

AEF 130360 Overseeding Safety

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Abstract

Several items need consideration when products are evaluated for use as transition agents. These are (1) efficacy of ryegrass removal [rate of ryegrass decline and appearance of turf during transition], (2) tolerance and performance of incoming bermudagrass and (3) application safety for next season's repeat overseed operations. This test was designed to evaluate application safety for the next overseeding which occurs in the early fall. Therefore, AEF was applied in the summer to bermudagrass turf prior to overseed operations.

Most responses of the perennial ryegrass (overseed) turf to previous treatments of AEF 130360 occurred immediately after overseeding, from mid-October to early November. AEF 130360 applied 2 weeks before overseeding caused a significant decrease in seedling vigor, percent plot ryegrass cover, and percent bermudagrass plot straw present. Both AEF treatments applied closest to overseeding (2 weeks prior) had the least amount of initial ryegrass, the greatest amount of green bermudagrass, and later in the season, the most amount of straw (dormant) bermudagrass. Differences in turfgrass quality were not significant due to treatments at any time throughout the test, and most treatments ranked higher than the control in overall quality. Under the conditions of this test, application of AEF 130360 at either 0.64 or 1.28 ounces/product/M made one month before actual overseeding did not cause detrimental effects to ryegrass emergence, ryegrass cover, turfgrass color or overall quality.

Introduction

AEF 130360 was previously tested under replicated conditions for efficacy as a transition agent in perennial ryegrass turf (overseed) for enhancing the return of bermudagrass via the suppression of the overseed turf itself. The increased persistence in ryegrass in overseeded bermudagrass is a major concern of turfgrass managers in the southern U.S. Several items need consideration when products are evaluated for use as transition agents. These are (1) efficacy of ryegrass removal [rate of ryegrass decline and appearance of turf during transition], (2) tolerance and performance of incoming bermudagrass and (3) application safety for next season's repeat overseed operations. This test was designed to evaluate application safety prior to overseeding which occurs in the early fall.

Materials and Methods

A ten-year old stand of Arizona Common bermudagrass was selected for testing application timing and rate structure treatments of AEF 130360 experimental herbicide. Two rates of the herbicide (0.64 oz. and 1.28 oz. per 1000 ft²) were applied at 8, 6, 4 and 2 weeks prior to actual overseeding. Application dates were August 7, August 22, September 5, and September 25. Overseeding occurred on October 4, 2000 using Charger II perennial ryegrass

at 605 lbs. PLS/acre. In preparation for overseeding, the turf was scalped from 1.5 to ½ inch by lowering a reel-type mower in ¼ inch increments, followed by double mowing at each new successive height. After seeding in 4 directions, plots were drag matted and rolled in two directions using a 675 lb roller.

AEF 130360 was applied to plots using a CO₂ back-sprayer using 8004 nozzles and 28 PSI, delivering a final solution spray of 53 GPA. Plot size was 5x10", with plots replicated three times in a RCBD field configuration.

Plots were irrigated 4-5 times daily for short durations, following standard germination and emergence procedures for overseed establishment. Plots were then mowed 2-3x weekly at 1.5 inches, using a walk behind rotary mower.

From October 12, 2000 to January 22, 2001, plots were evaluated to determine various responses to herbicide treatments. Percent plot ryegrass (0-100%), percent plot green bermudagrass (0-100%), and percent plot straw bermudagrass (0-100%) were assigned study plot composition responses. Turfgrass color, quality, and density were assigned to plots when appropriate using NTEP visual rating scales of 1-9, 9=best. Ryegrass vigor scores were assigned once to plots immediately after emergence.

After January 2001, the test was terminated at the close of complete grow-in and fall performance determination.

Results and Discussion

Most responses which exhibited significant treatment effects occurred immediately after overseeding, from mid-October to early November. Significant treatment responses occurred for ryegrass seedling vigor, percent ryegrass suppression, percent plot ryegrass cover, and percent bermudagrass plot straw present (Appendix Table A). Percent plot green bermudagrass was significant on only one of four evaluation dates (Nov 02). Turfgrass color scores were significantly different on only two of seven dates (Nov 20, Dec 5). Throughout the test, there were no significant differences in overall turfgrass quality due to tested herbicide treatments (from Oct 23 to Dec 11) (Appendix Table A, Table 4).

Thirty days after overseeding:

Ratings for October 12, October 23 and November 02 show responses within the first 30 days after overseeding.

Percent plot ryegrass, bermuda straw, seedling vigor and % ryegrass suppression (as a function of the untreated control) were responses that were highly affected by the treatments (Appendix Table A). Ryegrass stand density was not affected by treatment in the first 30 days after overseeding, but ryegrass seedling vigor and percent turf suppression were. Percent plot green bermudagrass was significantly different on Nov 02 only. (Appendix Table A, Table 5).

