



A Review of 1996-97 Snow Mold Control Evaluations: *The Winter of New Findings*

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This past winter was an excellent winter to do snow mold evaluations throughout most of the state. The snow-fall was plentiful, and the snow cover was long. On top of this, the Northern Regions of the state lost their frost halfway through the winter, which is ideal for the development of snow molds. These uninvited guests visited much of the state, even those with the no trespassing signs (AKA: fungicide treatments). Failure of chemical treatments was noted in many of the north-central states. In a conversation with Dr. Ward Steinstra of the University of Minnesota, he said, "I am sorry that I was unable to put out trials this year; it was a perfect year to do trials."

Why was there so much failure this year or so much snow mold? This is probably a question that will never

fully be answered. One thing that complicates the problem is that there are at least three different low temperature
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TABLE 1. O. J. NOER FACILITY BENTGRASS FAIRWAY
(*Typhula incarnata* & *Microdochium nivale*)

Trt. #	Treatment	Form.	Amount /1000 ft ²	4-9-97 % Damage Rating	
1	Bio-Releaf B Plus Plasma 10-0-0 High K 6-2-18		1.47 fl. oz. 2.44 fl. oz. 5.88 fl. oz.	15.0	a b c
2	Bio-Releaf B Plus Plasma 10-0-0 High K 6-2-18		1.47 fl. oz. 2.44 fl. oz. 5.88 fl. oz.	5.0	c
3	Bio-Releaf 8-2-4 Bio-Releaf 8-2-4 PCNB	75 WP	8.0 fl. oz. 110.2 oz. 110.2 oz.	18.8 6.3	a b c c
4	Bio-Releaf 8-2-4 Bio-Releaf 8-2-4 PCNB	75 WP	8.0 oz.	20.0	a b c
5	Bio-Releaf B Plus Plasma 10-0-0 High K 6-2-18		1.47 fl. oz. 2.44 fl. oz. 5.88 fl. oz.	12.5	a b c
6	Bio-Releaf 8-2-4 Bio-Releaf 8-2-4 Plasma 10-0-0 High K 6-2-18 Bio-Releaf 8-2-4 PCNB	75 WP	1.47 fl. oz. 2.44 fl. oz. 5.88 fl. oz. 110.2 oz. 8.0 oz.	13.8	a b c
7	Eminent Star Surfactant	F	2.0 fl. oz. 0.05%	11.3	b c
8	Eminent Star Surfactant	F	4.0 fl. oz. 0.05%	10.0	b c
9	PCNB	75 WP	8.0 oz.	12.5	a b c
10	Iprodione Chlorothalonil	2 F 4.17 F	4.0 fl. oz. 8.0 fl. oz.	30.0 25.0	a a b
11	PennMulch		125.0 lb.	18.8	a b c
12	PennTarp		125.0 lb.	22.5	a b c
13	PennMulch PCNB	75 WP	125.0 lb. 8.0 oz.	8.8 6.3	b c c
14	PennTarp PCNB	75 WP	125.0 lb. 8.0 oz.	30.0 15.0	a a b c
15	Confidential			8.8	b c
16	Confidential			6.3	c
17	Green Cover			30.0	a
18	Green Cover 5.8 PCNB	75 WP	8.0 oz.	15.0	a b c
19	Untreated Control			21.3	a b c

LSD (P=.05)

14.72

Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT).

TABLE 2. NORTH HILLS COUNTRY CLUB BENT/POA FAIRWAY
(*Typhula incarnata* & *Microdochium nivale*)

