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Offset Stage of Development Affects Hosta Propagation by Stem Cuttings[1]

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Abstract

Offset stem cuttings of *Hosta sieboldiana* at different stages of development (SOD) were removed from mother plants previously treated with BA; half of the cuttings at each SOD were treated with 1000 ppm IBA prior to placing under intermittent mist. Rooting percentages, primary and secondary root counts, root lengths, root rating, root dry weights, and final shoot SOD were greater for cuttings removed at a more advanced SOD. Rooting was greater than 85% for cuttings with 3 unfurled leaves, the most advanced SOD in this study. Treatment of cuttings with IBA increased primary root counts by 35%, but did not affect other measured characteristics.

Index words: plantain lily, blue hosta, cytokinin, growth regulator.

Growth regulator used in this study: benzylaminopurine or benzyladenine (BA), N-(phenylmethyl)-1*H*-purin-6-amine, K-IBA (potassium salt of 1*H*-indole-3-butyric acid).

Species used in this study: blue hosta (*Hosta sieboldiana* (Lodd.) Engl.).

Significance to the Nursery Industry

Single eye divisions (1 offset) of hosta are typically planted in the field or potted in spring and grown until fall, when they are divided. Large divisions are usually sold and small divisions replanted the following spring. This cycle usually yields relatively low plant numbers per division. Treatment of mother plants with BA can stimulate more rapid offset formation. Offsets can be removed as stem cuttings prior to root formation and rooted under intermittent mist, provided there is sufficient leaf development. This strategy should result in more rapid multiplication of hosta than the traditional system of annual division.

Introduction

Hosta is usually propagated in the spring or fall by crown division, a process that produces only a few plants per mother plant. In an earlier study, rhizomic and lateral buds of hosta treated with the cytokinin BA elongated within 14 days of treatment (1). However, offset counts from these buds decreased over time during the season of treatment, indicating the abortion of random offsets. Following a period of dormancy, offset counts were equal to or higher than at the end of the previous season. Offsets removed in June, following treatment with BA the previous July, formed well-developed root systems within 6 weeks. Our study was conducted to determine if offsets removed as stem cuttings soon after bud elongation could be rooted. If successful, this procedure would shorten the time required to increase stock and avoid the loss of offsets experienced in the earlier study.

Materials and Methods

Uniform, single eye (no offsets) stock plants of blue hosta were transferred on July 13, 1993, from a 47% light-exclusion shadehouse to a shaded, double-layer polyethylene greenhouse with ventilation and heat setpoints of 25.6C (78F) and 21C (70F), respectively. Plants were grown in 0.8 liter (5 in) azalea pots containing Metro-Mix 360 (Grace Horticultural Supplies, Cambridge, MA) and fertilized 3 times per week with 300 ppm N from 20N-4.3P-16.6K (20-10-20) Peters Peatlite Special (Grace-Sierra, Fogelsville, PA). On July 20, a single foliar spray of 2500 ppm BA (Pro-Shear, Abbott Laboratories, N. Chicago, IL) was applied to runoff (≈ 6.5 ml (0.22 oz)/plant). Buffer-X (Kalo Agr. Chemicals, Inc., Overland Park, KS) at 0.2% was added as a surfactant to the spray solution. On August 13, offsets were cut from the mother plants and divided into 4 stem cutting groups based upon stage of development (SOD). A description of SOD stage follows; SOD 1: elongated bud, first leaf furled; SOD 2: 1 furled and 1 unfurled leaf; SOD 3: 2 unfurled leaves; SOD 4: 3 unfurled leaves. Only SOD 4 cuttings exhibited visible preformed root initials. Basal ends (1.3 cm (0.5 in)) of one-half the offsets representing each SOD were dipped for 5 seconds in a 1000 ppm K-IBA solution. Stem cuttings were stuck in 804 cell-packs of Metro-Mix 360 medium and placed under intermittent mist (3 seconds every 5 minutes) from 8 am to 5 pm. The experiment was a 2 × 4 factorial (4 SOD X ± IBA) with 6 replicates of 4 offsets each in a randomized complete block design.

On September 24, the study was terminated and response measured as: percent rooting; primary and secondary root counts; root length (mean of the 3 longest primary roots per cutting); root rating (0 = no roots, 5 = dense root mass); root dry weight; and shoot SOD. Shoot SOD included the 4 treatment stages, plus SOD 5 (4 or 5 unfurled leaves) and SOD 6 (≥ 6 unfurled leaves). Main effects and interactions were determined by an analysis of variance. Interactions were not significant, hence means of main effects were separated by Duncan's Multiple Range Test.

