

Endophytic Fungus, TSTh20-1,  
promotes plant growth on oil sands  
tailings.

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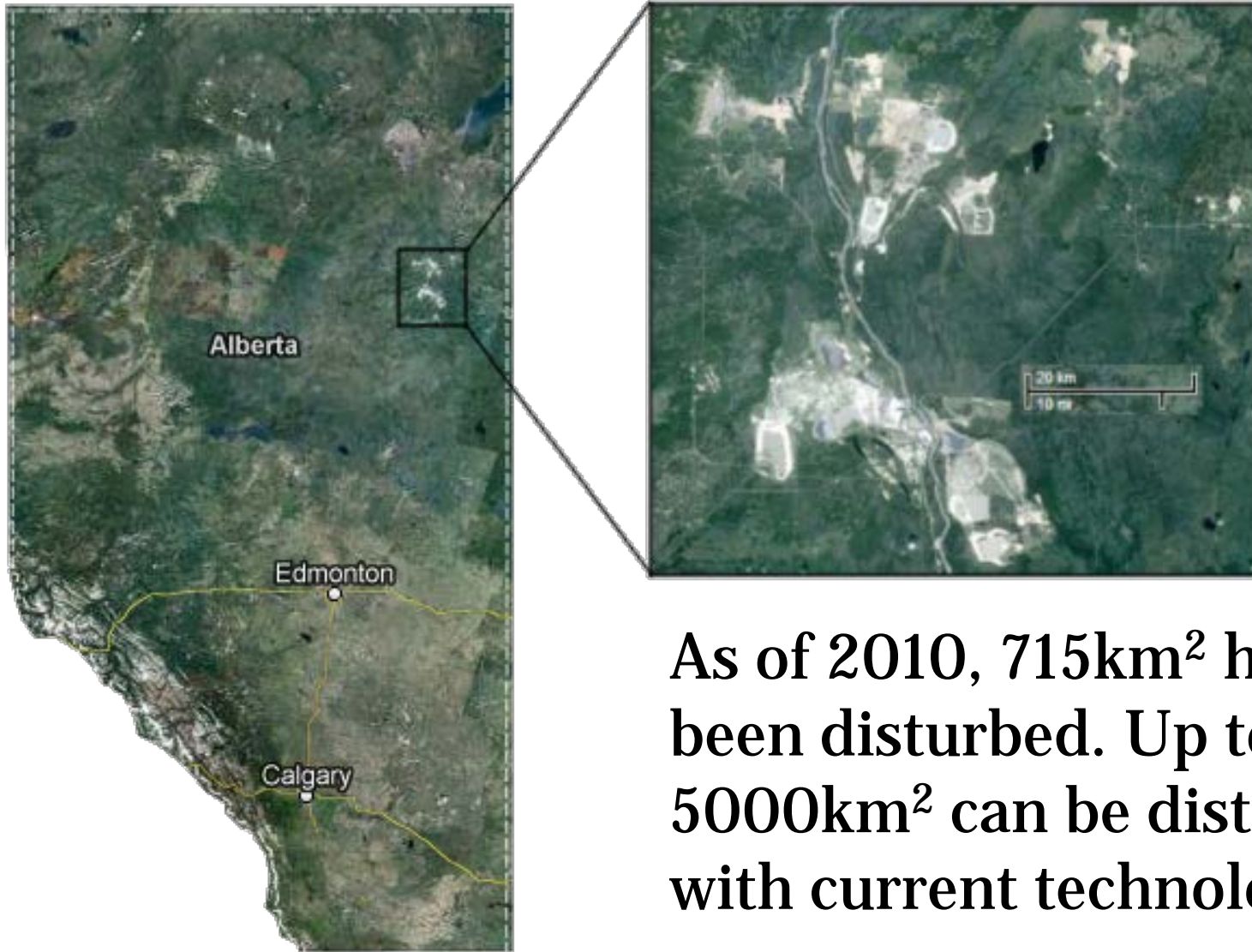
# Coarse Tailings - A Difficult Environment



