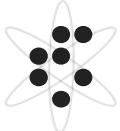


Using micro-PIXE to evaluate nutritional value of plant-based foods



Institut "Jožef Stefan"
F2 / Odsek za fiziko
nizkih in srednjih energij



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From good practices towards socioeconomic impact

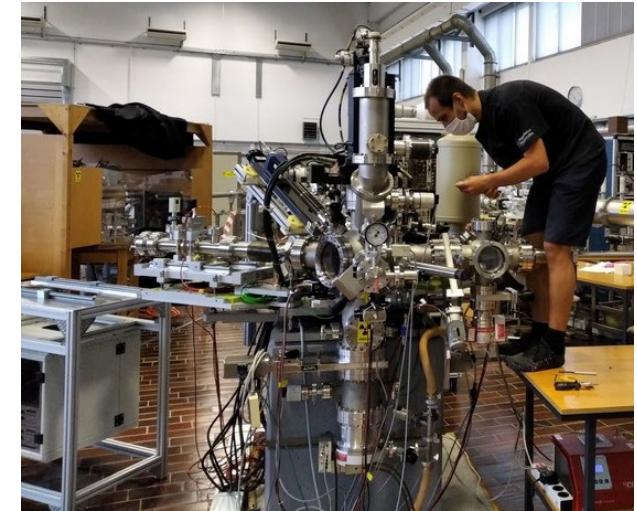
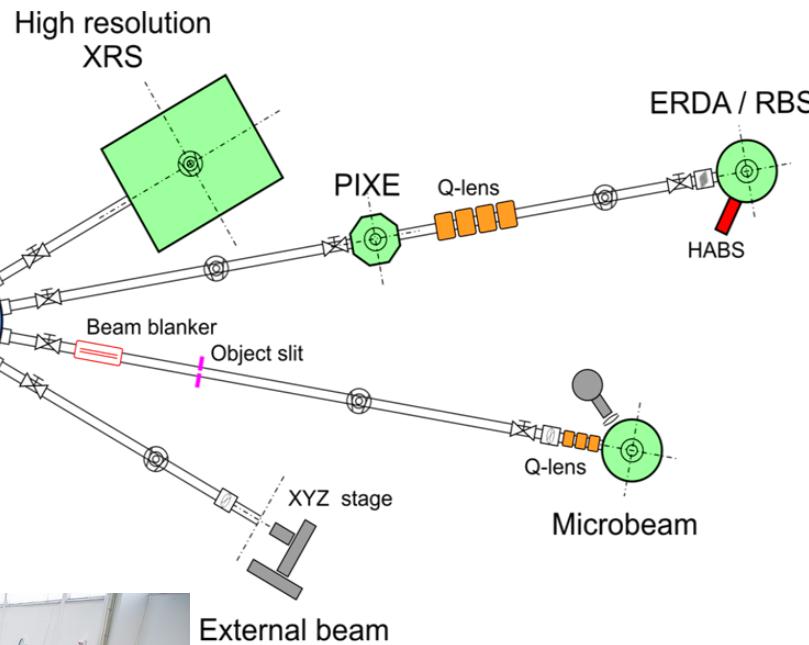
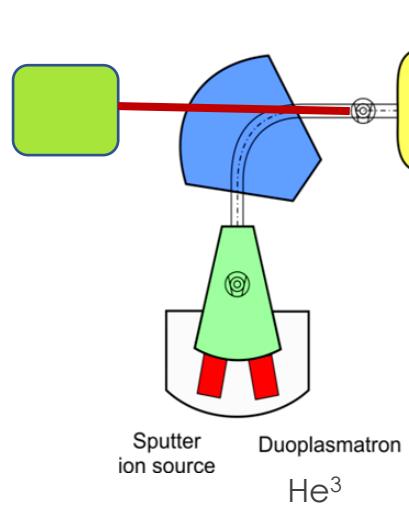


23–27 May 2022

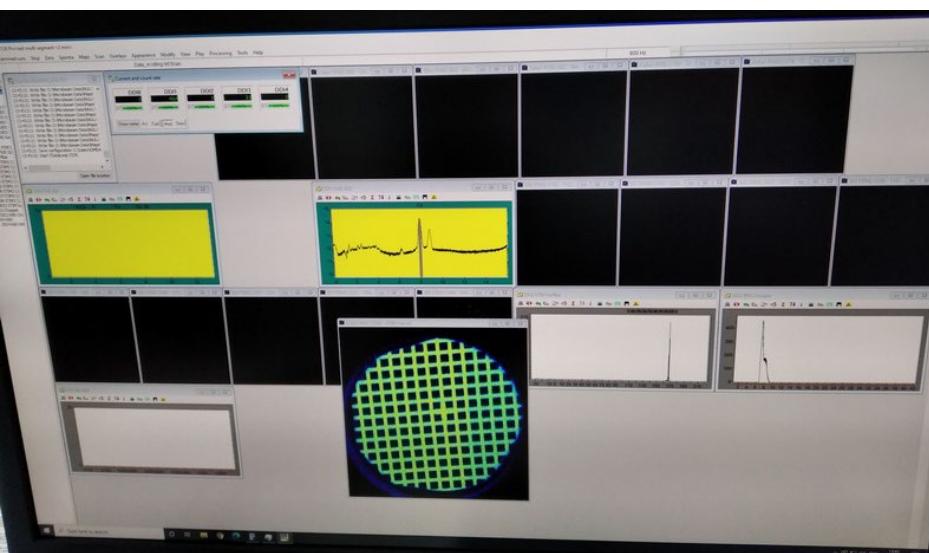
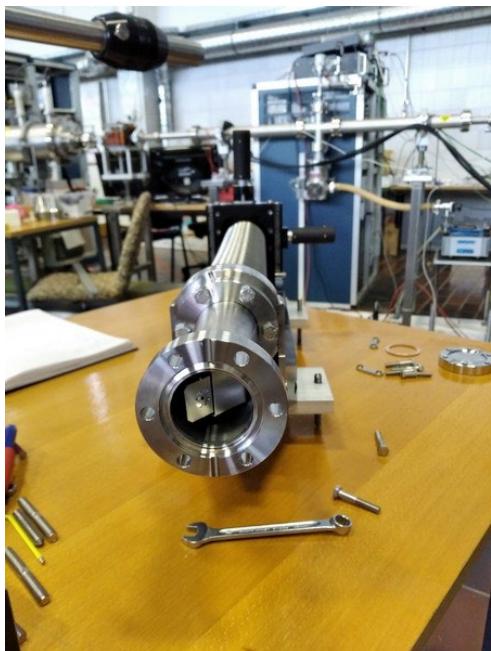
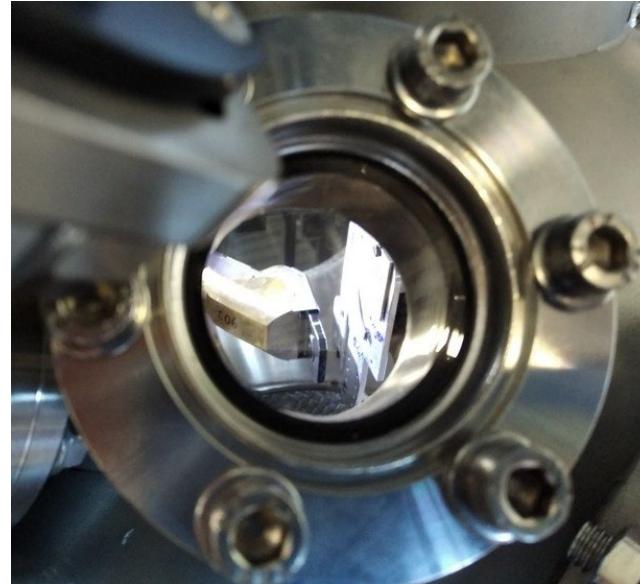
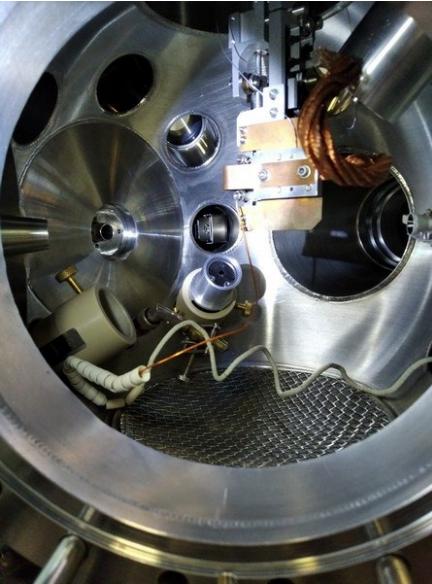
IAEA Headquarters, Vienna, Austria

