



ENTOMO CONVERSION

Newsletter on Insects for feed, food and bioconversion of organic substrates

Items published between 01 December 2023 and 31 January 2024

This newsletter is produced by a research team on entomoconversion and the “Direction pour la Science Ouverte” (DipSO). It is the result of multi- source monitoring (media, articles, ...).

Scope :

- **Europe/France**
- **Thematics axes** : insects (*Tenebrio molitor* et *Hermetia Illucens*) , substrates (organic waste, by-products, ...), industrials applications and products (frass, fertilizer, ...)
- **Sources** : articles, information on ongoing and completed projects, regulatory documents, calls for expressions of interest, private sector activities.

Note : Items in this newsletter do not represent INRAE's position.

Call for proposals, call for tenders,

- o ATB: May 14-16, 2024: INSECTA 2024 International Conference
- o The 75th EEAP Annual Meeting | REVOLVE

Substrate - media

- o The Hungarian animal feed insect protein production company received an investment of several million euros
- o Arla Foods Ingredients and Enorm harness upcycling power of insects to tackle food waste
- o UK research collaborators investigate how insect protein can decarbonize livestock production
- o Upcycling food waste into alt protein: On-site insect farming developed for manufacturers and retailers

Substrate - articles

- o Food waste-derived black soldier fly (*Hermetia illucens*) larval resource recovery: A circular bioeconomy approach - Ganesan et al.
- o Biodegradation of polystyrene by bacteria isolated from the yellow mealworm (*Tenebrio molitor*) gut - Lin et al.
- o Multigenerational effect of seaweed or selenium enriched substrates on nutritional composition of black soldier fly (*Hermetia illucens*) - Ottoboni et al.
- o Revaluation process of cheese whey through the cultivation of black soldier fly larvae (*Hermetia illucens*) - Caltzontzin-Rabell et al.
- o Cultivation of Black Soldier Fly (*Hermetia illucens*) Larvae for the Valorization of Spent Coffee Ground: A Systematic Review and Bibliometric Study - Hutabarat and Mangindaan
- o Addition of plantation waste to the bioconversion of pig manure by black soldier fly larvae: Effects on heavy metal content and bioavailability - Deng et al.
- o The Influence of Different Sustainable Substrates on the Nutritional Value of *Tenebrio molitor* Larvae - Jankauskienė et al.
- o Minor impact of probiotic bacteria and egg white on *Tenebrio molitor* growth, microbial composition and pathogen infection - Savio et al.
- o Fatty acid profile of black soldier fly larvae and frass as affected by different growing substrates - Addeo et al.
- o Can black soldier fly larvae (*Hermetia illucens*) be reared on waste streams for food and feed? – A safety perspective - Hoffmans et al.
- o Mineral profile and heavy metals bioaccumulation in black soldier fly (*Hermetia illucens*, L.) larvae and frass across diverse organic substrates - Addeo et al.
- o From Food Waste to Functional Biopolymers: Characterization of Chitin and Chitosan Produced from Prepupae of Black Soldier Fly Reared with Different Food Waste-Based Diets - Mannucci et al.
- o Effect of larval handling on black soldier fly life history traits and bioconversion efficiency - Loiotine et al.
- o Biodegradation of polyethylene terephthalate by *Tenebrio molitor*: Insights for polymer chain size, gut metabolome and host genes - He et al.
- o Intestinal microbial community well explain larval growth than feed types - Li et al.
- o Inhibition of pathogenic microorganisms in solid organic waste via black soldier fly larvae-mediated management - Shi et al.
- o Characteristics of gut bacterial microbiota of black soldier fly (Diptera: Stratiomyidae) larvae effected by typical antibiotics - Ruan et al.
- o Effect of moisture content on larval gut microbiome and the conversion of pig manure by black soldier fly - Wang et al.
- o The Impact of Farm and Industrial Feed Waste on the Safety Parameters of *Tenebrio molitor* Larvae - Jankauskienė et al.
- o Exploiting fall foliage by-products to optimize *Tenebrio molitor* nutraceutical value - Brai et al.
- o Integration of Pretreated Crop Residues to Improve the Valorization of Biogas Digestate by the Black Soldier Fly (*Hermetia illucens* L.; Diptera: Stratiomyidae) Larvae - Brodeur et al.
- o Retention and excretion of microplastics by Yellow Mealworm (*Tenebrio molitor*) larvae reared on an amino formaldehyde polymer microbeads contaminated substrate - Randazzo et al.
- o Reducing the mass and decreasing the bioavailability of heavy metal from organic wastes treated by black soldier fly larvae - Li et al.
- o Larval biomass production from the co-digestion of mushroom root waste and soybean curd residues by black soldier fly larvae (*Hermetia illucens* L.) - Randazzo et al.

