ROOTING RESPONSE OF *MAGNOLIA GRANDIFLORA* 'GLEN ST. MARY' AS A FUNCTION OF CUTTING HARVEST DATE AND EXOGENOUSLY-APPLIED HORMONES

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Abstract. Terminal stem cuttings from field-grown, non-irrigated stock plants of *Magnolia grandiflora* 'Glen St Mary' were harvested and basally treated with 0 5%, 1 0%, 2 0% K-IBA (potassium salt of indole-3-butyric acid), or Dip'N-Grow (1 0% IBA plus 0 5% 1-naphthaleneacetic acid) on 5 cutting harvest dates during the summer of 1987, and 0, 0 5%, 1 0%, or 2 0% K-IBA on 8 cutting harvest dates during the summer and fall of 1988 During 1987 rooting percentages for all hormone treatments were higher from 10 August propagation than those in July Across harvest date, rooting percentages ranged from 6 (1 0% K-IBA, 1 July) to 89 (1 0% K-IBA, 10 August) During 1988, rooting percentages exceeding 80% were observed for harvest dates of 15 June, 1 and 15 August, and 1 September For all harvest dates in 1988 rooting percentages for treatments ranged from 0 (0 K-IBA, 15 August) to 92 (2 0% K-IBA, 1 September) Mean root number per cutting ranged from 1 0 (0 K-IBA, 1 October) to 12 7 (1 0% K-IBA, 15 June) and was greatest with 2 0% K-IBA treatments on 6 of 8 harvest dates For field-grown, non-irrigated stock plants, rooting response as a function of applied hormone appeared to correlate with the physiological age of the cutting (time after growth flush)

Southern magnolia is a native landscape specimen tree generally considered difficult to propagate by cuttings (9). Rooting success requires application of synthetic auxins and may be cultivar-specific (1). Harvest date recommendations vary from July through November (2, 4, 6). Conflicting reports exist in the literature regarding the type and concentration of hormone used to promote root formation (2, 3). Rooting percentages exceeding 50% generally are considered acceptable (5).

Magnolia grandiflora 'Glen St. Mary', a popular selection for use in southeastern United States landscapes, has lustrous deep-green foliage with dense brown pubescence on the leaf under-side. Flowers are cream-white in color, large, and fragrant. Grafting or budding techniques are often used; however, this process is labor intensive.

Determination of appropriate harvest dates and hormone levels to facilitate rooting of cuttings would provide nursery operators with valuable information for use in production scheduling. Therefore, a two-year study was conducted at the University of Florida, Gainesville, Florida, in conjunction with Glen St. Mary

Nursery Co., Glen St. Mary, Florida 32040, to evaluate rooting responses of 'Glen St. Mary' magnolia as a function of harvest date and exogenously-applied hormones.

MATERIALS AND METHODS

1987. Cuttings were collected randomly from 15 non-irrigated, grafted stock trees during early mornings (0630 to 0900 HR) in Glen St. Mary, Florida. Stock trees were 5 to 25 ft. in height. Rainfall distribution patterns for the northeast Florida area during the summer of 1987 ranged from less than 50% of normal from April to mid-July, to normal for late July and August (7). Terminal stem cuttings 6 to 10 in. in length, were harvested on 5 dates at 2-week intervals from 1 July to 25 August and were placed inside an ice-cooled, styrofoam chest for transport from the field to the propagation greenhouse. All cuttings were stripped to 2 or 3 leaves, trimmed to 6 in by a 45° diagonal cut and basally wounded. Wounding utensils and cuttings were sterilized between cuttings in a solution containing 0.5% Physan disinfectant. All cuttings were quick-dipped for 5 to 10 sec. in 0.5%, 1.0%, or 2.0% K-IBA, or Dip'N-Grow (Alpkem Inc., Clackamas, OR 97015).

