

Investigation Report of Environmental
Residual of Agricultural Chemicals Related to
Strategic Programs on Environmental
Endocrine Disruptors '98
(SPEED ' 98)

Soils and Agricultural Chemicals Dept.,

Water Quality Management Division, Environment Agency

Outline of the Investigation

1. Preface

The Environment Agency has been enforced Strategic Programs on Environmental Endocrine Disruptors in each Division, which the Soils and Agricultural Chemicals Dept. took in charge of environmental residual of agricultural chemicals specified in the SPEED '98 and here is the investigation report.

2. Outline of the investigation result

Outline of the investigation result is as shown below.

As a result of the quality of water by gathering water three times in 249 points throughout Japan, 11 substances is detected out of 47 substances related to agricultural chemicals, which are to be analyzed. Detection ratio in the total detected substances is 0.7% at 1st inspection (July), 0.9% at 2nd (September), and 0.8% at 3rd (November).

Note: Sampling time is the approximate month. (The same for the followings.)

As a result of sediments sampled in 94 points throughout Japan in September 3 substances are detected out of 47 substances, which are to be analyzed. Detection ratio in the total detected substances is 0.4%.

As a result of aquatic animals (fish) sampled in 48 points throughout Japan in September 11 substances are detected such as substances that were used as agricultural chemicals before, out of 47 substances. Detection ratio in the total detected substances is 6.9%.

As a result of soils sampled in 94 points throughout Japan in November adding substances other than agricultural chemicals for investigation and 32 substances are detected out of 95 substances. Detection ratio in the total detected substances is 2.3%.

It is important for the chemical substances, which are to be analyzed this time to promote further investigation research as their strength and mechanisms are not yet clearly understood, such as existence of endocrine disruption function. Therefore, the Environment Agency is going make development of test method to decide if the endocrine disruption function exists or not and investigation using the developed procedure, by enriching scientific information. This investigation result should be analyzed in detail from now on including the necessity of supplement investigation, for the further measure.

II Contents of Investigation

1. Purpose of the investigation

This investigation is executed to grasp the actual situation of environmental residual of agricultural chemicals specified in "Strategic Programs on Environmental Endocrine Disruptors '98" (hereinafter referred to as SPEED '98).

2. Investigated medium, sampling time and numbers of sampling point

Investigated medium, sampling time and numbers of sampling point for each medium are as follows. Sampling was made by the cooperation of each prefecture. Sampling times in the following table differ according to the sampling point.

Investigation medium	Sampling time	Point numbers
Quality of water	1 st : July 2 nd : September 3 rd : November	249 points (214 points in rivers, 20 points in lakes, 11 points in sea areas, 4 points in groundwater) 2 to 9 points classified by each prefecture
Sediments	September	94 points (84 points in rivers, 6 points in lakes, 4 points in sea area) *2 points in each prefecture from the point where sampling of water is made
Aquatic animals and plant	September	48 points (41 points in rivers, 6 points in lakes, 1 point in sea area) *Generally 1 point in each prefecture from the point where sampling of water is made
Soils	November	94 points *2 points in each prefecture from the surrounding soils of the point where sampling of water is made

3. Target substances

(1) Target substance related to water quality, sediments and aquatic animals and plant life

1) Among the chemical substances given in SPEED'98 to be investigated in water, sediments and aquatic animals and plant life in the first investigation, 39 substances are selected as shown in Table 1. (Substances to be analyzed are 47 substances as isomers are analyzed individually.) These 39 substances breaks down to following three types: agricultural chemicals which are actually registered and have result of sales in Japan (19 agricultural chemicals), agricultural chemicals which had been registered before and had sales result in Japan but actually, agricultural chemical registration has expired in Japan (15 substances) and metabolite of the agricultural chemical which had been registered before or substances without registration of agricultural chemical but used for other than agricultural chemical (5 substances).

2) On the 2nd and 3rd investigations of water quality, 20 substances adding Amitrole to the actually registered 19 agricultural chemicals are settled as substances to be detected, considering the possibility of detection to make the investigation effectively.

(2) Target substances in soil investigation

In addition to 39 target substances in water quality etc., 20 substances are added shown

in table 2, totaling 59 substances (substances to be analyzed are 95 substances).

III Outline of Investigation Result

Investigation result is as shown in Table 3.

1. Quality of water

(1) In the 1st investigation, any of substances are detected from 85 specimens out of about 12000 specimens (detection ratio 0.7%), in the 2nd investigation, 43 specimens out of about 5000 specimens (0.9%) and in the 3rd investigation, 38 specimens out of about 5000 specimens (0.8%), respectively. Overall detection ratio is low and each ratio become lower following the 1st investigation.

