

Collection and cultivation of Magnoliaceae plants at Kunming Botanic Garden of China

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Since the founding of Kunming Botanic Garden in 1938, plant collection and cultivation (including plants from Magnoliaceae) have been conducted in the garden under the direction of the older generation of Chinese botanists like Hu Xian-Xiao (Hu Hsen-hsa), Cai Xi-Tao (Tsai Hse-Tao), Yu De-Jun (Yu Te-Tsun) Wu Zheng-Yi and Feng Guo-Mei. But for Magnoliaceae, plant collection from all over the world mainly began in 1981. From 1984, materials, including seeds and living plants, have been collected in the garden, and most of the young plants have been planted since 1986. So far 218 species from 11 genera of Magnoliaceae have been collected and planted, and about 79 species from 9 genera have been successfully cultivated.

Of those 79 species, 30 species have flowered and fruited, and others are growing very sturdily. During our project on the Magnoliaceae, some experience in cultivation was gained. Here we would like to briefly introduce most of the collection and our general cultivation experience to TMS members. Hopefully it will give members a rough idea about Magnoliaceae in the Yunnan Province of China. Maybe some TMS members will be interested in them, and, one day, a trip to Yunnan can be planned.

1. The Collected Magnoliaceae species in the Garden

The family Magnoliaceae consists of about 15 genera with 240 species in the world. Yunnan Province of China has about

11 genera with 70 species (China has 11 genera with 90 species) which are mainly native to the mountains at elevations of 1200–2600 meters. The ecological system and geographic features are very complex; the mountains at altitudes of 1200–2600 meters are very rich in the diversity of Magnoliaceae species. Unfortunately, conditions in the wild are gradually becoming worse and worse, and some species are threatened. In order to conserve the diversity of plants in Yunnan, our goals for the collection are focused mainly on the wild species in Yunnan. Of course, some species from other countries have been acquired through plant and seed exchanges. All the successful accessions to the collection and their source locality are as follows:

Plant Name	Source Locality
<i>Liriodendron chinense</i>	Ma-Li-Po, Southeast Yunnan, China
<i>L. tulipifera</i>	North America
<i>L. chinense</i> x <i>L. tulipifera</i>	Nan-Jing University of China
<i>Manglietia aromatica</i>	Xi-Chou County of Yunnan, China
<i>M. Chingii</i>	Xi-Lin County of Hu-Nan, China
<i>M. crassipes</i>	Xi-Chou County of Yunnan, China
<i>M. duclouxii</i>	Lao-Jin-Shan Mountain of Yunnan, China
<i>M. fordiana</i>	Yong-De County of Yunnan, China
<i>M. forestii</i>	Lu-Chun County of Yunnan, China
<i>M. glauca</i>	Vietnam
<i>M. grandis</i>	Ma-Li-Po, Ma-Guan and Xi-Chou of Yunnan, China
<i>M. hainanensis</i>	Yong-De of Yunnan, China
<i>M. hebecarpa</i>	Xi-Chou of Yunnan, China
<i>M. hookeri</i>	Teng-Chong of Yunnan, China
<i>M. insignis</i>	Yun-Jiang and Wen-Shan of Yunnan, China
<i>M. kungshanensis</i>	Gong-Shan of Yunnan, China
<i>M. megaphylla</i>	Xi-Chou of Yunnan, China
<i>M. wangii</i>	Lu-Chun of Yunnan, China
<i>Manglietiastrum sinicum</i>	Xi-Chou of Yunnan, China
<i>Magnolia amoena</i>	Shan-Hai Botanic Garden, China
<i>M. campbellii</i>	Jing-Chuang of Yunnan, China
<i>M. coco</i>	Jing-pin of Yunnan and Si-Chuang, China



Above: *Michelia yunnanensis*.
Below: *Manglietia insignis*.



