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Hedge Bamboo Growth Management Near Power Lines

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A twenty-seven-month study was conducted to evaluate the use of Plant Growth Regulators (PGRs) and mechanical methods to manage the growth of Hedge bamboo, *Bambusa glaucescens*, growing in proximity to power lines. Two formulations of the PGR paclobutrazol were tested; one as a foliar treatment, the other as a soil drench. Mechanical trimming was evaluated alone and in combination with the PGR soil drench. Both foliar treatment and soil drench resulted in comparable cost and acceptable bamboo height after a twenty-seven-month period. Mechanical trimming resulted in the least cost; however, height was not acceptable at twenty-seven months. Mechanical trimming in combination with PGR soil drench was effective during the first twelve months, but not during the second twelve months of the study.

Hedge bamboo, *Bambusa glaucescens*, is an ornamental shrub with a clump growth habit. The plants remain in a relatively confined area, unlike other bamboo species that spread rapidly and require root system confinement (Halfacre and Shawcroft, 1989). Due to the confined growth habit, hedge bamboo is frequently planted as a privacy screen in south Florida landscapes. Occasionally, the hedge is planted under or in proximity to overhead power lines. In order to minimize interference with power distribution, the bamboo may be trimmed frequently to reduce height of the hedge. This trimming may be required on an annual basis in some situations.

Vegetation growing in close proximity to power lines can result in power interruptions which inconvenience customers. This phenomenon is most commonly encountered with trees, both hardwoods and conifers. However, other woody monocots such as palms may also contribute to conflicts (Tamsberg, 1990). Vegetation-related power line conflicts are most pronounced during severe weather events.

Most vegetation management efforts incorporate the use of mechanical methods or chemical (herbicide) applications. Sulak and Kielbaso (2000) report acreage of vegetation management along transmission lines treated mechanically outnumbered those treated chemically by 2.7:1. Abrahamson et al. (1991a) compared the cost of various vegetation management methods in a utility right-of-way. Even though no significant differences were found among treatments, there was a trend for lower cost associated with clear or selective cutting with no herbicide treatment. When comparing the cost effectiveness of various chemical treatments, Abrahamson et al. (1991b) concluded that stem-foliar treatments were more cost effective than basal treatments.

Losses to the U.S. economy from weather-related outages between 2003 and 2012 are estimated at $33 billion (White House, Washington, D.C. 2013). Campbell (2012) estimates annual weather-related power losses at $20 billion to $55 billion. One of his suggested solutions is to improve tree trimming schedules to keep rights-of-way clear. The costs of repetitive trimming may be ameliorated with the use of plant growth regulators.

Plant growth regulators (PGRs) have been investigated as a management tool to prevent plant and power line conflicts (Bowles, 1985; Tamsberg, 1990). PGRs are useful in slowing plant growth and potentially prolonging the interval between trim cycles. Tamsberg (1990) reported a re-trim cost saving of $96.14 per 100 ft of Australian pine, *Casuarina* spp., hedgerow treated with PGRs compared to an untreated section. Paclobutazol (PBZ) is a PGR which has been in use for decades (Barrett and Nell, 1983; Ruter, 1994). It reduces growth by inhibiting gibberellin synthesis in the meristem of woody plants (Bai et al. 2004; Bladow, 2003). The activity of PBZ on certain arborescent monocots (palms) was demonstrated by several authors (Carvajal et al. 1998; El-Hodairi et al. 1998; Hensley and Yogi 1996). However, Ali and Bernick (2010) reported lack of activity against the Royal Palm, *Roystonea regia*. Han et al. (2005) showed reduced bamboo growth when treated with PBZ.

This study was conducted to evaluate cost effectiveness of mechanical control (trimming) and/or PGRs for bamboo growth management. The goal is to reduce overall trimming and maintenance costs while maintaining a reliable power supply.

Materials and Methods

A mature stand of Hedge bamboo growing in a well maintained landscape setting in Ft. Myers, FL, was selected for this study. The hedge consisted of individual clumps growing in proximity to overhead power lines–within 1 m (3 ft) of the easement. Individual clump height averaged 4.5 m (15 ft) and circumference 7.6 m (25 ft). Two formulations of the plant growth regulator paclobutrazol [Trimtect (8% PBZ)] and Cambistat (22.3% PBZ); Rainbow Treecare Scientific Advancements, Minnetonka, MN) were evaluated. Trimtect was applied as a foliar treatment to leaf

