

Appendix A: Tables and Diagrams

DETERMINING PRIORITY

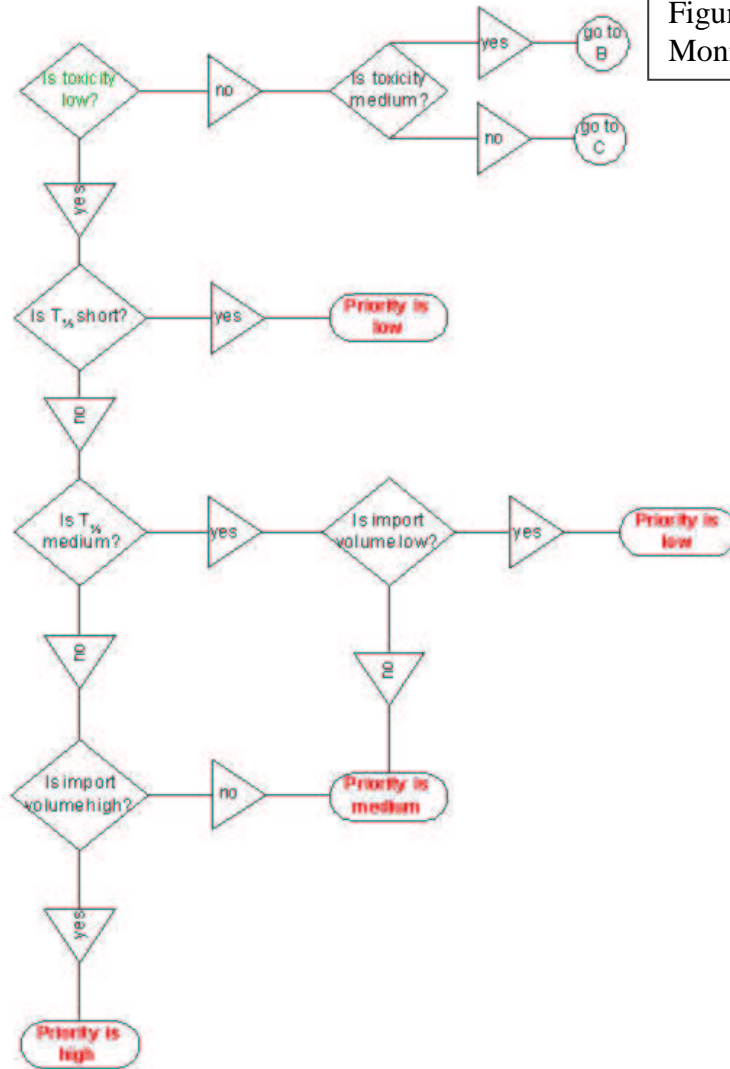


Figure 1a: Determining Priority for Monitoring

Figure 1b: Determining Priority for Monitoring

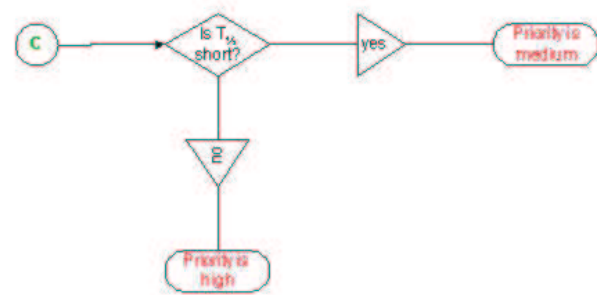
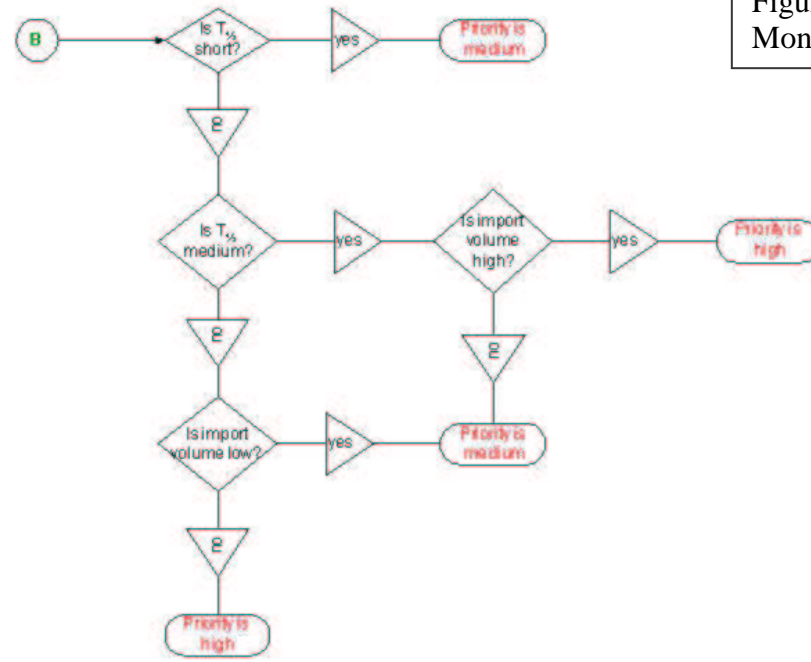


