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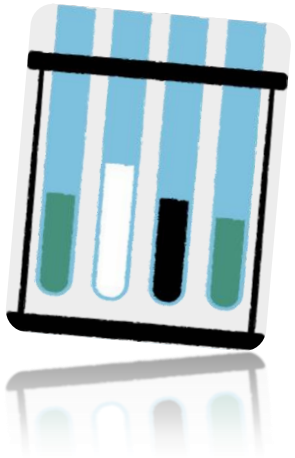

IMPACT OF WATER MATRIX ON PERSULFATE ACTIVATION EFFICIENCY FOR THE REMOVAL OF LINDANE AND β-ENDOSULFAN USING CORN COB BIOCHAR

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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

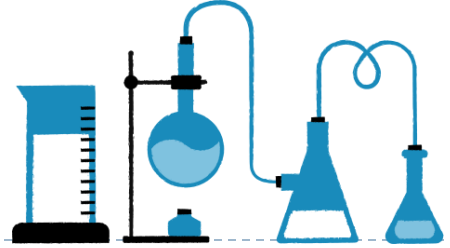
Call identifier: The Science Fund of the Republic of Serbia

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 ± SD

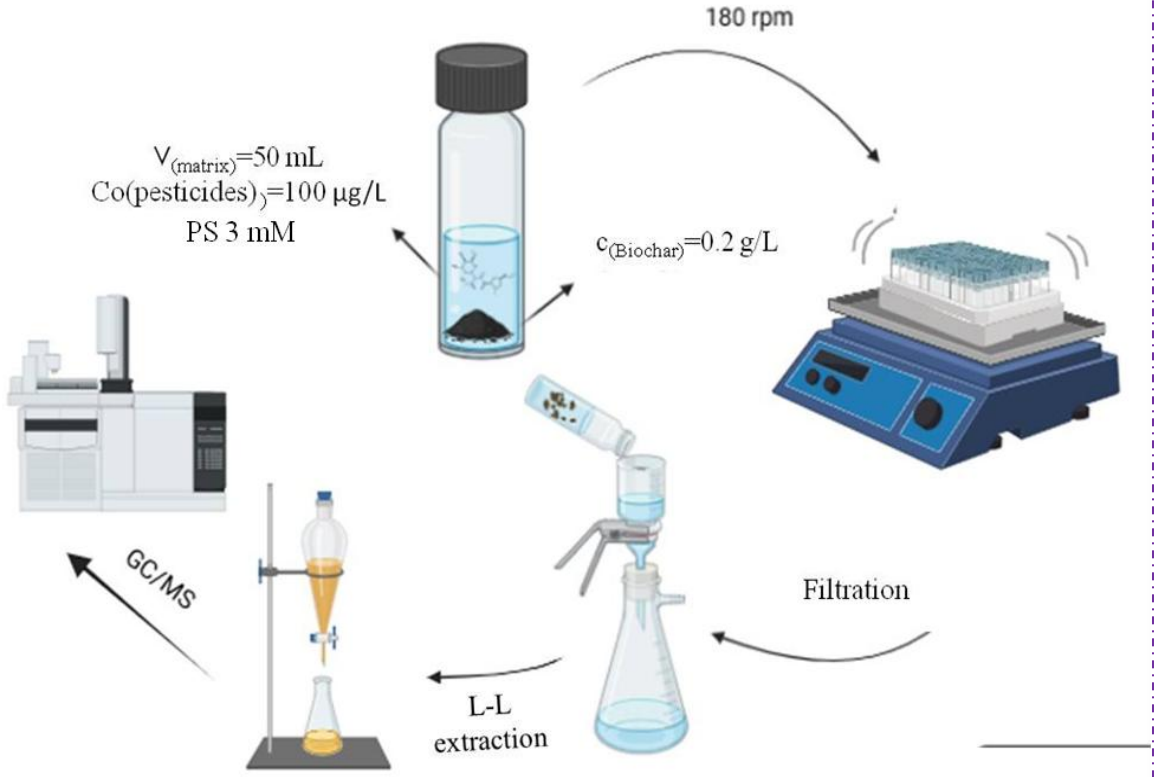


Figure 1. *Experimental design*

Results and discussion

-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.

