TropicLine ***Volume 6, Number 1, January-February, 1993***

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Growth Response Of West Indies Mahogany To Continuem^tm Or Osmocote^tm Application During Transplanting: *Another follow-up on polymers (hydrogels)*

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Hydrogels are sold under various brand names and include many formulations. These "polymers" can absorb hundreds of times their weight in water. The assumption for their use is that incorporating these polymers into soils or growing media increases retention of large quantities of water that becomes available for plant use; thus, plant growth rates could be increased, and/or water supplies conserved.

Research has suggested that polymers may reduce watering frequency of container-grown or field-grown plants (Letey, 1992; Wang, 1989), enhance plant growth (Bearce and McCollum, 1977), increase media mineral nutrient retention (Henderson and Hensley, 1985), and increase the shelf-life of potted crops (Bearce and McCollum, 1977; Gehring and Lewis, 1980). Some studies have reported a delay in the onset of permanent wilting when evaporation is intense (Johnson, 1984) or when twice the manufacturers recommended rate of polymer was used (Wang and Boogher, 1987). In contrast, many other studies have indicated that there is little or no benefit from use of polymers (Austin and Bondari, 1992; Conover and Poole, 1976; Henderson and Davies, 1987; Ingram and Yeager, 1987; Keever et al., 1989; Steinberger and West, 1991; Tripepei et al., 1991; Wang, 1989).

Common media fertilizer amendments, such as dolomitic limestone, have been shown to reduce the water absorption of polymers (Foster and Keever, 1990), leading some researchers to conclude that polymer amendment provides little or no significant improvement in the water holding capacity of most container media (Bowman et al., 1990). One study suggested that much of the "extra" water held by polymers may not be available for use by plants (Tripepei et al., 1991). Polymers used as soil amendments during transplanting killed from 25% (Gupton, 1985) to 100% of blueberries (*Vaccinium* sp., Austin and Bondari, 1992), depending upon the amount of concurrent addition of organic matter.

ContinuemTM is a hydrogel containing N-P-K fertilizer in its polyacrylamide matrix (Pan Agro, Inc., Logan, Utah). The manufacturer claims the N-P-K is plant-available as the hydrogel breaks down (slow-release fertilizer); thus, you obtain the benefits of a hydrogel treatment (water retention in the soil), and the benefits from fertilizer treatment from the labor of a single application.

The objective of this study was to determine if the application of ContinuemTM would influence the field establishment or subsequent growth of West Indies mahogany (*Swietenia mahagoni*), and to determine if that influence was related to the polymer or the fertilizer component of the product.

MATERIALS AND METHODS

West Indies mahogany seedlings growing in 4-inch pots (3.5 inch top diameter, 2.75 inch bottom diameter, 3.75 inch height to rim) in a 5 pine bark: 4 Florida sedge peat: 1 sand (by volume) medium were selected for field transplanting. Seedlings averaged 32±1.2 inches tall, with a caliper of 6.0±0.2 millimeters at the soil line. Seedlings were field-planted at the University of Florida-FLREC (Miramar fine sand soil) using the treatments listed in Table 1 (footnotes).

After planting, seedlings were not watered, receiving only natural rainfall. Rainfall of 0.25 inches occurred within 2 hours of transplanting, and rainfall exceeding 1.5 inches occurred within 24 hours of transplanting. Nearby weeds were mowed, but were not removed.

Seedling heights and stem calipers were recorded over 9 months. Data were analyzed with analysis of variance, and means were separated using Duncan's New Multiple Range Test at the 5% level of significance.

RESULTS AND DISCUSSION

Control seedlings were shorter than all other treatments only 30 days after planting (Table 1), and remained the shortest for the duration of the study. Seedlings given 1 tsp. OsmocoteTM as a dibble were taller than all other treatments after 30 days, and this treatment had the tallest seedlings at all measurement times for the duration of the 281 day study. Stem caliper growth responded similarly to height in response to treatments (Table 1). While seedlings treated with ContinuemTM were taller than controls, they were not taller than seedlings treated only with fertilizer.

Treatment effects were exhibited during the first 30 days after planting (Table 1), with growth responses after 30 days explainable as a response to plant size (larger plants growing faster than smaller plants). ContinuemTM did enhance plant growth, but the effect was no different than the response to slow-release fertilization. If there had been a benefit from the polymer component of the ContinuemTM, then the ContinuemTM seedlings would have been larger than the 2 tsp. dibbled OsmocoteTM seedlings. Therefore, the ContinuemTM functioned only as a slow-release fertilizer, with no benefit from the polymer component.

The largest plants were in the treatment providing the lower rate of fertilizer (1 tsp. OsmocoteTM, dibbled), suggesting that faster growth may not have been possible if higher fertilizer rates had been used. The top-dress treatment (1 tbsp. OsmocoteTM) may have been less beneficial compared to the dibble treatment due to more efficient weed competition for fertilizer in the top-dress treatment.