Fig. 2a - Selected Pesticides Imported into Jamaica, 1998-2000

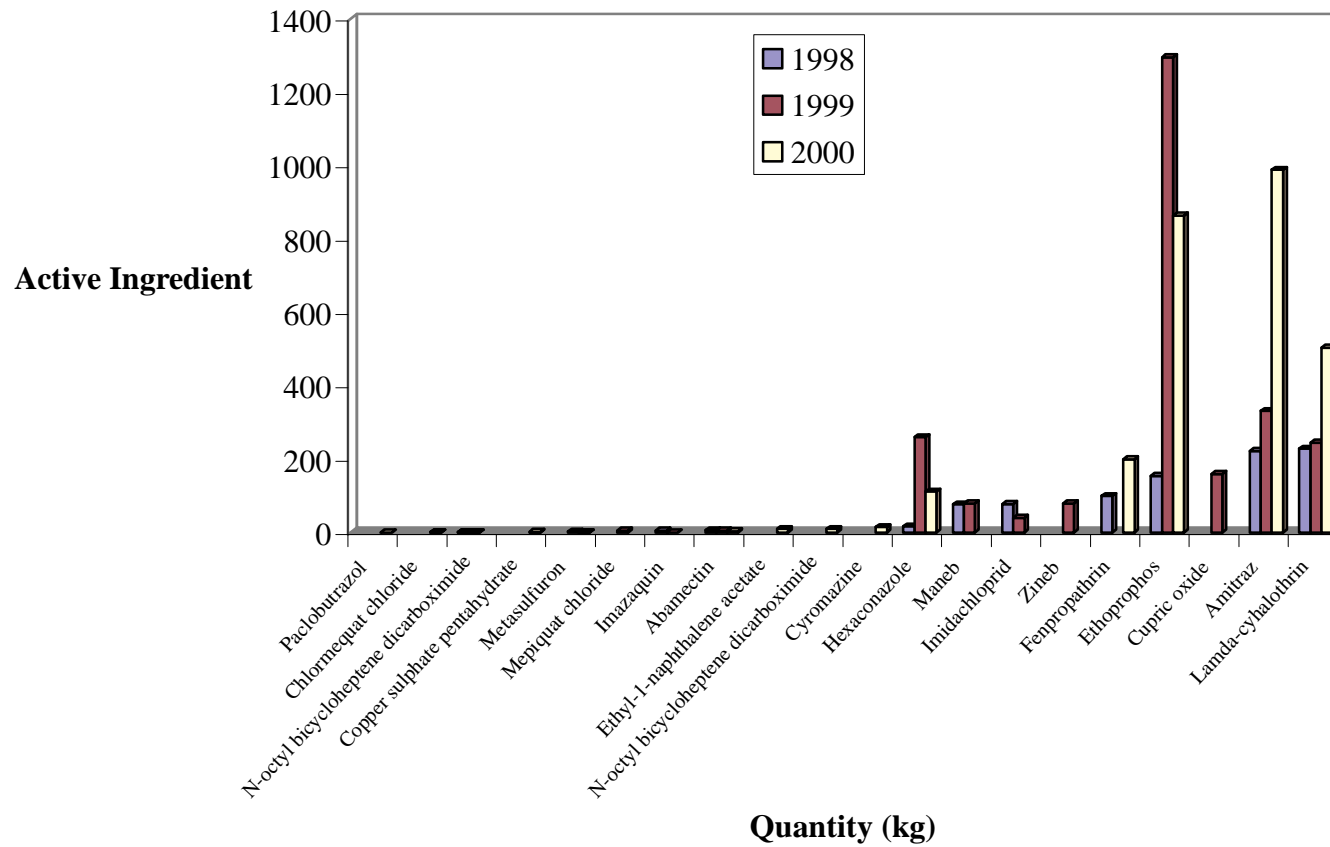


Fig. 2b - Selected Pesticides Imported into Jamaica, 1998-2000

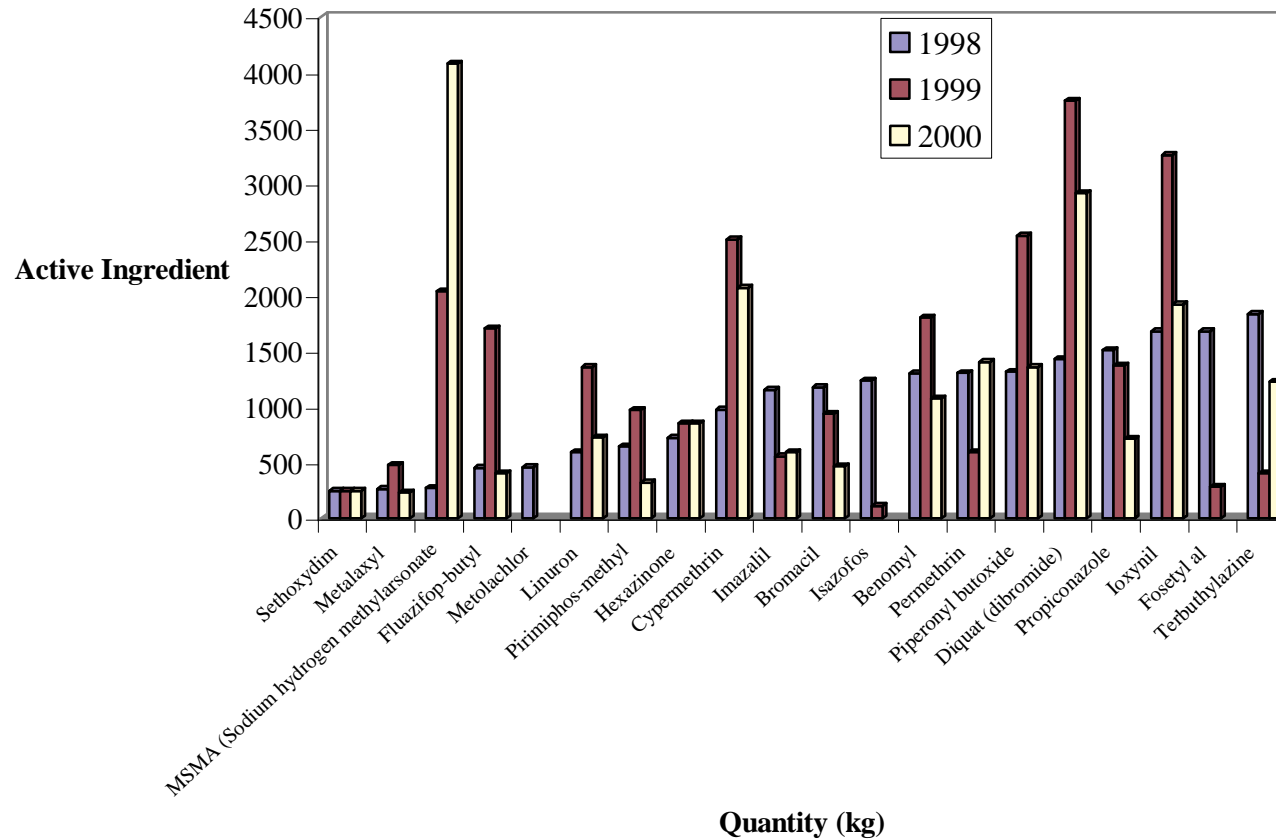


Fig. 2c - Selected Pesticides Imported into Jamaica, 1998-2000

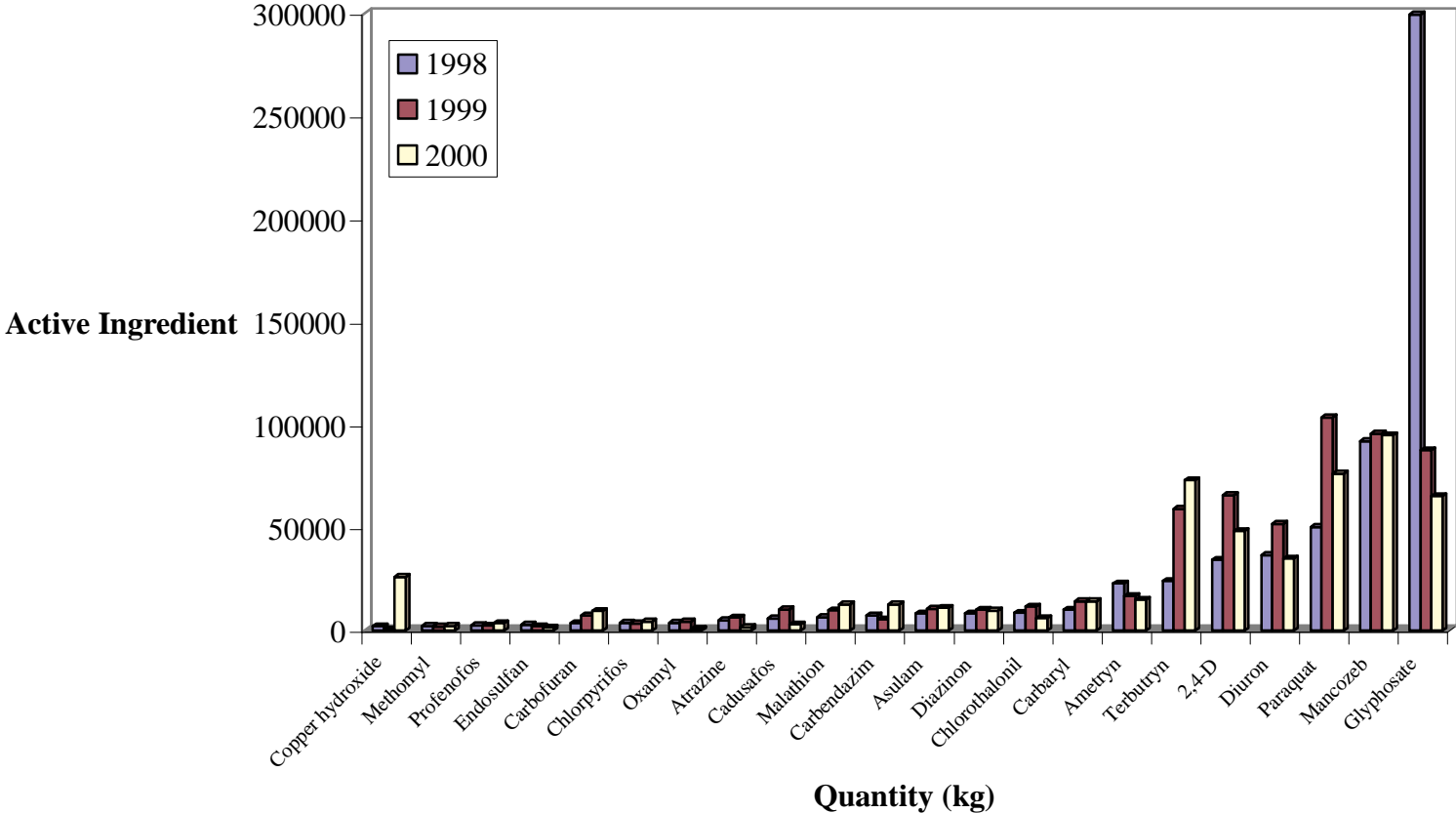


Fig. 3a - Selected Pesticides Imported into St Lucia, 1998-2000

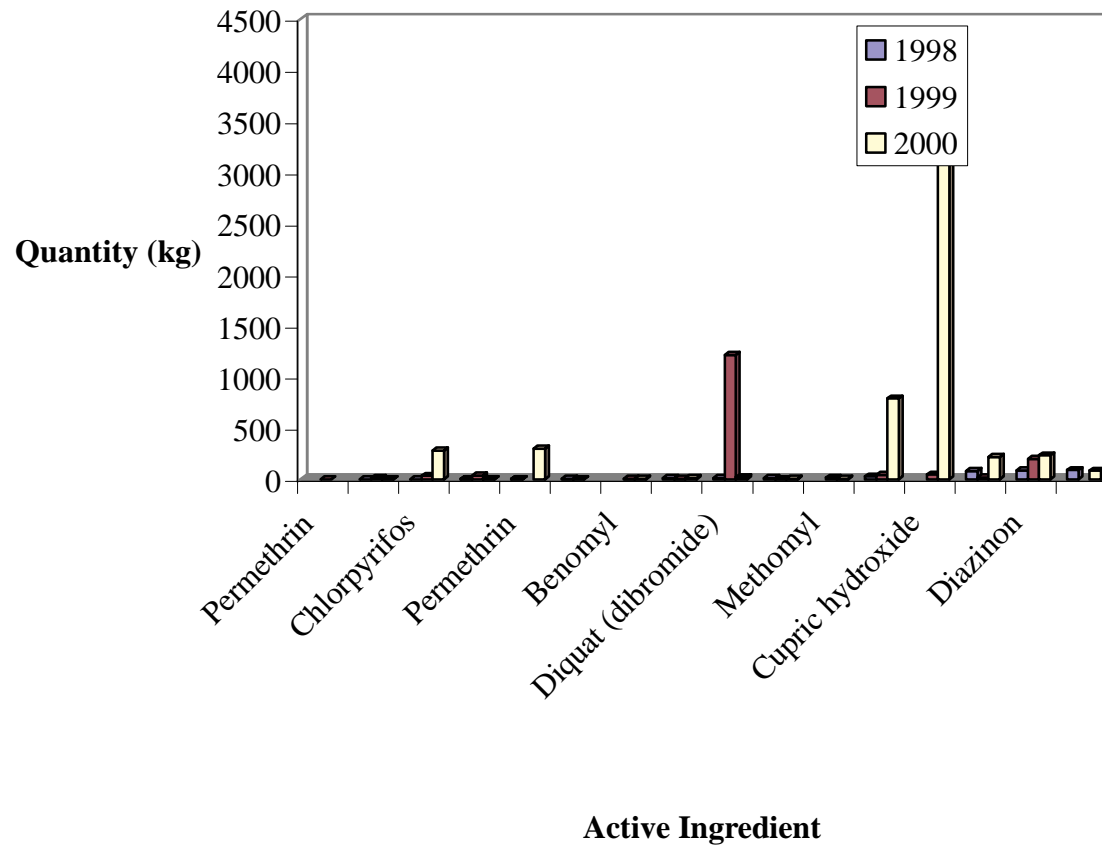


Fig. 3b - Selected Pesticides Imported into St Lucia, 1998-2000

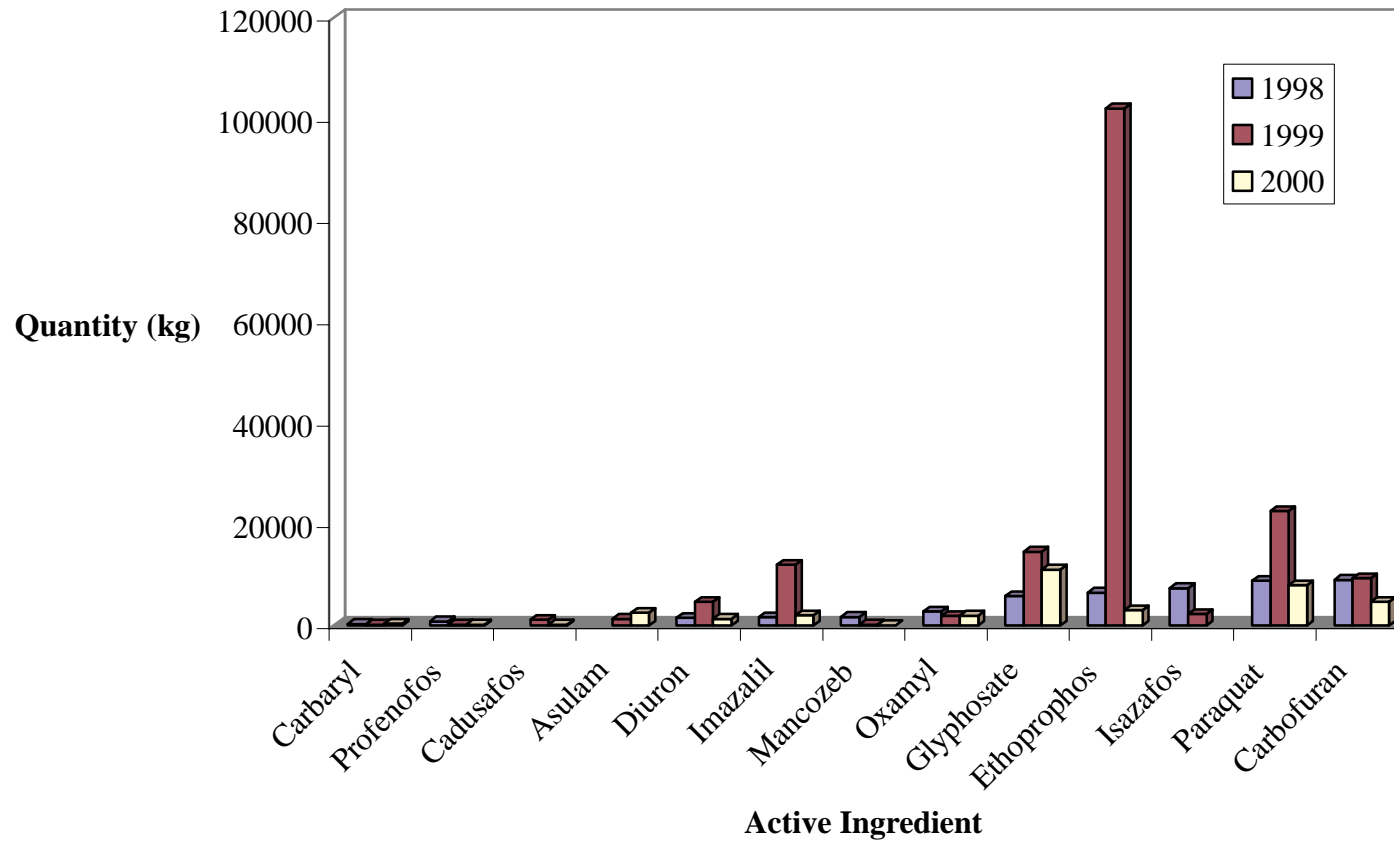


Table 3: WHO Toxicity Classification¹²
 The World Health Organization classification for estimating the acute toxicity of pesticides

LD ₅₀ for the rat (mg/kg)					
Class		Oral		Dermal	
