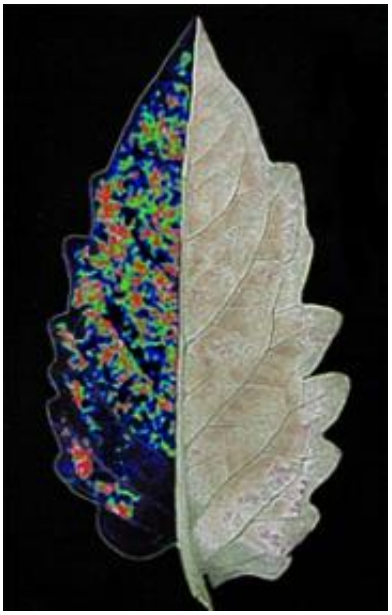
Smart fungus disarms plant, animal and human immunity

August 20 2010



Fungal and bacterial pathogens are well capable of infecting plants, animals and humans despite their immune systems. Fungi penetrate leafs, stalks and roots, or skin, intestines and lungs, to infect their hosts.

Dutch researchers of Wageningen University discovered, together with Japanese colleagues, how this is possible. They found that the fungus secretes a protein that makes stray building blocks of the fungal cell wall invisible for the immune system of the plant, such that infection remains

unnoticed. In *Science* of August 20th they report their findings.

Fungi prepare their attack, for instance on a tomato plant, well. Take for example the fungus Cladosporium fulvum that causes leaf mould of tomato. Once the fungus starts to infect, the tomato plant would recognize the fungus based on the presence of chitin fragments that are derived from the fungal cell wall. Chitin does not naturally occur in plants, but chitin fragments can always be found near fungi, just like cat hairs betray a cat's presence. The tomato immune system recognizes the chitin fragments as "non-self and unwanted" and alarms the immune system to combat the infection. So far so good.

Ecp6

However, *Cladosporium fulvum* as well as nearly all other fungi carry a secret weapon. A team of researchers under the supervision of plant pathologist Bart Thomma discovered that the fungus secretes the protein Ecp6 during host attack. Ecp6 is the code name for 'extracellular protein 6'. Ecp6 finds the chitin fragments that surround the fungus and binds them. This binding makes the chitin fragments invisible for the tomato plant, like a stealth-jet is invisible for radar, such that the immune system is not alarmed. As a result the plant gets diseased. Animal and human fungal pathogens also produce the protein, and are likely to disarm the immune system of their hosts in a similar way.

From experiments that the researchers performed to investigate the role of Ecp6, it appears that a fungus that does not produce Ecp6 is much less aggressive and less capable of causing disease on tomato plants.

Since not only Cladosporium but nearly all fungi, including pathogens of humans and animals, have Ecp6, the binding of chitin fragments appears a general strategy of fungi to evade the immune system of their hosts.

This knowledge allows to design novel methods to combat fungal diseases in agriculture (leaf mould, root and stalk rot, smut, wilt disease, apple scab, rust, tree cancer) and in health care (dandruff, athlete's foot, candida-infections, aspergillosis, etc.).

Provided by Wageningen University