next? Host resistance is the cornerstone of disease control and Cavendish's resistance to Race 1 - that still holds - is the ultimate benchmark of the required level of resistance to manage FWB caused by TR4, but foremost the crop needs to be diversified. Furthermore, all options for early warning, disease management, and innovation of cultivation systems need to align to sustainably secure this important crop.

**C8.5-2**

## FROM GENE DISCOVERY TO COMMERCIAL RELEASE: A GM CAVENDISH BANANA HIGHLY RESISTANT TO FUSARIUM WILT TROPICAL RACE 4

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**Text**

Around 20 years ago, we started the search for a banana gene that would provide resistance to Fusarium wilt (Panama Disease) tropical race 4 (TR4). At that time, TR4 had a limited distribution, confined primarily to south east Asia and northern Australia. It is now present and spreading in five continents and is considered the greatest threat to banana production worldwide. We identified a NBS-LRR gene in a TR4 resistant wild diploid banana that had characteristics consistent with a potential TR4 resistance gene. We transferred this gene to Cavendish bananas and regenerated several transgenic lines. These lines, together with controls, were transferred to a field with a history of high TR4 disease incidence. From the first small scale field trial, we identified four lines with varying levels of resistance and these were progressed into a large scale field trial. After three years and 5 crop cycles, one line, QCAV-4, was shown to be highly resistant to TR4 with only 2% of plants infected compared with 66% of the non-GM controls. Importantly, there was virtually no yield penalty for QCAV-4 compared with uninfected non-GM controls. We have now fully characterised this event and have submitted an application to the regulators in Australia towards commercial release of this line. Further, we have recorded the history of each plant of the four initial lines as well as non-GM controls and this is providing significant insights into the progression of the disease in a plantation.

**C8.5-3**

## LIMITING FUNGICIDE USE IN THE MANAGEMENT OF BANANA LEAF SPOT DISEASES

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**Text**

Three related fungi cause similar leaf diseases of banana and form the sigatoka leaf spot complex: Pseudocercospora fijiensis, P. musae et P. eumusae. The more aggressive species P. fijiensis has been recently spread throughout the world leading to a massive

systematic use of fungicides in most countries, especially in industrial export plantations. Research work has been conducted to limit the use of fungicides. The development of forecasting strategies and cultural practices (such as necrotic deleafing) first allowed to reduce significantly the number of applications. Other studies have been recently conducted at landscape or farm scale to quantify the effects on epidemics of hedgerows or association with other crops. In parallel, genetic improvement programs are being conducted to create new resistant varieties. However, as for fungicides, it has been shown that pathogen populations can adapt and breakdown or erode banana resistances after 5 years of monoculture. A more durable deployment strategy would be to combine resistances with antagonistic interactions in order to constrain and limit the adaptation of pathogen populations. Studies on populations pathogen adaptation and host-pathogen interactions are thus underway. Finally, a generic model has being adapted to P. fijiensis to test the efficiency and durability of various resistance deployment strategies. The last results obtained from all these studies will be presented.

**C8.5-4**

## EFFECT OF A PLANT-BASED BIOLOGICAL CONTROL OF FUSARIUM WILT ON THE SOIL MICROBIOME

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**Text**

Plant root exudates exert strong influences on the soil microbiome, and rhizospheres are among the most diverse microbial communities. In agriculture, there is growing interest in the manipulation of the soil microbiome through root exudate management, for example for disease suppression. Fusarium Wilt is an important soil-borne pathogen of certain banana (Musa spp.) cultivars. Fusarium Wilt is difficult to eradicate from soils and currently there are no economically viable controls. Observations of apparent disease suppression in some Chinese banana plantations have resulted in the identification of a culinary understorey plant, Allium tuberosum (colloquially Chinese leek), as producing root exudates that kill Fusarium spores and inhibit disease development. However, the wider, non-target effects of Allium root exudates on soil microbes are unknown. Potentially, strong general antimicrobial activity could impact soil ecosystem function. Here, we investigate the influence of banana and Chinese leek roots on soil microbes in a pot trial. We compared the bulk soil and rhizosphere microbiome of Allium and bananas and evaluated the effect of their co-cultivation under greenhouse conditions. Our results indicate that Allium induces a significant shift in soil microbe community, however, this effect is outweighed by the presence of banana roots. Therefore, Allium is a potential plant-based biocontrol for Fusarium that does not significantly alter the soil microbiome in general.

**C8.5-5**

## BANANA BUNCHY TOP VIRUS – MANAGING THIS EVER-EXPANDING THREAT