



## 1. Food Safety for using insects

### 1.1 Soluble Production of the Insect-derived Recombinant Antimicrobial Peptide Lucimycin in the Novel Expression Host *Vibrio natriegens* Vmax Express

Joel Eichmann<sup>1,2</sup>, Doree Gerlach<sup>3</sup>, Tobias Weidner<sup>1</sup>, Peter Czermak<sup>1,2,3,4</sup>

<sup>1</sup>Institute of Bioprocess Engineering and Pharmaceutical Technology, University of Applied Sciences Mittelhessen, Giessen/Germany

<sup>2</sup>Faculty of Biology and Chemistry, Justus Liebig University, Giessen/Germany

<sup>3</sup>Department of Bioresources of Fraunhofer Institute for Molecular Biology and Applied Ecology IME, Giessen/Germany

<sup>4</sup>Department of Chemical Engineering, Kansas State University, Manhattan/USA

### 1.2 Detection of Aflatoxin B1 in different Life Stages of Black Soldier Fly (*Hermetia illucens*)

Annalisa Grisendi, Valeria Listorti, Francesco Defilippo, Giorgio Fedrizzi, Michele Dottori, Paolo Bonilauri  
Lombardy and Emilia Romagna experimental Zooprophyllactic institute, Reggio Emilia, Italy

### 1.3 Bioaccumulation Factor of Cadmium in the different Life Stages the Black Soldier Fly, *Hermetia illucens*

Francesco Defilippo, Annalisa Grisendi, Valeria Listorti, Giorgio Fedrizzi, Michele Dottori, Paolo Bonilauri  
Lombardy and Emilia Romagna experimental Zooprophyllactic institute, Reggio Emilia, Italy

### 1.4 Exploring the Use of the larval Immunity to manage the Microbiota of Black Soldier Fly Larvae and increase their microbial Safety during Rearing – a Literature Evaluation.

Jeroen De Smet, Enya Wynants, Leen Van Campenhout  
KU Leuven, Microbial and molecular systems, Geel, Belgium

### 1.5 Detecting fine Plastic Contamination in the Feed and Body of the Larvae of *Hermetia illucens*

Ward Tollenaar, Eric Schmitt, Aman Paul  
Protix Biosystems, Research and development, Dongen, Netherlands

### 1.6 Separation of Faeces, Exuvia and Feed Residues from *Tenebrio molitor* Larvae

Andreas Baur, Mohamed Hussein, Antonio Delgado  
FAU Erlangen – Nuremberg, Institute of Fluid Mechanics, Erlangen, Germany

### 1.7 Volatile Compounds emitted during Black Soldier Fly Larvae Rearing, show antagonistic Effect toward Molds

Doron Levy<sup>1</sup>, Chen Katz<sup>2</sup>, Adi Jonas-Levi<sup>3</sup>

<sup>1</sup>Biotechnology Department, Faculty of Sciences and Technology, Tel Hai College, Kiriath Shmona, Israel.

<sup>2</sup>Molecular and Environmental Microbiology Laboratory, MIGAL – Galilee Research Institute LTD, Kiriath Shmona, Israel

<sup>3</sup>Food Sciences Department, Faculty of Sciences and Technology, Tel Hai College, Kiriath Shmona, Israel

### 1.8 Israel National Center for the Expression of Beneficial Insects

Yoram Yerushalmi  
Israel National Center for the Expression of Beneficial Insects, Afula, Isarel

### 1.9 Transfer rates of zearalenone fed to mealworms (*Tenebrio molitor*) into the oestrogenic metabolite $\alpha$ -zearalenol

Carlos Gonçalves<sup>1</sup>, Katrien Bouten<sup>1</sup>, Joerg Stroka<sup>1</sup>, Petr Karlovsky<sup>2</sup>

<sup>1</sup>European Commission, Joint Research Centre, Geel, Belgium

<sup>2</sup>Molecular Phytopathology and Mycotoxin Research, University of Göttingen, Germany



## 2. Insects production systems

### 2.1 Predicting the Number of Offspring in *Tenebrio molitor*

David Deruytter, Carl Coudron, Jonas Claeys, Stefan Teerlinck  
Inagro, Rumbeke-Beitem, Belgie

