UNIVERSITI TEKNOLOGI MARA

MICROPLASTIC ABUNDANCE AT DIFFERENCES AGRICULTURAL PRACTICES: A CASE STUDY IN TANJONG KARANG, SELANGOR.

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In the name of Allah, The Most Gracious, The Most Merciful.

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ABSTRACT

Microplastic contamination has become a huge concern in the wide range of ecological, with agricultural activities being a significant source of microplastics in soils. Numerous plastic items are employed in the process of agricultural production which leads to the generation of a huge number of microplastics. Therefore, the microplastic contamination in agricultural areas required being investigated urgently. In this study, we determined the occurrence of microplastic in soil and water at difference agricultural practices of Tanjong Karang, Selangor. This study proclaims the occurrence and characteristics of microplastic pollution in typical farmland soils and irrigation water of suburb land using Stereomicroscopes and μ- FTIR for identification and verification of microplastic. Microplastics pollution characteristics (shape, size, colour) was revealed in mulch and non-mulching farmlands soil and in their irrigation water. Non-mulched soils contained much higher abundances of microplastics than mulched soils. Non-mulching soils contained larger amounts of microplastics than non-mulching soils, with 130 pieces kg−1 and 121.25 pieces kg−1, respectively, on average. Microplastics were mainly fragments, films, foam and fibre, and mulched soils had much higher percentage of films, than non-mulched soils that had greater proportion of fragment. Furthermore, the use of nearby water sources increases the abundance of microplastic in the soil, with fibre being the most abundant in the water, where there was enough evidence to conclude that there is a significant linear relationship between fibre microplastic type in soil and irrigation in both areas. Mulched soils had much lower proportion of microplastics <0.5 mm than non-mulched soils and white microplastics account for the highest proportion in both fields. Multiple polymers, e.g., Polyethylene terephthalate (PET), polyester, polypropylene (PP), polyvinyl chloride (PVC), polyethylene (PE), and polyamide were found in the soil microplastics indicate contributions from irrigation and plastic waste residues from farming practices. PET, PE, and PVC were the dominated polymer compositions. Overall, this study may serve as a valuable basis for further investigation into the circumstances behind the presence of microplastics in agricultural areas. In the future, more focus should be placed on associated remediation and management techniques to lessen microplastics-based mulching contamination and the establishment of effective recycling technologies to combat agricultural waste.

Keywords: *Agricultural soils; irrigation water; microplastics; plastic mulching*

CHAPTER 1

INTRODUCTION

1.1 Background of study

In the last decades, microplastics (MPs) are one of the top environmental concerns that have always been raised at world summits. As the name implies, microplastic is plastic with a tiny size (<5 mm) (Mao et al., 2021). As the name suggests, microplastic is plastic that is less than 5 mm in size (Mao et al., 2021). According to several sources, microplastics can be categorised into primary microplastics and secondary microplastics (Mao et al., 2020). Primary microplastics are defined as plastics that enter the environment directly through any of a number of pathways and have a dimension of less than 5 mm, for instance from personal care products or abrasion during washing, and secondary microplastics are not produced by humans, but rather develop as a result of weathering processes including wave action, wind abrasion, and UV radiation from sunlight that cause large-scale plastics to age and break (Zhu et al., 2020).

The tiny pieces of mostly invisible plastic have already been discovered almost everywhere else on Earth, from the deepest oceans to the highest mountains as well as in the air, soil and food chain (AFP, 2022). Microplastics are already pervasive on our planet that there are no places where they are not present A large number of agricultural plastics, including as vinyl tunnels, plastic film mulching, shade nets, fertiliser sacks, and sludge application, were thought to be direct MPs inputs to terrestrial ecosystems (Kasirajan and Ngouajio, 2012; Horodytska et al., 2018). These MPs were detected in a broad range of shapes, polymers, sizes and concentrations in the environments of marine water, freshwater, agroecosystems, atmosphere, food and drinking water, biota, and other remote locations (Campanale et al., 2020). In general, the existence of these MPs includes soil and water.