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# FERMENTED PHEROMONES – A SUSTAINABLE SOLUTION FOR PLANT PROTECTION FROM INSECT PESTS

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Sex pheromones produced naturally by insects for mating communication present an environmentally safe alternative to insecticides for pest control. Whereas insecticides have severe negative effects on public health and the environment, pheromones are biodegradable species-specific compounds that neither affect beneficial species in the ecosystem nor exert adverse effects on human health. Pheromones are currently produced by chemical synthesis, which requires expensive and often hazardous specialty chemicals as starting materials and usually results in toxic waste.

We have developed a biotechnology-based solution to enable cheaper and environmentally friendly production of pheromone components from renewable feedstocks using yeast cell factories. We have reconstructed synthetic biochemical pathways towards pheromones in yeast, performed extensive metabolic engineering of the yeast host to improve the flux towards the products, and optimized fermentation and downstream processes. The integrated process was up-scaled and demonstrated at 100+ m<sup>3</sup> scale. The biologically produced pheromone blend was just as effective for attracting the cotton bollworm in the field tests as a synthetic pheromone mix.

It is a disrupting technology that enables a wide economic application of pheromones for pest control in fruits, vegetables, and row crops. Broad implementation of pheromones will have a tremendous impact on health and the environment, reducing workers' exposure to chemical insecticides, reducing the residues of insecticides in the food, and supporting biodiversity.

## References

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