SEASONAL ROOTING OF BLUE CHINAFIR CUTTINGS

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Landscape architects and nurserymen are constantly looking for new plants that may serve as an accent or focal point of urban landscape design. Before these new plants can be produced by the nurseryman in a profitable manner, successful means for propagation and nursery production must be developed.

A specimen plant with good potential for the southeastern United States is the blue chinafir (*Cunninghamia lanceolata* 'Glauca'). This selection of chinafir has a lustrous, glaucous blue foliage and is an excellent accent plant. It has slightly pendulous branches bearing large flat needles that give it an exotic appearance. A tree growing on the University of Tennessee, Knoxville, grounds has survived all adverse weather conditions for the past 20 years, including temperatures as low as -24° F, and has had no insect or disease problems. The blue chinafir is probably a more suitable blue-foliage conifer for the Southeast than either blue spruce or concolor fir, even though it has a somewhat coarser foliage texture.

Little information is available on the propagation of this species. Dirr (1) recommended taking cuttings during November and using high concentrations of indolebutyric acid (IBA). Since no other published information on the rooting of blue chinafir could be found, it was not clear whether it would root fairly well like *Taxus*, or have a narrow window of rootability like *Sciadopytis*. Since the plant is somewhat rare in the nursery trade, it was suspected that problems might be encountered.

Differences in genetic characteristics, such as anatomy and physiology usually explain why certain plants do not root readily (5). Hartmann and Kester (3) stated that hardwood cuttings of certain narrow-leaved evergreens are slow to root, often taking several months to a year. They categorized rootability of various species as easy (*Thuja*, creeping juniper), fair (*Taxus*), difficult (*Picea, Tsuga*), and very difficult (*Abies, Pinus*). They recommended that narrow-leaved evergreen cuttings be taken between late fall and late winter. Lanphear and Meahl (4) showed that rooting peaked for Andorra juniper cuttings taken in December, January, and February with relatively poor rooting taking place from June to October. Propagation research conducted on *Sciadopitys verticillata* showed that the highest levels of rooting occurred in February and March and again in July and August (9).

Cuttings of Leyland cypress (× *Cupressocyparis leylandii*) are most successfully rooted from February to March (2).

Quite different seasonal rooting responses are evident in deciduous ornamental species (8). Cuttings of certain broad-leaved plants have very distinct "windows" of rootability. Succulent deciduous azaleas cuttings root quite readily if taken in early spring, but by late spring, rooting percentages decline rapidly (6). Chinese fringetree, (*Chionanthus retusus*), is notoriously difficult to root except during a month-long period beginning about 6 weeks after bloom (10). Pokorny and Dunavent (7) showed that cuttings of southern wax myrtle (*Myrica cerifera*) rooted satisfactorily only during the period between May and August.

Cuttings of *Cunninghamia lanceolata* 'Glauca' were taken at intervals throughout the year in order to develop a rooting curve to show peak periods of root formation. A second purpose was to determine effects of varying levels of IBA on root formation.

MATERIALS AND METHODS

Forty cuttings were taken at about two-week intervals from a superior mature blue chinafir located on the Agricultural Campus of the University of Tennessee at Knoxville. Terminal cuttings four to five inches long were removed from random lateral branches in the lower half of the tree. Wounding of each cutting consisted of removal of basal leaves for two inches. Propagation was carried out in 4-in. deep flats filled with a peat moss and perlite (1:1) medium. Flats were placed on a greenhouse bench equipped with mist irrigation and Biotherm bottom heat at 18 °C. Mist intervals were 12 sec every 6 min, from 8 a.m. to 5 p.m. The bench was covered with a polyethylene tent to prevent air currents from disturbing the mist pattern.

Four levels of a commercial IBA hormone powder formulation, Hormex, were used to initiate rooting. Concentrations used were 8000, 16,000, 30,000, and 45,000 ppm. Ten cuttings were treated with each concentration per date.

Cuttings remained in the bench about 2½ months. Data were recorded on number of roots per cutting for each hormone level at each cutting date. The percentage of cuttings that rooted at each hormone level at each cutting date was calculated. The experiment was arranged in a randomized complete block design. Data were statistically analyzed using PC-SAS procedures.