Product - media

- o Sumitomo Corporation invests in Brazilian insect protein and biotechnology company Cyns to support the next generation of sustainable feed production
- o Go big for bugs: APAC insect protein sector needs substantial big brand and retailer support to move past longstanding 'nascent' stage
- o Globe Buddy introduces new dog food with insect protein
- o Skretting signs deal to purchase insect meal from Finnish startup
- o Is the UK bar for insect protein entry too high?
- o Benefits of Insect Protein for Dogs and Cats
- o European Patent Issued for Insect Protein Technology; Company Seeks Investors
- o In Romania, the distribution of products containing insect meal was restricted by law
- o America's largest poultry producer for insect protein production

Product - articles

- o Nutritional Value and Microbiological Aspects of Dried Yellow Mealworm (*Tenebrio molitor* L.) Larvae Pretreated with a Pulsed Electric Field - Bogusz et al.
- o Live black soldier fly (*Hermetia illucens*) larvae in feed for laying hens: effects on hen gut microbiota and behavior - Huang et al.
- o Consumer Expectation and Perception of Farmed Rainbow Trout (*Oncorhynchus mykiss*) Fed with Insect Meal (*Tenebrio molitor*) - Magnani et al.
- o Effects of Dietary Plant Protein Replacement with Insect and Poultry By-Product Meals on the Liver Health and Serum Metabolites of Sea Bream (*Sparus aurata*) and Sea Bass (*Dicentrarchus labrax*) - Donadelli et al.
- o Chemical composition, fatty acid profile, antioxidant content, and microbiological loads of lesser mealworm, mealworm, and superworm larvae - Mattioli et al.
- o Effect of fatty acid-enriched black soldier fly larvae meal combined with chitinase on the metabolic processes of Nile tilapia - Agbohessou et al.
- o Combined Effects of Yellow Mealworm (*Tenebrio molitor*) and *Saccharomyces cerevisiae* on the Growth Performance, Feed Utilization Intestinal Health, and Blood Biomarkers of Nile Tilapia (*Oreochromis niloticus*) Fed Fish Meal-Free Diets - Anany et al.
- o Inclusion of Dried Black Soldier Fly Larvae in Free-Range Laying Hen Diets: Effects on Production Efficiency, Feed Safety, Blood Metabolites, and Hen Health - Bejaei et al.
- o Chemical and Nutritional Fat Profile of *Acheta domesticus*, *Gryllus bimaculatus*, *Tenebrio molitor* and *Rhynchophorus ferrugineus* - Orkusz et al.
- o Effects of black soldier fly larvae meal on production performance, meat quality, antioxidant capacity and serum biochemical indices of squabs - Ma et al.
- o A Systematic Review and Metanalysis on the Use of *Hermetia illucens* and *Tenebrio molitor* in Diets for Poultry - Katagiri Dalmoro et al.
- o Apparent nutrient digestibility, metabolizable energy and apparent ileal amino acid digestibility of commercial partially defatted *Hermetia illucens* meal for laying hens - Kwakernaak et al.
- o Incorporating whole insect larvae into poultry diets: state of the art and future perspectives - Schiavone et al.
- o Does the provision of live black soldier fly and yellow mealworm larvae improve Muscovy duck welfare? - Gariglio et al.
- o Improving the nutritional values of yellow mealworm *Tenebrio molitor* (Coleoptera: Tenebrionidae) larvae as an animal feed ingredient: a review - Syahrulawal et al.

Industrials applications - media

- o Industrial symbiosis: a blueprint for green insect protein production?
- o Insect feed company Protix gets backing to build production plant in Poland | IntraFish.com
- o Siemens Bulgaria, Nasekomo partner for insect protein boost
- o Agroloop commissions Bühler to provide proven insect-rearing tech for animal feed
- o Lithuanian insect supplier to set up yellow mealworm plant

Industrials applications - articles

- o Quality and staling characteristics of white bread fortified with lysozyme-hydrolyzed mealworm powder (*Tenebrio molitor* L.) - Pyo et al.
- o Exploring the potential of black soldier fly larvae oil: Supercritical CO₂ extraction, physicochemical analysis, antioxidant properties, shelf life, and keratinocyte growth inhibition - Muangrat and Pannasai
- o Antimicrobial activity of lipids extracted from *Hermetia illucens* reared on different substrates - Franco et al.
- o An analysis of emerging food safety and fraud risks of novel insect proteins within complex supply chains - Traynor et al.
- o Consumer perception of insects and derived ingredients as food - Brombach et al.
- o Insect-based fish feed in decoupled aquaponic systems: Effect on lettuce production and resource use - Pinho et al.
- o Basil (*Ocimum basilicum*) growth and biochemical attributes are influenced by various black soldier fly (*Hermetia illucens*) larvae frass types - Romano et al.
- o Potential use of frass from edible insect *Tenebrio molitor* for proteases production by solid-state fermentation - Munoz-Seijas et al.
- o Black soldier fly larvae (*Hermetia illucens*) frass and sheddings as a compost ingredient - Jasso et al.
- o Development of Healthy Snacks Incorporating Meal from *Tenebrio molitor* and *Alphitobius diaperinus* Using 3D Printing Technology - Madail Herdeiro et al.
- o Enhancing the bioconversion rate and end products of black soldier fly (BSF) treatment – Siddiqui et al.
- o Insect frass composition and potential use as an organic fertilizer in circular economies - Amorim et al.
- o Black soldier fly larvae should be considered beyond their use as feedstuff - Tettamanti and Bruno
- o Utilization of Edible Insects as Food and Feed with Emphasis on the Red Palm Weevil - El-Shafie
- o Novel adhesive based on black soldier fly larvae flour for particleboard production - Garcia et al.
- o Effect of replacing durum wheat semolina with *Tenebrio molitor* larvae powder on the techno-functional properties of the binary blends - Carpentieri et al.
- o Evaluation of In Vitro Protein Hydrolysis in Seven Insects Approved by the EU for Use as a Protein Alternative in Aquaculture - Rodriguez-Rodriguez et al.
- o Black soldier fly as a New chitin source: Extraction, purification and molecular/structural characterization - Pedrazzani et al.
- o Chitinase and Insect Meal in Aquaculture Nutrition: A Comprehensive Overview of the Latest Achievements - Hasan et al.
- o Copping out of novel feeds: HOW climate change pledgers and food summits overlooked insect protein - Malematja et al.
- o Effect of blanching, storage and drying conditions on the macro-composition, color and safety of mealworm *Tenebrio molitor* larvae - Ribeiro et al.
- o Effect of full fat and defatted insect meals in breadmaking quality - Bottle et al.

