

## The Effects of De-icing Chemicals on Turfgrass - 1997 Trial

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This is the second year of an ongoing study examining the effects of several common de-icer products on turfgrass. The purpose of this study is to evaluate the effects of runoff from various de-icer products on turf areas. This is accomplished by simulating brine runoff with spray applications of salt solution directly on turf plots throughout the winter and evaluating injury during the growing season. The study area is then reseeded in the fall to evaluate turf establishment in salt-affected soils.

The second year of this study was conducted in the winter and early spring of 1997 on the Iowa State University campus in Ames, Iowa. The experimental plot was in an area of established common Kentucky bluegrass and perennial ryegrass.

Individual experimental plots were 2 x 4 ft with three replications. Because of possible de-icer runoff, the test area was arranged so each individual plot was completely surrounded by a 1 ft border. The experimental design was a randomized complete block. There were two rows per replication with 2 ft borders between rows.

There were a total of 43 treatments (Table 1). Urea [ $\text{CO}(\text{NH}_2)_2$ ] was applied alone and in two different mixtures with calcium chloride ( $\text{CaCl}_2$ ). Potassium chloride (KCl) and Safe Step [50% salt ( $\text{NaCl}_2$ ) + 50% potassium chloride] were applied alone. Magnesium chloride ( $\text{MgCl}_2$ ) was applied alone and with urea. Calcium chloride also was applied alone and in combination with two additional nitrogen sources: ammonium nitrate ( $\text{NH}_4\text{NO}_3$ ) and ammonium sulfate [ $(\text{NH}_4)_2\text{SO}_4$ ]. In addition, rock salt was used in three different combinations with calcium chloride in a flake formulation. An untreated control was included for comparisons. Treatment rates of 2, 4, and 8 oz/yd<sup>2</sup> were used to simulate typical amounts of product used in the ice melt industry (Table 1). Nine applications were made during the winter resulting in a total application rate of 18, 36, and 72 oz/yd<sup>2</sup>.

The de-icers were dissolved in water and applied using a carbon dioxide backpack sprayer. TeeJet flat fan EVS #8008, white nozzles were used at 40 psi. Windbreak 'cages' were employed to prevent drift of the materials. No runoff or drift was observed after treatment differences became apparent on the turf. Applications were made on January 14, 23, and 31 and February 15, 17, 19, 22, 24, and 26.

Soil samples were taken from each plot on March 14. Samples were taken 4" deep and 10 samples were taken per plot. The soil was air dried, ground, and analyzed for electroconductivity by the Plant Nutrition Lab in the Department of Horticulture.

Turf phytotoxicity data were taken on February 27 and March 27. Phytotoxicity was assessed using a 10 to 1 scale: 10 = no injury and 1 = most serious damage (plot completely brown). Percent living green turf data were taken March 27. These figures represent the percentage of area per plot covered by green, healthy turf.

Data were analyzed using the Statistical Analysis System (SAS) version 6.10 and the Analysis of Variance (ANOVA) procedure. Fisher's least significant difference (LSD) tests were used as means comparisons analyses.

**Table 1.** Phytotoxicity<sup>1</sup> and percentage turf cover<sup>2</sup> data for field plots treated with de-icer products for the 1997 Brine De-icer Study.

