I. INTRODUCTION

1.1 Background

Plastics have become inseparable components used in our lives. Plastic is used in nearly every area of daily life, including transportation, communications, clothes, footwear, and packaging. According to Andrady and Neal (2009), packaging contributes for almost a third of consumption (with common products such as containers and plastic bags). Plastic has various other benefits, including being inexpensive, lightweight, strong, resilient, and easy to form (Thompson et al., 2009). The disadvantage of this material is its low biodegradability. Plastics are difficult to degrade and might cause environmental issues when they are no longer used.

Plastics are manufactured in a wide variety of materials; including polyethylene terephthalate (PET), and polyurethane (PU) plastics. PET is one of the major synthetic petro-plastics (commercial water bottles) produced in huge quantities worldwide (Monahan et al., 2020). PU is commonly used in the production of plastic foams, pillows, and rubber items. In 2019, it is anticipated that Indonesia would generate 68 million tons of waste, of which 9.52 million tons will be plastic waste. With this quantity, Indonesia is the second-largest producer of plastic waste in the world (Rudianto et al., 2020). In general, the most majority of plastic waste is either disposed of in landfills or recycled. Globally, just 5% of plastic garbage is recycled, while the remainder is buried or decomposes over thousands of years (Anani and Adetunji, 2021). Burning process is one of the most frequent methods for removing plastic waste. However, this procedure has not eliminated all the difficulties associated with plastic waste. When plastic waste is burned, it releases carcinogenic substances such as CO_2 and SO_2, which can pollute the environment and contribute to lung and skin problems (Ermawati, 2011). Plastic that accumulates in fields can diminish soil fertility, hinder water absorption by plants, and harm human and animal life (microplastic) (Pramila and Ramesh, 2015). Therefore, it is essential to find a sustainable treatment that is safer for human health and the environment.

Recent attention has been drawn to the microbial plastic degradation treatment, due to the fact that it is efficient and environmentally safe, (Anani and Adetunji, 2021). Microbial plastic degradation can break down the polymers in plastic by releasing enzymes that enable the bacteria to get energy for its growth (Elahi et al., 2021). Additionally, several isolated microbes from landfills such as *Bacillus subtilis* sp*. , Pseudomonas* sp., and *Ideonella sakaiensis* were proven from previous research to have the ability to do biodegradation (Tokiwa et al., 2009) (Shah et al., 2013) (Yoshida et al., 2016). In this study, the Bantargebang landfill was chosen as the site for sample collection. Various types of samples from the Bantargebang landfill were collected, including soil, leachate, and plastic debris, to improve the variety of isolates and the probability of discovering the plastic-degrading microbes.

Bantargebang landfill is located in the city of Bekasi, West Java and has been used to accommodate waste disposal from the Jakarta area, since 1989 (Sukwika and Noviana, 2020). Bantargebang landfill has an area of up to 115 ha and can be considered as the biggest landfill in Indonesia. The average volume of waste from Jakarta to Bantargebang landfill is around 7,000 to 8,000 tons per day served by 1,200 garbage trucks, 60% of the waste comes from domestic or household waste (Sukwika and Noviana, 2020). Although the Bantargebang landfill is very large, the potential of characterization of microorganisms to degrade plastic polymer in this landfill has never been analyzed before. Through this research, the prospects to analyze microorganisms that potentially have the ability to degrade plastic polymers (PET and PU) in the Bantargebang landfill will be obtained.

1.2 Objective

This research aimed to characterize the microorganisms isolated from different samples (soil, leachate, and plastic waste) in Bantar Gebang landfills-Jakarta and evaluate their ability to degrade plastic waste of Polyethylene Terephthalate (PET), and Polyurethane (PU).

1.3 Research Scope of Work

The scope of work for this experiment includes sample collection (soil, leachate, and plastic waste), cultivation of microorganisms isolated from Bantar Gebang landfills from soil, leachate, and plastic waste using selective media (screening 1 and screening 2), characterization of the bacterial isolates (gram staining, morphology observation, and biochemical testing), and plastic degradation potency test (measure the percentage of plastic weight loss, and Fourier transform infrared).

1.4 Research Questions and Hypothesis

According to the project background and scope of work, the research questions can be formulated and listed as below:

a. Do microorganisms isolated from the Bantargebang landfill have the ability to degrade PET polymer?
b. Do microorganisms isolated from the Bantargebang landfill have the ability to degrade PU polymer?

From the research question formulated above, the hypothesis for this research are:

1. H_0: Microorganisms isolated from Bantargebang landfill have the ability to degrade PET polymer

   H_1: Microorganisms isolated from Bantargebang landfill did not have the ability to degrade PET polymer
2. H_0: Microorganisms isolated from Bantargebang landfill have the ability to degrade PU polymer

   H_1: Microorganisms isolated from Bantargebang landfill did not have the ability to degrade PU polymer.