

Distribution and Habitat Characteristics of *Lonicera japonica* Thunb. in the Inland and the Seashore Areas of Korea

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ABSTRACT : This study was conducted to evaluate the status of habitat distribution, environmental characteristics and plant species growing with *Lonicera japonica* in its habitats. In the distribution of plant coverage below 30%, it was 84.6% in the inland area and 80.7% in the seashore area. There was similar coverage in both inland and seashore areas. But the average relative coverage in the seashore area was 26.1%, which is a little higher than that of the inland area (22.5%). In the habitats, both inland and seashore areas showed a high distribution ratio below 10 degrees. But among them, inland areas showed a high distribution ratio (62.4%) below 10 degrees, which was about twice as much as the seashore areas (32.2%). Habitat distribution was most often found on the southern slopes in both inland and seashore areas. The average soil pH of *Lonicera japonica* habitat was 5.2 in the inland areas and 6.9 in the seashore areas. Also, the seashore areas showed little content of P₂O₅, but high content of K, Mg, Na on the other hand compared to the inland area. *Miscanthus sinensis* was the highest importance value (16.4) among plants growing with *Lonicera japonica* in their habitats in both inland and seashore areas. But in the inland areas, *Artemisia princeps* showed the highest importance value, and *Miscanthus sinensis* was the highest in the seashore areas.

Key words : *Lonicera japonica* Thunb., distribution, habitat characteristics, inland and seashore area, medicinal herb, relative frequency, relative coverage, geography, soil

INTRODUCTION

Lonicera japonica, belonging to the Caprifoliaceae family, is a vine shrub which is widely distributed in Japan, China, and the Korean Peninsula. On the Korean Peninsula, *Lonicera japonica* is growing widely on both mountain and plain areas, except for high lands and Hamkyongbukdo (Song, 2004a; Lee, 2006). This plant has been used widely in civilian and traditional sectors. Water which has had leaves and flowers of *Lonicera japonica*, boiled in it, has been used as a substitute for tea and also it has been used as a medicinal herb for diuretic therapy, counteracting poison, tumors, colds, and for the stopping of bleeding (Bae, 2000).

Research of *Lonicera japonica* conducted till now were that of Song *et al.* (2004b; 2005) who investigated the status of native distribution, and of Chun (1994) who presented the status of the Korean Peninsula distribution in the course of carrying out research for taxonomic study of the *Lonicera*. Especially, Song (2003) classified *Lonicera japonica* as the study species necessary to determine whether the leaf is deciduous or evergreen in its taxonomic classification. Lee *et al.* (1994) and Schlotzhauer *et al.* (1996) conducted research to find the ingredients of *Lonicera japonica*, and to determine the

efficiency of the ingredients' medical action. It is necessary to investigate the status of *Lonicera japonica* habitat distribution, because the benefits of wild genetic resources are newly recognized as important materials in breeding crops and as functional substances for many industrial uses.

There has been little systematic research about habitat distribution, plant density, and environmental characteristics of *Lonicera japonica* habitat. This research was conducted to offer basic data for *Lonicera japonica* by the investigation of habitat distribution, relative density, relative coverage, environmental characteristics, and plant species growing with *Lonicera japonica* habitat in the inland and the seashore areas of Korea.

MATERIALS AND METHODS

We investigated habitat distribution and environmental characteristics of *Lonicera japonica* south of the 38 th parallel from May 2005 to December 2007. We divided them into two character areas, inland and seashore areas of Korea, respectively. Quadrates were established to examine plant density and coverage. The size of the quadrates were made randomly as 2 × 2 m, 2 × 3 m and 3 × 3 m in each sample plot.

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In order to analyze plant density, coverage, frequency and importance value of plants growing with *Lonicera japonica* habitat, parameters of relative density [(number of any plant/total number of plants \times 100%) in sampling quadrat], relative coverage [(base area of any plant/total base area \times 100%)], relative frequency [frequency of any plant/total plant frequency \times 100%] in the sampling quadrat, and importance value (relative density + relative coverage + relative frequency) were used.

In order to investigate plant density and coverage, 85 quadrat in the inland area and 31 quadrat in the seashore area were established. GPS (Global positioning System) and a clinometer were used to investigate geographical characteristics such as direction, latitude, longitude, slope and so on of the habitat. Soils of 19 habitats in the inland area and 7 habitats in the seashore area were collected to analyze chemical characteristics. Soil chemical characteristics was analyzed by the method of National Institute of Agricultural Science and Tech-

nology, Rural Development Administration and Allen *et al.* (1986). Soil pH, organic and P_2O_5 content were measured by pH meter (model : HM 30R), by the method of Tyurin (Scholten, 1927) and by the method of Lancaster respectively. Contents of Ca, Mg, K, and Na were analyzed by photometer (Model : 8020) after leaching at pH 7.

