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THIN-LAYER CHROMATOGRAPHY OF PESTICIDES AND RELATED COMPOUNDS ON FLORISIL

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SUMMARY

The behaviour of a number of pesticides and related compounds has been studied by thin-layer chromatography (TLC) on Florisil in five different solvents. As Florisil is used as a cleanup prior to final analysis of pesticide residues, an attempt has been made to relate the behaviour of these compounds on Florisil TLC to their elution volume on a Florisil column. From the R_F values obtained by TLC it could be seen which solvents would be required to elute the compounds from a Florisil column.

INTRODUCTION

The use of column chromatography as a cleanup method in residue analysis is of considerable interest to the pesticide chemist. Because of its high selectivity Florisil¹⁻⁷ (registered trade mark of Floridin Co.) is one of the most extensively used adsorbents for this type of analysis.

As Florisil TLC has basically the same physical properties as the Florisil used for cleanup it seemed that the R_F values of pesticides on Florisil TLC in a number of solvents could be used to indicate which solvent to use in a residue cleanup procedure on a Florisil column. A fairly extensive range of pesticides was selected. The polarities of the pesticides chosen range from the chlorinated hydrocarbons with no functional groups to compounds with phenolic and amino groups which are more strongly held on the Florisil.

SANS⁶ has used a Florisil column to separate pesticides into different groups for subsequent determination by gas chromatography. Our aim was rather to find a solvent which would allow cleanup of a particular pesticide whose behaviour on Florisil was not known.

EXPERIMENTAL

Apparatus and reagents

Thin-layer chromatographic plates. Glass plates, 20 × 20 cm, were spread with a slurry of Florisil (20.0 g Florisil TLC + 52 ml cold distilled water for five plates) to a thickness of 0.25 mm. After air drying the plates were stored in an atmosphere of 40 % relative humidity at 25°.

Chromatographic columns. Chromatographic columns used were of 2.0 cm I.D. incorporating sintered glass plugs and Teflon stopcocks.

Solvents. Five solvent systems were used throughout the investigation. These were hexane (b.p. 62–68°), diethyl ether–hexane (6:94, v/v), diethyl ether–hexane (15:85, v/v), toluene and acetone–toluene (1:9, v/v). Laboratory reagent grade solvents were used in each case.

Pesticides. Many compounds were used in the pure state; others were technical grade material. In these cases the largest spot formed was taken as the compound of interest. In the case of chlordane a number of spots was recorded.

Thin-layer chromatography adsorbent. Florisil TLC (Floridin Co., 2 Gateway Centre, Pittsburgh 22, Pa., U.S.A.).

Column chromatography adsorbent. Florisil 60–80 mesh, 660° factory treated (Floridin Co., 2 Gateway Centre, Pittsburgh 22, Pa., U.S.A.).

Chromogenic reagents. (1) Silver nitrate reagent prepared according to MITCHELL⁸. (2) 4-(*p*-Nitrobenzyl)-pyridine reagent according to WATTS⁹. (3) Iodine vapour.

Procedure

Thin-layer chromatography. The compounds being investigated were prepared for spotting by dissolving 2 mg of each compound in 2 ml of acetone. Five microlitres of these solutions were spotted 2.5 cm from the bottom of the plate.

To ensure constant working conditions, trifluralin, *p*-phenylazoaniline and *N,N*-dimethyl-*p*-phenylazoaniline were used as markers. In the hexane system trifluralin alone was used, since the dyes remained at the origin.

After spotting, the plates were again stored in an atmosphere of 40% relative humidity at 25° for a minimum of 24 h. Equilibration of plates at constant relative humidity before use was found necessary as changes in atmospheric humidity produced variable R_F values, particularly with low polarity solvents.

Saturation of the solvent tanks was ensured by lining the walls with filter paper and allowing the solvent to stand in the chamber overnight before use. A portion of the adsorbent 15 cm from the sample origin was scraped off and the solvent run to this line using the overrunning technique of DALLAS¹⁰. Similar portions of adsorbent were scraped off on both sides of the plates to minimise edge effect. Development time ranged from 15 to 20 min, depending on the solvent system used. After development the plates were air dried.

