

A fungicide with anti-stress potential

Fighting **fungal infestation** and **heat shock**



Long periods of drought or sudden cold snaps – the impending climate change is already putting crops under stress. The consequences could be harvest failures and the threat of shortages of staple foods. Crop protection scientists at Bayer CropScience are taking a fresh look at a tried and tested active substance which not only protects cereals and vegetables against fungal diseases but also increases plants' resistance to stress.

Only healthy crops give optimum yields. Yet in the time between sowing and harvesting, plants are exposed to a great many threats: aphids, caterpillars and other harmful insects feed on them, fungal diseases rob maize, barley and wheat of their vital force and weeds compete with them for light, water and nutrients. Farmers can combat 'biotic' stress factors like these with powerful pesticides, but water shortages, heat or excessive rainfall also place crops under stress and weaken their vitality. "The reductions in yield resulting from these abiotic stress factors, as they are known, are enormous – in some cases up to 80 percent," says Dr. Dirk Ebbinghaus, a crop protection scientist at Bayer CropScience, and he believes that climate change could make the situation even worse.

He is therefore working on completely new approaches to this problem in his laboratory, and currently researching the active substance trifloxystrobin in great detail. Although the substance has been known for a long time and farmers throughout the world have been using it for years to protect their wheat, vegetable and fruit crops against harmful fungal diseases, trifloxystrobin, a strobilurin derived from a natural fungal substance, is apparently not only successful in controlling harmful fungi. Ebbinghaus is convinced that the substance also increases plants' resistance to stress. When Bayer products such as Flint®, Stratego® and Nativo® are used, an unusual phenomenon can be observed: fields of cereals or corn treated with strobilurins become especially lush and



Title story

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green. What's more: "Field trials have made it plain that crops on which strobilurins were used gave higher yields than those protected with fungicides of other active substance classes," says Ebbinghaus.

Strobilurins: a fitness cocktail for stressed crops


"Trifloxystrobin appears to directly increase the plants' tolerance to stress," says the crop protection scientist. He and his colleagues have discovered that crops protected with trifloxystrobin do considerably better than untreated ones when there is a shortage of water. "Drought puts the plants under stress. Their first reaction to this is to produce free oxygen radicals which are poisonous to them," explains Ebbinghaus. However, the plants have enzymes which make the free radicals harmless again. "We know that the strobilurins increase the activity of these enzymes," he says.

The strobilurins apparently trigger several different beneficial effects in the plant, which together result in an above-average increase in yield. Scientists explain the observed green effect in part by suggesting that strobilurins slow down the ageing process of the plant. This is especially important when drought or other stress factors weaken the plant, because when under stress, plants start an emergency program, producing the plant hormone ethylene which accelerates the ripening process. "This 'emergency ripening' means that the plant can form seeds prematurely in order to ensure that the species is preserved," explains Ebbinghaus. However, the price for emergency ripening is high: lower yields and a lower nutrient content in the seeds. Trifloxystrobin – like other strobilurins

– helps to counteract this. "The active substance inhibits ethylene production, thereby allowing the seeds to ripen fully," he says.

However, this is not all; scientists have also discovered that cereal grains contain especially high levels of starch and protein if the fields have been treated with strobilurins beforehand. "Strobilurins stimulate both photosynthesis – and hence starch production – and also nitrogen assimilation, the basis for protein synthesis," Ebbinghaus continues. European studies have shown that Bayer's active substance trifloxystrobin is streets ahead of other substances in its class, especially in regard to protein formation. According to these studies, wheat plants which have been treated with the compound are able to utilize the nitrogen in the soil especially well, even when there are only low levels of this growth-promoting substance in the field.

The Bayer scientists are now aiming to determine the anti-stress potential of trifloxystrobin so that the company's products from Flint® to Nativo® can be used more selectively to increase yields in future.

 www.plantstress.com
This website offers further background information on the topic of plant stress.

Stress research: Dr. Dirk Ebbinghaus and Dr. Albert Witzemberger (large photo, left to right) check the chlorophyll content in wheat (below) and the active ingredient distribution (right) on plant leaves.

