

Hydrangea Production

by Mark Halcomb, UT Extension Area Nursery Specialist
and Dr. Sandra Reed, USDA-ARS, McMinnville, Tenn.
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Hydrangeas are summer-flowering shrubs that have undergone a resurgence in popularity during the past decade. Several species are cultivated world-wide, but the most popular in the U.S. are *Hydrangea macrophylla*, *H. arborescens*, *H. paniculata*, and *H. quercifolia*. This effort will not attempt to stay current with new cultivar releases.

The first part of this publication deals with each of these species separately and provides information related to common homeowner questions concerning cultivar selection, site selection and care. It is followed by a discussion of production and harvesting practices commonly utilized by commercial producers.

Hydrangea macrophylla — Bigleaf, Florist, Garden, House, French or Japanese Hydrangea. There are over 500 named cultivars reported in existence. They all are considered to have the ability to change bloom color based on soil pH. There are also a few white-flowered cultivars whose flowers may turn very pale pink or blue as they age. Plants are grown as both garden and pot plants. Commercial greenhouse growers force *H. macrophylla* into bloom for Easter and Mother's Day in Tennessee.

Two botanical varieties of *H. macrophylla* are recognized. *Hydrangea macrophylla* var. *macrophylla* cultivars are also known as mopheads or Hortensias. They have large round inflorescences that consist primarily of showy sterile flowers. The lacecap cultivars (*H. macrophylla* var. *normalis*) have a flattened inflorescence that consists of an outer ring of showy sterile flowers and an inner ring of small fertile flowers.

A subspecies, *H. macrophylla* subsp. *serrata*, is also recognized. This subspecies is often referred to as *H. serrata* or Mountain Hydrangea. Members of this subspecies have smaller leaves and flowers than do other *H. macrophylla* cultivars, and their foliage may develop some red coloration in fall. Their inflorescences are generally of the lacecap type.

***Hydrangea macrophylla* cultivars – Old Standards and Promising New Releases:**

'All Summer Beauty' – One of the most reliable mophead cultivars. Continues to produce a few flowers throughout the summer. Good blue color in acidic soil.

- 'Alpengluhen' – Also sold as 'Glowing Embers'. Attractive dark green foliage. Thick sturdy stems. Not suitable for low pH soils. Susceptible to damage from late spring freezes.
- 'Blaumeise' – One of the "Teller Series" lacecaps. Sterile flowers are much larger and showier than in other lacecaps. Beautiful pure blue color in acidic soil. Other members of the Teller Series to consider are 'Fasan', 'Libelle', 'Kardinal', and 'Taube'. These cultivars are often marketed as 'Teller Blue', 'Teller Red', 'Teller Pink' etc. Hardiness not evaluated.
- 'Blue Billow' – Small plant with coarse foliage. Leaves burn in sun. Blooms moderately well.
- 'Blue Bird' – Commonly available lacecap. Looks great planted at edge of woodland. Fairly reliable flowering.
- 'Blue Wave' – Commonly available lacecap cultivar. Performs very poorly following late spring freezes.
- 'Coerulea' – More tolerant to late spring freezes than most cultivars. Attractive lacecap flowers. May be difficult to find.
- 'Dooley' – New cultivar from the University of Georgia. Reported to flower well even following late spring freezes. Large blue mophead flowers.
- 'Endless Summer' – Non-stop flowering, even after spring freezes. Small plant with mophead flowers.
- 'Lemon Wave' – Green, yellow and white variegated foliage. Attractive even without flowering.
- 'Lemon Zest' – Lime green foliage and pink mophead flowers. Unusual contrast. Attractive even without flowering.
- 'Madame Emile Mouillere' – White-flowered mophead cultivar. Large plant with slender stems. May re-flower in fall.
- 'Mariesii Variegata' – Green and white variegated foliage. Attractive even if lacecap flowers destroyed by cold weather.
- 'Nikko Blue' – Most commonly available cultivar. Large blue mophead flowers. One of the most reliably flowering cultivars. May re-flower in fall.
- 'Nigra' – Black stems. Light green foliage and large mophead flowers.
- 'Penny Mac' – Reported to flower well even following spring freezes. Attractive blue-to pink- flowered mophead.

