

## FY 2020 Survey Results of Agricultural Chemicals in Drainage Waters of Golf Courses

September 30, 2021

The Ministry of the Environment has collected the results of monitoring surveys of agricultural chemicals in drainage waters of golf courses, conducted by local government in FY 2020.

The monitoring surveys were conducted in accordance with the “Guideline for the Prevention of Water Pollution, and Damage to Aquatic Animals and Plants by Agricultural Chemicals Used in Golf Courses”, hereinafter referred to as “the Guideline”. A total of 38,964 samples from 1,539 golf courses were measured in the surveys, and six samples of the drains exceeded reference values of concentrations set in the Guideline (Table 1 and Table 2). The reference values are as of March 8, 2021.

**Table 1 Summary of survey results \***

Prefectures	Number of golf courses surveyed	Number of agricultural chemicals surveyed	Total number of samples <sup>*, **</sup>	The number of samples surveyed from drains	Number of samples exceeding the reference value <sup>**</sup>		O.R <sup>***</sup>
					W.P	D.A	
					Hokkaido	93	
Aomori	15	58	316	139	0	0	0
Iwate	24	74	223	74	0	0	0
Miyagi	12	77	327	18	0	0	0
Akita	17	45	108	19	0	0	0
Yamagata	4	32	125	0	-	-	-
Fukushima	23	106	1,145	477	0	0	66
Ibaraki	113	135	3,102	1,180	0	1	0
Tochigi	102	141	2,410	688	0	0	13
Gunma	61	106	1,112	129	0	0	0
Saitama	80	139	2,239	622	0	0	2
Chiba	31	124	732	429	0	0	10
Tokyo	20	77	538	354	0	0	10
Kanagawa	50	102	1,172	460	0	0	0
Yamanashi	37	87	478	106	0	1	0
Nagano	65	146	2,597	180	0	0	0
Niigata	44	76	1,016	215	0	0	18
Toyama	15	57	360	360	0	0	0
Ishikawa	24	60	236	70	0	0	0
Fukui	12	57	153	31	0	0	0
Gifu	37	51	176	57	0	0	0
Shizuoka	14	87	445	187	0	0	0
Aichi	20	119	262	48	0	0	3
Mie	51	73	564	84	0	0	0
Shiga	43	64	684	160	0	3	0
Kyoto	30	104	896	266	0	0	0
Osaka	38	105	853	140	0	0	0
Hyogo	141	188	8,179	650	0	1	0
Nara	24	56	911	0	-	-	-
Wakayama	3	39	175	0	-	-	-
Tottori	3	13	16	0	-	-	-
Shimane	8	35	185	2	0	0	0
Okayama	33	99	1,392	150	0	0	0
Hiroshima	8	102	800	800	0	0	0
Yamaguchi	18	54	125	77	0	0	0
Tokushima	13	25	122	43	0	0	0
Kagawa	19	45	237	6	0	0	0
Ehime	26	35	54	0	-	-	-
Kochi	9	29	150	0	-	-	-
Fukuoka	8	52	196	79	0	0	0
Saga	15	81	578	210	0	0	8
Nagasaki	19	89	507	149	0	0	0
Kumamoto	34	95	856	65	0	0	2
Oita	25	66	408	35	0	0	0
Miyazaki	27	59	218	18	0	0	0
Kagoshima	25	102	399	61	0	0	0
Okinawa	6	40	80	0	-	-	-
Total	1,539	220	38,964	9,140	0	6	132

Notes<sup>\*</sup> The total number of samples includes those surveyed by municipalities and golf courses reported to their prefectures.

Notes<sup>\*\*</sup> The total number of samples includes those collected from drain, pond in golf courses, and water outside of golf courses.

Notes<sup>\*\*\*</sup> “W.P”: Water Pollution; “D.A”: Damage to Aquatic Animals and Plants, “O.R”: number of samples the detection limit exceeded the reference value.