Cuttings were placed in individual 2¼ in. black polyethylene, square rose-pots containing 100% perlite rooting medium, and located under 50% shade on elevated, wire-meshed benches. A 2½ sec. mist was applied every 5 min. during 10 hrs. daily. The mist interval was increased to 10 min. on 15 October and to 15 min. on 15 November. The misting cycle was discontinued on overcast days during October and November. All cuttings were drenched twice monthly with Benlate at the rate of one tbs/gal. Greenhouse temperatures ranged from 103°/75°F, day/night during early July, to 82°/60°F day/night during late November. Bottom heat was not applied.

Evaluation of root development commenced 8 weeks after the cutting harvest date and continued twice-monthly for 8 additional weeks. Criteria for rooting evaluation included firmness of the cutting in the medium and/or the presence of roots at the container drainage holes.

1988. The experimental procedure was similar to the previous year except where noted. Rainfall during 1988 in northeast Florida during June to mid-August averaged 50% below normal and increased to 200% greater than normal for September (8). The eight cutting harvest dates were the 1st and 15th days of each successive month from 15 June to 1 October. All cuttings were quick-dipped (5 to 10 sec.) into 0 (control), 0.5%, 1.0%, or 2.0% K-IBA.

The 1987 and 1988 experimental designs were a harvest date by hormone factorial arrangement in a randomized complete block

with 4 replications per treatment and 9 cuttings per replication. Data collected included percentage rooted and number of roots per cutting. Statistical comparisons were made for rooting percentages by analysis of variance. Mean separation of hormone treatment within harvest date was made by Tukey's HSD following significant F tests. Comparisons of root number per cutting were made by analysis of variance using least square means.

RESULTS AND DISCUSSION

1987. Harvest date and exogenously-applied hormones interacted to affect root formation on stem cuttings of 'Glen St. Mary' magnolia (Figure 1). Rooting percentages ranged from 6 (1.0% K-IBA, 1 July) to 89 (1.0% K-IBA, 10 August). Hormone treatment did not affect rooting on 1 July or 15 July when rooting percentages were below 40%. Hormone treatment did affect rooting on 28 July, 10 August, and 25 August (Figure 1).

