CHLORIDE NUTRITION AT MACRONUTRIENT LEVELS REGULATES PLANT DEVELOPMENT, WATER BALANCE AND DROUGHT RESISTANCE OF TOBACCO PLANTS

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Chloride (Cl^-) is considered to be a strange micronutrient since actual Cl^- concentrations in plants is 10-100 times higher than the content required as essential micronutrient, (Marschner, 1995; Brumós et al, 2010), whereas all the other mineral micronutrients (B, Cu, Fe, Mn, Mo, Ni, Zn) are present at much lower concentrations in plant tissues (1-5 orders of magnitude below). Since Cl^- uptake and transport is an energetically expensive process (White and Broadley 2001; Brumós et al, 2010), we propose that Cl^-, when accumulated to concentrations typical of the content of a macronutrient, plays a poorly understood biological role, not critical under normal growth conditions. Since Cl^- appears to be particularly well suited to accomplish osmoregulatory functions, the proposed biological role could be related to the regulation of water balance at both the cell and the whole plant level.

There is little experimental evidence in this regard since: i) it is unclear in which extent Cl^- is specifically required to fulfil osmoregulatory roles or whether other anions, like nitrate, phosphate, sulphate, and organic acids can replace chloride in such functions; ii) usually the role of Cl^- is not adequately differentiated from that of their accompanying cations; iii) the concepts linking Cl^- homeostasis with osmotic/turgor regulation have been frequently discussed in the context of halophyte species and in glycophytes under salt stress conditions (Flowers et al, 1988), what have led to some confusion in the context of Cl^- nutrition. We intend to establish the role of Cl^- in glycophyte plants when accumulated to macronutrient levels, and we will present results showing that under non-saline conditions (1-5 mM external Cl^- concentrations) and no water limitation, Cl^- specifically promotes the growth of tobacco plants through mechanisms regulating leaf cell elongation and water relations. Furthermore, under water deficit conditions, Cl^--treated plants exhibit drought resistance due to the sum of stress avoidance (reduced estomatal water loss) and tolerance (probably ue to higher solute accumulation) mechanisms.

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