IMPACT OF ORGANIC AMENDMENTS AND FERTILIZATION STRATEGIES ON ESTABLISHMENT OF ZOYSIAGRASS TURF FROM SPRIGS

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IMPACT STATEMENT

The rapid establishment of zoysiagrass *(Zoysia japonica)* from sprigs can have a significant impact on many turfgrass sites, including sod production, golf courses, and home lawns. A study was conducted to look at the effects of an organic amendment and various rates and forms of nitrogen (N) on establishment of 'Meyer', 'Cavalier', and 'El Toro' zoysiagrasses. The organic amendment, GroWin®, had a significant effect on the establishment of 'El Toro', but had no effect on 'Meyer' or 'Cavalier'. Neither increased N rates nor foliar N applications had any impact on rate of establishment. These studies further support earlier findings that fertilizer inputs have little or no effect on the establishment of zoysiagrass from sprigs.

BACKGROUND

Previous studies conducted at the University of Arkansas have demonstrated that an organic soil amendment marketed under the trade name GroWin® can produce a significant increase in establishment rates of several turfgrass species under various soil conditions (Richardson et al., 1999). One area where this amendment failed to enhance establishment was during the establishment of 'Meyer' zoysiagrass from cut sprigs (Richardson, unpublished data). Several possible reasons could exist for this lack of response. First, 'Meyer' zoysiagrass is an inherently slow-growing grass, taking as long as three years to establish a full turf from sprigs (Henry et al., 1988). In addition, previous studies have shown little, if any, response of 'Meyer' to N during sprig establishment (Carroll et al., 1996; Fry and Dernoeden, 1987; Richardson and Boyd, 2001).

Although 'Meyer' zoysiagrass continues to be the major cultivar in the transition zone where both warm and cool season turfgrasses can be grown, other zoysiagrass cultivars have emerged in the last 10 years that are gaining interest in the sod trade. Of the many new cultivars, 'El Toro' and 'Cavalier' are in various stages of production in Arkansas. Both are quite distinct from each other relative to morphology and growth habit. 'El Toro' is the oldest of the cultivars and, once established, is slightly more coarse in texture than 'Meyer'. It is a very aggressive cultivar that can be grown and marketed quickly. 'Cavalier' is a very fine-textured *Z. matrella* cultivar that should find a niche in the high-end turf market. With respect to growth rate, 'Cavalier' is considered intermediate between 'Meyer' and 'El Toro'.

Based on the limited studies conducted to date on establishment of zoysiagrass from sprigs, and the continued use of this species by the golf and landscape industries, further studies on establishing this grass from sprigs are needed. The objective of this study was to expand knowledge of cultural effects on zoysiagrass sprig establishment, focusing on the potential effects of an organic amendment (GroWin®), N rates, and foliar- vs. root-feeding of N.

RESEARCH DESCRIPTION

A field study was established on a fumigated site at the Arkansas Agricultural Research and Extension Center, Fayetteville. The site is located in USDA Hardiness Zone 6 and the soil is a Captina silt loam soil, typic hapludults, pH 6.2. The site was fertilized with 90 lb/acre of 0N-8.8P- 16.6K and prepared to seed-bed quality prior to planting on 5 June 2000. The study was arranged as a randomized complete block, split-split-plot design, with cultivar as the main plot factor, GroWin® treatments as the first split, and post-planting fertilization methods as the second split factor. Main plots were 18 x 21 ft and treatments included the cultivars Cavalier, El Toro, and Meyer. GroWin® plots were 6 x 21 ft and included a control (no GroWin®), GroWin® at 25 lb/1000 ft^2 and GroWin® at 50 lb/1000 ft^2. Prior to sprigging, GroWin® was incorporated with a rototiller to a 4-in. depth. Fertility plot size was 3 x 6 ft and fertilizer treatments included those listed in Table 1. Granular fertilizers were applied by hand while weekly foliar applications were applied using a CO_2 sprayer with a carrier volume equivalent to 80 gal/acre. Foliar nutrients were applied during dry periods to assure foliar uptake.