Tandem laboratory at the Jožef Stefan Institute, Ljubljana, Slovenia

High-brightness
H⁻ source: multicusp

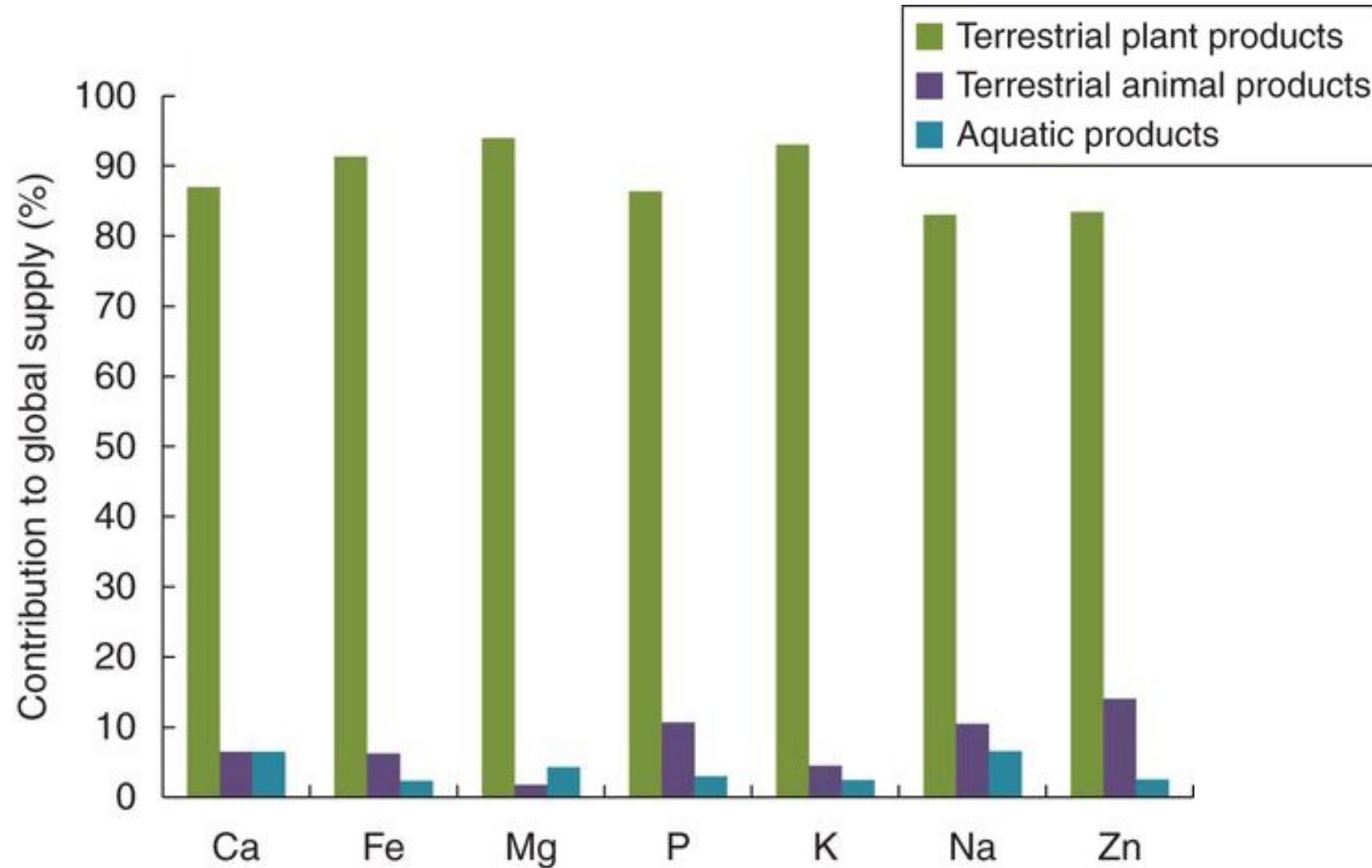


Installation of custom-made annular SDD detector



