



unite!

University Network for Innovation,
Technology and Engineering

Research Methodology & Scientific Writing MOOC – Unite!Energy

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Personal data

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Research Methodology & Scientific Writing MOOC – content

Research process – Step 1

1. Formulating the research problem / Identifying a research topic
2. Finding background information / Extensive literature survey (systematic tracking of scientific literature; creating search queries; current databases – Web of Knowledge, Scopus, Google Scholar, etc.)
3. Developing the research hypothesis
4. Preparing the research design (approach / methodology)
5. Collecting the research data / Variables and their types (basic elements of statistical analysis)
6. Analysis of data
7. Hypothesis testing
8. Interpretation of data / Findings and drawing conclusions



BRIDGE CENTER

RESEARCH METHODOLOGY: TOOLS AND TECHNIQUES

Dr. Prabhat Pandey

Dr. Meenu Mishra Pandey

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Romania, European Union

Research Methodology & Scientific Writing MOOC – content

Research process – Step 2

1. Methods of presenting results (figures, tables, drawings, photos, etc.)
2. Preparing of the report / thesis
3. Writing of scientific publication:
 - Discussion of the structure of a research publication (Instructions for authors) / Different publication templates depending on the publisher
 - Abstract writing strategies / Preparing a graphic abstract
 - Preparing a Cover Letter
 - Discussing the publication submission system / Selecting the most appropriate journal
 - Corresponding with editors and responding to questions from reviewers and the editor

Assessment – Final report

Report – Research Methodology & Scientific Writing MOOC – Unite!Energy

1. Name and surname
2. E-mail address
3. University name
4. Scientific profiles – if applicable
5. PhD title / Proposed PhD title
6. Summary of planned research (500 words)
7. Graphical abstract presenting the topic of the PhD thesis
8. Keywords (5-7)
9. What is the research hypothesis put forward in the doctoral dissertation?
10. What is (or could be) the „bottleneck” in your research and why?
11. List of 3-5 best journals in the research area of the doctoral dissertation (e.g., with the highest Impact Factor and Category quartile, briefly justify)
12. List of the 5-10 best scientific papers in the research area of the doctoral dissertation (number of citations)
13. The best scientific publication you have read so far and motivate shortly your choice
14. The worst scientific publication you have read so far and motivate shortly your choice
15. List 3 patents (patent number) that are similar to the topic of the doctoral dissertation
16. Data on the researchers (2-3) and their affiliations where would you like to do an internship (briefly justify)

Deadline: 31 October 2025 ➡ E-mail: izabela.michalak@pwr.edu.pl



Types of journal articles

Original Research (or *Original Article*, *Research Article*, *Research*, or just *Article*) – this is the most common type of journal manuscript used to publish full reports of data from research.

Short reports or **Letters** or **Brief communications** – communicate brief reports of data from original research that editors believe will be interesting to many researchers, and that will likely stimulate further research in the field.

Review Articles – provide a comprehensive summary of research on a certain topic, and a perspective on the state of the field and where it is heading.

- Reviews are often written by **leaders in a particular discipline** after invitation from the Editors of a journal.
- Reviews are often **widely read** (for example, by researchers looking for a full introduction to a field) and **highly cited**.
- Reviews commonly **cite** approximately **100 primary research articles**.

Types of journal articles

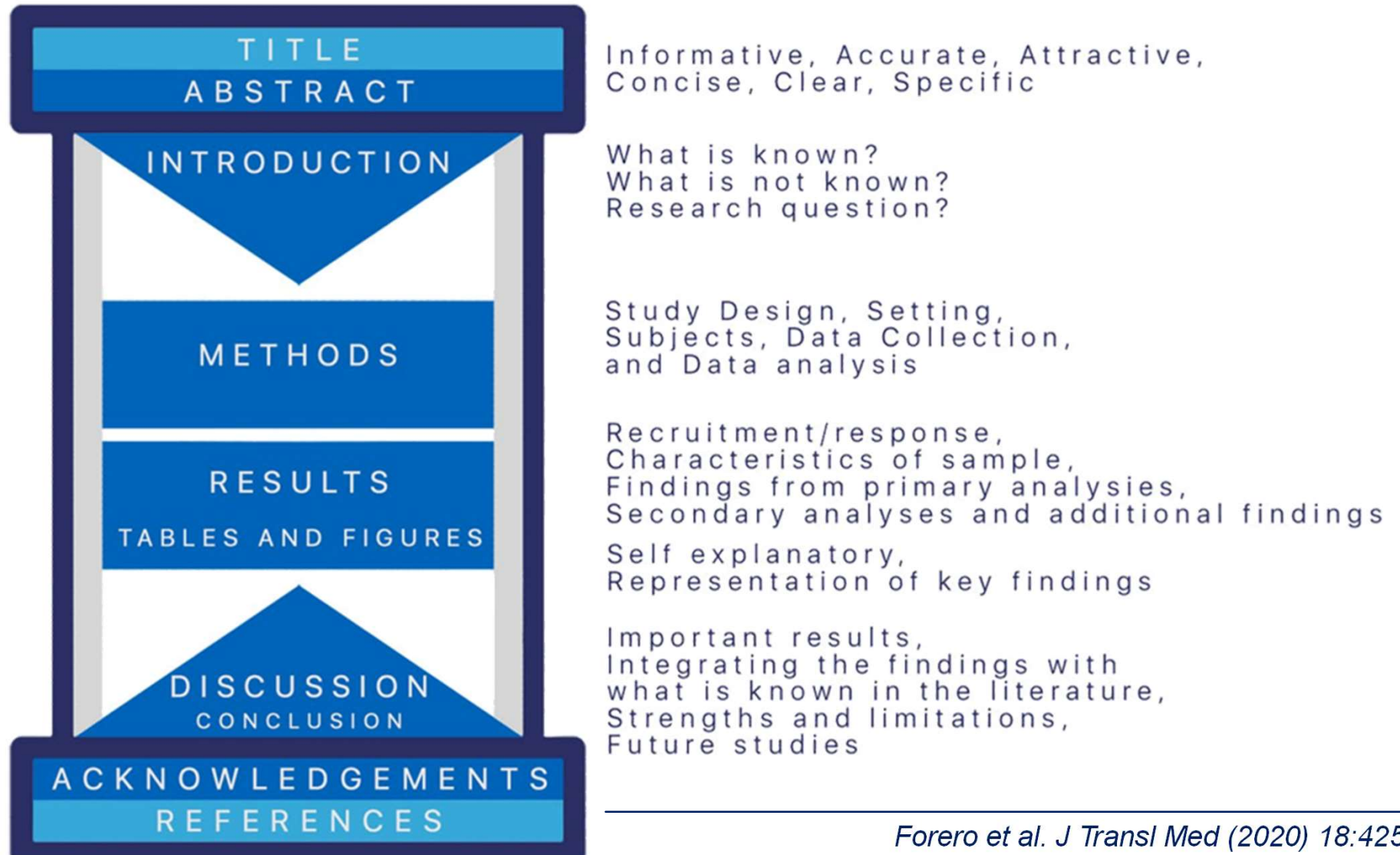
Case Studies – these articles report **specific instances** of **interesting phenomena**.

- A goal of Case Studies is to make other researchers aware of the possibility that a specific phenomenon might occur.
- This type of study is often used **in medicine** to report the occurrence of previously unknown or emerging pathologies.

Methodologies or Methods – these articles present a **new experimental method, test or procedure**.

- The method described may either be completely new, or may offer a better version of an existing method.
- The article should describe a demonstrable advance on what is currently available.

General structure of a scientific publication



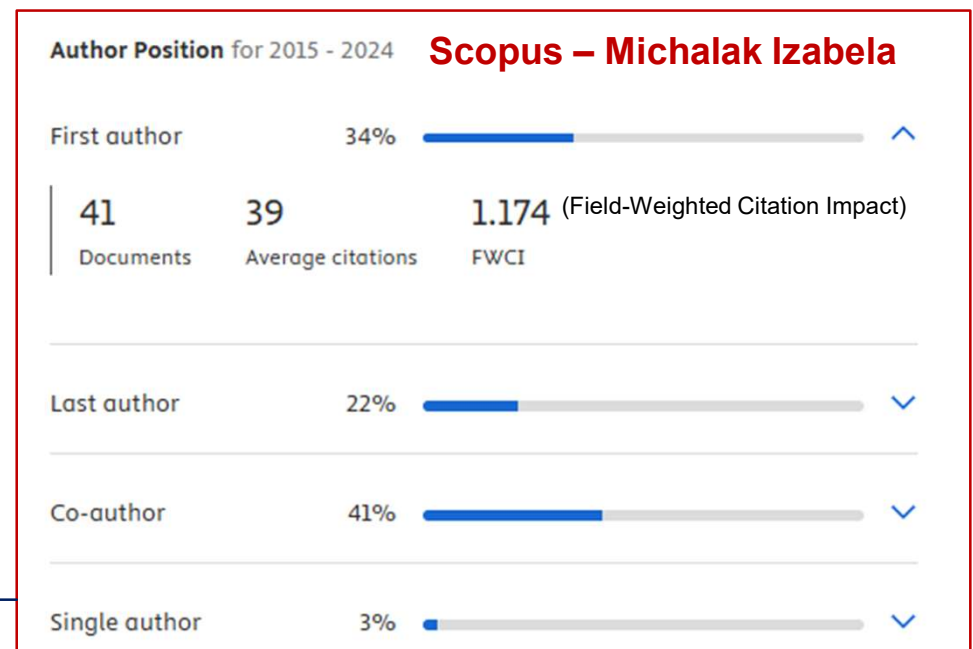
Preparation of the publication – tips

Whole manuscript

- ☐ The manuscript should be written linguistically and stylistically correct
- ☐ The same font and size throughout the work (unless otherwise indicated by the Journal)
- ☐ All authors should read the entire publication (not only their part of the research) before submitting to the Journal

Authors

- ☐ The meaning of the order of the listed authors varies between fields – in many disciplines, the author order indicates the magnitude of the contribution, with the last author usually representing the principal investigator



Preparation of the publication – authors

Niedzbala et al.
Bioresources and Bioprocessing (2024) 11:27
<https://doi.org/10.1186/s40643-024-00741-z>

Bioresources and Bioprocessing

RESEARCH

Open Access



Potential use of *Ulva intestinalis*-derived biochar adsorbing phosphate ions in the cultivation of winter wheat *Triticum aestivum*

PhD student

Natalia Niedzbala^{1*}  Ewa Lorenc-Grabowska², Piotr Rutkowski², Jacek Chęćmanowski¹, Anna Szymczycha-Madeja³, Maja Welna³ and Izabela Michalak¹

Supervisor / Project manager

Author contributions

All authors contributed to the study conception and design. IM: conceptualization, methodology, supervision, data curation, writing—original draft, writing—review and editing, project administration, funding acquisition; NN: conceptualization, methodology, investigation, formal analysis, data curation, visualization, writing—original draft; ELG: methodology, investigation, resources, writing—original draft, writing—review and editing; JC: resources, writing—original draft; MW: methodology, resources,—review and editing; PR: resources, writing—review and editing. All authors read and approved the submitted manuscript.

