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Effect of drying, composing and pelletizing of biowaste-based digestates on providing water soluble nutrients and stabilizing iron-cyanide (Fe-CN) complexes

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With recent policy developments under the German Renewable Energies Law (Erneuerbare-Energien-Gesetz, EEG) and the German Waste and Recycling Law (Kreislaufwirtschaftsgesetz, KrWG) increase in organic waste utilization is expected, which can be utilized for the waste sites restoration. We present a novel application of organic amendments to reduce the mobility of iron-cyanide (Fe-CN) complexes and simultaneously promote vegetation. Two batches of digestates from anaerobic treatment of separately collected municipal organic waste in a two-stage semi scale biogas plant have been conditioned by a) drying, b) composting and c) pelletisation. To evaluate the influence of post-treatment of digestates on nutrient and carbon release and contaminants sorption, two batch experiments were conducted, using I) deionized water and II) potassium hexacyanoferrate (II) solution. Batch experiment I resulted in a considerably higher nutrient and carbon elution from dried digestates. Batch experiment II revealed the highest significant tot. CN conc. reduction using not composted, air dried (100%) and oven dried (82%) biowaste digestates. The FTIR analysis of dried and mortared digestate materials indicated Fe-CN complexation on inorganic (K₂Mn[FeII(CN)₆], NH₄Fe[FeII(CN)₆]) and organic constituents, and possibly formation of nitriles. In terms of rapid soil fertility enhancement and feasibility to decrease Fe-CN complexes mobility, air and oven dried fresh biowaste digestates revealed the highest efficiency.