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New details of rice fungus may help control disease

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Singapore: A study by an international team of researchers has shed light on how the rice blast fungus, Magnaporthe oryzae, invades plant tissue. The finding is a step toward learning how to control the disease, which by some estimates destroys enough rice to feed 60 million people annually.

The team, led by distinguished professor in plant pathology, Dr Barbara Valent of Kansas State University, found that the fungus has evolved two distinct secretion systems that facilitate its invasion into rice plants. Study results have been published in *Nature Communications.*

"Knowing that a special secretion system is required for disease is significant, because it means we can block this system without harming other fungi that are critical for healthy ecosystems," Dr Valent said.

In addition to researchers from Kansas State University, the team includes professor Nicholas Talbot from the University of Exeter in the United Kingdom, and students in his laboratory, as well as scientists from the Iwate Biotechnology Research Center in Japan.

Rice blast has been known throughout recorded history and occurs in all countries where rice is grown. In 1985, wheat blast emerged as a new disease sharply reducing wheat yields in Brazil. So far, wheat blast has only spread within South America and has not been detected in the US. Dr Valent is now leading a team of scientists focused on developing resources for rapid identification and elimination of the disease if it should arrive in US wheat regions.

"Rice blast disease is a threat to global food security and it's closely related to wheat blast," Dr Valent said. "Because those two crops are the most important food staples worldwide, learning about these diseases is incredibly important," she added.

Researchers know that to cause plant diseases, pathogenic microorganisms secrete proteins, called effector proteins, into

the host plant's tissue, Dr Valent said. The proteins suppress the plant's immunity and support the pathogen's growth. The goal of the study was to learn if fungi need different secretory systems to aid their invasion into host plants. "We knew that over time bacterial pathogens evolved multiple secretion systems to target effector proteins where they need to go. We didn't know whether fungi, which cause the major diseases in most crop plants, also require different secretory mechanisms," she said.

"In this study, we focused on investigating how the fungus secretes effectors during invasion of rice tissue by producing strains secreting effectors linked to fluorescent proteins from jellyfish and corals. We performed microscopy to watch the fungus secreting these fluorescent proteins as it grows inside rice cells, and we noticed that normal treatments that block protein secretion didn't stop those effectors that end up inside rice cells," Dr Valent said. "Identifying how these processes function will help us understand how disease microorganisms evolve and prove pivotal in controlling blast diseases," she said.