Multi-author publication
– interdisciplinary
publication

Title and Abstract

- ❑ **The title and abstract are the most important parts of a paper**
- ❑ They are important:
 - **for editors**, who will scan the title and abstract to decide if it should be sent out for external peer review
 - **for reviewers**, who will get a first impression of the paper
 - **for readers**, as the title, abstract, and keywords are often the only parts of the paper that are freely accessible to everyone on-line
- ❑ The title should be **attractive and catch the reader's attention**
- ❑ Sometimes, there is a limit on the title length
- ❑ Some journals also require a **Running Title** – a short version of your title, consisting of 40 characters or less, including spaces

Abstract

- ❑ Abstract should provide a brief description of the main sections of the manuscript, describing key methods, findings and conclusions
- ❑ Once the abstract is completed, it helps to ask yourself four questions, each relating to one section:
 - „What is known and why is this study needed?” (**Background**)
 - „What did we do?” (**Methods**)
 - „What did we find?” (**Results**) – this section is the most important part of the abstract
 - „What does it mean?” (**Discussion**)
- ❑ Also ask yourself “**So what?**” (this is what editors and reviewers often ask themselves when reviewing papers)
- ❑ Usually 200-300 words (it depends on the Journal – if the abstract is longer, you won't be able to submit your paper to the Journal !)
- ❑ The abstract is usually written at the end – when the entire publication is ready
- ❑ **Please write your abstract with due care !!!**

Graphical abstract – review article

Bioresource Technology 375 (2023) 128830



Contents lists available at ScienceDirect

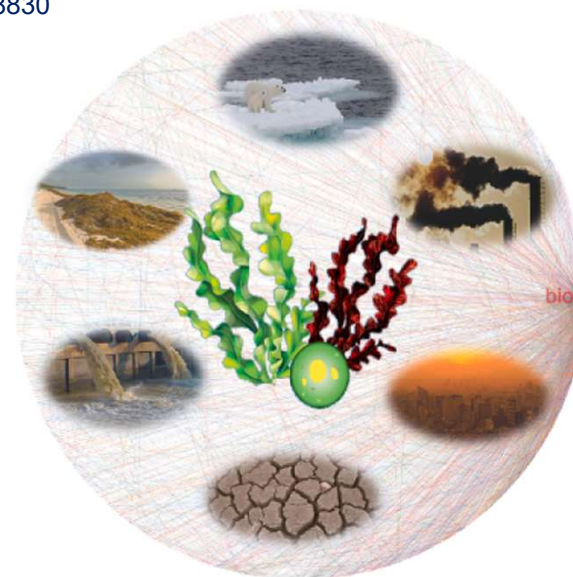
Bioresource Technology

journal homepage: www.elsevier.com/locate/biortech



Review

Current application of seaweed waste for composting and biochar: A review
<https://doi.org/10.1016/j.biortech.2023.128830>



Seaweed adapting to
climate change



- High alkalinity, yield and ash
- N-, O-rich functional groups
- Sorption of emerging pollutants
- Moderate pyrolysis production
- Soil amendment

Seaweed Biochar



Realizing SDGs



- Improve final C/N ratios
- Improve nitrogen cycle
- High N, P, K and metals
- High earthworm production
- Improve soil health and fertility

Seaweed Compost

Journals are increasingly requesting the submission of a “**graphical**” or “**visual abstract**” alongside the body of the article.



Chemical, physical and morphological properties of biochars produced from agricultural residues: Implications for their use as soil amendment

Paloma Campos^a, Ana Z. Miller^b, Heike Knicker^a, Manuel F. Costa-Pereira^c, Agustín Merino^d, José María De la Rosa^{a,*}

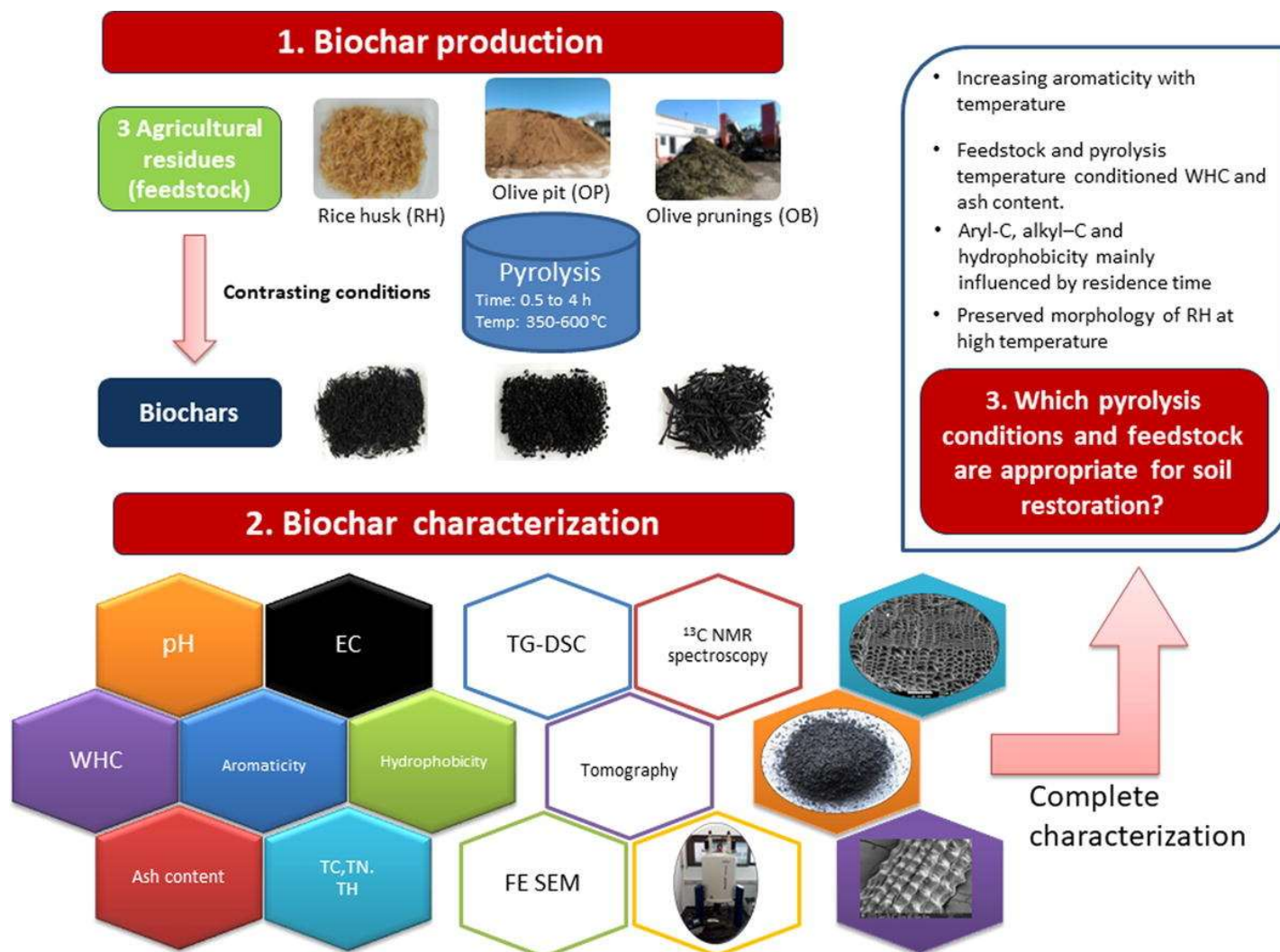
^aInstituto de Recursos Naturales y Agrobiología de Sevilla (IRNAS-CSIC), Av. Reina Mercedes 10, 41012 Sevilla, Spain

^bHercules Laboratory, University of Évora, Largo Marquês de Marialva 8, 7000-809 Évora, Portugal

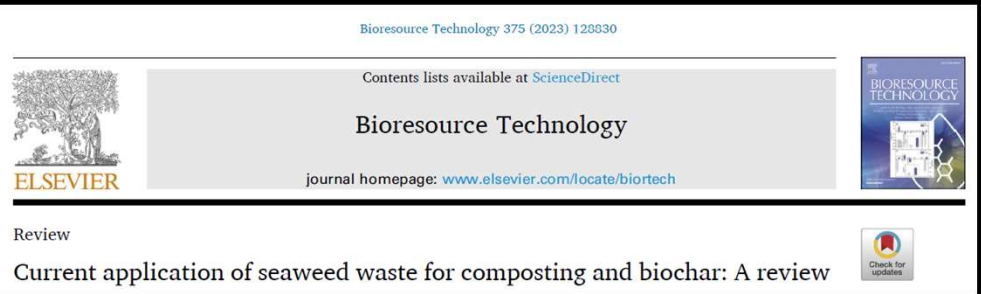
^cCERENA, Instituto Superior Técnico, Universidade de Lisboa (IST-UL), Av. Rovisco Pais, 1, 1049-001 Lisbon, Portugal

^dDepartment of Soil Science and Agricultural Chemistry, University of Santiago de Compostela-Lugo Campus, Lugo 27002, Spain

Graphical abstract – research article



Highlights



<https://doi.org/10.1016/j.biortech.2023.128830>

H I G H L I G H T S

- Seaweed derived-compost and biochar have distinct properties from terrestrial plants.
- Complex polysaccharides, moisture, metals, and C/N ratios affect compost production.
- Seaweed increases the earthworm cocoon and microbial consortium for vermicomposting.
- Biochar provides many functional groups for pollutant removal and soil amelioration.
- Pyrolysis temperature effects biochar yield, ash, O/C ratio, surface and porosity.

Highlights are a short collection of three to five bullet points that:

- Provide readers with a quick textual overview of the article
- Each individual Highlight should be a maximum of 85 characters long, including spaces
- Convey the core findings
- Describe the essence of the research (i.e. results or conclusion)
- Highlight what is distinctive about it

Highlights are **mandatory** for some journals and **optional** for others.

You can check the requirements for the journal you're submitting to by reading the **Guide for Authors**.

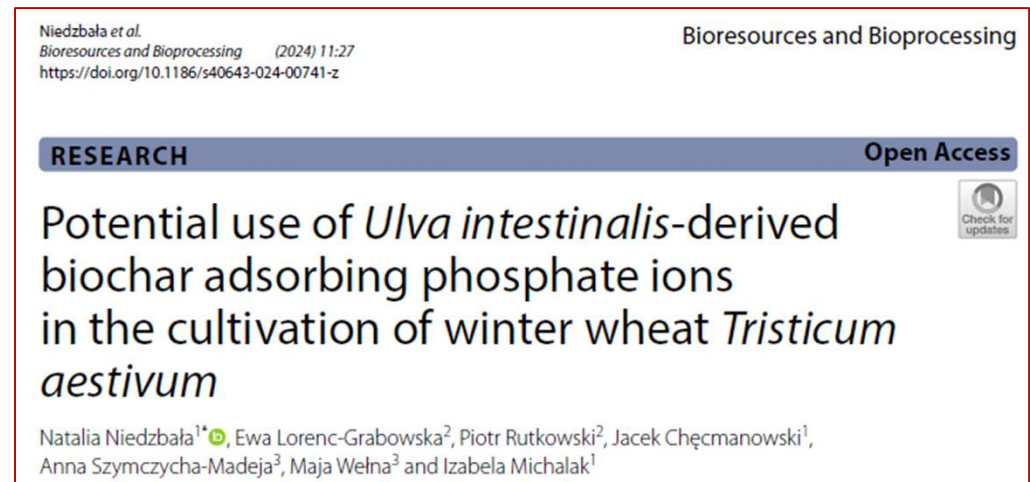
<https://www.elsevier.support/publishing/answer/how-do-i-include-highlights-with-my-manuscript>

Keywords

- ❑ Keywords are a tool to help **indexers** and **search engines** find relevant papers
- ❑ If database search engines can find your journal manuscript, readers will be able to find it too
- ❑ This will increase the number of people reading your manuscript, and likely lead to more citations
- ❑ However, to be effective, Keywords must be chosen carefully, they should:
 - Represent the content of your manuscript
 - Be specific to your field or sub-field
- ❑ 4-6 precise keywords

I arrange keywords in the order of research performed – chronologically

Example:



Keywords Green seaweed, Pyrolysis, Biochar, Phosphate ions, Wastewater treatment, Soil additives

<https://www.springer.com/gp/authors-editors/authorandreviewertutorials/writing-a-journal-manuscript/title-abstract-and-keywords/10285522?srsIid=AfmBOopRAYUilgVIAKI2r2COF3xqkxbsJZ8WUINblsIE-tBzEhOAbBOP>

Introduction – content

- ❑ The Introduction should provide readers with **the background information** needed to understand your study, and the reasons why you conducted your experiments
- ❑ The Introduction should answer the question: **what question / problem was studied?**

- ❑ The introduction should have **a funnel shape** with clear sections on:
 - ***general background*** (what is this all about?)
 - ***what is known and what is unknown about this specific subject*** (why was this study needed, and why is it important?)
 - ***primary research question*** (what did we want to know?)
 - ***study aim and design*** (what did we do to answer the research question?)



