Physiological and anatomical root traits conditioning drought tolerance in oats

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Under drought stress conditions plants reduce transpiration by closing stomata as a method to save water. However, stomata closure uncouple the electron flux for CO_2 reduction and promote oxidative stress and a decrease in carbon fixation and plant growth. As an alternative to cope with drought, some plants species follow another strategy according to which, plants exhibit higher stomata control showing lower sensitivity to evaporative demand and soil moisture, and allowing larger fluctuations in leaf potential, maintaining photosynthesis and avoiding oxidative stress. However, such strategy expose plants to a higher risk of xylem embolism. In this work, we studied the response to water deprivation of a drought resistance and a drought susceptible oat genotype. We observed that the susceptible genotype increased dramatically the abscisic acid reducing stomatal conductance. Despite this, leaf water potential decreased concomitantly due to a decrease in root hydraulic conductivity (total and per root length) in this genotype that showed early drought symptoms. By contrast, the resistance genotype, showed a mild and slow increase in abscisic acid that allowed maintaining transpiration longer. This was associated with an increase in the total root hydraulic conductivity that were associated with an increase in total root length and in the length of the thinnest roots. In addition, root conductivity per root surface increased in the resistant genotype. In order to determine whether the increase in root conductivity per root surface was correlated with changes in root anatomy we carried out a histology study. Preliminary results show that root cortex keep thinner in resistant genotype compared with the susceptible. This strategy might allow less resistance to water transport maintaining higher water potential, reducing drought symptoms and promoting growth under water deficit conditions.

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