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Canopy Openness and LAI Estimates in Mixed Pine-Oak Forest with Different Management System in Northeast Mexico using Hemispherical Photography

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Abstract

Structural variation in mixed pine oak forest canopies influences light availability and distribution. In temperate mixed forest, natural and man-made small scale disturbances produce canopy openings that are an important source of heterogeneity in forest understory light regimes, and play a critical role in determining patterns of tree regeneration. The canopy structure in mixed pine-oak forest was characterised using hemispherical photography technique. The experimental study was carried out in two stands: one stand without thinning (SM) and other with thinning (mainly used for firewood). The objective of this study was to determine how canopy openness (CO) is affected by selection cutting, and how the CO influences the woody regeneration. The parameters used to characterise the forest canopy were the canopy openness (CO) and the leaf area index (LAI). We took nine hemispherical photography per plot, at 1.3 m above-ground. Forest structure was measured in three compartments (A) 500 m² for tree species ≥ 10 cm, (B) 100 m² for individuals with $dbh \leq 10$ cm and $dbh \geq 3$ cm and (C) for all woody species $dbh \leq 3$ cm. The results on forest structure showed that the species richness for the compartment A do not shown significant differences between the stand SM (3 ± 1.2) and the stand CM (3 ± 1.2). Moreover, no significant differences were found on compartment B, but significant differences were found on compartment C. A higher species richness were found on stands SM (9.4 ± 2.6) in comparison with the stand CM (3.8 ± 1.3). The canopy openness (CO) values varied between 22 %-35 % on both stands. On the other hand, the LAI on the stands (SM) varied from 1.1 m² m⁻² to 1.7 m² m⁻², while on the stands (CM) the LAI values ranged from 0.9 m² m⁻² to 1.9 m² m⁻² for the month of February 2007. Finally, the results obtained confirmed the usefulness of hemispherical photographs in forest ecology and direct future research in mixed pine-oak forest in the Sierra Madre Oriental, Mexico.

Keywords: Canopy openness, hemispherical photographs, Mexico, mixed pine-oak forest