Schematic presentation on the overall scope and objectives of the comprehensive review

In the
„Introduction”
section

The overarching objective of this review is to conduct a critical analysis of recent advancements in the application of biochar for carbon sequestration in soil and to explore climate change mitigation on a large scale. The overall scope of this review is presented in Fig. 2. Specifically, the commonly used thermal-based synthesis methods (e.g., pyrolysis)

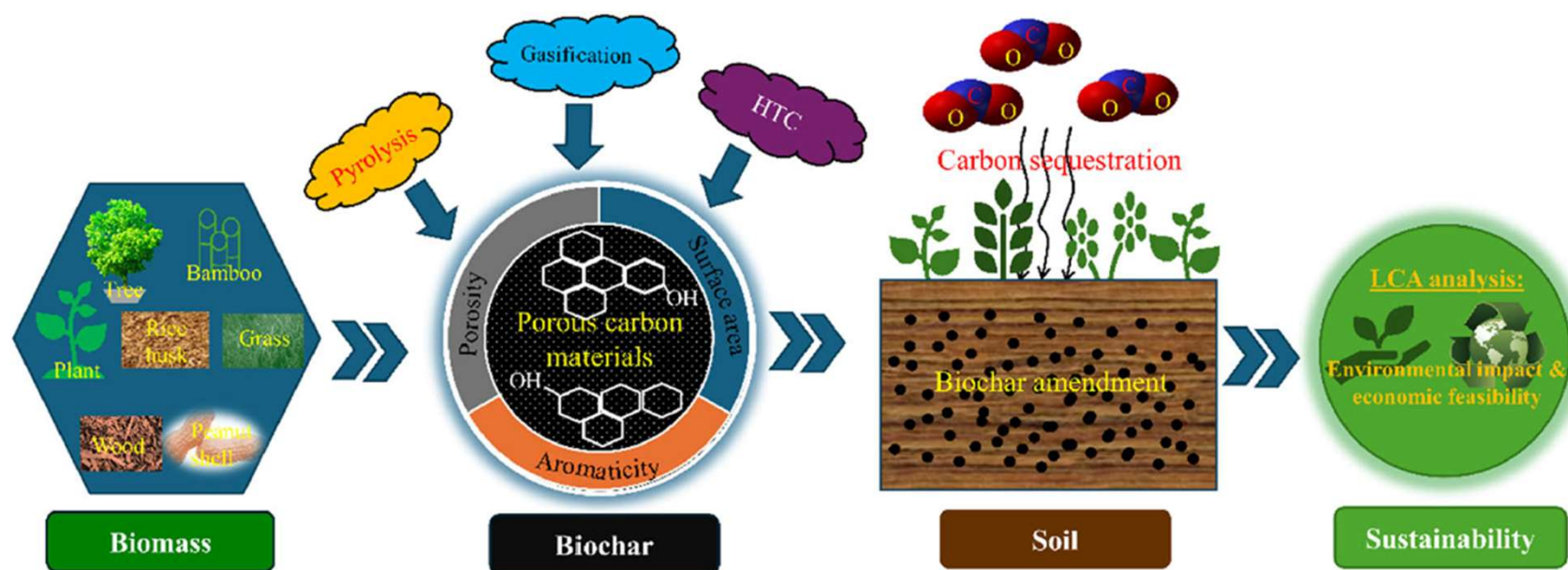
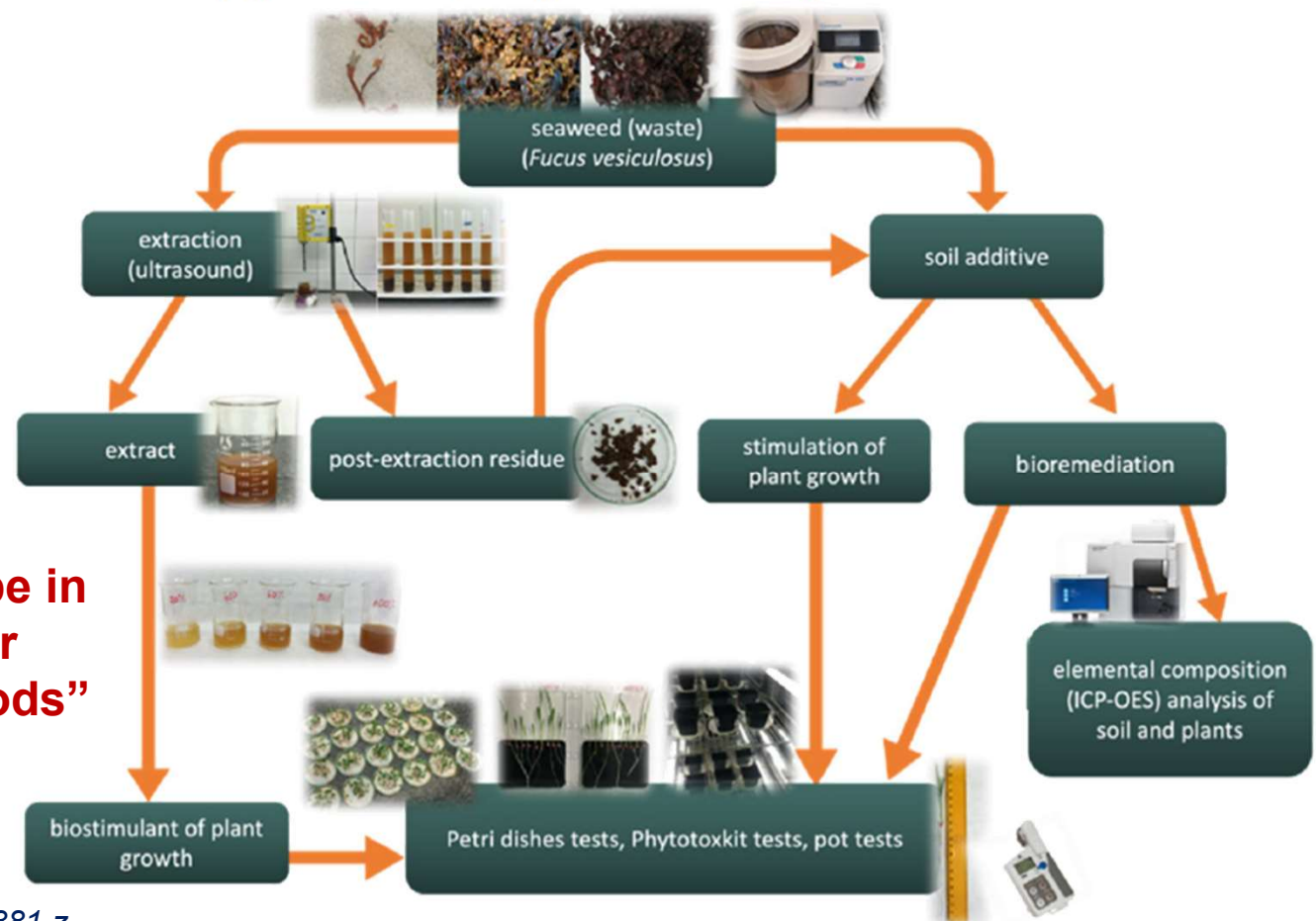


Fig. 2 | Schematic presentation on the overall scope and objectives of this comprehensive review. HTC hydrothermal carbonization.

Research scheme

In the Introduction (last sentence): The effectiveness of the proposed solutions was verified in plant germination tests to assess the potential phytotoxicity of *Fucus vesiculosus* extracts (biostimulation on radish (*Raphanus sativus*)) as well as in pot experiments (biostimulation on radish and bioremediation on sorgo (*Sorghum saccharatum*) seeds, i.e., seeds that are recommended for phytotoxkit tests). The general scheme of performed experiments is presented in Fig. 1.



Such a scheme could be in the „Introduction” or in „Materials and Methods”

Research scheme

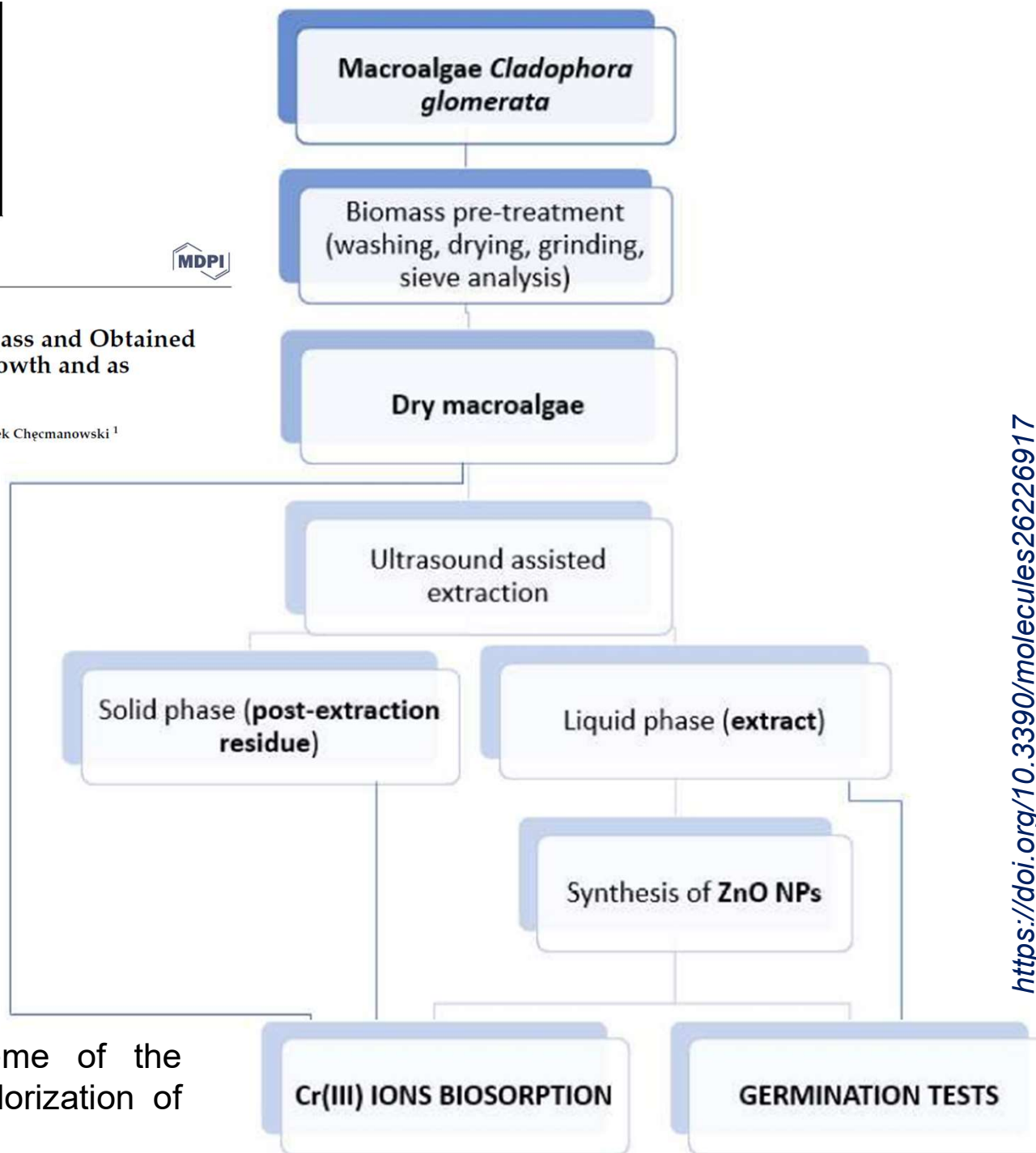
Article

Valorization of *Cladophora glomerata* Biomass and Obtained Bioproducts into Biostimulants of Plant Growth and as Sorbents (Biosorbents) of Metal Ions

