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Unlocking the potential for using by-products as feed (substrate) to produce edible insects

Insects like black soldier fly larvae (BSFL) can efficiently convert a broad range of low-value organic matter into edible biomass with a high content of high value protein and other nutrients. As such, BSFL provide a superior way of recirculating and upgrading organic sidestreams from the food industry back into the feed and food chain, compared with turning these valuable resources into energy via combustion or biogas.

However, it is currently not possible to exploit this opportunity fully, because BSFL as farmed animals come under EU feed law. The law allows for BSFL to feed off feed-grade matter only. This also means a strong competition with other uses of the available feed-grade matter, which significantly impairs both profitability and sustainability of BSFL production today.

A step towards solving this problem would be to expand the range of feed (substrates) that the law would allow in the production of edible insects. This is considered to be a reasonable scope as the feed quality standards in place to ensure the health and food safety of conventional food producing animals are less pertinent for insects due to their natural feeding behavior.

New knowledge to document health and food safety

However, it is essential to document that using 'low quality' substrates for insect production will not compromise the health and food safety of the insects, the insect derived product or the humans or animals consuming the products. A first step is therefore to provide such documentation.

A wide range of vegetable-based materials is in principle already accepted as feed for food producing animals. This includes sidestreams and by-products from food production and former foodstuffs (FF) without animal content. Still, the use of these vegetable-based materials is immediately challenged due to spoilage during storage or fungal attacks that occurred while the plants were growing – both of which can lead to a toxin content above the tolerated level in feed made from such vegetable-based materials.

Another significant challenge for the use of former foodstuff as feed is the difficulties in removing packaging materials completely as there is a zero tolerance for such materials in feed. A first – and logical – choice is therefore to document that these low-quality feed sources can be utilized for insect production without negative effects on food and feed safety, as insects differ significantly from other food producing animals with respect to their biology.

The next choice is recirculation of the vast amounts of catering and food waste into nutritious and protein rich insects, which is strictly prohibited today. The restrictions for use of food waste as feed exist to avoid the spread of serious animal diseases like African swine fever in food producing animals. However, insects themselves are not prone to these diseases. Also, in case the disease agents will not be cleared through the insects' growth period already, proper processing should ensure the insect product can safely be used as animal feed.



Research priorities to facilitate the removal of legal barriers

Scientific risk assessments that identify the specific microbiological and chemical hazards that are potentially associated with different sources of substrate and their consequential risks along the insect (BSFL) production chain are crucial to facilitate the safe use of these low-quality substrates.

The following three different categories of currently unaccepted feed (substrates) provide a huge potential for insect production and should be assessed for associated risks.

1. Vegetable-based materials of low hygienic quality - e.g. spoiled due to molding.
2. Vegetable-based materials - e.g. former foodstuff with remains of packaging material.
3. Catering and food waste and former foodstuff with animals content.

Performance of experimental exposure studies with relevant harmful agents (in confined facilities) will provide the data needed for performing valid quantitative risk assessments, which are currently lacking. This will demonstrate the actual risk of expanding the range of accepted substrates specifically for production of insects for food and feed or alternatively for technical applications, i.e. in non-edible products.

Providing risk assessments will be an essential prerequisite for adjusting and modifying the existing EU regulation, so they take the special biology of insects and production conditions into account. A law change making it possible to allocate more low-value organic materials for insect production would support the development of a sustainable and circular bioeconomy.

For more information

If you are interesting in finding out more about the research potential related to the safe production of insects for food and feed, or if you want to explore options for a research collaboration, please contact:

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