*Kor. Turfgrass Sci.*, 9(4), 317~329, 1995

# Studies of Species Composition and Standing Crop and Soil Nutrients in Conifer of Kwangnung Forests

**Shinn, Chang-Nam and Nam-Kee Chang**

*Dept. of Biology, College of Education, Seoul National University*

# 光陵의 松柏林에 있어서 種多樣性, 現存量 및 土壤養分에 관한 硏究

신 창 남 · 장 남 기

서울대학교 사범대학 생물학과

## ABSTRACT

The study of standing crop of the ground vegetation under the coniferous stands was pursuited in regard of soil nutrients at Kwangnung plantation from May to October, 1971 and 1991.

The coniferous stands implied pine and larch associations of which the young stands of each association were 9~12 years and the older one 40~70 years.

The larch stands were more plentiful in species than in the pine stands and the *Festuca ovina* and *Oplismenus burmannii* each were dominant species of pine and larch stands.

The standing crop of pine stands is from 98.02g /m² to 385.32g /m². The standing crops of those stands showed great increase from June to August when the air temperature and rainfall were fairly high.

The standing crop has correlation to total nitrogen and organic matter in the soil.

**Key words** : Species compositon, Standing crop, Soil nutrients, Conifer

## INTRODUCTION

The productivity of the ground vegetation in conifer stands in relation to soil nutrients has been studied by several investigators.

Richards(1962) noted greatly increased growth of *Araucaria cumninghamii* Ait. beneath canopies of larch, *Binus taeda* Linne and *Pinus elliottii* Engelm, as well as nitrogen availability in Australia.

Stone & Fisher(1968) proved that comparison the soil and herbaceous vegetation be-

neath young conifers and adjacent open field identical in prior treatment showed that conifers increased nitrogen availability above their own net uptake in the vicinity of Ithaca, New York.

According to Chang, Yun and Kim(1968), and Chang and Yun(1995) the standing crop of grasslands in Chulwon, Kang-won province is from 142.2g /$m^2$ to 332.9g /$m^2$ and net productivity is from 17.2g /$m^2$ to 77.0g /$m^2$.

Cha(1969) submitted report of the dominant species the ground vegetation of larch, *Larix kaemfreri* Sargent, was *Oplismenus Burmannii* Beauv, *Stephanandra incisa* Zabel etc. in Kwangnung.

Kim and Chang(1970) reported pine forest contained soil nutrients in low and larch, hornbeem, acacia forest in medium and fir, oak, Korean pine forest in high.

Oh(1971) investigated the relationship between the annual height growth of *Pinus densiflora* and seven properties and refered the easily-soluble phosphorus seemed to have particular influence to annual height growth in Kwangnung.

In this study, the relationship between the productivity of the ground vegetation beneath conifer stands and soil nutrients was pursuited in the Kwangnung plantation located in the center of South Korea.

## AREA STUDIED

The Kwangnung plantation is located 30 miles north-west from Seoul and has recently been famous for its abundant vegetation.

Within a two-miles radius of Bongsun Buddist Temple in Kwangnung, four stands were

**Fig. 1.** The general view of area studied.

selected as sample plots. Two of those stands consist of young and old pine, other two young and old larch. These stands placed side by side. Beneath the young stands of larch and pine(9~32 years) the herbs occupied almost the whole space but the old stands (40~70 years) had shurbs and herbs beneath.

The climate of this district is cool, (mean annual temperature, 8℃) with a mean annual rainfall of about 1,245.5mm and about 65 percent of the rainfall has been recorded in summer.

The soil is silty loam, which belongs to brown forest soil and the reaction is acid(pH 5.3~6.0)

**Table 1.** Mechanical analysis of mineral soils in pine and larch stands.

| Stand | Horizon | Soil texture | | | | Soil type |
|---|---|---|---|---|---|---|
| | | Clay(%) | Silt(%) | Fine sand(%) | Coarse sand(%) | |
| Young pine | H | 17.75 | 28.16 | 35.14 | 18.95 | Brown forest Soil |
| | A | 23.74 | 25.61 | 30.35 | 20.31 | |
| | B | 36.05 | 28.39 | 28.28 | 13.64 | |
| Old pine | H | 19.41 | 27.16 | 32.14 | 21.95 | 〃 |
| | A | 21.16 | 23.35 | 32.30 | 23.19 | |
| | B | 30.67 | 26.38 | 29.39 | 19.96 | |
| Young larch | H | 18.14 | 24.43 | 38.95 | 18.48 | 〃 |
| | A | 29.28 | 25.64 | 34.39 | 19.05 | |
| | B | 33.96 | 23.82 | 29.91 | 12.31 | |
| Old pine | H | 20.67 | 28.37 | 33.56 | 18.40 | 〃 |
| | A | 24.30 | 28.42 | 30.54 | 16.74 | |
| | B | 30.14 | 25.17 | 29.38 | 16.21 | |

Table 1 shows that the clay content increased, whereas the fine sand decreased with depth.