<i>M. cuspidata</i>	Nan-Yue Botanic Garden of China
<i>M. cylindrica</i>	Huan-Shan Forestry Institute of China
<i>M. dawsoniana</i>	New Zealand
<i>M. delavayi</i>	Kunming, Yunnan, China
<i>M. delavayi</i> (Red Form)	Hua-Fu Mountain of Mou-Din County of Yunnan, China
<i>M. delavayi</i> var. <i>albirlosa</i>	Mong-Hai and Mong-Lun of Yunnan, China
<i>M. denudata</i>	Kunming of Yunnan, China
<i>M. globosa</i>	Gong-Shan County of Yunnan, China
<i>M. grandiflora</i>	Kunming Nursery, Yunnan, China
<i>M. heptapeta</i> [denudata]	Da-Guan County of Yunnan, China
<i>M. kobus</i>	Japan
<i>M. liliiflora</i>	Da-Li of Yunnan and Zhe-Jiang, China
<i>M. macrophylla</i>	New Zealand
<i>M. mollicomata</i>	New Zealand
<i>M. odoratissima</i>	Xi-Chou of Yunnan, China
<i>M. officinalis</i>	Xin-Wei of Yunnan, China
<i>M. officinalis</i> var. <i>biloba</i>	Xin-Wei of Yunnan, China
<i>M. penetalauma</i>	Zen-yun of Yunnan, China
<i>M. rostrata</i>	Gong-Shan and Yun-Long of Yunnan, China
<i>M. sargentiana</i>	Da-Guang of Yunnan, China
<i>M. sieboldii</i>	Shen-Yang Arboretum of China
<i>M. x soulangiana</i>	Kunming of Yunnan, China
<i>M. x soulangiana</i> (white)	New Zealand
<i>M. stellata</i>	Germany
<i>M. tripetala</i>	Germany
<i>M. virginiana</i>	Germany
<i>M. wilsonii</i>	Li-Jiang of Yunnan, China
<i>M. zenii</i>	Han-Zhou Botanic Garden of China
<i>Parakmeria lotungensis</i>	Han-Zhou Botanic Garden of China
<i>P. nitida</i>	Gong-Shan of Yunnan, China
<i>P. omeiensis</i>	Ma-Guan of Yunnan, China
<i>P. yunnanensis</i>	Ma-Li-Po and Xi-Chou of Yunnan, China
<i>Alcimandra cathcardii</i>	Lao-Jin-Shan Mt. of Yunnan, China
<i>Michelia aenea</i>	Xi-Chou of Yunnan, China
<i>M. alba</i>	Kai-Yun of Yunnan, China
<i>M. calcicola</i>	Ma-Li-Po Mt. of Yunnan, China
<i>M. champaca</i>	Yong-Pin of Yunnan, China

<i>M. cavaleriei</i>	Ma-Li-Po of Yunnan, Hu-Nan of China
<i>M. chapensis</i>	Guan-Xi Forestry Institute of China
<i>M. Chingii</i>	Hu-Nan Province of China
<i>M. crassipes</i>	Jin-Guan-Shan of China
<i>M. doltsopa</i>	Chen-Du Botanic Garden, Si-chuang Province of China
<i>M. fallax</i>	Xin-Lin County of Hu-Nan Province of China
<i>M. figo</i>	Kunming of Yunnan, China
<i>M. floribunda</i>	Jin-Dong and Chu-Xiong of China
<i>M. foveolata</i>	Xin-Lin County of Hu-Nan Province of China
<i>M. fulgens</i>	Xi-Chou of Yunnan, China
<i>M. hedyosperma</i>	Xi-Chou of Yunnan, China
<i>M. kisopa</i>	Kui-Shan of Yunnan, China
<i>M. longipetiolata</i>	Da-Guan of Yunnan, China
<i>M. lacei</i>	Lu-Xi, Jiang-Pin and Ma-Guan of Yunnan, China
<i>M. macclurei</i>	Guan-Xi Botanic Garden of China
<i>M. martinii</i>	Chen-Du Botanic Garden of China
<i>M. maeilui</i>	Xin-Lin of Hu-Nan Province of China
<i>M. maudiae</i>	Xin-Lin of Hu-Nan Province of China
<i>M. megalimba</i>	Long-Lin of Yunnan, China
<i>M. microtricha</i>	Da-Yao and Long-Lin of Yunnan, China
<i>M. pachycarpa</i>	Ma-Guan of Yunnan, China
<i>M. platypetala</i>	Hu-Nan Province of China
<i>M. skinneriana</i>	Hu-Nan Province of China
<i>M. sphaerantha</i>	Wu-Lian-Shan of Yunnan, China
<i>M. yunnanensis</i>	Kunming of Yunnan, China
<i>Paramichelia baillonii</i>	Lu-Chun of Yunnan, China
<i>Tsoongiodendron odorum</i>	Guan-Xi Province of China

Of the above cultivated species, 58 were collected from Yunnan, 20 from other provinces of China, and 10 from other countries. Still, there are about 20 species of Magnoliaceae plants in Yunnan which need to be introduced or conserved in their natural environmental condition. At present, about 80 species listed above are growing very healthily at Kunming Botanic Garden (KBG).

2. Cultivation of Magnoliaceae plants at KBG

Propagation from seeds—

For most of the species whose seeds mature in the same year it is the right time for seed collection when the fruits split to reveal the bright red or orange seed coat; this usually occurs in late summer and early autumn. Almost all the seed need to be sown as soon as collected, otherwise the seeds have to be stratified in sand. Usually, if the seeds are stored more than 6 months their viability will be rapidly reduced. In Kunming seeds can be sown after maturing in autumn and the seedlings will be transplanted in the following late spring or early summer. The key for culturing the sturdy seedlings and reducing costs is to transplant seedlings in time. For example, *Michelia sphaerantha*, *Parakmeria yunnanensis*, *Michelia maudiae* and *Magnolia delavayi* seeds can be sown after collecting, and next May to June the seedlings reach 6–10 cm high. This stage is the right time for transplanting. In December of the same year of transplanting the young plants can reach 50 cm high. If the seedlings are transplanted in August, the growth will be remarkably inhibited and the average height in December is only about 14 cm.

