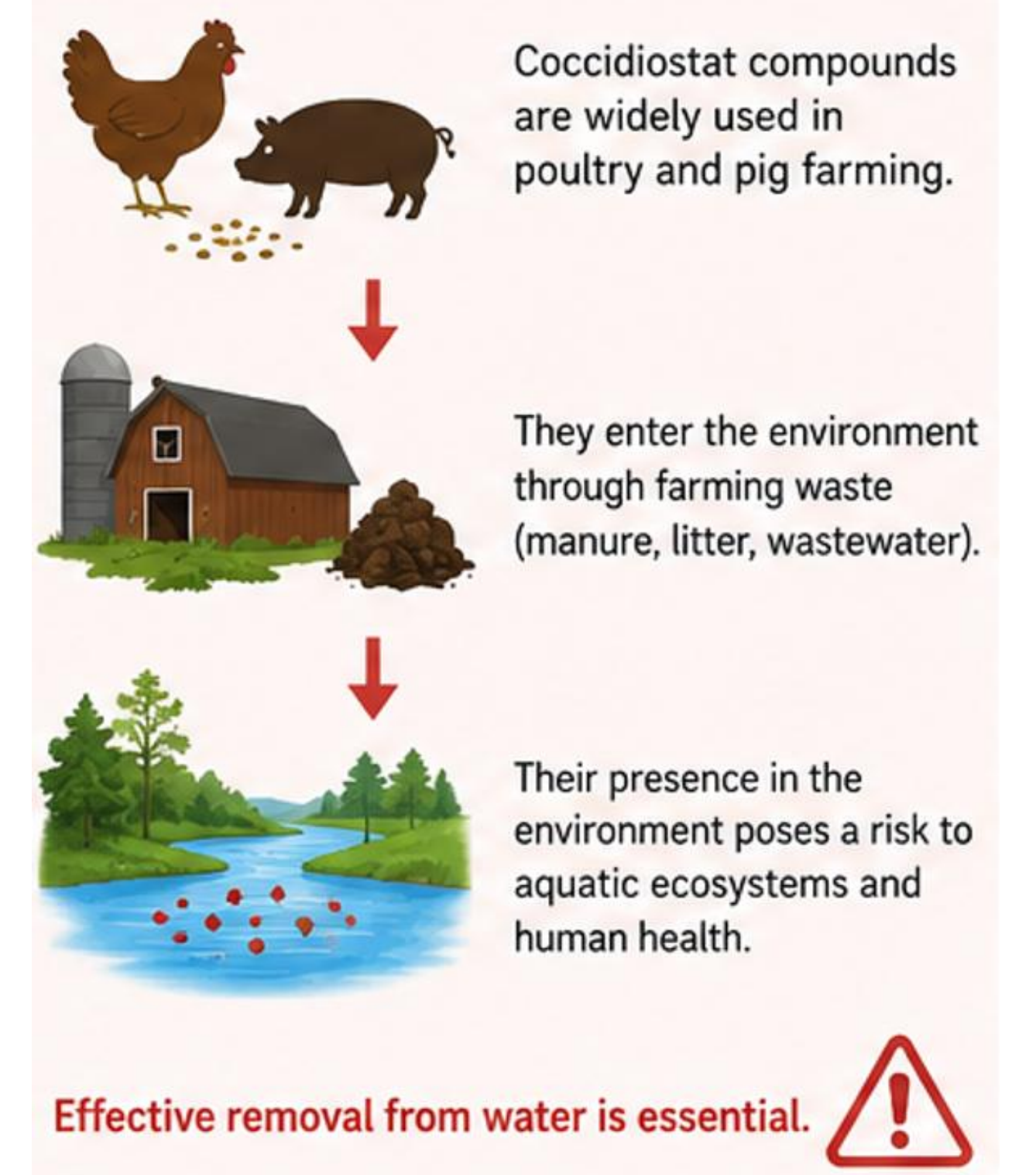


Removal of coccidiostats from aqueous solutions using biochar

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Environmental problem under investigation

