

Description of Additional Supplementary Files

File Name: Supplementary Data 1

Description: Metabolites detected in biocrust soil water.

File Name: Supplementary Data 2

Description: Metabolites detected in killed control biocrust samples.

File Name: Supplementary Data 3

Description: ANOVA results for killed control vs. active biocrust from 4 successional stages. A "1" in columns E-H indicate $p < 0.05$ (temporal patterns were significantly different)

File Name: Supplementary Data 4

Description: Distinct rplO genes identified and their corresponding taxonomic information and rpkm values across samples.

File Name: Supplementary Data 5

Description: Comparison of 16 ribosomal protein gene phylogenetic markers (between four biocrust metagenome-assembled genomes and their closest related isolates).

File Name: Supplementary Data 6

Description: Isolate exometabolomics versus biocrust soil water (metabolites whose temporal patterns were not significantly different from the killed controls were excluded).

File Name: Supplementary Data 7

Description: Binomial test of microbe-metabolite relationships

File Name: Supplementary Data 8

Description: Data obtained from Rajeev et al (2013) and categorized into relevant KEGG pathways. Values indicate fold change relative to dry biocrust (time 0).