

Safe Insects investigates whether insects can grow safely on residual streams

Residual streams such as poultry manure, by-products from the slaughtering industry, food waste from household kitchens and supermarket mix currently end up in the fermenter or are used as compost. Researchers Elise Hoek and Arjan Borghuis hope that the Safe Insects project will help to change this. They are investigating whether insects can grow safely on these waste streams. The first interim results are promising.

The Safe Insects project has a clear research question: Is it possible to rear insects on the waste streams of poultry manure, category-2 meat meal, household kitchen waste and supermarket mix? And if so, can food safety be guaranteed? In the best case scenario, all these waste streams would then be approved as substrate for insect farming - which would be a major step towards circular agriculture.

Four residual flows

As the project is still ongoing, not all questions have been answered yet. But researchers Elise Hoek (Wageningen Food Safety Research) and Arjan Borghuis (HAS Green Academy) are already able to answer the first question. In a pilot project at HAS, they investigated which waste streams could support the growth of black soldier fly and yellow mealworm larvae. They looked at four

different streams: poultry manure, category-2 meat and bone meal, vegetable, fruit and food waste from households and supermarket mix.

'Supermarket mix proves to be a good substrate for black soldier fly larvae'

"Supermarket mix consists of products from the supermarket that are past their sell-by date or no longer marketable for other reasons," Elise explains. The residual flows are not currently approved as a substrate for insect farming. Elise and Arjan hope this will change if they can prove they are safe to use.

Optimal substrate

After two years of research, Elise and Arjan now know which substrate is best for which insect. For example, they found that fresh poultry manure is too sticky for mealworms, which prefer dried manure; black soldier fly larvae, on the other hand, thrive on fresh manure. "Mealworms prefer drier substrates, while black soldier fly larvae grow better on wetter substrates," says Arjan. In any case, manure did not yield the best growth results as it has a lower nutritional value. "But if the insects can grow on it, it's still an interesting option, given that it's a substantial residue flow," explains Elise.

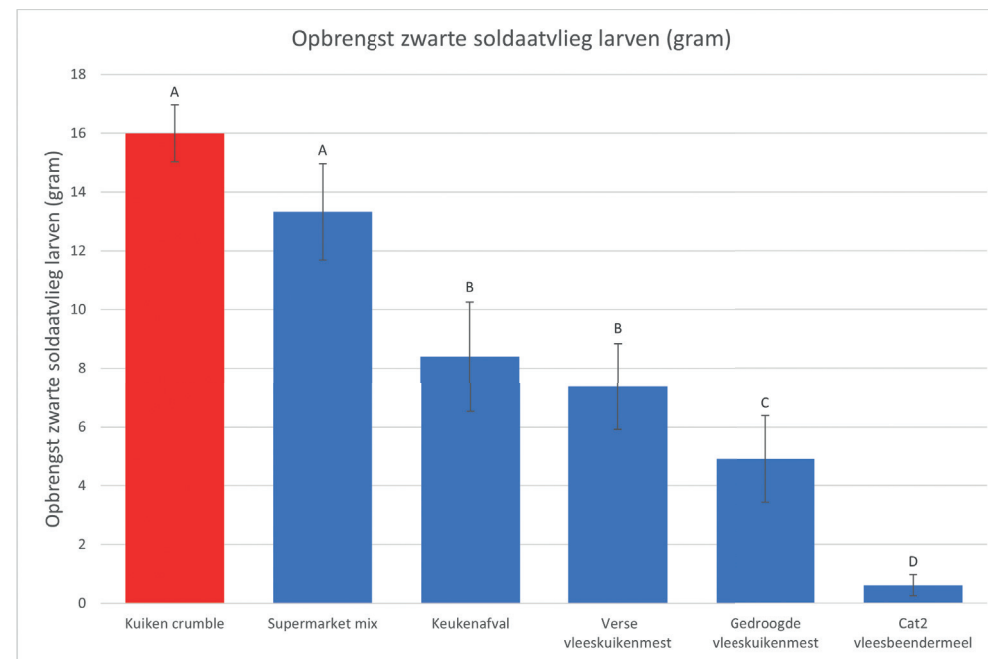


Figure 1: Yield of black soldier fly larvae reared at pilot scale and fed different residual flows compared to the control feed (chick crumbs). Growing substrates of fresh and dried broiler manure and category-2 meat and bone meal were mixed with water. The error bars represent the standard deviation; the letters A-D indicate which results are significantly different from each other.



