FY 2019 Survey Results of Agricultural Chemicals in Drainage Waters of Golf Courses

December 10, 2020

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 2019.

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 41,962 samples from 1,607 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 27, 2020.

Table 1 Summary of survey results*

Prefectures	Number of golf courses surveyed	Number of agricultural chemicals surveyed	Total number of samples*, **	The number of samples surveyed from drains	Number of samples exceeding the reference value**		O.R***
					W.P	D.A	
Hokkaido	111	72	1,219	320	0	0	0
Aomori	15	59	372	213	0	0	0
Iwate	24	78	220	59	0	0	0
Miyagi	23	54	377	58	0	0	0
Akita	16	48	102	17	0	0	0
Yamagata	5	33	123	9	0	0	3
Fukushima	26	101	1,187	521	0	0	78
Ibaraki	112	135	3,263	1,205	0	1	5
Tochigi	102	136	2,830	741	0	0	22
Gunma	67	111	1,096	138	0	0	5
Saitama	102	137	3,966	1,199	0	0	48
Chiba	41	127	835	480	0	0	0
Tokyo	20	85	500	330	0	0	0
Kanagawa	49	91	1,201	560	0	0	0
Yamanashi	39	91	495	109	0	0	0
Nagano	65	140	2,743	156	0	0	9
Niigata	42	83	1,025	237	0	0	18
Toyama	15	66	297	297	0	0	4
Ishikawa	24	65	256	78	0	0	0
Fukui	14	68	195	44	0	0	0
Gifu	38	51	176	57	0	0	0
Shizuoka	16	83	455	363	0	0	3
Aichi	20	96	246	54	0	0	3
Mie	45	71	537	73	0	0	1
Shiga	45	62	526	121	0	0	0
Kyoto	30	127	1,113	541	0	0	0
Osaka	39	120	943	306	0	2	0
Hyogo	145	182	7,839	910	0	0	0
Nara	24	55	889	0	-	-	-
Wakayama	3	40	180	0	-	-	-
Tottori	2	9	8	0	-	-	-
Shimane	8	39	235	20	0	0	0
Okayama	37	97	1,487	243	0	1	12
Hiroshima	8	98	768	768	0	0	0
Yamaguchi	3	26	29	29	0	0	0
Tokushima	14	21	129	34	0	1	0
Kagawa	18	39	262	8	0	0	0
Ehime	26	24	52	0	-	-	-
Kochi	9	25	117	0	0	0	0
Fukuoka	9	58	178	46	0	0	0
Saga	14	72	504	162	0	1	8
Nagasaki	21	96	545	150	0	0	0
Kumamoto	37	104	1,104	59	0	0	2
Oita	26	66	410	41	0	0	0
Miyazaki	26	61	267	33	0	0	0
Kagoshima	26	104	588	127	0	0	3
Okinawa	6	39	73	0	-	-	-
Total	1,607	231	41,962	10,916	0	6	224

