

The Potential of Tuna Bone Char as a Sorbent Material for Pharmaceuticals Removal from Wastewaters

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The extensive consumption of pharmaceuticals combined with the limited removal capacity of wastewater treatment processes result in their continuous accumulation in water bodies which can adversely affect the environment and human health. Thus, efficient strategies to avoid the release of these persistent compounds in the environment are needed. The adsorption-based processes are promising methodologies to reduce the impact of pharmaceutical residues on the environment.

In the present work, the efficiency of a tuna bone char (TBC) material to adsorb tramadol (TRA) and venlafaxine (VNF) from different aqueous matrices, namely water, non-saline wastewater, and saline wastewaters with different salinity levels (7.5 and 12 g/L) was evaluated. The pharmaceuticals were present individually or in a mixture in each aqueous matrix, at an initial concentration of 10 mg/L. Over 24 hours, the concentration of pharmaceuticals was monitored using a validated liquid chromatography-tandem mass spectrometry (LC-MS/MS) method.

Overall, the TBC presented a higher affinity for adsorbing TRA than VNF, with the highest adsorption capacities achieved in non-saline matrices. Although the TBC adsorption capacity was lower in saline matrices, the TBC was still effective for pharmaceuticals adsorption. If the matrix only contains one pharmaceutical, the TBC adsorption capacity ranged from 0.72 to 1.69 and 0.77 to 1.17 mg/g for TRA and VNF, respectively, depending on the aqueous matrix. Whenever both pharmaceuticals were present in the aqueous matrices, the TBC adsorption capacities for TRA and VNF were reduced to 0.57-0.73 and 0.79-0.96 mg/g, respectively.

The TBC has shown promise in removing VNF and TRA from saline and non-saline wastewaters, highlighting its potential for environmental remediation applications.

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