

Optimising fertiliser formulations for cereal biofortification with selenium

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Humans have been consuming inadequate levels of the essential micronutrient selenium (Se) for several decades, which puts them at risk of health problems. A cost-effective method of improving dietary Se is through the fortification of staple crops with Se fertilisers. Several studies have investigated the effect of applying different forms of Se (selenite and selenate) using a range of delivery methods (e.g. granular and foliar) to determine the optimal strategy for improving the Se status of crop plants. However, few studies have focused on the possibility of using existing fertilisers enriched with Se, which would inherently reduce labour and operational costs. We studied the effect of enriching common nutrient NPK and S fertilisers with Se on crop uptake. Fertilizer applications included urea (50 mg N kg⁻¹), muriate of potash (40 mg K kg⁻¹), mono-ammonium phosphate, di-ammonium phosphate and single superphosphate (20 mg P kg⁻¹) and sulfate of ammonia (20 mg S kg⁻¹). Sodium selenate was mixed with the above fertilisers, to obtain a rate equivalent to 10 g Se ha⁻¹ (3.33 µg kg⁻¹) and the resulting compound fertilizer mixture was pressed into tablets for soil application. The Se uptake from these fertilizers was compared in a pot trial with wheat, ensuring optimal nutrient supply in all treatments. Because Se dynamics vary significantly with soil conditions, two contrasting soils were used. A separate treatment looking at the effect of applying foliar Se-enriched urea on Se crop uptake was included, to compare the efficiency of contrasting Se application methods. Liquid urea mixed with sodium selenate solution (10 g Se ha⁻¹) was applied to wheat at ear emergence using a nebulizer. Selenium uptake data will be presented and differences in Se accumulation due to macronutrient carrier and application method will be discussed.