

Studies On *Magnolia Delavayi* and Its Natural Forms

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Background

Franchet named *Magnolia delavayi* in 1889 based on the specimen collected in China in 1886 by the French missionary, Père Jean M. Delavay. It was first introduced into cultivation in England by E. H. Wilson, who collected seeds during the autumn of 1899 from southern Yunnan. Since then, *M. delavayi* has gradually spread into many countries as an evergreen ornamental shrub.

Magnolia delavayi is a special species in Magnoliaceae. Its flower tepals open mostly in the evening and last only a few hours. In China, it is called the *Holy Flower of Chinese Buddhism*, or, in Chinese, *Youtan Hua*, which means “Flower Briefly as the Broad-leaved Epiphyllum.” (*Editor’s Note: Epiphyllum oxypetalum* is a species of Orchid Cactus. There are about 20 spp., all of which are native to the New World Tropics. The flowers are stunning but only bloom briefly at night.) Before it was named, the Holy Flower of Chinese Buddhism had been cultivated in China as an ornamental, religious, and medicinal plant for over 800 years. Thus, most of the very old trees are commonly found near temples or in villages in Yunnan and other parts of China. For example:

- An 800-year old *M. delavayi* grows in the yard of the Caoxi Temple at Anning county near Kunming in Yunnan. This tree is 8m high, with a 74cm base-trunk diameter and still flowers well every year.
- A 230-year old *M. delavayi* thrives in the Yufen Temple of Lijiang in the province of Yunnan. This tree is also a very attractive



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M. Delavayi normal forms. This form is the same as the species in nature. There are nine tepals: the outer three are green and the inner six are pure white.



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M. Delavayi 'Red Buddha.' This form has nine tepals, which are pure red in color except on the base. The styles are red and fresh carpels are creamy white.



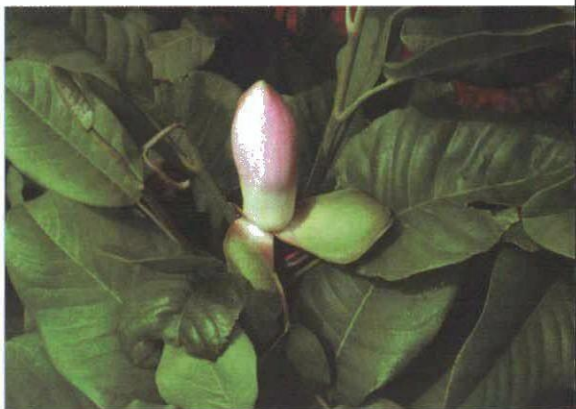
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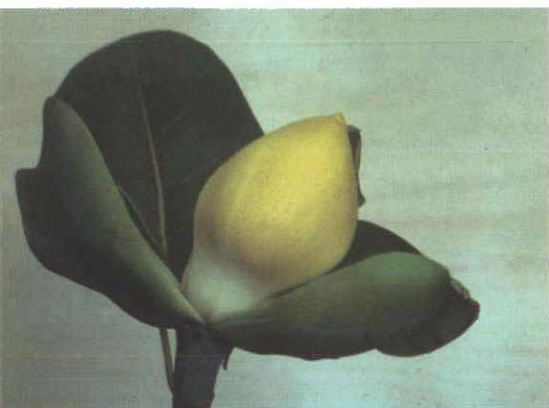
M. Delavayi 'Pink Buddha.' The six inner tepals of this form are light pink and the outer three tepals are pinkish green or green.



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M. Delavayi 'Pinkish White Buddha.' The color of the inner tepals are somewhere between the 'Pink Buddha' and the normal form. The outer three tepals are green.



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M. Delavayi 'Yellow Buddha.' This form has six yellow inner tepals with three outer tepals that are pure green.



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M. Delavayi 'Multi-tepal.' This form has more than nine tepals per flower. The tepals gradually decrease in size from the outer circle to the inner circle.

specimen growing about 10m high with a 134cm base-trunk diameter. (Also growing near the temple are four *Michelia yunnanensis*, aged 120–200 years.)

So far, our investigations have discovered some ten cultivated *M. delavayi* in Yunnan over the age of 130 years, which suggests the importance of *M. delavayi* to Chinese Buddhism and to traditional gardening.

Horticulturally, there are no reports about hybrids or cultivars being raised from this Chinese species. However, some naturally occurring new forms have been found and it is important to consider the many factors that may have affected *M. delavayi* during its long history of cultivation. It is essential to study all the natural forms and their propagation in the horticultural field. This is not only just to name the forms being used horticulturally, but also to create new Magnolia cultivars by using the forms in hybridization.

