

growth. As each new shoot becomes 2 to 3" long it is pinched to force out bushy lateral growth. This growth may be pinched several times if desired to develop a bushy top (or head). When the understock is well rooted in the pot and the top is of sufficient size the young tree roses (standards) are ready to sell.

## **ROSE HYBRIDIZATION**

**WILLIAM A. WARRINER**

*Jackson and Perkins  
6767 Irvine Blvd  
Santa Ana, California 92705*

Rose hybridizing does not really fit into the usual concept of plant propagation; that is, making more plants of the same cultivar than what you start with. This kind of propagation is an important part of hybridization and will be touched on later, but the first requirement is to make or propagate plants quite different from what you start with.

Plant breeding is one of the really important aspects of agriculture having been one of the sciences contributing to the ever increasing production of food and fiber. There are many Ph.D's in universities and industry researching, teaching, and producing new products, plus all their support people. The size of individual crops is tremendous whether measured in acres, dollars, yield or any way you want to measure.

Rose breeding and rose growing are tiny parts of the agricultural industry, although one of the larger parts of the nursery industry. Rose breeding, along with other ornamental breeding departs, also, from a purely scientific nature to a mixture of science and art or aesthetics.

For the most part, rose breeding is supported by private business although a few universities and experiment stations in North America are doing a little and trying to get funded to do more. In Holland, there is government supported work on rose breeding, supposedly to develop an understanding of the genetics of hybrid roses, but Dutch breeders fear it will be government competition. This effort is separate from the Aalsmeer proof-station where new cultivars from all over are tested for performance as producers of cut flowers.

Europe, with a population comparable to that of North America, has, at least, 29 active commercial rose breeders, some small, but three; Kordes, Tantau and Meilland may be the largest in the world.

In our country, there is only a handful of commercial breeders, under ten, plus a number of active amateur breeders. Another interesting comparison is in the consumption of rose plants and cut flowers. Great Britain, France and Germany each consume about as many plants as the United States. People of the European continent buy approximately ten times as many cut roses as Americans. The Aalsmeer flower auction moved over 800 million cut roses in 1979.

Roses have been desired by people for their beauty and scent for thousands of years. Travelers, whether they were traders or armies, often returned to their homelands with plants and seeds collected on their journeys. Roses were thus distributed throughout Europe and Asia and the art/science of rose breeding began.

Gardeners must have shown an increasing curiosity over the years when seeds of the various roses were planted and some did not come true. It is generally thought that some natural cross-pollination had occurred giving rise to new hybrids.

Native European roses were large but flowered very little after spring. Some species of roses from China were prolific all-season bloomers but of less plant vigor and some not so winter-hardy.

Books and chapters of books have been written on the ancient roses and their progression to modern roses. To say the subject is confusing is a gross understatement. Records were not kept in ancient times and, in fact, gardeners did not really know where it came from when they saw a new rose. Up to a hundred years ago and, in many instances, even now, records were not kept even when crosses were known. Rose breeding got its start with the growing of seedlings from seeds collected in the gardens. There was no concern about what was crossed with what.

As examples of this, the parentages of two of the most famous roses of the Hybrid Tea group are not known or have never been known. The cultivar, La France, given the distinction of being the first Hybrid Tea rose, was selected from a bed of seedlings growing from randomly picked hips at the nursery of the Guillot family near Lyon, France.

Another famous cultivar, Ophelia, was, reportedly, a mix delivered to Wm. Paul & Son Nursery in an order of the cultivar Antoine Rivoire 'Ophelia' became the progenitor of a large number of cultivars through mutations, seedlings and mutations of seedlings. Among its descendents are 'Columbia', 'Talisman', 'Joanna Hill', 'Briarcliff' and 'Better Times'.

Knowledge of the history of roses is interesting and helpful, but only as background information. One would be hard pressed

to conduct a rose hybridization program based on past history. Modern roses show little resemblance to ancient or species roses.

What, then, is rose hybridization?