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

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

Notes*** “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	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)	2	N.D.	0	260	98,000	0	0	0
2	EPN	14	N.D.	0	37	0.50	0	0	0
3	MCPA-Isopropylamine MCPA-Ethyl MCPA-Sodium	50	N.D. ～ 1	2	51	81,000	0	0	0
4	Asulam-sodium or Asulam	791	N.D. ～ 100	124	10,000	90,000	0	0	0
5	Acetamiprid	42	N.D.	0	1,800	25	0	0	6
6	Acephate	40	N.D. ～ 0.31	1	63	55,000	0	0	0
7	Azoxystrobin	529	N.D. ～ 20	56	4,700	280	0	0	26
8	Atrazine	30	N.D. ～ 3	4	U.D.	1,500	0	0	0
9	Amicarbazone	7	N.D. ～ 8.0	3	420	1,800	0	0	0
10	Amisulbrom	29	N.D.	0	2,000	36	0	0	1
11	Ametocradin	19	N.D.	0	71,000	64	0	0	0
12	Alachlor	20	N.D. ～ 28	2	200	47	0	0	0
13	Isoxathion	63	N.D.	0	50	0.20	0	0	17
14	Isoxaben	24	N.D.	0	1,300	1,300	0	0	0
15	Isoprocarb or MITC	8	N.D.	0	100	24	0	0	0
16	Isoprothiolane	82	N.D.	0	2,600	9,200	0	0	0
17	Iprodione	100	N.D. ～ 3	1	3,000	1,800	0	0	0
18	Iprobenfos or IBP	11	N.D.	0	930	2,700	0	0	0
19	Imazosulfuron	18	N.D. ～ 4.5	3	U.D.	6,900	0	0	0
20	Imidacloprid	94	N.D. ～ 3.0	3	1,500	19	0	0	12
21	Iminoctadine tris(Albesilate) Iminoctadine-Triacetate	193	N.D. ～ 6	1	60	27	0	0	0
22	Imibenconazole	6	N.D.	0	260	180	0	0	0
23	Indaziflam	43	N.D.	0	500	710	0	0	0
24	Uniconazole P	8	N.D.	0	420	5,600	0	0	0
25	Esprocarb	8	N.D.	0	200	150	0	0	0
26	Ethephon	2	N.D.	0	U.D.	71,000	0	0	0
27	Ethoxysulfuron	38	N.D.	0	1,400	3,000	0	0	0
28	Etofenprox	37	N.D.	0	820	6.7	0	0	7
29	Etobenzanide	61	N.D.	0	1,100	780	0	0	0
30	Endothal-dipotassium Endothal-disodium	1	N.D.	0	230	18,000	0	0	0
31	Oxadiargyl	63	N.D.	0	200	73	0	0	0
32	Oxaziclomefone	146	N.D.	0	240	8,300	0	0	0
33	Oxytetracycline	14	N.D. ～ 0.001	2	700	840	0	0	0
34	Oxine-Copper	143	N.D. ～ 19	25	200	18	0	1	10
35	Oxpoconazole Fumarate	1	N.D.	0	790	2,500	0	0	0
36	Oxolinic-Acid	1	N.D.	0	550	4,500	0	0	0
37	Orysastrobin	1	N.D.	0	1,300	1,200	0	0	0
38	Oryzalin	11	N.D.	0	U.D.	750	0	0	0
39	Sodium Oleate	1	N.D.	0	U.D.	23,000	0	0	0
40	Kasugamycin Hydrochloride or Kasugamycin	1	N.D.	0	2,500	66,000	0	0	0
41	Cadusafos	9	N.D.	0	6.6	2.5	0	0	0
42	Cafenstrole	74	N.D. ～ 5	8	70	20	0	0	0
43	Cartap	8	N.D.	0	U.D.	160	0	0	0
44	Carbaryl or NAC	8	N.D.	0	U.D.	16	0	0	0
45	Carfentrazone-Ethyl	4	N.D.	0	700	130	0	0	0
46	Quinoclamine or ACN	39	N.D.	0	55	63	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	
47	Captan	78	N.D.	0	2,000	26	0	0	8