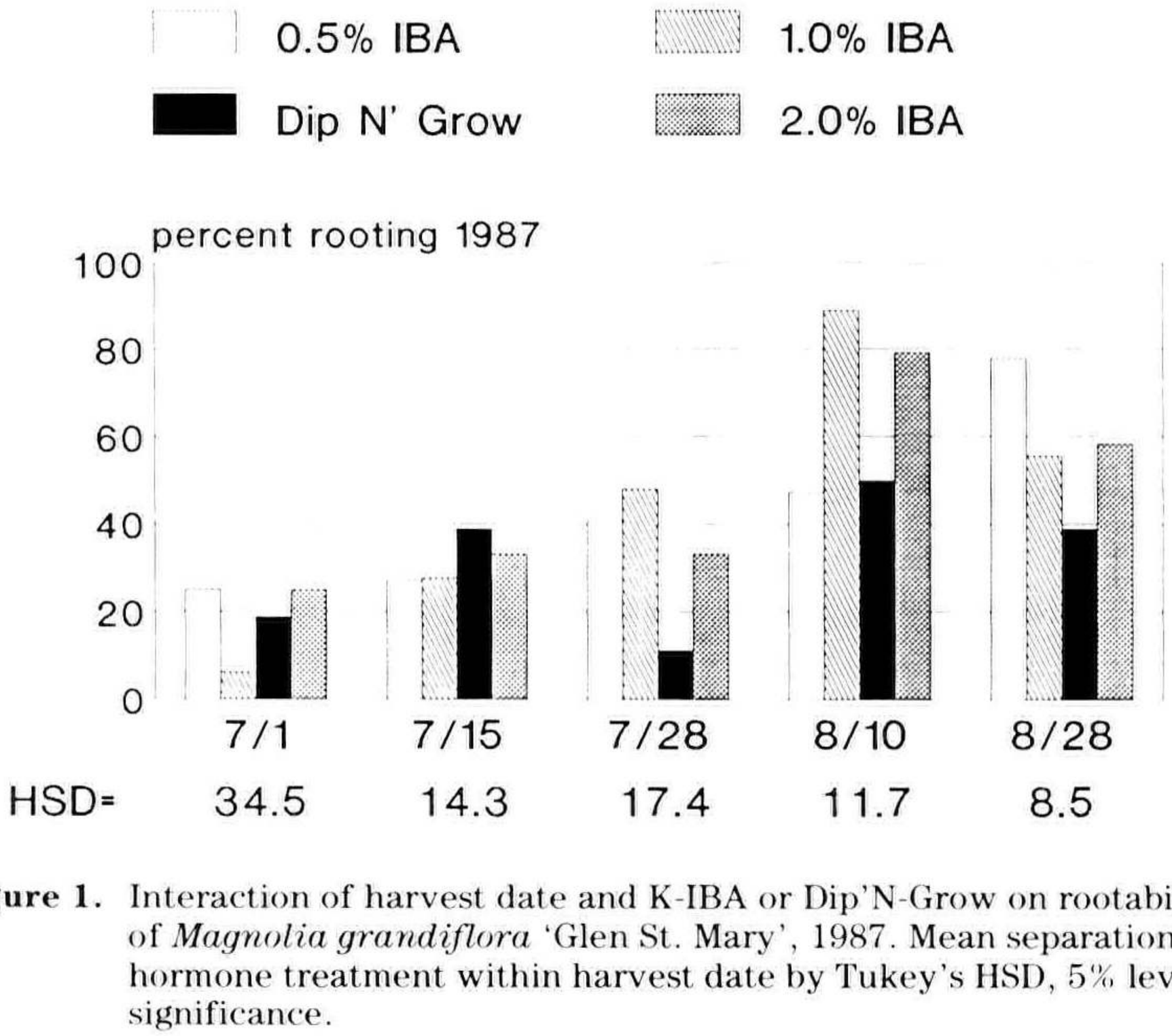

Figure 1. Interaction of harvest date and K-IBA or Dip'N-Grow on rootability of *Magnolia grandiflora* 'Glen St. Mary', 1987. Mean separation of hormone treatment within harvest date by Tukey's HSD, 5% level of significance.

Rooting percentages for cuttings taken 28 July and treated with K-IBA-based hormones were higher than for cuttings treated with Dip'N-Grow. However, all treatments resulted in rooting percentages less than 50%. On 10 August rooting percentages for cuttings treated with 1.0% or 2.0% K-IBA were higher than for

cuttings treated with 0.5% K-IBA or Dip-N-Grow. Cuttings treated 25 August with 0.5% K-IBA had the highest rooting percentage (78%) and rooting percentages were higher for cuttings treated with 1.0% and 2.0% K-IBA than cuttings treated with Dip'N-Grow. Rooting percentages for all treatments were increased on 10 August compared to harvest dates during July. The increase in rooting percentage during August coincided with increased precipitation (Figure 2), suggesting that rooting response as a function of hormone may be affected by stock plant moisture status.

