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The olive tree: a paradigm for drought tolerance in Mediterranean climates

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Abstract. Olive trees (*Olea europaea* L.) are commonly grown in the Mediterranean basin where prolonged droughts may occur during the vegetative period. This species has developed a series of physiological mechanisms, that can be observed in several plants of the Mediterranean macchia, to tolerate drought stress and grow under adverse climatic conditions. These mechanisms have been investigated through an experimental campaign carried out over both irrigated and drought-stressed plants in order to comprehend the plant response under stressed conditions and its ability to recover. Experimental results show that olive plants subjected to water deficit lower the water content and water potentials of their tissues, establishing a particularly high potential gradient between leaves and roots, and stop canopy growth but not photosynthetic activity and transpiration. This allows the continuous production of assimilates as well as their accumulation in the various plant parts, so creating a higher root/leaf ratio if compared to well-watered plants. Active and passive osmotic adjustment due to the accumulation of carbohydrates (in particular mannitol and glucose), proline and other osmolytes have key roles in maintaining cell turgor and leaf activities. At severe drought-stress levels, the non-stomatal component of photosynthesis is inhibited and a light-dependent inactivation of the photosystem II occurs. Finally, the activities of some antioxidant enzymes involved in the scavenging of activated oxygen species and in other biochemical pathways increase during a period of drought. The present paper provides an overview of the driving mechanisms adopted by olive trees to face drought stress with the aim of better understanding plant-soil interactions.

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