Katarzyna Dziergowska ¹, Maja Welna ², Anna Szymczycha-Madeja ², Jacek Chęćmanowski ¹ and Izabela Michalak ^{1,*}

„Introduction”

Figure 1. The general scheme of the proposed approach for the valorization of *Cladophora glomerata*



Introduction – length

- ❑ Look at the length of the Introduction (**maximum 10-15% of the total word count**) – 1.5 pages maximum (avoid long reviews about the topic of the article)
- ❑ Many journals provide the total number of words in an article that can be used

Engineering
in Life Sciences

Eng. Life Sci. 2015, 15, 160–176

www.els-journal.com

Izabela Michalak
Katarzyna Chojnacka

Department of Advanced
Material Technologies, Faculty of
Chemistry, Wrocław University of
Technology, Wrocław, Poland

Review

Algae as production systems of bioactive compounds

Algal extracts are gaining increasing interest due to their unique composition and possibilities of wide industrial applications. Various extraction techniques are used for conversion of algal biomass into extracts. Recently, attention of scientists has been paid to novel methods, such as enzyme-assisted extraction, microwave-assisted extraction, pressurized liquid extraction, supercritical fluid extraction, and ultrasound-assisted extraction, which enable the extraction of biologically active compounds without their degradation. In this review, the properties of biologically active compounds extracted from the biomass of algae reported in the literature are presented in a structured way. Algal extracts contain compounds such as carbohydrates, proteins, minerals, oil, fats, polyunsaturated fatty acids as well as bioactive compounds such as antioxidants (polyphenols, tocopherols [vitamin E], vitamin C, mycosporine-like amino acids), and pigments, such as carotenoids (carotene xanthophyll), chlorophylls, and phycobilins (phycocyanin, phycoerythrin), which possess antibacterial, antiviral, antifungal, antioxidative, anti-inflammatory, and antitumor properties. Finally, we assemble a list of applications of algal extracts in different developing branches of agriculture (biostimulants, bioregulators, feed additives) and in pharmaceutical industry.

Keywords: Algal extracts / Algae applications / Bioactive compounds / Biomass / Extraction methods

Received: September 9, 2014; revised: November 19, 2014; accepted: December 15, 2014

DOI: 10.1002/elsc.201400191

TIP: Do not write a literature review in your Introduction, but **do** cite reviews where readers can find more information if they want it.

Table 1. Review papers on biologically active compounds in algae.

Biologically active compounds	Reference
Polysaccharides	[1, 2, 10, 23–29]
Lipids and fatty acids	[1–3, 23–25, 27–29, 42]
Pigments	[1–4, 10, 23–25, 27, 29, 42, 43]
Antioxidants	[1, 2, 10, 23, 25, 26, 44, 49]
Proteins and amino acids	[1, 2, 10, 25, 27, 28]
Minerals	[25, 28]

The second most cited publication in my scientific achievements !

Izabela Michalak
Katarzyna Chojnacka

Review

Department of Advanced
Material Technologies, Faculty of
Chemistry, Wrocław University of
Technology, Wrocław, Poland

Algae as production systems of bioactive compounds

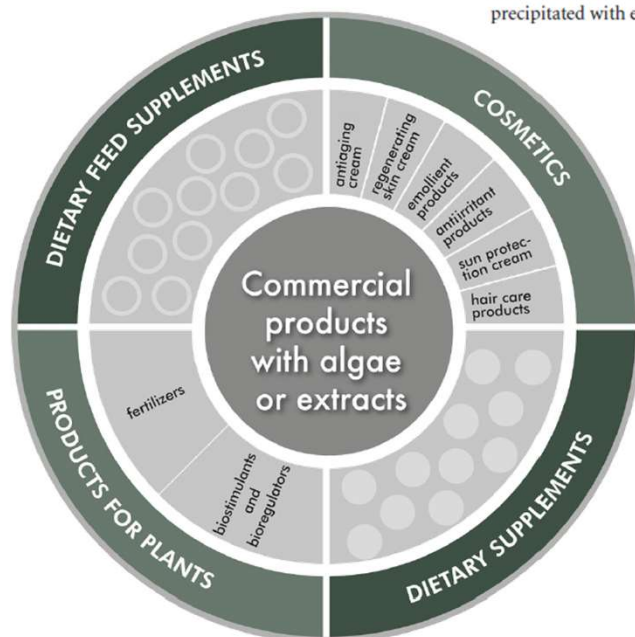
Algal extracts are gaining increasing interest due to their unique composition and

This publication includes:

- current knowledge review
- eye-catching figures
- detailed tables
- future prospects

Table 2. Examples of (a) antibacterial, (b) antiviral, (c) antifungal, (d) antioxidative, (e) anti-inflammatory, (f) antitumor properties of compounds in algal extracts.

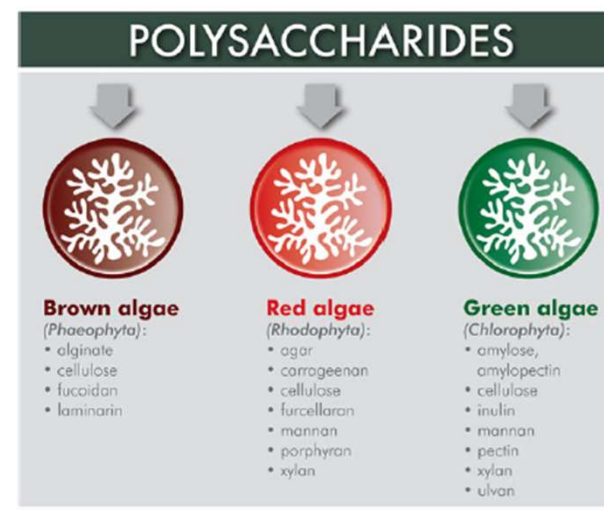
Extracted compound	Algal species	Extraction method	Target	Reference
(a) Antibacterial activity				
PUFAs	<i>Gracilaria corticata</i> <i>Ulva fasciata</i> <i>Enteromorpha compressa</i>	Solvent extraction with hexane, chloroform, ethyl acetate, chloroform:alcohol (1:1), methanol by soaking the material in the solvents thrice overnight at room temperature (1:3v/v)	Bacteria pathogenic to fish: <i>Edwardsiella tarda</i> , <i>Vibrio alginolyticus</i> , <i>Pseudomonas fluorescens</i> , <i>P. aeruginosa</i> , <i>Aeromonas hydrophila</i>	[92]
Fats (palmitic acid)	<i>Ulva reticulata</i>	Extraction of powdered algal samples with ethanol, chloroform, petroleum ether, water. Samples were soaked in the solvents for 24 h and homogenized in a blender with the solvents at room temperature	<i>Escherichia coli</i> , <i>P. aeruginosa</i> , <i>Staphylococcus aureus</i> , <i>Enterococcus faecalis</i>	[93]
Proteins (amino acids)	<i>Caulerpa occidentalis</i>			
Bioflavonoids (rutin, quercetin, and kaempferol)	<i>Cladophora socialis</i> <i>Dictyota ciliolata</i> <i>Gracilaria dendroides</i>			
Sulfated polysaccharide	<i>Sargassum swartzii</i>	Dried seaweed powder was extracted with water at 90–95°C for 16 h. The syrup was filtered through filter paper, cooled, and precipitated with ethanol	<i>S. aureus</i> , <i>Proteus vulgaris</i> , <i>E. coli</i> , <i>Bacillus subtilis</i> , <i>Pseudomonas aeruginosa</i> , <i>Salmonella typhi</i> , <i>Shigella flexneri</i> , <i>Klebsiella pneumoniae</i> , <i>E. faecalis</i> ,	[94]



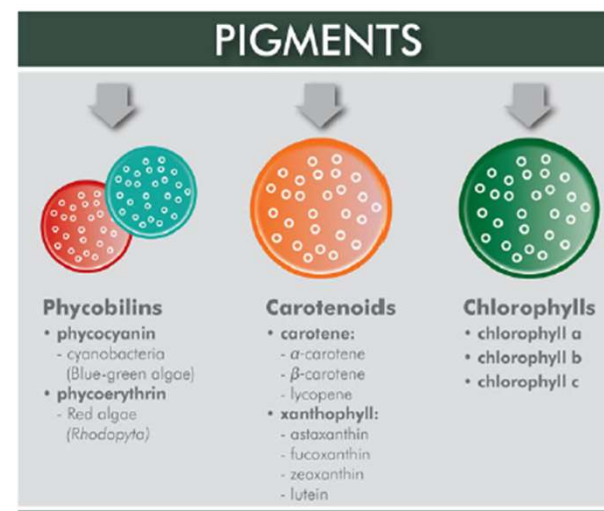
Practical application

Algal extracts produced by novel extraction techniques, such as supercritical fluid extraction, microwave-assisted extraction, ultrasound-assisted extraction, enzyme-assisted extraction and pressurized liquid extraction, have several applications in different branches of industry. These techniques protect the algal bioactive compounds from degradation. The multitude of applications results from the unique properties of algae. They are rich in compounds such as carbohydrates, proteins, minerals, oil, fats, and polyunsaturated fatty acids (e.g., eicosapentaenoic acid, docosahexaenoic acid, and γ -linolenic acid), as well as bioactive compounds, such as polyphenols, terpenoids, carotenoids, and tocopherols, which have antibacterial, antiviral, antifungal, antioxidative, anti-inflammatory, and antitumor properties. Algal extracts produced in solvent-free environments or with minimal use of solvents are safe for plants, animals, and humans. So far, they have been used in modern agriculture for plants (biostimulants, bioregulators, fertilizers), animals (feed additives), and humans (food, pharmaceuticals, cosmetics).

