Journal of Insects as Food and Feed

ISSN 2352-4588

2022 – VOLUME 8 – SUPPLEMENT 1

Publication information

Journal of Insects as Food and Feed
ISSN 2352-4588 (online edition)

Subscription to 'Journal of Insects as Food and Feed' (10 issues a year) is either on institutional (campus) basis or on personal basis. Subscriptions can be online only. Prices are available upon request from the publisher or from the journal's website (www.wageningenacademic.com/jiff). Subscriptions are accepted on a prepaid basis only and are entered on a calendar year basis. Subscriptions will be renewed automatically unless a notification of cancellation has been received before the 1st of December before the start of the new subscription year.

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June 12 – 16, 2022

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Revivable eggs by cryopreservation for insect production enhancement

A. Gligorescu[1], C.H. Fischer[1], K.K. Dam-Nielsen[1], A. Baumann[2], S. Chen[2], J.-W. Heesakkers[2], I. Alyagor[3], Y. Politi[3] and Y. Gilad[3]

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The production of *Hermetia illucens* (BSF) is centralised with each factory producing the entire fly lifecycle, maintaining on-site colonies to supply their production. However, reproduction of BSF in captivity requires high investments and profound biological knowledge. The number of eggs produced from a BSF colony also varies from week to week, and the larvae are known to be very fragile and prone to high mortality during the first five days of life. Therefore, current BSF factories must produce surplus eggs and neonates to maintain their planned production capacity. Some large-scale BSF producers are developing new genetic strains of BSF with enhanced traits. Without a reliable preservation system, specialised genetic strains may lose some of their traits due to e.g. colony collapses or diseases. RECIPE aims to develop innovative technologies for cryopreservation of eggs and suspension of neonates that can enhance and consolidate breeding sites and allow for the implementation of smarter and smaller rearing sites in the proximity of waste streams. During the presentation the main results of the project will be presented including: Optimisation of cryopreserved egg/ suspended neonates and packaging: FreezeM has been developing and optimising the process of suspended neonates and the packaging. The focus was to optimise the density, decrease handling and increase survival rate. Validation of the cryopreserved egg/ suspended neonates: the suspended neonates from FreezeM has been validated at DTI's facility in Denmark; focusing on validating the suspended neonates' survival rate after different transportation condition/time and shelf-life. Business model: Bühler has conducted a business evaluation of different production value chain including distance from breeding to rearing, size of facilities and shelf-life of suspended neonates.

Population genetics and domestication of the black soldier fly (*Hermetia illucens*)

T.N. Generalovic[1], C. Sandrock[2], B. Roberts[3], M. Hauser[4], M. Pipan[5], R. Durbin[6] and C.D. Jiggins[1]

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Insect farming is on the rise to becoming a sustainable and economically viable food and feed industry. The black soldier fly (BSF; *Hermetia illucens* L.) is poised as key species of interest due to its natural bioconversion properties. However, genetic screening and management is currently overlooked. Here, we present the first high coverage (22×) genome-wide assessment of a global sample of BSF individuals (n=54) belonging to both domesticated and wild lineages. We identify a pronounced population structure within BSF explained primarily by captivity status. Phylogenetic reconstruction reveals a deep divergence in BSF lineages. Patterns of introgression are strikingly absent between diverged lineages of wild and domesticated BSF. We also show that commercial activity is dominated by a particular lineage whilst wild populations harbour significant genetic diversity. Recent domestication has had a significant impact on shaping the genomic architecture of captive populations and has left signatures of selective sweeps throughout the genome. This study not only sheds light on the process of domestication but highlights the importance of genetic screening and the introduction of breeding programs to this novel industry.