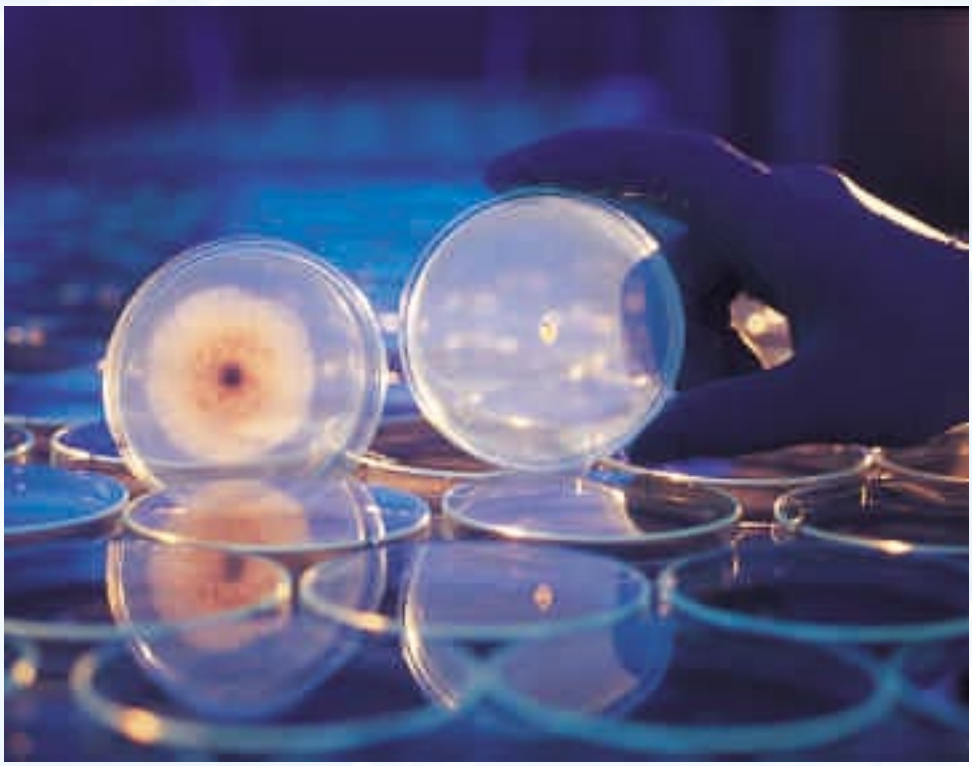
New fungicide provides useful plants with dual protection

Double whammy for fungi



These fungal cultures in Petri dishes – with (right) and without treatment with Fandango® – are suitably convincing.

Full ears of corn infected with fungi – a farmer's nightmare but one that could soon belong to the past now that researchers from Bayer CropScience have developed a new treatment. They combined two active substances with different mechanisms of action to produce an effective agent for the treatment of fungal diseases. As well as saving farmers money, it is also environmentally friendly.

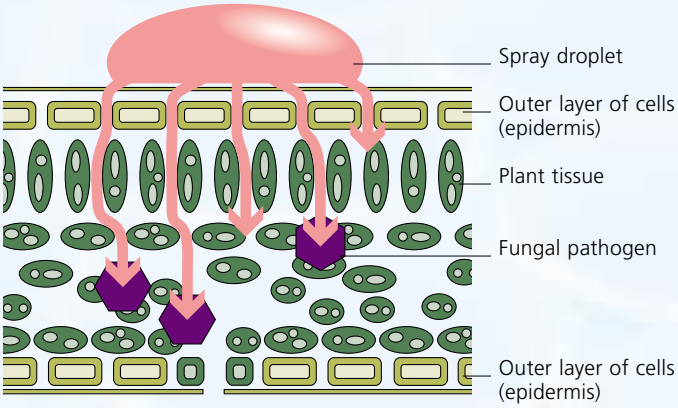
Although warm summers with adequate rainfall are ideal for a good grain harvest, such warm, damp conditions are also just what fungi love. When the temperature in early summer rises above 20 degrees and a heavy evening downpour leaves small puddles of water in its wake, fungi are in their element. They then colonize the leaves of the cereal plants. "That may have dire consequences," says Dr. Friedrich Kerz-Möhlendick who heads the Cereal Fungicides team at Bayer CropScience in Monheim. "In humid weather, fungi multiply like wildfire and may destroy the bulk of a crop."

