Cell viability in natural phytoplankton communities quantified by a membrane permeability probe

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ABSTRACT: A nonstaining method, based on the digestion of dead cells, the membranes of which are permeable when exposed to an enzymatic cocktail (DNAse I and Trypsin), was used to identify living cells in cultured and natural phytoplankton populations. The cell digestion method was applied to cultures of nine phytoplankton species, encompassing a broad taxonomic range. The percentage of living cells obtained with the enzymatic digestion test was found to be consistent with that obtained with the vital stain fluorescein diacetate, which could be applied to only six of the species used. Use of the cell digestion method showed the phytoplankton community viability in Blanes Bay (NW Mediterranean littoral) to be very low at the beginning of the summer (34% and 31% of diatoms and cyanobacteria cells were alive, respectively), when oligotrophic conditions prevailed. The phytoplankton viability increased slightly by midsummer, with the entire cyanobacteria population, which dominated the community, composed of living cells, and most (81%) of the diatom cells were living in the fall. The patterns in cell viability revealed by the cell digestion method were consistent with the seasonal variability in phytoplankton lysis rates and the shifting contribution of different groups to the phytoplankton community.

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