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Functions of straw for *in situ* remediation of acidic mining lakes

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Abstract:

The addition of straw in combination with 'Carbokalk', a by-product from the sugar-industry, was successfully used to stimulate microbial alkalinity generation in an acidic mining lake. To get detailed information about functions of straw, an enclosure experiment was carried out. Straw bundles were placed at the sediment surface of an acidic mining lake (ML 111) and the physiochemical conditions and the microbiology of the sediment-water contact zone were studied. Straw was degraded by anaerobic microorganisms and dissolved organic carbon (DOC) leached from straw bundles. Pigmented flagellates responded to the DOC supply in the water column and a considerable amount of algal carbon was transported to the sediment. Straw addition led to microbial reduction of iron and sulfate in the sediment. Sulfate reduction was observed at a pH of 5.5. The pH, however, was not high enough to precipitate H₂S completely. Thus, some H₂S diffused into the water column, where it was reoxidized. Straw did not create or stabilize an anoxic water body above the sediment. Microbial sulfate reduction and pyrite formation only took place in the sediment, whereas iron reduction also took place in the straw. Straw, however, altered the flow conditions above the sediment surface and prevented complete mixing of the profundal water. Straw did not serve as a substratum for a reactive biofilm. We conclude that the most important function of straw for mining lake remediation is to be a long-term nutrient source for microbial alkalinity generation in the sediment.

Key-words: acidic mining lake, acid mine drainage, enclosure, iron reduction, remediation, straw, sulfate reduction