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논문제목(Title)

[논문]Growth and Photoacclimation Strategies of Three Zostera Species Along a Vertical Gradient: Implications for Seagrass Zonation Patterns

주저자명(FirstAuthor)

Sang Rul Park

공동저자명(Co-Author)

Kyeonglim Moon

공동저자명(Co-Author)

Seung Hyeon Kim

공동저자명(Co-Author)

Kun-Seop Lee

초록(Abstract)

Seagrasses typically display vertical zonation patterns in tropical and temperate areas. In East Asia, three *Zostera* species (*Z. japonica*, *Z. marina*, and *Z. caespitosa*) are distributed at different water depths, leading to zonation patterns from intertidal to subtidal zones. The present study aimed to determine whether these patterns could be explained by differences in their physiological responses, morphological traits, and meadows architecture caused by depth variations. Intertidal *Zostera japonica* had the lowest shoot height and blade width and the highest shoot density, while subtidal *Z. caespitosa* exhibited the largest specific leaf area. Total carotenoid content and the total chlorophyll/total carotenoid ratio were significantly higher in *Z. japonica* than in *Z. marina* or *Z. caespitosa*. The average carbon stable isotope ($\delta^{13}\text{C}$) values were significantly less negative in *Z. caespitosa* than in *Z. marina* and *Z. japonica*. The average maximum relative electron transport rate was higher for *Z. marina* than for *Z. japonica* and *Z. caespitosa*, while the maximum quantum yield values were higher for *Z. caespitosa* than for *Z. japonica* and *Z. marina*. The non-photochemical quenching (NPQ) of *Z. japonica* extinguished within 5-min following the rapid light curve, indicating that most of its NPQ was energy-dependent quenching (qE). The rapid light curve (RLC) parameters and leaf relaxation after RLC showed that *Z. japonica* is a high-light adapted species and *Z. caespitosa* is a low-light adapted one. Additionally, *Z. caespitosa* showed the lowest dark respiration values and *Z. japonica*, the highest, suggesting that *Z. caespitosa* can survive with low photosynthetic activity. These results suggested that interspecific variations in the morphological and physiological characteristics, photosynthetic pigments, and meadows architecture of three *Zostera* species were associated with vertical zonation patterns and likely explain their patterns.

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