Hunan (China) Flora with Rich Ornamental Plants

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Abstract

Hunan (China) is located in transition zone between subtropical and temperate forests with mild temperature and sufficient rainfall. The special locality and variable topography enrich the diversity of plant species. More than 5,500 taxa of vascular plants have been documented. Since no plant exploration in Hunan occurred for the purpose of ornamental plants, we have studied its ornamental plant potential in recent years. By comparing with cultivated ornamental plants in Asia, Europe, and North America, Hunan has more than 2,000 native plants that can be introduced and cultivated as ornamental plants. Some endemic species to Hunan, such as red loropetalum, already brought to the worldwide attention in the ornamental field. Others, such as red-flower Mulian and Dong-an Tea, have great ornamental potential and for their breeding. The distinguishable ornamental groups, such as native fern (about 300 species), conifers (46 species), camellia (33), holly (63), magnolia (31), orchid (66), and rhododendron (46), had been addressed at species level. The potential for further breeding work and cold hardiness had been investigated. This study will enhance the plant exploration and utilization for Hunan and bring more beautiful plants in our daily gardens.

INTRODUCTION

Hunan is a province in southeastern China, adjacent to Jiangxi (east), Guangdong and Guangxi (south), Guizhou and Sichuan (west), and Hubei province (north). It is situated between N 24°39'-30°08' and E 108°47'-114°15', with total area of 211,800 km^2. In the north of Hunan there is the Dongting plain, and its central portion is characterized by rolling-hills and basin, whereas the east, south, and west of Hunan are surrounded by a series of mountains. Therefore, the overall topography of Hunan Province may be by and large viewed as a kind of "horse-shoe" landform facing northwards (Chen, 1986). The special location (transition zone from Yunnan-Guizhou plateau to flat-plain) and natural conditions (right between subtropical and temperature climate) bring a great diversity of plants from the northern, southern, eastern, and western China. In term of plant species, Hunan ranks the 4th place (right behind Yunnan, Sichuan, and Guangxi), which earns her nickname, the birthplace of ornamental flowers (Hunan Floral Editoral Committee, 2000). The highest diversity of plants occurs in Wuling, Xuefeng, Heng, Luxiao, and Nanling mountains. Many botanists have explored these mountains. Among the resource of ornamental plants, the most famous ones are dove tree, red loropetalum (*Loropetalum chinense* var. *rubrum*), Xiangfei Bamboo, Lotus, *Liriodendron*, *Sinojackia*, *Pseudolaris*, *Cyclocarya*, and etc. (Qi and Lin, 2001; Qi and Yu, 2002). The variety of wild plants in Hunan can be introduced for potential garden plants. Actually, these plants are important natural resources for exploration and development of potential ornamental plants and their breeding lines.

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The climate of Hunan is generally mild with sufficient rainfall. The mean annual temperature is between 16 and 18.5 °C (recorded high 41.3 °C), the monthly mean temperature in January between 4.0 and 7.3 °C, the monthly mean temperature in June between 26.5 and 30 °C, and >10 °C annual accumulated temperature between 5,000 and 5,700 °C. The lowest recorded temperature is –12 °C (-20 °C on the top of mountains). The frost-free duration is about 260-310 days. The annual precipitation ranges from 1,400 to 1,700 mm, though in the mountainous areas it can be up to 2,000 mm. The annual mean relative humidity is 80% in the lower-lying areas and 85% in the mountainous areas (Hsu, 1986). As indicated above, the geographical location and climate in Hunan favor the growth of wide variety of plant species (Qi, 1984). More than 5100 vascular plant species (not include taxa under the species level) have been documented, which belong to 1422 genera and 255 families. The zonal vegetation is evergreen broad-leaf forest, evergreen and deciduous broad-leaf mixed forest at lower mountains, and temperate conifer forest on the high mountains (Qi and Yu, 2002). The characteristics of potential native ornamental plants can be summarized as the following.

Great Diversity of Potential Ornamental Plant Species

Based on our exploration of native plants in Hunan and comparison with cultivated ornamental plants in Asia, Europe, and North America, Hunan has more than 2,000 native plants can be introduced as potential garden plants. Among them, 150 species are fern, 39 gymnosperm, and 1800 angiosperm (Armitage, 1997 and 2001, Dirr, 1998, Qi and Yu, 2002). These plants distribute at different habitat with strong adaptability. Both genotype and phenotype show wide variation of plant morphology and ornamental features. A small group of plants, such as camellia, orchid, and magnolia, had been widely cultivated in our gardens for thousands of years (Liu and Yang, 2001). They are indispensable part of our living environment today. However, the majority of native plants in Hunan with great ornamental value is still in the remote mountainous areas. Their unique beauty of these plants can only be admired by a few plant explorers (botanists or horticulturists). To explore, select, and breed these plants will bring more beautiful plants to our everyday landscape.

