Plant Growth Regulators to Speed Fairway Establishment

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Turfgrass establishment rarely seems to occur fast enough. I often am asked "How can I increase the rate of establishment?" For every need out there, there seems to be some product or device marketed for the situation.

Plant growth regulators (PGRs) have been used for years to decrease clipping yields (Watschke et al., 1992). Some of the newer PGRs, notably trinexapac-ethyl (Primo®), can increase turf quality and density by stimulating tiller production and root growth (Stier, 1997).

Some superintendents have begun questioning whether PGRs can be useful to hasten turf establishment. This is an area of particular interest when new courses are being constructed or when fairways are being re-established because of the potential revenue to be made from opening the course for play. Testimonials abound, but testimonials do not usually give a complete picture. During the spring and summer of 1999 we completed two studies at the O.J. Noer Turfgrass Research and Educational Facility which were designed to determine the potential for PGRs to affect establishment rates of fairway turf.

Study 1: Primo Effects on Creeping Bentgrass Establishment

Materials and Methods

'Penncross' creeping bentgrass was seeded on a Miami silt loam soil on 10 May 1999 (1 lb per 1000 ft^2). Starter fertilizer (10-22-20) was applied to supply 1 lb P2O5 per 1000 ft^2. The seed was lightly raked in and the plots were irrigated three times daily until one week after emergence when irrigation was reduced to supply approximately 70% evapotranspiration (ET) three times weekly. The turf was first mowed at 0.75 inch height using a lightweight McLane reel mower. A walking greens mower set at 0.5 inch height was used for the second mowing. A fairway triplex mower set at 0.5 inch height was used for all subsequent mowings. Plots were mowed three times weekly. On 19 July a potentially severe yellow nutsedge (*Cyperus esculentus*) weed infestation was controlled using halosulfuron (Manage®; 0.062 lb ai acre-1).

The experimental design was a randomized complete block with three replications. Each plot measured 60 ft^2 (6 ft x 10 ft). Trinexapac-ethyl (Primo®) was applied on 3 June when there was approximately 50% turf cover. Subsequent treatments were applied at either two or four week intervals depending on the treatment (17 June, 7 July and 25 July). We compared the label rate for bentgrass fairways (0.25 oz/1000 ft^2 at four week intervals) to a 0.5x and a 2x rate, plus a 0.5x rate applied at two week intervals. Treatments were applied in two gallons of water per 1000 ft^2 using 8004 flat fan nozzles.

Turf density and quality were evaluated weekly using a visual rating scale from one to nine where one denoted dead turf/bare soil, six was acceptable turf, and nine was perfect turf. Data on growth characteristics were collected twice during the season (six weeks apart) by selecting 10 plants from each plot area using a pre-marked grid. For each plant, the number of shoots, the number of stolons, average length of stolons, and the average length of the internodes on the stolons were determined. Internode data was determined by counting the number of nodes on each plant and dividing this figure by the total length of all stolons, providing an average internode length for the entire plant. At the end of the experiment two four-inch diameter cores were collected from weed-free areas near the center of each plot. The verdure and thatch were removed and the soil below three and one-half inch depth was discarded. The cores were broken apart, washed, and the roots collected using sieves. The

Table 1. Primo effects on percent cover of creeping bentgrass during establishment (Verona, WI, 1999).[†]

Primo rate	24 Jun	7 Jul	16 Jul	23 Jul	30 Jul	6 Aug	13 Aug	19 Aug
Untreated	91.0	93.3	94.3	95.3	92.0	95.0	95.0	95.0
0.25 oz/4 wks	90.3	91.0	92.0	92.7	90.3	91.7	91.7	92.7
0.50 oz/4 wks	88.0	88.7	90.0	91.7	85.7	88.3	87.7	88.7
0.125 oz/2 wks	90.3	93.3	94.3	94.3	92.7	93.7	94.3	94.7
0.125 oz/4 wks	90.0	92.3	94.3	93.3	91.7	94.0	94.0	94.3
LSD (0.05)	ns	ns	2.0	ns	ns	3.8	4.5	3.2

