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Phototrophic Fe(II) oxidation takes place in organic rich environments

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Rhodopseudomonas palustris TIE-1, a phototrophic non-sulphur bacterium can utilize Fe(II) as an electron donor to generate reducing equivalents to fix CO_2 and build biomass. Additionally *R. palustris* TIE-1 can also grow photoheterotrophically with a variety of organic substrates like acetate, lactate, pyruvate, butyrate and glucose. However, it is unclear whether such organisms would conduct Fe(II) oxidation in environments with abundant organic substrates. To investigate the contribution of anoxygenic phototrophs to the iron cycle in organic-rich environments, we tested the substrate preference of *R. palustris* TIE-1. In batch experiments *R. palustris* TIE-1 was incubated with $FeCl_2$ and an additional organic substrate. Experiments were conducted both in the presence and absence of an external CO_2 source i.e with either HCO_3^- or PIPES buffer. With PIPES buffer only the organic substrates acetate, lactate and pyruvate were consumed. When CO_2 was present, iron and all organic substrates were consumed but the timing and rates of consumption were substrate-dependent. With acetate, butyrate and pyruvate sequential consumption and with lactate and glucose simultaneous consumption with iron were observed. The presence of Fe also accelerated the consumption rate of the organics, especially lactate. The presence of an organic substrate had no impact on iron mineralogy. This study demonstrates that Fe(II) oxidation proceeds in the presence of organics, and that Fe(II) is even beneficial in a number of scenarios.