the European Mediterranean and, above all, the management model that has been developed in recent decades.

Widely disclosed terms, expressions and concepts such as *dumping water into the sea, hydraulic works are of general interest, wet Spain and dry Spain, the transfer will solve the problem definitively, water deficit, water must be distributed with solidarity, everyone has the right to water, water is a public good*, etc. They will be reviewed from a scientific approach.

My conclusion is that The New Culture of Water, from the South, requires prior recognition that the greatest manifestations of water scarcity are not produced by climatic conditions, but rather because of the economic and social development model followed, by the mismanagement of the competent institutions and, definitely, because the conflicts evidenced between the different users have been resolved solely with arguments of political and, ultimately, economic power.

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&

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## **Evaluation of Pilot-Scale Surfactant and Foam Remediation Processes for LNAPL Removal**

Surfactant injection has been widely used in enhanced oil recovery (EOR) over decades to increase hydrocarbon production from petroleum-bearing geological formations, where surfactant molecules play an important role by reducing capillary force and interacting with reservoir oil components. The efficiency of surfactant process can further be improved by foaming the follow-up gas injection with surfactant solutions (together or alternatively), which has long been regarded as an effective means of overcoming reservoir heterogeneity, delaying gravity segregation (between the existing liquids and injected gas), controlling mobility of the injectants, and therefore increasing sweep efficiency. The versatility of these foam characteristics comes from the stability of foam films (thermodynamically unstable but can be long-lived) and the non-Newtonian flow rheology that can counteract the permeability contrast (through capillary actions). These surfactant/foam processes have recently been extended into the in-situ remediation of NAPLs (nonaqueous phase liquids) in shallow aquifer and soil layers.

This study presents a series of steps taken over the years to investigate pilot-scale surfactant and foam processes for the in-situ NAPL remediation within a military base in South Korea. The pilot test has the treatment area of 5 m × 5 m (a real view) with the vertical depth of 3 m (side view), prepared with a line-drive pattern (i.e., 3 wells for injection and 3 wells for extraction). The in-situ treatment consists of 20 days of surfactant injection to have an easy oil out first, and next 3 days of surfactant and gas injection to accelerate the removal of remaining oil (i.e., a total of 23 days of operations).

More details on the site and process information are given as follows. The geological system is made up of shallow unconsolidated sands (between the concrete pavement (upper boundary) and fresh rock (lower boundary)), with the pore fraction of 8.3% and the absolute permeability of 1.0 darcy, which are saturated with groundwater

(except for the near-top vadose-zone layer where a small amount of gas resides) and with the average remaining oil saturation of 5.0%. The NAPL phase of interest has the density of 0.68 g/cc and viscosity of 0.70 cp, while the surfactant solution (i.e., low concentration non-ionic Tween-80 surfactant and field water) has the density of 1.04 g/cc and the viscosity of 1.0 cp.

The field pilot test and associated numerical simulation studies can be summarized as follows: (i) the surfactant/foam process applied in this particular field is shown to be effective by recovering more than 90% of contaminants, (ii) computer simulations can be a useful tool for history matching the field test outcomes and guiding the design of similar operations, and (iii) computer simulations can help predicting the outcomes from various possible scenarios, as a part of sensitivity study

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## **Data Driven Methods in Identifying Climate Change Induced Coastal Erosion around Local Beaches**

Global warming has impacted the coastal communities in multiple ways. The increased frequency in cyclone occurrence and rising sea-levels act as dual threat to the already vulnerable coastal population and ecosystem. Long-term changes in wave climate will have potential impacts on the evolution of regional coastlines. This study investigates the impact of variable wave climate on the temporal dynamics of sediment transport and coastal erosion on local scales along the Indian Ocean rim countries. Longshore sediment transport is an important nearshore process that governs coastal processes and in turn defines the orientation of coastlines. Here, we assess the changes in sediment transport rates due to the potential changes in future wave climate under variable climate scenarios. A fit for purpose model accounting for major wave parameters and longshore current was used that resulted in sediment transport volumes and indicated temporal shoreline evolution. To give a broad-brush characterisation of the coastline, the shoreline elements are classified as erosive, accretive or stable based on the comparative longshore transport rates of neighbouring elements. Net sediment transport was also measured due to the governing wave type. At some open beaches, the swell wave induced sediment transport was observed to be an order of magnitude higher than the wind wave induced transport, however, both swell and wind wave induced transport show seasonal variation. Finally, a link was established between the seasonal variation of sediment transport and the cyclogenesis periods. In addition, the wind wave induced transport was noticed to have a direct link with the latitudinal position of the inter-tropical convergence zone (ITCZ) in the northern Indian Ocean. The outcomes of this study will build resilience and reduce vulnerability to climate-related disasters at coastal defences through the development of novel tools and technical feedback into local coastal zone management policies.

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&

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**Effectiveness of Sequential Batch Reactor in Treating  
Wastewater from a Residential Campus of Academic  
Institute**

The effectiveness of a Sequential Batch Reactor (SBR) in treating domestic wastewater from a residential campus of an academic institute was assessed in this study. The experiments were carried out on a laboratory-scale SBR cylindrical vessel of geometric volume 4.6 L, having internal diameter of 14 cm, a height of 30 cm, and a working volume of 3.4 L. The SBR research test period lasted for 45 days, including the 15-day start-up cycle for sludge acclimatization. During the course of study, the reactor was run at a 15-hour, 12-hour and 9-hour cycle periods with fixed intervals of filling, reaction, settling, decanting, and idle phases. The average removal efficiency for BOD and COD increased with increase in cycle time of 9h (79.08%), 12h (85.19%) and 15h (90.52%). The percentage removal efficiency with respect to both these parameters was observed to be within a range of about 10% for all the three cycle times. Thereafter, the performance of the SBR was evaluated with 9-hour cycle time for the parameters that are necessary for Indian discharge standards. BOD, COD, TS, TDS, TSS, Amm-N, TN and TP average concentrations in the effluent were 24.75, 59.04, 385.7, 336.8, 48.9, 0.258, 4.649 and 1.341 mg/L respectively, with the removal efficiency rates of 79.08, 71.54, 62.39, 52.85, 83.07, 94.54, 69.52 and 52.53 percent respectively. The average concentration of turbidity in the effluent was 9.494 NTU with the removal efficiency rate of 91.98 percent; and the pH of the effluent was 7.241. When comparing the SBR effluent values to the Indian Standards, it was observed that all the parameters met the standards for the disposal of municipal sewage in 'Inland Surface Water Bodies' as well as on 'Land for Irrigation'. The SBR technology, thus exhibit the potential of a convenient, effective, economical and ecologically conscientious biological treatment that can address the issue of domestic wastewater treatment for small and medium communities in developing countries.

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## **Ecological Civilization: The Fourth Stage of Human Civilization**

Ecological Socialism and Ecological Civilization are two new concepts of political philosophy, associated with the concept of New Era, that remain insufficiently studied around the world, and are structural in the Xi Jinping thought.

Western model of industrial modernization historically results in serious conflicts with the environment and natural resources in developing countries.