		Solids	Liquids	Solids	Liquids
Extremely or Highly hazardous	1	50 or less	200 or less	100 or less	400 or less
Moderately hazardous	2	51 – 500	201 – 2000	101 – 1000	401 – 4000
Slightly hazardous	3	501 and over	2001 and over	1001 and over	4001 and over

Table 4: Quantities of Selected Pesticides imported into Jamaica, 1998-2000

Active Ingredients	Active Ingredient	Year	Quantity (kg)	Active Ingredient	Year	Quantity (kg)	Active Ingredient	Year
34456.5	2,4-D	1998	65705.056	2,4-D	1999	48407.91	2,4-D	2000
5.7133	ABAMECTIN	1998	4.8792	ABAMECTIN	1999	3.1502	ABAMECTIN	2000
22888.96	AMETRYN	1998	16886.4	AMETRYN	1999	15126.4	AMETRYN	2000
222.625	AMITRAZ	1998	331	AMITRAZ	1999	989.025	AMITRAZ	2000
8400	ASULAM	1998	10640	ASULAM	1999	11200	ASULAM	2000
4992	ATRAZINE	1998	6345.9	ATRAZINE	1999	1552	ATRAZINE	2000
1302.5	BENOMYL	1998	1802.5	BENOMYL	1999	1076.6	BENOMYL	2000
1177.16	BROMACIL	1998	940.4	BROMACIL	1999	470.4	BROMACIL	2000
5832	CADUSAFOS	1998	10368	CADUSAFOS	1999	2916	CADUSAFOS	2000
10209.17	CARBARYL	1998	14289.3	CARBARYL	1999	14252.77	CARBARYL	2000
7353.35	CARBENDAZIM	1998	5404.7	CARBENDAZIM	1999	12813.1	CARBENDAZIM	2000
3600	CARBOFURAN	1998	7400	CARBOFURAN	1999	9600	CARBOFURAN	2000
8732.4276	CHLOROTHALONIL	1998	11687.76	CHLOROTHALONIL	1999	6048.239	CHLOROTHALONIL	2000
3704.6844	CHLORPYRIFOS	1998	3474.8	CHLORPYRIFOS	1999	4294.961	CHLORPYRIFOS	2000
2038.3596	COPPER HYDROXIDE	1998	502.5507	COPPER HYDROXIDE	1999	26152.48	COPPER HYDROXIDE	2000