A. POLYSACCHARIDES



B. PIGMENTS



Introduction – background and citations

While writing **the background**, make sure your **citations** are:

- **Relevant:** this is the most important requirement. The studies you cite should be strongly related to your research question (you should cite original works, those that were created first)
- **Current:** every field is different, but you should aim to cite references that are **not more than 10 years** old if possible. Although be sure to cite the first discovery or mention in the literature even if it older than 10 years
- **Well balanced:** if experiments have produced contradictory results on a given topic, studies that presented both types of results should be reported/cited

Introduction – purpose / aim / objective of the study

- ❑ Once you have provided background material and stated the problem or question for your study, tell the reader the **purpose of your study**
- ❑ Usually the reason is to **fill a gap in the knowledge** or to **answer a previously unanswered question** – highlight the novelty of the work / the existing knowledge gap
- ❑ The final thing to include at the end of your Introduction is a clear and exact **statement of your study aims**. You might also explain in a sentence or two how you conducted the study (examples provided earlier in the presentation).
- ❑ **Finally: Ask yourself: „Will this introduction sell my paper to editors, reviewers, readers, etc.?”**

TIPS:

- Varied citation in the text of manuscript (not one per half of the page)
- In the introduction I use publications that I can then use in the „Materials and Methods” and „Results and Discussion” sections
- In some journals there is a reference limit – a limited number of cited publications
- All abbreviations used in the publication should be explained in the place where they appear for the first time

Materials and Methods

This section provides the reader with all the details of **how you conducted your study**.

You should:

- ☐ Describe what you did in the **past tense**
- ☐ Use **subheadings** to separate different methodologies (the description should be clear)
- ☐ Describe new methods in enough detail that another researcher **can reproduce your experiment**
- ☐ Describe established methods briefly, and **simply cite a reference** where readers can find more detail
- ☐ State **all** statistical tests and parameters (mentioned in the first presentation)

Example: description of the „Statistical analysis” section in the publication

Most often, this description is in the „**Materials and Methods**” section as the last subsection.

Statistical analysis. Statistical analysis was performed using *Statistica* ver. 13.0 (TIBCO Software Inc., Tulsa, OK, USA). For all experimental groups, descriptive statistics (mean and standard deviations or median and quantiles) were performed. The Shapiro–Wilk test was used to assess the normality of the distribution of experimental results. The Brown-Forsythe’s test was used to check the homogeneity of variances. The statistical test (used to investigate the significance of differences between the tested groups) was selected based on the previously mentioned tests. The one-way analysis of variance (ANOVA) allowed the determination of the statistically significant differences between several groups. The Tukey multiple comparison test was used for normal distribution and homogeneous variances. For the lack of the normal distribution or lack of the homogeneity of variances, the Kruskal–Wallis test was used. The results were considered significantly different when $p < 0.05$.

Materials and Methods

TIPS:

- The work schedule is recommended (example on the next slide)
- If there is a page limit in the manuscript, citations may be added to the described methods
- Specify the reagents used in the study, manufacturer and country
- For the equipment used, list the device type, model, and manufacturer
- Number all formulas / equations
- Pay attention to the units, they should be unified (e.g., ml or mL or cm³)

RESEARCH ARTICLE

A comprehensive analysis of biosorption of metal ions by macroalgae using ICP-OES, SEM-EDX and FTIR techniques

Izabela Michalak^{1*}, Małgorzata Mironiuk¹, Krzysztof Marycz^{2,3}

1 Department of Advanced Material Technologies, Faculty of Chemistry, Wrocław University of Science and Technology, Wrocław, Poland, **2** Department of Experimental Biology, The Faculty of Biology and Animal Science, Wrocław University of Environmental and Life Sciences, Wrocław, Poland, **3** Faculty of Veterinary Medicine, Equine Clinic—Equine Surgery, Justus-Liebig-University, Gießen, Germany

„Materials and Methods”

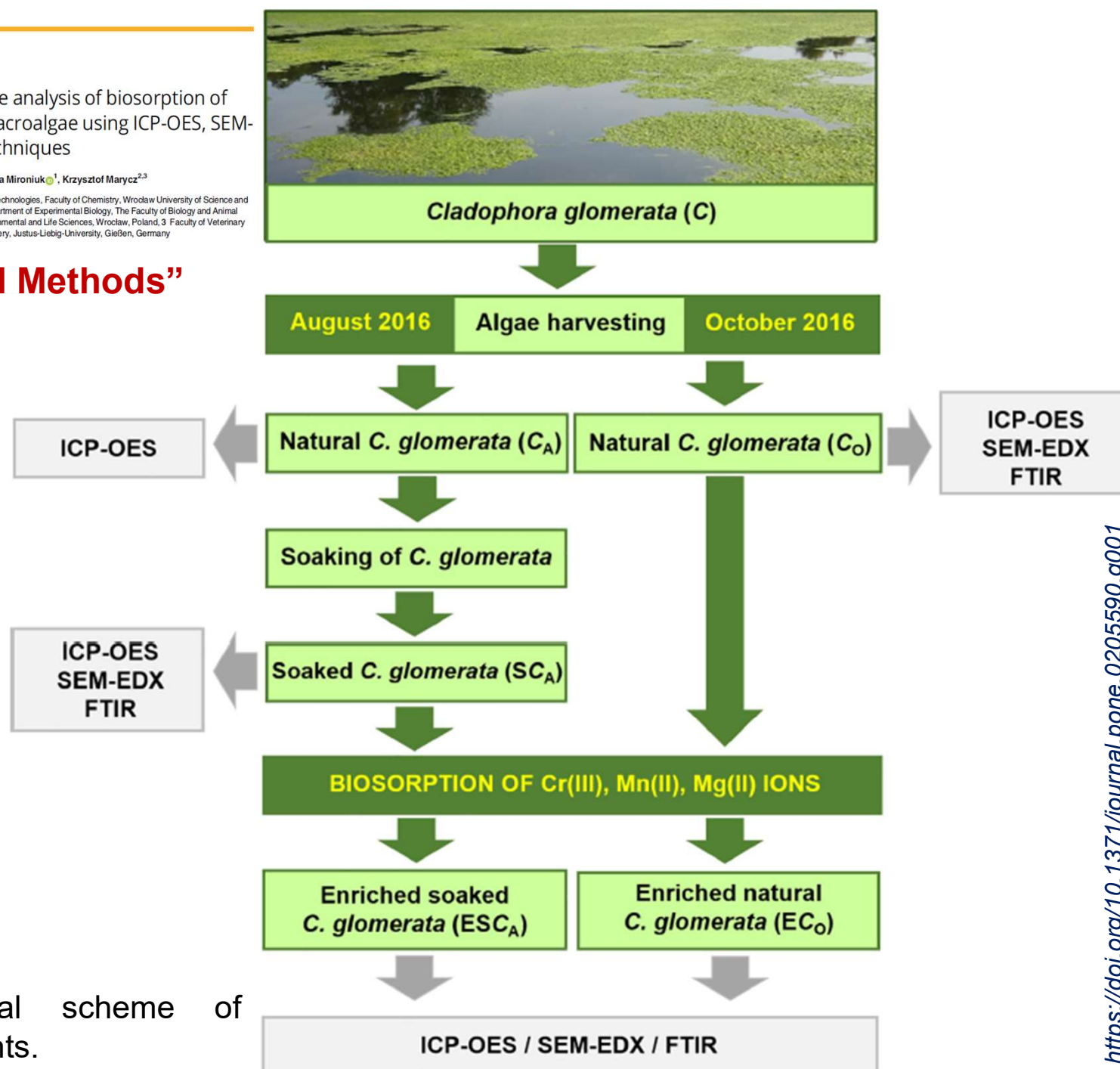


Fig 1. A general scheme of performed experiments.

ARTICLE

Open Access

AI-guided investigation of biochar's efficacy in Pb immobilization for remediation of Pb contaminated agricultural land

Yoora Cho^{1,6†}, Juin Yau Lim^{1,2†}, Avanthi Deshani Igalavithana³, Geonwook Hwang¹, Mee Kyung Sang⁴, Ondřej Mašek⁵ and Yonq Sik Ok^{1*}

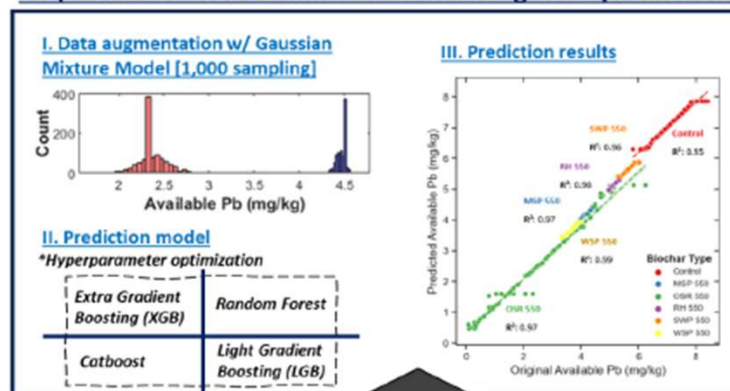
Step 1: Biochar preparation & soil sampling



Step 2: Assessment on Pb removal efficiency



Step 4: AI-assisted Pb immobilization long-term prediction



Step 3: Evaluation of on-field experiments

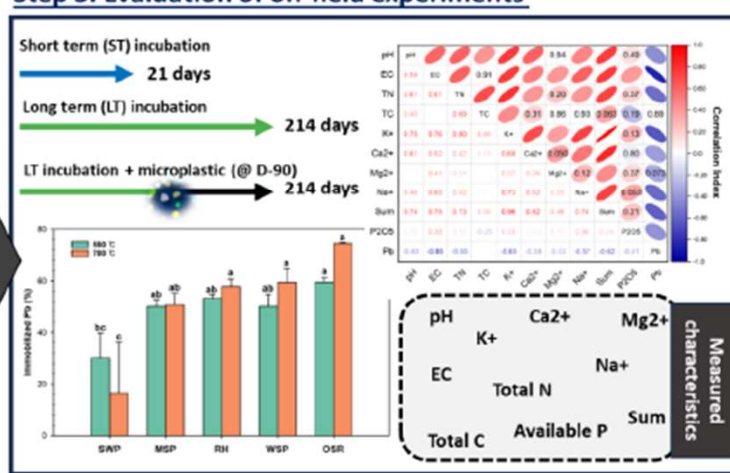


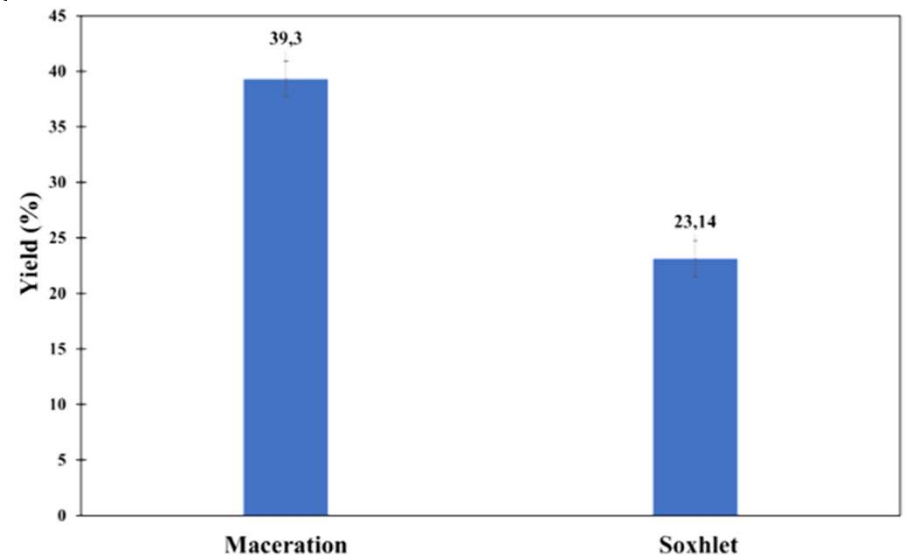
Fig. 1 An overall framework proposed to address the objective of determining the effectiveness of Pb immobilization with biochar

Results and Discussion

- ❑ Sometimes „Results” and „Discussion” **are separated**
- ❑ In the **Results section**, simply state what you found, but **do not** interpret the results or discuss their implications
- ❑ If the **Results and Discussion** constitute one section, after presenting the results they can be interpreted and related to the literature data
- ❑ As in the Materials and Methods section, use **subheadings** to separate the results of different experiments.
- ❑ Results should be presented in a **logical order**. In general this will be in order of importance, not necessarily the order in which the experiments were performed.
- ❑ Use the **past tense** to describe your results; however, refer to figures and tables in the present tense (e.g., Figure 1 presents.....)