Botanical and Horticultural Features

Magnolia delavayi is one of the evergreen magnolias. Specimens can reach some 12m in height. The trunk is rough with dark brown bark and the twigs are gray or brown, slightly pubescent at first and then becoming almost glabrous with maturity. The leaves are leathery, up to 17–32cm in length, 10–20cm in width, and usually ovate or rarely elliptic. Leaves are coriaceous, dark green above, pale green beneath, and slightly pubescent, becoming glabrous. In naturally occurring specimens, the flowers are 18–20cm across, scented, pure white, and have nine glabrous tepals. The outer three tepals are greenish, becoming reflexed. The flowers are sparse, usually opening at night and lasting only a few hours. Its follicetum is oblong, about 5–6cm long, and brown. *Magnolia delavayi* usually flowers from April through June; however in cultivation, it sometimes flowers a second time in October. The fruits ripen in September and October producing seeds covered with a reddish-orange skin.

Magnolia delavayi has elegant evergreen matte leaves and a handsome, bush-like shape. It is a very attractive ornamental plant. Because of its

horticultural value and its place in Chinese Buddhism, *Magnolia delavayi* has long been grown in yards, temples, parks, and gardens, as well as on the streets in cities. Nowadays, it is the most common evergreen Magnolia growing in China, followed by *Magnolia grandiflora*, which was introduced from SE North America.

Natural Distribution and Habitat

Magnolia delavayi is native to Yunnan, south Sichuan, and southwest Guizhou in southwest China. In Yunnan, it is a very widely distributed species, and can be found from the lower altitude regions like Wenshan and Mengzi of southeast Yunnan, through the center to the west and northwest parts of the province. Its natural habitat is in the broad-leaved forests or on the wet limestone mountain slopes by streams at 1500–2850 meters. Sometimes, it also grows well on sunny, dry mountain slopes. Most likely, Yunnan is the distribution center of this magnolia. Unfortunately, its habitat is being destroyed by heavy logging and the large specimens and large populations are rarely seen in their natural habitat nowadays. It is very fortunate that *M. delavayi* is so loved by the Chinese people in Yunnan and elsewhere in China, because it has been well conserved *ex situ* through cultivation in public and private plantings—*M. delavayi* can be found somewhere in many Chinese cities.

Natural Forms and Their Horticultural Treatment

During the past several years, a comprehensive investigation of the status of *M. delavayi* in cultivation in Yunnan and in its natural condition has been conducted. In cultivation, *M. delavayi* has been traditionally propagated by seeds and layering. Similar to *M. officinalis*, *M. delavayi* has been cultivated in China for hundreds of years. Because of this long period of cultivation, *M. delavayi* has been affected by many factors such as artificial influences and genetic variations. The results of this study indicate that many different natural forms, based on flower characters such as tepal color and number of tepals, exist. It is essential that these forms be studied and

be considered for future breeding so that new and improved cultivars of *M. delavayi* can be made available to world horticulture.

Forms and Their Names

Almost all of the currently known natural forms of *Magnolia delavayi* have been introduced into cultivation at Kunming Botanic Gardens for in-depth studies. The morphology (Table 1) and palynology (Plate 1) indicate that there is no difference between forms in pollen structure and other morphological features except for flower color and tepal shape. Following the *International Code of Nomenclature for Cultivated Plants* (1995), we felt it better to treat all these "natural" forms as cultivars.

With regard to ornamental horticulture, these seven forms of *M. delavayi* (including the species) have been described and named as follows (see photographs on pages 2, 3, and 10):

- *Magnolia delavayi* (normal form)
This form is the same as the species in nature. There are nine tepals: the outer three are green and the inner six are pure white.
- *Magnolia delavayi* 'Red Buddha'
This form has been selected from seedlings during the long period of cultivation. The nine tepals are pure red in color except on the base. The styles are red, and fresh carpels are creamy white. 'Red Buddha' is the best of the forms and is not only important as an ornamental plant, but also has great potential in breeding programs.
- *Magnolia delavayi* 'Pink Buddha'
Again, this cultivar has been selected from the seed progeny of plants under cultivation. Its inner six tepals are light pink, and outer three tepals are pinkish green or green; the styles are creamy white.
- *Magnolia delavayi* 'Pinkish-white Buddha'
The color of the inner tepals is somewhere between the 'Pink Buddha' and the normal form. The outer three tepals are green; the styles are the same as the species.

