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Floristic inventory and distribution characteristics of algific talus slopes in a specific area of forest biodiversity in South Korea

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Abstract

Background

This study conducted a survey for establishing in-situ and ex-situ conservation measures for northern lineage plants that are vulnerable to climate change and for designating Forest Genetic Resource Reserve for 25 algific talus slope sites, which are specific areas of forest biodiversity. The survey was conducted in South Korea within a distance of 50 m to the east, west, north, and south from the core area where wind blows to the algific talus slopes. The study was conducted once or twice per season from April 2016 to November 2021.

New information

Vascular plants of 25 algific talus slope sites in South Korea included a total of 1,052 taxa of 125 families, 486 genera, 947 species, 23 subsp., 75 var., and 7 f. The maximum surveyed area was 0.09 km², accounting for only 0.00014% of the 62,860 km² forest area in Korea, but comprise 22.27% of the 4,724 species of vascular plants in Korea. The algific talus slopes are areas rich in forest biodiversity. Six taxa were categorized as endangered, including *Paeonia obovata* Maxim. Sixty-seven taxa, including *Astilboides tabularis* (Hemsl.) Engl.; 58 taxa endemic to the Korean Peninsula, including *Weigela subsessilis* (Nakai) L.H. Bailey; and 317 taxa of floristic target plants were categorized as rare plants in the Red list. Further, 181 taxa were identified as northern lineage plants and 32 taxa, including *Sillaphyton podagraria* (H. Boissieu) Pimenov, were limestone area plants. Regarding alien plants, 75 taxa, including *Oenothera biennis* L., were identified, and the naturalization and urbanization rates were 7.13% and 12.12%, respectively. Plants specific to the phytogeography of the 25 algific talus slope sites in this study were *Vaccinium vitis-*

idaea L., *Rosa koreana* Kom., *Syringa villosa* Vahl subsp. *wolfii* (C.K. Schneid.) Y. Chen & D.Y. Hong, *Lonicera chrysantha* Turcz. ex Ledeb., *Tephrosieris flammea* (Turcz. ex DC.) Holub, among others.

Keywords

Algific talus slope, Korea endemic plants, rare plants, floristic target species, alien plants, phytogeographic plants

Introduction

Biodiversity refers to the diversity of the biological species on the Earth as well as the diversity of the ecosystems the species inhabit and diversity of the genes they exhibit (United Nations 1992). Advancement in the economy in the 20th century led to sudden urbanization and indiscrete exploitation of natural resources, resulting in rapid increase in the temperature of the Earth due to climate change and global warming (Boo et al. 2006). Acceleration of climate change led to disturbance or alteration of habitats of plants growing in alpine and subalpine zones (Kim and Lee 2011) and the disappearance of the species that failed to adapt to the changing environment (Lee et al. 2022a). Additionally, species popularity and biodiversity reduced as invasive alien plants dominated the habitats of endemic species, resulting in the elimination of these species from their natural habitats (Kong et al. 2011). Moreover, the reduction of biodiversity is occurring at an unprecedented rate corresponding to the ever increasing causal activities such as overexploitation. Particularly, the COVID-19 pandemic experience has demonstrated the importance of the relationship between humans and nature. The well-being and survival of humans have been predicted to be severely affected by the continuous loss of biodiversity and destruction of the ecosystem (Locke et al. 2021). As biodiversity provides various ecosystem services and has a substantial role in the sustainability of the Earth, ecosystem, and humans, there is an urgent need to develop measures that support systematic conservation and sustainable utilization of nature with respect to biodiversity at a national level.

Algific talus slopes are characterized by locally detected unique micrometeorological phenomena such as cold air blowing or water getting frozen during summer and warm wind blowing during winter in a hole or crack on the rock (Kong et al. 2012). It is thus known that rare plants and plants that are uncommon in the environments at close proximity to humans are widely distributed on the algific talus slopes. Notably, as the habitats of polar and alpine plants that naturally grow in low temperature regions are being continuously reduced due to global warming or climate change, the micrometeorological phenomena on algific talus slopes, where low temperature is maintained even in summer, are critical for providing a refuge for plants sensitive to high temperatures and for the conservation of rare and endangered species (Kong et al. 2017).

Various studies have been conducted in South Korea and other countries on algific talus slopes. In advanced countries such as the U.S. and Japan, the importance of algific talus slopes has been recognized, which has led to their designation as reserve areas for protection. Since 1989, algific talus slopes in the U.S. have been designated as natural wildlife reserves and are managed as such; furthermore, in Japan, continuous studies are conducted on the algific talus slopes in central and northern regions of Honshu (Iokawa and Ishizawa 2003). In South Korea, data on algific talus slopes have been compiled since 1926 with the investigation of forests during the Japanese colonial era. A previous study reported a total of 149 algific talus slopes distributed across the nation (Park 2017). The Rio Convention has emphasized the importance of promoting biodiversity in response to climate change through continuous management, such as topographic and species distribution monitoring. Despite such efforts, all algific talus slopes other than that in Bangnae-ri, Hongcheon, designated as the Forest Gene Resource Reserve (FGRR), are yet to be designated and managed as a reserve, and concerns have been raised regarding their destruction (Kim et al. 2016).

The Korea Forest Service designates and manages the FGRRs as forests that require protection and management to conserve the plants within forest ecosystems. The designation of FGRRs is performed by the mayor, governor, or local branch of the Korea Forest Service. There are seven types of forests designated as reserve areas: virgin forest, rare and valuable forest, rare plant habitat, alpine plant habitat, forest marsh and valley, natural ecosystem reserve, and useful plant habitat. However, most algific talus slopes are currently not designated as reserve areas despite the urgent requirement of active forest management. Hence, algific talus slopes should be designated as FGRRs or there is a need for Other Effective Area-Based Conservation Measures (OECMs). OECMs are regional measures to conserve the biodiversity in and around a reserve area. An area of OECMs is not a reserve area but a geographically defined area that is managed in ways to achieve positive and continuous long-term results towards the conservation of biodiversity and the relevant ecosystem functions and services. The goal is to conserve an area with cultural, spiritual, social, and economic values (Convention on Biological Diversity 2018, Hong et al. 2017).

This study was conducted to rediscover the phytogeographic values of algific talus slopes by investigating the distribution of five plant types across 25 algific talus slopes as the specific areas of forest biodiversity. This will aid in developing optimal conservation measures for algific talus slopes that serve as a refuge for northern lineage plants among alpine plants and those vulnerable to climate change, as well as providing basic data for the systematic management of algific talus slopes and facilitating the designation of algific talus slopes as FGRRs.

Materials and methods

Study site

Arboretum of Korea Forest Service (Korea National Arboretum 2013, Suppl. material 1, Fig. 1). Algific talus slopes are classified into five types: talus, cave, dent, vertical cave, and others. According to the current status of algific talus slopes by type, 14 algific talus slopes are type talus (e.g., Bangnae-ri, Nae-myeon, Hongcheon-gun), 4 algific talus slopes are type cave (Dongmak-ri, Yeoncheon-eup, Yeoncheon-gun, Gyeonggi-do), 4 algific talus slopes are type dent (Milyang Ice Valley of Samyang-ri, Sannae-myeon, Milyang-si, Gyeongsangnam-do), 1 algific talus slope is type vertical cave (Geom-eun Oreum of Seonheul-ri, Jocheon-eup, Jeju-si, Jeju-do) and 2 algific talus slopes are type others (one of Gwandong-ri, Hwasan-myeon, Haenam-gun, Jeollanam-do and the other of Gwnagjeom-dong, Macheon-myeon, Hamyang-gun, Gyeongsangnam-do).

Method

Vascular plants were investigated in each season during April 2016 to November 2021. In the investigation, we aimed to cover up to 50 m to the east, west, south, and north from the center of the core area from where the wind blows to the algific talus slopes. The detected plants were mainly identified on-site. The plants that posed a difficulty in identification were made into a specimen to be identified at the laboratory in reference to Korea National Arboretum (2008a), Korea National Arboretum (2011), Korea National Arboretum (2012), Korea National Arboretum (2016), Korea National Arboretum (2019b), Lee (2014a), Lee (2014b). Vascular plants were listed in order from pteridophytes to gymnosperms to angiosperms according to the Engler's classification system (Melchior 1964). The scientific names were recorded according to the National Standard Floristic Inventory (Korea National Arboretum 2023). The names of rare plants and Red list species were recorded in reference to Korea National Arboretum (2008b), Korea National Arboretum (2021), National Institute of Biological Resources (2021) and those for endangered wildlife were recorded in reference to Korea Ministry of Environment (2023). Chung et al. (2017) and Korea National Arboretum (2022) were referred for the endemic plants of the Korean Peninsula. For the endemic species, references were made to National Institute of Biological Resources (2013), National Institute of Biological Resources (2020). The floristic target species were recorded according to the class defined by National Institute of Ecology (2018). The northern lineage plants of the Korean Peninsula were recorded according to Gantsetseg et al. (2020), and the 300 species threatened by climate change were recorded according to Korea National Arboretum (2010). The limestone area plants were listed according to Kim et al. (2021). The alien plants and invasive alien plants were listed in reference to the national floristic inventory of alien plants Korea National Arboretum (2019a) and Kang et al. (2020), respectively. The calculation of the Naturalization Index (NI) and Urbanization Index (UI) was based on Numata and Kotaki (1975) and Kim et al. (2000), respectively.

The set of all the records collected for the present work was included in the dataset of occurrences of vascular plant on algific talus slopes in South Korea, which was published through GBIF (An and Lee 2023).

The distribution of the species listed below is base on Royal Botanic Gardens, Kew (2023).

Checklist of vascular plant on algific talus slopes in South Korea

***Huperzia miyoshiana* (Makino) Ching, 1981**

Distribution: Alaska to NW. U.S.A., Russian Far East to Korea, Japan

***Huperzia serrata* (Thunb.) Trevis., 1874**

Distribution: Russian Far East to NE. China and Japan, Hawaiian Islands, Mexico, Cuba to Hispaniola

***Lycopodium annotinum* L., 1753**

Distribution: Temperate Northern Hemisphere

***Lycopodium obscurum* L., 1753**

Distribution: Russian Far East, Subarctic America to U.S.A.

***Selaginella helvetica* (L.) Spring, 1838**

Distribution: Europe to Japan and Himalaya

***Selaginella involvens* (Sw.) Spring, 1843**

Distribution: Tropical & Subtropical Asia to NW. Pacific

***Selaginella rossii* (Baker) Warb., 1900**

Distribution: South Russian Far East to North China and Korea

***Selaginella tamariscina* (P.Beauv.) Spring, 1843**

Distribution: Russian Far East to Central & South Malesia

***Equisetum arvense* L., 1753**

Distribution: Subarctic & Temperate Northern Hemisphere

***Osmunda cinnamomea* L., 1753**

Distribution: New World, Arunachal Pradesh to Russian Far East and North Indo-China

***Osmunda japonica* Thunb., 1780**

Distribution: Pakistan to Sakhalin and Indo-China

***Crepidomanes minutum* (Blume) K.Iwats., 1985**

Distribution: India to Ogasawara-shoto and Pacific

***Dennstaedtia hirsuta* (Sw.) Mett. ex Miq., 1867**

Distribution: China to South Russian Far East and Temperate East Asia

***Dennstaedtia wilfordii* (T.Moore) Christ, 1910**

Distribution: Pakistan to West Himalaya, South Russian Far East to China and Japan

***Microlepia strigosa* (Thunb.) C.Presl, 1851**

Distribution: Tropical & Subtropical Asia to Pacific

***Pteridium aquilinum* var. *latiusculum* (Desv.) Underw. ex A. Heller, 1909**

Distribution: India to South Russian Far East and Temperate East Asia, Canada to North Mexico

***Cystopteris fragilis* (L.) Bernh., 1806**

Distribution: Cosmopolitan

***Gymnocarpium dryopteris* (L.) Newman, 1851**

Distribution: Temperate Northern Hemisphere

***Gymnocarpium jessoense* (Koidz.) Koidz. 1936**

Distribution: Himalaya to Siberia and Japan

***Adiantum pedatum* L., 1753**

Distribution: Himalaya to Russian Far East and Japan

***Cheilanthes argentea* (S.G.Gmel.) Kunze, 1850**

Distribution: Siberia to Japan and North Indo-China

***Coniogramme intermedia* Hieron., 1916**

Distribution: Pakistan to Russian Far East and Indo-China, Taiwan

***Coniogramme japonica* (Thunb.) Diels, 1899**

Distribution: Central & S. China to North Vietnam and Temperate East Asia

***Asplenium incisum* Thunb., 1794**

Distribution: Russian Far East to China and Temperate East Asia

***Asplenium pekinense* Hance, 1867**

Distribution: Pakistan to South Russian Far East and Temperate East Asia

***Asplenium ruprechtii* Sa.Kurata, 1961**

Distribution: South Siberia to Japan and China

***Asplenium tenuicaule* Hayata, 1914**

Distribution: Pakistan to South Russian Far East and Philippines

***Asplenium trichomanes* subsp. *quadrivalens* D.E.Mey., 1962**

Distribution: North America, Temperate & Subtropical Old World to NorthEast & East
Tropical Africa

***Parathelypteris japonica* (Baker) Ching, 1963**

Distribution: South China to Temperate East Asia

***Phegopteris connectilis* (Michx.) D.Watt, 1867**

Distribution: Subarctic & Temperate Northern Hemisphere

***Thelypteris palustris* (A.Gray) Schott, 1834**

Distribution: Central Canada to Mexico, Bermuda, Cuba, Temperate Eurasia, Morocco

***Woodsia macrochlaena* Mett. ex Kuhn, 1868**

Distribution: South Russian Far East to Japan and North China

***Woodsia manchuriensis* Hook., 1861**

Distribution: China to South Russian Far East and Japan

***Woodsia microsora* Kodama, 1917**

Distribution: North Korea

***Woodsia polystichoides* D.C.Eaton, 1858**

Distribution: Mongolia to Japan and China

***Woodsia subcordata* Turcz., 1832**

Distribution: SouthEast Siberia to North & Central Japan and North China

***Onoclea interrupta* (Maxim.) Ching & P.C.Chiu, 1974**

Distribution: SouthEast Siberia to Japan and China

***Pentarhizidium orientale* (Hook.) Hayata, 1927**

Distribution: East Himalaya to South Russian Far East and Japan

***Athyrium iseanum* Rosenst., 1913**

Distribution: China to Japan

***Athyrium monomachii* (Kom.) Kom., 1931**

Distribution: Siberia to North & Central Japan and North China

***Athyrium niponicum* (Mett.) Hance, 1872**

Distribution: East Himalaya to Temperate East Asia and North Indo-China

***Athyrium spinulosum* (Blume) Milde, 1870**

Distribution: Sulawesi to New Guinea

***Athyrium yokoscense* (Franch. & Sav.) Christ, 1896**

Distribution: China to South Russian Far East and Japan

***Cornopteris crenulatoserrulatum* (Makino) Nakai, 1931**

Distribution: South Russian Far East to North & Central Japan and North & East China

***Deparia conilii* (Franch. & Sav.) M.Kato, 1977**

Distribution: East China to Japan

***Deparia coreana* (Christ) M.Kato, 1984**

Distribution: China to South Russian Far East and Japan

***Deparia japonica* (Thunb.) M.Kato, 1977**

Distribution: Pakistan to South Kuril Islands and Lesser Sunda Islands

***Deparia pycnosora* (Christ) M.Kato, 1977**

Distribution: Russian Far East to Japan and North China

***Diplazium sibiricum* (Turcz. ex Kunze) Sa.Kurata, 1961**

Distribution: North & NorthEast Europe to North & Central Japan

***Arachniodes borealis* Seriz., 1986**

Distribution: East Himalaya to South Russian Far East and Japan

***Arachniodes standishii* (T.Moore) Ohwi, 1962**

Distribution: Korea (Jeju-do), Japan

***Cyrtomium fortunei* J.Sm., 1866**

Distribution: East Himalaya to Korea and Indo-China, Japan, Taiwan

***Dryopteris bissetiana* (Baker) C.Chr., 1905**

Distribution: China, South Korea, Japan

***Dryopteris chinensis* (Baker) Koidz., 1930**

Distribution: South Russian Far East to China and Japan

***Dryopteris crassirhizoma* Nakai, 1920**

Distribution: Central East & Central North China to Russian Far East and Japan

***Dryopteris erythrosora* (D.C.Eaton) Kuntze, 1891**

Distribution: China to Temperate East Asia

***Dryopteris expansa* (C.Presl) Fraser-Jenk. & Jermy, 1977**

Distribution: Subarctic & Temperate Northern Hemisphere

***Dryopteris fragrans* (L.) Schott, 1834**

Distribution: North Finland to Russian Far East and Korea, North & Central Japan, Subarctic America to North U.S.A.

***Dryopteris gymnophylla* (Baker) C.Chr., 1905**

Distribution: China to Japan and North Thailand

***Dryopteris lacera* (Thunb.) Kuntze, 1891**

Distribution: China to Temperate East Asia

***Dryopteris sacrosancta* Koidz., 1924**

Distribution: Central & South Japan

***Dryopteris saxifraga* H.Itô, 1936**

Distribution: China (Jilin, Liaoning), South Korea, Japan

***Dryopteris uniformis* (Makino) Makino, 1909**

Distribution: SouthEast China, South Korea, Japan

***Polystichum braunii* (Spenn.) Fée, 1852**

Distribution: Temperate Northern Hemisphere

***Polystichum craspedosorum* (Maxim.) Diels, 1899**

Distribution: South Russian Far East to Japan and China

***Polystichum ovato-paleaceum* var. *coraiense* (Christ) Sa.Kurata, 1964**

Distribution: Central Korea, North & Central Japan

***Polystichum polyblepharum* Nakai, 1925**

Distribution: Zimbabwe to South Africa, West Indian Ocean, Himalaya to Japan and Vietnam

***Polystichum tripterum* (Kunze) C.Presl, 1851**

Distribution: China to South Russian Far East and Japan

***Davallia mariesii* H.J.Veitch, 1880**

Distribution: North & East China to Temperate East Asia

***Lemmaphyllum microphyllum* C.Presl, 1851**

Distribution: Arunachal Pradesh to Temperat East Asia

***Lepisorus onoei* (Franch. & Sav.) Ching, 1933**

Distribution: South Korea, Japan to North Nansei-shoto

***Lepisorus thunbergianus* (Kaulf.) Ching, 1933**

Distribution: Himalaya to Temperate East Asia, Philippines (North Luzon), Hawaiian Islands

***Lepisorus ussuriensis* (Regel & Maack) Ching, 1933**

Distribution: South Russian Far East to North & East China and Korea, Japan

***Pleurosoriopsis makinoi* (Maxim. ex Makino) Fomin, 1939**

Distribution: South Russian Far East to China and Japan

***Polypodium sibiricum* Sipliv., 1974**

Distribution: Siberia to North & Central Japan and North China, Subarctic America to West & Central Canada

***Pyrrosia linearifolia* (Hook.) Ching, 1935**

Distribution: China (Jilin) to Temperate East Asia

***Pyrrosia petiolosa* (Christ) Ching, 1935**

Distribution: Mongolia to Korea and China

***Ginkgo biloba* L., 1771**

Distribution: China (Zhejiang)

***Abies holophylla* Maxim., 1866**

Distribution: Primorye to Korea

***Abies nephrolepis* (Trautv. ex Maxim.) Maxim., 1866**

Distribution: Russian Far East to Korea

***Larix kaempferi* (Lamb.) Carrière, 1856**

Distribution: Central Japan

***Picea abies* (L.) H.Karst., 1881**

Distribution: Europe

***Picea jezoensis* (Siebold & Zucc.) Carrière, 1855**

Distribution: Russian Far East to Korea, North & Central Japan

***Pinus densiflora* Siebold & Zucc., 1842**

Distribution: South Russian Far East to Korea and Central & South Japan

***Pinus koraiensis* Siebold & Zucc., 1842**

Distribution: Russian Far East to Korea, Japan

***Pinus rigida* Mill., 1768**

Distribution: SouthEast Canada to East U.S.A.

***Pinus thunbergii* Parl., 1868**

Distribution: Korea, Central & South Japan

***Juniperus rigida* Siebold & Zucc., 1846**

Distribution: NorthEast China, Korea, Japan

***Thuja koraiensis* Nakai, 1919**

Distribution: China (Jilin) to Korea

***Cephalotaxus harringtonia* (Knight ex J.Forbes) K.Koch, 1873**

Distribution: China to Korea, Central & S. Japan, Taiwan

***Taxus cuspidata* Siebold & Zucc., 1846**

Distribution: South Russian Far East to North China and Japan

***Juglans mandshurica* Maxim., 1856**

Distribution: Russian Far East to China and Temperate East Asia

***Platycarya strobilacea* Siebold & Zucc., 1843**

Distribution: Central & South China to Vietnam, Korea, Central & S. Japan

***Populus tremula* var. *davidiana* (Dode) C.K.Schneid., 1916**

Distribution: Temperate Eurasia, Algeria

***Populus tomentiglandulosa* T.B.Lee, 1955**

Distribution: Korea (artificial hybrid)

***Salix caprea* L., 1753**

Distribution: Europe to North Asia, North China to Japan

***Salix gracilistyla* Miq., 1867**

Distribution: Russian Far East to North China and Korea, Japan

***Salix koriyanagi* Kimura ex Goerz, 1931**

Distribution: Korea

***Salix pierotii* Miq., 1867**

Distribution: Russian Far East to North China and Japan

***Salix rorida* Laksch., 1911**

Distribution: Central Asia to Russian Far East and Japan

***Salix xerophila* Flod., 1930**

Distribution: Subarctic to U.S.A.

***Alnus incana* subsp. *hirsuta* (Spach) Á.Löve & D.Löve, 1976**

Distribution: South Siberia to Korea, Japan

***Alnus japonica* (Thunb.) Steud., 1840**

Distribution: South Russian Far East to East China, Korea, Japan, Taiwan

***Betula chinensis* Maxim., 1879**

Distribution: North & East China to Korea

***Betula costata* Trautv., 1859**

Distribution: Russian Far East to Korea

***Betula davurica* Pall., 1784**

Distribution: SouthEast Siberia to North & Central Japan

***Betula ermanii* Cham., 1831**

Distribution: Siberia to Japan

***Betula pendula* Roth, 1788**

Distribution: Temperate Eurasia, NorthWest Africa, Alaska to Canada

***Betula schmidtii* Regel, 1865**

Distribution: Russian Far East to Korea, Japan (North & Central Honshu)

***Carpinus cordata* Blume, 1851**

Distribution: SouthWest Primorye, China, Korea, Japan

***Carpinus laxiflora* (Siebold & Zucc.) Blume, 1851**

Distribution: Japan, Korea

***Carpinus tschonoskii* Maxim., 1882**

Distribution: South China, South Korea, Central & South Japan

***Carpinus turczaninonii* Hance, 1869**

Distribution: China, Korea, South Central & South Japan

***Corylus heterophylla* Fisch. ex Trautv., 1844**

Distribution: SouthEast Siberia to China and Japan

***Corylus sieboldiana* Blume, 1851**

Distribution: South Siberia to North China and Japan

***Corylus sieboldiana* var. *mandshurica* (Maxim.) C.K.Schneid., 1916**

Distribution: SouthEast Siberia to North China and North & Central Japan

***Castanea crenata* Siebold & Zucc., 1846**

Distribution: Korea, Japan

***Quercus acutissima* Carruth., 1861**

Distribution: Himalaya to China and Indo-China, Korea, Central & S. Japan

***Quercus aliena* Blume, 1851**

Distribution: South Russian Far East to Indo-China, Central & South Japan, Taiwan

***Quercus dentata* Thunb., 1784**

Distribution: Mongolia to South Russian Far East and China, Temperate East Asia

***Quercus mongolica* Fisch. ex Ledeb., 1850**

Distribution: SouthEast Siberia to Japan and North China

***Quercus serrata* Murray, 1784**

Distribution: East Himalaya to China, Taiwan, Korea (including Chenju Do), Japan

***Quercus variabilis* Blume, 1851**

Distribution: Central & South Japan, Korea, Taiwan, Central, East & South China, Tibet, Vietnam

***Eucommia ulmoides* Oliv., 1890**

Distribution: Central & S. China

***Celtis aurantiaca* Nakai, 1930**

Distribution: East China to Korea

***Celtis biondii* Pamp., 1910**

Distribution: Central & South China to Temperate East Asia

***Celtis bungeana* Blume, 1856**

Distribution: China to Korea

***Celtis chosoniana* Nakai, 1930**

Distribution: Korea, Japan

***Celtis jessoensis* Koidz., 1913**

Distribution: Korea, Japan

***Celtis koraiensis* Nakai, 1909**

Distribution: East China to Korea

***Celtis sinensis* Pers., 1805**

Distribution: Central & S. China to Indo-China and Temperate East Asia

***Hemiptelea davidii* (Hance) Planch., 1872**

Distribution: China to Korea

***Ulmus davidiana* var. *japonica* (Rehder) Nakai, 1932**

Distribution: South Siberia to North Myanmar and Japan

***Ulmus laciniata* (Herder) Mayr ex Schwapp., 1895**

Distribution: Russian Far East to China and Japan

***Ulmus macrocarpa* Hance, 1868**

Distribution: SouthEast Siberia to Korea and East Qingai

***Ulmus parvifolia* Jacq., 1798**

Distribution: Central & South China to Vietnam, S. Korea, Japan (Honshu, Kyushu) to Taiwan

***Zelkova serrata* (Thunb.) Makino, 1903**

Distribution: China to South Kuril Islands and Temperate East Asia

***Broussonetia hanjiana* M.Kim, 2009**

Distribution: Korea and Japan

***Fatoua villosa* (Thunb.) Nakai, 1927**

Distribution: Central & South Japan to Jawa and North Australia

***Ficus erecta* Thunb., 1786**

Distribution: East Himalaya to South China and Vietnam, Temperate East Asia

***Morus alba* L., 1753**

Distribution: Central China

***Morus bombycis* Koidz., 1915**

Distribution: Sakhalin and Indo-China

***Morus mongolica* (Bureau) C.K.Schneid., 1916**

Distribution: Mongolia to China and Japan

***Humulus scandens* (Lour.) Merr., 1935**

Distribution: Russian Far East to North Vietnam and Temperate East Asia

***Boehmeria japonica* (L.f.) Miq., 1867**

Distribution: China, Kuril Islands to Temperate East Asia

***Boehmeria nivea* (L.) Gaudich., 1830**

Distribution: Indian Subcontinent to Temperate East Asia and Indo-China

***Boehmeria paraspicata* Nakai, 1930**

Distribution: Central & East China to Japan, North Taiwan

***Boehmeria platanifolia* (Franch. & Sav.) C.H.Wright, 1899**

Distribution: China, South Korea, Japan

***Boehmeria spicata* (Thunb.) Thunb., 1794**

Distribution: Central & East China to Japan, North Taiwan

***Boehmeria tricuspis* (Hance) Makino, 1912**

Distribution: Central & South China, Kuril Islands to Temperate East Asia

***Laportea cuspidata* (Wedd.) Friis, 1981**

Distribution: SouthEast Tibet to Central & South China and Myanmar, South Korea, Japan

***Nanocnide japonica* Blume, 1856**

Distribution: Central & South China, South Korea, Central & South Japan, Taiwan

***Pilea japonica* (Maxim.) Hand.-Mazz., 1929**

Distribution: South Russian Far East to China and Temperate East Asia

***Pilea peplodes* (Gaudich.) Hook. & Arn., 1832**

Distribution: South Russian Far East and Malesia, Hawaiian Islands, Galápagos

***Pilea pumila* (L.) A.Gray, 1848**

Distribution: East Canada to Central & East U.S.A.

