How to mass-produce flies the right way

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Credit: AI-generated image (disclaimer)

As flies increasingly make the buzz, a consortium of EU researchers studied their biology and ecological features to improve artificial and mass rearing practices.

To most people, flies are just an annoyance. Sure, they're nature's best recyclers and play an essential role in our ecosystem. But that doesn't make them any more tolerable to the layperson.

There is, however, a market that is beginning to consider flies as tomorrow's gold. Since the EU Regulation 2017/893 came into force on 1 July 2017, insect proteins from seven different species – including house flies and black soldier flies – have made their way to the aquaculture business. These flies are now authorised for use as feed for fish and crustaceans, with substantial benefits for the environment.

The Black Soldier Fly (BSF), for instance, is largely recognised as one of the insects with the most potential for the sector. And this is just a start: European Commission services are currently exploring the possibility of authorising insect-based proteins in feed for poultry and other animals. According to the likes of the FAO and IPIFF (International Platform of Insects for Food and Feed), insects as a source of proteins will largely contribute to future food security.

This whole trend calls for sounder mass rearing, which was precisely the focus of FlyHigh. The project studied underexplored fly species along with more common ones, with a view to elucidate specific ecological features that would make them ideal for controlled artificial rearing and mass production. In one of their studies, they focused on the genetic diversity of different strains of black soldier flies around the world.

"After a survey of samples from different commercial and research cultures, we found a surprisingly high molecular divergence for the COI mitochondrial barcode marker. Molecular characterisation of cultured BSF flies revealed distinct haplotypes when compared to flies obtained from natural habitats, and we found that the barcodes reveal the geographical origin of the tested flies," Dr. Gunilla Ståhls, researcher at the University of Helsinki, explains. This discovery enabled the creation of a comprehensive library of BSF barcode sequences linked to geographic data, which will be informative for current and future programs of artificial rearing, selection and intensive production.

FlyHigh also explored ways to improve controlled rearing protocols, including optimal temperature, humidity, diet and density for the Black Soldier Fly and other fly species. The team analysed and compared different larval feeding media and evaluated the performance of different strains of flies on these substrates. "The enhanced artificial rearing protocols increased maggot activity and enabled more effective and sustainable fly production," Dr. Santos Rojo, project partner at the University of Alicante, notes.

Another key part of the project consisted in describing and characterising flies' ecological requirements and interaction with plants. "We found that groups of flower fly species that feed very little during the adult stage can better be characterised biologically if the larval stage is also studied. We collected taxonomic and ecological data for fly species distributed in Mediterranean ecosystems in both Europe and South Africa, recorded new host plants such as specific bulb plants (e.g. lilies) or aloe succulent plants for these species, and found that insect-plant relationships varied considerably among the studied species – showing potential patterns of coevolution between them," says Dr. Aino Juslén, coordinator of FlyHigh on behalf of the University of Helsinki. The researchers also systematically screened selected molecular markers to evaluate the genetic diversity and phylogeographical patterns of the flies and their host plants, and have documented the results in multiple scientific publications.

All in all, project results will help make fly rearing more efficient. It could also be advantageous in developing new ideas for future use by recognising their important role in natural ecosystems.

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