

Modeling climate change impacts on nitrogen stress for the Portuguese viticulture

Helder Fraga, Aureliano Malheiro, João A Santos

Centre for the Research and Technology of Agro-environmental and Biological Sciences, CITAB, Universidade de Trás-os-Montes e Alto Douro, UTAD, Vila Real, Portugal

Nitrogen (N) is essential for crop growth. For viticulture, a suitable nitrogen supply is key to attain high yields and quality attributes. A limitation in nitrogen uptake reduces photosynthetic activity, resulting in production losses and unbalanced ripening. Conversely, N excess also results in detrimental impacts, not only for the grapevine physiology but also for the environment. Excess N may run-off or infiltrate water bodies. For vine growers, N application depends on vine status and seasonal weather conditions. Given the strong relationship between N demand and edaphic-climatic factors, climate change may impose additional threats. Herein, an assessment of present (1980-2005) and future (2041-2070) N stress/demand for viticultural activities, is provided over mainland Portugal. The STICS crop-soil model is calibrated using regional climate, soil, topography, viticultural practices and varieties. Additionally, the crop model was coupled with 4 regional climate models under the RCP4.5 future scenario. Results point at stress increases over Beira-Atlântico, Douro/Porto, Minho, Terras-de-Cister, Terras-do-Dão and Trás-os-Montes, and decreases over Alentejo, Algarve, Península-de-Setúbal and Tejo. The results provide future projections for N demand over the Portuguese viticultural regions, highlighting the need for suitable climate change adaptation measures.