Exploring microbial denitrifers and potential for mitigation of N_2O emissions in agricultural soils – PhD position

Background

We seek a highly motivated and able candidate to undertake a PhD project in soil microbiology that will address questions around greenhouse gas emissions from agricultural soils. Nitrous oxide (N_2O) is a potent greenhouse gas with global warming potential 310 times that of carbon dioxide. N_2O emissions comprise over one-third of all agricultural emissions and decreases of N_2O emissions are critical emissions reductions required by EU Climate and Energy Package targets. Reductions of emissions, particularly within the context of a rising human population and sectoral expansion, represent a major challenge for agriculture globally. Nitrogen (N) losses from agricultural soils also represent an economic loss to the agricultural sector. Thus, managing N resources in soil is critical for environmental and agronomic sustainability, and underpins efforts to meet global challenges of increasing food production and climate change mitigation.

This PhD is part of a larger project funded by the Irish Department of Agriculture, Food and the Marine, which includes 3 PhD studentships, a postdoctoral researcher and a technician. The overall objectives of this project, entitled MINE (Manipulation and Integration of Nitrogen Emissions) are to divert gaseous N losses from N_2O to N_2 and Integrate N_2O emissions on a spatial and temporal scale. Within this it aims to (a) identify and quantify the contribution of different nitrogen transformation pathways on nitrogen budgets in soils, and their resulting impacts on N_2O emissions; (b) identify regulators of each pathway, particularly those regulating co-denitrification and denitrification to N_2 and (c) devise strategies, based on those key regulators, to divert N_2O to N_2 arising from urine and fertiliser N application. Microorganisms drive the majority of biogeochemical processes in soil and are responsible for much of the gaseous losses. By understanding how these organisms function there is great potential to predict when deleterious environmental N losses are likely to occur and to manage soils in such a way as to reduce losses. This PhD will focus on the occurrence, diversity and activity of microbial denitrifiers in Irish soils, and determine the impact of management, environmental and edaphic factors on microbial production of N_20. This project will use a mixture of molecular, high throughput sequencing, biochemical and isotopic approaches, and will provide valuable multidisciplinary training and research opportunities in soil microbiology, soil chemistry, environmental science, agronomy and bioinformatics. The student will join a successful research group, and lively graduate training communities, and will also receive training in other aspects of scientific work, e.g. result dissemination, writing for publication and conference presentations.

Requirements

Applications are invited from graduates holding at least a 2.1 class honours degree or M.Sc. in Microbiology, Soil Science, or a related discipline. Prior experience in molecular ecology or soil microbiology would be advantageous. A full driving licence and fluency in English are essential.

Award

The PhD Fellowship is a joint research project between NUI Galway and Teagasc. The student will be principally based at the Environment, Soils and Landuse Department in Teagasc, Johnstown Castle, Wexford. Supervision will be provided by Dr Fiona Brennan (Teagasc), Dr Karl Richards (Teagasc) and Prof Vincent O'Flaherty (NUI Galway). The Fellowship provides an annual stipend of €18000, which is tenable for 4 years, plus university fees. Expected start date for this project is Sept/Oct 2017.

Further Information

Dr Fiona Brennan, Phone: +353 53 9171332; email: fiona.brennan@teagasc.ie

Application Procedure

Applicants should submit a CV (including the names of two referees) and covering letter detailing their qualifications, research experience and motivation to: Fiona Brennan (fiona.brennan@teagasc.ie)

Closing date: May 31st 2017