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A Comparison of Sod Type and Fertilization during Turf Establishment

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Abstract. **Organic-(muck) and mineral-(sand) grown sods of 'Floratam' St. Augustinegrass [*Stenotaphrum secundatum* (Walt.) Kuntze] were planted on 27 Apr. 1982. Two fertilizer rates (5 g N m^{-2} and 10 g N m^{-2}) were applied before planting (sodbed surface) or after planting (sod surface). Rooting strength and turf quality were evaluated at 2 and 4 weeks, and growth rate at 4 weeks postplanting. Mineral-grown sod had greater rooting strength at 2 and 4 weeks after planting. Fertilizer placement was a factor only at 4 weeks, with sod surface better than sodbed placement. Strongest rooting occurred at 5 g N m^{-2}. Turf quality and growth rate were greatest for organic-grown sod whereas the 10 g N m^{-2} fertilizer rate produced the best quality and greatest growth rate.**

Sodding is the fastest and most expensive method of turf establishment. Success of any sodding operation depends on root initiation or knitting of the sod into the underlying soil. Previous work with Kentucky bluegrass *Poa pratensis* (4, 5, 6) showed that organic-grown sod ranked higher in root production than mineral-(clay) grown sod. No differences were noted in root production between soil-incorporated and surface fertilizer placement. Other studies (1) showed that root production was best when fertilizer was applied to the sodbed surface or incorporated into the sodbed. Both studies used sod of Kentucky bluegrass, a strongly rhizomatous turf species.

St. Augustinegrass [*Stenotaphrum secundatum* (Walt.) Kuntze] is a stoloniferous turf species. Root initiation must occur from crown tissue at nodes on stolons. This study evaluated sod soil type and fertilizer rate and placement effects on sod rooting, turf quality, and growth rates.

This study was initiated on 27 Apr. 1982 at the Univ. of Florida Turfgrass Field Laboratory, Gainesville, Fla. An Arrendondo loamy fine sand (Grossaremic Paleudults, loamy siliceous, hyperthermic) was rototilled to a 10 cm depth and graded prior to treatment initiation. Exerimental design was a 2 × 2 × 2 factorial arranged in a randomized complete block in 4 replications. Plot size was 2m × 3 m. Variables included sod-soil type [organic-(muck) or mineral-(sand) grown sod], fertilizer placement [sod surface or sodbed surface] and fertilizer rate [5 or 10 g N m^{-2}]. 'Floratam' St. Augustinegrass sod from the 2 different soil types was the same age and obtained from one grower and fertilizer used was a 16N–1.7P–6.7K with minor elements. Irrigation was daily for the 1st 2 weeks at a 3.8 mm rate and 7.6 mm every other day for the next 2 weeks. Mowing with a rotary mower at a 7.5 cm height commenced once sufficient leaf growth had occurred. Clippings were returned to the sod.

Sod rooting strength was measured at 2 and 4 weeks after after planting. The horizontal force in kPa required to shear laterally a vertically detached 20 × 20 × 5 cm block of sod from the soil surface was determined using a device adapted from Dunn and Engel (2). Three sub samples per plot were averaged. Turf quality was evaluated by visual estimates at 2 and 4 weeks. Growth rate at 4 weeks was calculated by collecting clippings above the 7.5 cm mowing height on a 1.3 m^2 area of the plot (equivalent to one mower swath). Clippings were dried at 60°C for 48 hr and dry weights determined. Dry weight determinations per unit area over the 6 days from the previous mowing allowed calculation of a daily growth rate.

Statistical analyses, indicating main effects and interactions, are noted in Table 1. Greatest rooting strength was observed for mineral-(sand) grown sod at both 2 and 4 weeks after planting (Table 2). Nitrogen at 5 g N m^{-2} produced greater rooting than at 10 g N m^{-2} (Table 2). Nitrogen placement affected rooting only at 4 weeks after planting (Table 2). All rooting strengths were in excess of 5 kPa which is considered the threshold for well-rooted sod (3).

Turf quality was affected at 2 and 4 weeks after planting by sod-soil type, N rate, and N rate × N placement (Table 1). Turf quality at 2 and 4 weeks was superior for the organic-grown sod, and the 10 g N m^{-2} fertilizer rate produced superior turf quality at 4 weeks (Table 3 and 4). At 2-weeks, no differences were noted in turf quality with fertilizer placement at the 5 g N m^{-2} rate, but sod surface placement was superior at the 10 g N m^{-2} rate. Growth rate was influenced by sod-soil type and fertilizer rate. The greatest growth rate occurred with the organic grown sod and the 10 g N m^{-2} fertilizer rate (Tables 3 and 4).

