ECOLOGY/ENVIRONMENT

Oghenerobor Benjamin Akpor
Tshwane University of Technology

Mentor: Prof M Muchie

Broad research area: Water and wastewater

Specific research field: Innovation practices in drinking water supply and wastewater discharge in Africa

Purpose of study:

The Millennium Development Goals clearly acknowledge that access to safe drinking water and proper discharge of wastewater are integral factors in reducing poverty and sustaining the environment. The United Nations has designated 2005-2015 as the Internal Decade for Action "Water for Life". Currently, many African countries are faced with the challenge of discharge of waste and meeting the supply of sufficient water of a good quality and at a reasonable price. Efficient and equitable water distribution is vital for sustainable use. Making clean water available demands scientific knowledge and research to feed into policy learning that can help design adequate and functioning management practices. Throughout time there has been the existence of several formal and informal institutional arrangements in most African countries, whose focus is the management of water. The mere presence of such institutions is not enough. It requires commitment from citizens, scientists, governments and all other stakeholders to meet the objective. There is also the need for such institutions to be able to find a state where they can function with lowest transaction costs by combining the formal institutions with the informal ones. Also, there is the need for such institutions to be able to find a state where they can function with lowest transaction costs by combining the formal institutions with the informal ones. The study is therefore aimed at evaluating eco-innovation indicators in the water sector that have been proposed and their application in Africa. It also seeks to explore the concept of eco-efficient water infrastructures and their applicability in Africa. The strategies and innovative technologies that have been implemented in Africa to tackle challenges faced in the water sector, with respect to treatment, monitoring, management and distribution will also be investigated.

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Julia L Angstmann
University of Cape Town

Mentor: E February

Broad research area: Ecosystem ecology

Specific research field: Nitrogen deposition in fynbos ecosystems: consequences of anthropogenic Nitrogen deposition to ecosystem function

Purpose of study:

Atmospheric pollution has increased the deposition of Nitrogen (N) and other chemicals into urban and natural areas all over the world with urban deposition rates of averaging 10-30 kg N ha^{-1} yr^{-1} compared to estimated preindustrial rates of < 2 kg ha^{-1} yr^{-1}. Alarmingly, a previous study conducted by Cinotta et al. (2000) estimated that in 1995, nearly 20% of the world's population lived within biodiversity hotspots with an expected growth of 1.8% per year, much greater than the global population growth rate. Cape Town is a rapidly developing metropolitan area located within one of these hotspots with an estimated population of 3.4 million over an approximate land area of 2 421 km^2 that is currently experiencing annual population growth of 0.86% per annum and an annual migration rate of 0.75. The Cape Town Metropolitan Area (CMA) is not only of interest due its rapid development, but is also home to the Cape Floristic Region (CFR) housing over 9 000 plant species with 80% being endemic to the small land area within the CMA. Anthropogenic sources of volatilised nitrogen from increased agricultural (NH_3) and combustion (NO_X and other oxidised forms) processes to support a larger population base will result in increased inputs of N urban and natural systems. My poster outlines a collaborative research project conducted by the University of Cape Town and Arizona State University measuring wet (rain, snow, sleet, and hail) and dry (impaction directly from atmosphere) depositional processes in 30 natural fynbos patches spanning from city centre south to Cape Point National Park and east across Cape Flats to the far side of False Bay. Increased N deposition into nutrient-poor fynbos systems will likely increase plant growth but long-term deposition may cause shifts in species composition, invasion of non-native species, removal of endemics, leaching into stream- and groundwater, increase susceptibility to drought, and shorten fire intervals as a result of greater biomass and/or drought. Thus, N deposition from urban activities may significantly alter ecosystem functioning of threatened fynbos habitats, impact ecosystem services of Cape Town residents, and should be considered a potential factor in biodiversity management.

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Cushla Maree McGoverin
Stellenbosch University
Mentor: M Manley
Broad research area: Spectroscopy
Specific research field: Cereal breeding plant selection

Purpose of study:
The endosperm of maize kernels is a composite of vitreous and floury textures, the proportions of which determine the hardness of the kernel. Maize hardness is an important grain parameter as it influences dry milling yield and processing for certain foods. Previously, the promise of NIR hyperspectral imaging in the classification of vitreous and floury endosperm of maize kernels was shown by the Manley lab. However, these classifications were made on the basis of samples aligned with the embryo 'facing down'. The purpose of this study was to determine the influence of embryo signals on differentiation of vitreous and floury endosperm.

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Julia Meitz
Stellenbosch University
Mentor: Dr C Lennox
Broad research area: Microbiology
Specific research field: Molecular characterisation of apple scab populations

Purpose of study:
Apple scab caused by the ascomycete fungus *Venturia inaequalis* causes large annual losses in apple production due to decrease in yield and lowered quality of the fruit. To estimate the efficiency of alternative control strategies such as orchard sanitation in an integrated management approach we have optimised a molecular detection method based on real time polymerase chain reaction (Q-PCR) of *V. inaequalis* DNA. The spore pressure was assessed from bud break to full bloom, when apple scab primary inoculum is released. In milder climates such as the *Koue Bokkefeld* in the Western Cape, scab lesions might overwinter in the asexual form and not just as winter-hardy pseudothecial structures. Pseudothecia form in fallen leaves during winter and aerially disperse their sexual spores at bloom in the form of ascospores. Our hypothesis was that the overwintered (asexual) mycelium or conidiospores might be the cause for the release of infectious spores before the so-called primary ascospore inoculum is expected. A Q-PCR method was developed using species specific *V. inaequalis* genes and Sybrgreen™ to test the increased risk of infection before the start of fungicide spray routines at bloom. Our results show that different levels of spore pressure of conidiospores and ascospores are found.

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