

Initial Effects of Different Thinning Patterns on Carbon Storage of *Cunninghamia lanceolata* Plantation

Zou Xianhua¹, Yang chutong², Zheng Ziyang¹, Yao Bida¹, Huang Zhijun¹, Zhu Liqin¹, Yang Mengjia¹, Guo Zhijuan¹, Xu Liqing³, Lin Kaimin⁴

1Nanchang Institute of Technology, Nanchang 330099, China

2 Fujian Forestry Prospect and Design Institute, Fuzhou 350001, China

3 Pushang State-owned Forest Farm in Shunchang, Nanping 353205, China

4 Fujian Agriculture and Forestry University, Fuzhou 350002, China

Abstract:

Reasonable management mode can ensure the stability of carbon in forest ecosystem, and serve as a sustainable carbon sink to store atmospheric CO₂. In this study, Chinese fir (*Cunninghamia lanceolata*) was selected as the research object, the short-term effects of target tree management and traditional thinning measures on tree growth, stand structure and carbon storage of Chinese fir plantation were analyzed and compared by using target tree management (TM), traditional thinning mode [retention density 900 trees/hm² (T-60), 600 trees/hm² (T-40)], and no thinning (CK). The results showed that after three years of different thinning measures, TM treatment had the best growth, in which the average annual increment of DBH, height and volume per plant was significantly higher than that of traditional thinning treatments and CK treatment, which were 62.5%, 61.3% and 74.1% higher than that of CK respectively. Except for undergrowth vegetation, the carbon storage of tree layer, litter layer, and soil layer showed significantly higher CK than that of thinning treatments. The comparison of different thinning patterns showed that the total carbon storage of tree layer was mainly affected by thinning intensity, decreased with the increase of thinning intensity, and was not affected by thinning mode. The carbon storage of litter treated with TM and T-40 was significantly higher than that of T-60. Soil carbon storage also showed that TM was higher than that of traditional thinning treatments, and this difference decreased with the increase of soil depth. The undergrowth vegetation was significantly affected by different thinning patterns, among which the carbon storage of herb and shrub layer of TM was significantly higher than that of traditional thinning treatments and CK. It mainly because the canopy opening and leaf inclination angle of TM increased by 23.8% and 17.7% respectively compared with CK, while the leaf area index decreased by 4.7%, which effectively improved the environment and canopy structure of the forest, thus promoting the growth of vegetation under the forest. In summary, in the short term, the carbon storage of Chinese fir plantations with different thinning modes was lower than that of non thinning treatment, but the promotion effect on the growth of individual trees and undergrowth vegetation were significant. Among them, target tree management was better than traditional thinning treatments. How different thinning measures affect the carbon storage of Chinese fir plantation ecosystem on a long-term scale needs long-term monitoring and in-depth study.