

New active ingredients for greenhouse plants

Water with added protection



Consumers nowadays expect to be able to buy tomatoes or roses all year round. But growers producing vegetables and flowers depend on modern cultivation methods and greenhouses with the latest technology to offer top-quality produce at reasonable prices. Research scientists working for Bayer CropScience are developing novel active ingredients to combat plant pests and diseases that are tailored specifically to greenhouse growing conditions: they are water-soluble and protect plants from beneath – through the roots.



European consumers are a finicky bunch: they will only allow fruit and vegetables into their supermarket trolley if it's fresh, looks attractive, and is available in a wide variety. People buying cut flowers and ornamental plants apply the same criteria. Quality sells: accounting for almost half of global imports, and over 40 percent of global exports, Europe is the primary source and target region for perishable food-stuffs. 42 percent of the world's ornamental plant production is grown here, on an area of land that makes up 12 percent of the total worldwide surface given over to flower production. So the European market is a particularly competitive one. With prices stable, vegetable and flower producers can only survive by improving product quality and employing increasingly efficient growing techniques.

Low-cost and good for the environment

That is why they use technically sophisticated greenhouses that ensure optimum plant growth irrespective of weather conditions or the time of year. In modern greenhouses soil has been replaced by artificial substrates such as rockwool. Plants root in this soil-free medium and receive the nutrients they need at every stage of growth in the form of liquids supplied through long hoses. Computers keep a record of how much water and fertilizer they use, and these inputs are topped up as necessary. This results in an economical, almost closed water and fertilizer cycle:

good for the environment and helping control the high costs incurred in this sector of agriculture.

Soil-free crops require less protection

Soil-free substrates are also easier to keep free from fungal spores and insect larvae. "Consumers turn their noses up at fruits or flowers with defects such as spots or malformation caused by pests or diseases. The products don't appeal to the eye, and the damage can also affect how long they will last or how good they will taste," explains Dr. Martin Vaupel of Bayer CropScience's Biological Fungicide research unit in Monheim. His colleague Dr. Erich Sanwald, who works on insecticide research, adds: "Crop protection products are only used when absolutely necessary. Insects, however, are an enormous problem, because they enter through open windows and then multiply in this new paradise."

Bayer's crop protection specialists are developing chemicals that are tailored to the particular growing conditions in greenhouses: the substances are not applied by spraying, as they would be in the field, but are added to the nutrient solution and reach the plant's roots directly via the hose. This drench method, as it is known, allows growers to use exactly the right dose. It's a highly economical technique: "When you apply some substances to plants growing in rockwool, you only need a tenth of the normal amount to achieve the same protective effect,"

Protection from below: in modern greenhouses, new crop protection agents are poured instead of sprayed (left), and are therefore supplied via the water supply, as Claudia Ebke-Fischer demonstrates (above right).



Cool customer: Maren Jagieniak clips pests to cucumber plants to provoke an infestation (above). The plants are grown in soil-free conditions in rockwool (below).



As ugly as a rose: hungry caterpillars spell the end for rose cultivation. Flowers that have been partially eaten are almost certain to remain unsold.

says Dr. Vaupel. And spraying is an unpopular method with greenhouse growers: "It usually has to be done manually, and that puts up labor costs."

However, by no means every active substance is suitable for drench application. Dr. Sanwald tests new insecticidal substances to find out whether they are soluble in water, are taken up by the roots and distributed throughout the plant. He and his colleagues work under conditions replicating those found in practice to ascertain what is the lowest concentration at which each substance kills the principal insect pests, how long it remains effective, and whether it breaks down without leaving any residue.

Beneficial insects are left unharmed

Of course, it is also important to ensure that no harm comes to beneficial insects. These new substances score very well in this respect as beneficial organisms that occur naturally or are introduced by the farmer, such as ladybirds, lacewings, predatory mites, bumblebees and honeybees, rarely come into contact with them.

And other Bayer products which have long been used as a conventional spray or seed dressing are sometimes

suitable for drench application too. A joint venture with the Dutch Bayer CropScience unit has been working to develop the highly successful chemical imidacloprid for greenhouse use. It has now been registered for greenhouse use in over 120 countries.

New substances complement the existing range of products

Dr. Wolfgang Thielert, who is responsible for background product research at Monheim, talks about an equally promising potential new substance which he discovered during a systematic substance search. This new insecticidal substance has a similar spectrum to imidacloprid, but is also effective on spider mites. As it works in a different way, it is ideal for use alternately with the "old favorite" imidacloprid: this makes it difficult for pests to build up resistance.

Bayer's research staff may also have struck gold when it comes to fungicides. If the new substance does as well in testing as it is expected to do, then it might in future be able to protect roses, sweet peppers and other crops against mildew and other fungal diseases from the ground up. It would be absorbed by the roots, going straight where it is needed – an approach that would benefit the environment and consumers alike.



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Drench application minimizes need for crop protection agents

Spraying plants to protect them against mildew uses 100 grams of fungicide per hectare compared with only 20 grams with drenching. Furthermore, the results are even slightly better with drenching than with spraying.