Some other plants like *Liriodendron chinense*, *Manglietia aromatica*, and *Michelia martinii* are un-pollinated fruiting plants. If the population is small, the fruits can be developed but the seeds undeveloped and are not worth sowing. For those species is it necessary to make hand-pollinations and spray chemicals like boron which result in more developed seeds. The percent germination can also be improved by washing seeds before sowing.

Vegetative Propagation—

Our experiment showed that many Magnoliaceae species can be propagated by cuttings, scion grafting, and inarching (approach grafting). The cuttings taken from 2–3 year seed-plants are very easy to root, but cuttings from older stems (or flowering branches) of same age seed-plants are difficult to root. In Kunming, vegetative propagation can be done during the time period before sprouting for deciduous species, but for evergreen species it is possible anytime if the proper facilities are provided. Difficulty of cutting propagation, from easy to

hard, is *Michelia*, *Magnolia*, *Parakmeria*, *Liriodendron*, *Manglietia*, etc.

Main considerations for cultivation—

For Magnoliaceae plants, warm and damp weather and fertile soils of pH under 7 with good drainage are important. In central Yunnan the deciduous species are planted in spring, and early summer is the most suitable time for planting evergreen species. For big plants of *Liriodendron chinense*, *Magnolia denudata*, *Magnolia delavayi*, *Parakmeria yunnanensis*, *Michelia floribunda*, *Michelia macclueri*, and *Michelia maudiae* the root system needs to be protected prior to transplanting. This is particularly important for bare root plants.

As with other reforestation programs, the maintenance after planting or replanting is very important, especially watering, drainage, and top-dressing with fertilizer during the first 3 years. The planted street trees of *Michelia sphaerantha* in Qin-Nin-Lu Road of Kunming City and *Manglietia insignis* in the north part of Bei-Jing Road of the City are growing very poorly just because the maintenance is not good.

3. Further Utilization of Yunnan Magnoliaceae Plants

At present some Yunnan Magnoliaceae plants like *Parakmeria yunnanensis*, *Manglietia insignis*, *Michelia yunnanensis*, *Michelia sphaerantha*, red form *Magnolia delavayi* and so on have already been used as street trees in most big cities of Yunnan Province. Quite a lot of plants, including the introduced species from the family, have long been popularly cultivated in gardens and parks, and some of them are very old. For example, the 300 year old *Magnolia delavayi* inside Qiong-Zhu Temple of Kunming, 300 year old *Magnolia denudata* in Shong-Ming County, 600 year old *Manglietia insignis* in Hong-He County, 600 year old *Magnolia campbellii* in Nan-Hua county, 400 year old *Parakmeria yunnanensis* in Xi-Chou County, and so on. They are the treasures in this Province.

Recently in China some Magnoliaceae plants used for sources of ornamental perfume have become increasingly in demand. There are particularly some new varieties and hybrids found naturally in the wild, such as the red form *Magnolia delavayi*, the red form *Magnolia officinalis*, and so on. The exploration of Yunnan Magnoliaceae plant resources for both the domestic and international market is becoming more and more important. Unfortunately this has just been started recently. Dwarf plants with long lasting flowers, with a rich color range, and a wide adaptability are desirable.

Generally, most of the plants from the Magnoliaceae have big, fragrant flowers which are of interest to people, but some genera like *Manglietia* and *Michelia* have flowers that are aromatic but much smaller. Plants flowering in early spring to early summer are the colorful species, and those that flower in late summer to autumn are not interesting in their flower color. We found cultivated *Magnolia campbellii* plants that were purple, red, and white. Purple *Michelias* were found as well. Other plants, like *Michelia floribunda*, have a very big variation in flower color and plant shape; even in leaf color. All of the above are important for breeding new cultivars for further utilization.

As with other trees it takes a long time (about 10 years) to flower these species from seed at Kunming. Of course some species, like *Michelia yunnanensis* and *Magnolia delavayi* could be flowered after 3-5 years from seeds if the right cultivation conditions could be provided. Usually, Magnoliaceae plants flower once a year and last about one month. But some cultivated plants in the Kunming Botanic Garden can flower at least twice a year with long lasting flowering. It is possible that some new cultivars with long lasting flowers and more flowering times per year could be bred by using the above-mentioned plant materials. ❁