Magnolia garrettii at the botanic garden in Graz, Austria

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The evergreen *Magnolia garrettii* (Craib) V.S. Kumar of the Asian section *Manglietia* has raised our interest due to its strongly colored flowers and its, up to now, unknown phytochemical and pharmacological properties. A few notes on the cultivation of this species at the botanical garden in Graz together with some remarks on its phytochemistry may be of interest to the reader.

The British botanist at Kew, William Grant Craib (1882-1933) described *Manglietia garrettii* in 1922. He dedicated the new species to its collector, the Briton Henry Burton Guest Garrett, conservator at the Forestry Department in Chiang Mai (May 12, 1871, Teddington, Middlesex, England April 26, 1959, Chiang Mai, Thailand). Garrett was an important collector of flowering plants (c. 1500 collection numbers) in northern Thailand (Jacobs, 1962).

In the course of a stay in northern Thailand, seeds of *M. garrettii* were collected in early 1998 by Dr. Hans Malicky (Lunz, Austria) near Doi Inthanon in the province of Chiang Mai (Gusenleitner & Malicky, 2010). Like other members of the section *Manglietia*, *M. garrettii* typically inhabits evergreen broad-leaf forests at mid-elevation at c. 1500 msm (Gardner et al., 2000). Its Thai name is *montha doi*, *montha pa*, มณฑาป่า, and the section *Manglietia* has a center of diversification in Thailand. *M. garrettii*, at first only known from Thailand, has also been reported from Vietnam and southern Yunnan province in China. In its natural habitat, the tree reaches up to 30 m. The section *Manglietia* currently consists of approximately 36 taxa, out of which *M. phuthoensis* (Dandy ex Gapnep.) V.S. Kumar from Vietnam is probably the most well-known species for its medicinal use. The bark of other members of the section *Manglietia* may be in use as a substitute for the more costly magnolia bark (Magnoliae cortex, Hou-Po) which is harvested mainly from *Magnolia officinalis* from China.

Among other material for the botanic garden in Graz, Malicky had fortunately collected seeds from *M. garrettii* as well. After returning from Thailand on January 29, 1998, the seeds were personally picked up (H. T. and H. Gruebler) at Malicky´s home in Lunz to avoid any possible exposure to freeze during a postal shipment. Immediately afterwards, the seeds were sown on February 9th in a warm-bed of the tropical house at the botanic garden. The temperature was maintained at around 25 °C and the seeds were readily germinating and becoming visible above the soil on March 22nd. The seedlings were transplanted during summer 1998 and kept in pots during the first winter. About two years later, one plant was then bedded out into the temperate house, where it developed into a medium-sized tree. A few notes may help to illustrate the climate inside the temperate

house at the botanic garden of Graz. The winter daily minimum temperature is kept relatively constant at 13-14°C, sometimes dropping to 12°C. During average winter days, the daily maximum temperature reaches 18-20°C, with peaks on sunny days up to 24°C. Naturally, the temperature span is greater in summer, where the night temperatures are around 14-16°C, but average daily maximum temperatures may reach over 30°C. The absolute highest temperature recorded was 37°C, and it could be assumed that the tree top gets exposed to even higher temperatures because of the tree's close proximity to the roof of the temperate house.

Magnolia garettii in the greenhouse at Graz.

Our individual tree of *M. garrettii* turned out to be relatively fast-growing and reached the top of the greenhouse, 14 m, within less than 10 years. Thus, the top of the tree had to be trimmed several times beginning in 2007. The parts of the plant that were removed from the top could then be used for phytochemical investigation. A striking character of the tree grown at the temperate house is its narrow columnar crown habit, where the diameter of the crown averages 3.2 m (November 2010) and the circumference of the whole plant is not greater than about 9-10 m. The diameter at breast height (DBH) is 18/20 cm. As seen from the figure, the branches at first bend downward, but then begin curving upward in a characteristic manner. Their length is about 1 m near the top and up to 3-4 m in the middle and below. About 20 cm above soil, the tree has produced a stem about 6.3 m high, with a diameter of 6 cm at its base and a DBH of 5.5 cm and branches of 0.5-2 m. The bark of the trunk is light brown in color and bears cork lenticels. Another character that could be often seen in the section *Manglietia* are the stipules, which are adnate to the petiole. However, the main distinguishing character of *Manglietia* lies in the presence of four to many ovules per carpel. So far, the tree has not been affected by either a fungus or an infestation of insects.

Similar to *M. insignis* from section *Manglietia*, *M. garrettii* is known for its strong flower coloration, which in the case of *M. garrettii* is slightly more purplish. The first reported blossom of *M. garrettii* in our temperate house occurred in April 2009 with three flowers on branches c. 0.3 m above the ground. A second, but more productive, flowering occurred in

April and May 2010 when 5 flowers were produced. The buds measured 10 cm long and remained at this stage for several days, making it difficult to anticipate the exact day of anthesis. The flowers were lovely, displaying a rather dark pink color. The nine tepals are fleshy and the flower is slightly fragrant. The dehiscence of the stamens during the male phase of the anthesis can be seen as well. Immature fruits were collected under the tree in August 2010.

Mature flower-bud and sumptuous bloom of *Magnolia garrettii*.

The botanic garden at Graz at its present location dates back to the 1870s, when under H. Leitgeb, former professor of botany at the University of Graz, a suitable area in the vicinity of the University was found. In 1888/89, the garden in its current form was established and about 100 years later, new greenhouses were erected, which were inaugurated in June 1995 (Teppner, 1997). The geographical coordinates are 47°04′55″ N latitude and 15°27′28″ E longitude and the elevation is 365 m. It mostly serves scientific purposes.

Medicinal magnolias

The Magnoliaceae is a rich source of natural compounds (i.e. secondary metabolites) belonging mainly to the compound classes of sesquiterpenes alkaloids and lignans. Some of its secondary compounds have reported pharmacological activities of various kinds. The family is therefore famous in Asian traditional medicine, where, e.g., *M. officinalis* Rehd. & Wilson, *M. officinalis* var. *biloba* Cheng & Law from China and *M. obovata* Thunb. from Japan, all belonging to the section *Rhytidospermum* have been used medicinally since ancient times. Interestingly, the umbrella tree, *M. tripetala* (L.) L., also belongs to *Rhytidospermum*, and it, too, was used medicinally by the Native Americans of the southeastern United States. Together with *M. virginiana* and *M. acuminata*, it was recognized in the U.S. Pharmacopoeia (2nd list, 1820-94) for treating rheumatism (Schuehly et al., 2001). Taking the interesting chemical and pharmacological properties of the family Magnoliaceae together, a study of *M. garrettii* appeared worthwile. In the course of ongoing investigations on the secondary metabolites as well as the pharmacology of the Magnoliaceae, we have investigated

the non-polar extract of leaves and young twigs of *M. garrettii* (Schuehly et al., 2010). As a result, besides the known biphenyl lignan honokiol, certain dimeric lignans, which we called garrettilignans, could be detected. All these lignans resemble compounds that have been previously isolated from *M. officinalis* and *M. obovata*. From a chemotaxonomic point of view, this finding may underline the close relationship between sections *Manglietia* and *Rhytidospermum*, as these sections turned out to be sister clades in most of the DNA based molecular phylogenies.

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