Characters

Forms	Leaves					Twigs				Tepals		
	Shape	Width/Length	Surface	Texture	Color	Surface	Bark	Outer	Middle	Inner		
Normal form	ovate, narrowly ovate to elliptic	0.5-0.6	glabrous or sparsely pubescent over the surface to midrib; veins above; glaucous glabrous or few pubescent beneath	chartaceous; dark green	dull green	yellowish hairs	lenticels	3, whitish or deep green	3, white	3, white		
'Red Buddha'	ovate, narrowly ovate to elliptic	0.5-0.6	glabrous or sparsely pubescent over the surface to midrib; veins above; glaucous glabrous or few pubescent beneath	chartaceous; dark green	dull green	yellowish hairs	lenticels	3, pink	3, deep red	3, deep red		
'Pink Buddha'	ovate, narrowly ovate to elliptic	0.4-0.5	glabrous or sparsely pubescent over the surface to midrib; veins above; glaucous glabrous or few pubescent beneath	chartaceous; dark green	dull green	yellowish hairs	lenticels	3, pink on top with green base	3, pink	3, pink		
'Pinkish-white Buddha'	ovate, narrowly ovate to elliptic	0.52-0.64	glabrous or sparsely pubescent over the surface to midrib; veins above; glaucous glabrous or few pubescent beneath	chartaceous; dark green	dull green	yellowish hairs	lenticels	3, pinkish white	3, pinkish white	3, pinkish white		
'Yellow Buddha'	ovate, narrowly ovate to elliptic	0.55-0.68	glabrous or sparsely pubescent over the surface to midrib; veins above; glaucous glabrous or few pubescent beneath	chartaceous; dark green	dull green	yellowish hairs	lenticels	3, green or creamy green	3, creamy yellow	3, creamy yellow		
'Multi-tepal'	ovate, narrowly ovate to elliptic	0.54-0.65	glabrous or sparsely pubescent over the surface to midrib; veins above; glaucous glabrous or few pubescent beneath	chartaceous; dark green	dull green	yellowish hairs	lenticels	flowers up to 27 tepals in multi-whorl arrangement; outer petals are largest, gradually getting smaller towards center; white or creamy white.				
'Agate'	ovate, narrowly ovate to elliptic	0.56-0.68	glabrous or sparsely pubescent over the surface to midrib; veins above; glaucous glabrous or few pubescent beneath	chartaceous; dark green	dull green	yellowish hairs	lenticels	flowers of 9-12 tepals on the same tree; 1 or 2 of the outer 3 tepals are whitish pink with vertical green stripes				