Results and Discussion

All measured characteristics were influenced by stem cutting SOD (Table 1). Percent rooting increased from 56.3% for cuttings removed at SOD 1 to over 90% for cuttings initially at SOD 3 or 4. When the experiment was terminated

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none of the cuttings had died. It is possible that percent rooting for each treatment would have been higher if the rooting period had been extended. Primary and secondary root counts were highest for cuttings removed at SOD 4, followed by those at SOD 3, and least for those at SOD 1 and 2 which were similar (Table 1, Fig. 1). Primary root counts of cuttings at SOD 3 and 4 were 106% and 170%, respectively, higher than those at SOD 1, while secondary root counts were 296% (SOD 3) and 521% (SOD 4) higher, respectively. A similar trend in root dry weight was observed. Root weights at SOD 3 and 4 were 270% and 557%, respectively, greater than those of cuttings removed at SOD 1. Lengths of the 3 longest primary roots and root ratings were similar for cuttings at SOD 3 and 4, but higher than those of cuttings at SOD 1 and 2. Mean SOD of all cuttings increased during rooting, indicating continued leaf development. The initial differences in SOD were still present when the experiment was terminated.

Of all the root and shoot characteristics examined, only primary root number was affected by IBA treatment. Primary root counts averaged 8.1 without IBA and 10.9 with IBA, a 35% increase. Although other measured root characteristics were not influenced by IBA, we did note a difference in the time to visible root formation. On August 30, 2½ weeks after cutting removal, 6 cuttings from each treatment were examined and then reinserted into the rooting medium. Roots were visible on SOD 3 and 4 cuttings treated with IBA but not on SOD 3 or 4 cuttings without IBA. This observation suggests a quicker rooting response with IBA, at least at more advanced stages of development, while data show similar rooting 6 weeks after offset removal.

Within 3½ weeks of treatment numerous offsets had formed on mother plants. Although not a part of this study, untreated plants similarly maintained formed no offsets. This agrees with previous research (1). Offset stem cuttings removed at a more advanced SOD rooted in higher percentages and formed more primary and secondary roots of a greater biomass than did cuttings at SOD 1 or 2. This suggests at least 2 alternatives to enhance rooting. First, cuttings were removed only 3½ weeks after treatment. If cuttings had not been removed so soon, it is likely that a higher percentage of cuttings would be at a more advanced SOD which should enhance rooting. A potential limitation to this strategy would be the decrease in offset counts over time reported earlier (1); however, this decrease did not generally occur until at least 60 days after treatment. A second approach would be to remove only cuttings at SOD 3 or greater; these cuttings should root readily, and removal may stimulate remaining offsets to develop more quickly. However, this option may not lend itself to some commercial hosta growers because of the need to remove offsets more than once during a season.

Finally, most offsets stimulated to develop in 3½ weeks rooted following removal from the mother plant and placement under mist for 6 weeks. Less than 10 weeks were needed to produce rooted offsets from mother plants with no visible offsets. This approach to hosta propagation provides a more rapid method of multiplication than through annual division.

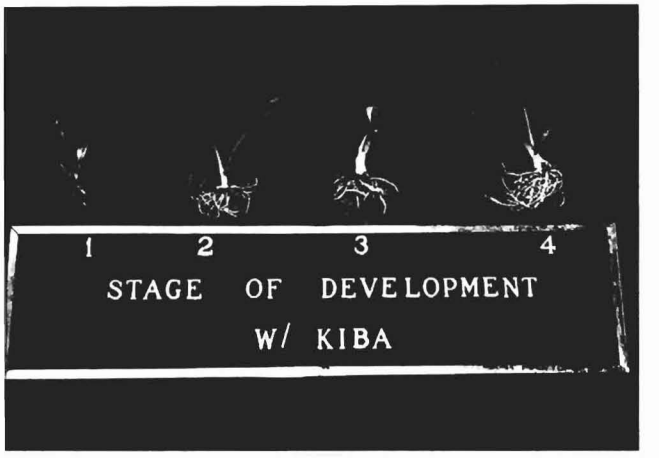

Fig. 1. Stages of development of stem cuttings treated with K-IBA as they appeared 6 weeks after removal.

Literature Cited

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Table 1. Rooting response of blue hosta stem cuttings based on stage of development (SOD).

SOD[z]	Rooting (%)	Root number		Root			SOD[w]
		Primary	Secondary	Dry weight (mg)	Rating[y]	Length[x] (cm)	
1	56.3b[v]	5.3c	5.3c	90.6c	1.6b	3.1b	2.6d
2	68.8ab	7.5c	8.2c	164.6c	2.1b	4.0b	3.3c
3	81.3a	10.9b	21.0b	335.2b	3.0a	5.8a	4.0b
4	87.5a	14.3a	32.9a	595.8a	3.6a	7.2a	4.9a

[z]SOD: 1 = elongated bud, first leaf furled; 2 = 1 furled and 1 unfurled leaf; 3 = 2 unfurled leaves; 4 = 3 unfurled leaves; SOD determined when offsets were removed from mother plants.

[y]Root rating: 0 = no roots; 5 = dense root mass.

[x]Root length: mean of 3 longest primary roots per cutting.

[w]SOD: 1–4 the same as SOD treatments; 5 = 4 or 5 unfurled leaves; 6 = 6 unfurled leaves; SOD determined 6 weeks after offsets were removed from mother plants and placed under mist.

[v]Mean separation by Duncan's Multiple Range Test, P = 0.05.