### 2.2 Wheat Diets Supplemented with Calcium Iodate lead to altered Growth Performance and Iodine Accumulation in *Tenebrio Molitor* Larvae

Anna-Kristina Marel, Lucas Hartmann, Marcel Lieber, Ann-Katrin Meinhardt, Alexandra Müller, Ralf Greiner  
Max Rubner-Institut, Federal Research Institute of Nutrition and Food, Department of Food Technology and Bioprocess Engineering, Karlsruhe, Germany

### 2.3 Storable Feed Substrates in the Feeding of Field Crickets (*Gryllus bymaculatus*) and Desert Locusts (*Schistocerca gregaria*)

Brigitte Paulicks, Philipp Straub, Wilhelm Windisch  
Technische Universität München, Lehrstuhl für Tierernährung, Freising, Deutschland

### 2.4 Optimization of Black Soldier Fly artificial Reproduction.

Bertrand Hoc, Rudy Caparros Megido, Frédéric Francis  
Gembloux Agro-Bio Tech-University of Liège, Entomologie fonctionnelle et évolutive, Gembloux, Belgique

### 2.5 Towards Insect Bioeconomy in Finland

Susanne Heiska, Vilja Varho, Johanna Kohl  
Natural Resources Institute Finland, Luke, Joensuu, Finland

### 2.6 Optimization of Hatching and Neonate Survival of *Hermetia illucens* Larvae

Lotte Froninckx<sup>1</sup>, Meggie Van Peer<sup>1</sup>, Liesbeth Vogels<sup>1</sup>, Ann Wuyts<sup>1</sup>, Enya Wynants<sup>2</sup>,  
Jeroen De Smet<sup>2</sup>, Leen Van Campenhout<sup>2</sup>, Sabine Van Miert<sup>1</sup>  
<sup>1</sup> Thomas More University College of Applied Sciences, Geel, Belgium  
<sup>2</sup> KU Leuven, Lab4Food, Geel, Belgium

### 2.7 Technical Basis for the small-scale Production of Black Soldier Fly, *Hermetia illucens* Meal as Fish Feed in Benin

Armel Goubédji<sup>1</sup>, Rudy Caparros Megido<sup>1</sup>, Philippe A. Lalèyè<sup>2</sup>, Frédéric Francis<sup>1</sup>  
<sup>1</sup> Gembloux Agro-bio Tech/University of Liege, Agro Biochem, Gembloux, Belgium  
<sup>2</sup> Faculty of Agricultural Sciences/University of Abomey-Calavi, Management of Natural Ressources, Abomey-Calavi, Benin

### 2.8 Testing three artificial light sources on oviposition and half-life of Black Soldier Fly to improve small-scale indoor rearing

Carina Desirée Heussler<sup>1</sup>, Andreas Walter<sup>2</sup>, Hannes Oberkofler<sup>3</sup>, Heribert Insam<sup>3</sup>, Wolfgang Arthofer<sup>4</sup>,  
Birgit C. Schlick-Steiner<sup>4</sup>, Florian M. Steiner<sup>4</sup>  
<sup>1</sup> University of Innsbruck, Ecology, Mikrobiology, Innsbruck, Austria  
<sup>2</sup> Management Center Innsbruck, Biotechnology & Food Engineering, Innsbruck, Austria  
<sup>3</sup> University of Innsbruck, Microbiology, Innsbruck, Austria  
University of Innsbruck, Ecology, Innsbruck, Austria

### 2.9 Morphological and molecular study of larval and adult *Hermetia illucens* L. (Diptera: Stratiomyidae) olfactory system

Andrea Scala<sup>1</sup>, Marisa Nardiello<sup>1</sup>, Rosanna Salvia<sup>1</sup>, Carmen Scieuzo<sup>1</sup>, Antonio Franco<sup>1</sup>, Heiko Vogel<sup>2</sup>, Patrizia Falabella<sup>1</sup>  
<sup>1</sup> University of Basilicata, Department of Science, Potenza, Italy  
<sup>2</sup> Max Planck Institute for Chemical Ecology, Department of Entomology, Jena, Germany



### 3. Application of insects as feeds and food

#### 3.1 Isolation and Characterization of Lipids, Proteins and Chitin from Black Soldier Fly (*Hermetia illucens*) Larvae, Prepupae and Pupae