977.2383	CYPERMETHRIN	1998	2505.013	CYPERMETHRIN	1999	2069.323	CYPERMETHRIN	2000
8465.803	DIAZINON	1998	10235.465	DIAZINON	1999	9705.407	DIAZINON	2000
1432	DIQUAT (DIBROMIDE)	1998	3750.4	DIQUAT (DIBROMIDE)	1999	2921.6	DIQUAT (DIBROMIDE)	2000
36695.84	DIURON	1998	51843.92	DIURON	1999	35106.48	DIURON	2000
2800	ENDOSULFAN	1998	2100	ENDOSULFAN	1999	1400	ENDOSULFAN	2000
154.5	ETHOPROPHOS	1998	1296	ETHOPROPHOS	1999	864	ETHOPROPHOS	2000
100	FENPROPATHRIN	1998				200	FENPROPATHRIN	2000
455.5	FLUAZIFOP-BUTYL	1998	1705.5	FLUAZIFOP-BUTYL	1999	405	FLUAZIFOP-BUTYL	2000
23091.516	GLYPHOSATE	1998	81622.42	GLYPHOSATE	1999	57843.44	GLYPHOSATE	2000
6846.72	GLYPHOSATE-TRIMESIUM	1998	6007.68	GLYPHOSATE-TRIMESIUM	1999	7407.36	GLYPHOSATE-TRIMESIUM	2000