***Urtica angustifolia* Fisch. ex Hornem., 1819**

Distribution: Temperate Eurasia

***Urtica laetevirens* Maxim., 1876**

Distribution: Russian Far East to North & Central China, South Korea, Japan

***Urtica thunbergiana* Siebold & Zucc., 1846**

Distribution: Russian Far East to North & Central China, South Korea, Japan

***Thesium chinense* Turcz., 1837**

Distribution: SouthEast Siberia to China and Temperate East Asia

***Viscum album* var. *lutescens* (Makino) Kitag., 1979**

Distribution: Russian Far East to China and Temperate East Asia

***Aconogonon alpinum* (All.) Schur, 1853**

Distribution: Temperate Eurasia

***Fagopyrum esculentum* Moench, 1794**

Distribution: East Tibet to China (Sichuan, Yunnan)

***Fallopia dentatoalata* (F.Schmidt) Holub, 1971**

Distribution: Russian Far East to North & Central Japan and West Himalaya

***Fallopia dumetorum* (L.) Holub, 1971**

Distribution: Temperate Eurasia

***Persicaria filiformis* (Thunb.) Nakai, 1914**

Distribution: NorthEast Pakistan to Kuril Islands and Philippines

***Persicaria hydropiper* (L.) Delarbre, 1800**

Distribution: NorthWest Africa, Temperate Eurasia to West & Central Malesia, Australia

***Persicaria lapathifolia* (L.) Delarbre, 1800**

Distribution: Subarctic & Temperate Northern Hemisphere to West & Central Malesia, North Africa to Ethiopia

***Persicaria longiseta* (Bruijn) Kitag., 1937**

Distribution: Pakistan to Russian Far East and Philippines

***Persicaria nepalensis* (Meisn.) H.Gross, 1913**

Distribution: Eritrea to KwaZulu-Natal, Madagascar, Tropical & Subtropical Asia to Russian Far East

***Persicaria perfoliata* (L.) H.Gross, 1919**

Distribution: NorthEast Türkiye to Russian Far East and New Guinea

***Persicaria posumbu* (Buch.-Ham. ex D.Don) H.Gross, 1913**

Distribution: Himalaya to Russian Far East and Philippines

***Persicaria sagittata* (L.) H.Gross, 1919**

Distribution: Siberia to Himalaya and Temperate East Asia, Central & East Canada to Central & East U.S.A., Hispaniola

***Persicaria senticosa* (Meisn.) H.Gross, 1919**

Distribution: China to Vietnam, Russian Far East to Temperate East Asia

***Persicaria thunbergii* (Siebold & Zucc.) H.Gross, 1913**

Distribution: NorthEast. Türkiye to West Caucasus, Himalaya to Russian Far East and Temperate East Asia

***Polygonum aviculare* L., 1753**

Distribution: Temperate Northern Hemisphere, Macaronesia to Eritrea

***Reynoutria ciliinervis* (Nakai) Moldenke, 1941**

Distribution: China to Korea

***Reynoutria japonica* Houtt., 1777**

Distribution: Russian Far East to China and Temperate East Asia Royal Botanic Gardens, Kew 2023

***Rumex acetosa* L., 1753**

Distribution: Temperate Eurasia, NorthWest Africa Royal Botanic Gardens, Kew 2023

***Rumex acetosella* L., 1753**

Distribution: Temperate Eurasia

***Rumex crispus* L., 1753**

Distribution: Macaronesia, North Africa, Temperate Eurasia

***Rumex japonicus* Houtt., 1777**

Distribution: Russian Far East to Vietnam and Temperate East Asia

***Rumex obtusifolius* L., 1753**

Distribution: Europe to Central Siberia and Iran, NorthWest Africa

***Phytolacca americana* L., 1753**

Distribution: East Canada to Mexico

***Mollugo pentaphylla* L., 1753**

Distribution: India, Sri Lanka, Korea

***Portulaca oleracea* L., 1753**

Distribution: Macaronesia, Tropical Africa, Mediterranean to Pakistan and Arabian Peninsula

***Arenaria serpyllifolia* L., 1753**

Distribution: Temperate Eurasia to Philippines (Luzon), North Africa to Ethiopia

***Cerastium glomeratum* Thuill., 1799**

Distribution: Europe, Macaronesia to Assam

***Cerastium holosteoides* subsp. *vulgare* (Hartm.) Buttler, 1997**

Distribution: Temperate & Subarctic Eurasia to New Guinea (Mt. Kaindi)

***Dianthus chinensis* L., 1753**

Distribution: East Europe to Temperate Asia and North India

***Lychnis cognata* Maxim., 1859**

Distribution: South Russian Far East to North & East China and Korea

***Pseudostellaria coreana* (Nakai) Ohwi, 1935**

Distribution: Korea, Japan (Honshu)

***Pseudostellaria heterophylla* (Miq.) Pax, 1934**

Distribution: South Russian Far East to China and Central & South Japan

***Pseudostellaria palibiniana* (Takeda) Ohwi, 1935**

Distribution: Korea, Japan (Honshu)

***Sagina japonica* (Sw.) Ohwi, 1937**

Distribution: Indian Subcontinent to Russian Far East and Temperate East Asia

***Silene baccifera* (L.) Durande, 1782**

Distribution: Temperate Eurasia

***Silene firma* Siebold & Zucc., 1845**

Distribution: SouthEast Siberia to China and Temperate East Asia

***Silene seoulensis* Nakai, 1909**

Distribution: NorthEast China to Korea, Japan (Shikoku)

***Stellaria alsine* Grimm, 1767**

Distribution: Temperate Northern Hemisphere to West Malaysia

***Stellaria aquatica* (L.) Scop., 1771**

Distribution: Temperate Eurasia

***Stellaria media* (L.) Vill., 1789**

Distribution: Temperate Eurasia, North & NorthEast Tropical Africa

***Chenopodium album* L., 1753**

Distribution: Temperate to Indian Subcontinent

***Chenopodium album* var. *centrorubrum* Makino, 1910**

Distribution: Temperate to Indian Subcontinent

***Chenopodium bryoniifolium* Bunge, 1876**

Distribution: SouthEast. Siberia to North & Central Japan

***Chenopodium ficifolium* Sm., 1800**

Distribution: Europe to Korea and North Indo-China

***Achyranthes bidentata* var. *japonica* Miq., 1865**

Distribution: Tropical & Subtropical Asia to NorthWest Pacific

***Amaranthus blitum* subsp. *oleraceus* (L.) Costea, (2001)**

Distribution: Paraguay to South Brazil and NorthEast Argentina

***Amaranthus patulus* Bertol., 1837**

Distribution: South Ontario to West South America

***Amaranthus retroflexus* L., 1753**

Distribution: Mexico

***Magnolia sieboldii* K.Koch, 1853**

Distribution: Central China to Japan

***Kadsura japonica* (L.) Dunal, 1817**

Distribution: South Korea, South Japan to Taiwan

***Schisandra chinensis* (Turcz.) Baill., 1868**

Distribution: Russian Far East to North China and Central Japan

***Illicium anisatum* L., 1759**

Distribution: South Korea, Japan to Taiwan

***Actinodaphne lancifolia* (Blume) Meisn., 1864**

Distribution: South Korea, South Central & South Japan to Central Taiwan

***Lindera erythrocarpa* Makino, 1897**

Distribution: Central & South China to Korea, South Central & South Japan, Taiwan

***Lindera glauca* (Siebold & Zucc.) Blume, 1851**

Distribution: Central & South China to Indo-China and Korea, South Central & South Japan, Taiwan

***Lindera obtusiloba* Blume, 1851**

Distribution: Bhutan to China and Myanmar, Korea, South Central & S. Japan

***Machilus japonica* Siebold & Zucc, 1846**

Distribution: South Korea, South Central Japan to Taiwan

***Neolitsea aciculata* (Blume) Koidz., 1918**

Distribution: South Korea, South Central & South Japan to Taiwan

***Neolitsea sericea* (Blume) Koidz., 1926**

Distribution: China (Zhejiang), South Korea, Central & South Japan to Taiwan

***Aconitum albobolaceum* Kom., 1901**

Distribution: South Russian Far East to North & Central Korea

***Aconitum austrokoreense* Koidz., 1934**

Distribution: North Korea

***Aconitum barbatum* Patr. ex Pers., 1806**

Distribution: Siberia to Korea

***Aconitum coreanum* (H.Lév.) Rapaics, 1907**

Distribution: Mongolia to South Russian Far East and North & Central Korea

***Aconitum jaluense* Kom., 1901**

Distribution: South Russian Far East to North & Central Korea, Central & South Japan

***Aconitum longecassidatum* Nakai, 1909**

Distribution: East China to Korea

***Aconitum pseudolaeve* Nakai, 1935**

Distribution: Korea

***Actaea asiatica* H.Hara, 1939**

Distribution: Tibet to Russian Far East and Japan

***Actaea bifida* (Nakai) J.Compton, 1998**

Distribution: Korea

***Actaea cimicifuga* L., 1753**

Distribution: Siberia to Korea

***Actaea dahurica* (Turcz. ex Fisch. & C.A.Mey.) Franch., 1883**

Distribution: SouthEast Siberia to Korea

***Anemone reflexa* Steph. ex Willd., 1799**

Distribution: East European Russia to Korea

***Caltha palustris* L., 1753**

Distribution: Temperate & Subarctic Northern Hemisphere

***Clematis apiifolia* DC., 1817**

Distribution: Central & SouthEast China, Korea, Central & South Japan

***Clematis brachyura* Maxim., 1876**

Distribution: Korea

***Clematis brevicaudata* DC., 1817**

Distribution: Mongolia to North Vietnam and East Korea, Japan

***Clematis fusca* Turcz., 1840**

Distribution: East Siberia to Russian Far East and North & North Central Japan

***Clematis fusca* var. *violacea* Maxim., 1859**

Distribution: Russian Far East to North China and Central Japan

***Clematis patens* C.Morren & Decne., 1836**

Distribution: East China to Central & South Japan

***Clematis serratifolia* Rehder, 1911**

Distribution: Russian Far East to Korea

***Clematis terniflora* DC., 1817**

Distribution: Central & South China to Temperate East Asia

***Clematis terniflora* var. *mandshurica* (Rupr.) Ohwi, 1938**

Distribution: South Russian Far East to Korea

***Clematis trichotoma* Nakai, 1912**

Distribution: Korea

***Clematis urticifolia* Nakai ex Kitag., 1937**

Distribution: China to Korea

***Enemion raddeanum* Regel, 1861**

Distribution: Russian Far East to North & Central Korea, Central Japan

***Eranthis stellata* Maxim., 1859**

Distribution: Russian Far East to Korea

***Hepatica asiatica* Nakai, 1937**

Distribution: South Russian Far East to North & East China to Korea, Central & South Japan

***Pulsatilla koreana* (Y.Yabe ex Nakai) Nakai ex T.Mori, 1922**

Distribution: Russian Far East to Korea

***Ranunculus chinensis* Bunge, 1833**

Distribution: Siberia to Temperate East Asia and Peninsula Malaysia

***Ranunculus japonicus* Thunb., 1794**

Distribution: Siberia to Russian Far East and Temperate East Asia

***Ranunculus sceleratus* L., 1753**

Distribution: Temperate Eurasia, North Africa, Ethiopia to Rwanda, Central & East Canada to Central & East U.S.A.

***Ranunculus tachiroei* Franch. & Sav., 1878**

Distribution: East China, Korea & Japan

***Semiaquilegia adoxoides* (DC.) Makino, 1902**

Distribution: China to West Central & S. Japan

***Thalictrum actaeifolium* var. *brevistylum* Nakai, 1937**

Distribution: South Korea

***Thalictrum aquilegiifolium* var. *sibiricum* Regel & Tiling, 1858**

Distribution: Russian Far East to North & Central China, South Korea, Japan

***Thalictrum ichangense* Lecoy. ex Oliv., 1888**

Distribution: Central & S. China to Vietnam and Korea

***Thalictrum kemense* Fr., 1817**

Distribution: Subarctic to the Caucasus, North & North Central Japan

***Thalictrum minus* var. *hypoleucum* (Siebold & Zucc.) Miq., 1867**

Distribution: Temperate Eurasia, North West Africa

***Thalictrum tuberiferum* Maxim., 1876**

Distribution: South Russian Far East to Korea, Central & South Japan, Temperate Asia & Europe

***Berberis amurensis* Rupr., 1857**

Distribution: Mongolia to North China and Japan

***Berberis koreana* Palib., 1899**

Distribution: Korea

***Akebia quinata* (Houtt.) Decne., 1839**

Distribution: Central & East China to Japan

***Stauntonia hexaphylla* (Thunb.) Decne., 1839**

Distribution: South Korea, Central & South Japan

***Cocculus orbiculatus* (L.) DC., 1817**

Distribution: Himalaya to Japan (Kerama Islands) and Central Pacific

***Menispermum dauricum* DC., 1817**

Distribution: South Siberia to China and Japan

***Chloranthus japonicus* Siebold, 1828**

Distribution: South China to Vietnam, South Korea, South Kuril Islands to Japan

***Aristolochia contorta* Bunge, 1833**

Distribution: South Russian Far East to Vietnam and Japan

***Aristolochia manshuriensis* Kom., 1904**

Distribution: South Russian Far East to North & East Central China and Korea

***Asarum chungbuensis* (C.S.Yook & J.G.Kim) B.U.Oh, 2005**

Distribution: Korea

***Asarum maculatum* Nakai, 1914**

Distribution: Korea

***Asarum mandshuricum* (Maxim.) M.Kim & S.So, 2008**

Distribution: East China to South Russian Far East and North Central Japan

***Asarum mandshuricum* var. *seoulense* (Nakai) M.Kim & S.So, 2017**

Distribution: East China to South Russian Far East and North Central Japan

***Asarum misandrum* B.U.Oh & J.G.Kim, 1997**

Distribution: Korea

***Asarum sieboldii* Miq., 1865**

Distribution: South Russian Far East to Korea, Japan

***Paeonia japonica* (Makino) Miyabe & Takeda, 1910**

Distribution: Korea & Japan

***Paeonia lactiflora* Pall., 1776**

Distribution: SouthEast. Siberia to North & East China

***Paeonia obovata* Maxim., 1859**

Distribution: China to Russian Far East and Japan

***Actinidia arguta* (Siebold & Zucc.) Planch. ex Miq., 1867**

Distribution: Russian Far East to China, Temperate East Asia

***Actinidia kolomikta* (Maxim. & Rupr.) Maxim., 1859**

Distribution: Russian Far East to Central China, North & Central Japan

***Actinidia polygama* (Siebold & Zucc.) Planch. ex Maxim., 1859**

Distribution: South Russian Far East to China, Korea, Japan

***Camellia japonica* L., 1753**

Distribution: China, Korea, Central & South Japan to Taiwan

***Eurya japonica* Thunb., 1783**

Distribution: China to Temperate East Asia

***Stewartia koreana* Nakai ex Rehder, 1926**

Distribution: Korea & Japan

***Hypericum ascyron* L., 1753**

Distribution: Temperate Asia, East Canada to North Central & East U.S.A.

***Hypericum erectum* Thunb., 1784**

Distribution: South China, South Sakhalin to Temperate East Asia

***Chelidonium majus* subsp. *asiaticum* H.Hara, 1949**

Distribution: Russian Far East to North China and Japan

***Corydalis alata* B.U.Oh & W.R.Lee, 2010**

Distribution: NorthEast. China, Central Korea

***Corydalis incisa* (Thunb.) Pers., 1806**

Distribution: Central & East China to Temperate East Asia

***Corydalis maculata* B.U.Oh & Y.S.Kim, 1987**

Distribution: Korea

***Corydalis namdoensis* B.U.Oh & J.G.Kim, 2004**

Distribution: NorthEast. China, South Korea

***Corydalis ochotensis* Turcz., 1840**

Distribution: Russian Far East to North China

***Corydalis pauciovulata* Ohwi, 1942**

Distribution: Central & South Korea, Central Japan

***Corydalis raddeana* Regel, 1862**

Distribution: Russian Far East to North & East China and Temperate East Asia

***Corydalis remota* Fisch. ex Maxim., 1859**

Distribution: SouthEast Siberia to North China

***Corydalis speciosa* Maxim., 1859**

Distribution: Russian Far East to China and Korea, North & North Central Japan

***Corydalis turtschaninovii* Besser, 1834**

Distribution: SouthEast Siberia to North China

***Dicentra spectabilis* (L.) Lem., 1847**

Distribution: NorthEast China to North Korea

***Hylomecon vernalis* Maxim., 1859**

Distribution: Russian Far East to China and Central & South Korea

***Arabidopsis halleri* subsp. *gemmifera* (Matsum.) O'Kane & Al-Shehbaz, 1997**

Distribution: East Siberia to Temperate East Asia

***Arabis hirsuta* (L.) Scop., 1771**

Distribution: Temperate Eurasia, Algeria

***Barbarea orthoceras* Ledeb., 1824**

Distribution: Temperate Asia, Subarctic America to North, West & Central U.S.A.

***Barbarea vulgaris* W.T.Aiton, 1812**

Distribution: Europe, Mediterranean to Japan

***Berteroella maximowiczii* (Palib.) O.E.Schulz, 1919**

Distribution: North & East China to Korea & Japan

***Capsella bursa-pastoris* (L.) Medik., 1792**

Distribution: Temperate Eurasia, North Africa

***Cardamine fallax* (O.E.Schulz) Nakai, 1919**

Distribution: Temperate Eurasia, Subarctic America to North, Central & East U.S.A.

***Cardamine flexuosa* With., 1796**

Distribution: Europe to Iran, NorthWest Africa

***Cardamine impatiens* L., 1753**

Distribution: Temperate Eurasia

***Cardamine komarovii* Nakai, 1914**

Distribution: NorthEast China to Korea

***Cardamine leucantha* (Tausch) O.E.Schulz, 1903**

Distribution: SouthEast Siberia to Japan and China

***Catolobus pendulus* (L.) Al-Shehbaz, 2005**

Distribution: East Europe to Japan

***Draba nemorosa* L., 1753**

Distribution: Subarctic and Temperate Northern Hemisphere

***Erysimum amurense* Kitag., 1937**

Distribution: South Siberia to North China

***Lepidium apetalum* Willd., 1800**

Distribution: East Europe to Temperate Asia

***Rorippa palustris* (L.) Besser, 1821**

Distribution: Temperate Northern Hemisphere to Tropical Mountains

***Thlaspi arvense* L., 1753**

Distribution: Temperate Eurasia

***Turritis glabra* L., 1753**

Distribution: Temperate Northern Hemisphere to Tropical Mountains

***Hylotelephium erythrostictum* (Miq.) H.Ohba, 1977**

Distribution: China to Korea, South Sakhalin to Japan

***Hylotelephium viviparum* (Maxim.) H.Ohba, 1977**

Distribution: South Russian Far East to Korea

***Orostachys japonica* (Maxim.) A.Berger, 1930**

Distribution: East China to Korea, South Central & South Japan

***Orostachys minuta* (Kom.) A.Berger, 1930**

Distribution: NorthEast China to Korea

***Phedimus aizoon* (L.) 't Hart, 1995**

Distribution: Siberia to China and North & Central Japan

***Phedimus kamtschaticus* (Fisch. & C.A.Mey.) 't Hart, 1995**

Distribution: Russian Far East to North China and North Japan

***Phedimus middendorffianus* (Maxim.) 't Hart, 1995**

Distribution: East Siberia to Korea, Japan

***Sedum bulbiferum* Makino, 1891**

Distribution: Central China to Korea, Central & South Japan to Taiwan

***Sedum polytrichoides* Hemsl., 1887**

Distribution: North & East China to Korea, Japan

***Sedum sarmentosum* Bunge, 1835**

Distribution: Thailand to Japan

***Astilbe chinensis* (Maxim.) Franch. & Sav., 1873**

Distribution: Russian Far East to China and South Japan

***Astilboides tabularis* (Hemsl.) Engl., 1919**

Distribution: NorthEast China to North Korea

***Chrysosplenium flagelliferum* F.Schmidt, 1868**

Distribution: Russian Far East to Korea, Japan

***Chrysosplenium grayanum* Maxim., 1877**

Distribution: East Central Korea, Sakhalin to Japan

***Chrysosplenium japonicum* (Maxim.) Makino, 1909**

Distribution: East China to Korea, Japan, NorthEast Taiwan

***Micranthes octopetala* (Nakai) Y.I.Kim & Y.D.Kim, 2015**

Distribution: Russian Far East to Korea

***Mukdenia rossii* (Oliv.) Koidz., 1935**

Distribution: NorthEast China to Korea

***Rodgersia podophylla* A.Gray, 1859**

Distribution: NorthEast. China to Korea, Japan

***Saxifraga fortunei* Hook., 1863**

Distribution: South Central China, South Russian Far East to Korea, Japan

***Saxifraga stolonifera* Curtis, 1774**

Distribution: Central & South China, South Korea, Central & South Japan, Taiwan

***Deutzia glabrata* Kom., 1903**

Distribution: South Russian Far East to North China

***Deutzia grandiflora* var. *baroniana* (Diels) Rehder, 1911**

Distribution: North Central & East China

***Deutzia paniculata* Nakai, 1913**

Distribution: Korea

***Deutzia parviflora* Bunge, 1835**

Distribution: South Russian Far East to China and Korea

***Deutzia uniflora* Shirai, 1898**

Distribution: Central & South Korea, Central Japan

***Hydrangea macrophylla* subsp. *serrata* (Thunb.) Makino, 1929**

Distribution: Korea & Japan

***Hydrangea petiolaris* Siebold & Zucc., 1840**

Distribution: Korea, Sakhalin to Japan

***Philadelphus schrenkii* Rupr., 1857**

Distribution: South Russian Far East to North China and Korea

***Philadelphus tenuifolius* Maxim. & Rupr., 1856**

Distribution: Russian Far East to Korea

***Schizophragma hydrangeoides* Siebold & Zucc., 1837**

Distribution: Korea to Japan

***Parnassia palustris* L., 1753**

Distribution: Subarctic & Temperate Northern Hemisphere

***Ribes fasciculatum* var. *chinense* Maxim., 1874**

Distribution: Central & East China to Korea, Central & South Japan

***Ribes komarovii* Pojark., 1926**

Distribution: South Russian Far East to North China and North Korea

***Ribes mandshuricum* (Maxim.) Kom., 1904**

Distribution: Russian Far East to North & East Central China and Korea

***Ribes maximowiczianum* Kom., 1904**

Distribution: Siberia to China, Korea & Japan

***Agrimonia coreana* Nakai, 1918**

Distribution: South Russian Far East to North & East China, Japan

***Agrimonia pilosa* Ledeb., 1823**

Distribution: North & East Central Europe to Japan and North Indo-China

***Aria alnifolia* (Siebold & Zucc.) Decne., 1874**

Distribution: China to South Russian Far East and Temperate East Asia

***Aruncus dioicus* (Walter) Fernald, 1939**

Distribution: Europe to the Caucasus, East Siberia to Russian Far East, North Central & East U.S.A.