RESULTS AND DISCUSSION

Seasonal variation and rooting. Nearly 100% rooting occurred in March and again in late June and late July. Figure 1 shows pooled data averaged for all hormone concentrations. Rooting exceeded

80% from June 20 to September 20 and then declined to a low of about 30% in January. Poorest rooting occurred in mid- to late May when the tree was making a growth flush. Cuttings taken on dates that gave the highest percentage of rooting also showed the largest number of roots per cutting. A small number of roots per cutting coincided with poor percent rooting (Table 1). This data suggests that *Cunninghamia lanceolata* 'Glauca' has a bimodal seasonal rooting curve with a narrow peak in late winter and a broad peak in mid- to late summer.

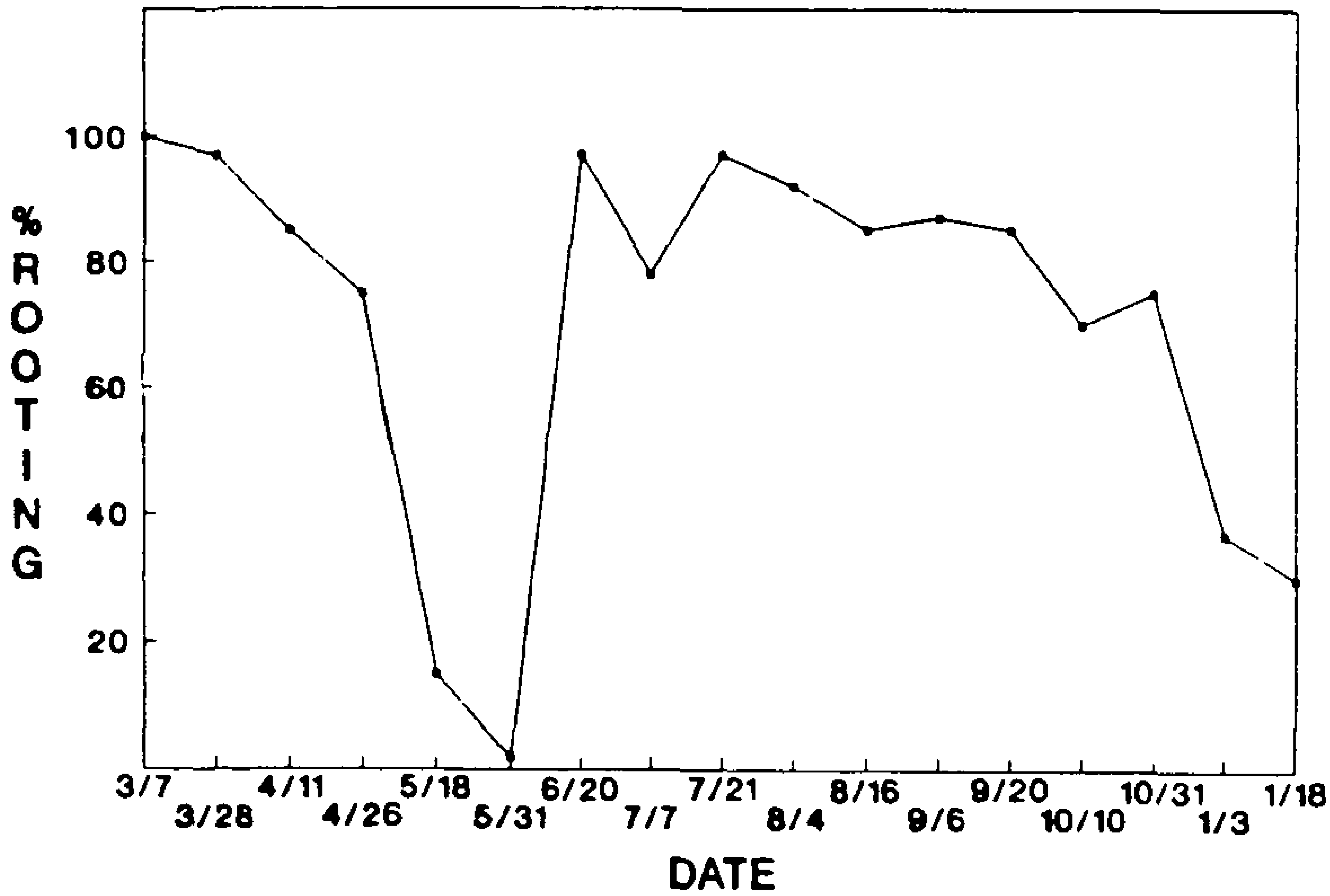

Figure 1. Effect of cutting date on percent rooting of blue chinafir

Hormone concentration and rooting. There was little effect of hormone concentration level on the rooting percentage of cuttings (Figure 2). Hormone concentrations of 8000 and 16,000 ppm were sufficient to induce an acceptable level of rooting. There were a few minor aberrations in the mean number of roots produced per cutting and in