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Ecological Studies on the Seed Production and Natural Regeneration in Hornbeam Forest

I. Basic Survey

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개서나무林의 種子生産과 天然更新에 관한 生態學的 硏究

I. 기초연구

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ABSTRACT

This study was carried out to estimate the seed crop of Carpinus forest in Piagol of Mt. Chiri for six years and the results obtained were as follows ;

Upper two layers of Capinus forest were dominated by *C. tschonoskii* and Subfall tree layer ranging from 15.40 to 17.20 m in height. The distribution of seed weight of *C. tsconoski* was skewed to light weight classes.

Most seeds fall in November. The best crop was shown in 1984, while virtually no crops in 1985. Since 1985, annual seed crop increased gradually.

INTRODUCTION

To reproduce a forest naturally, promptly, and effectively and to assure at the same time a desirable species composition in the new crop is the most critical phase of natural regeneration.

To reproduce toe forest in not simple matter. It depends on a whole chain processes, and the failure of the whole may result frem weakness in any lind.

The essential factors necessary for reproduction by seed seems to be an adequate seed supply, effective dissemination over the area, small losses prior to germination, prompt germination, successful establishment as a self-sustaining plant, and survival up to the

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time when competition with other trees begins.

It is necessary to know the actual seed production per stand for various purposes, and such information is obtainable only through long and intensive studies. Seed trap is generally used to estimate seed crop. Seed trap method to estimate seed crop was adopted by a lot of researchers (Allen, 1941 ; Allen and Trousdel ; Averell, 1929 ; Baron, 1969 ; Boe, 1955 ; Brender, 1958 ; Carvell and Kirstian, 1955 ; Cram and Worden ; Rim and Shidei, 1973). Seed trap with suitable size provides the most reliable information on seed production. However, this method requires more effort, time, and expenditure than allometric method.

Carpinus species appears in the warm and moist regions in Korea. In Piagol of Mt. Chiri they are well conserved as natural forest.

In this paper, vegetation and seed crop of Carpinus forest in Piagol of Mt. Chiri were presented on the basis of the monthly investigations which were carried out from 1984 to 1989.

MATERIALS AND METHODS

Fig. 1. Seed traps set up on forest floor of hornbeam.

Vegetation survey of Carpinus forest was carried out by the Braun-Blanquet's method (1964), using 15×15m quadrats.

Sixty-four seed traps were set up on the forest floor. A seed trap made of a large polyethene screen bag hung mouth upwards from a square wire frame sized 50×50cm mounted under a thick wire(Fig. 1). The polyethene bag tended to move slightly by the wind, but the contents of the trap was observed to be safe because of bottom stone of the trap.

Seeds were collected from these traps at an interval of 15 days from 30 September to 30 November each fall.

RESULTS AND DISCUSSION

Vegetation of the study area was consisted of 4 layers in Table 1. Tree-Ⅰ layer was dominated by *Carpinus tschonoskii*. Interspersed with *Acer mono* and *Quercus serrata* appeared.

Tree-Ⅱ layer was also dominated by *C. tschonoski*, but other species were *Palura chinensis* and *C. laxiflora* were also present. *C. tschonoski* and *C. laxiflora* were established by natural regeneration.

Table 1. Floristic composition of studied area

Scientific Name	Cover degree	Scientific Name	Cover degree
Tall-tree I layer		Herb-layer	
Carpinus tschonoskii	5.5	*Palura chinensis*	1.1
Acer mono	1.1	*Sasa norealis* var. *chiisanensis*	3.3
Quercus serrata	1.1	*Benzoin erythrocarpum*	3.3
Tall-tree II-layer		*Lespedeza maximowiczii*	+
Carpinus tschonoskii	2.3	*Lepisorus thunbergiana*	+
Carpinus laxiflora	1.1	(*Polypodium lineare*)	
Palura chinensis	1.1	*Acer palmatum*	+
Shrub-layer		*Arisaema amurense*	+
Lespedeza maximowiczii	2.2	*Sambucus williamsii*	+
Benzoin obtusilobum	1.1	*Melampyrum roseum*	+
Weigela subsessilis	1.1	*Calamagrostis arundinacea*	+
Callicarpa japonica	+	*Quercus serrata*	+
Morus bombycis	+	*Pteridium aquilinum*	+
Magnolia parviflora	+	*Ampelopsis brevipedunculata*	+
Ampelopsis brevipedunculata	+	*Carpinus laxiflora*	+
		Viola collins	+