***Crataegus pinnatifida* Bunge, 1835**

Distribution: Russian Far East to North & East China

***Duchesnea chrysantha* (Zoll. & Moritzi) Miq., 1855**

Distribution: South East China to Temperate East Asia and Central & South Malaysia

***Duchesnea indica* (Andrews) Tescem., 1835**

Distribution: Afghanistan to Russian Far East and Malaysia

***Exochorda serratifolia* S.Moore, 1877**

Distribution: South Russian Far East to North China and Korea

***Filipendula glaberrima* Nakai, 1914**

Distribution: Primorye to North China and Korea, Sakhalin to North Japan

***Geum aleppicum* Jacq., 1781**

Distribution: Temperate Northern Hemisphere to Mexico

***Geum japonicum* Thunb., 1784**

Distribution: China to Korea & Japan

***Malus baccata* (L.) Borkh., 1803**

Distribution: Siberia to Korea and Himalaya

***Malus mandshurica* (Maxim.) Kom. ex Skvortsov, 1925**

Distribution: Russian Far East to North China, North & Central Japan

***Potentilla chinensis* Ser., 1825**

Distribution: Mongolia to Russian Far East and Temperate East Asia

***Potentilla cryptotaeniae* Maxim., 1873**

Distribution: Russian Far East to Central China and Japan

***Potentilla dickinsii* Franch. & Sav., 1878**

Distribution: North & East China to Sakhalin and Japan

***Potentilla discolor* Bunge, 1833**

Distribution: South Russian Far East to China and Central & South Japan

***Potentilla fragarioides* var. *major* Maxim., 1859**

Distribution: Mongolia to Russian Far East and Temperate East Asia

***Potentilla freyniana* Bornm., 1905**

Distribution: Russian Far East to China and Temperate East Asia

***Potentilla nivea* L., 1753**

Distribution: Subarctic & Subalpine

***Pourthiaea villosa* (Thunb.) Decne., 1874**

Distribution: Central & South China to Korea, Japan, North Taiwan

***Prunus armeniaca* L., 1753**

Distribution: Central Asia to North & Central China

***Prunus buergeriana* Miq., 1865**

Distribution: Himalaya to Korea & Central & South Japan

***Prunus choreiana* Nakai ex H.T.Im, 2006**

Distribution: Korea

***Prunus davidiana* (Carrière) Franch., 1884**

Distribution: North Central China to Korea

***Prunus japonica* var. *nakaii* (H.Lév.) Rehder, 1922**

Distribution: NorthEast China to Korea

***Prunus mandshurica* (Maxim.) Koehne, 1893**

Distribution: South Russian Far East to Korea

***Prunus padus* L., 1753**

Distribution: Temperate Eurasia, Morocco

***Prunus persica* (L.) Batsch, 1801**

Distribution: North Central China

***Prunus sargentii* Rehder, 1908**

Distribution: Russian Far East to Japan, Korea

***Prunus sargentii* var. *verecunda* (Koidz.) Chin S.Chang, 2004**

Distribution: North & East China to Korea, Japan

***Prunus serrulata* var. *pubescens* (Makino) Nakai, 1915**

Distribution: North & East China to Korea, Japan

***Prunus serrulata* f. *spontanea* (E.H.Wilson) Chin S.Chang, 2007**

Distribution: Central & South Japan

***Prunus sibirica* L., 1753**

Distribution: South Siberia to North China and Korea

***Prunus tomentosa* Thunb., 1784**

Distribution: Tibet to China, Sakhalin

***Prunus yedoensis* Matsum., 1901**

Distribution: Japan, Korea

***Pyrus calleryana* var. *fauriei* (C.K.Schneid.) Rehder, 1920**

Distribution: Korea, Japan & Taiwan

***Pyrus ussuriensis* Maxim. ex Rupr., 1856**

Distribution: North & East China to Korea, Russian Far East to North Japan

***Rhaphiolepis indica* var. *umbellata* (Thunb. ex Murray) H.Ohashi, 1988**

Distribution: China to Temperate East Asia

***Rosa acicularis* Lindl., 1820**

Distribution: North Europe to North & Central Japan, Central Alaska

***Rosa davurica* Pall., 1788**

Distribution: Suberia to Russian Far East and Korea

***Rosa koreana* Kom., 1901**

Distribution: Russian Far East to Korea

***Rosa luciae* Franch. & Rochebr. ex Crép., 1871**

Distribution: SouthEast China, South Korea, Central & South Japan to Philippines

***Rosa multiflora* Thunb., 1784**

Distribution: East China to Korea, Japan

***Rubus corchorifolius* L.f., 1782**

Distribution: China to North Indo-China, Korea, Japan

***Rubus coreanus* Miq., 1867**

Distribution: North & East China to Korea

***Rubus crataegifolius* Bunge, 1833**

Distribution: South Siberia to Korea, Japan

***Rubus idaeus* var. *microphyllus* Turcz., 1843**

Distribution: Subarctic to North & Central China and Mexico

***Rubus parvifolius* L., 1753**

Distribution: China to Vietnam, Sakhalin to Temperate East Asia, East & South East Australia

***Rubus phoenicolasius* Maxim., 1872**

Distribution: China (Qinghai) to Korea, Japan

***Rubus pungens* Cambess., 1844**

Distribution: North Pakistan to Primorye and Temperate East Asia

***Sanguisorba hakusanensis* Makino, 1907**

Distribution: Korea & Japan

***Sanguisorba officinalis* L., 1753**

Distribution: Temperate Northern Hemisphere

***Sorbaria sorbifolia* var. *stellipila* Maxim., 1879**

Distribution: NorthEast China to Korea, Japan

***Sorbus commixta* Hedl., 1901**

Distribution: Central China to Korea, Sakhalin to Japan

***Spiraea blumei* G.Don, 1832**

Distribution: China to Korea, Central & South Japan

***Spiraea chamaedryfolia* L., 1753**

Distribution: SouthEast Europe to Korea, Japan

***Spiraea chamaedryfolia* var. *pilosa* (Nakai) H.Hara, 1952**

Distribution: SouthEast Europe to Korea, Japan

***Spiraea chartacea* Nakai, 1928**

Distribution: Korea & Japan

***Spiraea chinensis* Maxim., 1879**

Distribution: China to Korea

***Spiraea fritschiana* C.K.Schneid., 1905**

Distribution: China to Korea

***Spiraea prunifolia* f. *simpliciflora* Nakai, 1909**

Distribution: South China

***Spiraea salicifolia* L., 1753**

Distribution: East Central Europe to North & Central Japan

***Spiraea trichocarpa* Nakai, 1909**

Distribution: North China to Korea

***Stephanandra incisa* (Thunb.) Zabel, 1885**

Distribution: China to Temperate East Asia

***Albizia julibrissin* Durazz., 1772**

Distribution: East Transcaucasus to Japan

***Amorpha fruticosa* L., 1753**

Distribution: U.S.A. to North Mexico

***Amphicarpaea bracteata* subsp. *edgeworthii* (Benth.) H.Ohashi, 1966**

Distribution: Himalaya to Russian Far East and Temperate East Asia

***Astragalus penduliflorus* var. *dahuricus* (DC.) X.Y. Zhu, 2005**

Distribution: Siberia to Russian Far East and West & North China

***Caragana fruticosa* (Pall.) Besser, 1816**

Distribution: Central Asia to Siberia and NorthEast China

***Chamaecrista nomame* (Makino) H.Ohashi, 1989**

Distribution: Eritrea to Zimbabwe, Madagascar, Tropical & Subtropical Asia to North & East Australia

***Glycine max* subsp. *soja* (Siebold & Zucc.) H.Ohashi, 1982**

Distribution: Russian Far East to China and Temperate East Asia

***Hylodesmum oldhamii* (Oliv.) H.Ohashi & R.R.Mill, 2000**

Distribution: South Russian Far East to China and Central & South Japan

***Hylodesmum podocarpum* (DC.) H.Ohashi & R.R.Mill, 2000**

Distribution: Himalaya to Temperate East Asia and Philippines

***Hylodesmum podocarpum* subsp. *fallax* (Schindl.) H.Ohashi & R.R.Mill, 2000**

Distribution: Central & South China to Central & South Japan

***Hylodesmum podocarpum* subsp. *oxyphyllum* (DC.) H.Ohashi & R.R.Mill, 2000**

Distribution: Himalaya to South Russian Far East and Temperate East Asia

***Hylodesmum podocarpum* var. *mandshuricum* (Maxim.) H.Ohashi & R.R.Mill, 2000**

Distribution: Himalaya to South Russian Far East and Temperate East Asia

***Indigofera grandiflora* B.H.Choi & S.K.Cho, 1996**

Distribution: Korea

***Indigofera kirilowii* Maxim. ex Palib., 1899**

Distribution: China to Korea, Japan

***Indigofera pseudotinctoria* Matsum., 1902**

Distribution: China to Temperate East Asia

***Kummerowia stipulacea* (Maxim.) Makino, 1914**

Distribution: Russian Far East to China and Temperate East Asia

***Kummerowia striata* (Thunb.) Schindl., 1912**

Distribution: Russian Far East to North Indo-China

***Lathyrus davidii* Hance, 1871**

Distribution: Russian Far East to China and Korea, Japan

***Lespedeza bicolor* Turcz., 1840**

Distribution: SouthEast Siberia to Korea, Japan

***Lespedeza cuneata* (Dum.Cours.) G.Don, 1832**

Distribution: Afghanistan to Japan and Tropical Asia, East & South East Australia

***Lespedeza cyrtobotrya* Miq., 1867**

Distribution: South Russian Far East to North & East China and Central & South Japan

***Lespedeza juncea* (L.f.) Pers., 1807**

Distribution: Temperate Asia to North India

***Lespedeza maritima* Nakai, 1923**

Distribution: Korea

***Lespedeza maximowiczii* C.K.Schneid., 1907**

Distribution: Korea & Japan

***Lespedeza maximowiczii* var. *tomentella* (Nakai) Nakai, 1927**

Distribution: Korea

***Lespedeza virgata* (Thunb.) DC., 182**

Distribution: China to Temperate East Asia

***Lotus corniculatus* var. *japonica* Regel, 1865**

Distribution: Temperate East Asia

***Maackia amurensis* Rupr., 1856**

Distribution: Russian Far East to North China and Japan

***Medicago lupulina* L., 1753**

Distribution: Macaronesia, Europe to the Caucasus, North & NorthEast Tropical Africa to Arabian Peninsula Indian Subcontinent to China

***Medicago sativa* L., 1753**

Distribution: Mediterranean to West Siberia and Iran

***Melilotus albus* Medik., 1787**

Distribution: Europe to China, North Africa to Myanmar, Ethiopia to South Africa

***Pueraria lobata* (Willd.) Ohwi, 1947**

Distribution: China to North Australia

***Robinia pseudoacacia* L., 1753**

Distribution: East Central & East U.S.A

***Sophora flavescens* Aiton, 1789**

Distribution: Siberia to Temperate East Asia

***Sophora koreensis* Nakai, 1919**

Distribution: Korea

***Styphnolobium japonicum* (L.) Schott, 1829**

Distribution: Central & South China

***Trifolium dubium* Sibth., 1794**

Distribution: Macaronesia, Europe to Mediterranean and Caucasus

***Trifolium pratense* L., 1753**

Distribution: Macaronesia, NorthWest Africa, Europe to Mongolia and Himalaya

***Trifolium repens* L., 1753**

Distribution: Macaronesia, NorthWest. Africa, Egypt to Zimbabwe, Europe to Mongolia and Himalaya

***Vicia amoena* Fisch. ex Ser., 1825**

Distribution: Temperate Asia

***Vicia amurensis* Oett., 1906**

Distribution: South Siberia to Korea, Japan

***Vicia chosenensis* Ohwi, 1936**

Distribution: Korea

***Vicia cracca* L., 1753**

Distribution: Temperate Eurasia

***Vicia hirsuta* (L.) Gray, 1822**

Distribution: Macaronesia, Temperate Eurasia, North Africa to Tanzania

***Vicia sativa* subsp. *nigra* Ehrh., 1780**

Distribution: Macaronesia, Temperate Eurasia, North Africa to Kenya

***Vicia unijuga* A.Braun, 1853**

Distribution: Temperate Asia

***Vicia venosa* (Willd. ex Link) Maxim., 1872**

Distribution: Siberia to China and Japan

***Vicia venosa* var. *cuspidata* Maxim., 1886**

Distribution: South China to Korea, Central Japan

***Vigna angularis* var. *nipponensis* (Ohwi) Ohwi & H. Ohashi, 1969**

Distribution: Nepal to South China and North Indo-China, Taiwan, Central & South Japan

***Wisteria floribunda* (Willd.) DC., 1825**

Distribution: South Central & South Japan

***Oxalis acetosella* L., 1753**

Distribution: Europe to Japan, Algeria

***Oxalis corniculata* L., 1753**

Distribution: Mexico to Venezuela and Peru, Caribbean

***Oxalis obtriangulata* Maxim., 1868**

Distribution: Russian Far East to Korea, Japan

***Oxalis stricta* L., 1753**

Distribution: Central & East China to North & Central Japan, North America

***Geranium koreanum* Kom., 1901**

Distribution: East China to Korea

***Geranium krameri* Franch. & Sav., 1878**

Distribution: Russian Far East to Korea, Central & South Japan

***Geranium sibiricum* L., 1753**

Distribution: Romania to Temperate Asia

***Geranium thunbergii* Siebold & Zucc., 1845**

Distribution: China, Kuril Islands to Temperate East Asia

***Acalypha australis* L., 1753**

Distribution: South Russian Far East to North Philippines

***Euphorbia humifusa* Willd. ex Schlttdl., 1814**

Distribution: Moldova to Temperate Asia

***Euphorbia hypericifolia* L., 1753**

Distribution: Tropical & Subtropical America

***Euphorbia maculata* L., 1753**

Distribution: SouthEast Canada to Belize, Cuba, Bahamas

***Euphorbia sieboldiana* Morren & Decne., 1836**

Distribution: China to Russian Far East and Temperate East Asia

***Mallotus japonicus* (L.f.) Müll.Arg., 1865**

Distribution: China to Temperate East Asia

***Mercurialis leiocarpa* Siebold & Zucc., 1845**

Distribution: Nepal to Temperate East Asia

***Neoshirakia japonica* (Siebold & Zucc.) Esser, 1998**

Distribution: South & East China, Korea (including Jeju-do), Central & South Japan to Nansei-shoto

***Phyllanthus ussuriensis* Rupr. & Maxim., 1857**

Distribution: Mongolia to China and Temperate East Asia

***Securinega suffruticosa* (Pall.) Rehder, 1932**

Distribution: Temperate Asia

***Dictamnus dasycarpus* Turcz., 1842**

Distribution: South East Siberia to China and Korea

***Orixa japonica* Thunb., 1783**

Distribution: Central & South China to South Korea, Central & South Japan

***Phellodendron amurense* Rupr., 1857**

Distribution: Russian Far East to North & East China, Temperate East Asia

***Tetradium daniellii* (Benn.) T.G.Hartley, 1981**

Distribution: SouthEast Tibet to China

***Zanthoxylum piperitum* (L.) DC., 1824**

Distribution: China to South Korea, Japan

***Zanthoxylum schinifolium* Siebold & Zucc., 1845**

Distribution: Central & East China to Temperate East Asia

***Ailanthus altissima* (Mill.) Swingle, 1916**

Distribution: China

***Picrasma quassioides* (D.Don) Benn., 1844**

Distribution: Himalaya to Temperate East Asia

***Rhus chinensis* Mill., 1768**

Distribution: North Pakistan to Japan, Sumatera

***Toxicodendron sylvestre* (Siebold & Zucc.) Kuntze, 1891**

Distribution: South China, South Korea, South Central & South Japan to Taiwan

***Toxicodendron trichocarpum* (Miq.) Kuntze, 1891**

Distribution: South China to Korea, Kuril Islands to Japan

***Acer barbinerve* Maxim., 1867**

Distribution: South Russian Far East to North Korea

***Acer komarovii* Pojark., 1949**

Distribution: South Russian Far East to Korea

***Acer palmatum* Thunb., 1784**

Distribution: SouthWest Korea, Central & S. Japan

***Acer pictum* var. *mono* (Maxim.) Maxim., 1880**

Distribution: China to Mongolia and Russian Far East, North & Central Japan

***Acer pseudosieboldianum* (Pax) Kom., 1903**

Distribution: South Russian Far East to Korea

***Acer negundo* L., 1753**

Distribution: Canada to Honduras

***Acer tataricum* subsp. *ginnala* (Maxim.) Wesm., 1890**

Distribution: Russian Far East to North & East Central China and Korea

***Acer tegmentosum* Maxim., 1856**

Distribution: Russian Far East to Korea

***Acer triflorum* Kom., 1901**

Distribution: NorthEast China to Korea

***Acer truncatum* Bunge, 1833**

Distribution: Russian Far East to North & East China, Korea, Japan

***Acer ukurunduense* Trautv. & C.A.Mey., 1856**

Distribution: Russian Far East to Korea and Japan

***Meliosma pinnata* var. *oldhamii* (Miq. ex Maxim.) Beusekom, 1971**

Distribution: Central & South China to Korea, Japan

***Impatiens noli-tangere* L., 1753**

Distribution: Temperate Eurasia, Alaska to Central Canada and West Central California

***Impatiens textorii* Miq., 1865**

Distribution: Russian Far East to North China and Japan

***Impatiens textorii* var. *koreana* (Nakai) Nakai, 1917**

Distribution: Russian Far East to North China and Japan

***Ilex macropoda* Miq., 1867**

Distribution: SouthEast China (to Hubei), Korea, Japan

***Celastrus flagellaris* Rupr., 1857**

Distribution: South Russian Far East to North China and Korea, Central & South Japan

***Celastrus orbiculatus* Thunb., 1784**

Distribution: Russian Far East to China and Central & South Japan

***Celastrus stephanotiifolius* (Makino) Makino, 1926**

Distribution: Korea & Japan

***Euonymus alatus* (Thunb.) Siebold, 1830**

Distribution: South Siberia to Japan and China

***Euonymus alatus* f. *ciliato-dentatus* (Franch. & Sav.) Hiyama, 1956**

Distribution: South Siberia to Japan and China

***Euonymus fortunei* (Turcz.) Hand.-Mazz., 1933**

Distribution: Assam to Temperate East Asia and West & Central Malaysia

***Euonymus hamiltonianus* Wall., 1824**

Distribution: East Afghanistan to Central & South Japan

***Euonymus macropterus* Rupr., 1857**

Distribution: Russian Far East to Korea and Japan

***Euonymus oxyphyllus* Miq., 1865**

Distribution: Kuril Islands to China and Temperate East Asia

***Euonymus pauciflorus* Maxim., 1859**

Distribution: Central Europe to Korea, Central Japan

***Euonymus sachalinensis* (F.Schmidt) Maxim., 1882**

Distribution: South Russian Far East to North East China and North & Central Japan

***Tripterygium regelii* Sprague & Takeda, 1912**

Distribution: North East China to Korea, Japan

***Euscaphis japonica* (Thunb.) Kanitz, 1878**

Distribution: Central & South China to North Vietnam and Temperate East Asia

***Staphylea bumalda* DC., 1825**

Distribution: China to Korea, Japan

***Buxus sinica* var. *insularis* (Nakai) M.Cheng, 1980**

Distribution: Korea & Japan

***Berchemia berchemiifolia* (Makino) Koidz., 1925**

Distribution: Korea & Japan

***Hovenia dulcis* Thunb., 1781**

Distribution: Indian Subcontinent to Korea, Japan

***Rhamnus davurica* Pall., 1776**

Distribution: South Siberia to Russian Far East and Korea

***Rhamnus koraiensis* C.K.Schneid., 1908**

Distribution: Russian Far East to China, Korea and Japan

***Rhamnus ussuriensis* J.J.Vassil., 1940**

Distribution: Russian Far East to North Vietnam and Korea

***Rhamnus yoshinoi* Makino, 1904**

Distribution: China to Korea, South Central & South Japan

***Ziziphus jujuba* Mill., 1768**

Distribution: North & East China to South Korea

***Ziziphus jujuba* var. *inermis* (Bunge) Rehder, 1922**

Distribution: North & East China to South Korea

***Ampelopsis glandulosa* var. *heterophylla* (Thunb.) Momiy., 1977**

Distribution: South Russian Far East to China, South Sakhalin to Japan

***Parthenocissus tricuspidata* (Siebold & Zucc.) Planch., 1887**

Distribution: South Russian Far East to East China and Temperate East Asia

***Vitis amurensis* Rupr., 1857**

Distribution: Russian Far East to East China and Korea, Japan

***Vitis coignetiae* Pulliat ex Planch., 1883**

Distribution: South Korea, Sakhalin to Japan

***Vitis flexuosa* Thunb., 1794**

Distribution: China to Korea, Japan and Tropical Asia

***Vitis heyneana* subsp. *ficifolia* (Bunge) C.L.Li, 1996**

Distribution: North Central & East Central China to South Korea, Japan

***Corchoropsis tomentosa* (Thunb.) Makino, 1903**

Distribution: Caribbean to North Venezuela

***Corchoropsis tomentosa* var. *psilocarpa* (Harms & Loes. ex Gilg & Loes.)
C.Y.Wu & Y.Tang, 1994**

Distribution: North & East China to Korea

***Grewia biloba* G.Don, 1831**

Distribution: Central & South China to Korea, Taiwan

***Tilia amurensis* Rupr., 1869**

Distribution: Russian Far East to Korea

***Tilia mandshurica* Rupr. & Maxim., 1856**

Distribution: Russian Far East to North & East Central China and Central Japan

***Tilia taquetii* C.K.Schneid., 1909**

Distribution: Russian Far East to Korea

***Triumfetta japonica* Makino, 1913**

Distribution: Korea, South Central & South Japan to Philippines

***Citrus trifoliata* L., 1763**

Distribution: China

***Viola acuminata* Ledeb., 1842**

Distribution: Siberia to China and North & Central Japan

***Viola albida* Palib., 1900**

Distribution: South Russian Far East to Korea

***Viola albida* var. *chaerophylloides* (Regel) F.Maek. ex H.Hara, 1954**

Distribution: South Russian Far East to China and Korea, South Japan

***Viola collina* Besser, 1816**

Distribution: Temperate Eurasia

***Viola hirtipes* S.Moore, 1879**

Distribution: South Russian Far East to Korea, Japan

***Viola japonica* Langsd. ex Ging., 1824**

Distribution: Korea, Japan & Taiwan

***Viola keiskei* Miq., 1866**

Distribution: Korea & Japan

***Viola lactiflora* Nakai, 1914**

Distribution: East China to Korea

***Viola mandshurica* W.Becker, 1917**

Distribution: Russian Far East to North & East China and Japan

***Viola orientalis* (Maxim.) W.Becker, 1915**

Distribution: South Russian Far East to East China and Korea, Central & South Japan

***Viola ovato-oblonga* (Miq.) Makino, 1907**

Distribution: Korea & Japan

***Viola phalacrocarpa* Maxim., 187**

Distribution: South Russian Far East to Korea, Japan

***Viola philippica* Cav., 1800**

Distribution: Asia

***Viola rossii* Hemsl., 1886**

Distribution: South Russian Far East to East Central & East China and Korea, Japan

***Viola selkirkii* Pursh ex Goldie, 1822**

Distribution: North Europe to Japan, Subarctic America to North & West Central U.S.A.

***Viola sororia* Willd., 1806**

Distribution: Canada to U.S.A. and East Mexico

***Viola tenuicornis* W.Becker, 1920**

Distribution: NorthEast China to Korea

***Viola tokubuchiana* var. *takedana* (Makino) F.Maek., 1954**

Distribution: NorthEast China to South Korea, Japan

***Viola variegata* Fisch. ex Link, 1821**

Distribution: SouthEast. Siberia to North China and Japan

***Viola verecunda* A.Gray, 1858**

Distribution: Asia

***Viola violacea* Makino, 1891**

Distribution: SouthEast China, South Korea, Central & South Japan

***Sicyos angulatus* L., 1753**

Distribution: East Canada to Central & East U.S.A.

