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## Floristic study of Cheondeungsan Mountain in Korea

Ro-Young Lee<sup>a</sup>, Min-Su Park<sup>b</sup>, Hyun-Do Jang<sup>c</sup>, Sungyu Yang<sup>c</sup>, Chang-Seok Jang<sup>c</sup>,  
Ki-Hong Kim<sup>c</sup>, Byoung-Un Oh<sup>c,\*</sup><sup>a</sup> Department of Variety Examination, National Forest Seed and Variety Center, Chungju, Chungbuk 380-941, South Korea<sup>b</sup> Herbal Medicine Research Division, Herbal Research Ministry of Food and Drug Safety, Cheongju, Chungbuk 363-700, South Korea<sup>c</sup> Department of Biology, Chungbuk National University, Cheongju, Chungbuk 361-763, South Korea

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## ABSTRACT

The distribution of native plants of Cheondeungsan Mountain (807 m, N 37°05'00"–37°05'30", E 128°00'0"–128°02'0") in Chungcheongbuk-do was determined and the major flora were identified. During field investigations carried out from May 2011 to October 2011, 87 families, 254 genera, and 369 taxonomic groups (327 species, 4 subspecies, 33 varieties, and 5 forms) were confirmed, and the distribution of 219 taxonomic groups was discovered for the first time. The distribution of four endemic plants of Korea, including *Ajuga spectabilis* Nakai and *Salvia chamryoenica* Nakai, and that of *Penthorum chinense* Pursh, a Grade V specific plant species, was found. There were 20 taxa of naturalized plants at Cheondeungsan; the growth and development of plants that are harmful to the ecosystem, such as *Ambrosia artemisiifolia* L., *Ambrosia trifida* L., *Eupatorium rugosum* Houtt., and *Aster pilosus* Willd., was observed around the forest paths and lowlands.

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## Introduction

Administratively, Cheondeungsan Mountain (807 m, north latitude 37°05'00"–37°05'30" and east longitude 128°00'00"–128°02'30") is located on the border between Sancheok-myeon in Chungju-si and Baegun-myeon in Jecheon-si. Topographically, it is the vein of the Charyeong Mountain Range and is located on the northeast part of the Chungju basin. To its south is located Indeungsan Mountain (665 m) and to the north are Sirangsan Mountain (691 m) and Bakdaljae Pass. Cheondeungsan has deep valleys which give rise to the development of many small streams. The mountain stream that flows along the northeast slope becomes the Jecheongang River and flows into Chungjuho Lake, while the mountain stream on the southwest slope flows into the Namhangan-gang River.

The area of investigation was north of the Sobaek Mountain Range, where the metasedimentary and granite rocks have been greatly affected by folds and faults. It has a very complex geological structure as a result of the rock types present, the distribution of

strata, and the interrelationship of the rocks and strata. The mountainous area of Cheondeungsan is a gneiss residuum and the soil has good drainage. The surface soil layer is composed of soil containing dark brown gravel (Kang and Park, 2002). The annual average temperature at Cheondeungsan is 11.2°C, annual average rainfall is 1212.7 mm, and it displays a typical central continental climate (Korea Meteorological Administration, 2011).

A study on the flora of this region was carried out in the past by Kang and Ko (2002) and, together with the voucher specimens, a total of 311 taxa were reported. The plant list included planted vegetation such as *Eucommia ulmoides* Oliv., *Prunus salicina* Lindl., and *Prunus yedoensis* Matsum., and erroneously identified taxa such as *Artemisia sylvatica* Maxim., *Artemisia montana* (Nakai) Pamp., and *Corydalis turtschaninovii* var. *pectinata* (Maxim.) Nakai, therefore this cannot be viewed as an accurate list of the native plants of Cheondeungsan.

However, in this study, voucher specimens were collected through field investigations at Cheondeungsan. Based on the data on vascular plants drafted using the voucher specimens, the accurate distribution of vascular plants in the region and the spontaneous areas of endemic plants and other major plants were identified, to check the invasion of naturalized plants and collect basic data for the preservation of natural resources in this region in the future. In addition, we conducted this study in order to confirm

\* Corresponding author. Tel.: +82 43 261 2296.

E-mail address: [obutaxon@chungbuk.ac.kr](mailto:obutaxon@chungbuk.ac.kr) (B.-U. Oh).

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the distributional characteristics of plants of Cheondeungsan and provide complete information on the floristic data.

## Materials and methods

This study was carried out based on four field-investigation results from May 29 to October 18, 2011 (Figure 1 and Table 1). During the field investigations, only those plants with reproductive organs such as flowers, fruits, and spores were collected as voucher specimens to maintain accuracy, and the collected specimens were stored at the Chungbuk National University Herbarium. Using the illustrative guides of Lee (1996, 2003, 2006) and Park (2009). The use of scientific names was in accordance with the Korea National Arboretum and the Plant Taxonomic Society of Korea (2007). For the specific plants of the investigated area, the data of Oh et al. (2005), the Korea National Arboretum (2008), the Ministry of Environment (2006, 2009), Park (2009), and Lee et al. (2011) were considered.