To assure uniform planting densities, the main plots were planted in sub-plot increments, using the GroWin® plots as the plot size for planting. Sprigs of each cultivar were obtained from shredding 2.3 yd^2 of freshly harvested sod. This sprigging rate (800 bushels/acre) was based on the definition that one bushel (1.25 ft^3) of sprigs represents those obtained from 1 yd^2 of sod (McCarty et. al, 1999). Sprigs were uniformly broadcast over the sub-plot area, pressed lightly into the soil using a roller, and watered immediately to prevent desiccation. Oxadiazon was applied to all plots at 3.0 lb / acre immediately after planting to suppress weeds, and water was applied as needed during the test to provide optimum growing conditions.

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Plots were rated monthly for percentage cover by two raters beginning at 60 days after planting (DAP). Cover estimates from the two raters were combined for an average single-cover estimate for that month. At the end of the season, the plots were also rated for a maturity index (MI), which indicates the qualitative condition of plot in relation to a harvestable sod crop. All treatments were replicated four times. Data from each measurement date were analyzed by analysis of variance procedures of the split-split-plot model.

FINDINGS

Weather during the first four weeks of the experiment severely hindered the growth of all the plots. Over 14 in. of rain fell at the research station during the month of June and temperatures were cooler than normal. However, within four to five weeks of establishment, the plots were actively growing and excellent growing conditions continued throughout the remainder of the experiment.

The analysis of variance for each evaluation date indicated a significant effect of cultivar and GroWin® and a significant cultivar x GroWin® interaction. There were no significant effects of fertilizer application method (foliar vs. granular) and no effects of N rate across the entire test (data not shown). The lack of fertility response continues to support the working hypothesis that zoysiagrass does not respond favorably to N fertilization during the establishment phase. Prior to the study, it was predicted that more aggressive cultivars such as 'El Toro' and 'Cavalier' would respond more favorably to N fertility than the slow-growing 'Meyer', but this was not the case, as there was no cultivar x N rate interaction for any measurement (data not shown). Based on this analysis of variance, the remaining discussion will focus on the cultivar x GroWin® effects.

A significant effect of cultivar was seen at all evaluation dates, with 'Cavalier' being the most aggressive cultivar at all dates, followed by 'El Toro' and 'Meyer' (Fig. 1). This was a surprising finding since 'El Toro' is generally considered a more aggressive species (Gibeault and Cockerham, 1988). A possible explanation may be the difference in sprigs of 'Cavalier' and 'El Toro'. 'Cavalier' is a *Z. matrella* cultivar and is a very fine-textured, dense species, with a higher stolon / rhizome number per unit area and shorter stolon and rhizome internode length than 'El Toro'. These key morphological features dictate that a higher number of growing points (stolon and rhizome nodes) would be obtained from a bushel of sprigs of 'Cavalier' than a bushel of sprigs of 'El Toro'. As such, early establishment would be greater, as seen is Fig. 1, since a higher number of plants would be established using equal numbers of sprigs. Work to establish the numbers of potential growing points per bushel of sprigs for the three cultivars tested is underway. 'El Toro' did move quickly ahead of 'Meyer' at later establishment dates and was almost equal to 'Cavalier' at the end of the season (Fig. 1), suggesting that if planting rates were equivalent, 'El Toro' would likely be the most aggressive cultivar, as expected.