Trt	De-icer product	Rate oz/yd <sup>2</sup>	Total applied oz/yd <sup>2</sup>	Phytotoxicity data			Percentage turf cover (%)
				Feb 25	March 27	Mean	March 27
1	Untreated Control	NA	NA	8.0	8.3	8.2	89.7
2	30% Urea [CO(NH <sub>2</sub> ) <sub>2</sub> ]	2	18	7.0	7.0	7.0	66.3
3	+ 70% Calcium chloride (CaCl <sub>2</sub> )	4	36	6.0	4.0	5.0	26.7
4		8	72	4.0	2.7	3.3	5.3
5	50% Urea [CO(NH <sub>2</sub> ) <sub>2</sub> ]	2	18	5.7	6.3	6.0	55.0
6	+ 50% Calcium chloride (CaCl <sub>2</sub> )	4	36	4.0	3.3	3.7	15.0
7		8	72	3.0	2.0	2.5	3.7
8	61% Magnesium chloride [MgCl <sub>2</sub> ]	2	18	4.0	5.7	4.8	46.7
9	(47% a.i.) + 39% Urea [CO(NH <sub>2</sub> ) <sub>2</sub> ]	4	36	2.7	2.0	2.3	4.0
10		8	72	2.0	1.0	1.5	1.0
11	Potassium chloride (KCl)	2	18	5.7	6.0	5.8	51.7
12		4	36	3.7	5.0	4.3	45.0
13		8	72	1.7	3.3	2.5	11.7
14	Urea [CO(NH <sub>2</sub> ) <sub>2</sub> ]	2	18	1.0	2.0	1.5	5.0
15		4	36	1.0	1.0	1.0	1.0
16		8	72	1.0	1.0	1.0	1.0
17	Rock salt (NaCl <sub>2</sub> )	2	18	4.0	5.7	4.8	63.3
18		4	36	2.0	3.3	2.7	23.7
19		8	72	2.0	1.7	1.8	3.7
20	Safe Step [50% (NaCl <sub>2</sub> )	2	18	5.0	5.3	5.2	41.7
21	+ 50% Potassium chloride (KCl)]	4	36	4.0	6.0	5.0	55.0
22		8	72	3.0	2.3	2.7	7.0
23	Magnesium chloride (MgCl <sub>2</sub> ) (47% a.i.)	4	39	6.3	4.0	5.2	18.3
24		9	77	3.7	1.3	2.5	1.0
25		17	153	2.7	1.0	1.8	1.0
26	Calcium chloride (CaCl <sub>2</sub> ) pellets	2	18	5.3	3.3	4.3	13.3
27		4	36	5.0	2.3	3.7	7.0
28		8	72	4.3	1.7	3.0	2.3
29	42% Ammonium nitrate (NH <sub>4</sub> NO <sub>3</sub> )	2	18	5.7	3.7	4.7	16.7

Trt	De-icer product	Rate oz/yd <sup>2</sup>	Total applied oz/yd <sup>2</sup>	Phytotoxicity data			Percentage turf cover (%)
				Feb 25	March 27	Mean	March 27
30	+ 58% Calcium chloride (CaCl <sub>2</sub> )	4	36	4.0	2.7	3.3	5.0
31		8	72	2.3	1.0	1.7	1.0
32	54% Ammonium sulfate [(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub> ]	2	18	2.0	4.0	3.0	25.0
33	+ 46% Calcium chloride (CaCl <sub>2</sub> )	4	36	1.0	2.7	1.8	6.7
34		8	72	1.0	1.0	1.0	1.0
35	75% Rock Salt (NaCl <sub>2</sub> )	2	18	5.0	4.7	4.8	38.3
36	+ 25% Calcium chloride (CaCl <sub>2</sub> ) flakes	4	36	4.0	4.0	4.0	25.0
37		8	72	3.0	2.3	2.7	7.0
38	67% Rock Salt (NaCl <sub>2</sub> )	2	18	5.3	5.0	5.2	31.7
39	+ 33% Calcium chloride (CaCl <sub>2</sub> ) flakes	4	36	4.3	4.0	4.2	33.3
40		8	72	3.7	3.0	3.3	8.7
41	50% Rock Salt (NaCl <sub>2</sub> )	2	18	5.3	6.0	5.7	46.7
42	+ 50% Calcium chloride (CaCl <sub>2</sub> ) flakes	4	36	5.0	5.0	5.0	30.0
43		8	72	4.7	2.7	3.7	13.7
LSD <sub>0.05</sub>				0.9	1.8	1.1	21.0

<sup>1</sup>Phytotoxicity was assessed using a 10 to 1 scale: 10 = no injury and 1 = foliage completely brown.

<sup>2</sup>These figures represent the total area per plot covered by green, healthy turf.

The data taken thus far is inconclusive and only represents de-icer injury that appears in late-winter. Turf recovery data during spring, summer, and fall replanting will be determined in 1997.

Preliminary results indicate:

1. At the 2 oz/yd<sup>2</sup> rate, urea + calcium chloride (trt 2) had significantly more living turf cover than Safe Step (trt 20), urea (trt 14), magnesium chloride (trt 23), calcium chloride (trt 26), ammonium nitrate + calcium chloride (trt 29), ammonium sulfate + calcium chloride (trt 32) and rock salt + calcium chloride (trts 35, 38, and 41).
2. At the 4 oz/yd<sup>2</sup> rate, potassium chloride had significantly more living turf cover than urea + calcium chloride (trt 6), magnesium chloride + urea (trt 9), urea (trt 15), rock salt (trt 18), magnesium chloride (trt 24), calcium chloride (trt 27), ammonium nitrate + calcium chloride (trt 30) and ammonium sulfate + calcium chloride (trt 33).
3. All treatments gave similar injury at the highest treatment rate of 8 oz/yd<sup>2</sup>.

4. All de-icer treatments resulted in significantly more injury than the untreated grass in the control plots.