Contribution ID: **35** Type: **Oral Presentation**

Plant metallomics: Are metal distribution patterns a cause or a consequence of plant tissue fate?

Wednesday, July 12, 2023 2:45 PM (15 minutes)

Seeds undergo a tightly regulated developmental program throughout their germination. Although mineral nutrients are crucial during all phases of a plant's life cycle, little is known regarding their role in tissue differentiation. Herein, both synchrotron and benchtop-based X-ray fluorescence spectroscopy approaches revealed that manganese (Mn) and iron (Fe) exhibit particular 'stripe-like'distribution patterns in the radicle of mature soybean seeds, where Fe signals are found as quadrupole structure surrounded by Mn. Spatio-resolved X-ray fluorescence spectroscopy of soybean seed's radicle cross-sections at the Tarumã endstation of the Carnaúba beamline at the Sirius Brazilian Synchrotron Light Source, Brazil, revealed that these patterns are not artefacts induced by constating cell densities across different tissues. Furthermore, a 72-h microscopical assessment of the cell's fate on germination soybean seeds points that the radicle's Fe quadrupole is associated with the proto and meta-xylem procambial tissues. These findings suggest that the polarised Fe and Mn distribution might play an important role in the differentiation of the radicle cells during the early development of soybean plants.

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Session Classification: Fundamental research and in vivo studies

Track Classification: Fundamental Research and In Vivo Studies