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Influence of phototrophic biofilms on nutrient availability in soil

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In the current times, the protection of the environment is becoming more and more important in all sectors. This also includes agriculture, which has to overcome particularly large hurdles in this respect, since on the one hand the world population is steadily increasing and thus more people have to be fed, but on the other hand the usable land is limited. Therefore, the yield must be increased, which is mainly done through the excessive use of mineral fertilizers, which are extremely energy-intensive to produce and are harmful to the environment. Therefore, natural, living fertilizers are searched that form a mutualism with crop plants. Thus, the problems of over-fertilization can be overcome. Cyanobacteria, ubiquitous phototrophic prokaryotes, are a possible source of biological fertilizer, mainly because of their ability to fix elemental nitrogen from the atmosphere and to release it in a usable form into the environment. Among other organisms, cyanobacteria are able to enter into symbiosis with plants, whereby not only nitrogen but also other nutrients or growth-promoting substances can be exchanged. Furthermore, cyanobacterial biofilms contribute to an improvement of the soil condition. By producing extracellular polymeric substances, which consist largely of polysaccharides, it can positively influence both soil aggregation and soil water retention and thus reduce soil erosion. In addition, the biofilm can also change the nutrient composition or availability in soils. Cyanobacteria thus represent a promising environmentally friendly alternative to traditional fertilizers.
Wheat is one of the most important food grains in the world, so this work investigates the co-cultivation of common wheat (*Triticum aestivum*) and cyanobacteria. Diazotrophic strains isolated from the temperate zone are used as cyanobacteria to investigate the effect of nitrogen fertilization by cyanobacteria on the growth of wheat. In addition, the influence on nutrient availability will be investigated by analyzing the pore water. Furthermore, it will be determined whether the use of cyanobacteria can lead to an increase in water retention in the soil. All experiments are conducted in typical agricultural soils for a complete growing season of wheat.

Participation

In-Person

References

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