## METHOD

The ground vegetation was investigated by the method of Goodall(1952) and Oosting (1956) using random numbers with quadrat of one by one meter.

This survey was carried on May, June, August, October in 1971.

The coverage of each species was determined by cover occupying the quadrats. The unit "clump" was used for determination of density, because grass was difficult to differentiate individually from one another.

The standing crops were indicated by average dry weight, which was found in plants collected from each stand and dried in incubator for 8 hours.

The soil samples were collected at depths ranging from 2 to 30cm in the study area. The soil were sieved through a stainless steal 2mm mesh and dried at 80℃ for 120 hours. The soil was used for determination of such items as below; pH was determined on one set of

samples using pH-meter. Organic matter was determined by loss on ignition in a muffle furnace at 550~700℃ for not less than 5 hours.

Total nitrogen was determined on oven-dry soil by the micro-Kieldahl method and express as a percentage of oven-dry weight of soil.

Field capacity was determined on fresh soil.

## RESULS AND DICUSSION

The numerical values of the species composition, standing crop and soil nutrients of pine and larch stands obtained present in the order of following headings.

### 1. The species composition and standing crop of the ground vegetation in pine stands

**Table 2.** The main species and their seasonal production (g/m²) of the ground vegetation beneath the young pine stand (9~12 years).

| Species \ Date | 5.15 | 6.15 | 7.9 | 8.17 | 10.3 | Relative cover (%) | Density (g/m²) | Korean name |
|---|---|---|---|---|---|---|---|---|
| *Festuca ovina* | 4.11 | 7.54 | 12.58 | 10.11 | 6.21 | 21.4 | 8.5 | 김 의 털 |
| *Pteris aquila* | 6.70 | 6.67 | 11.15 | 14.65 | 13.72 | 11.3 | 4.4 | 고 사 리 |
| *Artemisia kyeiskeana* | 2.83 | 2.94 | 4.24 | 5.56 | 5.36 | 5.2 | 5.4 | 맑은대쑥 |
| *Disporum smilacinum* | 1.61 | 3.31 | 4.36 | 4.89 | 2.44 | 5.1 | 9.6 | 애기나리 |
| *Carix siderosticta* | 3.99 | 5.14 | 10.31 | 11.31 | 7.17 | 5.0 | 8.4 | 대 사 초 |
| *Aster scaber* | 2.53 | 4.37 | 7.79 | 7.58 | 3.61 | 3.5 | 3.4 | 취 |
| *Potentilla fregaiodes* | 1.74 | 3.24 | 3.65 | 4.45 | 3.27 | 2.9 | 3.2 | 양 지 꽃 |
| *Convallaria keiskei* | 2.38 | 4.50 | 6.71 | 7.41 | 5.50 | 2.5 | 3.1 | 은 방 울 |
| *Avundinella hirta* | 5.5 | 7.67 | 12.65 | 15.47 | 19.46 | 1.8 | 1.2 | 새 |
| *Syneilesis palmata* | 2.37 | 3.21 | 8.17 | 12.55 | | 1.3 | 1.7 | 우산나물 |
| *Vicia subcapidata* | 2.11 | | 5.26 | 5.84 | 4.74 | 1.3 | 1.2 | 전잎갈퀴 |
| *Querous dentata* | 20.15 | 25.05 | 31.50 | 37.54 | 36.62 | 13.2 | 2.4 | 떡갈나무 |
| *Stephanandra incisa* | 13.05 | 15.02 | 11.21 | 18.92 | 19.45 | 5.1 | 2.5 | 국수나무 |
| *Fragara mantchurica* | 11.16 | 11.5 | 36.55 | | 37.96 | 4.9 | 1.2 | 산초나무 |
| *Euonymus alatus* | | 10.61 | | 29.66 | 22.63 | 2.2 | 1.1 | 화살나무 |
| Others | 16.31 | 22.41 | 28.41 | 25.78 | 38.16 | 17.3 | | |

**Table 2.** Contiunued

| Species \ Date | 5.15 | 6.15 | 7.9 | 8.17 | 10.3 | Relative cover (%) | Density (g/m²) | Korean name |
|---|---|---|---|---|---|---|---|---|
| Total live stading crop | 98.02 | 127.33 | 220.92 | 235.2 | 231.41 | | | |
| Net productivity by intervals | | 60.48 | 86.08 | 96.08 | 35.24 | | | |
| Days between samples | | 30 | 24 | 39 | 48 | | | |
| Average daily productivity by intervals | | 2.0460 | 3.5866 | 2.1997 | 0.6298 | | | |

