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Rice (*Oryza sativa* L.) biofortification with selenium: Enrichment index and interactions among nutrients

Ana Marques[1,2]*, Cláudia Pessoa[1,2], Ana Coelho[1,2], Inês Luís[1,2], Diana Daccak[1,2] , Paula Scotti-Campos[2,3], Manuela Simões[1,2], Ana Sofia Almeida[3,4], Maria Pessoa[1,2], Fernando Reboredo[1,2], Mauro Guerra[5] , Roberta Leitão[5] , José Ramalho[2,6], Paula Marques[4], Maria Manuela Silva[2,7], Paulo Legoinha[1,2], Isabel Pais[2,3] and Fernando Lidon[1,2]

[1]Earth Sciences Department, Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa, Caparica, Portugal
[2]GeoBioTec Research Center, Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa, Caparica, Portugal
[3]INIAV, Instituto Nacional de Investigação Agrária e Veterinária, Oeiras, Portugal
[4]COTArroz, Centro Operativo e Tecnológico do Arroz, Salvaterra de Magos, Portugal
[5]LIBPhys-UNL, Physics Department, Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa, Caparica, Portugal
[6]PlantStress & Biodiversity Lab, Centro de Estudos Florestais (CEF), Instituto Superior Agronomia (ISA), Universidade de Lisboa (ULisboa), Quinta do Marquês, Av. República, 2784-505 Oeiras and Tapada da Ajuda, 1349-017 Lisboa, Portugal
[7]ESEAG / Grupo Universidade Lusófona, Lisboa, Portugal

FCT Faculdade de Ciências e Tecnologia Universidade Nova de Lisboa · geobiotec Geobiociências, Geoengenharias e Geotecnologias · Almeida Garrett Escola Superior de Educação · COTARROZ Centro de Competências do Arroz · cef Centro de Estudos Florestais · LIBPhys-UNL · iniav Instituto Nacional de Investigação Agrária e Veterinária, I.P.

Abstract: Selenium is an antioxidant trace mineral important for human health and development. Therefore, the growing demand for efficient, bioeconomic and sustainable strategies to increase Se content in cereals, namely rice, is therefore justified. In this context, biofortification is a strategy that can promote nutrient enhancement in food crops and, therefore, increased nutrient uptake in the human body. In this framework, a technical itinerary was implemented using a rice genotype (OP1509), through foliar spraying with two selenium concentrations (25 and 100 g Se.ha-1) of sodium selenate (Na2SeO4) and sodium selenite (Na2SeO3). It was found that the average of Se biofortification index was 1.8 - 4.7 and 5.4 - 6.0 fold in selenate and selenite treatments, respectively. The contents of Se, Ca, Fe, K, P, C, H and O in brown rice grains, were also quantified being found that both forms of fertilizers increased Zn contents with 25 g Se.ha-1 but decreased with 100 g Se.ha-1. Moreover, Ca only increased significantly with selenate pulverization. The application of both forms also increased grain weight but did not affect the colorimetric analysis. It is concluded that the applied itinerary can be implemented to minimize Se malnutrition

Keywords: Selenate; Selenite; Selenium biofortification

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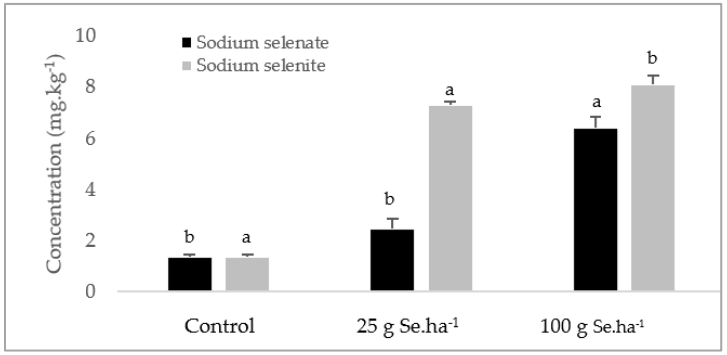
Results and Discussion



Treatments	Zn	Ca	P	C	H	O
(g Se.ha^{-1})	mg.kg^{-1}					
0	28.6±1.43a	116.1±5.80a	0.57±0.03a	43.7±2.18a	6.11±0.31a	48.6±2.43a
25	30.1±1.50a	147.5±7.38a	0.58±0.03a	43.8±2.19a	6.12±0.31a	48.6±2.43a
100	26.1±1.31a	175.1±8.76b	0.66±0.66a	43.7±2.19a	6.12±0.31a	48.6±2.43a
0	28.6±1.43a	116.1±5.80c	0.57±0.03b	43.7±2.18a	6.11±0.31a	48.6±2.43a
25	42.4±2.12b	260.4±13.02b	0.90±0.04a	43.5±2.17a	6.08±0.30a	48.2±2.41a
100	23.3±1.17a	150.5±7.52a	0.53±0.03b	43.8±2.19a	6.13±0.31a	48.7±2.43a

Foliar spraying with sodium selenate and sodium selenite promoted the accumulation of Se in the brown grains. Foliar fertilization with Se interfered with the accumulation of other chemical entities. When selenate was applied only the contents of Ca increased significantly, whereas the other chemical elements did not varied significantly.

Conclusions

Foliar spraying with selenate or selenite concentrations (25 and 100 g Se.ha^{-1}) did not surpass the threshold of toxicity in O. *sativa* L. Poaceae. The average of Se biofortification index was 1.8-4.7 times in selenate treatment and 5.4-6.0 times in selenite treatment. The contents of Ca, Fe, K and P varied according to the form and concentration applied however the C, H and O contents did not vary significantly. The application of both forms increased grain weight in the genotype and did not affect the colorimetric analysis. Accordingly, it is concluded that the applied itinerary applied for biofortification in rice (variety OP1509) can be implemented to minimize Se malnutrition.

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