Call for proposals, call for tenders,

Sources : ANR, Horizon Europe, BPI...



30/01/2024

ATB: May 14-16, 2024: INSECTA 2024 International Conference

The INSECTA 2024 International Conference aims to give an overview of state-of-the-art technology of insects for food, feed and non-food application. ...

www.atb-potsdam.de



16/01/2024

The 75th EEAP Annual Meeting | REVOLVE

The Italian Association for Animal Science and Production proudly hosts the 75th annual meeting of the European Association for Animal Production ...

revolve.media

Substrate - media

Sources : mainstream media, regulatory sources, institutionnal, company,..



23/01/2024

The Hungarian animal feed insect protein production company received an investment of several million euros

Agroloop has yet another successful capital raising: it has signed a multi-million euro capital investment contract with Enter Tomorrow Venture ...

trademagazin.hu



08/12/2023

Arla Foods Ingredients and Enorm harness upcycling power of insects ...

--- Arla Foods Ingredients has launched a partnership with Enorm, Northern Europe's largest insect farm. This collaboration is set to change ...

www.foodingredientsfirst.com



07/12/2023

UK research collaborators investigate how insect protein can decarbonize livestock production

The University of Leeds and Entocycle are behind a new Â430,000 (US\$540,315) research program to develop the protocols and codes of practice ...

...

www.feednavigator.com



02/12/2023

Upcycling food waste into alt protein: On-site insect farming developed for manufacturers and retailers

Upcycling food waste into alt protein: On-site insect farming developed for manufacturers and retailers ...

www.foodnavigator.com

30/01/2024

Food waste-derived black soldier fly (*Hermetia illucens*) larval resource recovery: A circular bioeconomy approach - Ganesan et al.

Black Soldier Fly (*Hermetia illucens* [L.], Diptera: Stratiomyidae) larvae (BSFL) production from food waste is gaining interest. Food waste, a heterog...

www.sciencedirect.com

[black soldier fly](#) [hermetia illucens](#)

29/01/2024

Multigenerational effect of seaweed or selenium enriched substrates on nutritional composition of black soldier fly (*Hermetia illucens*) - Ottoboni et al.

Abstract Selenium (Se) is an essential trace element for livestock. To ensure an adequate intake is achieved, several supplementation sources have been studied targeting the different animal species. Although Se-enriched yeast remains one of ...

brill.com

[hermetia illucens](#) [black soldier fly](#)

27/01/2024

Cultivation of Black Soldier Fly (*Hermetia illucens*) Larvae for the Valorization of Spent Coffee Ground: A Systematic Review and Bibliometric Study - Hutabarat and Mangindaan

The global surge in coffee consumption has led to the generation of significant amounts of spent coffee grounds (SCG), a by-product of the brewing process. If it is left unprocessed in the landfill, it will generate methane, one of the greenhouse ...

www.mdpi.com

[black soldier fly](#) [hermetia illucens](#)

30/01/2024

Biodegradation of polystyrene by bacteria isolated from the yellow mealworm (*Tenebrio molitor*) gut - Lin et al.

Polystyrene (PS) is commonly used in human production and life because it is chemically stable and easy to produce and process. However, PS is difficu...

www.sciencedirect.com

[tenebrio molitor](#) [yellow mealworm](#)

28/01/2024

Revaluation process of cheese whey through the cultivation of black soldier fly larvae (*Hermetia illucens*) - Caltzontzin-Rabell et al.

Cheese whey is generated in greater quantities each year. Current treatments of cheese whey do not allow its full degradation or use. The use of black soldier fly larvae is proposed as treatment for ...

onlinelibrary.wiley.com

[black soldier fly](#) [hermetia illucens](#)

23/01/2024

Addition of plantation waste to the bioconversion of pig manure by black soldier fly larvae: Effects on heavy metal content and bioavailability - Deng et al.

During the conversion of pig manure by black soldier fly larvae (BSFL), the accumulation and speciation changes of heavy metals (HMs) have adverse eff...

www.sciencedirect.com

[hermetia illucens](#) [black soldier fly](#)

23/01/2024

The Influence of Different Sustainable Substrates on the Nutritional Value of *Tenebrio molitor* Larvae - Jankauskienė et al.

