

RESEARCH NEWS

RESEARCH NEWSDecember 2, 2019 || Page 1 | 3

Sustainable crop protection

An eco-friendly method for curbing crop pests

Moths and other winged insects, and particularly their larva, can become a problem for farmers, often causing major damage to crops. Pesticides help alleviate the problem, but they have also been strongly criticized. Pheromones offer a sustainable alternative, albeit an expensive one. A new manufacturing technique is designed to reduce the costs of pheromones and make them competitive. In the EU project OLEFINE researchers at the Fraunhofer Institute for Building Physics IBP are dedicated to sustainability and Life Cycle Assessment.

Pesticides are under fire from critics: If they are sprayed on fruit, cereals or other plants, they harm the environment. After all, insecticides not only decimate crop pests such as the corn borer or the fall armyworm, but also reduce the numbers of useful insects such as bees, and thus decrease biodiversity. Moreover, pesticide residues can adhere to food. Having said that, the world population is growing and needs to be fed – without crop protection agents, this is practically impossible. Pheromones offer a sustainable solution. Instead of killing the insects, they ensure that male pests no longer find their female partners, thus preventing reproduction. As a result, there will be hardly any of the real pests – i.e. the larvae, which strip the plants bare. Pheromones offer numerous advantages over pesticides: They do not harm the farmer or pollinating insects, and they leave no residues on the crops. However, the chemical synthesis process that has been used to manufacture the pheromones before now is very costly and often harmful to the environment.

Manufacturing pheromones more cost effectively

A new manufacturing technique is set to change this in future – bringing about a substantial and lasting reduction in the costs for the pheromones. Researchers are currently developing the technique in the EU's "OLEFINE" project, in which the Fraunhofer Institute for Building Physics IBP is a partner. "Instead of chemically synthesizing the pheromones, the team has taken a biotechnological manufacturing approach," explains Eva Knüpfper, research associate at Fraunhofer IBP. The principle is familiar from insulin manufacture, for example, and is based on yeast cells, which produce the pheromones metabolically under certain circumstances. Meanwhile, the company BioPhero in Denmark is lead partner in the development of the manufacturing process itself. The Fraunhofer IBP personnel working on the project are focusing on sustainability and life-cycle assessment – both of the manufacturing method and of the subsequent use of the pheromones. "We're using models, for example, to investigate

Editorial Notes

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how much materials and energy are required for manufacture and what their impact is on the environment. To do this, we analyze the individual steps in great detail and indicate for which individual steps changes would have a strong effect. We send this information to our Danish partners for them to implement accordingly," says Knüpfper.

RESEARCH NEWS

December 2, 2019 || Page 2 | 3

Effects on the environment

In the future, the researchers also want to investigate the effect of the pheromones on the environment in greater detail. Field trials with the biotechnologically manufactured pheromones are planned for 2020. With the data collected there, they will carry out further calculations and investigations based on life-cycle assessment models. Two of the questions they will be addressing are: What impact do the pheromones have on biodiversity? And what effect do they have on pests? In each case, they will be comparing the pheromones against conventional insecticides. In this way, the researchers can estimate to what extent the pheromones can reduce the environmental damage from pesticides.

Similar price framework to pesticides conceivable in long term

The researcher team at Fraunhofer IBP is also carrying out a cost analysis. Although specific statements are not possible at this stage, Knüpfper is confident nonetheless: "The biotechnological manufacture of the pheromones is significantly more cost-effective than chemical production. Furthermore, the pheromones only have to be applied once a year during the flight phase of the lepidoptera, whereas insecticides generally have to be sprayed several times a year. As such, it's a very real possibility that they will eventually be sold in the same kind of price class as traditional pesticides," says the researcher. Another advantage for farmers is that they don't have to drive a heavy tractor over their fields to apply the crop protection agent, as the pheromones are spread out at regular intervals across the field in biodegradable dispensers. This also reduces diesel consumption and soil compaction on farms, with the corresponding benefits for the environment.



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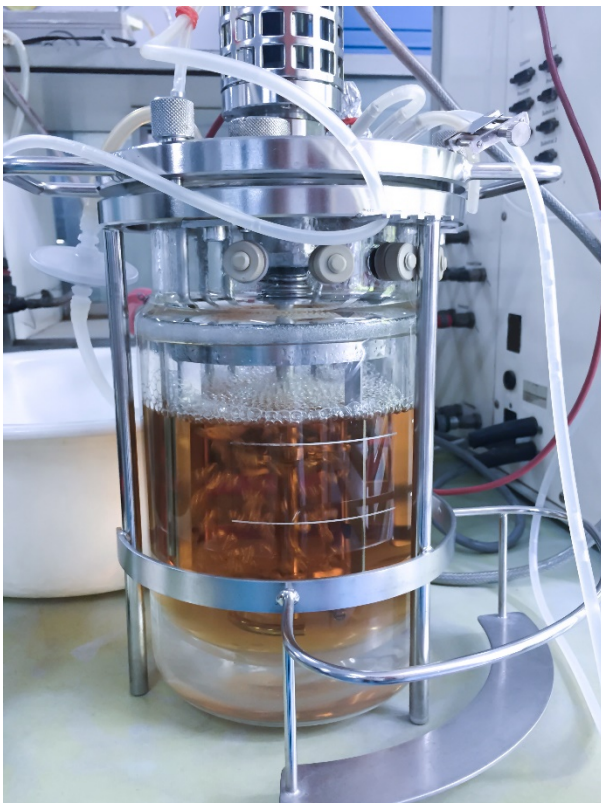


Picture 1: Pest damage to crops can be avoided with the use of pheromones.

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RESEARCH NEWS

December 2, 2019 || Page 3 | 3



Picture 2: Biotechnological method as alternative to conventional synthesis.

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