Verse kippen- en kuikenmest blijkt te plakkerig voor meelwormen. Ze geven de voorkeur aan gedroogde mest.

Safe Insects

The Safe Insects research project was launched in 2021 and will run until 2024. The project is funded by the Ministry of Agriculture, Nature and Food Quality. Several partners are involved, including several research institutes from Wageningen University & Research and HAS Green Academy, as well as Darling Ingredients, Dorset, Nijsen company, Entogreen, AVINED, AMS, Venik, Wadudu Insect Centre and Nevedi.

PFAS in the substrates. If these contaminants are found in the substrates, or if we add them, will we also detect them in the insects?"

Elise cannot share too much about these results yet, but she does know that heavy metals accumulate in insects and that mycotoxins are actually broken down by insects. Ultimately, they hope that their research will lead to changes in laws and regulations. "There's a willingness in Europe to use insects as a source of protein for food and feed. We are seeing a lot of interest in the results of our research. At the moment, insects can only be grown on substrates that are permitted for other farm animals. We hope that the results will be positive enough to actually change the legislation." ■

Black soldier flies

Black soldier fly larvae do not seem to grow well on category-2 meat and bone meal, most likely because the dry powder is not particularly good at binding water, so the substrate does not provide a good habitat for the larvae. Supermarket mix, on

Scaling up insect farming

The research has now entered a new phase: insect farming has been scaled up, enabling research into food safety to begin. "We're now checking for the presence of heavy metals, pharmaceuticals, dioxins, PCBs, pathogens, pesticides, viruses and

'We hope legislation can actually be changed'

the other hand, was found to be a good substrate for black soldier fly larvae, without the need for any pre-treatment or additives (see Figure 1).

Mealworms

For mealworms, the supermarket mix is far too liquid for immediate use, and kitchen waste contains too much moisture. "We had to mix these substrates with wheat semolina," explains Arjan. The moisture content and physical properties of the substrate therefore influence the result. For mealworms, category-2 meat and bone meal worked best (see Figure 2). This was mixed with small pieces of carrot, as the bugs also need moisture. "It will be interesting to see if the carrot can be replaced by moist waste streams or water mist," says Arjan.

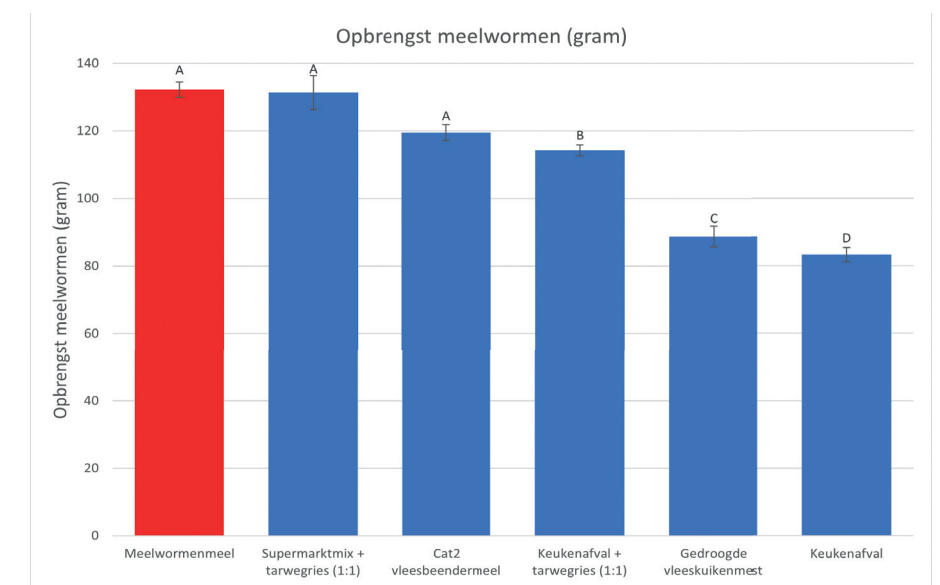


Figure 2: Yield of mealworms reared at pilot scale and fed different residual flows compared to the control feed (mealworm meal). Supermarket mix and kitchen waste were mixed with wheat meal. Kitchen waste without other additives was also tested. With the exception of kitchen waste, carrots were used in all experiments to meet the moisture requirements of mealworms. The error bars represent the standard deviation; the letters A-D indicate which results are significantly different from each other.