

Flowering Sequence of Deciduous Magnolia Cultivars in North Florida

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Weather during most of winter 2006–2007 was unseasonably mild for much of eastern North America (National Climatic Data Center, 2007). In north Florida, spring-like temperatures forced many deciduous magnolias into flower as much as six weeks earlier than usual. When more normal winter weather reached the area in late January and February, it was no surprise that sub-freezing temperatures damaged many magnolia flowers. Weather is unpredictable, but planting magnolia varieties that bloom later can help avoid frost and freeze damage.

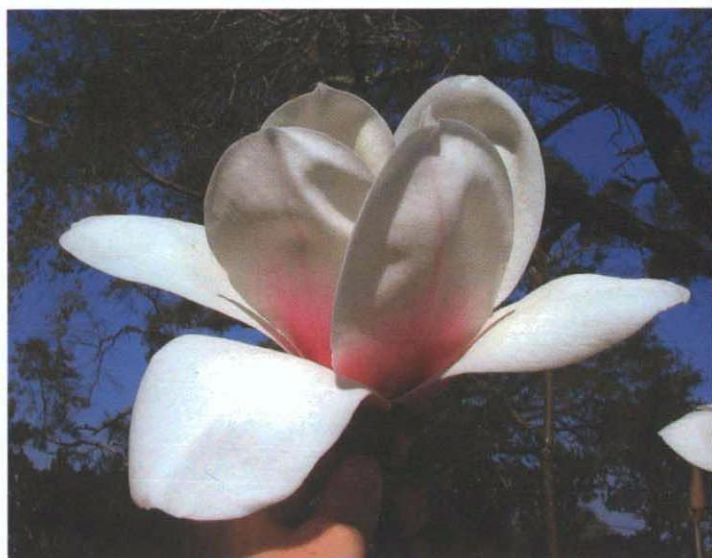
Most widely grown deciduous magnolias were selected from early spring-blooming Yulan Magnolia (*Magnolia denudata*), Lily Magnolia (*Magnolia liliiflora*), Star Magnolia (*Magnolia stellata*), and their hybrids. Many selections of these species and hybrids begin flowering in late December and January in north Florida with peak bloom occurring in January and February. Many newer, improved hybrids flower later, as do selections derived from the Cucumber Tree magnolia (*Magnolia acuminata*), thus reducing the risk of frost damage.

To characterize the flowering sequence of magnolia cultivars in north Florida, I evaluated flowering data collected over a five-year period (2003–2007) at a planting in Quincy, Florida. Statistical comparisons of cultivar flowering dates is not possible because this planting includes only one plant of each cultivar, trees were not the same size at planting, and not all trees were planted at the same time. However, comparative flowering times of established trees over several years may be of interest.

Magnolia garden description

More than 95 cultivars and species of deciduous flowering magnolias have been planted at the University of Florida/IFAS North Florida Research and Education Center in Quincy, Florida (Knox 2007). This location is in USDA cold hardiness zone 8b and AHS heat zone 9. The site has an elevation of about 190 feet and is located at 30°:32':6"N and 84°:35':79"W, about ten miles south of the Georgia state line, 20 miles west of Tallahassee, Florida, and 50 miles north of the Gulf of Mexico. The soil is a Ruston loamy fine sand with pH of 5.8. The 2½-acre site includes a scattering of about 12 mature trees (oaks, Southern magnolias, pecans and pines), providing a minor amount of shade.

Annual rainfall from 2003 through 2006 was 47.9, 58.2, 54.6, and 41.2 inches (121.7, 147.8, 138.7, and 104.7 centimeters), respectively, as compared to the average annual precipitation of 56.311 (143cm)/year (Florida Automated Weather Network 2007). Winter monthly minimum and maximum air temperatures and hours below 45°F (7.2°C) are shown in Table 1.



Magnolia 'Athene'

The trees are young, having been planted since 2000, though some selections now are approaching 16ft (4.9m) in height (Knox 2007). Most trees were planted from #3, #5, or #7 containers and were 3 to 5ft (0.9 to 1.5m) tall at planting. Trees were placed 20ft (6m) apart within rows treated with herbicide spaced 20ft (6m) apart. Turf grass is maintained in aisles between rows. Trees are fertilized each spring with a slow release fertilizer applied within 3ft (0.9m) of the trunk at a rate of 6lb (2.7kg) actual nitrogen per 1000 square feet (9.3 square kilometers). Drip irrigation provides 2gal (7.6l) per plant about once per week in winter and summer and three times per week in spring and fall. Minimal pruning is performed once each year to establish main leaders and remove dead wood, crossing branches and water sprouts.

