bark:peat:sand had larger root systems, were generally one size grade larger and were fuller plants due to increased lateral branching. The peat not only improved the growth when mixed with the coarse bark but reduced labor costs by reducing the number of waterings needed. The coarse bark, which is more *readily available to us, produced better plants than the finely* hammermilled bark. Although further testing is warranted, either urea or ammonium nitrate could be used as the nitrogen source which allows us to be flexible with the fertilizer market.

As for production advantages, less frequent waterings were necessary with the bark mixes, fewer weedings were needed the first summer and fewer pesticide drenches were required. Finally, worker productivity was increased during canning, spacing and shipping due to decreased weight of the media. These results have been incorporated into our production system and we are now completing our first growing season with plants in a bark:peat:sand medium.

LITERATURE CITED

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HOW TO GROW MINIATURE ROSES

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The story of present day miniature roses in the United States has been created mostly by two men: the late John de Vink of Boskoop, Holland, and the late Robert Pyle of The Conard-Pyle Co., West Grove, Pennsylvania. When Mr. Pyle was in Europe in 1933 he visited Mr. de Vink in Holland and found him experimenting with the breeding of miniature roses for his own amusement. Mr. Pyle was charmed with the idea of having "Fairy Roses", as he thought of them, and was sure they would be popular if he could produce them on a commercial scale. This would also permit Mr. de Vink to afford to keep amusing himself by developing more, and better, cultivars.

The miniature rose is a newcomer to the West. Miniature roses were known in England early in the 19th century. It is believed that the plants were a form of *Rosa chinensis* 'Minima'

found by traders in the Far East, and brought in from China or Japan, where they had been dwarfed by patient oriental art. This little rose, known as *Rosa pusilla* (*Rosa humilis*) when it first came to England, was there renamed in favor of Mary Lawrence, a popular exhibitor at the Royal Academy, whose specialty was flower paintings. "The first drawing of this charming little rose", says Miss Willmott in her Genus Rosa Vol. I, "appears in the Botanical Magazine of 1815, where it is called '*Rosa semperflorens*'." Two cultivars appeared and were called *Rosa lawrenceana* varieties, one credited to Roudoute in 1821, and the other, *Rosa Lawrenceana* 'Alba', to Mouget in 1827.

Later, these little roses were apparently lost to cultivation. A century later a miniature rose was again found — this time in Switzerland — and propagated by Henry Correvon, a Swiss nurseryman, and named *Rosa roulettii* by him for the man who rediscovered it.

Mr. John de Vink had plants of this *Rosa rouletti*, and he was crossing them with any pollen that he had on hand. His first miniature rose was sent to The Conard-Pyle Co. in 1934 and was patented and introduced in 1936. It was named *Rosa* × 'Tom Thumb', and was the first patented miniature rose. There are now a large number of different cultivars in various colors on the market.

The size of miniature roses ranges from 8 to 15 inches high; the bloom sizes range from 1/2 to 1½ inches, and the petals range in number from 10 to 80. Some have single blooms, while others bloom in heavy clusters; all are constant bloomers.

Miniature roses can be grown indoors or outdoors. Indoors they do well in a sunny window or balcony. Outdoors they can be grown in any part of the garden in full sun; 6 hours of sun is sufficient to grow them well. Pests are not a problem but plants should be sprayed at least every 2 weeks to prevent disease. A light dose of fertilizer in early spring and again in early summer will give them plenty of nutrients.

We grow approximately 250,000 miniature roses yearly. We start mother plants in the field, using *Rosa multiflora* understock. We bud them in summer, in late winter the tops are cut leaving just the bud. The following summer we take cuttings from these plants. We go to the stock block in the morning and take cuttings for 2 hours, enough cuttings for a day's work. The cuttings are 2-3 inches in length and cut right under the bottom node for better rooting. They are dipped in 0.1% IBA powder, stuck directly in 3 inch plastic pots filled with 50% peat/50% perlite, and placed on benches in a glass greenhouse or in plastic-covered quonset huts.

We mist 30 sec each 5 min from 8:30 a.m. to 5:30 p.m. About 10 days after the cuttings are stuck, we begin to cut down the mist. Miniatures take 2-3 weeks to root, and as soon as they are rooted we start to feed them using 150 ppm N of Peter's 20-20-20 on a constant feeding program. We spray every 10 days with Phaltan, Diazinon and Manzate.

A few weeks later these plants are moved outdoors to quonset huts, and are heeled in sand about 2-3 inches deep to prevent root damage during cold weather. We continue with the same feeding and spraying program we used indoors. In late fall we cover the quonset huts with a single layer of 6 mil poly film for winter protection. At this time these plants are ready for sale.

Our sales are approximately 85% wholesale and 15% retail. For shipping, the plants are cut back to about 4 inches and wrapped in aluminum foil to prevent the soil mix from coming out of the pot. They are ready for forcing when the customer receives them; forcing takes about 6 to 9 weeks, depending upon the cultivar.

INJURY TO SELECTED PLANTS DUE TO FLUORIDE TOXICITY

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Chlorosis and necrosis of plant foliage is caused by various agents including: disease causing organisms, insects, mites, nematodes, high soil salinity and air pollutants. Occasionally, foliar problems cannot be directly attributed to these causes. Such is the case with certain plants which respond to excessive fluoride ions in irrigation water, soil solution or fertilizer. As recently as 1971 (5), the necrotic lesions which often develop on the distal portion of leaves of Cordyline terminalis propagated from terminal cuttings was reported to be of a non-pathogenic nature. Research findings at that point indicated that *Cordyline* could be propagated best if cuttings were stuck in either calcined clay (Turface) or Louisiana sedge peat, in preference to other available rooting media.

The first report of fluoride toxicity in tropical foliage plants was made by Conover and Poole (1) in late 1971. Freshly harvested cuttings of *Cordyline terminalis* 'Baby Doll' developed