Olive tree (Olea europaea L.) is commonly grown under environmental conditions characterized by water deficit, high temperatures and irradiance levels typical of Mediterranean semi–arid regions. Measurement of photosynthetic efficiency, photoinhibition and gas exchange were carried out on two–years–old olive trees (cv. 'Coratina' and cv. 'Biancolilla') subjected to a 21 day–period of water deficit under two different light regimes (exposed plants, EP; PAR = 2000 µmol m–2 s–1; and shaded plants, OP; PAR = 900 µmol m–2 s–1) followed by 23 days of rewatering during which the soil water conditions were restored. During the experimental period, measurements by light response curves were carried out to study the photosyntetical performance of olive plants. The synergical effect of drought stress and high irradiance levels caused a reduction of gas exchange and an increase in photoinhibition more marked in EP than in OP. While EP had a higher capacity for thermal energy–dissipative processes, OP showed a better photochemical efficiency and an efficacious stomatal regulation. Gas exchange measurements indicate that mechanisms of stomatal regulation affected PSII efficiency in OP. Difference between the two cultivars were also observed, with a higher photosynthetic efficiency under drought stress in Biancolilla and a better physiological recovery during rewatering in Coratina. The information here obtained can be important to understand the mechanisms by which olive plants minimize photoinhibition when subjected to different abiotic stresses and suggest that photoinhibition due to high light intensity and water deficit can be an important factor that affects photosynthetic productivity of this species.

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Adriano Sofo

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