Percent plot ryegrass averaged 56% across all plots on October 12, and ranged from 18% to 72% across treated plots (Table 1). Both rates of AEF 130360 applied 2 weeks before overseeding had poor ryegrass germination, as the 0.64 and 1.28 ounce rates showed 35% and 18% ryegrass cover, respectively (Figure 1). All remaining treatment/timing combinations ranged from 57-72% germination. Five treatments exhibited 60-77% plot cover ryegrass. The low rate of AEF applied 8 weeks before overseeding at 0.64 ounce/product/M ranked highest numerically, with 72% plot ryegrass cover.

On October 23, average percent plot ryegrass was 51%, (Table 1) and ranged from 40% to 70% plot cover (Figure 1). Following repeated mowing, the percent plot ryegrass appeared less than was previous. This response is due to the lack of tillering and the predominance of single tillered plants less than 20 days after overseeding. Oddly enough, there was a decrease in ryegrass cover and complete rank reversal for the eight week 0.64 ounce/M treatment. At 0.64 oz/M/8 wk prior to overseed turf cover decreased from 72% to 40% cover in 12 days time. Perhaps this decrease is an artifact of leaf removal in an otherwise aggressive bermudagrass canopy due to mowing. Note that this treatment did rank high in bermudagrass on both of the early measurement dates, which would seem to explain this artifact (Figure 1).

Seedling vigor (relative height/growth/density) was assigned to all plots on October 12, which was 8 days after overseeding. Using a visual scale of 1-6 [1=minimal, no growth; 3=slight, moderate growth; 6=unrestricted growth] it was shown that both rates applied 2 weeks before overseed were “stunted”, as far as the ryegrass was concerned. This response was also rate dependent, as the low and high rates had mean scores of 2.0, and 3.0, respectively (data not shown). All other treatments showed statistically similar responses to that of the control (ranging from 4.0 to 5.3).

When adjusted for the growth of the average of all non-treated control plots using the seedling vigor data, suppression of ryegrass ranged from 0 (none) to 72% on October 12 (Figure 3). Again, those treatments with the most suppression included both 1x and 2x rate treatments applied two weeks before overseeding. The 0.64 ounce/M and 1.28 ounce/M treatments applied just two weeks prior to overseeding caused on average 47% and 73% ryegrass suppression 8 days after overseeding, respectively.

The percent plot straw (as bermudagrass after overseed prep and seed application) was also affected by the treatments after initial ryegrass emergence on October 12 (8 days after overseeding) (Table 2, Figure 2). Again, both the 1x and 2x rate treatments applied 2 weeks before overseeding had the greatest amount of bermudagrass straw present (25% and 37%, respectively) (Figure 4). The visual bermudagrass straw response was also rate dependent. The greater amount of bermudagrass straw present was no doubt a function of the weaker ryegrass cover present from the identical treatments. By October 23, percent plot straw from bermudagrass averaged 14% for all treatments, with treatment ranges between 5-26%, and the control averaging 18%. Interestingly, the 0.64 ounce/M treatment applied 8 weeks before overseed had the largest numerical value for “straw” at 27% (Figure 4). The reasons for this observation were discussed previously.

On October 23, only the percent plot ryegrass cover was significantly affected by the “treatments” applied previously (Appendix Table A). Those treatments which exhibited the greatest amount of perennial ryegrass included the 1.28 ounce/M applied four weeks before overseeding (70% ryegrass cover) (Figure 1). Note that turfgrass color, quality and visual density (when assigned) were not significantly different due to treatments for the first 30 days period.

Although not statistically different, density of turf that received the high rate of 1.28 ounces/product/M two weeks before overseeding was noticeably different from that of the control (2.3 vs. 5.3, respectively). Perhaps differences in leaf width affected the visual estimates of density, since shoot counts were not taken. Likewise, the low rate (0.64 ounce/M) applied on the same date was also visibly less dense than that of the controls (3.3 vs. 5.3, respectively). With the exception of the 1.28 ounce rate applied 8 weeks prior to overseed, treatments ranked in order of time of application (relative to overseeding), with visual density scores being higher the further from the actual overseeding event (Data not shown).

Fall/Early Winter:

There were no significant responses due to treatments for % rye, % green bermudagrass turf, or % plot straw from Nov 7 to the end of the test (Jan 22, 2001) (Appendix Table A). Grand averages show a decrease in % plot rye from Nov 20 to December 5, 2000. This decrease was due to hard frosts which typically occur, and is an anticipated response. With the “decrease” in ryegrass from frost and chilling events, an increase in % bermudagrass straw also occurred, peaking at 27% (for all plots) on December 5 (Figure 4).

On November 20, percent plot ryegrass cover ranged from 70% to 88%, and was not significant due to the treatments themselves (Table 1, Figure 1). By December 11, plots ranged from 80% to 90% ryegrass cover, and from 86% to 98% by Jan 22, 2001 (end of test) (Figure 1).

