DBH and basal area growth by thinning intensity of major coniferous plantations in the Republic of Korea

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Introduction

Controlling stand density by various thinning intensities has been the major tool to regulate tree growth and improve timber quality. Much work has been conducted on stand or tree responses to thinning intensities by establishing permanent plots and repeating periodic measurements. *Pinus densiflora, Pinus koraiensis and Larix kaempferi* are the most important species in commercial timber plantations South Korea.

Objectives

To analyzed the effect of thinning intensity on DBH and basal area growth of major coniferous plantations, which are *Pinus densiflora(Pd)*, *Pinus koraiensis(Pk)*, and *Larix kaempferi(Lk)* in the Republic of Korea.

Materal & Method

For the study permanent monitoring plots were installed in 38 sites, 45 sites and 45 sites of *Pd*, *Pk*, and *Lk* respectively from 2012~2015 with each plot consisting of non-thinning(C), light thinning(L) and high thinning(H) plots(Fig. 1). They were inventoried again during 2015~2018. The thinning ratio ranged in 0~5% for non-thinning, 10~28% for low thinning, and 30~50% for high thinning based on basal area. Increment and growth ratio of DBH and BA were numerically calculated and analyzed by ANOVA.

Result and Discussion

DBH increment

Thinning intensity was found to have an overall effect on the DBH increment and growth rate of the three species (C<L<H). ANOVA analysis also showed that there was a significant difference ($P<0.001$) in DBH increments among thinning intensities or stand densities(Fig. 2).

It was found, meanwhile, that thinning was not effected on DBH growth of some sites in this short-term study. The factors such as residual basal area, physiography (slope characteristic), and site quality were considered to be the other factors on DBH growth besides thinning intensity.

BA increment

Total BA increment per hectare of the three species increased larger with increasing stand density (control>light>heavy). However, the growth rate in heavy thinning plot was the greatest while the smallest occurred in unthinned plot ($p<0.01$)(Fig. 3). The results showed the average total BA increment per hectare was higher with increasing stand density. Growth rate conversed total BA increment for Lk and Pk (heavy>light>control), while Pd showed growth rate was the highest in light and the lowest in heavy thinning plot (light>control>heavy)

The effect of thinning intensity for 6 years was analyzed on DBH and basal area growth of *Pinus koraiensis(Pk)*. Overally the result showed the similar to the above. The noteworthy is that second 3 years was larger than first 3 years in terms of increment and growth ratio of DBH and BA(Fig. 4)

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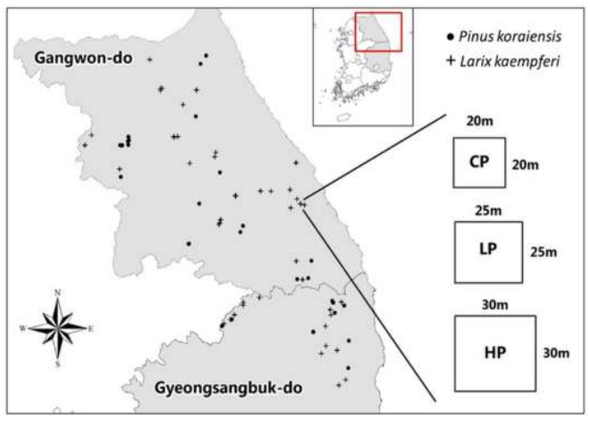

Species	No. of sites	1st inventory	2nd inventory	3rd inventory
Pinus koraiensis	45	2012	2015	2018
Pinus densiflora	38	2014	2017	2020
Larix kaempferi	45	2013	2016	2019
Total	128	2012-14	2015-17	2018-20

※ Repeat inventory every 3 years

Fig. 1 Distribution of permanent monitoring plots ; installed in 38 sites, 45 sites and 45 sites of *Pd*, *Pk*, and *Lk*