- The coccidiostat compounds are widely used in animal husbandry worldwide in poultry and pig farming and they enter the environment through farming waste.
- Their presence in the environment poses a risk to the environment and to human health [1] and their removal from water samples needs to be investigated.
- The adsorption method is generally regarded as a simple process for the removal of veterinary medicinal products (VMP) from aqueous samples. The removal process has a low operating cost and depends mainly on the versatile use of the adsorbent material in terms of its recyclability, large surface area, and adsorption capacities.
- The biochar produced from biomass waste serves as a sustainable and a cost-effective adsorbent for the removal of organic contaminants from liquid samples.

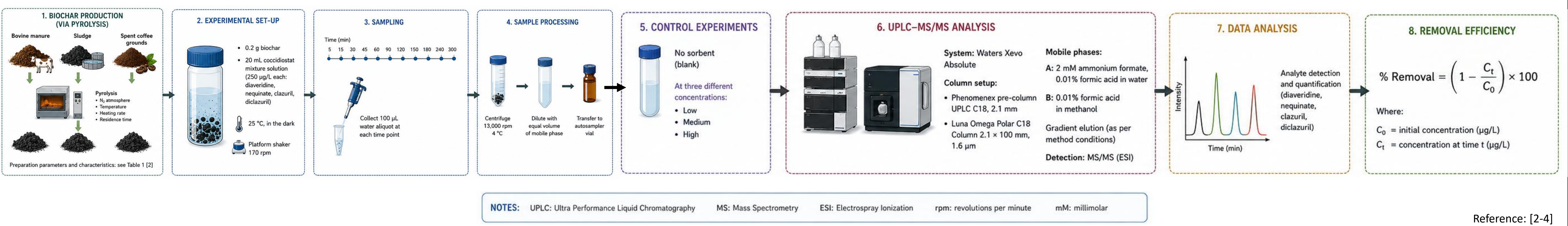


Aim of the current research

To study the potential use of biochar produced from waste material in order to remove coccidiostat compounds from aqueous samples.



Materials and Methods



Results - Discussion

Model compounds

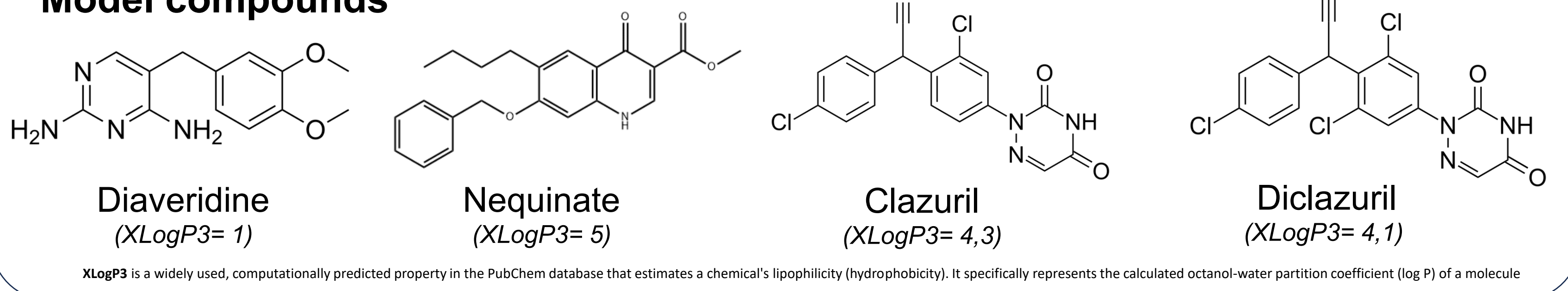


Table 1. Pyrolysis parameters and final product properties [4]

Parameter	Bovine manure	Sludge biochar	Spent Coffee Grounds biochar (SCG)
Pyrolysis temperature (°C)	550	550	550
Time of pyrolysis (h)	1.5	1.5	1.5
pH	10.43	9.77	9.42
EC (µS cm ⁻¹)	4123	745	2723
Density (g mL ⁻¹)	2.31	1.53	1.44
Pore diameter (nm)	3.94	3.95	60.39
BET surface area (m ² g ⁻¹)	14.03	3.98	1.53

