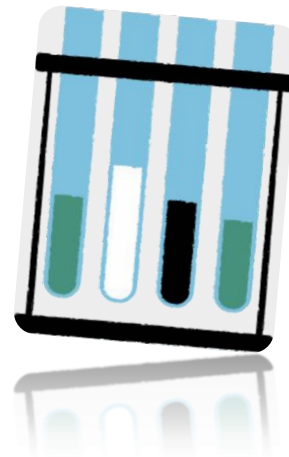




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IMPACT OF WATER MATRIX ON PERSULFATE ACTIVATION EFFICIENCY FOR THE REMOVAL OF LINDANE AND β -ENDOSULFAN USING CORN COB BIOCHAR

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About us:



EnviroChar is one of 30 projects funded by the **Science Fund of the Republic of Serbia** through the **PROMIS 2023** program for young researchers.

Project title: Sustainable solutions in environmental chemistry: exploring biochar potential

Project acronym: EnviroChar

Project coordinator: Dr. Jelena Beljin, Faculty of Sciences, University of Novi Sad

Call identifier: The Science Fund of the Republic of Serbia

Duration: 24 months



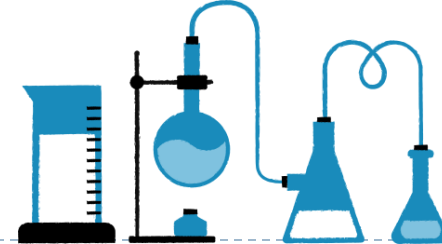
Aim of the study



The aim of this study was to evaluate the efficiency of removing the pesticides from water using biochar (BC) as a catalyst for persulfate (PS) activation, and to understand how different water types (Milli-Q water and surface water) influence the removal process.



Experimental design



Matrix: Milli-Q water and surface water

Pesticides: Lindane and β -endosulfan
(in mixture)

Contact time: 0.5, 1.0 2.0, and 4.0 h
(equilibrium established after 4.0 h, as confirmed in previous experiments)

PS concentration: 3 mM
(optimal dose determined in previous experiments)

Catalyst: BC derived from corn cob biomass

All experiments were performed in duplicate.
Results are presented as mean \pm SD

