Chapter 1

Introduction

With the global economy and population increasing, the consumption of daily goods are also rising. In turn, this also increases the amount of waste produced worldwide. It was reported by The World Bank (2018) that the amount of global waste amassed is estimated to be 3.40 billion tons by 2050. There are different types of waste generated, such as hazardous waste, industrial waste, medical waste, and so on. However, municipal solid waste (MSW), or more commonly known as garbage, is critical to be tackled as the increase of the populace and income will complicate the efforts to manage waste (Ahsan, et al., 2014). If it is not disposed of properly it can affect public health, environment health, and climate change (Vergara & Tchobanoglous, 2012). It is important for the government and private sectors of each country to cooperate to achieve an effective and sustainable plan in handling waste. MSW composition may vary depending on the income level of the country. However, on average, food and green waste is the highest percentage of waste produced, accounting for 44% of global waste composition (Kaza et al., 2018).

According to the Ministry of Environment and Forestry (2021), there are 29 million tons of waste produced per year in Indonesia. The most common type of waste produced is food waste, which is accountable for approximately 40% of the total litter produced annually (Ministry of Environment and Forestry, 2021). In addition, 35% of waste produced is still not managed properly and 40.8% of the total waste produced in Indonesia comes from households (Ministry of Environment and Forestry, 2021). Because of this predicament, the government has issued a law in regards to waste management, which is *Undang-Undang Republik Indonesia* No. 18/2008. Within the law, it is incentivized for Indonesian citizens to be proactive in reducing, reusing, and recycling waste. One of the ways to reduce organic MSW is by converting their food waste into eco-enzyme.

Eco-enzyme (EE), or also known as garbage enzyme, is the resulting product from fermenting food and vegetable waste with molasses and water. The end-product is a complex dark brown solution that contains a crude mixture of enzymes (protease, lipase, and amylase). The method to create EE was researched and developed by Dr. Rosukon Poompanvong, a pioneer in the organic farming movement in Thailand (Food and Agriculture Organization, 2003). According to Jiang (2021), EE has been proven to have beneficial effects on wastewater treatment, soil treatment, plant growth hormones, and accumulation of heavy metals. The process to create EE is relatively simple as it only requires an air-tight container and the materials listed above in a 3:1:10 weight ratio respectively. Considering the simplicity of the process and the added benefit, there have been several attempts across Indonesia to socialize the method to household communities (Alkadri & Asmara, 2020; Febriani et al, 2021).

Despite the simple method, there is a waiting period of 3 months for eco-enzyme to ferment before it becomes a usable product. This might deter people living in urban areas from picking up this recycling method due to the lack of space for it to be sustainable long-term whilst the production of MSW of urban areas is more than rural areas. It might be possible to add a starter that could increase the fermentation rate of EE. EM4 is a liquid inoculant of beneficial native microbes (Mayer et al., 2010). Due to its ability to degrade and compost, it may be possible to increase the fermentation rate this way.

Hence this study aims to investigate the effects of incorporating EM4 as an accelerator in the fermentation process of EE. This study is limited to investigating EE that are fermented normally and uses EM4 according to the instruction manual provided on the bottle. In addition, the parameters that will be monitored are the pH, temperature, and enzyme activity of the eco-enzyme.