From the perspective of Chinese modern environmental philosophy, the following thesis can systematize the perspective of the dialectic socialism and ecological civilization:

1th thesis: The historical genesis. The ecological wisdom heritage of in Chinese civilization is an important component of the ecological civilization.

2th thesis: "An ecological civilization is possible only with socialism."

3th thesis: Ecological civilization represents a new humanism, without the domination of nature.

4th thesis: Having transcended the industrial civilization, the ecological civilization represents a more advanced state of human civilization.

### *Discussion*

In the cause of building up the ecological civilization, China has an important role to take.

Today, a series of new political concepts put forward by the Communist Party of China, like scientific development, the construction of a socialist harmonious society and an environmentally friendly society, are complementary to such concepts as, sustainable development of the world, ecological socialism, a common future for the humankind in a New Era and China's traditional culture.

The integration of these concepts is expected to promote the ecological civilization in China, the great revitalization of the Chinese nation, the new trend of sustainable development around the world as well as the overall development of mankind and the harmony of human society.

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&

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### **Effects of Microplastics in Plants**

The effect of exogenous amino acid on some physiological and biochemical properties of broccoli seedlings under salt stress was investigated. Two products containing amino acids (Ga and Pr) were applied from the soil to the root zone of the plant 3 times with one-week intervals in this study. The solutions prepared with 0 and 80 mM NaCl were applied to the plant as irrigation water. In the study, the effects of salt stress and applications on H<sub>2</sub>O<sub>2</sub>, MDA, proline sucrose, catalase (CAT), superoxide dismutase (SOD), indole acetic acid (IAA), salicylic acid (SA), gibberellic acid (GA) and abscisic acid (ABA) content of seedlings were investigated. The content of H<sub>2</sub>O<sub>2</sub>, MDA, proline, sucrose, CAT, SOD and ABA increased, while the content of IAA, GA and SA in the plant decreased with salinity. However, with exogenous amino acid applications, the effect of salt stress on these parameters in the plant was alleviated, thus contributing to the increase in the tolerance of broccoli seedlings to salt stress.

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## **Reforestation of Urban Districts in Mediterranean Climate: New Decarbonization Models for Cities**

The transformation of cities and urban and peri-urban districts into flexible, adaptive and sustainable organisms, under the most recent European policy proposals on climate, energy, transportation, land and resource use, have become today's issues that can no longer be postponed. Climate change, increases in impacts from carbon emissions, accelerated in the last year by greater reliance on coal due to the ongoing energy and geopolitical crisis, the increased cost of finding and supplying natural gas on which member countries depend for more than 54 percent, determine urgent policy measures to make city dwellers more responsible and resilient toward impacts generated and derived from economic, social and environmental changes.

In particular, if cities and urban districts are primarily responsible for producing more than 75 percent of global carbon emissions and consuming more than 70 percent of natural resources, they now become the first victims of the dramatic consequences of climate change; floods, sectorized adverse weather events, landslides, sea level rise due to melting glaciers and erosion of the coastal dune system, and heat waves define the magnitude of phenomena whose unpredictability is far beyond the current policies of individual nations and which are unlikely to be controlled without a common policy direction on climate change mitigation at the global level. Today, urban districts have the opportunity to become real players in the fight against climate change through serious decarbonization actions, a challenge that is as urgent and necessary as ever, through the issues defined as "crucial" today, such as the use of renewable energy sources, emissions reduction, the public transport system and private mobility, and the responsible management and maintenance of natural resources.

Urban regeneration measures aimed at the decarbonization of cities and urban districts can include reforestation and afforestation practices as well as actions, strategies, interventions, falling under environmental technology solutions, such as, for example, Nature Based Solutions, capable of increasing the sustainability of urban systems, the recovery of degraded ecosystems and the implementation of adaptive



interventions capable of protecting, managing and safeguarding them sustainably, providing benefits for humanity and biodiversity.

These objectives introduce the focus that has been experimentally analyzed through the study, census and subsequent cataloging of more than 100 tree and shrub species present in the Mediterranean basin according to their carbon uptake and storage capacities, defining a synoptic framework useful, for the actors in the field, in forestry and urban reforestation. These solutions led to the drafting of a detailed database through experimental research that took place in a public housing district in the Municipality of Rome Capital, the subject of a proposed urban regeneration, numerically quantifying the carbon absorbed and stored for each individual species.

The topic is of great scientific relevance in light of national and European strategies and in the proposal, put forward by the European Commission, on the New EU Forest Strategy Fit for 55.

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**Preliminary Studies on the Potential of Button Mushroom  
Production in Mauritius: Research Undertaken and the  
Future Production Prospects and Impact Food Security**

Mushroom is a well appreciated commodity in the Mauritian cuisine and button mushroom is the most favoured one. However, there is no cultivation of button mushroom in Mauritius and, for its needs, the country depends only on importation which amounted to USD 2.8 M in 2021. In 2022, preliminary study was undertaken at the Food and Agricultural Research and Extension Institute of Mauritius on the cultivation of button mushroom (*Agaricus bisporus*) on a composted sugarcane bagasse based substrate. The identified substrate, chosen based on its availability, was composted over the period of one month with regular turnings until a compost free from ammonia was obtained. The peak heating requirement of 60°C was attained prior to each heap turning (at 4-8 days' interval depending on temperature increase). After composting, the substrate was filled into plastic bags and inoculated with *Agaricus* spawn. The inoculated fruiting bags were placed in the production unit at temperature ranging from 19 to 24°C. After time taken for colonisation was 4-6 weeks. The fruiting bags were cased after colonisation, using a mixture of soil and lime having a pH of 7.5 and were shifted to a controlled temperature Growing Room. The temperature in the Growing Room was maintained at 18 °C during the case run and fructification period. The relative humidity was 85% after spawning and was increased to 90-95% during case run and fructification. An average fruit weight of 55.5 g was harvested per fruiting bag. In light of the positive results obtained in the first run, the cultural practices were further assessed with the evaluation of different potential casing materials notably potting mix, peat and coconut coir. The yield per bag varied between 59.2 g to 65.3 g of fresh button mushroom irrespective of casing material. The outcome of these first research trials showed the possibility of undertaking commercial button mushroom production. Further research will be undertaken to optimise production of button mushroom fruiting bags. Success in production of

button mushroom can contribute to import substitution and furthermore will be important for food security and sustainable agricultural production in Mauritius.

