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Background

Municipal grass cuttings are regularly mulched or composted, thereby stressing public budgets as well as the climate by the release of greenhouse gases. Utilisation of green cuttings in energy recovery is possible with adapted technology but municipalities shy away from taking advantage of this opportunity because of concerns about the heavy metal content of the material and related legal uncer-

tainties. For potential energy recovery biogas or IFBB technology (Integrated generation of solid fuel and biogas from biomass) is possible. To investigate these opportunities a 4-cut (biogas) and a 2-cut (IFBB) management is established.

Material and methods

At 10 sites within the city of Kassel, samples of roadside verge green cuttings were taken in 2013 (Fig. 1) from a 2-cut and a 4-cut regime to analyse the heavy metal content (Cd, Cr, Cu, Mn, Pb, Zn). Elemental concentrations were measured with ICP-OES in the raw material of the 4-cut regime as well as in the raw material of the 2-cut regime and after IFBB processing with a screw press of stainless steel containing Cr (standard machinery configuration).



Fig. 1. Experimental site in the city of Kassel.

Results

Cd and Pb could barely be detected (data not shown). Cr contents were lower than in common agricultural grass and Cu as well as Zn contents were slightly higher. Mn contents meet the agricultural reference value. All elements fall below the limiting value of DIN EN 14961-6 for herbaceous biofuels (Mn is not considered by the DIN, Fig. 2).

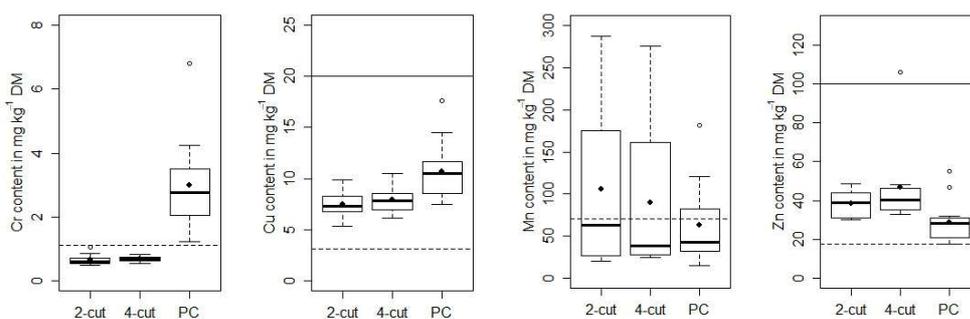


Fig. 2. Contents of Cr, Cu, Mn and Zn in mg kg⁻¹ DM with median (solid line in box) and arithmetic mean (full dot). Broken line indicates element contents of agricultural grass (Kabata-Pendias, 2011; Lindström *et al.*, 2013) and solid line indicates DIN EN 14961-6 limiting values (not shown for Cr (limiting value: 50 mg kg⁻¹ DM) and Mn (not considered by the DIN)). PC (press cake) indicates the combustible IFBB product.

Outlook

The heavy metal content (Cd, Cr, Cu, Mn, Pb, Zn) of roadside grass green cuttings of the city of Kassel is low in general. Thus, it is suggested to explore the economic and ecological conditions, which are necessary to successfully maintain green areas for energy recovery purpose.

References: DIN Deutsches Institut für Normung e. V. (2012) Solid biofuels - Fuel specifications and classes - Part 6: Non-woody pellets for non-industrial use, DIN EN 14961-6, Beuth, Berlin; Kabata-Pendias A. (2011) Trace elements in soils and plants, 4. ed, CRC Press, Boca Raton, 520 pp; Lindström B.E.M., Frankow-Lindberg B.E., Dahlin A.S., Wivstad M., Watson C. A. (2013) Micronutrient concentrations in common and novel forage species and varieties grown on two contrasting soils. Grass and Forage Science 68, 427–436.

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