Trt. #	Treatment	Form.	Amount /1000 ft ²	4-4-97 % Damage Rating	
1	Chipco 26019 Daconil 2787	2 F 4.17 F	4.0 fl. oz. 8.0 fl. oz.	0.0	c
2	EXP 10790A Daconil 2787	2 F 4.17 F	4.0 fl. oz. 8.0 fl. oz.	0.0	c
3	Exp 10790A Daconil 2787	2 F 4.17 F	4.0 fl. oz. 8.0 fl. oz.	0.0	c
4	Turficide 400 Exp 10790A Daconil WS	4 F 2 F 6 F	8.0 fl. oz. 4.0 fl. oz. 6.0 fl. oz.	0.0	c
5	Exp 10790A Heritage	2 F 50 D	4.0 fl. oz. 0.4 fl. oz.	0.0	c
6	Exp 10790A Penstar	2 F 75 WP	4.0 fl. oz. 4.0 fl. oz.	0.0	c
7	Daconil 2787 Daconil ZN	4.17 F 4.17 F	8.0 fl. oz. 8.0 fl. oz.	0.0	c
8	Chipco 26019 Daconil Ultrex	2 F 82.5 D	4.0 fl. oz. 3.8 oz.	0.0	c
9	Chipco 26019 Daconil WS	2 F 6 F	4.0 fl. oz. 6.0 fl. oz.	0.0	c
10	Turficide 400 Prostar	4 F 50 WP	8.0 fl. oz. 6.0 oz.	0.0	c
11	Terraclor Prostar	75 WP 50 WP	4.0 oz. 6.0 oz.	0.0	c
12	Daconil 2787	4.17 F	10.0 fl. oz.	8.8	b
13	Fore Terraclor	80 WP 75 WP	8.0 oz. 8.0 oz.	0.0	c
14	Fore Terraclor	80 WP 75 WP	8.0 oz. 8.0 oz.	0.0	c
15	Eagle Fore	40 WP 80 WP	1.2 oz. 8.0 oz.	0.0	c
16	Terraclor	75 WP	8.0 oz.	1.3	c
17	Rizolex	75 WP	4.0 oz.	0.0	c
18	Rizolex Terraclor	75 WP 75 WP	4.0 oz. 4.0 oz.	0.0	c
19	Sentinel Terraclor	40 D 75 WP	0.33 oz. 4.0 oz.	0.0	c
20	Sentinel Chipco 26019	40 D 50 WP	0.33 oz. 2.0 oz.	0.0	c
21	Sentinel Heritage	40 D 50 D	0.33 oz. 0.4 oz.	0.0	c
22	FF II / 14-3-3	15.4 G	3.15 lb.	0.0	c
23	FF II / 14-3-3	15.4 G	6.30 lb.	0.0	c
24	Fungicide IX	4.9 G	5.7 lb.	0.0	c
25	FF II / 14-3-3 Fungicide IX	15.4 G 4.9 G	3.15 lb. 5.7 lb.	0.0	c
26	Heritage	50 D	0.4 oz.	0.0	c
27	Heritage	50 D	0.7 oz.	0.0	c
28	Heritage Terraclor	50 D 75 WP	0.4 oz. 8.0 oz.	0.0	c
29	Heritage Terraclor	50 D 75 WP	0.7 oz. 8.0 oz.	0.0	c
30	Untreated Check			21.3	a

LSD (P=.05)

6.37

Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT).

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pathogens that are currently recorded as pathogenic to turf in Wisconsin (*Typhula incarnata*, *T. ishkariensis*, and *Microdochium nivale*). But, this may change in the next couple months. This spring, during the rating of my evaluations, I found some sclerotia that were quite a bit larger than those of the Typhulas (see Millett, Typhula Tour '97 for comparison pictures).

These sclerotia range in size from about 1 mm to over 5 mm. The color of the sclerotia are tan, burgundy, or even black. The shape varies from a tear-drop to almost banana shaped. One of the most interesting differences of this low temperature pathogen is its rind pattern. Under magnifications of 400x and 1000x the rind almost looks like a jig-saw puzzle.

So, what is this pathogen? This is the same question that we are asking some of the world's authorities on snow molds. So far we have sent micrographs to Dr. Drew Smith, retired Turfgrass Pathologist from Saskatoon, Canada, and Dr. Ward Steinstra. Neither could give a firm confirmation on its identity.