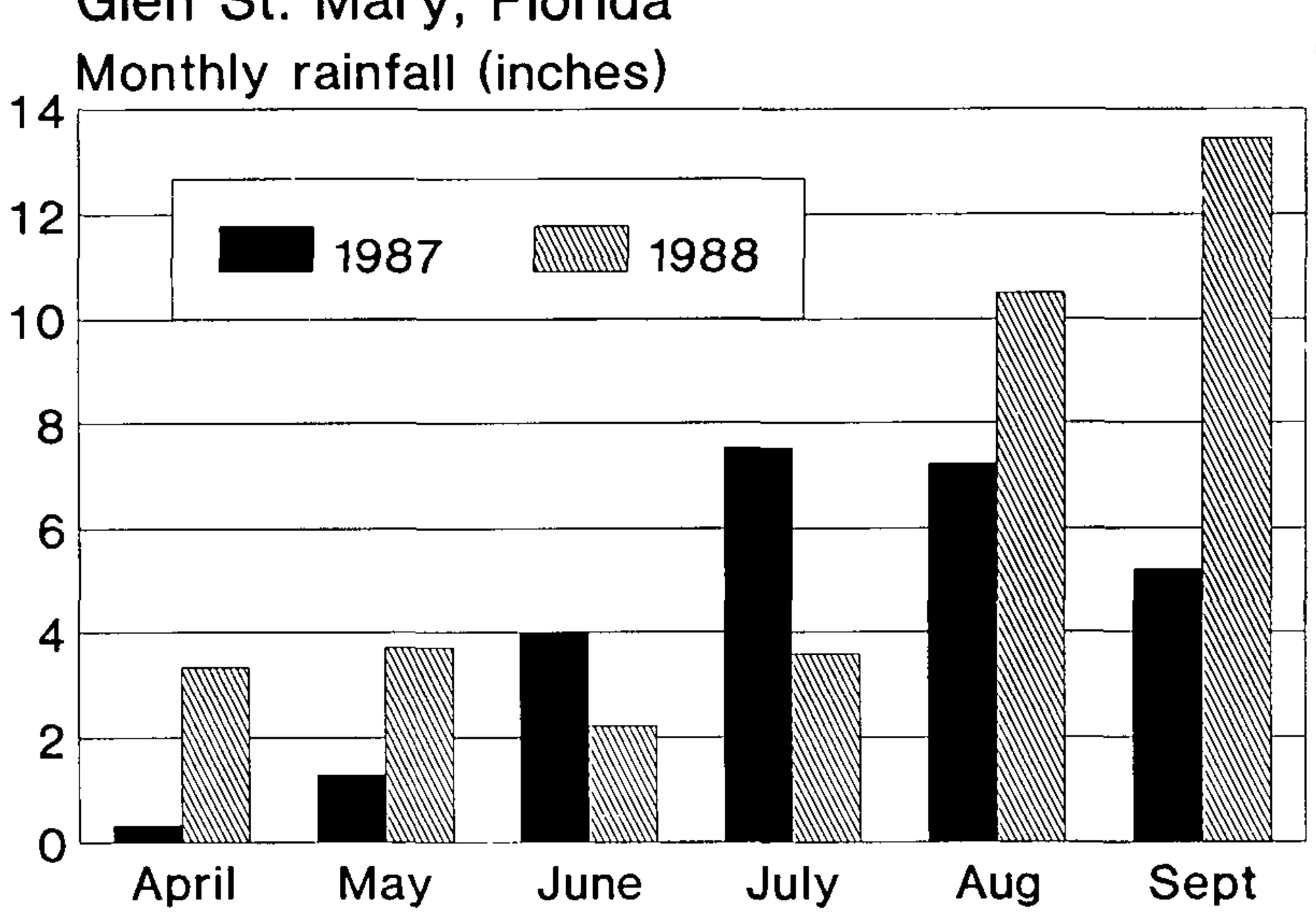

Figure 2. Monthly rainfall for Glen St Mary, Florida, during summer 1987 and 1988 (National Climatic) Data Center United States Department of Commerce, Asheville, NC 28801)

1988. Hormone treatments were modified based on results obtained during 1987. Harvest date and exogenously-applied hormones interacted to affect both rooting percentage (Figure 3) and mean number of roots per cutting (Table 1).

Across harvest date rooting percentages ranged from 0 to 92 (Figure 3). Rooting responses to the three K-IBA concentrations were similar but greater than the control for the cutting harvest dates of 15 July, 1 August, and 1 and 15 September. On 15 June, rooting percentages using 0.5% and 1.0% K-IBA were greater than for the control; however, increasing hormone concentration to 2.0% resulted in rooting percentages that were similar to the control. On 1 July rooting percentages were highest, using either

1.0% or 2.0% K-IBA compared to 0.5% and the control. On 15 August, rooting percentages increased as hormone concentration was increased. On 1 October rooting percentages were highest using 1.0% K-IBA, with 0.5% and 2.0% K-IBA resulting in higher percentages versus the control.