[†] Plots were seeded to one pound per 1000 ft^2 on 10 May 1999 on a Miami silt loam soil. Primo was initially applied on 3 June 1999 when turf cover was approximately 50%.

root masses were oven-dried at 50 C for three to four days and weighed. The average of the root mass from both cores within a plot were used for statistical analysis. All data were analyzed by ANOVA procedures and means were separated using Fisher's LSD (MSTAT, 1988).

Results and Discussion

Primo did not enhance the rate of creeping bentgrass establishment at any of the rates or application times evaluated (Table 1). The 2x rate of Primo (0.5 oz/1000 ft^2) significantly delayed creeping bentgrass establishment and resulted in increased weed density (data not shown), primarily fall panicum (*Panicum dichotomiflorum*). (The halosulfuron treatment effectively controlled the yellow nutsedge without damaging the appromixately four-week old creeping bentgrass.) Heat stress which developed during mid and late July caused a transient decline in turf cover as temperatures rose above 90 F.

Contrary to responses occasionally reported from trials of mature turf, Primo did not affect stolon density, stolon length, stolon internode length, or root mass (Table 2). The 2x rate and the 0.5x rate (biweekly applications) appeared to increase shoot density although visual turf density was not affected. The 2x rate occasionally resulted in higher turf quality during periods of heat stress compared to the control and other treatment rates (Table 3). This may have been due to the buildup of carbohydrates and other osmotic agents resulting from suppressed leaf expansion. No phytotoxicity was observed at any rate at any time of the study.

Study 2: Chipco Proxy® effects on Kentucky bluegrass establishment

Materials and methods

Plots were seeded 7 May at 1.5 lb seed per 1000 ft^2 using a blend of elite Kentucky bluegrass cultivars developed for fairway maintenance regimes including a 0.5 inch mowing height ('Award', 'America', and 'SR2100'). The soil type was a Miami silt loam. Starter fertilizer (10-22-20) was applied and both fertilizer and seed were lightly raked into the top 0.125 to 0.25 inch of soil. Plots were irrigated three times daily until establishment, then three times weekly at 70% ET.

The experimental design was a split-plot, randomized block design with three replications. Plots were split to evaluate both pre-emergence and post-emergence applications of Proxy. Plot sizes were 60 ft^2 (6 x 10 ft). Proxy was applied at three rates to both bare soil and seedling Kentucky bluegrass. Pre-emegent treatments were applied

Table 2: Primo effects on plant growth characteristics during creeping bentgrass establishment (Verona, WI, 1999).†

	Stolon internode length (cm)		No. shoots plant^{-1}		No. stolons plant^{-1}		Total stolon length plant^{-1}		Root mass (g)
Primo rate	1 July	12 Aug	1 July	12 Aug	1 July	12 Aug	1 July	12 Aug	23 Aug
Untreated	0.89	0.78	2.47	0.83	3.2	4.0	10.1	19.1	4.8
0.25 oz/4 wks	0.85	0.67	2.83	0.70	3.3	4.1	11.1	17.8	4.2
0.50 oz/4 wks	0.84	0.75	3.37	1.53	3.5	3.8	9.1	19.7	4.1
0.125 oz/2 wks	0.88	0.69	3.23	1.57	3.6	3.8	10.7	16.9	4.2
0.125 oz/4wks	0.87	0.66	3.37	1.07	3.4	4.4	11.0	18.4	5.3
LSD (0.05)	ns	ns	ns	0.66	ns	ns	ns	ns	ns

† Plots were seeded to one pound per 1000 ft^2 on 10 May 1999 on a Miami silt loam soil. Primo was initially applied on 3 June 1999 when turf cover was approximately 50%.