Based on these results, successful St. Augustinegrass sod establishment is best accomplished by limiting fertilizer application to 5 g N m^{-2} and fertilizing after the sod is laid. From rooting strength results, either sod type can be established on a properly prepared sodbed. From growth rate and turf quality data, organic-grown sod which has organic N available may have partitioned more photosynthates to shoot growth than did mineral-grown sod. Mineral-grown sod may exhibit an advantage over organic-grown sod by increased rooting leading to improved drought tolerance and fertilizer efficiency.

Table 1. F ratios for the analysis of variance on each measured characteristic.

Source	df	Rooting strength 2 weeks	Rooting strength 4 weeks	Growth rate	Turf quality 2 weeks	Turf quality 4 weeks
Rep	3	1.18	2.01	0.81	3.59	4.25*
Sod type	1	6.87**[z]	3.47*	11.31**	22.99**	24.52**
N rate	1	4.08*	5.83*	6.84**	4.54	28.97**
N placement	1	1.09	4.60*	0.39	13.91**	0.05
Sod × N rate	1	1.95	0.10	1.26	0.28	0.05
Sod × N placement	1	1.33	2.33	0.00	0.00	1.16
N rate × N placement	1	0.00	0.01	0.50	7.09**	0.42
Sod type × N rate × N placement	1	0.53	0.46	0.04	1.14	1.16
Error	21					

[z]*,**Significant at 5%(*) or 1%(**) levels, respectively.

Table 2. Effects of sod-soil type, N rate, and N placement on rooting strength of St. Augustinegrass at 2 and 4 weeks after planting.

Variable	Rooting strength (KPa) 2 weeks	Rooting strength (KPa) 4 weeks
Sod-soil type		
Mineral	6.3 a[z]	14.4 a
Organic	5.2 b	13.0 b
N rate (g m^{-2})		
5	6.2 a	13.3 a
10	5.4 b	11.7 b
N placement		
Sod surface	5.4 a	13.2 a
Sodbed surface	5.1 a	11.8 b

[z]Means in columns within main effects followed by the same letter are not significantly different at the 5% level.

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Table 3. Effects of sod-soil type on turf quality of St. Augustinegrass at 2 and 4 weeks and growth rate at 4 weeks after planting.

Sod-soil type	Turf quality[z] 2 weeks	Turf quality[z] 4 weeks	Growth rate kg ha^{-1} day^{-1}
Organic	6.8 a[y]	7.8 a	1.31 a
Mineral	5.7 b	6.4 b	0.66 b

[z]Visual estimate on a 1 to 9 scale, 9 = best.
[y]Means in columns within main effects followed by the same letter are not significantly different at the 1% level.

Table 4. Effects of N rate and placement on turf quality at 2 weeks and of N rate on turf quality and growth rate at 4 weeks after planting.

N rate (gm^{-2})	Turf Quality[z] N placement Sod surface 2 weeks	Turf Quality[z] N placement Sodbed surface 2 weeks	Turf Quality[z] 4 weeks	Growth rate kg $ha^{-1}day^{-1}$
5	6.1 b[y]	5.9 a	6.3 b	0.74 b
10	7.2 a	5.8 a	7.9 a	1.24 a

[z]Visual estimate on a 1 to 9 scale, 9 = best.
[y]Means in columns for N rates followed by the same letter are not significantly different at the 1% level. Means in a row within N placement bracketed by a line are not significantly different at the 1% level.

Literature Cited

1. Bruneau, A.H., R.C. Shearman, E.J. Kinbacher, and W.M. Knoop. 1981. Nitrogen carrier, rate and placement influence on sod transplant rooting. Agronomy. (Abstr.)
2. Dunn, J.H. and R.E. Engel. 1970. Rooting ability of Merion Kentucky bluegrass sod grown on mineral and muck soil. Agron. J. 62:517–520.
3. Green, R.L. and A.E. Dudeck. 1983. A comparison of vegetative propagation methods for centipedegrass establishment during the dormat season. Soil and Crop Sci. Soc. Fla. Proc. 42:52–53.
4. King, J.W. and J.B. Beard. 1967. Soil and management factors affecting the rooting capability of organic and mineral grown sod. Agronomy. (Abstr.)
5. King, J.W. and J.B. Beard. 1969. Measuring rooting of sodded turfs. Agron. J. 61:497–498.
6. King, J.W. and J.B. Beard. 1972. Postharvest cultural practices affecting the rooting of Kentucky bluegrass sod grown on organic and mineral soils. Agron. J. 64(3):259–262.