Across all cultivars, GroWin® provides a small, but significant effect on establishment from sprigs (data not shown). These effects were not evident until 90 and 120 DAP, but the overall increases were less than 10%. To analyze the cultivar x GroWin® interaction, analysis of variance was conducted on each cultivar to test the effects of various GroWin® treatments. 'Cavalier' was not affected by amending the soil with GroWin® at any application date (Fig. 2). However, 'El Toro' did show a significant response to both a low (25 lb) and high (50 lb) rate of GroWin® at 60, 90, and 120 DAP (Fig. 2). This supported the hypothesis that the more aggressive cultivar, 'El Toro', might respond more favorably to soil amendments or nutritional increase. 'Meyer' zoysiagrass responded slightly to the high rate of GroWin® at the first observation period, but this significant difference had disappeared by the 90 DAP evaluation (Fig. 2).

Prior to the completion of this study, it was observed that percent turf coverage may not fully reflect the ultimate goal of these experiments, which was to establish a functional turf or harvestable sod. In zoysiagrass, as maturity of the turf increases, the leaf blades on the grass become very erect and produce a smooth, stiff surface. At the end of the growing season, two visual estimations of maturity, referred to as the maturity index (MI), were taken to ascertain the condition of the plots in relation to a completely mature turf, not just percent turfgrass cover. In relation to MI, there were significant differences in both cultivar and GroWin® applications, with 'Cavalier' producing the most mature turf, followed by 'El Toro' and 'Meyer' (Fig. 3). A GroWin® x cultivar interaction was also observed relative to maturity index. 'Cavalier' turf produced a near-mature turf in the first growing season, regardless of GroWin® rates, while both 'Meyer' and 'El Toro' responded favorably to applications of GroWin® when rated for MI. (Fig. 3).

In summary, GroWin® produced slight but significant responses to hasten the establishment of zoysiagrass from sprigs. Nitrogen fertility rates or application methods had no effect on the establishment rates of the plots, similar to earlier work. These findings further clarify that zoysiagrasses are a very low-input option for a range of turf situations.

LITERATURE CITED

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Table 1. Fertilizer treatments applied to plots throughout the growing season.

Treatment	Application method	Application interval	Application rate (lb N /1000 ft^2 / application)
1	control	control	control
2	foliar	1 week	0.0625
3	foliar	1 week	0.125
4	foliar	1 week	0.188
5	granular	4 weeks	0.25
6	granular	4 weeks	0.50
7	granular	4 weeks	0.75

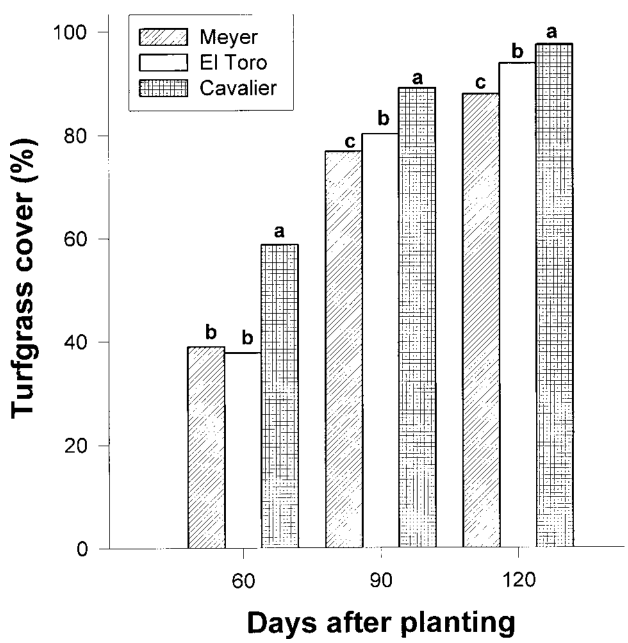

Fig.1. Establishment rate of three zoysiagrass cultivars from sprigs. Letters at each date that are different indicate a significant difference *($P \leq 0.05$)* in cover rate due to cultivar for that observation period.