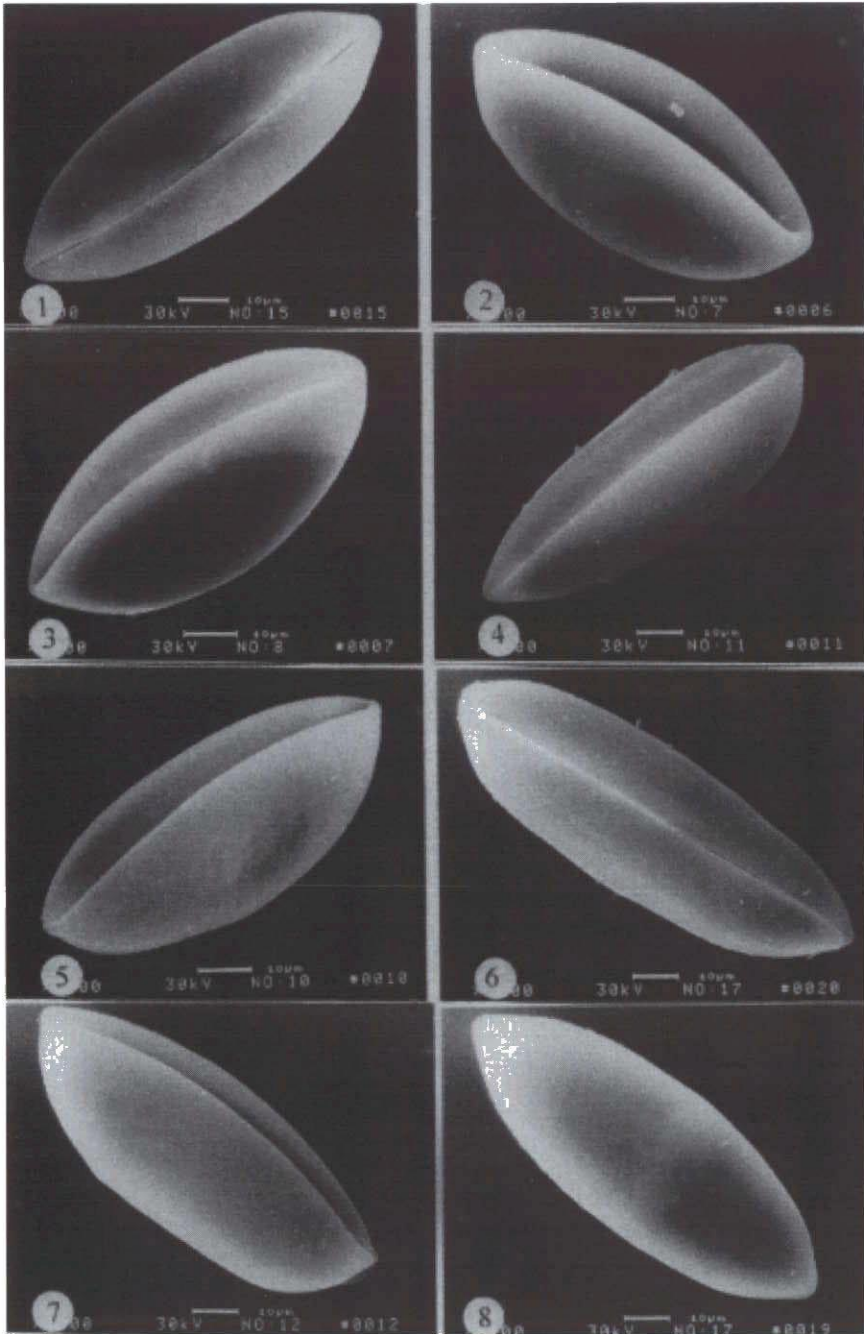


Plate 1 Pollen morphology of the forms of *M. delavayi*

1. Normal form 2. 'Red Buddha' 3. 'Pink Buddha' 4. 'Pinkish White Buddha'
5. 'Yellow Buddha' 6. 'Multi-tepal' 7 & 8. 'Agate'

- *Magnolia delavayi* 'Yellow Buddha'
This form has six yellow inner tepals with three outer tepals that are pure green. Again, it has a great potential in a breeding program of magnolias.
- *Magnolia delavayi* 'Multi-tepal'
In the cultivated forms of *M. delavayi*, it has been observed that the plants have more than nine tepals (normally 10, 11, 12) per flower. There appears to be no ornamental differences between this form and the species except that 'Multi-tepal' has more than 20 creamy-white tepals in a single flower, and the tepals gradually decrease in size from the outer circles to the inner circles. Our observations suggest that the multi-tepal character is the result of stamen tepalization.
- *Magnolia delavayi* 'Agate'
For this form, the number of tepals per flower varies between 9 to 12 on the same plant. One or two outer tepals are pinkish white, with long, green vertical stripes in the center; inner tepals are pale pinkish with some pinkish vertical (variegated green) stripes. 'Agate' is one of the most beautiful *M. delavayi*.

Problems in Cultivation

Magnolia delavayi can be grown in subtropical and temperate regions, but can also be grown in cooler areas if the seeds or other propagation materials were collected from higher altitudes. Under cultivation it does not have serious problems with pests and diseases. Unfortunately, however, it is slow to reproduce vegetatively and does not produce many fruits, which makes collecting seed difficult.

Sexual Propagation

Generally, *M. delavayi* does not produce many fruits, especially in cultivation. To try to understand the reasons for poor fruiting, we carried out some detailed observations on the pollination process. The results of our observations indicated that one of the primary reasons for poor fruiting is that *M. delavayi* most always blooms at night. If the flowers are only open at night, it might be more difficult for pollinators to visit. We noticed that *M. delavayi* growing under the



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M. Delavayi 'Agate.' For this form, the number of tepals per flower varies between 9 and 12 on the same plant. One or two outer tepals are pinkish white with long, green vertical stripes in the center. The inner tepals are pale pinkish with some pinkish vertical stripes.

street lights at Kunming fruited well every year. We assumed this was because the night lighting attracts pollinators like beetles or moths, who then visit the opened flowers. (Because of *M. delavayi*'s nighttime pollinating habits, it has been given the nickname "Spectres of the Night.")

