ABSTRACT

Microplastic pollution has emerged as a concern in freshwater environments, particularly lakes, and reservoirs. In Pakistan, there are limited research studies on the MP's distribution in water, sediments, and fish. This study was carried out with 2 main objectives (1) MPs quantification, and characterization in water, sediment, and fish samples of Rawal Lake, Islamabad, Pakistan, and (2) the treatment process for the removal of MPs from water through magnetic extraction and chemical coagulation process. The MPs quantification and identification were done via Stereomicroscope and the polymer characterization was done via ATR- FTIR Spectroscopy. Results indicated that the average abundance of microplastics in water was 71 ± 12.94 items/ 500 ml, in sediments was 114 ± 23.02 items/ 100 g, and in fish was 17 ± 4.65 items/fish. Fibers and filaments were the most abundant in water samples, whereas fragments and fibers were abundant in sediment, and fish samples and dominant colors as blue, transparent, brown, green, purple, red, and pink. The ATR-FTIR analysis of visible MPs was identified as PET, PPS, PVA, and PIB in water. In sediments, the identified polymer types were PET, PP, PE, PPS, EDPT, VCVA, and PIB. PET was the most dominant polymer in water, sediments, and fish correspondingly. The MPs removal rate through magnetic extraction using commercially-available Iron Ore was observed to be 85% for the different polymer types. Also, the chemical coagulation process showed its high removal efficiency at different concentrations treatments of coagulants. The high removal efficiency for PET, PPS, and PIB was 88.90%, 99%, and 99.98% with T1: Alum + PS (150 + 15 mg/L). The high removal rate for PET, and PPS was 88.88% and 83% with T2: $FeCl_3$ + PS (111 + 15 mg/L). Also, the high removal rate for PET, PPS, and PIB was 88%, 84% and 99% with T3: Alum + $FeCl_3$ + PS (150 + 111.68 + 17.5 mg/L) respectively. Overall, the study provides a better understanding of microplastic contamination and a novel approach to the removal efficiency of the MPs from different environmental compartments.