

Studies on the Pruning Methods for Seed Production in *Pinus densiflora* Seed Orchard

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Pinus densiflora is one of the most economically important timber species and the most widely distributed conifer species in Korea. To produce genetically improved seed of *P. densiflora*, the establishment of seed orchard was started from 1968. The cones of *P. densiflora* were attached at the top crown. As the height of trees get higher, we have faced on the difficulty of seed production. Additionally, the vitality of trees was a problematic, because the closed crown shaded the light. Thus, we decided to introduce crown pruning method to overcome these problems. This study was conducted to investigate the effect of crown pruning for seed production and seed quality in a seed orchard of *P. densiflora*.

MATERIALS AND METHODS

The test site was located in Anmyun-do, Chungnam province, which was established in 1977. From 1988 to 1995, the 1st crown pruning was executed in this test site. In 2001, the 2nd crown pruning was executed with several pruning methods such as (A) top pruning, (B) top + branch pruning, (C) top + branch pruning + branch trimming and (D) control (Figure 1). After 2nd crown pruning, the growth characteristics of pruned trees had been examined for five years. We investigated the number of male and female flowering per branch, cone survival rate seed production and seed quality at each treatment. Additionally, the implications of crown pruning on seed orchard management of *P. densiflora* were discussed.

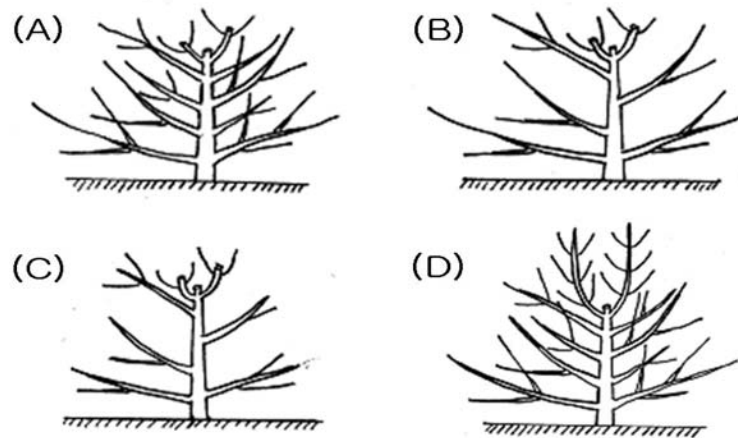


Figure 1. The crown pruning methods used in this study.

RESULTS AND DISCUSSION

The number of female flower per branch was largely decreased in 1st year after crown pruning, which was due to the diminishment of number of branch containing flower bud by pruning. In 2nd year after pruning, however, the number of female flowering and seed production of pruned

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trees were started to increase than that of control. Among the crown pruning methods, top + branch pruning + branch trimming showed the best promoting effect of female flowering at 3rd year after crown pruning (Figure 2). On the contrary, the number of male flowering per branch was largely decreased in all pruning treatment for five years investigated.

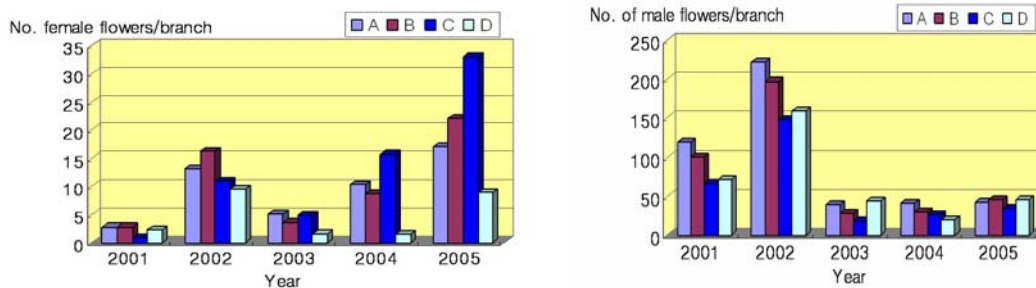


Figure 2. Flowering patterns of female and male for five years after pruning.

Cone survival rate and seed quality of pruned trees were higher than that of control (Table 1). Particularly, the top + branch pruning + branch trimming showed relatively high cone survival rate. Comparing seed quality, there were slight differences among treatments. The top + branch pruning + branch trimming showed highest seed production and seed quality (Table 2). Because crown pruning brought about the effect of cone density control per branch and affect the resource allocation among sinks, it was suggested that the cone survival rate and seed quality were enhanced through crown pruning treatments.

Table 1. Cone survival rate at different crown pruning treatments.

Treatment	Per cone				
	East	West	South	North	Average
A	89.4	62.3	65.4	83.2	73.7
B	78.4	68.5	89.0	73.2	76.0
C	75.5	69.7	76.8	80.8	75.9
D	60.7	70.2	75.7	73.2	73.3

Table 2. Comparison of seed quality at different crown pruning treatments.

Treatment	Per cone				
	Total seed weight (g)	Fulled seed weight (g)	No. of total seed	No. of fulled seed	Fulled seed rate (%)
A	0.45	0.43	38.0	32.7	86.1
B	0.34	0.33	34.5	29.9	86.7
C	0.55	0.54	47.3	43.0	90.9
D	0.58	0.56	47.9	41.6	86.8

According to above results, crown pruning was beneficial to seed orchard management of *P. densiflora* in relation to sustainable seed production, i.e. female flowering promotion at 3rd year after crown pruning. It might be a clue of artificial control of seed production. Particularly, top +

branch pruning + branch trimming treatment was a promising method for *P. densiflora*. However, more attention was required to apply this method for practice, because it is brought about male flower deficiency at early stage of treatment.

LITERATURE CITED

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