***Elaeagnus macrophylla* Thunb., 1784**

Distribution: East China, South Korea (including Jeju-do), South Central & South Japan to Taiwan

***Elaeagnus umbellata* Thunb., 1784**

Distribution: Afghanistan to Temperate East Asia

***Lythrum salicaria* L., 1753**

Distribution: Temperate Eurasia, North West Africa, Ethiopia, Australia

***Circaea alpina* L., 1753**

Distribution: Temperate Northern Hemisphere

***Circaea cordata* Royle, 1835**

Distribution: NorthEast Pakistan to Russian Far East and Temperate East Asia

***Circaea lutetiana* subsp. *quadrисulcata* (Maxim.) Asch. & Magnus, 1870**

Distribution: European Russia to North & North Central Japan

***Circaea mollis* Siebold & Zucc., 1845**

Distribution: South Russian Far East to Indo-China

***Ludwigia prostrata* Roxb., 1820**

Distribution: South Russian Far East to Tropical & Subtropical Asia

***Oenothera biennis* L., 1753**

Distribution: Canada to Central Mexico

***Alangium platanifolium* var. *trilobum* (Miq.) Ohwi, 1965**

Distribution: South Russian Far East to China, Temperate East Asia

***Aucuba japonica* Thunb., 1783**

Distribution: SouthEast. China to Temperate East Asia

***Cornus controversa* Hemsl., 1909**

Distribution: Central Himalaya to South Kuril Islands and North Indo-China

***Cornus kousa* Bürger ex Hance, 1873**

Distribution: China to Temperate East Asia

***Cornus macrophylla* Wall., 1820**

Distribution: Afghanistan to Sakhalin, Korea

***Cornus walteri* Wangerin, 1908**

Distribution: China to Korea

***Aralia cordata* Thunb., 1784**

Distribution: SouthEast China (to Hubei), Sakhalin to Temperate East Asia

***Aralia cordata* var. *continentalis* (Kitag.) Y.C.Chu, 1989**

Distribution: South Russian Far East to China and Korea

***Aralia elata* (Miq.) Seem., 1868**

Distribution: Russian Far East to China and Temperate East Asia

***Eleutherococcus divaricatus* (Siebold & Zucc.) S.Y.Hu, 1980**

Distribution: Korea & Japan

***Eleutherococcus divaricatus* var. *chiisanensis* (Nakai) C.H.Kim & B.-Y.Sun, 2000**

Distribution: Korea & Japan

***Eleutherococcus sessiliflorus* (Rupr. & Maxim.) S.Y.Hu, 1980**

Distribution: Russian Far East to North China and Korea

***Hedera rhombea* (Miq.) Paul, 1867**

Distribution: Temperate East Asia

***Kalopanax septemlobus* (Thunb.) Koidz., 1925**

Distribution: Russian Far East to China and Temperate East Asia

***Oplopanax elatus* (Nakai) Nakai, 1927**

Distribution: South Primorye, China (E. Jilin), Korea

***Angelica amurensis* Schischk., 1951**

Distribution: Russian Far East to Central China and Korea, Japan

***Angelica cartilaginomarginata* (Makino ex Y.Yabe) Nakai, 1909**

Distribution: NorthEast China to Central & South Japan

***Angelica dahurica* (Fisch. ex Hoffm.) Benth. & Hook.f. ex Franch. & Sav., 1873**

Distribution: South Siberia to North China and Japan

***Angelica decursiva* (Miq.) Franch. & Sav., 1873**

Distribution: Vietnam to South Russian Far East and Temperate East Asia

***Angelica gigas* Nakai, 1917**

Distribution: NorthEast China to Korea

***Angelica polymorpha* Maxim., 1873**

Distribution: North & East China to Central & South Japan

***Angelica reflexa* B.Y.Lee, 2013**

Distribution: Russian Far East to Korea and North & Central Japan, Aleutian Islands to West U.S.A.

***Anthriscus caucalis* M.Bieb., 1808**

Distribution: Macaronesia to NorthWest Africa, Europe to Caucasus

***Anthriscus sylvestris* (L.) Hoffm., 1814**

Distribution: Temperate Eurasia to Tropical African Mountains

***Bupleurum longeradiatum* Turcz., 1844**

Distribution: SouthEast Siberia to Japan and South Central China

***Cnidium monnieri* (L.) Cusson, 1782**

Distribution: Temperate Asia to Indo-China

***Ligusticum officinale* (Makino) Kitag., 1963**

Distribution: Japan, Korea

***Oenanthe javanica* DC., 1830**

Distribution: SouthEast Siberia to Tropical & Subtropical Asia

***Osmorhiza aristata* (Thunb.) Rydb., 1894**

Distribution: Temperate Asia

***Ostericum grosseserratum* (Maxim.) Kitag., 1936**

Distribution: Mongolia to Korea and China

***Ostericum sieboldii* (Miq.) Nakai, 1942**

Distribution: Russian Far East to North China and Korea, Central & South Japan

***Peucedanum terebinthaceum* (Fisch. ex Trevir.) Turcz., 1838**

Distribution: South Siberia to Japan and North China

***Pimpinella brachycarpa* (Kom.) Nakai, 1909**

Distribution: South Russian Far East to Central & East China and Korea, South Central & South Japan

***Sanicula chinensis* Bunge, 1835**

Distribution: Russian Far East to China, Korea and Japan

***Sillaphyton podagraria* (H.Boissieu) Pimenov, 2016**

Distribution: Korea

***Torilis japonica* (Houtt.) DC., 1830**

Distribution: Temperate Eurasia to North Indo-China

***Torilis scabra* (Thunb.) DC., 1830**

Distribution: China to Temperate East Asia

***Chimaphila japonica* Miq., 1866**

Distribution: Russian Far East to Bhutan, Japan to Taiwan

***Pyrola japonica* Klenze ex Alef., 1856**

Distribution: South Russian Far East to North & East Central China and Korea, Japan, Taiwan

***Rhododendron brachycarpum* D.Don ex G.Don, 1834**

Distribution: Korea & Japan

***Rhododendron mucronulatum* Turcz., 1837**

Distribution: Russian Far East to North & East China and Korea, West Central & South Japan

***Rhododendron mucronulatum* var. *ciliatum* Nakai, 1917**

Distribution: Russian Far East to North & East China and Korea, West Central & South Japan

***Rhododendron schlippenbachii* Maxim., 1870**

Distribution: South Russian Far East to North China and Japan

***Rhododendron yedoense* f. *poukhanense* (H.Lév.) Sugim. ex T.Yamaz., 1996**

Distribution: Korea & Japan

***Vaccinium bracteatum* Thunb., 1784**

Distribution: South China to South Central & South Japan and West Malaysia

***Vaccinium hirtum* var. *koreanum* (Nakai) Kitam., 1972**

Distribution: China to Korea

***Vaccinium oldhamii* Miq., 1866**

Distribution: East China, South Korea, Japan

***Vaccinium vitis-idaea* L., 1753**

Distribution: Subarctic & Temperate Northern Hemisphere

***Ardisia japonica* (Thunb.) Blume, 1826**

Distribution: Central & South China to Temperate East Asia

***Androsace umbellata* (Lour.) Merr., 1919**

Distribution: North Pakistan to Russian Far East and Philippines (N. Luzon), NorthEast New Guinea

***Lysimachia clethroides* Duby, 1844**

Distribution: South Russian Far East to Indo-China and Temperate East Asia

***Primula jesoana* Miq., 1867**

Distribution: Primorye to East China and Korea, North & Central Japan

***Diospyros lotus* L., 1753**

Distribution: NorthEast & South Central Türkiye to Korea

***Styrax japonicus* Siebold & Zucc., 1837**

Distribution: Nepal to Japan and North Philippines

***Styrax obassia* Siebold & Zucc., 1839**

Distribution: East & SouthEast China to Korea, Japan

***Symplocos sawafutagi* Nagam., 1993**

Distribution: Korea & Japan

***Symplocos tanakana* Nakai, 1918**

Distribution: East China, South Korea, Japan

***Forsythia saxatilis* (Nakai) Nakai, 1921**

Distribution: Korea

***Fraxinus chiisanensis* Nakai, 1929**

Distribution: Korea

***Fraxinus mandshurica* Rupr., 1857**

Distribution: Russian Far East to Central China, North & Central Japan

***Fraxinus rhynchophylla* Hance, 1869**

Distribution: South Russian Far East to East China and Japan

***Fraxinus sieboldiana* Blume, 1851**

Distribution: SouthEast China to Korea, Central & South Japan

***Ligustrum obtusifolium* Siebold & Zucc., 1846**

Distribution: East China to Korea, Japan

***Ligustrum ovalifolium* Hassk., 1844**

Distribution: Korea & Japan

***Syringa fauriei* H.Lév., 1910**

Distribution: Russian Far East to Korea

***Syringa pubescens* subsp. *Patula* (Palib.) M.C.Chang & X.L.Chen, 1990**

Distribution: North East China to Korea

***Syringa reticulata* (Blume) H.Hara, 1941**

Distribution: Russian Far East to China and Japan

***Syringa villosa* subsp. *wolfii* (C.K.Schneid.) Y.Chen & D.Y.Hong, 2007**

Distribution: South Russian Far East to Korea

***Mitrasacme pygmaea* R.Br., 1810**

Distribution: Tropical & Subtropical Asia to West Pacific

***Gentiana scabra* Bunge, 1836**

Distribution: SouthEast Siberia to Japan, Korea and East China

***Gentiana squarrosa* Ledeb., 1812**

Distribution: Siberia to North Pakistan and Japan

***Gentiana triflora* var. *japonica* (Kusn.) H.Hara, 1949**

Distribution: Sakhalin to North & Central Japan, Korea

***Gentiana zollingeri* Fawc., 1883**

Distribution: Russian Far East to Central China and Japan

***Cynanchum ascyrifolium* (Franch. & Sav.) Matsum., 1912**

Distribution: North & East China to Russian Far East and Japan

***Cynanchum paniculatum* (Bunge) Kitag. ex H.Hara, 1948**

Distribution: South Siberia to Temperate East Asia and China

***Cynanchum wilfordii* (Maxim.) Maxim. ex Hook.f., 1883**

Distribution: Russian Far East to China, Central & South Japan

***Metaplexis japonica* (Thunb.) Makino, 1903**

Distribution: China to Russian Far East Korea and Japan

***Trachelospermum asiaticum* (Siebold & Zucc.) Nakai, 1922**

Distribution: North India to Central & South Japan and Borneo

***Tylophora floribunda* Miq., 1866**

Distribution: East Central & SouthEast China to Central & South Japan

***Asperula lasiantha* Nakai, 1938**

Distribution: Korea

***Galium bungei* var. *trachyspermum* (A.Gray) Cufod., 1940**

Distribution: Central & South China, Korea, Japan

***Galium dahuricum* Turcz. ex Ledeb., 1844**

Distribution: South Siberia to Russian Far East and China

***Galium gracilens* (A.Gray) Makino, 1903**

Distribution: Central & South China, Korea, Japan

***Galium maximowiczii* (Kom.) Pobed., 1970**

Distribution: China to Russian Far East Korea and Japan

***Galium odoratum* (L.) Scop., 1771**

Distribution: Temperate Eurasia, Algeria

***Galium pogonanthum* Franch. & Sav., 1878**

Distribution: China to Temperate East Asia

***Galium spurium* var. *echinospermum* (Wallr.) Klett & Richt., 1830**

Distribution: Temperate Northern Hemisphere

***Galium tricornutum* Dandy, 1957**

Distribution: Europe to West Himalaya and Arabian Peninsula

***Galium trifidum* L., 1753**

Distribution: Temperate Northern Hemisphere to Mexico, Hispaniola

***Galium trifloriforme* Kom., 1901**

Distribution: China (Qinghai) to Korea, Sakhalin to Japan

***Galium verum* subsp. *asiaticum* (Nakai) T.Yamaz., 1993**

Distribution: Russian Far East to China and Japan

***Paederia foetida* L., 1767**

Distribution: East Nepal to Korea, Japan and Malesia

***Rubia argyi* (H.Lév. & Vaniot) H.Hara, 1972**

Distribution: Central & South China to Temperate East Asia

***Rubia chinensis* Regel & Maack, 1861**

Distribution: Russian Far East to Korea, Japan

***Rubia cordifolia* L., 1767**

Distribution: Greece, Sudan to South Africa, Asia

***Calystegia hederacea* Wall., 1824**

Distribution: Ethiopia, Afghanistan to Korea, Japan

***Calystegia pubescens* Lindl., 1846**

Distribution: Central & East China to Korea, Kuril Islands to Japan

***Cuscuta australis* R.Br., 1810**

Distribution: Old World

***Ipomoea nil* (L.) Roth, 1797**

Distribution: Tropical & Subtropical America

***Quamoclit coccinea* (L.) Moench, 1794**

Distribution: Central & East U.S.A

***Bothriospermum zeylanicum* (J.Jacq.) Druce, 1917**

Distribution: Central Asia to Japan and Philippines

***Brachybotrys paridiformis* Maxim. ex Oliv., 1878**

Distribution: Primorye to Korea

***Lithospermum erythrorhizon* Siebold & Zucc., 1846**

Distribution: East Siberia to Korea, Japan

***Trigonotis peduncularis* (Trevis.) Benth. ex Hemsl., 1890**

Distribution: South European Russia to Temperate Asia

***Callitriche palustris* L., 1753**

Distribution: Temperate Northern Hemisphere to West Malesia

***Callicarpa dichotoma* (Lour.) K.Koch, 1872**

Distribution: Central & South Japan, Korea to Vietnam

***Callicarpa japonica* Thunb., 1784**

Distribution: China to Temperate East Asia

***Clerodendrum trichotomum* Thunb., 1784**

Distribution: China, Temperate East Asia to North Philippines

***Tripura divaricata* (Maxim.) P.D.Cantino, 1999**

Distribution: China to Korea, Japan

***Agastache rugosa* (Fisch. & C.A.Mey.) Kuntze, 1891**

Distribution: Russian Far East to Temperate East Asia

***Clinopodium chinense* var. *parviflorum* (Kudô) H.Hara, 1936**

Distribution: Korea, South Kuril Islands to Japan

***Clinopodium micranthum* (Regel) H.Hara, 1940**

Distribution: Korea, Sakhalin to Japan

***Clinopodium multicaule* (Maxim.) Kuntze, 1891**

Distribution: Korea & Japan

***Clinopodium multicaule* var. *shibetchense* (H.Lév.) Melnikov, 2016**

Distribution: Korea & Japan

***Dracocephalum argunense* Fisch. ex Rchb., 1821**

Distribution: SouthEast Siberia to Korea, North & Central Japan

***Elsholtzia ciliata* (Thunb.) Hyl., 1941**

Distribution: Temperate Asia to Peninsula Malaysia

***Elsholtzia splendens* Nakai ex F.Maek., 1934**

Distribution: China to Korea

***Isodon excisus* (Maxim.) Kudô, 1929**

Distribution: Russian Far East to Korea

***Isodon inflexus* (Thunb.) Kudô, 1929**

Distribution: China to Korea, Japan

***Isodon japonicus* (Burm.f.) H.Hara, 1948**

Distribution: Russian Far East to Central China and Japan

***Isodon serra* (Maxim.) Kudô, 1929**

Distribution: South Russian Far East to Taiwan

***Lamium album* subsp. *Barbatum* (Siebold & Zucc.) Mennema, 1989**

Distribution: Siberia to Japan and China

***Lamium amplexicaule* L., 1753**

Distribution: Temperate Eurasia, Macaronesia to Ethiopia

***Lamium purpureum* L., 1753**

Distribution: Macaronesia, Mediterranean, Europe to West Siberia

***Leonurus japonicus* Houtt., 1778**

Distribution: China to Russian Far East and North Australia

***Leonurus macranthus* Maxim., 1859**

Distribution: Russian Far East to North China and Japan

***Lycopus lucidus* Turcz. ex Benth., 1848**

Distribution: South & East Siberia to Temperate East Asia

***Meehania urticifolia* (Miq.) Makino, 1899**

Distribution: South Primorye to Korea, Central & South Japan

***Mosla scabra* (Thunb.) C.Y.Wu & H.W.Li, 1974**

Distribution: China to Vietnam and Temperate East Asia

***Phlomis umbrosa* Turcz., 1840**

Distribution: Central & East China to Korea

***Prunella vulgaris* subsp. *Asiatica* (Nakai) H.Hara, 1948**

Distribution: East China to far East Asia and Alaska (Aleutian Islands)

***Scutellaria baicalensis* Georgi, 1775**

Distribution: South Siberia to North Korea and Vietnam Royal Botanic Gardens, Kew
2023

***Scutellaria indica* L., 1753**

Distribution: Tropical & Subtropical Asia

***Scutellaria peginensis* var. *transitra* (Makino) H.Hara, 1948**

Distribution: SouthEast China to Korea, Japan

***Scutellaria peginensis* var. *ussuriensis* (Regel) Hand.-Mazz., 1939**

Distribution: Mongolia to Korea, North & Central Japan

***Teucrium viscidum* var. *miquelianum* (Maxim.) H.Hara, 1937**

Distribution: South Korea, South Kuril Islands to Japan

***Physalis alkekengi* L., 1753**

Distribution: Temperate Eurasia

***Solanum japonense* Nakai, 1923**

Distribution: Himalaya to China and North Indo-China, Temperate East Asia, Central Sumatra

***Solanum lyratum* Thunb., 1784**

Distribution: China to Temperate East Asia and Indo-China

***Solanum nigrum* L., 1753**

Distribution: Temperate Eurasia, Macaronesia, North & NorthEast Tropical Africa

***Mazus pumilus* (Burm.f.) Steenis, 1958**

Distribution: Asia

***Mazus stachydifolius* (Turcz.) Maxim., 1875**

Distribution: SouthEast Siberia to China and Temperate East Asia

***Melampyrum roseum* Maxim., 1859**

Distribution: Russian Far East to China, Japan to North Taiwan

***Melampyrum roseum* var. *japonicum* Franch. & Sav., 1873**

Distribution: Russian Far East to China, Japan to North Taiwa

***Melampyrum roseum* var. *ovalifolium* (Nakai) Nakai ex Beauverd, 1916**

Distribution: China (Zhejiang), Korea, West Japan

***Melampyrum setaceum* var. *nakaianum* (Tuyama) T.Yamaz., 1954**

Distribution: Russian Far East to Korea, Japan

***Paulownia coreana* Uyeki, 1925**

Distribution: Central & East China, South Korea

***Pedicularis resupinata* L., 1753**

Distribution: E. European Russia to Korea, Japan

***Phtheirospermum japonicum* (Thunb.) Kanitz, 1878**

Distribution: Russian Far East to China and Japan

***Pseudolysimachion dauricum* (Steven) Holub, 1967**

Distribution: South Siberia to Russian Far East and North & East Central China

***Pseudolysimachion pyrethrinum* (Nakai) T.Yamaz., 1968**

Distribution: Korea

***Veronica anagallis-aquatica* L., 1753**

Distribution: Temperate Eurasia to Tropical Mountains

***Veronica arvensis* L., 1753**

Distribution: Macaronesia, NorthWest Africa, Europe to SouthWest Siberia and West Himalaya

***Veronica persica* Poir., 1808**

Distribution: Caucasus to North Iran

***Justicia procumbens* L., 1753**

Distribution: Tropical & Subtropical Asia to Central China

***Strobilanthes oliganthus* Miq., 1865**

Distribution: South Korea (Jeju island) & Japan

***Phryma leptostachya* var. *oblongifolia* (Koidz.) Honda, 1936**

Distribution: Korea & Japan

***Plantago asiatica* L., 1753**

Distribution: Asia

***Lonicera chrysantha* Turcz. ex Ledeb., 1844**

Distribution: SouthEast Siberia to China and North Japan

***Lonicera harae* Makino, 1914**

Distribution: Korea & Japan

***Lonicera japonica* Thunb., 1784**

Distribution: China to Temperate East Asia

***Lonicera maackii* (Rupr.) Maxim., 1859**

Distribution: Russian Far East to China and Central Japan

***Lonicera praeflorens* Batalin, 1892**

Distribution: South Russian Far East to Korea, Central Japan

***Lonicera subhispida* Nakai, 1921**

Distribution: South Russian Far East to North Korea

***Lonicera subsessilis* Rehder, 1920**

Distribution: Korea

***Lonicera vidalii* Franch. & Sav., 1877**

Distribution: Korea & Japan

***Sambucus racemosa* subsp. *Kamtschatica* (E.Wolf) Hultén, 1930**

Distribution: Korea, Kamchatka to Japan

***Sambucus williamsii* Hance, 1866**

Distribution: South Siberia to China and South Korea, Japan

***Viburnum carlesii* Hemsl., 1888**

Distribution: SouthEast China, Korea, West & South Japan

***Viburnum dilatatum* Thunb., 1784**

Distribution: Central & South China to Temperate East Asia

***Viburnum erosum* Thunb., 1784**

Distribution: Central & South China to Korea, Central & South Japan, Taiwan

***Viburnum opulus* var. *calvescens* (Rehder) H.Hara, 1956**

Distribution: SouthEast Siberia to China and North & Central Japan

***Weigela florida* (Bunge) A.DC., 1839**

Distribution: South Russian Far East to North & East China and Korea, Japan

***Weigela subsessilis* (Nakai) L.H.Bailey, 1929**

Distribution: Korea

***Zabelia biflora* (Turcz.) Makino ex Hisauti & H.Hara, 1954**

Distribution: South Russian Far East to North & East Central China and South Korea

***Zabelia tyaihyonii* (Nakai) Hisauti & H.Hara, 1954**

Distribution: NorthEast China to Korea, Sakhalin

***Patrinia rupestris* (Pall.) Dufr., 1811**

Distribution: Siberia to Korea and China

***Patrinia scabiosifolia* Fisch. ex Trevir., 1820**

Distribution: SouthEast Siberia to Russian Far East and Vietnam, Japan

***Patrinia villosa* (Thunb.) Dufr., 1811**

Distribution: South China to Vietnam, Temperate East Asia

***Valeriana fauriei* Briq., 1914**

Distribution: Russian Far East to Temperate East Asia

***Adenophora remotiflora* (Siebold & Zucc.) Miq., 1866**

Distribution: South Russian Far East to North China and Japan

***Adenophora triphylla* (Thunb.) A.DC., 1830**

Distribution: South Siberia to Sakhalin and North Indo-China

***Adenophora triphylla* var. *japonica* (Regel) H.Hara, 1951**

Distribution: South Siberia to Sakhalin and North Indo-China

***Asyneuma japonicum* (Miq.) Briq., 1931**

Distribution: Russian Far East to Korea, Japan

***Campanula punctata* Lam., 1785**

Distribution: East Siberia to China and Japan

***Codonopsis lanceolata* (Siebold & Zucc.) Benth. & Hook.f. ex Trautv., 1879**

Distribution: Russian Far East to China, Korea, Japan

***Peracarpa carnososa* (Wall.) Hook.f. & Thomson, 1857**

Distribution: Kamchatka to Tropical Asia

***Platycodon grandiflorus* (Jacq.) A.DC., 1830**

Distribution: SouthEast Siberia to Japan and China

***Achillea alpina* L., 1753**

Distribution: Siberia to Japan and China

***Adenocaulon himalaicum* Edgew., 1846**

Distribution: Himalaya to Russian Far East and Japan

***Ageratina altissima* (L.) R.M.King & H.Rob., 1970**

Distribution: East Canada to U.S.A.

***Ainsliaea acerifolia* Sch.Bip., 1855**

Distribution: NorthEast China to Korea, Central & South Japan

***Ambrosia artemisiifolia* L., 1753**

Distribution: Subarctic America to U.S.A.