(2) When classified by substances, organochlorine compound (HCB, HCH, Chlordane, Oxychlordane, trans-Nonachlor, DDT, DDE/DDD, Kelthane, Aldrin, Endrin, Dieldrin, Heptachlor, Heptachlor epoxide, Methoxychlor), synthetic pyrethroid agricultural chemicals (Cypermethrin, Fenvalerate, Permethrin), Dithiocarbamate agricultural chemicals (Manzeb, Maneb, Zineb, Ziram), Pentachlorophenol (PCP), 2, 4, 5-Trichlorophenoxyacetic acid, Ethyl parathion, 1,2-dibromo-3-chloropropane, Nitrofen, Metribuzin, Vinelozolin are not detected from all investigated 249 points.

(3) On the other hand, 2,4-Dichlorophenoxy acetic acid, Amitrole, Atrazine, Alachlor, CAT, NAC, Endosulfan (SO₂ body), Malathion, Methomyl (Note 1), Trifluralin, and Carbendazim (Note 2) are detected from a part of rivers and lakes. For agricultural chemicals, which registration has lost effect already, only Amitrole was detected. Amitrole (lost effect in 1975) has been detected all three times of the investigation, maybe because it has usage other than agricultural chemicals.

When comparing the detected value with the standard value of the substances (28 substances) included in beverage in Japan, WHO or in Europe and America, all the values detected this time lowered these standard values enough.

(4) No substances were detected from sea areas and groundwater.

Note 1) As for Methomyl mentioned in the list of SPEED '98, chemical substances having similar chemical construction with Methomyl generates Methomyl as metabolite and such substances are included in total quantity of Methomyl.

Note 2) Benomyl mentioned in the list of SPEED '98 decomposes quickly to Carbendazim in environment. Also chemical substances having similar chemical construction generate Carbendazim as metabolite. As it is determined as Carbendazim in this investigation and measured totally as Carbendazim originated from these similar compounds, it is denoted as Carbendazim. (Same as for the following investigation medium.)

2. Sediments

(1) Any of the substances are detected from 19 specimens out of about 4400 specimens. (Detection ratio 0.4%).

(2) When classified by substances, total amount of "Manzeb, Maneb, Zineb" measured as total related to analyzing method (Note 3), Ziram (Note 4) and Carbendazim are detected from a part of rivers and lakes.

Note 3) Manzeb, Maneb and Zineb, mentioned in the list of SPEED '98 are measured after compounding disodiumethylene-bis-dithiocarbamate and made as derivative. There may be a possibility of detecting other chemical substance derivative generating same sodium. (Same as for the following investigation medium.)

Note 4) Ziram mentioned in the list of SPEED '98 is measured after compounding sodium dimethyldithiocarbamate and made as derivative, so there may be a possibility of detecting other chemical substance derivative generating same sodium.

3. Aquatic animals (Fish)

(1) All aquatic animals to be analyzed are fish, and they are mainly daces (14 specimens) and crucians (14 specimens). Specimens of these two fish amount to about 60% of the total specimen (48 specimens) and specimen numbers of other fish type are few, distributing from 1 to 7 specimens.

(2) Any of the substances are detected from 156 specimens out of about 2300 specimens. (Detection ratio 6.9%)

(3) When classified by substances, Kelthane, Trifluralin, Permethrin and Carbendazim are detected from total 13 specimens, which are registered as agricultural chemicals in Japan. As substances not registered as agricultural chemicals, p,p'-DDE, p,p'-DDD, HCB, trans-Chlordane, cis-chlordane, trans-Nonachlor, and PCP are detected from total 143 specimens. Especially, trans-Nonachlor (43 specimens) and p,p'-DDE (31 specimens) are detected in high frequency. These detected substances are used for purposes other than agricultural chemicals or are their metabolism.

(4) Among the detected substances, each substance not registered as agricultural chemicals presently, excluding PCP has been investigated for aquatic animals before and has been detected. Detection density compared to the past investigation is almost the same, but the detection density of p,p'-DDE this time is lower compared to the past detection result.

(5) For the investigation this time, target specimens are decided so that it can be sampled in each investigation point and that enough specimens can be secured, for the indices of environmental monitoring. Analyzed specimens are homogenized and adjusted for the whole target.

4. Soils

(1) Specimen soils are mainly sampled from the land possessed by the self-government body, which can be easily gain cooperation for sampling.

(2) Any of the substances are detected from 207 specimens out of about 8,900 specimens. (Detection ratio 2.3%)

(3) When classified by substances, PCP, p,p'-DDT, o,p'-DDT, p,p'-DDE, p,p'-DDD, HCB, -HCH, trans-chlordane, and Oxychlordane are detected from total 26 specimens as substances not registered as agricultural chemicals among substances of agricultural chemical shown in Table 1 and Atrazin, CAT, Malathion, Carbendazim, total quantity of "Manzeb, Maneb, Zineb" (refer to Note 3), and Permethrin are detected from 16 specimens as substances registered as agricultural chemicals actually in Japan.

For substances other than agricultural chemicals shown in Table 2, Polychlorinated

biphenyl (7 substances), Alkyl phenol (2 substances), Bisphenol A, Di-(2-ethylhexyl) phthalate, Butyl benzyl phthalate, Di-n-butyl phthalate, Benzophenone, 4-Nitrotoluene, Styrene dimer and trimer (1 substance), and n-Butylbenzene are detected from total of 165 specimens.

