Nitrogen loss in soils unearthed

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Researchers from The University of Western Australia have challenged the current understanding about which microorganisms carry out important nitrogen transformations in semi-arid agricultural soils.

Understanding which microorganisms are responsible for nitrification is critical to agricultural management of nitrogen.

Nitrogen cycling in soil is a complex network of interacting processes carried out by microorganisms.

The process of nitrification and the conversion of ammonium to nitrate is particularly significant, as it is the major pathway by which nitrogen can be lost from the soil and therefore the crop.

The research, recently published in the prestigious Nature Publishing Groups' *Scientific Reports*, concluded that ammonia-oxidising bacteria are responsible for the majority of soil nitrification activity, and not ammonia-oxidising archaea as has been found in other parts of the world.

Research Fellow Natasha Banning from UWA's School of Earth and Environment and Institute of Agriculture, who co-authored the paper, said the results are cutting-edge because they challenge the most recent understanding about which microorganisms are responsible for nitrification.

"For years, scientists thought nitrification was only carried out by

nitrifying bacteria," she said.

"Then, advanced molecular techniques showed that another group of microorganisms, called archaea, are also capable of nitrification.

"So thinking shifted to accepting that ammonia-oxidising archaea dominate the bacteria in nitrification of acidic soils.

"However, this was found not to be the case in the acidic agricultural soils we examined in WA."

Dr Banning said while archaea were present throughout the soil depth profile analysed, ammonia-oxidising bacteria were dominant in the surface and this is where most of the nitrification activity was occurring.

"These findings highlight that ammonia-oxidising bacteria are most likely responsible for regulating nitrification in semi-arid soils," she said.

The research will contribute the development of farm management strategies around minimising nitrification and nitrogen losses and increasing fertiliser use efficiency.

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