Bare-root Roses and Dormancy: Digging Timing and Cold Storage Affect Plant Performance

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Forcing dormant bare-root containerized roses into bloom for spring sales is an expanding market. Each year, several million plants are dug bare-root from production fields in Arizona and California and plants are shipped to nurseries nationwide where they are forced in containers. Growers in Texas specializing in forcing roses observed variable quality and time to flowering of different rose cultivars based on when plants were dug in the field and when they were potted. Questions about what influence the time of digging has on flowering, and how growers can assure high quality of plants forced into bloom led to a cooperative research project at the University of Arizona and Texas A&M. Several experiments were conducted to determine how plant quality and flowering performance are affected by time of digging and cold storage.

Researchers and growers have long looked for a measurable parameter to determine when deciduous plants are dormant and ready for digging in fall. Plants are most resistant to withstand the rigors of digging, storage, transport and transplanting when dormant. The onset of dormancy is easier to determine in cooler climates where temperatures reliably decrease and foliage is shed in fall. In warmer climates such as the Arizona rose production area around Phoenix, warm temperatures can linger into October and November and foliage often remains on plants until mid-winter.

Dormancy requirements of garden roses have not attracted much interest until recently when marketing bare-root plants has been increasingly replaced by marketing containerized roses in bloom. This required growers who force roses to predict flowering and have a reliable supply of flowering plants from late winter for markets in mild winter climates until late spring for markets in the coldest climates of the country. While the environment in which roses are forced influences the time to flowering and to a certain extent the quality at bloom, it is well known that plants that require chilling and are denied this period of cold temperatures will perform poorly during the next growing season.

As plants enter dormancy, they generally accumulate more starch in the canes. A common hypothesis in the rose industry is that starch reserves at the time of digging and possibly at the time of potting are related to the quality of forced plants where greater starch reserves in the canes are expected to yield larger plants with more flowers. This belief is likely based on studies that demonstrated the seasonal fluctuation of starch in deciduous woody plants and the conclusion that nursery stock
should remain in the field in fall until sufficient starch reserves are accumulated to allow plants to endure storage and resume new growth. The importance of rose cane or shank starch levels as a measure of capacity to endure cold storage and successfully regrow after digging has been noted by researchers as early as 1933.

We conducted a study to determine the relationship between visually determined starch content of current year’s canes and flowering of containerized field-grown garden roses that were dug early in the season. Plants of the cultivars ‘Chrysler Imperial’, ‘Christian Dior’, ‘Garden Party’, and ‘Oregold’ were harvested bare-root on 18 November and 2 December from a commercial field nursery in Arizona. Grade 1 plants were stored for either 0, 2, or 4 weeks at 35°F (2°C) and then were potted and forced to flowering in plastic-covered hoop houses in Tucson, Arizona and Tyler, Texas. At the time of digging and at the end of each storage period, representative plants were visually evaluated for starch content using stem cross sections stained with lugol solution (Fig. 1).

Starch ratings were similar across weeks of cold storage for the 18 November digging date, but declined with weeks of cold storage for some cultivars dug on 2 December. The number of flowering shoots differed between cultivars, digging dates and time in cold storage. We found no evidence that starch ratings of rose canes at the time of potting were related to the number of flowering shoots or the time from potting to flowering when bare-root plants are containerized and forced into flower.

Requests for flowering roses in mid winter for sales in mild climate regions require digging plants early in the season. The experiment we conducted to test the suitability of six rose cultivars for early digging was based on growers’ reports that some cultivars that were dug early in the season had slow and non-uniform growth of shoots and flower buds and sometimes failed to grow at all. Plants were either dug on November 22 or on December 12 in a commercial field nursery in Arizona and were placed for 0, 2, or 4 weeks in cold storage at 35°F (2°C). Bare-root plants were subsequently potted in 2-gallon containers and were forced in plastic covered greenhouses in Tyler, Texas or a retractable roof greenhouse in Tucson, Arizona.

Flowering and plant performance of containerized plants differed by cultivar, but in general the later digging date and cold storage resulted in better performance of forced plants. We found that ‘Oregold’ was the only cultivar which was not affected by the time of digging or cold storage. This suggests that ‘Oregold’ has extremely low or no dormancy requirement and is a good cultivar for early digging without compromising plant quality or time to flowering of forced plants. Cultivars ‘Christian Dior’, ‘Chrysler Imperial’, ‘Blue Girl’, ‘Mr. Lincoln’, and ‘Garden Party’ all improved in some aspect of flowering with either the later dig date or two or four weeks of cold storage, indicating their need for chilling before reaching their full growing potential when forced into bloom.

What can growers do to assure optimum performance of containerized roses? To investigate this question, different cultivars of roses were dug for two consecutive years at different dates starting as early as November 1 until January 13 and were kept
for 0, 2, 4, or 6 weeks in cold storage at 35°F (2°C). Bare-root plants were potted in 2-gallon containers and forced in Tucson, Arizona and Tyler, Texas.

We found that a two- to four-week period of cold storage reduced the number of days from planting to first leaf and flowering by one third up to half of the time for several cultivars compared to plants that were dug early in November and not placed in cold storage. Later digging dates or two to four weeks of cold storage of plants dug in early November increased the number of flowers (Fig. 2). Numbers of flowers varied by cultivar; ‘Sonia’ and ‘Don Juan’ produced the greatest numbers, and ‘Mr. Lincoln’ produced the least flowers.

Temperatures below 45°F (7°C) are considered chilling hours and the amount of chilling plants receive in the field will vary from year to year. Therefore, early in the season the date of digging is less critical than knowing the number of chilling hours plants have received in the field. Unlike many stone fruits where chilling requirements are well established, the exact amount of chilling hours necessary for containerized rose plants to reach their optimum quality is not known. We recorded that for the dig date of November 22, 2002 plants in the field had received 23 chilling hours, but after two and four weeks of storage plants had been exposed to 360 and 695 chilling hours, respectively. Cold storage of bare-root roses, especially those that were dug early in the season, provides chilling for plants and can be used to ensure good quality at flowering.

In conclusion, it appears that many rose cultivars destined for forcing in containers will benefit from two to four weeks of cold storage to shorten the time to flowering and increase the number of flowers. This benefit is greatest for plants dug in early fall, starting in November.

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Figure 1. Examples of starch ratings after cross sections of stems were stained with lugol solution to show starch.

Figure 2. Plants dug on November 22 were placed in cold storage for 0, 2, or 4 weeks (from left to right) before potting and forcing to bloom.