## Tailings are:

- Nutrient Poor (NPK non-detectable)
- Caustic when fresh
- Contaminated with residual hydrocarbons
- As a result, can be strongly hydrophobic

# Extent of Mining Operations



**As of 2010, 715km<sup>2</sup> have been disturbed. Up to 5000km<sup>2</sup> can be disturbed with current technology.**

# *Trichoderma harzianum*, TSTh20-1



**Left: Pioneer plants growing on tailings.**

**Right: TSTh20-1 growing from surface sterilized plant material**



# Plant Growth Promotion



# Improved Drought Recovery



# Seed Germination Enhancement



With TSTh20-1

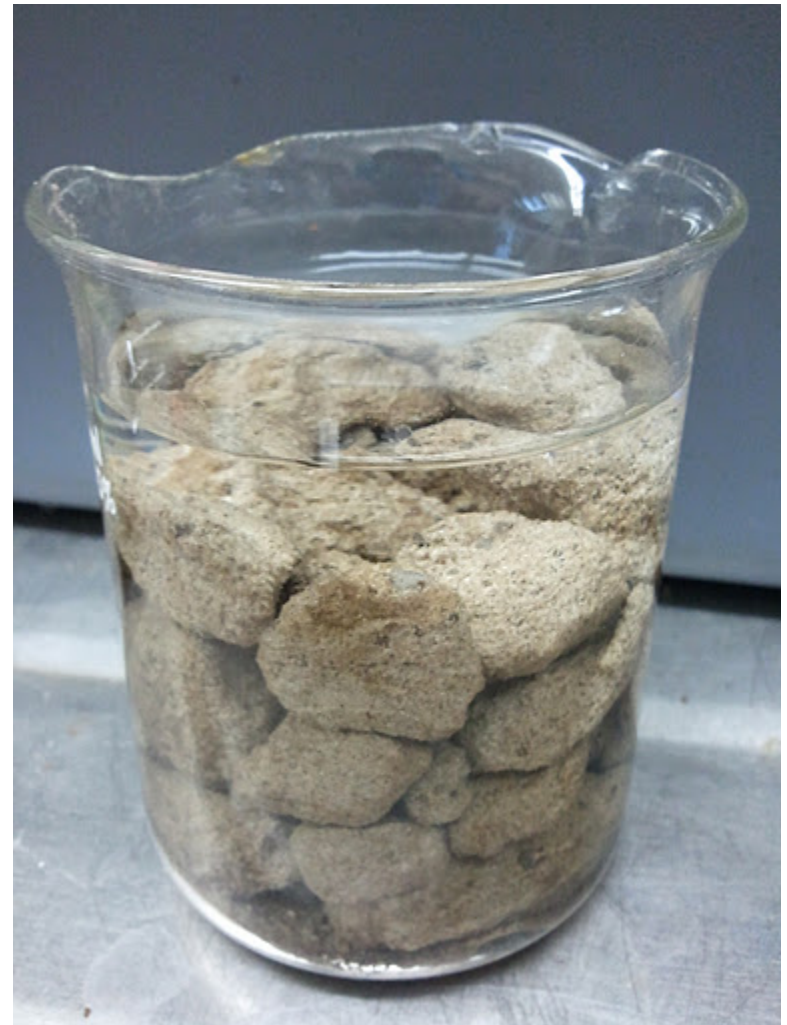


Without TSTh20-1

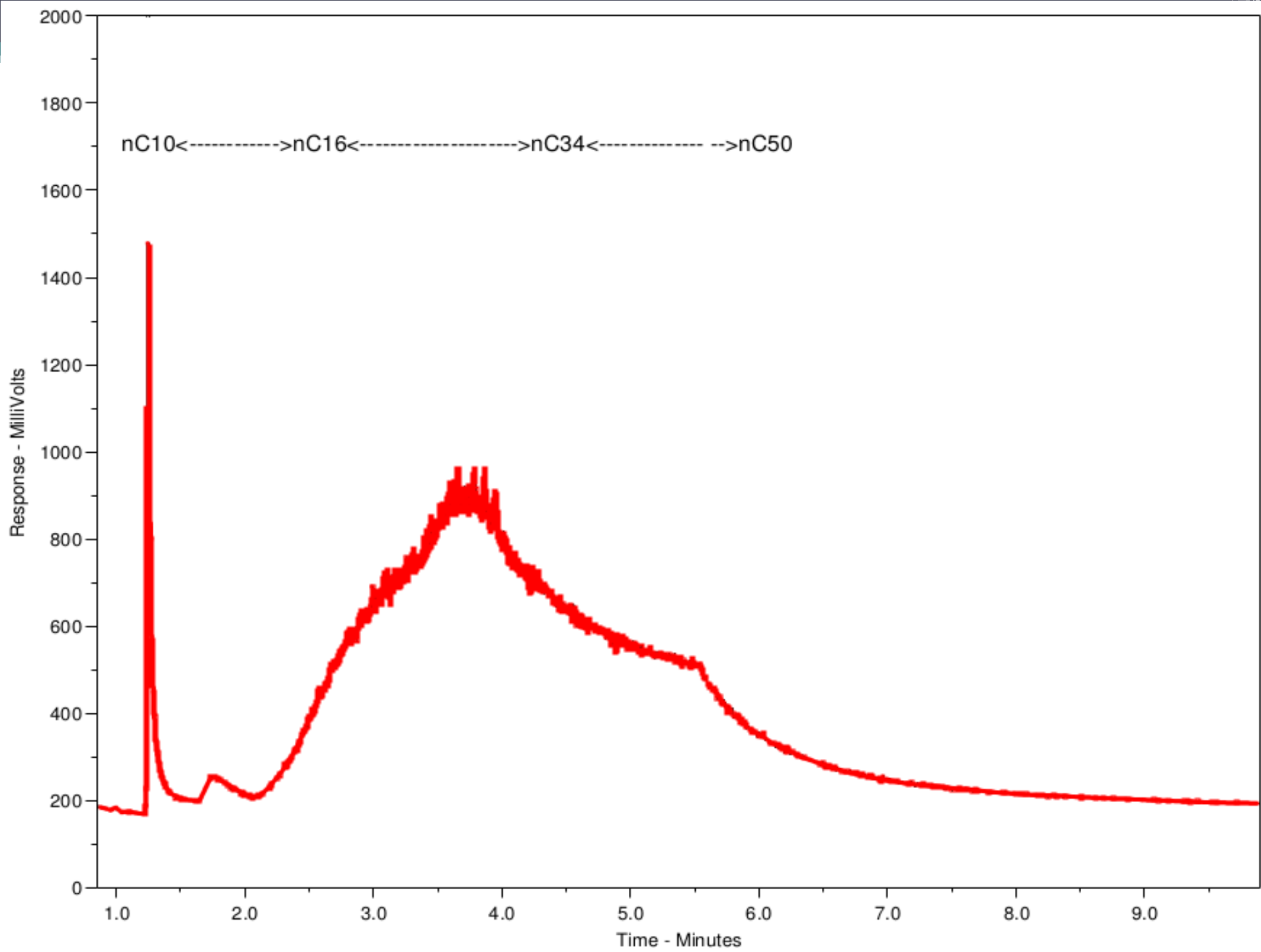


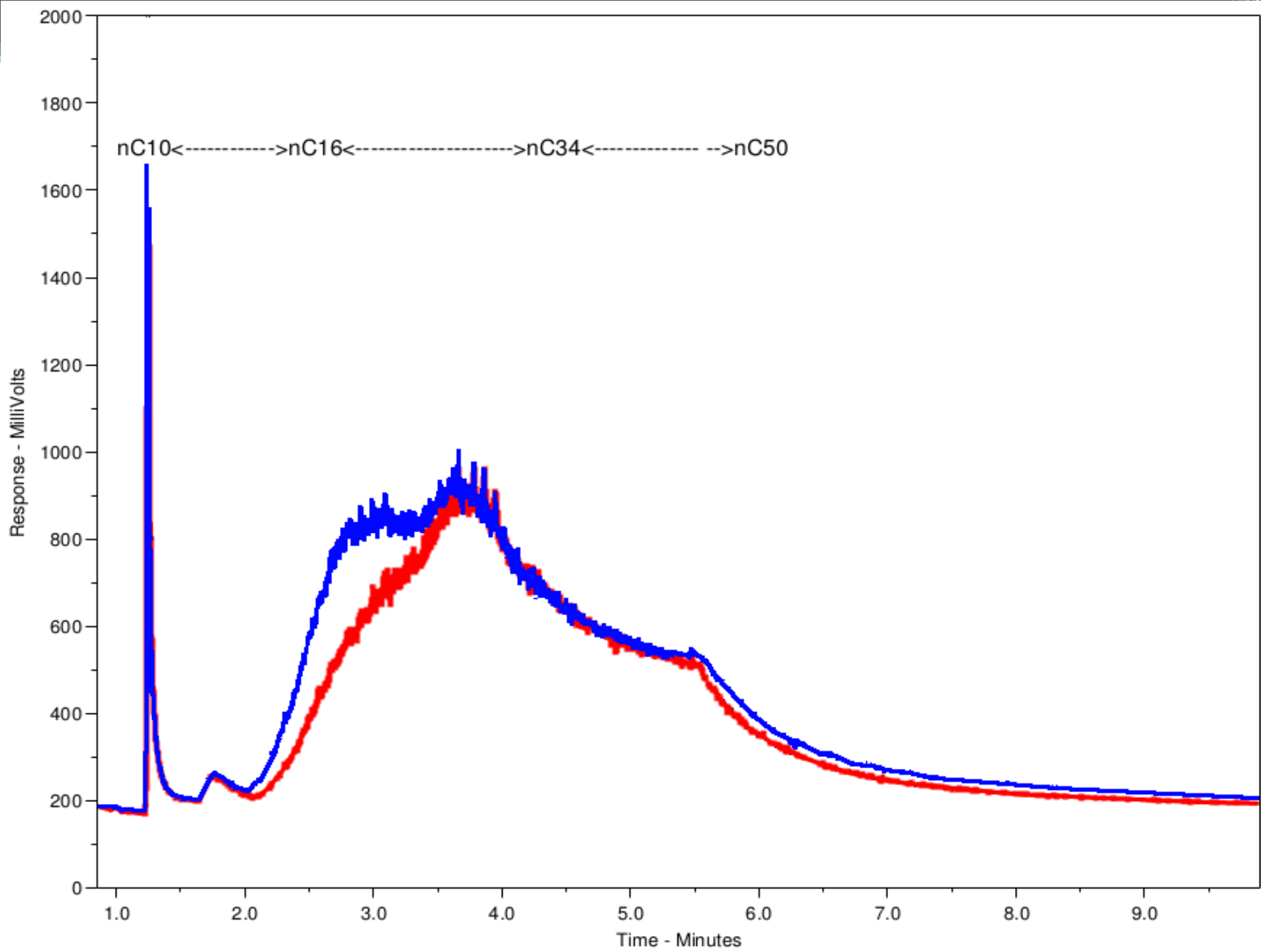