Every year, over 30% of food production is wasted. However, promoting a sustainable food supply not only fosters economic stability in agriculture and the food industry, but also safeguards precious natural resources and ensures universal food ...

www.mdpi.com

yellow mealworm

tenebrio molitor

22/01/2024

Fatty acid profile of black soldier fly larvae and frass as affected by different growing substrates - Addeo et al.

Abstract This study aimed to evaluate how different food wastes used as growth substrates affected the lipid composition of *Hermetia illucens* larvae; the relationship among substrates, larvae, and frass fatty acid (FA) composition was studied. ...

brill.com

hermetia illucens

black soldier fly

17/01/2024

Mineral profile and heavy metals bioaccumulation in black soldier fly (*Hermetia illucens*, L.) larvae and frass across diverse organic substrates - Addeo et al.

Organic wastes from vegetable mix (V) and butchers (B) were used as substrates (V100%, V75%+B 25%, and V50%+B50%) for *Hermetia illucens* to assess the mineral profile of the larvae and frass, and th...

www.tandfonline.com

hermetia illucens

black soldier fly

23/01/2024

Minor impact of probiotic bacteria and egg white on *Tenebrio molitor* growth, microbial composition and pathogen infection - Savio et al.

The industrial rearing for feed and food purposes of the yellow mealworm, *Tenebrio molitor*, on agricultural by-products may expose larvae and adults to entomopathogens used as biocontrol agents in crop production. Bacterial spores/toxins or ...

www.frontiersin.org

yellow mealworm

tenebrio molitor

19/01/2024

Can black soldier fly larvae (*Hermetia illucens*) be reared on waste streams for food and feed? – A safety perspective - Hoffmans et al.

Abstract The use of insects as feed and food can be part of the solution towards a circular economy, in case the safety of insect products is assured. Black soldier fly larvae (BSFL, *Hermetia illucens*) can be reared on different waste streams. ...

brill.com

hermetia illucens

black soldier fly

16/01/2024

From Food Waste to Functional Biopolymers: Characterization of Chitin and Chitosan Produced from Prepupae of Black Soldier Fly Reared with Different Food Waste-Based Diets - Mannucci et al.

The use of food waste as a rearing substrate to grow insects is an ecofriendly and sustainable alternative to food waste disposal. In the present research, *Hermetia illucens* prepupae were reared with a standard diet, different food waste-based ...

www.mdpi.com

hermetia illucens

black soldier fly

15/01/2024

Effect of larval handling on black soldier fly life history traits and bioconversion efficiency - Loiotine et al.

IntroductionThe black soldier fly is considered the most promising insect species for mass production; however, information on the effects of handling, which is unavoidable during experimental trials and rearing practices, is still limited.Materials ...

www.frontiersin.org

[hermetia illucens](#) [black soldier fly](#)

04/01/2024

Intestinal microbial community well explain larval growth than feed types - Li et al.

Abstract Black soldier fly larvae (BSFL) are considered a sustainable ingredient in livestock feed. However, addressing issues related to feed substrate and intestinal microbiota is essential to ensure optimal larval development. The aim of ...

link.springer.com

[hermetia illucens](#) [black soldier fly](#)

27/12/2023

Characteristics of gut bacterial microbiota of black soldier fly (Diptera: Stratiomyidae) larvae effected by typical antibiotics - Ruan et al.

As agents in an emerging technology, *Hermetia illucens* (Linnaeus, 1758) (Diptera: Stratiomyidae) larvae, black soldier fly, have shown exciting potent...

www.sciencedirect.com

[hermetia illucens](#) [black soldier fly](#)

22/12/2023

The Impact of Farm and Industrial Feed Waste on the Safety Parameters of *Tenebrio molitor* Larvae - Jankauskienė et al.

The rising global demand for animal-based food has an increasingly detrimental ecological impact, exacerbated by significant food waste (approximately one-third of all food). This research aimed to analyze the possibility of changing the usually ...

www.mdpi.com

[yellow mealworm](#) [tenebrio molitor](#)

06/01/2024

Biodegradation of polyethylene terephthalate by *Tenebrio molitor*: Insights for polymer chain size, gut metabolome and host genes - He et al.

Polyethylene terephthalate (PET or polyester) is a commonly used plastic and also contributes to the majority of plastic wastes. Mealworms (*Tenebrio m...*

www.sciencedirect.com

[yellow mealworm](#) [tenebrio molitor](#)

02/01/2024

Inhibition of pathogenic microorganisms in solid organic waste via black soldier fly larvae-mediated management - Shi et al.

Inadequately managed solid organic waste generation poses a threat to the environment and human health globally. Biotransformation with the black sold...

www.sciencedirect.com

[hermetia illucens](#) [black soldier fly](#)

23/12/2023

Effect of moisture content on larval gut microbiome and the conversion of pig manure by black soldier fly - Wang et al.

The study investigated the influence of varied moisture levels in pig manure on the gut microbiome of black soldier fly larvae (BSFL) and their waste ...

www.sciencedirect.com

[black soldier fly](#) [hermetia illucens](#)

21/12/2023

Exploiting fall foliage by-products to optimize *Tenebrio molitor* nutraceutical value - Brai et al.

