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Assimilate partitioning towards the roots at increased nutrient solution concentration affected by tomato fruit size and origin

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To improve tomato quality nutrient solution concentration (electrical conductivity, EC) is increased. One reason for an enhancement is the raised carbon assimilate influx into fruits. This results in an increased root/shoot ratio. The literature indicates that average root size is diminished in modern cultivars compared with landraces, tomato included. Therefore, we wanted to test the hypothesis if dry matter partitioning towards the roots is reduced in newly bred cultivars also at higher EC levels. Four modern greenhouse cultivars and four landraces selected for their fruit size. EC in the effluent solution was controlled at 2 and 9 dS m-1. Total dry mass production amounted to 550 g plant-1 after 100 growing days. Neither EC nor cultivar significantly influenced dry mass produced. Ratio of vegetative to generative plant parts was manifold higher for the newer cultivars (1.0 g g-1) compared with the landraces (7.4 g g-1). Though, EC levels did not influence the ratio (4.8 g g-1). Root/shoot ratio and thus dry matter partitioning toward the roots was significantly enhanced at the higher EC level. Landraces had also a significant higher root/shoot ratio compared with modern cultivars. No treatment interactions were determined for the allometric relationships. Root dry mass portion related to the total plant dry mass decreased with plant age (beginning: 30 %; end: 10 % and 15 % at EC2 and EC 9). Results indicate that modern cultivars have really smaller root systems compared with landraces. However, a higher supply of nutrients counteracts the reduction of smaller root systems of new cultivars. Thus, regulation of dry mass partitioning in response to EC establishes or restores allometric growth among plant parts and functional balance between the supply and use of carbon in a way that tomato root systems at higher EC levels can better encounter stress conditions.

Keywords: electrical conductivity, Lycopersicon esculentum, landraces, root size, shoot/root ratio