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## **Study on Electrical Characteristics and Formation Mechanism of Micro-Ion- Capacitor in Shale Pore and Fracture Structure**

Because of small pore size, poor connectivity, complex path, microfracture development and co-existence of organic and inorganic pores, knowing about shale properties such as pore characterization or fluid flow behavior, has been one of the challenging research hotspots in geoscience. Regardless of its great importance, compared to referred subtopics (i.e. pore characterization and fluid flow behavior), shale electrical properties has received less attention from the community; In order to contribute in bridging this gap, in present work, we mainly studied electrical properties of shale. To this aim, as we firstly used the experimental test data including, scanning electron microscope (SEM) thin section and micro-tomography CT images to analyze the shale pore type, pore structure characteristics and development situation of fracture. Then, since pyrite, as an important mineral with high electrical conductivity, is often developed in shale in clusters, the characteristics of pyrite distribution, pyrite and organic matter content and the influence of the graphitization of resistivity are discussed. On this basis, the electrical characteristics of shale, including conductive path of special pore structure of shale, the influence of pyrite, double electric layer and Zeta potential on the resistivity of shale were discussed in depth. The results revealed that, the content of pyrite, the content of organic matter, the vitrinite maturity and the degree of graphitization are inversely proportional to shale resistivity. It was also found that in presence of an external electromagnetic field, the fluid in shale pores is subjected to the combined strength of pore pressure and external field potential difference; Thus, its response equation should be an improved Navier-Stokes equation which considers both pore pressure and electric field Coulomb force. Thus, by combining these two factors and the response equation of the electromagnetic field, a new expression of the applied electromagnetic field was established. Based on our results, when shale is subjected to an external electromagnetic field, due to the isolation of pores, it represents more dielectric-like behavior than electrical behavior. In this aspect, three main types of microscopic ionic capacitors were characterized and introduced, (I) the microscopic ion capacitor model of the intergranular pore, (II) the microscopic ion capacitor model of the particle + isolated pore, and (III) the microscopic

ion capacitor model of pyrite or graphite or other organic matter. Finally, the microscopic ion capacitors in shale and conventional parallel plate capacitors are different from each other in several aspects including: positive and negative electrodes, plate area shape, the distance between the plates, the potential difference between the plates and dielectric variation with time.

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## **Evaluation of Future Climate in the Bouregreg River Basin (Morocco) Under Climate Change**

Assessing the impact of climate change on the watershed's hydrological regime requires knowledge of its future climate evolution. This study explored the use of locally observed data and large-scale atmospheric variables to generate future climatic information (mean temperature and rainfall) over three rain gauge stations: Tsalat, Lalla Chafia, and Aguibet Ezziar and Rabat's synoptic weather station of the Bouregreg catchment for three future periods: 2030-2050 (near term), 2051-2070 (medium term) and 2071-2090 (long term) relative to the reference periods by applying the Statistical Downscaling Model (SDSM, version 4.2.9). The study's findings demonstrate that the SDSM model's performance in downscaling daily precipitation and daily mean temperatures throughout the calibration and validation step can be well accepted. Compared to the reference period 1975-2005, the annual mean temperature projections for the Rabat station showed an increase of 2-6°C. The summer and spring see the most significant increases in terms of the seasonal scale, whereas the yearly cumulative rainfall for the three rain gauge stations decreased by 18-30% for the RCP4.5 scenario and by 20-40% for the RCP8.5 scenario in comparison to the baseline periods. The magnitudes of the decline are more pronounced in the winter and autumn.

This work's result will contribute to a better understanding of future runoff regime changes to propose adaptation strategies to reduce climate change effects on water resources.

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### **16SrRNA-Based Bacterial Community Profiling of *Ascaridia Galli* Positive and Negative Village Chickens Using Next Generation Sequencing**

Village chickens are commonly reared in rural households of South Africa and other developing countries. They play a vital role as a primary source of protein through provision of meat and eggs. The village chicken production system in South Africa is characterized by few or no inputs for housing, feeding and health care, late sexual maturity and slow growth rate. Internal parasites infections are prevalent in village chickens and can in severe cases cause major reduction in production or far worse, death. The chicken gut microbiota plays an important role in chicken's immune system, its health, physiological development of the gut, digestion of food, nutrient absorption and productivity. Thus, it is imperative to critically investigate the chicken microbial composition and its interaction with helminth parasites in order to develop effective disease control measures and increase production. In this present study, a total of 34 live non-descript mixed gender matured chickens was purchased from Itieleng, Thakgalang and Senwamokgope villages in Mopani districts, Limpopo province, South Africa. After slaughter, microbial DNA was isolated from the chickens' intestinal contents followed by high throughput Illumina sequencing using 16S rRNA gene. The 34 samples passed QC and their results revealed a high microbial diversity and composition in female chickens than males. Senwamokgope village also had the largest microbiota composition as compared to the other two villages. Moreover, the highest microbial composition was well observed in chickens free from parasites as compared to *A. galli* chickens. Overall, the *Firmicutes* was the most abundant phylum followed by *Actinobacteria* and *Proteobacteria*. At the genus level, *Lactobacillus* was the dominant bacteria in both negative and *A. galli* chickens and other genera included *Sphingomonas*, *Cutibacterium* and *Bacillus*. It is suggested that the highest microbial abundance in females might be attributed to egg development which does not occur in males. Moreover, intestinal microbiota in free-range chickens is also reported to have higher abundance of functions involved in amino acids and glycan metabolic pathway. The phylum *Firmicutes* observed in this study is known to express enzymes required for butyrate production. The findings of this study provide baseline information that assists to

better understand the chicken gut microbiota and its interaction with helminth parasites in order to understand the poultry defence mechanism against parasites and diseases.



**Gloria Marchetti**

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## **The Changes in the Approach to Environmental Protection by the European Union and its Member States and the Regulatory Innovations in Italy**

The speech aims at analyzing the recent changes in the approach to environmental protection by the European Union and its Member States, with particular regard to the Italian regulatory innovations.

The European Union has gradually become aware of the need for interventions aimed at protecting the environment. Thus, there has been an evolution of the provisions of the EU Treaties which have included a commitment of the Member States to guarantee a "high level" of environmental protection. This is also thanks to a greater awareness, at the international level, of environmental problems which led, among other things, to the proclamation of a series of principles at the Rio Conference in 1992. The Rio Conference has started a process of elaboration of the so-called "Global conventions" dedicated to the environment problems. More recently, the European Union, especially with the "Green Deal" and the Next Generation EU programs, has strengthened the ecological vision of environmental issues, aimed at ensuring greater protection of ecological elements (climate, ecosystems, biodiversity, etc.) and sustainable development.

In this context, Italy, in compliance with its European and international obligations, has launched a process of reforms aimed at strengthening environmental protection.

On one side, the Italian Government, with the implementation of the National Recovery and Resilience Plan (PNRR), which is part of the Next Generation EU program, has started an ecological transition, laying the foundations for a strong commitment to address the environmental/ecological issues.

On the other side, the Italian Parliament recently approved constitutional law no. 1/2022 implementing "Amendments to Articles 9 and 41 of the Constitution regarding environmental protection". The constitutional revision introduced protection of the environment — which was originally mentioned in the Constitution for the sole purpose of distributing the legislative competences between the State and the Regions even though the protection of the environment has been positivized by the jurisprudence of the Constitutional Court — among the fundamental principles of the Italian legal system. The recent constitutional law — through the amendment of articles 9 and 41

— has included in the Constitution an express reference to the protection of the environment, biodiversity and ecosystems, also in the interest of future generations, and an additional limit to the exercise of economic activities that must be now addressed also for environmental purposes.

The purpose of the speech is to examine: the impact of these European and Italian changes on the effective protection of the environment; the impact of the National Recovery and Resilience Plan on ecological transition policies in Italy; the consequences of the Italian constitutional reform of 2022 on the action of the legislator, public administration and constitutional jurisprudence regarding the balance between environmental protection and other constitutional values and rights.

