**Na**\(^+\)-dependent **NO**\(_3^-\) uptake in leaf cells of the seagrass *Posidonia oceanica* L. Delile

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*Posidonia oceanica* (L.) Delile is an endemic Mediterranean seagrass of recognized ecological significance and, as other seagrasses, this species has secondarily adapted to live in the marine environment. In this alkaline medium with a high Na\(^+\) concentration (0.5 M), the high inwardly directed electrochemical potential gradient for sodium is used in the seagrass *Zostera marina* to energize the uptake of nitrate\(^1\) and phosphate that usually occur at concentration below 10 \(\mu\)M. Here we summarize several evidences for the operation of a sodium-dependent high-affinity nitrate transport system at the plasma membrane of the mesophyll leaf cells of *P. oceanica*.

Leaf cells of *P. oceanica* possess a H\(^+\)-ATPase as a primary pump, exhibit a plasma membrane potential (\(E_m\)) of -174 ± 10 mV and show reduced Na\(^+\) permeability. The addition of micromolar nitrate concentrations induces membrane depolarizations that show saturation kinetics. Curve fitting of the values renders a semisaturation constant (\(K_m\)) of 21.3 ± 6.6 \(\mu\)M and a maximum depolarization (\(D_{max}\)) of 7 ± 1 mV. In dark conditions, \(D_{max}\) decreases by fifty percent but no significant effect is observed on the \(K_m\) value. On the other hand, nitrate induced depolarizations show sodium dependence. The depolarizations induced by 100 \(\mu\)M **NO**\(_3^-\) in media containing increasing Na\(^+\) concentrations (from 0 to 250 mM) show saturation kinetics, rendering a \(K_m\) value of 16 ± 5 mM Na\(^+\). Moreover, the depolarization induced by 100 \(\mu\)M **NO**\(_3^-\) is accompanied by a simultaneous increase of cytosolic sodium, measured by Na\(^+\)-sensitive microelectrodes, of 0.4 ± 0.2 mM above the resting cytosolic sodium concentration (17 ± 2 mM).

Finally, nitrate uptake rates, measured in depletion experiments, decreases by 50% and 80% in dark conditions and in the absence of Na\(^+\), respectively, compared with control conditions (0.5 M Na\(^+\) and light).

All together, these results strongly suggest that **NO**\(_3^-\) uptake in *P. oceanica* leaf cells is mediated by a high-affinity nitrate carrier that uses Na\(^+\) as the driving ion.


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