



Tropentag, September 14-16, 2022, hybrid conference

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

Heavy metals in Zambian fish as potential hazard for food safety and nutrition security

NILS NÖLLE¹, SVEN GENSHICK², KLAUS SCHWADORF¹, HOLGER HRENN¹, SONJA BRANDNER¹,
HANS KONRAD BIESALSKI¹

¹University of Hohenheim, Nutritional Science, Germany

²Deutsche Gesellschaft fuer Internationale Zusammenarbeit (GIZ), Zambia

Abstract

In Zambia fish is the main animal food source of the poor population, especially for women and children and has been shown to be a great source of micronutrients (iron, calcium, zinc) that are usually lacking in the Zambian diet. However, only limited information on the heavy metal contents of consumed fish species is available, despite heavy metal pollution being one of Zambia’s biggest environmental problems. As heavy metals are highly toxic even in small doses, eating heavy metal contaminated food has serious health outcomes in consumers. Therefore, this study aimed to elucidate the heavy metal contents of approximately 40 fish species in various kinds of processing to ensure both food and consumer safety.

Fish were collected from Zambian water bodies, where high levels of heavy metal contamination are documented, such as Kafue River, Lake Itzhi tezhi and Lake Kariba. Samples were prepared following local customs (big and medium fish fileted, small fish left whole) and analysed for cadmium and lead via ICP-MS (inductively coupled plasma mass spectrometry) as well as for mercury via AAS (atomic absorption spectrometry). Results were compared with legal maximum levels formulated either by FAO/WHO (lead, mercury) or EFSA (cadmium).

All analysed fresh samples were below the legal maximum levels for either heavy metal. Processed big and medium fish showed higher lead contents than their fresh counterparts, even than compared on a dry weight basis, but were still below the legal maximum level of 0.3 mg kg^{-1} . However, a sample of Mbubu (*Mormyrus lacerde*) and a sample of Nsuku (*Serranochromis robustus*) contained about 1.5 or 1.7 times as much mercury as the legal maximum level of 0.5 mg kg^{-1} . Regarding small, processed fish, two samples of dried Kapenta (*Limnothrissa miodon*) contained about double the amount of the legal cadmium levels of 0.1 mg kg^{-1} . One of these samples also contained about 1.5 times as much lead as the legal maximum level.

Thus, apart from these few samples with excessive heavy metal contents, fish from Zambia, were found to be generally safe for human consumption and should be strongly considered in strategies against micronutrient malnutrition.

Keywords: Fish, food safety, heavy metal contamination, nutrition security, Zambia