48	Cumyluron	15	N.D.	0	200	900	0	0	0
49	Glyphosate-Ammonium Glyphosate-Isopropylammonium Glyphosate-Potassium Gyphosate-Sodium	27	N.D. ～ 4.0	1	26,600	62,000	0	0	0
50	Glufosinate Glufosinate-P-Sodium	1	N.D.	0	240	100,000	0	0	0
51	Kresoxim-Methyl	11	N.D.	0	9,500	160	0	0	0
52	Clothianidin	524	N.D. ～ 17	83	2,500	28	0	0	11
53	Chromafenozide	1	N.D.	0	7,100	970	0	0	0
54	Chlorantraniliprole	215	N.D. ～ 2	9	6,900	29	0	0	9
55	Chlorimuron-Ethyl	45	N.D. ～ 4	3	2,000	37	0	0	0
56	Chlorpyrifos	46	N.D.	0	20	0.46	0	0	18
57	Chlorphthalim	2	N.D.	0	69	150	0	0	0
58	Chlorfluazuron	95	N.D. ～ 0.2	1	870	0.29	0	0	1
59	Chlorpropham or IPC	4	N.D.	0	1,000	3,700	0	0	0
60	Chlorothalonil or TPN	263	N.D. ～ 6	2	470	80	0	0	2
61	Cyazofamid	91	N.D. ～ 8	2	4,500	88	0	0	3
62	Cyanazine	12	N.D.	0	1.4	290	0	0	0
63	Cyantraniliprole	12	N.D.	0	250	18	0	0	0
64	Diuron or DCMU	8	N.D.	0	U.D.	250	0	0	0
65	Dicamba (MDBA) Dicamba-Potassium or MDBA-Potassium Dicamba-Dimethylammonium or MDBA-Dimethylammonium	57	N.D. ～ 2.3	1	9,300	88,000	0	0	0
66	Cyclaniliprole	32	N.D. ～ 6.0	6	310	77	0	0	0
67	Cyclosulfamuron	176	N.D. ～ 2	13	800	35	0	0	4
68	Dichlobenil or DBN	8	N.D.	0	200	1,500	0	0	0
69	Dithiopyr	106	N.D. ～ 0.8	1	95	560	0	0	0
70	Dinotefuran	3	N.D.	0	5,800	120	0	0	0
71	Cyhalothrin	7	N.D.	0	U.D.	0.081	0	0	2
72	Cyhalofop-Butyl	8	N.D.	0	U.D.	330	0	0	0
73	Difenoconazole	86	N.D. ～ 20	4	250	750	0	0	0
74	Cyproconazole	110	N.D. ～ 17	6	300	20,000	0	0	0
75	Cyprodinil	8	N.D.	0	710	27	0	0	0
76	Simazine or CAT	54	N.D. ～ 1.20	1	30	1,700	0	0	0
77	Simeconazole	38	N.D.	0	220	14,000	0	0	0
78	Dimethametryn	8	N.D.	0	250	120	0	0	0
79	Dimethoate	8	N.D.	0	U.D.	2,000	0	0	0
80	Simetryn	8	N.D.	0	U.D.	62	0	0	0
81	Silafluofen	8	N.D.	0	2,900	0.67	0	0	0
82	Ziram	61	N.D.	0	U.D.	9.6	0	0	0
83	Streptomycin Sulfate or Streptomycin	11	N.D.	0	U.D.	4,100	0	0	0
84	Spinetoram	4	N.D.	0	630	3,100	0	0	0
85	Diazinon	113	N.D. ～ 2	4	50	0.77	0	2	22
86	Daimuron	8	N.D.	0	7,900	420	0	0	0
87	Thiacloprid	31	N.D. ～ 6	1	310	36	0	0	0
88	Tiadinil	1	N.D.	0	1,000	1,600	0	0	0
89	Thiamethoxam	120	N.D. ～ 10	16	470	35	0	0	18
90	Thiram or Thiuram	187	N.D.	0	200	100	0	0	0
91	Thiodicarb	144	N.D. ～ 2.2	1	800	27	0	0	8
92	Thiophanate-Methyl	111	N.D. ～ 4	4	3,000	1,000	0	0	0
93	Thiobencarb or Benthiocarb	26	N.D.	0	200	260	0	0	0
94	Thifensulfuron-Methyl	3	N.D.	0	250	64,000	0	0	0
95	Thifluzamide	267	N.D. ～ 40	81	370	1,400	0	0	0
96	Tetraconazole	70	N.D.	0	100	2,800	0	0	0
97	Tetradifon	3	N.D.	0	340	60	0	0	0