# Possible Hydrocarbon Degradation

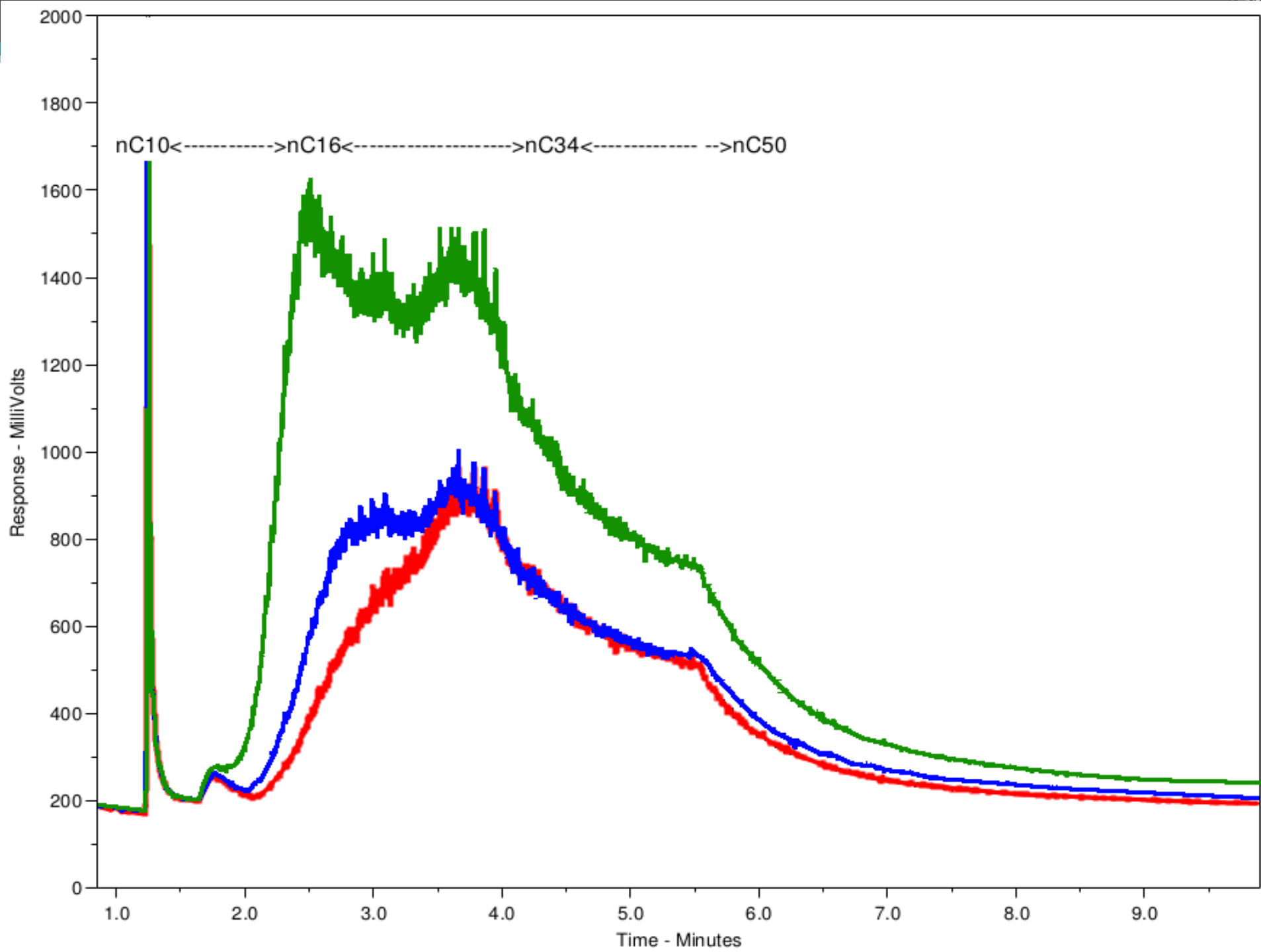
- Strong hydrophobicity suggested residual hydrocarbons
- Following data is a preliminary study from a meso-scale experiment
- Plants were grown on tailings for 2 months with and without TSTh20-1