**Table 3.** The main species and their seasonal production (g/m²) of the ground vegetation beneath old pine stand (40~70 years).

| Species \ Date | 5.15 | 6.15 | 7.9 | 8.17 | 10.3 | Relative cover (%) | Density (g/m²) | Korean name |
|---|---|---|---|---|---|---|---|---|
| *Festuca ovina* | 5.42 | 7.52 | 8.12 | 10.32 | 7.21 | 24.3 | 8.2 | 김 의 털 |
| *Aster scaber* | 2.82 | 3.62 | 5.33 | 5.71 | 3.21 | 6.6 | 8 | 취 |
| *Avvndinella hirta* | 6.61 | 10.56 | 12.22 | 18.65 | 20.41 | 4.3 | 4.2 | 새 |
| *Artemisia kyeiskeana* | 1.84 | 3.17 | 5.77 | 5.60 | 4.65 | 4.1 | 6.3 | 맑은대쑥 |
| *Senecio canpestris* | 2.20 | 2.46 | 3.09 | | 1.92 | 2.4 | 5 | 솜방망이 |
| *Potentilla fragarioides* | 1.22 | 2.30 | 3.26 | 3.51 | 2.61 | 2.2 | 4 | 양 지 꽃 |
| *Syneilesis palmata* | 4.64 | 7.25 | 5.55 | 9.70 | 7.67 | 1.7 | 2 | 우산나물 |
| *Carix siderostica* | 3.21 | 5.31 | | 7.21 | 5.31 | 1.1 | 6 | 대 사 초 |
| *Viola mandshurica* | 0.90 | 2.12 | | | | 0.2 | 3 | 제 비 꽃 |
| *Lespedeza bicolor* | 19.51 | 28.61 | 37.51 | | 28.31 | 10.3 | 2 | 싸 리 |
| *Quercus dentata* | | 43.61 | 63.61 | 90.50 | 40.61 | 7.2 | 1.5 | 떡갈나무 |
| *Fragara mantchurica* | 20.22 | | 30.47 | 58.61 | 43.78 | 6.6 | 1.7 | 산초나무 |
| *Euonymus alatus* | 15.21 | 20.30 | | 43.53 | 37.96 | 3.2 | 1.9 | 화살나무 |
| *Stephanandra incisa* | | | 32.76 | 30.41 | 36.47 | 2.6 | 2 | 국수나무 |
| *Carpinus bixiflora* | 15.14 | 20.69 | | 63.25 | 57.69 | 2.1 | 1.2 | 서 나 무 |

**Table 3.** Continued

| Species \ Date | 5.15 | 6.15 | 7.9 | 8.17 | 10.3 | Relative cover (%) | Density (g/m²) | Korean name |
|---|---|---|---|---|---|---|---|---|
| *Almus japonica* | 16.11 | 20.38 | 33.76 | 27.27 | | 1.8 | 1.1 | 오리나무 |
| *Smilax nipponica* | 2.61 | | 6.21 | 14.91 | | 0.8 | 1.4 | 밀나물 |
| Others | 14.19 | 20.64 | 27.25 | 26.79 | 24.23 | 18.7 | | |
| Total live standing crop | 211.23 | 247.76 | 241.08 | 340.12 | 365.32 | | | |
| Net productivity by intervals | | 80.58 | 69.41 | 186.94 | 50.53 | | | |
| Days between samples | | 30 | 24 | 39 | 49 | | | |
| Average daily productivity by intervals | | 2.6460 | 2.4755 | 4.4792 | 0.9110 | | | |

The Table 2 and 3 show the species composition of young pine stands in which *Festuca ovina* was dominated the species composition among the 34 kinds of species, however, old pine stand differed from the young stand in view of the presence of shrubs such as *Lespedeza bicolor* and sampling of older which had hardly seen in young stand.

The standing crop of young pine stand was from 98.02 to 235.2g/m² and that of old pine stand was from 192.32 to 357.32g/m².

The highest values of standing crop of the ground vegetation beneath the young pine obtained in August but that of old stand in October, while the net productivity and average daily productivity of the ground vegetation were higher in young stand and that of old stand in August. The difference of standing crop in two stands was significant judging from the t-test.