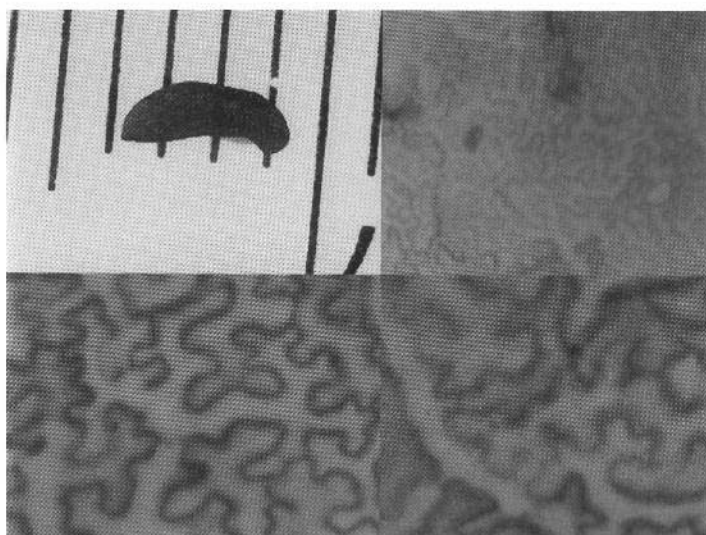


FIG 1. Unknown Pathogen Sclerotia & Rind Pattern (starting upper left and moving clockwise); Sclerotia on millimeter ruler; rind pattern at 400x magnification, rind pattern at 1000x magnification.

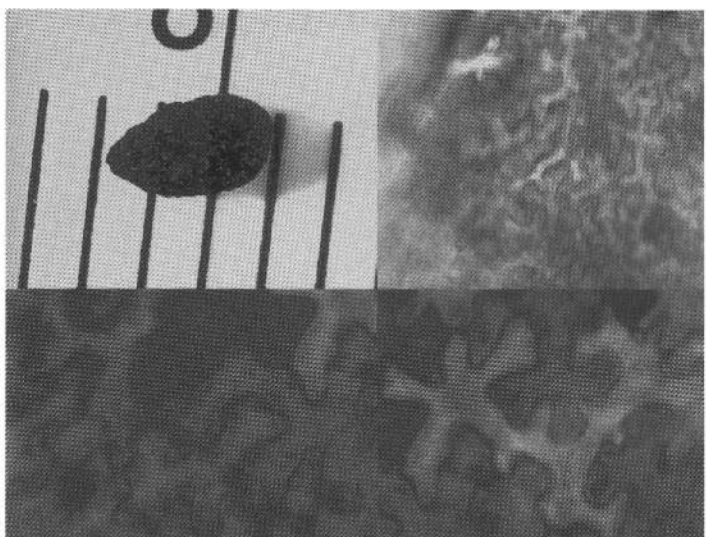


FIG. 2 (same as FIG 1.)

New Snow Mold?

Currently, we have run some preliminary molecular techniques and have differentiated it from the *T. incarnata* and *T. ishkariensis*. The next step is to sequence the DNA so we can compare it with other sequence data. Also, we are obtaining import permits to receive isolates from other researchers in Canada. Within the next couple months, we should have a positive identification of this pathogen and be able to pass this information on to you.

To date we have obtained sclerotia of this pathogen from only a few sites in Wisconsin. A majority of them are in northern Wisconsin near the Michigan U. P. But a home lawn sample came into the lab with similar sclerotia from the La Crosse area. This means that the pathogen has a potential of having a very large distribution area within the state. We are asking your help in the future to determine the distribution of this pathogen.

Snow Mold Control Evaluation Trials

A total of six evaluations was conducted in five locations in the state. There were essentially two trials conducted. One trial had 19 treatments and was conducted at the O.J. Noer Facility. This trial looked at some biological, cultural, and chemical control methods. The other trial had 30 fungicide treatments and was conducted at four sites: one at North Hills CC, Menomonee Falls (Bentgrass

TABLE 3. SENTRYWORLD BENTGRASS PUTTING GREEN & PENNLINKS NURSERY (*Typhula incarnata* & *Typhula ishkariensis*)