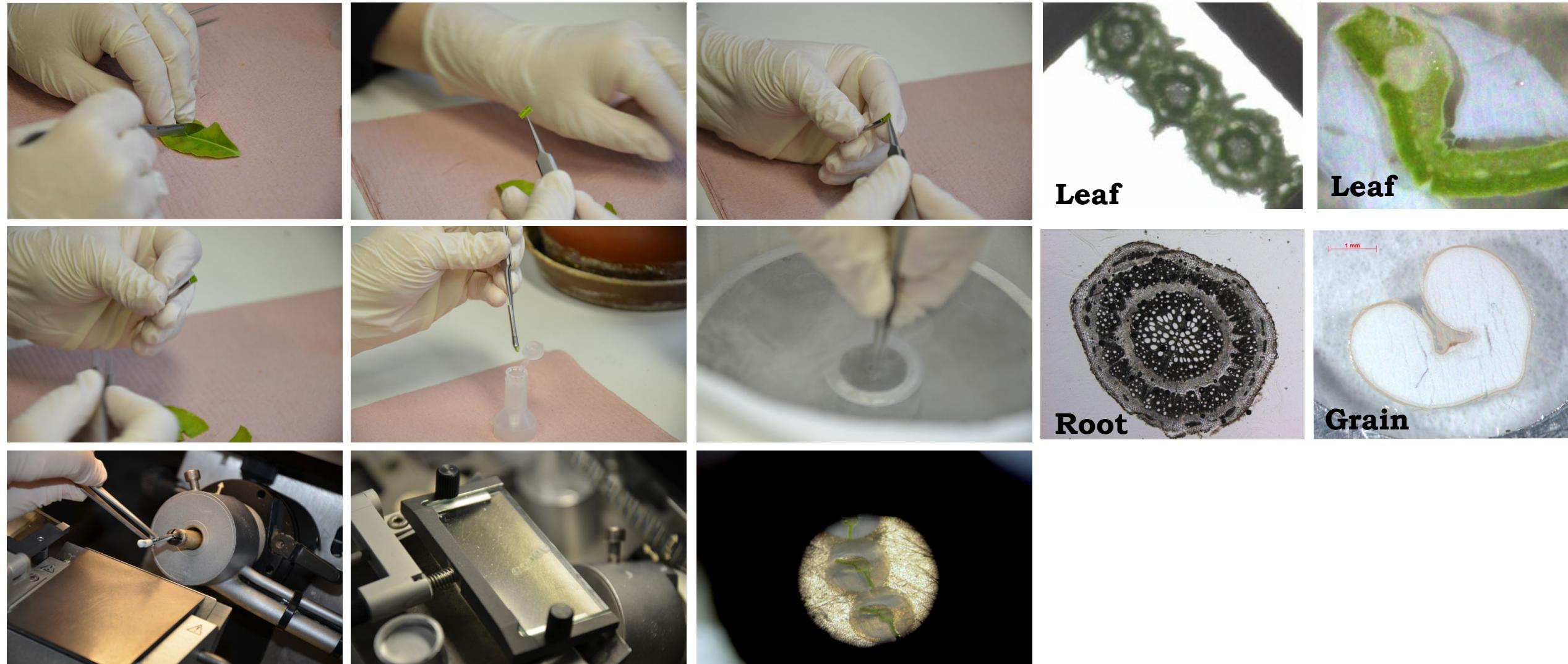
PNDetector

Plant-based products are main contributors to our mineral supply



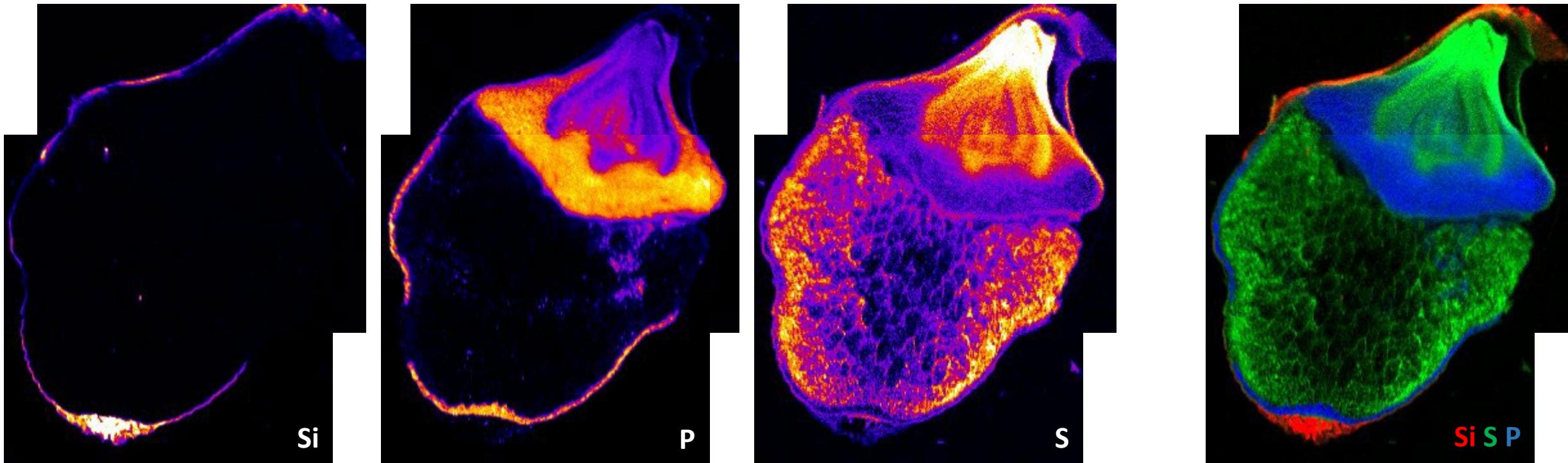
White et al. 2013 Annals of Botany 112, 207–222.