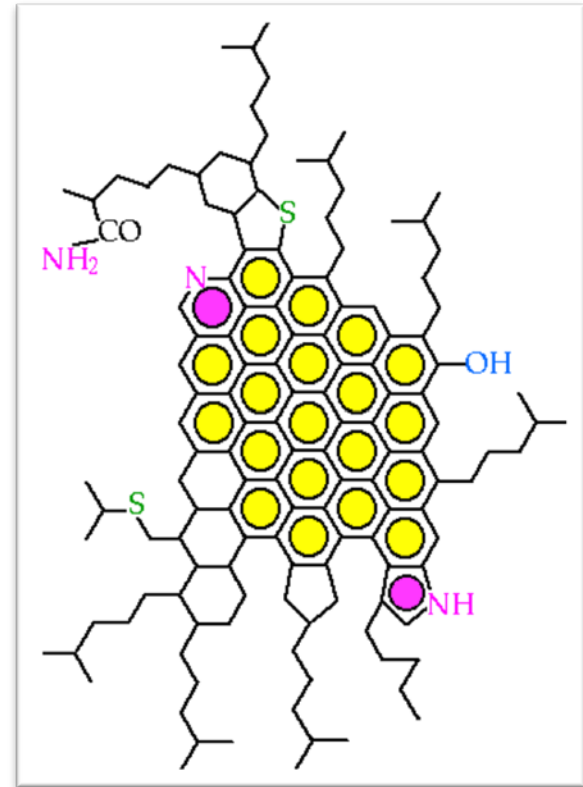
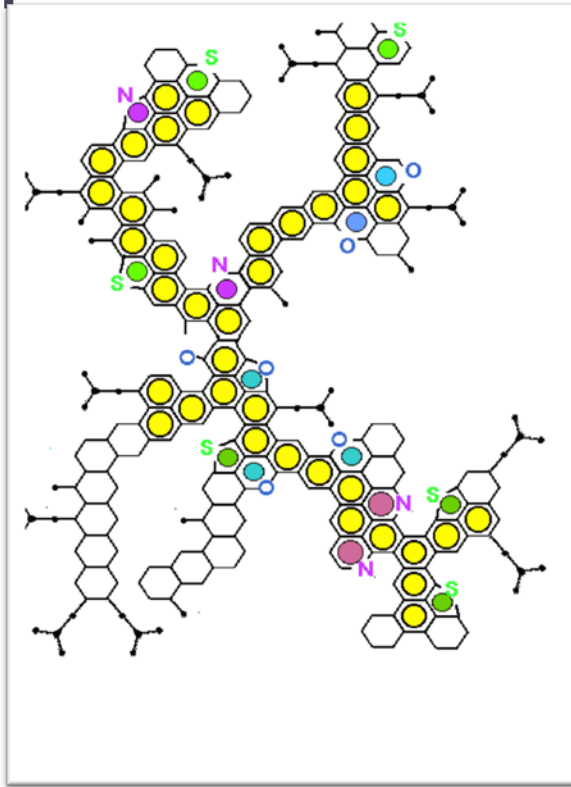








