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HCO_3^- enrichment causes cytosolic NO_3^- efflux in *Posidonia oceanica* leaf cells

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Posidonia oceanica (L.) Delile is a seagrass, the only group of vascular plants to colonize the marine environment. Seawater is an extreme yet stable environment, characterized by high salinity, alkaline pH and low availability of essential nutrients, such as nitrate or phosphate. In addition, in aquatic environments the supply of CO_2 for the photosynthesis is limited by diffusion and therefore many aquatic plants use HCO_3^- as the inorganic carbon source for photosynthesis. Our previous results have shown that Na^+ -dependent transport systems operate on the plasma membrane of *P. oceanica* mesophyll leaf cells for the high-affinity NO_3^-, Pi or amino acids uptake (Rubio *et al.*, 2018). In addition, a direct transport of HCO_3^- driven by H^+ has been found in this species that provides inorganic carbon for photosynthesis and could be a significant component of a carbon concentrating mechanism in this species (Rubio *et al.*, 2017). Interestingly, this HCO_3^- direct uptake caused the efflux of chloride from the cytosol, probably through *S*-type anion channels, pointing that other anions could also be removed from the cytosol (Rubio *et al.* 2017). This hypothesis could be relevant in the case of NO_3^-, since the decrease of cytosolic NO_3^- in response to HCO_3^- enrichment could limit N-assimilation. Here we analyse the effect of HCO_3^- increase on NO_3^- uptake and cytosolic homeostasis in *P. oceanica*. Enrichment of natural seawater with 3 mM HCO_3^- evokes the on-going decrease of cytosolic NO_3^-, from 5.7 ± 0.2 to 4.8 ± 0.7 mM after 40 min of treatment. On the other hand, the incubation of *P. oceanica* leaf pieces in natural seawater enriched with 3 mM HCO_3^- for 30 min causes an initial increase of NO_3^- concentration in the medium. Maximum efflux (21 nmol NO_3^- g_{FM}^{-1} min^{-1}) occurs within the first minute of incubation. Then, external NO_3^- is depleted from the medium at lower net uptake rate (4 ± 0.7 nmol NO_3^- g_{FM}^{-1} min^{-1}) than the value observed in non HCO_3^- -enriched natural seawater (10 ± 0.3 nmol NO_3^- g_{FM}^{-1} min^{-1}). These results also fit the hypothesis that natural seawater HCO_3^- enrichment causes the nitrogen loose from *P. oceanica* leaf. Thus, the chronic diminution of cytosolic NO_3^- concentration could impair nitrogen assimilation and would contribute to the N biomass dilution expected under elevated inorganic carbon (Taub and Wang, 2008).

References.
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