20 - Plant nutrition

P20.1
Iron acquisition by barley plants from natural Fe-complexes

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Soluble Fe in soil is represented by a mixture of complexes between Fe and organic ligands such as organic acids and phytosiderophores (PS). In this work we studied the mechanisms of Fe acquisition in barley plants supplied with ^{59}Fe-PS or ^{59}Fe-citrate (1 μM Fe, pH 7.5). Fe-sources has been supplied at the beginning (max release of PS) and at the end (basal release) of light cycle. Results show that Fe-deficient plants accumulate higher amounts of Fe from both sources, compared to the Fe-sufficient ones. The uptake rate changed during the light cycle, especially in Fe-deficient plants, reaching the highest values in the morning, and was dependent on the Fe-sources, being generally higher when Fe was supplied as Fe-PS. The pH influence on Fe uptake was evaluated in the range 5.5 - 8.0; pH increase caused a reduction in the capability of plants to take up Fe. Measurements of Fe-PS stability by LC-ICP/MS at different pHs showed that the formation of the complex is highly dependent on pH. These results highlight the importance of proton gradient not only for the release of PS and Fe-PS uptake, but also for the formation of the complex.
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P20.2
Molecular characterization of the Lotus japonicus NRT1(PTR) and NRT2 families

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Nitrate is an essential element for plant growth, both as a primary nutrient in the nitrogen assimilation pathway and as an important signal for plant development. Low and high affinity transport systems are involved in the nitrate uptake from the soil and its distribution between different plant tissues. We identified putative members of both systems in the model legume L. japonicus. We investigated the transcripts abundance in root tissues of nine and four genes encoding putative low-affinity (NRT1) and high-affinity (NRT2) nitrate transporters, respectively. The genes were sub-classified as inducible, repressible and constitutive on the basis of their responses to provision of nitrate, auxin or cytokinin. Furthermore, members specifically and significantly regulated in root and nodule tissues during the symbiotic interaction with Mesorhizobium loti have been identified. The interpretation of the global regulative networks obtained, allowed to postulate roles for nitrate transporters as possible actors in the cross talks between different signaling pathways triggered by biotic and abiotic factors. A biochemical and functional characterization is in progress.

P20.3
Ionomic maps of *Solanum pennellii x S. lycopersicum* introgression lines variation as response to toxic elements

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A central theme of ionomics is the study of variations in the ionome in response to physiological stimuli, environmental conditions and genetic modifications. Our gol was to characterise the ionome modification induced by mineral elements on introgression lines (ILs) population in wich each line is identical across their whole genome to cv. M82 except for a single introgressed region of the wild species *S. pennellii*. Until now the contribution of the genome of *S. pennellii* in the tomato cultivated variety for ions accumulation has not yet been studied. ICP-MS analysis were performed on apical tips of ILs grown on no-lethal concentration of As, Cd, Cr, Cu, Ni, Pb and Zn. Macro, micro, trace and toxic elements concentration in each IL and in parental cultivated cv. M82 were determined. Ionome variations of ILs were evaluated as the differences between each IL and cv. M82. Data were elaborate by T-test analysis. Results showed that traits correlated to ion homeostasys were significantly modified in response to the treatment and to a specific single introgression. The ionomic maps drawn represent the first obtained on these important genotypes.

P20.4
Brassica rapa plants saved inflorescences under sulphur deficiency

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The strong decrease in S atmospheric emissions and the use of low-S fertilizers caused a widespread S deficiency. Sulphur nutrition strongly influences productivity and nutritional value of crop plants. In particular in Brassica vegetables sulphur is essential for biosynthesis of glucosinolates, that are S-containing secondary metabolites of high nutraceutical value. In this work the effect of sulphur nutrition on metabolite profiles of. Brassica rapa L. subsp. sylvestris ecotypes was investigated. Nitrogen and sulphur metabolite profiles were determined in different organs. The results evidenced that growth was strongly reduced in low S plants. The non sulphur free aminoacids concentration increased. The S-metabolites cysteine, glutathione and glucosinolates that were at lower level in the leaves, were kept high in the flower sprouts, suggesting that plants in any case try to save the reproductive organs.
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P20.5
Root retention activity and accumulation of Cd in the shoot of two barley cultivars

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Manel and Lemsi are two barley (Hordeum vulgare L.) cultivars characterized by relatively high and low Cd accumulations in shoot and grain. With the aim of deciphering the reason of the different behaviours we compared, under low and environmentally realistic Cd concentrations, the activities of components of the root 'firewall system' limiting the translocation of Cd towards the shoot. Kinetic analyses with 109Cd as a tracer showed that the Vmax of the Cd influx in the root was higher for Lemsi than Manel. Nevertheless, the Cd concentration in the roots did not differ between the two cultivars as a consequence of a more efficient loading of the metal into the xylem of Lemsi. The higher Cd translocation observed in Lemsi is related to a lower synthesis of phytochelatins and, moreover, to a lower level of transcript of the P1B-ATPase HvHMA3 actively accumulating the metal into the vacuole. As a consequence, in the root of Lemsi a higher amount of free soluble Cd available for the loading into the xylem exists. The lower HvHMA3