Bert Verbinnen<sup>1</sup>, Ilse Van de Voorde<sup>2</sup>, Guido Aerts<sup>2</sup>, Johan Claes<sup>2</sup>, Mik Van Der Borgh<sup>2</sup>

<sup>1</sup> Thomas More, Geel, Belgium

<sup>2</sup> University of Leuven, Department of Microbial and Molecular Systems, Ghent, Belgium

#### 3.2 Edible Insects used by the indigenous People in the Ucayali, Amazonian Peru

Ruben Casas Reategui<sup>1</sup>, Pablo Villegas Panduro<sup>2</sup>, Zbyn Polesny<sup>1</sup>

<sup>1</sup> Czech University of Life Sciences, Department of Crop Sciences and Agroforestry, Suchdol, Czech Republic

<sup>2</sup> Universidad Nacional Intercultural de la Amazonía, Ingeniería Agroforestal Acuícola, Yarina, Peru

#### 3.3 How Oven-Drying and Freeze-Drying influence the nutritional Composition of blanched *Ruspolia differens*

Tengweh Forkwa Fombong<sup>1</sup>, Mik Van Der Borgh<sup>2</sup>, Jozef Vanden Broeck<sup>1</sup>

<sup>1</sup> KU Leuven, Biology-Division of Animal Physiology and Neurobiology, Leuven, Belgium

<sup>2</sup> KU Leuven, Department of Microbial & Molecular Systems, Geel, Belgium

#### 3.4 Insects' proximate Composition and nutritional Characteristics as Feed, according to biological Phase: some descriptive Statistics from a Review

David Meo Zilio, Monica Guarino Amato

Council for Agricultural Research and Economics (CREA), Livestock Production and Aquaculture (CREA-ZA), Monterotondo Scalo (Rome), Italy

#### 3.5 Comparison of suitable Drying Techniques on nutritional Quality of Mealworms (*Tenebrio molitor*)

Nina Kröncke<sup>1</sup>, Claudia Keil<sup>2</sup>, Sandra Grebenteuch<sup>3</sup>, Verena Böschen<sup>4</sup>, Sebastian Demtröder<sup>1</sup>, Andreas Thünemann<sup>5</sup>, Lothar Kroh<sup>4</sup>, Hajo Haase<sup>3</sup>, Rainer Benning<sup>1</sup>

<sup>1</sup> University of Applied Sciences Bremerhaven, Institute of Food Technology and Bioprocess Engineering, Bremerhaven, Germany

<sup>2</sup> TU Berlin, Institute of Food Technology and Food Chemistry, Department Food Chemistry and Toxicology, Berlin, Germany

<sup>3</sup> TU Berlin, Institute of Food Technology and Food Chemistry, Department, Food Chemistry and Analytics, Berlin, Germany

<sup>4</sup> Research Institute of Feed Technology of the International Research Association of Feed Technology e.V., Braunschweig-Thune, Germany

<sup>5</sup> Federal Institute for Materials Research and Testing (BAM), Berlin, Germany

#### 3.6 Effects of a Complete Substitution of Soybean Meal by Insect Meal (*Hermetia illucens*) in Meat-Type Chicken Diets

Susanne Velten, Carmen Neumann, Frank Liebert

Georg-August-University Goettingen, Department of Animal Sciences, Chair Animal Nutrition, Goettingen, Germany

#### 3.7 Extrusion Texturization of Cricket Flour (*Acheta domestiscus*) and Soy Protein Isolate: Influence of Insect Content, Extrusion Temperature and Moisture Level on Extruder Response and Texture Properties

Anna Martin<sup>1</sup>, Samuel Kiiru<sup>2</sup>, Raffael Osen<sup>1</sup>, John N. Kinyuru<sup>3</sup>, Anna-Kristina Marel<sup>2</sup>

<sup>1</sup> Fraunhofer Institute for Process Engineering and Packaging IVV, Freising, Germany

<sup>2</sup> Max-Rubner-Institut Federal Research Institute of Nutrition and Food, Karlsruhe, Germany

<sup>3</sup> Jomo Kenyatta University of Agriculture and Technology, Food Science and Technology, Nairobi, Kenya

