

A SURVEY OF PESTICIDE USE ON OHIO GOLF COURSES 1978



AUTHORS:

Dr. Philip O. Larsen
Associate Professor of Plant Pathology
The Ohio State University
1735 Neil Avenue, Columbus, Ohio 43210

and

Dr. Richard L. Miller
Extension Entomologist and Professor of Entomology
The Ohio State University
1735 Neil Avenue, Columbus, Ohio 43210

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A SURVEY OF PESTICIDE USE
ON OHIO GOLF COURSES FOR 1978

P. O. Larsen and R. L. Miller

Introduction

In 1978, pesticide use on Ohio golf courses was surveyed in conjunction with a grant from the North Central Regional Pesticide Impact Assessment Program. The primary objective was to determine the type and quantity of fungicides, herbicides, and insecticides used on Ohio golf courses. This information is to be used to determine the importance of pesticides that have been and are being considered for Rebuttable Presumption Against Reregistration (RPAR) action.

Survey Method

A questionnaire was developed and mailed to 639 Ohio golf courses. In 1978 it was estimated that there were 648 courses in the state, however, addresses could only be obtained for 639 of them. An initial mailing was made in summer 1978 followed by a fall 1978 mailing to those who did not respond to the first. One hundred sixty-nine usable responses (26% of total number of golf courses) were finally obtained. Data presented have been extrapolated to express total usage patterns on 648 Ohio golf courses by dividing the values obtained from 169 responses by 0.26. Respondents were asked to identify the target for which each pesticide was applied in addition to information on type and quantity of pesticide applied.

Sample Composition

The sample composition for 165 responses is illustrated in Table 1 and is broken down by number of holes per course and by course type (i.e. private, semi-private, or public). Four of the respondents did not indicate the course type or size. It is assumed that this sample is representative of golf courses in Ohio. It is recognized that some error may be introduced in making the above assumption by ignoring such factors as formal education of the respondent, or length of time as a turf manager, for example.

Budget Information

Respondents were asked to provide budget information regarding their total operational cost for 1978 and amounts spent for fungicides, insecticides, and herbicides. Table 2 indicates over 59 million dollars were spent on maintenance of Ohio golf courses in 1978 with approximately 2.6, 0.6 and 0.7 million dollars being spent on fungicides, insecticides, and herbicides, respectively.

Fungicide Use

Table 3 provides a summary of estimated fungicide use on Ohio golf courses

for 1978. Chlorothalonil was used in greater quantity (126,602 pounds active ingredient) and cycloheximide was applied to more area (8681 acres) than any other fungicide. Twenty different fungicides were used by respondents as a group. It is possible to make an approximate estimate of the relative importance of various turf diseases by compiling the number of fungicide applications per disease. This approximation is given in table 4. Dollar spot and brown patch were the diseases for which fungicides were most often applied. No consideration is given to area sprayed per application in this ranking.

Insecticide Use

A summary of insecticide use is given in table 5. Carbaryl was used in the highest quantity (30,755 pounds active ingredient) and chlorpyrifos was applied to the most area (4423 acres). A total of eight different insecticides were used.

Table 6 ranks turfgrass insect groups based on the number of insecticide applications per group in 1978. Cutworms (450 applications) and sod webworms (300 applications) were the insects for which insecticides were most frequently applied.

Herbicide Use

Table 7 summarized herbicide use on Ohio golf courses for 1978. The post-emergent herbicide, 2,4-dichloro-phenoxyacetic acid (2,4-D) was used in the highest amount (44,289 pounds active ingredient) and also applied to the largest area (53,446 acres) of any herbicide reported. Dimethyl tetrachloroterephthalate (DCPA) was the preemergent herbicide used in greatest quantity (37,071 pounds active ingredient) however, benefin was applied to slightly more area than DCPA (3160 acres for benefin versus 3074 acres for DCPA).

Conclusions

The data recorded in this study point to extensive use of pesticides on Ohio golf courses. Approximately four times more money is spent on fungicides as on herbicides or insecticides. This difference is largely explained by the need for fungicides to be applied more often during the growing season than for herbicides or insecticides for effective pest control.

