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# The aeroterrestrial green alga Klebsormidium (Klebsormidiales, Streptohyta) shows different preferences for sandstone and limestone: Is pH an important factor for sympatric speciation?

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Geochemistry has a direct influence on the pH levels in biological soil crust communities. In the present study, we investigate 12 strains representing four different genotypes of the filamentous green alga Klebsormidium. The strains were isolated from sandstone and limestone rocks and were cultivated at five different pH levels ranging from pH 4 to pH 8. We determined the responses to the experimental pH conditions by (1) determining the growth rates after cultivation at different pH levels and (2) measuring the effective quantum yield of photosystem II upon cultivation in liquid media or on the surface of natural substrates. Our results showed a strong ecological differentiation of Klebsormidium clades. Strains isolated from two limestone clades showed the highest growth rates at pH 7 and pH 8 and had significantly lower growth rates at pH 4 and pH 5. Strains isolated from sandstone exhibited distinct growth responses. While clade E13 showed the highest growth rate at pH 6, strains from clade E1 showed almost identical growth rates at all investigated pH levels. In contrast, all investigated strains showed highest effective quantum yields of photosystem II at pH 8, the values were down-regulated at lower pH values. These results corroborate our hypothesis that sympatric speciation of terrestrial algae is driven by ecological divergence. We clearly showed that pH is a critical ecological factor that influences the diversity of autotrophic protists in terrestrial habitats.