Phytoliths in *Miscanthus sinensis* and rice straws: a comparative study

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A classification of energy crops on the basis of their inorganic constituents (e.g., alkali elements, metalloids including Si, heavy metals) is needed to evaluate the critical role these components play during combustion and, later, when the ashes are used as fertilizer or as secondary raw material, or when they are released into the environment. The aim of this study is to characterize and compare the silica phytoliths in *Miscanthus sinensis*—a grass species cultivated for biomass combustion— and rice straw, their dry extracts, and in the ash produced under different combustion conditions. The Miscanthus cyclone ash was generated by the semi-industrial (400 kW) burning of the crop, whereas rice straw was combusted in a domestic multi-fuel boiler (REKA, 40 kW). This comparative study was conducted by using fluorescent and white-light microscopy, in combination with environmental scanning electron microscopy (ESEM) on the entire sample pool. Phytoliths were found in the dried plant material as well as in the dry extract, and in the ashes from combustion of *Miscanthus sinensis* and rice straws. The phytoliths ranged in size from 10 to 30 μm. Phytolith morphology was variable, but most common were nearly-spherical, elongated ellipsoid, bilobate and trilobate structures. Energy-dispersive X-ray spectroscopy (EDXS) was performed on bilobate and trilobate phytoliths in the starting material (straws), dry extracts, and ashes to investigate the possiblity of a compositional changes during the combustion process. We observed no change in the chemical composition of the phytoliths, which are composed almost entirely of silica. Release of phytoliths into the environment, emitted along with the flue gases, could contribute to the total suspended particles (TSP) in the atmosphere, with potential impacts on air quality and health.