

Fusarium Resistance and Genetics



Research GAP

Fusarium wilt, caused by the soil borne fungus *Fusarium oxysporum*, has long been a **problem for banana growers worldwide**. In East Africa, *Mchare* bananas are particularly susceptible to a type of Fusarium wilt called



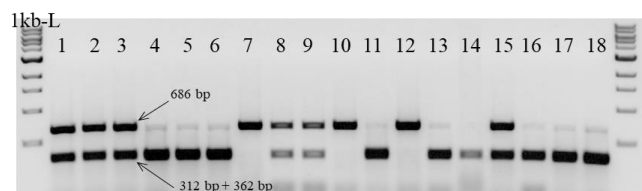
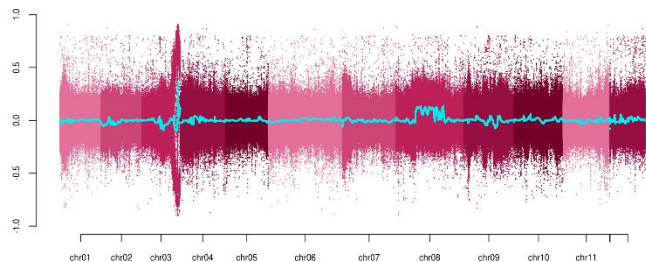
Race 1, which causes the yellowing, then death, of leaves and plants. However, a more aggressive strain that affects a wider range of cultivars, TR4 (tropical race 4), is reported from many countries but not yet from East Africa. It is anticipated that **should TR4 arrive in East Africa, it will inflict serious damage** to *Mchare* production and that of other local banana types. **Breeding for Fusarium resistance is therefore important**. The difficulty, however, is that in the absence of TR4 in East Africa, assessing for

TR4 resistance is problematic. The identification of **molecular markers associated with Fusarium wilt resistance** has therefore been our goal.



What WE DID

The **molecular marker development** would rely on a population of banana plants that segregate for resistance to Fusarium. A population of the seeded **diploid banana subspecies, *Musa acuminata* ssp. *malaccensis***, was sent to Arusha to be **challenged with Race 1**, the Fusarium wilt that is



endemic to East Africa. Meanwhile, in Australia the population was **tested against TR4 and sub-tropical race 4**. In the lab, molecular markers were mapped in the population to confirm its location relative to the trait position (QTL) and to its position in the reference genome 'DH Pahang'. The aim being to **generate markers that co-segregate with resistance**. We knew already that *M. a. malaccensis* segregates for resistance to Fusarium, which allows

selection of an identifiable fragment of DNA (marker) that co-segregates with the trait. Working together between our partners, the **interpretation of this genomic region has improved**. Studies are continuing to specifically identify the actual gene(s) encoding the resistance.



What **WE ACHIEVED**

We **identified a molecular marker that signifies Fusarium resistance**. This has now been tested and validated against banana germplasm and breeding lines from IITA (both East and West Africa accessions) and Brazil. The **marker can detect resistance** in accessions where *M. a. malaccensis* is a progenitor. Work is now underway to identify QTLs from other wild banana lines that are resistant but show the absence of the *M. a. malaccensis* resistance marker. This will **broaden our ability to detect Fusarium resistance**.



Why **THIS IS IMPORTANT**

Having a molecular marker for a pest or disease resistance and knowing where the resistant gene(s) are placed **enables the rapid assessment of banana** progeny, at an early stage of growth, using simple molecular tools. This provides for **efficient and rapid evaluation of banana plants** for resistance to Fusarium, without even needing to challenge them with the disease. This **drastically improves the efficiency of the breeding pipeline**, substantially reducing cost and time.

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