Percent plot ryegrass cover was not significant due to applied treatments on Nov 7, Nov 20, Dec 11, or Jan 22. The high rate (1.28 ounce/M) applied closest to overseeding was almost always the lowest in rank for percent ryegrass, averaging about 18% less in cover on Nov 20 and Dec 5, and 10% by Dec 11 and Jan 22, respectively (Figure 1). Again, note that on these dates, the treatment affect was not significant (Table 1).

Turfgrass color scores were not significant on Nov 7, but were significantly different on Nov 20 and Dec 5. There were three treatments which ranked better than the control for color (1.28 ounce/2 weeks; 1.28 ounce/4 weeks; and 0.64 ounces/6 weeks) (Figure 5). All of the 1.28 ounce rates had mean color scores of 6.0, or greater. The darker green color observed on the above treatments may be a typical latent response to the herbicide. In general terms, color was not affected by AEF 130360 to any appreciable extent throughout the test.

Turfgrass overall quality was not significant statistically on any of the six test dates (Appendix TableA). However, any treatments with a mean quality of less than 5.0 would not generally be acceptable in a commercial lawn application (Figure 6). Also note the poor performance of the control, which ranked absolute last on five of the six evaluation dates.

Conclusions

1. Most responses of overseeded turf to previous treatments of AEF 130360 occurred immediately after overseeding, from mid-October to early November.
2. AEF 130360 applied 2 weeks before overseeding was significant in causing short term loss in ryegrass seedling vigor, suppressed ryegrass growth, which affected the percent plot ryegrass cover, an artifact of less initial ryegrass competition.
3. Both AEF treatments applied closest to overseeding (2 weeks prior) had the least amount of initial ryegrass, the greatest amount of green bermudagrass, and later in the season, the most amount of straw (dormant) bermudagrass.
4. Turfgrass quality was not significantly affected by the treatments evaluated at any time throughout the trial, and most herbicide treated turf ranked higher than the control for overall quality.
5. AEF 130360, at either 0.64 or 1.28 ounces/M, applied one month before actual overseeding did not cause detrimental affects to ryegrass emergence, ryegrass cover, or turfgrass color or overall quality.

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FIGURES = FN: XXXXXX

Appendix Table A. Mean Response Summary of Turf Treated with AEF 130360¹. University of Arizona 2000-2001. Means are value of all treatments followed by the (LSD)² Mean Separation Statistic Value, where applicable.

RESPONSE			Date of Evaluation							
			<u>Oct</u> <u>12</u>	<u>Oct</u> <u>23</u>	<u>Nov</u> <u>02</u>	<u>Nov</u> <u>07</u>	<u>Nov</u> <u>20</u>	<u>Dec</u> <u>05</u>	<u>Dec</u> <u>11</u>	<u>Jan</u> <u>22</u>
% Rye ³	Mean	56	51	58	43	78	73	85	92	
	LSD		(22)	(21)	N/A	N/A	N/A	N/A	N/A	N/A
% Green ³	Mean		37	37	32	51	--	--	--	--
Bermuda	LSD		N/A	N/A	(9)	N/A	--	--	--	--
% Straw ³	Mean		12	14	11	5	22	27	14	8
Bermuda	LSD		(21)	N/A	8	N/A	N/A	N/A	N/A	N/A
Density ⁴	Mean	4.4	--	--	--	6.6	--	6.5	--	--
	LSD		N/A	--	--	--	N/A	--	N/A	--
Color ⁴	Mean		--	5.9	5.3	4.4	6.1	6.8	6.1	5.7
	LSD		--	N/A	N/A	N/A	1.2	0.9	N/A	N/A
Quality ⁴	Mean	--	5.8	5.6	4.9	6.3	5.3	5.9	--	--
	LSD		--	N/A	N/A	N/A	N/A	N/A	N/A	--
% Rye	Mean		18%	0	0	2.6	0	0	0	0
Suppression ⁵	LSD		15%	N/A						
Rye Seedling	Mean		4.1	--	--	--	--	--	--	--
Vigor ⁶	LSD		1.9	--	--	--	--	--	--	--

¹Bermudagrass turf treated with AEF 130360 at 8, 6, 4, 2, weeks before overseeding with perennial ryegrass on Oct 4, 2000. Values are the mean off six treatments and control.

²LSD Value = mean separation statistic. Means which differ by absolute values greater than the LSD statistic, are significantly different from each other. N/A = not applicable, if F ratio for treatment Anova was P=0.10, or greater.

³Percent plot cover attributes (0-100%) of entire plot.

⁴NTEP visual plot ratings, 1-9; 1=dead, 9=best, 6=fully acceptable commercial turf.

⁵Rye Suppression = 1- (TRT/Control) * 100. Response based on seedling vigor values.