**Table 2 Summary of survey results of each chemical in golf course drains**

Agricultural chemicals		Number of samples	Concentration range detected (µg/L)*	Number of Detection	Reference Value (µg/L)**,**		Number of samples exceeding the reference value**		O.R****
					W.P	D.A	W.P	D.A	
1	Asulam-sodium or Asulam	569	N.D. - 60	77	10,000	90,000	0	0	0
2	Acetamiprid	37	N.D.	0	1,800	25	0	0	6
3	Acephate	40	N.D. - 0.079	1	63	55,000	0	0	0
4	Azoxystrobin	389	N.D. - 23	63	4,700	280	0	0	13
5	Atrazine	33	N.D. - 3.6	5	U.D.	1,500	0	0	0
6	Amicarbazone	3	N.D. - 3	1	420	1,800	0	0	0
7	Amisulbrom	19	N.D.	0	2,000	36	0	0	1
8	Ametocradin	13	N.D.	0	71,000	64	0	0	0
9	Alachlor	14	N.D.	0	200	47	0	0	0
10	Isoxathion	42	N.D.	0	50	0.2	0	0	10
11	Isoxaben	17	N.D. - 3	1	1,300	1,300	0	0	0
12	Isoprocarb or MITC	8	N.D.	0	100	24	0	0	0
13	Isoprothiolane	71	N.D. - 2	3	2,600	9,200	0	0	0
14	Iprodione	87	N.D. - 0.3	1	3000	1,800	0	0	0
15	Iprobenfos or IBP	11	N.D.	0	930	2,700	0	0	0
16	Imazosulfuron	21	N.D. - 16	3	U.D.	6,900	0	0	0
17	Imidacloprid	85	N.D. - 2	2	1,500	19	0	0	6
18	Iminoctadine tris(Albesilate) Iminoctadine-Triacetate	164	N.D. - 1	3	61	27	0	0	0
19	Indaziflam	52	N.D.	0	500	710	0	0	0
20	Indanofan	8	N.D.	0	93	29	0	0	0
21	Uniconazole P	8	N.D.	0	420	5,600	0	0	0
22	Esprocarb	8	N.D.	0	200	150	0	0	0
23	Ethephon	3	N.D.	0	U.D.	71,000	0	0	0
24	Ethoxysulfuron	29	N.D.	0	1,400	3,000	0	0	0
25	Etofenprox	53	N.D. - 0.01	2	820	6.7	0	0	6
26	Etobenzanide	36	N.D.	0	1,100	780	0	0	0
27	Emamectin benzoate	1	N.D.	0	U.D.	0.96	0	0	0
28	Endothal-potasium Endothal-sodium	1	N.D.	0	230	18,000	0	0	0
29	Oxadiazyl	48	N.D. - 1	2	200	73	0	0	0
30	Oxaziclomefone	111	N.D. - 1	3	240	8,300	0	0	0
31	Oxytetracycline	5	N.D. - 1	2	700	840	0	0	0
32	Oxine-Copper	116	N.D. - 0.001	11	200	18	0	0	0
33	Orysastrobin	8	N.D.	0	1,300	1,200	0	0	0
34	Oryzalin	14	N.D. - 7	4	1,000	750	0	0	0
35	Cadusafos	8	N.D.	0	6.6	2.5	0	0	0
36	Cafenstrole	63	N.D. - 9	11	70	20	0	0	0
37	Cartap	8	N.D.	0	420	160	0	0	0
38	Carbaryl or NAC	8	N.D.	0	190	16	0	0	0
39	Carfentrazone-Ethyl	3	N.D.	0	700	130	0	0	0
40	Quinoclamine or ACN	29	N.D. - 1	1	55	63	0	0	0
41	Captan	56	N.D.	0	2,000	26	0	0	10
42	Cumyluron	14	N.D.	0	200	900	0	0	0
43	Glyphosate-Ammonium Glyphosate-Isopropylammonium Glyphosate-Potassium Gyphosate-Sodium	28	N.D.	0	26,600	62,000	0	0	0