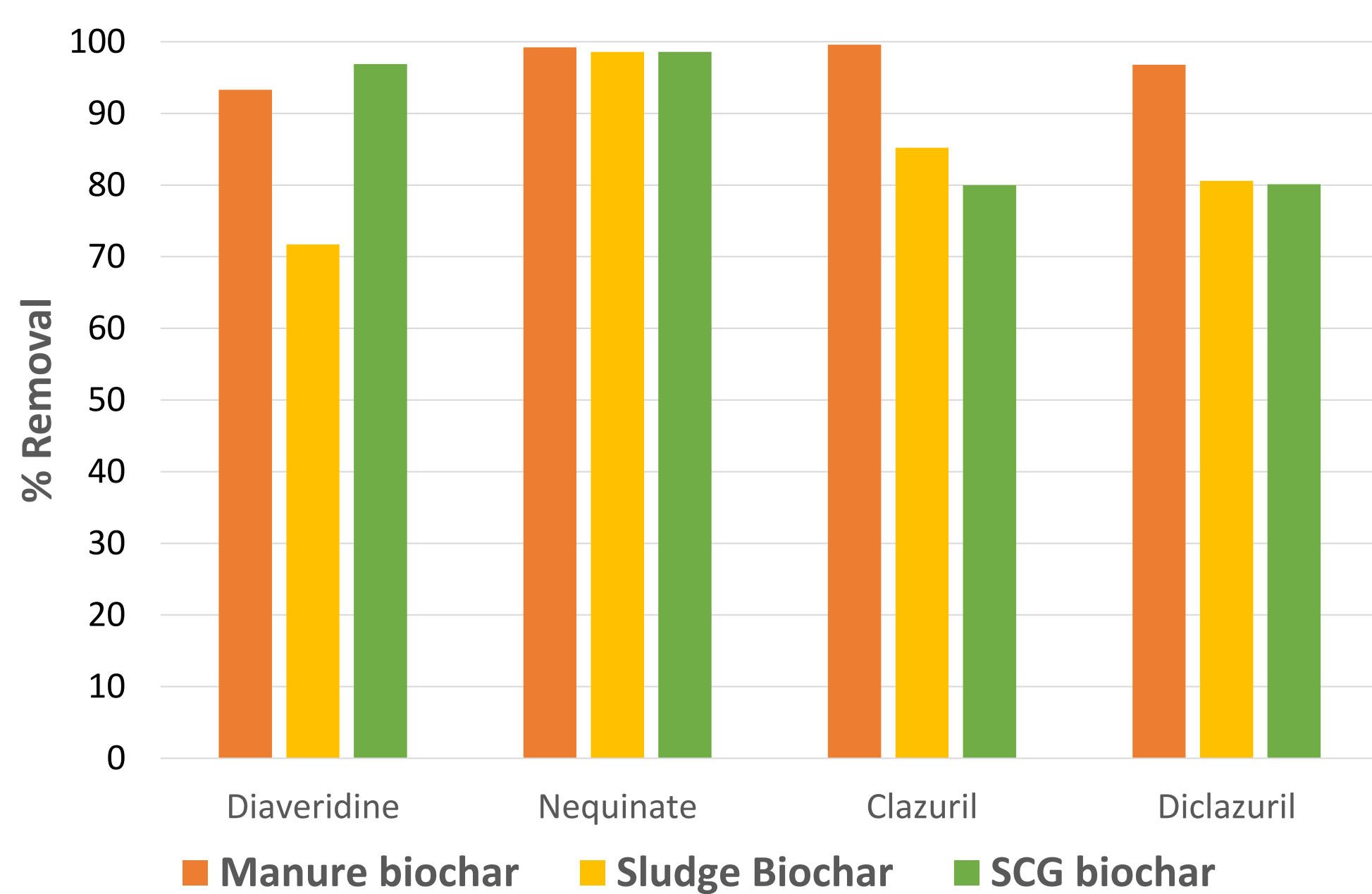


Figure 1. Percentage removal of the four studied coccidiostats (C₀=250µg/L) after 300 minutes of contact with the three biochars.