Lindane

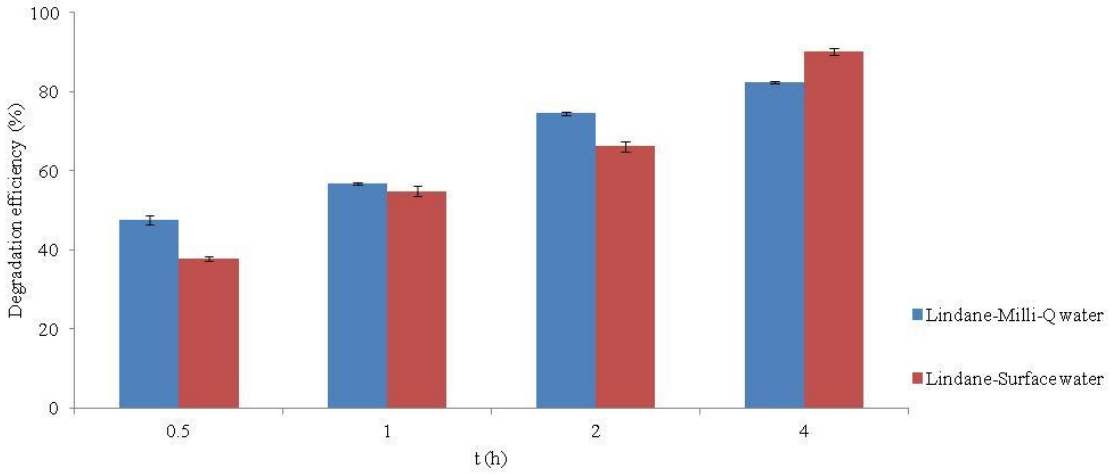


Figure 2. *Comparison of lindane degradation efficiency in Milli-Q and surface water using biochar (700 °C) and persulfate (3 mM) over time; Results are shown as mean ± SD for n = 2)*

Standard deviation in all experiments was below 5%.

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

Results and discussion

-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.

β-endosulfan

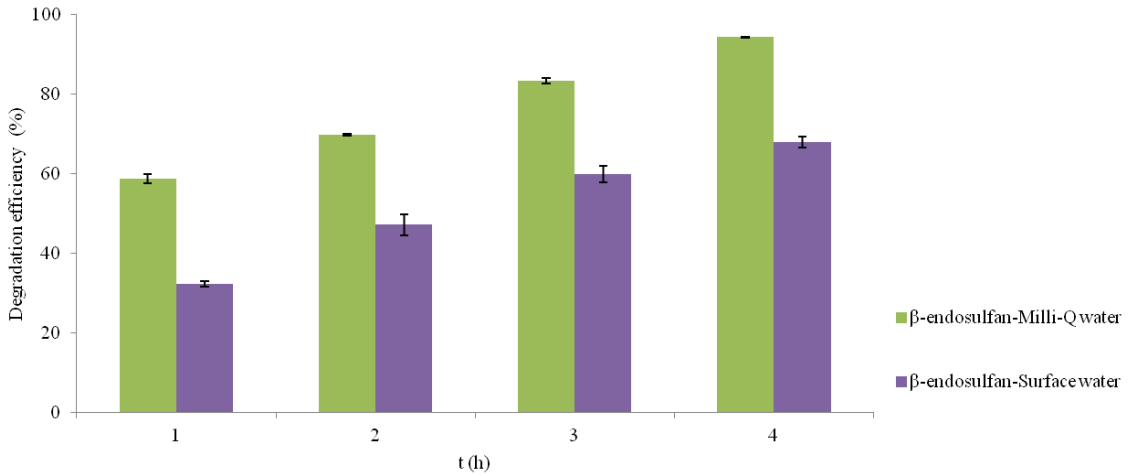


Figure 3. *Comparison β-endosulfan degradation efficiency in Milli-Q and surface water using biochar; (700 °C) and persulfate (3 mM) over time Results are shown as mean ± SD for n = 2)*

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
Total Nitrogen	mg N/L	0.930	EPA 351.3
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Ammonia	mg N/L	1.05	SRPS ISO H.ZI. 184:1974

Standard deviation in all experiments was below 5%.

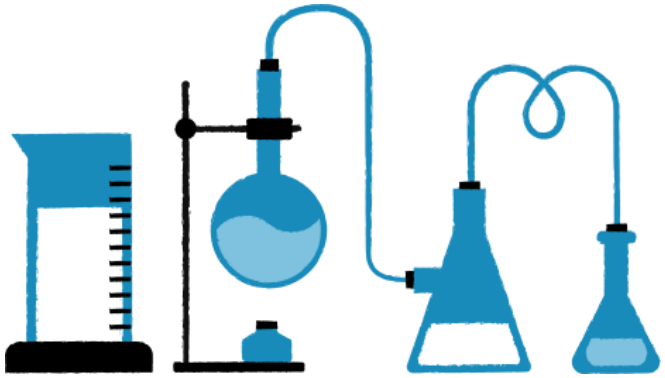
Conclusion

-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.