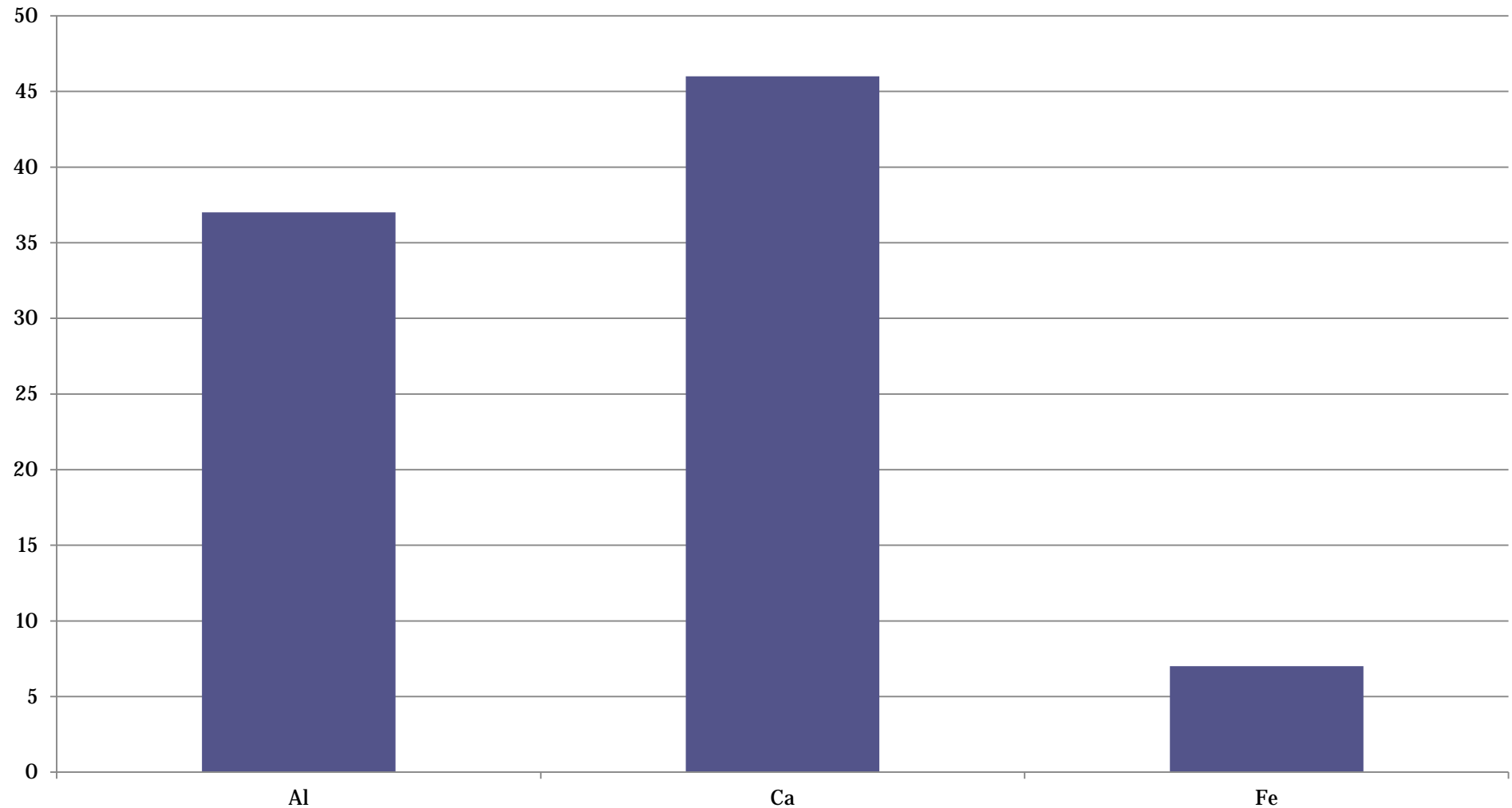
# Asphaltenes



Can be as large as 3000Da and are complex polyaromatic molecules. Known to exist in oil sands deposits as well as other hydrocarbon deposits.

