

Soil treatments and chitin-degrading microbes

We wanted to investigate how treating soils with lime and sewage sludge affected soil microbe diversities. Rather than investigating the organisms themselves, we looked at their genes, in particular an ecologically important group of enzymes that break down chitin. Chitin is a common nitrogen-containing polymer that is food for some bacteria and fungi, and is abundant in soil.

Chitin is usually broken down by a group of enzymes called 18 glycoside hydrolases. We developed a molecular tool kit to detect bacterial and fungal genes coding for these enzymes, using Polymerase Chain Reaction (PCR) techniques. This was the first ever study of the molecular diversity of chitinase genes within a terrestrial microbial community.

We buried litter bags baited with chitin at Sourhope, and sampled microbes from nearby soil several months later. Our PCR toolkit let us take a snapshot of the molecular diversity of chitinase enzymes present.

We found over 60 unique clones, ie at least 60 different

versions of genes coding for chitinases. Many were similar to genes from a group of bacteria called actinobacteria, and we conclude this group are important in breaking down soil chitin.

More detailed analysis suggested the bacteria were from the genera *Arthrobacter*, *Streptomyces* and *Rhodococcus*, *Stenotrophomonas*, *Cellovibrio* and *Prostheco bacter*. Fungal genes were similar to *Chaetomium* and *Mortierella* fungi.

Treating soils with lime did not affect diversity, but applying sewage reduced diversity. However, chitin was broken down faster, and enzyme activity was increased in soils treated with sewage. So sludging may improve soil fertility by increasing the activity of key bacteria that can metabolise chitin, but at the expense of overall bacterial diversity.

Further information

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