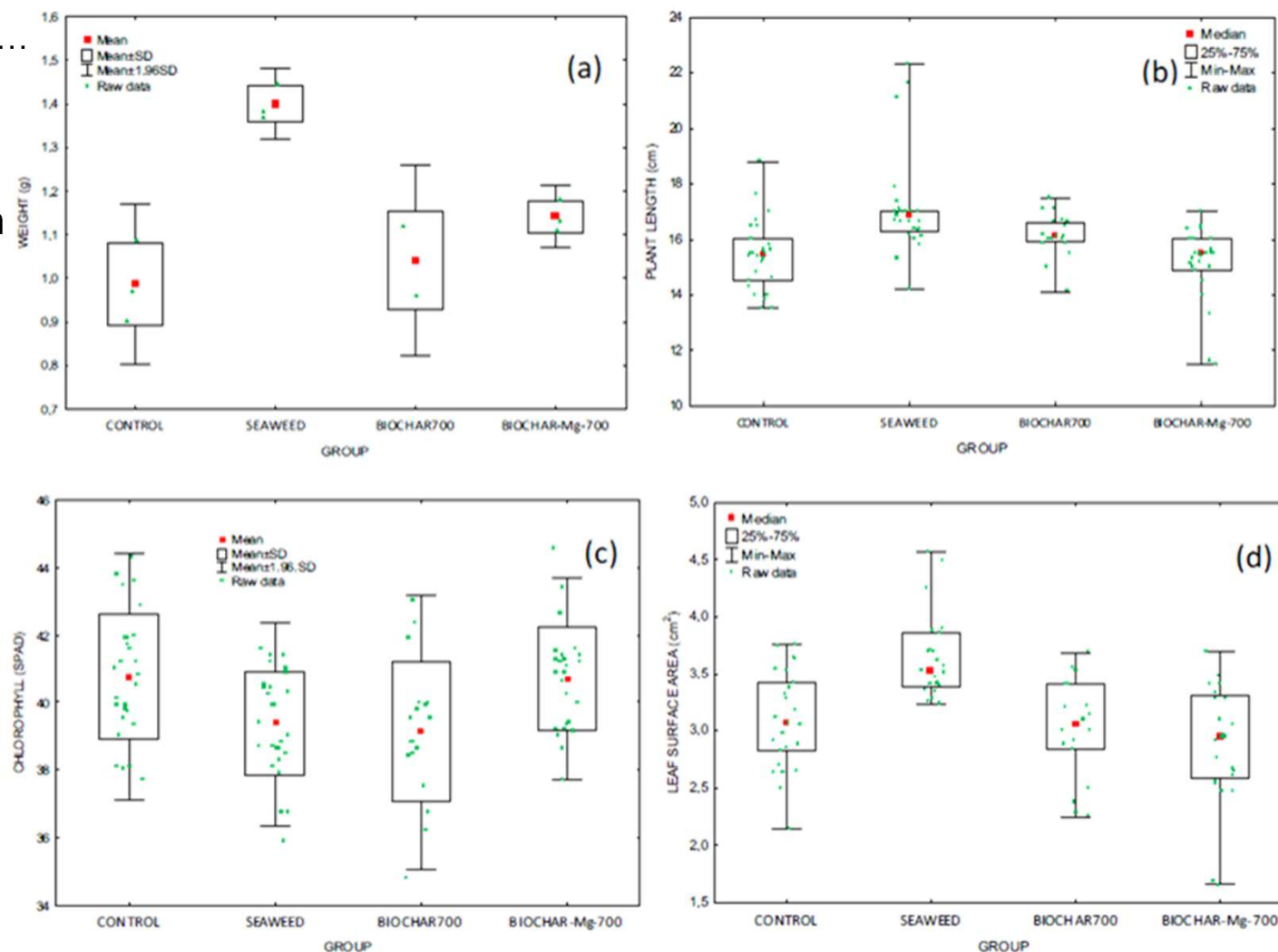
Results and Discussion – Figures and Tables

- ❑ **Do not duplicate data** among figures, tables, and text
 - A common mistake is to re-state much of the data from a table in the text of the manuscript
 - Instead, use the text to summarize what the reader will find in the table, or mention one or two of the most important data points
 - It is usually much easier to read data in a table than in the text
- ❑ Include **the results of statistical analyses** in the text, usually by providing *p* values wherever statistically significant differences are described.
- ❑ Do not include in the publication Figures with small amounts of data – it is better to describe it in one sentence in the publication
- ❑ There is usually a **limit to the number of tables / figures** in publications



Results and Discussion – Figures and Tables

Instead of Figure 1, 2, 3...
you can use
Figure 1(a), 1(b), 1(c)...
– limiting the number of
figures in the publication



Niedzbala et al.

Bioreources and Bioprocessing (2024) 11:27
<https://doi.org/10.1186/s40643-024-00741-z>

Fig. 6 Results of the pot experiments (a) fresh weight of the aboveground parts of plants, (b) plant length, (c) chlorophyll, (d) leaf surface area using different soil additives

Figures and Tables

Figures and **tables** are often the **quickest way to communicate large amounts of complex information** that would be complicated to explain in text

❑ Figures and tables are also important **for attracting readers to your work**

Tables are a concise and effective way to present large amounts of data

❑ You should design them carefully so that you clearly communicate your results to busy researchers

The following is an example of a well-designed table:

- Clear and concise legend / caption
- Data divided into categories for clarity
- Sufficient spacing between columns and rows
- Units are provided
- Font type and size are legible
- Use the same abbreviations for a given parameter throughout the publication (e.g. q_m or $q_{\max}$ – for maximum sorption capacity)

Figures and Tables

Figures are ideal for presenting:

- Images
- Data plots
- Maps
- Schematics

Just like tables all figures need to have a clear and **concise legend caption** to accompany them.

All figures and tables in the manuscript **should be numbered chronologically** and there should be a reference to them in the text of the publication:

Pot experiments using enriched biochar

Pot experiments carried out after phytotoxicity studies on the same plant showed that biochar was not toxic to wheat (*Triticum aestivum*). Three different soil additives were used for these tests—*Ulva intestinalis* (S), biochar enriched with phosphate ions (B700+P) and modified biochar enriched phosphate ions (B700MgCl₂+P). The results are presented in Table 10 and Fig. 6.

<https://doi.org/10.1186/s40643-024-00741-z>

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Appendix – Supplementary materials

If we have **more tables or figures** and there is no space in the main text of the manuscript, we can add them to the **Supplementary Materials**

Example:

Cho et al. *Applied Biological Chemistry* (2024) 67:82
<https://doi.org/10.1186/s13765-024-00933-3>



ARTICLE

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AI-guided investigation of biochar's efficacy in Pb immobilization for remediation of Pb contaminated agricultural land

Yoora Cho^{1,6†}, Juin Yau Lim^{1,2†}, Avanthi Deshani Igalavithana³, Geonwook Hwang¹, Mee Kyung Sang⁴, Ondřej Mašek⁵ and Yong Sik Ok^{1*}

<https://doi.org/10.1186/s13765-024-00933-3>

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s13765-024-00933-3>.

Supplementary Material 1

Supplementary Material 2

Supplementary Material 3

Supplementary Material 4

Acknowledgements

This work was supported by the National Research Foundation of Korea (NRF) grant funded by the Korean government (MSIT) (No. 2021R1A2C2011734). This research was also supported by the Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education (NRF-2021R1A6A1A10045235). This work was supported by the Technology Innovation Program (RS-2024-00432915, Development of biodegradable polymer and their applications using high-performance enzyme activation technologies for acceleration of biodegradability) funded By the Ministry of Trade, Industry & Energy (MOTIE, Korea).

Author Contributions

Yoora Cho: Formal analysis, Investigation, Writing – original draft, Visualization. Juin Yau Lim: Methodology, Formal analysis, Investigation, Writing – original draft. Avanthi Deshani Igalavithana: Methodology, Writing – review & editing. Geonwook Hwang: Writing – review & editing. Mee Kyung Sang: Methodology, Formal analysis, Writing – review & editing. Ondřej Mašek: Resources, Writing – review & editing. Yong Sik Ok: Conceptualization, Writing – review & editing, Funding acquisition, and Supervision.

Data Availability

All data generated or analyzed during this study are included in this published article and supplementary materials.

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 **Journal of Cleaner Production**
Volume 270, 10 October 2020, 122462



A comprehensive review of engineered biochar: Production, characteristics, and environmental applications

Hamed Kazemi Shariat Panahi ^{a b c}, Mona Dehghaghi ^{a b c}, Yong Sik Ok ^d, Abdul-Sattar Nizami ^e, Benyamin Khoshnevisan ^f, Solange I. Mussatto ^g, Mortaza Aghbashlo ^h  , Meisam Tabatabaei ^{a c i j}  , Su Shiung Lam ^{a k}  

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A comprehensive review of engineered biochar: Production, characteristics, and environmental applications

Author:

Hamed Kazemi Shariat Panahi, Mona Dehaghghi, Yong Sik Ok, Abdul-Sattar Nizami, Benyamin Khoshnevisan, Solange I. Mussatto, Mortaza Aghbashlo, Meisam Tabatabaei, Su Shiung Lam

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A Review on the Adaption of Alginate-Gelatin Hydrogels for 3D Cultures and Bioprinting

Magdalena B. Labowska ¹, Karolina Cierluk ², Agnieszka M. Jankowska ¹, Julita Kulbacka ³, Jerzy Detyna ^{1,*} and Izabela Michalak ⁴

<https://doi.org/10.3390/ma14040858>

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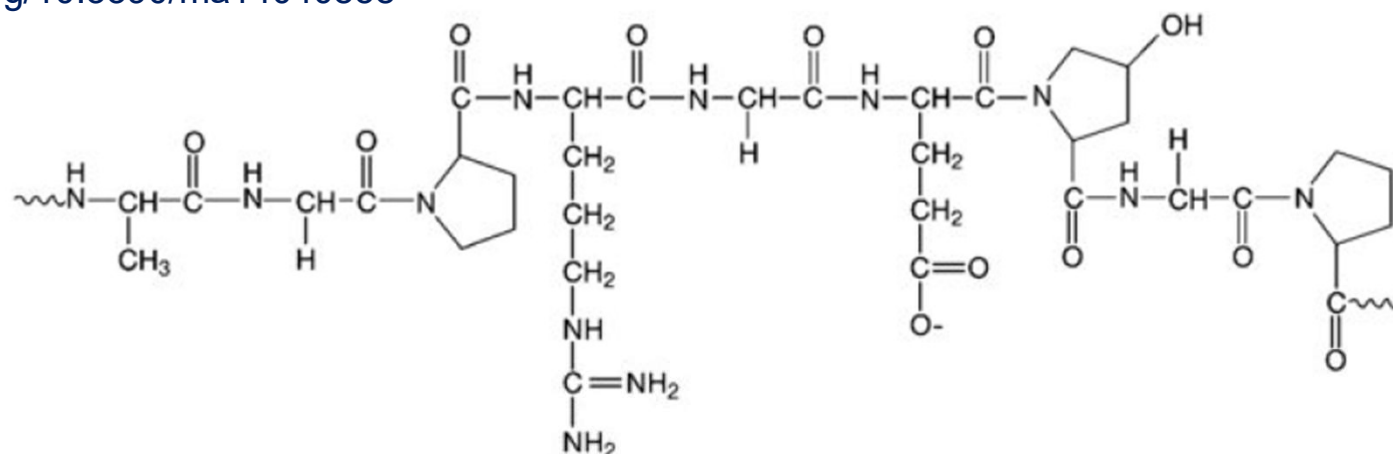


Figure 3. Chemical structure of gelatin. Reproduced with permission from [50]. Copyright 2020 John Wiley & Sons.

