

# How bacteria manipulate plants

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Attack at the protein front: Xanthomonas bacteria causes disease in tomato and pepper plants and injects harmful proteins into plant cells. Researchers from Martin Luther University Halle-Wittenberg (MLU), the University of Bonn, the University of Freiburg and the Leibniz Institute of Plant Biochemistry (IPB) in Halle have now discovered how one of these proteins manipulates the nutrient supply and hormonal balance of plants. Their study was recently published in the renowned journal *Nature Communications*.

The research group, led by Halle-based plant geneticist Professor Ulla Bonas, has been investigating the interaction between pathogenic [bacteria](#) and [plants](#) for quite some time. The group focuses on Xanthomonas bacteria, which primarily attack tomato and pepper plants. In their earlier work, the Halle lab proved that the bacteria introduce a number of harmful proteins, so-called effectors, into plant cells via a specialised secretion system that works like a molecular syringe. "This protein cocktail weakens the plant's defences and allows the bacteria to multiply inside the plants. The plants age faster, lose their leaves and produce less fruit," says Ulla Bonas.

One of these harmful proteins is XopH. The research groups from Halle, Bonn and Freiburg investigated this particular protein's mechanism of action in more detail. Using new analytical methods developed by the Freiburg researchers, they were able to show that the XopH protein targets one of the main phosphorus supplies inside plant cells. "When XopH depletes this supply, it probably not only takes nutrients away from the plant but also prepares it to receive the [harmful bacteria](#),"

explains Bonas. It is likely that the XopH protein also weakens the plant's defences and changes its [hormonal balance](#), which is suggested by the fact that the affected plants have a problem to grow.

Some host plants have adapted to attacks from Xanthomonas bacteria and can recognise the manipulation through XopH. "We do not know yet how exactly they do this. However, the result is always the same: The diseased tissue dies to seal-off the infected area and to prevent the [pathogenic bacteria](#) from spreading further through the plant tissue," Bonas concludes.

The study in *Nature Communications* provides another answer to the question of how bacteria harm plants and how plants react to this threat. However, all in all, a lot of basic research still needs to be carried out to fully understand the disease process: XopH is only one of a total of more than 35 effector proteins that bacteria inject into plants to colonise them.

**More information:** Doreen Blüher et al, A 1-phytase type III effector interferes with plant hormone signaling, *Nature Communications* (2017). [DOI: 10.1038/s41467-017-02195-8](https://doi.org/10.1038/s41467-017-02195-8)

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