

Bioextracts of *Cistus ladanifer* L. growing in São Domingos mine as source of valuable compounds

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The rehabilitation of abandoned mines is essential and a priority because these areas are sources of contamination and environmental and health risk. The rehabilitation of mining areas by phytostabilisation involves several ecological improvements but, nowadays, the economical approaches are also essential. Some autochthonous plant species with refereed aromatic and medicinal properties are able to naturally colonize contaminated soils from mining areas contributing to their natural rehabilitation. A study was carried out in order to characterize and valorise autochthonous species, which are used in rehabilitation processes of mining areas, as new sources of bioactive substances. The main aims of this study were to: i) characterise the phytochemical profile of the bioextracts from shoots of *Cistus ladanifer* growing in soils from São Domingos mining area and a control area; and ii) evaluate the influence of potentially hazardous elements (PHEs) accumulated in the shoots on the quality of the bioextracts.

Composite samples of soils, developed on mine wastes and/or host rocks, as well as *C. ladanifer* shoots were collected in São Domingos mine (Iberian pyrite Belt, SE of Portugal) and in a reference area with non-contaminated soils and the same climatic conditions (Corte do Pinto). Classical characterisation of soils and total concentrations of PHEs (Al, As, Cr, Cu, Mn, Sb and Zn) in soils and plant shoots were determined. The bioextracts from *C. ladanifer* shoots were obtained by an accelerated solvent extractor, and the compounds were analysed by GC-MS. Extracts were extracted with hexane and major components were quantified.

The total concentrations of As, Cu, Pb, Sb and Zn were higher in soils from São Domingos than from those of Corte do Pinto, while the opposite was obtained for Al, Cr and Mn. However, soils from São Domingos can only be considered contaminated with As, Cu, Pb and Sb. The concentrations of PHEs in plant shoots from São Domingos presented intrapopulation variability being these concentrations, in general, higher than in plant shoots from non-contaminated area (except Cr).

Cistus ladanifer bioextracts from the two populations exhibited similar profiles and quite variation in the qualitative composition. Major component in bioextracts obtained from *C. ladanifer* shoots of the two populations was viridiflorol (8.9-12.8 %). Other compounds were identified in all bioextracts (<2.5 %, independently of the plant sample) with great odoriferous interest (amber-like scent: ambrox and caryophyllene oxide; fresh-camphoraceous: bornyl acetate, borneol and myrtenol) and microbial effect (alfa-pinene, beta-pinene, fenchone and camphor).

Slight variability was observed in the concentrations of major components (mg/kg – alfa-pinene: 107.8-163.7; camphene: 20.8-53.3; camphor: 14.5-70.2; fenchone: 4.2-20.7; verbenone: 131.8-232.0, depending on sample), but no relationship was found between these components and the concentrations of PHEs in shoots. Therefore, contamination in soils from São Domingos and PHEs in *C. ladanifer* shoots did not affect the quality of the bioextracts. Bioextracts obtained from *C. ladanifer* growing in São Domingos mining area had valuable compounds. Phytostabilisation of mining areas from IPB with this species can provide economic return by the exploration of this plant-based product for fragrance and pharmaceutical industries.