Propagation of *Osmanthus heterophyllus* 'Variegatus' by Stem Cuttings[1]

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Abstract

Nontreated softwood cuttings of Variegatus' osmanthus [*Osmanthus heterophyllus* (G. Don) P.S. Green 'Variegatus'] collected in early June 2009 and late May 2010 rooted at > 70%. Treatment of cuttings with solutions of the potassium (K) salt (K-salt) of indolebutyric acid at 500 to 2000 mg·liter^{-1} (ppm) was generally ineffective and does not appear to be necessary for satisfactory rooting.

Index words: adventitious rooting, auxin, indolebutyric acid, holly osmanthus, false holly, holly tea olive.

Significance to the Nursery Industry

The most consistent rooting (> 70%) of stem cuttings of 'Variegatus' osmanthus is achieved with nontreated softwood cuttings collected in late May to early June. Auxin treatment of softwood cuttings does not stimulate rooting and is unnecessary. Rooting of semi-hardwood cuttings is variable from year to year, and rooting of hardwood cuttings is negligible.

Introduction

'Variegatus' osmanthus [*Osmanthus heterophyllus* (G. Don) P.S. Green 'Variegatus' (Oleaceae Hoffmanns. & Link)] is one of many cultivars of *Osmanthus heterophyllus* (holly tea olive, holly osmanthus, false holly) (3). The cultivar is an extremely attractive, slow growing, evergreen shrub having leaves similar in morphology to the species. However, what makes 'Variegatus' osmanthus so attractive is the creamy white margins on the leaves. The striking foliage and the upright growth habit contribute to it being an outstanding landscape plant that can reach heights ≥ 3.0 m (8 to 10 ft) (3).

The various cultivars of *O. heterophyllus* are generally propagated by stem cuttings, but propagation information regarding particular cultivars is lacking. Blazich and Acedo (2) reported nontreated semi-hardwood and hardwood cuttings of 'Ilicifolius' osmanthus rooted in high percentages (> 80%), whereas comparable results were only noted for hardwood cuttings of 'Rotundifolius' osmanthus. Semi-hardwood cuttings of 'Rotundifolius' did not root. The response of both cultivars following treatment with the free acid of indolebutyric acid (IBA) at 2500 to 10,000 mg·liter^{-1} (ppm) IBA was variable and often inhibited rooting. Blazich and Acedo (2) did not attempt to root softwood cuttings of either cultivar.

On several occasions the authors have tried to root semi-hardwood and hardwood cuttings of 'Variegatus' osmanthus. Results with hardwood cuttings have been consistently poor, leading to the conclusion they do not root. On the other hand, results with semi-hardwood cuttings taken in late August to mid September have been mixed. Some years,

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semi-hardwood cuttings root well; in other years they root poorly. Lack of consistent results resulted in the following research with the objective to investigate propagation of 'Variegatus' osmanthus by softwood cuttings as influenced by auxin treatment.

Materials and Methods

Two hundred terminal softwood cuttings approximately 7 to 9 cm (2.8 to 3.5 in) in length were collected on June 2, 2009, and May 31, 2010, from each of two plants of 'Variegatus' osmanthus growing under uniform fertility on the grounds of a private residence in Raleigh, NC. The plants were large exceeding 3.7 m (12 ft) in height and 2.4 m (8 ft) in width. The stems of the cuttings were light to pale green in color and when pressure was applied to a cutting the stem broke but the pieces remained attached at the point where pressure was applied.

Following collection, cuttings from both plants were pooled. Cuttings were trimmed from the bases to lengths of 6 to 8 cm (2.4 to 3.1 in). They were then treated with solutions of the potassium (K) salt (K-salt) of indolebutyric acid (IBA) at 0, 500, 1000, 1500, or 2000 mg·liter^{-1} (ppm). Solutions were prepared by dissolving reagent grade K-IBA in distilled water. When treating cuttings with K-IBA, the basal 1 cm (0.4 in) was dipped into the K-IBA solution for 2 sec followed by 20 min of air drying before insertion into the rooting medium. After auxin treatment, cuttings were inserted to a depth of 2 to 3 cm (0.8 to 1.2 in) in individual plastic Anderson bands (Anderson Tool & Die, Portland, OR) [6.0 × 6.0 × 12.7 cm (2.4 × 2.4 × 5.0 in)] held in deep propagation flats/trays [40.6 × 40.6 × 12.7 cm (16 × 16 × 5 in)] with 36 bands per flat (6 rows × 6 columns). The rooting medium was peat:perlite (1:1, by vol).

The trays were placed under natural photoperiod and irradiance on a single raised bench in a glass covered greenhouse on the campus of NC State University, Raleigh. Day/night temperatures were approximately 23.9 + 5.6/21.1 + 2.8C (75 + 10/70 + 5F). Intermittent mist operated 4 sec every 5 min from 7:00 am to 8:30 pm daily. The experimental design was a randomized complete block using 12 cuttings per treatment with six replications.

Fifteen weeks after the rooting studies were initiated, cuttings were harvested and data recorded. Data included the number and length of primary roots > 1 mm (0.04 in). Any cutting having one or more roots was classified as rooted. Data were subjected to analysis of variance procedures and regression analysis.

Results and Discussion

For both years, 2009 and 2010, nontreated softwood cuttings of 'Variegatus' osmanthus rooted at > 70% with the influence of K-IBA treatment being generally nonsignificant (Table 1). The only significant response ($P \leq 0.10$) to K-IBA treatment was a linear decrease in mean root length for cuttings taken in 2009. Results for 2009 and 2010 indicate auxin treatment of softwood cuttings of 'Variegatus' osmanthus is of questionable value. In a previous study, Blazich and Acedo (2) investigated propagation of *O. heterophyllus* 'Ilicifolius' and 'Rotundifolious' by stem cuttings. They reported nontreated semi-hardwood and hardwood cuttings of 'Ilicifolius' osmanthus and hardwood cuttings of 'Rotundifolius' osmanthus rooted in high percentages (> 80%). Response to treatment with solutions of the free acid of IBA at 2500 to 10,000 ppm was variable, and generally inhibited rooting.

