# Quantification and localization of Ca and interaction with other nutrients by XRF analysis and SEM-EDS, in tubers of *Solanum tuberosum* L. naturally mineral enriched.

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## Abstract

Calcium (Ca) is one of the three essential minerals for the functioning of the human body and the most abundant in it, being required in relatively high quantities. It is essential in bone synthesis and metabolism, tooth mineralization and in the regulation of intracellular processes in different tissues. Ca deficiency can result in low bone density and fragility, and can also cause the evolution of pathologies such as osteoporosis and rickets. Ca Biofortification is a strategy that promotes the increase of nutrients in food crops, and can provide, in the long term, an increase in the assimilation and accumulation of nutrients in the human body. The main objective of this work was to develop a technical itinerary for the biofortification in Ca of three potato varieties (Agria, Picasso and Rossi), during the 2018 production cycle. In this context, leaf fertilization of plants was promoted, throughout the respective production cycle, after planting on 4/5/2018, 5/11/2018 and 5/15/2018 (in the Moledo, Boas Águas and Casal Galharda fields, respectively). Four leaf applications were carried out with four treatments of calcium chloride or, alternatively, calcium nitrate. At harvest, the interactions between Ca accumulation and the remaining chemical elements present in the different tissues of the tuber were studied. Performing the mapping at tissue level using a µ-EDXRF M4 Tornado ™ system, it was found that the tubers produced in the Moledo, Boas Águas and Casal Galharda fields presented, respectively, an increase in the Ca content of about 2.6 , between 2-2.5 and between 1.5-2.5 times (in relation to the application of Ca $(NO_3)_2$ and $CaCl_2$). Using scanning electron microscopy, with X-ray energy dispersive spectroscopy (SEM-EDS), it was identified in which area of the tuber the Ca predominates. At harvest, was found that, by X-ray fluorescence, the average Ca biofortification index, considering the tuber pulp, was between 1.9-27.4%. Considering that biofortification in Ca consists in the development of a product for human consumption that presents functional characteristics in the physiological plan, it is concluded that it's possible to develop products such as chips or purees enriched in this macroelement, enabling the creation of a value added product.

## Recent Publications

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2. EFSA (European Food Safety Authority) (2015). EFSA Panel on Dietetic Products, Nutrition and Allergies. Scientific Opinion on Dietary Reference Values for calcium. EFSA Journal.13(5), 4101, 82 pp. DOI:10.2903/j.efsa.2015.4101
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4. Lockyer, S., White, A., Walton, J., & Buttriss, J. (2018). Proceedings of the 'Working together to consider the role of biofortification in the global food chain' workshop. Nutrition Bulletin, 43(4), 416-427pp. doi: 10.1111/nbu.12348
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## Biography

Ana Rita Fonseca Coelho is a PhD student at FCT-UNL, in Portugal. Her research focuses on the biofortification of *Solanum tuberosum* L. in Calcium. She has extensive experience and mastery of various analytical procedures and methods such as: atomic absorption spectrophotometry, X-ray fluorescence, MDA, pigment determination, xanthophylls, carotene, lutein and sugars.

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