The mechanics of crossing are quite simple, much simpler than some other species of ornamentals or food crops. Rose flowers are complete, with both sexes in each flower. Anthers are easily removed in preparation for hand pollination and to save for application to other flowers. The stigmas are large, easily examined without hand lenses and mostly are supported in plants in easily accessible positions.

Most rose pollinations are done in some kind of greenhouse although in mild climates reasonable success can be expected outside. Established plants, a little on the hungry side, make the most fecund and productive parents.

Two aspects of rose breeding are at the same time the most interesting and the most challenging. Rose breeders may argue the degree of difficulty or position of importance of these two. The first is selection of parents; the second, naturally, the selection of seedlings. In my opinion, the first is more complex and challenging. A third aspect of hybridization to be mentioned is the propagation of selected seedlings. The fourth aspect, the mechanics of pollination and seed handling, already touched on will be completed under the section on seedling selection.

Most of the firms active in rose hybridization are working in two or more areas of rose use, such as greenhouse, garden, miniatures, or landscape cultivars. In each area, there are needs for numerous classes and colors so that rose hybridization is a larger field than one would think.

But each cross made must have a reason to be made; there must be a definite objective. Once the objective is determined in the mind of the hybridizer, the next step, the tough one, is selection of parents.

For the most part, selecting parent cultivars is learned through trial and error. Obviously, one would select parents of his hoped for objective which showed characteristics approaching the objective. Also, obviously, the breeder is trying to develop a cultivar better or different than existing ones and must put together parents whose different types will be complementary and additive.

Many cultivars, excellent in themselves, are not particularly good as parents while others, not very good in their own right, are fine parents. Often an unnamed, undistributed cultivar will be found to transmit certain traits to its progeny that make it valuable as a parent. One such cultivar, named but not widely distributed, is *Konigen der Rosen*. Its stiff stems and heavy, well-

formed petals made one of its seedlings, Mercedes, one of the best roses in recent times.

Essentially, cultivars are tried as parents because of what they look like, but are retained as parents because of what their seedlings look like. One European breeder believes that a population of seedlings from self-pollinated flowers of a cultivar can give a clue to the value of that parent.

Little things can be important, also. In breeding for cut flower cultivars, thorniness is one consideration. It has been found that thorniness of the rachis is inherited independently from thorniness of stems. A thornless rachis is a valuable asset to a cut flower cultivar as well as a thornless stem. It's just a little thing, but to the person cutting roses, it can make a big difference.

The question is often asked "What do you look for in a new rose?" The answer primarily in two parts is novelty and performance, but this is too obvious. What is novelty and what is performance? We usually think of novelty in regard to the flower; color, form, fragrance and performance as the way the plant grows and manufactures the flower.

There is so much difference between the requirements of greenhouse cultivars and garden cultivars that it is almost like two different crops. There is much latitude allowed in garden cultivars as to color, size, plant habit, etc., but the cut flower people are very demanding. The range of colors is small, and the type of flower is restricted, flower production is very important and thorns are bad news. Novelty is less important than performance. We have found, as have others, that one cannot evaluate garden roses in a greenhouse or greenhouse roses outside.

Major rose breeders will work with over 100 cultivars, usually closer to 200, to develop their program for any given year and these will be changed from year to year as the hybridizer learns more about them. Each hybridizer works a little differently, but essentially a program of crosses is laid out for the pollinating season (spring), the hips develop and are harvested in late summer.

Seed treatment has been studied and studied over many years with little or no improvement. Some say stratification is essential, some say not. I have never been able to prove that it is or is not. In practice, we begin to collect hips in August and begin removing seeds in September. The seeds are placed in moist peat in plastic bags and stored in a refrigerator at approximately 4.5°C (40°F) until all are collected. Sowing begins when all seeds are ready, usually late October. It works out that some have been stratified six weeks and some maybe only a few days.

Leaching seeds in plain water for four or five days also seems to hasten germination.

