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São Domingos and Lousal mines, nowadays in abandoned state, are located in Portugal, in the Iberian Pyrite Belt, a world-class volcanic-hosted massive sulfide. As a result of the intense mining activity large volumes of wastes containing metal(loid)s were partly exposed to weathering realising potential hazardous elements contaminating waters, soils and sediments. In both mines, a great part of the contaminated areas is relatively covered by several wild species. These species have developed mechanisms of response to oxidative stress originated by high concentration of metal(loid)s in plant tissues, whose presence leads to the formation of reactive oxygen species, thus causing oxidative damage.
The main objective of this study was to evaluate changes in the ecophysiological behaviour of Cistus monspeliensis L., which grows spontaneously in both mine areas, in soils containing high concentrations of metal(loid)s. With this purpose, the variation of some physiological parameters was analysed in order to identify which parameters can be indicators of the plant'sresponse to oxidative stress.
Representative soils from rhizosphere and plants were sampled, in the same locations, in different areas of São Domingos and Lousal mines and in an uncontaminated area nearby São Domingos. Soils were characterized for the classic properties. Multielemental total concentration was analysed in soils and plants (shoots and roots), and multielemental concentration in the available fraction of soils. Pigments (chlorophylls, anthocyanins and carotenoids), glutathione, ascorbate, H_2O_2 and antioxidative enzyme activities were measured in plant shoots.
In general, total and available concentrations (mg/kg) of Zn (total 149-463; available 2-16), As (total 62-3030; available 0.03-1.9), Cd (total 0.3-1.2; available 0.01-0.05), Cu (total 79-375; available 0.8-10) and Pb (total 95-9210; available 0.2-40) are significantly higher in mine soils than in uncontaminated soils Zn (total 92-123; available <0.6), As (total 18-20; available <0.08), Cd (total <0.3; available <0.01), Cu (total 25-47; available <0.1) and Pb (total 28-50; < available 0.08). Also, shoots and roots of the plants collected in both mine areas contain in general higher concentrations (mg/kg) of As (shoot 0.6-75; root 0.8-13.5)and Pb (shoot 2.5-35; root 1.8-91) than plants from uncontaminated soils (As (shoot 0.8-1.2; root <0.8); Pb (shoot <3.2; root 4-9)). Physiological analyses showed a decrease in chlorophylls, anthocyanins, ascorbic acid levels and percentage of glutathione in shoots of C. monspeliensis collected in contaminated areas compared to the plants growing on uncontaminated soils. The decrease in anthocyanins is correlated with the content of Cd and Zn in plants shoots. A negative correlation was observed between carotenoid contents and Cd concentration in shoots in both mine areas. Arsenic and Cd

concentrations were correlated positively with an increase of glutathione in plants grown on mine soils. Moreover, high concentrations of metals in mine soils triggered defence mechanisms against oxidative stress, in the form of increased antioxidative enzyme activity. Therefore, these results reveal that C. monspeliensis is a species adapted to unfavourable environments with high concentrations of metal(loid)s, adjusting its tolerance mechanisms at the metabolic and physiological levels.