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					W.P	D.A	W.P	D.A	
98	Thenylchor	8	N.D.	0	U.D.	170	0	0	0
99	Tebuconazole	224	N.D. ～ 70	13	770	2,600	0	0	0
100	Tebufenozide	45	N.D.	0	420	830	0	0	0
101	Tralomethrin	1	N.D.	0	190	0.063	0	0	0
102	Triaziflam	74	N.D. ～ 5	2	230	2,500	0	0	0
103	Triclopyr-Triethylammonium (include Triclopyr)	80	N.D. ～ 13.86	2	60	86,000	0	0	0
104	Triclopyr-Butotyl	7	N.D.	0	60	900	0	0	0
105	Trichlorfon or DEP	31	N.D.	0	50	1.1	0	0	6
106	Tricyclazole	8	N.D.	0	1,000	21,000	0	0	0
107	Trinexapac-Ethyl	42	N.D. ～ 0.001	1	150	57,000	0	0	0
108	Triflumizole	30	N.D.	0	390	860	0	0	0
109	Trifluralin	8	N.D.	0	630	240	0	0	0
110	Trifloxystrobin	21	N.D. ～ 2.0	1	1,000	15	0	0	0
111	Trifloxysulfuron-Sodium	33	N.D. ～ 2.3	3	U.D.	280	0	0	0
112	Tolclofos-Methyl	171	N.D. ～ 10	31	2,000	U.D.	0	0	0
113	Napropamide	57	N.D. ～ 2.0	5	300	6,800	0	0	0
114	Nicosulfuron	4	N.D.	0	U.D.	98,000	0	0	0
115	Nitenpyram	3	N.D.	0	14,000	110	0	0	0
116	Paclobutrazol	15	N.D.	0	530	25,000	0	0	0
117	Validamycin A or Validamycin	36	N.D.	0	12,000	100,000	0	0	0
118	Halosulfuron-Methyl	73	N.D. ～ 2	2	2,600	50	0	0	8
119	Picarbutrazox	12	N.D.	0	610	340	0	0	0
120	Bispyribac-Sodium	10	N.D.	0	U.D.	12,000	0	0	0
121	Bifenthrin	68	N.D.	0	260	0.058	0	0	5
122	Hymexazol or Hydroxyisoxazole	57	N.D.	0	1,000	28,000	0	0	0
123	Pyraclostrobin	38	N.D.	0	900	6	0	0	0
124	Pyraziflumid	2	N.D.	0	550	1,600	0	0	0
125	Pyrazosulfuron-Ethyl	11	N.D. ～ 0.6	1	200	8.7	0	0	0
126	Pyraflufen-Ethyl	6	N.D.	0	4,500	8.2	0	0	4
127	Pyributicarb	36	N.D.	0	230	100	0	0	0
128	Pyriproxyfen	8	N.D.	0	2,600	75	0	0	0
129	Pyribencarb	24	N.D. ～ 0.006	3	1,000	600	0	0	0
130	Pyriminobac-Methyl	8	N.D.	0	500	59,000	0	0	0
131	Pirimiphos-Methyl	3	N.D.	0	U.D.	0.31	0	0	0
132	Pyroxasulfone	128	N.D. ～ 24	38	500	7.4	0	3	0
133	Pyroquilone	8	N.D.	0	500	33,000	0	0	0
134	Fipronil	20	N.D.	0	5.0	0.24	0	0	0
135	Fenitrothion or MEP	143	N.D. ～ 4	9	130	U.D.	0	0	0
136	Fenoxasulfone	52	N.D. ～ 1	4	4,500	9.3	0	0	0
137	Fenobucarb or BPMC	33	N.D.	0	340	19	0	0	0
138	Ferimzone	7	N.D.	0	500	6,200	0	0	0
139	Phenthoate or PAP	8	N.D.	0	77	0.77	0	0	0
140	Fthalide	16	N.D.	0	U.D.	870	0	0	0
141	Butachlor	12	N.D.	0	260	31	0	0	0
142	Butamifos	39	N.D.	0	200	620	0	0	0
143	Buprofezin	8	N.D.	0	230	800	0	0	0
144	Flazasulfuron	52	N.D.	0	300	170	0	0	0
145	Furametpyr	25	N.D. ～ 0.1	1	100	1,400	0	0	0
146	Fluoxastrobin	10	N.D.	0	390	470	0	0	0
147	Fluxapyroxad	84	N.D. ～ 42	13	550	290	0	0	0
148	Fludioxonil	54	N.D.	0	8,700	770	0	0	1
149	Flucetosulfuron	5	N.D. ～ 3.3	1	1,000	79,000	0	0	0
150	Flutolanil	88	N.D. ～ 1	1	2,300	3,100	0	0	0
151	Flubendiamide	97	N.D. ～ 4	2	450	58	0	0	0
152	Flupoxam	118	N.D. ～ 2.0	3	210	2,300	0	0	0
153	Flurprimidol	1	N.D.	0	390	11,000	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	
154	Pretalachlor	8	N.D.	0	470	29	0	0	0
155	Prodiamine	65	N.D.	0	1,700	4.6	0	0	5
156	Procymidone	11	N.D.	0	930	4,200	0	0	0