⁶Rye Seedling Vigor = 1-6; 1=no vigor, 6=extreme vigor. FN: AEFSAFETY.doc Q2/01

**Table 1. Percent plot ryegrass (as overseed) following a single application of AEF 120260.
University of Arizona, Karsten Turfgrass Research Facility, Tucson AZ.**

	<i>12-Oct-00</i>	<i>23-Oct-00</i>	<i>2-Nov-00</i>	<i>7-Nov-00</i>	<i>20-Nov-00</i>	<i>5-Dec-00</i>	<i>11-Dec-00</i>	<i>22-Jan-01</i>
control	66.7	51.7	55.0	38.3	80.0	68.3	85.0	90.0
0.64 oz.@ 8 wks	71.7	40.0	55.0	35.0	71.7	68.3	80.0	86.7
1.28 oz.@ 8 wks	60.0	45.0	60.0	46.7	88.3	73.3	88.3	93.3
0.64 oz.@ 6 wks	65.0	56.7	55.3	55.0	80.0	80.0	88.0	95.0
1.28 oz.@ 6 wks	66.7	51.7	56.7	43.3	80.0	80.0	90.0	97.7
0.64 oz.@ 4 wks	56.7	41.7	60.0	38.3	75.0	70.0	85.7	90.0
1.28 oz.@ 4 wks	61.7	70.0	64.0	45.0	80.0	75.0	88.3	95.0
0.64 oz.@ 2 wks	35.0	58.3	54.3	48.3	78.3	71.7	83.3	94.7
1.28 oz.@ 2 wks	18.3	43.3	56.7	41.7	70.0	66.7	82.3	86.3
test mean	55.7	50.9	57.4	43.5	78.1	72.6	85.7	92.1
LSD	22.8	NS	NS	NS	NS	NS	NS	NS

**Table 2. Percent plot bermudagrass straw following a single application of AEF 10360.
University of Arizona, Karsten Turfgrass Research Facility, Tucson AZ.**

Treatment	<i>12-Oct-00</i>	<i>23-Oct-00</i>	<i>2-Nov-00</i>	<i>7-Nov-00</i>	<i>20-Nov-00</i>	<i>5-Dec-00</i>	<i>11-Dec-00</i>	<i>22-Jan-01</i>
control	0.0	18.3	11.7	5.7	20.0	31.7	15.0	10.0
0.64 oz.@ 8 wks	0.0	26.7	18.3	11.7	28.3	31.7	20.0	13.3
1.28 oz.@ 8 wks	5.0	15.0	10.0	5.0	11.7	26.7	11.7	6.7
0.64 oz.@ 6 wks	10.0	5.0	4.7	3.0	20.0	20.0	12.0	5.0
1.28 oz.@ 6 wks	8.3	11.7	10.0	4.0	20.0	20.0	10.0	2.3
0.64 oz.@ 4 wks	16.7	13.3	15.0	6.7	25.0	30.0	14.3	10.0
1.28 oz.@ 4 wks	8.3	11.7	9.0	3.3	20.0	25.0	11.7	5.0
0.64 oz.@ 2 wks	25.0	11.7	10.7	3.0	21.7	28.3	16.7	5.3
1.28 oz.@ 2 wks	36.7	13.3	8.3	3.7	30.0	33.3	17.7	13.7
test mean	12.2	14.1	10.9	5.1	21.9	27.4	14.3	7.9
LSD	20.8	NS	8.0	NS	NS	NS	NS	NS

**Table 3. Ryegrass visual color following a single application of AEF 130360.
University of Arizona, Karsten Turfgrass Research Facility, Tucson AZ.**

Treatment	<i>23-Oct-00</i>	<i>2-Nov-00</i>	<i>7-Nov-00</i>	<i>20-Nov-00</i>	<i>5-Dec-00</i>	<i>11-Dec-00</i>	<i>22-Jan-01</i>
control	6.0	5.7	4.0	6.3	6.0	6.0	5.7
0.64 oz.@ 8 wks	5.0	5.0	3.3	5.0	7.0	6.0	5.3
1.28 oz.@ 8 wks	5.3	5.3	4.0	6.0	6.0	5.7	5.7
0.64 oz.@ 6 wks	6.0	5.0	5.3	7.0	7.7	6.3	6.0
1.28 oz.@ 6 wks	6.3	5.3	4.3	6.3	7.0	7.0	6.3
0.64 oz.@ 4 wks	5.7	5.7	4.3	6.0	7.7	5.7	5.0
1.28 oz.@ 4 wks	6.0	5.3	4.7	6.7	6.3	6.0	6.3
0.64 oz.@ 2 wks	5.7	4.7	5.0	5.3	6.7	6.0	5.7
1.28 oz.@ 2 wks	6.7	5.3	4.7	6.7	6.7	6.0	5.7
test mean	5.9	5.3	4.4	6.1	6.8	6.1	5.7
LSD	NS	NS	NS	1.3	0.9	NS	NS

