## ABSTRACT

Plastic products are popularly used in daily life, which undergo several degradation processes in the environment to produce small particles (of < 5mm diameter), i.e. microplastics. In recent years, these microplastics have become a global concern. Nevertheless, the microplastics in agro-ecosystems and terrestrial environments have received limited scientific attention globally as compared to the aquatic environment. The current study is a pioneer investigation to evaluate the distribution of microplastics in agricultural crop fields using synthetic (i.e. urea, di-ammonium phosphate) and organic fertilizers (animal dung, poultry waste). The microplastic inputs from atmospheric deposition were also assessed in agricultural fields. The study areas encompass Lahore and its adjacent districts including Nankana Sahib, and Sheikhupura. The methodology includes laboratory analysis by stereomicroscopic quantification and Attenuated Total Reflectance-Fourier Transform Infrared Spectroscopy (ATR-FTIR). According to the current study, the microplastic concentrations (mean ± standard deviation) in the atmospheric fallout accounted to be 153 ± 5.5 to 1002 ± 353 particles/m2/day. The stereomicroscopic analysis revealed the concentration of fibers to be highest among all atmospheric deposition samples, comprising of 79% of the total microplastics count. While fragments and films accounted for 11% and 9.6%, respectively. Spatial patterns showed high concentrations in peri-urban sites of Lahore city. On the other hand, the concentrations of microplastics (mean ± standard deviation) in agricultural soils ranged from 1484 ± 397 to 2695 ± 694 particles/kg/ha (hectare). The microplastic contamination was observed to be higher in the fields with the application of poultry waste. In agricultural soils, the concentration of fibers was 67% followed by films, fragments and beads accounting for 19.6%, 14% and 0.4%, respectively. Based on colors, transparent particles were the most common microplastics observed in both the soil and the atmospheric deposition samples. Polypropylene and polyethylene were the most abundant polymers among all microplastics (found in both air deposition and agricultural soil samples), accounting for 27% and 18% of the total polymers in case of air deposition samples, while 26% and 22% in case of agricultural soil samples as identified by ATRGCU Lahore FTIR spectroscopy. The current study reports the contribution levels of fertilizers and atmospheric deposition in microplastic contamination within agricultural soils. Such data is useful for further researchers to design various monitoring technologies and also to design better management systems to decrease the microplastic inputs in agroecosystems.



**Keywords:** Microplastics, Atmospheric deposition, agriculture soil, ATR-FTIR