percent rooting. One occurred August 16 in which the mean number of roots was highest in the 45,000 ppm IBA treatment (Table 1). Another was the high rooting percentage in the 16,000 ppm IBA treatment on October 31 (Figure 2). These values are probably random effects due to the small sample size and should not be interpreted as being different from the general pattern.

Table 1. Number of roots formed per cuttıng of blue chinafır for each IBA level at each cuttıng date.

Date	IBA ppm				Overall Mean**
	8000	16,000	30,000	45,000	
3/7	5.7*	8.9*	9.8*	11.5*	9.0 bc
3/28	6 8	9.1	5.4	8.8	7 5 cd
4/11	6 8	5.0	5.1	6 9	6.0 de
4/26	3.3	3.5	4 6	6 7	4.5 efg
5/18	2.3	0.1	0.2	0	0.7 h
5/31	0	0	0	0 4	0 1 h
6/20	12 3	14 1	9 8	14.7	12 7 a
7/7	6.9	3.0	4.7	6 6	5.3 ef
7/21	9.7	8 4	7.5	8.1	8 4 bc
8/4	12.6	14 5	8.6	3.4	10 0 b
8/16	7.8	6 4	6 1	16.7	9.3 bc
9/6	8 0	5.3	6.2	4 8	6.1 de
9/20	7.8	6 9	5 2	3.2	5 8 e
10/10	4.6	5.5	2 8	2 0	3.7 fg
10/31	7.5	6 7	5 1	3.9	5.8 de
1/3	1.2	0 5	2.0	0.8	1 1 h
1/18	5.3	3.2	3 7	0	3.1 fg
Overall Mean	6.39a**	5 97 a	5 11 b	5.82 a	

** Means wıthın a row or column followed by the same letter are not signıficantly dıfferent usıng Duncan's multıple range test at the 5% level
* Mean of ten cuttings.

