

Session: Biofilm application

Influence of phototrophic biofilms on plant growth promoting properties of soil

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Due to a steadily increasing world population, the agricultural industry is facing more and more challenges. The increase in yields is mostly achieved through the excessive use of chemical fertilizers, which cause great environmental damage. Therefore, the search for biofertilizers that are completely degradable is an important area of research. Cyanobacteria, ubiquitous phototrophic prokaryotes, are a possible source of biological fertilizer, mainly because of their ability to fix elemental nitrogen 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. In addition to the direct effects of cyanobacteria on plant growth through the exchange of nutrients, there are also indirect effects resulting, for example, from a change in soil quality. For instance, the water retention capacity of soils can be increased by biofilms. Furthermore, the nitrogen fixation of the cyanobacteria can increase the content of biologically available nitrogen in the soil. The synthesis of extracellular polymeric substances (EPS) additionally increases the amount of organic carbon, whereby the EPS also leads to an increase in the aggregate stability of the soil. The growth of cyanobacteria on soil takes place in a surface-associated and air-exposed manner, which is why emerge photobioreactors are used for cultivation in this work. Changes in the cultivation parameters lead to a changed composition, e.g. with regard to the proportion of EPS, of the biofilm and thus also to a changed water retention capacity.

The aim of this work is to increase the water retention capacity of phototrophic biofilms and furthermore to investigate the influence of biofilms on the water retention of soils. Since the ability of the cyanobacteria to fix nitrogen is required for the subsequent use of the biofilms as biological fertilizer, only diazotrophic strains are used in this work.