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&

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## **Radicle Protrusion: An Alternative to Predict Germination Percentage in Seed Certification Processes**

In agricultural production, using certified seed is vital to reach field goals, however, during the certification process, seed producing companies must comply with either government standards protocols or international rules that include the investment of time and money. Based on the International Seed Testing Association Rules, the percentage of normal seedlings counted in a standard germination test represents the percentage of germination to be reported on certification labels and quality control documents, information obtained after the period indicated by the rule, which can range from one week in many cereals or up to three weeks in some vegetables. Then reducing the periods would be very useful for the seed industry because of the saving of time and money. Through the germination process the radicle protrusion is a visible sign of the beginning of seedling growth and consequently that germination has taken place. In this context, several experiments were developed in cereal and vegetable seeds with the objective to evaluate during a standard germination test, the correlation between the percentage of normal seedlings and the percentage of seeds with radicle protrusion, to figure out if this parameter can be used as an indicator of the percentage of germination in a shorter period. In this study, four species were evaluated: maize (*Zea mays* L.), barley (*Hordeum vulgare* L.), tomato (*Lycopersicon esculentum* Mill) and husk tomato (*Physalis ixocarpa* Brot. ex Horm). A standard germination test between paper and top of paper for cereals and vegetables, respectively, were developed at 25-30 °C in a Seedburo® germination chamber. Each test was established under a completely randomized experimental design with four repetitions of one hundred seeds each and were evaluated percentage of normal and abnormal seedlings, non-germinated seeds, and percentage of seeds with radicle protrusion. An analysis of variance, means comparisons Tukey's test, and Pearson correlation were developed. The results showed that in all cases the radicle protrusion had a high correlation with the percentage of normal seedlings, so it is possible to obtain results for certification in two and three days.

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## **Temporal Patterns and Trend Analysis of Trace Gases for Selected Sites in South-Eastern Romania**

Atmospheric pollutants affect air quality and climate and have significant impacts on human health. In the previous studies on South-Eastern Romania, a large region under detected climate changes, the researches were focused mainly on the particulate matter in the atmosphere and much less attention was paid to gaseous pollutant levels.

Therefore, the aim of this study is to characterize the temporal patterns and trends of major trace gases (NO<sub>2</sub>, CO, SO<sub>2</sub> and O<sub>3</sub>) over South-Eastern Romania. Hourly data from three types of air quality monitoring stations were processed and analyzed using statistical methods for temporal patterns and long-term trends. The selected locations are as follows: Constanta (urban) is an important city on the Black Sea shore where tourists come regularly even in weekends and has a maritime port with high activity related to merchandise trades, the suburban area of Turnu Magurele, where the anthropogenic activity includes, but is not limited to, chemistry, textile, wood processing industry, and the rural area in the county Giurgiu, close to the main custom gate Romania-Bulgaria, a place through which a huge number of exchange goods trucks pass 24/7.

Temporal patterns were obtained using using R software with the Openair package. The temporal trend analysis was performed using the non-parametric Mann-Kendall's test and Theil-Sen's method and the trends were calculated as percent change in the concentration per unit time. The time series for trend detection had lengths between 11 and 15 years.

Temporal patterns seem to reflect the main anthropogenic activities in each area. While the levels of CO are higher from Fridays afternoon up to late Sundays in Constanta, they present a regular weekly pattern, with a pronounced peak in the afternoons for Giurgiu,

and two moderate peaks mornings and afternoons for Turnu Magurele. Ozone levels are elevated in the rural area, followed by suburban and urban area, with peaks reached shortly after middays, when the solar radiation reaches its maximum and during summer. NO<sub>2</sub> levels appear as having smaller variations, with peaks matching the rush traffic hours, while SO<sub>2</sub> presents higher values during cold season. Each pollutant behavior is region specific. The same output stands for the estimated trends: CO increases in the urban area, but it has an opposite decreasing trend for suburban and rural areas; O<sub>3</sub> calculated trends indicate a negative tendency with a trend of -1.27 % per year in Constanta and a positive tendency in suburban (+1.55% per year) and rural areas (+2.49% per year). In general, SO<sub>2</sub> and NO<sub>2</sub> levels seem to remain stable in time, although negative small trends, below 0.5% per year, were detected.

Present work provides important insights on NO<sub>2</sub>, CO, SO<sub>2</sub> and O<sub>3</sub> temporal variations, in the context of identification of main pollution sources and for definition of future pollution abatement strategies.

#### *Acknowledgments*

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Data regarding ground-level air pollution by site was extracted from the public available Romanian National Air Quality Database, [www.calitateaer.ro](http://www.calitateaer.ro).

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## **Multi-modal Porous Microstructure for High Temperature Fuel Cell Application**

This research examines the impact of porous nickel electrode microstructure on high-temperature fuel cell performance, focusing on the molten carbonate fuel cell (MCFC) cathode. The cathode materials were created using a tape casting technique with a slurry composed of nickel powder and a polymeric binder/solvent mixture. The final pore structure was manipulated by modifying the slurry composition, either with or without the inclusion of porogens. A comprehensive analysis of the materials was conducted using various methods, including X-ray tomography, scanning electron microscopy (SEM), mercury porosimetry, BET, and the Archimedes method. Tomographic images were scrutinized and quantified to reveal the pore space evolution caused by nickel's in situ oxidation to NiO and electrolyte infiltration.

Performance tests of individual cells were conducted under MCFC operational conditions to assess the effectiveness of the manufactured materials. The study found that a multimodal microstructure in the MCFC cathode significantly enhances the power density generated by the reference cell. To gain a deeper understanding of how microstructure impacts cathode properties, a model based on 3D tomography image transformation has been proposed.

The research presented here delves into the role of porous nickel electrode microstructure on high-temperature fuel cell performance, with a focus on the molten carbonate fuel cell (MCFC) cathode. To create the cathode materials, a tape casting method was employed, utilizing a slurry containing nickel powder and a mixture of polymeric binder and solvent. The final pore structure was influenced by altering the slurry composition, with some samples containing porogens and others without. The materials produced were thoroughly examined using a range of techniques, including X-ray tomography, scanning electron microscopy (SEM), mercury porosimetry, BET, and the Archimedes method.

Analysis of tomographic images provided insight into the evolution of pore space as a result of nickel's in situ oxidation to NiO and electrolyte infiltration. Single cell performance tests were conducted under MCFC operating conditions to evaluate the efficiency of the materials created. The study discovered that a multimodal

microstructure in the MCFC cathode significantly improves the power density produced by the reference cell.

To provide a more in-depth understanding of the effects of microstructure on cathode properties, a model based on 3D tomography image transformation has been proposed. This research contributes valuable information to the field of high-temperature fuel cell performance, particularly in relation to the molten carbonate fuel cell cathode. By investigating the influence of porous nickel electrode microstructure on fuel cell performance, this study offers insights that could potentially lead to the development of more efficient and effective fuel cell technologies in the future.