Table 1. Interaction of harvest date and K-IBA[z] on mean root number per cutting of *Magnolia grandiflora* 'Glen St Mary', 1988.

	K-IBA			
Date	0	0.5%	1 0%	2.0%
6/15	1.9 ± 1.6[y]	6 9 ± 1 1	12.7 ± 1 1	7.4 ± 1 3
7/1	1.5 ± 1 4	7.4 ± 1.3	7.0 ± 0 9	11 4 ± 0 8
7/15	3 5 ± 3.0	8.0 ± 1.1	7.5 ± 1 3	12 5 ± 1 1
8/1	1.9 ± 1.8	9 6 ± 1 3	11 3 ± 1.3	11.1 ± 1.3
8/15	0[x]	3 7 ± 1 5	9 6 ± 1 1	11 0 ± 0.9
9/1	2 2 ± 1 2	5 2 ± 0.8	7.2 ± 0.8	11 0 ± 0.8
9/15	2 3 ± 1 4	5 3 ± 0 8	7.2 ± 0.8	9 0 ± 0.7
10/1	1 0 ± 0 8	4 1 ± 0 7	4.8 ± 0.6	5 8 ± 0.7

[z] Differences due to K-IBA within each harvest date are significant at the 1% level
[y] Least square means
[x] Cuttings did not root

Mean number of roots per cutting was greatest using 2.0% K-IBA on all cutting harvest dates except 15 June and 1 August (Table 1). On 15 June the mean number of roots per cutting using 1.0% K-IBA was 71% greater than 2.0% K-IBA. On 1 August the mean number of roots per cutting for 1.0% and 2.0% K-IBA treatment were similar. On all cutting harvest dates the mean root number per cutting using K-IBA was greater than the control. Root number per cutting was greater for harvest dates on or before 1 September, compared to 15 September and 1 October, regardless of hormone treatment (main effects data not shown).

Rainfall distribution patterns in the southeastern United States during the summer months are characterized by extreme local variation. Rooting percentages for cutting harvest dates during July 1987 were relatively low when compared to July harvest dates during 1988. Early to mid-summer precipitation deficiencies for 1987 appeared to relate directly to the lower rooting percentages observed.

Field-grown magnolia typically experience a flush of growth during early to mid-summer after flowering. However, heavy rainfall during early September, 1988, after below normal rainfall initiated a second flush of growth during September. During 1988, rooting exceeded 80% on cuttings harvested 15 June and was greatest on 1 October using 1.0% K-IBA) Cuttings harvested on these dates were succulent, without having set terminal buds.

Rooting response for cuttings harvested on 1 and 15 August and 1 September exceeded 80% using 2.0% K-IBA. These cutting harvest dates were during or immediately following a period of below normal rainfall, and cuttings were from hardened wood that had resulted from growth flushes during early summer.