Lespedeza maximowiczii was not a complete do minat species in shrub layer. ***Sasa borealis*** was the dominant species in herb layer. And this species is seemed to be harmful to the establishment of Carpinus seedlinges. Besides ***Sasa borealis***, ***P. chinensis***, ***Benzoin erythrocarpum***, ***L. maximowiczii***, ***Lepisorus thunbergiana***, ***Acer palmatum***, ***Arisaema amurense***, ***Sambucus williamsii***, ***Melampyrum roseum***, ***Calamagrotis arundinaea***. ***Quercus serrata***, ***Pteridium aquilinum***, ***Ampelopsis brevipedunculata***, and ***Viola collins*** were also observed.

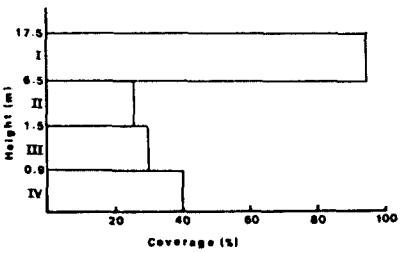

Fig. 2. Diagram of stratification of study area.
I : Tall-I layer II : Tall-II layer
III : Shrub layer IV : Herb layer

Table 2 shows the tree inventory of study area. Height of *C. tschonoskii*, the dominant species, ranged from 15.4 to 17.2m and DBH 18.00 to 46.20cm.

The stratification foliage in studied area in shown in Fig. 2. With the tree height, Tree-I layer showed generation 90% or more in coverage, but Tree-II layer only about 25%.

Ten thousands of more seeds collected from seed trap were weighed individually(Fig. 3).

Weight of purchased hornbeam seeds of showed a normal distribution in weight. At first, authors expected that collected seeds would also show normal distribution, when the

Table 2. Tree inventory of studied area in Piagol (1984)

Species	Height (m)	DBH (cm)	Up (cm)	Down (cm)	Left (cm)	Right (cm)
Carpinus tschonoskii	16.00	25.20	290	395	110	525
	15.80	45.90	270	485	540	595
	16.70	27.10	200	210	450	0
	16.50	30.00	220	230	350	160
	17.00	34.70	620	190	420	290
	15.40	18.00	225	265	450	270
	17.00	28.10	255	290	350	115
	16.50	45.20	240	590	330	390
	16.00	36.30	40	775	300	625
	16.50	39.80	305	215	475	300
	15.90	27.10	305	265	290	345
	17.00	63.70	295	555	185	415
	17.20	46.20	410	410	365	490
	7.50	7.00	70	145	255	0
	1.30	2.00	125	245	110	150
Lespedeza maximowiczii	1.54	0.30	30	35	55	20
	1.80	0.20	35	70	50	65
	1.60	0.10	20	0	35	20
	1.60	0.30	54	65	40	40 (2)
	1.90	0.30	50	65	70	110 (2)
	1.40	0.20	30	30	0	60
Weigela subsessilis	1.54	0.30	50	40	36	30
	1.70	0.30	55	40	40	34
	1.50	0.30	3	40	50	40
Carpinus laxiflora	6.40	8.00	90	330	210	295
Palura chinensis	6.10	6.20	185	290	260	145 (2)
Quercus serrata	16.80	29.30	95	350	125	225
Acer pseudo-sieboldianum	16.00	15.00	190	70	180	140
A. palmatum	1.60	0.30	45	30	40	14
Benzoin obtusilobum	1.50	0.50	150	55	50	60
Callicarpa japonica	1.70	0.30	30	65	59	65
	1.70	0.50	20	50	50	38
Fraxinus rhynchophylla	1.50	0.20	25	20	26	32
Stewartia koreana	14.30	21.00	365	290	350	195

