Anatomical and Ultrastructural Alterations in Leaves and Roots of Tomato Plants (*Lycopersicum esculentum*) Related to Aluminum Toxicity

Capaldi, F.R.[1]; Rossi, M.L.[2]; Martinelli, A.P.[2]; Peres, L.E.P.[3]; Azevedo, R.A.[1]
[1]Dep. Genética, Escola Superior de Agricultura Luiz de Queiroz, Universidade de São Paulo, Piracicaba/SP, Brasil, Lab. Biotecnologia Vegetal, CENA/USP; [3]Dep. Ciências Biológicas, ESALQ/USP.

Aluminum (Al) is one of the most abundant elements on the earth's crust. In acid soils, its availability increases causing toxicity, initially evidenced by the interruption of root growth. Plants exposed to Al can generate excessive reactive oxygen species, oxidative damage to cellular metabolism, such as lipid peroxidation and even cell death. We evaluated Al toxicity in tomato plants cv. Micro-tom subjected to 5.0 mM $AlCl_3$ in hydroponics, considering ultrastructural aspects of leaves and roots, lipid peroxidation and growth analysis. After 15 days of exposure, analysis in root cross sections showed a decrease in root diameter and moderate disruption of cell layers, mainly in the cortex and epidermis. After 25 days there was intense disruption in root cell layers. In leaves, after 15 days, structural differences in the mesophyll, mainly in the palisade and spongy parenchyma of leaves from plants submitted to Al were identified, alterations in cellular size and form with consequent reduction in the intercellular spaces that may be related to cell death or changes in cell expansion. In these leaves we observed lower presence of starch grains and increase in plastoglobuli and mitochondria, when compared to the control. After 25 days, severe changes were observed in chloroplasts with thylakoid and stroma disorganization and increase of plastoglobuli. In addition to the damage in the root system, there was an effect of Al in the aerial part of the plants, causing changes in cell ultrastructure, lipid peroxidation and decrease of plant growth and biomass production.

Key-words: Al toxicity, abiotic stress, hydroponics, microscopy, ultrastructure, chloroplasts, tomato.

[Financial Support: FAPESP, CNPq]