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Adaptation mechanism to drought in the Mediterranean shrub Cistus monspeliensis

D. Liberati, G. Guidolotti, G. de Dato, and P. De Angelis
University of Tuscia, Italy (darioliberati@unitus.it)

Life on the earth is highly dependent on the properties and functions of water.
In front of water limitation plants have developed a wide diversity of adaptation mechanism, ranging from molecular to whole plant level. The present work is focused on the adaptations to summer drought of Cistus monspeliensis L., one of the most widespread species in the circum-Mediterranean area. In the contest of a rainfall exclusion experiment, the responses of this species to natural and induced drought was investigated at different levels : leaf physiology (stomatal and biochemical limitation to photosynthesis), leaf morphology (leaf mass per area, folding of leaf margin) and plant phenology (number of new- shed leaves).
During summer drought, C. monspeliensis shed most of "winter leaves" characterized by low leaf mass per area, reducing the total traspirative surface, only keeping a small amount of “summer leaves” with sclerophyllous habitus: in this period, the net CO_2 assimilation rate decrease, because of stomatal closure and down-regulation of photosynthetic process, and the leaf margins fold toward the midrib, further reducing the part of leaf lamina exposed to sun. After the first autumn rainfall, the leaf mass per area of the summer standing leaves decrease, due to unrolling of leaf margin and the expansion of the leaf lamina, and a new cohort of leaves start to grow. These changes were associated to a fast recovery of high assimilation rates.
The extension of drought period obtained cutting these rains delayed the unrolling and the expansion of the leaf lamina, the growth of new leaves, and the recovery of the photosynthetic rates until the next rain events, occurred a month later.
The different adaptations evolved seem to enable this species to maintain a net assimilation rate throughout the year, and to face a longer dry period.