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Changes of Plant Communities Classification and Species Composition along the Micro-topography at the Lienhuachih Forest Dynamics Plot in the Central Taiwan

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ABSTRACT: How micro-topography affecting plant communities classification and species composition at one stand-level was investigated through the plant communities and species composition varied across fine-scale environmental heterogeneity at the 25-ha Lienhuachih broad-leaved forest dynamics plot (FDP). All free-standing woody plants with diameter at breast height ≧1 cm were identified, measured, tagged and mapped. Four plant communities were identified and represented with dominant and indicating species based on two-way indicator species analysis (TWINSPAN). Type I, *Pasania nantoensis - Randia cochinchinensis*, locating on the ridge and the highest elevation was with the highest stem density; Type II, *Mallotus paniculatus - Engelhardtia roxburghiana*, locating on the upper slope was an ecotone between type I and type III, with the middle stem density and basal area among four plant community types; Type III, *Diospyros morrisiana - Cryptocarya chinensis*, locating on the lower slope and stream side was with lower stem density but the highest species heterogeneity; and Type IV, *Machilus japonica* var. *kusanoi - Helicia formosana* locating on west stream side was with the lowest stem density and basal area. Detrended Correspondence Analysis (DCA) results showed nearly 27.11% of the plant species composition was attributable to micro-topographic variables. Ridge distance, stream distance and convexity were the most important factors effected the changes of plant community and species composition. Classification and regression tree (CART) method was also used to examine the relationship between each single specie and micro-topographic variables. Over 70% species had more than 27.11 % variations which explained by DCA results. To conclude, our results support the existence of habitat association and niche divergence related to micro-topography in a subtropical evergreen broad-leaved forest.

KEY WORDS: Habitat association, niche divergence, plant communities, species composition, micro-topography, subtropical evergreen broad-leaved forest.

INTRODUCTION

Topography is one of the most important factors affecting the vegetation pattern within a climatic region. In hilly or mountane areas, the vegetation pattern is closely related to the pattern of micro-topography (Hack and Goodlet, 1960; Miura and Kikuchi, 1978; Ishizaki and Okitsu, 1988). It not only creates a gradient of water and nutrient availability in the soil (Zak *et al.*, 1991; Enoki *et al.*, 1997; Hirobe *et al.*, 1998), but also affects the pattern of disturbances such as landslides, windstorms and fires (Kilgore and Taylor, 1979; Foster, 1988).

The fine-scale heterogeneity may affect the establishment of tree seedlings, which in turn influence the spatial distribution of tree species (Beatty, 1986; Núñez-Farfán and Dirzo, 1988; Harmon and Franklin, 1989; Nakashizuka, 1989). Resulting from niche differentiation, a micro-site could be important in maintaining species composition in a community. Closely related species may coexist in a non-uniform environment that permits partitioning among species, or even restriction to special microhabitats (Harper and Sagar, 1953; Harper ,1957, 1958).

Taiwan's montane areas are very steep and rugged. Previous vegetation studies in Taiwan have indicated that variations of forest composition at medium to large scales are primarily governed by climatic factors and reflect among different altitudinal or geographic regions (Su, 1984; Su, 1985; Hsieh *et al.*, 1997). However, there have been few direct and quantitative analyses that focused on relationships between the forest composition