



Tropentag, September 14-16, 2022, hybrid conference

“Can agroecological farming feed the world?
Farmers’ and academia’s views”

Microbiological safety of farmed and wild harvested edible insects from East Africa

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Abstract

Africa still lacks behind in terms of meeting its food security goals and food availability is often seasonal. Edible insects are part of the seasonal available diet in most communities within the savannah grasslands and forests. Locusts, grasshoppers, dung beetle larvae and termites are commonly harvested from the wild in Africa, while crickets and black soldier fly farming is widespread. Edible insects are highly perishable and traditional techniques like smoking, salting, frying, and sun drying used for preservation often leads to spoilage. Reports of increased diarrhea are well-documented during insect swarming, however, data on the contamination of insects with pathogenic and antibiotic resistant bacteria are rare. We therefore aimed to analyse the occurrence of these pathogens in 23 insect and six frass samples from different regions and production sites in Kenya, Uganda and Tanzania. *Salmonella*, diarrheic *Escherichia coli*, *Staphylococcus aureus* and *Bacillus cereus* (s.l.) were analysed. A questionnaire was used to collect information about the source of the insects; persons involved in the collection; processing techniques and process flow description. Initial results revealed a wide diversity, with the total aerobic bacterial count ranging from 10^2 to 6.3×10^9 CFU per gram of dried and powdered insect samples and from $<10^2$ up to 10^{10} CFU per gram frass. Coliform bacteria were detected in 9 of 23 insect and two of six frass samples, and *Bacillus cereus* (s.l.) species were detected in 20 of 23 insect samples with a maximum of 2×10^8 CFU/g in a cricket sample. Moreover, *staphylococci* were detected in 7 of 23 insect and five of six frass samples. The dung beetle samples contained the highest coliform load (n=3; $> 5 \times 10^4$ CFU/g). The ongoing detection and characterisation of pathogenic and antibiotic resistant bacteria will enlighten distribution and contamination of edible insects according to their source and harvesting style. This knowledge would help to increase the acceptance of edible insects.

Keywords: Antibiotic resistant, food safety, food security, pathogenic, preservation, protein