ESRF	Experiment title: **Iron distribution and Fe chemical form in common bean and maize low phytic acid (*lpa*) mutants**	**Experiment number**: LS- 2374
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Names and affiliations of applicants (* indicates experimentalists):

Katarina Vogel-Mikuš[a,b*], Peter Kump[b*], Iztok Arčon[b, c*], Paula Pongrac[a*], Eleonora Cominelli[d*], Francesca Sparvoli [d*], Roberto Pilu[e*]

[a] Biotechnical faculty, Dept. of biology, Večna pot 111, SI-1000 Ljubljana, Slovenia
[b] Jožef Stefan Institute, Jamova 39, POB 000, SI-1001 Ljubljana, Slovenia
[c] University of Nova Gorica, Vipavska 13, POB 301, SI-5001, Nova Gorica, Slovenia
[d] Italian National Research Council, Rome, Italy
[e] University of Milan, Milano, Italy

Report:

Iron (Fe) is an important micronutrient for all living organisms. Almost 30% of the world population is affected by Fe deficiency. A sustainable way to reduce Fe malnutrition in humans is to develop staple crops with increased content of bioavailable Fe. Bioavailability of Fe in staple seeds and grains is severely hindered by the presence of the so called antinutrients, such as phytic acid (*myo*-inositol-1,2,3,4,5,6-hexa*kis*phosphate, $InsP_6$) and various polyphenols. The development of genotypes with significantly decreased $InsP_6$ and/or polyphenols presents a promising approach to improve mineral nutrition in humans and animals. The aim of this experiment was to study possible changes in spatial distribution of mineral nutrients, such as Fe and P, and Fe speciation and ligand environment in specific seed tissues of common bean (with contracting polyphenol concentrations) and maize low phytic acid mutants (*lpa*) generated by chemical mutagenesis, versus the wild types, by µ-XRF imaging and Fe-K-µ-XANES.

Within the beamtime we have analysed Fe distribution and Fe ligand environment in black, cream and white bean seeds (wild type and *lpa* mutants) and wild type and *lpa* maize seeds in frozen hydrated tissue cuttings (cryo environment). We have analysed at least two cuttings of two independent seeds, all together 10 indipendent samples.

The 60 µm cuttings were prepared in our lab at University of Ljubljana, packed between two layers of ultralene foil and brought to the beamline in cryo-shipper. Sample pre-preparation enabled us a very smooth transfer to the cryo holder that was done in a polystyrene box filled with small amount of LN2 in order to maintain the samples in frozen state, so the sample changing was rather fast and simple.

Fe-K XANES spectra were measured in two modes - point and scanning mode in order to avoid radiation damage in particular tissues - perivascular, parenchyma and seed coat.

The imaging results show that in both wild type and *lpa* mutants Fe is localized in perivascular tissues. In black beans significant amount is also found in the seed coat. Fe-K XANES results show that in *lpa* mutants there is a trend of shifting of Fe from Fe (III) phytate to Fe (II) and Fe(III) citrate.