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CHLORIDE NUTRITION AFFECTS ROOT ARCHITECTURE DURING EARLY VEGETATIVE DEVELOPMENT IN TOBACCO AND TOMATO PLANTS

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Abstract:

Chloride (Cl^-) is an anion that participates in key processes for plants, such as photosynthesis and osmotic regulation[1]. Cl^- has recently been defined as a beneficial macronutrient for higher plants, due to the stimulation of plant growth, inducing morphological and cellular changes that include the stimulation of leaf cell size, reducing stomatal conductance and inducing additional osmolarity and turgor in adult tobacco plants. Thus, Cl^- generates bigger plants with better water and nitrogen use efficiency and, as a result, a better photosynthetic performance[2,3].

Roots are in charge of searching for water and nutrients which are essentials for plant development and growth. Nutrients distribute to the rest of plant organs via the vascular system, being regulated by complex hormonal mechanisms[4]. Although some proteins regulating Cl^- homeostasis (e.g. Cation-Chloride Cotransporter) have been reported to be important for root cell elongation[5], little is known about the effect of Cl^- nutrition on root developmental processes during early vegetative growth.

To this aim, in this work tobacco and tomato seeds were sown under greenhouse conditions and seedlings were harvested at different developmental stages, from 8 to 35 days after sowing. A Cl^- treatment (5 mM of Cl^- salts) was supplemented to the basal nutrient solution, and a treatment with a mix of sulphate+phosphate salts (SP) with the same cationic content was used as a control. Afterwards, biomass and root system architecture (RSA) parameters (primary root length, number and length of lateral roots) were analysed by using 'ImageJ' and 'Optimas' software.

Results from this work showed that the Cl^- treatment generated bigger plants with longer primary roots and shorter lateral roots during the early vegetative development. These effects may be caused by higher cell size or division during the root development, with a possible effect on hormonal regulation. Therefore, these root architecture changes are particularly relevant during early vegetative development, allowing to Cl^--fertilized crops

with longer roots to reach deeper zones in the soil with more water and nutrients and, consequently, helping to withstand drought periods that are increasingly more frequent because of climate change.

Key words: Chloride, Beneficial macronutrient, Root architecture, Early vegetative stage

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