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Sugar Accumulation along the Seminal Root Axis, as Affected by Osmotic Stress in Maize: A Possible Physiological Basis for Plastic Lateral Root Development

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Abstract: We assumed that allocation of photosynthate is one of the main factors that regulate lateral root development in root systems under water deficit conditions. Six-days-old maize seedlings were exposed to osmotic stress (-0.21 MPa). Then, the sugar content of the 10 mm segment of seminal roots sampled successively along the root axis was examined in relation to the development and elongation of lateral roots at 0, 1 and 2 after the start of the stress treatment. In the basal 0-40 mm region of the seminal root, lateral roots emerged before the stress treatment, but further initiation and elongation of lateral roots in this region was inhibited by the stress treatment. In contrast, in the region more than 40 mm distant from the base of the seminal root, lateral roots emerged after the start of stress treatment and their development was not influenced or was slightly promoted by the stress treatment as compared with the control plant. The concentrations of glucose and sucrose were determined for every 10 mm segment along seminal root axis. The concentrations of glucose and sucrose tended to increase acropetally, and were increased by the stress treatment, especially in the apical 50-mm portions in both roots sampled after 1 day and 2 days of the stress treatment. On these root portions, while lateral roots had not yet developed when the root was sampled, lateral roots were initiated and they elongated one or two days later. These facts suggest that the accumulation of glucose and sucrose promoted lateral root development, and as a result, canceled the inhibitory effects of stress treatment, and thereby sustained lateral root development under osmotic stress conditions.

Keywords: [Elongation](#), [Glucose](#), [Initiation](#), [Lateral root](#), [Osmotic stress](#), [Plasticity](#), [Sucrose](#), [Zea mays](#)



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