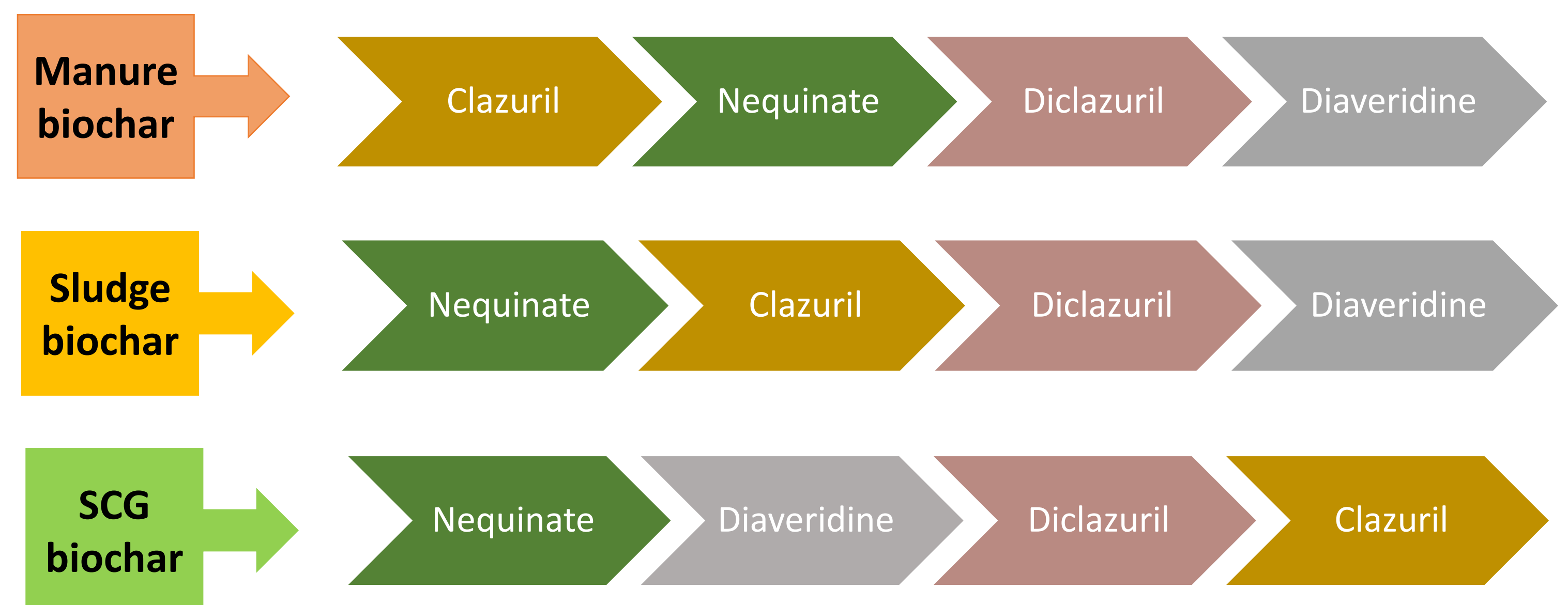


Figure 2. Selectivity of the four studied coccidiostats in relation to the three biochars.