The number of applications of pesticides for a given pest provides a useful method for roughly assessing the importance of various turfgrass pests on Ohio golf courses. Some caution should be used, however, in assessing the relative importance of the target pest indicated by turf managers in this survey. In many instances turf managers may have had no formal training in pest identification which may introduce some error in assessment of major pests for which a pesticide was applied.

The amount of pesticide use in 1978 is a definite indication of the dependence of golf course turfgrass managers on pesticides for pest control. Although some information is known concerning cultural practices that limit pest populations without applying pesticides the extent of this information is not sufficient to rely on it solely. The golf course industry demands a very low tolerance level for turf pests when compared to pest management on home lawns or parks. This is especially true on golf course greens and tees as compared to fairways. Similarly, the use of disease or insect resistant turfgrass cultivars have not sufficiently

been incorporated into turf areas to seriously eliminate disease strictly through that avenue. In many cases pest-resistant turfgrass cultivars are not available. The use of pesticides for control of turf diseases, weeds and insects will continue to be important for many years. We must continue to strive to understand how to effectively and efficiently use turf pesticides while gradually incorporating new sources of genetic resistance and disease suppressing cultural practices into turf pest control strategies.

Table 1. ANALYSIS OF TYPE AND SIZE OF
GOLF COURSES INCLUDED IN SURVEY

Course Type	9	18	27	36	54	72	
Private	6	53	1	3	-	-	63
Semi-private	10	12	-	1	-	-	23
Public	29	38	3	6	2	1	79
Total	45	103	4	10	2	1	165

* No information on course type from 4 respondents

Table 2. OHIO GOLF COURSE
BUDGET INFORMATION - 1978

	<u>Per Course</u>	<u>Total*</u>
Total Budget	\$91,685	\$59,408,137
Fungicide	4,074	2,638,330
Insecticide	24	598,207
Herbicide	1,151	745,400

* Based on projection to total number golf courses in Ohio (648).

Table 3.

TOTAL ESTIMATED USE OF FUNGICIDES
FOR OHIO GOLF COURSES DURING 1978*

Fungicide Name Common/Trade	Formulation	Pounds Act. Ingred. Used	Number Applications	Area Treated (Acres)	% Courses Using	Major Uses
<u>Anilazine</u>						
Lescorene	50% WP	1,834	62	15	1	
Proturf Fungi- cide III	8.7% G	1,126	71	56	5	Dollar Spot
Dyrene	50% WP	30,357	1116	1623	29	Leaf Spot
Spectro	50% WP (33.33%)+	39	8	7	1	Brown Patch
Total	---	33,354	1257	1701		
<u>Auramine</u>						
Kromad	27.5% WP (.5%)+	20	35	163	1	Dollar Spot
Total	---	20	35	163		
<u>Benomyl</u>						
Tersan 1991 Proturf Fert. plus DSB fung.	50% WP	27,847	1881	3989	53	Snow Mold Dollar Spot Brown Patch
	1.95% G	953	412	155	11	
Total	---	28,800	2293	4144		
<u>Cadmium Chloride</u>						
Caddy	20.1%	102	98	362	2	Dollar Spot
Total	---	102	98	362		
<u>Cadmium Sebecate</u>						
Kromad	27.5% WP (5%)+	202	35	163	1	Dollar Spot
Total	---	202	35	163		