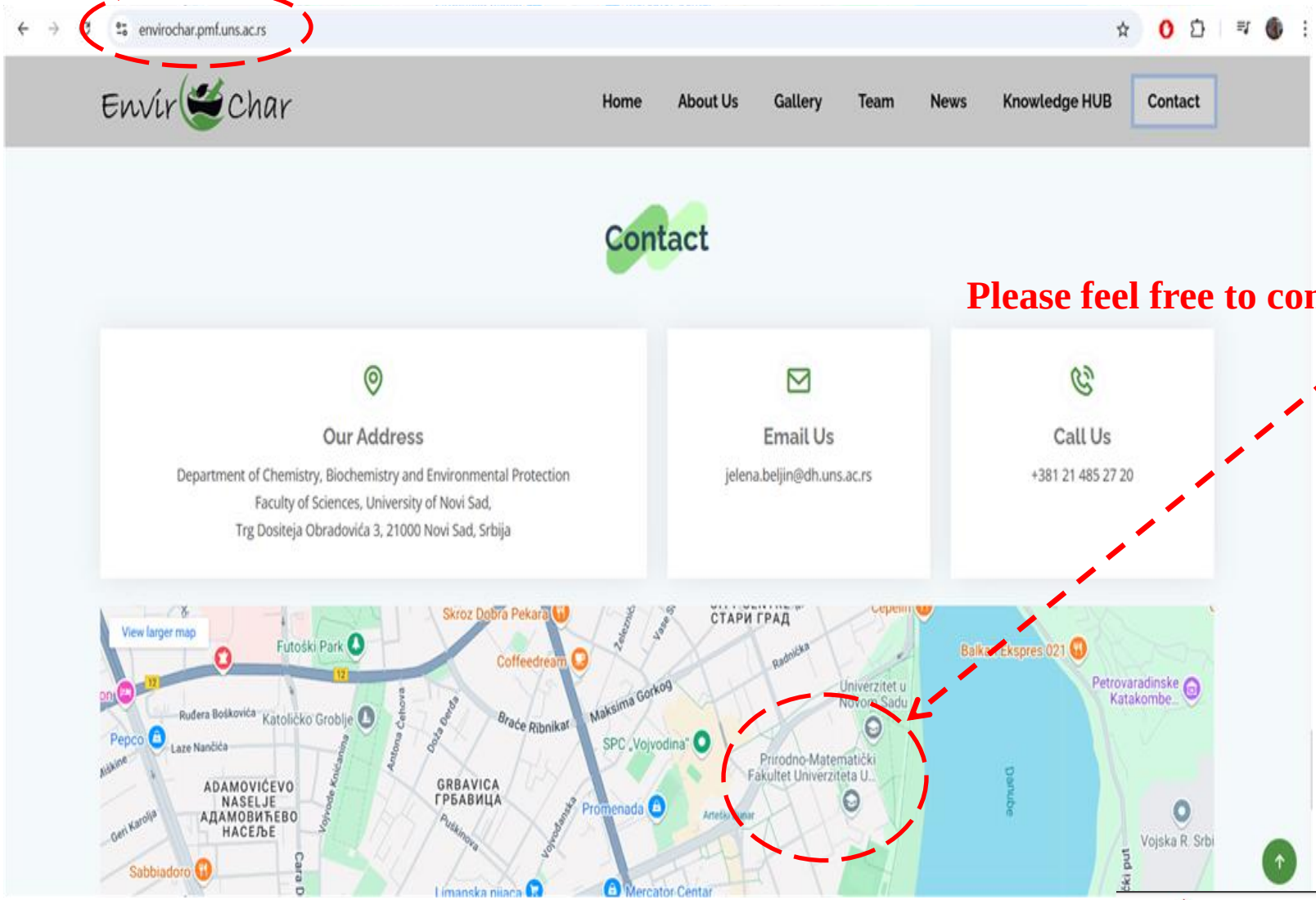
-Lindane showed increased degradation after prolonged contact in surface water, while β-endosulfan was less available for oxidation.

-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



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Thank you for your attention!

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