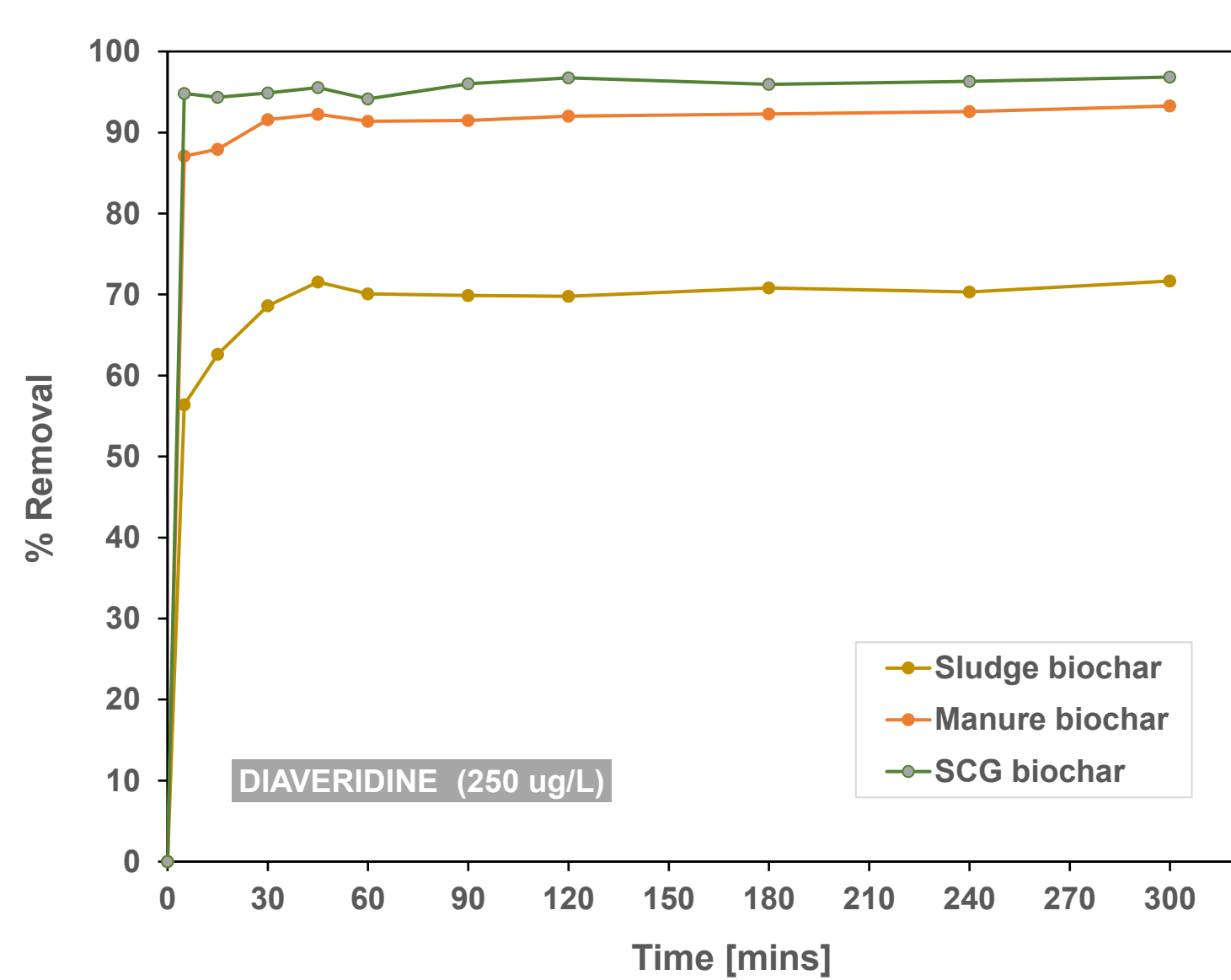


Figure 3. Removal efficiency of Diaveridine treated with the three biochars over time.