Abstract *Tenebrio molitor* larvae (TML) are a novel smart food recently declared safe by the European Food Safety Authority (EFSA). These edible insects are a complete source of digestible proteins, and their farming requires limited space and ...

brill.com

[yellow mealworm](#) [tenebrio molitor](#)

17/12/2023

Integration of Pretreated Crop Residues to Improve the Valorization of Biogas Digestate by the Black Soldier Fly (*Hermetia illucens* L.; Diptera: Stratiomyidae) Larvae - Brodeur et al.

The growing interest in anaerobic digestion has led to an increase in the production of digestate that can be re-used. This work evaluates the possibility of using black soldier fly larvae (BSFL) to valorize biogas digestate, maize residue and ...

link.springer.com

[black soldier fly](#) [hermetia illucens](#)

12/12/2023

Reducing the mass and decreasing the bioavailability of heavy metal from organic wastes treated by black soldier fly larvae - Li et al.

Black soldier fly larvae (BSFL), *Hermetia illucens* L., are widely used to reduce the mass of various wastes. However, the potential metal tolerance me...

www.sciencedirect.com

[black soldier fly](#) [hermetia illucens](#)

15/12/2023

Retention and excretion of microplastics by Yellow Mealworm (*Tenebrio molitor*) larvae reared on an amino formaldehyde polymer microbeads contaminated substrate - Randazzo et al.

Abstract Yellow mealworm (*Tenebrio molitor* L., TM), one of the main cultured insect species, is used for feed and food. Larval stages of this species can be reared on several substrates, including grains and industrial by-products. However, ...

brill.com

[yellow mealworm](#) [tenebrio molitor](#)

11/12/2023

Larval biomass production from the co-digestion of mushroom root waste and soybean curd residues by black soldier fly larvae (*Hermetia illucens* L.) - Randazzo et al.

Black soldier fly larvae (BSFL) are progressively being used as a sustainable waste management solution. They are high in protein and other essential nutrients, making them an ideal food source for livestock, poultry, and fish. Pure mushroom ...

www.researchsquare.com

[black soldier fly](#) [hermetia illucens](#)

Product - media

Sources : mainstream media, regulatory sources, institutionnal, company,...

do Brasil S

31/01/2024

Sumitomo Corporation invests in Brazilian insect protein and biotechnology company Cyns to support the next ...

NEW YORK, January 30, 2024 /PRNewswire/ — Sumitomo Corporation, through Sumitomo Corporation do Brasil SA announced today a co-investment in ... getaboutcolumbia.com



31/01/2024

Go big for bugs: APAC insect protein sector needs substantial big brand and retailer support to move past ...

The Asia Pacific insect protein industry will need a substantial amount of both big brand and retailer support alongside regulatory developments ... www.foodnavigator-asia.com



30/01/2024

Globe Buddy introduces new dog food with insect protein

Pet food producer Globe Buddy has launched Globe Buddy Brown, a new sustainable dog food featuring protein from black soldier fly larvae. Danish ... www.feedandadditive.com



18/01/2024

Skretting signs deal to purchase insect meal from Finnish startup

Finnish insect producer set to begin deliveries in 2024. Continue reading www.salmonbusiness.com



10/01/2024

Is the UK bar for insect protein entry too high?

As we head into 2024, the focus turns to where the European landscape on insect protein is currently and how it may evolve in the coming year. www.foodnavigator.com



07/01/2024

Benefits of Insect Protein for Dogs and Cats

The benefits of insect protein for dogs and cats are many, including supplying them with vitamins and minerals. What's more, insect protein can ... animalwellnessmagazine.com



27/12/2023

European Patent Issued for Insect Protein Technology; Company Seeks Investors

European Patent Issued to All Things Bugs LLC for Insect Protein Technology; Company Seeks Investors OKLAHOMA CITY, OK, UNITED ... soilerosion.einnews.com



18/12/2023

In Romania, the distribution of products containing insect meal was restricted by law

From now on, products containing insect meal that are recognized and authorized as food by the European Union may only be distributed in Romania ... trademagazin.hu

09/12/2023



America's largest poultry producer for insect protein production

Photo by Jahuussid:
Bigstockphoto The largest poultry manufacturing conglomerate in the United States Tyson Foods Inc launched a cooperation ...

www.news-today.com

Product - articles

Sources : HAL, Pubmed, BASE, MDPI, F100Research, Journal of Insects as Food and Feed, ...

23/01/2024

Nutritional Value and Microbiological Aspects of Dried Yellow Mealworm (*Tenebrio molitor* L.) Larvae Pretreated with a Pulsed Electric Field - Bogusz et al.

Complete protein, which includes all the essential amino acids, and bioactive compounds needed in human nutrition, can be found in edible insects. Bioactive compounds play a crucial role in protecting cells from the damage caused by free radicals. ...

www.mdpi.com

yellow mealworm

tenebrio molitor

17/01/2024

Consumer Expectation and Perception of Farmed Rainbow Trout (*Oncorhynchus mykiss*) Fed with Insect Meal (*Tenebrio molitor*) - Magnani et al.