Detection

Halogens. The method used was similar to that of HAMILTON¹¹. After air drying, the plates were exposed to unfiltered ultraviolet radiation from a medium pressure mercury arc (300 W) for 30 min. The plates were then sprayed with the silver nitrate chromogenic reagent and further exposed under the ultraviolet light for 1 min, after which the halogenated (bromine and chlorine) compounds appeared as dark brown spots.

Organophosphates. The method followed was that of WATTS⁹. The plates were sprayed with a solution of 2% 4-(*p*-nitrobenzyl)-pyridine in redistilled acetone and, after evaporation of the acetone, placed in an oven at 110° for 5 min. While still warm the plates were sprayed lightly with a solution of 2% tetraethylenepentamine in redistilled acetone until spots appeared. All organophosphates appeared as blue spots except diazinon, which gave a red colour.

TABLE I

 R_F VALUES ($\times 100$) OF PESTICIDES AND RELATED COMPOUNDS USING VARIOUS SOLVENT SYSTEMS

Sample No.	Common name	Hexane	Diethyl ether-hexane (6:94, v/v)	Diethyl ether-hexane (15:85, v/v)	Toluene	Acetone-toluene (1:9, v/v)
1	Hexachlorobenzene	70	76	80	90	90
2	Aldrin	61	71	77	90	90
3	Chlordane	52, 45, 37, 28, 20	69, 48, 22	75, 64, 57	90	90
4	DDE	51	69	80	87	88
5	Isobenzan	48	71	78	90	90
6	1-Chloro-2,2-bis(4-chlorophenyl)ethylene	48	69	78	88	89
7	Quintozene	43	68	82	87	89
8	DDT	40	58	67	87	88
9	α -BHC	35	61	68	85	86
10	γ -BHC	26	51	61	86	87
11	TDE	24	46	63	83	86
12	Trifluralin	19	74	76	88	88
13	Pentachlorophenyl acetate	19	55	65	80	87
14	Benfluralin	12	63	74	83	90
15	Bromophos-ethyl	13	57	64	83	84
16	Dichlofenthion	7	57	65	78	89
17	Dursban®	3	55	65	77	89
18	Fenoprop butyl	3	50	60	74	87
19	4,4'-Dichlorobenzophenone	2	47	58	63	87
20	Endrin	9	39	57	74	85
21	Dieldrin	7	39	53	75	85
22	Ethion	2	33	50	79	89
23	Dicofol	4	(50) 32	(60) 48	63	87
24	Fenoprop methyl	4	34	48	62	84
25	2,4,5-T <i>n</i> -butyl	2	31	50	57	86
26	Dinocap	0	30	50	61	88
27	2,4,5-T isobutyl	0	32	50	52	87
28	2,4,5-T isopropyl	0	32	50	53	87
29	Tetradifon	2	30	47	65	87
30	Bromoxynil octanoate	0	28	46	57	86
31	2,4,5-T <i>n</i> -propyl	0	27	45	49	87
32	Nitrofen	2	26	43	78	85
33	N,N-Dimethyl- <i>p</i> -phenylazoaniline	0	26	41	42	84
34	2,4,5-T ethyl	0	25	41	43	86
35	2,4-D <i>sec</i> -butyl	0	23	44	51	83
36	Parathion	4	23	38	51	85
37	2,4-D isobutyl	0	21	39	43	86
38	Dicloran	2	21	25	45	73
39	2,4-D <i>n</i> -butyl	0	20	37	47	84
40	2,4-D isopropyl	0	19	38	46	84
41	2,4,5-T methyl	1	18	33	43	82
42	2,4-D ethyl	0	17	31	43	82
43	Phenothiazine	1	16	28	65	75
44	2,4-Dichlorophenol	4	18	27	37	59
45	δ -BHC	4	14	28	80	84
46	Diazinon	2	14	28	30	84
47	2,4-D methyl	0	13	21	32	79
48	2,4,5-T butoxyethyl	0	11	23	26	83
49	α -Naphthol	2	11	23	29	63
50	3,4-Dichloroaniline	4	7	13	42	84
51	Mercaptodimethur	0	7	22	23	65