**Table 4.** The main species and their seasonal production (g/m²) of the ground vegetation beneath young larch stand.

| Species \ Date | 5.15 | 6.15 | 7.9 | 8.17 | 10.3 | Relative cover (%) | Density (g/m²) | Korean name |
|---|---|---|---|---|---|---|---|---|
| *Oplismenus Burmannii* | 12.23 | 18.89 | 29.40 | 30.80 | 32.67 | 17.7 | 8 | 주름조개풀 |
| *Miscanthus purpurasens* | 5.30 | 9.41 | 16.38 | 15.86 | 17.96 | 8.3 | 6 | 억 새 |
| *Avundinella hirta* | 7.58 | 9.72 | 15.42 | 11.57 | 11.48 | 8.1 | 4.3 | 새 |
| *Pteris aquaila* | 6.39 | 18.10 | 35.81 | 50.67 | 50.11 | 7.4 | 4 | 고 사 리 |
| *Aster scaber* | 0.90 | 1.40 | 3.71 | 5.15 | 3.52 | 4.3 | 10 | 취 |
| *Artemisia gigantea* | 9.88 | 14.88 | | | 10.69 | 3.8 | 6 | 산 쑥 |
| *Tricercandra japonica* | 5.37 | 7.69 | 11.31 | 27.69 | 9.21 | 2.3 | 4.9 | 홀아비꽃대 |
| *Meehania urticifolia* | 7.40 | 10.67 | | 28.44 | | 2.3 | 1.3 | 벌 깨 덩 굴 |

**Table 4.** Continued

| Species \ Date | 5.15 | 6.15 | 7.9 | 8.17 | 10.3 | Relative cover (%) | Density (g/m²) | Korean name |
|---|---|---|---|---|---|---|---|---|
| *Festuca ovina* | 2.10 | 6.15 | 6.17 | 5.71 | 3.36 | 2.2 | 4 | 김의털 |
| *Galium pseudoasprellum* | | | 4.47 | | 12.62 | 1.7 | 2.6 | 긴잎갈퀴 |
| *carex siderostica* | | | | 5.88 | 4.21 | 1.1 | 9.3 | 대사초 |
| *Convallaria keiskei* | | | 9.72 | 5.25 | 8.17 | 0.9 | 4 | 은방울 |
| *Disporum smilacinum* | 2.11 | | | 3.77 | 3.41 | 0.7 | 4.7 | 애기나리 |
| *Potentilla fragaioides* | 5.67 | 4.18 | 9.36 | 11.39 | 13.69 | 0.6 | 4.2 | 양지꽃 |
| *Asperula platygalium* | 3.24 | 5.85 | 7.67 | 11.03 | | 0.6 | 0.8 | 개갈퀴 |
| *Solenolantana carlesii* | | | 14.20 | | 16.31 | 0.6 | 1.0 | 동자꽃 |
| *Patrinia scabiosatfolia* | 4.74 | | 27.01 | 36.70 | 50.27 | 0.5 | 0.3 | 마타리 |
| *Viola mandshuria* | 1.77 | 2.93 | | | 3.2 | 0.4 | 3.2 | 제비꽃 |
| *Lespedeza bicolor* | 9.38 | 20.41 | 34.50 | 35.69 | 57.89 | 14.4 | 1.0 | 싸리 |
| *Quercus dentata* | 16.62 | 19.10 | 30.61 | 45.15 | 51.71 | 6.8 | 3.1 | 떡갈나무 |
| *Stephandra incisa* | 4.76 | | 6.76 | 29.21 | 12.83 | 3.2 | 2.1 | 국수나무 |
| *Pueraria thunbergiana* | | | 15.31 | | 20.12 | 2.1 | 1.8 | 칡 |
| *Acer ginnala* | 33.88 | | 14.88 | | | 2.1 | 0.1 | 신나무 |
| *Corylus heterophylla* | | | 11.39 | | 13.69 | 1.0 | 1.3 | 개암나무 |
| *Fraxinus rhynchophyll* | | | 13.72 | | | 0.8 | 0.1 | 물푸레나무 |
| Others | 12.61 | 21.41 | 18.78 | 20.61 | 24.85 | 11.4 | — | |
| Total live standing crop | 150.62 | 161.04 | 295.76 | 395.40 | 409.75 | | | |
| Net productivity by intervals | | 86.63 | 165.83 | 151.12 | 110.55 | | | |
| Days between samples | | 30 | 24 | 39 | 49 | | | |
| Average daily productivity intervals | | 2.8575 | 6.9096 | 3.8723 | 2.3521 | | | |

**Table 5.** The main species and their seasonal production (g/m²) of the ground vegetation beneath the old larch stand (40~70 years).