In recent years, insect meal has attracted increasing interest as an innovative protein source to replace fish meal in feed formulations due to its valuable nutritional profile. This research aimed to compare the effects of different levels ...

pubmed.ncbi.nlm.nih.gov

tenebrio molitor

yellow mealworm

04/01/2024

Chemical composition, fatty acid profile, antioxidant content, and microbiological loads of lesser mealworm, mealworm, and superworm larvae - Mattioli et al.

In the last decade, great attention was placed on insects to increase feed-food production without negatively affecting the environment. In this research study we compare three different insect spe...

www.tandfonline.com

yellow mealworm

tenebrio molitor

19/01/2024

Live black soldier fly (*Hermetia illucens*) larvae in feed for laying hens: effects on hen gut microbiota and behavior - Huang et al.

This study examined the effects of including live black soldier fly (BSF, *Hermetia illucens*) larvae in the diet of laying hens on gut microbiota, and ...

www.sciencedirect.com

hermetia illucens

black soldier fly

12/01/2024

Effects of Dietary Plant Protein Replacement with Insect and Poultry By-Product Meals on the Liver Health and Serum Metabolites of Sea Bream (*Sparus aurata*) and Sea Bass (*Dicentrarchus labrax*) ...

The liver health of Gilthead sea bream and European sea bass, fed with fish meal-free diets, including various proportions of plant proteins, as well as insect and poultry by-product meals, was investigated through biochemical and histological ...

www.mdpi.com

hermetia illucens

black soldier fly

02/01/2024

Effect of fatty acid-enriched black soldier fly larvae meal combined with chitinase on the metabolic processes of Nile tilapia - Agbohessou et al.

Effect of fatty acid-enriched black soldier fly larvae meal combined with chitinase on the metabolic processes of Nile tilapia

www.cambridge.org

hermetia illucens

black soldier fly

29/12/2023

Combined Effects of Yellow Mealworm (*Tenebrio molitor*) and *Saccharomyces cerevisiae* on the Growth Performance, Feed Utilization Intestinal Health, and Blood Biomarkers of Nile T... (*Oreochromis ..*) (*Oreochromis* ...

Aquafeed quality is the most critical factor for aquaculture sustainability. However, limitations of traditional feed ingredients such as fishmeal (FM) need alternative strategies to ensure the nutritional requirements for aquatic animals. In ...

link.springer.com

yellow mealworm

tenebrio molitor

21/12/2023

Chemical and Nutritional Fat Profile of *Acheta domesticus*, *Gryllus bimaculatus*, *Tenebrio molitor* and *Rhynchophorus ferrugineus* - Orkusz et al.

The use of edible insects in the human diet is gaining importance because they are characterized by high nutritional value, and their cultivation is much more environmentally friendly than traditional livestock farming. The objective of this ...

www.mdpi.com

yellow mealworm

tenebrio molitor

12/12/2023

A Systematic Review and Metanalysis on the Use of *Hermetia illucens* and *Tenebrio molitor* in Diets for Poultry - Katagiri Dalmoro et al.

Insect meal as a protein source has been considered a sustainable way to feed animals. *H. illucens* and *T. molitor* larvae meal are considered high-protein sources for poultry, also presenting considerable amounts of fatty acids, vitamins, and ...

www.mdpi.com

hermetia illucens

black soldier fly

yellow mealworm

tenebrio molitor

23/12/2023

Inclusion of Dried Black Soldier Fly Larvae in Free-Range Laying Hen Diets: Effects on Production Efficiency, Feed Safety, Blood Metabolites, and Hen Health - Bejaei et al.

Identifying alternative feedstuffs to replace conventional nutrient sources in poultry diets is crucial to supplying the growing demand for animal feed. A 17-week-long feeding experiment with three diets, including 0% (control), 10%, and 18% ...

www.mdpi.com

hermetia illucens

black soldier fly

15/12/2023

Effects of black soldier fly larvae meal on production performance, meat quality, antioxidant capacity and serum biochemical indices of squabs - Ma et al.

Abstract The aim of the study was to evaluate the effects of dietary black soldier fly larvae meal (BSFLM) on production performance, meat quality (including sensory quality, muscle fiber histological characteristics, chemical composition, and ...

brill.com

hermetia illucens

black soldier fly

08/12/2023

Apparent nutrient digestibility, metabolizable energy and apparent ileal amino acid digestibility of commercial partially defatted *Hermetia illucens* meal for laying hens - Kwakernaak et al.

Abstract A digestibility study with laying hens was carried out to determine the nutritional value of a commercial and representative (batch to batch variance adjusted) insect meal based on *Hermetia illucens* (HI) larvae, (from black soldier ...

brill.com

black soldier fly

hermetia illucens

06/12/2023

Incorporating whole insect larvae into poultry diets: state of the art and future perspectives - Schiavone et al.

A wide range of insects are being considered as potential candidate sources of dietary protein; however, it was only recently that the European Union, with Regulation (EU) 2017/893 of May 24, first...

www.tandfonline.com

hermetia illucens

black soldier fly

yellow mealworm

tenebrio molitor

03/12/2023

Improving the nutritional values of yellow mealworm *Tenebrio molitor* (Coleoptera: Tenebrionidae) larvae as an animal feed ingredient: a review - Syahrulawal et al.

