Researchers develop pollution-busting plants to clean up contaminated land

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Scientists at the University of York have played a crucial role in developing a way of using plants to clean up land contaminated by explosives.

The research, by a team led by Professor Neil Bruce in CNAP (Centre for Novel Agricultural Products) in the University's Department of Biology, uses micro-organisms found in soil to turn trees and plants into highly-effective pollution-busters. The research findings are published in *Nature Biotechnology*.

Decades of military activity have resulted in pollution of land and groundwater by explosives resistant to biological degradation. Large tracts of land used for military training, particularly in the USA, are contaminated by RDX, one of the most widely-used explosives, which is both highly toxic and carcinogenic.

The six-strong CNAP team has isolated a bacterial micro-organism in the soil in contaminated land that can utilise the explosives as a source of nitrogen for growth. But, because RDX is so mobile in soil, the bacteria present are not degrading it quickly enough to stop the contamination of land and ground water. So the York team has redeployed the enzyme in the bacteria into plants, giving them the ability to biodegrade the pollutant more efficiently.

Professor Bruce said: "We have taken that activity from the bacteria and put it in plants with large amounts of biomass. A tree, for instance, is

effectively a big pump, seeking out water, and if we can redeploy the enzyme which degrades the explosive making it harmless, it combines the capabilities of soil bacteria with the high biomass and uptake properties in plants.

"We are using an enzyme already existing in the soil but putting it into a more efficient machine to biodegrade the RDX. It is a sustainable, low maintenance and low cost process which has the potential to clean up large areas of land in military training ranges or industrial sites."

So far, the research has involved redeploying the enzyme into a model plant system – Arabidopsis thaliana – but in collaboration with researchers at the University of Washington, the CNAP team are now extending the technique to robust plants species such as trees, including aspen and poplar, and perennial grasses.

The technique can also be used to modify plants to resist other organic pollutants.

Source: University of York