

Ability of *Cistus* L. shrubs to promote soil rehabilitation in extensive oak woodlands of Mediterranean areas

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**ABSTRACT**

To assess the ecological function of *Cistus salviifolius* (CS) and *C. ladanifer* (CL) shrubs in evergreen oak woodlands, a study was conducted over a 4-year period in southern Portugal. Annual potential return of bio-elements to the soil through litterfall and throughfall, and necromass on soil surface under shrub canopies were assessed along with the dynamics of leaf litter decomposition. Soil bulk density and soil-water retention at different soil matric potential were measured at 0–5 and 5–10 cm depth, and soil chemical properties were determined at 0–5, 5–10, 10–20 and 20–30 cm depth beneath canopies and at barren spaces. Litterfall was higher for CL (4.4–4.6 Mg DM ha<sup>-1</sup> year<sup>-1</sup>) than for CS (3.3–3.8 Mg DM ha<sup>-1</sup> year<sup>-1</sup>). Annual amount of N returned to the soil through litterfall of CS (22.9 kg N ha<sup>-1</sup> year<sup>-1</sup>) was higher than by that of CL (17.2 kg N ha<sup>-1</sup> year<sup>-1</sup>), whereas the return of P in CL (4.1 kg P ha<sup>-1</sup> year<sup>-1</sup>) was higher than in CS (2.1 kg P ha<sup>-1</sup> year<sup>-1</sup>). Leaf decomposition was faster for CS ( $k = -0.87$ ) than for CL ( $k = -0.44$ ). N release was also faster for CS than for CL, while that of P was much faster for CL than for CS. Throughfall proportions were 61% of bulk rainfall for CS and 79% for CL. Annual return of Cl<sup>-</sup>, K<sup>+</sup>, Ca<sup>2+</sup> and Mg<sup>2+</sup> by throughfall was more pronounced for CL than for CS. Shrubs improved soil quality, especially in the 0–5 cm top soil layer, by enhancement of organic matter and nutrient content beneath shrub canopies. Therefore, shrubs may promote the invasion of more demanding species, since local areas of high fertility are likely to be favoured sites for vegetation regeneration.

**Keywords** Oak woodlands, Mediterranean shrubs, Litterfall, Decomposition, Throughfall, Potential return of bio-elements, Soil rehabilitation.