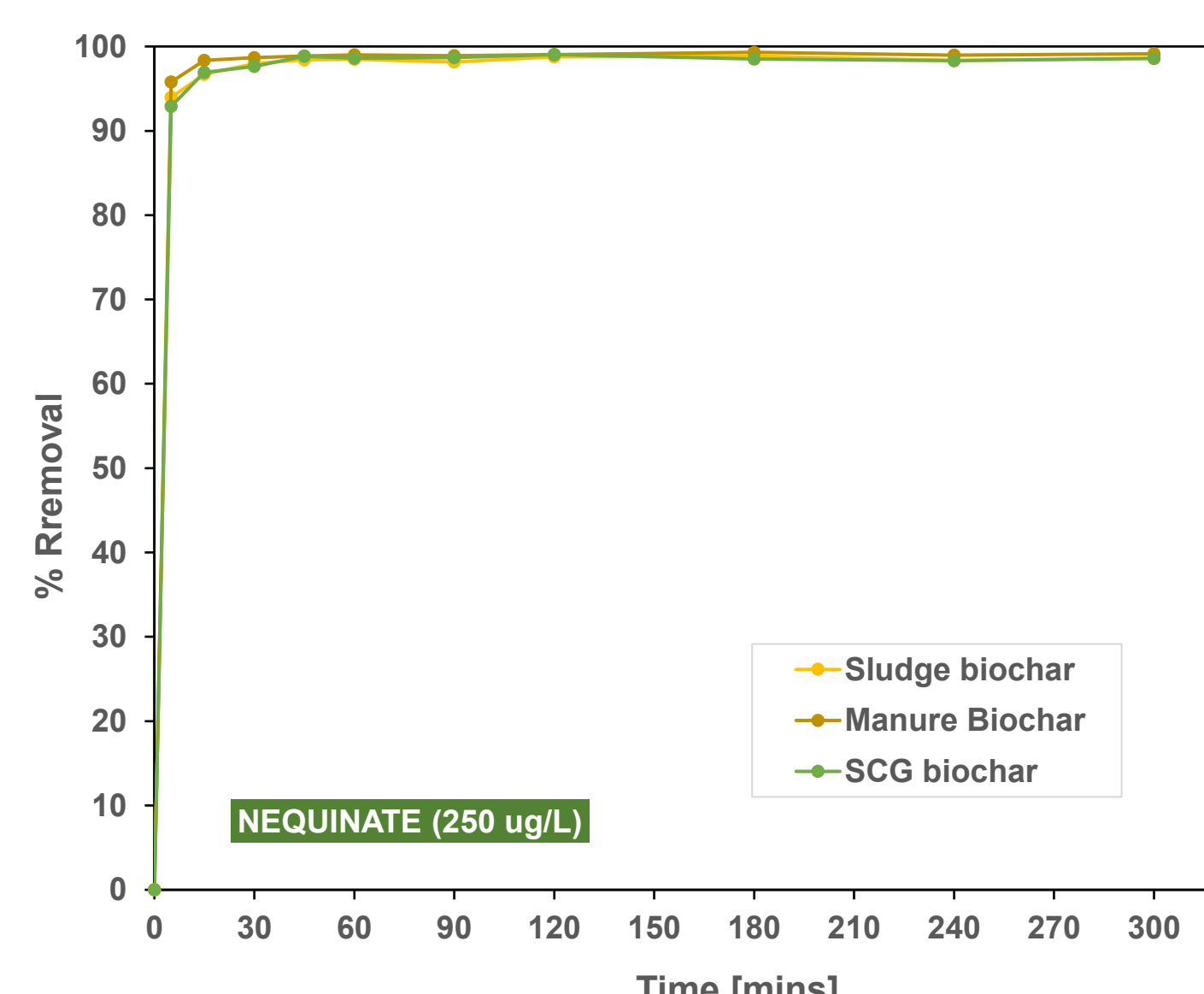


Figure 4. Removal efficiency of Nequinat treated with the three biochars over time.