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Nitrogen Effects on Monostands and Polystands of Annual Bluegrass and Creeping Bentgrass

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Abstract. **Annual bluegrass (*Poa annua* L.) and 'Penncross' creeping bentgrass (*Agrostis palustris* Huds.) were grown in monostand and polystand in silica sand and supplied with solutions in which 0%, 25%, 50%, 75% or 100% of the N was NH_4^+ and the remainder was NO_3^-. In polystand, annual bluegrass was more competitive than 'Penncross', producing more shoot and root dry weight and more tillers. Competitive ability of annual bluegrass was decreased as the percentage of NH_4^+ increased in nutrient solution. The decrease in competitive ability was reflected by a decline in tiller number and root and shoot dry weight. 'Penncross' was less affected by N form than was annual bluegrass.**

Annual bluegrass is an undesirable but persistent component of intensively cultured turf areas, particularly athletic fields and golf course greens, tees, and fairways. Its rapid tiller production and prostrate growth habit under close clipping makes it very competitive to most Kentucky bluegrass cultivars (3). Although it has been shown to invade 'Penncross' creeping bentgrass swards (4), little information is available on the differences in growth characteristics of annual bluegrass and creeping bentgrass to account for its ingress. Annual bluegrass is less invasive in a high density creeping bentgrass sward than in turf which has been injured through wear or maintenance practices (4). Waddington et al. (11) and Engel and Bussey (5) found that less annual bluegrass was present in 'Penncross' turf when the N source was urea, or a slow release nitrogen fertilizer containing urea, than when the nitrogen source was an activated sewage sludge. Whereas creeping bentgrass seems to be relatively unaffected by N form (7, 8), little information is available on the effect of N form on the growth of annual bluegrass.

The object of this study was to determine the effect of N form on the growth of annual bluegrass and 'Penncross' creeping bentgrass.

Three separate experiments were conducted from 2 Apr. 1981 to 9 Dec. 1981 on *Poa annua* L. (annual bluegrass) and *Agrostis palustris* Huds., 'Penncross' (creeping bentgrass) grown in monostand and polystand. The annual bluegrass plants, grown from seed, consisted of a normal distribution of *Poa annua* var. *annua* (L.) Timm and *Poa annua* var. *reptans* (Hausskn.) Timm. In monostand, 4 plants of either annual bluegrass or 'Penncross' were grown in a square arrangement at a 2 cm spacing. In polystand, 2 plants of annual bluegrass and 2 plants of 'Penncross' were grown on opposite corners of a square arrangement at a 2 cm spacing. Seeds were germinated in petri dishes and seedlings transplanted one cm deep into silica sand in 10-cm diameter plastic pots at the one-leaf stage. After a 3-week establishment period during which the seedlings were fertilized with Hoagland's (6) nutrient solution 3 times weekly, a fertility regime was started with N as 0%, 25%, 50%, 75% or 100% ammonium nitrogen, as described by Nittler and Kenny (9). Hoagland's number 1 nutrient solution (6) was the 0% NH_4^+ solution. Nitrate nitrogen constituted the remainder of the N in the complete nutrient solution as per Nittler and Kenny (9). The pH of the nutrient solutions ranged from 4.3 to 4.9. On Monday, Wednesday and Friday, the pots were separated into treatments, and each pot was treated with 100 ml of nutrient solution for a total of 0.5 g actual N per pot during the experiment. The pots were allowed to drain for 1 hr before they were returned to their location in each block. As some drainage continued after the 1 hr period, the pots were set on inverted petri dishes to avoid contamination from other treatments. The treatments were arranged in a randomized complete block design with 5 replications. The daylength was 16 hr. The greenhouse night and day temperatures were maintained at 16° and 21°C, respectively. Daytime temperatures sometimes exceeded 21° by 6°, and the plants were not mowed. The experiments were terminated 55 days

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