Sample preparation: cryo-fixation and cryo-sectioning



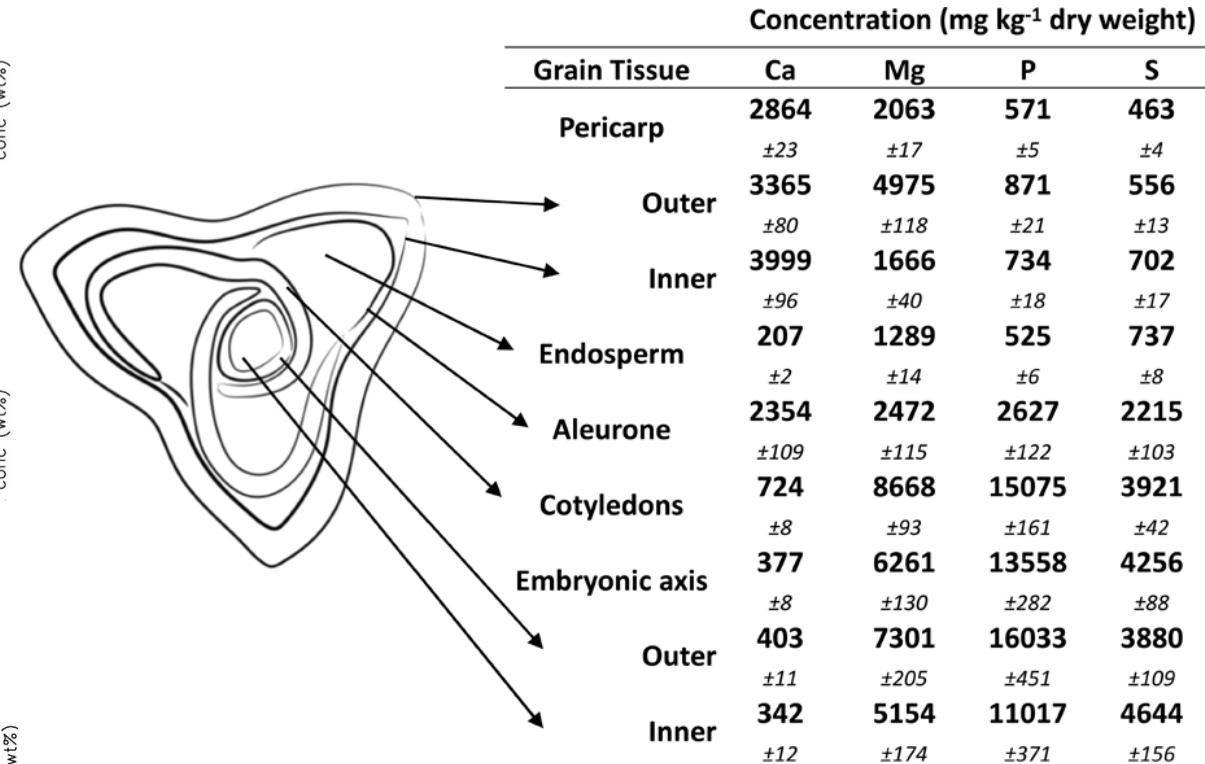
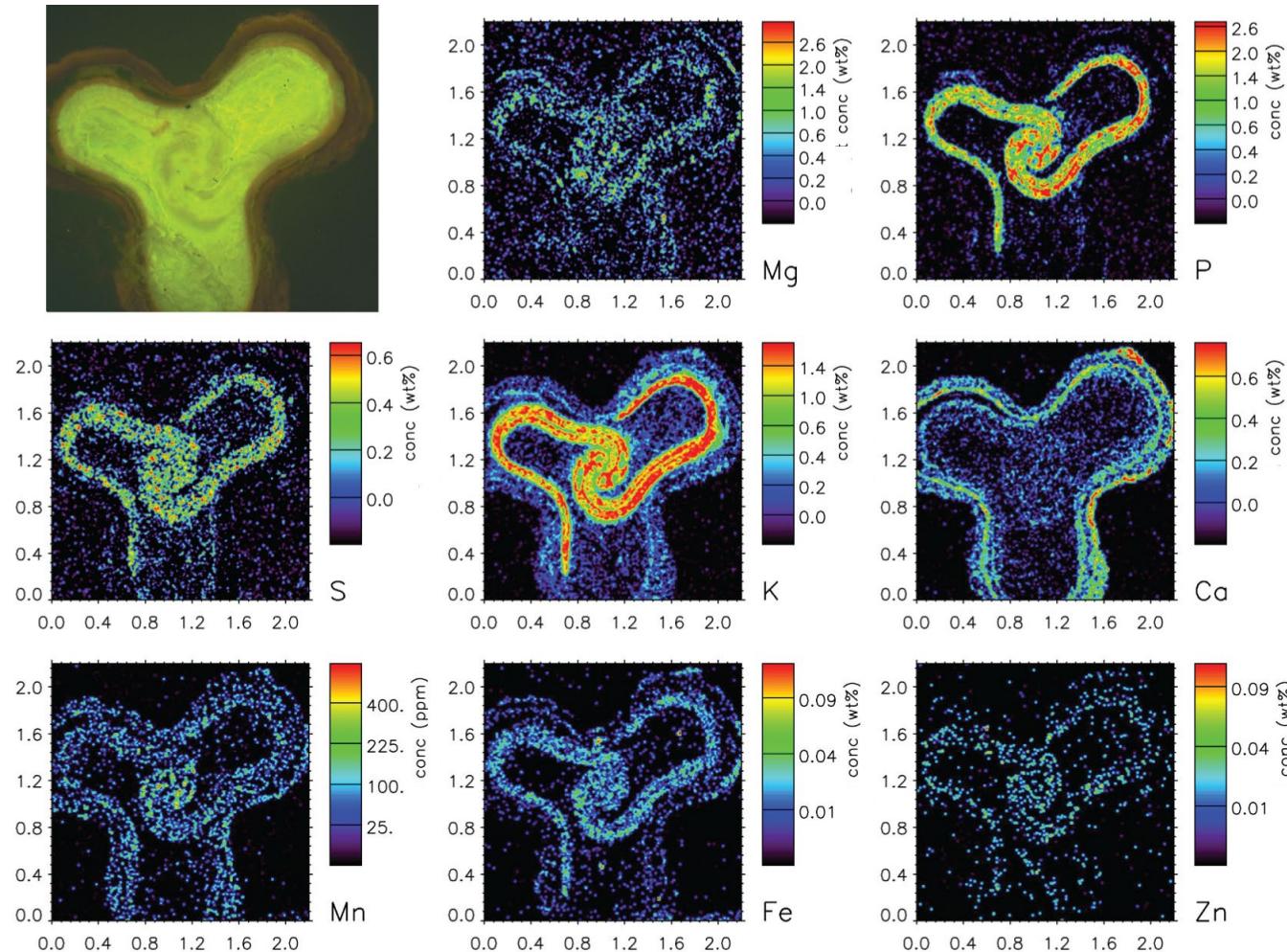
Vogel-Mikuš et al. 2014. Int J PIXE 24, 217–233.