157	Propamocarb Hydrochloride	46	N.D.	0	7,700	100,000	0	0	0
158	Propiconazole	99	N.D. ～ 0.001	6	500	5,600	0	0	0
159	Propyzamide	184	N.D. ～ 44	28	500	4,700	0	0	0
160	Propineb	83	N.D.	0	U.D.	210	0	0	0
161	Prohexadione-Calcium	3	N.D.	0	5,300	93,000	0	0	0
162	Probenazole	1	N.D. ～ 0.001	1	200	2,700	0	0	0
163	Bromacil	8	N.D.	0	500	270	0	0	0
164	Prometryn	8	N.D.	0	700	350	0	0	0
165	Bromobutide	8	N.D.	0	1,000	4,800	0	0	0
166	Florasulam	18	N.D. ～ 1	2	U.D.	94	0	0	0
167	Hexaconazole	88	N.D. ～ 1.5	5	120	2,900	0	0	0
168	Benomyl	29	N.D. ～ 14.0	1	200	350	0	0	0
169	Permethrin	127	N.D. ～ 1	2	1,000	1.7	0	0	4
170	Pencycuron	392	N.D. ～ 8	28	1,400	1,000	0	0	0
171	Benzyladenine or Benzylaminopurine	2	N.D.	0	1,600	19,000	0	0	0
172	Benzpyrimoxan	2	N.D.	0	U.D.	2,200	0	0	0
173	Bensultap	21	N.D.	0	900	200	0	0	0
174	Bensulfuron-Methyl	8	N.D.	0	5,000	560	0	0	0
175	Bentazon-Sodium or Bentazon	13	N.D. ～ 1.1	1	U.D.	88,000	0	0	0
176	Penthiopyrad	45	N.D.	0	2,000	560	0	0	0
177	Pendimethalin	174	N.D. ～ 1	1	3,100	140	0	0	6
178	Penflufen	69	N.D. ～ 10	29	530	100	0	0	0
179	Benfluralin or Bethrodine	32	N.D.	0	100	29	0	0	0
180	Benfuresate	8	N.D.	0	690	21,000	0	0	0
181	Phosalone	8	N.D.	0	50	0.73	0	0	0
182	Boscalid	81	N.D. ～ 1.0	2	1,100	5,000	0	0	0
183	Fosthiazate	9	N.D.	0	U.D.	230	0	0	0
184	Phosethyl-Alminium or Phosethyl	69	N.D. ～ 0.60	2	23,000	28,000	0	0	0
185	Foramsulfuron	82	N.D. ～ 1.4	3	13,000	97,000	0	0	0
186	Manzeb	48	N.D.	0	U.D.	120	0	0	0
187	Mandestrobin	8	N.D.	0	5,000	1,200	0	0	0
188	Myclobutanil	7	N.D.	0	630	9,700	0	0	0
189	Milbemectin	1	N.D.	0	700	10	0	0	0
190	Mecoprop-Potassium Mecoprop-Dimethylammonium Mecoprop-P-Isopropylammonium Mecoprop-P-Potassium	135	N.D. ～ 39	9	470	81,000	0	0	0
191	Mesotrione	14	N.D.	0	70	43,000	0	0	0
192	Methomyl	8	N.D. ～ 1	1	U.D.	15	0	0	0
193	Metamifop	13	N.D.	0	110	280	0	0	0
194	Metam-Ammonium (Carbam) Metam-Sodium (Carbam-Sodium)	3	N.D.	0	100	200	0	0	0
195	Metalaxyl Metalaxyl-M	132	N.D. ～ 0.1	2	580	95,000	0	0	0
196	Methidathion or DMTP	8	N.D.	0	U.D.	1.1	0	0	0
197	Methoxyfenozide	6	N.D.	0	2,600	3,700	0	0	0
198	Metconazole	62	N.D. ～ 59	2	500	2,100	0	0	0
199	Metsulfuron-Methyl	5	N.D.	0	U.D.	8,700	0	0	0
200	Metominostrobin	8	N.D.	0	420	4,800	0	0	0
201	Metolachlor S-Metolachlor	54	N.D. ～ 34	12	2,500	230	0	0	0
202	Metribuzin	8	N.D.	0	U.D.	230	0	0	0
203	Mefenacet	8	N.D.	0	100	320	0	0	0
204	Mepronil	53	N.D.	0	1,000	4,200	0	0	0
205	Molinate	8	N.D.	0	55	5,000	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	
206	Iodosulfuron-Methyl-Sodium	13	N.D.	0	U.D.	610	0	0	0
207	Rimsulfuron	12	N.D.	0	U.D.	9,800	0	0	0
208	Lenacil	9	N.D.	0	U.D.	150	0	0	0
209	Dicopper chloride trihydroxide Copper(II) hydroxide sulfate Copper (II) hydroxide Copper(II) sulfate Copper(II) sulfate pentahydrate	1	N.D. ～ 0.84	1	U.D.	3.8	0	0	0
	Total	10,916		749			0	6	224

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.