Multiyear patterns of fungal biomass dynamics and productivity within naturally decaying smooth cordgrass shoots

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ABSTRACT: Ascomycetous fungi are predominant secondary microbial producers of the smooth cordgrass (*Spartina alterniflora*) shoot decay system. A 3-yr examination of concentrations of living fungal mass (as ergosterol content) in naturally decaying cordgrass, and of instantaneous rates of cordgrass-fungal production (as rates of incorporation of radiolabeled acetate into ergosterol at a standard temperature of 20° C), was conducted in three salt-marsh watersheds of Sapelo Island. Though the years of study were climatologically different (e.g., rainfall ranging over a factor ~2), ergosterol content of decaying leaves was not different from year to year, with a grand mean of 371 μg ergosterol g^{-1} organic mass of decaying system, and there was little difference among yearly average fungal productivities (range = 155-217 μg fungal organic mass g^{-1} system organic mass h^{-1} for autumn-spring data). Significant differences in ergosterol content of decaying leaves were found among marsh watersheds, probably due to differences in nitrogen (but not phosphorus) availability, but these were not large (maximum 1.3-fold for multiseasonal data), and differences were not found among marsh subsites (short to tall shoot) nor, for the most part, among types or parts of decaying leaves. Season of sampling, however, had a large effect upon fungal biomass and fungal productivity: average ergosterol contents were significantly higher in winter and spring (e.g., 416-554 μg g^{-1} organic mass of decaying blades) than in summer or autumn (<310 μg g^{-1}). Among the potential reasons for this unexpected pattern of seasonality might be (1) greater access of mycophagous invertebrates and/or bacterial competitors due to higher tides and lower elevation of leaves in late summer and fall, and (2) leaching of leaf digestate during periods of high rainfall and high spring tides. Significant correlations were found between ergosterol content of decaying leaves and mean tidal height for the 3 months before sampling ($r = -0.77$) and for fungal productivities and 3-month rainfall ($r = -0.62$). Grazing of decaying leaves by salt-marsh periwinkles over the range of snail densities of the study sites (0-85 m^{-2}) gave no clear evidence of depression of fungal biomass or repression of fungal activity, contrary to previous findings for higher snail densities. The calculated seasonal change in living fungal percentage of decaying leaves was from ~6 (summer-autumn) to 9% (winter-spring), and in 6-month fungal production, the change was from 101 to 434 g organic fungal mass m^{-2} marsh surface.

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