Yellow mealworm larvae (YML; *Tenebrio molitor*) are considered as a valuable insect species for animal feed due to their high nutritional values and ability to grow under different substrates and rearing conditions. Advances in the understanding ...

link.springer.com

yellow mealworm

tenebrio molitor

04/12/2023

Does the provision of live black soldier fly and yellow mealworm larvae improve Muscovy duck welfare? - Gariglio et al.

Background The provision of environmental enrichments to Muscovy ducks could reduce the expression of the aggressive behaviors. The aim of the present study was to evaluate the effects of black soldier fly (BSF) and yellow mealworm (YM) live ...

link.springer.com

black soldier fly

yellow mealworm

Industrials applications - media

Sources : mainstream media, regulatory sources, institutionnal, company,...



30/01/2024

Industrial symbiosis: a blueprint for green insect protein production?

Not content with setting targets for its own carbon emissions, French insect protein producer Innovafeed is on a mission to decarbonize the value ...

www.feednavigator.com



22/01/2024

Insect feed company Protix gets backing to build production plant in Poland | IntraFish.com

Management are currently investigating multiple locations in Poland.

www.intrafish.com



05/12/2023

Siemens Bulgaria, Nasekomo partner for insect protein boost

December 5 (SeeNews) - Bulgarian biotechnology scale-up Nasekomo and Siemens Bulgaria have signed a memorandum of understanding to collaborate ...

seenews.com



05/12/2023

Agroloop commissions Bühler to provide proven insect-rearing ...

--- Hungary-based insect producer Agroloop has selected Bühler's insect growth system for its industrial black soldier fly plant. The facility ...

www.foodingredientsfirst.com



04/12/2023

Lithuanian insect supplier to set up yellow mealworm plant

Image Divaks has partnered with Switzerland-based group Bühler to set up a commercial-scale production facility by 2025.

Insect ...

globalpetindustry.com

27/01/2024

Quality and staling characteristics of white bread fortified with lysozyme-hydrolyzed mealworm powder (*Tenebrio molitor* L.) - Pyo et al.

Edible insects have a low environmental impact but are rich in nutrients and have been promoted as alternative protein sources. However, adding insect...

www.sciencedirect.com

yellow mealworm

tenebrio molitor

23/01/2024

Antimicrobial activity of lipids extracted from *Hermetia illucens* reared on different substrates - Franco et al.

Abstract As the problem of antimicrobial resistance is constantly increasing, there is a renewed interest in antimicrobial products derived from natural sources, particularly obtained from innovative and eco-friendly materials. Insect lipids, ...

link.springer.com

black soldier fly

hermetia illucens

19/01/2024

Consumer perception of insects and derived ingredients as food - Brombach et al.

Planetary boundaries and food security are two major topics that arise in the context of a growing global population. Insects have been proven to be a...

www.sciencedirect.com

yellow mealworm

tenebrio molitor

23/01/2024

Exploring the potential of black soldier fly larvae oil: Supercritical CO₂ extraction, physicochemical analysis, antioxidant properties, shelf life, and keratinocyte growth inhibition - Muangrat ...

The oil production potential of *Hermetia illucens*, commonly known as black soldier fly larvae, showed a great promise, yielding approximately 20.18 %–...

www.sciencedirect.com

black soldier fly

hermetia illucens

20/01/2024

An analysis of emerging food safety and fraud risks of novel insect proteins within complex supply chains - Traynor et al.

Food consumption play a crucial role in human life, yet conventional food production and consumption patterns can be detrimental to the environment. Thus, research and development has been directed towards alternative proteins, with edible insects ...

www.nature.com

yellow mealworm

tenebrio molitor

19/01/2024

Insect-based fish feed in decoupled aquaponic systems: Effect on lettuce production and resource use - Pinho et al.

The utilisation of insect meal-based fish feed as a substitute for conventional fish meal-based fish feed is considered as a promising innovative alternative to boost circularity in aquaculture and aquaponics. Basic research on its use in aquaponics ...

www.ncbi.nlm.nih.gov

black soldier fly

hermetia illucens

18/01/2024

Basil (*Ocimum basilicum*) growth and biochemical attributes are influenced by various black soldier fly (*Hermetia illucens*) larvae frass types - Romano et al.

Abstract A major by-product of black soldier fly larvae (BSFL) farming is the leftover mineral-rich 'frass', which shows promise as a soil amendment. The composition of BSFL frass, and potentially their efficacy, is influenced by the initial ...

brill.com

[hermetia illucens](#) [black soldier fly](#)

05/01/2024

Black soldier fly larvae (*Hermetia illucens*) frass and sheddings as a compost ingredient - Jasso et al.

One of the byproducts from rearing Black soldier fly larvae (BSFL) is its excrement, referred to as frass, and sheddings. As the commercial insect rearing industry is emerging in the U.S., there is not yet an established market for frass although ...

www.frontiersin.org

[black soldier fly](#) [hermetia illucens](#)

04/01/2024

Enhancing the bioconversion rate and end products of black soldier fly (BSF) treatment - Siddiqui et al.

