Research on grapevine diseases sees Zim friends receive PhDs

Friends and classmates, Dr Providence Moyo and Dr Mukani Moyo, who studies together at Zimbabwe's Midlands State University in their undergraduate years both received their PhD degrees in agricultural sciences from Stellenbosch University. The newly capped doctors both researched diseases that are associated with grapevines.

Dr Mukani Moyo and Dr Providence Moyo on graduation day in Stellenbosch. Photo: Anina Fourie/Stellenbosch University

According to Providence, the two friends met in 2002 while they studied Biological Sciences as undergraduates. They then went their own separate paths, just to meet up again in Stellenbosch to pursue their postgraduate careers. The two friends even defended their PhDs in the same week, which forms part of the academic process that students have to go through before successfully attaining their postgraduate degrees.

Their graduation ceremony took place on Tuesday 14 March. Providence received a PhD in plant pathology, and Mukani a PhD in Wine Biotechnology. They are among a group of 18 PhD students and 61 masters degree students who graduated this week after doing research in the SU Faculty of AgriSciences. The PhD group represents students from six African countries: South Africa, Ghana, Nigeria, Namibia, Zimbabwe, and Mozambique.

“One of the missions of Stellenbosch University is for the institution to extend its footprint into Africa, and especially its research footprint in particular,” says Prof Danie Brink, acting dean of the Faculty of AgriSciences at Stellenbosch University. “One way of doing so is by providing postgraduate support to students from around the continent. This is reflected in growing numbers of postgraduate students from African countries in the Faculty of AgriSciences.”

Dr Providence Moyo’s research work

For her PhD in plant pathology, Providence surveyed which types of Diatrypaceae fungi species are found on grapevines and other woody plants growing near South African vineyards. This fungal family, and especially the species Eutypa lata, is known to cause a potentially devastating disease called Eutypa dieback. It causes the arms or trunk of a grapevine to rot, until the plant dies over a period of a few years.

She found fifteen different species of Diatrypaceae and established that some species are associated with specific dieback symptoms. In the process, she identified a new species of Eutypa never described before in the world, as well as seven species of Diatrypaceae that viticulturists and plant pathologists did not know occurred in South Africa.

Providence completed her research under the guidance of supervisors Dr Francois Halleen of the Agricultural Research Council and Dr Lizél Mostert of the SU Department of Plant Pathology.

The project was instigated after local plant pathologists received reports from overseas about the discovery of new fungal species, which were thought to also be involved in the development Eutypa dieback. “We did not know whether these species occurred in South Africa, and therefore decided to investigate,” explains Providence, who has taken up a position as a plant pathologist at Citrus Research International in Nelspruit after completing her studies.

Her study is more than just a tick list of the types of fungi that cause dieback in South African vineyards. She, among others, also developed a laboratory test that plant pathologists and viticulturists can use to detect whether the species Eutypa lata and Cryptovalsa ampelina are present in the woody part of a vine.

Dr Mukani Moyo’s research work

For her PhD in wine biotechnology, Mukani used different molecular techniques to investigate the interplay between grapevines and fungal pathogens that cause diseases. In particular, she investigated what happens when grapevine plants are infected by Botrytis cinerea, a fungal pathogen that causes grey mold of grapevine.

She used techniques that made it possible to identify the attack strategies of the fungus, as well as the defence strategies of the plants. These so-called interactome studies lead to interesting insights into the interaction between grapevine and its pathogens.

She found proof that some of the defences of grapevine are not used, or even effective against the pathogen. For example, a grapevine defence protein, the polygalacturonase-inhibiting protein (PGIP), was shown to be ineffective against protecting the plants against Botrytis. This is interesting because the same protein, when tested in tobacco, helps to effectively control the fungus. “Vines are naturally susceptible to Botrytis infections and unlike other plant species, the PGIP protein does not seem to play a defence role in protecting the grapevine against such infection,” she explains.

Mukani says the best part of her PhD – and probably also the part that taught her many a lesson in tenacity – has been to find out just why the gene provides protection in some plants, but not in others. "It has to do with changes in the cell walls of plants overexpressing the grapevine pgip gene, emission of volatile organic compounds and expression profiles of genes involved in crucial defence mechanisms such as hormonal regulation. Studying the process both from the perspective of the pathogen and the plant, made the detail understanding possible in the end,” she explains.

Dr Moyo completed her degree under the guidance of Prof Melané Viviers of the Institute for Wine Biotechnology in the SU Department of Viticulture and Oenology.