Distribution Center of Ornamental Plants

There are many natural plant groups originated from Hunan, then extended their geographical range. Some of these native plant groups are also important ornamental plants. *Ilex* (holly), for example, has 68 species in Hunan, which account for 57.6% of its total species in China (Qi and Yu, 2002). Why is Hunan the geographical distribution centers for some plants? From geological history, Hunan did not or only slightly affect by Quaternary ice. A great number of relic, ancient, and primitive species have been preserved (Qi, 1984). Also, the complex and variation of microclimate and habitat sped-up the plant evolution and many new close-related species were produced (Chen, 1986; Hsu, 1986). The evolution and variation from natural plant groups created great opportunities for selection and breeding of better ornamental plants. In our daily gardens, the major ornamental species, such as roses, rhododendron, camellia, and orchid, are originated in Hunan or other places of China. Thousands of new taxa were bred from these parentage plants and widely cultivated in today's landscape. As "Chinese" Wilson (1929) said that China had contributed tremendous ornamental plant resource to the worldwide gardens, from magnolia flowers in early spring, peony and rose in summer, mums in fall. The major ornamental genera and their number of species in Hunan are listed in Table 1.

Wide Adaptability of Ornamental Plants

Ornamental plants can be classified into many different systems by their adaptability, habit, ornamental features, utilization, and etc. According to geographical location, floristic analysis, distribution, and cultivated history, native plants with potential ornamental value in Hunan can be categorized into four types, warm plants (south of

Changjiang (Yangtze) River to Nanling Mounts), temperate plants (north of Changjiang River to Qinling Mounts, including Yellow River region), north temperate plants (distributed to the northern China), and cosmopolitan plants (adapted from warm to cold climate regions).

1. Warm Plants (equal to USDA Hardiness Zone 7-9/10). This type of plants originated from the northern-most tropical plants. They are closely related to the tropical plants, but required low temperatures and less rainfalls. Nanling Mount, locate between Hunan and Kuangdong provinces, stops the cold air-stream from the north, which becomes the natural border between tropical and subtropical regions. Southern slope of Nanling Mount has high temperatures, long summer and warm winter, and frost-free climate due to the influence of monsoon. The majority of ornamental plants are tropical plants. Southern Hunan, situated in the northern slope of Nanling Mount, has hot summer and cold winter because cold air from the north can reach this region. Most of ornamental plants are warm and temperate plants. Some transitional plants distribute in border areas of Hunan with ornamental potentials are *Alsophila podophylla, Amgiopteris fokiensis, Cibotium barom, Aglaia odorata, Quisequalis indica, Radermachera sinica, Pithecellobium lucidum, Capparis urophylla, Pygeum topengii, Pinus fenzeliana, Codariocalyx motorius, Alocasia macrorrhiza, Amydrium hainanense*. Although these plants are limited and only distribute in small areas, they increase the diversity of ornamental plants and are very important for breeding of cold hardiness clones of tropical plants.

Typical warm plants are the major ornamental plant resource in Hunan. They are also the major components of Hunan zonal vegetation -- evergreen broad-leaf forest. Members from Lauraceae, Magnoliaceae, Theaceae, Aquifoliaceae, Fagaceae, and etc. can be planted as the dominant or background plants in the gardens. They are also excellent choice for the shade trees. Gymnosperms, such as *Podocarpus, Pseduolarix, Amentotaxus, Taxus, Fokienia, Keteleeria, Pseudotsuga, Pseudotaxus*, distribute in warm areas. These conifers have outstanding habit for ornamentals. Angiosperms are extremely rich, which consist of wide variety of trees, shrubs, and herbaceous plants with great ornamental flowers and fruits. Some representatives are members of *Manglietia, Michelia, Cinnamomum, Camellia, Schima, Osmanthus, Ilex, Zenia, Eleaocarpus, Sloanea, Ormosia, Schefflera, Ardisia, Melastoma, Fissitigma, Millettia, Alyxia, Begonia, Aspidistra, Pothos,* and *Hedychium*. Some of them are widely cultivated in our daily gardens. However, Majority of them only grows in the natural habitat and wait for being discovered.