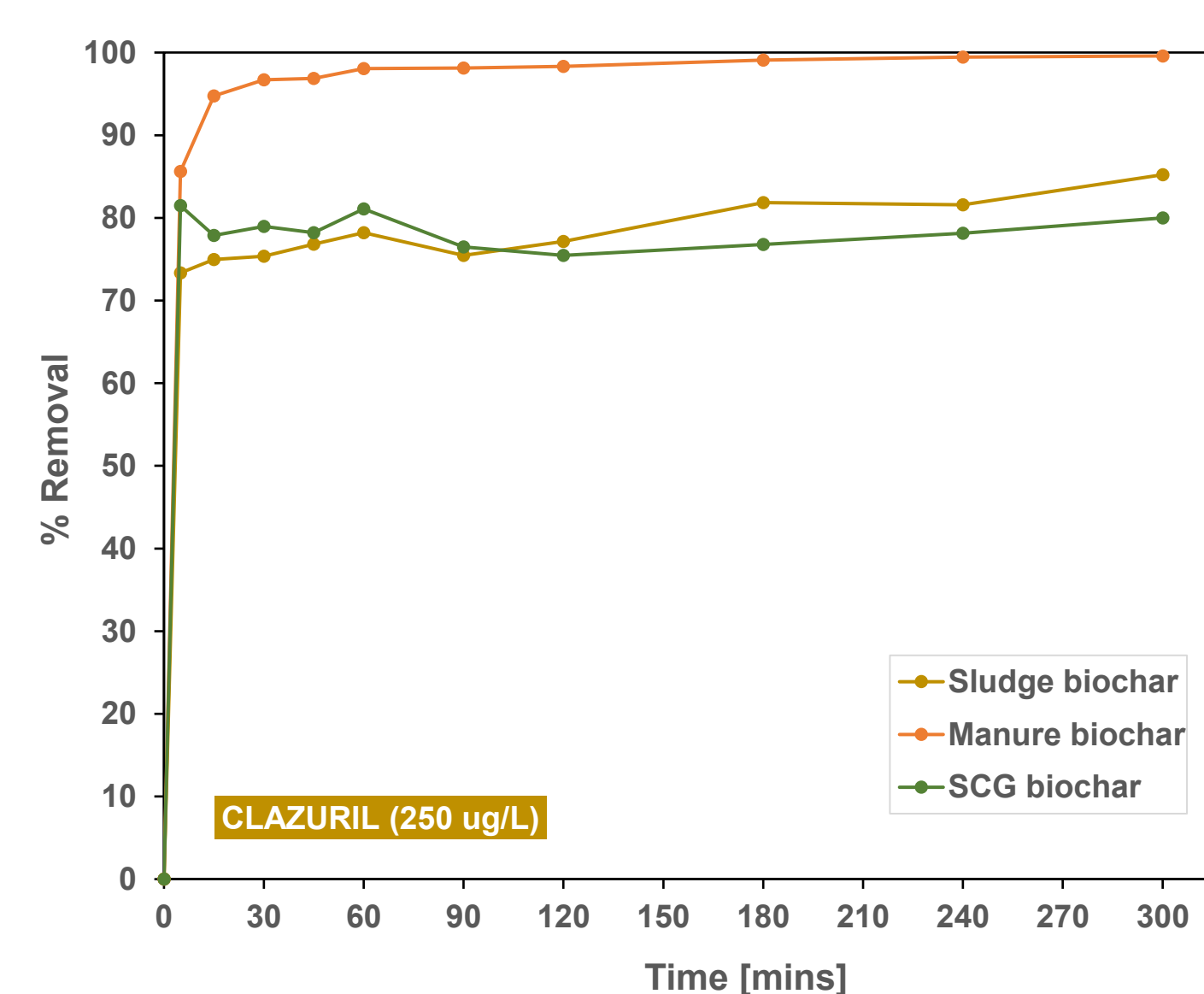


Figure 5. Removal efficiency of Clazuril treated with the three biochars over time.