| Species \ Date | 5.15 | 6.15 | 7.9 | 8.17 | 10.3 | Relative cover (%) | Density (g/m²) | Korean name |
|---|---|---|---|---|---|---|---|---|
| *Oplismenus burmannii* | | 8.1 | 9.53 | 11.25 | 10.47 | 9.3 | 5.3 | 주중조개풀 |
| *Miscanthus purpurasens* | 17.89 | 19.24 | 22.84 | 23.92 | 26.78 | 9.3 | 4.0 | 억새 |
| *Avundinella hirta* | 6.58 | | 10.78 | | 9.27 | 5.9 | 5.2 | 새 |
| *Pteris aquila* | 7.03 | 22.44 | 53.37 | 40.60 | 41.27 | 3.3 | 3.4 | 고사리 |
| *Dispsrum smilacinum* | 1.20 | 1.51 | 3.78 | 4.21 | 2.06 | 2.6 | 8.2 | 애기나리 |
| *Aster scaber* | 0.40 | 1.20 | 2.07 | 2.45 | 1.97 | 2.1 | 8 | 취 |
| *Iris pallasii* | 17.40 | 10.38 | | | | 1.8 | 2 | 붓꽃 |
| *Caltha minor* | 6.21 | 3.01 | | | | 1.5 | 2 | 동의나물 |
| *Artemisia kyeiskeana* | 3.69 | 5.56 | 6.15 | 6.54 | 2.78 | 1.3 | 6 | 맑은대쑥 |
| *Feetuca ovina* | 2.16 | 2.57 | 3.79 | 6.31 | 3.21 | 1.1 | 3 | 김의털 |
| *Agrinonia pilosa* | | | | | 5.64 | 0.9 | 1.1 | 짚신나물 |
| *Hydrocharis asiatica* | | 3.36 | 3.24 | | | 0.8 | 1 | 자라풀 |

**Table 5.** Continued

| Species \ Date | 5.15 | 6.15 | 7.9 | 8.17 | 10.3 | relative cover (%) | Density (g/m²) | Korean name |
|---|---|---|---|---|---|---|---|---|
| *Syneilesis palamata* | | 4.27 | 6.51 | | | 0.3 | 0.5 | 우산나물 |
| *Hemerocallis aurantica* | | | | 19.21 | | 0.3 | 1 | 원추리 |
| *Arisaema amuren* | | | | 15.90 | | 0.1 | 0.6 | 천남성 |
| *Lespeza bicolor* | 22.59 | 34.44 | | 50.37 | 47.69 | 14.8 | 3.0 | 싸리 |
| *Stephanandra incisa* | 15.58 | 17.44 | 20.62 | 16.52 | 24.31 | 12.3 | 4.0 | 국수나무 |
| *Quercus dentata* | 28.51 | | 36.20 | 39.51 | 39.79 | 11.4 | 1.2 | 떡갈나무 |
| *Euonymus alatus* | 21.51 | 30.41 | | 28.21 | 18.21 | 3.1 | 1.6 | 화살나무 |
| *Acer ginnala* | | 40.31 | 45.1 | | 39.21 | 2.4 | 1.6 | 신나무 |
| *Pueraria thunbergiana* | 4.19 | 19.37 | | 35.76 | 40.21 | 1.9 | 0.9 | 칡 |
| *Aralia elata* | | 26.9 | 30.15 | | 47.6 | 1.8 | 0.9 | 두릅나무 |
| *Actinidia kolomicta* | | 30.21 | 36.17 | 30.21 | | 1.7 | 1.2 | 쥐다래 |
| *Fraxinus rhynchophyll* | | 36.2 | 31.64 | | 22.9 | 1.2 | 2.3 | 물푸레나무 |
| *Pioscoria nipponica* | | 19.3 | 15.21 | 13.5 | | 1.0 | 0.9 | 부채마 |
| *Clematis appifolia* | 10.21 | | 27.68 | | | 0.7 | 0.1 | 사위질빵 |
| Others | 22.81 | 22.0 | 21.23 | 29.67 | 20.61 | 11.6 | | |
| Total live standing crop | 194.81 | 338.18 | 303.27 | 369.82 | 303.06 | | | |
| Nat productivity by Intervals | | 139.41 | 131.40 | 174.29 | 60.61 | | | |
| Days between samples | | 30 | 24 | 39 | 49 | | | |
| Average daily productivity by intervals | | 4.6473 | 5.4750 | 4.4690 | 1.2365 | | | |

According to Table 4 and 5, the vascular flora of the ground vegetation in young and old larch stands were composed of 54 and 49 spcies, the most important of which were *Miscanthus purpurasers, Oplismenus Burmannii, Avundinella hirta.*

In old larch stands there were many shrubs such as *Lespedeza bicolor, Stephanandra incisa, Quercus dentata,* however few shrubs were found in young larch stands.

The standing crop in young larch stand was from 150.52g/m² to 409.75g/m² and that of old larch stand from 194.81g/m² to 369.82g/m² and the highest value of the standing crop obtained in August and October.