5. Analysis procedure

Analysis procedure is made in accordance with "Analysis Procedure of Environment Residual Situation of Agricultural Chemicals" which is specified as an analysis method to be able to measure many ingredients effectively at the same time and can deal measurement of a very small quantity of ingredients. Detection limit for each substances are as shown in Table 3. For those analysis method, detection limit and accuracy controls are examined by the expert of agricultural chemical analysis, out of the institution in charge of the analysis and are considered to be appropriate.

IV Necessity of Further Investigations

(1) Agricultural chemicals investigated this time are the chemical substances indicated as a result of investigations of many scientific documents by the "Research group related to environmental endocrine disruptors" settled in March 1997 by the Environment Agency. However, existence of disruptor function, its strength and mechanisms are not yet been made clear and the further promotion of investigation research is important. The Environment Agency is going to gain further scientific information, develop methods to decide whether there is endocrine disruptor function (screening test method) and make investigation using the developed procedure.

(2) As for this investigation result, detail analysis will be made including the necessity of supplement investigation to study for the further measure.

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Table 1 List of investigated compounds

No.

Substance name

Registration* 1

Water quality investigation

1st

2nd

3rd

Sediments

Animals

Soils

(表の番号順)

Hexachlorobenzene (HCB)

Pentachlorophenol (PCP)

2,4,5 Trichlorophenoxyacetic

2,4 Dichlorophenoxyacetic

Amitrole

Atrazine

Arachlor
 CAT
 Hexachlorocyclohexane
 Ethyl parathion
 NAC
 Chlordane (cis, trans)
 Oxychlordane
 trans-Nonachlor
 1,2-dibromo-3-chloropropane
 DDT (o,p' body and p,p' body)
 DDE and DDD (each o,p' body and p,p' body)
 Kelthane
 Aldrin
 Endrin
 Dieldrin
 Endosulfan (Benzoepin) (、 、 SO₂ body)
 Heptachlor
 Heptachlor epoxide
 Malathion
 Methomyl *2
 Methoxychlor
 Nitrofen
 Trifluralin
 Carbendazim *3
 Manzeb (Mancozeb) *4
 Maneb *4
 Metribuzin
 Cypermethrin
 Fenvalerate *5
 Permethrin
 Vinclozolin
 Zineb *4
 Ziram *6

Note 1: Column marked with is an agricultural chemical now registered and has a result of sales in Japan; marked is a substance which had been registered but now has lost effect; marked is a metabolism of agricultural chemical which had been registered before or has not been registered as an agricultural chemical in Japan but was used for other than agricultural chemical.

2: Chemical substances having chemical construction similar to Methomil generates Methomil as metabolism. Therefore, they are measured as total quantity of Methomil that are derived from those substances.

3: Benomyl decomposes quickly to Carbendazim in environment. Also chemical substances having similar chemical construction generate Carbendazim as metabolite. As it is determined as Carbendazim in this investigation and measured totally as Carbendazim originated from these similar compounds, it is denoted as Carbendazim.

4: Manzeb, Maneb and Zineb are measured totally as they are measured after compounding disodiumethylene-bis-dithiocarbamate and made as derivative. There may be a possibility of detecting other chemical substance derivative generating same sodium.

5: Esfenvalerate is measured as Fenvalerate. Therefore, when Fenvalerate is detected, Esfenvalerate is analyzed separately. Though Esfenvalerate is registered, it has no result of sales in Japan.

6: Ziram is measured after compounding sodium dimethyldithiocarbamate and made as derivative, so there may be a possibility of detecting other chemical substance derivative generating same sodium.

7: As Mirex, Toxaphene, Aldicarb, and Kepone mentioned in SPEED '98 has no registration result in Japan and has no other use than agricultural chemicals and as Metiram has no residue analysis method to gain quantitative analysis in relation with impurities derived from nature when sampled from beverages, they are excluded from the investigation target.