**Table 4. Ryegrass visual quality following a single application of AEF 130360.
University of Arizona, Karsten Turfgrass Research Facility, Tucson AZ.**

Treatment	<i>23-Oct-00</i>	<i>2-Nov-00</i>	<i>7-Nov-00</i>	<i>5-Dec-00</i>	<i>11-Dec-00</i>	<i>22-Jan-01</i>
control	5.0	5.3	4.3	5.7	4.7	5.7
0.64 oz.@ 8 wks	4.3	4.0	3.7	6.0	5.0	5.3
1.28 oz.@ 8 wks	5.3	5.3	5.0	6.0	5.3	6.0
0.64 oz.@ 6 wks	6.7	6.7	6.3	6.7	6.7	6.7
1.28 oz.@ 6 wks	6.0	5.7	5.3	6.7	6.0	7.0
0.64 oz.@ 4 wks	5.3	5.3	4.7	6.3	4.7	5.3
1.28 oz.@ 4 wks	6.7	6.0	4.7	7.0	5.0	5.7
0.64 oz.@ 2 wks	6.0	6.0	5.3	6.3	5.3	6.0
1.28 oz.@ 2 wks	6.3	5.7	4.3	6.0	5.3	5.3
test mean	5.7	5.6	4.9	6.3	5.3	5.9
LSD	NS	NS	1.6	NS	NS	NS

**Table 5. Percent plot green 'live' bermudagrass following a single application of AEF 130360.
University of Arizona, Karsten Turfgrass Research Facility, Tucson AZ.**

Treatment	<i>12-Oct-00</i>	<i>23-Oct-00</i>	<i>2-Nov-00</i>	<i>7-Nov-00</i>
control	41.7	30.0	33.3	56.0
0.64 oz.@ 8 wks	41.7	40.0	26.7	53.3
1.28 oz.@ 8 wks	40.0	43.3	30.0	48.3
0.64 oz.@ 6 wks	28.3	38.3	40.0	42.0
1.28 oz.@ 6 wks	35.0	40.0	33.3	52.7
0.64 oz.@ 4 wks	35.0	45.0	25.0	55.0
1.28 oz.@ 4 wks	30.0	18.3	30.0	51.7
0.64 oz.@ 2 wks	40.0	31.7	35.0	48.7
1.28 oz.@ 2 wks	45.0	46.7	35.0	54.7
test mean	37.4	37.0	32.0	51.4
LSD	NS	NS	8.8	NS

**Table 6. Ryegrass 'Vigor' following a single application of AEF 130360.
University of Arizona, Karsten Turfgrass Research Facility, Tucson AZ.**

<i>Control</i>	<i>12-Oct-00</i>
0.64 oz.@ 8 wks	5.3
1.28 oz.@ 8 wks	4.3
0.64 oz.@ 6 wks	5.0
1.28 oz.@ 6 wks	4.7
0.64 oz.@ 4 wks	4.0
1.28 oz.@ 4 wks	4.0
0.64 oz.@ 2 wks	3.0
1.28 oz.@ 2 wks	2.0
test mean	4.1
LSD	1.9