'Pia' – Dwarf cultivar that rarely exceeds 2 feet in height. Produces small bright pink mophead inflorescences throughout the summer. Very susceptible to Cercospora leaf spot. Leaves scorch in sun. Should not be planted in low pH soil.

'Preziosa' – Thought to be a hybrid between var. *macrophylla* and subsp. *serrata*. Small mophead inflorescences open white then gradually age to bright fluorescent pink. Not very cold hardy, but very attractive and unusual.

'Sister Therese' – White-flowered cultivar. Not considered to be very cold-hardy.

Origin: Native to Japan and Korea.

Hardiness: *Hydrangea macrophylla* is considered hardy in zones 6 to 9. Cold injury to the flower buds and improper pruning are the usual reasons for flower failure. These hydrangeas form flower buds during the fall months. Because they bloom on last years' wood, they are very susceptible to low temperature injury. When they freeze back, the blooms are lost for the year and the only benefit then is the foliage. In Tennessee, wildly fluctuating temperatures in fall and spring probably do more damage to *H. macrophylla* flowering than do low winter temperatures.

Size: Usually 3 to 6 feet in height, but can grow to 10 feet. Width equal to or greater than height.

Site Selection: Hydrangeas can be grown on less than the best soils. Select a site where water never stands. In the landscape: plants should be planted where they can receive some late afternoon shade. Plants will not flower well in heavy shade. Needs supplemental water during dry spells. Plants in afternoon sun will wilt if the temperature is in the high 80's, even with adequate moisture.

Flowering: Most cultivars flower in early summer, but a few may continue to produce flowers throughout the growing season. Produce either large round corymbs consisting primarily of large sterile flowers (mophead or Hortensia cultivars) or flattened inflorescences consisting of an outer ring of large sterile flowers and an inner ring of small fertile flowers (lacecap cultivars). Flower color varies depending on the soil pH. A few cultivars do not produce blue flowers, regardless of pH.

Flower Color: *Hydrangea macrophylla* is unusual because the flower color varies from a deep blue to a bright pink in relation to the soil pH. When the soil pH is acid (4.5 – 5.5), the color can be expected to be blue because of the availability of aluminum. A soil pH of 6.0 to 7.0 results in a pink flower color. At pH's from 5.5 to 6.5, flowers may be pink, blue, or lavender, or a mixture of pink and blue flowers may be present on the same plant.

Do You like Pink or Blue Hydrangeas? You can sell both, but the color may not hold; the color will be dependent on the pH of the soil in which they are eventually planted. There are a few cultivars, such as 'Pia', 'Masja', 'Alpengluhen' ('Glowing Embers') and 'Todi' that do not turn blue. At low pH their flowers may turn an unattractive muddy-red.

Container: The addition of aluminum sulfate to the substrate is required. Variables in this process, though, are the amount of lime in the potting mix, the quality of irrigation water and the source and rate of applied fertilizer.

Aluminum is what is lacking in container substrate and the minor elements to provide the blue color in hydrangea. If the substrate pH is discovered to be higher than 5.5 apply aluminum sulfate before the flower buds form. Too much can stress, damage or kill roots resulting in plant stunting, some leaf drop and smaller flowers.

Apply 1 Tablespoon aluminum sulfate per #3 container. Dip the spoon in and slightly shake it to make it nearly level full. Apply it in early May and again 2 weeks later.

Landscape or Field Production: There will be sufficient available aluminum in most soils that test between 4.5 – 5.5 so a soil test will be required. Hydrangeas grown in soil can be induced to bloom blue by lowering the soil pH with 90% sulfur several months in advance of bud set. (6 months if the pH is high) Caution: lowering the pH rapidly with a large amount of sulfur can cause the soil pH to go below 4 before it comes back up. (a rebound effect) Plant roots will be damaged or die at that pH. The desired pH range in soil is 4.5 – 5.5 to induce blue flowers on hydrangea.