TABLE I (continued)

Sample No.	Common name	Hexane	Diethyl ether-hexane (6:94, v/v)	Diethyl ether-hexane (15:85, v/v)	Toluene	Acetone-toluene (1:9 v/v)
52	Dioxathion	3	8	17	32	86
53	Malathion	2	5	14	22	79
54	2,4-D butoxyethyl	0	4	13	14	84
55	Folpet	0	0	12	27	80
56	<i>p</i> -Phenylazoaniline	0	4	10	24	68
57	Trichlorophenol	2	3	4	13	86
58	Captan	0	0	6	13	70
59	Linuron	0	2	5	11	68
60	Dithianon	0	0	0	13	81
61	Imidan®	0	0	3	10	73
62	Carbaryl	0	(11) 1	(24) 4	(30) 11	(64) 53
63	Ametryne	1	4	6	10	59
64	2,4-Dichlorophenoxyethanol	0	2	3	8	52
65	Propazine	0	0	5	6	60
66	Azinphos-ethyl	0	0	4	5	73
67	Azinphos-methyl	0	0	2	4	68
68	Atrazine	0	2	4	5	60
69	Thiram	0	2	5	8	45
70	Dazomet	0	0	1	8	45
71	Simazine	0	0	0	1	43
72	Cyolane®	0	2	3	3	41
73	4-Nitrophenol	1	3	4	5	35
74	Crotoxyphos	0	0	0	0	41
75	Demeton-methyl	0	0	1	3	39
76	Diuron	0	0	0	0	41
77	Bromacil	0	0	0	0	41
78	Monuron	0	0	0	0	35
79	Fluometuron	0	0	2	3	33
80	1,1-Bis-(4-hydroxyphenyl)-2,2,2-trichloroethane	0	0	0	0	26
81	Methomyl	0	0	0	6	25
82	Fenuron	0	0	0	3	25
83	Haloxon	0	0	0	0	25
84	Coumaphos	0	0	5	6	14
85	Dimethoate	0	0	0	2	17
86	Thiabendazole	0	0	0	0	11
87	Warfarin	0	0	0	0	11
88	Trichlorfon	0	0	0	0	7
89	Pentachlorophenol	0	0	0	0	7
90	Amitrole	0	0	0	0	0

Miscellaneous. Compounds other than halogenated pesticides and organophosphates were detected with iodine vapour. When using this method, the plates were left in a chamber of iodine vapour until spots appeared and marked immediately after removal.

Before the R_F values were calculated, all markers were compared to ensure minimum variation among plates. Plates were discarded if the R_F values of the marker dyes exceeded ± 0.02 of an R_F unit from the average. Relative R_F values were calculated with respect to a particular marker and then converted to true R_F values based on the average position of the marker. The compounds were then tabulated in order of increasing polarity. The polarity order was determined by firstly considering the R_F

values of the compounds in hexane. These R_F values were then listed in decreasing order to a level of approximately 0.1. From this point the polarity was determined by the R_F values in diethyl ether-hexane (6:94, v/v) to approximately the same level and the process repeated with all solvents.

Column chromatography

Before use, the Florisil was heated at 130° for 24 h. Florisil was then packed dry into the column to a height of 18 cm from the sintered glass plug. A 1 cm layer of anhydrous sodium sulphate was placed above the dry Florisil.

One hundred millilitres of hexane were added to the column and the flow stopped when the solvent reached the sodium sulphate level.

Several compounds were selected, of varying polarity, and transferred to the column with a small volume of hot hexane. These compounds were then eluted using 200 ml of each of the five solvents in the following order: hexane, diethyl ether-hexane (6:94, v/v), diethyl ether-hexane (15:85, v/v), toluene and acetone-toluene (1:9, v/v).

Fractions of 25 ml were collected on an automatic fraction collector so that all eluting solvents were recovered.