Flowering data collected

The number of flowers on each magnolia has been recorded weekly, year-round, since 2003. *Flowers* for our counting purposes includes flowers in all stages, including flower buds *showing color* (that is, buds where perules have fallen, thus exposing outer tepals of unopened flowers). We believe flower buds showing color significantly contribute to a magnolia's overall floral display.

These flowering data allow us to determine annual dates of first flowering, dates of peak flowering, number of flowers at peak flowering, and number of weeks in which flowers were recorded. Date of first flowering is the earliest date on which one or more flowers are counted; date of peak flow-

ering is the date on which the maximum number of flowers was counted during the year.

Criteria for selecting cultivars to compare flowering

As mentioned previously, trees in this planting were installed at different times and were various sizes. Variable planting dates and tree sizes at planting might affect flowering. In particular, small or recently planted trees may not be fully established and could exhibit abnormal flowering due to plant

stress or insufficient time at the site to reflect typical flowering under site conditions. To avoid these potentially confounding situations and improve validity of flowering comparisons, I limited cultivars for evaluation to those having 20 or more flowers open at one time at least once per year during three of the past five years.



Magnolia 'Maxine Merrill'

The criterion of 20 flowers was chosen arbitrarily since staff and I felt that 20 flowers indicated a significant, minimum number of flowers blooming at one time characteristic of established, healthy trees. Similarly, averaging data from three or more years with 20 flowers also would serve to further validate tree establishment and typical flowering at this site.

Results

Forty-six cultivars satisfied these criteria (Tables 2-4). All were planted in 2000 and 2001 except 'Candy Cane' and 'Pink Goblet,' which were planted in 2002.

We found dates of first flowering were variable. Deciduous magnolia selections start blooming as early as late December in north Florida. In some years, one or more flowers of a given cultivar will show color much earlier than most other flowers on the same tree. For example, 'Alixeed,' 'Emma Cook,' 'Leonard Messel,' and 'Pink Goblet' each had one flower on 5 January 2004. The next flower on each plant did not occur until 20 January, 16 February, 20 January, and 23 February, respectively. Dates of earliest flowers may be of interest, but frost damage to one or a few flowers is of much less signif-

icance than frost damage to many flowers. For this reason, I believe that dates of peak flowering are more important when determining which cultivars may be recommended for late flowering and less risk of frost damage.

Mean date of peak flowering was calculated for 46 selections having 20 or more flowers at peak bloom for at least three of the past five years. Table 2 lists selections derived from *Magnolia stellata* ranked by mean date of peak bloom at Quincy, Florida; Table 3 lists cultivars derived from *Magnolia acuminata*; Table 4 lists deciduous selections derived from other *Magnolia* species and hybrids. Note that 'Maxine Merrill' is listed in two tables.



Magnolia 'Daybreak'

Discussion

Dates of peak flowering for cultivars listed in Tables 2–4 will be similar in other locations along the Gulf Coast of the United States and would occur progressively later moving north. Flowering sequences of these cultivars are most relevant for the Gulf Coast but may be applicable throughout eastern North America and perhaps beyond. Indeed, these data show rough agreement with relative bloom pe-



Magnolia 'Woodsman'

riods attributed to groups of hybrids by Callaway (1994). Data in Tables 2-4 contribute new information on some hybrids not easily classified into a group.

Magnolia enthusiasts in higher latitudes may be surprised to see *M. stellata* selections flowering at the same time as *M. × soulangeana* and some other hybrid selections. Kanellos (2001) concluded that exposure to low temperatures during dormancy predisposed magnolia buds to open once warm temperatures arrived; furthermore, the warmer the temperature following exposure to low temperatures, the faster flower buds open. Thus, the rapidly warming temperatures typical of late winter/early spring in north Florida may accelerate flowering and compress flowering seasons. It would be interesting to compare annual temperature and chilling data to each cultivar's flowering to more closely determine the relationship between temperature and flowering.

