

Changes of nitrogen utilization in a hinoki cypress plantation at Kochi city for 25 years

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Hinoki cypress is an evergreen conifer and major plantation species in Japan. During stand development leaf biomass increases and the canopy is closed about 20 years after planting. Low light condition at the forest floor reduces understory vegetation and should cause surface soil erosion. Thinning management in this period should increase abundance of understory vegetation. Therefore competition between hinoki cypress and understory vegetation for light and soil resources may change during forest development. Stable nitrogen isotopes in the soil affected by soil depth and nitrogen forms and the nitrogen isotopes of plant leaves can give us information about soil nitrogen sources. The study investigated changes of nitrogen isotope ratio in the leaves of hinoki cypress and understory vegetation in a forest at Kochi city for 25 years.

Leaf litter fall of hinoki cypress and understory vegetation was 271 g/m²/yr, and 46 g/m²/yr, respectively. Leaf fall of hinoki cypress was not related with stand age while that of understory vegetation increased exponentially. Nitrogen input by leaf litter of hinoki cypress decreased during stand development while it increased exponentially. Nitrogen concentration in the leaves of hinoki cypress and understory was 6.5 mg/g and 11.5mg/g, respectively was not change during stand development. $\delta^{15}\text{N}$ in the leaves of hinoki cypress and understory vegetation was -3.37‰ and -1.16‰, respectively and annual decrease was 0.05‰ and 0.08‰, respectively. By contrast, annual decrease of $\delta^{15}\text{N}$ in the total leaves was small (0.014‰). The results suggest the increase of understory vegetation with high $\delta^{15}\text{N}$ value should keep $\delta^{15}\text{N}$ in the total leaves relatively constant. Hinoki cypress should change its nitrogen sources having low $\delta^{15}\text{N}$ to avoid competition with understory vegetation.

Keywords: nitrogen isotopes, nitrogen sources, leaf liter, hinoki cypress, understory vegetation