Agricultural chemicals		Number of samples	Concentration range detected (µg/L)*	Number of Detection	Reference Value (µg/L)**,**		Number of samples exceeding the reference value**		O.R****
					W.P	D.A	W.P	D.A	
44	Glufosinate Glufosinate-P-Sodium	1	N.D.	0	240	100,000	0	0	0
45	Kresoxim-Methyl	13	N.D.	0	9,500	160	0	0	0
46	Clothianidin	417	N.D. - 15	68	2,500	28	0	0	0
47	Chlorantraniliprole	203	N.D. - 2	7	6,900	29	0	0	1
48	Chlorimuron-Ethyl	39	N.D. - 10	11	2,000	37	0	0	0
49	Chlorthal-Dimethyl	8	N.D.	0	200	350	0	0	0
50	Chlorpyrifos	32	N.D.	0	20	0.46	0	0	18
51	Chlorfluazuron	55	N.D. - 0.2	2	870	0.29	0	0	11
52	Chlorpropham or IPC	4	N.D.	0	1,000	3,700	0	0	0
53	Chlorothalonil or TPN	220	N.D. - 6	5	470	80	0	0	0
54	Cyazofamid	80	N.D. - 10	3	4,500	88	0	0	2
55	Cyanazine	11	N.D.	0	14	290	0	0	0
56	Cyanophos of CYAP	8	N.D.	0	26	97	0	0	0
57	Cyantraniliprole	3	N.D.	0	250	18	0	0	0
58	Diuron or DCMU	8	N.D.	0	U.D.	250	0	0	0
59	Dicamba (MDBA) Dicamba-Potassium or MDBA-Potassium Dicamba-Dimethylammonium or MDBA-Dimethylammonium	57	N.D.	0	9,300	88,000	0	0	0
60	Cyclaniliprole	25	N.D.	0	310	77	0	0	0
61	Cyclosulfamuron	160	N.D. - 2	5	800	35	0	0	0
62	Dichlobenil or DBN	9	N.D.	0	200	1,500	0	0	0
63	Disulfoton or Ethylthiometon	8	N.D.	0	U.D.	32	0	0	0
64	Dithiopyr	78	N.D.	0	95	560	0	0	0
65	Dinotefuran	3	N.D.	0	5,800	120	0	0	0
66	Cyhalothrin	1	N.D.	0	U.D.	0.081	0	0	0
67	Cyhalofop-Butyl	8	N.D.	0	U.D.	330	0	0	0
68	Difenoconazole	83	N.D. - 10	5	250	750	0	0	0
69	Cyproconazole	78	N.D. - 1	7	300	20,000	0	0	0
70	Cyprodinil	8	N.D.	0	710	27	0	0	0
71	Simazine or CAT	52	N.D. - 2.2	1	30	1,700	0	0	0
72	Simeconazole	30	N.D.	0	220	14,000	0	0	0
73	Dimethametryn	8	N.D.	0	250	120	0	0	0
74	Simetryn	8	N.D.	0	U.D.	62	0	0	0
75	Silafluofen	10	N.D.	0	2,900	0.67	0	0	0
76	Ziram	62	N.D. - 0.5	1	U.D.	9.6	0	0	0
77	Cyromazine	3	N.D.	0	470	97,000	0	0	0
78	Streptomycin Sulfate or Streptomycin	4	N.D. - 1	2	U.D.	4,100	0	0	0
79	Diazinon	88	N.D. - 2.7	6	20	0.77	0	1	11
80	Daimuron	8	N.D.	0	7,900	420	0	0	0
81	Thiacloprid	28	N.D. - 1	2	310	36	0	0	0
82	Thiamethoxam	75	N.D. - 11	11	470	35	0	0	7
83	Thiram or Thiuram	169	N.D. - 1	2	200	100	0	0	0
84	Thiodicarb	121	N.D. - 10	3	800	27	0	0	2
85	Thiophanate-Methyl	93	N.D. - 10	6	3000	1,000	0	0	0
86	Thiobencarb or Benthioicarb	23	N.D.	0	200	260	0	0	0
87	Thifluzamide	210	N.D. - 28	47	370	1,400	0	0	0
88	Tetraconazole	69	N.D. - 10	3	100	2,800	0	0	0
89	Thenylchor	8	N.D.	0	U.D.	170	0	0	0