Both ContinuemTM and OsmocoteTM are sold as "three to four-month" treatments, but neither influenced growth after 30 days. Application rates may have been too low, or a different application technique may be required to extend usefulness beyond 30 days. Since fertilizer salts have been shown to destroy the integrity of polymers (Bowman, Evans and Paul, 1990), the presence of fertilizers in the ContinuemTM may have reduced the effectiveness of the polymer component of the product.

In a separate study, ContinuemTM reduced the irrigation frequency of *Hypoestes* transplanted into 14-in nursery containers from 4-in pots by about one day for every seven days (data not shown), certainly not even close to the 2 to 3 week frequency suggested on some labels (see Letey et al., 1992).

CONCLUSION

In this study, ContinuemTM functioned as an effective slow-release fertilizer for field-planted seedlings. Consistent with earlier studies (Conover and Poole, 1976; Henderson and Davies, 1987; Ingram and Yeager, 1987; Tripepei et al.; Wang, 1989), no growth benefits were obtained from the polymer component of the product.

Polymers do not reduce evapotranspiration (Letey et al., 1992; Wang, 1989; Wang and Boogher, 1987). Since the amount of water lost through evapotranspiration must be replaced by irrigation, polymers do not conserve water. Even if the polymer were able to extend the time-period between irrigations (Letey et al., 1992), more water would be needed to bring the growing medium or soil to full water-holding capacity -- allowing a grower to schedule the use of more water, less often. If a grower's labor or other expenses are high for each irrigation application, then the reduction in irrigation frequency could be economically important. However, the available research data indicates that the total amount of water needed will be about the same with or without polymers.

Polymers may be effective at accomplishing certain goals, such as increasing the water-storage capacity or enhancing plant growth in coarse-textured growing media or soils (such as coarse sands or light gravel), or under saline conditions (Letey et al., 1992). One report suggests the presence of polymers might reduce nematode populations in coarse-textured soils (Steinberger and West, 1992). However, polymers are not beneficial in all situations. Simply altering the physical properties of your growing medium could produce as much benefit as the use of a polymer. Polymer users should clearly identify what they hope to accomplish by using the product, and keep accurate records to determine if the goal was attained. Possible alternative ways to accomplish the same goal should be evaluated, and the relative costs compared.

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Table 1. Height and stem diameter of West Indies Mahogany from 30 to 250 days after transplanting as influenced by application of ContinuemTM or OsmocoteTM application. All seedlings averaged 32.8+1.2 cm of height at the start of the study. Means and standard errors.

			Days after transplanting			
Treatment	30	60	104	148	200	250
Control [height]	32.8±1.9	32.8±1.9	34.5±1.9	34.8±1.9	35.6±2.1	39.3±2.4
[caliper]	6.4±0.3	6.8±0.4	7.7±0.4	8.2±0.5	8.6±0.6	9.3±0.7
Gel dibbled[1]	35.8±2.1	37.3±2.1	38.0±2.2	39.1±2.1	39.9±1.8	43.9±1.9
	6.4±0.2	7.5±0.3	8.4±0.3	9.1±0.3	9.3±0.3	9.7±0.4
Gel Backfill[2]	37.3±1.5	39.3±1.6	40.2±1.6	41.4±1.7	42.6±1.7	46.5±2.1
	6.3±0.3	7.5±0.3	8.5±0.4	9.0±0.5	9.2±0.6	9.8±0.6
Osmocote dibbled[3]	36.6±1.4	38.9±1.5	39.6±1.7	40.4±1.5	42.8±1.9	46.8±2.3
	6.1±0.3	7.5±0.3	8.5±0.4	9.4±0.4	9.9±0.4	10.1±0.4
Osmocote dibbled[4]	41.8±1.5	42.7±1.5	43.5±1.5	46.7±2.0	51.3±2.3	56.0±4.4
	6.9±0.4	7.7±0.4	9.1±0.4	9.8±0.5	10.8±0.7	11.3±0.9
Osmocote dressed[5]	37.0±0.5	39.3±1.6	39.9±1.7	40.2±1.7	42.0±1.8	45.1±1.6
	6.3±0.3	7.1±0.3	8.1±0.3	8.2±0.4	9.2±0.5	9.2±0.3
			Significance (ANOVA F-test), Height			
	0.014	0.006	0.029	0.001	<0.001	0.005
			Significance (ANOVA F-test), Stem Caliper			
	ns	ns	ns	ns	ns	ns

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[1]ContinuemTM 16-16-16 (2 tbsp/liter) amended soil dibbled below the actual root ball.

[2]ContinuemTM 16-16-16 (2 tbsp/liter) amended soil used as backfill around root ball.

[3]OsmocoteTM 14-6-12 (2 tsp./liter) amended soil dibbled below the actual root ball.

[4]OsmocoteTM 14-6-12 (1 tsp./liter) amended soil dibbled below the actual root ball.

[5]OsmocoteTM 14-6-12 (1 tbsp./liter) topdressed on soil after transplanting.