Trt. #	Treatment	Form.	Amount /1000 ft ²	Putting Green % Damage Rating 4-7-97	Pennlinks Nursery % Damage Rating 4-7-97
1	Chipco 26019	2 F	4.0 fl. oz.	0.0 a	12.5
	Daconil 2787	4.17 F	8.0 fl. oz.		
2	EXP 10790A	2 F	4.0 fl. oz.	0.0 a	15.0
	Daconil 2787	4.17 F	8.0 fl. oz.		
3	Exp 10790A	2 F	4.0 fl. oz.	0.0 a	2.5
	Daconil 2787	4.17 F	8.0 fl. oz.		
	Turficide 400	4 F	8.0 fl. oz.		
4	Exp 10790A	2 F	4.0 fl. oz.	0.0 a	8.8
	Daconil WS	6 F	6.0 fl. oz.		
5	Exp 10790A	2 F	4.0 fl. oz.	0.0 a	43.8
	Heritage	50 D	0.4 fl. oz.		
6	Exp 10790A	2 F	4.0 fl. oz.	0.0 a	0.0
	Penstar	75 WP	4.0 fl. oz.		
	Daconil 2787	4.17 F	8.0 fl. oz.		
7	Daconil ZN	4.17 F	8.0 fl. oz.	0.0 a	13.8
	Chipco 26019	2 F	4.0 fl. oz.		
8	Daconil Ultrex	82.5 D	3.8 oz.	3.8 a	26.3
	Chipco 26019	2 F	4.0 fl. oz.		
9	Daconil WS	6 F	6.0 fl. oz.	0.0 a	5.0
	Turficide 400	4 F	8.0 fl. oz.		
10	Prostar	50 WP	6.0 oz.	0.0 a	0.0
	Terracolor	75 WP	4.0 oz.		
11	Prostar	50 WP	6.0 oz.	0.0 a	0.0
	Daconil 2787	4.17 F	10.0 fl. oz.		
12	Fore	80 WP	8.0 oz.	2.5 a	31.3
13	Fore	80 WP	6.0 oz.	0.0 a	15.0
	Terracolor	75 WP	8.0 oz.		
14	Fore	80 WP	8.0 oz.	0.0 a	10.0
	Terracolor	75 WP	8.0 oz.		
15	Eagle	40 WP	1.2 oz.	0.0 a	17.5
	Fore	80 WP	8.0 oz.		
16	Terracolor	75 WP	8.0 oz.	0.0 a	40.0
17	Rizolex	75 WP	4.0 oz.	0.0 a	5.0
18	Rizolex	75 WP	4.0 oz.	0.0 a	12.5
	Terracolor	75 WP	4.0 oz.		
19	Sentinel	40 D	0.33 oz.	1.3 a	1.3
	Terracolor	75 WP	4.0 oz.		
20	Sentinel	40 D	0.33 oz.	0.0 a	10.0
	Chipco 26019	50 WP	2.0 oz.		
21	Sentinel	40 D	0.33 oz.	0.0 a	6.3
	Heritage	50 D	0.4 oz.		
22	FF II / 14-3-3	15.4 G	3.15 lb.	2.5 a	36.3
23	FF II / 14-3-3	15.4 G	6.30 lb.	0.0 a	22.5
24	Fungicide IX	4.9 G	5.7 lb.	0.0 a	62.5
25	FF II / 14-3-3	15.4 G	3.15 lb.	0.0 a	31.3
	Fungicide IX	4.9 G	5.7 lb.		
26	Heritage	50 D	0.4 oz.	0.0 a	46.3
27	Heritage	50 D	0.7 oz.	0.0 a	41.3
28	Heritage	50 D	0.4 oz.	0.0 a	13.8
	Terracolor	75 WP	8.0 oz.		
29	Heritage	50 D	0.7 oz.	0.0 a	10.0
	Terracolor	75 WP	8.0 oz.		
30	Untreated Check			3.8 a	95.0 a
LSD (P=05)				3.08	14.37
Means followed by same letter do not significantly differ (P=05, Duncan's New MRT).					

Fairway); two at SentryWorld, Stevens Point (bentgrass green, pennlinks nursery); one at Plum Lake GC, Sayner (*Poa annua* fairway); one at Gateway GC., Land O' Lakes (*Poa annua* fairway). Treatments were applied in late October to early November, using the equivalent of 3 gallons/1000 ft². Granular applications were applied using a shaker jar. The plots were evaluated within a short time after snow melt. See Table 1 to Table 5 for specific treatments, rates, and percent damage ratings.

In a general summary, no two trials were alike. In selecting snow mold control products it is very important to know what you may be battling. The controls will not cover every pathogen as many of my trials have proven. If you are north of Highway 10, it might be a good idea to use a tank mixture of two or three components. The southern regions will probably be able to get by with more standard applications.

