

Adaptation Patterns of Prickly Lettuce in Korea

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Abstract

The dispersion and adaptation of the recently immigrated plant, prickly lettuce (*Lactuca serriola*), were studied. The distribution of prickly lettuce was limited to south of the central districts of the Korean peninsula. The distribution range is being diffused continuously by manual transportation. The 10 selected sites showed typical road side vegetation of an early successional stage; the quadrats had 90% herbaceous cover, 5% shrub cover, and no tree cover. Dominant species were *Kummerowia stipulacea*, *Ixeris chinensis*, *Ambrosia artemisiifolia*, *Lactuca indica*, *Youngia sonchifolia*, *Cephalonoplos segetum*, *Rubus parvifolius*, *Ixeris polycephala*, *Hemistepta lyrata*, *Cercis chinensis*, *Artemisia capillaris*. The investigated sites were divided into 4 patterns based on vegetation with high dissimilarity. The presence of many patterns, despite high levels of differences, indicated that the characteristic prickly lettuce communities were not yet formed.

Key words : Neophyte, *Lactuca serriola*, Prickly Lettuce

Introduction

Neophyte in Korea have been reported by Palibin^{1,2)}, Lee and Kim³⁾, Chung^{4,5,6)}, Lee and Oh⁷⁾, Park⁸⁾, Lee and Chung⁹⁾ and Lee and Lim¹⁰⁾. They were classified into 27 families and 110 species, and most species were therophytes¹¹⁾. Prickly lettuce was found by Lim and Chun¹¹⁾.

Lactuca serriola (synonym : *L. scariola*) belongs to compositae and is distributed Central and Southern Europe as a pioneer and ruderal plant¹²⁾, Oberdorfer¹³⁾. Lindqvist¹⁴⁾ reported that lettuce (*L. sativa*) originated from *L. serriola*, *L. saligna* and other *Lactuca* genus by hybridization, and Zeven and Zhukovsky¹⁵⁾ took a stand that lettuce originated from prickly lettuce. Ehleringer and Cook¹⁶⁾, Yem et al.¹⁷⁾, Takagi¹⁸⁾, Paterson-Jones¹⁹⁾ and

Simionescu et al.²⁰⁾ studied on the physiological and biochemical properties of prickly lettuce, and Prince and Carter²¹⁾ reported the distribution and species composition and vitality in the United Kingdom.

The distribution and the adaptation of prickly lettuce in the period of 15 years in Southern Korea are the main interests in this study.

MATERIALS AND METHODS

Morphology of prickly lettuce : The morphological descriptions of prickly lettuce in Korea are as figure 1 ; ruderal plant in garden, road and stream side, 150-200 cm height, round and thick brown stem with spiny trichomes and well developed laticifer, typical taproot system, alternate, parted, auriculate 18-20 cm leaves

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with spiny trichomes on the main vein, rosette form by young plants, yellow panicle flower in July~August, dark brown obovate achene has hair at the top.

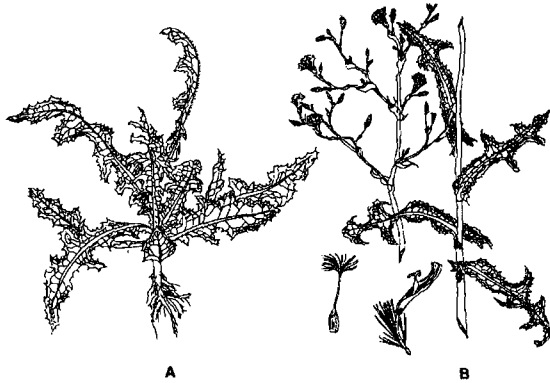


Fig. 1. Morphology of prickly lettuce.

- A. Root and rosette leaves.
- B. Stem, flower and seed.

Distribution : Rural areas of 26 cities randomly distributed in South Korea were investigated for two years and two growing seasons.

Study sites : For the study of adaptation we analysed vegetation structure, interspecies relationship and vegetation patterns. From the main distribution areas of Gyeongsan, Daegu, Gyeongju and Yeongcheon 10 sites were selected and from each site 10 relevés of 25 m² were used for analysis adaptation.

Affinities of coexisting species : From the data of total vegetation table we calculated X²-values of each species and constructed total X²-matrix. With the species positively associated in 5% of X²-distribution, expressed pleus diagram²²⁾.

