EFFECT OF TIMING AND WOOD MATURITY ON ROOTING OF CUTTINGS OF *COTINUS COGGYGRIA* 'ROYAL PURPLE'

JAMES D. KELLEY and JAMES E. FORET, JR.[1]

Iowa State University
Ames, Iowa 50011

Abstract. Softwood cuttings of *Cotinus coggygria* 'Royal Purple' rooted best when taken as early as June 11. Rooting response decreased on each subsequent date, to 33% rooting on July 24. On all dates, with the exception of June 11, rooting was best when immature, actively growing, terminal wood was used and when cuttings were treated with a rooting hormone and rooted under intermittent mist. Hormones influenced root quality more than cutting time or maturity of the wood. Results indicate that with *Cotinus coggygria* 'Royal Purple' rooting percentage can be at least 95% when attention is given to timing, wood selection, and the use of hormones.

Seasonal variation in the rooting response of cuttings can be an important factor influencing the successful propagation of many plants. Since the rooting response can be seasonal, this increases the importance of timeliness in propagation. The effect of timing and wood selection has been shown by Congdon (2) to be an important factor in successful propagation by cuttings. Others (1,4,5) have demonstrated the importance of timing in the successful propagation of a number of species. This work is concerned with the role of wood type, timing and auxins on the rooting of *Cotinus coggygria* 'Royal Purple'.

Hancock (3) has described the propagation of *Cotinus coggygria* by layering, while Sjulin (6) reported his method of propagation of 'Royal Purple' Smoke Bush by using softwood cuttings under mist. He found best results were obtained when terminal cuttings were taken from stock plants with 10 to 12 inches of new growth and when the wood was quite soft. This resulted in about a 60% stand going into the winter.

MATERIALS AND METHODS

Cuttings were taken from established stock plants growing in a nursery in Hamburg, Iowa. Cuttings of three wood types were collected on four dates. Cuttings were 5 inches in length. The three types of cuttings were immature, intermediate, and mature. The immature cuttings were terminal cuttings taken from shoots in active growth. This was readily visible since the leaves near the end of the shoot were immature and had not expanded. Looking at the immature cutting from the side it had a pyramidal outline. A mature cutting had all leaves including the very youngest fully expanded, while the intermediate type bore at least some leaves that were still expanding.

[1] Associate Professor and former Graduate Student, Dept. of Horticulture.

Cuttings of these three types were taken on June 11, June 25, July 8, and July 24. The auxin treatments consisted of a check and a quick dip (5 sec) of 1425 ppm IBA, 1425 ppm NAA and 50 ppm boron as boric acid. The lower 1-1/2 inches of the cuttings was placed in the quick dip. The above resulted in 6 treatments on each of the four dates. Each treatment consisted of 80 cuttings in 10 replicates or a total of 1,920 cuttings in the entire experiment. Cuttings were rooted in horticultural grade perlite under intermittent mist in the greenhouse. The cuttings were under mist for 10 weeks, then evaluated for percent rooting and root quality. Root quality was based on a scale of 1 to 5 with 1 considered poor and 5 excellent.

RESULTS

The effect of timing and wood maturity on rooting percentage and root quality is shown in Table 1. The data show a gradual decline in rooting percentage as the season progressed. The highest rooting percentage was obtained from cuttings taken June 11 and dropped to the lowest percentage on July 24. Immature wood resulted in the best rooting percentage on all three dates with the exception of June 11. The data suggest that as wood matures and the summer progresses rooting percentage drops dramatically.

Root quality was not as greatly influenced by wood maturity and cutting date as was rooting percentage. Best root quality was obtained on cuttings taken July 8 while the least quality was on cuttings taken July 24. Mature cutting were poorest in root quality at all cutting dates. These results indicate that cutting dates had a significant influence on root initiation but little or no influence on root development. Auxins influenced both root initiation and root development.

Table 1. Effect of time and wood maturity on rooting percentage (R.P.) and root quality (R.Q.) of *Cotinus coggygria* 'Royal Purple'.

	Cutting Date									
	June 11		June 25		July 8		July 24		Mean	
Wood Maturity	R.P.	R.Q.[x]	R.P.	R.Q.	R.P.	R.Q.	R.P.	R.Q.	R.P.	R.Q.
Immature	85	2.8	82	3.1	80	3.3	63	2.7	77	3.1
Intermediate	90	3.0	71	2.8	73	3.4	33	3.1	66	3.1
Mature	84	2.8	59	2.6	38	3.0	4	2.0	46	2.8
Mean	86	2.8	70	2.9	64	3.3	33	2.6		

[x] 1 = Poor, 5 = Excellent.

The effect of timing and auxin treatment on rooting percentage and root quality are shown in Table 2.

Table 2. Effect of timing and auxin on rooting percentage (R.P.) and root quality (R.Q.) of cuttings of *Cotinus coggygria* 'Royal Purple'.

