

New lease of life for a well-established fungicide

# When plants get rusty



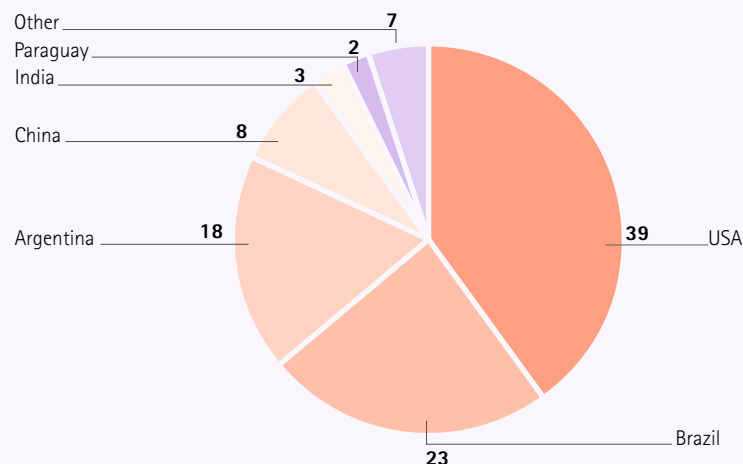
*A global network of trial stations supports Bayer CropScience's major research centers' work developing crop protection products. These stations test new products under field conditions, examine existing substances under varying climatic and regional conditions, or try them out in new applications. And sometimes these fairly routine tests produce astonishing results.*

When a new disease comes on the scene, or a well-known disease starts to spread rapidly, those affected need urgent help. This is just as true for plants as it is for people. Soybean farmers in Latin America faced just this situation in 2002: soybean rust, *Phakopsora pachyrhizi*, a fungus that can strip all the leaves from a plant, had reproduced massively on their plantations within a few years, causing yield losses of up to 80 percent in some cases.



Well distributed: Dr. Isolde Häuser-Hahn checks on an X-ray film whether an experiment with a radioactively labeled compound has succeeded. The colors indicate how the active substance has penetrated into the leaves (left). The chlorophyll content of the plants is also measured (above).

## World soybean production (percent)



Along with the United States, Brazil and Argentina are the largest producers of soybean, which was originally grown in Asia. The arrival of this high-protein plant also helped to introduce the soybean rust fungus to the American continent, however, where it has rapidly spread north from Argentina since 2004 and has since arrived in the United States as well.

Soybean rust was first discovered in 1902 in Japan, where it had never caused much of a problem. It started to spread in the 1970s, moving first to Africa and then to Latin America. It recently hit Brazil, the second-largest soybean producer in the world after the United States. Soy farms there can cover up to 30,000 hectares. The vast areas under cultivation, the mild climate and the presence of many intermediate hosts presented ideal growing conditions for the fungus. "This aggressive fungus is also particularly active in Latin America," according to Dr. Ulrike Wachendorff from Bayer CropScience in Monheim. "Normally, rust fungi penetrate the host plant only through the stomata in the leaves by which plants control absorption of carbon dioxide and release of oxygen and water vapor. But soybean rust usually attacks the leaf cells directly."

The scientists at Bayer CropScience's Brazilian subsidiary had to react swiftly. They could not wait for a new product, as development of a new substance takes eight years on average. But they knew that the active substance tebuconazole had exhibited excellent efficacy against various types of rust when it was first registered twenty years ago. The Brazilian trial station quickly set up a new array of tests to investigate the effects

of tebuconazole on the Latin American version of soybean rust. The investigators discovered that tebuconazole was extremely effective against soybean rust, both on its own and in combination with trifloxystrobin, a compound belonging to the strobilurin group of active substances (product name Nativo®).

### Support from Bayer scientists around the world

At the same time, independent scientists working for the state-run Brazilian agricultural research institute Embrapa conducted comparative tests and found that tebuconazole was much more effective than other products in protecting soybean plants.

The product research team in Monheim that has been supporting this work is going to take things further: "We are trying to find out which parts of the plant the product penetrates, and are also testing new formulations to channel the substances into the leaf more effectively," says Dr. Isolde Häuser-Hahn. Scientists are also examining electron microscope images of the various fungal stages to try to understand why it grows so aggressively.

Resistance monitoring is a key aspect of every new application. "We worked

with local scientists to devise the simplest possible test system," explains Dr. Andreas Mehl of the Resistance Management unit in Monheim. "As the fungus can only grow on living material, we developed a 'detached leaf set': infected leaves from all over the cultivation region are regularly sent to the Brazilian trial station, where the various fungal strains are cultivated on freshly grown leaves in Petri dishes, treated and analyzed. This gives us an up-to-date view of the degree of sensitivity." Soybean rust is responding very well to tebuconazole at the moment. But Mehl knows that "it is impossible to predict when resistance will occur."

To guard against this, the Japanese research center in Yuki has now added the Latin American version of Phakopsora to its screening program in which potential new fungicides are tested.



[www.plantpath.iastate.edu/soybeanrust/node/24](http://www.plantpath.iastate.edu/soybeanrust/node/24)

A speech in which Dr. Alvaro Almeida of Embrapa, Brazil, explains his strategies for controlling soybean rust.