To test our theory, we conducted an artificial lighting experiment on the Magnoliaceae collection at the Kunming Botanical Garden during the flowering season of 1997 and 1998. We conducted an experiment whereby a group of *M. delavayi* were subjected to standard artificial lighting, which attracted pollinators such as beetles. When compared with *M. delavayi* that were *not* subjected to artificial lighting, the experimental group produced an excellent crop of fruit. This technique is an important discovery, not just for *M. delavayi*, but for other plants that have similar flowering habits. In fact, some researchers using the same technique have achieved enhanced fruit production for *Magnolia coco*.

Our observations have also shown that the pollination of *M. delavayi* can take place at night at lower temperatures if the pollination is performed by hand. This theory is supported by the work of British amateur researcher, Mr. John D. Carlson, (through personal conversation).

Using both of the techniques described above, we are now able to produce more seed than otherwise would be possible. With a substantial increase in the production of seed, we are able to rapidly raise young plants for further new cultivar selection or for use in traditional gardening. It is also a feasible way to produce a great number of stock plants for vegetative propagation of the natural forms.

Seeds can be sown directly in the growing medium, or they can be stratified with sand or stored in the freezer at a temperature of 3–5 °C. The seeds can then be sown in the spring. Seeds treated in this manner will germinate within 3 to 5 weeks after sowing. The seedlings can be transplanted when they are about 5–8cm high, and potted on in the same year. It takes about 3 to 5 years for the resulting plants to produce flowers.

Asexual Propagation

We also investigated various asexual, or vegetative, propagation techniques with the intent of propagating the forms of *M. delavayi*. We tested the techniques of layering, cuttings, grafts (chip-budding), and micropropagation.

A major problem emerged when propagating using layering or cuttings: the rooting process is extremely slow; it can take some 1-2 years to root. Also only about 15–30% of the cuttings successfully rooted. We have tried many methods, but further studies on rooting are still needed.

For chip-budding, the common form of *M. delavayi* or *M. grandiflora* can be used as stock. Here, the key for successful budding is to keep the graft moist enough in the first two months. In Kunming, late summer is the optimum season for cuttings, grafting, and layering.

We have done some testing with micropropagation of *M. delavayi* and, once again, the main problem is difficulty in inducing roots.

Choosing a Site, Transplanting, and Culture

Magnolia delavayi will grow well in sunny sites with a soil pH of 5.0–6.5. The soil must be fertile and well drained. Although, *M. delavayi* is considered a subtropical plant, it can be grown in areas with minimum temperatures of -5°C or even -15°C , especially when using plants from a high elevation provenance. *M. delavayi* can be found on mountain slopes at elevations of 2800 meters on Gaoligong Mtn. in W. Yunnan and on Huaifu Mtn. in the center of Yunnan. Even though *M. delavayi* can sometimes be grown in cold regions, note that there are wide variations in hardiness between individual seedlings, even from the same population.

Once the seedlings or vegetative plantlets are 5–12cm in height, they should be transplanted. First, bag the young plants and then pot them on until they are big enough to be planted out in the garden or other places. *M. delavayi* does not need special care, but watering after planting is the key to survival. A good layer of mulch around the tree at all times keeps the soil moist and reduces weeds. Normally, pruning is not necessary, but it is sometimes required to shape the tree two or three years after planting. Once the shaped tree has been established, prune only to remove dead and diseased branches. Top dressing is sometimes necessary, and usually it should be applied before the end of the growing season.

It can be said that it is easy to grow the *Holy Flower of Chinese Buddhism* if you are a real lover of Magnolias. 🌸

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Acknowledgement: Prudence Holliger and Dick Figlar for helping in editing the paper.

This study was supported by the Magnolia Society and the National Science Foundation of China (NSFC).

Corrections

Issue 66 contained the following errors:

Cover. Volume number should be XXXIV No. 2.

Cover. Mr. Sima Yongkang's name is spelled incorrectly.

Caption for Figure 6 should read *Manglietia conifera*.

Caption for Figure 7 on page 14 should read *M. macclurei* var. *sublanaea* Dandy. (See related article on page 29 of this issue.)

Page 7. The plant referred to as *M. xanthantha* should be called *M. calcicola* C. Y. Wu. (See related article on page 29 of this issue.)

Figure caption on page 25 should read 'Banana Split.'

Photo credit for Figure 12 on page 15 should read 'Anita Figlar.'