Ordination of species : To see the grouping patterns of species DECORANA^{23,24)} was used for the calculation, and the dominance scales of field records were replaced by fully numerical 1-9 Maarel values²⁵⁾.

Classification of vegetation patterns : To calculate community similarities the values of dominance were rep-

laced as DECORANA above and classified by TWINS-PAN²⁶⁾. All process of DECORANA and TWINS-PAN calculation were performed by VES-PAN II.

Results

Distribution : The distribution of prickly lettuce in South Korea is described in figure 2. Newly identified sites after 1980 are distributed in the areas of Pusan, Jinju, Yeongcheon, Incheon, and Kunsan. Climate diagrams of these or near to these areas are in figure 2. A mean monthly temperature of 10°C and a mean monthly precipitation of 20 mm are considered equivalent in terms of evapotranspiration. Vertical hatching indicates periods of water surplus. Angle hatched bars denote months with frost, and black bars indicate months with freezing temperature. Black field indicates mean monthly precipitation in excess of 100 mm. The 10 selected sites showed typical road side vegetation of early successional stage : herbaceous layer was found more than 90% of the each quadrat, whereas 5% of shrub layer and

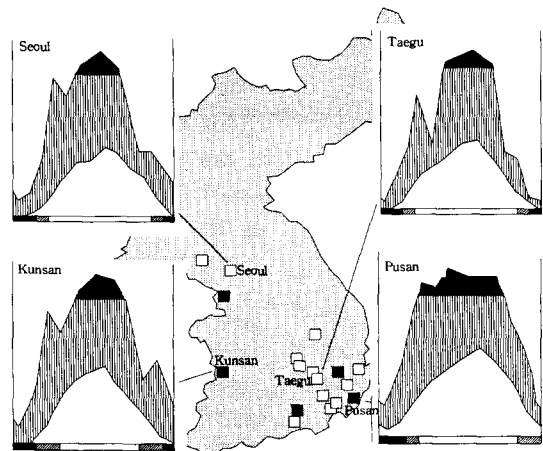


Fig. 2. Distribution of prickly lettuce and climate diagram on Seoul, Taegu, Pusan and Kunsan.

- : The sites identified by Lim & Chun(1980).
- : The sites newly identified.

no tree layer were found.

Affinities of coexisting species : The calculated X^2 -va-

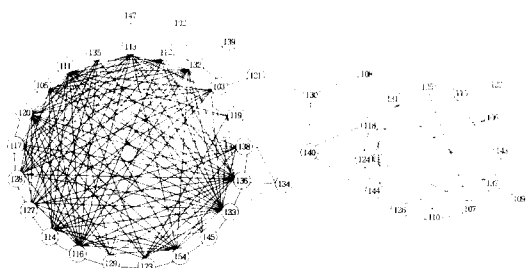


Fig. 3. Plexus diagram of integrated diagnostic species.

--- $p \leq 1\%$, - - - $1\% < p \leq 5\%$

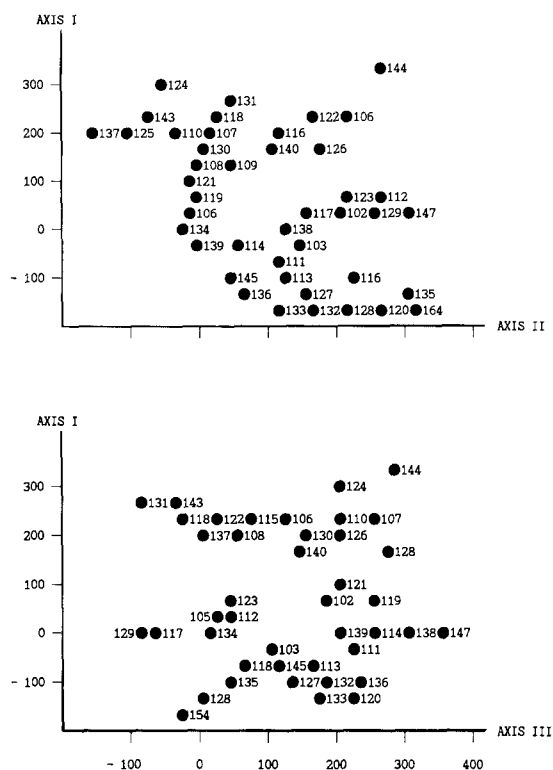


Fig. 4. Projection of major species based on DECORANA in axis I, II and III. Eigenvalue and distribution of axis I are 0.415 and 55%, axis II are 0.208 23%, and axis III are 0.112 and 15%.

