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The role of stomatal limitation to CO2 assimilation on summer and diurnal depression of NEE, in a Quercus cerris L. coppice.

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This study was conducted in the framework of GHG-Europe project, and was primarily aimed to study the role of midday and summer depression of leaf CO_2 assimilation rates on the already observed reduction of NEE in a Mediterranean Turkey oak (*Quercus cerris* L.) coppice. A secondary objective was to test if the favorable root/shoot ratio of coppiced trees mitigates the effect of water shortage, increasing the spatial heterogeneity of carbon fluxes at the stand level.

Diurnal time courses of net CO_2assimilation rates and stomatal conductance were measured *in situ* (on attached leaves) in a compartment of the forest of Roccarespampani (Central Italy), where an Eddy Covariance flux tower is installed. The climate of this area is Mediterranean with an irregular distribution of the rainfall, with a typical drought period in summer of about two months. The area is managed as coppice with a selective cutting every 20 years and the standards are reserved for 2 or 3 coppice rotations. The field measurements were carried out during one day for each month from June to September, on sun leaves of two coppice shoots (19 year-old) and on two standards (39 and 59-year-old). Net photosynthesis (A) and stomatal conductance (g_s) were measured in the morning, around midday and in the afternoon with a gas exchange system (Li-6400 Li-Cor, Lincoln, NE), under fixed light intensity (2000 μmol photons m^{-2} s^{-1}). Pre-dawn and midday leaf water potentials were measured on similar leaves of the study trees, and in the same days. The obtained results were compared with the values of NEE measured during the same days.

On a daily scale, the reduction of CO_2 assimilation occurred only in August on standard, and was not clearly related on leaf water potential. On the other hand, the photosynthetic daily maxima, through the seasons, were significantly dependent on pre-dawn water potential.

Leaf conductance follows the same relationships, resulting the main cause of the observed reduction of CO_2 assimilation.

The comparison between coppice shoot and standard showed that under drought conditions, gas exchange rates differ significantly with better performance of coppice shoots.

At the ecosystem level, the NEE decrease during summer was partially compensated by the stronger reduction of soil CO_2 efflux, so that a positive C-balance results also during the drought period.

These results confirm the feasibility of coppice management in seasonal drought environments, as normally occur in Mediterranean forests.