Table 3. Continued

Fungicide Name Common/Trade	Formulation	Pounds Act. Ingred. Used	Number Applications	Area Treated (Acres)	% Courses Using	Major Uses
<u>Cadmium Suci-</u>						
<u>inate</u>						
Cadmate	60% WP	676	81	393	2	Dollar Spot
Total	---	676	81	393		Red Thread
<u>Chloroneb</u>						
Proturf Fung.						
II.	6.8% G	526	58	35	4	Pythium
Tersan SP	65% WP	54,330	772	3065	32	Snow Mold
Total	---	54,856	830	3100		
<u>Chlorothalonil</u>						
Daconil 2787	75% WP	43,142	848	1655	19	
Daconil 2787	6F	81,485	2862	4637	39	Dollar Spot
Proturf 101 V						Brown Patch
Broad Spectrum	9.5% G	1,975	169	72	7	Leaf Spot
Total	---	126,602	3879	6364		
<u>Cycloheximide</u>						
Acti-Dione						
Thiram	75.75% WP (.75%) ⁺	329	1292	1346	22	
Acti-Dione						Dollar Spot
TGF	2.1% WP	132	1315	5592	27	Brown Patch
Acti-Dione RZ	76.3% WP (1.3%) ⁺	216	340	1743	8	Leaf Spot
Total	---	680	2947	8681		
<u>Ethazol</u>						
Koban 30	30% WP	798	54	195	4	Pythium
Total	---	798	54	195		
<u>Malachite Green</u>						
Kromad	27.5% WP (1%) ⁺	41	35	163	1	Dollar Spot
Total	---	41	35	163		

Table 3. Continued

Fungicide Name Common/Trade	Formulation	Pounds Act. Ingrd. Used	Number Applications	Area Treated (Acres)	% Courses Using	Major Uses
<u>Mancozeb</u>						
Lesco 4	80% WP	2,700	46	8	1	Dollar Spot
Fore	80% WP	40,943	331	968	9	Pythium
Total	---	43,643	377	976		
<u>Maneb</u>						
Maneb	80% WP	323	12	25	1	Brown Patch
Tersan LSR	80% WP	19,067	454	1397	17	Leaf Spot
Total	---	19,390	466	1422		Brown Patch
<u>Mercurous/ Mercuric Chloride</u>						
Calo-Gran	2.2% G	277	19	45	3	Snow Mold
Calo-Chlor	90% WP	6,312	158	597	14	Typhula
Total	---	6,589	177	642		
<u>Pentachloronitro- Benzene</u>						
Proturf FF II	15.4% G	68,879	135	1271	8	Snow Mold
Acti-Dione RZ	76.3% WP (75%)+	12,466	340	1743	8	Leaf Spot
Total	---	81,345	475	3014		Dollar Spot
<u>Phenyl Mercuric Acetate</u>						
Proturf Calif. Fert. Plus Fung.	3.37% G (.42%)+	61	19	28	2	
Proturf Broad Spectrum Fung.	5.34% G (.69%)+	302	50	178	10	Dollar Spot
Proturf Fert. Plus Fung.	6.4% G (.80%)+	69	31	12	6	Brown Patch
Pmas	10% W/W	43,949	335	1179	8	Snow Mold
Total	---	44,381	435	1397		

Table 3. Continued

Fungicide Name Common/Trade	Formulation	Pounds Act. Ingred. Used	Number Applications	Area Treated (Acres)	% Courses Using	Major Uses
<u>Potassium</u>						
<u>Chromate</u>						
Kromad	27.5% WP (5%) ⁺	202	35	163	1	Dollar Spot
Total	---	202	35	163		
<u>Thiophanate</u>						
<u>Ethyl</u>						
Cleary 3336	50% WP	7,110	181	742	7	Dollar Spot
Bromosan	66.67% WP (16.67%) ⁺	332	42	63	1	Brown Patch
Spectro	50% WP (16.67%) ⁺	20	8	7	.6	Fusarium
Total		7,462	235	812		
<u>Thiram</u>						
Acti-Dione						
Thiram	75.75% WP (75%) ⁺	32,859	1292	1342	22	
Bromosan	66.67% WP (50%) ⁺	997	46	63	1	
Proturf Fert. Plus fung.	6.4% G (5.6%) ⁺	481	31	12	.6	Dollar Spot
Proturf Calif. Fert. Plus fung.	3.37% G (2.95%) ⁺	428	19	28	2	Brown Patch Snow Mold
Thiram	75% WP	50,207	875	2149	19	
Proturf Broad Spectrum fung.	5.34% G (4.65%) ⁺	2,037	50	178	10	
Kromad	27.5% WP (16%) ⁺	648	35	168	1	
Total	---	87,657	2348	3935		

+ Indicates combination of more than one fungicide. Number in parentheses applies to amount of indicated fungicide in the formulation

* Data based on responses from 169 golf courses and extrapolated to reflect usage on total number of golf courses in Ohio (648).