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**Changes in Stress Levels Influence the Non-Specific  
Antimicrobial Protection in Angora Goats during  
Acclimatization**

Goats are frequently exposed to a potentially pathogenic  
microbiome in their habitats. Appropriate protection is essential in  
preserving health and welfare, therefore any changes in farming must



be controlled to maintain a fully functional immune system. This study monitored how the changes in raising technology from intensive to extensive farming, in sub-urban or rural habitats and simultaneous climate change (Mediterranean to temperate) would influence the protection through phagocytosis in Angora goats (females < 2 years, F<2, females > 2 years, F>2, and males, n=24, rural environment, n=26 in sub-urban area). Total leukocyte counts and subpopulations, the N/L (neutrophil/lymphocyte) ratio and phagocytosis by carbon particle inclusion test were carried out at the arrival of the animals and one year after their relocation.

The results indicated a significant ( $p<0.05$ ) decrease in total leukocyte numbers in the urban area in females, while in males the total values stayed similar to the arrival (Table 1). Nevertheless, after one year the N/L ratio used to indicate stress, relatively similar upon arrival (0.14-0.21) showed significantly lower values in both young and adult females (0.46,  $p=0.021$  and 0.57,  $p=0.017$  respectively) when compared to the males (which thus showed elevated stress levels in the rural (0.75), but not in the urban area (0.59)). There was a significantly positive correlation ( $r=0.584$ ,  $p<0.05$ ) of the phagocytosis as a measure of leukocyte functionality, with the N/L ratio only in young females in the rural area, not in any of the other categories. In males, the phagocytosis showed a reverse correlation with the level of stress ( $r=-0.587$  in rural and  $-0.0678$  in urban areas).

We concluded that the acclimatization process to a different habitat and technology was only partially completed after one year of observation, the adaptability of younger animals in terms of non-specific antimicrobial protection being more flexible than in adult animals.

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## **Determination of Radiological Stressors in Petroleum Drilling, Bitumen Exploitation and Coal Mining Site in Southern Nigeria**

In-situ exposure measurement and activity concentration of naturally occurring radionuclides  $^{40}\text{K}$ ,  $^{238}\text{U}$ , and  $^{232}\text{Th}$  in soil, water and vegetables was determined in a vicinity of petroleum drilling, bitumen and coal mining in southern Nigeria using advanced gamma scout survey meter and sodium iodide detector NaI (TI) gamma ray spectroscopy techniques

Exposure and radioactivity level of radionuclides in a mineralized zone were investigated on a view to evaluate its radiological health impact in the environment. An advanced Gamma scout survey meter was used to determine the exposure level while a gamma ray spectroscopy (Sodium Iodide detector NaI (TI) determined radionuclides. Some of the radiological indices that were evaluated is the absorbed dose, effective dose, annual equivalent dose, Internal and External hazard indices, annual gonadal dose equivalent, gamma index and the Excess lifetime cancer risk.

A digital survey meter 992 Fluke Victoreen Gamma Scout Model detector was used to determine the exposure rate in the vicinity of the sampling point. The gamma-scout that was used to determine the exposure level was oriented vertically upward through the survey point. In the whole sampling area, ten different measurements at each site were activities of petroleum drilling, coal mining and bitumen exploration were conducted. The data measured were read directly from the display screen of the gamma-scout. The gamma scout was placed 1 m above the soil level for an hour which enabled us to determine the average exposure in each of the sampling points.

Environmental media (Soil, water and foodstuff) samples were collected in order to determine the radionuclides such as potassium-40, thorium 232 and uranium-238 in the laboratory. All the samples were weighed for the soil (50 g), water (100 ml) and plants (50 g) respectively and put in a well labelled cylindrical airtight plastic container previously washed thoroughly with dilute  $\text{HNO}_3$  and rinsed with distilled water. Instrumentation analysis was carried out at centre for Energy and research development (CERD), Obafemi Awolowo University, Ile-Ife, Nigeria.

The preliminary results obtained for the exposure level in petroleum drilling environment for ranges from 0.0825 to 0.1134  $\mu\text{Sv/hr}$  with a mean value of 0.0945  $\mu\text{Sv/hr}$ , while in the bitumen exploration and exploitation area ranges from 0.0870 to 0.1230  $\mu\text{Sv/hr}$  with a mean value of 0.1101  $\mu\text{Sv/hr}$  and the coal mining environment ranges from 0.075 to 0.1500  $\mu\text{Sv/hr}$  with a mean value of 0.1066  $\mu\text{Sv/hr}$  respectively. Results obtained were compared to the data obtained by the international Atomic Energy Agency recommended standard.

The result in this study will provide insight into environmental behaviour and fate of contaminants and serve as baseline data for future investigation and monitoring.

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### **Stratigraphy, Micropaleontology (Benthic Foraminifer) and Sedimentology of the Cretaceous Carbonate Sequence on the Northern Arabian Plate (Southeast Turkey)**

The Mardin Group strata, as a product of the Cretaceous carbonate platform developed in the northern margin of the Arabian Platform, consists of a thick sedimentary sequence composed mostly of carbonates with subordinate clastic sediments. In this study, three stratigraphic sections Türkoğlu, Derik and İnışdere addressing this sequence have been investigated in terms of lithostratigraphy and biostratigraphy combined with microfacies analysis and sequence stratigraphic interpretation. A comprehensive examination of both benthic and planktonic foraminifers in thin sections has revealed that the age of the Mardin Group ranges from early Aptian to Santonian. The lower Aptian and Cenomanian deposits are characterized by benthic foraminifers, whereas the planktonic foraminifers predominate in the upper Albian, Turonian, Coniacian and Santonian. Following a detailed microfacies analysis, a wide depositional environment ranging from inner to outer ramp have been recognized in the Mardin Group carbonates. A sequence stratigraphic analysis has been carried out in order to trace the signals of global sea–level changes during the deposition of Areban, Sabunsuyu and Derdere formations of the Mardin Group. Twenty one depositional sequences are recognized in the interval from lower Aptian to upper Turonian and, under the control of paleontological data, sequence boundaries are correlated with the cycle boundaries of global charts. Eustatic signals enable to recognize several time lines within the Aptian, Albian, Cenomanian and Turonian stages and some important eustatic events like mid–Aptian sea–level fall and the onset of a more accentuated sea–level rise starting from the early Albian.

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## **Prospects for Using Herbarium and Archival Data to Track the Relationship between Climate Change and Plant Morphological Parameters**

Various methods of remote study of plant species are as relevant as possible at the present time when we still regularly face the issue of quarantine.

In the last decade, herbarium data have been very actively used to study plant phenology, determine environmental pollution, and in molecular genetic studies.

The study of morphometric parameters from herbarium samples is much less common, although the digitization of herbariums gives us a lot of opportunities in this regard.

For example, knowing the changes in climatic factors at the points of plant sampling (in the same years) and using the co-inertia analysis, it is possible to trace the contribution to the change in the morphology of species that the climate shift makes.

Such work was carried out by us in 2020 and showed very good results. Such works can be used to identify rapid evolutionary processes of studied species and predict their further course, as well as to reconstruct past climate changes based on plants morphological parameters.