After concentration, each 25 ml fraction was spotted on silica gel thin-layer plates (0.25 mm) for identification. The detection procedure used on silica gel was identical to that used for Florisil. The order in which compounds were eluted was thus able to be determined.

DISCUSSION

The range of compounds studied included insecticides, acaricides, fungicides, herbicides and some possible decomposition products. Also included were some derivatives, *e.g.* pentachlorophenyl acetate, since in some cases it is useful to carry out cleanup after the derivatives have been formed.

Because of its lower toxicity, toluene was used rather than benzene. Halogenated solvents such as chloroform were not used, as possible decomposition products on the alkaline column could interfere if compounds were to be further analysed by gas chromatography using the electron capture detection system.

As stated in the experimental procedure, Table I lists the compounds studied in a type of polarity series starting with the compounds with no functional group to those compounds with polar functional groups. It is important to note that the series in Table I is not necessarily a true polarity series as Florisil, because of its basic property, would tend to hold compounds of an acidic nature more strongly.

From Fig. 1 it can be seen that using the solvent systems specified, the compounds should be eluted from the Florisil column in the same order as they are listed in Table I. Fig. 1 also shows in which solvent the compounds are eluted.

Table I can thus be roughly sub-divided showing which compounds will be eluted in the different solvent systems. It is, however, important to note that such a sub-division of Table I should not be taken as exact for all conditions, because different batches of Florisil have been shown to vary in activation^{12,13}.

Compounds having an R_F value greater than approximately 0.4 in a particular solvent on Florisil TLC will be eluted by that solvent on the Florisil column. For

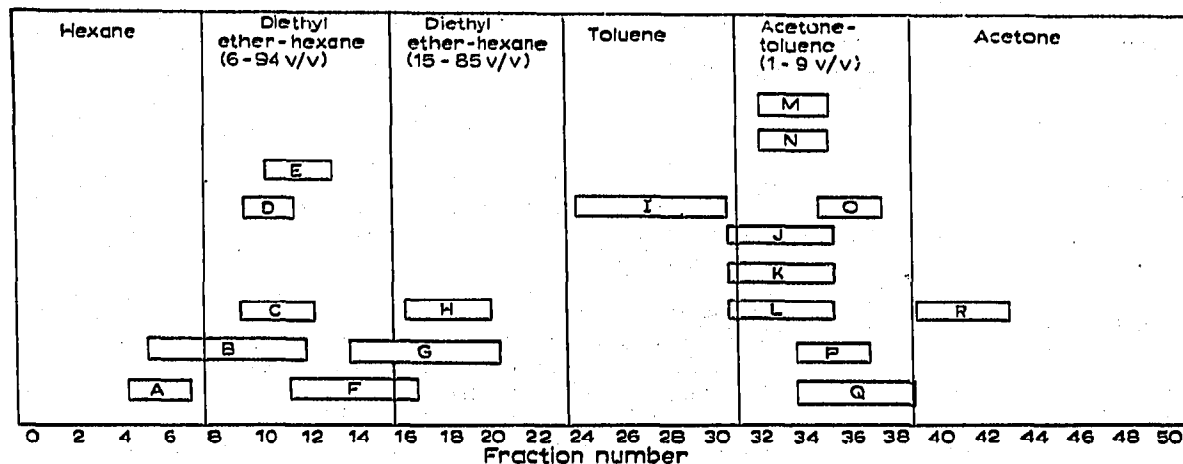


Fig. 1. Elution of pesticides from a Florisil column. 25 ml fractions are collected on an automatic fraction collector from an 18.0 cm (2.0 cm I.D.) column. (A) DDE; (B) DDT; (C) γ -BHC; (D) trifluralin; (E) bromophos-ethyl; (F) 4,4'-dichlorobenzophenone; (G) dieldrin; (H) fenoprop methyl; (I) 2,4-D butyl; (J) 2,4-D methyl; (K) 2,4-D ethyl; (L) 2,4,5-T methyl; (M) 2,4-D butoxyethyl; (N) 2,4,5-T butoxyethyl; (O) bromacil; (P) diuron; (Q) monuron; (R) trichlorfon.