Figure 1

AEF 130360
Percent Plot Rye

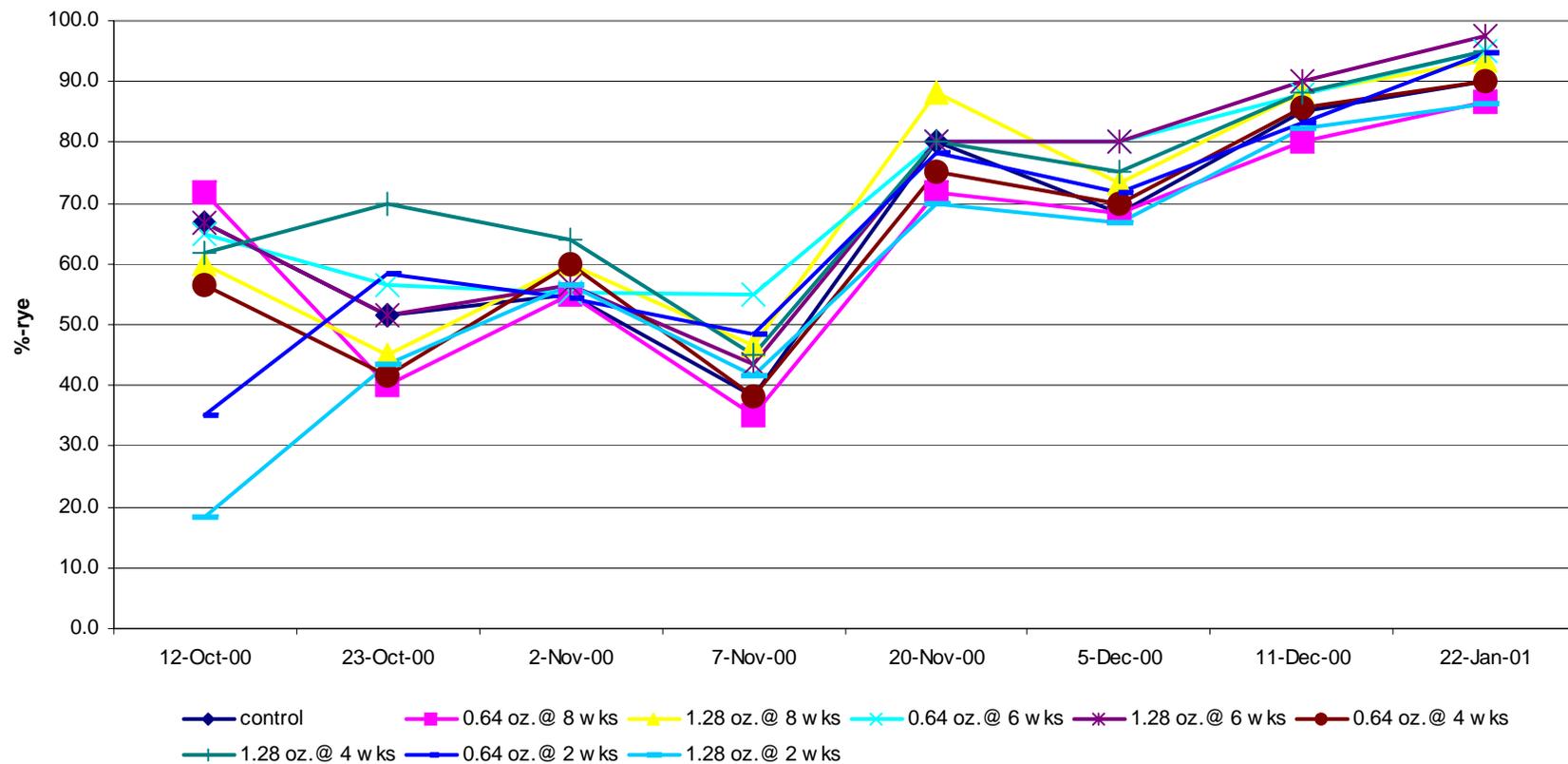


Figure 2

AEF 130360
Bermudagrass Straw

