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Novel analytical method of airborne microplastics captured by forest canopy

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Microplastics (MPs) are defined as plastic fragments with a particle size of 5 mm or less and known to be one of serious problems to marine ecosystems. Recent studies have shown that MPs are present in the atmosphere as well as in the ocean. They are referred to as airborne microplastics (AMPs), but the fate of AMPs is not yet clear. Forest, which covers 30% of land surface, have a forest filter effect, *i.e.*, filtering pollutants in the air through the tree canopy, and the potential to be a main sink for AMPs. To clarify this possibility, it is essential to analyze AMPs on the forest canopy. In this study, we develop and evaluate a novel analytical method of AMPs on leaves.

Konara (*Quercus serrata Murray*) leaves were collected on 21st June and 9th August 2022 in Nishi-Ikuta campus of Japan Women's University located in Kanagawa prefecture, Japan. The samples were treated sequentially by (i) rinsing with Milli-Q water, (ii) ultrasonication in Milli-Q water, and then (iii) extraction with 10% KOH aqueous solution. At every step, leaf surface was observed with SEM (Hitachi, TM3030), and AMPs in every solution were collected and identified by μ-FTIR (Perkin Elmer, Spectrum 3 Spotlight 400). Sextuplicate experiments were performed using more than 10 leaves samples for each.

For the leaves collected on 9th August 2022, the average numbers of AMPs found in solution (i), (ii) and (iii) were 0.03, 0.17, and 0.19 MPs per cm^2, respectively. About 50% of the AMPs recovered were detected in (iii) 10% KOH solution. SEM images showed that the 10% KOH solution completely degraded the leaf cuticle and significantly altered the leaf surface, while rinsing with pure water and ultrasonic washing had little effect. These results suggest that most AMPs were captured in the cuticle wax. It means that previous studies [1][2], in which AMPs were collected by rinsing with Milli-Q water and ultrasonic washing, may underestimate the amount of AMPs captured by leaves.

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