Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Federal Department of Home Affairs FDHA
Federal Food Safety and Veterinary Office FSVO
Research Management

Tiergesundheit, Zoonosen **Monitoring Surveillance**

Verbesserte Diagnose von *Aethina tumida*

Peter Neumann[1], Orlando Yañez[1], Franck Ouessou Idrissou[1], Qiang Huang[1]

[1]Institute of Bee Health, Vetsuisse Faculty, University of Bern, CH-3003 Bern, Switzerland

Key words
Aethina tumida, honey bee, mandatory disease, small hive beetle, PCR, diagnosis

Aim of the study
Small hive beetle (= SHB) diagnosis is a basic, but there are problems with the PCR diagnostics. Here, we will fill these gaps by developing an efficient and species-specific qPCR diagnosis. The results will lead to enhanced diagnosis of SHB. At present, conventional PCR detection methods (Ward et al. 2007; Neumann et al. 2013) failed to work with SHB specimen (unpublished data), thereby creating an urgent demand to improve this diagnostic method. At early stages of invasion and with low infestation levels, SHBs are often overlooked during inspections asking for a new method to better detect them. Here, we will develop species specific reliable PCR primers and we will also test a novel method using adult bees as matrices for detection.

Material and methods
Adult SHBs were sampled from 20 infested *Apis mellifera* colonies from 10 native locations in Africa (Benin, Togo, Nigeria, Central African Republic, Burkina Faso, Democratic Republic of Congo, South Africa, Ethiopia, Tanzania, and Madagascar) and from 10 SHB introductions (US-Lousiana1, US-Louisiana2, Brazil, Costa-Rica, Australia-Cairns, Australia-Nambour, Portugal, Italy, Jamaica, and South Korea). *Aethina concolor*, *Aethina flavicollis,* and *Aethina inconspicua* specimens were sampled in Australia and South Korea. All Aethina samples were preserved in 70% Ethanol, transported at room temperature and stored at −20 °C in the laboratory until further analyses. DNA was extracted, primers developed and PCR tests conducted using routine previously published protocols.

Results and significance
We have developed SHB primers, which amplify for 10 native African locations and 10 reported introductions, but not for three closely related species (*Aethina concolor*, *Aethina flavicollis*, and *Aethina inconspicua*). We also show that adult honey bee workers can be used as matrices for PCR-based detection of SHBs. The sensitivity of this novel method appears to be 100%, which is identical to conventional visual screenings. Furthermore, the specificity of this novel approach was also high (90.91%). Since both sensitivity and specificity are high, we recommend this novel PCR method and the new primers for routine surveillance of hives in high-risk areas in CH and elsewhere.

Publications, posters and presentations (Formatvorlage Überschrift 2)
* = degree anticipated

Franck Ouessou Idrissou (2018*) Invasion pathways and population genetics of small hive beetles, Aethina tumida (Coleoptera: Nitidulidae). PhD thesis, University of Bern

Ouessou Idrissou F, Huang Q, Yañez O, Lawrence Akinwande K, Neumann P (2018) PCR diagnosis of small hive beetles. Insects 9(24): 1-7. doi:10.3390/insects9010024.

Global movement of the small hive beetle (*Aethina tumida* Murray) using DNA evidence. Oral presentation by Franck Ouessou Idrissou at BEECON 2017, Piacenza, Italy, 2017

Project *1.16.05*

Project duration *January 2016 – April 2018*