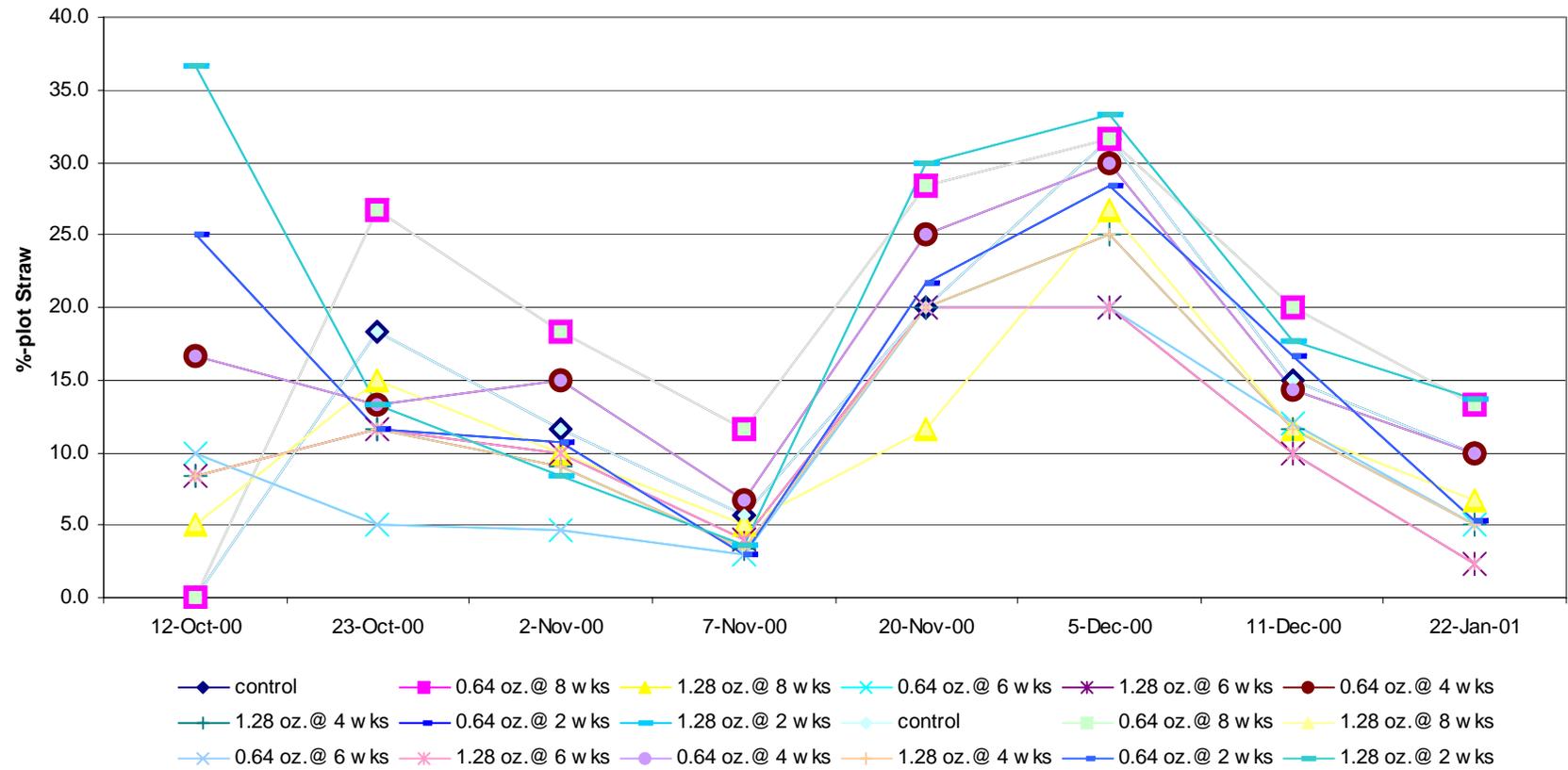


Figure 3

AEF 130360
Ryegrass Color

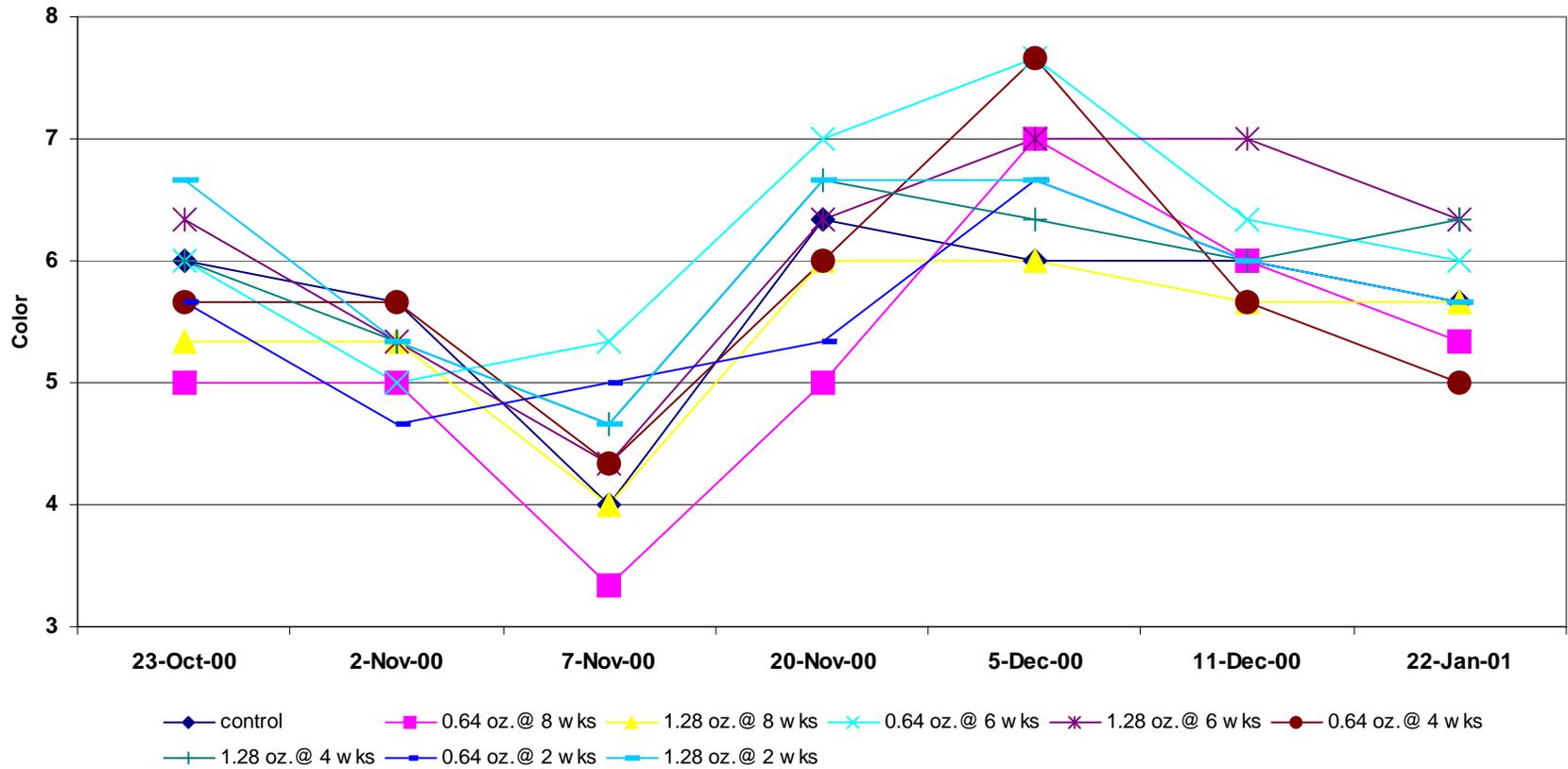


Figure 4

