LEACHING OF Na AND K AZIDE FROM GRANULES APPLIED TO ESTABLISHED TURF

S. Wells*, L.J. Simmons, R.H. Walker, and R. Rodriquez-Kabana, and J.L. Belcher Alabama Agric. Exp. Stn., Auburn University, Auburn, AL 36849
wellssm@auburn.edu

Granular formulations of sodium (Na) and potassium (K) azides were evaluated for their nematicidal efficacy in established turf. Azide salts were impregnated on/into granular carriers consisting of Profile fired clay and Biodac, a cellulose-based product. Profile is currently used as a soil amendment for putting greens and Biodac is a common carrier for pesticides. Small particle size carriers were chosen so they would readily disperse into the closely-mowed turf canopy. Previous research had shown the need to wash the azide salts out of the turf canopy and into the soil in order to minimize phytotoxicity. Therefore, studies were conducted in order to determine depth of leaching with selected amounts of irrigation water. A secondary objective was to compare two laboratory methods for determining sodium and potassium azide from soil. However, results from both methods were identical and thus only data from the Fe +++ method is presented. Three tests were conducted, two in 2006 and one in 2007. All were conducted on a 'Mini-Verdi' bermudagrass putting green consisting of a 90/10 sand/peatmoss mixture.

Study 1: A small-plot replicated field study was initiated September18, 2006. Treatments included 0 and 30 lb ai/A. Na azide on Profile. Immediately after application, before irrigation was applied, soil cores were collected with a ¾-in. diameter soil probe at a 0-3 inch depth. Three cores per plot were collected and combined. Irrigation was applied at 0.25 in. and before the next sampling 0.32 in. rainfall occurred, for a total of 0.57 in. of water. Approximately 3 hours later, a second set of samples was collected at depths of 0-3 and 3-6. A 0.75-in. rainfall occurred overnight for a total of 1.32 in. of water after which a third set of samples was collected at 0-3 and 3-6 depths. Soil samples from the experiment were brought to the lab, weighed, and placed in sealable micro-diffusion chambers for quantification of sodium azide. Phosphoric acid was delivered into the sample to cause conversion of sodium azide to hydrazoic acid. Hydrazoic acid is gaseous and is easily trapped in a sodium hydroxide solution. Procedural controls were included as well as the experimental controls. After 24 hours, aliquots of the NaOH were taken to determine azide content by two colorimetric procedures (R. Rodríguez-Kábana and L. J. Simmons; unpublished). One method is based on the Fe +++ reaction and the other is a diazotization procedure. Results are presented in Table 1.

Study 2: A second study was initiated on September 26, 2006 with the addition of a potassium azide/Profile treatment. No rainfall occurred during this study so irrigation simulated the irrigation + rainfall amounts received during the first study. Results are presented in Table 2.

Study 3: A third leaching study was initiated on May 22, 2007. Treatments included Na/ K azide on both carriers at a 30 lb ai/A rate. The Biodac formulations were repeated since they were not included in previous studies. A third sampling depth of 6-9 was added in this study. Results are presented in Tables 3 and 4.

Conclusion: Data from these studies clearly show that sodium and potassium azide readily leached through the sand/peatmoss profile as water was applied. After 0.57 inches of irrigation/rainfall, azide salts remaining in the top 6 inches of the sand/peatmoss profile ranged from 21 to 60% and both were for potassium azide on Profile carrier. We believe our original target of applying 0.25 inches of irrigation followed by another 0.25 inches within 24 hours would have maintained optimum percentage of azide salts in the upper 6 inches of sand/peatmoss profile. However, rainfall events that occurred during our initial study are common in the Southeast. Leaching of azide salts from both carriers was very similar. Future research will be conducted on native soils with different textural classifications in order to quantify azide movement in these soils.

Table 1. Percent of total sodium azide as influenced by Profile carrier, soil sampling depths, and cumulative water amounts.		
Sample depth Inches	Cumulative water Inches	% of Total Na azide
0-3	0	100
0-3	0.57	46
0-3	1.32	9
3-6	0.57	4
3-6	1.32	35

Table 2. Percentage of sodium and potassium azide as influenced by Profile carrier, soil sampling depths, and cumulative water amounts.			
Sample depth Inches	Cumulative water Inches	% of Total	
		Na azide	K azide
0-3	0	100	100
0-3	0.57	23	20
0-3	1.32	0.3	0
3-6	0.57	6	1
3-6	1.32	16	12

Table 3. Percent of total sodium and potassium azide as influenced by Profile and Biodac carrier, soil sampling depths, and cumulative water amounts.					
Sample depth Inches	Cumulative water Inches	% if Total			
		Na azide Profile	K azide Profile	Na azide Biodac	K azide Biodac
0-3	0	100	100	100	100
0-3	0.57	32	52	47	38
0-3	1.32	0	3	3	0
3-6	0.57	25	8	6	7
3-6	1.32	11	30	40	34
6-9	0.57	4	0.2	0.4	0
6-9	1.32	21	11	12	28

Table 4. Percentage of total sodium and potassium azide as influenced by Biodac carrier, soil sampling depths, and cumulative water amounts.			
Sampling depth Inches	Cumulative water Inches	% of Total	
		Na azide	K azide
0-3	0	100	100
0-3	0.57	18	32
0-3	1.32	0.4	0.5
3-6	0.57	22	16
3-6	1.32	5	11
6-9	0.57	1	0
6-9	1.32	14	11