Contribution ID: **751** Type: **Poster (+) Presentation**

Bacillus subtilis, A Plant Growth Promoting Rhizobacteria, Improves Soil Hydro-Physical Properties

Monday, 31 May 2021 19:35 (1 hour)

Bacillus subtilis is a well-known plant-growth-promoting-rhizobacteria (PGPR). It has been suggested that PGPR influences the hydro-physical properties of soil, but the mechanistic understanding of this is still scarce. As a stress-tolerant-bacteria, *Bacillus subtilis* can produce biosurfactant to create surface-tension and viscosity gradient and thus form and spread visco-elastic biofilm in order to cope with the fluctuating water conditions of the soil. This, in turn, can affect the hydraulic and interfacial properties of soil. Understanding the ecological significance of such a strategy and identifying some key missing links of the important physicochemical traits of EPS (Extra-cellular Polymeric Substances) and biofilm to soil physics and hydraulics were the motivation of this work. We conducted evaporation, percolation, and pellicle experiments on the wild-type and its EPS-knock out (eps-) and surfactin-knock out (sfp-) mutants-treated sands to identify key mechanisms responsible for EPS' (and PGPR's) potency on water retention. Our results show that EPS produced by the *Bacillus subtilis* can increase water retention of fine sands by reducing the upward (evaporation loss) and downward (percolation) flow of water. Interrupted capillarity, increased sorption and hydraulic decoupling are likely the causative mechanisms here. SEM-imaging and water repellency data suggest that the occurrence of hydraulic stability rather than mechanical stability in imparting such an outcome. Our study highlights the importance of flow-related variables of surface tension, viscosity, and water repellency to understand the water retention phenomena in a low Reynold's number condition. These research outcomes would contribute to the fundamental understanding of early-stage-biofim mediated hydro-physical changes of soil and thereby provide a scientific basis for developing biofilm strategies that could effectively manage soil-water in order to achieve sustainability in agriculture.

Time Block Preference

Time Block C (18:00-21:00 CET)

References

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Primary authors: KANIZ, Fatema (University of Delaware); Dr JIN, Yan (University of Delaware); Dr BAIS, Harsh (University of Delaware)

Presenter: KANIZ, Fatema (University of Delaware)

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