Ecological engineering for the reinforcement of Astragalus tragacantha populations in the Calanques National Park

Laurence Affre[1], Lucie Miché[*†2], Pascal Mirleau[‡2], Isabelle Laffont-Schwob[§2], Clémence Guiller[¶2], Alex Baumel[‖2], Franck Torre[**2], and Lidwine Le Mire-Pécheux[††3]

[1]Institut méditerranéen de biodiversité et d'écologie marine et continentale (IMBE) – INEE, Université d'Avignon et des Pays de Vaucluse, Institut de recherche pour le développement [IRD] : UMR237, Aix Marseille Université, CNRS : UMR7263, INSB, INSU – Aix Marseille Université, Campus Etoile, Faculté St-Jérôme case 421 Av. . escadrille Normandie-Niemen 13397 MARSEILLE CEDEX 20, France
[2]Institut méditerranéen de biodiversité et d'écologie marine et continentale (IMBE) – INEE, Université d'Avignon et des Pays de Vaucluse, Institut de recherche pour le développement [IRD] : UMR237, Aix Marseille Université, CNRS : UMR7263, INSB, INSU – Aix Marseille Université, Campus Etoile, Faculté St-Jérôme case 421 Av. . escadrille Normandie-Niemen 13397 MARSEILLE CEDEX 20, France
[3]parc national des Calanques – Parc National des Calanques – France

Abstract

Astragalus tragacantha (Fabaceae) is a xerophyte plant endemic of the west Mediterranean coasts that form thorny cushions. In France, *A. tragacantha* has a nationwide protection status and 96% of its populations gather in the Calanques National Park (CNP), at the border of Marseille. Past and present anthropic pressures such as urbanization, stamping and soil pollution have caused the fragmentation of *A. tragacantha* populations. Moreover, despite abundant flowering and seed production, this species shows reduced seedling persistence and leaf necrosis, leading to adult plant death and regressive demographical dynamic. In line with the conservation priority of *A. tragacantha*, this study aimed at developing an ecological engineering protocol to reinforce the most threatened populations at three experimental sites. We first used a metabarcoding approach to estimate the microbial diversity associated to bulk and rhizospheric soils at each site. We then established an in situ transplantation protocol aiming to determine the seed/soil combinations most favorable to plant growth, native root symbiosis and post-transplantation seedling survival.
Metabarecoding results highlights the variability of rhizobia, endomycorrhizae and dark septate endophytes across sites. Monitoring *ex situ* and *in situ* plant growth revealed the effect of seed and soil origins on seedling growth and nodulation rates. To increase young plant-survival rates, our study opens perspectives to select plant beneficial microbial strains that

[*]Speaker
[†]Corresponding author: lucie.miche@imbe.fr
[‡]Corresponding author: pascal.mirleau@imbe.fr
[§]Corresponding author: isabelle.laffont-schwob@imbe.fr
[¶]Corresponding author: clemence.guiller@imbe.fr
[‖]Corresponding author: alex.baumel@imbe.fr
[**]Corresponding author: franck.torre@imbe.fr
[††]Corresponding author: lidwine.lm-pecheux@calanques-parcnational.fr

improve the transplantation, growth and population reinforcement of *A. tragacantha* at a wider scale in the CNP.

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