Effect of Nitrogen Source and Timing on Kentucky Bluegrass Seed Yield in Central Oregon, 2012-2013

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Abstract

Kentucky bluegrass seed growers in central Oregon surface-apply nitrogen fertilizer in early to mid-October after the final irrigation of the season. This research measured the impact of nitrogen sources and timing on seed yield in commercial fields. Urea, urea coated with Agrotain at 3 lbs/ton, and ammonium nitrate were applied at 150 lbs N/acre prior to, or after, the final irrigation in the fall. Data analyses revealed that there were no statistically significant differences in seed yield among nitrogen fertilizer sources or timing of nitrogen fertilizer application. The significance of, and possible explanations for, these results are discussed.

Introduction

Kentucky bluegrass seed growers in central Oregon surface-apply nitrogen (N) fertilizer in autumn after the irrigation season, to provide the majority of N for the coming growing season. Historically, concern over too much regrowth in the fall influenced growers to delay fertilization until growth rate slowed. Delayed application of urea means that growers depend on precipitation to incorporate N fertilizer. Under these conditions there is potential volatilization loss of N as ammonia (NH_3) with urea-based fertilizers, particularly when there is little or no precipitation over weeks or months following N application.

The objective of this project was to evaluate whether seed yield was affected by different N sources applied before or after the final irrigation in early to mid-October.

Methods and Materials

Trials were conducted in three second-year commercial Kentucky bluegrass fields of cultivar Gladstone (Field 1), Crest (Field 2), and Merit (Field 3) grown for seed. Nitrogen source variables included urea, urea coated with Agrotain at 3 lbs/ton, and ammonium nitrate, all applied at 150 lb N/acre. Each nitrogen source was applied either prior to, or three weeks after, the last irrigation in the fall. Pre-irrigation fertilizer was applied on October 4, 2012 for Field 1 and October 10 for Fields 2 and 3. Post-irrigation fertilizer was applied on November 6 for Field 1 and on November 5 for Fields 2 and 3.

Plots at each location were 6 ft by 25 ft, with N Source X Timing treatments replicated four times in a randomized complete block design. Plots were covered with tarps to exclude commercial fall fertilizer application. Otherwise, plots were managed by the grower cooperators similar to the rest of the field. Irrigation at Field 1 is by furrow, while Field 2 and 3 are under center pivot. Plots were swathed at Field 1 using a Jeri mower due to corrugates for furrow irrigation, while a small-plot, forage harvester was used for Field 2 and 3. Plots were harvested on July 5, 2013 for Field 1 and 2, and July 8 for Field 3. Samples were bagged and hung to dry until threshing with a stationery Wintersteiger plot combine. Seed samples were cleaned using a debearder and small scale Clipper cleaner at the USDA-ARS Seed Conditioning lab in Corvallis to determine clean seed weight.

Results and Discussion

Statistical analysis of combined data revealed that while seed yield was increased significantly by N fertilization, and differed significantly across locations, there were no significant differences among N fertilizer sources or between pre- and post-irrigation N application (Table 1). Seed yield differences among fields were likely caused by differences in the varieties being grown and/or differences in site potential. Positive responses to N fertilizer applied at 150 lb N/acre were measured at all locations (Table 2). Nitrogen fertilizer increased seed yield by 141 lb/acre (21%) at Field 3, 156 lb/acre (50%) at Field 1, and 550 lb/acre (241%) at Field 2. Differences in magnitude of seed yield response to N across locations are likely attributable to differences in yield potential and/or the capacity of soils to supply N to plants.

Absence of significant differences among N fertilizer sources or between N application times would be expected if either (1) volatilization losses of NH_3 were minimal, or (2) the rate of N fertilizer applied was greater than rate needed to maximize seed yield. Data collected in this study are not sufficient to distinguish between these two possibilities. However, data from an earlier study with ^{15}N-labeled urea fertilizer showed that 93 to 100% of fall-applied N fertilizer could be accounted for in above-ground biomass and soil in the spring (COARC unpublished data). This suggests that perhaps NH_3 volatilization losses may not be as great under central Oregon conditions as in other areas of the state.

Although results across the three locations from this one year of data suggest that N source and timing do not significantly affect seed yield, there may continue to be concern about excessive regrowth following early fall fertilizer application. However, many of the newer varieties being grown produce less biomass and excessive regrowth may be less of a problem than it has been in the past. A review of temperatures during the fall of 2012 indicates they were similar to or slightly above the five year average. These weather conditions would not be expected to significantly change fall regrowth from the norm for recent years.

Table 1. Kentucky bluegrass seed yield as influenced by N fertilizer Source and Timing across three locations near Madras, Oregon, 2013.

Variable	Seed yield (lbs/acre)
N Fertilizer Source	
Unfertilized control	408 a[1]
Urea@ 150 lb N/acre	688 b
Agrotain-coated Urea @ 150 lb N/acre	683 b
Ammonium Nitrate@ 150 lb N/acre	701 b
N Fertilizer Timing	
Pre-Irrigation(October 4 or 10, 2012)	700 ns[2]
Post-Irrigation(November 4 or 5, 2012)	681 ns
Location	
Field 1	443 a[3]
Field 2	600 b
Field 3	808 c

LSD(P = 0.05)[1]41, [2]NS, [3]92

Table 2. Kentucky bluegrass seed yields at three sites near Madras, Oregon where three N fertilizer sources were applied at 150 lb N/acre prior to or after the final fall irrigation in 2012.

N Fertilizer Source/Timing	Field 1	Field 2	Field 3
	Seed yield (lbs/acre)		
Unfertilized control	309 c	228 b	687 c
Pre-Irrigation			
Urea	447 ab	727 a	917 a
Agrotain-coated Urea	492 ab	784 a	780 bc
Ammonium Nitrate	527 a	768 a	850 b
Post-Irrigation			
Urea	429 ab	811 a	793 abc
Agrotain-coated Urea	410 bc	827 a	806 abc
Ammonium Nitrate	487 ab	753 a	821 abc
LSD (P = 0.05)	113	161	135