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## **Planning and Implementing an ISO 14 001 Environmental Management System in a High Technology Company in South Africa: A Case Study of Conceptualisation, Benefits and Challenges**

Across the globe an Environmental Management System (EMS) is regarded as part of an organizational framework for addressing the management of short-term and long-term impacts of a company's products, services and processes on the environment. The environment in this context entail not only the natural environment but also the human or social environment. More effectively, the ISO 14 001 EMS is a business enhancement tool that may assist organizations to systematically and proactively analyze their most significant environmental aspects, thus providing them with a strategy to control and mitigate environmental impacts in an integrated manner. Furthermore, successful implementation of such a system requires amongst other things, the allocation of sufficient resources for its roll-out, maintenance and improvement. Whereas the EMS can generate benefits such as improved company reputation and the prevention of environmental pollution, its implementation is fraught with barriers and challenges, thus necessitating continuous reflection and improvement. South Africa has limited research on the assessment of how such environmental management systems are conceptualized and implemented for the reduction of environmental damage and for addressing the socio-economic needs of various stakeholders in society.

By adopting a case study research design, this paper reports on the conceptualization of the ISO 14 001 EMS, benefits realized, areas of conformance and non-conformance as well as the challenges experienced in a high technology company. The company is a multinational firm and employs more than 1000 people in its South African subsidiary. However, this study focussed only on those employees and managers (i.e., 40 in total) who are involved in the different aspects of the Safety, Health, Environment, Risk, and Quality (SHERQ) portfolio as they are directly or indirectly involved with the implementation of the ISO 14 001 EMS. Thus, primary data were collected through purposive sampling and by means of online questionnaire-interviews and telephonic communications.

The results indicated that (1) understanding the organizational context in the identification of relevant internal and external issues, (2)

systematic identification of environmental aspects, and the (3) assignment of different roles, responsibilities and lines of authority were instrumental in the conceptualization and implementation of the EMS. The respondents also revealed several benefits such as the decreased incidence of environmental incidents and risks; enhanced environmental protection; higher environmental awareness amongst employees; and increased waste material recycling rates. Moreover, areas of conformance were relatively more than areas of non-conformances. However, a number of barriers and challenges were identified within the existing EMS and within the organizational framework, thus necessitating the need to overcome the difficulties experienced before external and independent environmental audits can be conducted. Lastly, further research is necessary for similar companies in terms of organizational size and industry sector so that useful comparisons can be made for improved environmental compliance.

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## **Environmental (In)Justice for Women in Africa Caused by Climate Change**

Africa, home to about 15% of the world's population, faces serious environmental challenges, like deforestation, land degradation, biodiversity loss and extreme vulnerability to climate change. The continent loses an estimated \$195 billion worth of natural capital annually because of activities such as illegal mining, logging, and fishing, according to the UN Environment Program. This research is to focus on women in Africa, a major marginalized group in the African continent on how the recent climate change phenomenon has added to their misery leading to more environmental injustice for them. Using data from African Development Bank, this research will identify hotspots where women are most vulnerable in accessing clean water. Statistical analysis will be performed to study how the accessibility of clean water has become worse over the decades and what is the significance of climate change in contributing to this vulnerability. This 'hotspots' along with the results of the statistical analysis can be used for policies to make women in Africa climate resilient and thereby reduce environmental injustice.



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## **Logistic Probability of Mortality Models to Estimate Adaptation to Fire in Three Mexican Tree Species**

Logistic models ( $P = 1 / (1 + \exp - (\alpha + \beta_1 X_1 + \beta_n X_n))$ ), where P is probability of mortality,  $\alpha$  is a constant,  $\beta_n$  is a constant associated to the variable  $X_n$ ) have been successfully applied to investigate the effect of tree dimensions (mostly diameter to the breast height, bark thickness and total height) and fire severity variables (like height of trunk fire scar or percentage of crown scorch) to estimate post fire probability of mortality and post fire probability of resprouting. The different tree and fire severity variables involved, when compared in their parameters and graphs, may provide insights of fire resistance (mechanisms that prevent the mortality of the tree during the fire, like bark thickness) or fire tolerance (capacity of the tree to recuperate, i.e., by resprouting, after fire). Under a similar range of tree sizes (for instance, tree diameters) and also under a similar range of fire severities (for instance crown scorches), and in forest fires on similar fuel models, trees from species less adapted to fire (like *Callitropsis lusitanica*) will show a higher curve than those more adapted to fire (like *Pinus hartwegii*). Under a similar fire intensity, typically the larger the tree the lower the probability of mortality. Very low intensity severity fire scenarios (with no tree mortality) or those with very high intensity/severity (with total or practically total mortality) alone, do not provide the necessary severity variability to assess the probability of mortality or probability of resprouting. High probability of top tree mortality and high probability of resprouting are associated to fire-tolerant species, like *Quercus crassifolia*. This kind of information is also potentially useful when elaborating the prescription for prescribed burns, to minimize tree mortality, as well as to estimate probability of post fire mortality in drier and hotter environments, like the ones global warming is producing.

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## **Sustainable Rural Development: Mapping and Multidisciplinary Analysis**

This study aims to assess the origins, evolution and influence of the literature on the topic called Sustainable Rural Development (SRD) in a variety of areas of knowledge. For this purpose, data were collected on the Scopus platform, which is considered one of the most complete databases and widely used in several studies of Scientometrics, which provides extensive coverage in different areas of knowledge, such as: social sciences, environmental, arts and humanities. The data set was obtained from the keywords “Sustainable Rural Development” present in the title, or in the abstract or in the keywords, considering all areas of knowledge, in the period from 1984 to September 2022. The database Scopus presented 963 scientific studies, prepared by 2,540 authors and published in 602 journals. The bibliographic references of these publications generated 39,277 citations of previous studies. The origins of publications can be found in the 1980s. However, existing studies provide a perspective focused only on analysis methods. This study goes further by presenting a comprehensive portrait of rural sustainability themes in the literature. Therefore, it is presented as a complement to other scientific studies. The bibliometric method provides an analysis of possible paths and trends of a specific research topic, as well as an objective assessment of seminal and collaborative contributions. It was possible to verify that the number of articles increased considerably in the last ten years. In the period from 2012 to September 2022, 662 publications were registered, which are equivalent to 68.74% of the total, while in the initial period, from 1984 to 2011 (27 years), 301 studies were published, only 31.26% of the total of papers

addressing SRD. The 963 studies considering SRD were published in 602 scientific journals. The ten journals that published the most in the period from 1984 to September 2022, concentrated 156 works, which is equivalent to 16.2% of the total number of publications, which suggests a dispersion of publications in different scientific journals. The top five journals in terms of citations are: *Journal of Rural Studies*, *Land Use Policy*, *Sustainability (Switzerland)*, *Sociologia Ruralis*, *Renewable and Sustainable Energy Reviews*. It is also worth mentioning the top five countries that most published about SRD in the period evaluated: China, Spain, United States, United Kingdom and India, respectively. This research has shown that the SRD theme has been considered increasingly relevant, in an increasingly competitive and globalized world, in which people prefer more sustainable products. Thus, scarce resources must be used to improve competitiveness and at the same time ensure the sustainability of the planet, as well as maximize the value and use of natural resources, which requires well-defined public policies with well-targeted results. In this sense, it is important to understand what is already known about this relationship and what could be the best way to direct the frontiers of science and also adjust public policies.