#### 3.8 Influence of Corn By-Products on chemical Composition of Black Soldier Fly (*Hermetia illucens*) Larvae.

Marco Meneguz<sup>1</sup>, Andrea Dama<sup>1</sup>, Christian Caimi<sup>1</sup>, Marta Gariglio<sup>2</sup>, Achille Schiavone<sup>2</sup>, Francesco Gai<sup>3</sup>, Laura Gasco<sup>1</sup>

<sup>1</sup> Università degli Studi di Torino, Department of Agricultural, Forestry and Food Sciences, Grugliasco Italia

<sup>2</sup> Università degli Studi di Torino, Department of Veterinary Science, Grugliasco, Italia

<sup>3</sup> National Research Council, Institute of Science of Food Production, Grugliasco, Italia



### 3.9 Apparent Digestibility of Insect-based PAPs for Rainbow Trout Feeds

Laura Gasco<sup>1</sup>, Christian Caimi<sup>1</sup>, Achille Schiavone<sup>2</sup>, Giuseppe Serra<sup>3</sup>, Roberta Anedda<sup>4</sup>, Angela Trocino<sup>5</sup>, Marta Gariglio<sup>2</sup>, Ilaria Biasato<sup>2</sup>, Carola Lussiana<sup>1</sup>, Marco Meneguz<sup>1</sup>, Christophe Trespeuch<sup>6</sup>, Francesco Gai<sup>7</sup>

<sup>1</sup> University of Turin, Department of Agricultural, Forest and Food Sciences, Grugliasco, Italia

<sup>2</sup> University of Turin, Department of Veterinary Sciences, Grugliasco, Italia

<sup>3</sup> National Research Council, Institute of Ecosystem Study, Italia

<sup>4</sup> Porto Conte Ricerche, Italia

<sup>5</sup> University of Padova

<sup>6</sup> Mutatec, Italia

<sup>7</sup> National Research Council, Italia

### 3.10 Fuhneschrecken: an everyday food?

Thorsten Breitschuh, Cornelia Häffner

Agrar Insects, Germany

### 3.11 Digestibility of different dietary Fibres by Black Soldier Fly Larvae

Moritz Gold<sup>1,2</sup>, Robert Spiess<sup>1</sup>, Christian Zurbrugg<sup>2</sup>, Michael Kreuzer<sup>3</sup>, Alexander Mathys<sup>1</sup>

<sup>1</sup>ETH Zurich, Institute of Food, Nutrition and Health, Sustainable Food Processing Laboratory, Zurich, Switzerland

<sup>2</sup>Eawag: Swiss Federal Institute of Aquatic Science and Technology, Sandec: Department of Water, Sanitation and Solid Waste for Development, Dübendorf, Switzerland

<sup>3</sup>ETH Zurich, Institute of Agricultural Sciences, Animal Nutrition, Zurich, Switzerland

### 3.12 Evaluation of a potential dry processing route for transforming insects into food and feedstuff

Bußler, Sara; Durek, Julia; Fröhling, Antje; Schlüter, Oliver

Leibniz Institute for Agricultural Engineering and Bioeconomy (ATB), Germany

### 3.13 Influence of drying on the recovery of different biopolymers from cricket (*Acheta domesticus*) flour

Bußler, Sara; Durek, Julia; Fröhling, Antje; Schlüter, Oliver

Leibniz Institute for Agricultural Engineering and Bioeconomy (ATB), Germany

### 3.14 Processing of mealworms into paste at pilot scale and fermentation of the paste at laboratory scale

An Borremans, Sanne Lenaerts, Mik Van Der Borght, Leen Van Campenhout

KU Leuven, Department of Microbial and Molecular Systems, Geel, Belgium

### 3.15 How can developmental stage influence nutritional value of Death's head cockroach (*Blaberus craniifer*)

Martin Kulma, Lenka Kouřimská, Dana Homolková

Czech University of Life Sciences Prague, Praha-Suchdol, Czech Republic



#### 4. Non-food applications of insects

##### 4.1 Continuous Production of Antimicrobial Peptides in Insect Cells

Lukas Paul Käßer, Tobias Weidner, Denise Salzig, Peter Czermak  
TH Mittelhessen University of Applied Sciences (THM), Institute of Bioprocess Engineering and Pharmaceutical Technology (IBPT), Giessen, Germany