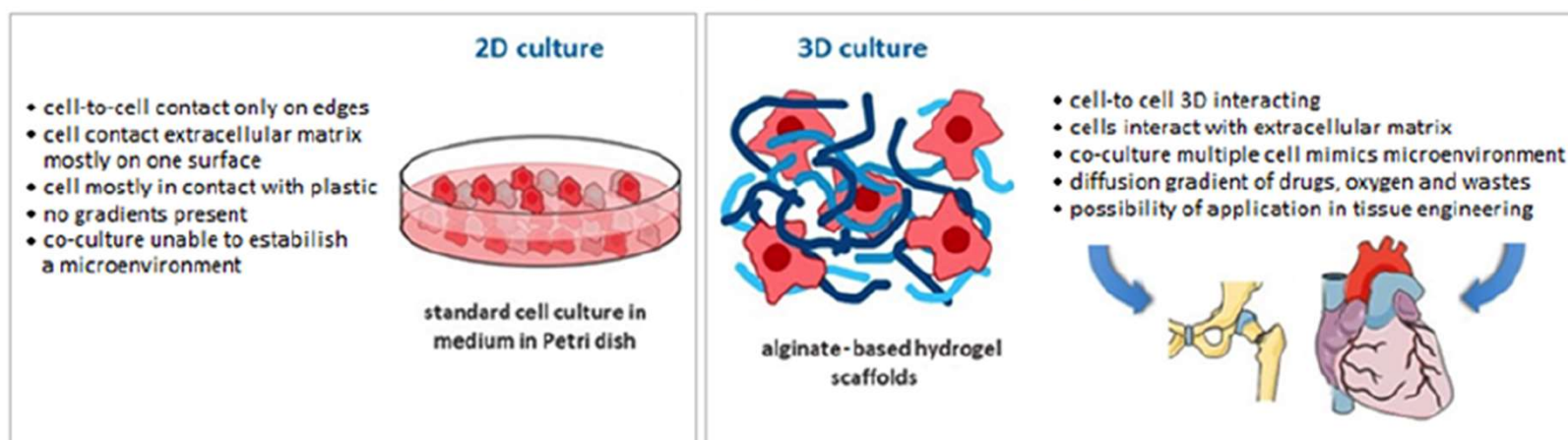


Figure 7. Comparison of 2D culture and 3D model based on alginate hydrogel (own source).

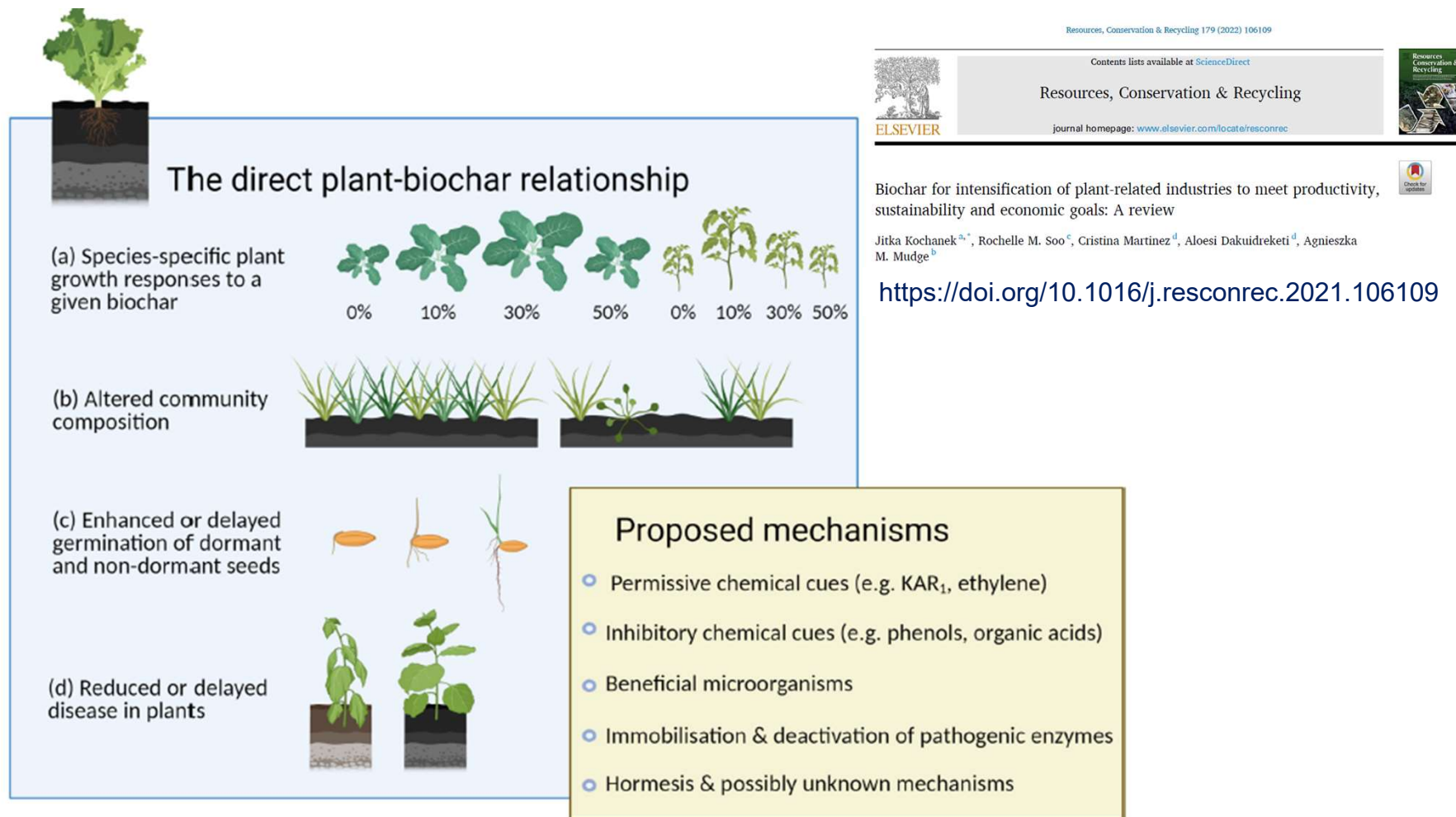


Fig. 2. Direct effects of biochar on plants that are not related to nutritional, water-holding, physical or liming attributes (the ‘charcoal effect’, (Graber et al., 2010). For example, (a) biphasic and species-specific responses to biochar occur whereby plant size or growth increase in dose-response trials to a species-specific maximal peak and then declines above the peak rate (Kochanek et al., 2016a, b; Spokas et al., 2012; Biederman and Harpole, 2013; Graber et al., 2010; Mukherjee and Lal, 2014); (b) biochar can alter plant community composition, reducing the density of some species and increasing others within the same site (Drake et al., 2015; Grau-Andres et al., 2021); (c) biochar can assist in or delay germination of dormant and non-dormant seeds, such as of agricultural, native and weedy species (Kochanek et al., 2016a); and (d) biochar can sometimes reduce or delay disease in plants (Elad et al., 2010; Jaiswal et al., 2019). Proposed mechanisms are an interplay of permissive chemical cues, such as the plant growth regulating compounds karrikinolide (KAR₁; Kochanek et al., 2016a) and ethylene (Fulton et al., 2013), and inhibitory cues such as phenols and organic acids; stimulation of beneficial microbiota at low concentrations and impairment at high concentrations (Graber et al., 2010; Elad et al., 2010; Warnock et al., 2007); immobilization and deactivation of pathogenic enzymes (Jaiswal et al., 2018c); low phytotoxin doses stimulating plant growth but high doses suppressing growth (hormesis; Graber et al., 2010; Elad et al., 2010; Prithiviraj et al., 2007) and likely as-yet unknown phenomena (Backer et al., 2018). Created with BioRender.com.

Discussion

Discussion section should be an interpretation of your results.

You should:

- ❑ **Compare** your results with those from other studies: are they consistent? If not, discuss possible reasons for the difference
- ❑ Mention any **inconclusive results** and explain them as best you can
 - You may suggest additional experiments needed to clarify your results
- ❑ Briefly describe the **limitations** of your study to show reviewers and readers that you have considered your experiment's weaknesses
 - Many researchers are hesitant to do this as they feel it highlights the weaknesses in their research to the editor and reviewer
 - However doing this actually makes a positive impression of your paper as it makes it clear that you have an in depth understanding of your topic and can think objectively of your research

Discussion of results



Open Chem., 2018; 16: 1066–1076

DE GRUYTER

Research Article

Open Access

Izabela Michalak*, Sylwia Lewandowska, Jerzy Detyna, Sylwia Olsztyńska-Janus, Henryk Bujak, Paulina Pacholska

The Effect of Macroalgal Extracts and Near Infrared Radiation on Germination of Soybean Seedlings: Preliminary Research Results

Table 2: The number of normal, abnormal and dead seedlings in the tested groups.

Group		Normal seedlings **		Abnormal seedlings ***		Dead seedlings ***	
		Average*	SD	Average*	SD	Average*	SD
1	C	84.5 ^{abcdef}	3.1	14.5 ^a	3.1	1.0	0.0
2	NIR3 E50	52.5 ^{agh}	4.8	28.3	3.0	19.3	2.1
3	NIR3 E100	55.5 ^{bijk}	2.9	24.8	3.5	19.8	4.8
4	NIR5 E50	47.3 ^{clm}	8.1	31.0	7.0	21.8	3.0
5	NIR5 E100	49.0 ^{dno}	2.4	26.0	1.8	25.0 ^a	3.5
6	NIR3	85.0 ^{gilmpr}	2.2	14.8 ^b	1.7	0.3 ^a	0.5
7	NIR5	85.3 ^{hjmst}	3.0	14.0 ^c	2.9	0.8	1.0
8	E50	44.5 ^{ekps}	4.2	33.3 ^{abc}	3.1	22.3	6.1
9	E100	47.8 ^{ft}	3.8	29.0	5.4	23.3	2.4

* – average from 4 replications in each group; SD – standard deviation

** – normal distribution, ANOVA test

*** – abnormal distribution, Kruskal-Wallis test

a, b... – statistically significant differences for $p < 0.05$



Soaking of 100 soybean seeds in extract (40 ml) for 1 h



Abnormal



Normal

The soaking of soybean seeds in macroalgal extract caused many of the germinated seedlings to be classified as abnormal and dead (the highest percentage) – **seeds swelled in the extract**

New experiment – changing the method of the application of algal extract to soybean seeds



Open Chem., 2019; 17: 516–525

DE GRUYTER

Research Article

Sylwia Lewandowska*, Izabela Michalak, Katarzyna Niemczyk, Jerzy Detyna, Henryk Bujak, Pelin Arik

Influence of the Static Magnetic Field and Algal Extract on the Germination of Soybean Seeds

(a) Soaking of paper substrate in an algal extract **(b)** Putting 100 soybean seeds on a paper substrate **(c)** Storing of soybean seedlings in a growth chamber.



