UNIVERSITI TEKNOLOGI MARA
Cawangan Terengganu
Kampus Bukit Besi

TITLE:

DETERMINATION OF PLASTIC POLLUTION AND ITS DEGRADATION IN SOIL AT BANANA PLANTATION AREA

SUPERVISOR:

PROF. MADYA TS. DR. SARIFAH FAUZIAH BINTI SYED DRAMAN

SCHOOL OF CHEMICAL ENGINEERING
COLLEGE OF ENGINEERING

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ABSTRACT

Plastic is a synthetic material considered to be hazardous to the environment of the ground surface. If plastic does not decompose sufficiently on the land surface, it can contribute to plastic pollution issues and endanger soil quality. Therefore, a research study was conducted in a banana plantation area in Machang, Kelantan (5°45'37.2"N 102°14'25.0"E) to assess the presence of plastic in soil as a result of cultivation activities and to evaluate the impact of polyethylene plastic on soil quality. For conduct this research, soil samples from the area were collected and analysed using Attenuated Total Reflectance – Fourier-Transform Infrared spectroscopy (ATR-FTIR) to identify microplastics in soil. The findings of the study illustrated that only a small size of plastic was successfully identified toward the end of the procedure, whereas during cleaning phase prior to the ATR-FTIR analysis. Seeing as the obvious FTIR peaks corresponded to the wavelength's numbers of polyethylene plastic, the FTIR analysis indicate that the plastic obtained was polyethylene plastic. Therefore, it is undeniable that the soil used for this agriculture activities has already been subjected to plastic pollution, resulting in decreased in its composition and quality of the soil in this area. Once analysing the findings of this study, the results will be discussed.

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CHAPTER ONE
BACKGROUND

1.1 Introduction

The plastics industry has undergone enormous expansion in recent decades, and it is now among the largest and most economically significant of the industries that make up our civilization. This material's qualities, such as its reliability, malleability, light in weight, and competitive pricing, have led to the expansion of the sector and its numerous applications. For instance, plastics have potential applicability in the fields of agriculture, building and construction, the automotive industry, and the building also in construction.

Plastics are characterized by significant levels of waste and leakage into the environment, even though the materials offer a broad range of advantages to those who use them. This is a consequence of the widespread use of single-use plastics, insufficient end-of-life treatments, low rates of recyclability and reusability, and a high potential for decomposition into microplastics (Geyer et al., 2017). It is completely obvious that the presence of plastics in the environment, either in the form of macroplastic waste or in the form of microplastics, is a problem on a global basis. The risk of contamination is one of the most significant factors contributing to the decline of ecosystems on our planet. It is also one of the most challenging manmade phenomena affecting our world.

The issue of plastics and microplastic pollution in aquatic ecosystems (marine and freshwater) has now been receiving more attention meanwhile the problem of plastic contamination in the environment has remained extensively ignored. Plastic and microplastic pollution may be more easily observed in marine ecosystems, even so, more than 80 percent of the plastics uncovered in marine ecosystems were created, consumed, and disposed of on land.

Therefore, plastic pollution on land is an issue both in terms of contaminating agricultural settings and severely damaging to those environments, as well as in considerations of the relocation of pollutants to aquatic systems. On land, high levels of contamination with microplastics have been discovered and it is

estimated that these levels are between four and twenty-three times higher than in the waters (Machado et al., 2017, Horton et al., 2017).

1.2 Literature Review

1.2.1 Plastic

The term "plastics" is used to describe a wide variety of materials that may be processed into precise shapes and textures by processes such as extrusion, moulding, casting, spinning, and coating. Synthetic chemicals are frequently added to synthetic polymers, which have been normally created by polymerization of monomers obtained from oil or gas, to produce plastics. Plastics are incredibly versatile materials ; they are inexpensive, lightweight, strong, durable, corrosion-resistant, with high thermal and electrical insulation properties. The diversity of polymers and the versatility of their properties facilitate the production of a vast array of plastic products that bring technological advances, energy savings and numerous other societal benefits (Andrady and Neal, 2009). Considering these qualities, plastics have found widespread use in a variety of consumer and industrial contexts, including but not limited to packaging, construction, healthcare supplies, automobile parts, household goods, and also agricultural tools.

According to a recently published report (PlasticEurope, 2020), the annual demand for plastic converters in Europe in 2019 was estimated to be 50.7 Mt, with PE (29.8%) and PP (19.4%) accounting for the majority of the demand, followed by polyvinyl chloride (PVC, 10.0%), polyurethane (PUR, 7.9%), and poly(ethylene terephthalate) (PET, 7.9%). It has also been suggested that agricultural activities require 1.7 Mt of carbon dioxide per year for greenhouse facility development, soil mulching, and various agricultural consumables.

The durability and increasing usage of plastics create a major waste management problem with plastic accounting for approximately 10% of the waste we generate. Some of this is recycled, but a substantial proportion is disposed of to landfill (Barnes et al., 2009 ; Hopewell et al., 2009). As a consequence of the durability of plastics, these encounters typically result in injury or impaired movement and can ultimately result in death (Gregory, 2009).