Table 1 List of investigated compounds

No.	SPEED '98No.	Substance name	Registration *1	Water quality investigation			Sediments	Animals	Soils
				1st	2nd	3rd			
1	4	Hezachlorobenzene(HCB)	▲	○	—	—	○	○	○
2	5	Pentachlorophenol(PCP)	●	○	—	—	○	○	○
3	6	2,4,5Trichlorophenoxyacetic	●	○	—	—	○	○	○
4	7	2,4Dichlorophenoxyacetic	◎	○	○	○	○	○	○
5	8	Amitrole	●	○	○	○	○	○	○
6	9	Atrazine	◎	○	○	○	○	○	○
7	10	Arachlor	◎	○	○	○	○	○	○
8	11	CAT	◎	○	○	○	○	○	○
9	12	Hexachlorocyclohexane	●	○	—	—	○	○	○
10	12	Ethyl parathion	●	○	—	—	○	○	○
11	13	NAC	◎	○	○	○	○	○	○
12	14	Chlordane(cis,trans)	●	○	—	—	○	○	○
13	15	Oxychlordane	▲	○	—	—	○	○	○
14	16	trans-Nonachlor	▲	○	—	—	○	○	○
15	17	1,2-dibromo-3-chloropropane	●	○	—	—	○	○	○
16	18	DDT(o,p'body and p, p' body)	●	○	—	—	○	○	○
17	19	DDE and DDD(eacho, p'body)	▲	○	—	—	○	○	○
18	20	Kelthane	◎	○	○	○	○	○	○
19	21	Aldrin	●	○	—	—	○	○	○
20	22	Endrin	●	○	—	—	○	○	○
21	23	Dieldrin	●	○	—	—	○	○	○
22	24	Endosulfan(Benzoepin)(α 、 β 、	◎	○	○	○	○	○	○
23	25	Heptachlor	●	○	—	—	○	○	○
24	26	Heptachlor epoxide	▲	○	—	—	○	○	○
25	27	Malathion	◎	○	○	○	○	○	○
26	28	Methomyl*2	◎	○	○	○	○	○	○
27	29	Methoxychlor	●	○	—	—	○	○	○
28	35	Nitrofen	●	○	—	—	○	○	○
29	32	Trifluralin	◎	○	○	○	○	○	○
30	50	Carbendazim*3	◎	○	○	○	○	○	○
31	52	Manzeb(Mancozeb)*4	◎	○	○	○	○	○	○
32	53	Maneb*4	◎	○	○	○	○	○	○
33	55	Metribuzin	◎	○	○	○	○	○	○
34	56	Cypermethrin	◎	○	○	○	○	○	○
35	58	Fenvalerate*5	◎	○	○	○	○	○	○
36	59	Permethrin	◎	○	○	○	○	○	○
37	60	Vinclozolin	●	○	—	—	○	○	○
38	61	Zineb*4	◎	○	○	○	○	○	○
39	62	Ziram*6	◎	○	○	○	○	○	○

Note 1: Column marked with is an agricultural chemical now registered and has a result of sales in Japan; marked is a substance which had been registered but now has lost effect; marked is a metabolism of agricultural chemical which had been registered before or has not been registered as an agricultural chemical in Japan but was used for other than agricultural chemical.

2: Chemical substances having chemical construction similar to Methomil generates Methomil as metabolism. Therefore, they are measured as total quantity of Methomil that are derived from those substances.

3: Benomyl decomposes quickly to Carbendazim in environment. Also chemical substances having similar chemical construction generate Carbendazim as metabolite. As it is determined as Carbendazim in this investigation and measured totally as Carbendazim originated from these similar compounds, it is denoted as Carbendazim.

4: Manzeb, Maneb and Zineb are measured totally as they are measured after compounding disodiumethylene-bis-dithiocarbamate and made as derivative. There may be a possibility of detecting other chemical substance derivative generating same sodium.

5: Esfenvalerate is measured as Fenvalerate. Therefore, when Fenvalerate is detected, Esfenvalerate is analyzed separately. Though Esfenvalerate is registered, it has no result of sales in Japan.

6: Ziram is measured after compounding sodium dimethyldithiocarbamate and made as derivative, so there may be a possibility of detecting other chemical substance derivative generating same sodium.

7: As Mirex, Toxaphene, Aldicarb, and Kepone mentioned in SPEED '98 has no registration result in Japan and has no other use than agricultural chemicals and as Metiram has no residue analysis method to gain quantitative analysis in relation with impurities derived from nature when sampled from beverages, they are excluded from the investigation target.

Table 2 List of investigated compounds (additional substances in soil)

No.	SPEED'98	Substance name	Use
40	2	Polychlorinated biphenyl (PCB)	Heat medium, non-carbon paper, electric product
41	3	Polybromobiphenyl (PBB)	Fire retardant
42	36	Alkylphenol (C5 ~ C9)	Raw material for surface-active agents/decomposition product
43	37	Bisphenol A	Raw material for resins
44	38	Di-(2-ethylhexyl)phthalate	Raw material for Plastics
45	39	Butyl benzyl phthalate	Raw material for Plastics
46	40	Di-n-butyl phthalate	Raw material for Plastics
47	41	Dicyclohexyl phthalate	Raw material for Plastics
48	42	Diethyl phthalate	Raw material for Plastics
49	43	Benzo(a)pyrene	(Unintended product)
50	44	2,4-Dichlorophenol	Dye intermediate
51	45	Diethylhexyl adipate	Plasticizer for plastics
52	46	Benzophenone	Synthetic raw materials for medical products, perfume, etc.
53	47	4-Nitrotoluene	2,4 dinitrotoluene intermediate
54	48	Octachlorostyrene	(By-product of organic chlorine compound)
55	63	Dipentyl phthalate	
56	64	Dihexyl phthalate	
57	65	Dipropyl phthalate	
58	66	Styrene dimer and trimer	Non-reacting substance of styrene-rubber plastic
59	67	n-Butylbenzene	Synthesis intermediate, for liquid crystal manufacture

Note 1: Tributyltin and Triphenyltin are excluded from investigation target of soils.

