Natural fortification of tomato with Mg: quantification and localization using atomic absorption, XRF analysis and SEM-EDS.

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Abstract

In human body almost 53% of magnesium (Mg) is involved in the development and maintenance of bone and other calcified tissues, 27 % in muscle, 19 % in the soft tissues and the remain 1% in the serum. Mg is a nutrient involved in protein synthesis, muscle and nerve functions, blood glucose control and blood pressure regulation. In addition, Mg deficiency is uncommon in humans because of the kidney limit urinary excretion of this nutrient. However, there are some group of people at risk of Mg inadequacy, people with gastrointestinal diseases, type 2 diabetes, chronic alcoholism. Mg biofortification is a strategy that promotes nutrient enhancement in food crops and can increase nutrient uptake and accumulation in the human body. This study aims to develop a technical itinerary for Mg biofortification of two tomato varieties (H1534 and H9205) during the 2018 production cycle. As such, the study was carried out in a test area with 15 x 66 m, in Beja region, Portugal. In this framework, leaf fertilization of plants was promoted after planting and throughout the respective production cycle. Six leaf applications were carried out with four different treatments of magnesium sulfate. At harvest were studied the interactions between Mg accumulation and with others chemical elements present in the tomato tissues. The average of Mg biofortification index in variety H1534 was 16.2% and the opposite was verified in variety H1534, by atomic absorption. However, it was found, performing the mapping at tissue level using a μ-EDXRF M4 Tornado ™ system, that the content of Mg increased 90% and 78.8%, respectively, in H1534 and in H9205. Using scanning electron microscopy, with X-ray energy dispersive spectroscopy (SEM-EDS), it was possible to identify in which area of the tomato tissue the Mg predominates. Considering that biofortification with Mg consists in the development of a functional product, it is concluded that it's possible to develop a new product such as biofortified tomato pulp.

Recent Publications

1. Bouis, H., & Saltzman, A. (2017). Improving nutrition through biofortification: A review of evidence from HarvestPlus, 2003 through 2016. Global Food Security, 12, 49-58pp. doi: 10.1016/j.gfs.2017.01.009
2. DiNicolantonio, J.J., O'Keefe, J.H., Wilson, W. (2018). Subclinical magnesium deficiency: a principal driver of cardiovascular disease and a public health crisis. Open Heart; 5:e000668. DOI:10.1136/openhrt-2017-000668
3. 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
4. National Institutes of Health, 2017. https://ods.od.nih.gov/Factsheets/Calcium/ Accessed in January, 2020.
5. Schwalfenberg, G.K. and Genuis S.J. (2017). The importance of magnesium in clinical healthcare. Scientifica. Article ID 4179326, 14 pages DOI: 10.1155/2017/4179326



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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