2. Temperate Plants (equal to USDA Hardiness Zones 5-7). This type of plants originated from temperature zone in the North Hemisphere. They are major components of flora in East Asia and also have close relationship with flora of North America and Euroasia. Many similarity species within some genera are evidence to indicate that flora of East Asia and North America originated from the same sources (Li, 1952). The major species-pairs are *Liriodendron sinensis* (E. Asia) vs. *L. tulipifera* (N. America), *Sassafras tzumu* vs. *S. albidum, Nyssa sinensis* vs. *N. sylvatica*, *Pseudotsuga sinensis* vs. *S. menziesii*, *Junipers chinensis* vs. *J. virginiana*, *Carya hunanensis* vs. *C. illinoensis*. All above species were cultivated in both continents and grew well (Dirr, 1998; Qi and Yu, 2002).

Temperate plants are major components of flora of Central China. Many plant-hunters had collected in this area and brought thousands of ornamental plants to the western countries (Cox, 1986). The diversity of plant species in this region brought the worldwide attention through cultivation of some ornamental plants. Many species, such as members of *Rhododendron*, *Rosa*, Orchids, *Davidia*, *Ginkgo, Metasequoia*, have been widely cultivated around the world. Based on our survey and studies, the following woody representatives of temperate plants in Hunan can be cultivated as ornamental plants. They are *Rhododendron* (54 species), *Clematis* (46), *Acer* (42), *Prunus* (36), *Viburnum* (35), *Actinidia* (32), *Lonicera* (25), *Hypericum* (18), *Spiraea* (13), *Hydrangea* (12), *Malus* (7), *Magnolia* (7), *Chimonanthus* (3, with pure stand). Herbaceous orna-

mental flowering plants include Orchids (56 genera, 134 species), *Lilium*, *Paeonia*, *Hosta*, *Iris*, *Dysosma*, *Disporum*, *Dianthus*, *Lycoris*, *Sedum*. The distribution center of temperate plants is Yangtze River region. The northern border is Qingling Mount and Yellow River. The major distribution areas of temperate plants in Hunan are Northwestern and Northern regions and high mounts of Southern region. Majority of plants can tolerates –15 °C or lower and can be introduced to 36-42 °N in latitude. In Qiangdao and Yantai of Shandong Province (36-37 °N in latitude, China), the garden plants are dominant by native Hunan temperature plants, such as *Magnolia denudata*, *M. officinalis, Rhododendron fortunei, Chimonanthus praecox, Liriodendron chinense, Hydrangea chinensis, Actinidia chinensis*, *Aesculus chinensis*. In Changchun of Jilin province (42 °N in latitude, China), native Hunan temperature plants, such as *Ginkgo biloba, Metaesquoia glyptostroboides, Junipers chinensis, Rosa rugosa, Hibiscus syriacus, Pterocarya stenoptera, Viburnum odoratissimum, Amygdalus persica (Prunus persica), Cerasus pseudocerasus (Prunus pseudocerasus), Cornus controversa*, can be cultivated outdoor. The ornamental potential of native Hunan temperate plants is great for introduction of high latitude regions around the world.

3. North Temperate Plants (equal to USDA Zones 3-6). This type of plants mainly distributes on the higher elevation in Hunan. Usually, the temperatures are lower and the extreme lowest temperature reach below –20 °C with relatively longer frost and icing seasons. The environmental conditions can only grow small amount of cold hardiness plants. These native Hunan plants, such as *Continus cogygaria, Magnolia sieboldii, Potentilla fruticosa, P. glabra, Acer mono, Sorbaria arborea, Staphylea bumalda, Gentiana* spp., *Hemerocallis* spp., *Pedicularis* sp., and *Paeonia lactiflora*, can be cultivated as ornamental plants in Hunan and adjacent areas. These plants can also be introduced to the northern and northeastern China (or similar climate in Europe and North America) and survive well outdoor during the winter season.

4. Cosmopolitan plants (equal to USDA Zones 3-10). Temperature does not important to this type of plants and they can occur in the wide range of geographical locality. In China, this type of plants grows in many climatic zones and no distinguished vertical distribution. In Hunan, these plants, such as *Platycladus orientalis, Albizia julibrisin, Ailanthus altissima, Wisteria sinensis, Hypericum ascyron, Kerria japonica, Nymphaea* sp., *Sedum* spp., *Chenopodium* sp., *Ophiopogon* sp., *Acorus* sp., and *Belamcanda* sp. could be cultivated from the South to North in China and some of them were introduced and grown in the New England area of the United States (Dirr, 1998).

Diversity of Ornamental Plants

The diversity of wild plant materials (natural selections) in Hunan has a great potential to be selected as our landscape plants today. To explore, introduce, reproduce, and select of these plants for landscape uses is the new blood for ornamental horticultural industries. People buy more plants if they enjoy them. To reach this goal, we have to increase the diversity of ornamental plants by exploration and breeding. Based on our survey and studies, native Hunan plants can be further classified into the following five categories by their ornamental features.

