

What's your favourite fungus?

The One That Produces the Highest Pressure Known in Nature

Magnaporthe grisea, commonly known as the 'rice-blast fungus', is a pathogen that causes a major disease of rice. This important disease destroys rice crops that could feed 60 million people each year, making it the most devastating agricultural disease in the world. Because this disease can be economically devastating, everything about the fungus becomes very interesting to scientists as they try to find ways to combat the pathogen. This story about the method the fungus uses to infect a rice plant comes out of this research.

When a fungal spore lands on the leaf of a rice plant it produces a tube which swells at the tip. The tip swells due to stored glycogen and lipids being converted into sugars and glycerol. The sugars produce a concentration gradient (an 'osmotic potential') that causes water to move from the rice plant into the tip of the tube. The resultant swollen tip is now called an 'appressorium'.

The appressorium has a thick wall all around it; the only opening is where it touches the leaf forming a small pore. The purpose of an appressorium is to build up enough pressure to be able to force a hyphal strand through that pore and into the leaf. It is the intake of water that does this, causing a hydrostatic pressure of up to 80 atmospheres to build up within the appressorium. The appressorium produces adhesives that firmly fix it to the leaf surface so that all the pressure is focused on the one spot where the hypha is forced into the leaf.

Once inside the plant the fungus grows between the plant cells and steals the plant's nutrients. The fungus eventually grows so much that the rice plant dies because it does not have enough nutrients to survive.

The enormous pressure produced by the appressorium is the highest pressure recorded in any living organism to date!