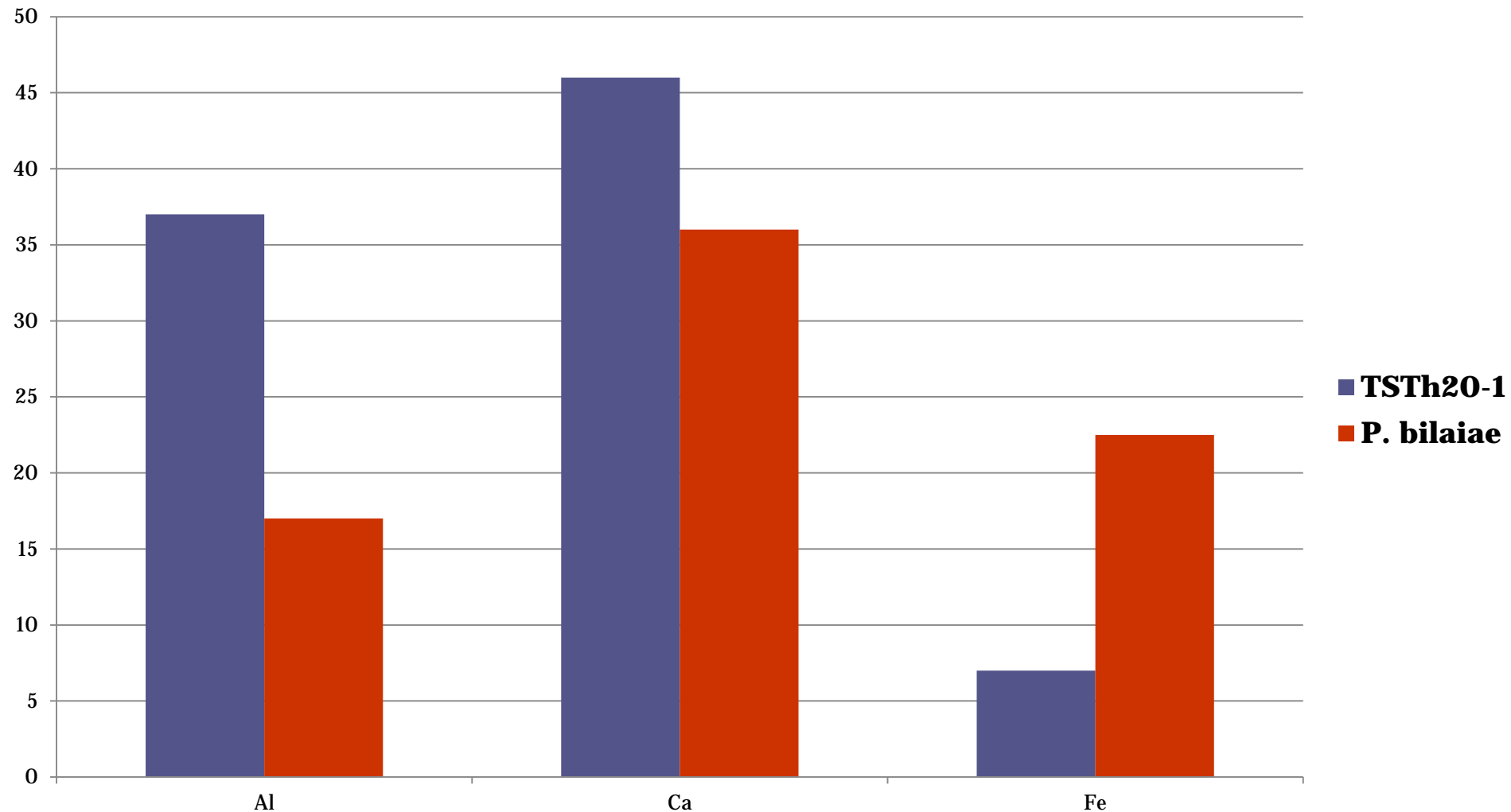
# Phosphate Solubilization

**Trichoderma harzianum**



# Phosphate Solubilization

TSTh20-1 is able to solubilize Ca- and Al- P better than a fungus known for strong phosphate solubilization, *P. bilaiae*





# Current and Future Directions

- **Taking a closer look at hydrocarbon degradation.**
- **Production of extracellular enzymes**
- **A more statistical representation of drought recovery.**
- **P-uptake enhancement in a variety of soils**
- **Production of essential plant hormones**

# Conclusions

**Endophytic fungi are multitalented and may be part of the solutions needed for big problems.**



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# Acknowledgments

- A big thanks to both of my supervisors for their continued support and openness to new ideas.
- Everyone in the Kaminskyj lab for putting up with my, sometimes messy, experiments and always being there for support.
- Everyone at Novozymes for their continued help and support



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Any Questions?

