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Effect of differently pelletized digestate on the plant growth of spring wheat

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In Germany, biowaste is used in more than 100 biogas plants and has increasing potential as a fermentation substrate. To optimise waste cycle management organic digestates should be redistributed and innovative products for soil amendment of agricultural areas could be developed. The BMBF-funded VeNGA project seeks to find answers on how to improve the properties of soil amendments produced from fermentation residues. Here, we report findings from our study that focuses on plant growth and soil development.

Within a three-month rhizotron experiment, the influence of differently prepared fermentation residues on the root development of summer wheat was investigated. The four variants of the prepared digestate (rolled pellet, pressed pellet, shredded, loose) were tested under constant conditions in the greenhouse on two soils with different textures (sandy and loamy-sand). All fermentation residues originated from the same batch and were composted before the preparation to ensure adequate hygienisation.

Depending on preparation type and soil substrate significant differences in root growth and root development have been observed. Plant growth was most intense in the rhizotron experiment with the loose digestate, indicating high nutrient availability due to the large surface area of the organic matter. Plant growth in the substrate with the rolled and pressed pellets was less pronounced, indicating a more persistent stability of the pellets. In rhizotrons applied with rolled and pressed pellets root growth into the mineral fabric was significantly lower in sandy substrate than in the loamy-sand. However, in the sandy substrate root growth within the rolled pellets was more intense than in the substrate with the pressed pellets. Obviously, the different production techniques of the pellets seem to have an influence on the rooting of the pellets and facilitate the long term stability of soil organic carbon. Furthermore, the comparison of the two different textures indicate, that sandy substrates benefit more from the positive effects of soil amendments on increased water retention than loamy substrates.