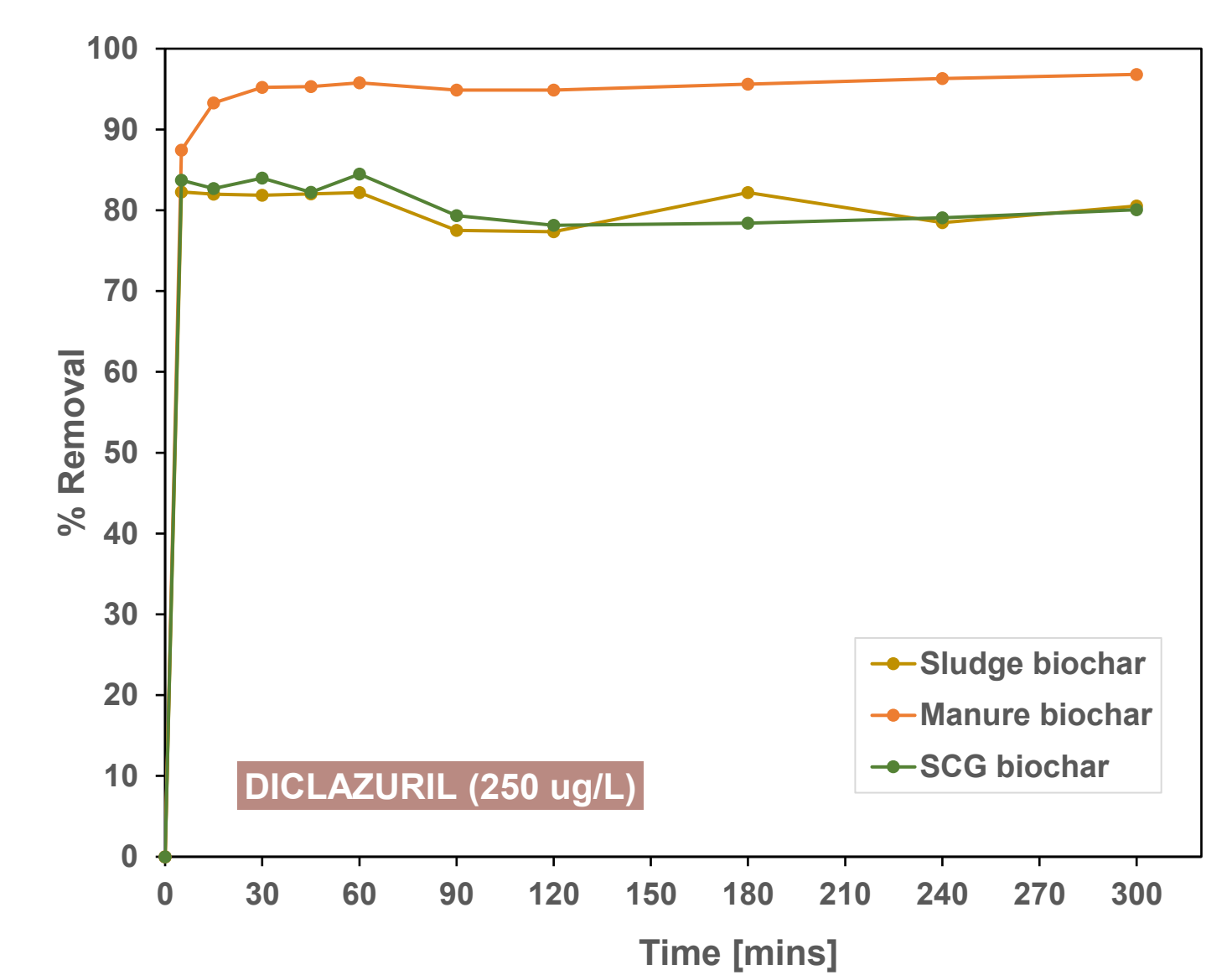


Figure 6. Removal efficiency of Diclazuril treated with the three biochars over time.

Conclusions

- Manure biochar can effectively remove all the compounds studied, achieving better results with clazuril (100% removal).
- Additionally, more than 90% of the compounds are removed within the first 30-45 minutes.
- Sludge biochar has shown the lowest efficiency, which is probably due to its complex matrix.
- SCG biochar is more effective at removing Diaveridine and Nequinat, but less effective at removing Clazuril and Diclazuril.
- The removal of compounds when treated with different types of biochar depends on their physicochemical properties, which is determined by the type of material used to prepare the biochar. For example, compounds in the same coccidiostat group showed similar removal trends.

References

1. One Health Approach: https://www.who.int/health-topics/one-health#tab=tab_1
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4. B. Kalebic et al., *Minerals* (2021), 11, 518.