According to Poter(1967) standing crop for grassy vegetation in Florida was from 90.6 to 161.4g/m². Kim and Chang(1969) showed that the standing crop of grass-land in Chulwon, Kangwon province, was from 117.6~350g/m².

The net productivity and average daily productivity of two larch stands were abundant in August.

Comparing the standing crop of the two stands, namely pine and larch stands, the latter was much higher than the former.

According to stastistic analysis the difference of standing crops between pine and larch stand seemed to be influenced by soil nutrients. Kim and Chang(1969) have found the

standing crop in the grassland was governed by soil nutrients-espicially organic matter through enriching the total nitrogen in soil. The standing crop of the larch stands were the most of all, and soil nutrients was richest.

### 2. Soil properties in pine stands and larch stands

Table 6 indicates the results of some soil properties in pine and larch stands in the Wangnung plantation.

**Table 6.** Total nitrogen, organic matter and field capacity of the soil sampled from the pine and larch stands.

| | | Total nitrogen(%) | | | | | Organic matter(%) | | | | | Field capacity(%) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | | 5 | 6 | 7 | 8 | 10 | 5 | 6 | 7 | 8 | 10 | 5 | 6 | 7 | 8 | 10 |
| Stand | | 15 | 15 | 9 | 17 | 3 | 15 | 15 | 9 | 17 | 3 | 15 | 15 | 9 | 17 | 3 |
| Young | H | 0.30 | 0.32 | 0.31 | 0.31 | 0.28 | 13.1 | 14.8 | 12.2 | 13.2 | 12.6 | 32.8 | 57.3 | 41.2 | 43.8 | 30.8 |
| pine | A | 0.24 | 0.27 | 0.23 | 0.22 | 0.23 | 7.0 | 8.2 | 9.4 | 10.6 | 7.2 | 30.8 | 40.3 | 36.4 | 37.4 | 24.5 |
| | B | 0.21 | 0.23 | 0.21 | 0.17 | 0.21 | 4.9 | 6.2 | 3.4 | 5.6 | 5.6 | 26.5 | 32.6 | 20.7 | 36.2 | 22.4 |
| Old | H | 0.31 | 0.40 | 0.28 | 0.26 | 0.24 | 12.6 | 11.9 | 10.2 | 15.8 | 11.2 | 26.05 | 65.0 | 42.5 | 36.6 | 48.3 |
| pine | A | 0.31 | 0.33 | 0.27 | 0.23 | 0.27 | 9.4 | 10.4 | 8.2 | 11.0 | 7.3 | 24.86 | 53.3 | 30.2 | 33.7 | 46.1 |
| | B | 0.21 | 0.21 | 0.21 | 0.19 | 0.21 | 6.2 | 8.6 | 7.2 | 9.2 | 5.2 | 21.50 | 54.8 | 30.1 | 39.4 | 28.4 |
| Young | H | 0.44 | 0.45 | 0.36 | 0.34 | 0.32 | 18.4 | 17.5 | 24.1 | 19.6 | 18.7 | 49.5 | 88.3 | 52.0 | 46.4 | 56.4 |
| larch | A | 0.34 | 0.38 | 0.27 | 0.31 | 0.29 | 15.5 | 15.5 | 16.7 | 16.2 | 17.1 | 37.8 | 86.2 | 54.5 | 43.8 | 53.2 |
| | B | 0.39 | 0.32 | 0.21 | 0.21 | 0.24 | 10.2 | 11.3 | 11.2 | 10.6 | 8.7 | 32.8 | 83.2 | 48.11 | 42.6 | 44.8 |
| Old | H | 0.44 | 0.41 | 0.31 | 0.34 | 0.31 | 20.6 | 21.7 | 18.9 | 21.2 | 24.3 | 62.0 | 90.8 | 54.4 | 57.6 | 40.6 |
| larch | A | 0.38 | 0.39 | 0.26 | 0.27 | 0.21 | 15.2 | 14.2 | 14.9 | 16.8 | 14.6 | 34.5 | 80.2 | 44.5 | 54.2 | 39.2 |
| | B | 0.21 | 0.26 | 0.19 | 0.20 | 0.30 | 9.2 | 12.2 | 13.7 | 15.1 | 10.2 | 48.00 | 81.4 | 32.8 | 52.1 | 35.3 |

Total nitrogen, organic matter and field capacity decreased with in young and larch stand as well as in old pine and larch stand. However soil pH of each stand was almost constant in each profile.

The seasonal variation of total nitrogen of the stands had to be considered. According to Stone and Fisher(1969) the content of gradully total nitrogen in the soil of conifer stand was higher in May and June and then decreased from July toward October.