Table 4. FUNGICIDE APPLICATIONS PER DISEASE
1978

Dollar spot	1762*
Brown patch	1085
Leaf spot/melting out	635
Snow mold	496
Pythium blight	292
Fusarium blight	123
Red thread	50
Anthracnose	31
Smuts	27
Rusts	19
Curvularia	4

* Values extrapolated to number of golf courses in Ohio (648)

Table 5.

TOTAL ESTIMATED INSECTICIDE USE FOR OHIO GOLF COURSES
DURING 1978*

Insecticide Name Common/Trade	Formulation	Pounds Act. Ingred. Used	Number Applications	Area Treated (Acres)	% Courses Using	Major Uses
<u>Carbaryl</u>						
Sevin	4 L	391	19	36	.6	
Sevin	10% G	56	4	6	.6	
Sevin	80% SP	27,168	708	1404	16	Grubworms
Sevin	50% WP	3,130	58	737	8	Cutworms
Proturf Broad Spectrum	16.6% G (8.3%)+	10	8	1	.6	Sod Webworms
Total	--	30,755	797	2184		
<u>Chlordane</u>						
Proturf Broad Spectrum	16.6% G (8.3%)+	10	8	1	.6	Grubworms
Chlordane	8 EC	5,608	75	1022	4	Japanese Beetle
Total	--	5,618	83	1023		
<u>Chlorpyrifos</u>						
Dursban	4 EC	6,077	525	2931	24	
Proturf Insect. III	1.35%G	333	96	372	5	Cutworms
Dursban	15% G	952	69	97	6	Sod Webworms
Total	--	12,980	773	4423		
<u>Diazinon</u>						
Diazinon	4 L	5,479	108	1077	7	
Proturf Insect. one	4.5% G	4,499	202	505	12	Cutworms
Diazinon	50% WP	3,690	304	682	10	Grubworms
Total	--	13,666	614	2264		Sod Webworms

Table 5. Continued

Insecticide Name Common/Trade	Formulation	Pounds Act. Ingred. Used	Number Applications	Area Treated (Acres)	% Courses Using	Major Uses
<u>Ethoprop</u>						
Mocap	10% G	2	4	4	.6	Ataenius
Total	--	2	4	4		
<u>Fensulfothion</u>						
Dasanit	15% G	186	12	608	2	Grubworms
Total	--	186	12	608		Nematodes
<u>Malathion</u>						
Malathion	4 EC	1,937	19	514	1	Mosquitos
Total	--	1,937	19	514		
<u>Trichlorfon</u>						
Dylox	80% SP	2,143	115	340	7	Cutworms
Proxol	80% SP	115	4	9	.6	Insects
Total	--	2,258	119	349		

+ Indicates combination of more than one insecticide. Number in parentheses applies to amount of indicated insecticide in the formulation.

* Data Based on responses from 169 golf courses and extrapolated to reflect usage on total number of golf courses in Ohio (648).

Table 6. INSECTICIDE APPLICATIONS PER INSECT GROUP
1978

Cutworm	450*
Sod webworm	300
Grubworm	188
Chinch bug	88
Armyworm	65
Black turfgrass ataenius	54
Bluegrass billbug	15
Other insects	158

* Values extrapolated to total number golf courses in Ohio (648).

Table 7.

