

Decis: a classic with innovation potential

The tree lives on...

This year, Decis celebrates its 30th birthday. The insecticide remains one of the most successful crop protection products ever. The latest milestone in this success story was set as recently as the beginning of 2009 – the market introduction of Decis fLUXX – with greatly improved efficacy.

The Decis tree is probably one of the most striking and well-known branding images in the crop protection business. I think that many farmers around the world recognize it immediately as the symbol for Decis”, says Kai Wirtz, Global Asset Manager for pyrethroids at Bayer CropScience. He’s referring to the familiar tree that has been used as the Decis® product logo since the beginning of the 1980s, on which almost everything “grows” that can be produced from fields and plantations: from apples and avocados to watermelon and wheat. A very illustrative depiction of Decis’s versatility.

“More than 300 crops can be protected from infestation by pest insects using Decis”, according to Wirtz. The product is currently registered in more than a hundred countries. Bayer CropScience calculates that an average of around 30 million hectares is treated with the product each year – that’s about two percent of the global agricultural surface.

All of this makes Decis one of the most popular of all pyrethroid products. Pyrethroids are the class of substances developed by chemists after using the chemical components of pyrethrum powder – i.e. dried and ground chrysanthemum flowers – as a starting point. The researchers managed to achieve an increase in insecticidal efficacy, along with an improvement to the stability of the molecules. Natural pyrethrum is actually light-unstable, so it is unsuit-

able for use outside in the field, despite its insecticidal potential.

The decisive synthesis work was done by researchers at the Rothamsted Research Institute in England (see also box on page 21). In 1974, they developed deltamethrin, and after the necessary development phase, the resulting product – Decis – entered the market for the first time in May 1979, some 30 years ago.

The start of a revolution

The introduction of pyrethroid compounds such as deltamethrin was tantamount to a revolution in the control of insect pests. Suddenly, application rates of around ten grammes per hectare were sufficient. This was in contrast to the organophosphorus acid esters that were widely used at the time: these had to be applied in amounts of up to 500 grammes per hectare.

One of the factors behind Decis’ particular ability to be effective at extremely low doses was the high degree of purity of deltamethrin, which comprises a single, highly-active isomer. Most other pyrethroids were (and remain) a mixture of different structural variants of a molecule, some of which are active and others not. Deltamethrin proved to be 750 times more effective than natural pyrethrum. The pyrethroids thus provide an excellent example of how scientists have been able

The Decis tree has become one of the best-known branding images in the crop protection business.





“Good prospects”

Even after more than 60 years, the scientists at the Rothamsted Research Institute in England are still actively researching into pyrethroids. “The prospects are still looking good for this class of substances”, believes Dr. Emyr Davies. However, the Rothamsted researcher adds that it will be even more important in future to understand how resistance develops – in order to take measures to avoid it. And this is the very area he is working on.

Even today, around 50 percent of all pyrethroid products are based on active substances that were originally characterized by the English researchers. Davies’ predecessors were recognized twice (in 1976 and 1980) with a Queen’s Award for their achievements in pyrethroid research. The Rothamsted researcher Dr. Michael Elliott, who died in 2007, will be honored in a special memorial event in January 2010. Elliott’s team discovered a number of important pyrethroids, including, in 1974, what was to become the active substance behind Decis – deltamethrin.



to take a naturally-occurring substance as a starting point, modifying it such that the efficacy and other properties of the substance are significantly improved.

A further advantage associated with deltamethrin is the rapidity of its action on the nervous systems of pest insects. And all that against the background of an improved ecotoxicological profile compared with conventional products at the time. The introduction of the pyrethroids represented a true milestone in the story of insecticides. "Only a very few other active substance classes have had such an extensive influence on crop protection", stated Dr. Rüdiger Scheitza, Member of the Bayer CropScience Board of Executive Directors, on the occasion of a symposium on pyrethroids held in June 2009 at Bayer CropScience's Headquarters in Monheim, Germany. The fact that the company devoted a major specialist conference to the pyrethroids, 30 years after the introduction of Decis, is an indication of the status this group of substances still enjoys today.

Indeed, in terms of turnover, pyrethroids are still the second-most important group of substances in the insecticides segment of the crop protection market, with a market share of 15 percent. Kai Wirtz is convinced that "almost all farmers will have pyrethroid products in their crop protectant store".