As expected, trees derived from *M. acuminata* flower later. Most of these cultivars are obvious recommendations for late-blooming selections to avoid frost damage. However, these cultivars offer a limited range of flower colors since most are yellow or creamy white and only one is pink ('Daybreak') and one is multicolored ('Woodsmen'). Fortunately, several cultivars derived from *M. stellata* and other hybrids also flower later and offer additional flower colors ranging from red-purple (for example, 'Jane' and 'Marillyn') to bicolor (for example, 'Athene' and 'Jon Jon') to white (for example, 'Leather Leaf').

Growth is also being recorded for these and other species and cultivars in the planting. Further analysis of flowering and growth may provide interesting insight into magnolia flowering and garden performance.

Table 1. Monthly minimum and maximum air temperatures and hours below 45°F (7.2°C) for 2002/2003–2006/2007 winters at the University of Florida/IFAS North Florida Research and Education Center in Quincy, Florida (Florida Automated Weather Network 2007), and mean monthly minimum and maximum air temperatures for Tallahassee, Florida, averaged over 1971 through 2000 (National Weather Service 2007) (mean monthly chilling hours not available).

| Month | Winter 2002–2003 | | | Winter 2003–2004 | | | Winter 2004–2005 | | | Winter 2005–2006 | | | Winter 2006–2007 | | | Mean Winter 1971–2000 | | | |
|----------|------------------|-----|------------------|------------------|-----|------------------|------------------|-----|------------------|------------------|-----|------------------|------------------|-----|------------------|-----------------------|-----|----------|----------|
| | Air temp. (°F) | | Hours below 45°F | Air temp. (°F) | | Hours Below 45°F | Air temp. (°F) | | Hours below 45°F | Air temp. (°F) | | Hours below 45°F | Air temp. (°F) | | Hours below 45°F | Air temp. (°F) | | Mean Min | Mean Max |
| | Min | Max | | Min | Max | | Min | Max | | Min | Max | | Min | Max | | Min | Max | | |
| December | 27 | 74 | 253 | 25 | 71 | 332 | 27 | 77 | 317 | 24 | 77 | 296 | 26 | 77 | 145 | 18 | 81 | | |
| January | 16 | 73 | 378 | 24 | 77 | 309 | 23 | 76 | 177 | 28 | 75 | 155 | 26 | 76 | 205 | 15 | 81 | | |
| February | 32 | 77 | 164 | 30 | 74 | 211 | 30 | 78 | 134 | 24 | 79 | 201 | 20 | 76 | 231 | 19 | 84 | | |

Table 2. Mean dates of peak flowering, number of years with 20 or more flowers at peak flowering (2003–2007) and parentage for cultivars derived from *Magnolia stellata* and its hybrids.

| Name | Mean date of peak flowering ¹ | Parentage | | | | | | Number of years averaged ² |
|---------------------|------------------------------------------|---------------------|--------------------|-----------------|----------------------|--------------------|----------------------|---------------------------------------|
| | | <i>M. acuminata</i> | <i>M. denudata</i> | <i>M. kobus</i> | <i>M. liliiflora</i> | <i>M. stellata</i> | <i>M. × loebneri</i> | |
| Alixed | January 27 | | | | | X | | 4 |
| Merrill | February 3 | | | | | | X | 4 |
| Emma Cook | February 10 | | X | | | X | | 4 |
| Chrysanthemumiflora | February 21 | | | | | X | | 3 |
| Centennial | February 26 | | | | | X | | 3 |
| King Rose | February 28 | | | | | X | | 4 |
| Ann | March 6 | | | | X | X | | 5 |
| Leonard Messel | March 10 | | | | | | X | 4 |
| Jane | March 16 | | | | X | X | | 5 |
| Maxine Merrill | March 21 | X | | | | | X | 3 |

¹Mean date of peak flowering for those years between 2003 and 2007 with 20 or more flowers at peak.

²Number of years from 2003 through 2007 with 20 or more flowers recorded at peak flowering.