AEF 130360
Ryegrass Quality

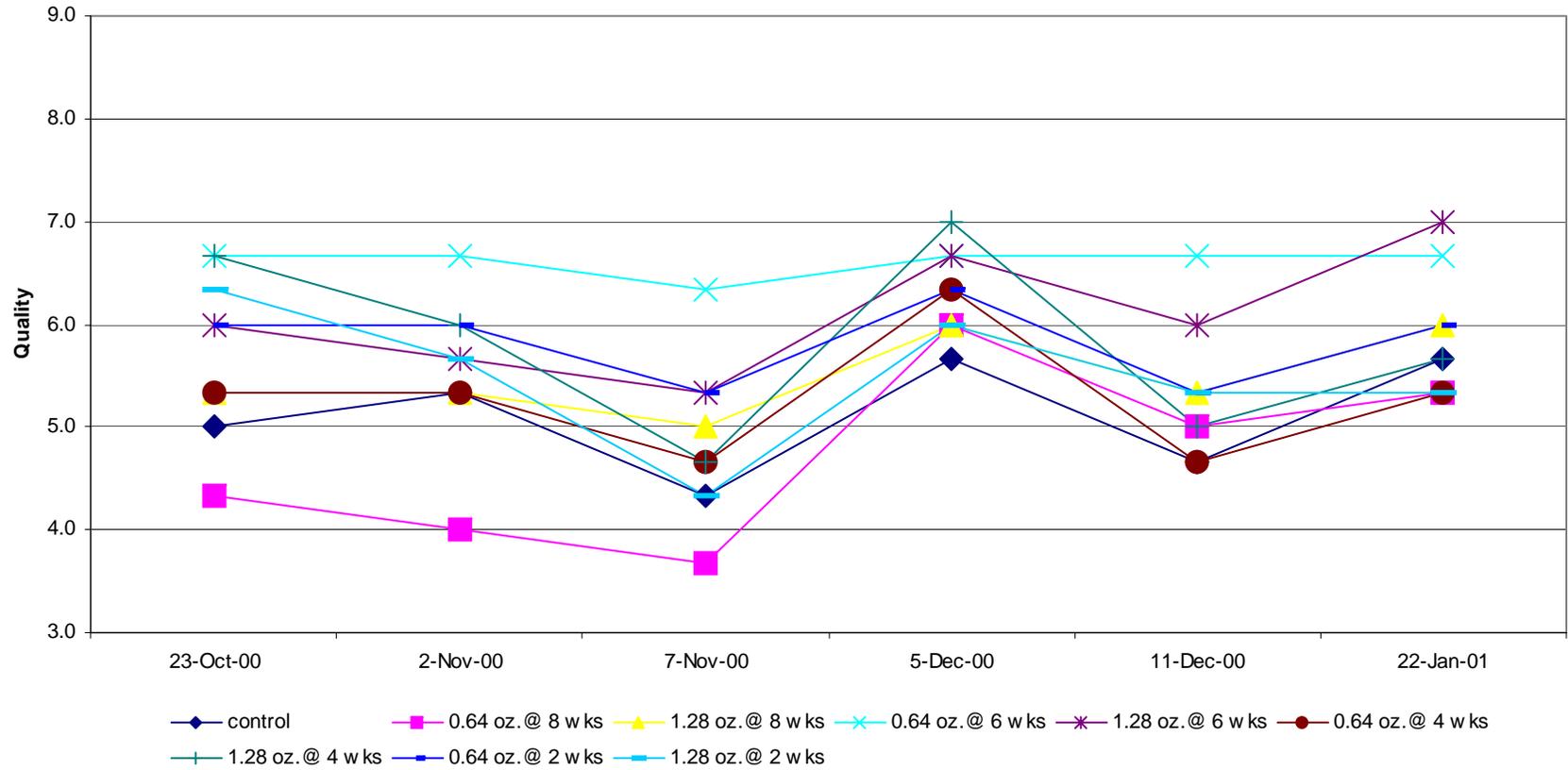


Figure 5

AEF 130360
Percent Plot Green Bermudagrass

