

Growth performance and physiological traits of *Posidonia Oceanica* exposed to a hypersaline environment

Spinelli Marco¹, Bernardeau-Esteller Jaime², Tomasello Agostino¹, Ruiz Juan Manuel² and Calvo Sebastiano¹

¹ Department of Earth and Marine Sciences (DiSTeM), University of Palermo, ED 16 Viale delle Scienze, 90123 Palermo, Italy

E-mail: marco.spin86@gmail.com

² Centro Oceanográfico de Murcia, Seagrass Ecology Group, Instituto Español de Oceanografía, C/Varadero s/n, 30740 San Pedro del Pinatar, Murcia, Spain

The endemic seagrass *Posidonia oceanica*, widely distributed along the coasts of the Mediterranean Sea, is a seagrass species which form dense meadows between the surface and depths of 30–40 m, constituting the *climax* stage of infralittoral zones. *P. oceanica* is generally considered a highly sensitive species to salinity increments; however, in a particular case, natural populations can grow under salinity levels above its normal threshold of tolerance.

One such case is a population of *P. oceanica* in the Stagnone of Marsala, a semi-enclosed lagoon, situated on the western coast of Sicily. This environment is characterized by extreme temperature and salinity variations, with seasonal periods of hypersalinity in summer, that potentially representing a stress for plants, which are able to survive under this natural hydrodynamic gradient. In this study, growth performance and physiological traits variations of *P. oceanica* population growing inside the Stagnone of Marsala, were analysed in order to assess if the shoots coming from such gradient are able to differentially response, adapt and tolerate this kind of stress. *P. oceanica* collected along such gradient, from the semi-enclosed lagoon towards open sea, was exposed to a controlled hypersaline short term stress in a mesocosm environment, with the aim of separating effects of salinity from other potentially deleterious stressors, like temperature. It examined effects of salinity stress compared with seawater controls over 4 weeks at 46 PSU on *P. oceanica* growing in mesocosms.

An interesting aspect to highlight is the gradient of adaptation to hypersaline stress from the open sea towards the Stagnone of Marsala with an increasing for these population in the content of proline and respiratory rates, reduction of growth and photosynthetic rates, of leaf water potential (Ψ_w) and osmotic potential (Ψ_π) (i.e. more negative), while turgor pressure (Ψ_p) was unaffected.

These responses suggest that *P. oceanica* plants growing in the center of the Stagnone of Marsala under the fluctuating influence of hypersaline waters (up to 46 PSU) for decades evolved an osmo-acclimation strategy that differs from the plants growing under natural salinity levels (37–38 PSU) and at longer time have been able to develop physiological and/or structural to support this particular strategy.

Keywords: *Posidonia oceanica*; hypersaline stress; hypersaline lagoon; water relations; photosynthesis; osmolytes