***Ambrosia trifida* L., 1753**

Distribution: North America

***Artemisia angustissima* Nakai, 1915**

Distribution: China, Korea & Japan

***Artemisia capillaris* Thunb., 1780**

Distribution: Pakistan to Japan

***Artemisia codonocephala* Diels, 1912**

Distribution: East Europe to Russian Far East & China

***Artemisia indica* Willd., 1803**

Distribution: Indian Subcontinent to Japan & Philippines

***Artemisia japonica* Thunb., 1780**

Distribution: Afghanistan to Russian Far East & Philippines

***Artemisia keiskeana* Miq., 1866**

Distribution: South Russian Far East to Japan & North China

***Artemisia lancea* Vaniot, 1903**

Distribution: Mongolia to Korea, Japan & China

***Artemisia rubripes* Nakai, 1917**

Distribution: East Europe, Mongolia to Japan & China

***Artemisia sacrorum* var. *iwayomogi* (Kitam.) M.S.Park & G.Y.Chung, 2016**

Distribution: Central Asia to Russian Far East and Himalaya, Japan

***Artemisia selengensis* Turcz. ex Besser, 1832**

Distribution: South Siberia to Japan and Thailand

***Artemisia stolonifera* (Maxim.) Kom., 1907**

Distribution: Russian Far East to China

***Aster ageratoides* Turcz., 1837**

Distribution: Himalaya to Temperate East Asia

***Aster hispidus* Thunb., 1784**

Distribution: Mongolia to Korea, Japan and Vietnam

***Aster incisus* Fisch., 1812**

Distribution: SouthEast Siberia to NorthEast China, Central & South Japan

***Aster koraiensis* Nakai, 1909**

Distribution: Korea

***Aster maackii* Regel, 1861**

Distribution: Mongolia to Korea & Japan

***Aster meyendorffii* (Regel & Maack) Voss, 1894**

Distribution: South Russian Far East to North China and Japan

***Aster scaber* Thunb., 1784**

Distribution: China to Russian Far East and Japan

***Aster tataricus* L.f., 1782**

Distribution: South Siberia to Korea, Japan

***Aster yomena* (Kitam.) Honda, 1938**

Distribution: South Korea, Central & South Japan

***Atractylodes ovata* (Thunb.) DC., 1838**

Distribution: Russian Far East to China and Japan

***Bidens bipinnata* L., 1753**

Distribution: East Canada to Central & East U.S.A. and Arizona

***Bidens biternata* (Lour.) Merr. & Sherff ex Sherff, 1929**

Distribution: Tropical & Subtropical Old World

***Bidens frondosa* L., 1753**

Distribution: Canada to U.S.A

***Bidens parviflora* Willd., 1809**

Distribution: South Siberia to Japan and China

***Bidens tripartita* L., 1753**

Distribution: Temperate Northern Hemisphere

***Carduus crispus* L., 1753**

Distribution: Europe to Siberia and Caucasus

***Carpesium abrotanoides* L., 1753**

Distribution: South & Central Europe to Japan and Himalaya

***Carpesium cernuum* L., 1753**

Distribution: Eurasia

***Carpesium divaricatum* Siebold & Zucc., 1846**

Distribution: China to Temperate East Asia

***Carpesium macrocephalum* Franch. & Sav., 1878**

Distribution: South Russian Far East to Japan

***Chrysanthemum boreale* Makino, 1909**

Distribution: China to Korea, Japan

***Cirsium japonicum* var. *maackii* (Maxim.) Matsum., 1912**

Distribution: Russian Far East to Japan and Taiwan

***Cirsium pendulum* Fisch. ex DC., 1838**

Distribution: South Siberia to Japan and China

***Cirsium setidens* (Dunn) Nakai, 1920**

Distribution: Korea

***Conyza canadensis* (L.) Cronquist, 1943**

Distribution: New World

***Crepidiastrum chelidoniifolium* (Makino) J.H.Pak & Kawano, 1992**

Distribution: South Russian Far East to Korea, Central & South Japan

***Crepidiastrum denticulatum* (Houtt.) J.H.Pak & Kawano, 1992**

Distribution: Vietnam to Russian Far East and Japan

***Crepidiastrum sonchifolium* (Maxim.) J.H.Pak & Kawano, 1992**

Distribution: Mongolia to Russian Far East and North Indo-China

***Dendranthema oreastrum* (Hance) Y.Ling, 1980**

Distribution: South Russian Far East to North & Central China and Korea

***Dendranthema zawadskii* (Herbich) Tzvelev, 1961**

Distribution: Siberia to Korea, Japan & China

***Dendranthema zawadskii* var. *latiloba* (Maxim.) Kitam., 1978**

Distribution: Russian Far East to Japan & China

***Eclipta thermalis* Bunge, 1833**

Distribution: Temperate & Subtropical America

***Erechtites hieraciifolius* (L.) Raf. ex DC., 1838**

Distribution: East Canada to Tropical & Subtropical America

***Erigeron annuus* (L.) Desf., 1804**

Distribution: Canada to U.S.A., Nicaragua to Panama

***Erigeron philadelphicus* L., 1753**

Distribution: Subarctic America to U.S.A.

***Erigeron strigosus* Muhl. ex Willd., 1803**

Distribution: Canada to U.S.A.

***Eupatorium japonicum* Thunb., 1784**

Distribution: China to Japan and Vietnam

***Eupatorium lindleyanum* DC., 1836**

Distribution: Russian Far East to Japan and Indo-China, Philippines

***Eupatorium makinoi* var. *oppositifolium* (Koidz.) Kawah. & Yahara, 1995**

Distribution: Russian Far East to Vietnam & Temperate East Asia

***Eupatorium tripartitum* (Makino) Murata & H.Koyama, 1982**

Distribution: Russian Far East to Vietnam & Temperate East Asia

***Galinsoga quadriradiata* Ruiz & Pav., 1798**

Distribution: Mexico to South Tropical America

***Hemisteptia lyrata* (Bunge) Fisch. & C.A.Mey, 1836**

Distribution: NorthEast India to Japan & Indo-China, East Australia

***Hieracium umbellatum* L., 1753**

Distribution: Temperate Northern Hemisphere

***Ixeridium dentatum* (Thunb.) Tzvelev, 1964**

Distribution: China to Korea, Kuril Islands & Japan

***Ixeris stolonifera* A.Gray, 1858**

Distribution: Temperate East Asia

***Ixeris strigosa* (H.Lév. & Vaniot) J.H.Pak & Kawano, 1992**

Distribution: South China to Russian Far East and Temperate East Asia

***Lactuca indica* L., 1771**

Distribution: SouthEast Siberia to Japan and Malesia

***Lactuca indica* var. *laciniata* (Houtt.) H.Hara, 1952**

Distribution: SouthEast Siberia to Japan and Malaysia

***Lactuca raddeana* Maxim., 1874**

Distribution: Russian Far East to Japan and Vietnam

***Lactuca triangulata* Maxim., 1859**

Distribution: Russian Far East to North China and Japan, Vietnam

***Leibnitzia anandria* (L.) Nakai, 1937**

Distribution: Temperate Asia

***Ligularia fischeri* (Ledeb.) Turcz., 1847**

Distribution: NorthEast Pakistan to South Siberia, Korea and Japan

***Parasenecio auriculatus* var. *matsumurana* (Nakai) M.Kim, 2 017**

Distribution: Russian Far East to North China, Korea and North Japan, Aleutian Islands (Alaska)

***Petasites japonicus* (Siebold & Zucc.) Maxim., 1866**

Distribution: China to South Russian Far East and Central & South Japan

***Pseudognaphalium affine* (D.Don) Anderb., 1991**

Distribution: Caucasus to Temperate East Asia and Indo-China

***Rhynchospermum verticillatum* Reinw., 1828**

Distribution: Nepal to Korea, Japan and Indo-China, Java

***Saussurea gracilis* Maxim., 1874**

Distribution: Korea, Central & South Japan

***Saussurea macrolepis* (Nakai) Kitam., 1933**

Distribution: Korea

***Saussurea odontolepis* (Herder) Sch.Bip. ex Maxim., 1883**

Distribution: Mongolia to Russian Far East and North China

***Saussurea pulchella* (Fisch.) Fisch. ex Colla, 1834**

Distribution: SouthEast Siberia to Japan and North China

***Saussurea seoulensis* Nakai, 1911**

Distribution: Korea

***Scorzonera albicaulis* Bunge, 1833**

Distribution: SouthEast Siberia to Russian Far East and China

***Senecio vulgaris* L., 1753**

Distribution: Macaronesia, Europe to China and Arabian Peninsula

***Sigesbeckia glabrescens* (Makino) Makino, 1917**

Distribution: South China to Japan

***Sigesbeckia orientalis* subsp. *pubescens* (Makino) H.Koyama, 1995**

Distribution: China to Korea, Japan

***Solidago altissima* L., 1753**

Distribution: Canada to Mexico

***Solidago gigantea* Aiton, 1789**

Distribution: Canada to North East Mexico

***Solidago virgaurea* subsp. *asiatica* (Nakai ex H.Hara) Kitam. ex H.Hara, 1952**

Distribution: North Pakistan to Russian Far East and Philippines, Alaska (Aleutian Islands)

***Sonchus asper* (L.) Hill, 1769**

Distribution: Temperate Eurasia, North Africa to Sahel and Somalia

***Sonchus oleraceus* L., 1753**

Distribution: Macaronesia, Europe to Mediterranean, Sahara to Arabian Peninsula

***Stemmacantha uniflora* (L.) Dittrich, 1984**

Distribution: South Siberia to Korea & Japan

***Symphyotrichum pilosum* (Willd.) G.L.Nesom, 1995**

Distribution: East Canada to North Central & East U.S.A.

***Syneilesis palmata* (Lam.) Maxim., 1874**

Distribution: Korea, Central & South Japan

***Synurus deltoides* (Aiton) Nakai, 1932**

Distribution: South Siberia to Central & South Japan and China

***Tagetes minuta* L., 1753**

Distribution: Brazil to South South America

***Taraxacum officinale* F.H.Wigg., 1780**

Distribution: Macaronesia, Europe to Siberia, North West Africa

***Tephroseris flammea* (DC.) Holub, 1973**

Distribution: South Siberia to Japan and North China

***Tephroseris kirilowii* (Turcz. ex DC.) Holub, 1977**

Distribution: Siberia to Japan and China

***Youngia japonica* (L.) DC., 1838**

Distribution: Tropical & Subtropical Asia

***Potamogeton oxyphyllus* Miq., 1867**

Distribution: South Russian Far East to North Sumatera

***Allium macrostemon* Bunge, 1833**

Distribution: Russian Far East to China and Japan

***Allium tuberosum* Rottler ex Spreng., 1825**

Distribution: Himalaya to China

***Allium thunbergii* G.Don, 1827**

Distribution: East Central China to Temperate East Asia

***Asparagus cochinchinensis* (Lour.) Merr., 1919**

Distribution: Japan to Indo-China and Philippines

***Asparagus oligoclonos* Maxim., 1859**

Distribution: Mongolia to Korea & Japan

***Asparagus schoberioides* Kunth, 1850**

Distribution: SouthEast Siberia to Korea & Japan

***Barnardia japonica* (Thunb.) Schult.f., 1829**

Distribution: China to Temperate East Asia

***Convallaria keiskei* Miq., 1867**

Distribution: SouthEast Siberia to Korea & Japan

***Disporum smilacinum* A.Gray, 1857**

Distribution: Sakhalin to China, Korea and Japan

***Disporum uniflorum* Baker, 1875**

Distribution: China to Korea

***Disporum viridescens* (Maxim.) Nakai, 1911**

Distribution: Russian Far East to Korea, North & Central Japan

***Erythronium japonicum* Decne., 1854**

Distribution: NorthEast China to Korea, South Sakhalin to Japan

***Heloniopsis koreana* Fuse, N.S.Lee & M.N.Tamura, 2004**

Distribution: Korea

***Hemerocallis dumortieri* C.Morren, 1834**

Distribution: China (Jilin) & Korea

***Hemerocallis fulva* (L.) L., 1762**

Distribution: China to Temperate East Asia

***Hemerocallis hakuunensis* Nakai, 1943**

Distribution: Korea & Japan

***Hosta capitata* (Koidz.) Nakai, 1930**

Distribution: Korea & Japan

***Hosta clausa* Nakai, 1930**

Distribution: Russian Far East to Korea

***Hosta longipes* (Franch. & Sav.) Matsum., 1894**

Distribution: Korea & Japan

***Hosta minor* (Baker) Nakai, 1911**

Distribution: Korea

***Lilium amabile* Palib., 1901**

Distribution: China (SouthEast Liaoning) to Korea

***Lilium callosum* Siebold & Zucc., 1835**

Distribution: Russian Far East to East China and Temperate East Asia

***Lilium distichum* Nakai ex Kamib., 1915**

Distribution: Russian Far East to Korea

***Lilium lancifolium* Thunb., 1794**

Distribution: Russian Far East to Japan and Tibet

***Lilium tsingtauense* Gilg, 1904**

Distribution: China (Anhui, Shandong) to Korea

***Liriope muscari* (Decne.) L.H.Bailey, 1929**

Distribution: China to Temperate East Asia

***Liriope spicata* (Thunb.) Lour., 1790**

Distribution: Korea, Central & South Japan to Cambodia

***Maianthemum japonicum* (A.Gray) LaFrankie, 1986**

Distribution: Russia Far East to Central China, Korea & Japan

***Ophiopogon japonicus* (A.Gray) LaFrankie, 1986**

Distribution: Central & South China to Vietnam, Temperate East Asia to Philippines

***Paris verticillata* M.Bieb., 1819**

Distribution: North Kazakhstan to Siberia, Korea and Japan

***Polygonatum inflatum* Kom., 1901**

Distribution: Primorye to Korea, South Central & South Japan

***Polygonatum involucratum* (Franch. & Sav.) Maxim., 1883**

Distribution: Russian Far East to Korea, Japan

***Polygonatum lasianthum* Maxim., 1883**

Distribution: Korea & Japan

***Polygonatum odoratum* var. *pluriflorum* (Miq.) Ohwi, 1949**

Distribution: Korea & Japan

***Polygonatum thunbergii* C.Morren & Decne., 1834**

Distribution: Russian Far East to Korea, Japan

***Smilax china* L., 1753**

Distribution: China to Japan and Philippines

***Smilax nipponica* Miq., 1868**

Distribution: China to Temperate East Asia

***Smilax riparia* A.DC., 1878**

Distribution: South Russian Far East to China and Philippines

***Smilax sieboldii* Miq., 1868**

Distribution: East China to Temperate East Asia

***Smilax sieboldii* f. *inermis* (Nakai) H.Hara, 1958**

Distribution: East China to Temperate East Asia

***Trillium camschatcense* Ker Gawl., 1805**

Distribution: Russian Far East to Korea and North & North Central Japan

***Tulipa edulis* (Miq.) Baker, 1874**

Distribution: China to Korea, Central & South Japan

***Veratrum maackii* var. *japonicum* (Baker) Shimizu, 1960**

Distribution: Korea & Japan

***Veratrum oxysepalum* Turcz., 1840**

Distribution: Siberia to Korea, West Alaska and Japan

***Dioscorea japonica* Thunb., 1784**

Distribution: Assam to Korea & Japan

***Dioscorea nipponica* Makino, 1891**

Distribution: Central China to North & Central Japan

***Dioscorea polystachya* Turcz., 1837**

Distribution: South Russian Far East to Central & South China, Korea and Kuril Islands, Taiwan

***Dioscorea quinquelobata* Thunb., 1784**

Distribution: SouthEast China to Temperate East Asia

***Dioscorea septemloba* Thunb., 1784**

Distribution: China to Korea, Central & South Japan

***Dioscorea tokoro* Makino ex Miyabe, 1889**

Distribution: China to Korea & Japan

***Iris rossii* Baker, 1877**

Distribution: NorthEast China (Liaoning) to Korea, SouthWest & South Japan

***Iris sanguinea* Hornem., 1813**

Distribution: South Siberia to Korea & Japan

***Juncus decipiens* (Buchenau) Nakai, 1928**

Distribution: Assam to Russian Far East and New Guinea

***Juncus papillosus* Franch. & Sav., 1876**

Distribution: Russian Far East to East China and Japan

***Juncus tenuis* Willd., 1799**

Distribution: East Canada to Mexico

***Luzula capitata* (Miq. ex Franch. & Sav.) Kom., 1927**

Distribution: Russian Far East to Korea & Japan

***Luzula multiflora* (Ehrh.) Lej., 1811**

Distribution: Subarctic & Temperate Northern Hemisphere, Costa Rica, Argentina to Falkland Islands

***Luzula rufescens* var. *macrocarpa* Buchenau, 1906**

Distribution: Russian Far East to Korea

***Commelina communis* L., 1753**

Distribution: East Europe to Korea, Japan and Indo-China

***Streptolirion volubile* Edgew., 1845**

Distribution: Himalaya to Primorye and Indo-China

***Achnatherum pekinense* (Hance) Ohwi, 1953**

Distribution: North & Central China to Russian Far East and Japan

***Agrostis clavata* Trin., 1821**

Distribution: North Europe to Temperate East Asia, New Guinea, Alaska to Yukon

***Agrostis clavata* var. *nukabo* Ohwi, 1941**

Distribution: North Europe to Temperate East Asia, New Guinea, Alaska to Yukon

***Alopecurus aequalis* Sobol., 1799**

Distribution: Temperate Northern Hemisphere to Andes

***Arthraxon hispidus* (Thunb.) Makino, 1912**

Distribution: Tropical Africa, West Indian Ocean, Asia to East Australia

***Arundinella hirta* (Thunb.) Tanaka, 1925**

Distribution: South Siberia to Temperate East Asia and North Indo-China

***Arundinella hirta* var. *ciliata* (Thunb.) Koidz., 1925**

Distribution: South Siberia to Temperate East Asia and North Indo-China

***Beckmannia syzigachne* (Steud.) Fernald, 1928**

Distribution: European Russia to Russian Far East, Subarctic America to North & West U.S.A.

***Bothriochloa ischaemum* (L.) Keng, 1936**

Distribution: Temperate Eurasia, NorthWest Africa

***Brachyelytrum japonicum* (Hack.) Matsum. ex Honda, 1930**

Distribution: Central & East China, South Korea (including Jeju-do), Central & South Japan

***Bromus japonicus* Thunb., 1784**

Distribution: Mediterranean to Temperate Eurasia

***Calamagrostis arundinacea* (L.) Roth, 1788**

Distribution: Temperate Eurasia, New Guinea

***Calamagrostis purpurea* (Trin.) Trin., 1824**

Distribution: Subarctic & Subalpine

***Cleistogenes hackelii* (Honda) Honda, 1936**

Distribution: South Russian Far East to China, Korea and Japan

***Cymbopogon goeringii* (Steud.) A.Camus, 1921**

Distribution: Central & South China to Vietnam, Temperate East Asia

***Dactylis glomerata* L., 1753**

Distribution: Macaronesia, Mediterranean to Temperate Eurasia

***Diarrhena fauriei* (Hack.) Ohwi, 1941**

Distribution: South Russian Far East to East China and Central Japan

***Diarrhena japonica* Franch. & Sav., 1878**

Distribution: NorthEast China, Korea (Jeju-do), Kuril Islands to Japan

***Diarrhena mandshurica* Maxim., 1888**

Distribution: Russian Far East to North & East China

***Digitaria ciliaris* (Retz.) Koeler, 1802**

Distribution: Tropical & Subtropical Old World

***Echinochloa crus-galli* (L.) P.Beauv., 1812**

Distribution: South & East Europe to Asia, West, East & South Tropical Africa to South Africa, Madagascar

***Eleusine indica* (L.) Gaertn., 1788**

Distribution: Tropical & Subtropical Old World

***Elymus ciliaris* (Trin. ex Bunge) Tzvelev, 1972**

Distribution: Assam to Russian Far East and Temperate East Asia

***Elymus tsukushiensis* var. *transiens* (Hack.) K.Osada, 1990**

Distribution: South Russian Far East to China and Temperate East Asia

***Eragrostis ferruginea* (Thunb.) P.Beauv., 1812**

Distribution: Himalaya to Temperate East Asia

***Eriochloa villosa* (Thunb.) Kunth, 1829**

Distribution: Russian Far East to Vietnam and Temperate East Asia

***Festuca arundinacea* Schreb., 1771**

Distribution: Europe to Xinjiang and Himalaya, Macaronesia to North Africa

***Festuca ovina* L., 1753**

Distribution: Temperate Eurasia, Alaska to West U.S.A.

***Festuca parvigluma* Steud., 1854**

Distribution: Nepal to Temperate East Asia

***Festuca rubra* L., 1753**

Distribution: Subarctic & Temperate Northern Hemisphere to Mexico

***Hierochloa odorata* (L.) P.Beauv., 1812**

Distribution: Subarctic & Temperate Northern Hemisphere

***Hystrix longe-aristata* (Hack.) Honda, 1930**

Distribution: West & Central Himalaya to Korea & Japan

***Koeleria macrantha* (Ledeb.) Schult., 1824**

Distribution: Temperate Northern Hemisphere to Mexico

***Melica nutans* L., 1753**

Distribution: Temperate Eurasia

***Melica onoei* Franch. & Sav., 1878**

Distribution: Pakistan to China, Temperate East Asi

***Melica scabrosa* Trin., 1833**

Distribution: Tibet to Mongolia and Korea

***Microstegium vimineum* (Trin.) A.Camus, 1922**

Distribution: Himalaya to Japan and Jawa

***Milium effusum* L., 1753**

Distribution: Temperate Northern Hemisphere

***Miscanthus sinensis* var. *purpurascens* (Andersson) Matsum., 1895**

Distribution: China to Malesia, Russian Far East to Temperate East Asia

***Muhlenbergia hakonensis* (Hack. ex Matsum.) Makino, 1917**

Distribution: China (Sichuan, Anhui), Korea, South Central & South Japan

***Muhlenbergia japonica* Steud., 1854**

Distribution: China to Russian Far East and Japan

***Oplismenus undulatifolius* (Ard.) P.Beauv., 1812**

Distribution: South Central & South Europe to Iran, Cameroon, Ethiopia to South Africa, West Indian Ocean, Central & South China to Japan and Tropical Asia, East Australia

***Panicum bisulcatum* Thunb., 1815**

Distribution: Assam to Russian Far East and Central Malesia

***Paspalum thunbergii* Kunth, 1829**

Distribution: East Himalaya to Temperate East Asia

***Pennisetum alopecuroides* (L.) Spreng., 1824**

Distribution: China to Temperate East Asia and West & Central Malesia, North West & East Australia

***Phaenosperma globosum* Munro ex Benth., 1881**

Distribution: China to Assam, Temperate East Asia

***Phalaris arundinacea* L., 1753**

Distribution: Temperate & Subtropical Northern Hemisphere to Tropical Mountains

***Phragmites australis* (Cav.) Trin. ex Steud., 1841**

Distribution: Temperate & Subtropical to Tropical Mountains

***Phragmites japonicus* Steud., 1854**

Distribution: Russian Far East to Korea & Japan

***Poa acroleuca* Steud., 1854**

Distribution: Tibet to Sakhalin and Temperate East Asia

***Poa annua* L., 1753**

Distribution: Temperate Old World to Tropical Mountains

***Poa hisauchii* Honda, 1928**

Distribution: Primorye, China (Hebei, Zhejiang), South Korea, South Kuril Islands to Japan

***Poa matsumurae* Hack., 1899**

Distribution: North Korea & Japan

***Poa nemoralis* L., 1753**

Distribution: Subarctic & Temperate Northern Hemisphere, NorthWest Africa

***Poa pratensis* L., 1753**

Distribution: Subarctic to Temperate Northern Hemisphere and North Mexico

***Poa sphondylodes* Trin., 1833**

Distribution: South Siberia to Temperate East Asia

***Poa viridula* Palib., 1902**

Distribution: Azores, Morocco, Temperate Eurasia

***Sasa borealis* (Hack.) Makino & Shibata, 1901**

Distribution: Korea, Sakhalin to Japan

***Sasa quelpaertensis* Nakai, 1933**

Distribution: Korea, Sakhalin to Japan

***Schizachyrium brevifolium* (Sw.) Nees ex Büse, 1854**

Distribution: Tropics & Subtropics

***Setaria faberi* R.A.W.Herrm., 1910**

Distribution: West Siberia, Russian Far East to China, Temperate East Asia

***Setaria pumila* (Poir.) Roem. & Schult., 1817**

Distribution: Old World

***Setaria viridis* (L.) P.Beauv., 1812**

Distribution: Old World to Central & SouthEast Australia

***Sibirotrisetum bifidum* (Thunb.) Barberá, 2019**

Distribution: China to Temperate East Asia, New Guinea

***Spodiopogon cotulifer* (Thunb.) Hack., 1889**

Distribution: West Himalaya, Assam to Central & South China, Temperate East Asia

***Spodiopogon sibiricus* Trin., 1820**

Distribution: Siberia to Japan and China

***Sporobolus piliferus* (Trin.) Kunth, 1833**

Distribution: Tropics & Subtropics

***Themeda triandra* Forssk., 1775**

Distribution: Africa, Tropical & Subtropical Asia to Australia

***Vulpia myuros* (L.) C.C.Gmel., 1805**

Distribution: Europe to Korea, Taiwan and Sri Lanka, Macaronesia to Arabian Peninsula and North Tanzania

***Zoysia japonica* Steud., 1854**

Distribution: South Russian Far East to East China and Temperate East Asia

***Arisaema amurense* Maxim., 1859**

Distribution: South Russian Far East to Korea

***Arisaema amurense* f. *serratum* (Nakai) Kitag., 1939**

Distribution: South Russian Far East to Korea

***Arisaema heterophyllum* Blume, 1836**

Distribution: China to Temperate East Asia

***Arisaema ringens* (Thunb.) Schott, 1832**

Distribution: East China (Zhoushan Islands), South Korea, Central Japan to Taiwan