Up : upper part of crown
Down : down part of crown
Left : left part of crown
Right : right part of crown

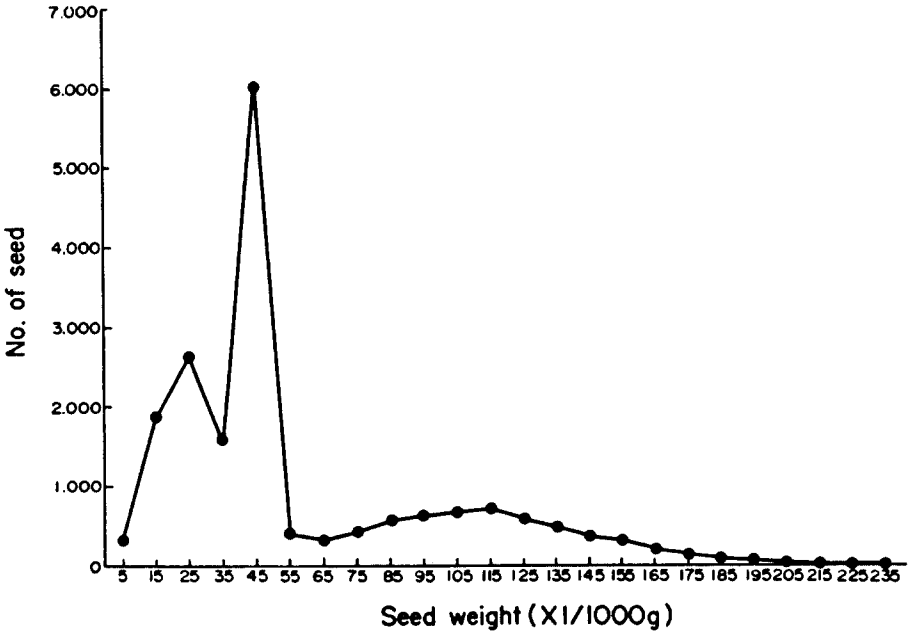

Fig. 3. The frequency distribution of seed weight of *C. tzonoskii*, in 1989.

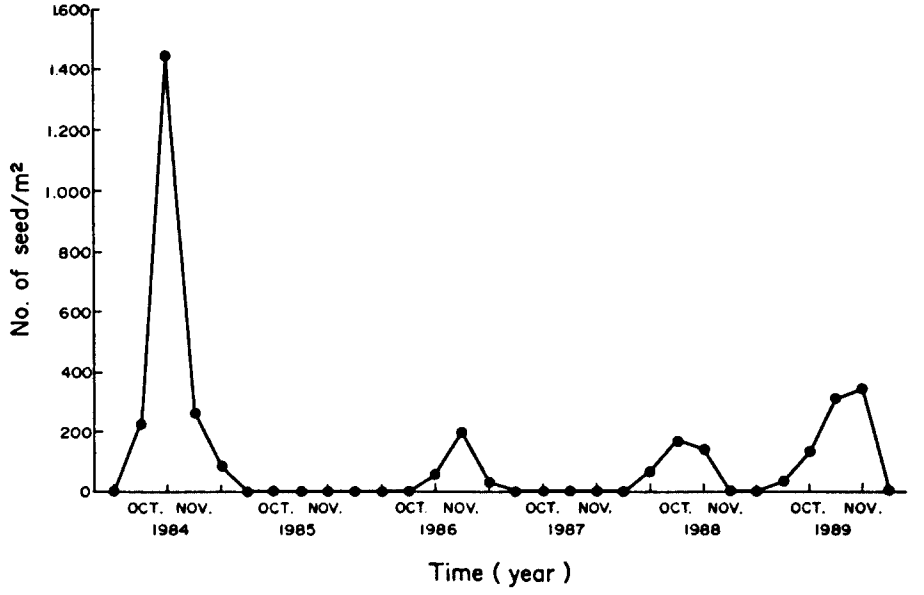

Fig. 4. Seed crops of Carpinus forest in Piagol, 1984 to 1989.

population size was one thousand. But it did not. So authors weighed ten thousands or more Carpinus seeds individually, but the result was the same. That is, Carpinus produsedtoo many light weight, seeds.