Prior to beginning rooting studies with softwood cuttings of 'Variegatus' osmanthus, the authors attempted in three different years to root hardwood cuttings, with negligible results. This led to research with softwood and semi-hardwood cuttings. Attempts to root softwood cuttings of 'Variegatus' osmanthus began in early June 2007 and this was done at the same time each year through late May 2010. For brevity, only results for 2009 and 2010 are presented (Table 1), however, results for 2007 and 2008 were similar (data not presented). Treatment with K-IBA had little or no statistically significant affect on percent rooting, mean root length, or mean root number.

During 2007 to 2010 we also attempted to root semi-hardwood cuttings of 'Variegatus' osmanthus taken in late September to early October. These cuttings were treated similarly as the softwood cuttings and rooted under similar greenhouse conditions. In 2007 and 2008 nontreated semi-hardwood cuttings rooted at > 70%, and K-IBA treatments were generally ineffective (data not presented). However, in 2009 and 2010 rooting was poor with the best rooting approximately 20% for nontreated cuttings. Why rooting of semi-hardwood cuttings was so variable during this 4-year period is unknown and might be related to the number of growth flushes during the growing season.

Table 1. Influence of K-IBA treatments on the rooting of softwood cuttings of 'Variegatus' osmanthus.

	Rooting (%)[z]		Mean root no.[y]		Mean root length (mm)[y]	
Treatment	**6/2/2009**	**5/31/2010**	**6/2/2009**	**5/31/2010**	**6/2/2009**	**5/31/2010**
Nontreated	84.7	73.6	6.0	9.6	37.4	31.4
500 ppm K-IBA	79.2	83.6	6.4	8.4	36.3	34.1
1000 ppm K-IBA	63.9	81.9	4.9	7.7	37.0	34.9
1500 ppm K-IBA	76.4	58.3	5.9	4.8	32.0	33.7
2000 ppm K-IBA	62.5	80.6	4.3	7.3	30.9	35.7
Linear	NS	NS	NS	NS	*	NS
Quadratic	NS	NS	NS	NS	NS	NS

[z]Each value is based on 72 cuttings.

[y]Each value is based on the number of cuttings which rooted for a particular treatment.

[NS,*]Nonsignificant or significant at $P < 0.10$, respectively.

Growth is uniform in the spring when the first flush of growth of 'Variegatus' osmanthus occurs. The terminal vegetative buds of all shoots break and produce a flush of growth. Following shoot elongation, growth ceases and the new shoots lignify/harden. Sometimes, a second flush occurs in late summer. This growth, however, will not be uniform throughout a plant. Some shoots produce a second flush of growth; others do not. Consequently, some cuttings representing the first flush appear to fit the description of semi-hardwood cuttings and cuttings of the second flush appear to be softwood (4). If both types of cuttings are taken and kept separate for rooting, rooting of each type is generally poor. On the other hand, if the plant has not produced a second flush of growth and all the cuttings are semi-hardwood, rooting is generally similar to results presented in Table 1 for softwood cuttings. Perhaps when a second flush of growth occurs and the growth is not uniform throughout the plant, the physiology of the plant is altered, resulting in a situation where softwood cuttings of the second flush and semi-hardwood cuttings of the first flush do not root as well as softwood cuttings taken after the first flush. As reported by Hartmann et al. (4), 'August softwood cuttings in the Southeastern United States are not physiologically the same as June softwood cuttings'. This could explain why rooting of softwood cuttings from the first growth flush is generally much better than rooting of cuttings from the second flush. Owing to the unpredictable rooting response of semi-hardwood cuttings and softwood cuttings following a second flush of growth, the most consistent rooting of stem cuttings of 'Variegatus' osmanthus is usually achieved with softwood cuttings following the first flush of growth. In Raleigh, NC, this condition normally occurs in late May to early June.

Genotype variation with respect to adventitious rooting has been reported for many species (1, 6, 7, 8, 9, 11) but appears to not be an issue with the many cultivars of *O. heterophyllus*, which are clones. However, another aspect of this phenomenon, which has not received much consideration, is genotypic variation with respect to the growth stage of the stock plant (stem tissue maturity). Thus, not only do clones of some species exhibit variation in adventitious rooting, but the growth stage of the clones that is also most conducive to rooting can vary by genotypes, as has been reported (5, 8, 10, 11). This also seems to apply to some cultivars of *O. heterophyllus* when one compares results herein with those of Blazich and Acedo (2). For example, in the present investigation, optimum rooting of stem cuttings of 'Variegatus' osmanthus occurred with softwood cuttings collected in late May or early June following the first flush of growth, whereas rooting of semi-hardwood cuttings taken later in the growing season was inconsistent, and rooting of hardwood cuttings was negligible. On the other hand Blazich and Acedo (2) reported nontreated semi-hardwood and hardwood cuttings of 'Ilicifolius' osmanthus rooted in high percentages (> 80%) whereas comparable results with 'Rotundifolius' osmanthus occurred only with hardwood cuttings. They did not, however, attempt to root softwood cuttings of these cultivars.

Similar to other cultivars of *O. heterophyllus* such as 'Ilicifolius' and 'Rotundifolius', adventitious roots of 'Variegatus' osmanthus are coarse and brittle, even when rooted in a medium of peat:perlite (1:1, by vol). Therefore direct rooting/sticking should be employed when rooting stem cuttings of 'Variegatus' to reduce possible transplant shock.

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