Future Trials

This next season we hope to expand our evaluations to look at rate adjustments, application timings and alternative controls. If you have several thousand square feet of turf that you would want to loan us for the winter, let's us know. Again this year I will be looking to put treatments in at least five locations of the state (northwest, northeast, central, southwest, southeast). Another important requirement is that the site has not received mercury fungicide

TABLE 4. GATEWAY GOLF CLUB POA FAIRWAY
(*Typhula incarnata*, *T. ishikariensis*, *Microdochium nivale*, & currently unidentified low-temperature pathogen)

Trt. #	Treatment	Form.	Amount /1000 ft ²	Rating 4-15-97
1	Chipco 26019	2 F	4.0 fl. oz.	45.0 e f g h i j
	Daconil 2787	4.17 F	8.0 fl. oz.	
2	Exp 10790A	2 F	4.0 fl. oz.	58.8 b c d e f
	Daconil 2787	4.17 F	8.0 fl. oz.	
3	Exp 10790A	2 F	4.0 fl. oz.	10.0 k l
	Daconil 2787	4.17 F	8.0 fl. oz.	
4	Turfide 400	4 F	8.0 fl. oz.	
	Exp 10790A	2 F	4.0 fl. oz.	37.5 f g h i j k
	Daconil WS	6 F	6.0 fl. oz.	
5	Exp 10790A	2 F	4.0 fl. oz.	51.3 c d e f g h i
	Heritage	50 D	0.4 fl. oz.	
6	Exp 10790A	2 F	4.0 fl. oz.	12.5 k l
	Penstar	75 WP	4.0 fl. oz.	
	Daconil 2787	4.17 F	8.0 fl. oz.	
7	Daconil ZN	4.17 F	8.0 fl. oz.	46.3 d e f g h i j
	Chipco 26019	2 F	4.0 fl. oz.	
8	Daconil Ultrex	82.5 D	3.8 oz.	36.3 f g h i j k
	Chipco 26019	2 F	4.0 fl. oz.	
9	Daconil WS	6 F	6.0 fl. oz.	13.8 k l
	Turfide 400	4 F	8.0 fl. oz.	
10	Prostar	50 WP	6.0 oz.	85.0 a b
	Terracolor	75 WP	4.0 oz.	
11	Prostar	50 WP	6.0 oz.	83.8 a b
	Daconil 2787	4.17 F	10.0 fl. oz.	
12	Fore	80 WP	8.0 oz.	83.8 a b
13	Fore	80 WP	6.0 oz.	21.3 i j k l
	Terracolor	75 WP	8.0 oz.	
14	Fore	80 WP	8.0 oz.	27.5 g h i j k l
	Terracolor	75 WP	8.0 oz.	
15	Eagle	40 WP	1.2 oz.	47.5 d e f g h i j
	Fore	80 WP	8.0 oz.	
16	Terracolor	75 WP	8.0 oz.	60.0 b c d e f
17	Rizolex	75 WP	4.0 oz.	55.0 b c d e f g h
18	Rizolex	75 WP	4.0 oz.	32.5 f g h i j k l
	Terracolor	75 WP	4.0 oz.	
19	Sentinel	40 D	0.33 oz.	25.0 h i j k l
	Terracolor	75 WP	4.0 oz.	
20	Sentinel	40 D	0.33 oz.	76.3 a b c d
	Chipco 26019	50 WP	2.0 oz.	
21	Sentinel	40 D	0.33 oz.	80.0 a b c
	Heritage	50 D	0.4 oz.	
22	FF II / 14-3-3	15.4 G	3.15 lb.	75.0 a b c d e
23	FF II / 14-3-3	15.4 G	6.30 lb.	45.0 e f g h i j
24	Fungicide IX	4.9 G	5.7 lb.	35.0 f g h i j k
25	FF II / 14-3-3	15.4 G	3.15 lb.	2.5
	Fungicide IX	4.9 G	5.7 lb.	
26	Heritage	50 D	0.4 oz.	83.8 a b
27	Heritage	50 D	0.7 oz.	57.5 b c d e f g
28	Heritage	50 D	0.4 oz.	20.0 j k l
	Terracolor	75 WP	8.0 oz.	
29	Heritage	50 D	0.7 oz.	17.5 j k l
	Terracolor	75 WP	8.0 oz.	
30	Untreated Check			95.0 a

LSD (P=.05) 25.84
Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT).

applications. Fairways are an ideal size for the trials as they can consume large areas.

* A note on the statistics and reading the data tables. The letters that follow the percent damage are used as a comparison factor in statistics. Any treatment that is followed by the same letter is not statistically different. This is the form that I will be using in the future when I print data from any evaluation trials.