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**Proof of Principle of Wastewater Treatment Using Plasma  
Discharge to Reduce the Amount of Methylparaben**

Synthetic substances like many pharmaceuticals, preservatives or other chemical compounds are actually very difficult to handle in sewage treatment. These compounds are very stable in aqueous solution and their degradation reactions are insufficient. Therefore, to eliminate these substances from wastewater additional effort is necessary. Extreme conditions like pH value, redox potential, chemical or physical energy need to be present. With our study we try to show that the use of plasma discharge could be a solution to this problem.

Using the example of methylparaben, a preservative, we could show, that the physical energy of plasma discharge is able to initialize the degradation reaction in aqueous environment. The concentration was reduced by up to 70 percent in our setting depending on the treatment duration.

Overall, the system showed potential to optimize wastewater treatment. Further examinations are necessary for example regarding undesirable by-products.

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## **Utilization of Satellite-Derived Cloud Cover in the Model of Road Surface Conditions**

Forecast of road surface temperature is important to maintenance authorities responsible for road ploughing and salting decisions in winter seasons. Timely and accurate forecast of road surface temperature (RST) and condition can significantly decrease road maintenance costs and reduce traffic accidents. Road weather model FORTE, which is a 1D physically based model solving energy balance and heat conduction equations, uses radiation fluxes at the road surface as important input data. These fluxes are taken from numerical weather prediction (NWP) model forecasts and they fundamentally influence road model forecasts. However, forecasted fluxes calculated by NWP models are not very accurate. Therefore, we prepared and tested a new approach based on cloud coverage predictions, using the extrapolated Cloud mask product calculated by NWC SAF from Meteosat Second Generation (MSG) satellite measurements. The estimates of radiative fluxes from forecasted cloud coverage are then used in road weather model. The first results show that MSG data apparently improve the RST forecasts for the first 3 hours.

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## **Phytochemical Microbial Fungal and Oxidant Properties of Syzygium Cumini Leaves Extract: Flora of Guyana**

*Syzygium cumini* is an evergreen tropical tree in flowering plant family myrtaceae. The plant material leaves of *Syzygium cumini* (Jamun) were collected from Institute of Applied Science and Technology (IAST), University of Guyana, Turkeyen Campus. Leaves were dried in oven at 50-60 °C for 72 h. The moisture content was calculated. The dried leaves were grounded and extracted in each ethanol, methanol, ethylacetate, and chloroform solvents. Extracts were collected and evaporation of solvent was done on rotavapour. The respective solvent was added to viscous semi solid liquid extract to make up the desired volume of extract solution. The micro-organisms (*Escherichia coli*, *Staphylococcus aureus* and *Candidus albicans*) obtained from GPHC, Georgetown, Guyana. The antioxidant, antimicrobial, antifungal activity of different leaves extract was examined by method reported in chemical literature. The maximum and minimum antioxidant power of leave extract exhibited by methanol and chloroform extract, respectively. The chloroform and ethylacetate were found to have maximum and minimum antibacterial activity against *Escherichia coli*, *Staphylococcus aureus* and *Candidus albicans* by disc diffusion method. Phytochemical analysis of the *Syzygium cumini* leave extract revealed the presence of carbohydrates, terpenoids, proteins, amino acids and flavonoids. The leaves of *S. cumini* are use as food for live stocks. The leaves and bark are used for control blood pressure. Woods of *S. cumini* is water resistance because of this it is use in railway sleepers and to install motors in wells. Vinegar and wine are also made from the fruit. It has high source of vitamin A and C. Seeds of *S. cumini* are used in various alternative healing system like Unani, Chinese, and Ayurveda medicine.

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**Space Eco Literacy as a Public Good for Enabling  
Communities**

Since Pythagoras (581 BC), Thales (624 BC), and others of Greek science, there has been an authentic effort to find out about self and the outer world. In other scientific endeavour it is as old as human culture. On the fragile spaceship TERRA, challenges like planetary defence, climate change, disaster risk reduction, and pandemics/infodemic afflict everyone today. The impacts of the pandemic are on the academic, ecological, and financial spheres as well. Global agencies such the UN and WB projected that the academic and scholarly rhythm has been delayed down for at least ten years. Based on the UNCC COP26 discussions, the pandemic had a financial toll of one fifth of the \$25 trillion global economy. According to WHO, 766,895,075 confirmed cases of COVID-19 worldwide as on May 24, 2023, with 6,935,889 deaths. Significant population suffer repeatedly for no fault of their own, similar to the effects of climate change. It might involve one of the more than 200 technical or natural disasters that occur annually today, up from roughly 50 in 1900. By empowering the community to take care of its own well-being, for living through these gauntlets seems clear. It is in line with the scientific wisdom evolved at IUCN, UNEP, and WWF and civic societies well before UNCED 1992. One of the certain sustainable solution is non-formal, affordable, and centred on the individual and the community space education outreach program.

In this paper, details of six non formal space education models of science with culture responses are presented. The time scale of these models are from 1987 till date. Each of these are based on objectives of UNESCO/UNEP/IEEP, 1977 Environmental Education, awareness,

attitude, knowledge, skill and participation. First, non formal Ecological and Environmental Studies by Students( EESS). This is a spin off of 1987 Bharat Jan Vigyana Jatha (BJVJ): People Science March in India which converged at Bhopal from five corners of the India traversing 50,000 Kms. EESS got cited as one of the 20 best education guide under Earth day Network 2000. The second, Sunday volunteer work of picking plastic wastes, household eco literacy campaigns with handouts, and street play around Kukkarahally Lake, Mysuru,India. This marathon volunteer work lived for over 300 weekends, and acknowledged as community enabler by UNEP during 2003. The third, parents and children ten week weekend on Space Situational Awareness and space age. The results were reported in COSPAR 2012 at Mysuru, India. The fourth and fifth virtual Space Eco Literacy: Sky Watch for 5-9 Std students seeking a poem, painting or a slogan. The last one is ongoing ten week Planetary Defence for all with Community emergency preparedness focus.

The lessons from these six non formal education models are decentralized, participatory, self learning is cost free. These models could be furthered with location specific and customized for specific cultural and indigenous needs. Tens of poems, paintings and notes from young students to senior citizens in their own dialect are listed and discussed.



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## **Tectonic and Sedimentary Evolution of the Precaspian Basin during Late Paleozoic Period**

The Precaspian Basin is located in the north and northern margin of the Caspian Sea, and extends in east-west direction with a near elliptical outline. It has a length of about 1000 km, a maximum width of 650 km, and an area of about  $58 \times 10^4$  km<sup>2</sup>.

The Precaspian Basin is one of the most petroliferous regions in the world. The thickest sedimentary rocks in this basin is about 22 km, and there are abundant oil and gas resources in subsalt strata. 85% of the proven oil and gas reserves found in the basin are distributed in the Carboniferous subsalt carbonate strata, and the formation and distribution of oil and gas are obviously controlled by tectonic and sedimentary evolution of the Precaspian Basin during the late Paleozoic period.

