

Growth responses of zoysiagrass influenced by different rates of a growth stimulant (Soil Solution One)

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Abstract

Zoysiagrass (*Zoysia spp.*) cv. El Toro was used in this experiment to evaluate its shoot growth in terms of length and dry weight under control and different levels of a growth stimulant Soil Solution One (SS1) applications in a pot study. Four treatments [Control, no SS1, 10.75 g SS1/m² (½ the recommended rate), 21.5 g SS1/m² (recommended rate) and 43 g SS1/m² (double the recommended rate)] and 6 replications of each treatment were used in a randomized complete block (RCB) design in this investigation. Plants were grown under the above treatment conditions for 8 weeks. Plant shoots (clippings) were harvested bi-weekly for the evaluation of the dry matter (DM) production. At each harvest, shoot lengths were measured and recorded and the visual growth was also evaluated before the harvest was made. The harvested plant materials were oven-dried at 60°C and dry weights were measured and recorded. The shoot growth (length) was stimulated under any levels of SS1 application rates compared with the control. Overall, among the treatment rates, the 21.5 g SS1/m² (the recommended rate) numerically stimulated the shoot length most. However in most cases, there were not statistically significant differences detected among the 10.75 g SS1/m² (½ the recommended rate), 21.5 g SS1/m² (the recommended rate) and the 43 g SS1/m² (double the recommended rate) application rates of the compound on the shoot length of the grass. The shoot (clippings) dry weights of the plants followed essentially the same pattern as the shoot lengths. The visual evaluation of the grass supported the measured parameters.

Key words: Zoysiagrass, shoot growth, dry matter production, Soil Solution One, growth stimulant, plant nutrient.

Introduction

Zoysiagrass (*Zoysia spp.*) is a warm season grass¹ used as turfgrass species in warm regions of the United States and other parts of the world. The species is relatively very tolerant to salinity, drought and heat stresses (all characteristics of the dry and hot regions). These characteristics substantially reduce plant/turfgrass growth in arid and semi-arid regions where the soils are usually saline/sodic and water and nutrients are limited for normal plant growth and development. There are numerous compounds commercially available claiming to enhance plant growth and development^{3,4}. However, adequate scientific evidence and experimental data are lacking to support these claims. Therefore, this investigation was conducted to examine one of these products (Soil Solution One) on the growth of zoysiagrass. The objectives of this study were to compare growth responses in terms of shoot length and shoot (clippings) dry weights of zoysiagrass grown under control and different levels of Soil Solution One application rates.

Materials and Methods

Zoysiagrass cv. El Toro was used in this experiment to evaluate its shoot growth in terms of length and dry weight under control and different levels of Soil Solution One applications in a pot study. The plants were vegetatively grown in square surface pots 10.16 cm x 10.16 cm dimensions and 10.16 cm height. Soil (plant growing mixture) was used as the plant anchor medium. The plants were well established (two years old) before the treatments were started. Four treatments, control (no Soil Solution One, SS1),

10.75g SS1/m² (½ the recommended rate), 21.5 g SS1/m² (recommended rate) and 43 g SS1/m² (double the recommended rate)] and 6 replications of each treatment were used in a randomized complete block (RCB) design in this investigation. Plants were allowed to grow under the above treatment conditions for 8 weeks. During this period, plants received daily watering (50 mL/pot tap water) and bi-weekly fertilization (50 mL/pot, ½ strength Hoagland Solution No.1²) to ensure adequate amount of plant essential nutrient elements and moisture for normal growth and development.

Plant shoots (clippings) were harvested bi-weekly for the evaluation of the dry matter (DM) production. At each bi-weekly harvest, shoot lengths were measured and recorded and the visual growth was also evaluated before the harvest was made. The harvested plant materials were oven dried at 60°C and dry weights were measured and recorded. The recorded data were considered the bi-weekly plant DM production. The data were subjected to analysis of variance, using SAS statistical package⁶. The means were separated, using Duncan's multiple range test.