***Arisaema serratum* (Thunb.) Schott, 1832**

Distribution: Primorye to Korea, South Kuril Islands to Japan

***Arisaema thunbergii* Blume, 1836**

Distribution: Temperate East Asia

***Pinellia ternata* (Thunb.) Makino, 1901**

Distribution: China to Temperate East Asia

***Typha angustifolia* L., 1753**

Distribution: Temperate Northern Hemisphere

***Carex accrescens* Ohwi, 1931**

Distribution: Siberia to Korea, North & North Central Japan

***Carex aphanolepis* Franch. & Sav., 1878**

Distribution: Russian Far East to East China, Japan, Vietnam

***Carex bostrychostigma* Maxim., 1886**

Distribution: Russian Far East to East China, Central & South Japan

***Carex breviculmis* R.Br., 1810**

Distribution: India to South China and New Zealand

***Carex brevispicula* G.H.Nam & G.Y.Chung, 2020**

Distribution: Korea

***Carex ciliato-marginata* Nakai, 1914**

Distribution: East China to Central & South Japa

***Carex fernaldiana* H.Lév. & Vaniot, 1901**

Distribution: Russian Far East to East China and Japan

***Carex filipes* Franch. & Sav., 1878**

Distribution: South China to Korea & Japan

***Carex filipes* var. *oligostachys* Kük., 1909**

Distribution: South Russian Far East to North China, Korea & Japan

***Carex forficula* Franch. & Sav., 1878**

Distribution: Russian Far East to East China, Korea & Japan

***Carex fusanensis* Ohwi, 1932**

Distribution: Korea

***Carex gibba* Wahlenb., 1803**

Distribution: Korea to Vietnam, Central & South Japan

***Carex heterolepis* Bunge, 1833**

Distribution: South Siberia to China, Korea & Japan

***Carex humilis* var. *nana* (H.Lév. & Vaniot) Ohwi, 1936**

Distribution: Siberia to Korea & Japan

***Carex japonica* Thunb., 1784**

Distribution: China to Korea, Sakhalin and Japan

***Carex laevissima* Nakai, 1914**

Distribution: South Siberia, South Russian Far East to Korea, Japan

***Carex lanceolata* Boott, 1857**

Distribution: Siberia to Korea & Japan

***Carex leiorhyncha* C.A.Mey., 1831**

Distribution: Siberia to North China & Korea

***Carex lenta* D.Don, 1824**

Distribution: Central & South Japan to Korea & Tropical Asia

***Carex mira* Kük., 1905**

Distribution: Korea & Japan

***Carex neurocarpa* Maxim., 1859**

Distribution: South Russian Far East to North & East China and Central Japan

***Carex okamotoi* Ohwi, 1936**

Distribution: Korea

***Carex onoei* Franch. & Sav., 1875**

Distribution: South Russian Far East to North & East China, North & Central Japan

***Carex pediformis* C.A.Mey., 1831**

Distribution: East Europe to Korea

***Carex pediformis* var. *pedunculata* Maxim., 1859**

Distribution: Russian Far East to Korea

***Carex polyschoena* H.Lév. & Vaniot, 1903**

Distribution: Russian Far East to East China and Japan

***Carex siderosticta* Hance, 1873**

Distribution: Russian Far East to East China, Korea & Japan

***Carex tristachya* Thunb., 1784**

Distribution: South China to Temperate East Asia, Malesia to New Guinea

***Carex ussuriensis* Kom., 1901**

Distribution: Russian Far East to North China

***Cyperus amuricus* Maxim., 1859**

Distribution: Russian Far East to China and Temperate East Asia

***Cyperus difformis* L., 1756**

Distribution: Tropical & Subtropical Old World

***Cyperus iria* L., 1753**

Distribution: Tropical & Subtropical Old World to Central Asia

***Cyperus microiria* Steud., 1854**

Distribution: Japan to Himalaya

***Kyllinga brevifolia* var. *leiolepis* (Franch. & Sav.) H.Hara, 1938**

Distribution: Central Himalaya to Korea & Japan

***Scirpus wichurae* Boeck., 1870**

Distribution: East Himalaya to Korea & Japan

***Trichophorum polygamum* D.C.Son & K.S.Chang, 2019**

Distribution: Korea

***Zingiber mioga* (Thunb.) Roscoe, 1807**

Distribution: South China to South Central & South Japan

***Calanthe discolor* Lindl., 1838**

Distribution: South China to South Korea & Japan

***Cephalanthera erecta* (Thunb.) Blume, 1859**

Distribution: Nepal to Temperate East Asia

***Cephalanthera falcata* (Thunb.) Blume, 1859**

Distribution: South China, South Korea, Central & South Japan

***Cephalanthera longibracteata* Blume, 1859**

Distribution: Russian Far East to Korea, Japan, Laos

***Cymbidium goeringii* (Rchb.f.) Rchb.f., 1852**

Distribution: Himalaya to Korea & Japan

***Cyrtosia septentrionalis* (Rchb.f.) Garay, 1986**

Distribution: SouthEast China, South Korea, Japan to Taiwan

***Gastrodia elata* Blume, 1856**

Distribution: Himalaya to Russian Far East and Temperate East Asia

***Goodyera henryi* Rolfe, 1896**

Distribution: Central Nepal, Central & South China to South Kuril Islands and Taiwan

***Goodyera repens* (L.) R.Br., 1813**

Distribution: Temperate Northern Hemisphere

***Goodyera schlechtendaliana* Rchb.f., 1850**

Distribution: Tibet to Korea, Japan and Sumatera

***Hemipilia gracilis* (Blume) Y.Tang, H.Peng & T.Yukawa, 2015**

Distribution: China to Temperate East Asia

***Liparis kumokiri* F.Maek., 1936**

Distribution: South Russian Far East to Korea, Central & South Japan

***Liparis suzumushi* Tsusumi, T.Yukawa & M.,Kato, 2019**

Distribution: Korea & Japan

***Spiranthes sinensis* (Pers.) Ames, 1908**

Distribution: Assam to South Central Japan and New Caledonia

Analysis

Vascular flora of algifoc talus slopes in South Korea

Vascular plants of the 25 algific talus slopes distributed in South Korea included 1,052 taxa of 125 families, 486 genera, 947 species, 23 subsp., 75 var., and 7 f. (Suppl. materials 2, 3). Pteridophytes included a total of 77 taxa (7.3%) of 16 families, 35 genera, 74 species, 1 subsp., 2 var., and 2 f.; gymnosperms included a total of 14 taxa (1.3%) of 5 families, 9 genera, 14 species; angiosperms included a total of 771 taxa (73.3%) of 92 families, 352 genera, 682 species, 22 subsp., 62 var., and 5 f. for dicotyledons and a total of 190 taxa (18.1%) of 12 families, 90 genera, 177 species, 11 var., and 2 f. for monocotyledons. These accounted for approximately 22.27% of all vascular plants in South Korea (4,724 species) (Korea National Arboretum 2023). The plant family that showed the largest number of detected species was Asteraceae (96 taxa, 9.1%), followed by Poaceae (70 taxa, 6.7%), Rosaceae (65 taxa, 6.2%), Fabaceae (49 taxa, 4.7%), Liliaceae (44 taxa, 4.2%), Ranunculaceae (39 taxa, 3.7%), and Cyperaceae (36 taxa, 3.4%).

The most frequently detected species across the 25 algific talus slopes in South Korea was *Parthenocissus tricuspidata* (Siebold & Zucc.) Planch. (n = 23), followed by *Fraxinus rhynchophylla* Hance., *Lindera obtusiloba* Blume., and *Rhododendron mucronulatum* Turcz. (n = 21); *Ampelopsis glandulosa* (Wall.) Momiy var. *brevipedunculata* (Maxim.) Momiy and *Philadelphus tenuifolius* Rupr. & Maxim. (n = 20); *Ulmus davidiana* Planch. ex DC. var. *japonica* (Rehder) Nakai., *Actinidia arguta* (Siebold & Zucc.) Planch. ex Miq., *Callicarpa japonica* Thunb., *Lespedeza maximowiczii* C.K. Schneid., *Viola acuminata* Ledeb., and *Oplismenus undulatifolius* (Ard.) Roem. & Schult. Magnoliophyta (n = 19); *Alangium platanifolium* (Siebold & Zucc.) Harms var. *trilobum* (Miq.) Ohwi, *Athyrium yokoscense* (Franch. & Sav.) H. Christ., *Euonymus alatus* (Thunb.) Siebold, and *Dryopteris crassirhizoma* Nakai (n = 18); *Toxicodendron trichocarpum* (Miq.) Kuntze, *Securinea suffruticosa* (Pall.) Rehder, *Polygonatum odoratum* (Mill.) Druce var. *pluriflorum* (Miq.) Ohwi, *Zanthoxylum schinifolium* Siebold & Zucc., *Quercus mongolica* Fisch. ex Ledeb., *Acer pseudosieboldianum* (Pax) Kom., and *Rubus crataegifolius* Bunge (n = 17); 9 taxa, including *Carex lanceolata* Boott and *Aster ageratoides* Turcz. (n = 16); 11 taxa, including *Acer pictum* Thunb. var. *mono* (Maxim.) Maxim. ex Franch. and *Aster scaber* Thunb. (n = 15); 11 taxa, including *Dryopteris chinensis* (Baker) Koidz. and *Corylus heterophylla* Fisch. ex Trautv. (n = 14); 15 taxa, including *Maackia amurensis* Rupr. and *Viola collina* Besser (n = 13); 11 taxa, including *Quercus aliena* Blume, *Stephanandra incisa* (Thunb.) Zabel, and *Symplocos sawafutagi* Nagam. (n = 12); 24 taxa, including *Athyrium reflexipinnum* Hayata. and *Asplenium incisum* Thunb. (n = 11). In contrast, plants of 783 taxa were detected five or less times: 321 taxa, including *Corydalis ochotensis* var. *raddeana* and *Aconitum longecassidatum* Nakai were detected once; 209 taxa, including *Phedimus aizoon* (L.) 't Hart and *Spiraea trichocarpa* Nakai were detected twice; 112 taxa, including *Rhamnus davurica* Pall. and *Ulmus laciniata* (Trautv.) Mayr were detected three times; 75 taxa, including *Lindera glauca* (Siebold & Zucc.) Blume and *Diarrhena mandshurica* Maxim.

were detected four times; *Betula chinensis* and *Viola orientalis* (Maxim.) W. Becker were detected five times.

Rare plants and Red list species

A total of 55 taxa (Suppl. material 4, Fig. 2) detected across the 25 algific talus slopes in South Kora were found to be rare plants designated by the Korea Forest Service. Seven taxa were Critically Endangered (CR) species, including *Cystopteris fragilis* (L.) Bernh., *Asplenium trichomanes* L. subsp. *quadrivalens* D.E. Mey., *Aconitum coreanum* (H. Lév.) Rapaics, *Paeonia obovata* Maxim., *Vaccinium vitis-idaea* L., *Cyrtosia septentrionalis* (Rchb.f.) Garay and *Goodyera repens* (L.) R.Br. Ten taxa were Endangered (EN) species, including *Zabelia tyaihyonii* (Nakai) Hisauti & H. Hara, *Astilboides tabularis* (Hemsl.) Engl., *Micranthes octopetala* (Nakai) Y.I. Kim & Y.D. Kim, *Deutzia paniculata* Nakai, *Rosa koreana* Kom., and *Sophora koreensis* Nakai. Fifteen taxa were Vulnerable (VU) species, including *Adiantum pedatum* L., *Athyrium spinulosum* (Maxim.) Milde, *Picea jezoensis* (Siebold & Zucc.) Carrière, *Illicium anisatum* L., and *Aconitum austrokoreense* Koidz. Twenty taxa were Least Concern (LC) species, including *Lycopodium annotinum* L., *Selaginella helvetica* (L.) Spring, *Aristolochia manshuriensis* Kom., *Gentiana triflora* Pall. var. *japonica* (Kusn.) H. Hara, and *Goodyera schlechtendaliana* Rchb.f. Three taxa were Data Deficient (DD) species, including *Gymnocarpium dryopteris* (L.) Newman, *Eleutherococcus divaricatus* (Siebold & Zucc.) S.Y. Hu var. *chiisanensis* (Nakai) C.H. Kim & B.-Y. Sun, and *Pseudolysimachion pyrethrinum* (Nakai) T. Yamaz.

A total of 52 taxa (Suppl. material 4) detected across the 25 algific talus slopes in South Kora were found to be Red list species of vascular plants on the Korean Peninsula, accounting for 9.58% of the 543 taxa of Red list species in total. While there was no CR species, four taxa were EN species, including *Picea jezoensis* (Siebold & Zucc.) Carrière, *Paeonia obovata* Maxim., *Vaccinium vitis-idaea* L., and *Prunus × yedoensis* Matsum., accounting for 4.7% of the total EN species; seven taxa were VU species, including *Gymnocarpium dryopteris* (L.) Newman, *Athyrium spinulosum* (Maxim.) Milde, *Aconitum coreanum* (H. Lév.) Rapaics, and *Goodyera repens* (L.) R.Br., accounting for 7.3% of the total VU species; 14 taxa were Near Threatened (NT) species, including *Lycopodium annotinum* L., *Cystopteris fragilis* (L.) Bernh., *Aconitum austrokoreense* Koidz., and *Rosa koreana* Kom., accounting for 25% of the total NT species; 26 taxa were LC species, including *Asplenium trichomanes* L. subsp. *quadrivalens* D.E.Mey., *Paeonia japonica* (Makino) Miyabe & Takeda, and *Tylophora floribunda* Miq., accounting for 27% of the total LC species; one taxon, *Celtis choseniana* Nakai, was a DD species, accounting for 2.5% of the total DD species.

The detection frequency of the 67 taxa of rare plants and Red list species was $n = 9$ for two taxa (2.94%): *Paeonia japonica* (Makino) Miyabe & Takeda and *Syringa reticulata* (Blume) H.Hara, $n = 5$ for two taxa (2.94%): *Spiraea chartacea* Nakai and *Rodgersia podophylla* A.Gray, $n = 4$ for two taxa (2.94%): *Aristolochia manshuriensis* Kom. and *Arisaema heterophyllum* Blume, $n = 3$ for six taxa (8.82%): *Rosa koreana* Kom., *Actaea bifida* (Nakai) J. Compton, *Aristolochia contorta* Bunge, *Viola albida* Palib., *Syringa villosa* Vahl

subsp. *wolfii* (C.K. Schneid) Y. Chen & D.Y. Hong, and *Polypodium sibiricum* Sipliv., $n = 2$ for 13 taxa (19.12%), including *Forsythia saxatilis* (Nakai) Nakai and *Berchemia berchemiifolia* (Makino) Koidz., and $n = 1$ for 42 taxa (63.24%), including *Goodyera repens* (L.) R.Br., *Calanthe discolor* Lindl., and *Aconitum barbatum* Patrin ex Pers.

Endangered wildlife

Endangered wildlife refers to those animal species designated for protection by the Ministry of Environment based on the Wild-life Protection and Management Act for effective conservation (Korea Ministry of Environment 2023). The Act states that all prohibited provisions and responsibilities regarding endangered species, and violation of the Act could result in a fine up to 50 million KRW or a prison sentence up to 7 years. The Act does not simply stipulate the prohibited provisions and responsibilities, but also states the regulations regarding the duty of the government to ensure the protection and survival of endangered species. This encompasses the conservation of wildlife habitats, development of protection measures on endangered species, relevant field study and research, designation of an institution for protection outside habitats and promotion of projects on the restoration of endangered species. Endangered wildlife is at risk of extinction in the near future based on the markedly reduced population or a very low number of entities due to natural or artificial threats. Thus, these species are legally protected and managed through designation by the law. Currently, 60 taxa of Class I EN species and 207 taxa of Class II EN species have been designated for independent management. The proportion of vascular plants among them is 11 taxa of Class I species and 77 taxa of Class II species.

The endangered wildlife species detected on the 25 algalic talus slopes in South Korea included a total of five taxa (Suppl. material 4): *Aconitum austrokoreense* Koidz., *Aconitum coreanum* (H. Lév.) Rapaics, *Paeonia obovata* Maxim., *Astilboides tabularis* (Hemsl.) Engl., and *Cyrtosia septentrionalis* (Rchb.f.) Garay, all of which correspond to Class II EN species (Table 4). The location in which each of these species was detected was as follows: Gwangjeom-dong, Hamyang-gun, Gyeongsangnam-do (A-E-2) for *Aconitum austrokoreense* Koidz.; Unchi-ri, Jeongseon-gun, Gangwon-do (A-C-2) for *Aconitum coreanum* (H. Lév.) Rapaics; Yeotan-ri, Jeongseon-gun, Gangwon-do (A-T-4) for *Paeonia obovata* Maxim.; Jangyeol-ri, Jeongseon-gun, Gangwon-do (A-T-5) and Binggye-ri, Uiseong-gun, Gyeongsangbuk-do (A-C-4) for *Astilboides tabularis* (Hemsl.) Engl.; Seonheul-ri, Jeju-si, Jeju-do (A-V-1) for *Cyrtosia septentrionalis* (Rchb.f.) Garay.

Endemic plants of the Korean Peninsula

Among the vascular plants detected on the 25 algalic talus slopes in South Korea, the endemic plants of the Korean Peninsula comprised 54 taxa (Suppl. material 5, Fig. 3), including *Populus × tomentiglandulosa* T.B. Lee, *Salix koriyanagi* Kimura ex Goerz, *Aconitum austrokoreense* Koidz., *Clematis trichotoma* Nakai, *Corydalis maculata* B.U.Oh & Y.S.Kim, *Micranthes octopetala* (Nakai) Y.I.Kim & Y.D.Kim, *Sillaphyton podagraria* (H.Boissieu) Pimenov, *Weigela subsessilis* (Nakai) L.H.Bailey, *Heloniopsis koreana* Fuse, N.S.Lee & M.N.Tamura, and *Hemerocallis hakuunensis* Nakai, accounting for 12.53% of

the 431 taxa of all the endemic plants of the Korean Peninsula. In addition, the endemic species detected on the 25 algalic talus slopes in South Korea comprised 44 taxa (Suppl. material 5), including *Aconitum pseudolaeve* Nakai, *Clematis brachyura* Maxim., and *Thalictrum actaeifolium* Siebold & Zucc. var. *brevistylum* Nakai, accounting for 11.70% of the 376 taxa of endemic species in total.

The detection frequency for the 58 taxa of endemic plants on the Korean Peninsula and endemic species across the 25 sites was the highest at $n = 11$ for *Weigela subsessilis* (Nakai) L.H.Bailey., followed by $n = 9$ for two taxa: *Clematis trichotoma* Nakai and *Clematis urticifolia* Nakai ex Kitag.; $n = 7$ for two taxa: *Vaccinium hirtum* Thunb. var. *koreanum* (Nakai) Kitam. and *Hemerocallis hakuunensis* Nakai; $n = 6$ for two taxa: *Asarum mandshuricum* (Maxim.) M.Kim & S. So var. *seoulense* (Nakai) M. Kim & S. and *Lonicera subsessilis* Rehder; $n = 5$ for three taxa: *Asperula lasiantha* Nakai, *Lilium amabile* Palib., and *Carex okamotoi* Ohwi; $n = 4$ for three taxa: *Thalictrum actaeifolium* Siebold & Zucc. var. *brevistylum* Nakai, *Angelica reflexa* B.Y. Lee, and *Rhododendron yedoense* Maxim. f. *poukhanense* (H. Lév.) Sugim. ex T. Yamaz.; $n = 3$ for eight taxa, including *Salix koriyanagi* Kimura ex Goerz and *Aconitum pseudolaeve* Nakai; $n = 2$ for 14 taxa, including *Populus × tomentiglandulosa* T.B. Lee and *Broussonetia × hanjiana* M. Kim; $n = 1$ for 24 taxa, including *Pseudostellaria coreana* (Nakai) Ohwi and *Indigofera grandiflora* B.H. Choi & S.K. Cho.

Floristic target species

The floristic target species detected on the 25 algalic talus slopes in South Korea included a total of 317 taxa (Suppl. material 6, Fig. 4), accounting for 21.48% of the 1,476 taxa of all floristic target species. For Degree V, 12 taxa were detected, including *Thuja koraiensis* Nakai and *Tephroseris flammea* (Turcz. ex DC.) Holub, accounting for 4.65% of the 258 taxa of all Degree V species. For Degree IV, 48 taxa were detected, including *Microlepia strigosa* (Thunb.) C.Presl, *Morus mongolica* (Bureau) C.K. Schneid., and *Caragana fruticosa* (Pall.) Besser, accounting for 10.90% of the 440 taxa of all Degree IV species. For Degree III, 103 taxa were detected, including *Lycopodium obscurum* L., *Acer ukurunduense* Trautv. & C.A. Mey. and *Hosta clausa* Nakai, accounting for 27.76% of the 371 taxa of all Degree III species. For Degree II, 58 taxa were detected, including *Huperzia miyoshiana* (Makino) Ching, *Pyrrosia petiolosa* (Christ) Ching, and *Hylotelephium viviparum* (Maxim.) H. Ohba, accounting for 28.02% of the 207 taxa of all Degree II species. For Degree I, 96 taxa were detected, including *Polystichum ovato-paleaceum* (Kodama) Sa. Kurata var. *coraiense* (Christ) Sa. Kurata, *Clematis patens* C.Morren & Decne., and *Vaccinium oldhamii* Miq., accounting for 48% of the 200 taxa of all Degree I species.

The detection frequency for the 317 taxa of floristic target species according to the respective degree was as follows. For the 12 taxa of Degree V species, the detection frequency was $n = 5$ for *Asperula lasiantha* Nakai; $n = 2$ for two taxa: *Astilboides tabularis* (Hemsl.) Engl. and *Oplopanax elatus* (Nakai) Nakai; $n = 1$ for nine taxa, including *Thuja koraiensis* Nakai and *Sophora koreensis* Nakai. For the 48 taxa of Degree IV species, the

detection frequency was $n = 5$ for *Ulmus macrocarpa* Hance and *Rodgersia podophylla* A. Gray; $n = 4$ for *Deutzia grandiflora* Bunge var. *baroniana* (Diels) Rehder; $n = 3$ for seven taxa, including *Woodsia macrochlaena* Mett. ex Kuhn and *Anemone reflexa* Steph. ex Willd.; $n = 2$ for 11 taxa, including *Laportea cuspidata* (Wedd.) Friis and *Berberis koreana* Palib.; $n = 1$ for 27 taxa, including *Athyrium iseanum* Rosenst. and *Phedimus middendorffianus* (Maxim.) 't Hart. For the 103 taxa of Degree III species, the detection frequency was $n = 11$ for *Betula schmidtii* Regel and *Philadelphus schrenkii* Rupr.; $n = 10$ for *Betula davurica* Pall.; $n = 9$ for four taxa, including *Dryopteris fragrans* (L.) Schott and *Sorbaria sorbifolia* (L.) A. Braun var. *stellipila* Maxim.; $n = 8$ for *Actinidia kolomikta* (Maxim. & Rupr.) Maxim.; $n = 7$ for four taxa, including *Urtica angustifolia* Fisch. ex Hornem. and *Spiraea chamaedryfolia* L.; $n = 6$ for four taxa, including *Actaea asiatica* H. Hara and *Ribes mandshuricum* (Maxim.) Kom.; $n = 5$ for two taxa: *Betula chinensis* Maxim. and *Celtis koraiensis* Nakai; $n = 4$ for two taxa: *Acer palmatum* Thunb. and *Brachybotrys paridiformis* Maxim. ex Oliv.; $n = 3$ for ten taxa, including *Selaginella tamariscina* (P. Beauv.) Spring and *Ulmus laciniata* (Trautv.) Mayr; $n = 2$ for 18 taxa, including *Abies nephrolepis* (Trautv. ex Maxim.) Maxim. and *Zabelia biflora* (Turcz.) Makino; $n = 1$ for 55 taxa, including *Dracocephalum argunense* Fisch. ex Link and *Lycopodium obscurum* L. For the 58 taxa of Degree II species, the detection frequency was the highest at $n = 16$ for *Schisandra chinensis* (Turcz.) Baill., followed by $n = 14$ for *Tilia amurensis* Rupr., $n = 13$ for *Magnolia sieboldii* K. Koch and *Weigela florida* (Bunge) A.DC., $n = 9$ for four taxa, including *Pinus koraiensis* Siebold & Zucc. and *Tripterygium regelii* Sprague & Takeda, $n = 8$ for *Euonymus pauciflorus* Maxim., $n = 7$ for *Euonymus macropterus* Rupr., $n = 6$ for three taxa: *Potentilla dickinsii* Franch. & Sav., *Tilia mandshurica* Rupr. & Maxim., and *Lonicera subsessilis* Rehder, $n = 5$ for six taxa, including *Polystichum braunii* (Spenn.) Fée and *Phellodendron amurense* Rupr., $n = 4$ for *Aristolochia manshuriensis* Kom. and *Rubia chinensis* Regel & Maack, $n = 3$ for five taxa, including *Crepidomanes minutum* (Blume) K. Iwats. and *Spiraea salicifolia* L., $n = 2$ for 16 taxa, including *Osmunda cinnamomea* L. and *Alnus japonica* (Thunb.) Steud., and $n = 1$ for 16 taxa, including *Coniogramme intermedia* Hieron. and *Viola tokubuchiana* Makino var. *takedana* (Makino) F. Maek. For the 96 taxa of Degree I species, the detection frequency was the highest across the 25 sites at $n = 19$ for *Ulmus davidiana* Planch. ex DC. var. *japonica* (Rehder) Nakai; followed by $n = 16$ for *Deutzia parviflora* Bunge; $n = 12$ for *Deutzia glabrata* Kom.; $n = 9$ for *Deutzia uniflora* Shirai and *Syringa pubescens* Turcz. subsp. *patula* (Palib.) M.C. Chang & X.L. Chen; $n = 8$ for four taxa, including *Juglans mandshurica* Maxim. and *Lindera erythrocarpa* Makino; $n = 7$ for three taxa, including *Pilea japonica* (Maxim.) Hand.-Mazz., *Clematis patens* C.Morren & Decne., and *Spiraea blumei* G.Don; $n = 6$ for five taxa, including *Hepatica asiatica* Nakai and *Impatiens noli-tangere* L.; $n = 5$ for four taxa, including *Ilex macropoda* Miq. and *Carex okamotoi* Ohwi; and $n = 4$ for nine taxa, including *Hemiptelea davidii* (Hance) Planch. and *Lindera glauca* (Siebold & Zucc.) Blume.