	Cutting Date									
	June 11		June 25		July 8		July 24		Mean	
Auxin	R.P.	R.Q.[x]	R.P.	R.Q.	R.P.	R.Q.	R.P.	R.Q.	R.P.	R.Q.
Check	81	2.6	60	2.6	55	2.7	27	2.2	56	2.7
IBA and NAA	91	3.0	81	3.1	72	3.8	40	3.3	71	3.3
Mean	86	2.8	70	2.9	64	3.3	33	2.8		

[x] 1 = Poor, 5 = Excellent.

Cuttings treated with IBA and NAA rooted best on all cutting dates. The later in the season the cuttings were taken the greater the response to auxins. Cuttings taken June 11 showed the least response to auxins.

The relationship between timing and auxin on root quality is also shown in Table 2. Auxins had the greatest effect on cuttings taken the last cutting date, July 24, and the least on those taken June 11. The pattern is similar to that of the rooting percentage. As the season progressed root quality remained essentially unchanged.

The effect of wood maturity and auxins on rooting percentage and root quality is shown in Table 3. Rooting percentage dropped significantly when mature wood was used for cuttings. This was true for both check and auxin treated material. The response to auxin was least on immature wood and greatest on mature wood. Root quality was increased when auxins were used but maturity of wood had little or no influence on root quality.

Table 3. Effect of wood maturity and auxins on rooting percentage and root quality of *Cotinus coggygria* 'Royal Purple'.

	Rooting Percentage		Root Quality[x]	
Wood Maturity	Check	Auxin	Check	Auxin
Immature	67	88	2.9	3.3
Intermediate	61	72	2.8	3.4
Mature	31	53	2.3	3.3

[x] 1 = Poor, 5 = Excellent.

DISCUSSION

Softwood cuttings of *Cotinus coggygria* 'Royal Purple' taken early in the growing season rooted better than cuttings taken 4 to 6 weeks later. Hartmann and Loreti (4) found a similar response for leafy olive cuttings, from easy-to-root and difficult-to-root clones. Cuttings of Chinese fringe tree (*Chionanthus retusus*) were also found to root best early in the growing season (7). A lower level of auxins in the mature cuttings and later in the season may have been responsible for a lower rooting per-

cent. Mature cuttings were most responsive to an application of growth regulators.

In general treatments had the greatest effect on root initiation as shown by rooting percent but had the least effect on root development as shown by root quality. However, root quality generally was least on immature and intermediate cuttings and on cuttings treated with a growth regulator.

Auxins were most effective in improving rooting as the season progressed but were beneficial on cuttings taken early in the season. Mature cuttings responded to auxins to a greater degree than immature cuttings. These results show that cuttings of *Cotinus coggygria* 'Royal Purple' root best from immature and intermediate cuttings taken early in the season and treated with auxin. If cuttings are made later in the season the propagator should select immature cuttings for best results.

LITERATURE CITED

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CASE HOOGENDOORN: How do you treat these cuttings to get them to survive?

JIM KELLEY: They are rooted in outdoor mistbeds and left in place until spring. The beds are protected in the winter; in the spring the cuttings are taken up and planted to the field with very good survival rates.

PETE VERMEULEN: We rooted them very successfully using direct stick methods with soil incorporated into the rooting medium. We've carried them over very successfuly in a deep frame and in controlled storage with temperatures between 33-38°F. In order to get a good supply of cutting wood we would top the new shoots about the time the wood is ready to mature and allow this to remain for another couple of weeks. The shoots would develop feathers 4-6 inches long, up and

down the stem. These were then taken as a cutting with a heel and they rooted very well indeed.

JIM KELLEY: That should work; I don't believe you can take the cuttings of this plant too soft.

MIST NOZZLES

L.P. STOLTZ, J.N. WALKER and G.A. DUNCAN[1]
University of Kentucky
Lexington, KY 40506

Prior to the development of mist propagation, the turgidity of cuttings in the rooting bench was maintained by manual syringing and shading. Hand syringing during hot weather requires a considerable amount of time especially for the first few days to acclimate the cuttings to their new situation without roots. The use of shade during the acclimation period or during the entire rooting period helped to reduce the transpiration rate but also increased rooting time as a result of light reduction. Early studies involved the use of various systems of supplying water to the cuttings such as centrifugal humidifiers, atomizing, deflector and whirling nozzles to alleviate the hand labor. The advent of mist propagation not only greatly alleviated the need for manual syringing but also permitted cuttings to be acclimated without the need for shading.

Although it is important to maintain the turgidity of the cuttings, excess mist can cause problems by reducing the medium temperature and/or leaching nutrients from the foliage. For maximum effectiveness, uniform water distribution over the cutting bench area is desired. This would allow the on cycle to be kept to a minimum which would conserve water, prevent leaching of nutrients from the foliage and avoid a reduction in medium temperature. Ideally this would require a square pattern spray nozzle with uniform water distribution over the area covered. Mist nozzles, however, spray a circular pattern which requires overlapping of the pattern at some locations and thereby gives non-uniform wetting of the area.

MIST PROPAGATION NOZZLES

The two basic types of nozzles used in mist propagation systems are the oil-burner type, which has a whirling action and deflection nozzles where a small stream of water hits a flat surface. The whirling nozzles use smaller orifices and some-

[1] Assoc. Prof. of Horticulture, Professor and Exten. Agric. Engineer, respectively.