The original product, Decis 25 EC, has been a reliable, well-proven tool in agriculture for a good 30 years now. But during this time, Bayer CropScience has also continued to develop the product further – bringing new formulations onto the market on a number of occasions. These included products such as Decis EXPERT (with increased concentration), Decis ULTRA (for aerial spray application), the granule formulation Decis PROFI and Decis Protech, which is especially environmentally compatible and free of classification by virtue of the solvent it contains.

Decis fLUXX: "Fluid Intelligence"

At the beginning of 2009, the introduction of Decis fLUXX set another milestone in the deltamethrin success story. This new formulation contains special additives that ensure strongly enhanced efficacy of the active substance at the leaf surface. "Among the advantages is the fact that spray solution run-off from the leaf is inhibited", comments Kai Wirtz. "Instead, the droplets stick to the leaf in an optimal way, and even become distributed across the entire leaf surface." And there's more: the use of a new type of wetting agent prevents the active substance from crystallizing out. "Because the active substance remains in liquid form, the high level of insecticidal activity that would normally

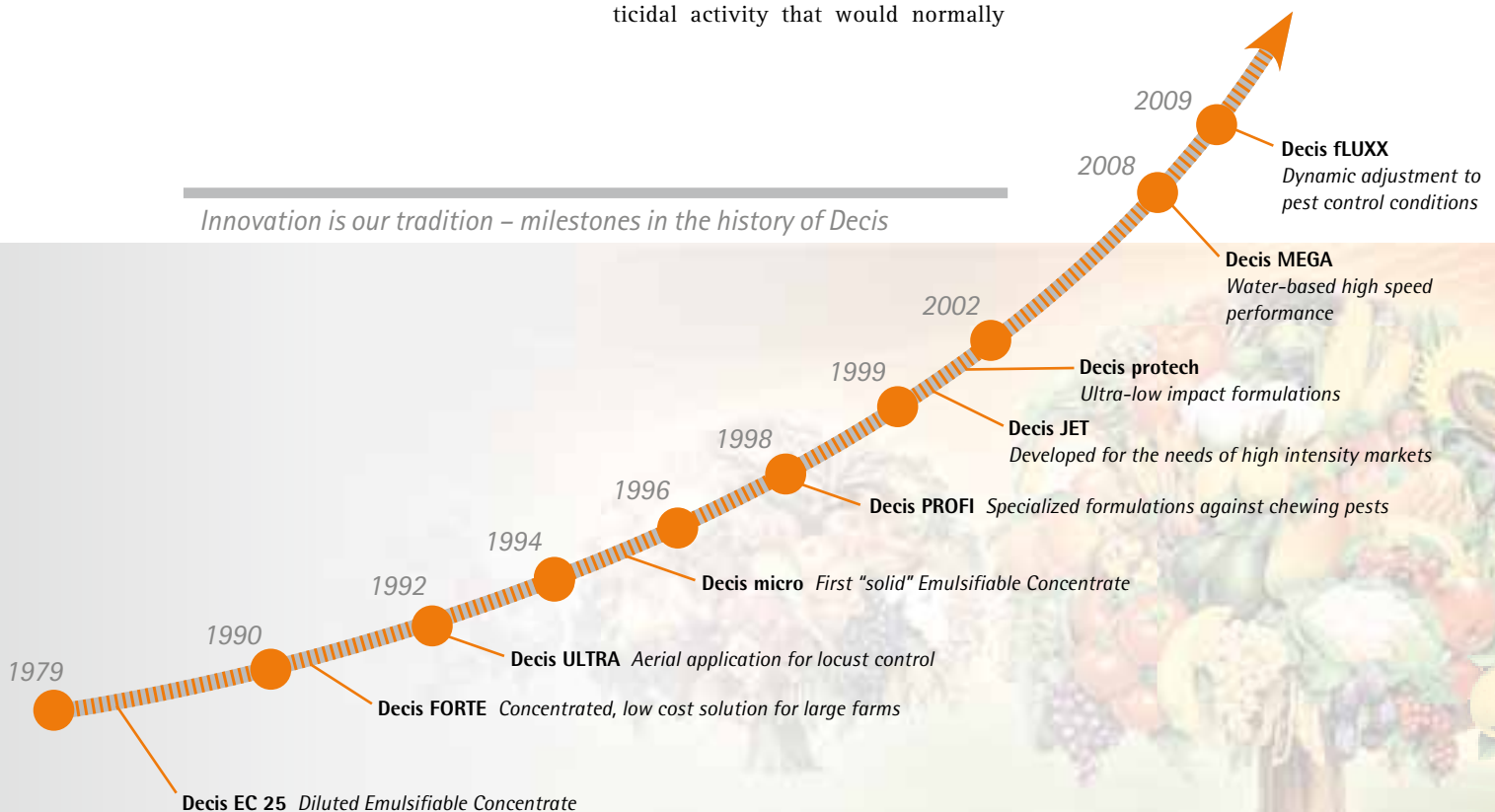
only be seen straight after application is maintained, extending until long after the application", explains Wirtz.