lue($p \geq 5\%$) from total vegetation table expressed in plexus diagram (figure 3), and the species in figure 3 ordinated in figure 4. Eigenvalue and distribution of axis I are 0.415 and 55%, axis II are 0.208 and 23%, and axis III are 0.112 and 15%. Species number used in figures translated in table 1.

Table 1. Species numbers used in figures.

101 <i>Lactuca serriola</i>	102 <i>Setaria viridis</i>
103 <i>Kummerowia stipulace</i>	104 <i>Erigeron canadensis</i>
105 <i>Cosmos bipinnatus</i>	106 <i>Humulus japonicus</i>
107 <i>Bromus japonicus</i>	109 <i>Lepidium apetalum</i>
110 <i>Agropyron ciliare</i>	111 <i>Ixeris chinensis</i>
112 <i>Calystegia hederacea</i>	113 <i>Ambrosia artemisiifolia</i>
114 <i>Lactuca indica</i>	115 <i>Euphorbia maculata</i>
116 <i>Youngia sonchifolia</i>	117 <i>Amphicarpha edgeworthii</i>
118 <i>Metaplexis japonica</i>	119 <i>Oenothera odorata</i>
120 <i>Cephalonoplos segetum</i>	121 <i>Trifolium repens</i>
122 <i>Bidens biternata</i>	123 <i>Cuscuta australis</i>
124 <i>Artemisia capillaris</i>	125 <i>Rumex japonicus</i>
126 <i>Erigeron annuus</i>	127 <i>Eriochloa villosa</i>
128 <i>Equisetum arvense</i>	129 <i>Lespedeza cuneata</i>
131 <i>Commelina comminis</i>	132 <i>Rubus parvifolius</i>
133 <i>Ixeris polycephala</i>	134 <i>Arenaria serpyllifolia</i>
135 <i>Miscanthus sacchariflorus</i>	136 <i>Hemistepta lyrata</i>
137 <i>Torilis japonica</i>	138 <i>Viola mandshurica</i>
139 <i>Plantago asiatica</i>	140 <i>Sonchus asper</i>
143 <i>Cassia mimosoides</i>	144 <i>Polygonum aviculare</i>
145 <i>Salvia pleveia</i>	147 <i>Taraxacum platycarpum</i>
148 <i>Sagina japonica</i>	151 <i>Leonurus sibiricus</i>
152 <i>Tagetes sp.</i>	153 <i>Androsace umbellata</i>
154 <i>Cercis chinensis</i>	183 <i>Amaranthus retroflexus</i>

Classification of vegetation patterns : 100 quadrats from 10 sites were calculated by TWINSpan (figure 5) and divided 4 groups in high level of differences.