Distribution of Si and essential elements in rice grain



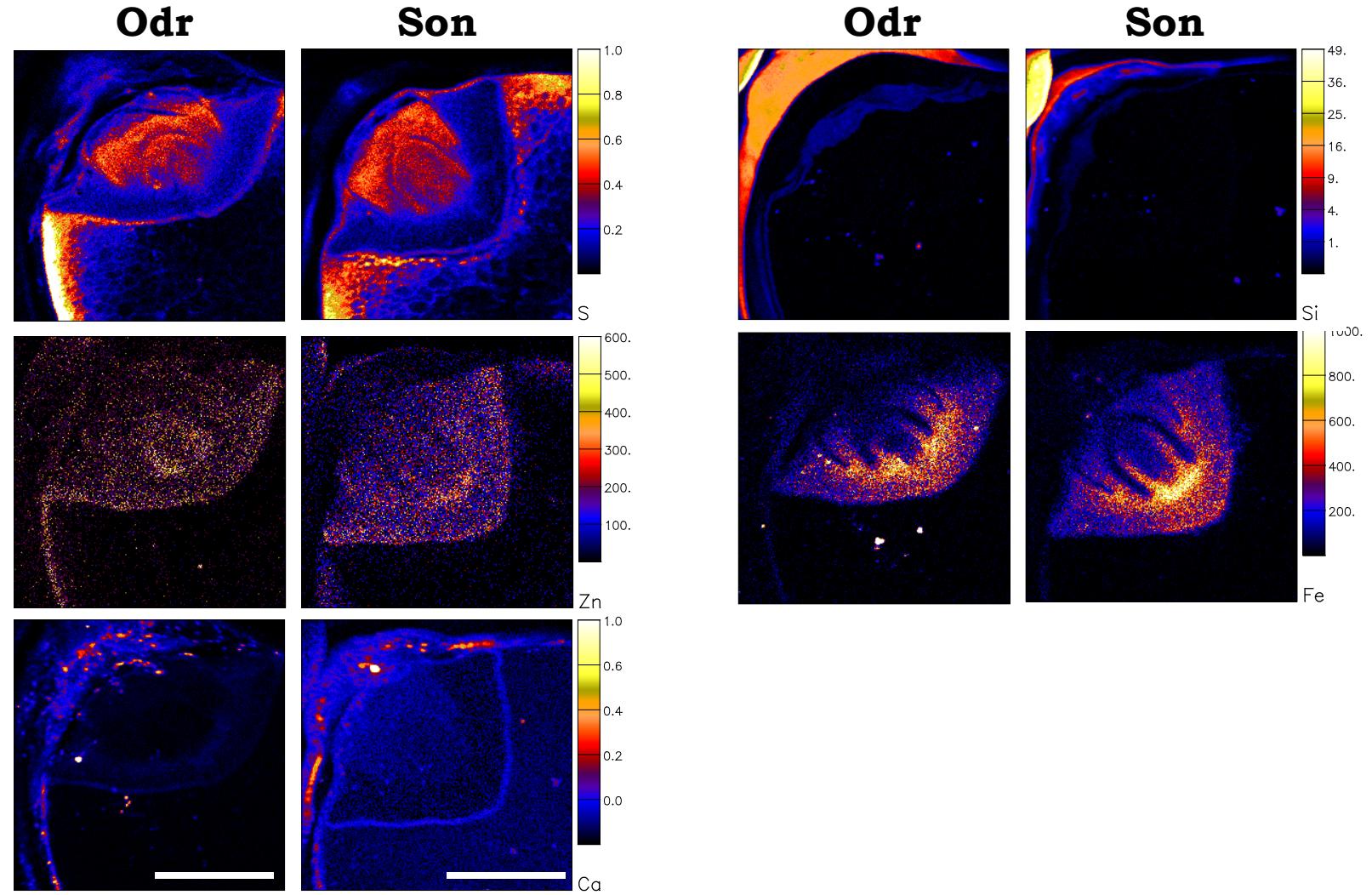
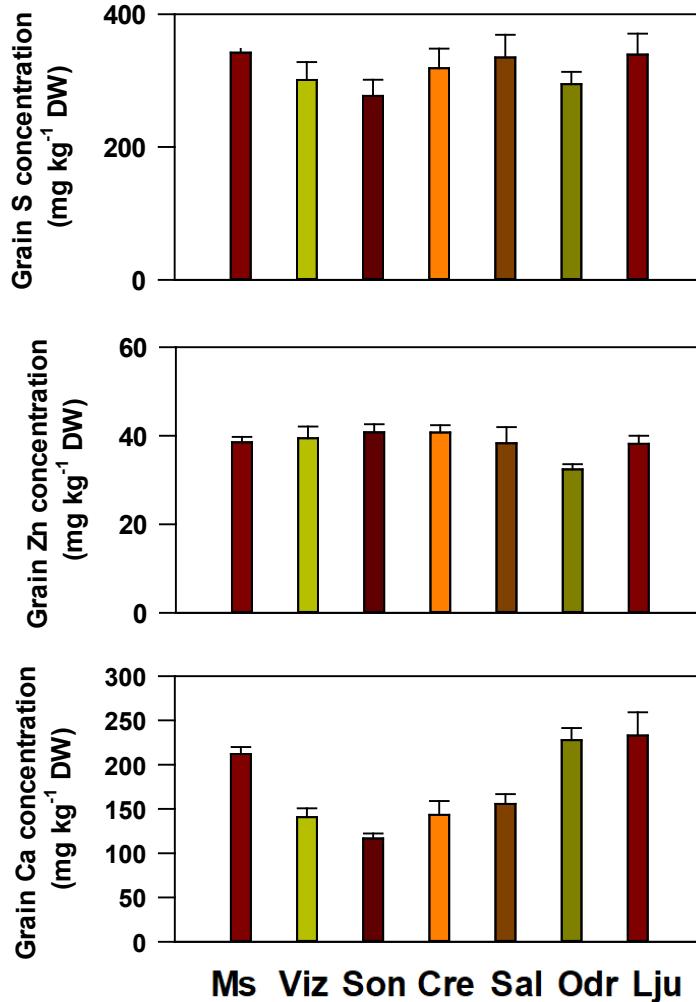
Bonto, Vogel-Mikuš, Pongrac, Kelemen, Vavpetič, Pelicon et al. unpublished results.