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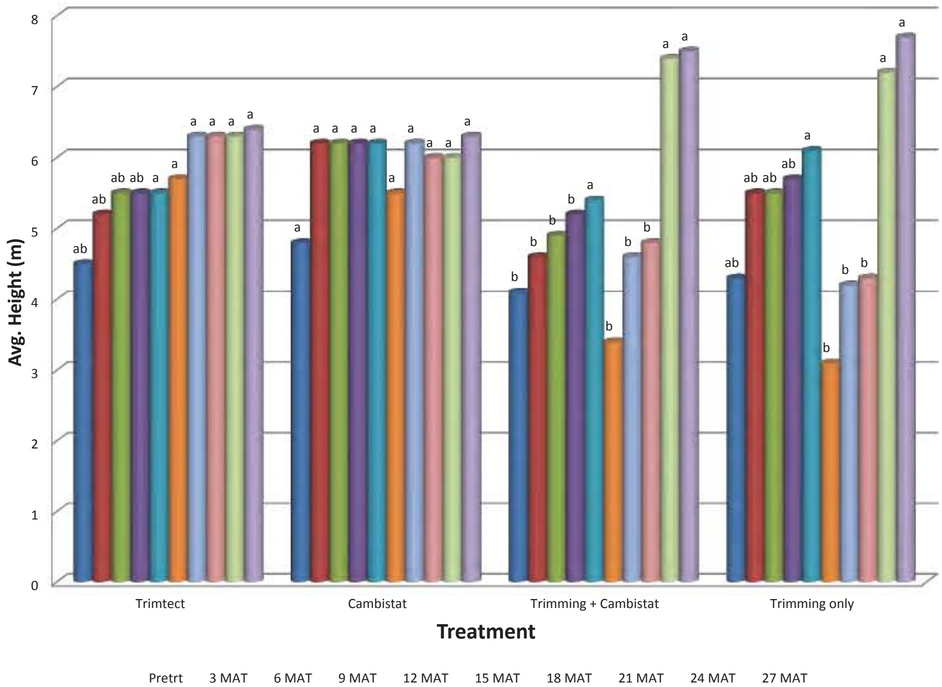

Fig 1. Average growth of hedge bamboo as affected by selected growth management treatments, Ft. Myers, FL. Mean separation within evaluation periods by Student-Newman-Keuls test, 5% level.

Table 1. Estimated labor and material cost per clump over the 27-month study period.

Treatment	Labor and Material Cost/h	Hours/Clump	Cost/Clump
Trimtect	\$60, \$82	2.6	\$238[z]
Cambistat	\$60 + \$165	1	\$225
Cambistat+Trimming	\$60, \$165	4[y]	\$405[x]
Trimming Only	\$60	3	\$180

[z]Includes labor at \$60/h x 2.6 h plus material cost.
[y]Includes1 h labor and 3 h trimming.
[x]Includes Cambistat drench labor at \$60/h x 1 h plus trimming labor at \$60/h x 3 h plus material cost.

wetness with a 95-L (25-gal) sprayer and electric pump at the rate of 192 ml/3.785 L (6.4 fl oz/gal). Cambistat was mixed according to label instructions and applied as a basal soil drench at the rate of 10 ml/0.1 m^2, a.i. (0.3 fl oz/sq ft^2, a.i.) basal clump area. Mechanical trimming to reduce plant height was accomplished with an aerial lift (Genie, Redmond, WA). The treatments were: 1) Trimtect foliar spray; 2) Cambistat basal soil drench; 3) Cambistat basal soil drench + mechanical trimming; and 4) mechanical trimming only. Trimtect was applied on 5 Oct. 2011 and on 7 Dec. 2012. Cambistat was applied on 5 Oct. 2011. Mechanical trimming was conducted on 5 Oct. 2011 and on 14 Dec. 2012.

Bamboo height was determined with a clinometer (Brunton Classic Clinomaster CM66LA, Sweden). The length of four stems per clump in each Cardinal direction also was recorded every 3 months for the first 12 months. Evaluations of height were made at 0, 3, 6, 9, 12, 15, 18, 21, 24, and 27 months after treatment (MAT). The plants were fertilized three times per year (Mar., May and Oct.) with 8N-0.9P-9.6K granular fertilizer at N 2.3 kg x 94 m^2 (5 lb x 1,000/ft^2) broadcast to the root zone. Irrigation in the amount of 1.25 cm (0.5 in) occurred twice per week during the absence of rain.

The study was initiated in Oct. 2011 and completed in Dec. 2013. The experimental design was a randomized complete block with three replications (clumps) per treatment. Data were analyzed with ANOVA and mean separation via Student-Newman-Keuls test at $P = 0.05$ (ARM6, Gylling Data Management, Brookings, S.D.).

Results and Discussion

Average clump height is shown in Fig. 1. Both the Trimtect foliar and the Cambistat soil drench treatments resulted in arrested growth within 3–6 MAT. Plants receiving the second application of Trimtect (12 MAT) showed a slight increase in height; however, the growth was again, arrested through 27 MAT. Plants that received the Cambistat soil drench and manual trimming increased in height slightly, yet consistently during the first 12 months. Pursuant to the second trimming (15 MAT), the plants resumed growth and Cambistat did not appear to reduce growth rate. A possible explanation for the lack of growth suppression is the removal of growing tips and the residual Cambistat where it acts on developing cells (Bai et al. 2004). Plants receiving Trimming only continued to grow and increase in height at a slow pace during the first 12 months, then at a faster pace through 27 MAT.

Estimated costs for the various treatments are shown in Table 1. Both the Trimtect foliar and Cambistat soil drench resulted in comparable costs per clump. Trimming only resulted in the lowest cost over the period of the study; however, clump height was unacceptable at 27 MAT. Costs were based on current year (2013) contractor pricing.

The average stem length data were not used due to unreliability. Individual stem growth patterns were not representative of overall clump response. Therefore, the overall clump height was the more reliable parameter used.

Both Trimtect foliar and Cambistat soil drench suppress the growth of Hedge bamboo clumps. Trimming alone or with Cambistat does not seem to slow the growth rate over a 27-month period. Additional multi-year studies may illustrate the long term cost benefits of these PGRs in maintaining a reliable power supply.

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