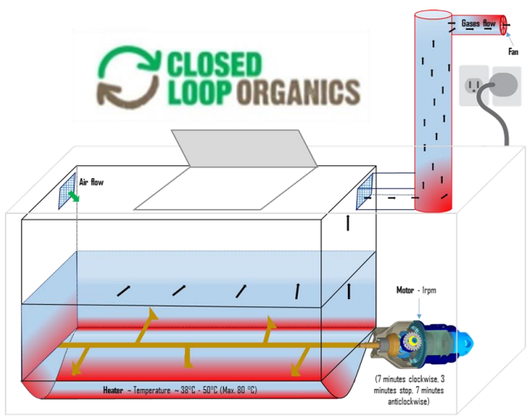
RP 2019

THE MICROBIAL ECOLOGY OF URBAN ORGANIC WASTE TREATMENT (COMPOST)

Research Question

- ***What time is necessary for in-vessel composting to produce stable, high-quality compost?***
- ***Is the final product from in-vessel composting free of pathogens?***
- ***How does the quality of final compost depend on the type of inputs?***

Figure 1: 20 kg capacity "Closed Loop" composter



Methodology

My research explores three main components:

1. Inputs (*food waste)*,
2. Process *(in-vessel composting*)
3. Outputs (*compost, gas*).

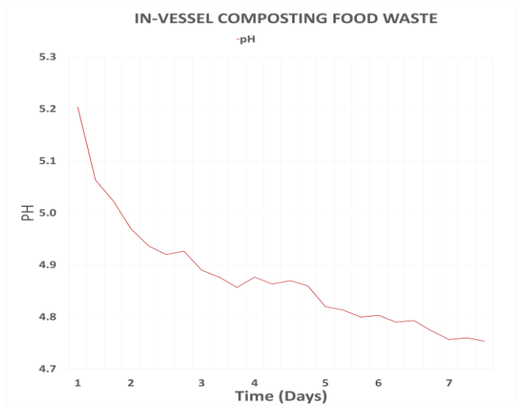
Measured parameters include food waste content, temperature, pH, electrical conductivity, moisture, C:N ratio and volatile organic compounds.

The cellular microbial communities, including pathogens, present during the composting process and in the final compost will be determined.

Results

Food waste was taken from cafes at Swinburne University of Technology and run in the in-vessel composter for 24 hours (first experiment) and for 7 days (second experiment).

Figure 2: pH of seven days in-vessel composting



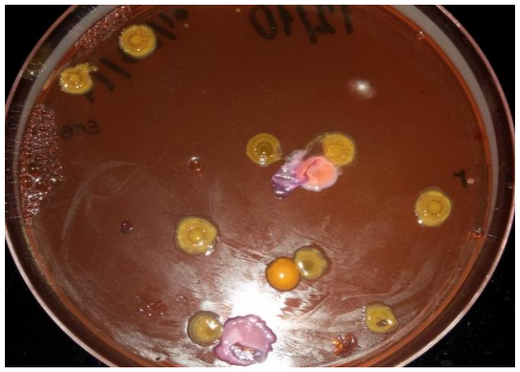
In these experiments, high vessel temperatures caused moisture loss in the compost bed, impeding desired microbes from flourishing, and consequently precluding pH rising to neutral, which is caused by normal microbial biochemical processes.

The main feature was that the composter increased the temperature artificially, preventing the typical microbial community development from mesophilic species through thermophilic species as occurs in the traditional windrow composting.

Compost samples from the first and second experiment were tested to determine the presence of pathogenic bacteria by using selective/differential growth media and methods. Pathogens sought included enterococci*, Escherichia coli* and *Salmonella Typhimurium.*

Preliminary experiments showed no pathogenic bacteria were isolated. However, there are other types of bacteria which grew on the selective/differential media and these are being identified by 16S rRNA gene sequencing.

Figure 3: Colonies of microbial growth in EMB selective media.



Conclusions

Both the 24 hour and 7 day composting experiments resulted in minimal bacterial activity typical of conventional composting. The output produced by this composter was classified as "partially degraded food waste".

Anticipated impacts

By improving the design and operation of the in-vessel composter, and providing optimal conditions for microbial activity, it is likely possible to produce an acceptable quality of compost, free of pathogens.

Implementing an efficient short-term onsite composting process on a large scale can have a positive impact not only in urban organic waste management, but can also create new business, generating new jobs thus developing the economy and at the same time, minimising our impact on the environment.

Further information

Find more information here:
http://www.foodcompostfood.org/

http://www.lowcarbonlivingcrc.com.au/research/program-2-low-carbon-precincts/rp2019-co2-reduction-and-food-production-household-and

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