In this study total nitrogen was higher in June thereafter it did not decrease until October.

According to Kim and Chang(1969) the content of organic matter related paralell to the amount of total nitrogen. Considering the seasonal variation of organic matter in a whole year was susceptible even distribution of the total nitrogen.

Organic matter and pH were comparatively consistent throughout the growing season.

Field capacity was fairly high in July and August, which seemed to be influenced by the rainy season(Poter, 1967).

As the Table 6 showed both the total nitrogen and organic matter were higher in the larch stand than pine stand.

This result agrees with Kim et al.(1968).

### 3. The relationship between standing crop and total nitrogen and organic matter in the soil

Fig. 2, 3 showed the results of correlation between the total nitrogen, organic matter and standing crops in each stand.

In order to separate the effects of total nitrogen and organic matter on the standing crop the partial correlation coefficients and values of each variable were calculated.

The partial correlation coefficient between standing crop and organic matter was 0.79 and total nitrogen was 0.58.

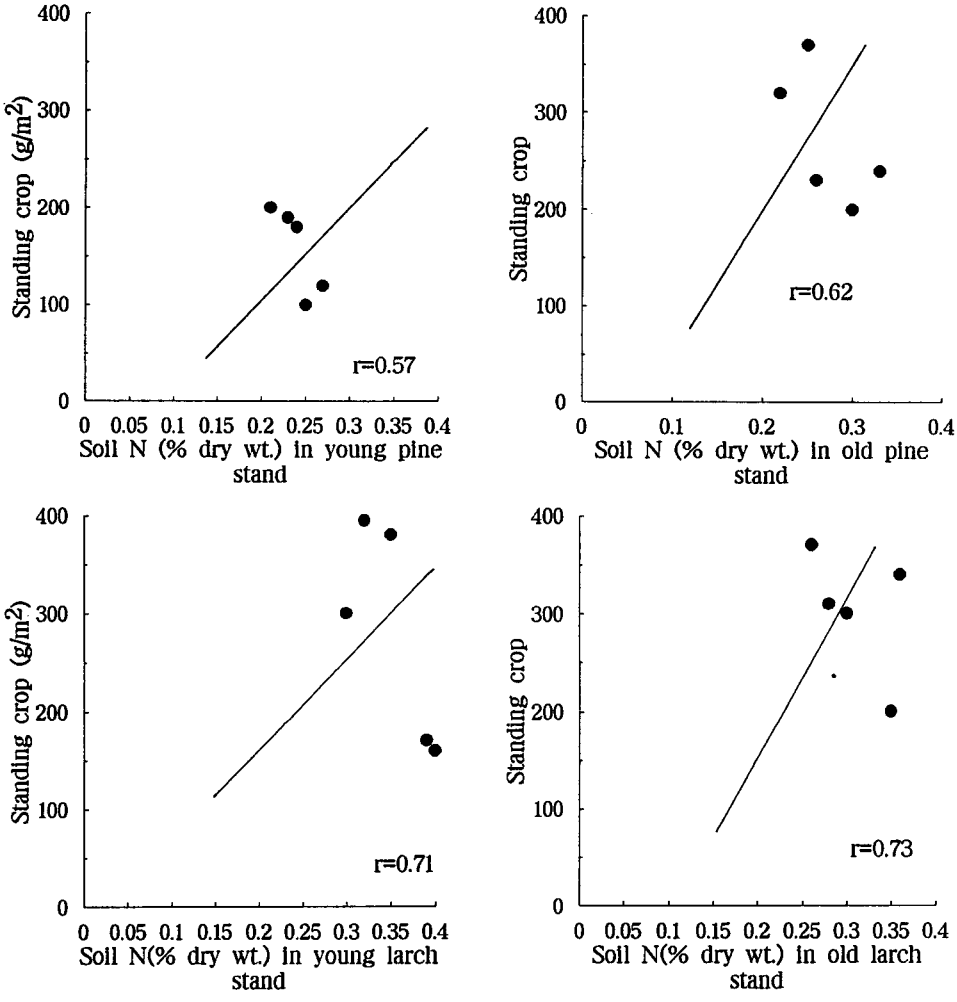