Distribution of essential elements in buckwheat grain



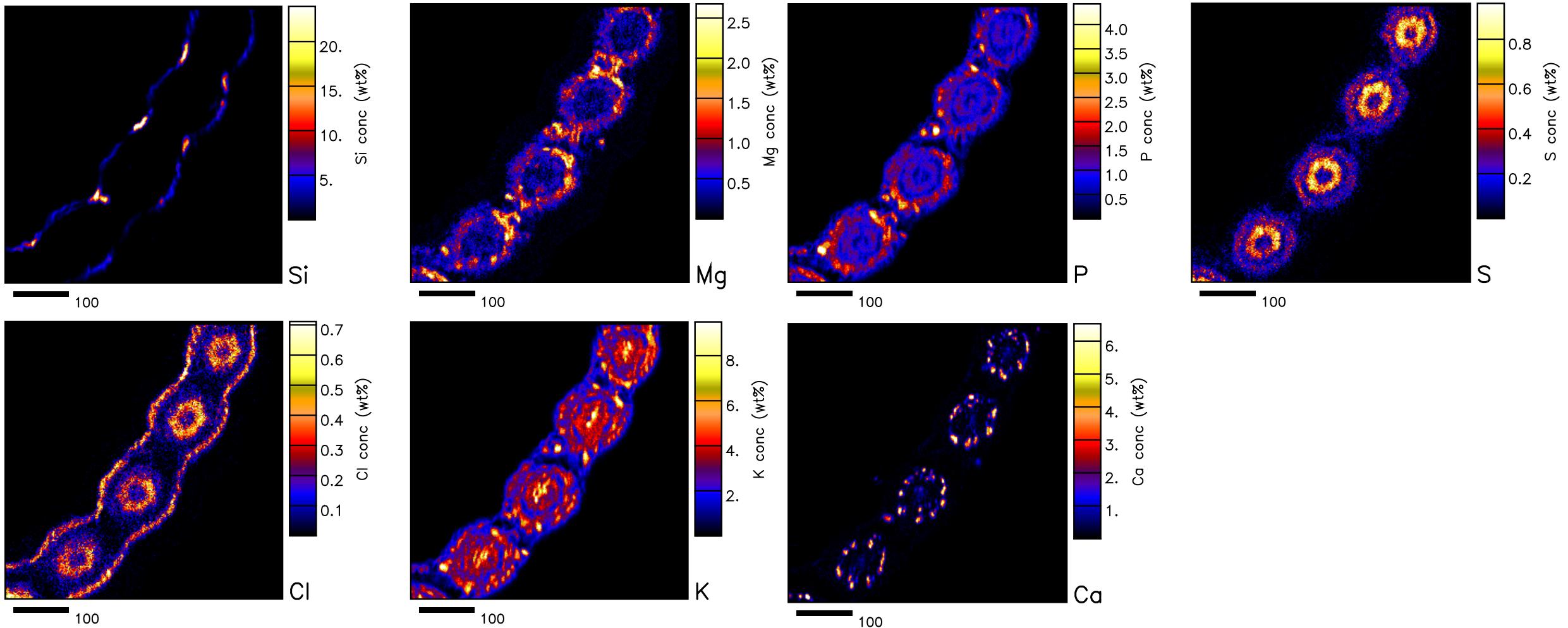
Pongrac et al. 2013. Food Res Inter 54, 125–131.

Distribution of elements in grain of different proso millet populations



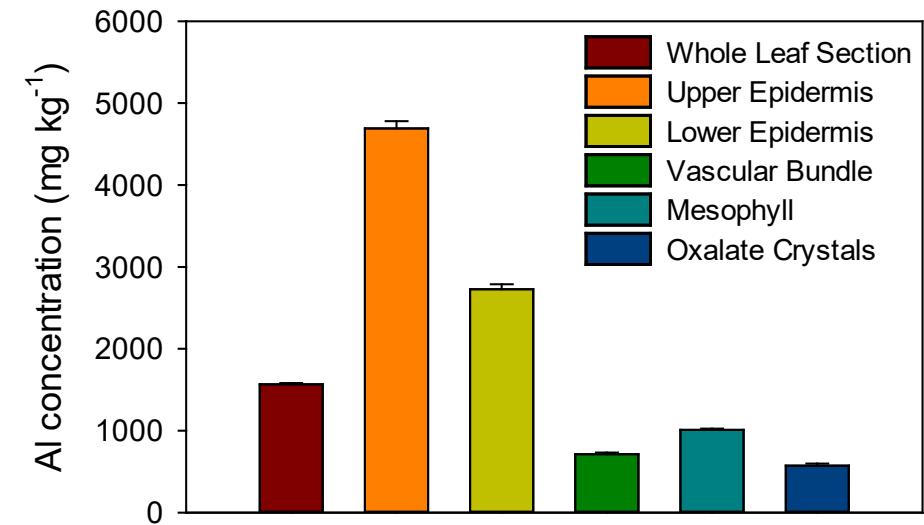
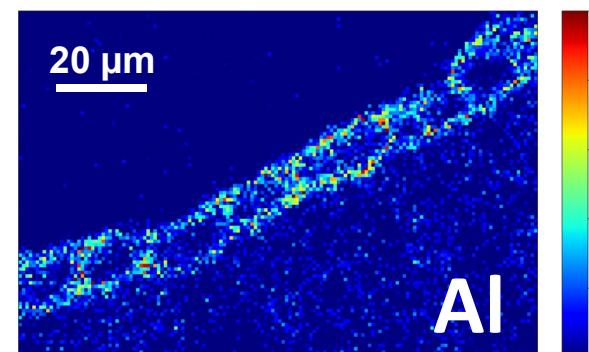
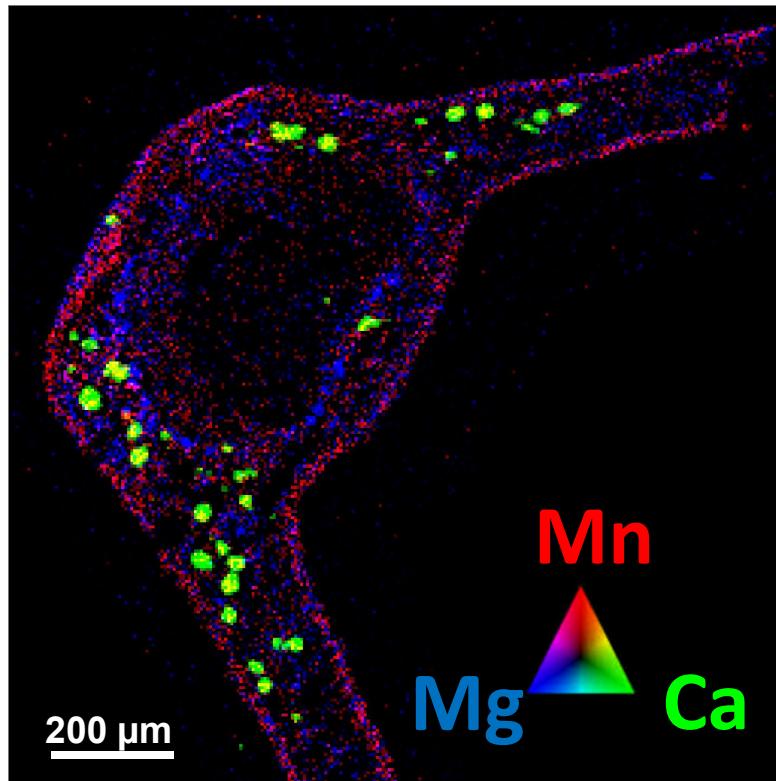
Pongrac, Müller, Vavpetič, Vogel-Mikuš, Kelemen, Pelicon et al. unpublished results.