example, if a compound has an R_F value greater than 0.4 in hexane it will be eluted by hexane on the column. Compounds with an R_F value less than 0.4 in hexane but with a value greater than 0.4 in diethyl ether-hexane (6:94, v/v) will be eluted by diethyl ether-hexane (6:94, v/v) when the column has been previously washed with 200 ml of hexane. γ -BHC, for example, has an R_F value of 0.26 in hexane and 0.51 in diethyl ether-hexane (6:94, v/v) and is eluted by diethyl ether-hexane (6:94, v/v) from the column. Compounds with R_F values close to 0.4 will be eluted on the overlap between two different solvents, e.g. dieldrin with an R_F value of 0.39 in diethyl ether-hexane (6:94, v/v) is eluted over the interface between diethyl ether-hexane (6:94, v/v) and diethyl ether-hexane (15:85, v/v). As toluene is only slightly more polar than diethyl ether-hexane (15:85, v/v) only a small number of compounds are eluted by this solvent. Those compounds with an R_F value of less than 0.4 in acetone-toluene (1:9, v/v), e.g. methomyl (0.25), can be removed by flushing the column with acetone.

Since the activation of Florisil TLC is different from that of the Florisil used in cleanup, the relationship between the R_F value of 0.4 and the retention volume is purely empirical, based on experimental results.

Because only 200 ml of each solvent were used in the column chromatography procedure, a compound eluted on the interface between two solvent systems, e.g. DDT could be fully eluted by continuing with the less polar solvent.

When studying pesticides of reasonably high polarity e.g. 2,4-D butyl ester, it is necessary only to use a solvent which will elute this compound, e.g. toluene, providing other pesticides of lower polarity are not present to the extent that they will interfere with the final analysis.

Table II lists all the compounds studied in alphabetical order of common name showing both common and chemical nomenclature. The common names used are either ISO names or proposed ISO names. Where these do not occur, trade names have been used e.g. Cyolane[®] and Imidan[®]. The names haloxon, phenothiazine and

