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“Filling gaps and removing traps  
for sustainable resource management”

## Potential of Edible Insects to Combat Hidden Hunger in Sub-Saharan Africa

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### Abstract

Edible insects are gaining attention as an alternative food source to fish and livestock. However research has mainly focused on the protein content of edible insects, while their micronutrient content and thus their potential to combat hidden hunger, is far less studied. Therefore, edible insects, commonly consumed in Kenya and Uganda, two countries, which show a high risk to suffer from hidden hunger, were collected. Samples included long horned grasshoppers (*Ruspolia differens*), crickets (*Gryllus bimaculatus*), as well as several kinds of caterpillars (*Gonimbrasia zambesina*, *Cirina forda*). If available, samples were collected fresh and processed, e.g. boiled or fried, to account for possible losses during processing. Samples were analysed for selected (pro)vitamins (riboflavin, carotenoids) via HPLC and for dietary minerals (e.g. iron and zinc) measured either by ICP-MS or ICP-OES. To ensure consumer safety, levels of heavy metals were also analysed, using either ICP-MS or atomic absorption spectrometry.

All analysed samples showed high contents of riboflavin (1.18–3.11 mg/100 g dried sample material). Grasshoppers analysed with their wings on contained remarkably higher amounts of lutein, zeaxanthin and beta-cryptoxanthin compared to their plucked counterparts. Beta-carotene was contained within all samples, ranging from 1.82 to 49.70 mg/100 g dried sample material contained in crickets. All analysed samples contained substantial amounts of iron (33.05–1078.57 mg kg<sup>-1</sup> dried sample material) and zinc (49.91–131.88 mg kg<sup>-1</sup> dried sample material), and, surprisingly, also calcium (223.30–1458.99 mg kg<sup>-1</sup> dried sample material). All samples showed negligible levels of cadmium and mercury, but some had elevated levels of lead (0.10–3.15 mg kg<sup>-1</sup> dried sample material).

Therefore insects, consumed in Kenya and Uganda show great potential for delivering high levels of micronutrients in particular those related to hidden hunger.

**Keywords:** Alternative food sources, insects, malnutrition, micronutrients, nutrition