Discussion – continued... and Conclusions

You should:

- ☐ Discuss **what your results may mean** for researchers in the same field as you, researchers in other fields, and the general public. How could your findings be applied?
 - ☐ State how your results **extend the findings** of previous studies
 - ☐ If your findings are preliminary, suggest **future studies** that need to be carried out
 - ☐ Summarize the hypothesis (accepted or rejected) and purpose of the study
-
- ☐ Discuss your **Conclusions** in order of **most to least important**
 - ☐ Conclusions should be supported by the results obtained
 - ☐ **Often, this is the weakest section in the publications I review...**

Acknowledgments

Acknowledgments:

- ❑ Its purpose is to **thank all of the people who helped with the research** but did not qualify for authorship (check the target journal's Instructions for Authors for authorship guidelines)
- ❑ Acknowledge anyone who provided **intellectual assistance, technical help** (including with writing and editing), or **special equipment or materials**
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Funding

This work was performed in the framework of grant: "Eco-friendly technologies for the management of seaweed biomass for products useful for sustainable agriculture and biosorbents used for the removal of heavy metal ions from the environment" (2019/33/B/NZ9/01844) from the National Science Centre in Poland.

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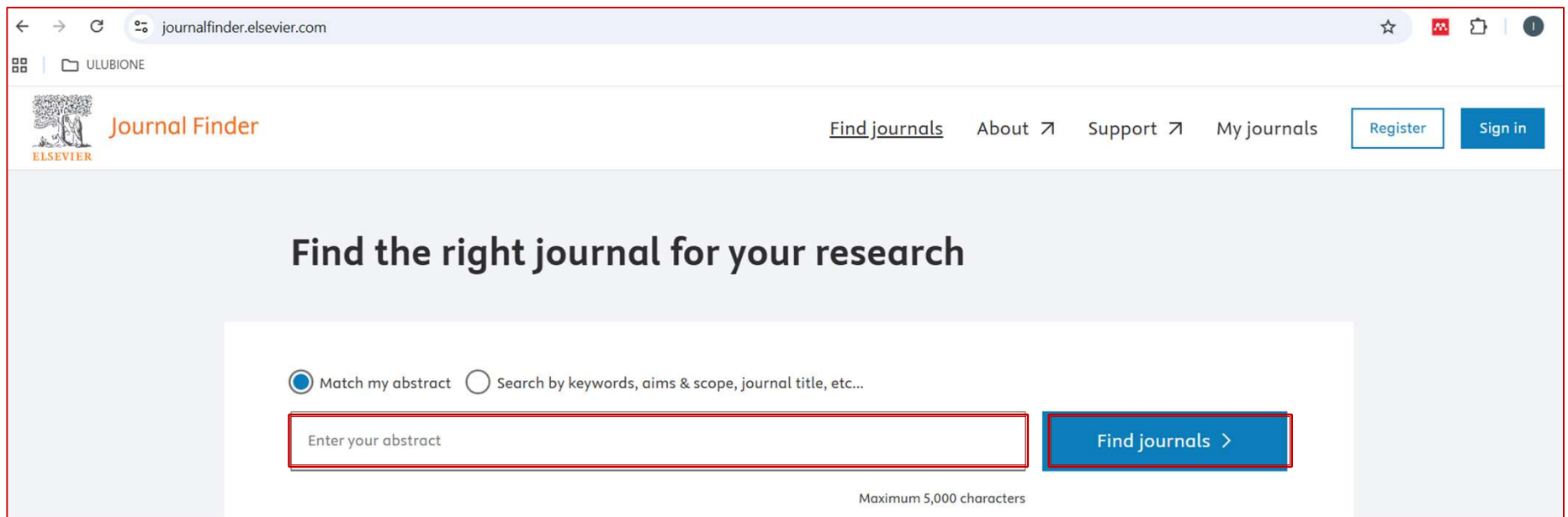
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Cited publications in References can make it easier to choose a potential journal to which we can submit our publication – it is worth checking which journal is most frequently cited.

Where is the best place to publish my research?

Select few potential journals according to the following rules:

- ☐ Analyze the list of the journals you read and cite the most
- ☐ Ask the **co-authors**, they should be involved in choosing the journal/conference
- ☐ Ask more experienced colleagues, supervisors
- ☐ Use tools such as **Elsevier Journal Finder**



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One of the main reasons for rejecting a publication from a journal (and not sending it for review) is its non-compliance with the aim and scope of the Journal (**out of scope**).

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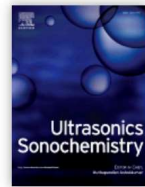


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Before publication submission – preparing a Cover Letter

- ❑ A good Cover Letter can **help to “sell” your manuscript** to the journal editor
- ❑ As well as introducing your work to the editor you can also take this opportunity to **explain why the manuscript will be of interest to a journal's readers**, something which is always at the forefront of editors' mind
- ❑ As such it is worth spending time writing a coherent and persuasive Cover Letter !!!

Before publication submission – preparing a Cover Letter

- ❑ If known, **address the editor** who will be assessing your manuscript by their name. Include the date of submission and the journal you are submitting to.
- ❑ **First paragraph:** include the title of your manuscript and the type of manuscript it is (e.g. review, research, case study). Then briefly explain the background to your study, the question you sought out to answer and why
- ❑ **Second paragraph:** you should concisely explain what was done, the main findings and why they are significant
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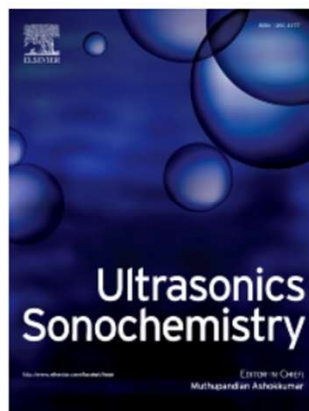
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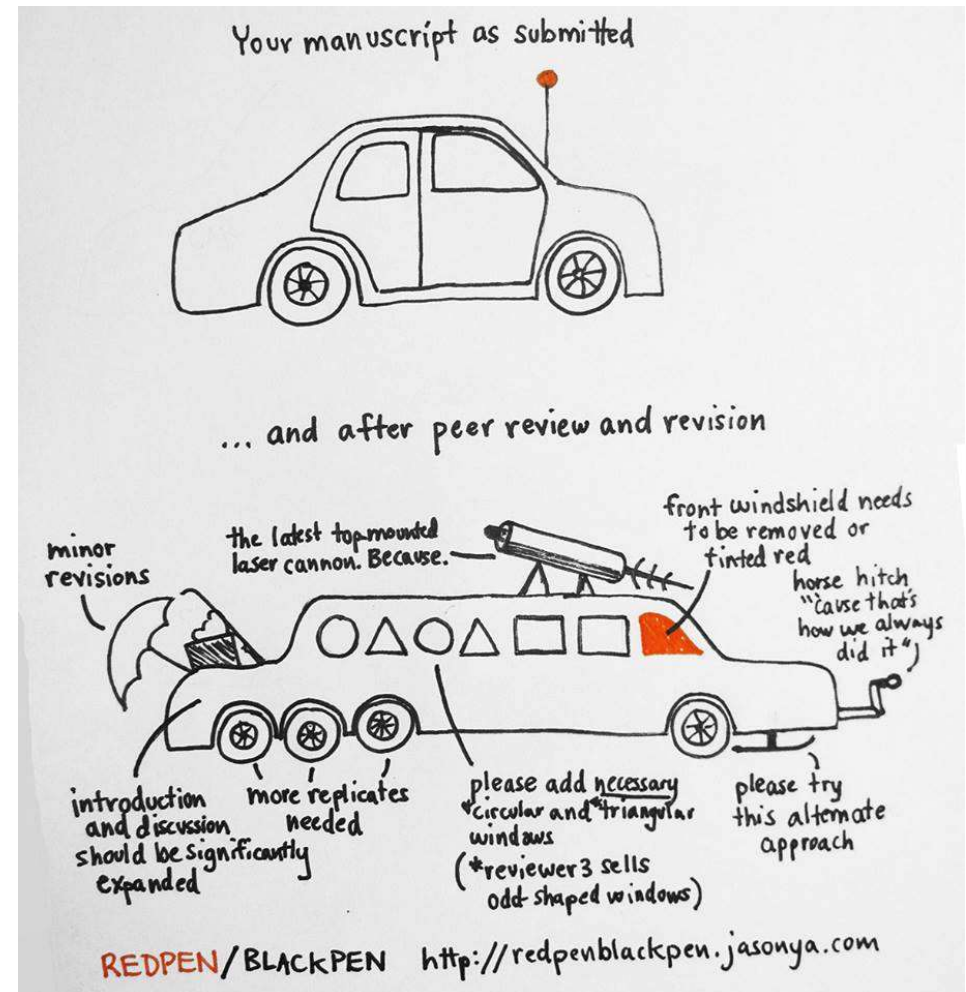
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- ❑ This letter usually contains information on how to return your revised manuscript including instructions on how to highlight the changes made and when you need to return the revised version

TIP:

- Journals have different revision deadlines which vary from as little as a few weeks to three months depending on the revisions that need to be made
- If you do not think you will be able to return a revised manuscript in the allotted time tell the editor immediately
- They should be able to offer you an extension but it is best to discuss this with them as early as possible

Revision – response to Reviewers

- ❑ The reviewer is (**almost** 😊) always right
- ❑ Carefully analyze all comments in the reviews
- ❑ Include all comments in the revised version of the work
- ❑ In the revised paper, highlight the changed and new fragments with a color
- ❑ In response to reviews, refer to each critical remark contained in the review:
 - Describe realized changes in work
 - If the comment was not taken into account (we do not agree with it) justify why we do not agree, including citing other works



Revision

Options:

The manuscript can be accepted in the present form

The manuscript can be accepted after minor revision

The manuscript can be accepted after major revision.

The manuscript should be rejected

Prof. Izabela Michalak

Wrocław University of Science and Technology

Faculty of Chemistry

Department of Advanced Material Technologies

Smoluchowskiego 25

50-372 Wrocław, Poland

e-mail: izabela.michalak@pwr.edu.pl

Dear Editor-in-Chief of ...

Professor ...

We would like to give answers to remarks of Reviewers. Reviewers have read this paper very thoroughly and their remarks were very helpful to significantly improve this manuscript. Many new texts have been added that better explain the assumptions of the article and the results obtained. We included all the changes according to the suggestions of Reviewers. The corrections in the revised manuscript were made in red colour.

Reviewer: 1

Recommendation: Publish after minor revisions.

Comments:

It is recommended to conduct a bibliographic review of studies published in the last 10 years and update the references in the text. Many references are more than 10 years old.

Thank you for this remark. This section has been significantly revised and expanded. New texts and current citations have been added. New references:

Adegoke, K.A.; Adesina, O.O.; Okon-Akan, O.A.; Adegoke, O.R.; Olabintan, A.B.; Ajala, O.A.; Olagoke, H.; Maxakato, N.W.; Bello, O.S. Sawdust-biomass based materials for sequestration of organic and inorganic pollutants and potential for engineering applications. Cur. Res. Green Sustain. Chem. **2022**, *5*, 100274. <https://doi.org/10.1016/j.crgsc.2022.100274>

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Thank You for Your Attention

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