Northern lineage plants on the Korean Peninsula and 300 species threatened by climate change

From the 1,342 taxa of shared species between South Korea and Russia, (Gantsetseg et al. 2020) compiled a list of northern lineage plants on the Korean Peninsula that includes

615 taxa after excluding 727 taxa that were distributed worldwide, inhabit marine ecosystems, are distributed mainly in temperate regions of East Asia, or are cultivative or invasive alien plants. The northern lineage plants detected on the 25 algific talus slopes in South Korea included a total of 181 taxa (Suppl. material 7, Fig. 5), which accounted for 29.43% of all northern lineage plants. The 181 taxa included *Gymnocarpium dryopteris* (L.) Newman, *Dryopteris expansa* (C. Presl) Fraser-Jenk. & Jermy, and *Eranthis stellata* Maxim. In addition, among the 300 species of plants adaptable to climate change as reported in Korea National Arboretum 2010, 100 species of northern lineage plants comprised 39 taxa, including *Clematis fusca* Turcz., *Aristolochia manshuriensis* Kom., and *Spiraea trichocarpa* Nakai, whereas southern lineage plants comprised 21 taxa, including *Ficus erecta* Thunb. and *Toxicodendron sylvestre* (Siebold & Zucc.) Kuntze

The detection frequency for the 218 taxa of northern lineage plants on the Korean Peninsula and of northern and southern lineage plants among the 300 plants adaptable to climate change on the Korean Peninsula was the highest across the 25 sites at $n = 21$ for *Rhododendron mucronulatum* Turcz., followed by $n = 20$ for *Philadelphus tenuifolius* Rupr. & Maxim.; $n = 19$ for *Viola acuminata* Ledeb.; $n = 18$ for *Dryopteris crassirhizoma* Nakai; $n = 17$ for *Rubus crataegifolius* Bunge; $n = 16$ for five taxa, including *Sambucus williamsii* Hance and *Deutzia parviflora* Bunge; $n = 15$ for two taxa, including *Corydalis speciosa* Maxim. and *Pinus densiflora* Siebold & Zucc.; $n = 14$ for *Tilia amurensis* Rupr.; $n = 13$ for *Melampyrum roseum* Maxim., *Maackia amurensis* Rupr.; and *Vitis amurensis* Rupr.; $n = 12$ for *Pyrola japonica* Klenze ex Alef. and *Deutzia glabrata* Kom.; $n = 11$ for four taxa, including *Betula schmidtii* Regel and *Disporum smilacinum* A. Gray; and $n = 10$ for *Asplenium ruprechtii* Sa. Kurata and *Betula davurica* Pall. Meanwhile, 73 taxa, including *Asarum mandshuricum* (Maxim.) M. Kim & S. So were detected once and 41 taxa, including *Ribes maximowiczianum* Kom. were detected twice.

Limestone area plants

According to Kim et al. 2021, the floristic inventory for vascular plants in limestone areas on the Korean Peninsula included 1,290 taxa and the distribution characteristics were analyzed for 102 taxa (Suppl. material 8, Fig. 6) of limestone area plants to categorize the Calciphilous Indicator Plant (CIP; 14 taxa), Superative Calciphilous Plant (SCP; 30 taxa), and Comparative Calciphilous plant (CCP; 58 taxa). The limestone area plants detected on the 25 algific talus slopes in South Korea included a total of 32 taxa, among which three taxa: *Prunus choreiana* Nakai ex H.T.Im, *Zabelia tyaihyonii* (Nakai) Hisauti & H.Hara, and *Trichophorum polygamum* D.C.Son & K.S.Chang were CIP; six taxa, including *Gymnocarpium jessoense* (Koidz.) Koidz., *Morus mongolica* (Bureau) C.K. Schneid., *Astragalus penduliflorus* Lam. var. *dahuricus* (DC.) X.Y. Zhu, *Caragana fruticosa* (Pall.) Besser, and *Carex ussuriensis* Kom. were SCP; 23 taxa, including *Asplenium tenuicaule* Hayata, *Polystichum craspedosorum* (Maxim.) Diels, and *Saussurea odontolepis* (Herder) Sch.Bip. ex Maxim. were CCP.

The detection frequency for the 32 taxa of limestone area plants was $n = 6$ for *Spiraea chinensis* Maxim.; $n = 5$ for *Ulmus macrocarpa* Hance, and *Celtis koraiensis* Nakai; $n = 3$

for *Actaea bifida* (Nakai) J. Compton and *Buxus sinica* (Rehder & E.H. Wilson) M.Cheng var. *insularis* (Nakai) M. Cheng; n = 2 for 13 taxa, including *Spiraea trichocarpa* Nakai, *Lithospermum erythrorhizon* Siebold & Zucc., and *Zabelia biflora* (Turcz.) Makino; n = 1 for 14 taxa, including *Exochorda serratifolia* S. Moore and *Aster maackii* Regel.

Alien plants, invasive alien plants, and introduced disturbing plants

Seventy-five taxa (Suppl. material 9) of alien plants, including *Rumex crispus* L., *Amorpha fruticosa* L., and *Bidens frondosa* L., were detected on the 25 algific talus slopes in South Korea. Categorization of the alien plants by life form showed 10 taxa of woody plants, including *Ailanthus altissima* (Mill.) Swingle and *Robinia pseudoacacia* L., 26 taxa of annual plants, including *Chenopodium album* L., *Anthriscus caucalis* M. Bieb., and *Tagetes minuta* L., 12 taxa of biennial plants, including *Lepidium apetalum* Willd. and *Carduus crispus* L., and 27 taxa of perennial plants, including *Barbarea vulgaris* W.T.Aiton, *Trifolium repens* L., *Oxalis corniculata* L., and *Erigeron philadelphicus* L.

Categorization of the alien plants by native habitat indicated one taxon, *Trifolium repens* L., from Africa; 10 taxa, including *Rumex crispus* L. and *Rumex obtusifolius* L. from Europe, Africa and Asia; three taxa: *Cerastium glomeratum* Thuill., *Anthriscus caucalis* M.Bieb., and *Solanum nigrum* L., from Europe and Africa; four taxa, including *Amaranthus blitum* L. subsp. *oleraceus* (L.) Costea and *Medicago sativa* L. from Europe; 14 taxa, including *Rumex acetosella* L. and *Dactylis glomerata* L. from Europe and Asia; 13 taxa, including *Ailanthus altissima* (Mill.) Swingle and *Zingiber mioga* (Thunb.) Roscoe from Asia; 17 taxa, including *Amaranthus retroflexus* L. and *Ambrosia artemisiifolia* L. from North America; two taxa: *Ipomoea nil* (L.) Roth and *Tagetes minuta* L., from South America; nine taxa, including *Phytolacca americana* L. and *Eclipta thermalis* Bunge from America; one taxon, *Poa pratensis* L., from North America, Europe and Asia; and one taxon, *Sicyos angulatus* L. Magnoliophyta, from North America and Oceania (Suppl. material 9, Fig. 7).

The alien plants were categorized into archaeophytes, potentially invasive plants, and invasive alien plants according to time of invasion and settlement, whereas potentially invasive plants were divided into concerned alien plants and uncertain plants. Invasive alien plants were divided into casual alien plants and naturalized plants (Korea National Arboretum 2019a). Eleven taxa of archaeophytes were considered potentially invasive plants, including *Thlaspi arvense* L., *Oxalis corniculata* L., and *Amaranthus blitum* L. subsp. *oleraceus* (L.) Costea; concerned alien plants were six taxa, including *Pinus rigida* Mill. and *Styphnolobium japonicum* (L.) Schott; uncertain plants were four taxa, including *Lepidium apetalum* Willd. and *Scutellaria baicalensis* Georgi. For invasive alien plants, one taxon, *Veronica anagallis-aquatica* L., was a casual alien plant, and 53 taxa, including *Euphorbia maculata* L., *Veronica persica* Poir. and *Conyza canadensis* (L.) Cronquist, were naturalized plants.

According to Kang et al. (2020), distribution data on invasive alien plants were used to categorize the distribution into five levels: widespread (WS) species, serious spread (SS) species, concerned spread (CS) species, minor spread (MS) species and potential spread (PS) species. Among the 53 taxa of invasive alien plants detected at 25 algific talus slopes

in South Korea, the WS species were 19 taxa, including *Chenopodium ficifolium* Sm., *Ambrosia artemisiifolia* L., and *Erechtites hieraciifolius* (L.) Raf. ex DC.; SS species were nine taxa, including *Trifolium pratense* L. and *Senecio vulgaris* L.; CS species were seven taxa, including *Euphorbia hypericifolia* L. and *Solidago gigantea* Aiton; MS species were 11 taxa, including *Erigeron strigosus* Muhl. ex Willd. and *Vulpia myuros* (L.) C.C. Gmel.; PS species were eight taxa, including *Viola sororia* Willd. and *Lamium purpureum* L.

In this study, the NI, calculated as = (number of alien plants / total number of detected plants) × 100, was 7.13%, and the UI, calculated as = (number of alien plants detected in the study site / number of alien plants inhabiting the Korean Peninsula) × 100, was 12.12%. According to Kim et al. (2000), an NI ≥4% for a forest indicates disturbance. Thus, the 25 sites of algific talus slopes in South Korea investigated in this study appear to be at an initial stage of disturbance. Meanwhile, preventive measures on potential spread should be implemented due to the high accessibility of sites which are in close proximity to roads.

The detection frequency for the 75 taxa of alien plants was highest at n = 13 for *Erigeron annuus* (L.) Pers., thereby exhibiting the widest level of distribution. The detection frequency was n = 11 for *Oenothera biennis* L.; n = 9 for *Taraxacum officinale* F.H.Wigg.; n = 7 for four taxa, including *Bidens frondosa* L. and *Galinsoga quadriradiata* Ruiz & Pav.; n = 6 for four taxa, including *Robinia pseudoacacia* L. and *Ambrosia artemisiifolia* L.; n = 5 for four taxa, including *Barbarea vulgaris* W.T.Aiton and *Conyza canadensis* (L.) Cronquist; n = 4 for five taxa, including *Symphyotrichum pilosum* (Willd.) G.L. Nesom and *Chenopodium ficifolium* Sm.; n = 3 for 10 taxa, including *Senecio vulgaris* L. and *Euphorbia hypericifolia* L.; n = 2 for 16 taxa, including *Festuca arundinacea* Schreb. and *Amaranthus patulus* Bertol.; n = 1 for 29 taxa, including *Quamoclit coccinea* (L.) Moench and *Ageratina altissima* (L.) R.M. King & H. Rob.

The introduced disturbing plants detected on the 25 algific talus slopes in South Korea were eight taxa: *Humulus scandens* (Lour.) Merr., *Rumex acetosella* L., *Sicyos angulatus* L., *Ageratina altissima* (L.) R.M. King & H. Rob., *Ambrosia artemisiifolia* L., *Ambrosia trifida* L., *Solidago altissima* L., and *Symphyotrichum pilosum* (Willd.) G.L. Nesom. The detection frequency was n = 9 for *Humulus scandens* (Lour.) Merr., followed by n = 6 for *Ambrosia artemisiifolia* L., n = 4 for *Symphyotrichum pilosum* (Willd.) G.L. Nesom, n = 3 for *Ambrosia trifida* L., n = 2 for *Rumex acetosella* L. and n = 1 for *Sicyos angulatus* L., *Ageratina altissima* (L.) R.M. King & H. Rob., and *Solidago altissima* L.

Flora of the algific talus slope by type

The flora by type across the algific talus slope sites in South Korea was as follows. Suppl. material 10: 804 taxa of 114 families, 394 genera, 722 species, 18 subsp., 59 var., and 5 f. for 14 sites of type talus; 701 taxa of 107 families, 361 genera, 623 species, 18 subsp., 53 var., and 7 f. for four sites of type cave; 306 taxa of 82 families, 173 genera, 274 species, 5 subsp., 25 var., and 2 f. for four sites of type dent; 80 taxa of 44 families, 68 genera, 77 species, 1 subsp., and 2 var. for one site of type vertical cave; 173 taxa of 72 families, 129 genera, 152 species, 5 subsp., 14 var., and 2 f. for two sites of type others. Each type

accounted for 76.43%, 66.63%, 29.09%, 7.60%, and 16.44%, respectively, of the 1,052 taxa of detected plants in total.

Notable plants were analyzed for each type of algific talus slope. First, analysis was based on the class of rare plants above or equal to VU species, as designated by the Korea Forest Service. The six taxa of CR species included three taxa, *Paeonia obovata* Maxim., *Vaccinium vitis-idaea* L., and *Goodyera repens* (L.) R.Br., for the type talus; three taxa, *Cystopteris fragilis* (L.) Bernh., *Asplenium trichomanes* L. subsp. *quadrivalens* D.E. Mey., and *Aconitum coreanum* (H. Lév.) Rapaics, for the type cave; one taxon, *Cyrtosia septentrionalis* (Rchb.f.) Garay, for the type vertical cave; and none for the types dent and others. The 11 taxa of EN species included nine taxa, *Astilboides tabularis* (Hemsl.) Engl., *Sophora koreensis* Nakai, etc., for the type talus; four taxa, *Rosa koreana* Kom., *Dracocephalum argunense* Fisch. ex Link, etc., for the type cave; three taxa, *Micranthes octopetala* (Nakai) Y.I. Kim & Y.D. Kim, *Deutzia paniculata* Nakai, and *Oplopanax elatus* (Nakai) Nakai, for the type dent; and none for the types vertical cave and others. The 15 taxa of VU species included five taxa, *Adiantum pedatum* L., *Paeonia japonica* (Makino) Miyabe & Takeda, etc., for the type talus; seven taxa, *Athyrium spinulosum* (Maxim.) Milde, *Scorzonera albicaulis* Bunge, etc., for the type cave; five taxa, *Picea jezoensis* (Siebold & Zucc.) Carrière, *Paeonia japonica* (Makino) Miyabe & Takeda, etc., for the type dent; two taxa, *Illicium anisatum* L. and *Calanthe discolor* Lindl., for the type vertical cave; and one taxon, *Aconitum austrokoreense* Koidz., for the type others. Regarding the NT species of Red list species of vascular plants, the four taxa of EN species included two taxa, *Paeonia obovata* Maxim. and *Vaccinium vitis-idaea* L., for the type talus; one taxon, *Prunus × yedoensis* Matsum., for the type cave; and one taxon, *Picea jezoensis* (Siebold & Zucc.) Carrière, for the type dent. The eight taxa of VU species included six taxa, *Gymnocarpium dryopteris* (L.) Newman, *Zabelia tyaihyonii* (Nakai) Hisauti & H. Hara, for the type talus; three taxa, *Athyrium spinulosum* (Maxim.) Milde, *Aconitum coreanum* (H. Lév.) Rapaics, and *Spiraea chartacea* Nakai, for the type cave; and three taxa, *Gymnocarpium dryopteris* (L.) Newman, *Spiraea chartacea* Nakai, and *Oplopanax elatus* (Nakai) Nakai, for the type dent. Further, the 14 taxa of NT species included eight taxa, *Aconitum barbatum* Patrin ex Pers., *Prunus choreiana* Nakai ex H.T. Im, etc., for the type talus; four taxa, *Cystopteris fragilis* (L.) Bernh., *Rosa koreana* Kom., etc., for the type cave; three taxa, *Lycopodium annotinum* L., *Thuja koraiensis* Nakai, and *Deutzia paniculata* Nakai, for the type dent; two taxa, *Cyrtosia septentrionalis* (Rchb.f.) Garay and *Goodyera henryi* Rolfe, for the type vertical cave; and one taxon, *Aconitum austrokoreense* Koidz., for the type others.

Analysis of the endemic plants on the Korean Peninsula and the endemic species across the 25 algific talus slopes by type indicated that the type talus had 45 taxa, including *Aconitum pseudolaeve* Nakai and *Angelica reflexa* B.Y. Lee; the type cave had 26 taxa, including *Clematis trichotoma* Nakai and *Asarum chungbuensis* (C.S. Yook & J.G. Kim) B.U. Oh; the type dent had 21 taxa, including *Asarum mandshuricum* (Maxim.) M. Kim & S. So var. *seoulense* (Nakai) M. Kim & S. So and *Stewartia koreana* Nakai ex Rehder; the type vertical cave had one taxon, *Sasa quelpaertensis* Nakai; the type others had six taxa, including *Hosta minor* (Baker) Nakai and *Thalictrum actaeifolium* Siebold & Zucc. var.

brevistylum Nakai. In addition, when the analysis was based on the degree of floristic target species above or equal to III, the 163 taxa included 98 taxa, *Actinidia kolomikta* (Maxim. & Rupr.) Maxim., *Cephalanthera falcata* (Thunb.) Blume, etc., for the type talus; 67 taxa, *Woodsia macrochaena* Mett. ex Kuhn, *Catolobus pendulus* (L.) Al-Shehbaz, etc., for the type cave; 44 taxa, *Lycopodium obscurum* L., *Aruncus dioicus* (Walter) Fernald, etc., for the type dent; 24 taxa, *Coniogramme japonica* (Thunb.) Diels, *Actinodaphne lancifolia* (Blume) Meisn., etc., for the type vertical cave; and eight taxa, *Lepisorus onoei* (Franch. & Sav.) Ching, *Vaccinium bracteatum* Thunb., etc., for the type others.

Analysis of the alien plants and invasive alien plants detected on the 25 algific talus slopes by type indicated that, for the 75 taxa of alien plants, the type talus had 48 taxa, including *Phytolacca americana* L. and *Erigeron annuus* (L.) Pers.; the type cave had 62 taxa, including *Medicago sativa* L. and *Euphorbia hypericifolia* L.; the type dent had four taxa, including *Chenopodium ficifolium* Sm.; the type vertical cave had one taxon, *Zingiber mioga* (Thunb.) Roscoe; and the type others had no alien plant. Next, for the 54 taxa of invasive alien plants, the type talus had 34 taxa, type cave had 45 taxa, type dent had four taxa, and type vertical cave had one taxon. Categorization based on the level of distribution revealed that the 35 taxa at the type talus included 17 taxa, *Rumex acetosella* L., etc., for the WS species; seven taxa, *Euphorbia maculata* L., etc., for the SS species; four taxa, *Amaranthus patulus* Bertol., etc. for the CS species; six taxa, *Melilotus albus* Medik., etc., for the MS species; one taxon, *Erigeron philadelphicus* L., for the PS species. The 45 taxa at the type cave included 18 taxa, *Rumex crispus* L., etc., for the WS species; seven taxa, *Trifolium pratense* L., etc., for the SS species; five taxa, *Chenopodium album* L., etc., for the CS species; nine taxa, *Sicyos angulatus* L., etc., for the MS species; and six taxa, *Anthriscus caucalis* M.Bieb., etc., for the PS species. The four taxa at the type dent included one taxon, *Chenopodium ficifolium* Sm., for the WS species; none for the SS and CS species; one taxon, *Barbarea vulgaris* W.T. Aiton, for the MS species; two taxa, *Anthriscus caucalis* M. Bieb. and *Ageratina altissima* (L.) R.M. King & H. Rob., for the PS species. The one taxon at the type vertical cave was *Zingiber mioga* (Thunb.) Roscoe, which is a PS species.

Floral distribution on the algific talus slopes by region

Across the 25 algific talus slopes in South Korea, the flora by region was as followsSuppl. material 11: 431 taxa of 87 families, 256 genera, 377 species, 13 subsp., 36 var., and 5 f. for Unchi-ri, Jeongseon-gun (A-C-2); 361 taxa of 81 families, 232 genera, 326 species, 9 subsp., 24 var., and 2 f. for Binggye-ri, Uiseong-gun (A-C-4); 331 taxa of 84 families, 203 genera, 295 species, 6 subsp., 28 var., and 2 f. for Yeotan-ri, Jeongseon-gun (A-T-4); 298 taxa of 76 families, 176 genera, 267 species, 5 subsp., 23 var., and 3 f. for Bangnae-ri, Hongcheon-gun (A-T-2) and 298 taxa of 80 families, 207 genera, 260 species, 12 subsp., 24 var., and 2 f. for Naeryong-ri, Cheongsong-gun (A-T-13); and 281 taxa of 86 families, 204 genera, 241 species, 11 subsp., 26 var., and 3 f. for Boopyeong-ri, Inje-gun (A-T-7).

Notable plants were analyzed for each region. On the algific talus slope in Seongdong-ri, Pocheon-si (A-T-1), one taxon, *Gastrodia elata* Blume, was a VU species of rare plants

designated by the Korea Forest Service and an LC species of the Red-list. Three taxa, *Clematis brachyura* Maxim., *Asarum misandrum* B.U. Oh & J.G. Kim, and *Indigofera grandiflora* B.H. Choi & S.K. Cho, were endemic plants of the Korean peninsula. Five taxa, including *Ulmus macrocarpa* Hance and *Sorbaria sorbifolia* (L.) A. Braun var. *stellipila* Maxim. were floristic target species of degree III or above. Seven taxa were invasive alien plants, out of which four were WS species, including *Ambrosia artemisiifolia* L.; one was an SS species, *Symphyotrichum pilosum* (Willd.) G.L. Nesom, two were MS species, *Cerastium glomeratum* Thuill. and *Ambrosia trifida* L., and there were no CD or PS species. On the algific talus slope in Bangnae-ri, Hongcheon-gun (A-T-2), one taxon, *Vaccinium vitis-idaea* L., was a CR species of rare plants designated by the Korea Forest Service, two taxa, *Prunus choreiana* Nakai ex H.T. Im and *Rosa koreana* Kom., were EN species, and two taxa, *Actaea bifida* (Nakai) J.Compton and *Paeonia japonica* (Makino) Miyabe & Takeda, were VU species. One taxon, *Vaccinium vitis-idaea* L., was an EN species of the Red-list, and three taxa, including *Prunus choreiana* Nakai ex H.T. Im, were NT species. Sixteen taxa, including *Vaccinium hirtum* Thunb. var. *koreanum* (Nakai) Kitam., were endemic plants of the Korean Peninsula or endemic species. Thirty taxa, including *Ulmus laciniata* (Trautv.) Mayr, were floristic target species of degree III or above. Eleven taxa, including *Solanum nigrum* L., were alien plants, and six taxa were invasive alien plants out of which four were WS species, including *Bidens frondosa* L., one was a CS species, *Amaranthus patulus* Bertol., and one was a PS species, *Erigeron philadelphicus* L. On the algific talus slope in Shinghi-ri, Pyeongchang-gun (A-T-3), two taxa, *Rosa koreana* Kom. and *Oplopanax elatus* (Nakai) Nakai, were EN species of rare plants designated by the Korea Forest Service, and one taxon, *Adiantum pedatum* L., was a VU species. One taxon, *Oplopanax elatus* (Nakai) Nakai, was a VU species of the Red-list, and two taxa, *Rosa koreana* Kom. and *Paeonia lactiflora* Pall., were NT species. Nine taxa, including *Vicia chosenensis* Ohwi were endemic plants of the Korean Peninsula. Thirty-six taxa, including *Actaea asiatica* H. Hara were floristic target species of degree III or above. Six taxa, including *Oxalis corniculata* L. were alien plants and four taxa were invasive alien plants out of which three were WS species, including *Taraxacum officinale* F.H. Wigg., and one was an SS species: *Carduus crispus* L.