TOTAL ESTIMATED HERBICIDE USE FOR OHIO GOLF COURSES
DURING 1978*

Herbicide Name Common/Trade	Formulation	Pounds Act. Ingred. Used	Number Applications	Area Treated (Acres)	% Courses Using	Major Uses
<u>Benefin</u>						
Balan	2.5% G	6,512	142	3169	13	Crabgrass
Total	--	6,512	142	3169		
<u>Bensulide</u>						
Betasan	4 EC	2,765	31	256	2	
Betasan	3.6% G	4,500	88	596	6	Crabgrass
Proturf Weed- Grass Prevent.	8.5% G	15	146	1199	9	<u>Poa annua</u>
Total	--	7,280	265	2051		
<u>2,4-Dichlorophen- oxyacetic acid</u>						
2,4-D + Dicamba	1.15 EC (.92) ⁺	1,189	73	1562	6	
2,4-D	4 EC	29,250	381	16352	36	Broadleaf
Proturf Weedicide II	5.56% G (2.78%) ⁺	3	8	1	.6	Broadleaf Weeds Dandelions
Proturf Fert. and Dicot Weed Control	1.45% G (1.10%) ⁺	22	81	854	6	Dicot Weeds
Lescopar	3 L (1.0) ⁺	1,577	88	31412	9	
Trex-san	4.26 L (2.62) ⁺	4,314	62	2415	5	
Trimec	3.52 L (2.2) ⁺	7,924	262	727	23	
Trimec (Bentgrass form)	2.2 L (.5) ⁺	10	4	123	.6	
Total	--	44,289	959	53446		

Table 7. Continued

Herbicide Name Common/Trade	Formulation	Pounds Act. Ingred. Used	Number Applications	Area Treated (Acres)	% Courses Using	Major Uses
<u>Dicamba</u>						
2,4-D + Dicamba	1.15 EC (.92)+	297	73	1562	6	
Banvel	4 EC	906	65	1518	5	
Banvel	5% G	14	15	30	1	Broadleaf
Proturf K-0-G Weed Control	.95% G	246	19	214	1	Clover Dicot Weeds
Proturf Fert. and Dicot Weed Control	1.45% G (.35%)+	7	81	854	6	
Trimec	3.52L (.22)+	792	262	727	23	
Trimec Bentgrass form	2.2 L (.2)+	9	4	123	.6	
Trexsan	4.26% L (.33)+	534	62	2415	5	
Total	--	2,805	581	7443		
<u>Dimethyl Tetra- chloroterephthalate</u> (DCPA)						
Dacthal	75% WP	37,071	119	3074	11	Crabgrass
Total	--	37,071	119	3074		
<u>Disodium Meth- ane arsonate</u> (DSMA)						
DSMA	81% SP	62	8	692	1	Crabgrass
Total	--	62	8	692		
<u>Glyphosate</u>						
Round Up	4 L	1,382	27	17	2	Perennial Weeds
Total	--	1,382	27	17		

Table 7. Continued

Herbicide Name Common/Trade	Formulation	Pounds Act. Ingred. Used	Number Applications	Area Treated (Acres)	% Courses Using	Major Uses
<u>Mecoprop (MCP)</u>						
MCP	2 EC	8,571	204	5488	15	
Trex-san	4.26 L (1.31) ⁺	2,140	62	2415	5	
<u>Trimec</u>						
Bentgrass form	2.2 L (1.5) ⁺	69	4	123	.6	Broadleaf
Trimec	3.52 L (1.1) ⁺	3,962	262	727	23	Clover
Proturf						Broadleaf Weeds
Weedicide II	5.56% G (2.78%) ⁺	3	8	1	.6	
Lescopar	3 L (2) ⁺	3,182	88	31412	9	
Lescopex	2.5 L	277	31	56	.6	
Total	--	18,204	659	40222		
<u>Monosodium Methane Arsonate (MSMA)</u>						
Monosodium Methanearsonate (MSMA)	8 L	1,118	12	308	1	Crabgrass
Total	--	1,118	12	308		

* Data based on responses from 169 golf courses and extrapolated to reflect usage on total number of golf courses in Ohio (648)

+ Indicates combination of more than one insecticide. Number in parentheses applies to amount of indicated herbicide in the formulation.