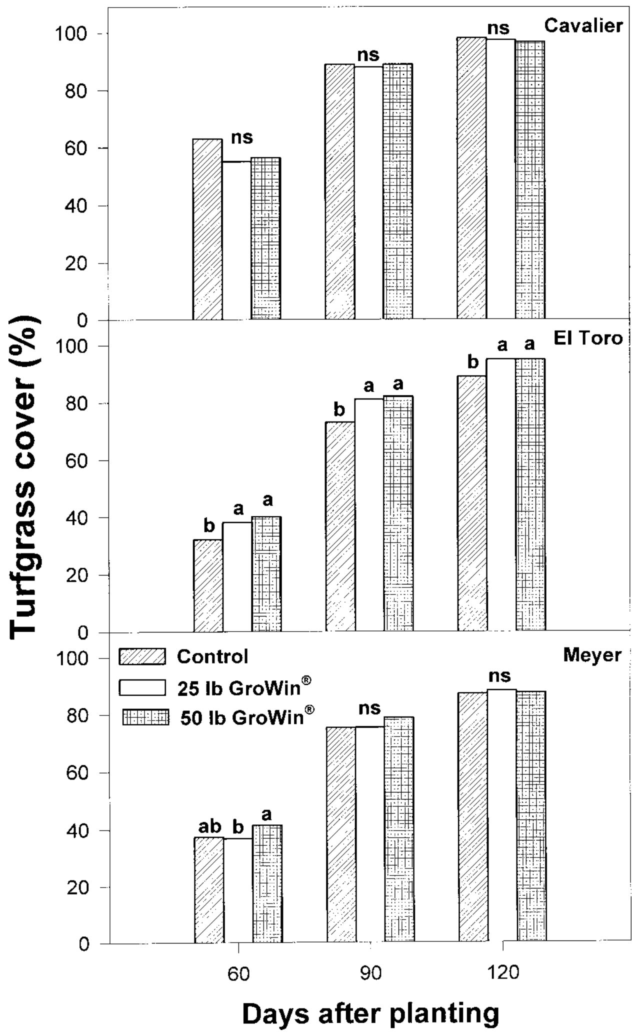

Fig. 2. Establishment rate of three zoysiagrass cultivars from sprigs, as affected by various levels of organic amendment applied prior to sprigging. Letters within each cultivar at each date that are different indicate a significant difference *($P \leq 0.05$)* in cover rate due to amendment for that observation period.

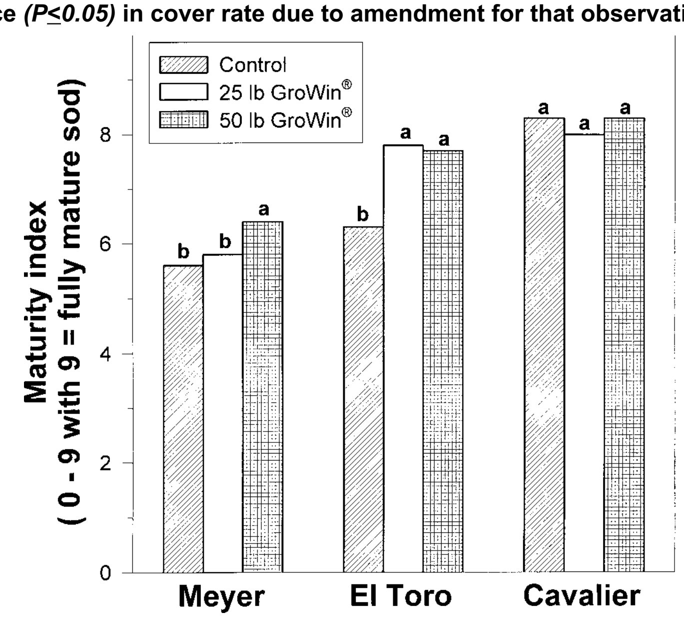

Fig. 3. Maturity index at the end of the growing season for three zoysiagrass cultivars, as affected by various levels of organic amendment applied prior to sprigging. Letters within each cultivar indicate a significant difference ($P \leq 0.05$) in maturity due to amendment.