RESULTS AND DISCUSSION

Status of plant density and coverage

Status of plant density and coverage of *Lonicera japonica* in both inland and seashore areas are presented in Table 1. Plant coverage area of 11 to 20% was high as such 37.6% (32 quadrat) in the inland area, whereas coverage area of 21 to 30% was high as such 38.76% (12 quadrat) in the seashore area. But plant coverage area of below 30% in both inland and seashore areas were 84.6% and 80.7% respectively, and it showed that there were no significant difference between inland and

Table 1. Plant coverage and density of *Lonicera japonica* Thunb. between inland and seashore areas in Korea

	Inland area		Seashore area		
	Number of quadrates	Ratio (%)	Number of quadrates	Ratio (%)	
Plant coverage (%)	below 10	28	32.9	7	22.6
	11-20	32	37.6	6	19.4
	21-30	12	14.1	12	38.7
	31-40	8	9.4	3	9.7
	41-50	1	1.2	—	—
	51-60	2	2.4	2	6.5
	61-70	1	1.2	1	3.2
	over 71	1	1.2	—	—
Relative density (%)	19.7		20.1		
Relative coverage (%)	22.5		26.1		

Table 2. Distribution of *Lonicera japonica* Thunb. due to habitat slope and aspect between inland and seashore areas in Korea

	Inland area		Seashore area		
	Number of quadrats	Ratio (%)	Number of quadrats	Ratio (%)	
Habitat slope (degree)	10° under	53	62.4	10	32.2
	11-20°	11	12.9	9	29.0
	21-30°	8	9.4	8	25.8
	31-40°	10	11.8	2	6.5
	41° over	3	3.5	2	6.5
Slope direction	east	10	11.8	5	16.1
	west	14	16.5	4	12.9
	south	20	23.5	6	19.4
	north	10	11.8	3	9.7
	southwest	7	8.2	4	12.9
	northeast	3	3.5	3	9.7
	flatland	21	24.7	6	19.4

seashore areas. The relative densities of *Lonicera japonica* in both inland and seashore areas were 19.7% and 20.1% respectively, no significant difference between them, whereas the relative densities were 22.5% and 26.1% respectively in their relative coverage, a little higher in the seashore areas. These results make it possible to suggest that not only *Lonicera japonica*, but also plants growing with it in the seashore area grow well compared to those in the inland area.

Status of habitat slope and direction

Habitat slope and direction between inland and seashore areas was presented in Table 2. Habitat distribution of *Lonicera japonica* below 10 degree among different slopes was higher in both inland and seashore areas. In the inland area below 10 degrees, it was 62.4% (53 quadrat), whereas it was 32.2% (10 quadrat) in the seashore areas. It was two times higher in the inland areas compared to the seashore

areas. Habitat distribution of *Lonicera japonica* in the inland areas were concentrated below 10 degrees of slope, but habitat distribution was 29% of 11 to 20 degrees and 25.8% of 21 to 30 degrees in the seashore areas. Habitat of *Lonicera japonica* was evenly distributed in the seashore areas below 30 degrees compared to that of inland areas.

Habitat of *Lonicera japonica* was higher for the southern slope direction in both inland and seashore areas, but there was no great concentrated aspect in different slope direction. In the inland areas, southern slope direction was the highest (23.5%) and followed in order by the western slope direction(16.5%), eastern slope direction (11.8%), while it was the highest for the southern slope direction (19.4%), and followed by eastern slope direction (16.1%), western slope direction (12.9%) in the seashore areas.