**Fig. 2.** Relationship between total nitrogen and standing crop.

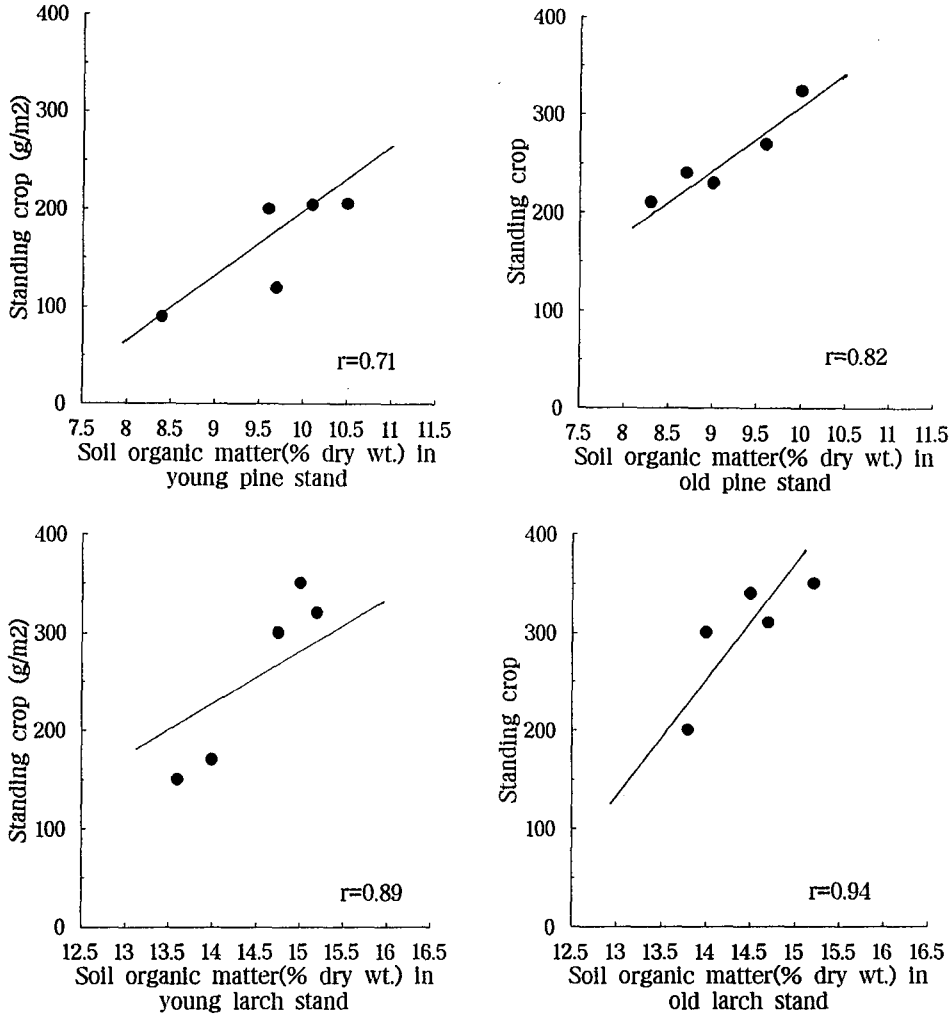


**Fig. 3.** Relationship between soil organic matter and standing crop.

From the values it can be seen that organic matter has the closest relation to standing crop in these stands.

## 摘 要

광능 봉선사 부근의 소나무 군락과 낙엽송 군락을 각각 9~12년생 및 40년생, 70년생의 4개 군락을 대상으로 그들의 林床植被의 組成 및 現存量을 조사하고, 같은 지소에서 토양을 채취하여 林床식물의 변화와의 관련을 추구하였다. 이 연구는 1971년과 1991년 5월부터 10월에 걸쳐서 이루어졌다.

소나무 군락과 낙엽송 군락의 林床植被의 구조를 보면 낙엽송군락에 있어서 林床植被의 種數

가 풍부하였다. 소나무 군락하에서의 우점종은 김의털(*Festuca ovina*)이고, 낙엽송 군락하에서의 우점종은 주름조개풀(*Oplismenus burmannii*), 억새(*Miscanthus purpurasens*)였다.

소나무 군락과 낙엽송 군락의 現存量은 10월에 가장 높았고, 그 양은 소나무 군락하에서 98.02~385.3g/m², 낙엽송 군락하에서 150.52~407.75g/m²였다. 6월과 8월 사이에 질소량 및 유기물량은 어느 군락에서나 높았으며, 군락사이의 차이도 유의하였다.

統計分析에 의하면 토양 양분과 現存量과는 정상관을 나타내며 (r=0.66-질소, r=0.84-유기물), 토양 양분중 유기물은 편상관계수가 0.79로서 現存量과의 관계가 가장 컸다.

## ACKNOWLEDGEMENT

I would like to my thanks to professor Dr. Choon-Min Kim. Seoul National University, who has given many invaluable suggestions in preparing this manuscript.

My sincere thanks is also due to Mr. Yi-Jong Kim and Hee-Sun Lee who were enough to help laboratory work in the experiment.

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