Active Ingredients	Active Ingredient	Year	Quantity (kg)	Active Ingredient	Year	Quantity (kg)	Active Ingredient	Year
16.2	HEXACONAZOLE	1998	260	HEXACONAZOLE	1999	112.05	HEXACONAZOLE	2000
723.7	HEXAZINONE	1998	851.5	HEXAZINONE	1999	851.725	HEXAZINONE	2000
1153.8258	IMAZALIL	1998	558.9884	IMAZALIL	1999	596.25	IMAZALIL	2000
1680	IOXYNIL	1998	3260	IOXYNIL	1999	1920	IOXYNIL	2000
1237.5	ISAZOFOS	1998	112.5	ISAZOFOS	1999	4882.5	ISAZOFOS	2000
229.1	LAMBDA-CYHALOTHRIN	1998	245.39	LAMBDA-CYHALOTHRIN	1999	504.255	LAMBDA-CYHALOTHRIN	2000
594.5	LINURON	1998	1360.5	LINURON	1999	725.95	LINURON	2000
6412.5	MALATHION	1998	9975	MALATHION	1999	12725.52	MALATHION	2000
92001.91	MANCOZEB	1998	95661.005	MANCOZEB	1999	94981.42	MANCOZEB	2000
266.4	METALAXYL	1998	480	METALAXYL	1999	234.135	METALAXYL	2000
2209.05	METHOMYL	1998	1850.4	METHOMYL	1999	2263.77	METHOMYL	2000
			2.16	METSULFURON	1999	1.08	METSULFURON	2000
274.758	MSMA (SODIUM HYDROGEN METHYLARSONATE)	1998	2040	MSMA (SODIUM HYDROGEN METHYLARSONATE)	1999	4080	MSMA (SODIUM HYDROGEN METHYLARSONATE)	2000
1.0001	N-OCTYL BICYCLOHEPTENE DICARBOXIMIDE	1998	1.0706	N-OCTYL BICYCLOHEPTENE DICARBOXIMIDE	1999	9.7686	N-OCTYL BICYCLOHEPTENE DICARBOXIMIDE	2000
3779.04	OXAMYL	1998	4360.32	OXAMYL	1999	872.304	OXAMYL	2000
50243.296	PARAQUAT	1998	103557.696	PARAQUAT	1999	76339.74	PARAQUAT	2000
1304.3812	PERMETHRIN	1998	597.4615	PERMETHRIN	1999	1405.349	PERMETHRIN	2000
1316.3846	PIPERONYL BUTOXIDE	1998	2538.7631	PIPERONYL BUTOXIDE	1999	1359.781	PIPERONYL BUTOXIDE	2000
648	PIRIMIPHOS-METHYL	1998	972	PIRIMIPHOS-METHYL	1999	324	PIRIMIPHOS-METHYL	2000
2447.702	PROFENOFOS	1998	2405.44	PROFENOFOS	1999	3605.256	PROFENOFOS	2000
1511.25	PROPICONAZOLE	1998	1372.5	PROPICONAZOLE	1999	715	PROPICONAZOLE	2000
250	SETHOXYDIM	1998	250	SETHOXYDIM	1999	250	SETHOXYDIM	2000
1836	TERBUTHYLAZINE	1998	408	TERBUTHYLAZINE	1999	1224	TERBUTHYLAZINE	2000

Active Ingredients	Active Ingredient	Year	Quantity (kg)	Active Ingredient	Year	Quantity (kg)	Active Ingredient	Year
24120	TERBUTRYN	1998	59040	TERBUTRYN	1999	73180	TERBUTRYN	2000
1680	FOSETYL AL	1998	288	FOSETYL AL	1999			
78.256	IMIDACLOPRID	1998	39.6	IMIDACLOPRID	1999			
77.76	MANEB	1998	80	MANEB	1999			
5.017	IMAZAQUIN	1998	0.0865	IMAZAQUIN	1999			
	Pesticides imported in a single year 1998-200			Pesticides imported in a single year 1998-200		516294.2	Jamaica's Total Agri-pesticide Imports 1998	
0.4484	CHLORMEQUAT CHLORIDE	2000	9.223	ETHYL 1-NAPHTHALENE ACETATE	2000	1571432.9	Jamaica's Total Agri-pesticide Imports 1999	
159.84	CUPRIC OXIDE	1999	5	MEPIQUAT CHLORIDE	1999	1361932.2	Jamaica's Total Agri-pesticide Imports 2000	
1.2816	COPPER SULPHATE PENTAHYDRATE	2000	460.8	METOLACHLOR	1998			
15	CYROMAZINE	2000	0.004	PACLOBUTRAZOL	2000			
			80	ZINEB	1999			

Table 5: Quantities of Selected Pesticides imported into St Lucia, 1998-2000

Active Ingredients	Active Ingredient	Year	Quantity (kg)	Active Ingredient	Year	Quantity (kg)	Active Ingredient	Year
			1291.08	ASULAM	1999	2512.48	ASULAM	2000
			5.89	BENOMYL	1999	6.024	BENOMYL	2000
			1080	CADUSAFOS	1999	180	CADUSAFOS	2000
262.84	CARBARYL	1998	139.56	CARBARYL	1999	343.895	CARBARYL	2000
9000	CARBOFURAN	1998	9280.3	CARBOFURAN	1999	4620	CARBOFURAN	2000
0.27	CHLORPYRIFOS	1998	34.51	CHLORPYRIFOS	1999	281.3052	CHLORPYRIFOS	2000
		1998	44.51	CUPRIC HYDROXIDE	1999	4373.82	CUPRIC HYDROXIDE	2000
80.53	CYPERMETHRIN	1998	16.38	CYPERMETHRIN	1999	218.83	CYPERMETHRIN	2000
87.75	DIAZINON	1998	199.34	DIAZINON	1999	233.72	DIAZINON	2000
12	DIQUAT (DIBROMIDE)	1998	1216.8	DIQUAT (DIBROMIDE)	1999	21.6	DIQUAT (DIBROMIDE)	2000
1477.6	DIURON	1998	4666.8	DIURON	1999	1299.2	DIURON	2000
3.84	COPPER OXYCHLORIDE	1998	0.69	COPPER OXYCHLORIDE	1999			
6480	ETHOPROPHOS	1998	102085.22	ETHOPROPHOS	1999	3024	ETHOPROPHOS	2000
0.21	COPPER SULPHATE PENTAHYDRATE	1998	13.67	COPPER SULPHATE PENTAHYDRATE	1999	0.96	COPPER SULPHATE PENTAHYDRATE	2000
12.75	FLUAZIFOP-P-BUTYL	1998	3	FLUAZIFOP-P-BUTYL	1999	6	FLUAZIFOP-P-BUTYL	2000
2857	GLYPHOSATE	1998			1999	1557.69	GLYPHOSATE	2000
3913	GLYPHOSATE-TRIMESIUM	1998	14517.12	GLYPHOSATE-TRIMESIUM	1999	9442.561	GLYPHOSATE-TRIMESIUM	2000
1.2	HEXACONAZOLE	1998	36.3	HEXACONAZOLE	1999	1.35	HEXACONAZOLE	2000
1620	IMAZALIL	1998	11932	IMAZALIL	1999	2018.88	IMAZALIL	2000
7330	ISAZOFOS	1998	2220	ISAZOFOS	1999			
10.9	LAMBDA-CYHALOTHRIN	1998	6.8	LAMBDA-CYHALOTHRIN	1999	11.921	LAMBDA-CYHALOTHRIN	2000
90.5	MALATHION	1998			1999	82.084	MALATHION	2000