Table 3. Primo effects on turf quality during creeping bentgrass establishment (Verona, WI, 1999).

	Date										
Primo rate	9 June	16 June	24 June	30 June	7 July	16 July	23 July	30 July	6 Aug	13 Aug	19 Aug
Untreated	8.0	7.8	7.7	7.2	6.5	6.0	6.8	5.2	5.3	6.0	6.2
0.25 oz/4 wks	8.0	7.5	7.5	7.2	6.5	6.0	6.5	5.8	5.8	6.0	7.0
0.50 oz/4 wks	8.0	7.7	7.5	7.2	6.5	6.0	7.0	6.0	5.8	6.5	7.0
0.125 oz/2 wks	8.0	7.7	7.5	7.3	6.5	6.0	6.5	5.5	5.7	6.2	5.5
0.125 oz/4wks	8.0	7.7	7.5	7.0	6.5	6.0	6.7	5.3	5.3	6.0	6.5
LSD (0.05)	ns	ns	ns	ns	ns	ns	0.3	0.6	ns	0.2	ns

† Plots were seeded to one pound per 1000 ft^2 on 10 May 1999 on a Miami silt loam soil. Primo was initially applied on 3 June 1999 when turf cover was approximately 50%.

Table 4. Effect of Chipco Proxy® on Kentucky bluegrass establishment for fairways (Verona, WI, 1999).

Treatment	16 Jun	24 Jun	1 Jul	8 Jul	16 Jul	23 Jul	30 Jul	6 Aug	13 Aug	20 Aug
Proxy (oz/M)	----------Percent turf cover----------									
0	25.8	33.3	55.0	55.8	62.5	61.7	61.7	62.5	71.7	66.7
3†	32.5	36.7	55.0	60.8	61.7	64.2	65.0	65.8	73.3	70.8
5	27.5	32.5	53.3	55.0	62.5	64.2	60.8	65.8	74.2	69.2
10	28.3	39.2	56.7	62.5	71.7	71.7	67.5	71.7	80.8	78.3
LSD (0.05)	ns	ns	ns	ns	ns	ns	ns	ns	ns	11.0
Timing										
Pre-emerge	29.6	35.4	55.8	60.4	64.6	65.0	63.8	65.4	73.3	70.8
Post-emerge	27.5	35.4	54.2	56.7	64.6	65.8	63.8	67.5	76.7	71.7
Proxy x timing	*	ns	ns	ns	ns	ns	ns	ns	ns	ns

* Significant at p=0.05; ns = not significant at p=0.05.

† Chipco Proxy® was applied to pre-emergent plots on 11 May and post-emergent treatments were applied 15 June 1999. Plots were seeded on 7 May 1999.

on 11 May and post-emergent treatments were applied on 15 June. Plots were rated for percent turf cover, percent weed cover, color, quality, and growth habit (prostrate versus upright).

Results and discussion

Chipco Proxy® had little effect on turf establishment (Table 4). Percent turf cover was affected only marginally on one date three months after planting, although percent weed cover was reduced at the 10 oz rate during the early part of the study (data not shown). Turf quality was not affected by rate. Generally, the pre-emergent treatment had no effect on the turf while the post-emergent treatment occasionally affected both turf quality and growth habit. By August the turf which received the post-emergent application had slightly lower turf quality than plots which received the pre-emergent application, though the differences were not significant on a practical basis (data not shown). The post-emergent treatment resulted in an upright growth habit compared to the pre-emergent treatment (data not shown).

CONCLUSION

Neither Primo® or Chipco Proxy® increased the speed of establishment of either creeping bentgrass or Kentucky bluegrass, respectively. Further studies during cooler periods of early spring or autumn may provide different results and are worth investigatin as creeping bentgrass growth is slowed during high temperatures. Other cultivars, soil types, maintenance regimes, and environments may cause different results, although data from other areas of the country generally mirror that which is shown here.

Literature Cited

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