



## Plant Breeding, Evaluation, Selection and Introduction.

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The program has made giant strides since the 2001 Open House, particularly with hydrangea advances. This year's report summarizes the status of the genera currently under evaluation.

***Hydrangea macrophylla*/H. serrata IMPROVEMENT:** The *Hydrangea macrophylla* breeding and improvement work continues to expand with 4,072 seedlings from open-pollinated and controlled crosses evaluated in 2002. In 2000 and 2001, 69 selections primarily from 1,156 'Veitchii' seedlings, were made, screened for flowering, foliage and disease resistance, with 16 extant in October, 2002. This year 104 seedlings from 19 maternal parents or hybrids (see Table 1) were selected, propagated and grown at the Center for Applied Nursery Research for continued evaluation.

Our 1999-2000 work indicated that characteristics of the maternal parent show prominently in the seedlings. For example, 60 of 62 'Nigra' seedlings had purple-black stems; 34 'Ayesha' seedlings possessed thick lustrous dark green foliage; all 'Preziosa' seedlings developed the reddish foliage cast and mildew; and all 'All Summer Beauty' and 'Forever Pink' seedlings developed mophead flowers and contracted severe mildew.

In 2002, two seedlings of remontant 'Penny-Mac' were grown to flowering. Typically the repeat flowering taxa have produced weak seedlings that eventually died. These two seedlings proved to be remontant flowering, the first evidence that this trait could be passed to the off-spring.

Jeff Adkins, former M.S. student, crossed 'Veitchii' × Endless Summer™ in 2001 with six seedlings extant, five of which flowered without cold or short day induction, and appear to have inherited the remontant genes.

### CURRENT STATUS:

1. Field plantings of hydrangea at College Station, University of Georgia, have provided great data on mildew and cold hardiness. Of 96 cultivated taxa in the ground, only 'Ayesha', 'Mme. Emile Mouillere', 'Domotoi', 'Lilacina', 'Veitchii', 'Westfalen', 'Geisha Girl, and 'Generale Vicomtesse de Vibraye' were not severely injured by cold and/or infected by mildew.
2. Jeff Adkins' MS research showed comparable results with laboratory cold hardiness determinations. For example, 'Mme. Emile Mouillere' survived ! 11EF in laboratory studies

- and also no injury in the field.
3. In the field, all remontant flowering selections were cold damaged but flowered in May. Flowers were removed in June and by October visible flower buds were evident on the regrowth of the five remontant taxa. In the laboratory test, Endless Summer™, a remontant taxon, was the least hardy surviving only 0EF on 5 January 2001 while ‘Mme. Emile Mouillere’, ‘Generale Vicomtesse de Vibraye’, and ‘Veitchii’ were hardy to ! 11EF, ! 11EF, and ! 6EF, respectively.
  4. Controlled crosses in the greenhouse (March 28, 2002) of ‘Decatur Blue’ (maternal), ‘David Ramsey’ (maternal) and ‘Veitchii’ (paternal) resulted in mature fruits and viable seeds. Seedlings from these crosses (~100 germinated by October 2002) should provide the quantum leap to superior foliage, remontant flowering and disease resistance.
  5. The best parental material has been screened to a reliable quotient that allows controlled crosses that should yield the desired phenotypes.
  6. The desired characteristics for the perfect *Hydrangea macrophylla* are presented below.

Hydrangea evaluation criteria:

- Repeat flowering, ie, flower on new growth even if flower buds are killed by low winter temperatures, early fall freezes, spring freezes, etc.
- Compact habit.
- Strong stems.
- Lustrous, dark green foliage.
- Fall color.
- Mildew-resistant foliage.
- Colorful stems.
- Drought tolerance.
- Cold hardiness (stem and flower bud to at least ! 10EF).
- Garden types as well as greenhouse forcing.

7. Received new hydrangea germplasm from China and the Philippines. *Hydrangea umbellata* is a white lacecap that is considered the most cold hardy of all the *H. macrophylla* group but has yet to be tested under southeastern conditions. Also, *H. lobanii* from the Philippines is a white lacecap with evergreen foliage and probably minimal cold hardiness. In addition to these accessions, two new purported remontant flowering types, ‘Ted Meredith’, a mophead, and ‘Patricia Dangler’, a lacecap, were provided to the program in 2002. The above four will be tested for cold hardiness and mildew resistance as well as remontant flowering in 2003.

## **FUTURE GOALS:**

1. Continue to collect germplasm that displays remontant flowering and/or increased cold hardiness, aesthetic and disease resistant foliage.
2. Continue evaluations of seedlings that did not flower in 2002. About 1,000 seedlings of 'Veitchii', 'White Wave', 'Lilacina', and 'Grayswood' remain.
3. Propagate 2003 selections for replicated evaluation in 2004 and later.
4. Evaluate 2002 selections (104) in a replicated trial under standard nursery conditions at the Center for Applied Nursery Research, Dearing, Georgia.
5. Make controlled crosses (and reciprocal) of remontant taxa  $\times$  cold hardy and/or disease resistant taxa. This will be conducted in the greenhouse.

Remontant	Cold and/or disease resistant
'David Ramsey'	'Veitchii'
'Decatur Blue'	'Lilacina'
Endless Summer™	'Geisha Girl'
'Oak Hill'	'Grayswood'
'Penny-Mac'	'Mme. Emile Mouillere'
'Ted Meredith' (? - remontant characteristic has yet to be determined)	
'Patricia Dangler' (? - remontant characteristic has yet to be determined)	

6. Write a patent on Penny Mac-01-02, a compact, dark green foliaged, remontant, blue mophead seedling. Have 10 seedling selections from 'Veitchii', 2/3 requiring some form of protection, i.e. trademark and/or patent.