As shown in Fig. 4, most seeds dispersed in November. Seed production generally show requlr cycle, but some species are notoriously irregular. Seed production of Carpinus forest in Piagol of Mt. Chiri showed irregular pattern by years.

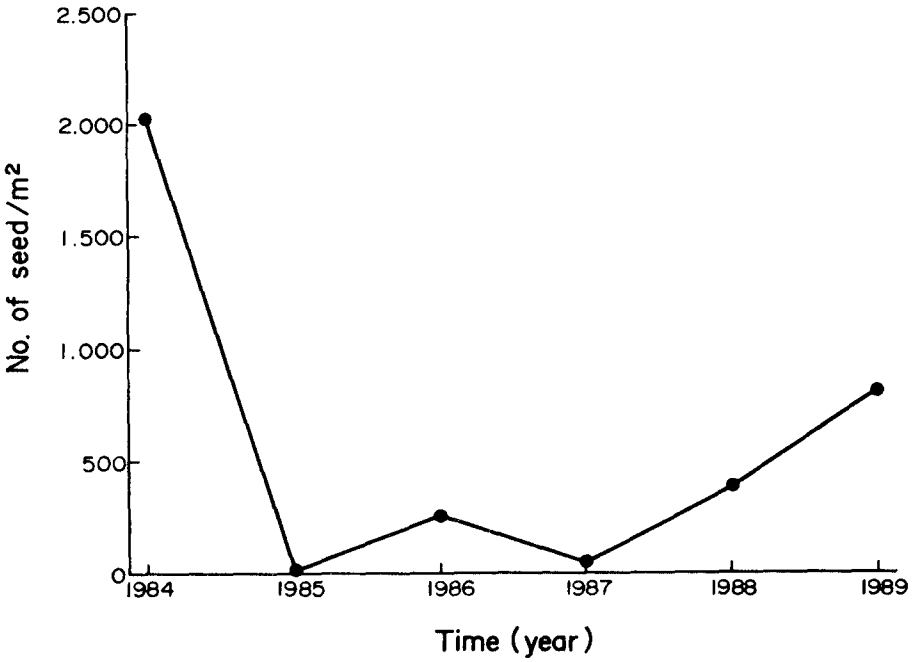

Fig. 5. Annual seed crops of Carpinus forest in Piagol, 1984 to 1989.

Fig. 5. shows the annual seed crops of Carpinus forest from 1984 to 1989. The best crop was shown in 1984, while no crop in 1985. The crop was very poor in 1987 and poor in 1986. The crop was normal in 1988 and comparatively good in 1989. It is difficult to predict seed crop in Carpinus forest with only six years' results. It will take further investigation to predict the seed crop in Carpinus forest and to determin therir periodicity.

摘 要

서나무군락의 종자생산량 및 천연갱신을 지리산의 피아골에서 1984년부터 1989년까지 6년간에 걸쳐 조사하였다. 이곳에 식생구조를 보면, 교목층(Ⅰ층)과 아교목층(Ⅱ)의 우점종은 개서나무였으며, 높이는 15.40m에서 17.20m사이였다. 그리고 개서나무는 무작위적으로 분포하였다. 개서나무의 종자는 무게는 변이가 많았으며 정규분포를 그리지 않고 가벼운 쪽으로 지우쳐 있었다. Seed trap방법으로 종자의 낙하를 본 결과 개서나무는 9월 말부터 떨어지기

시작하여 11월 말이 되면 전부 떨어졌다. 연간 종자의 생산량은 1984년에 가장 많았으며, 1985년에는 거의 없었으며 이후 조금씩 증가하는 것을 볼 수 있었다.

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