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A smart controlled-release fertilizer improved soil fertility but not olive tree physiology and yield

Ermelinda Silva[1,2*], Margarida Arrobas[3], Alexandre Gonçalves[4], Sandra Martins[2], Soraia Raimundo[3], Luís Pinto[4], Cátia Brito[2], José Moutinho-Pereira[2], Carlos Correia[2] & Manuel Ângelo Rodrigues[3]

[1]Association BLC3 -Technology and Innovation Campus, Centre Bio R&D Unit, Rua Comendador Emílio Augusto Pires, 14, Edifício SIDE UP, 5340-257 Macedo de Cavaleiros, Portugal; *ermelinda.silva@blc3.pt

[2] CITAB - Inov4Agro - Centre for the Research and Technology of Agro-Environmental and Biological Sciences - Institute for Innovation, Capacity Building and Sustainability of Agri-food Production, University of Trás-os-Montes and Alto Douro, Vila Real, PORTUGAL

[3]Centro de Investigação de Montanha (CIMO), Instituto Politécnico de Bragança. Campus de Sta Apolónia, Bragança, Portugal

[4]MORE - Collaborative Laboratory Mountains of Research, Brigantia Ecopark, Bragança, Portugal

Abstract

The use of a controlled-release fertilizer (CRF) was studied in a traditional rainfed olive grove in the northeast of Portugal where precipitation is very irregular, particularly in the spring. The objective of the study was to assess whether a CRF can improve the olive tree's performance compared to a conventional nitrogen (N) fertilizer (CF), by supplying N gradually and reducing the risk of potential N loss from leaching. The fertilized treatments showed better plant N nutritional status, which resulted in enhanced net photosynthesis and higher leaf concentrations of total soluble sugars, chlorophylls and soluble proteins which, in turn, increased olive yield by 43% in comparison to the unfertilized control. Meanwhile, CRF show some advantages over the CF, although by an unexpected effect. Not in a direct way, by improving trees performance, but by enhancing soil fertility. The CRF treatments showed higher levels of inorganic N in the soil by autumn, an aspect that at the outset could be interpreted as negative, since it could lead to N loss by leaching, but that proved to be a factor that may be behind the increase in the organic carbon, kjeldahl nitrogen and glomalin-related soil proteins. Thus, the availability of soil inorganic-N in the autumn, in a climate in which excess precipitation and the risk of leaching usually only occur in winter, led to weeds growth that seem to act as a catch crop, capturing residual inorganic N. Additionally, they contribute to protect the soil from erosion and to increase soil organic matter, aspects that can benefit the agrosystem in the long-term.

Keywords – *Olea europaea*, net photosynthesis, nitrogen fertilization, soil organic carbon.

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