Soil characteristics of *Lonicera japonica* habitat were presented in Table 3. Daubenmire (1974) mentioned that soil pH

Table 3. Component of soil between inland and seashore areas of *Lonicera japonica* Thunb. in Korea

	pH (1:5H ₂ O)	EC dS/m	O.M (g kg ⁻¹)	T-N (%)	NO ₃ -N (mg kg ⁻¹)	NH ₄ -N (mg kg ⁻¹)	Av. P ₂ O ₅ (mg kg ⁻¹)	Ex. cations(cmol+ kg ⁻¹)			
								K	Ca	Mg	Na
Inland area	6.9	0.8	30	0.16	19	15	12	0.98	4.2	2.3	0.98
	6.4	0.9	26	0.15	8	9	5	2.35	3.5	2.1	0.25
	6.2	1.0	49	0.14	42	6	19	0.35	7.5	2.0	0.09
	6.2	1.4	149	0.39	42	25	62	0.67	18.2	2.8	0.21
	6.0	1.5	62	0.21	61	6	25	0.29	7.7	1.5	0.04
	5.9	0.4	25	0.30	21	17	5	2.40	3.2	4.5	0.80
	5.8	0.5	21	0.13	8	9	20	0.35	2.5	3.2	0.23
	5.8	1.0	21	0.14	9	23	20	0.35	2.5	3.2	0.23
	5.6	1.0	126	0.30	6	33	12	0.48	7.2	3.2	0.39
	5.5	0.8	76	0.16	19	15	11	0.61	4.0	1.3	0.11
	5.4	0.2	30	0.16	22	17	5	0.16	3.6	1.2	0.04
	5.4	0.4	37	0.13	8	20	5	0.15	3.7	0.7	0.08
	5.1	0.5	42	0.11	0	38	6	0.10	0.5	0.3	0.11
	5.1	1.7	57	0.21	23	19	7	0.48	9.6	2.0	0.19
	4.8	0.4	30	0.13	0	28	9	0.06	0.5	0.1	0.07
	4.6	0.7	61	0.20	37	9	15	0.27	6.0	2.8	0.08
	4.6	3.5	117	0.34	115	24	53	0.55	6.1	1.1	0.06
4.5	0.6	43	0.13	3	23	30	0.08	1.3	0.4	0.08	
4.4	0.9	41	0.13	21	18	9	0.09	0.8	0.3	0.08	
Mean	5.2	1.0	54.9	0.19	24.4	18.6	17.4	0.57	4.9	1.8	0.21
Seashore area	7.5	0.8	32	0.13	9	6	6	5.60	6.2	4.2	1.03
	7.4	0.7	23	0.12	11	4	20	0.27	5.7	0.9	0.12
	7.2	1.0	53	0.13	19	6	5	2.30	3.5	4.2	1.30
	6.9	0.6	35	0.16	9	9	15	2.10	2.3	5.3	2.10
	6.8	0.8	16	0.15	8	10	6	2.40	5.4	2.5	1.20
	6.8	0.7	35	0.11	8	6	6	3.30	5.6	4.2	1.20
	5.7	0.5	13	0.20	21	15	10	0.98	4.5	3.2	2.00
Mean	6.9	0.7	29.6	0.14	12.1	8.0	9.7	2.42	4.7	3.5	1.28
Total mean	5.6	0.9	48.1	0.18	21.1	15.8	15.3	1.07	4.8	2.3	0.50

Table 4. Plant taxonomy growing with *Lonicera japonica* Thunb. in inland and seashore areas of Korea

	Family		Genus		Species		
	Inland	Seashore	Inland	Seashore	Inland	Seashore	
Pteridophytal	6	2	6	2	7	2	
Gymnospermae	2	1	2	1	3	1	
Angiospermae	Dicotyledoneae	62	31	144	64	239	93
	Monocotyledoneae	7	6	34	22	50	27
Total	77	40	186	89	299	123	

Table 5. Plant density and coverage growing with *Lonicera japonica* Thunb. in inland and seashore areas of Korea

