ONLINE ISSN : 1349-1008
PRINT ISSN : 1343-943X

Plant Production Science
Vol. 9 (2006) , No. 1 27-38

Root Osmotic Adjustment under Osmotic Stress in Maize Seedlings. 1. Transient Change of Growth and Water Relations in Roots in Response to Osmotic Stress

Atsushi Ogawa[1)] and Akira Yamauchi[2)]

1) Department of Biological Production, Akita Prefectural University
2) Graduate School of Bioagricultural Sciences, Nagoya University

(Received: March 25, 2005)

Abstract: The transient changes in seminal root elongation rate, osmotic potential, water potential, and turgor pressure in maize after the onset of stress treatments were examined using polyethylene glycol 6000 to evaluate the process of osmotic adjustment in root. Maize seedlings were exposed to different intensities of osmotic stress for 1, 3, 5, 10, and 20 minutes, and 2, 6, 12, and 24 hours. Seminal roots shrunk immediately after the onset of the -0.41 and -0.89 MPa stress treatments, due to dehydration. However, roots gradually resumed elongation from 5 minutes after the onset of the stress treatment. The osmotic potential in the root elongating zone dropped drastically with the onset of stress followed by a gradual decrease for 6 hours. We quantitatively analyzed the relative importance of the factors that contributed to the reduction of osmotic potential, and found that 46% reduction of osmotic potential was caused by tissue dehydration and 54% by solute accumulation 20 minutes after start of -0.89 MPa treatment. At hour 12, however, only 7% reduction of osmotic potential was caused by tissue dehydration and 93% by solute accumulation. In the root elongating zone, turgor pressure decreased immediately after the onset of the stress treatment due to the larger decline of water potential than that of the osmotic potential. However, from minute 20 onwards, turgor pressure started to recover due to osmotic adjustment. These results indicated that osmotic adjustment develops immediately after exposure to osmotic stress, especially in the root elongating zone, and substantially contributed to the maintenance of turgor pressure and root growth.

Keywords: Elongating zone, Elongation rate, Osmotic adjustment, Osmotic potential, Root, Turgor pressure, *Zea mays* L.

To cite this article:

Atsushi Ogawa and Akira Yamauchi: “Root Osmotic Adjustment under Osmotic Stress in Maize Seedlings. 1. Transient Change of Growth and Water Relations in Roots in Response to Osmotic Stress”. Plant Production Science, Vol. **9**, pp.27-38 (2006) .

doi:10.1626/pps.9.27

JOI JST.JSTAGE/pps/9.27