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Activation of soil enzymes by addition of artificial root exudate combinations

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In vegetated soils, plants naturally release root exudates, consisting of sugars, organic acids, and amino acids, into the soil increasing soil enzymatic activity. Liberty State Park, located in Jersey City, New Jersey, is an industrial brownfield contaminated with heavy metals and organic pollutants. Some sites have soils that function poorly, as indicated by low soil enzymatic activity, and do not support plant growth. This study will determine whether different combinations of artificial root exudates increase soil enzymatic activity in these contaminated and low functioning soils. Different combinations of sugars, organic acids, and amino acids and will be added to barren, poorly functioning soil. Three soil enzymatic activities will be examined at several time points over 120 days to assess the impacts of different combinations of root exudates on soil function. Further, soil microbial community composition will be determined to examine whether different artificial exudate solutions result in changes in soil microbial community. Preliminary results suggest that the combination of sugars, organic acids, and amino acids greatly increased phosphatase, cellobiohydrolase, and L-leucine amino peptidase activity over time in poorly-functioning, barren soil from Liberty State Park. The other combinations (sugars and organic acids, sugars and amino acids, organic acids and amino acids) also increase the three enzyme activities more than the individual groups. Dormant microbes in barren soil can possibly be revived with the addition of artificial root exudates to mimic the presence of plants in revitalizing the microbial communities and improving soil function.