

Genes from sweet pepper to fortify African banana against devastating wilt disease

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In a major breakthrough, crop scientists announced today the successful transfer of green pepper genes to bananas, conferring on the popular fruit the means to resist one of the most devastating diseases of bananas in the Great Lakes region of Africa.

The Banana Xanthomonas Wilt (BXW) costs banana farmers about half a billion dollars worth of damage every year across East and [Central Africa](#). The leaves of affected crops turn yellow and then wilt, and the fruit ripens unevenly and before its time. Eventually the entire plant withers and rots.

Dr. Leena Tripathi, a biotechnologist with International Institute of [Tropical Agriculture](#) (IITA) and lead author of the paper, said there is still a long way to go before the transgenic bananas find their way onto farmers' fields, but she called the breakthrough "a significant step in the fight against the deadly banana disease."

The transformed bananas, newly-infused with one of two proteins from the green pepper, have shown strong resistance to Xanthomonas wilt in the laboratory and in screen houses. The researchers are poised to begin confined field trials in Uganda soon.

Some of the findings on the protective impact of the two proteins—plant ferredoxin-like amphipathic protein (Pflp) and hypersensitive response-assisting protein (Hrap)—were published recently in the journal *Molecular Plant Pathology*.

"The Hrap and Pflp genes work by rapidly killing the cells that come into contact with the disease-spreading bacteria, essentially blocking it from spreading any further," Tripathi said. "Hopefully, this will boost the arsenal available to fight BXW and help save millions of farmers' livelihoods in the Great Lakes region."

The novel green pepper proteins that give crops enhanced resistance against deadly [pathogens](#) can also provide effective control against other BXW-like bacterial diseases in other parts of the world. Tripathi adds that the mechanism known as Hypersensitivity Response also activates the defenses of surrounding and even distant uninfected banana plants leading to a systemic acquired resistance.

Scientists from the IITA and the National Agricultural Research Organisation (NARO) of Uganda, in partnership with African Agricultural Technology Foundation (AATF), will soon begin evaluating these promising new banana lines under confined field trials. The Ugandan National Biosafety Committee recently approved the tests, which can now move forward.

The genes used in this research were acquired under an agreement from the Academia Sinica in Taiwan.

The highly destructive BXW affects all varieties, including the East African Highland bananas and exotic dessert, roasting, and beer bananas. The crop is also under threat from another deadly disease, the banana bunchy top.

Dr. Tripathi says that there are presently no commercial chemicals, biocontrol agents or resistant varieties that can control the spread of BXW. "Even if a source of resistance is identified today," Tripathi said, "developing a truly resistant banana through conventional breeding would be extremely difficult and would take years, even decades, given

the crop's sterility and its long gestation period."

BXW was first reported in Ethiopia 40 years ago on Ensete, a crop relative of banana, before it moved on to bananas. Outside of Ethiopia, it was first reported in Uganda in 2001, then rapidly spread to the Democratic Republic of Congo, Rwanda, Kenya, Tanzania, and Burundi, leaving behind a trail of destruction in Africa's largest banana producing and consuming region.

BXW can be managed by de-budding the banana plant (removing the male bud as soon as the last hand of the female bunch is revealed) and sterilizing farm implements used. However, the adoption of these practices has been inconsistent at best as farmers believe that de-budding affects the quality of the fruit and sterilizing farm tools is a tedious task.

The research to fortify [bananas](#) against BXW using genes from sweet pepper was initiated in 2007.

Provided by Burness Communications

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