Treatment of Simulated Acid Mine Drainage with Desulfovibrio Desulfuricans

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Acid mine drainage poses a major risk to the nearby ecosystems as the accompanying low pH and high metal content kill plants. Sulfate-reducing bacteria have the potential to remediate this drainage, but the effect of their amelioration on plants had not yet been tested. Simulated acid mine drainage was created with diluted sulfuric acid and dissolved iron, copper, and zinc. The sulfate-reducing bacteria Desulfovibrio desulfuricans was cultivated in an anaerobic environment on agar with the simulated drainage for treatment. Brassica rapa seeds grown in untreated drainage had a germination rate of 66% and a sprouting rate of 0%, while seeds in treated drainage had a germination rate of 98% and a sprouting rate of 19%. The treatment method increased the germination rate (X^2 (1, N = 100) = 34.68, $p < 0.00001$) and the sprouting rate (X^2 (1, N = 100) = 19.02, $p = 0.000013$). The germination rate in treated drainage was statistically no different than in water (X^2 (1, N = 100) = 2.02, $p = 0.155$), though the 96% sprouting rate in water was higher than in treated drainage (X^2 (1, N = 100) = 121.32, $p < 0.00001$). While the treatment did not remove all harmful effects, the number of seeds that were able to germinate in treated drainage was statistically indistinguishable from the number in water. The results indicate that treatment with sulfate-reducing bacteria, specifically Desulfovibrio desulfuricans, has the potential to be extremely effective at remediating acid mine drainage.

Awards Won:

Third Award of $1,000