Food security remains a pressing concern in the face of an increasing world population and environmental challenges. As climate change, biodiversity loss, and water scarcity continue to impact agricultural productivity, traditional livestock ...

link.springer.com

[hermetia illucens](#) [black soldier fly](#)

03/01/2024

Black soldier fly larvae should be considered beyond their use as feedstuff - Tettamanti and Bruno

Abstract In recent years the entomological landscape has witnessed substantial progress in the promotion of insects for food and feed purposes. In particular, the black soldier fly (BSF) sector is experiencing an unprecedented expansion and ...

brill.com

[hermetia illucens](#) [black soldier fly](#)

15/01/2024

Potential use of frass from edible insect *Tenebrio molitor* for proteases production by solid-state fermentation - Munoz-Seijas et al.

Novel, eco-saving and low-cost food sources are a global priority, such as edible insects. This work sets a valorization pathway for frass and *Tenebrio...*

www.sciencedirect.com

[yellow mealworm](#) [tenebrio molitor](#)

05/01/2024

Development of Healthy Snacks Incorporating Meal from *Tenebrio molitor* and *Alphitobius diaperinus* Using 3D Printing Technology - Madail Herdeiro et al.

This study analyzes the nutritional properties of edible insects, specifically *Tenebrio molitor* and *Alphitobius diaperinus*, and explores the potential of 3D printing technology to introduce a nutritious and tasty alternative to essential nutrients ...

www.mdpi.com

[yellow mealworm](#) [tenebrio molitor](#)

03/01/2024

Insect frass composition and potential use as an organic fertilizer in circular economies - Amorim et al.

Abstract. Insect manure or "frass" has emerged as an alternative nutrient source for alleviating the dependence on fossil fuel-based fertilizers, reducing food

academic.oup.com

[yellow mealworm](#) [tenebrio molitor](#)

01/01/2024

Utilization of Edible Insects as Food and Feed with Emphasis on the Red Palm Weevil - El-Shafie

Traditionally, overRed palm weevil 2000 edible insectEdible insects species are utilized as food in AfricaAfrica, Asia, and South America. Edible insectsEdible insects as novel foodNovel food can meet the amino acid requirement for humans and ...

link.springer.com

[yellow mealworm](#) [tenebrio molitor](#)

30/12/2023

Novel adhesive based on black soldier fly larvae flour for particleboard production - Garcia et al.

Protein-based adhesives are receiving considerable attention due to their potential to contribute to the development of environmentally friendly mater...

www.sciencedirect.com

[hermetia illucens](#) [black soldier fly](#)

27/12/2023

Evaluation of In Vitro Protein Hydrolysis in Seven Insects Approved by the EU for Use as a Protein Alternative in Aquaculture - Rodriguez-Rodriguez et al.

Rapid population growth is leading to an increase in the demand for high-quality protein such as fish, which has led to a large increase in aquaculture. However, fish feed is dependent on fishmeal. It is necessary to explore more sustainable ...

www.mdpi.com

[hermetia illucens](#) [black soldier fly](#) [yellow mealworm](#)
[tenebrio molitor](#)

14/12/2023

Chitinase and Insect Meal in Aquaculture Nutrition: A Comprehensive Overview of the Latest Achievements - Hasan et al.

The aquaculture industry is looking for sustainable alternatives to conventional fish meals in fish feed, and insect-based meals are proving to be a promising solution. These meals are nutritionally optimal as they have a high protein content ...

www.mdpi.com

[tenebrio molitor](#) [yellow mealworm](#) [black soldier fly](#)

12/12/2023

Effect of blanching, storage and drying conditions on the macro-composition, color and safety of mealworm *Tenebrio molitor* larvae - Ribeiro et al.

For food applications, the processing conditions applied to edible insects should present low energy requirements and environmental impact, while also...

www.sciencedirect.com

[tenebrio molitor](#)

28/12/2023

Effect of replacing durum wheat semolina with *Tenebrio molitor* larvae powder on the techno-functional properties of the binary blends - Carpentieri et al.

Tenebrio molitor (TM) larvae, due to their high nutritional value, are gaining growing attention in food and feed sectors. Although few studies dealt ...

www.sciencedirect.com

[yellow mealworm](#) [tenebrio molitor](#)

14/12/2023

Black soldier fly as a New chitin source: Extraction, purification and molecular/structural characterization - Pedrazzani et al.

Black Soldier Fly (BSF) represents a potential chitin source that has not been fully explored in terms of characterization, extraction, and purificati...

www.sciencedirect.com

[hermetia illucens](#) [black soldier fly](#)

13/12/2023

Copping out of novel feeds: HOW climate change pledgers and food summits overlooked insect protein - Malematja et al.

The intention with this critical review is to appraise recent work done on insect proteins as animal feeds, and to discuss the possible factors which led to the ruling out of insect proteins by food and feed commissioners, as well as climate ...

pubmed.ncbi.nlm.nih.gov

[tenebrio molitor](#) [yellow mealworm](#) [black soldier fly](#)
[hermetia illucens](#)

02/12/2023

Effect of full fat and defatted insect meals in breadmaking quality - Bottle et al.

Fat content and type of lipids in edible insect meals could affect bread quality when used to partially substitute wheat in bread formulations. This s...

www.sciencedirect.com

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