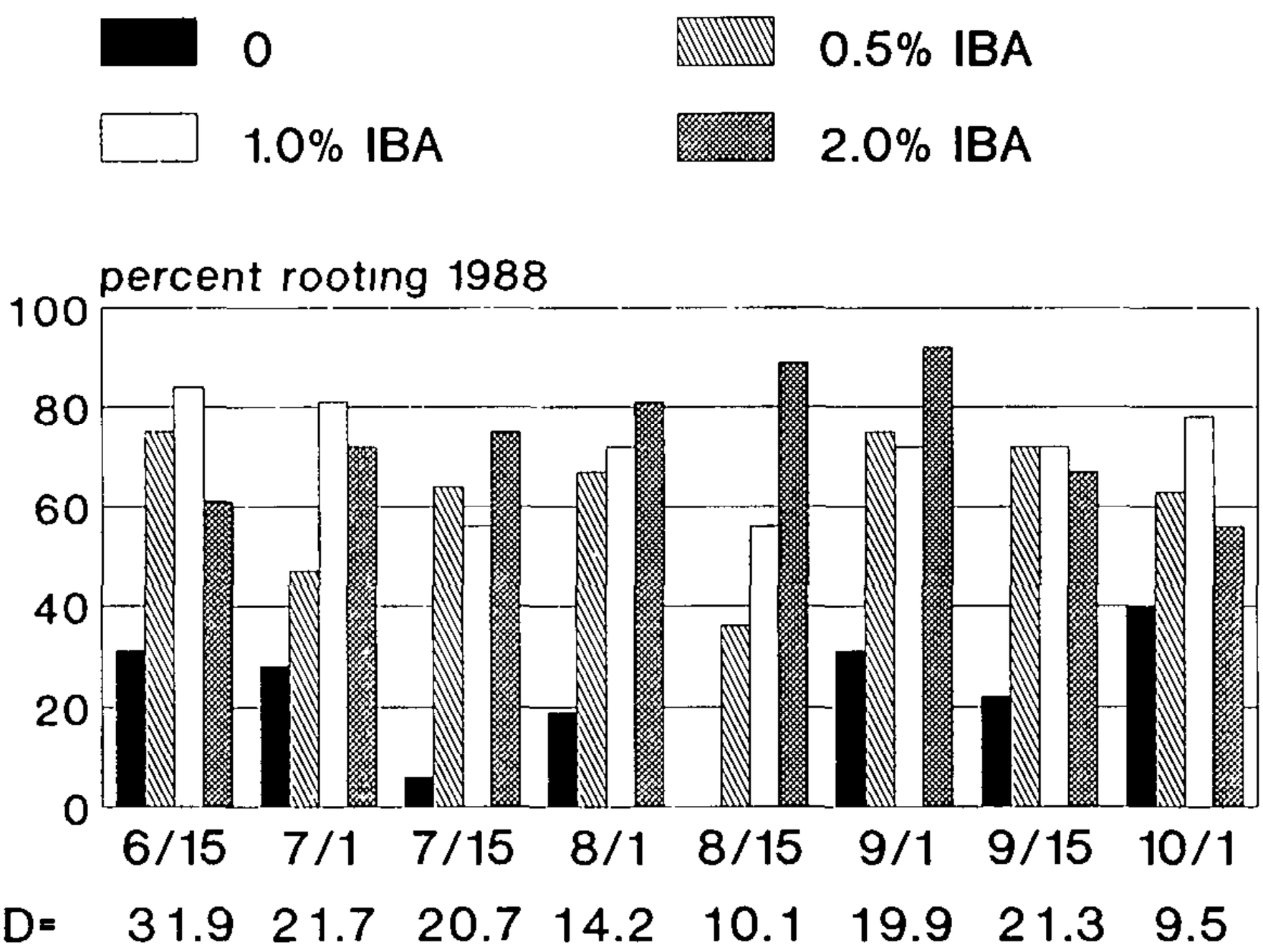

Figure 3. Interaction of harvest date and K-IBA on rootability of *Magnolia grandiflora* 'Glen St. Mary', 1988 Mean separation of hormone treatment within harvest date by Tukey's HSD, 5% level of significance.

In summary, rooting percentage and root number of 'Glen St. Mary' magnolia stem cuttings were a function of hormone concentration and may be correlated to the physiological age of the cutting wood. The rootability of succulent wood that has not fully hardened may be facilitated by using K-IBA concentrations of 0.5 to 1.0%. However, an increase in hormone concentration may be required to improve rootability of cutting wood that has hardened. Selecting the best rooted cuttings for stock trees and maintaining stock tree vigor may reduce the applied hormone concentration necessary to initiate root development.

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MICHAEL DIRR: What concentration of K-IBA did you find best?

CHRIS MARTIN: With good moisture 1% was satisfactory.