A microbial perspective on cardboard waste reduction through vermicomposting

Emma Trotta

Supervisors: Naowarat Cheeptham and Lisa Forth

Composting is a proactive approach to reusing cardboard. This alternative method uses less energy and water and emits far less greenhouse gasses.

Additionally, vermicomposting has many agricultural benefits. Within the diverse array of microbes present in compost, they share symbiotic relationships with plants that aid in plant growth, yield, nutrient uptake and nutrient cycling.

Methods

To isolate the bacteria, serial dilutions of each compost samples were made and spread plated on nutrient agar and potato dextrose agar

Gram staining was preformed for isolated colonies from NA plates to determine the microscopic and macroscopic morphology

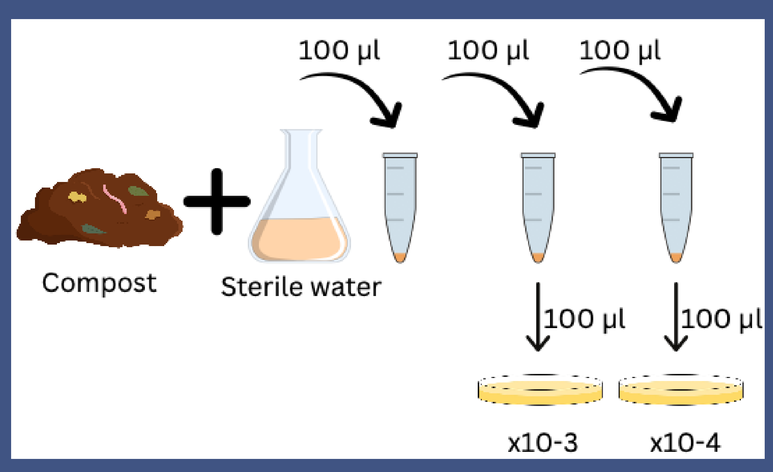

Figure 1. Microbial colonies and their macroscopic morphology observed on Petri plates for non-cardboard compost.

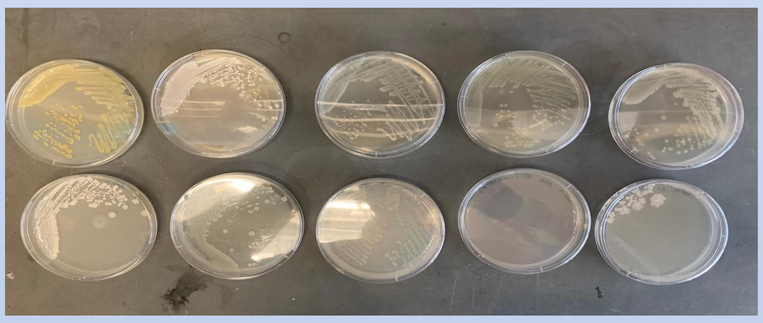

Figure 2. Microbial colonies and their macroscopic morphology observed on Petri plates for cardboard compost.

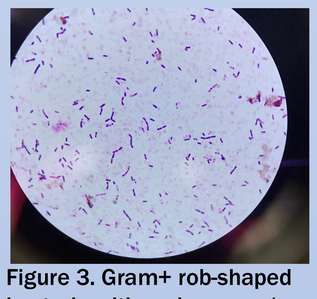

Figure 3. Gram+ rob-shaped bacteria with endospores (non-cardboard).

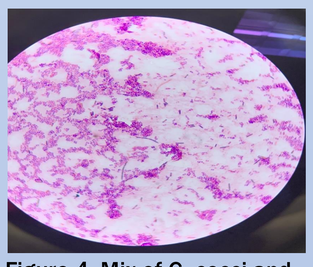

Figure 4. Mix of G- cocci and G+ rod-shaped bacteria (cardboard).

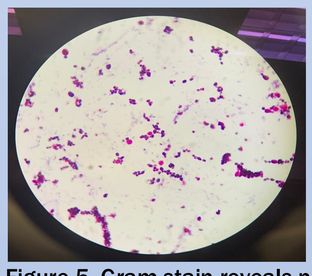

Figure 5. Gram stain reveals not bacteria but potentially yest.

Figure 6. Macroscopic morphology of microbial colonies grown on PD media after 72 hours at 20C (non-cardboard).

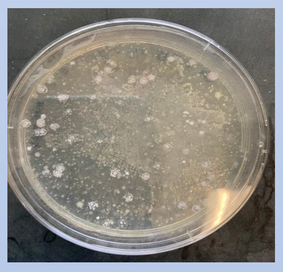

Figure 7. Macroscopic morphology of microbial colonies grown on NA media after 24 hours at 30C (cardboard).

Results

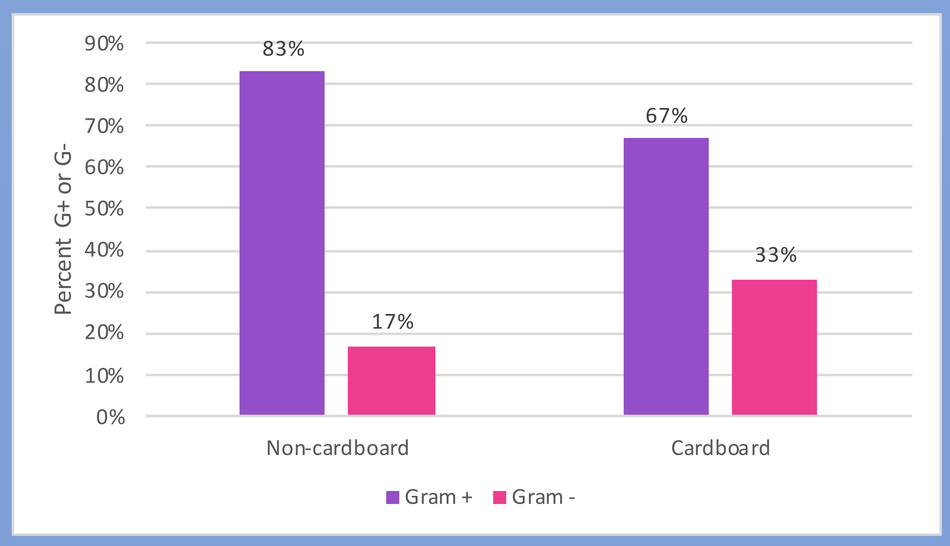

Figure 8. Percent abundance of Gram positive and negative bacteria in cardboard and non-cardboard samples.

Table 1. Table of cardboard and non-cardboard samples Simpson's and Shanna's Diversity Index's based on microbial observations.

	Simpson's Diversity Index (D)	Shannon's Diverity Index (H')	Richness
Non-cardboard	0.59	1.2	7
Cardboard	0.68	33.6	10

Bray Curtis's Dissimilarity (BCd)
0.76

Discussion

In conclusion, both vermicomposting conditions contained a diverse mixture of bacteria. The results show that the bacterial community compositions does differ between the two conditions.

FUTURE WORK:
To further confirm the results of this project, metagenomic of both the cardboard and non-cardboard samples will be done. This will allow for a more accurate interpretation of the microbial community composition.

Acknowledgments

Thanks you to Lisa Forth for making the compost and Dr. Cheeptham for her work. As well as the City of Kamloops for their financial support through the Climate Action Grant.

References: