

ABSTRACT

Microplastic (MP) Pollution is the most recent global environmental concern. A number of previous microplastic studies have targeted their presence in the nautical environment. However, particularly in Pakistan, there is limited information available on MPs concerning the freshwater ecosystem. The current study was carried out with two objectives of (1) quantification, characterization, and distribution of MPs in surface water, sediments and fish samples collected from Kallar Kahar Lake, Punjab, Pakistan, and (2) the treatment process for the removal of MPs from the water. Kallar Kahar Wetland is a notable game reserve and recreational site of the country that attracts and hosts migratory birds during winter. The MP quantification was done manually through the counting method via a Stereomicroscope. The polymer types and compositions were evaluated through Fourier Transform Infrared (ATR-FTIR) Spectroscopy analysis. Results indicated the average MP abundance as 49.6 ± 11.14 MP / 500ml and 143 ± 48.18 MP / 100g and 79 ± 12.2 items for water, sediments, and fish correspondingly. Threadlike fibers and irregular fragments were the most prevailing MP shape groups in all water, sediment, and fish samples. The dominance of colors in both compartments was observed as blue, transparent, and green. The ATR-FTIR examination identified the polymer types in lake water with respect to the demonstration of characteristic peaks to be in similarity to PPS, PIB, and PLF. Similarly, PET, PE, PP, and Natural Latex Rubber were the most prevailing polymer types in sediments. Similarly, the fish sample depicted the abundance of PET. Furthermore, the study revealed the high amount of MPs in lake sediments in contrast with the surface water. The MPs removal rate was observed high in both Kallar Kahar surface water treatments. The average % removal efficiency of Iron Ore Mineralization Treatment was observed to be 80% at 1300 mg/L dosage of Fe_2O_3 . The Chemical Coagulation Process revealed the highest MP removal efficiency by 80% (PPS) and 57.8% (PET) at the different concentration dosages of $150 + 15$ mg/L and $111 + 15$ mg/L for Combination 1 and Combination 2, respectively. Overall, this study provided a novel approach for the removal of MP from surface water, which also holds an explicit commercial utilization prospect to overpower the microplastic pollution in water bodies.