Distribution of Si and essential elements in proso millet leaf



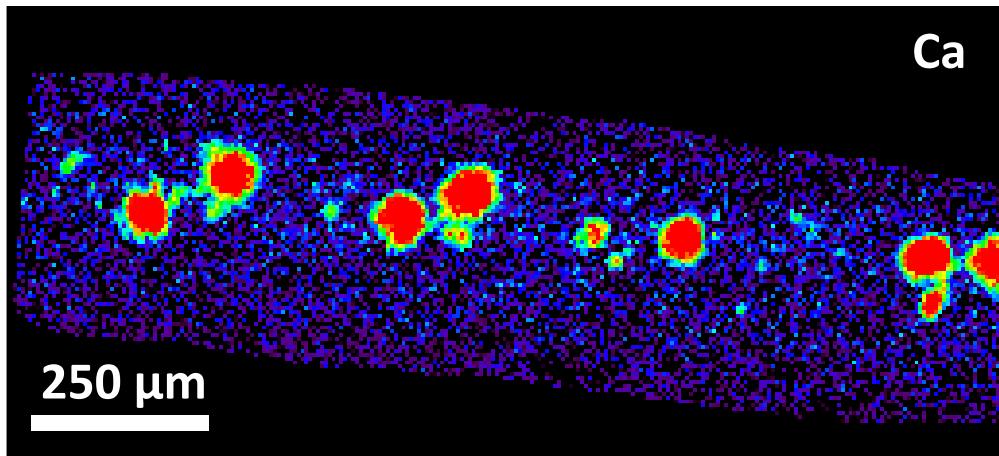
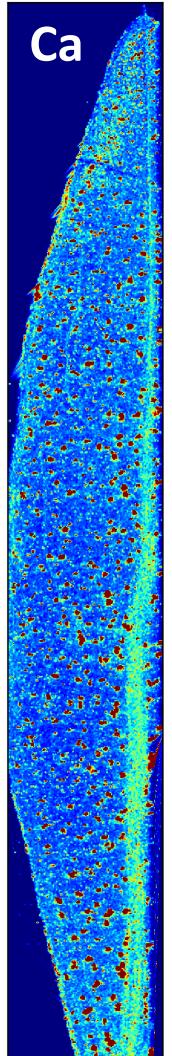
Pongrac, Vavpetič, Vogel-Mikuš, Kelemen, Pelicon et al. unpublished results.

Ca oxalate crystals in tea leaves

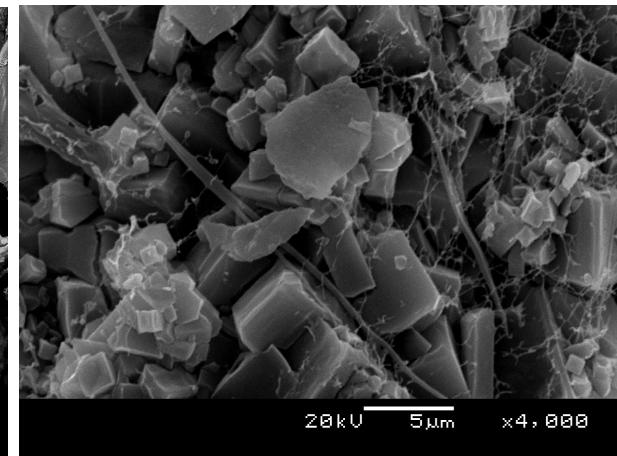
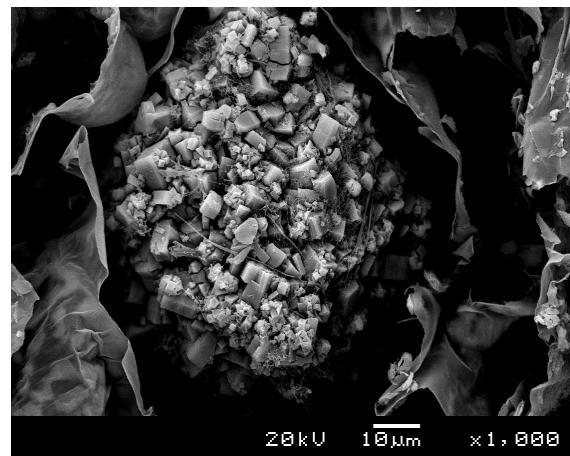
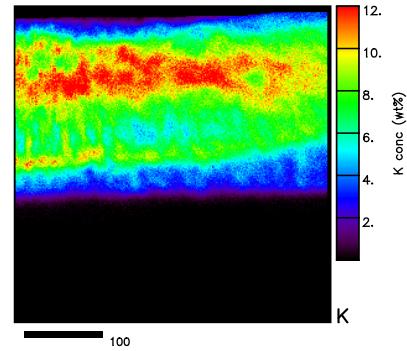
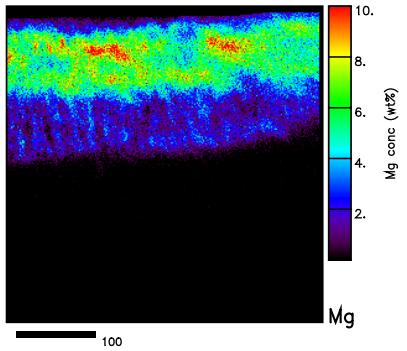
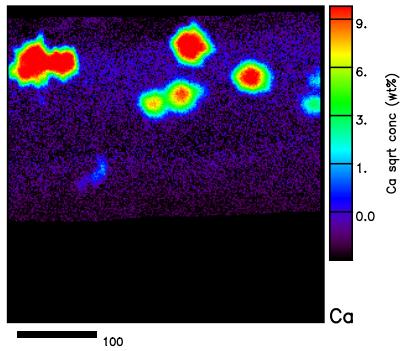


Pongrac et al. 2020 Food Chem Toxic 135, 110974.

