J Chem Ecol
DOI 10.1007/s10886-015-0610-x

Chemoreception of the Seagrass *Posidonia Oceanica* by Benthic Invertebrates is Altered by Seawater Acidification

Valerio Zupo[1] · **Chingoileima Maibam**[1] · **Maria Cristina Buia**[1] · **Maria Cristina Gambi**[1] · **Francesco Paolo Patti**[1] · **Maria Beatrice Scipione**[1] · **Maurizio Lorenti**[1] · **Patrick Fink**[2]

Received: 9 December 2014 / Revised: 27 April 2015 / Accepted: 22 June 2015

Abstract Several plants and invertebrates interact and communicate by means of volatile organic compounds (VOCs). These compounds may play the role of infochemicals, being able to carry complex information to selected species, thus mediating inter- or intra-specific communications. Volatile organic compounds derived from the wounding of marine diatoms, for example, carry information for several benthic and planktonic invertebrates. Although the ecological importance of VOCs has been demonstrated, both in terrestrial plants and in marine microalgae, their role as infochemicals has not been demonstrated in seagrasses. In addition, benthic communities, even the most complex and resilient, as those associated to seagrass meadows, are affected by ocean acidification at various levels. Therefore, the acidification of oceans could produce interference in the way seagrass-associated invertebrates recognize and choose their specific environments. We simulated the wounding of *Posidonia oceanica* leaves collected at two sites (a control site at normal pH, and a naturally acidified site) off the Island of Ischia (Gulf of Naples, Italy). We extracted the VOCs and tested a set of 13 species of associated invertebrates for their specific chemotactic responses in order to determine if: a) seagrasses produce VOCs playing the role of infochemicals, and b) their effects can be altered by seawater pH. Our results indicate that several invertebrates recognize the odor of wounded *P. oceanica* leaves, especially those strictly associated to the leaf stratum of the seagrass. Their chemotactic reactions may be modulated by the seawater pH, thus impairing the chemical communications in seagrass-associated communities in acidified conditions. In fact, 54 % of the tested species exhibited a changed behavioral response in acidified waters (pH 7.7). Furthermore, the differences observed in the abundance of invertebrates, in natural vs. acidified field conditions, are in agreement with these behavioral changes. Therefore, leaf-produced infochemicals may influence the structure of *P. oceanica* epifaunal communities, and their effects can be regulated by seawater acidification.

Keywords Acidification · *Posidonia oceanica* · Wound-activated · VOC · Invertebrate · Seagrass · Odor · Infochemical

Introduction

The acidification of oceans, due to increasing levels of CO_2 in the atmosphere and surface oceans (Brewer 2013), may interfere with the lives of various organisms and communities, due both to chemical influences imposing physiological adaptations and to changed relationships among organisms, affecting their communications and coexistence (Fabricius et al. 2014; Kroeker et al. 2011; Wyatt et al. 2014). Most seagrasses have been demonstrated to be able to thrive at high levels of CO_2 (Apostolaki et al. 2014; Garrard et al. 2014), and to survive in areas constantly characterized by low pH (Gartner et al. 2013). However, their epiphytic communities are dramatically influenced by seawater at low pH, since various calcareous algae may be selected against, even by slight pH changes (Donnarumma et al. 2014; Martin et al. 2008). The invertebrate community of the leaf stratum is associated strictly to the epiphytic community (Lebreton et al. 2009), both for shelter

✉ Valerio Zupo
vzupo@szn.it

[1] Stazione Zoologica Anton Dohrn, Center Villa Dohrn - Benthic Ecology, Punta San Pietro, 80077 Ischia, Italy

[2] Cologne Biocenter, Department of Aquatic Chemical Ecology, University of Cologne, Zülpicher Straße 47b, 50674 Köln, Germany

Published online: 30 August 2015