These special attributes led the developers of Decis fLUXX to talk about "Fluid Intelligence" – "clever droplets" if you like. The droplets seem to know how they should behave in order to work most effectively, even to the extent that they reach insects that are hidden. In field trials, the new formulation has proven itself to be a significant further development: it is better than standard treatments both in terms of the speed and the efficacy of action.

Beside the Decis product family, deltamethrin has also long been proving its worth in combination with other active substances. Proteus® and Confidor® ENERGY are examples of products in which Bayer CropScience has created combinations of deltamethrin with the neonicotinoids thiacloprid or imidacloprid.

"This type of combination will play an increasing role in the future", is Kai Wirtz's prediction. The pyrethroid Asset Manager is thinking mainly of the large number of markets that demand low price pesticides. At the moment, these markets are dominated by products

Innovation is our tradition – milestones in the history of Decis



from so-called “old chemistry”, that is, by organophosphorus acid esters, organochlorine compounds and carbamates. But many products based on these classes of active substance will disappear from the market sooner or later, so replacements will eventually be needed. “Pyrethroid products are an especially attractive alternative in countries where farmers are dependent on very cheap solutions – for example in the emerging markets of Brazil, China and India”, explains Wirtz. What’s more, the pyrethroids have proven to be particularly strong against the very pests farmers currently prefer to control with “old chemistry” – that is, against butterflies, sucking insects, and beetles.

The Decis tree continues to flourish

Some completely different solutions involving pyrethroids are also thinkable. For example, Bayer CropScience is working to develop pheromone traps that carry sex attractants inside, but have a layer of deltamethrin on the outside. Pest insects drawn by the volatile attractant are thus automatically controlled as soon as they touch the surface of the trap. These pheromone traps are an innovative approach to using a conventional crop protection product to control damaging pests in a way that is as compatible as possible with the environment. In many situations, traps of this type could even make spray applications to fruits or vegetables obsolete. “In Spain, we’re currently testing the first promising pilot application of this type against fruit flies in citrus and pome fruit plantations”, notes Kai Wirtz. So Decis’ spiral of innovation continues to turn. “Our current product developments show that the Decis tree will continue to flourish, and will remain in business as a familiar emblem”, is how Kai Wirtz outlines the innovative potential of Decis. It looks as though the future has only just begun. ◀

Karl Hübner



A consistent, intensive research effort around Decis' various areas of use provides the foundation for the product's continuing success.

Protection against malaria with deltamethrin

For years now, pyrethroids have also found an application in bed nets that people living in malaria areas can use at night as protection against mosquitoes, the vectors of the disease. So far, these bed nets have either been made of polyester (to which a layer of the active substance has been applied), or of polyethylene (into which the active substance has been incorporated). The former have the advantage of being soft, but unfortunately they have a rather limited period of effectiveness. In contrast, the active substance retains its efficacy for longer in polyethylene nets, but these are stiff and uncomfortable. According to World Health Organization (WHO) figures from 2006, 72 million nets of this type were in use at the time.

Bayer CropScience's Environmental Science Business Group is currently working on an innovation that is designed to combine the advantages of softer, more durable nets with long-term insecticidal protection. The basis for this is a fabric comprising polypropylene into which the active substance deltamethrin has been impregnated.

The new product, which will be sold under the brand name LifeNet™, is expected to be launched on the market within the next years.

According to a WHO statement of 2008, bed nets that give long-lasting insecticidal protection are the most important instrument for prophylaxis against malaria. The organization anticipates a strong, expanding need for this type of net in the future. Enhancing the longevity and efficacy could also lead to a significant reduction in cost.



Sleeping child protected against malaria mosquitoes by a bed-net.