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Plant-mediated transfer of CO_2 to aquifers as influenced by crushed concrete waste

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The global flux of CO_2into the groundwater is <1 % of the diffusion flux of CO_2 out of soils. The potential for CO_2storage in aquifers is investigated as a strategy to mitigate increasing atmospheric CO_2concentrations. Concrete production accounts for 7 % of the global CO_2emissions. Concrete waste is a major source of base cations that are potent soil pH elevators. The amount of CO_2 dissolved into the groundwater increases in response to high initial pH and high partial pressure of $CO_2(pCO_2)$. Here we studied whether the addition of concrete waste to soil mesocosms would increase CO_2 transport to the groundwater. The upper 15 cm of soil in each of two mesocosms (19 x 83 cm) were mixed with 0, 78 or 212 t/ha crushed concrete. Mesocosms were planted with barley (*Hordeum vulgare* L. cv Anakin) and maintained in a controlled environment. PCO_2, soil moisture and temperature in the mesocosms were measured with depth and time. Dissolved inorganic carbon (DIC) in the groundwater was collected weekly and CO_2 exchange between the top of the mesocosm and the atmosphere was measured at regular intervals. Results showed that pCO_2 increased during growth of barley in all treatments. Application of concrete waste tripled the pCO_2 compared to the control and values as high as 23 vol.% CO_2were measured in the 212 t/ha treatment. The high pCO_2 in crushed concrete-amended soil was reflected in the ecosystem respiration that increased linearly with plant age. The increase in concrete-amendment from 78 to 212 t/ha produced a 30 % increase in the aboveground biomass of barley. Data will be presented to show that DIC storage in aquifers increased significantly in response to the addition of crushed concrete. If threshold values for xenobiotic compounds are not exceeded, soil incorporation of concrete waste could be a cheap and safe way to increase natural (plant-mediated) CO_2 storage in aquifers.