

to relieve the acute pain of gout. Physicians still use it today for this purpose.

In the 1930s, botanists began to notice the effects of colchicine on cell division. Then, in 1937, the first doubling of chromosomes in plant cells was reported. (A. Blakeslee and A. Avery, "Methods of Inducing Doubling of Chromosomes in Plants," *Journal of Heredity*, Vol. 28, 1937: 393-411.) This discovery led to a veritable torrent of interest and research in genetics and plant breeding which persists to this day.

Most of this research, however, has been devoted to the food and fibre crops, while ornamental plants (yes, even the rose) have been sadly neglected. To the best of my knowledge, the rose amphidiploid described here is the first to be obtained with colchicine. Nature has her own way of producing them on rare occasions by uniting two unreduced gametes, as we think happened centuries ago with cotton, coffee, and tobacco. But to verify such a production and rule out the involvement of a third species is not easy. That is why I had to speak of a "probable amphidiploid" in the *1987 American Rose Annual*.

Many techniques for applying colchicine to double the chromosomes of plants have been tried. I present here, in careful detail, essentially the method which was suggested to me 28 years ago by the British rosarian and taxonomist, Gordon D. Rowley, and which I have found quite effective through the years in producing both autopolyploids and allopolyploids. The method is effective mainly with dicotyledons, which include roses. We describe the production of an allopolyploid, that is, a plant which results from crossing two species and then doubling the chromosomes of the cross. In our case, the two species are both diploids, so the allopolyploid can also be called, more specifically, an amphidiploid.

We begin in the greenhouse with a flat of germinating seeds of the cross, *R. banksiae* x *R. laevigata*. I must not digress here to describe the many details leading up to this point; although, the prime condition of the seedlings is of prime importance to success. I will just mention one thing. The seeds of this cross rarely germinate the first spring after harvest and must be held over till the following year. This might be expected, since seeds of both parents behave in the same way.

I should also mention that the seed parent, *R. banksiae*, is a completely thornless plant which I raised from seed sent to me many years ago by the Italian rose breeder, Domenico Aicardi. A mislabeled picture of it is shown on page 125 of the *1988 American Rose Annual*.

The medium in which the seeds are sowed is one part peat moss, one part milled sphagnum moss, and two or three parts thoroughly decomposed leafmold, all finely screened. The young seedlings, when they appear, are easily plucked out of this soft medium with a pair of tweezers and placed in water before being potted. The ideal time is when the cotyledons have emerged, but the neck has not yet straightened out. Plucking the seedlings a day on either side of this time should also be satisfactory.

Without being too specific, my potting soil contains 1) rich soil from the floodplains of a nearby river, 2) some peat moss, 3) a little sand, 4) a generous amount of leafmold, 5) a little gypsum, 6) a little 20-percent superphosphate, and 7) a little slow-acting fertilizer such as *Magamp* or *Osmocote*. To pot the seedlings, fill 2-inch clay pots with moderately moist potting soil and firm level with the rim. Water the soil until saturated. With a paring knife, open a slit in the center of each pot and insert the seedlings. After another watering, they may be moved into the greenhouse near sundown.

Within a day or two, the little seedlings will be erect and reaching for the sun, and the two cotyledons will become greener, larger, and plumper. Then, in the crotch between the cotyledons, the second leaves will become just barely visible. With cells dividing rapidly, this is the time to apply the colchicine to the tiny meristem. I use 0.5-percent aqueous colchicine, prepared by adding one-half gram of colchicine to 100 cubic centimeters of water. It is best applied with a medicine dropper and refrigerated in a small bottle when not in use.

With the medicine dropper apply, in late afternoon, a drop or less to cover the tiny second leaves in the crotch. How do you apply less than a drop? This is done by touching the end of the dropper to the crotch, pressing out the desired fraction of a drop, then pulling away the dropper before releasing pressure. Just enough colchicine to cover the tiny meristem region through the night is required. Using half a drop doubles the number of seedlings that can be treated with the precious fluid. In early morning, the seedlings are sprayed with water to wash away the colchicine. This treatment is carried out on four successive nights, after which the treated seedlings receive only normal greenhouse treatment.

To prevent the colchicine from evaporating overnight, polyethylene or plastic covers can be designed to span the greenhouse bench. Or the seedlings may be placed in a tight cold frame or in plastic boxes with covers.