Note 2: Usages are in accordance with SPEED '98.

Table 3 Outline of the investigation result

No.	SPEED'98 No.	Substance name 1.	Investigation medium2.	Detection limit μ g/kg (L)	Measurement result (μ g/kg(L))	Detection ratio		Beverage standard μ g/L
				μ g/kg(L)	Min ~ Max	Detected numbers / Specimen numbers	Detection ratio	
. Substance related to agricultural chemicals								
1	4	Hexachlorobenzene (HCB)	Water 1st Water 2nd Water 3rd Sediment Fish <small>dace, crucian, carp</small> Soil	0.05 10 2 5	ND ND ND ~ 16 ND ~ 5	0 / 249 0 / 0 0 / 0 0 / 94 6 / 48 1 / 94	0.0% - - 0.0% 12.5% 1.1%	1(USA)
2	5	Pentachlorophenol(PCP)	Water 1st Water 2nd Water 3rd Sediment Fish <small>ニジマス, dace</small> Soil	0.05 10 5 5	ND ND ND ~ 10 ND ~ 12	0 / 249 0 / 0 0 / 0 0 / 94 2 / 48 1 / 94	0.0% - - 0.0% 4.2% 1.1%	9(WHO, Provisional) 1(USA)
3	6	2,4,5-Trichlorophenoxyacetic (2,4,5-T)	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 10 10 5	ND ND ND ND	0 / 249 0 / 0 0 / 0 0 / 94 0 / 48 0 / 94	0.0% - - 0.0% 0.0% 0.0%	9(WHO)
4	7	2,4-Dichlorophenoxyacetic (2,4-PA)	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 0.05 0.05 10 10 5	ND ~ 1.56 ND ~ 1.15 ND ~ 0.42 ND ND ND	37 / 249 11 / 249 6 / 249 0 / 94 0 / 48 0 / 94	14.9% 4.4% 2.4% 0.0% 0.0% 0.0%	30(WHO) 70(USA)
5	8	Amitrole	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 0.05 0.05 10 10 5	ND ~ 0.90 ND ~ 0.49 ND ~ 1.06 ND ND ND	4 / 249 3 / 249 5 / 249 0 / 94 0 / 48 0 / 94	1.6% 1.2% 2.0% 0.0% 0.0% 0.0%	
6	9	Atrazine	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 0.05 0.05 10 2 1	ND ~ 0.09 ND ~ 0.09 ND ND ND ND ~ 20	6 / 249 3 / 249 0 / 249 0 / 94 0 / 48 2 / 94	2.4% 1.2% 0.0% 0.0% 0.0% 2.1%	2(WHO) 3(USA)
7	10	Arachlor	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 0.05 0.05 10 2 1	ND ND ND ~ 0.38 ND ND ND	0 / 249 0 / 249 1 / 249 0 / 94 0 / 48 0 / 94	0.0% 0.0% 0.4% 0.0% 0.0% 0.0%	20(WHO) 2(USA)
8	11	C A T	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 0.05 0.05 10 2 1	ND ~ 0.21 ND ~ 0.08 ND ~ 0.06 ND ND ND ~ 77	4 / 249 2 / 249 1 / 249 0 / 94 0 / 48 3 / 94	1.6% 0.8% 0.4% 0.0% 0.0% 3.2%	3(JPN) 2(WHO) 1(USA)
9-1	12	Hexachlorocyclohexane ()	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 10 5 5	ND ND ND ND	0 / 249 0 / 0 0 / 0 0 / 94 0 / 48 0 / 94	0.0% - - 0.0% 0.0% 0.0%	
9-2	12	Hexachlorocyclohexane ()	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 10 5 5	ND ND ND ND ~ 10	0 / 249 0 / 0 0 / 0 0 / 94 0 / 48 1 / 94	0.0% - - 0.0% 0.0% 1.1%	
9-3	12	Hexachlorocyclohexane ()	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 10 5 5	ND ND ND ND	0 / 249 0 / 0 0 / 0 0 / 94 0 / 48 0 / 94	0.0% - - 0.0% 0.0% 0.0%	7(WHO) 0.2(USA)
9-4	12	Hexachlorocyclohexane ()	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 10 5 5	ND ND ND ND	0 / 249 0 / 0 0 / 0 0 / 94 0 / 48 0 / 94	0.0% - - 0.0% 0.0% 0.0%	