The geotectonic position of the Precaspian Basin is at the southeast margin of the Eastern European Plate. The tectonic and sedimentary evolution of the Precaspian Basin during the late Paleozoic period can be divided into two stages: the Devonian-Carboniferous retroarc basin stage and the Permian foreland basin stage. It was obviously affected by the closing and orogenesis of the Ural Ocean at the eastern margin and the contemporaneous subduction of the Paleo Asian Ocean and the Paleo Tethys Ocean in the southern margin.

The Precaspian retroarc basin changed from retroarc expansion to convergence during Devonian period, while the retroarc basin was dominated by convergence during Carboniferous period.

The Carboniferous was the late stage of the retroarc basin, and the terrigenous clastic materials mainly came from the island arc of the eastern Ural Ocean. The Astrakhan-Aktobe micro landblock (uplift zone) in the Precaspian Basin was characterized by the development of carbonate platforms during the period of sea level decline, and neritic shelf argillaceous deposits during the period of sea level rise.

Since the Permian, the Baltic Plate collided with the Kazakhstan-Junggar Plate, and the Ural Ocean was closed and orogenic, leading to the transformation of the nature of the Precaspian Basin from a retroarc basin to a foreland basin. Due to the tectonic compression of the Ural orogenic belt, the southeast depression zone (foredeep) occurred tectonic subsidence, and the Carboniferous system was completely

preserved, but the top of the Carboniferous system (KT-I top) was also denuded to varying degrees.

During the early Permian Asselian-Artinskian period, sea level rose, and the Ural orogenic belt provided rich provenance for the eastern margin of the Precaspian foreland basin. On the angular unconformity between the Carboniferous and Permian systems, the southeast depression zone (foredeep) had large accommodation, mainly filled with coarse clastic turbidite deposits, and carbonate platforms were developed in local highs. The Astrakhan-Aktobe uplift zone (foreland uplift) mainly consists of neritic shelf argillaceous deposits, while the central depression zone (back-uplift depression) consists of bathyal argillaceous deposits. During the early Permian Kungurian period, the climate of the Precaspian Basin became dry, filled with massive evaporite deposits.

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## **Influence of Soil Properties on the Variability of Sediment Transport within Cave Systems - Owl Cave, Highland County Virginia, USA**

The Valley region of Virginia, USA is characterized by the presence of cave and karst systems. Mobile sediments in the vicinity of caves can have a profound influence on sediment transport within cave systems. Variation in the sediments inside a cave can provide insight for water flow during various stages of cave during development that remains largely protected from the local climate. Few studies have characterized internal cave sediments, despite the recorded variability and limited alteration after deposition. For instance, a study done in the submarine Trémies cave system near Marseille, France observed a decrease in organic carbon contents from the entrance to dark internal chambers. The present study juxtaposed the particle size distribution (PSD), organic carbon (OC%) and soil nutrient contents of the soil and sediment samples collected from Owl cave in Highland County, Virginia. We hypothesized that there is no difference in the PSD, OC and soil nutrient contents between the samples collected from the cave entrance and the internal chambers. Two sediment cores were obtained (0-150 cm depth at 10 cm intervals), one from inside the cave and the other from the cave entrance. Particle size distribution was performed prior to and after removal of organic carbon using laser diffraction methods. The loss on ignition (LOI) method was used (550<sup>o</sup> C for 2 hours) to remove and determine the percentage of OC. Soil major, micronutrient and heavy metal contents of the samples were determined using an Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES). Pooled T-test compared the variability of PSD, OC (%), and soil nutrient contents (including the heavy metals) of the two cores. The preliminary findings suggested that despite the removal of OC, the inside samples showed significantly higher sand content than the entrance. In contrast the silt content in the cave entrance samples were significantly greater than inside, while the variation in clay content was not significant. Regardless of the variability in the PSD before and after OC removal, the texture of both inside and cave

entrance samples remain unchanged. The OC contents of the cave entrance samples was greater compared with the cave inside indicating that there is limited influx organic material into the cave. Furthermore, the percentage of organic carbon inside the cave was below 5% while the entrance samples decreased from ~7% at the surface to 5% in the sub-surface. The difference in particle sizes inside and entrance of the cave are attributed to influx of sediments only during high intensity flow regimes and weathering of the cave walls. Moreover, the difference between the silt contents indicates water flux in the cave rarely stagnated and the flow aided in cave development after the initial passages formed. Currently we are at the final stage of the ICP-OES analysis to determine whether there is a variability in soil major and micronutrients between cave inside and entrance samples.

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### **Long-Term Trends of Ground-Level Ozone and its Precursors in Windsor, Canada**

Long-term (1996-2015) trends of ground-level O<sub>3</sub> (ozone) and its precursors, NO<sub>x</sub> (nitrogen oxides) and volatile organic compounds in Windsor, Ontario, Canada were evaluated. During the 20-year study period, annual mean O<sub>3</sub> concentrations increased by 33% (20.3 ppb in 1996 vs. 27 ppb in 2015), while NO<sub>x</sub>, non-methane hydrocarbon concentrations and ozone formation potential decreased substantially by 58%, 61%, and 73%, respectively. The overall increasing trend of annual mean O<sub>3</sub> is due to 1) decreased O<sub>3</sub> titration (by 50% between 1996 and 2015) owing to declining nitric oxide concentrations, which is evident by a slightly decreasing trend of annual mean total O<sub>3</sub> concentrations after the titration effect is removed, and 2) increased background O<sub>3</sub> levels. Peak O<sub>3</sub> concentrations during the smog season (May to September) had been decreasing due to a significant decline in ozone precursor emissions and reduced photochemical production. Our results indicate that the emission control measures are effective in reducing peak O<sub>3</sub> concentrations in Windsor. However, long-term comprehensive efforts in the region and around the globe may be required to reduce O<sub>3</sub> levels at the mid- and low-end of the distribution.

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## **Effect of Amino Acid Application on Physiological and Biochemical Properties of Salt-Stressed Broccoli Seedlings**

The effect of exogenous amino acid on some physiological and biochemical properties of broccoli seedlings under salt stress was investigated. Two products containing amino acids (Ga and Pr) were applied from the soil to the root zone of the plant 3 times with one-week intervals in this study. The solutions prepared with 0 and 80 mM NaCl were applied to the plant as irrigation water. In the study, the effects of salt stress and applications on H<sub>2</sub>O<sub>2</sub>, MDA, proline sucrose, catalase (CAT), superoxide dismutase (SOD), indole acetic acid (IAA), salicylic acid (SA), gibberellic acid (GA) and abscisic acid (ABA) content of seedlings were investigated. The content of H<sub>2</sub>O<sub>2</sub>, MDA, proline, sucrose, CAT, SOD and ABA increased, while the content of IAA, GA and SA in the plant decreased with salinity. However, with exogenous amino acid applications, the effect of salt stress on these parameters in the plant was alleviated, thus contributing to the increase in the tolerance of broccoli seedlings to salt stress.

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