Discussion

There are no morphological differences between Euro-

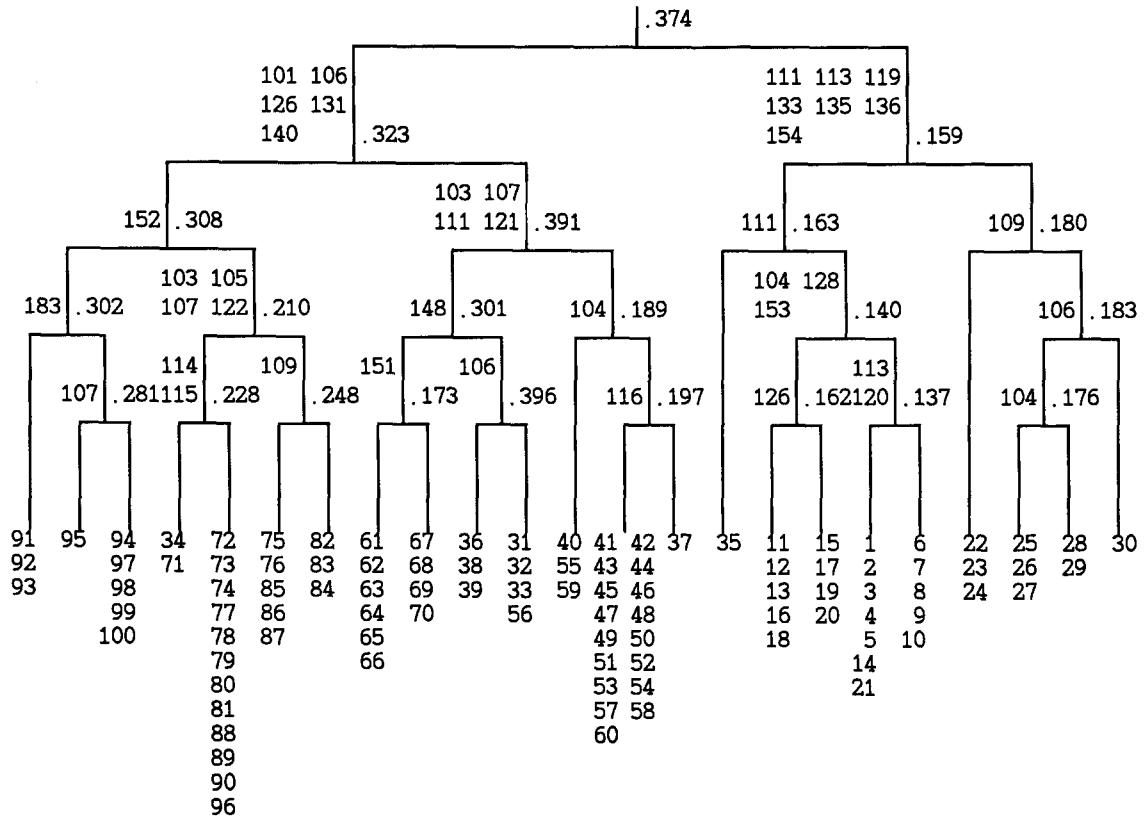


Fig. 5. Results of divisive cluster analysis by TWINSpan. The numbers on left side are species code number and the numbers on right side are eigenvalues for the divisions and the bottom numbers indicate relevés.

pean prickly lettuce and the Korean one. The distribution over Pusan, Incheon, Kunsan and Pohang (major harbours in Korea) requires transport by humans and the specimens found in Kunsan were new. Numbers of major species in prickly lettuce community were 44 ($p \geq 5\%$ in X^2 -test). Two types of communities were identified, one with *Kummerowia stipulacea*, *Ixeris chinensis*, *Ambrosia artemisiifolia*, *Lactuca indica*, *Youngia sonchifolia*, *Cephalonoplos segetum*, *Rubus parvifolius*, *Ixeris polycephala*, *Hemistepta lyrata*, *Cercis chinensis* and the other with *Humulus japonicus*, *Bromus japonicus*, *Euphorbia maculata*, *Metaplexis japonica*, *Artemisia capillaris*, *Commelina comminis*, *Torilis japonica*, *Sonchus asper*, *Polygonum aviculare*. TWINSpan divided the 4 groups in level 2

by low eigenvalue. All of these studies indicated that characteristic prickly lettuce communities were not yet formed.

Acknowledgement

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초록 : 가시상추의 한국 적응 유형

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최근에 귀화한 가시상추(*Lactuca serriola*)의 분산과 적응을 연구하였다. 가시상추의 분포는 한반도 중부 지방의 남부에 제한되었다. 그 분포지역은 인간에 의한 이동으로 점차 확산되고 있었다. 10개의 조사지역의 관측결과 천이의 초기단계에 있는 노변식생으로 나타났다. 즉 측구의 90%의 초본층과 5%의 관목층으로 구성되었으나 교목층은 없었다. 우점종군은 *Kummerowia stipulacea*, *Ixeris chinensis*, *Ambrosia artemisiifolia*, *Lactuca indica*, *Youngia sonchifolia*, *Cephalonoplos segetum*, *Rubus parvifolius*, *Ixeris polycephala*, *Hemistepta lyrata*, *Cercis chinensis* *Artemisia capillaris* 이었다. 조사지역은 식생의 높은 상이도로 4개유형으로 구분되지만 많은 유형이 나타나는 것은 아직 가시상추의 특유한 군락은 형성하지 못하고 있음을 보였다.