Table 3 Outline of the investigation result

No.	SPEED'98 No.	Substance name 1.	Investigation medium2.	Detection limit μ	Measurement result	Detection ratio		Beverage standard μ g/L
				g/kg(L)	(μ g/kg(L))	Detected numbers / Specimen numbers	Detection ratio	
10	12	Ethyl parathion	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 20 5 1	ND ND ND ND	0 / 249 0 / 0 0 / 0 0 / 94 0 / 48 0 / 94	0.0% - - 0.0% 0.0% 0.0%	30(AUS)
11	13	N A C	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 0.05 0.05 10 2 1	ND ~ 0.39 ND ~ 0.07 ND ~ 0.09 ND ND ND	5 / 249 1 / 249 1 / 249 0 / 94 0 / 48 0 / 94	2.0% 0.4% 0.4% 0.0% 0.0% 0.0%	50(JPN)
12-1	14	Chlordane(cis-)	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 10 2 5	ND ND ND ~ 22 ND	0 / 249 0 / 0 0 / 0 0 / 94 25 / 48 0 / 94	0.0% - - 0.0% 52.1% 0.0%	0.2(WHO) 2(USA)
12-2	14	Chlordane (trans-)	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 10 2 5	ND ND ND ~ 32 ND ~ 7	0 / 249 0 / 0 0 / 0 0 / 94 25 / 48 1 / 94	0.0% - - 0.0% 52.1% 1.1%	
13	15	Oxychlordane	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 10 30 10	ND ND ND ND ~ 10	0 / 249 0 / 0 0 / 0 0 / 94 0 / 48 1 / 94	0.0% - - 0.0% 0.0% 1.1%	
14	16	trans-Nonachlor	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 10 2 10	ND ND ND ~ 149 ND	0 / 249 0 / 0 0 / 0 0 / 94 43 / 48 0 / 94	0.0% - - 0.0% 89.6% 0.0%	
15	17	1,2-dibromo-3-chloropropane (DBCP)	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 5 10 1	ND ND ND ND	0 / 249 0 / 0 0 / 0 0 / 94 0 / 48 0 / 94	0.0% - - 0.0% 0.0% 0.0%	1(WHO)
16-1	18	D D T (p,p' -)	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 5 5 10	ND ND ND ND ~ 152	0 / 249 0 / 0 0 / 0 0 / 94 0 / 48 4 / 94	0.0% - - 0.0% 0.0% 4.3%	2(WHO)
16-2	18	D D T (o,p' -)	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 5 5 10	ND ND ND ND ~ 125	0 / 249 0 / 0 0 / 0 0 / 94 0 / 48 1 / 94	0.0% - - 0.0% 0.0% 1.1%	
17-1	19	D D E (p,p' -)	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 5 5 5	ND ND ND ~ 71 ND ~ 287	0 / 249 0 / 0 0 / 0 0 / 94 31 / 48 10 / 94	0.0% - - 0.0% 64.6% 10.6%	
17-2	19	D D E (o,p' -)	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 5 5 5	ND ND ND ND	0 / 249 0 / 0 0 / 0 0 / 94 0 / 48 0 / 94	0.0% - - 0.0% 0.0% 0.0%	
17-3	19	D D D (p,p' -)	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 5 5 10	ND ND ND ~ 24 ND ~ 305	0 / 249 0 / 0 0 / 0 0 / 94 11 / 48 6 / 94	0.0% - - 0.0% 22.9% 6.4%	

Table 3 Outline of the investigation result

No.	SPEED'98 No.	Substance name 1.	Investigation medium2.	Detection limit μ	Measurement result	Detection ratio		Beverage standard μ g/L
				g/kg (L) μ g/kg(L)	(μ g/kg(L)) Min ~ Max	Detected numbers /	Specimen numbers	
17-4	19	D D D (o,p' -)	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 5 5 10	ND ND ND ND	0 / 249 0 / 0 0 / 0 0 / 94 0 / 48 0 / 94	0.0% - - 0.0% 0.0% 0.0%	
18	20	Kelthane	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 0.05 0.05 20 20 20	ND ND ND ND ND ~ 43 ND	0 / 249 0 / 249 0 / 249 0 / 94 2 / 48 0 / 94	0.0% 0.0% 0.0% 0.0% 4.2% 0.0%	100(AUS)
19	21	Aldrin	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 10 10 5	ND ND ND ND	0 / 249 0 / 0 0 / 0 0 / 94 0 / 48 0 / 94	0.0% - - 0.0% 0.0% 0.0%	0.03(WHO, total with Dieldrin)
20	22	Endrin	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 20 30 5	ND ND ND ND	0 / 249 0 / 0 0 / 0 0 / 94 0 / 48 0 / 94	0.0% - - 0.0% 0.0% 0.0%	2 (USA)
21	23	Dieldrin	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 20 30 10	ND ND ND ND	0 / 249 0 / 0 0 / 0 0 / 94 0 / 48 0 / 94	0.0% - - 0.0% 0.0% 0.0%	0.03(WHO, total with Aldrin)
22-1	24	Endosulfan ()	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 0.05 0.05 20 40 5	ND ND ND ND ND ND	0 / 249 0 / 249 0 / 249 0 / 94 0 / 48 0 / 94	0.0% 0.0% 0.0% 0.0% 0.0% 0.0%	40(AUS)
22-2	24	Endosulfan ()	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 0.05 0.05 20 30 5	ND ND ND ND ND ND	0 / 249 0 / 249 0 / 249 0 / 94 0 / 48 0 / 94	0.0% 0.0% 0.0% 0.0% 0.0% 0.0%	
22-3	24	Endosulfan(SO2 body)	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 0.05 0.05 20 10 30	ND ND ND ~ 0.06 ND ND ND	0 / 249 0 / 249 1 / 249 0 / 94 0 / 48 0 / 94	0.0% 0.0% 0.4% 0.0% 0.0% 0.0%	
23	25	Heptachlor	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 10 10 5	ND ND ND ND	0 / 249 0 / 0 0 / 0 0 / 94 0 / 48 0 / 94	0.0% - - 0.0% 0.0% 0.0%	0.03(WHO, total with Epoxide) 0.4(USA)
24	26		Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 10 10 10	ND ND ND ND	0 / 249 0 / 0 0 / 0 0 / 94 0 / 48 0 / 94	0.0% - - 0.0% 0.0% 0.0%	0.03(WHO, total with Hptachlor) 0.2(USA)
25	27	Malathion	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 0.05 0.05 10 2 1	ND ~ 0.32 ND ~ 0.07 ND ~ 0.07 ND ND ND ~ 6	3 / 249 3 / 249 1 / 249 0 / 94 0 / 48 2 / 94	1.2% 1.2% 0.4% 0.0% 0.0% 2.1%	10(JPN, environment water)
26	28	Methomyl	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 0.05 0.05 10 2 2	ND ~ 0.30 ND ~ 0.65 ND ~ 0.15 ND ND ND	10 / 249 11 / 249 4 / 249 0 / 94 0 / 48 0 / 94	4.0% 4.4% 1.6% 0.0% 0.0% 0.0%	200(USA)

