Iowa turf study

The Effects of Common De-icing Chemicals on Turfgrass

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Runoff from de-icing products applied to walkways, driveways, etc. results in damaged and dead turfgrass borders. The purpose of this study is to asses the level of damage caused by several common de-icer products. Our approach was to simulate a brine runoff by spraying salt solution directly on turf plots throughout the winter and evaluation injury during the growing season. In addition, we applied the de-icers in granular form to turf plots.

The first year of this study was conducted in the winter and early spring of 1996 at the Iowa State University Research Station north of Ames, Iowa. The experimental plots were in an area of established common Kentucky bluegrass.

Brine solution de-icer study: Individual experimental plots were 2x4 ft with three replications. Because of possible de-icer runoff, each individual plot was completely surrounded by a 1 ft. border. Treatments containing Potassium chloride, 30% Urea + 70% CaCl2, 50% Urea + 50% CaCl2, 67% Urea + 33% CaCl2 pellets were evaluated. A control was treated with only water for comparison. Treatment rates of 2, 4, and 8oz/yd2 were applied nine times during the winter to simulate typical amounts of product used in the ice melt industry (Table 1). This resulted in 18, 36, or 72 oz/yd2 of total material applied for each treatment. Magnesium chloride is a hydrated salt and was applied at a higher rate (153 oz/yd2) to account for the extra water. Treatments were randomly placed within each replication. 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 45 psi. Windbreak 'cages' were employed to prevent drift of the materials. No runoff or drift was observed after treatment differences became apparent. Nine applications were made beginning February 22 and ending March 19, 1996. A deer 'cannon' was placed to minimize browsing damage. Turfgrass plugs were taken for each treatment. The plugs were placed into pots and maintained on a mist bench in the greenhouse until the grass began to green up.

Granular de-icer study: Individual experimental plots were 2x2 ft with three replications. Because of possible de-icer runoff, each individual plot was completely surrounded by a 1 ft border. Treatments containing Potassium chloride, 30% Urea + 70% CaCl2, Urea, Rock Salt, Safe Step (50% salt + 50% Potassium Chloride), Magnesium Chloride, and CaCl2 pellets were evaluated. An untreated control was included for comparisons. Treatment rates of 1,6, and 12 oz/yd² were used to simulate typical amounts of product used in the ice melt industry (Table 2). Treatments were randomly placed within each replication. The amount of de-icer products equivalent to 10 individual applications was applied (Table 2). The materials were spread evenly over the plots. The products were applied March 15, 1996. A deer 'cannon' was placed to minimize browsing damage.

Phytotoxicity and percent living plant material data were taken for the both the brine and granular studies on April 10 and May 9 (Tables 1 and 2). Phytotoxicity was assessed using a

scale from 10 to 1: 10 = no injury and 1 = foliage completely brown. Percent living material was estimated as the percentage of green plant material per plot. Some of the plots, especially those treated with rock salt, were damaged by deer browsing. In these plots, the remaining plant material was considered to represent the entire plot in the data collection. On April 15, Kentucky bluegrass percent recovery data were taken on the plugs from the brine study that were maintained in the greenhouse. Recovery was assessed using a scale for 10 to 1: 10 = best recovery and 1 = no living plants (Table 1).

Data were analyzed using the Statistical Analysis System (SAS) and the Analysis of Variance procedure. Fisher's least significant difference (LSD) tests were used to compare the effects of the de-icers on turfgrass phytotoxicity and percent living material.

	Ice Melter product	Rate oz/yd^2	Total applied oz/yd^2	Field Plots: Phytotoxicity[1] April 10	Phytotoxicity[1] May 9	Phytotoxicity[1] Mean	% Living green plant material[2] April 10	% Living green plant material[2] May 9	% Living green plant material[2] Mean
1	Untreated	NA	NA	7.7	9.7	8.7	53	98	76
2	30% Urea + 70% $CaCl_2$	2	18	5.7	8.7	7.2	48	97	73
3	30% Urea + 70% $CaCl_2$	4	36	2.7	3.0	2.8	20	26	23
4	30% Urea + 70% $CaCl_2$	8	72	1.0	1.0	1.0	0	1	1
5	50% Urea + 50% $CaCl_2$	2	18	5.0	6.0	5.5	40	83	62
6	50% Urea + 50% $CaCl_2$	4	36	1.7	1.3	1.5	3	1	2
7	50% Urea + 50% $CaCl_2$	8	72	1.0	1.0	1.0	0	1	1
8	67% Urea + 33% $CaCl_2$	2	18	2.3	3.0	2.7	8	22	15
9	67% Urea + 33% $CaCl_2$	4	36	1.0	1.0	1.0	0	1	1
10	67% Urea + 33% $CaCl_2$	8	72	1.0	1.0	1.0	0	1	1
11	KCl	2	18	5.0	7.7	6.3	28	88	58
12	KCl	4	36	2.0	3.3	2.7	3	27	15
13	KCl	8	72	1.0	1.0	1.0	0	1	1
14	Urea	2	18	1.7	1.3	1.5	3	2	3
15	Urea	4	36	1.0	1.0	1.0	0	1	1
16	Urea	8	72	1.0	1.0	1.0	0	1	1
17	Rock Salt	2	18	5.0	7.0	6.0	25	82	53
18	Rock Salt	4	36	1.7	1.7	1.7	3	12	8
19	Rock Salt	8	72	1.0	1.0	1.0	0	1	1
20	50% Salt + 50% KCl	2	18	4.7	7.7	6.2	28	82	55
21	50% Salt + 50% KCl	4	36	2.3	4.3	3.3	8	55	32
22	50% Salt + 50% KCl	8	72	1.0	1.0	1.0	0	1	1
23	Mg Cl2 (47% a.i.)	4	39	2.7	5.0	3.8	8	57	33
24	Mg Cl2 (47% a.i.)	9	77	1.3	1.0	1.2	0	1	1
25	Mg Cl2 (47% a.i.)	17	153	1.0	1.0	1.0	0	1	1
26	$CaCl_2$ Pellets	2	18	4.0	7.7	5.8	27	93	60
27	$CaCl_2$ Pellets	4	36	1.7	2.7	2.2	2	24	13
28	$CaCl_2$ Pellets	8	72	1.0	1.0	1.0	0	1	1
	$LSD_{0.05}$			0.9	1.2	0.9	9	17	11

[1]Phytotoxicity was assessed using a scale from 10 to 1 with 10 = no injury and 1 = foliage completely brown.

[2]Percent living plant material was assessed as percentage of green per plot.