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Effect of habitat preference on frond life span in three *Cyathea* tree ferns

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Abstract

It has been reported that plants living in various geographical areas had different physiological forms, as factors of microenvironment have strong impacts on physiological characters. However, the physiological characters of fronds have been scarcely reported in ferns. In this study, we investigated physiological differences in response to the habitat preference in the three tree ferns in northeast Taiwan, *Cyathea lepifera*, *C. spinulosa*, and *C. podophylla*, prefer to open site, edge of forest, and interior forest, respectively. The canopy openness above the individuals of *C. lepifera*, *C. spinulosa* and *C. podophylla* were 29.2 $\pm$ 14.10 , 7.0 $\pm$ 3.07 and 5.0 $\pm$ 2.24 %, respectively. Among three species, *C. podophylla* had the longest frond life span (13.0 $\pm$ 4.12 months) than the two others (*C. lepifera* (6.8 $\pm$ 1.29 months) and *C. spinulosa* (7.3 $\pm$1.35 months). Our result supported the general patterns that shade intolerant species have a shorter leaf life span than shade tolerant species. The maximum net CO_2 assimilation of *C. lepifera*, *C. spinulosa* and *C. podophylla* were 11.46 $\pm$ 1.34, 8.27 $\pm$ 0.69, and 6.34 $\pm$ 0.54 μmol CO_2 m^{-2} s^{-1}, respectively. As well, *C. lepifera* had the highest photosynthetic light saturation point (LSP), while *C. podophylla* had the lowest LSP among these three tree ferns. These suggested that *C. lepifera* could be more efficient for capturing and utilizing light resources under the larger canopy openness condition than the other two species. We also found that frond C : N ratio were positively correlated with frond life span among species. *C. podophylla*, with the longest frond life span, had the highest frond C : N ratio (22.17 $\pm$ 1.95), which was followed by *C. spinulosa* (18.58 $\pm$ 1.37) and *C. lepifera* (18.68 $\pm$ 2.63) with shorter frond life span. The results were consistent to the theory that the fronds and leaves of shade intolerant species have high photosynthetic abilities with low C : N ratio.

Key words: Canopy openness, frond life span, tree fern, *Cyathea*, frond C : N ratio