Ca oxalate crystals in spinach leaves

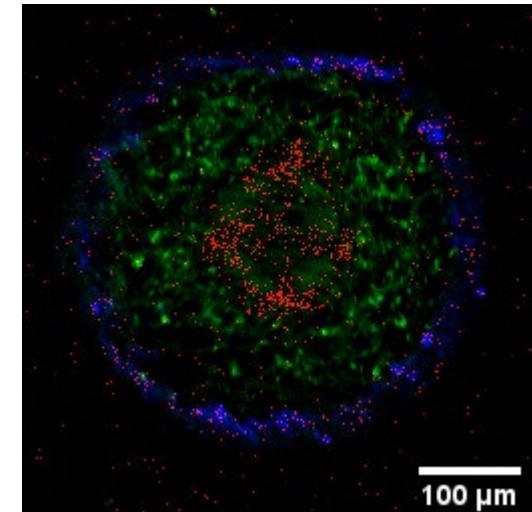
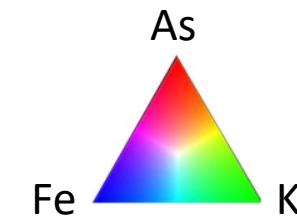
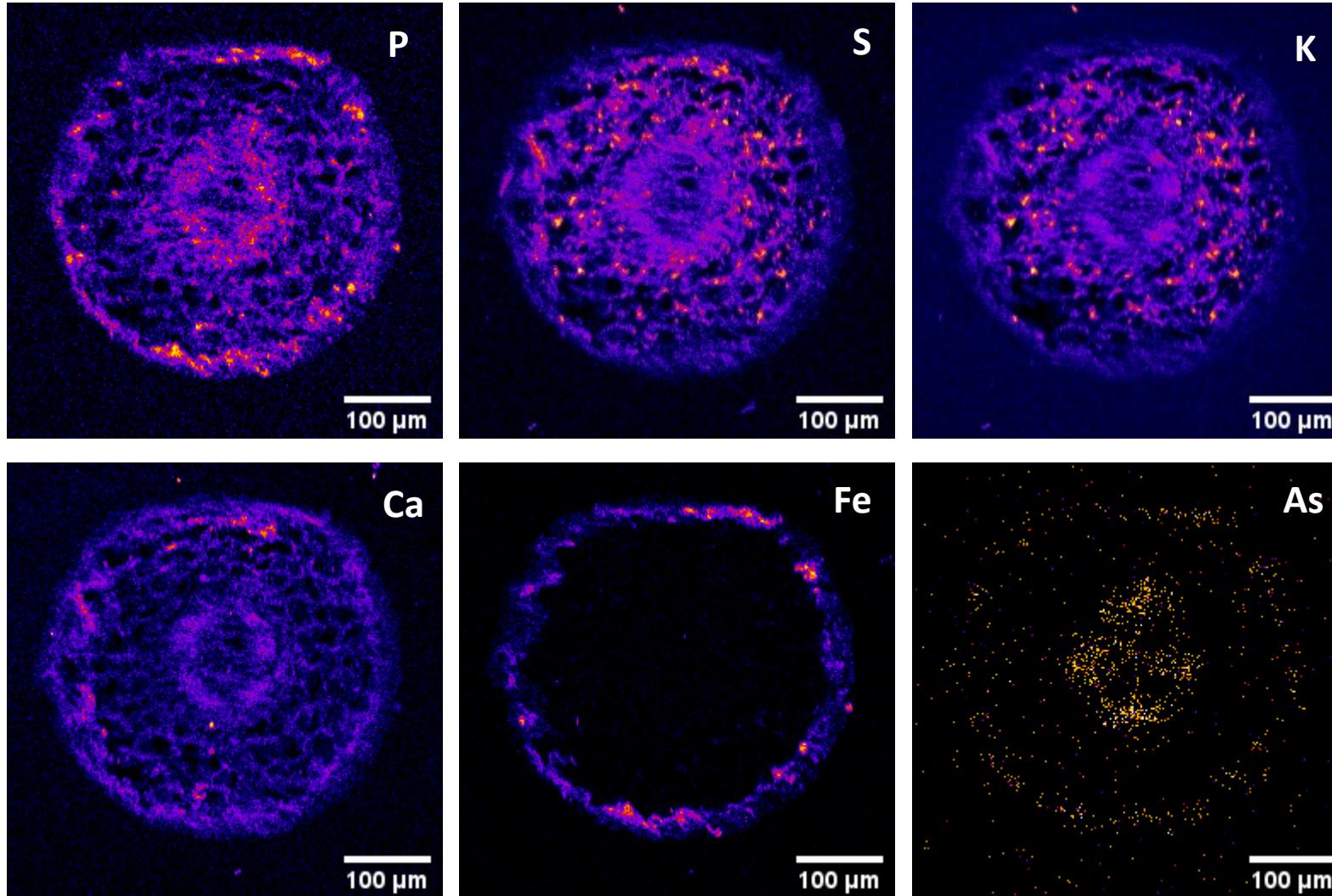


Ca



Pongrac, Šala, Kelemen, Vavpetič, Vogel-Mikuš, Pelicon et al. unpublished results.

Distribution of As and essential elements in roots of peanut plants



Bianucci, Pongrac, Hrovat, Vogel-Mikuš, Kelemen, Vavpetič, Poschenrieder, Pelicon et al. unpublished results

Conclusions

Elements are unevenly distributed within plants and therefore in edible foodstuff.

The information on element precise localisation is needed to understand their transport and deposition within the plant.

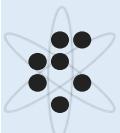
Micro-PIXE is ideally suited to provide information on lateral distribution of elements.

Screenings for element-rich plants performed worldwide would benefit from a routine, cheaper and more available localisation studies.

Thank you

Acknowledgements:

Slovenian Research Agency (P1-0212, P1-0112, N1-0105, N1-0090, J7-9418, J4-3091) and RADIATE project under the Grant Agreement 824096 from the EU Research and Innovation programme HORIZON 2020.



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From good practices towards socioeconomic impact



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