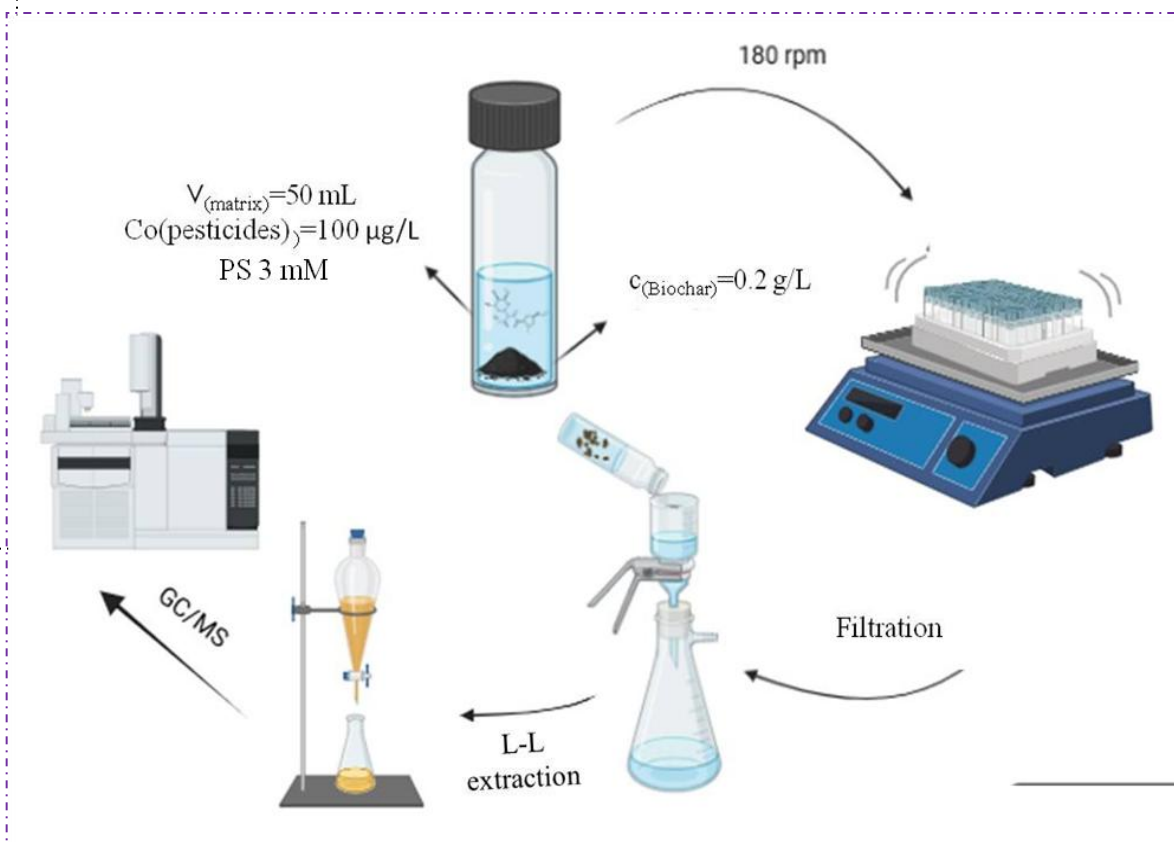


Figure 1. Experimental design

Results and discussion

Lindane

-Higher degradation efficiency in Milli-Q water compared to surface water (matrix effect).

-After 4 h, removal in surface water increased, likely due to enhanced solubility from interactions with organic matter.

-Natural organic matter and ions can both scavenge radicals and modify pesticide availability.

-Despite reduced performance in real water, the BC/PS system remained effective.

Table 1. Characteristics of the surface water

| Parameter | Unit | Result | Method |
|-------------------|----------------------|--------|-------------------------|
| pH | - | 7.30 | SRPS H.Z.1.111:1987 |
| TOC ^a | mg C/L | 1.98 | - |
| COD ^b | mg O ₂ /L | 18.5 | APHA, 2012 |
| UV ₂₅₄ | cm ⁻¹ | 0.116 | APHA, 2012 |
| Total Nitrogen | mg N/L | 0.930 | EPA 351.3 |
| Total Phosphorus | mg P/L | 0.361 | SRPS EN ISO 6878:2008 |
| Ammonia | mg N/L | 1.05 | SRPS ISO H.ZI. 184:1974 |

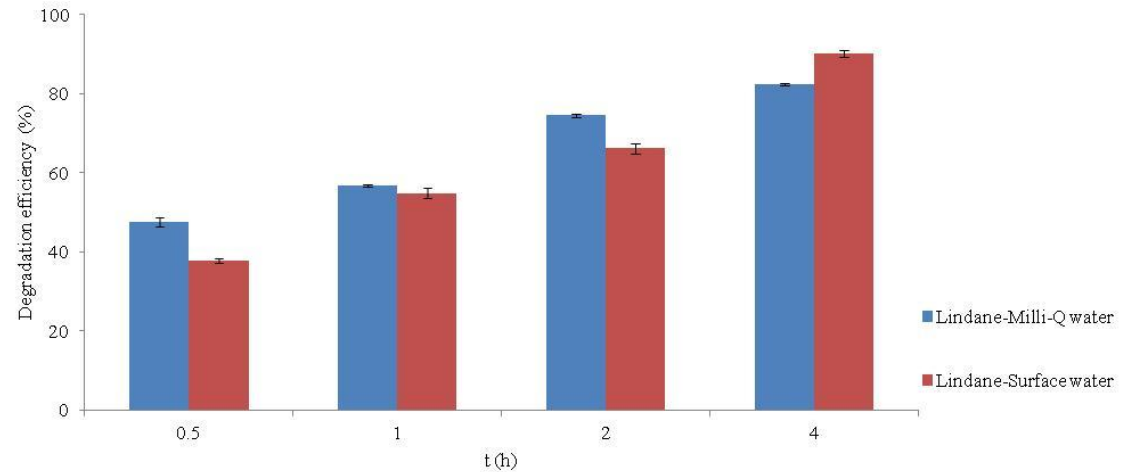


Figure 2. Comparison of lindane degradation efficiency in Milli-Q and surface water using biochar (700 °C) and persulfate (3 mM) over time; Results are shown as mean ± SD for n = 2)

Standard deviation in all experiments was below 5%.

Results and discussion

β -endosulfan

-Degradation efficiency was higher in Milli-Q water compared to surface water.

-Lower degradation in real water attributed to stronger interactions with organic matter, reducing bioavailability.

-Natural organic matter and ions can block active sites or quench radicals, lowering efficiency.

-Performance was diminished in surface water, but the BC/PS system still achieved removal.