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					W.P	D.A	W.P	D.A	
90	Tebuconazole	217	N.D. - 25	16	770	2,600	0	0	0
91	Tebufenozide	47	N.D. - 1	1	420	830	0	0	0
92	Triaziflam	87	N.D.	0	230	2,500	0	0	0
93	Triclopyr-Triethylammonium (include Triclopyr)	55	N.D. - 2	2	60	86,000	0	0	0
94	Triclopyr-Butotyl	10	N.D.	0	60	900	0	0	0
95	Trichlorfon or DEP	27	N.D.	0	50	1.1	0	0	7
96	Tricyclazole	8	N.D.	0	1,000	21,000	0	0	0
97	Trinexapac-Ethyl	34	N.D. - 1	1	150	57,000	0	0	0
98	Triflumizole	19	N.D. - 1	1	390	860	0	0	0
99	Trifluralin	13	N.D. - 0.2	5	630	240	0	0	0
100	Trifloxystrobin	31	N.D.	0	1,000	15	0	0	2
101	Trifloxysulfuron-Sodium	23	N.D. - 10	2	U.D.	280	0	0	0
102	Triforine	1	N.D. - 0.9	1	610	9,100	0	0	0
103	Tolclofos-Methyl	152	N.D. - 10	16	2000	930	0	0	0
104	Napropamide	41	N.D. - 41	6	300	6,800	0	0	0
105	Nicosulfuron	4	N.D.	0	U.D.	98,000	0	0	0
106	Nitenpyram	3	N.D.	0	14,000	110	0	0	0
107	Paclobutrazol	10	N.D.	0	530	25,000	0	0	0
108	Validamycin A or Validamycin	34	N.D.	0	12000	100,000	0	0	0
109	Halosulfuron-Methyl	49	N.D. - 38	6	2,600	50	0	0	6
110	Picarbutrazox	13	N.D. - 1	1	610	340	0	0	0
111	Picoxystrobin	1	N.D.	0	1,200	22	0	0	0
112	Bispyribac-Sodium	11	N.D.	0	U.D.	12,000	0	0	0
113	Bifenthrin	42	N.D.	0	260	0.058	0	0	0
114	Hymexazol or Hydroxyisoxazole	52	N.D. - 10	2	1000	28,000	0	0	0
115	Pyraclostrobin	46	N.D.	0	900	6	0	0	0
116	Pyraziflumid	10	N.D.	0	550	1,600	0	0	0
117	Pyrazosulfuron-Ethyl	20	N.D. - 0.5	1	200	8.7	0	0	0
118	Pyraflufen-Ethyl	12	N.D.	0	4,500	8.2	0	0	3
119	Pyributicarb	35	N.D.	0	230	100	0	0	0
120	Pyriproxyfen	8	N.D.	0	2,600	75	0	0	0
121	Pyribencarb	27	N.D.	0	1,000	600	0	0	0
122	Pyriminobac-Methyl	8	N.D.	0	500	59,000	0	0	0
123	Pirimiphos-Methyl	10	N.D. - 0.001	2	U.D.	0.31	0	0	0
124	Pyroxasulfone	103	N.D. - 23	36	500	7.4	0	4	0
125	Pyroquilone	8	N.D.	0	500	33,000	0	0	0
126	Fipronil	17	N.D.	0	5	0.24	0	0	0
127	Fenitrothion or MEP	143	N.D. - 5	4	130	U.D.	0	0	0
128	Fenoxasulfone	48	N.D. - 10	8	4,500	9.3	0	1	0
129	Fenobucarb or BMC	46	N.D. - 0.001	1	340	19	0	0	0
130	Ferimzone	9	N.D.	0	500	6,200	0	0	0
131	Fenthion or MPP	8	N.D.	0	U.D.	0.87	0	0	0
132	Phenthoate or PAP	8	N.D.	0	77	0.77	0	0	0
133	Fthalide	16	N.D.	0	U.D.	870	0	0	0
134	Butachlor	8	N.D.	0	260	31	0	0	0
135	Butamifos	23	N.D.	0	200	620	0	0	0
136	Buprofezin	8	N.D.	0	230	800	0	0	0
137	Flazasulfuron	44	N.D.	0	300	170	0	0	0
138	Furametpyr	19	N.D.	0	100	1,400	0	0	0
139	Fluoxastrobin	10	N.D.	0	390	470	0	0	0