Table 3. Mean dates of peak flowering, number of years with 20 or more flowers at peak flowering (2003–2007) and parentage for cultivars derived from *Magnolia acuminata* and its cultivars and hybrids.

| Name | Mean date of peak flowering ¹ | Parentage | | | | | | | Number of years averaged ² |
|----------------|------------------------------------------|---------------------|--------------------|---------|-------------------------|----------------------|-------------------------|----------------------|---------------------------------------|
| | | <i>M. acuminata</i> | <i>M. denudata</i> | Unknown | <i>M. × brooklynsis</i> | <i>M. × loebneri</i> | <i>M. × soulangeana</i> | <i>M. × veitchii</i> | |
| Sundance | February 22 | X | X | | | | | | 4 |
| Legend | February 26 | X | X | | | | | | 4 |
| Ivory Chalice | March 1 | X | X | | | | | | 5 |
| Yellow Lantern | March 4 | X | | | | | X | | 5 |
| Butterflies | March 5 | X | X | | | | | | 5 |
| Gold Cup | March 9 | X | X | | | | X | | 5 |
| Daybreak | March 17 | | | | X | | X | X | 3 |
| Golden Sun | March 18 | X | X | | | | | | 4 |
| Maxine Merrill | March 21 | X | | | | X | | | 3 |
| Tranquility | March 23 | X | | X | | | | | 3 |
| Woodsmen | March 31 | | | | X | | | | 5 |

¹Mean date of peak flowering for those years between 2003 and 2007 with 20 or more flowers at peak.

²Number of years from 2003 through 2007 with 20 or more flowers recorded at peak flowering.

Table 4. Mean dates of peak flowering, number of years with 20 or more flowers at peak flowering (2003–2007) and parentage for deciduous hybrid magnolia cultivars not derived from *M. acuminata* or *M. stellata*.

| Name | Mean date of peak flowering ¹ | Parentage | | | | | | | | | Number of years averaged ² | |
|------------------|------------------------------------------|----------------------|----------------------|--------------------|-----------------|-----------------------|-----------------------|---------------------|---------|-------------------------|---------------------------------------|----------------------|
| | | <i>M. campbellii</i> | <i>M. cylindrica</i> | <i>M. denudata</i> | <i>M. kobus</i> | <i>M. liliiiflora</i> | <i>M. sargentiana</i> | <i>M. sprengeri</i> | Unknown | <i>M. × soulangeana</i> | | <i>M. × veitchii</i> |
| Royal Crown | January 26 | | | | | X | | | | | X | 4 |
| Todd Gresham | January 26 | | | | | | | | | X | X | 4 |
| Moondance | February 5 | | | | | | | | | X | X | 3 |
| Pink Goblet | February 5 | | | | | | | | | X | X | 3 |
| Paul Cook | February 9 | | | | | | | X | | X | | 3 |
| Apollo | February 10 | X | | | | X | | X | | | | 3 |
| Full Eclipse | February 10 | | | | | | | | X | X | | 5 |
| Sarah's Favorite | February 10 | | | | | | | X | | | | 4 |
| Candy Cane | February 13 | | | | | | | | X | X | | 4 |
| Sentinel | February 13 | | | | | | | X | | | | 4 |
| Anticipation | February 14 | | X | | | | | X | | | | 4 |
| Elisa Odenwald | February 14 | | | | | | | | X | X | | 4 |
| Firefly | February 14 | | | | | | | | X | | | 3 |
| Galaxy | February 14 | | | | | X | | X | | | | 4 |
| Heaven Scent | February 14 | | | | | X | | | | X | | 4 |
| Rustica Rubra | February 14 | | | | | | | | X | | | 4 |
| Forrest's Pink | February 15 | | | X | | | | X | | | | 5 |
| Joe McDaniel | February 15 | | | | | | | | X | X | | 5 |
| March Til Frost | February 16 | | X | | | X | | | X | | | 3 |
| Sayonara | February 16 | | | | | X | | | | X | | 4 |
| Big Pink | February 25 | | | | | | | | X | | | 5 |
| Dark Shadow | February 25 | | | | | | | | X | X | | 5 |
| Leather Leaf | March 1 | | | | | | | | X | X | | 3 |
| Jon Jon | March 2 | | | | | | | | X | X | | 5 |
| Marilyn | March 6 | | | | X | X | | | | | | 5 |
| Athene | March 8 | X | | | | | X | | X | | | 4 |

¹Mean date of peak flowering for those years between 2003 and 2007 with 20 or more flowers at peak.

²Number of years from 2003 through 2007 with 20 or more flowers recorded at peak flowering.

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