



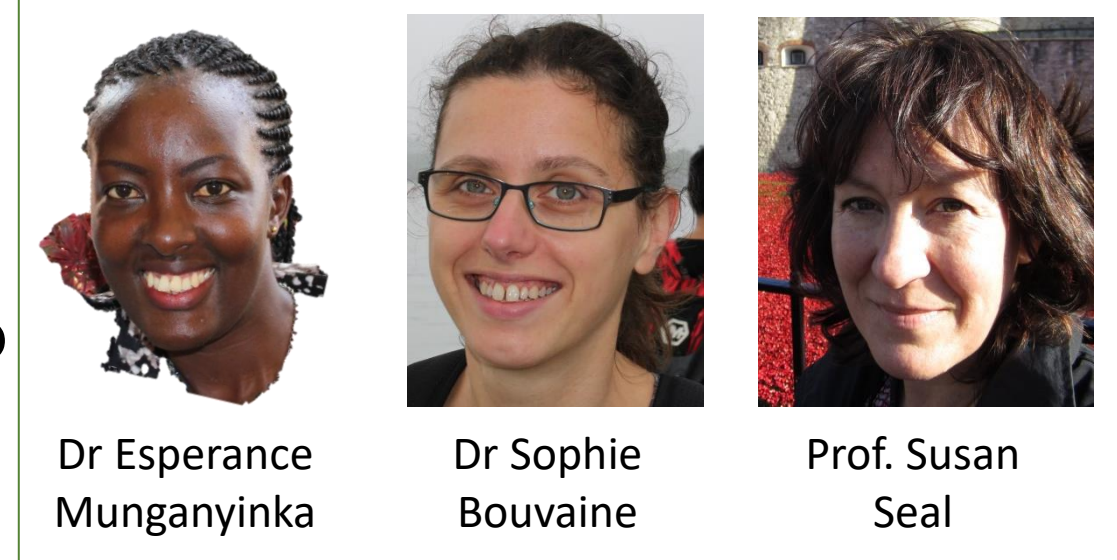
Community Network for African Vector-Borne Plant Viruses

PPF#23: Is there a correlation between root necrosis symptoms and virus titre in cassava brown streak disease-affected cassava roots?

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Project Objectives

This project sought to understand if cassava brown streak disease (CBSD)-affected cassava showing reduced root necrosis was due to translocation of the virus to the roots being restricted, by:

- 1. Sampling CBSD-affected cassava varieties that develop root necrosis and those that do not;*
- 2. Characterising viruses present in the leaves/roots of these selected varieties;*
- 3. Comparing virus titres in CBSD leaf samples/roots of the selected varieties with vs. without necrosis.*



Photograph (left) shows Dr Esperance Munganyinka collecting cassava leaf and root samples from the fields. The sample shown had virtually no leaf symptoms but marked root necrosis. The right photograph shows successful RNA extraction at RAB Rwanda from cassava roots and leaves and RT-PCR screening (Esperance, Susan Seal, Ghislaine).

Results

A detailed sampling protocol was drawn up and discussed with NRI and CBSD researchers at the University of Bristol, NaCRRRI Uganda and other international partners at the start of the project. Susan Seal then travelled to Rwanda in May 2019 and transferred (U)CBSV-diagnostic reagents and technologies to a team of RAB scientists (Esperance Munganyinka, Jeanne d'Arc Uwimana, Felix Gatunzi, Ghislain Niyonteze, Jules Mugabo, Josiane Umubyeyi and Virginie. Methodologies were optimised subsequently by Esperance's team so they worked reproducibly in RAB laboratories.

Sampling in Rwanda could only commence after coronavirus lockdown in June 2020. Esperance and team then conducted field sampling of four selected varieties (Nyiramabuye, Ndamirabana, Macadamia and Rwizihiza) from cassava-growing areas of Rwanda where varieties had already been well characterised by RAB breeders. Cassava varieties were selected to have two that only occasionally showed root necrosis, and two that commonly showed root necrosis.

Leaf and root samples (n=200, made up of 25 leaf and 25 root samples from 4 varieties) were collected showing a full spectrum of root-leaf symptoms. Leaf and root samples were recorded for symptoms and collected in an RNA preservation buffer. Samples were extracted and characterisation of cassava brown streak viruses present in the leaves and roots is ongoing. Laboratory analyses will as a result continue after the end date of the contract. When travel is possible again, and UK labs have re-opened fully, virus titres in extracted RNAs will be compared from roots and leaves of plants showing necrosis versus ones that did not.

Pathways to Impact

Knowledge on relationship between virus titres and symptom expression in leaves and tuberous roots will inform on plant response to virus infection and on identification of virus resistance in cassava (target beneficiaries: breeders, seed certification agency, plant health organizations). Results of the project activities can be easily scaled out to other African countries where cassava is important and yet threatened by CBSD. All these initiatives are hoped to generate new knowledge base to the cassava community, an information on which to base formulation of effective disease management strategies.

Future work

This project acted as a pump-prime project to improve our understanding of mechanisms underlying the development of root necrosis symptoms. Further funding will be sought for larger experiments to investigate the following questions:

- 1. Do findings hold on a more comprehensive study involving more cassava varieties regionally?*
- 2. What impact does the environment have on root necrosis symptoms? What impact might climate change have on symptom titres and severity, and does this differ between single versus mixed infections?*
- 3. Can virus sequence motifs be identified that influence the ability of certain virus strains to induce root necrosis?*
- 4. Can pathways leading to root-necrosis in cassava varieties be identified with a view to breeding cassava varieties that exhibit reduced root necrosis.*

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