Scientific name	RD (%)			RC (%)			RF (%)			IV		
	Inland	Seashore	Mean	Inland	Seashore	Mean	Inland	Seashore	Mean	Inland	Seashore	Mean
<i>Miscanthus sinensis</i>	3.0	7.7	5.4	4.2	11.0	7.6	1.6	5.3	3.5	8.8	24.0	16.4
<i>Artemisia princeps</i>	5.0	1.0	3.0	9.7	1.2	5.5	3.9	1.1	2.5	18.6	3.3	11.0
<i>Rubus parvifolius</i>	0.9	0.9	0.9	4.7	6.7	5.7	2.2	2.0	2.1	7.8	9.6	8.7
<i>Artemisia capillaris</i>	0.2	3.3	1.8	0.2	7.2	3.7	0.3	3.0	1.7	0.7	13.5	7.1
<i>Rosa multiflora</i>	1.0	0.5	0.7	4.6	1.7	3.2	2.5	1.5	2.0	8.1	3.7	5.9
<i>Aster spathulifolius</i>	–	3.6	1.8	–	3.7	1.9	–	2.0	1.0	–	9.4	4.7
<i>Quercus aliena</i>	0.5	0.3	0.4	3.9	2.1	3.0	1.4	1.0	1.2	5.8	3.4	4.6
<i>Smilax china</i>	0.3	0.6	0.5	1.6	3.4	2.5	1.0	2.0	1.5	3.0	6.0	4.5
<i>Paederia scandens</i>	0.7	1.7	1.2	1.1	2.1	1.6	0.9	2.5	1.7	2.6	6.3	4.4
<i>Coculus trilobus</i>	0.7	0.5	0.6	2.9	1.6	2.2	1.8	1.5	1.7	5.3	3.5	4.4
<i>Pinus thunbergii</i>	–	0.6	0.3	–	6.2	3.1	–	1.5	0.8	–	8.3	4.2
<i>Parthenocissus tricuspidata</i>	0.4	0.6	0.5	1.7	1.9	1.8	1.0	2.0	1.5	3.1	4.5	3.8
<i>Ligustrum obtusifolium</i>	0.5	0.6	0.6	1.8	2.1	2.0	1.0	1.0	1.0	3.4	3.7	3.5
<i>Artemisia montana</i>	0.9	0.6	0.8	2.4	0.9	1.6	1.1	1.0	1.0	4.3	2.5	3.4
<i>Chrysanthemum boreale</i>	0.4	0.6	0.5	1.1	1.7	1.4	0.9	2.0	1.5	2.4	4.3	3.4
<i>Commelina communis</i>	1.7	0.5	1.1	1.9	0.4	1.2	1.5	0.5	1.0	5.1	1.4	3.2
<i>Erigeron canadensis</i>	0.9	0.6	0.7	2.1	0.8	1.5	0.9	1.0	1.0	3.9	2.4	3.2

RD : Relative density, RC : Relative coverage, RF : Relative frequency, IV : Importance value

was a decisive factor in restricting natural plant distribution. The range of soil pH of *Lonicera japonica* habitat was 4.4 to 7.5, and the average was 5.6. This shows that *Lonicera japonica* distributes at slightly acid soil which is similar to pH 5.6 of Korea's upland soil (Jeong *et al.*, 2001), and pH 5.2–6.5 of native soil of *Codonopsis lanceolata* near forests (Lee *et al.*, 1998). Also Kim & Jung (1995) mentioned that soil pH was slightly acid (pH 5.0) for mountainous districts in the inland areas, whereas it was alkali (pH 7.5) for the saline area and reclaimed land. The average soil pH in both inland and seashore areas were 5.2 and 6.9, respectively. Especially seashore areas showed little content of P₂O₅, but on the other hand, they showed a high content of K, Mg, Na.

Classification of plants growing with *Lonicera japonica*

Plants growing with *Lonicera japonica* in both inland and

seashore areas was in Table 4. It were 77 family, 186 genus, and 299 species in the inland areas, while it were 40 family, 89 genus, and 123 species in the seashore area, which inland area had over twice plants growing with *Lonicera japonica* in their habitat compared to seashore area. The reason why little plants growing with *Lonicera japonica* in the seashore area compared to inland area was that more winds with salts eased off on the species diversity in its ecological character in the seashore area.

Plants growing with *Lonicera japonica* which have an importance value over 3.0 in both inland and seashore areas are presented in Table 5. *Miscanthus sinensis* had the highest importance value (16.4), next was *Artemisia princeps* (11.0), followed by *Rubus parvifolius* (8.7) and *Artemisia capillaris* (7.1) in their order among inland and seashore areas.

Artemisia princeps showed the highest importance value (18.6) and followed as such *Miscanthus sinensis* (8.8), *Rosa*

multiflora (8.1), *Rubus parvifolius* (7.8) in the inland areas, while *Miscanthus sinensis* showed the highest value (24.0), followed by *Artemisia capillaris* (13.5), *Rubus parvifolius* (9.6), and *Aster spathulifolius* (9.4) in the seashore area.

In relative density, relative coverage and relative frequency, *Artemisia princeps* was the highest in the inland areas, whereas *Miscanthus sinensis* Ander. was the highest in the seashore area. *Lonicera japonica* grows mainly with sunny plant of *Artemisia princeps* in the inland area, while it grows with sunny plants of *Miscanthus sinensis* in the seashore areas. So, judging by its ecological characters, *Lonicera japonica* like sunny places and are distributed on sunny places, their natural habitats.

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