TABLE II

Common name	Compound No.	Systematic name
Aldrin	2	1,2,3,4,10,10-Hexachloro-1,4,4a,5,8,8a-hexahydro- <i>exo</i> -1,4- <i>endo</i> -5,8-dimethanonaphthalene
Ametryne	63	2-Methylmercapto-4-ethylamino-6-isopropylamino-1,3,5-triazine
Amitrole	90	3-Amino-1,2,4-triazole
Atrazine	68	2-Chloro-4-ethylamino-6-isopropylamino-1,3,5-triazine
Azinphos-ethyl	66	Diethyl S-(3,4-dihydro-4-oxobenzo[<i>d</i>]-1,2,3)-triazin-3-ylmethyl) phosphorothiolothionate
Azinphos-methyl	67	Dimethyl S-(3,4-dihydro-4-oxobenzo[<i>d</i>]-1,2,3) triazin-3-ylmethyl) phosphorothiolothionate
Benfluralin	14	N-Butyl-N-ethyl- α,α,α -trifluoro-2,6-dinitro- <i>p</i> -toluidine
α -BHC	9	α -Hexachlorocyclohexane
γ -BHC	10	γ -Hexachlorocyclohexane
δ -BHC	45	δ -Hexachlorocyclohexane
Bromacil	80	1,1-Bis-(4-hydroxyphenyl)-2,2,2-trichloroethane
Bromophos-ethyl	77	5-Bfomo-3- <i>sec</i> -butyl-6-methyluracil
Bromoxynil octanoate	15	4-Bromo-2,5-dichlorophenyl diethyl phosphorothionate
Captan	30	2,6-Dibromo-4-cyanophenyl octanoate
Carbaryl	58	N-Trichloromethylmercapto-4-cyclohexene-1,2-dicarboxyimide
Chlordane	62	N-Methyl-1-naphthyl carbamate
	3	1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methanoindene and related compounds
Coumaphos	6	1-Chloro-2,2-bis-(4-chlorophenyl)-ethylene
	84	3-Chloro-4-methyl-2- <i>exo</i> -2H-1-benzopyran-7-yl diethyl phosphorothionate
Crotoxyphos	74	α -Methylbenzyl 3-(dimethoxyphosphinyloxy)- <i>cis</i> -crotonate
Cyolane®	72	2-Diethoxyphosphinothiolyimino-1,3-dithiolane
2,4-D methyl	47	Methyl 2,4-dichlorophenoxyacetate
2,4-D ethyl	42	Ethyl 2,4-dichlorophenoxyacetate
2,4-D isopropyl	40	Isopropyl 2,4-dichlorophenoxyacetate
2,4-D <i>n</i> -butyl	39	<i>n</i> -Butyl 2,4-dichlorophenoxyacetate
2,4-D isobutyl	37	Isobutyl 2,4-dichlorophenoxyacetate
2,4-D <i>sec</i> -butyl	35	<i>sec</i> -Butyl 2,4-dichlorophenoxyacetate
2,4-D butoxyethyl	54	Butoxyethyl 2,4-dichlorophenoxyacetate
Dazomet	70	Tetrahydro-3,5-dimethyl-2H-1,3,5-thiadiazine-2-thione
DDE	4	2,2-Bis-(4-chlorophenyl)-1,1-dichloroethylene
DDT	8	2,2-Bis-(4-chlorophenyl)-1,1,1-trichloroethane
Demeton-methyl	75	Mixture of demeton-O-methyl and demeton-S-methyl
Demeton-O-methyl		Dimethyl 2-ethylthioethyl phosphorothionate
Demeton-S-methyl		Dimethyl S-(2-ethylthioethyl) phosphorothiolate
Diazinon	46	Diethyl 2-isopropyl-4-methyl-6-pyrimidinyl phosphorothionate
Dichlofenthion	16	Diethyl 2,4-dichlorophenyl phosphorothionate
	50	3,4-Dichloroaniline
	19	4,4'-Dichlorobenzophenone
	44	2,4-Dichlorophenol
	64	2,4-Dichlorophenoxyethanol
Dicloran	38	2,6-Dichloro-4-nitroaniline
Dicofol	23	1,1-Bis-(4-chlorophenyl)-2,2,2-trichloroethanol
Dieldrin	21	1,2,3,4,10,10-Hexachloro-6,7-epoxy,1,4,4a,5,6,7,8,8a-octahydro- <i>exo</i> -1,4- <i>endo</i> -5,8-dimethanonaphthalene
Dimethoate	85	Dimethyl S-(N-methylcarbamoylmethyl) phosphorothiolothionate
	33	N,N-Dimethyl- <i>p</i> -phenylazoaniline

TABLE II (continued)