## Results

### Vascular plants of Cheondeungsan according to voucher specimens

The vascular plants of Cheondeungsan found in this investigation included 87 families, 254 genera, 327 species, four subspecies, 33 varieties, and five forms for a total of 369 taxa. There were seven families, 13 genera, 18 species, and one variation (5.1%) for pteridophyta; one family, two genera, and two species (0.5%) for gymnosperm; 67 families, 191 genus, 240 species, four subspecies, 23 variations, and five forms (73.6%) for angiosperm; and 12 families, 48 genera, 68 species, and nine variations (20.8%) for monocotyledons (Table 2 and Appendix 1). In the tree layer of the investigated area, *Quercus mongolica* Fisch. ex Ledeb. and *Quercus variabilis* Blume. were the dominant species; *Carpinus cordata* Blume, *Betula davurica* Pall., and *Quercus acutissima* Carruth were also found. In the subtree layer, *Platycarya strobilacea* Siebold & Zucc., *Morus bombycis* Koidz., and *Robinia pseudoacacia* L. were

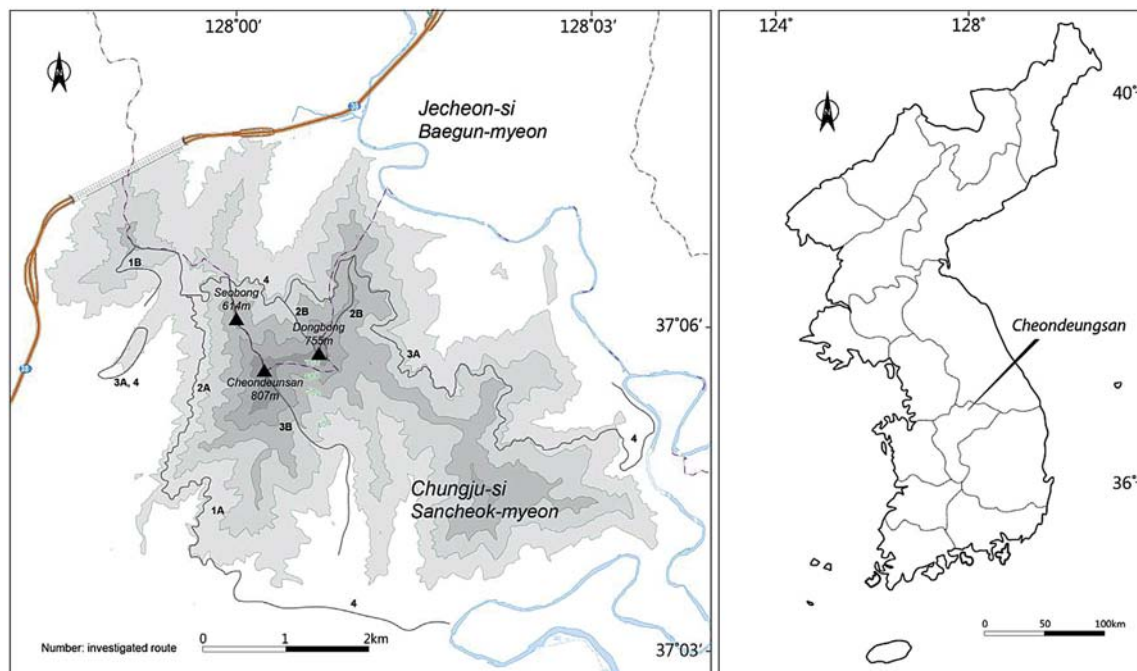
**Table 1**  
Dates and routes of investigations.

No.	Date	Investigation routes
1	May 29, 2011	A: Yeongdeok-ri → Forest road → Swaemaegigogae (hill) B: Cheondeungsa (temple) → 491 m hill → Dongsam-yeon
2	Jun 11, 2011	A: Neureupjae (hill) → Southern forest road → Darakjae (hill) → Western forest road → Pavilion → Northern forest road → Seokcheon-ri B: Northern forest road → Anbu → Northern slope → 638Goji → Northeastern slope → Dongbong → Northern valley → Forest road
3	Sep 5, 2011	A: Northern forest road → Seokcheon tri-way intersection → Seokcheon-ri → Songgang-ri (Gwangdong) B: Northern forest road → Northwestern slope → Sobong → Northern slope → Peak → Southern slope
4	Oct 18, 2011	Neureupjae (hill) → Samtan, Songgang-ri (Gwangdong) → Northern forest road → Seokcheon-ri → Aeryeon-ri

relatively commonly found. In the shrub layer, which makes up the lower structure, *Lespedeza bicolor* Turcz., *Lespedeza maximowiczii* C.K. Schneid., and *Rhododendron schlippenbachii* Maxim. grew commonly, while in the herb layer, there were *Impatiens textori* Miq., *Chelidonium majus* var. *asiaticum* (Hara) Ohwi, *Lysimachia clethroides* Duby, and *Convallaria keiskei* Miq. In the fallow grounds of the lowland, there were wetland plants such as *Rotala pusilla* Tul., *Eriocaulon robustius* (Maxim.) Makino, *Sagittaria aginashi* Makino, and *Monochoria vaginalis* var. *plantaginea* (Roxb.) Solms.

Above an altitude of 400 m, the environment of the forest vegetation was relatively good and favored the growth of *Q. mongolica* Fisch. and *Q. variabilis* Blume. However, in lowland areas (below 400 m) there was human interference, with relatively large areas being used as orchards and *Larix kaempferi* (Lamb.) Carrière forests; thus, these areas have relatively simple vegetation. Lowland areas comprise both housing and farming areas, and thus have a high density of naturalized plants.

Compared with previous studies (Kang and Ko, 2002) on the flora of Cheondeungsan, a total of 159 taxa such as *Asarum sieboldii*



**Figure 1.** Area investigated (Cheondeungsan) in this study.

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