##### 4.2 Bioactive Substances from *Hermetia illucens* Larvae

Ariane Müller<sup>1</sup>, Diana Wolf<sup>2</sup>, Katharina Starke<sup>1</sup>, Herwig O. Gutzeit<sup>1</sup>  
<sup>1</sup> Technische Universität Dresden Fakultät Biologie, Institut für Zoologie und Entwicklungsbiologie, Dresden, Germany  
<sup>2</sup> Technische Universität Dresden Institut für Mikrobiologie, Professur für Allgemeine Mikrobiologie, Dresden, Germany

##### 4.3 Utilization of *Yarrowia*-like Strains isolated from *Nicrophorus vespilloides* as Platform for intended Production of active Protein Aggregates

Oliver Birrenbach<sup>1</sup>, Doreen Gerlach<sup>2</sup>, Peter Czermak<sup>1</sup>  
<sup>1</sup> Institute of Bioprocess Engineering and Pharmaceutical Technology, University of Applied Sciences Mittelhessen, Giessen, Germany  
<sup>2</sup> Fraunhofer Institute for Molecular Biology and Applied Ecology (IME), Department of Bioresources, Giessen, Germany

##### 4.4 Processing of agricultural Plant Waste using the Black Soldier Fly Larvae causes Germination Reduction in various Weed Types

Adi Jonas-Levi, Itzhak Jean Jacques Martinez, Ofer Danay, Liora Shaltiel-Harpaz  
Tel-Hai College, Kiryat Shmona, Israel

##### 4.5 Insect Odorant Binding proteins are promising candidates for the development of innovative biosensors

Rosanna Salvia<sup>1</sup>, Andrea Scala<sup>1</sup>, Donatella Farina<sup>1</sup>, Antonio Moretta<sup>1</sup>, Heiko Vogel<sup>2</sup>, Patrizia Falabella<sup>1</sup>  
<sup>1</sup> University of Basilicata, Department of Science, Potenza, Italy  
<sup>2</sup> Max Planck Institute for Chemical Ecology, Department of Entomology, Jena, Germany

##### 4.6 Transcriptomic and proteomic approach for the identification of *Torymus sinensis* (Hymenoptera: Torymidae) venom gland proteins

Rosanna Salvia<sup>1</sup>, Andrea Scala<sup>1</sup>, Antonio Moretta<sup>1</sup>, Donatella Farina<sup>1</sup>, Piero Pucci<sup>2</sup>, Alberto Alma<sup>3</sup>, Chiara Ferracini<sup>3</sup>, Heiko Vogel<sup>4</sup>, Patrizia Falabella<sup>1</sup>  
<sup>1</sup> University of Basilicata, Department of Science, Potenza, Italy  
<sup>2</sup> University of Naples Federico II, Department of Chemical Sciences, Naples, Italy  
<sup>3</sup> University of Turin, Department of Agricultural, Forest and Food Sciences, Grugliasco, Italy  
<sup>4</sup> Max Planck Institute for Chemical Ecology, Department of Entomology, Jena, Germany

##### 4.7 *Toxoneuron nigriceps* (Hymenoptera: Braconidae) teratocytes: generation and analysis of a comprehensive transcriptome for the identification of antimicrobial peptides

Rosanna Salvia<sup>1</sup>, Andrea Scala<sup>1</sup>, Antonio Moretta<sup>1</sup>, Carmen Scieuzo<sup>1</sup>, Marisa Nardiello<sup>1</sup>, Donatella Farina<sup>1</sup>, Heiko Vogel<sup>2</sup>, Patrizia Falabella<sup>1</sup>  
<sup>1</sup> University of Basilicata, Department of Science, Potenza, Italy  
<sup>2</sup> Max Planck Institute for Chemical Ecology, Department of Entomology, Jena, Germany

##### 4.8 *Hermetia illucens* as organic waste treatment tool in South Tyrol: first results of a small-scale feed production unit

Bortolini Sara, Palmitano Marco, Angeli Sergio  
Faculty of Science and Technology, Free University of Bozen-Bolzano, Italy