Table 3 Outline of the investigation result

No.	SPEED '98 No.	Substance name 1.	Investigation medium2.	Detection limit μ	Measurement result	Detection ratio		Beverage standard μ g/L
				g/kg (L) μ g/kg(L)	(μ g/kg(L)) Min ~ Max	Detected numbers /	Specimen numbers	
27	29	Methoxychlor	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 5 20 10	ND ND ND ND	0 / 249 0 / 0 0 / 0 0 / 94 0 / 48 0 / 94	0.0% - - 0.0% 0.0% 0.0%	20(WHO) 40(USA)
28	31	Nitrofen	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 10 2 1	ND ND ND ND	0 / 249 0 / 0 0 / 0 0 / 94 0 / 48 0 / 94	0.0% - - 0.0% 0.0% 0.0%	
29	35	Trifluralin	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 0.05 0.05 10 2 1	ND ND ND ~ 0.05 ND ND ~ 4 ND	0 / 249 0 / 249 1 / 249 0 / 94 8 / 48 0 / 94	0.0% 0.0% 0.4% 0.0% 16.7% 0.0%	20(WHO)
30	50	Carbendazim	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.07 0.07 0.05 3 2 1	ND ~ 0.3 ND ~ 0.76 ND ~ 0.48 ND ~ 12 ND ~ 4 ND ~ 15	16 / 249 9 / 249 17 / 249 8 / 94 1 / 48 6 / 94	6.4% 3.6% 6.8% 8.5% 2.1% 6.4%	200(AUS, as Benomyl) 3(GBR,as Carbendazim)
31 32 38	52 53 61	Manzeb Manzeb Zineb	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.2 0.2 0.2 10 10 10	ND ND ND ND ~ 100 ND ND ~ 135	0 / 249 0 / 249 0 / 249 9 / 94 0 / 48 2 / 94	0.0% 0.0% 0.0% 9.6% 0.0% 2.1%	1(GBR) 1(GBR) 30(AUS)
33	55	Metribuzin	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 0.05 0.05 10 5 1	ND ND ND ND ND ND	0 / 249 0 / 249 0 / 249 0 / 94 0 / 48 0 / 94	0.0% 0.0% 0.0% 0.0% 0.0% 0.0%	
34	56	Cypermethrin	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 0.05 0.05 10 8 2	ND ND ND ND ND ND	0 / 249 0 / 249 0 / 249 0 / 94 0 / 48 0 / 94	0.0% 0.0% 0.0% 0.0% 0.0% 0.0%	
35	58	Fenvalerate (Including 57 Esfenvalerate)	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 0.05 0.05 10 10 2	ND ND ND ND ND ND	0 / 249 0 / 249 0 / 249 0 / 94 0 / 48 0 / 94	0.0% 0.0% 0.0% 0.0% 0.0% 0.0%	40(AUS)
36	59	Permethrin	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 0.05 0.05 20 8 2	ND ND ND ND ND ~ 9 ND ~ 9	0 / 249 0 / 249 0 / 249 0 / 94 2 / 48 1 / 94	0.0% 0.0% 0.0% 0.0% 4.2% 1.1%	20(WHO) 300(AUS)
37	60	Vinclozolin	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.05 20 10 1	ND ND ND ND	0 / 249 0 / 0 0 / 0 0 / 94 0 / 48 0 / 94	0.0% - - 0.0% 0.0% 0.0%	
39	62	Ziram	Water 1st Water 2nd Water 3rd Sediment Fish Soil	0.2 0.2 0.2 10 10 10	ND ND ND ND ~ 50 ND ND	0 / 249 0 / 249 0 / 249 2 / 94 0 / 48 0 / 94	0.0% 0.0% 0.0% 2.1% 0.0% 0.0%	