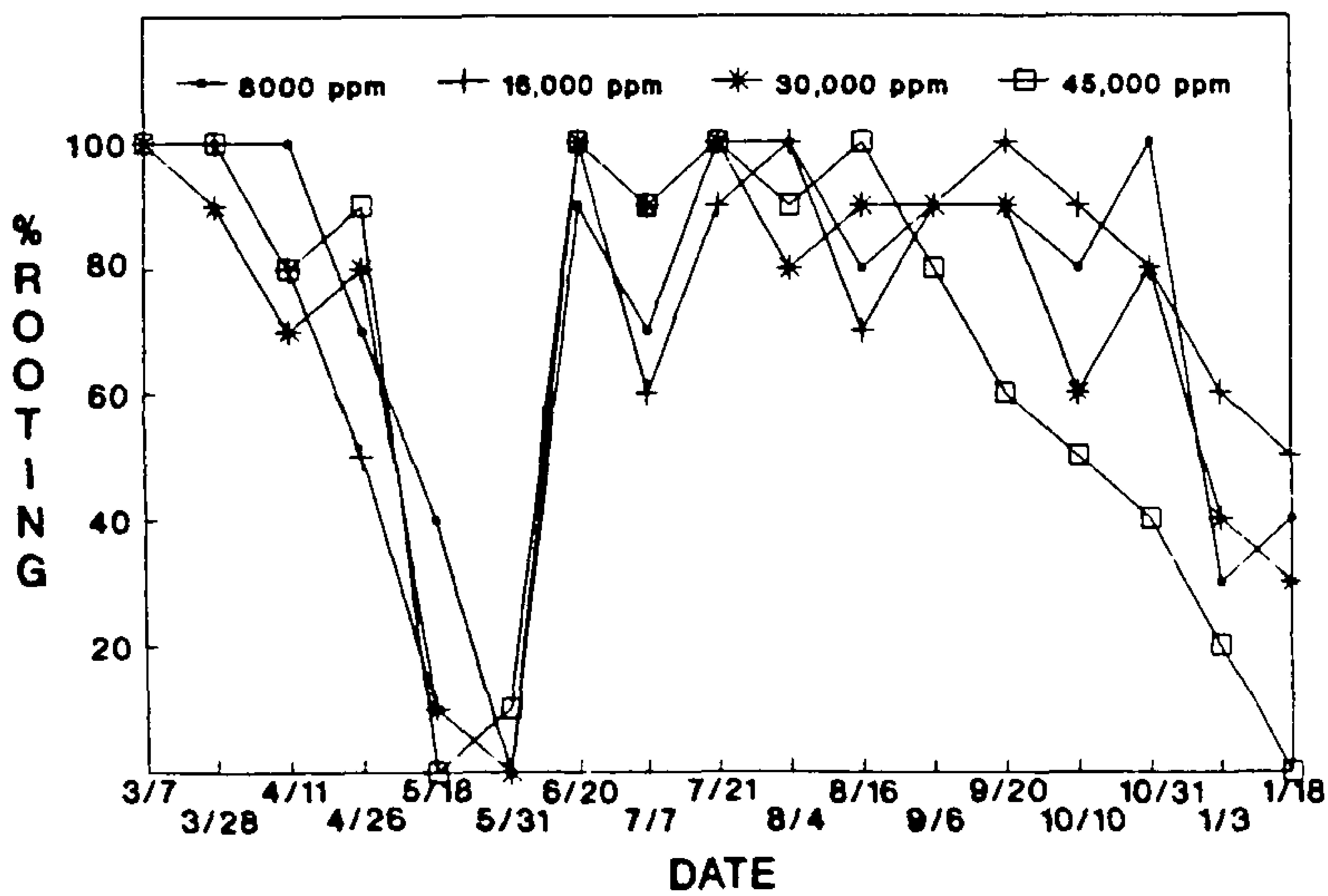

Figure 2. Effect of IBA level on percent rootıng of blue chınafır at each cuttıng date

In summary, data collected on the rooting of *Cunninghamia lanceolata* 'Glauca' shows two periods when cuttings may be rooted successfully, one in late winter and one in late summer. Cuttings taken in late winter have only a narrow "window" in which they will root well while cuttings taken in late summer have a longer rooting "window". The 8000 and 16,000 ppm levels of hormone were adequate for satisfactory rooting and for root numbers per cutting.

A question yet to be answered is whether or not these rooted cuttings will grow into attractive normally-shaped small trees. We anticipate that topophysis may be a problem, with the lateral branching habit of growth persisting for a time. Therefore, further research is being conducted on methods to encourage development of the spiral or radial habit of growth of the central leader as opposed to the flattened 2-ranked planar habit of the lateral branches.

LITERATURE CITED

1 Dirr, M A 1983. *Manual of Woody Landscape Plants.* Stipe Publishing Co., Champaign, Illinois

2. Dirr, M.A , and C W. Heuser Jr 1987 *The Reference Manual of Woody Plant Propagation. From Seed to Tissue Culture.* Varsity Press, Athens, Georgia

3 Hartmann, H T and D E. Kester 1983 *Plant Propagation: Principles and Practices* 4th ed. Prentice Hall, Englewood Cliffs, New Jersey

4 Lanphear, F.O , and R P Meahl. 1961 The effect of various photoperiods on rooting and subsequent growth of selected woody ornamental plants *Proc Amer. Soc. Hort Sci* 77 620-34

5. Macdonald, B 1986 *Practical Woody Plant Propagation for Nursery Growers* Volume 1 Timber Press, Portland, Oregon

6 Nienhuys, H.C 1980 Propagation of deciduous azaleas *Proc Inter Plant Prop Soc* 27 402-406.

7 Pokorny, F A , and M G Dunavent 1984 Seasonal influence and IBA concentration effects on rooting terminal cuttings of southern wax myrtle *Proc SNA Research Confr* 29.209-214

8 Tustin, D S. 1977 Physiological factors limiting the propagation of deciduous ornamentals by hardwood cuttings *Proc Inter Plant Prop Soc* 27 319-322

9 Waxman, S 1978 Propagation of umbrella pine—clonal differences in root initiation *Proc Inter Plant Prop Soc* 28 546-550

10 Witte, W T 1984 Rooting summer cuttings of Chinese fringetree *Proc SNA Res Confr* 29 215