# Rapid Artificial Biocrust Development by Co-Inoculation of Clay and Cyanobacteria

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**Abstract**

The establishment of biological soil crusts is widely perceived as a main method to control ecological environment in arid and semi-arid regions. However, artificial biocrusts are insufficient to face with some stress from environment by using traditional established methods. Hence in this study, kaolin, a common clay mineral, was introduced as a stabilizer by mixing with *Microcoleus steenstruppi* of different mass ratios for inoculating onto sand to establish artificial biocrust. The results showed that the addition of kaolin exhibited a significantly positive effect on promoting biocrust formation, and accelerating the biocrust development. Moreover, the artificial biocrust from 1:500 (algae:kaolin) inoculant achieved the best performances with coverage of 98%, and thickness of 5.62 mm after 86 days of incubation. The highest contents of chlorophyll *a*, exopolysaccharides, and soluble protein were also observed in 1:500 mass ratio of algae:kaolin throughout the biocrust development process. As for the water retention performances, the results of contact angle, water drop penetration time (WDPT), and repellency index (RI) illustrated that biocrusts improve water utilization in kaolin-treated groups by delaying the time of water infiltration, especially in 1:500 group. After 86 days post inoculation, a series of common bacteria appeared in the biocrusts such as actinobacteria and acidobacteria and decomposed metabolites from cyanobacteria as energy source to supply their own life activities. This study gains new insights on clay minerals on biocrust development and puts forward a new approach for rapid artificial biocrust establishment to reverse desertification.

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