Active Ingredients	Active Ingredient	Year	Quantity (kg)	Active Ingredient	Year	Quantity (kg)	Active Ingredient	Year
1651.8	MANCOZEB	1998	138.9	MANCOZEB	1999	45.226	MANCOZEB	2000
			15.7	METHOMYL	1999	6.3	METHOMYL	2000
2744.4	OXAMYL	1998	1865.04	OXAMYL	1999	1922.49	OXAMYL	2000
8775.2	PARAQUAT	1998	22556.15	PARAQUAT	1999	7876.22	PARAQUAT	2000
2.69	PERMETHRIN	1998	0.034	PERMETHRIN	1999	298.98	PERMETHRIN	2000
28	PIRIMIPHOS-METHYL	1998	42	PIRIMIPHOS-METHYL	1999	790	PIRIMIPHOS-METHYL	2000
805.2	PROFENOFOS	1998	163.8	PROFENOFOS	1999	136.8	PROFENOFOS	2000
Pesticides which were imported in only one year between 1998 and 2000								
89.7	2,4-D	2000	0.9	PIPERONYL BUTOXIDE	1998	50089.3554	St Lucia's Total Agri-pesticide Imports	1998
0.18	ABAMECTIN	2000	682.5	PROPICONAZOLE	1999	189684.523	St Lucia's Total Agri-pesticide Imports	1999
1	AMITRAZ	2000	4.5	ENDOSULFAN	1999	50605.09647	St Lucia's Total Agri-pesticide Imports	2000
200	METALAXYL	1998	11.1	IMAZAQUIN	2000			
1.303	IMIDACLOPRID	1998	0.3	FENPROPATHRIN	2000			

Table 6: Toxicity of Fungicides to rats, birds, aquatic organisms, and bees

Active Ingredients	Oral LD ₅₀ rats (mg/kg)	Oral LD ₅₀ birds (mg/kg)	LC ₅₀ (96hr exposure) aquatic organisms (mg/L)	Oral LD ₅₀ bees
benomyl	>10 000*	100 (redwing blackbirds) ¹	0.05-14(catfish, bluegill, rainbow trout) ²	>10 µg/bee*
chlorothalonil	10 000*	5000 (mallard ducks) ³	0.25 (rainbow trout) ³	non-toxic ³
copper oxychloride	1440 (male rats)*	-	[48 hr] 2.2 (carp)	not toxic*
copper sulphate pentahydrate	-	-	0.39 (pond snails), ² toxic to fish*	-
fluzifop-P-butyl	3680 (male rats)*	>3528 (ducks), 0.2 (bees)*	0.53 (bluegill sunfish), [48 hr] 10 (Daphnia magna - aquatic invertebrate) ⁴	>0.2*
fosetyl	5800*	>8000 (bobwhite quail)*	428 (rainbow trout)*	non-toxic*
hexaconazole	2189 (male rats)*	>4000 (mallard ducks)*	>6.7 (rainbow trout)*	>0.1*
imazalil	320 (male rats)*	[48 hrs] 5620 (mallard ducks), 6290 (bobwhite quail)*	2.5 (rainbow trout)*	not dangerous when used as directed*
mancozeb	> 5000*	[10 day dietary LC50] 6400 (mallard ducks) ^b	[48 hr] 2.2 (rainbow trout)*	not toxic*
metalaxyl	699*	non-toxic*	>100 (rainbow trout, bluegill sunfish, carp)*	not toxic*
propiconazole	1517*	non-toxic*	20 (brown trout)*	not toxic*
zineb	5200*	-	2 (perch), 6 – 8 (roach)*	not toxic*