1. Trees with Magnificent Habit. Although no brilliant flower, this type of plants has great habit, which can be attractive regardless they are cultivated as an individual or as a pure and mixed stand. The representatives are *Ginkgo biloba, Pseudolarix amabilis* (one of the five most beautiful ornamental trees in the world, other four plants are *Sequoiadendron giganteum, Sciadopitys verticillata, Cedrus*, and *Araucaria*), *Metasequoia glyptostroboides, Tetracentron sinense, Cercidiphyllum japonicum, Euptelea pleiospermum, Bischofia polycarpa, Acer amplum, Tapiscia sinensis, Kalopanax seplemlobus, Fraxinus chinensis, Stewartia sinensis, Semiliquidambar cathayensin, Cathaya argyrophylla, Abies ziyuanensis, Pinus armandii, Fokienia hodginsii, Nagdeia nagi, Machilus thumbergii, Helicia cochinchinensis, Elaeocarpus sylvestris, Prunus zippeliana, Tupinia affinia,* and ornamental bamboos (*Chimonobambusa quadrangularis, Phyllo-*

stachys aurea, Ph. bambusoides f. *lacrmadeae, Ph. nigra, Ph. bambusoides* var. *castilloni,* and *Pseudosassa aubsolida*).

2. Plants with Brilliant Flowers. Native Hunan plants with brilliant flowers and colorful bracts are very attractive. At meantime, they bring many imaginations while people admire them in the gardens. Some trees, such as *Dendrobenthamia* spp., *Emmenoptery henryi, Mussaenda pubescens, Hydrangea* spp., *Tilia* spp. and *Viburnum* spp., have bright white bracts and some infertile flowers, which bring a lot of attention and enjoyment during the bloom period. Other trees, such as *Bretschneidera sinensis, Koelreuteria* spp., *Zenia insignis, Albizia julibrissin, Paulownia* spp., *Catalpa bungei, Lagerstroemia indica, Mucuna sempervirens, Millettia* spp., *Caesalpinia decapetala, Hibiscus* spp. *Halesia macgregorii*, have huge showy inflorescences. The different shapes and colors of many small flowers dominate the canopy of plant communities, which are magnificent in the wild and gardens. Some shrubs, such as *Serissa japonica, Ardisia* spp., *Eurya* spp., *Spiraea* spp., *Vaccinium* spp., *Deutzia* spp. *Daphne* spp., *Murraya paniculata, Syzygium buxifolium*, have small flowers. They are very attractive because of their tiny, colorful, fragrant flowers. As we all know, members of Magnoliaceae, Illiciaceae, Schisandraceae, *Camellia* spp., *Gardenia* spp., *Chaenomeles* spp. are famous ornamental plants with big solitary flowers. Both terminal and axillary colorful flowers are subtended by green leaves, which bring bright, attractive, and stereoscopic effect to your attentions. Some plants, such as *Magnolia denudata, M. liliflora, Cercis chinensis*, load with white, pink, or red flowers in early spring, which tell the spring is approaching. Herbaceous ornamental plants are very rich in Hunan and the most unusually plants are *Changnienia amoena* and *Pleione bulbocodioides* because of one leaf and one big, pink flower for the whole plant. From the above examples, we determined that ornamental plants in Hunan were highly diversified and many of them awaited for introduction and cultivation.

3. Plants with Ornamental Fruits. Bright color, unique shape, and distinguished appearance are the characteristics of ornamental fruit plants. Plants with unique ornamental fruits are *Pithecellobium lucidum* (Monkey's Ear), *Sloanea sinensis* (Monkey's Happiness), *Decaisnea insignis* (Cat's Dung), *Radermachera sinica* (Long Bean Tree), *Staphylea holocarpa* (Bladder Fruit), *Pygeum topengii* (Butt Fruit), *Carrierea calycina* (Goat Horn Tree), *Morinda umbellate* (Chiecjen Eye Vine), *Sinojackia rehderiana* (Weight Tree), *Melliodendron xylocarpum* (Top Fruit), *Dipteronia sinensis* (Coin Maple), *Cyclocarya paliurus* (Money Plant), *Camellia parvimuricata* (Tumor Fruit). Their Chinese names in the parentheses describe their fruit shape and appearance. Plants with big, showy fruits are *Mucuna sempervirens, Catalpa bungei, Gleditsia sinensis* (more than 70cm long), *Chaenomeles sinensis, Rehderodendron kwangtungensis, Tsoongiodendron odorum, Magnolia officinalis, Trichosanthes kirilowii, Kadsura coccinea*. Plants with loaded fruits are *Ilex* spp., *Sorbus wilsoniana, Stranvaesia davidiana, Pyracantha fortuneana, Trema cannabina, Viburnum* spp., *Garcinia multiflora, Idesia polycarpa*. They are very attractive during the harvesting season.

