



ARC INFRUITEC-NIETVOORBIJ

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The Agricultural Research Council (ARC) and the University of the Western Cape (UWC) work together to provide excellence in Research and Services

The Research Institute Manager of ARC Infruitec-Nietvoorbij, Dr Johan van Zyl, as well as researchers from the Institute visited Professor Bongani Ndimba¹ at UWC to gain first-hand experience of the **National Agricultural Proteomics Research and Services Unit**. This ARC-UWC jointly owned Unit provides state-of-the-art Proteomics Research and Services, mostly to Agricultural and Biotechnology researchers and private companies in South Africa.

Proteomics is a collection of relatively new tools and expertise for Biologists and (Bio)chemists and its practical applications are growing fast. Proteomics is used primarily to profile and identify proteins of interest in any organism at a large scale. Proteins are the functional/operational units in cells, and 'proteins of interests' often include biomarker candidates for certain diseases or physiological/developmental status. The University has post graduate students ranging from BSc interns, Honours, Masters, PhD and Post-docs applying Proteomics in their own various biological experiments. Researchers from the ARC and private companies can also make use of the services offered.

The Proteomics Unit houses an advanced MALDI-TOF mass spectrometers (The Bruker UltrafleXtreme) for biomolecules mass, as well as instruments for 1 & 2 dimensional separation of proteins, imaging, Western Blotting and analysis tools. They also have automated spot picking and sample handling tools required for high throughput protein processing and identification.

For example, one could use Proteomics to investigate effects of environment or pathogens on cells, tissues, organs, organism protein expression levels and patterns. This information could be used to identify targets or strategies for the improvement of stress resistance / tolerance in both plants, animals and possibly human.

The research unit, situated in the purpose built New Life Sciences Building at UWC, has many societal benefits. Each year dozens of post graduate students are trained and some are able to be retained, creating a stable foundation for the next generation of scientists and biotech-entrepreneurs. Services such as advice, consultation, sample analysis and workshops are offered to students and researchers from internal and external research groups.

One of the applications includes a brand new MALDI Biotyper, a new method developed by Bruker for the identification of microorganisms at a super-fast speed. Microorganisms (like

bacteria) can be identified within 1-5 minutes and this is achieved relatively cheaply. The Biotyper has many applications in food safety and diagnostics-related areas of science.

The Unit also looks at Biofuels research using the most important grain in Africa, namely (Sweet) Sorghum. An upcoming project is a recently announced \$4.98 million initiative, funded by the US Agency for International Development (USAID), to work toward sustainable intensification of sorghum production.

This new project will be conducted by an international team led by the University of Georgia's Plant Genome Mapping Laboratory. They will use new research tools to address urgent needs for a more drought resilient food supply and increase rates of sorghum improvement to better meet long-term population growth. Production systems that promote sustainable farming, particularly regarding preservation and/or restoration of soil resources and water quality will also be investigated.

The research team includes partners from the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT, in India and Africa), Jimma University (Ethiopia), The Land Institute (Kansas, USA), and the Agricultural Research Council (ARC) of South Africa.

The ARC is represented by Professor Bongani Ndimba and Dr Nemera Shargie. Their respective roles include management of molecular biology evaluation and breeding/agronomic aspects of this project. Sorghum breeding and trials will take place at ARC research farms at the North West Province, inland, as well as in the Eastern Cape Province towards the southern coast.

“We have spent 20 years building genomic tools and fundamental knowledge of sorghum,” said the project director, UGA Regents Professor Andrew Paterson. “This is an exciting opportunity to put all this research to work, improving human lives in some of the most impoverished parts of the world while also advancing progress toward a more bio-based economy through sustainable intensification of agricultural production.”

Sorghum was the first plant of African origin to have its genome sequenced, as published in 2009 in an international effort also led by Paterson, who heads the UGA Plant Genome Mapping Laboratory.

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¹ Professor Bongani Ndimba represents both Institutes (ARC & UWC) through his role in the management of molecular biology evaluation at the Proteomics Research & Services Group: Department of Biotechnology.