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EFFECT OF SEAWATER INORGANIC CARBON ENRICHMENT ON NO_3^- TRANSPORTER AND REDUCTION ENZYME GENE EXPRESSION IN *ZOSTERA MARINA* LEAVES

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Abstract: CO_2 concentration has increased over the past 200 years and is expected to continue rising. In seawater, the increase of dissolved CO_2 has led to a decrease in pH, changing the inorganic carbon chemical speciation to increase HCO_3^-. Seagrasses are the only vascular plants that colonized the marine environment, developing the capacity to use bicarbonate as a source of carbon for photosynthesis (Beer *et al*., 2002). In *Posidonia oceanica* the direct uptake of HCO_3^- through a H^+ symporter and its subsequent dehydration renders CO_2 for photosynthesis, but alters cytosolic anion homeostasis promoting the cytosolic nitrate leak (Rubio *et al*., 2017; Rubio *et al*., 2020). Therefore, under increasing dissolved HCO_3^- conditions the cytosolic NO_3^- diminution could induce the N biomass impoverishment shifting the expression pattern of nitrate transporters in seagrasses. *Zostera marina* genome, the first fully sequenced from a marine angiosperm, reveals lost of important vascular plants innovations but less than 20% as specific gene families (Olsen *et al*., 2016). Thus, key physiological adaptations to thrive in seawater, characterized by a low concentration of NO_3^-, seem to be due to molecular changes of the same family genes rather than the speciation of pre-existing genes. This could be the case for the high-affinity nitrate transporters, sodium driven high-affinity transport unique among vascular plants (Rubio and Fernández, 2019). In this work we have analysed the gene expression levels related to cytosolic nitrate homeostasis, including transporters and enzymes, in leaves of *Z. marina* plants incubated in high HCO_3^- or in the absence of N. Overall gene analysed, expression levels of *ZosmaNTR2*, the only gene quoted as a high-affinity nitrate transporter belonging to NRT2 family in *Z. marina* genome (Rubio *et al*., 2019), as well as its regulatory protein *ZosmaNAR2*, were induced in both conditions. Interestingly, expression levels of such genes were higher than the obtained for *ZosmaCHL1* (*ZosmaNPF6.3*), which expression was lower in N-replete plants, but did not vary in response to HCO_3^-. These results suggest that the induction of the expression of the NO_3^- high-affinity transporter *ZosmaNRT2* and its regulatory protein *ZosmaNAR2* are the main response for the cytosolic NO_3^- decrease in both N-deficiency or in C-enrichment.

Key words: *Zostera marina*, HCO_3^- enrichment, *ZosmaNRT2* expression levels.

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