Years ago, seeds were sown close together in flats, transplanted into pots when very small and shifted up to larger pots or, in California, lined out in the field. Evaluations were made as the plants grew larger or in the field, usually beginning in the spring after lining out.

Most breeders, today, plant seeds in benches in greenhouses spaced about one inch apart in rows five or six inches apart. They are never transplanted. As they bloom, the very bad ones are rogued out and the good ones are budded onto rootstocks in the field. From a crop of 200,000 seeds, a hybridizer can expect a little over 100,000 seedlings and from this about 1,000 selections are made, each being budded to 10 or so stocks.

In the process of evaluation over a period of years, the best are increased and most of the original selections discarded. From pollination to sale is usually eight to ten years for garden cultivars and maybe a little less for cut flower cultivars.

Greenhouse cultivars can be propagated more rapidly by grafting and re-grafting in the greenhouse. There is much interest now and some work being done to propagate using tissue culture methods. The rate of increase is fairly fast and some differences in final plant habit have been observed. So far, the biggest difference is that plants seem to branch more profusely from the base.

New cultivars and certainly progress in improving roses come primarily from controlled pollination of carefully selected parents. Mutations (sports) have been very important throughout the years as sources of good, even outstanding new cultivars. Here are a few famous cultivars originating as mutations.

'New Dawn' — A hardy climber. This variety has the distinction of holding United States Plant Patent #1.

'Better Times' — Millions of these near red roses were grown in greenhouses during the '30's, '40's and '50's. It was a good producer but has been surpassed by red cultivars of much finer color.

The source of 'Better Times' was a popular pink cultivar named 'Briarcliff' which, itself, was a sport of 'Columbia'.

'Texas Centennial' — a sport of 'President Hoover', was very popular as a garden rose.

A pink shrub rose called 'The Fairy', discovered in 1932 was a sport of a white rose named 'Lady Godiva', itself a mutation. 'The Fairy' is now seeing a new popularity in Europe where far more roses are used in landscaping than in the United States.

A recent hybrid greenhouse orange cultivar from Kordes, named 'Mercedes', has proved to be one that mutates easily. It has given off several red sports, two of which, 'Gabriella' and 'Jaguar' are widely grown and a lighter version, 'Romeo', is fast becoming popular, and quite a few others.

## HUNTINGTON BOTANICAL GARDENS — A SAMPLER

AUDREY TEASDALE

*The Huntington*  
*Library • Art Gallery • Botanical Gardens*  
*San Marino, California*

The Huntington is known for many things: the paintings of Blue Boy and Pinkie, the Gutenberg Bible, and a renowned Library of American and English literature used by scholars from around the world.

As plant people, are we aware of the plants the Huntington Botanical Garden has introduced to the U.S. and of the annual plant sale which attempts to make these introductions and other rarities available to the public? The remnants of the first commercial avocado orchard is still in existence at the Huntington. The Huntington is one of the West Coast quarantine center for imported bamboo. Within its 13 different gardens are collections of many genera of plants including the largest world-wide collection of mature cactus and succulent specimens grown outdoors.

In 1901 Henry E. Huntington, the founder, purchased what was then the San Marino Ranch. Huntington had by this time created and developed the clean and convenient electric street-car system throughout Los Angeles. Huntington's goal pertaining to the garden was to determine "which of the world's plants would thrive in southern California." This brought plants from all over the world so that today we can enjoy mature selections of choice plants. Fortunately, Mr. Huntington set up a trust so the Library, Art Gallery, and Botanical Gardens are privately endowed and there is no admission charge to the public.

Let's take a visual tour through a few of the Gardens and talk about some of the interesting plants along the way.

The North Vista is our formal Italian Garden with a view of the San Gabriel Mountains as a background. This area contains collections of various camellia species. In between the 17th century statuary are azaleas and many choice trees. Our oldest *Camellia japonica*, 'Pink Perfection', was here when Mr. Huntington purchased the property almost 80 years ago.