Results and Discussion

Shoot length: The shoot growth (length) was stimulated under any levels of Soil Solution One (SS1) application rates (Tables 1 and 2). The effect of Soil Solution One on shoot length was shown from the first harvest at all application rates, including the lowest one [10.75 g SS1/m² (½ the recommended rate)]. Overall, among the treatment rates, the recommended rate (21.5 g SS1/m²)

Table 1. Zoysiagrass growth, shoot length and dry weight (DW) under control and 3 rates of Soil Solution One (SS1) applications for 4 bi-weekly harvests.

Treatment	Harvest 1		Harvest 2		Harvest 3		Harvest 4	
	Length (cm)	DW (g)	Length (cm)	DW (g)	Length (cm)	DW (g)	Length (cm)	DW (g)
Control (0 SS 1)	5.15c	0.56b	5.68b	0.62b	5.93b	0.55b	5.55b	0.43b
10.75 g SS1/m ²	6.73ab	0.86a	7.08a	0.77ab	6.83b	0.82ab	6.18ab	0.62ab
21.5 g SS1/m ²	6.47ab	0.94a	7.02a	0.65b	7.62a	0.96a	6.93a	0.79a
43 g SS1/m ²	5.90bc	0.99a	6.92a	0.84a	7.02ab	0.90a	7.08a	0.63ab

SS1 = Soil Solution One. The values are means of 6 replications. All the values followed by the same letter in each column are not statistically different at the 0.05 probability level.

Table 2. Zoysiagrass growth, shoot length and dry weight (DW) average of 4 bi-weekly harvests under control and 3 rates of Soil Solution One (SS1) applications.

Treatment	Length (cm)	DW (g)	Shoot		Length DW	
			Length (% of Control)	DW (% of Control)	(% increase, based on Control)	(% increase, based on Control)
Control (0 SS 1)	5.58c	0.54c	100	100	—	—
10.75 g SS1/m ²	6.71ab	0.77ab	120	143	20	43
21.5 g SS1/m ²	7.01a	0.84a	126	156	26	56
43 g SS1/m ²	6.73ab	0.84a	121	156	21	56

SS1 = Soil Solution One. The values are means of 6 replications. All the values followed by the same letter in each column are not statistically different at the 0.05 probability level.

stimulated the shoot length most. However in most cases, there was not statistically significant differences detected among the 10.75 g SS1/m² (½ the recommended rate), 21.5 g SS1/m² (the recommended rate) and the 43 g SS1/m² (double the recommended rate) application rates of the compound on the shoot length of the grass.

Shoot dry weight: The shoot (clippings) dry weights of the plants followed essentially the same pattern as the shoot lengths (Tables 1 and 2). For both lengths and dry weights of the shoots, the differences between the average values for different treatments were wider as the growth period progressed. This indicates that the application of the Soil Solution One had a positive response on zoysiagrass's long-term growth and development. The visual evaluation (color and density) of the grasses supported the measured parameters. Since both the studied parameters showed a positive growth response (20 to 56% increase in growth compared to the control, Table 2) of zoysiagrass due to the Soil Solution One application, it can be concluded that this compound is beneficial to this grass and enhances its growth and development.

Conclusions

Any levels of Soil Solution One (SS1) application rates substantially stimulated shoot growth (length) and shoot (clippings) dry matter (DM) weights of the grass. Overall, among the treatment rates, the 21.5 g SS1/m² (the recommended rate) numerically stimulated the plant growth most. However in most cases, there were not statistically significant differences detected among the 10.75 g SS1/m² (½ the recommended rate), 21.5 g SS1/m² (the recommended rate) and the 43 g SS1/m² (double the recommended rate) application rates of the compound on the growth (shoot length and shoot DM production) of the grass. The visual evaluation (color and density) of the grass supported the measured parameters. However, it should be noted that further

research needs to be done and the product should be tested on some other grasses for better validity of the results.

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