4. Foliage Ferns. There are 700 fern species in Hunan, which belongs to 166 genera and 53 families. Among them, 150 species can be used for ornamental foliage plants. The change of growth form, beautiful leaf blade, shade tolerant, and disease and insect free are the major ornamental features, which can place them in many house sittings. Based on the mature size, ornamental ferns can be further divided into the following five categories.

4.1. Giant Ferns. The plants are usually more than 80 cm taller, such as *Hicriopteris chinensis, Osmunda vachellii, JingMouGo, Coniogramme japonica, FuJianLianZuo, Abacopteria penangiana, Woodwardia, Blechnum orientale*. These plants can be planted in parks, scenery regions, water sides, under the street trees, and around buildings. They are very decorative.

4.2. Medium Ferns. The plants are from 30 to 80 cm tall, such as *Plagiogyria japonica, Onychium japonicum, Nephrolepis cordifolia, Pleris nervosa, Pleris vittata, Athyrium sinense, Cyrtomium balansae, Dicranopteris dichotoma*. They are excellent

plants for borders, planters, sides of walls and buildings. They are also great indoor plants for both quiet and busy foot traffic areas, like theaters and shopping centers.

4.3. Small Ferns. These plants are usually less than 30 cm tall, such as *Adianthum capillus-veneris, Phymatapsis hastate, Selaginella moellendorfii, Ophioglossum vulgatum, Asplenium trichomanes, Lepisorus thunberghanus*. These fern are cute for bonsai or small potted plants for office, balcony, and artificial rocky mounts.

4.4. Tiny Ferns with Membrane Foliage. These ferns are very small with transparent foliage. They are good for high humidity areas, such as fountains. The representative plants are *Mecodium badium, Gonocormus minutus, Hymenophyllum barbatum, Vandenboschia auriculata, Mecodium microsorum*. These ferns can also be placed in the shade and cool place in the house.

4.5. Climbing Ferns. Lycopodium clavatum, L. japonicum, L. casuarinoides, Selaginella davidii, S. uncinata are climbing ferns, which can be used for groundcover, hanging and other designed baskets.

Unique Ornamental Plants from Hunan

Many ornamental plants are only native to Hunan, nowhere else in the world. There are 120 ornamental species, which belongs to 55 genera and 14 families, are endemic to Hunan. The representatives are *Loropetalum chinense* var. *rubrum, Gleditsia japonica* var. *velutina, Camellia phellocarpa, Sinojackia dolichocarpa, S. oblongicarpa, Michelia longipetiolata, Parakmeria lotungensis* var. *xiangxiensis, Hunaniopanax hypoglaucus, Ombrocharis dulcis, Calanthe graciliflora* var. *xuefengensis, Aspidistra triloba, Berberis oblanceifolia, Sorbus rhombifolia, Rhododendron* spp. (9 species), *Ilex* spp. (5 species), and 22 bamboo species. The endemic plants are very important for the floristic studies, plant introduction and cultivation, species preservation, and ornamental plant breeding.

CONCLUSION

Hunan is an ideal place for the studies of ornamental plants because of the diversity and ornamental potential from its native plants. Since no plant exploration for ornamental purpose in Hunan has occurred, botanists, horticulturists, and plant lovers around the world are welcome to join us on the exploration, development, and introduction of these ornamental plants. Remember, a great ornamental plant does not only improve the quality of our life and enjoyment, but also bring the beauty and mystery of the plant world to our daily attentions.

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Tables

Table 1. Number of species in Hunan from some ornamental genera.

Genus	Number of Species		Percentage
	in Hunan	in China	Hunan/China
Phyllostachys	29	40	72.5
Epimedium	8	13	61.5
Actinidia	32	53	60.4
Ilex	68	118	57.6
Cymbidium	11	20	55.0
Callicarpa	23	42	54.8
Pittosporum	17	34	50.0
Viburnum	35	74	47.3
Michelia	15	35	42.9
Clematis	36	110	32.7
Calanthe	12	40	30.0
Acer	42	150	28.0
Hydrangea	12	45	26.7
Rosa	16	60	26.7
Prunus	36	140	25.7
Lonicera	25	100	25.0
Camellia	31	190	16.3
Rhododendron	54	650	8.3