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# Using nuclear techniques to investigate the plant absorption and mobility of foliar applied zinc

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In this agricultural focused study, we accessed ANSTO's Open Pool Australian Lightwater (OPAL) reactor and Australian Synchrotron (AS) to investigate the efficacy of new fertiliser products. As well as accessing these facilities, we also used multiple ANSTO Research Capabilities (Sydney) to investigate the behaviour of these fertilisers in live plants; specifically, the Vivarium; Radiobiology and Bioimaging; Isotope Tracing; Nuclear Stewardship; and, Nuclear Materials Development and Characterisation. All fertilisers tested in this study were applied to plants to provide zinc (Zn). Zinc is an essential plant micronutrient, and in Australia it is often applied to broadacre crops as Australian agricultural soils are some of the most Zn deficient globally. To supplement soil applications of Zn fertiliser, Zn can also be applied directly to the foliage of crops; it is this application method that was the focus of our study. The development of more efficient foliar Zn fertilisers is beneficial not only to growers, who will have a reduced outlay for Zn fertiliser, but also for the environment as some chelated Zn formulations may pose a risk to aquatic and terrestrial systems.
The objective of our study was to investigate the efficacy of novel Zn foliar fertilisers when applied to wheat plants. Conventional analytical techniques were found to be unsuitable for this study because the applied Zn could not be distinguished from background Zn in the plant. Therefore, by using Zn foliar fertilisers radiolabelled with 65Zn we were able to quantify and visualise the plant absorption and translocation of foliar applied Zn. Two newly developed Zn fertilisers; a nanoparticle formulation and a microparticle formulation were compared to two conventional formulations (soluble Zn and chelated Zn). Fertilisers were neutron activated at ANSTO's OPAL reactor to produce 65Zn labelled foliar fertilisers. We then used a novel time-resolved *in vivo* autoradiography imaging technique to visualise 65Zn in live plants. The images were supplemented by gamma-spectroscopy analysis for quantification. The distribution of applied 65Zn in wheat grain was then compared to that of unlabelled Zn using X-ray fluorescence (XRF) elemental mapping. The results of this study describe a new method for investigating the mobility and translocation of foliar applied Zn, and potentially other nutrients, in plants.

## Speakers Gender

Female

## Travel Funding

No

## Level of Expertise

Early Career <5 Years since PdD

## Do yo wish to take part in the poster slam

No

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