Pruning: Cut back to within 6 inches of ground in Feb-March after first growing season; and after 2nd growing season if not sold. Do not prune the last spring prior to harvest in order to leave the flower buds. In the Landscape: Prune after flowering. This species flowers on old wood, so it should not be pruned after bud set in late summer – early fall.

Propagation: *Hydrangea macrophylla* and its cultivars are propagated as rooted cuttings. Softwood cuttings root easily using 1000 ppm IBA. Most of our producers buy their liners from liner producers rather than root their own. They will be 4-6 inches tall when lined out.

Pest Problems: Hydrangeas are fairly disease and insect free, but can be attacked by Botrytis leaf and flower blight, Cercospora leaf spot, Phytophthora root rot and powdery mildew. Aphids can be a problem in greenhouses and shadehouses, but they are generally insect free in the field and landscape.

***Hydrangea arborescens* — Smooth Hydrangea**

Cultivar: 'Annabelle' – the only commonly available cultivar. Plant covered with large ball shaped inflorescences that are comprised primarily of sterile flowers. Flowers initially a pale green, but at maturity become a pure white color. Stems often pulled to ground by weight of flowers.

Origin: Native to the Eastern U.S.

Hardiness: Hardy to U.S.D.A. Hardiness zone 4.

Size: 3 to 5 feet in height and spread; suckers from roots and may fill a larger area over time.

Site Selection: Prefers partial shade, but will perform well in full sun if given adequate moisture.

Flowering: Large white corymbs produced in early to mid-summer. Inflorescences of native populations consist primarily of small fertile flowers with a few large sterile flowers.

Pruning: Flowers on new wood so should be pruned in late winter to early spring. Plants may produce a second flush of flowers, if they are pruned, fertilized and watered after the initial flowering.

Propagation: Easy to root from softwood cuttings using 1000 ppm IBA.

Pest Problems: Spider mites, leaf spots.

***Hydrangea paniculata* — Panicle Hydrangea**

Cultivars:

'Brussels Lace' – Very lacy-looking flowers. Flowers from mid-summer till frost. Relatively small plant (to 5 feet) with dark green foliage.

'Chantilly Lace' – New cultivar. Compact, dense plant with dark green leaves.

'Kyushu' – Flowers heavily from a young age. Pure white conical flower heads on upright stems.

'Limelight' – New cultivar. Fluorescent lime-green flowers.

'Pee Gee' (*H. paniculata* Grandiflora) – Rounded panicles of primarily sterile flowers. Large plant, often grown tree-form. Most commonly available cultivar.

'Pee Wee' – Compact plant, with leaves and inflorescences about half the size of other cultivars. Not readily available. Cultivar name not valid because a *H. quercifolia* 'Pee Wee' was already in trade when this cultivar was named; cannot use same cultivar name within a genus.

'Pink Diamond' – Very large inflorescences that age rapidly to pink. Both fertile and sterile flowers visible.

'Tardiva' – Later flowering than 'Pee Gee'. Panicles held upright on plant. Commonly available. Both sterile and fertile flowers visible, creating a lacy effect.

'The Swan' – A new cultivar from Belgium that has individual florets that are as large as the palm of a hand. Best grown in full sun. Not readily available yet.

'Unique' – Early flowering; flowers age to pink; large sterile flowers hide most of the fertile flowers.

'White Moth' – Large (10-12" diameter) ball-shaped inflorescences. Flowers until frost.

Origin: Native to Japan, eastern and southern China

Hardiness: U.S.D.A. Hardiness zone 4. The most cold hardy *Hydrangea* species.

Size: 10 to 20 feet in height and spread

Site Selection: Full sun to light shade

Flowering: Mid- to late-summer flowering. Large panicles that contain both fertile and sterile flowers. Flowers open white and age to a pale to medium pink.

Pruning: Flowers on new wood so should be pruned in winter or early spring. Often pruned tree-form.

