

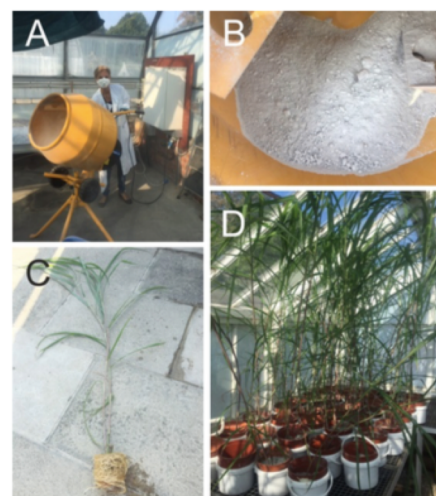
# Investigating uptake and catalytic potential of *Miscanthus* grown on palladium mine wastes

"We are very pleased that this BBSRC NIBB-funded Business Interaction Voucher has made it possible for us to establish contact with the University of York and support their research towards the development of additional uses for UK-grown *Miscanthus*." Mike Cooper, *Miscanthus* Nursery Ltd


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**OUTCOMES:** To simulate mine waste, *Miscanthus* plants were grown on synthetic mine tailings (containing kaolinite, gravel and palladium). The plants were dosed fortnightly with potassium cyanide (KCN) to solubilise palladium in the tailings. We achieved our objective to test the effect of multiple KCN treatments on palladium uptake by *Miscanthus*. Although the application of KCN significantly increased the concentration of palladium in the aerial tissues, additional KCN applications did not enhance palladium uptake. There was also an increase in the appearance of necrotic tissues with increasing number of KCN applications. These results suggest that palladium, or other metals in the tailings, were accumulating in the plants to phytotoxic levels. Our studies indicate that achieving palladium levels required for use as a commercially-comparable catalyst is difficult. Our further studies are investigating if lower levels of palladium in plant biomass can be used in alternative catalysis methods (controlled, low-energy pyrolysis), as well as whether synthetic biology methods can be used as an improved alternative to KCN solubilising treatments.



Mixing (A) and appearance (B) of synthetic mine tailings. Four-month old *Miscanthus* plants (C) and plants one week after planting (D) in synthetic mine tailings.

**INITIAL AIMS:** Following palladium mining and extraction, mined areas and waste tailings need to be re-vegetated. Tailings still contain significant levels of palladium but recovery using conventional methods is currently uneconomical. Plants can be used to re-green mined areas and have the potential to 'phytoextract' residual levels of precious metals, which could be used as catalysts. Because the insolubility of palladium in the waste is a major limitation to uptake, this project will determine the effects of solubilising treatments on palladium uptake and accumulation in *Miscanthus*.

- Sequential KCN applications did not enhance *Miscanthus* palladium uptake
- Lower palladium levels and other solubilising methods are under investigation