Over a dozen fungal pathogens need to be kept in check by farmers during the season. A cereal crop is constantly under attack from fungi, from infection of the stem through to various diseases of the leaves such as mildew and leaf spot and finally infection of full ears of grain. "An effective antifungal agent therefore has to combat many different pathogens at once and must also remain active for a long time," says Dr. Kerz-Möhlendick, outlining the requirements of fungicides, as such agents are known. "And it goes without saying that it must do all this without harming the plant itself."

Bayer CropScience researchers have now developed just such an agent by the name of Fandango® (marketing authorization anticipated in 2004). Farmers will soon have access to a new fungicide with which they will be able to control all major fungal diseases such as leaf spot, rust and moulds in one fell swoop. "Even if the first brownish spots have already appeared on the plants, the fungus can still be stopped in its tracks with Fandango," stresses Dr. Kerz-Möhlendick. "As a result, unnecessary spraying is avoided, saving the farmer money and helping to protect the environment."

Combined active ingredients penetrate the inside of the leaf

The new fungicide is a combination of two individual active ingredients: HEC™ and JAU™. These two compounds belong to two different chemical groups that are of major significance in fungicide research worldwide. HEC™ is a crop protection agent classified as a strobilurin. Unlike most other strobilurin fungicides, however, this product is leaf-systemic. The active substance does not remain on the surface of the leaf, but rather penetrates



Systemic action
A systemic crop protection agent such as HEC™ enters the plant in the form of spray droplets through the outermost layer of leaf cells. It penetrates deep down into the plant's tissues, where it attacks the causative agents of diseases (pathogens) by inhibiting key metabolic functions of the fungi. As a result, the pathogen is destroyed.

the plant and distributes itself evenly throughout. This is the only way of killing the mass of threads or fungal "mycelium" that will have spread throughout the plant tissues. JAU™ belongs to a new chemical class of the "tried and true" azole derivatives. By refinement of certain specific aspects, the Bayer researchers have succeeded in substantially improving the spectrum of action, duration of action and yield increase of the new compound compared with conventional azoles. The Bayer fungicide is unusual in that both of the active ingredients remain in close proximity to one another in the plant. There is no uncoupling of the molecules, as usually occurs. HEC™ and JAU™ permeate the plant jointly and therefore act in the same place at the same time. "This is the only way to afford the leaf lasting protection from base to tip," says Dr. Mauler-Machnik, project manager for both active ingredients, explaining the particular advantage of Fandango®.

Complementary action prevents resistance

The two compounds ideally complement one another in the way in which they control the fungi. Each uses a different biochemical mechanism. JAU™ inhibits synthesis of ergosterol, a substance required by the fungus for synthesis of its cell walls. Without this constituent, the fungal cell wall cannot develop properly and the fungus dies. HEC™, on the other hand, attacks the organisms' engine room, the mitochondria, and inhibits the respiratory chain of the fungi. So the two mechanisms act on completely different parts of the fungal cell. The result: "Even if the fungus adapts and manages to withstand an attack by one of the compounds, it will be killed by the other," says Dr. Mauler-Machnik, explaining the dual action. "Fandango will therefore also play an important role as part of an effective resistance management strategy." Bayer's experts have high hopes of the two new compounds financially, too. For HEC™ and JAU™ are constituents that can be combined with many other active ingredients. Says Dr. Kerz-Möhlendick: "Farmers will then have access to superlative products for a wide range of crops."

Volker Gerten and Dr. Astrid Mauler-Machnik check the action of the new fungicide to monitor its success.

www.frac.info/publications.html
This website contains a lot of background information on the management of fungicide resistance.

Potent agents alone and in combination

The two active ingredients HEC™ and JAU™ do not just control fungi in cereal plants. Individually, together or in combination with other agents, they will destroy fungal pathogens in many other agricultural crops too. Marketing authorization for the products is expected to be granted in 2004.

Tradename	Active ingredients	Areas of application in the first few years
Fandango®	HEC™ & JAU™	cereals
Proline®	JAU™	cereals, rape, groundnut
Input®	JAU™ & spiroxamine	cereals
Prosaro®	JAU™ & tebuconazole	cereals, rape
Bariton®	HEC™ & JAU™	seed dressing for cereals
Redigo®	JAU™	seed dressing for cereals