On the algific talus slope in Yeotan-ri, Jeongseon-gun (A-T-4), one taxon, *Paeonia obovata* Maxim., was a CR species of rare plants designated by the Korea Forest Service, two taxa, *Prunus choreiana* Nakai ex H.T.Im and *Forsythia saxatilis* (Nakai) Nakai, were EN species, and two taxa, *Actaea bifida* (Nakai) J.Compton and *Paeonia japonica* (Makino) Miyabe & Takeda, were VU species. One taxon, *Paeonia obovata* Maxim., was an EN species of the Red-list, three taxa, including *Gymnocarpium dryopteris* (L.) Newman were VU species, and three taxa, including *Aconitum barbatum* Patrín ex Pers. were NT species. Twenty-one taxa, including *Lilium amabile* Palib. were endemic plants of the Korean Peninsula. Thirty-eight taxa, including *Zabelia biflora* (Turcz.) Makino were floristic target species of degree III or above. Nineteen taxa, including *Galium tricornutum* Dandy were alien plants. Thirteen taxa were invasive alien plants out of which eight were WS species, including *Trifolium repens* L.; two were SS species, including *Symphyotrichum pilosum* (Willd.) G.L. Nesom and *Carduus crispus* L., two were MS species, including *Barbarea vulgaris* W.T. Aiton and *Melilotus albus* Medik., and one was a PS species, *Erigeron*

philadelphicus L. (Lee et al. 2022b). On the algific talus slope in Jangyeol-ri, Jeongseon-gun (A-T-5), two taxa, *Astilboides tabularis* (Hemsl.) Engl. and *Zabelia tyaihyonii* (Nakai) Hisauti & H. Hara, were EN species of rare plants designated by the Korea Forest Service. Two taxa, *Spiraea chartacea* Nakai and *Zabelia tyaihyonii* (Nakai) Hisauti & H. Hara, were VU species of the Red list, and one taxon, *Astilboides tabularis* (Hemsl.) Engl., was an NT species. Four taxa, including *Weigela subsessilis* (Nakai) L.H. Bailey were endemic plants on the Korean Peninsula. Fifteen taxa, including *Caragana fruticosa* (Pall.) Besser were floristic target species of degree III or above. Eleven taxa, including *Conyza canadensis* (L.) Cronquist were alien plants, and six taxa were invasive alien plants out of which five were WS species, including *Galinsoga quadriradiata* Ruiz & Pav., and *Trifolium pratense* L. was an SS species. On the algific talus slope in Bongoh-ri, Hwacheon-gun (A-T-6), one taxon, *Goodyera repens* (L.) R.Br., was a CR species of rare plants designated by the Korea Forest Service and a VU species of the Red list. One taxon, *Clematis trichotoma* Nakai, was an endemic plant on the Korean Peninsula. Seven taxa, including *Sorbaria sorbifolia* (L.) A. Braun var. *stellipila* Maxim. were floristic target species of degree III or above. Invasive alien plants included one taxon, *Ambrosia artemisiifolia* L., a WS species, and one taxon, *Symphytotrichum pilosum* (Willd.) G.L. Nesom, an SS species. On the algific talus slope in Boopyeong-ri, Inje-gun (A-T-7), one taxon, *Sophora koreensis* Nakai, was an EN species of rare plants designated by the Korea Forest Service, and one taxon, *Paeonia japonica* (Makino) Miyabe & Takeda, as a VU species. One taxon, *Sophora koreensis* Nakai, was an NT species of the Red-list. Five taxa, including *Pseudo-stellaria coreana* (Nakai) Ohwi were endemic plants of the Korean Peninsula. Fifteen taxa, including *Deutzia grandiflora* Bunge var. *baroniana* (Diels) Rehder were floristic target species of degree III or above. Nineteen taxa, including *Senecio vulgaris* L. were alien plants, and fourteen taxa were invasive alien plants out of which ten were WS species, including *Dactylis glomerata* L., three were SS species, including *Sonchus oleraceus* L., and one was an MS species, *Ambrosia trifida* L.

On the algific talus slope in Gaeahn-ri, Boeun-gun (A-T-8), there was no rare plant designated by the Korea Forest Service or Red list species. Two taxa, *Thalictrum actaeifolium* Siebold & Zucc. var. *brevistylum* Nakai and *Lonicera subsessilis* Rehder, were endemic plants of the Korean Peninsula. One taxon, *Woodsia macrochlaena* Mett. ex Kuhn, was a floristic target species of degree III or above. Four taxa, including *Erechtites hieraciifolius* (L.) Raf. ex DC. were alien plants, and three taxa were invasive alien plants, all of which were WS species, including *Erigeron annuus* (L.) Pers. On the algific talus slope in Oejungbang-ri, Danyang-gun (A-T-9), there was no rare plant designated by the Korea Forest Service or Red list species as an endemic plant of the Korean Peninsula. One taxon, *Celtis koraiensis* Nakai, was a floristic target species of degree III or above. Four taxa, including *Morus alba* L. were alien plants, and two taxa: *Oenothera biennis* L. and *Erigeron annuus* (L.) Pers., were invasive alien plants, both of which were WS species. On the algific talus slope in Shinjeong-ri, Jeongeup-si (A-T-10), one taxon, *Paeonia japonica* (Makino) Miyabe & Takeda, was designated as a rare plant by the Korea Forest Service and a VU species of the Red list. One taxon, *Weigela subsessilis* (Nakai) L.H. Bailey, was an endemic plant of the Korean peninsula. Two taxa, *Cephalanthera falcata* (Thunb.) Blume and *Rhamnus davurica* Pall., were floristic target species of degree

III or above; no alien plant was detected. On the algific talus slope in Beobhwa-ri, Yeongcheon-ri (A-T-11), one taxon, *Paeonia japonica* (Makino) Miyabe & Takeda, was a VU species of rare plants designated by the Korea Forest Service and an LC species of the Red-list. One taxon, *Carex fusanensis* Ohwi, was an endemic plant of the Korean Peninsula. Eight taxa, including *Spiraea chamaedryfolia* L. and *Syringa reticulata* (Blume) H. Hara were floristic target species of degree III or above; no alien plant was detected.

On the algific talus slope in Hwabuk-ri, Gunwi-gun (A-T-12), one taxon, *Berchemia berchemiifolia* (Makino) Koidz., was a VU species of rare plants designated by the Korea Forest Service and an LC species of the Red list. No endemic plant was detected, whereas six taxa, including *Rhamnus ussuriensis* J.J. Vassil. and *Celtis koraiensis* Nakai were floristic target species of degree III or above. Two taxa, *Erigeron annuus* (L.) Pers. and *Taraxacum officinale* F.H. Wigg., were invasive alien plants, both of which were WS species. On the algific talus slope in Naeryong-ri, Cheongsong-gun (A-T-13), two taxa, *Paeonia japonica* (Makino) Miyabe & Takeda and *Berchemia berchemiifolia* (Makino) Koidz., were VU species of rare plants designated by the Korea Forest Service and LC species of the Red-list. Twelve taxa, including *Asarum chungbuensis* (C.S. Yook & J.G. Kim) B.U. Oh were endemic plants of the Korean Peninsula. Nineteen taxa, including *Dryopteris fragrans* (L.) Schott were floristic target species of degree III or above. Twenty-four taxa, including *Rumex crispus* L. were alien plants, and twenty-two taxa were invasive alien plants, out of which 12 were WS species, including *Ambrosia artemisiifolia* L., six were SS species, including *Festuca arundinacea* Schreb., three were CS species, including *Quamoclit coccinea* (L.) Moench, and one was an MS species, *Tagetes minuta* L. On the algific talus slope in Nammyeong-ri, Milyng-si (A-T-14), one taxon, *Deutzia paniculata* Nakai, was an EN species of rare plants designated by the Korea Forest Service and an NT species of the Red-list. Eleven taxa, including *Carex okamotoi* Ohwi were endemic plants of the Korean Peninsula or endemic species. Fourteen taxa, including *Ulmus laciniata* (Trautv.) Mayr were floristic target species of degree III or above. Six taxa, including *Oenothera biennis* L. were invasive alien plants, and five taxa were introduced disturbing plants out of which three were WS species, including *Galinsoga quadriradiata* Ruiz & Pav., one was an SS species, *Euphorbia maculata* L., and one was an MS species, *Tagetes minuta* L.

On the algific talus slope in Dongmak-ri, Yeoncheon-gun (A-C-1), one taxon, *Asplenium trichomanes* L. subsp. *quadrivalens* D.E. Mey., was a CR species of rare plants designated by the Korea Forest Service; two taxa, *Rosa koreana* Kom. and *Forsythia saxatilis* (Nakai) Nakai, were EN species and three taxa, including *Adiantum pedatum* L. were VU species. One taxon, *Athyrium spinulosum* (Maxim.) Milde, was a VU species of the Red list and two taxa, *Rosa koreana* Kom. and *Forsythia saxatilis* (Nakai) Nakai, were NT species. Thirteen taxa, including *Asarum mandshuricum* (Maxim.) M. Kim & S. So var. *seoulense* (Nakai) M. Kim & S. So were endemic plants of the Korean Peninsula or endemic species. Twenty-eight taxa, including *Callicarpa dichotoma* (Lour.) Raeusch. ex K. Koch were floristic target species of degree III or above. Five taxa were invasive alien plants out of which two were WS species, including *Erechtites hieraciifolius* (L.) Raf. ex DC. and *Bidens frondosa* L., and three were MS species, including *Barbarea vulgaris* W.T. Aiton. Two taxa, *Sicyos angulatus* L. and *Ambrosia trifida* L., were introduced disturbing plants. On the algific talus slope in

Unchi-ri, Jeongseon-gun (A-C-2), two taxa, *Cystopteris fragilis* (L.) Bernh. and *Aconitum coreanum* (H. Lév.) Rapaics, were CR species of rare plants designated by the Korea Forest Service; two taxa, *Aconitum coreanum* (H. Lév.) Rapaics and *Spiraea chartacea* Nakai, were VU species of the Red-list, and one taxon, *Cystopteris fragilis* (L.) Bernh., was an NT species. Ten taxa, including *Paulownia coreana* Uyeki were endemic plants of the Korean Peninsula or endemic species. Thirty taxa, including *Ribes mandshuricum* (Maxim.) Kom. were floristic target species of degree III or above. Thirty-four taxa, including *Rumex acetosella* L. were alien plants, and twenty-five taxa were invasive alien plants out of which thirteen were WS species, including *Veronica persica* Poir., four were SS species, including *Carduus crispus* L., two were CS species, *Chenopodium album* L. and *Euphorbia hypericifolia* L., three were MS species, including *Ipomoea nil* (L.) Roth, and three were PS species, including *Anthriscus caucalis* M.Bieb. Two taxa, *Rumex acetosella* L. and *Ambrosia artemisiifolia* L., were introduced disturbing plants. On the algific talus slope in Jwapo-ri, Jinahn-gun (A-C-3), one taxon, *Taxus cuspidata* Siebold & Zucc., was a VU species of rare plants designated by the Korea Forest Service, and one taxon, *Prunus × yedoensis* Matsum., was an EN species of the Red-list. Four taxa, including *Broussonetia × hanjiana* M. Kim were endemic plants of the Korean Peninsula. Six taxa, including *Woodsia macrochlaena* Mett. ex Kuhn were floristic target species of degree III or above. Twenty-four taxa, including *Viola sororia* Willd. were alien plants, and twenty taxa were invasive alien plants out of which eleven were WS species, including *Phytolacca americana* L.; three were SS species, including *Sonchus asper* (L.) Hill, four were MS species, including *Rumex obtusifolius* L., and two were PS species, *Lamium purpureum* L. and *Viola sororia* Willd. On the algific talus slope in Binggye-ri, Uiseong-gun (A-C-4), six taxa were rare plants designated by the Korea Forest Service out of which one was a CR species, *Cystopteris fragilis* (L.) Bernh., two were EN species, *Astilboides tabularis* (Hemsl.) Engl. and *Dracocephalum argunense* Fisch. ex Link, and three were VU species, including *Tylophora floribunda* Miq. One taxon, *Spiraea chartacea* Nakai, was a VU species of the Red-list, and two taxa, *Cystopteris fragilis* (L.) Bernh. and *Astilboides tabularis* (Hemsl.) Engl., were NT species. Eight taxa, including *Artemisia angustissima* Nakai were endemic plants of the Korean Peninsula or endemic species. Twenty-eight taxa, including *Laportea cuspidata* (Wedd.) Friis were floristic target species of degree III or above. Thirty-two taxa, including *Solidago altissima* L. were alien plants. Twenty-one taxa were invasive alien plants out of which ten were WS species, including *Erigeron annuus* (L.) Pers., four were SS species, including *Poa pratensis* L., five were CS species, including *Medicago sativa* L., one was an MS species: *Tagetes minuta* L., and one was a PS species: *Solidago altissima* L. Two taxa: *Ambrosia artemisiifolia* L. and *Solidago altissima* L., were introduced disturbing plants.

On the algific talus slope in Changchon-ri, Hongcheon-gun (A-D-1), two taxa, *Micranthes octopetala* (Nakai) Y.I. Kim & Y.D. Kim and *Oplopanax elatus* (Nakai) Nakai, were EN species of rare plants designated by the Korea Forest Service, and three taxa, including *Taxus cuspidata* Siebold & Zucc. were VU species. One taxon, *Picea jezoensis* (Siebold & Zucc.) Carrière, was an EN species of the Red-list, two taxa, *Gymnocarpium dryopteris* (L.) Newman and *Oplopanax elatus* (Nakai) Nakai, were VU species, and two taxa, *Lycopodium annotinum* L. and *Thuja koraiensis* Nakai, were NT species. One taxon,

Micranthes octopetala (Nakai) Y.I. Kim & Y.D. Kim, was an endemic plant of the Korean Peninsula. Nineteen taxa, including *Lycopodium obscurum* L. and *Enemion raddeanum* Regel were floristic target species of degree III or above. No alien plant was detected. On the algific talus slope in Neunggang-ri, Jecheon-si (A-D-2), one taxon, *Paeonia japonica* (Makino) Miyabe & Takeda, was a VU species of rare plants designated by the Korea Forest Service and an LC species of the Red-list. Eleven taxa, including *Angelica reflexa* B.Y. Lee were endemic plants of the Korean Peninsula or endemic species. Sixteen taxa, including *Athyrium iseanum* Rosenst. were floristic target species of degree III or above. Four taxa were invasive alien plants out of which *Chenopodium ficifolium* Sm. was a WS species, *Barbarea vulgaris* W.T. Aiton was an MS species, and two were PS species, including *Anthriscus caucalis* M.Bieb. and *Ageratina altissima* (L.) R.M. King & H. Rob. One taxon, *Ageratina altissima* (L.) R.M. King & H. Rob., was an introduced disturbing plant. On the algific talus slope in Goobyeong-ri, Boeun-gun (A-D-3), two taxa, *Actaea bifida* (Nakai) J. Compton and *Paeonia japonica* (Makino) Miyabe & Takeda, were VU species of rare plants designated by the Korea Forest Service, and one taxon, *Spiraea chartacea* Nakai, was a VU species of the Red-list. Twelve taxa, including *Hemerocallis hakuunensis* Nakai were endemic plants of the Korean Peninsula or endemic species. Ten taxa, including *Hosta clausa* Nakai were floristic target species of degree III or above; no alien plant was detected. On the algific talus slope in Samyang-ri, Milyang-si (A-D-4), one taxon, *Deutzia paniculata* Nakai, was an EN species of rare plants designated by the Korea Forest Service and an NT species of the Red list. Five taxa, including *Stewartia koreana* Nakai ex Rehder were endemic plants of the Korean Peninsula or endemic species. Five taxa, including *Melampyrum setaceum* (Maxim. ex Palib.) Nakai var. *nakaiianum* (Tuyama) T. Yamaz. were floristic target species of degree III or above; no alien plant was detected. It is notable that, Samyang-ri exhibited the lowest number of plants among the 25 sites of algific talus slope.

On the algific talus slope in Seonheul-ri, Jeju-si (A-V-1), three taxa were rare plants designated by the Korea Forest Service out of which *Cyrtosia septentrionalis* (Rchb.f.) Garay was a CR species, and two were VU species, *Illicium anisatum* L. and *Calanthe discolor* Lindl. Two taxa, *Cyrtosia septentrionalis* (Rchb.f.) Garay and *Goodyera henryi* Rolfe, were NT species of the Red-list. One taxon, *Sasa quelpaertensis* Nakai, was an endemic plant of the Korean Peninsula. Twenty-four taxa, including *Kadsura japonica* (L.) Dunal and *Strobilanthes oliganthus* Miq. were floristic target species of degree III or above. One taxon, *Zingiber mioga* (Thunb.) Roscoe, was a PS species of invasive alien plants. On the algific talus slope in Gwandong-ri, Haenam-gun (A-O-1), one taxon, *Cymbidium goeringii* (Rchb.f.) Rchb.f., was a Red list species. Three taxa, including *Hosta minor* (Baker) Nakai were endemic plants of the Korean Peninsula. Four taxa, including *Rhaphiolepis indica* (L.) Lindl. ex Ker var. *umbellata* (Thunb. ex Murray) H. Ohashi were floristic target species of degree III or above; no alien plant was detected. On the algific talus slope in Choseong-ri, Hamyang-gun (A-O-2), one taxon, *Aconitum austrokoreense* Koidz., was a VU species of rare plants designated by the Korea Forest Service and an NT species of the Red-list. Four taxa, including *Thalictrum actaeifolium* Siebold & Zucc. var. *brevistylum* Nakai were endemic plants of the Korean Peninsula. Four taxa, including

Dicentra spectabilis (L.) Lem. were floristic target species of degree III or above; no alien plant was detected.

Discussion

The vascular flora at 25 sites of algific talus slopes was investigated as a specific area of forest biodiversity. The area of each site was approximately 0.25 km², which accounted for approximately 0.0004% of the total forest area of 62,860 km² in South Korea (Korea Forest Service 2023). Despite the relative narrowness of the area, the overall vascular flora across the 25 algific talus slopes comprised 1,052 taxa of 125 families, 486 genera, 947 species, 23 subsp., 75 var., and 7 f., thereby accounting for approximately 22.27% of all 4,724 taxa of known vascular plants in South Korea. Moreover, there were 55 and 52 detected taxa of rare plants as designated by the Korea Forest Service and Red list species, respectively. This accounted for approximately 10.09% of the total 545 taxa of rare plants and 9.58% of the total 543 taxa of Red list species. On the algific talus slope in Bangnae-ri, Hongcheon-gun (A-T-2), the area of the natural habitat of *Vaccinium vitis-idaea* L. is rapidly decreasing due to the spread of *Muhlenbergia hakonensis* (Hack. ex Matsum.) Makino, thereby implicating the need for developing ex-situ conservation measures. There were 54 (12.53%) and 44 (11.70%) detected taxa of endemic plants of the Korean Peninsula and endemic species, respectively. On the algific talus slope in Yeotan-ri, Jeongseon-gun (A-T-4), *Forsythia saxatilis* (Nakai) Nakai was found with phenotypic features similar to *Forsythia ovata* Nakai, thereby demanding taxonomic reinterpretation through genetic analyses. Further, 317 taxa of floristic target species were found and out of which 163 taxa of Degree III–V should be subjected to long-term monitoring plans and in-situ and ex-situ conservation measures. Moreover, long-term measures for ecological conservation should be developed via selecting plant species vulnerable to climate change on the 25 algific talus slope sites. There were 181 detected taxa of northern lineage plants of the Korean Peninsula; 60 taxa out of the 300 species threatened by climate change were also detected. The floristic inventory for northern lineage plants of the Korean Peninsula according to Gantsetseg et al. 2020 presents 616 species that are difficult to define as northern lineage plants. This appears to be because the inventory focuses solely on the shared species between South Korea and Russia so that the pattern of distribution for each taxon on the Korean Peninsula deviates to induce errors. Hence, a new floristic inventory should be produced for northern lineage plants based on the findings of this study; further studies are encouraged. For limestone area plants, 32 taxa (31.37%), including three taxa of CIP (21.43%), six taxa of SCP (20.00%), and 23 taxa of CCP (39.66%) were found. Seventy-five taxa of alien plants were detected, which account for 12.12% of the total 619 taxa of alien plants. However, care should be taken as most of the 25 algific talus slope sites are close to roads with high levels of accessibility and increasing number of tourists, which may consequently propel the continuously increasing spread of alien plants. In particular, tendency of alien plants to spread to areas surrounding the core areas of algific talus slope sites implies the need for suitable management measures. Systematic and continuous development of measures is necessary to ensure integrated conservation and management of the 25 algific talus slope

sites. Currently, however, only very few regions with an algific talus slope, such as Bangnae-ri, Hongcheon-gun (A-T-2), are designated as reserve areas. Therefore, the FGRR and OECMs should be applied to a greater scope of regions for systematic management (Lee et al. 2022b). An area of OECMs is not a reserve area but a geographically defined area, which is managed in ways to achieve positive and continuous long-term results for the in-situ conservation of biodiversity and regarding the relevant ecosystem functions, services, and cultural, socioeconomic, and other regional values (Convention on Biological Diversity 2018). In South Korea, seven regions, including algific talus slopes and buffer areas of the Korea National Arboretum have been selected for OECMs, and the results verified the effectiveness of OECMs as a means to extend the quantitative scope of reserve areas (Hong et al. 2017). Thus, algific talus slopes are thought to become a representative set of regions for OECMs. Furthermore, the day and night temperatures distinctly vary in regions such as the algific talus slope in Yeotan-ri and functions such as the cooling effect should be thoroughly analyzed through micrometeorological studies in order to provide pre-emptive responses against climate change.

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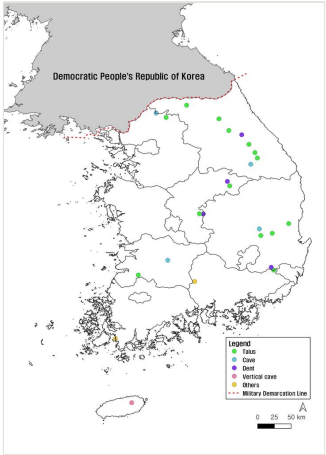


Figure 1.
Map showing location of survey area.



Figure 2.
Pictures showing rare plants and Red-list on the algific talus slope in South Korea.



Figure 3.
Pictures showing Korea endemic plants on the algific talus slope in South Korea



Figure 4.

Pictures showing floristic target plants on the algific talus slope in South Korea



Figure 5.
Pictures showing northern lineage plants on the algific talus slope in South Korea



Figure 6.

Pictures showing calciphilous plants on the algific talus slope in South Korea.



Figure 7.

Pictures showing invasive alien plants on the algific talus slope in South Korea.

Supplementary materials

Suppl. material 1: Location of algific talus slopes in South Korea

Authors: Lee, J.W., H. G. Yun, T. Y. Hwang, K. M. Kim, S. H. Jung and J. B. An

Data type: MS word

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Suppl. material 2: Flora of algific talus slopes in South Korea

Authors: Lee, J.W., H. G. Yun, T. Y. Hwang, K. M. Kim, S. H. Jung and J. B. An

Data type: MS word

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Suppl. material 3: Total list of vascular plants of algific talus slope of South Korea

Authors: Lee, J.W., H. G. Yun, T. Y. Hwang, K. M. Kim, S. H. Jung and J. B. An

Data type: MS word

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Suppl. material 4: List of rare plants and Red-list species in the algific talus slopes in South Korea

Authors: Lee, J.W., H. G. Yun, T. Y. Hwang, K. M. Kim, S. H. Jung and J. B. An

Data type: MS word

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Suppl. material 5: List of endemic plants of the Korean peninsula in the algific talus slopes of South Korea

Authors: Lee, J.W., H. G. Yun, T. Y. Hwang, K. M. Kim, S. H. Jung and J. B. An

Data type: MS word

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Suppl. material 6: List of the V–I degree taxa of Korean floristic target species on the algific talus slope in South Korea

Authors: Lee, J.W., H. G. Yun, T. Y. Hwang, K. M. Kim, S. H. Jung and J. B. An

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Suppl. material 7: List of the northern lineage plants on the Korean Peninsula and 300 species threatened by climate change in the algific talus slopes of South Korea

Authors: Lee, J.W., H. G. Yun, T. Y. Hwang, K. M. Kim, S. H. Jung and J. B. An

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Suppl. material 8: List of calciphilous plants in the algific talus slopes of South Korea

Authors: Lee, J.W., H. G. Yun, T. Y. Hwang, K. M. Kim, S. H. Jung and J. B. An

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Suppl. material 9: List of alien plants in the algific talus slopes of South Korea

Authors: Lee, J.W., H. G. Yun, T. Y. Hwang, K. M. Kim, S. H. Jung and J. B. An

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Suppl. material 10: Flora of algific talus slopes by type in South Korea

Authors: Lee, J.W., H. G. Yun, T. Y. Hwang, K. M. Kim, S. H. Jung and J. B. An

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Suppl. material 11: Flora of algific talus slopes by region in South Korea

Authors: Lee, J.W., H. G. Yun, T. Y. Hwang, K. M. Kim, S. H. Jung and J. B. An

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