

Timing and Auxin Concentration Affects *Cotinus coggygia* 'Royal Purple' Rooting

Diane Dunn

Greenleaf Nursery Company, HC 72 Box 163, Park Hill, Oklahoma 74451 U.S.A.

Softwood cuttings of *Cotinus coggygia* 'Royal Purple' had 92% rooting when taken on 25 May and treated with a 10,000 ppm IBA + 5,000 ppm NAA quick dip. With the exception of the 2,500 ppm IBA treatment, a higher percentage of rooted cuttings resulted when cuttings were taken on 25 May. Cuttings harvested on 25 May were from actively growing shoots with 13 to 19 cm (5 to 7.5 inches) of growth. Cuttings treated with 20,000 ppm IBA and cut on 25 May produced the highest number of roots per cutting (59).

INTRODUCTION

Cotinus coggygia, commonly known as smoketree or smokebush, is an upright multi-stemmed shrub or small tree reaching 3 to 7 m (10 to 20 ft) in height. Best known for their flower panicles that create a smoke effect, several green-leaved and purple-leaved cultivars are currently sold. Smoketree is easily propagated from seed, however this produces variable seedlings with a large percentage having green leaves. Hancock (1957) reported successfully mound layering *C. coggygia* in Canada. However, propagation from cuttings is the preferred propagation procedure because of seedling variability, preference for selling named cultivars, and impracticality of mound layering in commercial nurseries.

Rooting of *C. coggygia* 'Royal Purple' is variable based on time of cutting, wood selection, and auxin concentration. John Sjulín (1958) reported propagating softwood cuttings of *C. coggygia* 'Royal Purple' in outdoor mist beds in Iowa. Using softwood cuttings, treating them with Hormodin #2, he reported a 60% stand going into winter. Kelly and Foret (1977) reported softwood cuttings taken in Iowa rooted as high as 90% when taken 11 June and decreased to 33% by 24 July. Macdonald (1986) reported *C. coggygia* 'Royal Purple' is difficult to root due to the waxy nature of the cuticle causing excess water to accumulate on leaves, encouraging damping off. Additionally, stems "bleed" when severed.

Auxin applications have been shown to increase rooting in hard-to-root species. The most widely used root promoting chemicals today are IBA and NAA. Although IBA is the most commonly used auxin to induce rooting, NAA is superior for some species (Dirr, 1986; Morini and Isoleri, 1986). The purpose of this study was to determine the most advantageous cutting time for Royal Purple smoketree and optimum auxin treatment for cuttings at that time.

MATERIALS AND METHODS

On 15 May and 25 May, 1996 softwood terminal cuttings 10 to 13 cm (4 to 5 inches) long were taken from plants in 19-liter (5 gal) containers located in full sun at Greenleaf Nursery in Park Hill, OK. On 15 May shoot length from bud to the end of the terminal shoot was 10 to 13 cm (4 to 5 inches). The cuttings were very soft and

pliable. Shoots were in active growth with immature leaves at the terminal end of the shoot. Cuttings had no visible lenticels and had a "rubbery" appearance. On 25 May shoots were 13 to 19 cm (5 to 7.5 inches) and actively growing with leaves still expanding, and lenticels beginning to show. Cuttings were taken to a building, re-cut to 10 cm (4 inch) length and lower leaves were stripped. The basal 1 cm was dipped 5 sec in one of the following auxin treatments:

- tap water,
- 70% isopropyl alcohol,
- 2500 ppm IBA,
- 5000 ppm IBA,
- 10,000 ppm IBA,
- 20,000 ppm IBA,
- 1250 ppm NAA,
- 2500 ppm NAA,
- 5000 ppm NAA,
- 10,000 ppm NAA,
- 2500 ppm IBA + 1250 ppm NAA,
- 5000 ppm IBA + 2500 ppm NAA,
- 10,000 ppm IBA + 5000 ppm NAA,
- 20,000 ppm IBA + 10,000 ppm NAA.

Cuttings were placed in 12 cm (4.5 inch) wide \times 36 cm (14 inch) long \times 6 cm (2.4 inch) deep plastic flats filled with peatmoss and perlite (1 : 1, v/v) and placed in a quonset greenhouse on black groundcloth under 73% shade. DGT Mist Nozzels 2 LPM were placed 52 cm (20.5 inches) above the flats and spaced at 0.9 m (35.6 inch) intervals. Mist cycles were adjusted daily for changing environmental conditions, but averaged 6 sec duration every 60 min between 8:00 and 11:00, and then 8 sec every 30 min between 11:00 and 18:00 hours.

A randomized complete block design was used with 10 replications of 5 subsamples for each auxin treatment at each cutting date. Cuttings were evaluated 9 weeks after collection for primary root number and mean primary root length of the three longest roots.

RESULTS

Cuttings taken on 15 May had consistently lower rooting percentages than those cut on 25 May (Table 1). There was little rooting percentage difference between 20,000 ppm IBA (32%), 2500 ppm IBA (31%), and 5000 ppm IBA + 2500 ppm NAA (29%) treatments when cuttings were harvested 15 May.

