

EARLY ACOUSTIC DETECTION OF GRAIN STORAGE INSECT PESTS

Beetle Sound Tube



Foto: Verena Misgalski (JKI)

Problem statement

Insect pests in grain storages can cause severe financial losses. The insects itself and their feeding activity are one problem but they cause an increase of temperature and moisture that provides good conditions for mites and mould that can cause severe health problems. Due to fungal infection, the grain can be contaminated with mycotoxins which make it inedible for humans or animals and leads to a total loss of stock. Early detection of insect infestation is therefore crucial to keep stocks in a good state, for effective treatment and to reduce losses.

Conventional methods of insect detection include traps, temperature- and surface monitoring. Unfortunately these methods mainly work when the number of insects has already increased to a level on which some treatments are not effective anymore. Especially biological control using antagonists can only be successful at an early stage of population development.

Acoustic detection has so far rarely been used due to the very low level of movement and feeding sounds caused by insects and the therefore small detection range.

Aim of the project

The "Beetle Sound Tube"-System is planned as an acoustic early detection system permanently installed in grain silos that provides information about insect infestation much earlier than conventional monitoring methods. The farmer/storekeeper gets readily prepared information about insect species, an indication about the level of infestation, suggestions for the next steps and can decide on the most suitable treatment. Therefore, treatment can start earlier, hotspots, damage, and succeeding losses can be prevented.

Additionally, the introduction of parasitoids via the tube system will be tested. This could facilitate the access to the area of infestation and could increase the efficacy of biological control. This is especially important for organic farmers that cannot use chemical treatments.

The aim of the project is a ready to use acoustic early detection system for storage pest insects that farmers/storekeepers can run permanently in their grain storage to reduce losses due to infestation.

Innovative approach

The "Beetle Sound Tube"-System is the combination of tubes in which insect sounds are focused and an acoustic system that records and analyses the signals. While the surface of an acoustic sensor buried in grain could only detect insects in the close vicinity of the sensor, the surface of the tube increases the area in which signals can be detected significantly. The metal tubes work simultaneously as insect traps, which increases the chance to record infestation at a very early stage even further. The sounds of insects next to and inside the tube are recorded by a high sensitivity microphone located inside the tube. The signals will be analyzed automatically by a specialized software providing information about species and number of signals.

The innovative approach is the use of tubes to increase the area of detection and the automatic analysis of sounds. The "beetle sound tube"-system shall provide farmers and storekeepers with information about insect species and pest density that will be combined with suggestions for control treatments.

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Strategische Landnutzung

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- > BayWa AG Luckau
- > Biologische Beratung Prozell und Schöller GmbH
- > Biohof SteinReich
- > BKF Belziger Kraftfutter GmbH
- > FÖL- Fördergemeinschaft Ökologischer Landbau Berlin-Brandenburg e.V.
- > Gut Schmerwitz GmbH & Co. KG
- > Julius Kühn-Institut (JKI)
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