

**Enhica Young (T00685161)**  
**September 6, 2025**

## **Directed Study Proposal**

**Supervisor: Dr. Naowarat Cheeptham**

**Title: Isolation of and screening for microplastic degrading bacteria from compost**

### **Introduction and Objectives/Hypotheses (Introduction and Goals):**

Plastic is a durable, lightweight and cost effective material used in everyday items such as clothing, makeup, single-use items and many other products (Yip et al. 2024). However, it is because of cheap production and the components of plastic that it has become a large environmental pollutant (Bajt 2021). Most plastic is resistant to degradation and often ends up breaking down into microplastics; smaller fibers less than 5 millimeters in length (Bajt 2021). This has led to widespread accumulation of microplastics within our environment threatening ecosystems and possibly human health (Yip et al. 2024). For example, a study done at UBC found a microplastic particle in a Vancouver community garden bed (Falconi, 2024 Mar 12). Researchers suggest the presence of more microplastics that were not able to be identified by macroscopic techniques (Falconi, 2024 Mar 12). Moreover, a recent study conducted by Marfella et al. (2024) discovered the presence of microplastics in plaque lining the human arteries. Given these findings, strategies to reduce or eliminate microplastics is imperative.

In light of these concerns, the identification of plastic-degrading microbes creates an opportunity for a novel approach to reducing microplastics within the environment (Charnock 2021). These microbes contain enzymes that can depolymerize plastic into monomers which are more readily available for microbial metabolism (Charnock 2021).

The purpose of this study is to isolate microbial colonies from Kamloops municipal compost and screen for the presence of microbes that can potentially degrade microplastics. Preliminary research at TRU has already identified the presence of microplastics in Kamloops municipal compost (Trotta et al. 2025). It is with this context that this study will build upon to add to the growing knowledge base of microplastics in compost and suggest a novel approach to degrade microplastic.

### **Materials and Methods:**

The first step of this study will be to isolate colonies from the compost samples. This will be done by completing serial dilutions of the compost samples. These dilutions will then be plated on R2A medium agar plates at 37°C as suggested ideal by several studies (Charnock 2021; Nedi et al. 2024). Isolation and subculturing will follow under the same conditions. Plastic degrading microbes will be screened using methods adapted from recent studies. Charnock (2021) describes a media layering method in which R2A agar media is poured into a plate and allowed to solidify, followed by a plastic-containing agar on top. Another study by Nedi et al. (2024) offers an alternative method by identifying plastic material in landfill samples.

Researchers suspended soil and potential microbes from plastic pieces in saline before inoculating a carbon-free liquid media containing a piece of plastic with the saline solution (Nedi et al. 2024). This liquid media was then used to isolate and subculture microbes on carbon free solid media with plastic pieces as the sole carbon source (Nedi et al. 2024). Both approaches will be considered during this study.

## **Timeline**

Although this directed study will likely carry on into Winter 2026, there is a relative timeline which will be followed to allow for presentation of data at the 2026 Undergraduate Research Conference.

September - October:

- Isolating and subculturing microbes from compost samples
- Find best protocol for preparing media to screen for plastic-degrading microbes

November - December:

- Screening for microbes with plastic-degrading enzymes
- Gram Staining
- Microscopic and Macroscopic morphology

January - March:

- Analysis of data
- Write-up of report
- Preparation for poster presentation

late March - early April:

- Present results at TRU Undergraduate Research Conference
- Hand-in report

## **Literature cited**

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^Emma Trotta, Anusha Venkataraman, \***Naowarat Cheeptham** (2025) Exploratory Investigation of Microplastic Detection in Municipal Organic Waste. The 46<sup>th</sup> annual Pacific Ecology and Evolution Conference. Bamfield Marine Sciences Center, Bamfield, BC. March 21-23, 2025

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