Cuttings taken on 25 May and treated with 10,000 ppm IBA + 5000 ppm NAA produced the largest number of rooted cuttings (92%). Average number of roots per rooted cutting was higher on 25 May cuttings regardless of treatment. Treatments resulting in the highest number of roots per cutting included 20,000 ppm IBA (59.3), 10,000 ppm IBA + 5000 ppm NAA (51.5), and 10,000 ppm IBA (47.8). For all treatments, the longest mean primary root length of the three longest roots was measured on cuttings harvested on 25 May. Longest mean root length (15.9 cm) was produced by the 5000 ppm IBA + 2500 ppm NAA treatment. NAA treatments produced less rooted cuttings, less roots per cutting, and less root length than IBA or IBA + NAA treatments, regardless of cutting time.

Table 1. Effect of two cutting dates and IBA and/or NAA on *Cotinus coggygria* 'Royal Purple' rooting percentage, root number, and average length of the three longest roots.

| IBA (ppm) | NAA (ppm) | Rooted (%) | | No. of roots per cutting | | Avg. length three longest roots (cm) | |
|--------------|--------------|---------------|--------|-----------------------------|--------|--|--------|
| | | 15 May | 25 May | 15 May | 25 May | 15 May | 25 May |
| 2500 | 0 | 62 | 40 | 11.5 | 19.1 | 4.9 | 11.6 |
| 5000 | 0 | 34 | 72 | 11.6 | 30.8 | 6.5 | 11.8 |
| 10,000 | 0 | 56 | 86 | 15.0 | 47.8 | 8.3 | 13.8 |
| 20,000 | 0 | 64 | 64 | 27.0 | 59.3 | 8.5 | 13.7 |
| 0 | 1250 | 2 | 54 | 1.0 | 13.1 | 3.2 | 8.9 |
| 0 | 2500 | 4 | 62 | 3.5 | 22.0 | 2.6 | 11.9 |
| 0 | 5000 | 14 | 26 | 11.4 | 19.3 | 4.3 | 12.4 |
| 0 | 10,000 | 10 | 32 | 2.0 | 24.4 | 3.4 | 11.8 |
| 2500 | 1250 | 44 | 82 | 13.4 | 32.9 | 5.5 | 12.6 |
| 5000 | 2500 | 58 | 86 | 8.0 | 34.3 | 8.4 | 15.9 |
| 10,000 | 5000 | 54 | 92 | 16.5 | 51.5 | 8.4 | 13.9 |
| 20,000 | 10,000 | 44 | 56 | 23.3 | 25.9 | 9.1 | 13.2 |

DISCUSSION

Many varieties of trees and shrubs have a short (4 to 6 weeks) window of rootability. Stoutmeyer (1942) found difficult-to-root *Chionanthus retusus* Lindl. and Paxt. will root in high percentages if obtained during a 1-week period in May. A very narrow window of rootability was also shown in native *Rhododendron* (Nienhuys, 1980), *Syringa* (Wedge, 1977; Mezitt, 1978), and *Pistacia chinensis* (Dunn et al., 1996). Kelly and Foret (1977) found cuttings taken from *C. coggygria* 'Royal Purple' on 11 June produced the highest rooting percentage with rooting percentage dropping as wood matured. After evaluating three types of cutting wood (immature/green), intermediate, and mature at each cutting date they found immature wood resulted in the highest rooting percentages on all four cutting dates with the exception of 11 June when intermediate cuttings rooted better. The results of this experiment are consistent with Kelly and Foret's findings with slightly more mature cuttings taken on 25 May rooting in greater percentages than immature cuttings taken on 15 May. Control treatments showed a substantial increase in rooting from 15 May to 25 May indicating the importance of cutting time regardless of auxin treatment.

Beakbane (1961) proposed a correlation between the degree of sclerification of the primary phloem and rooting capacity suggesting that rooting of difficult subjects might be facilitated by using very young shoots taken before the cells of the primary phloem lose their living protoplasts. She suggested it may be possible to forecast rooting capacity from the structure of the stems. Our study shows that rooting

capacity for *C. cotinus* 'Royal Purple' is greater when cuttings are taken from soft actively growing shoots with 13 to 19 cm (5 to 7.5 inches) of new growth and immature leaves at the terminals. While softwood cuttings of *C. coggygia* 'Royal Purple' are necessary for rooting success, immature cuttings collected too early in spring had reduced rooting success. Softwood cuttings harvested on 25 May and treated with 10,000 ppm IBA, 2500 ppm IBA + 1250 ppm NAA, 5000 ppm IBA + 2500 ppm NAA, and 10,000 ppm IBA + 5000 ppm NAA produced the largest number of rooted cuttings. Cuttings treated with 20,000 ppm IBA + 10,000 ppm NAA had a decrease in rooting, indicating the negative effects of high auxin concentration. Cuttings harvested 25 May and treated with 2500 ppm IBA + 1250 ppm NAA produced the longest roots, but that may have been influenced by the lower number of roots per cutting when compared to the 10,000 ppm IBA + 5000 ppm NAA treatment. In conclusion, cuttings harvested on 25 May and treated with 10,000 ppm IBA + 5000 NAA produced the best overall results. It was visually noted that all IBA + NAA combinations produced more secondary roots than IBA or NAA alone. While 10,000 ppm IBA produced similar results to 10,000 ppm IBA + 5000 ppm NAA, the minimal difference in cost of auxin treatments makes addition of NAA more cost effective.

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