I would also like to thank the superintendents that left some untreated areas for us to use: Randy DuPont, North Hills CC; Gary Tanko, SentryWorld; Bob Brooker, Plum Lake; Todd Renk, Gateway GC. 🍷

TABLE 5. PLUM LAKE GOLF CLUB POA FAIRWAY
(*Typhula incarnata*, *T. ishikariensis*, *Microdochium nivale*, & currently unidentified low-temperature pathogen)

Trt. #	Treatment	Form.	Amount /1000 ft ²	% Damage Rating 4/24/97
1	Chipco 26019	2 F	4.0 fl. oz.	78.8 a b c d
	Daconil 2787	4.17 F	8.0 fl. oz.	
2	Exp 10790A	2 F	4.0 fl. oz.	83.8 a b c
	Daconil 2787	4.17 F	8.0 fl. oz.	
3	Exp 10790A	2 F	4.0 fl. oz.	11.3 k
	Daconil 2787	4.17 F	8.0 fl. oz.	
4	Turfide 400	4 F	8.0 fl. oz.	
	Exp 10790A	2 F	4.0 fl. oz.	73.8 a b c d
	Daconil WS	6 F	6.0 fl. oz.	
5	Exp 10790A	2 F	4.0 fl. oz.	51.3 d e f g h i
	Heritage	50 D	0.4 fl. oz.	
6	Exp 10790A	2 F	4.0 fl. oz.	15.0 j k
	Penstar	75 WP	4.0 fl. oz.	
	Daconil 2787	4.17 F	8.0 fl. oz.	
7	Daconil ZN	4.17 F	8.0 fl. oz.	63.8 a b c d e f
	Chipco 26019	2 F	4.0 fl. oz.	
8	Daconil Ultrex	82.5 D	3.8 oz.	90.0 a b
	Chipco 26019	2 F	4.0 fl. oz.	
9	Daconil WS	6 F	6.0 fl. oz.	41.3 f g h i j
	Turfide 400	4 F	8.0 fl. oz.	
10	Prostar	50 WP	6.0 oz.	73.8 a b c d
	Terracolor	75 WP	4.0 oz.	
11	Prostar	50 WP	6.0 oz.	91.3 a
	Daconil 2787	4.17 F	10.0 fl. oz.	
12	Fore	80 WP	8.0 oz.	67.5 a b c d e f
13	Fore	80 WP	6.0 oz.	33.8 g h i j k
	Terracolor	75 WP	8.0 oz.	
14	Fore	80 WP	8.0 oz.	60.0 c d e f g
	Terracolor	75 WP	8.0 oz.	
15	Eagle	40 WP	1.2 oz.	65.0 a b c d e f
	Fore	80 WP	8.0 oz.	
16	Terracolor	75 WP	8.0 oz.	57.5 c d e f g h
17	Rizolex	75 WP	4.0 oz.	62.5 b c d e f
18	Rizolex	75 WP	4.0 oz.	45.0 e f g h i
	Terracolor	75 WP	4.0 oz.	
19	Sentinel	40 D	0.33 oz.	28.8 i j k
	Terracolor	75 WP	4.0 oz.	
20	Sentinel	40 D	0.33 oz.	83.8 a b c
	Chipco 26019	50 WP	2.0 oz.	
21	Sentinel	40 D	0.33 oz.	67.5 a b c d e f
	Heritage	50 D	0.4 oz.	
22	FF II / 14-3-3	15.4 G	3.15 lb.	33.8 g h i j k
23	FF II / 14-3-3	15.4 G	6.30 lb.	32.5 h i j k
24	Fungicide IX	4.9 G	5.7 lb.	75.0 a b c d
25	FF II / 14-3-3	15.4 G	3.15 lb.	40.0 f g h i j
	Fungicide IX	4.9 G	5.7 lb.	
26	Heritage	50 D	0.4 oz.	78.8 a b c d
27	Heritage	50 D	0.7 oz.	71.3 a b c d e
28	Heritage	50 D	0.4 oz.	11.3 k
	Terracolor	75 WP	8.0 oz.	
29	Heritage	50 D	0.7 oz.	8.8 k
	Terracolor	75 WP	8.0 oz.	
30	Untreated Check			83.8 a b c

LSD (P=.05) 23.53
Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT).

LOHMANN

GOLF DESIGNS, INC.

GOLF COURSE DESIGN,
AND CONSTRUCTION MANAGEMENT

MARENGO, IL
815-923-3400