Propagation: Easily propagated from softwood cuttings using 1000 ppm IBA.

Pest Problems: Spider mites during hot dry weather.

***Hydrangea quercifolia* — Oakleaf Hydrangea**

Cultivars:

'Alice' – Large plant, 12 feet by 12 feet. Panicles to 14" in length. Flowers age to rosy-pink. Selected by Dr. Mike Dirr at the University of Georgia.

'Alison' – Another Mike Dirr selection. Slightly smaller than 'Alice' and with more upright panicles. Fall foliage turns a fluorescent burgundy red.

'Harmony' – Long panicles composed of primarily sterile flowers. Weight of flowers often pulls stems to the ground.

'Munchkin' – Very compact with medium pink flowers. Developed by Dr. Sandra Reed, USDA-ARS, McMinnville, Tenn. 'Munchkin' was trademarked as Little Lady around 3-2012 by Jim Berry, a commercial nursery producer, several years after USDA released it.

'Pee Wee' – Compact plant, only growing to 3 feet by 3 feet. Good plant for small garden. Should be relatively easy to find.

'Roanoke' – Similar to 'Harmony'

'Ruby Slippers' – Compact with flowers that age to deep rose. Developed by Dr. Sandra Reed, USDA-ARS, McMinnville, Tenn. 'Ruby Slippers' was trademarked as Minute Man around 3-2012 by Jim Berry, a commercial nursery producer, several years after USDA released it.

'Sikes Dwarf' – Compact plant, but probably will mature larger than 'Pee Wee'

'Snowflake' – Double-flowered form. Long panicles often droop to the ground, but more graceful than 'Roanoke' or 'Harmony'. Very attractive plant.

'Snow Queen' – Probably the most popular cultivar. Panicles are held upright. The sterile flowers are larger and more numerous, giving the inflorescence a more dense solid appearance. Flowers age to a medium pink.

Origin: Native to Southeastern U.S.

Hardiness: U.S.D.A Hardiness zone 5

Size: Most cultivars reach 6 to 8 feet in height. Spread greater than height. Suckers from roots.

Site Selection: Benefits from light shade. Subject to root rot if placed in poorly drained soil.

Flowering: Flowers early to mid-summer. Large white to cream-colored panicles that turn pink as they age. Inflorescences composed of a mixture of large sterile and small fertile flowers.

Pruning: Flowers on old wood so should be pruned after flowering.

Propagation:

By cuttings: Fairly easy to propagate using softwood cuttings and 5000 ppm IBA. May have problems surviving 1st winter.

By seed: Dirr's 5th ed says: No pretreatment necessary, fresh seed germinate profusely in two weeks. Don Shadow adds; collect seed heads Oct 1 to Dec 1. Place entire bloom in brown paper sack to catch the seed as they fall out naturally with drying. Dr. Sandra Reed, USDA-ARS, National Arboretum, McMinville, has learned that the storage of the seed in a refrigerator for one month seems to help but cold, moist stratification is not necessary.

Dr. Reed has had success with the following procedure: Plant the seed into trays in Sept/Oct/Nov, transplant into 36" cell pack/flats when the seedlings develop the second pair of true leaves (use a small dull knife blade to lift the seedlings tenderly), run them on the dry side; transplant into jumbo 5" pots and then #3 containers when the roots fill the containers; pinch top 2 nodes out to make fuller when in the 5" pots; cut any laterals back that are stimulated to take off after the pinching.

Container production of Oak-leaf:

The above procedure will have plants that will be looking very good in a #3 by April 20, but not large enough to sell. Number 1 containers could be ready to sell by late April if the seedlings go into #1's from the 36 cell pack and if grown with heat in a greenhouse all winter. It is not suggested to transplant the seedling straight into a #1 container or the 36 cell pack straight to a #3, for fear of overwatering and causing root rot. 2-23-05

They are easily overwatered, causing root rot.

Pest Problems: Phytophthora root rot; Japanese beetles; leaf spots.