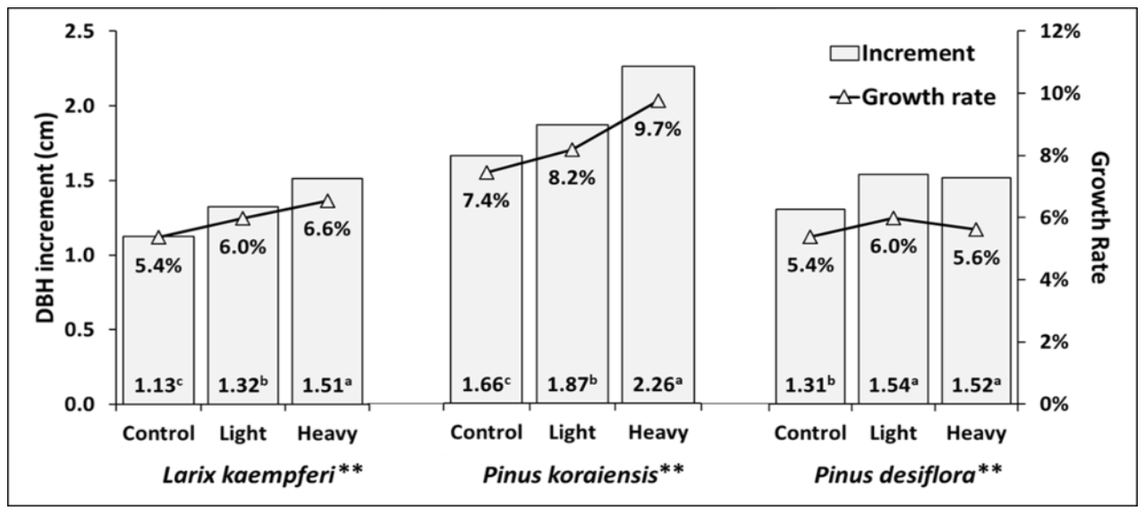

Fig. 2 DBH increment and growth rate by thinning intensity

※ Factors that could affect DBH growth besides thinning intensity in 19 sites

Site quality (site index) Poor site quality → less productivity

Site physiography* (slope and aspect)

Steeper slope, north > south

Residual basal area after thinning,

Residual BA thinning plot > control plot

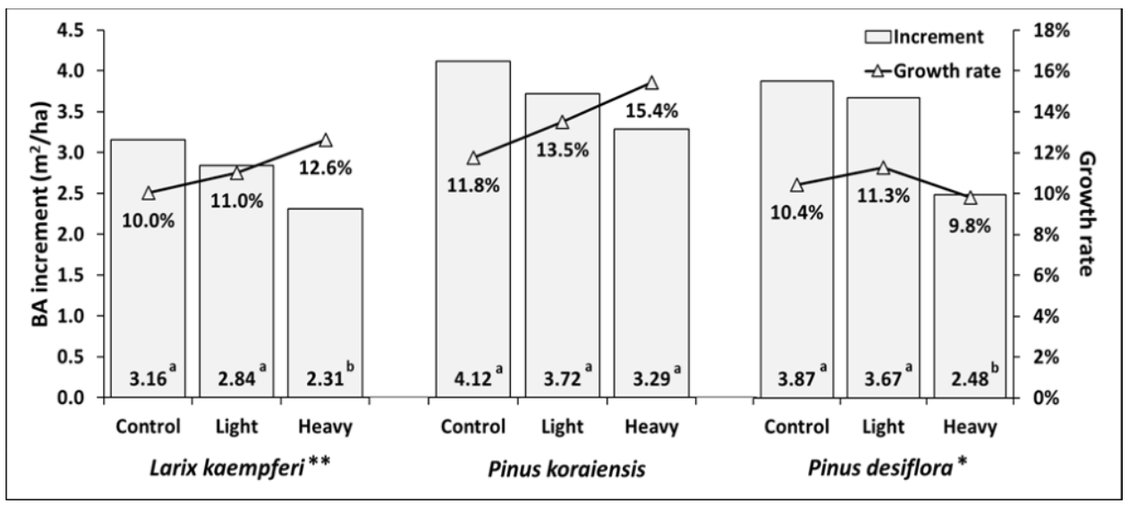

Fig. 3 BA increment and growth rate by thinning intensity

※ 20 sites of *Lk*, 13 sites of *Pk* and 5 sites of *Pd* do not follow needed to explain why?

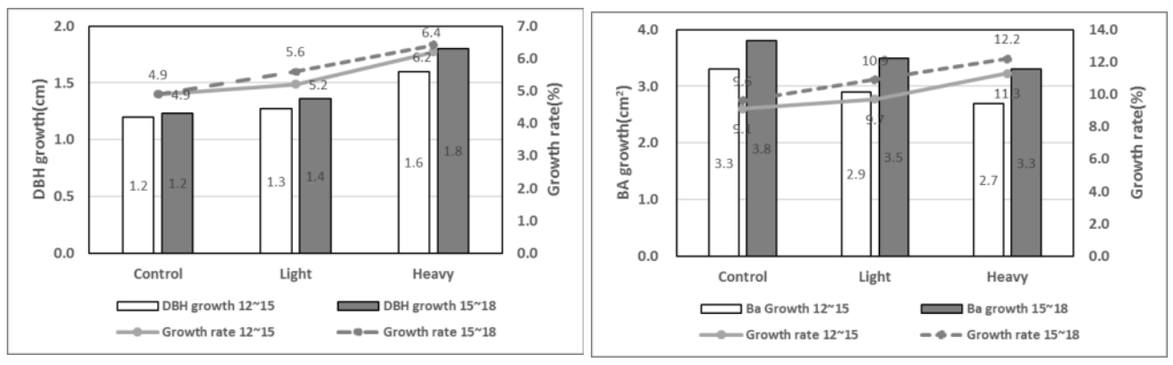

Fig. 4 DBH and BA increment and growth rate of *Pinus koraiensis* by thinning intensity for six years

※ DBH & BA increment and growth ratio

Second 3 years > first 3 years

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