Risk characterisation of microplastics in recycled organic wastes – getting the right count

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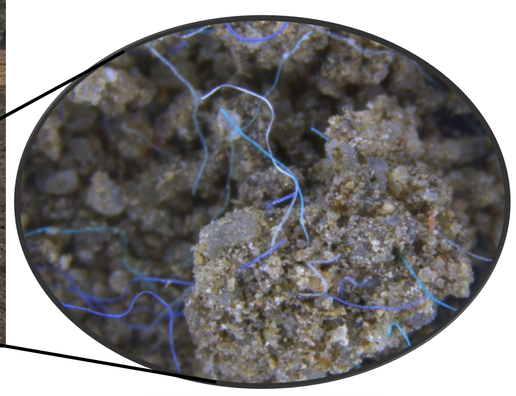
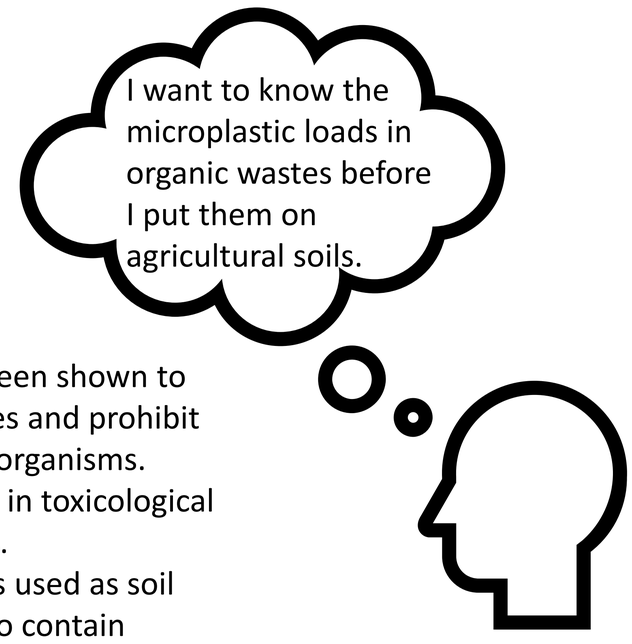
The environmental problem:



- Biosolids – sludge from municipal wastewater treatment plant – are applied on agricultural lands as soil amendments
- > 90% microplastics (< 5mm) in wastewater are deposited in sludge



- Microplastics have been shown to change soil properties and prohibit growth of some soil organisms.
- Significant gaps exist in toxicological data of microplastics.
- Other organic wastes used as soil amendment may also contain microplastics.

Experiment methodology:

Three types of organic waste collected in NSW

(1) Biosolids from wastewater treatment plants (3 sites)

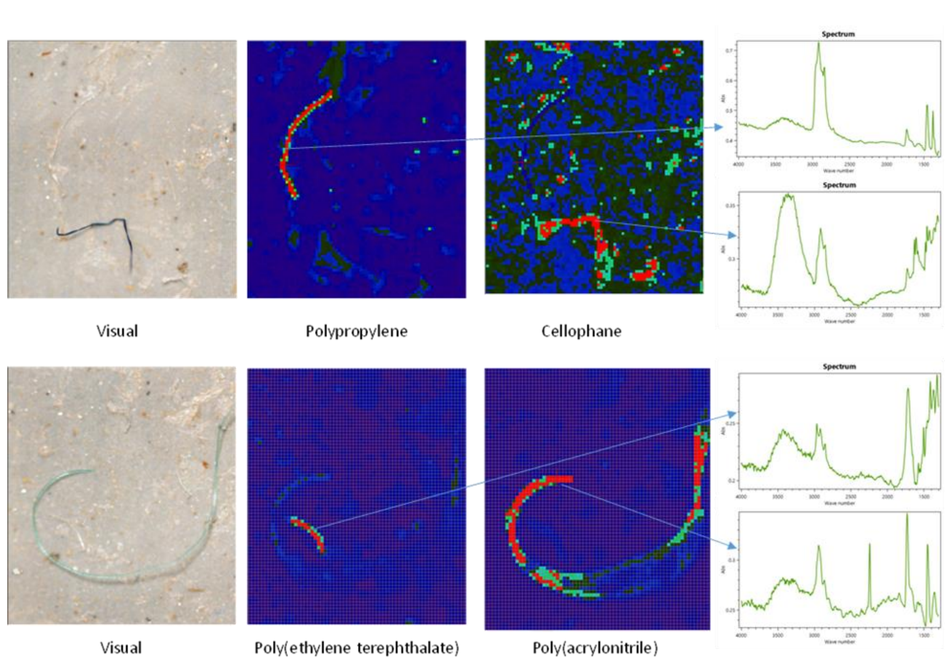
(2) Food and green organics waste (2 sites)

(3) Recovered construction fines (2 sites)

Three techniques are used to measure microplastic load

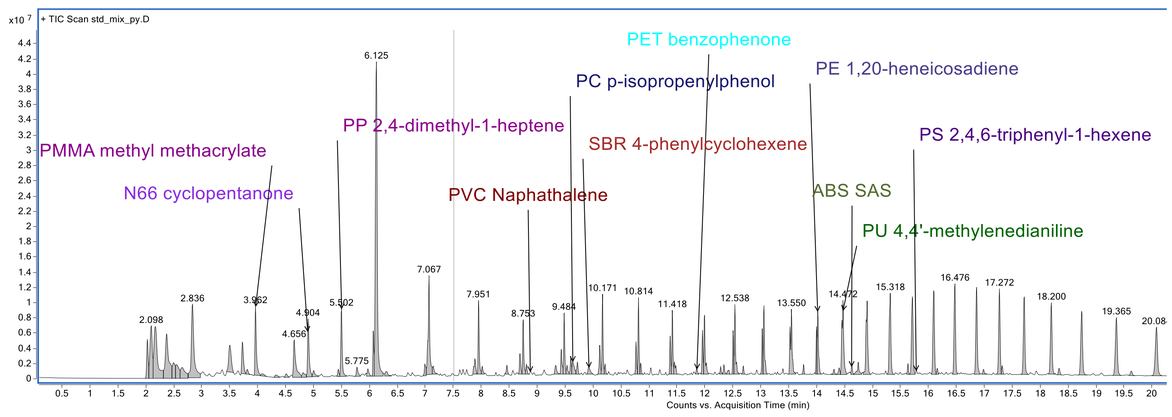
Microplastics will be analysed using pyrolysis GC-MS, laser direct infrared (LDIR) and Fourier transform infrared (FTIR) microscope spectroscopic imaging.

A majority of current reports on microplastics in biosolids used spectroscopic methods. These methods can provide information on shape, size and polymer type of each plastic particle detected. However, sample preparation and analysis are labour intensive and time consuming.



In recent years, pyGC-MS methods have been developed to quantify microplastics concentration in various environmental samples.

- Samples are extracted in dichloromethane under high pressure and temperature.
- Characteristic pyrolytic product compound of each plastic type is quantitated to give mass concentration (mg/kg) in sample.
- Does not measure particle number or morphology.
- PyGC-MS method has the advantage of including plastic particles smaller than the detection limit of the spectroscopic methods, as well as being rapid in sample preparation and analysis.



Expected outcomes:

Data from all three analytical methods will be integrated to provide a holistic understanding of the polymeric composition, number, and shape/size of microplastics in waste stream samples for development of a future microplastics regulatory strategy.

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