General production and harvesting information of hydrangea follows

Fertility

Hydrangeas grow best with a soil pH of 5.0 – 6.5. A medium to high level of phosphorus and potassium is desirable. Soil test early enough so that any lime, phosphate or potash can be broadcast prior to planting. Signs of iron deficiency may show at a higher pH. If so, soil test. Contact the lab or nursery specialist to determine the best course of action.

The normal UT Extension recommendation for all shrubs is no more than 50 pounds of actual nitrogen per acre applied in late Feb and again in late June. It is not always economical to broadcast fertilizer after the crop is planted. The per acre rate can be used for sidedressing, whether done by machine or hand. Additional tables and diagrams are available to explain this for different analysis.

50 lbs. of actual nitrogen per acre is provided by:

150 lbs. 34- 0- 0

250 lbs. 20-10-10

333 lbs. 15-15-15

385 lbs. 13-13-13

Field Spacing

Spacing examples of plants on 1 solid acre:

3 x 4 = 3,630

3 x 4.5 = 3,227

3 x 5 = 2,904

3 x 5.5 = 2,640

3 x 6 = 2,420

3 x 7 = 2,074

3.5 x 4 = 3,112

3.5 x 4.5 = 2,766

3.5 x 5 = 2,489

3.5 x 5.5 = 2,281

3.5 x 6 = 2,074

3.5 x 7 = 1,778

4 x 4 = 2,723

4 x 4.5 = 2,420

4 x 5 = 2,178

4 x 5.5 = 1,980

4 x 6 = 1,615

4 x 7 = 1,556

Consider no more than 8 rows per block. Remember to leave a 12 to 20 foot roadway between blocks from which to load and spray from with an airblast.

Planting

Exercise caution to not plant too deep. It is also critical not to allow cultivation to throw additional soil over the roots. Some producers replace the disc blade that throws the soil with a smaller diameter blade.

Herbicides

No pre-emergent herbicides were labeled for use on the common bigleaf (*Hydrangea macrophylla*) and oakleaf hydrangea (*Hydrangea quercifolia*) until recently. Dr. Fare, USDA-ARS, McMinnville sprayed pre-emergent herbicides over the top of 1 year old plants of bigleaf hydrangea at two field nurseries in Warren Co. April 19, 1996. We evaluated the plants several times and found no phytotoxicity or stunting based on visual observations and measurements made before and after.

The 2 and 3 quart rate of Surflan, the 3.33 and 5 pound rate of Pendulum 60 WDG and the 0.77 and 1.54 pound rate of Barricade 65 WDG were tank mixed with the 1 and 1.5 quart rate of Princep/Simazine 4L or the 0.66 and 1.33 pound rate of Gallery 75 DF.

These herbicide tank mixes, at these rates did not injure any of the bigleaf or oakleaf hydrangeas in 1996. Since then, Barricade 65 WDG and Pendulum 60 WDG have been labeled for *H. macrophylla* and Pennant Magnum has been labeled for the *Hydrangea* species. Surflan, Princep/ Simazine and Gallery are not labeled at this writing. We cannot recommend that unlabeled herbicides be used, even though we had good luck. Do not spray new transplants until after a settling rain or wait for root growth.

Georgia researchers tried several common preemergence herbicides on containerized *H. mac.* 'Nikko Blue'. Barricade, Gallery and Dimension caused the worse injury. Surflan caused a growth reduction. Pennant was the second safest. Granular Ronstar was the safest, but caused a reduction in plant height. The highest labeled rates were used. Overhead irrigation was turned on within 60 minutes of the application. The herbicides caused powdery mildew to be worse.

Fusilade T/O is labeled on *H. paniculata* and *H. quercifolia*, but not *H. macrophylla*. Segment (formerly Vantage) is labeled for *H. macrophylla*. Envoy Plus is not labeled for any *Hydrangea*. These herbicides kill tender, green grass.

Refer to Tables A and B: Preemergence and Postemergence-Nursery Crops under the Weed Control heading at <http://www.utextension.utk.edu/mtnpi/handouts.html> for a complete list of labeled pre and postemergence herbicides for most common woody ornamentals.