Table 3 Outline of the investigation result

No.	SPEED'98 No.	Substance name	Investigation medium	Detection limit μg/kg(L)	Measurement result (μg/kg(L)) Min ~ Max	Detection ratio		Detection ratio
						Detected numbers	Specimen numbers	
. Other than agricultural chemicals (Soil)								
40	2	Polychlorinated biphenyl (PCB)						
		C11	Soil	1	ND	0 / 94		0.0%
		C12	Soil	1	ND	0 / 94		0.0%
		C13	Soil	1	ND ~ 2	3 / 94		3.2%
		C14	Soil	1	ND ~ 131	5 / 94		5.3%
		C15	Soil	1	ND ~ 368	6 / 94		6.4%
		C16	Soil	1	ND ~ 269	6 / 94		6.4%
		C17	Soil	1	ND ~ 122	5 / 94		5.3%
		C18	Soil	1	ND ~ 28	4 / 94		4.3%
		C19	Soil	1	ND ~ 2	1 / 94		1.1%
		C110	Soil	1	ND ~ 0	0 / 94		0.0%
		Total of Polychlorinated biphenyl	Soil		ND ~ 825	6 / 94		6.4%
41	3	Polybromobiphenyl (PBB)						
		Br1	Soil	1	ND	0 / 94		0.0%
		Br2	Soil	1	ND	0 / 94		0.0%
		Br3	Soil	1	ND	0 / 94		0.0%
		Br4	Soil	1	ND	0 / 94		0.0%
		Br5	Soil	1	ND	0 / 94		0.0%
		Br6	Soil	1	ND	0 / 94		0.0%
		Br10	Soil	5	ND	0 / 94		0.0%
42	36	Alkyl phenol						
		4-t-Butyl phenol	Soil	5	ND ~ 6	1 / 94		1.1%
		4-n-Pentyl phenol	Soil	5	ND ~ 15	1 / 94		1.1%
		4-n-Hexyle phenol	Soil	5	ND	0 / 94		0.0%
		4-n-Oxyl phenol	Soil	5	ND	0 / 94		0.0%
		4-t-Oxyl phenol	Soil	5	ND	0 / 94		0.0%
		4-n-Heptyl phenol	Soil	5	ND	0 / 94		0.0%
		Nonyl phenol	Soil	50	ND	0 / 94		0.0%
43	37	Bisphenol A	Soil	5	ND ~ 2700	2 / 94		2.1%
44	38	Di-(2-ethylhexyl) phthalate	Soil	10	ND ~ 335	53 / 94		56.4%
45	39	Butyl benzyl phthalate	Soil	10	ND ~ 599	8 / 94		8.5%
46	40	Di-n-butyl phthalate	Soil	10	ND ~ 816	48 / 94		51.1%
47	41	Dicyclohexyl phthalate	Soil	10	ND	0 / 94		0.0%
48	42	Diethyl phthalate	Soil	10	ND	0 / 94		0.0%
55	63	Di-n-pentyl phthalate	Soil	10	ND	0 / 94		0.0%
56	64	Dihexyl phthalate	Soil	10	ND	0 / 94		0.0%
57	65	Di-n-propyl phthalate	Soil	10	ND	0 / 94		0.0%
49	43	Benzo (s)pyrene	Soil	5	ND	0 / 94		0.0%
50	44	2,4-Dichlorophenol	Soil	5	ND	0 / 94		0.0%
51	45	Diethylhexyl adipate	Soil	10	ND	0 / 94		0.0%
52	46	Benzophenone	Soil	1	ND ~ 3	8 / 94		8.5%
53	47	4-Nitrotoluen	Soil	1	ND ~ 2	7 / 94		7.4%
54	48	Octa chlorostyrene	Soil	10	ND	0 / 94		0.0%
58	66	Styrenes						
		Diphenylpropane	Soil	5	ND	0 / 94		0.0%
		Diphenylbutene	Soil	5	ND	0 / 94		0.0%
		Diphenylcyclobutane	Soil	5	ND	0 / 94		0.0%
		Triphenyl hexane	Soil	5	ND ~ 7	2 / 94		2.1%
		Tetralin (1)	Soil	5	ND	0 / 94		0.0%
		Tetralin (2)	Soil	5	ND	0 / 94		0.0%
		Tetralin (3)	Soil	5	ND	0 / 94		0.0%
		Tetralin (4)	Soil	5	ND	0 / 94		0.0%
59	67	n-Butylbenzene	Soil	1	ND ~ 3	5 / 94		5.3%

合計			Water 1st			85 / 11,703	0.7%
			Water 2nd			43 / 4,980	0.9%
			Water 3rd			38 / 4,980	0.8%
			Sediment			19 / 4,418	0.4%
			Fish			156 / 2,256	6.9%
			Soil			207 / 8,930	2.3%