Mangroves, charcoal production and mercury pollution in Matang Mangrove Forest Reserve, Malaysia

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Estuary mangroves can act as an important sink for heavy metals via sediments and plant tissues. Among the heavy metals, mercury (Hg) is one of the most hazardous, due to its high toxicity, mobility and long persistence in the environment (Pirrone *et al*., 2010). Globally, the problem of Hg emission is of great concern for human health due to the increase of anthropogenic activities. In this work, we studied the Hg distribution in Matang Mangrove Forest Reserve (MMFR) in Malaysia to assess whether charcoal production and increasing human activities in the vicinity can raise the Hg pollution and consequently risk to the environment and humans. Limitations such as no regular monitoring on metal concentration and very few scientific studies on Hg at MMFR, makes the present study highly relevant.

The main objectives are to evaluate Hg pollution level in different mangrove plant tissues and surface sediments and investigate if there is any concentration gradient from plausible point sources to the river mouth. To achieve this result, we sampled leaves (in four stages – young, mature, senescent and decomposing), bark and roots of the dominant species *Rhizophora apiculata* (Blume) for up- and midstream sampling sites and of *Rhizophora mucronata* (Lamk.) for two downstream locations; sediments from both the river bank and the inside of the forest; gastropods of the species *Cassidula aurisfelis* (Bruguiere) and cockles of the species *Anadara granosa* (Lamk.). Sample preparation was done by freeze-drying and grinding the samples to fine powder with mortar and pestle.

The concentration of Hg in each sample was detected using a mercury analyzer MA3000 (Nippon Instruments Corporation, Japan). Among the plant tissues, leaves showed relevant Hg concentration, ranging from (12.9±3.8) µg/Kg to (30.3±6.4) µg/Kg for mature leaves and from (31.3±3.9) µg/Kg to (42.6±7.4) µg/Kg for senescent and decomposing leaves, from which we might suggest a major influence of atmospheric deposition instead of water flow on the input of Hg. Geo-accumulation index calculated from the sediment data shows that all sites can be considered as unpolluted, indicating limited impact on Hg pollution from the human activities upstream, resulting also in safe consumption for cockles cultured in the estuary (being the measured Hg values below the permissible limit of 500 µg/Kg according to EC regulation no. 466/2001).

Perhaps future scientific investigation like detailed analysis of the smoke composition from the charcoal factories and analysis on other heavy metals in the mangroves might be able to provide more insights on the environmental impact(s) of charcoal production in the nearby area.

References

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