Harvesting

Hydrangeas are commonly sold when they are 2-4 feet tall. Hydrangeas are generally a 3 year crop; depending on species, soil type, fertility, moisture, growth rate, pruning, etc; with harvesting occurring the last year or two.

Digging the Correct Size Ball

The American Standard for Nursery Stock was written by the American Nursery & Landscape Assoc. (ANLA) (formerly the American Assoc. of Nurserymen, AAN). It establishes techniques for measuring plants and minimum rootball sizes for particular plant sizes and different plant types. A copy of the Standards may be viewed and printed from this link free:

<http://www.anla.org/docs/About%20ANLA/Industry%20Resources/ANLAStandard2004.pdf>

Producers are not legally bound to follow the ANLA Standards but it is a good business practice and eliminates surprises.

A portion of the information is presented below. Refer to the Standards for complete information. Intermediate type 2 deciduous shrubs are defined on page 26 as plants that typically mature at a height or spread from 3 feet up to 7 feet.

Table 12— Ball sizes—Type 2 deciduous shrubs

<u>Height</u>	<u>Minimum diameter ball</u>
3 ft.	14 in.
4 ft.	18 in.
5 ft.	24 in.

Determining the Correct Identification of Hydrangeas

Homeowners sometimes call with a question about how to care for the “hydrangea in their yard”. When asked what kind of hydrangea they have, they have no idea. The plant may have been in their yard when they bought the house and a neighbor or friend told them that it was “a hydrangea”. Or they may have been given a cutting of “a hydrangea” from a friend. Or, even worse, they may have bought it from a less-than-reputable source that simply labeled it as “hydrangea shrub”. Regardless of the source of the confusion, it is impossible to answer questions concerning hydrangea care without knowing the species. The following set of questions is presented as a guideline to help with determining, without seeing the plant, which species of hydrangea is being discussed.

Question	Answer	Species
#1 What color are the flowers?	Blue	<i>H. macrophylla</i>
	White	Go to Question #2.
	Pink	Go to Question #3.
	Don't know	Go to Question #4.
#2 Do the flowers start out pale green and then turn pure white? Are the flowers shaped like large (6 to 12" in diameter) balls?	Yes to both questions	<i>H. arborescens</i>
	No	Go to Question #4.
#3 Do the flowers start out white or cream-colored and only turn pink as they age?	Yes	Go to Question #4.
	No	<i>H. macrophylla</i>
#4 Does the leaf have lobes similar to an oak or maple?	Yes	<i>H. quercifolia</i>
	No	Go to Question #5.
#5 Is the leaf about twice as long as it is wide?	Yes	<i>H. paniculata</i>
	No	Go to Questions #6 and #7.
#6 Is the leaf about as wide as it is long?	Yes	<i>H. arborescens</i>
#7 Is the leaf about 1½ times as long as wide?	Yes	<i>H. macrophylla</i>

We recognize that some homeowners may have a hard time answering questions #5, 6 and 7, especially if they are calling during winter months. Keep in mind that, in at least 9 times out of 10, if the question is “Why doesn't my hydrangea flower”, then the species in question is *H. macrophylla*.

Precautionary Statement

In order to protect people and the environment, pesticides should be used safely. This is everyone's responsibility, especially the user. Read and follow label directions carefully before you buy, mix, apply, store, or dispose of a pesticide. According to laws regulating pesticides, they must be used only as directed by the label. Persons who do not obey the law will be subject to penalties.

Disclaimer Statement

Pesticides recommended in this publication were registered for the prescribed uses when printed.

Pesticides registrations are continuously reviewed. Should registration of a recommended pesticide be canceled, it would no longer be recommended by the University of Tennessee. Use of trade or brand names in this publication is for clarity and information; it does not imply approval of the product to the exclusion of others which may be of similar, suitable composition, nor does it guarantee or warrant the standard of the product.

Comm/Crops/Hydrangea Prod-Reed

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