Common name	Compound No.	Systematic name
Dinocap	26	Crotonate esters of 2,4-dinitro-6-(octyl)-phenol and 2,6-dinitro-4-(octyl)-phenol
Dioxathion	52	2,3- <i>p</i> -Dioxanedithiol-S,S'-bis-(diethyl phosphorothiothionate)
Dithianon	60	1,4-Dihydro-2,3-dinitrilo-1,4-dithia-anthraquinone
Diuron	76	N'-(3,4-Dichlorophenyl)-N,N-dimethylurea
Dursban®	17	Diethyl 3,5,6-trichloro-2-pyridyl phosphorothionate
Endrin	20	1,2,3,4,10,10-Hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro- <i>exo</i> -1,4- <i>exo</i> -5,8-dimethanonaphthalene
Ethion	22	Tetraethyl S,S'-methylene-bis-(phosphorothiothionate)
Fenoprop methyl	24	Methyl 2-(2,4,5-trichlorophenoxy)-propionate
Fenoprop butyl	18	<i>n</i> -Butyl 2-(2,4,5-trichlorophenoxy)-propionate
Fenuron	82	N'-Phenyl-N,N-dimethylurea
Fluometuron	79	N'-(3-Trifluoromethylphenyl)-N,N-dimethylurea
Folpet	55	N-Trichloromethylthiophthalimide
Haloxon	83	Bis-(2-chloroethyl) 3-chloro-4-methylcoumarin-7-yl phosphate
Hexachlorobenzene	1	Hexachlorobenzene
Imidan®	61	Dimethyl S-phthalimidomethyl phosphorothiothionate
Isobenzan	5	1,3,4,5,6,7,8,8-Octachloro-1,3,3a,4,7,7a-hexahydro-4,7-methano-isobenzofuran
Linuron	59	N-(3,4-Dichlorophenyl)-N'-methoxy-N'-methylurea
Malathion	53	Dimethyl S-[1,2-di(ethoxycarbonyl)-ethyl] phosphorothiothionate
Mercaptodimethur	51	4-(Methylthio)-3,5-xylyl methylcarbamate
Methomyl	81	S-Methyl-N-[(methylcarbamoyl)-oxy] thioacetimidate
Monuron	78	N'-(4-Chlorophenyl)N,N-dimethylurea
	49	α -Naphthol
Nitrofen	32	2,4-Dichlorophenyl 4-nitrophenyl ether
	73	4-Nitrophenol
Parathion	36	Diethyl 4-nitrophenyl phosphorothionate
Pentachlorophenol	89	Pentachlorophenol
Pentachlorophenyl acetate	13	Pentachlorophenyl acetate
Phenothiazine	43	Dibenzo-1,4-thiazine
	56	<i>p</i> -Phenylazoaniline
Propazine	65	2-Chloro-4,6-bis-(isopropylamino)-1,3,5-triazine
Quintozene	7	Pentachloronitrobenzene
Simazine	71	2-Chloro-4,6-bis-(ethylamino)-1,3,5-triazine
2,4,5-T methyl	41	Methyl 2,4,5-trichlorophenoxyacetate
2,4,5-T ethyl	34	Ethyl 2,4,5-trichlorophenoxyacetate
2,4,5-T <i>n</i> -propyl	31	<i>n</i> -Propyl 2,4,5-trichlorophenoxyacetate
2,4,5-T isopropyl	28	Isopropyl 2,4,5-trichlorophenoxyacetate
2,4,5-T <i>n</i> -butyl	25	<i>n</i> -Butyl 2,4,5-trichlorophenoxyacetate
2,4,5-T isobutyl	27	Isobutyl 2,4,5-trichlorophenoxyacetate
2,4,5-T butoxyethyl	48	Butoxyethyl 2,4,5-trichlorophenoxyacetate
TDE	11	2,2-Bis-(4-chlorophenyl)-1,1-dichloroethane
Tetradifon	29	2,4,5,4'-Tetrachlorodiphenyl sulphone
Thiabendazole	86	2,4-Thiazolyl-benzimidazole
Thiram	69	Tetramethylthiuram disulphide
Trichlorfon	88	O,O-Dimethyl (1-hydroxy-2,2,2-trichloroethyl)-phosphonate
Trichlorophenol	57	2,4,6-Trichlorophenol
Trifluralin	12	N,N-Di-(<i>n</i> -propyl)-2,6-dinitro-4-trifluoromethylaniline
Warfarin	87	3-(α -Acetonylbenzyl)-4-hydroxycoumarin

thiabendazole are British Veterinary Codex common names. Where there is no common name for a compound, the systematic name is used in the alphabetical listing. The numbering system incorporated ensures that any single compound may be rapidly found by consulting Table II for the compound and then Table I for its properties.

Several compounds, e.g. carbaryl and dicofol, were found to decompose slightly under the mildly alkaline conditions of Florisil. Carbaryl decomposed to give α -naphthol and dicofol to give 4,4'-dichlorobenzophenone. These decomposition products have been included in the study. Other compounds such as the chlorinated pesticides captan and folpet were also found to decompose slightly, and, after development on Florisil TLC plates, free chloride ion was found at the sample origin. It was observed that as the Florisil TLC plates were equilibrated for 24 h after spotting of compounds, the decomposition obtained was far greater than if the plates were developed immediately after spotting. Behaviour of these compounds should be taken into consideration before carrying out quantitative analysis using Florisil in the cleanup procedure.

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