Organic farming without cabbage flies

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Fertilizer and a biological pest repellent all in one: EcoBug Pellets, made from the residues of cow manure fermentation enriched with cyanobacteria.
Credit: Fraunhofer IGB

When cabbage root flies lay their eggs on freshly planted vegetables, organic farmers often lose their entire crop. In the future, pellets made of cyanobacteria and fermentation residues from biogas plants will repel these insects in an ecologically compatible manner – and simultaneously fertilize the plants. Researchers are presenting the pellets at the Hannover Messe from April 23–27.

More and more frequently, customers are buying organic vegetables, because these products are not treated with pesticides or laden with

chemicals. The flipside: if the plants are attacked by pests, farmers can do almost nothing to protect them. Thus, cabbage root flies for example, which lay their eggs in the spring and fall on freshly planted greens, can often cost an entire harvest. The only hope: farmers wait to plant until the fly‘s flying time has passed.

Soon, however, farmers will be able to repel these pests reliably – and still keep true to organic farming practices: with pellets that researchers at the Fraunhofer Institute for Interfacial Engineering and Biotechnology IGB in Stuttgart jointly engineered with their colleagues at the University of West Hungary in Mosonmagyaróvár, Hungary, on behalf of various organic agriculture associations. “The pellets primarily consist of fermentation residues from biogas production, but they also contain 0.1 percent cyanobacteria,” says Dr. Ulrike Schmid-Staiger, group manager at IGB. If you place the pellets around the freshly planted vegetables, then the cyanobacteria are degraded by the soil flora and release a scent that repels cabbage root flies. The nutrient-rich fermentation residues additionally fertilize the plants. The pellets are easy to apply, and the nutrients are directly available to the plants.

To cultivate cyanobacteria, the scientists used a flat-panel airlift reactor that they originally developed for microalgae. In this reactor, they can cultivate bacteria using only light, CO2 and mineral nutrients. The challenge: to mix the bacteria thoroughly, and drive them to the bright surface, air and CO2 had to flow into the reactor. However, cyanobacteria are extremely sensitive. Structurally, they are like a long string of pearls. If gases are introduced with too much pressure, it will destroy these strings. The researchers thus had to regulate the air inflow to permit the mass to be thoroughly mixed without damaging the bacteria. Next, the cyanobacteria are dried with super-heated steam. Then the dried cyanobacteria mass is blended with the fermentation residues and pressed into pellets.

The researchers obtain the fertilizing fermentation residues from eco-certified farms in which liquid manure is decomposed into biogas. In just 14 days, 300 liters of biogas per kilogram of organic dry mass is produced. Any remnants that cannot be further fermented are dried. To intensify the fertilization effect of these fermentation residues, the researchers mixed them with ordinary fertilizer from the organic farms, including horn meal. To determine the optimum mixture, they looked to ryegrass. Ryegrass can be cut three times within the relatively short space of only three months, drawing many nutrients from the soil in the process.

The researchers have already tested the pellets in open-field studies in Hungary and Spain. In the experiments, cabbage root flies did not attack any of the growing cabbage or kohlrabi. The fertilizer effect is also significant: the turnip cabbages grew twice as large as the unfertilized ones. Researchers will demonstrate the process at the Hannover Messe from April 23–27 (Hall 26, Booth C08). There, visitors can get a look at the pellets as well as the algae reactor.

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