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7. Assessment of contaminants in bokashi sampled from 76 pilots

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Introduction

Management of urban greenery and roadsides generates ca. 2 million tonnes of green waste in the Netherlands (RVO, 2014; BVOR, 2017), such as grass clippings, leaves and bark. These materials contain nutrients and organic matter, which could contribute to the maintenance of soil quality in agriculture and urban green spaces alike. However, the nutrient concentrations are quite low, and the biomass could contain contaminants, such as glass and plastic, heavy metals, PAHs or PFAS. If the biomass has to be disposed of it is legally regarded as biowaste (Directive 2008/98/EC) and is normally composted at certified facilities (Langsdorf et al., 2021). On-farm recycling of the biomass can reduce costs for transport and disposal. Recently, to improve the value of the biowaste, farmers are producing bokashi (Quiroz & Céspedes, 2019). Bokashi is made by anaerobically fermenting biomass after addition of specific microbial communities, water, clay, and lime. Bokashi has not been thoroughly studied yet, and it is not yet allowed to use bokashi from biowaste in the Netherlands, other than in pilots for research. In this study, the agronomic and environmental suitability of bokashi for agricultural use was investigated.

Methodology

Samples of bokashi and compost from roadside grass, leaves, or both, and untreated roadside grass were collected from 76 pilots throughout the Netherlands. The samples were subjected to a series of analyses, including analysis of nutrient contents, organic matter content, pH, electrical conductivity, C/N ratio, respiration rate, heavy metal contents, organic micropollutant contents, PFAS, pesticide residues, physical contaminants and weed pressure.

Results and discussion

Based on its nutrient concentration (sum of N, P_2O_5 and K_2O: <4% on average) and organic matter contents (~50% of the dry matter content), bokashi from leaves or roadside grass can be used as a soil improver, but generally have a low fertilising value. The heavy metal contents in bokashi were generally well below limits set for compost by both Dutch law and the EU Fertilising Products Regulation (FPR). Seven bokashi were investigated for organic pollutants and in all of these, mineral oil, PCB, PAH and/or dioxins were detected, but all contaminant concentrations were well below risk values as set in the Dutch Fertiliser Act for 'other organic fertilisers'. In every of these seven bokashi samples also PFAS were detected. No limits exist for PFAS in fertilisers or soil improvers in Dutch law or the FPR. For PFOA and PFOS, specific PFAS compounds, background values exist for Dutch soil, which were exceeded by two bokashi samples. Glass particles, stones and other physical contaminations such as plastic were found in 23, 102 and 33 samples, respectively, of the 166 bokashi samples investigated for physical contaminants. For physical contamination Dutch law sets a maximum of 0.5% on fresh matter basis, which was exceeded only by two bokashi samples. The weed pressure in bokashi was generally low (0-1 seed/L).

Conclusion

The studied bokashi do not exceed the limits for contaminants that are set for compost. Agronomically, the bokashi are suitable as soil improvers as they contain sufficient levels of organic matter. Environmentally, the main point of attention is physical contamination, especially from stones, glass and plastic.

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