Table 2. Characteristics of the surface water
(Same table as on the previous page)

| Parameter | Unit | Result | Method |
|-------------------|----------------------|--------|----------------------------|
| pH | - | 7.30 | SRPS H.Z.1.111:1987 |
| TOC ^a | mg C/L | 1.98 | - |
| COD ^b | mg O ₂ /L | 18.5 | APHA, 2012 |
| UV ₂₅₄ | cm ⁻¹ | 0.116 | APHA, 2012 |
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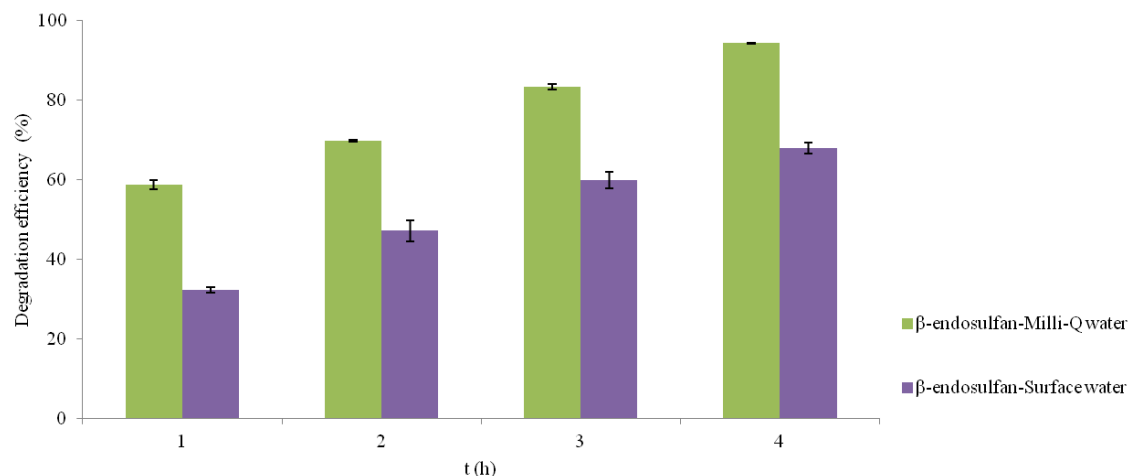


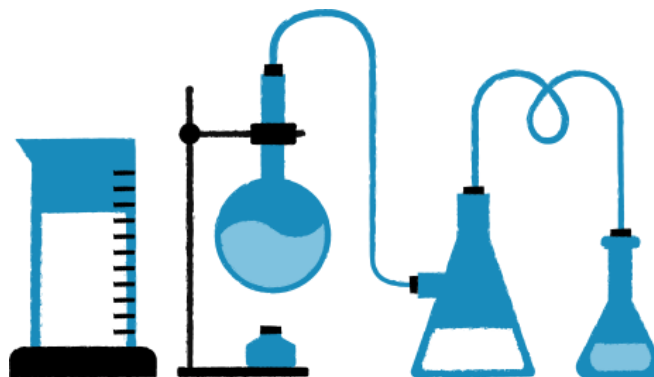
Figure 3. Comparison β -endosulfan degradation efficiency in Milli-Q and surface water using biochar; (700 °C) and persulfate (3 mM) over time
Results are shown as mean \pm SD for n = 2)

Standard deviation in all experiments was below 5%.



Conclusion

- The BC/PS system effectively degraded lindane and β -endosulfan in real surface water.
- Although efficiency was reduced by natural organic matter and ions, the system remained effective and applicable.
- Lindane showed increased degradation after prolonged contact in surface water, while β -endosulfan was less available for oxidation.
- These results confirm the importance of testing in realistic water matrices and highlight the potential of biochar-based persulfate activation for practical water treatment applications.



For more information...

envirochar.pmf.uns.ac.rs

The screenshot shows the 'Contact' page of the EnviroChar website. The browser's address bar at the top displays 'envirochar.pmf.uns.ac.rs', which is circled with a red dashed line. The website's navigation bar includes links for Home, About Us, Gallery, Team, News, Knowledge HUB, and Contact. The main heading is 'Contact'. Below this, there are three white boxes with green icons: 'Our Address' (location pin), 'Email Us' (envelope), and 'Call Us' (phone). The address box contains the text: 'Department of Chemistry, Biochemistry and Environmental Protection, Faculty of Sciences, University of Novi Sad, Trg Dositeja Obradovića 3, 21000 Novi Sad, Srbija'. The email box shows 'jelena.beljin@dh.uns.ac.rs'. The call box shows '+381 21 485 27 20'. At the bottom is a map of Novi Sad, with a red dashed circle highlighting the location of the 'Prirodno-Matematički Fakultet Univerziteta U.' near the Danube river. A red dashed arrow originates from the text 'Please feel free to contact us!' and points towards the map area.

Envir Char

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Contact

Our Address

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View larger map

Map showing the location of the Faculty of Sciences, University of Novi Sad, near the Danube river and the city center.

Please feel free to contact us!



Thank you for your attention!

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