Mediterranean Species of Caulerpa Are Polyploid with Smaller Genomes in the Invasive Ones

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Caulerpa species are marine green algae, which often act as invasive species with rapid clonal proliferation when growing outside their native biogeographical borders. Despite many publications on the genetics and ecology of Caulerpa species, their life history and ploidy levels are still to be resolved and are the subject of large controversy. While some authors claimed that the thallus found in nature has a haplodiplobiontic life cycle with heteromorphic alternation of generations, other authors claimed a diploid or haploid life cycle with only one generation involved. DAPI-staining with image analysis and microspectrophotometry were used to estimate relative nuclear DNA contents in three species of Caulerpa from the Mediterranean, at individual, population and species levels. Results show that ploidy levels and genome size vary in these three Caulerpa species, with a reduction in genome size for the invasive ones. Caulerpa species in the Mediterranean are polyploids in different life history phases; all sampled C. taxifolia and C. racemosa var. cylindracea were in haplophasic phase, but in C. prolifera, the native species, individuals were found in both diplophasic and haplophasic phases. Different levels of endopolyploidy were found in both C. prolifera and C. racemosa var. cylindracea. Life history is elucidated for the Mediterranean C. prolifera and it is hypothesized that haplophasic dominance in C. racemosa var. cylindracea and C. taxifolia is a beneficial trait for their invasive strategies.