Enrichment of grapes with zinc for vinification: mineral analysis with XRF, atomic absorption spectrophotometry and tissue analysis techniques

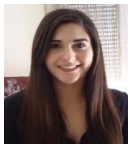
Diana F. Daccak, Master, Faculdade de CiÊncias e Tecnologia- UNL, Portugal,
Cláudia C. Pessoa, Master, Faculdade de Ciências e Tecnologia-UNL, Portugal
Ana R. F. Coelho, Master, Faculdade de Ciências e Tecnologia-UNL, Portugal
Ana M. C. Marques, Master, Faculdade de Ciências e Tecnologia-UNL, Portugal
Inês Luís, Master, Faculdade de Ciências e Tecnologia-UNL, Portugal
Fernando C. Lidon, Professor, Faculdade de Ciências e Tecnologia-UNL, Portugal
José C. Ramalho, Investigator, Instituto Superior de Agronomia-UL, Portugal
Ana I. F. Ribeiro, Investigator, Instituto Superior de Agronomia-UL, Portugal
Maria M. Silva, Professor, Escola Superior de Educação Almeida Garrett, Portugal
Maria M. Simões, Professor, Faculdade de Ciências e Tecnologia-UNL, Portugal
Fernando H. Reboredo, Professor, Faculdade de Ciências e Tecnologia-UNL, Portugal
Maria F. Pessoa Professor, Faculdade de Ciências e Tecnologia-UNL, Portugal
Carlos Galhano, Professor, Faculdade de Ciências e Tecnologia-UNL, Portugal
Paulo Legoinha, Professor, Faculdade de Ciências e Tecnologia-UNL, Portugal
Nuno Leal, Professor, Faculdade de Ciências e Tecnologia-UNL, Portugal
Paula S. Afonso, Investigator, Instituto Nacional de Investigação Agrária e Veterinária, Portugal
Isabel P. Pais, Master, Instituto Nacional de Investigação Agrária e Veterinária, Portugal
Mauro A. M. Guerra, Professor, Faculdade de Ciências e Tecnologia-UNL, Portugal
Roberta G. Leitão, Professor, Faculdade de Ciências e Tecnologia-UNL, Portugal

Abstract

The micronutrient deficiency affects more than two billion individuals, that is, one in three individuals globally, there for it is a public health problem that can lead to various diseases, so we should pay more attention to it nowadays. In order to combat this problem, several alternatives have appeared, namely biofortification, which consists on increasing the amount of nutrients in food crops. Zinc is one of the most relevant micronutrients for the body. This micronutrient has three main roles: catalytic, structural and regulatory, and its deficiency leads to several health issues. Zinc has recognized benefits for atopic dermatitis, prostate disorders, pregnancy, spermatogenesis, alopecia, and osteopenia. In order to put zinc biofortification into practice, a technical itinerary was outlined which took place in the fields located near the Montijo region in Portugal. This work aims to optimize a response to zinc biofortification of four grape varieties Fernão Pires, Moscatel, Castelão and Syrah. Biofortification was performed with leaf applications of zinc oxide (OZn) and zinc sulfate (SZn) throughout the production cycle. In order to assess the efficiency of biofortification, XRF, atomic absorption spectrophotometry and tissue analysis techniques were used in this process. All the techniques demonstrated an increase in zinc content. Using XRF, progressively higher levels were observed in all varieties, with increasing applications with OZn and SZn. Considering all the forms measured by atomic absorption spectrophotometry, the average biofortification index at harvest varied between 17.3% -123%. And with the aid of the technique of localization and quantification of nutritional elements at the tissue level, Castelão, Syrah and Fernão Pires showed a substantial rise in zinc levels in the grape's skin, with the application of zinc oxide or zinc sulfate.

Recent Publications

1. Bouis, H. E., Saltzman, A. (2017)- Improving nutrition through biofortification: A review of evidence from HarvestPlus, 2003 through 2016- Global Food Security, volume 12, pp 49-58.
2. Cakmak, I., Kutman, U. B. (2017)- Agronomic biofortification of cereals with zinc: a review.
3. Elise, F., Talsma, Pachón, H. (2017)- Biofortification of crops with minerals and vitamins -Biological, behavioural and contextual rationale. HarvestPlus, International Center for Tropical Agriculture (CIAT), Cali, Colombia; Emory University, Atlanta, USA.
4. Montanha, G. S., Rodrigues, E. S., Romeu, S. L. Z., Almeida, E., Reis, A. R., Lavres Jr, J., Carvalho, H. W. P. (2019) - Zinc uptake from ZnSO4 (aq) and Zn-EDTA (aq) and its root-to-shoot transport in soybean plants (Glycine max) probed by time-resolved in vivo X-ray spectroscopy.
5. Oliveira, N. T., Rezende, P. M., Bruzil, A. T., Melville, C. C. (2018)- Effects on food-type soybean cultivars when biofortified with different rates of zinc -Biofortificação com doses de zinco em cultivares de soja tipo-alimentação. Rev. de Ciências Agrárias vol.41 no.3.
6. Valença, A. W., Bake, A., Brouwer, I. D., Giller, K. E. (2017)- Agronomic biofortification of crops to fight hidden hunger in sub-Saharan Africa. Global Food Security Volume 12, pp 8-14.



Biography

Diana Daccak with a degree in Biochemistry and Agro-industrial Production and Transformation technologies. Presently is a PhD in Agroindustrial Technologies student with an emphasis on functional foods.

Email: d.daccak@campus.fct.unl.pt

Notes/Comments: