Contribution ID : **148** Type : **Oral**

Aluminum (Al) accumulates within the root apoplast in an Al-tolerant wheat cultivar

Friday, 25 November 2016 12:00 (15)

Acid soils comprise ca. 4 billion ha of the global ice-free land or ca. 40 % of the world's arable land. In these acid soils, the elevated solubility of Al-containing minerals results in increased concentrations of Al in the soil solution. Soluble Al is highly toxic to root growth, reducing elongation of roots in as little as 5 min due to an inhibition of wall loosening as required for cell elongation. Some plant species tolerate high levels of Al by releasing simple organic ligands (such as malate) to complex Al and reduce its toxicity. It is known that the secretion of malate from wheat roots occurs rapidly (within 15 min), increases with increasing Al concentration, and occurs largely from the apical 3-5 mm of the root. However, it remains unclear whether complexation of Al actually occurs within the rhizosphere or whether it occurs within the root tissue itself. We utilized low energy X-ray fluorescence (LEXRF) to examine the distribution of Al within root apices of two near-isogenic lines (NILs) of wheat (ET8 and ES8, being tolerant and sensitive, respectively) that differ ca. 15-fold in their tolerance to Al. When grown in solutions containing Al at concentrations resulting in a 50 % reduction in RER over 48 h (i.e. 3.5 μM Al for ES8 and 50 μM for ET8), concentrations of Al in the root apical tissues were ca. 4- to 6-times higher for ET8 than for ES8 despite the magnitude of the reduction in RER being the same. Of particular interest, we compared ES8 and ET8 at Al concentrations causing similar reduction in growth, and it was noted that the distribution of Al within the rhizodermis and outer cortex was similar – most Al was located within the cell wall in all instances. In the present study, we have shown that the ability of the Al-tolerant wheat NIL, ET8, to grow at elevated Al concentrations results not only from a reduction in Al concentrations within the root tissue due to the complexation of Al by malate external to the root (i.e. within the rhizosphere).

Keywords or phrases (comma separated)

Are you a student?

No

Do you wish to take part in</br>the Student Poster Slam?

No

Are you an ECR? (<5 yrs</br>since PhD/Masters)

No

What is your gender?

Prefer not to say

Primary author(s) : Dr KOPITTKE, Peter (The University of Queensland)

Co-author(s) : Dr GIANONCELLI, Alessandra (Elettra – Sincrotrone Trieste); Dr MCKENNA, Brigid (The University of Queensland); Dr KARUNAKARAN, Clithra (Canadian Light Source); Dr KOUROUSIAS, George (Elettra – Sincrotrone Trieste); Dr DYNES, James (Canadian Light Source); Dr MENZIES, Neal (The University of Queensland); Dr BLAMEY, Pax (The University of Queensland)

Presenter(s) : Dr KOPITTKE, Peter (The University of Queensland)

Session Classification : Concurrent Session 3: Imaging - Sponsored by MASSIVE

Track Classification : Imaging