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					W.P	D.A	W.P	D.A	
140	Fluxapyroxad	80	N.D. - 8.4	13	550	290	0	0	0
141	Fluxametamide	9	N.D.	0	220	39	0	0	0
142	Fludioxonil	42	N.D. - 10	2	8,700	770	0	0	1
143	Flucetosulfuron	2	N.D.	0	1,000	79,000	0	0	0
144	Flutolanil	67	N.D. - 1	3	2,300	3,100	0	0	0
145	Flufenacet	9	N.D. - 9	7	290	1,300	0	0	0
146	Flubendiamide	90	N.D. - 2	3	450	58	0	0	0
147	Flupoxam	80	N.D. - 4	8	210	2,300	0	0	0
148	Pretalachlor	8	N.D.	0	470	29	0	0	0
149	Prodiamine	91	N.D. - 1	3	1,700	4.6	0	0	3
150	Procymidone	4	N.D.	0	930	4,200	0	0	0
151	Propanil	8	N.D.	0	420	490	0	0	0
152	Propamocarb Hydrochloride	22	N.D. - 10	3	7,700	100,000	0	0	0
153	Propiconazole	83	N.D. - 1.6	7	500	5,600	0	0	0
154	Propyzamide	128	N.D. - 27	17	500	4,700	0	0	0
155	Propineb	51	N.D. - 1	1	U.D.	210	0	0	0
156	Prohexadione-Calcium	4	N.D. - 1	1	5,300	93,000	0	0	0
157	Bromacil	8	N.D.	0	500	270	0	0	0
158	Prometryn	8	N.D.	0	700	350	0	0	0
159	Bromobutide	8	N.D.	0	1,000	4,800	0	0	0
160	Florasulam	13	N.D. - 1	1	U.D.	94	0	0	0
161	Hexaconazole	82	N.D. - 10	15	120	2,900	0	0	0
162	Benomyl	23	N.D.	0	200	350	0	0	0
163	Permethrin	103	N.D. - 1	3	1,000	1.7	0	0	0
164	Pencycuron	305	N.D. - 160	32	1,400	1,000	0	0	0
165	Benzyladenine or Benzylaminopurine	3	N.D.	0	1,600	19,000	0	0	0
166	Bensultap	16	N.D. - 10	2	420	200	0	0	0
167	Bensulfuron-Methyl	8	N.D.	0	5,000	560	0	0	0
168	Bentazon-Sodium or Bentazon	16	N.D. - 7	5	U.D.	88,000	0	0	0
169	Penthiopyrad	51	N.D. - 3	1	2,000	560	0	0	0
170	Pendimethalin	136	N.D. - 1	1	3,100	140	0	0	6
171	Penflufen	75	N.D. - 4	14	530	100	0	0	0
172	Benfluralin or Bethrodine	21	N.D.	0	100	29	0	0	0
173	Benfuresate	9	N.D.	0	690	21,000	0	0	0
174	Boscalid	70	N.D. - 0.008	1	1,100	5,000	0	0	0
175	Fosthiazate	8	N.D.	0	U.D.	230	0	0	0
176	Phosethyl-Aluminium or Phosethyl	67	N.D. - 10	2	23,000	28,000	0	0	0
177	Foramsulfuron	37	N.D.	0	13,000	97,000	0	0	0
178	Polyoxin D-Zinc salt	16	N.D. - 1	2	U.D.	4000	0	0	0
179	Polyoxins	5	N.D.	0	U.D.	400	0	0	0
180	Malathion or Malathon	8	N.D.	0	7,700	3	0	0	0
181	Manzeb	24	N.D.	0	U.D.	120	0	0	0
182	Mandestrobin	8	N.D.	0	5,000	1,200	0	0	0
183	Myclobutanil	9	N.D.	0	630	9,700	0	0	0
184	Mecoprop-Potassium Mecoprop-Dimethylammonium Mecoprop-P-Isopropylammonium Mecoprop-P-Potassium	106	N.D. - 9	5	470	81,000	0	0	0
185	Mesotrione	3	N.D.	0	70	43,000	0	0	0
186	Methomyl	8	N.D.	0	U.D.	15	0	0	0

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					W.P	D.A	W.P	D.A	
187	Metamifop	13	N.D.	0	110	280	0	0	0
188	Metalaxyl Metalaxyl-M	127	N.D. - 10	6	580	95,000	0	0	0
189	Methidathion or DMTP	8	N.D.	0	U.D.	1.1	0	0	0
190	Methoxyfenozide	3	N.D.	0	2,600	3,700	0	0	0
191	Metconazole	60	N.D. - 1	2	500	2,100	0	0	0
192	Metsulfuron-Methyl	4	N.D.	0	U.D.	8,700	0	0	0
193	Metominostrobin	8	N.D.	0	420	4,800	0	0	0
194	Metolachl or S-Metolachlor	35	N.D. - 44	6	2,500	230	0	0	0
195	Metribuzin	8	N.D.	0	U.D.	230	0	0	0
196	Mefenacet	8	N.D.	0	100	320	0	0	0
197	Mepronil	36	N.D.	0	1,000	4,200	0	0	0
198	Molinate	8	N.D.	0	55	5,000	0	0	0
199	Iodosulfuron-Methyl-Sodium	21	N.D.	0	U.D.	610	0	0	0
200	Rimsulfuron	2	N.D.	0	U.D.	9,800	0	0	0
201	Lenacil	7	N.D. - 25	2	U.D.	150	0	0	0
202	2,4-D-Isopropylamine or 2,4-PA-Isopropylamine, 2,4-D-Dmethylamine or 2,4-PA-Dmethylamine, and 2,4-D-Sodium salt Monohydrate or 2,4-PA-Sodium salt Monohydrate (include 2,4-D or 2,4-PA)	3	N.D.	0	260	98,000	0	0	0
203	EPN	14	N.D.	0	37	0.5	0	0	0
204	MCPA-Isopropylamine MCPA-Ethyl MCPA-Sodium	35	N.D. - 1	3	51	61,000	0	0	0
total		9,140		676			0	6	132

Notes\* "N.D." : not detected.

Notes\*\* "W.P": Water Pollution; "D.A": Damage to Aquatic Animals and Plants.

Notes\*\*\* "U.D" : the reference value is not determined yet, colored cells: newly determined values last fiscal year.

Notes\*\*\*\* "O.R.": number of samples the detection limit exceeded the reference value.