## **ADDITIONAL PLANT IMPROVEMENT PROJECTS: CURRENT PROJECTS:**

### *Lagerstroemia* (crapemyrtle)

The original objective was to develop dwarf crapemyrtles with superb foliage, a range of flower colors, coupled with flea beetle and mildew resistance. This project was initiated in 1997 (first seeds sown) with 1,017 seedlings reduced to 14 in 2002 with 4 plant patents in progress as of October, 2002. Seeds from the superior seedlings were germinated with 2000 new plants on the ground in 2002. The range of flower colors, foliage types and growth habits are remarkable. Twenty-four selections were made in the summer of 2002 with the *first* true red (out of >3,000 seedlings). The original seed sources were hybrids with *L. fauriei*, a mildew resistant species. Interestingly, no mildew has developed on *any* seedlings.

### *Hydrangea arborescens* (smooth hydrangea)

In addition to the extensive work with *H. macrophylla*, large seedling populations of the above two taxa are being evaluated. With *H. arborescens*, the goal is to develop a pink selection with mophead inflorescences like the sterile flowered 'Annabelle'. From ~3,000 seedlings of pink

flowered 'Eco Pink Puff' (fertile flowers only) and 'Wesser Falls' (fertile flowers), 224 pink seedlings were selected, several with rich pink sepals and fertile flowers. It will be necessary to cross the best of these with 'Annabelle' to obtain pink mopheads. *Hydrangea arborescens* flowers on new growth and is adaptable to zones (3)4 to 9.

#### *Hydrangea paniculata* (panicle hydrangea)

With *H. paniculata* the goal is to develop compact *or* tree-types with strong stems, all with showy white flowers that mature to pink/rose. 'Brussels Lace' (397 seedlings) and 'Pink Diamond' (94) produced 22 selections. Growth habits varying from 2 feet to 5 feet in the first season, and the inflorescences were extremely diverse. These selections were propagated in 2002 with replicated evaluation planned for 2003 and 2004. The species flowers on new growth and is adaptable from zone 3 to 8.

#### *Nandina domestica* (heavenly bamboo)

Utilized seeds of 'Harbour Dwarf' (253 seedlings) and Gulfstream™ (238 seedlings), the two most widely sold and compact forms on the market to hopefully produce additional compact selections. Seedlings germinated in early 2001 were brought to the Center in late 2001 and yielded six compact seedlings (Gulfstream™) and fourteen compact seedlings ('Harbour Dwarf'). All have been accessioned and will be evaluated for 2 to 3 years to determine the degree of compactness. Gulfstream™ is patented and trademarked, controlled by Hines Nurseries, Houston, TX, and licensed to one outside grower. A competing cultivar has tremendous market potential.

#### *Nerium oleander* 'Sugarland Red'

This most cold hardy selection produced seedlings (315 total) which were evaluated and rogued during the 2001-2002 winter. Any seedling with winter foliage injury was eliminated, leaving 22 for further evaluation. None of these have flowered but will be evaluated at least through 2003. The goal is a one zone (10EF) more cold tolerant selection. In the seedlings that were eliminated, white, pink, and red flowered forms were noted.

#### *Spiraea japonica* and *S. formosana* seedlings

After three growing seasons, ~800 seedlings have been reduced to two potential introductions: one a compact (20"), yellow leaf, pink-flowered selection that holds the leaf color through the heat of summer; the other a 3" high pancake with yellow new growth maturing to soft green, turning orange-red in fall. The worldwide spirea market is over-saturated with yellow leaf and compact cultivars. The two that have been targeted are *unique* and *worthy* of at least trademark protection.

#### *Viburnum* breeding

The opportunities are unlimited and this program plans to work principally with the southeastern native species, *V. acerifolium*, *V. bracteatum*, *V. dentatum*, *V. cassinoides*, *V. nudum*, *V. obovatum* and *V. rufidulum*. Hopefully, the evergreen and/or fragrant Asiatic species can be hybridized with the natives. Dr. Carol Robacker is already assisting with embryo rescue to facilitate seedling development of one of our first wide crosses (*V. macrocephalum* f. *keteleeri* × *V. utile*). Fifty-four viburnum taxa have been accessioned and are growing at the University's Horticulture Farm or lath area. Most have been propagated and will be brought to the Center for evaluation.

Currently open-pollinated seedling populations of *V. ×juddii*, *V. ×burkwoodii* ‘Mohawk’ and *V. ×burkwoodii* ‘Eskimo’ show variation in leaf size, color, and thickness. This is a long term project and seeds of viburnum in nature often take 2 to 3 years to germinate. Our protocol to short-circuit the extensive natural stratification time is 3 months warm, 3 months cold, repeated again and seeds are then sown. This approach produced the germination of taxa mentioned previously. At best, 4 to 5 years will be required to assess the introduction potential of the seedling material.

Table 1. Maternal parents or hybrids and the number of seedling selections in 2002.

Parentage	No. of selections
<i>Hydrangea macrophylla</i>	
Unknown	1
‘All Summer Beauty’	5
‘Ayesha’	9
‘Goliath’	1
‘Holstein’	4
‘Lanarth White’	1
‘Libelle’	1
‘Lilacina’	19
‘Mme. Emile Mouillere’	1
‘Nigra’	2
‘Nikko Blue’	1
‘Penny-Mac’	2
‘Tokyo Delight’	3
‘Veitchii’	16
‘Veitchii’ × Endless Summer™	6
‘Westfalen’	2
‘White Wave’	13
<i>Hydrangea serrata</i>	
‘Grayswood’	15
‘Preziosa’	2
TOTAL	104