Comparing Fall and Spring-applied N for Corn in Iowa.

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Introduction

A common practice for nitrogen (N) management for corn in the northern Corn Belt is to apply anhydrous ammonia the fall prior to planting the crop. Studies have shown that corn N deficiencies can occur due to rapid nitrification and subsequent leaching or denitrification of fall-applied anhydrous ammonia under certain conditions. However, the exact conditions under which these losses occur and the magnitude of the losses have not been well quantified. Additionally, there are growing concerns about high nitrate levels in Iowa rivers, which are often related to losses of fall-applied N. Recently, attempts have been made to impose strict regulations on fall fertilizer applications in Iowa due to these concerns. The objective of this study was to evaluate the effectiveness of fall-applied anhydrous ammonia compared to spring-applied N.

Materials and Methods

Producers participating in the Iowa Soybean Association On-Farm Network™ conducted two-treatment on-farm strip trials at 57 sites during the 2005 and 2006 growing seasons in Iowa. The treatments were fall and spring-applied N and were replicated at least 3 times across a site. Anhydrous ammonia was applied the previous fall using equipment with guidance technology to properly space fertilizer treatments and record strip locations. The following spring, preplant anhydrous ammonia or sidedressed urea-ammonium-nitrate solution was applied to the strips adjacent to the fall-applied strips. Combines equipped with yield monitors and GPS were used to harvest the strips. Geographic information system (GIS) was used to filter the yield data and calculate strip and treatment means.

Results and Discussion

The mean yields across all sites for the fall and spring-applied N were the same,191 bu acre^{-1}. It is likely that losses of fall-applied N were minimal and therefore, did not cause yield decreases compared to spring N. It is also possible that soil and fertilizer N exceeded the crop's N requirement. Other studies conducted by the Iowa Soybean Association have shown that 100 lbs N acre^{-1} sidedressed typically maximizes profits for producers. The mean N rate applied for these studies was 135 lbs N acre^{-1}.

Previous studies have shown a good correlation between cumulative rainfall from March through May and nitrate concentrations in Iowa rivers. Forty-nine of the 57 sites had March through May rainfall less than the 55-year average for that site, indicating that losses of nitrate would not be expected during the 2005 and 2006 growing seasons.

Conclusions

Applying fertilizer N in fall or spring did not make a significant difference in yields at most sites. Additional studies are needed to better assess the effects of timing of N applications in years having higher than average amounts of early-season rainfall.

Year	County	March - May Rainfall	Nitrogen Rate	Spring Timing	Yield Fall	Yield Spring	Yield Response
		---- in ----	-- lb acre^{-1} --		------- bu acre^{-1} -------		
2005	Adams	10.6	140	Preplant	206	211	-5
2005	Greene	6.5	140	Sidedress	154	159	-5
2006	Greene	8.2	135	Sidedress	175	179	-4
2006	Hamilton	8.4	125	Preplant	188	192	-4
2005	Webster	7.5	140	Sidedress	189	193	-4
2006	Greene	8.2	140	Sidedress	178	181	-3
2005	Greene	6.5	150	Sidedress	197	200	-3
2005	Greene	6.5	140	Preplant	165	168	-2
2005	Story	9.0	135	Preplant	188	190	-2
2006	Delaware	9.4	135	Preplant	201	203	-2
2005	Greene	6.5	120	Sidedress	179	181	-2
2005	Greene	6.5	150	Sidedress	202	203	-1
2005	Greene	6.5	145	Sidedress	207	208	-1
2006	Greene	8.2	135	Preplant	188	189	-1
2005	Greene	6.5	145	Sidedress	193	194	-1
2005	Boone	9.0	140	Preplant	234	235	-1
2005	Calhoun	7.9	140	Sidedress	216	217	-1
2006	Boone	10.9	130	Preplant	192	192	-1
2006	Greene	8.2	120	Preplant	189	189	-1
2005	Humboldt	8.8	125	Preplant	195	195	0
2006	Boone	10.9	125	Preplant	163	163	0
2005	Greene	6.5	145	Sidedress	195	196	0
2005	Cerro Gordo	12.5	110	Preplant	197	197	0
2005	Buchanan	6.8	125	Preplant	213	212	0
2005	Greene	6.5	140	Sidedress	205	204	0
2005	Greene	6.5	150	Sidedress	189	189	1
2005	Buchanan	6.8	125	Preplant	179	178	1
2006	Boone	10.9	140	Preplant	196	195	1
2005	Buchanan	6.8	125	Preplant	210	209	1
2005	Buchanan	6.8	135	Preplant	204	203	1
2005	Greene	6.5	120	Sidedress	152	151	1
2005	Greene	6.5	140	Sidedress	161	161	1
2005	Greene	6.5	160	Preplant	206	205	1
2005	Story	9.0	135	Preplant	207	206	1
2005	Boone	9.0	130	Preplant	197	196	1
2005	Greene	6.5	160	Preplant	201	200	1
2005	Boone	9.0	140	Preplant	224	223	1
2005	Boone	9.0	130	Preplant	184	183	1
2005	Greene	6.5	100	Sidedress	187	186	1
2005	Greene	6.5	145	Sidedress	180	179	1
2005	Buchanan	6.8	125	Preplant	207	206	2
2005	Greene	6.5	100	Sidedress	180	179	2
2005	Keokuk	6.2	160	Preplant	206	204	2
2006	Greene	8.2	125	Sidedress	199	197	2
2006	Greene	8.2	145	Sidedress	210	208	2
2006	Boone	10.9	130	Preplant	169	166	2
2006	Delaware	9.4	135	Preplant	216	214	2
2006	Greene	8.2	140	Sidedress	184	182	3
2006	Hamilton	8.4	140	Preplant	184	181	3
2006	Greene	8.2	150	Sidedress	174	171	3
2006	Calhoun	8.9	135	Sidedress	166	162	4
2005	Humboldt	8.8	125	Preplant	195	191	4
2006	Adams	11.6	140	Preplant	211	207	4
2005	Greene	6.5	145	Sidedress	198	193	5
2006	Greene	8.2	140	Sidedress	182	177	5
2006	Boone	10.9	125	Sidedress	163	158	5
2006	Greene	8.2	135	Sidedress	176	169	7
Mean		**8.1**	**135**		**191**	**191**	**0**