Table 7: Toxicity of Herbicides to rats, birds, aquatic organisms, and bees

Active Ingredients	Oral LD ₅₀ rats (mg/kg)	Oral LD ₅₀ birds (mg/kg)	LC ₅₀ (96hr exposure) aquatic organisms (mg/L)	Oral LD ₅₀ bees
2,4-D	375*	1000 (mallards), 272 (pheasants), 668 (pigeons) ^{6 7 8}	>10 (immature crabs) ^{8 9} , 1 - 100 [(cutthroat trout) depending on formulation] ^{10 11}	0.0115 ⁸
ametryn	1110*	30000 (bobwhite quail), 23000 (mallard ducks) ¹²	8.8 (rainbow trout), 4.1 (bluegill), 14.1 (goldfish) ^{12 13}	slightly toxic ¹²
asulam	>4000*	>4000 (mallard ducks)*	>5000 (rainbow trout)*	not toxic*
atrazine	3080*	2000 (mallard ducks) ^{14 15}	8.8 (rainbow trout)*	not toxic ¹⁵
bromacil	5200*	practically non-toxic ¹⁶	182 (fathead minnows) ²	not toxic ¹⁷
diquat	231 , 31 (cows) *	200 - 400 (hens)*	21 (rainbow trout)*	non-toxic*
diuron	3400*	1730 (bobwhite quail)*	5.6 (rainbow trout)*	not toxic
fluzafop-butyl	3328*	17000*	1.37 (rainbow trout)*	very low toxicity*
glyphosate	5600*	>3850 (bobwhite quail)*	86 (bluegill sunfish), 120 (trout)*	>0.1*
glyphosate-trimesium				
hexazinone	1690*	2258 (bobwhite quail)*	320 - 420 (rainbow trout)*	not toxic*
imazaquin	>5000*	>100 (rainbow trout, bluegill sunfish, channel catfish)*	>2150 (bobwhite quail)*	-
linuron	1500 - 4000*	[8 day dietary LC50] > 5000 (Japanese quail)	16 (rainbow trout)*	not toxic*
metolachlor	2780*	[8 day dietary LC50] >10000 (bobwhite quail, mallard ducks)*	2 (rainbow trout)*	non-toxic*
metribuzin	2200*	164 (bobwhite quail)*	80 (bluegill sunfish)*	not toxic*
metsulfuron	>5000*	>5000 (mallard ducks)*	12.5 (rainbow trout)*	non-toxic*
MSMA (sodium hydrogen methylarsonate)	900*	-	>1000 (bluegill sunfish)*	-
paraquat	157*	262 - 380 (hens)*	32 (rainbow trout)*	non-toxic*
sethoxydim	3200 (male rats)*	>5000 (Japanese quail)*	30 (trout)*	not toxic*
terbuthylazine	2160*	-	4.6 (rainbow trout), 9.4 (goldfish)*	not toxic when used as directed*
terbutryn	2500*	[8 day dietary LC50] >20000 (bobwhite quail)*	3 (rainbow trout)*	not toxic*
trifluralin	>10000*	>2000 (chickens) *	0.01-0.04 (rainbow trout)*	0.011*

Table 8: Toxicity of Insecticides to rats, birds, aquatic organisms, and bees

Active Ingredients	Oral LD ₅₀ rats (mg/kg)	Oral LD ₅₀ birds (mg/kg)	LC ₅₀ (96hr exposure) aquatic organisms (mg/L)	Oral LD ₅₀ bees
abamectin	10*	>2000 (bobwhite quail) ¹⁸	0.003 (rainbow trout), 0.042 (carp) ¹⁸	0.009 µg/bee
amitraz	800*	788 (bobwhite quail) ¹⁹	1.3 (bluegill sunfish), 3.2-4.2 (harlequin fish) ^{19 20 21}	12 µg/bee ¹⁷
carbaryl	850*	2000 (mallards, pheasants), 1000-3000 (pigeons) ²²	1.3 (rainbow trout), 10 (bluegill) ²²	toxic to bees and beneficial insects*
chlorpyrifos	135-163*	32 (chickens)*	0.003 (rainbow trout)*	59 ng*
cypermethrin	250-4150, 138 (mice)*	10000 (mallard ducks), 2000 (chickens)*	0.0020-0.0028 (brown trout)*	toxic*
cyromazine	3387*	2510 (mallard ducks), 1785 (bobwhite quail)*	>90 (bluegill sunfish), >100 (carp and rainbow trout)*	non-toxic*
dazomet	520 , 320-620 (rabbits)*	-	toxic to fish*	not toxic when used as directed
diazinon	300-400*	3.5 (mallard ducklings)*	16 (bluegill sunfish), 2.6 - 3.2 (rainbow trout)	highly toxic*
endosulfan	70*	205-245 (mallard ducks)*	0.002 (golden orfe),* 1.5 (rainbow trout), 1.2 (bluegill sunfish) ²³	not toxic
ethoprophos	62*	5.6 (hens)*	13.4 (rainbow trout)*	not dangerous when used as directed
fenpropathrin	70.6 (male rats)*	1089 (mallard ducks)*	[48 hr] 0.00195 (bluegill sunfish)*	-
imazalil	320 (male rats)*	[48 hrs] 5620 (mallard ducks), (6290 (bobwhite quail)*	2.5 (rainbow trout)*	not dangerous when used as directed*
imidacloprid	424 (male rats)*	31 (Japanese quail)*, 152 (bobwhite quail) ²⁴	211 (rainbow trout)*	harmful*
lambda cyhalothrin	79 (male rats)*	>3950 (mallard ducks)*	0.00024 (rainbow trout)	38 ng*
malathion	1375 - 2800*	1485 (mallards), 525 (chickens) ²⁵	0.1 (bluegill sunfish)*	toxic*
methomyl	17*	15.9 (mallard ducks)*	3.4 (rainbow trout)*	toxic*
n-octyl bicycloheptene dicarboximide				
permethrin	400*	>3000 (chickens)*,	5.4 (rainbow trout)*	toxic*
piperonyl butoxide	>7500*	>100 (starlings)*	5.3 (carp)*	not toxic*
pirimiphos-methyl	2050*	140 (bobwhite quail)*	1.4 (mirror carp)*	toxic
profenofos	358*	toxic*	0.08 (rainbow trout)*	toxic*

Table 9: Toxicity of Nematicides to rats, birds, aquatic organisms, bees

Active Ingredients	Oral LD ₅₀ rats (mg/kg)	Oral LD ₅₀ birds (mg/kg)	LC ₅₀ (96hr exposure) aquatic organisms (mg/L)	Oral LD ₅₀ bees
cadusafos	37.1*	16 (bobwhite quail), 230 (mallard ducks)*	0.13 (rainbow trout), 0.17 (bluegill sunfish)*	-
carbofuran	8.2-14.1*	0.48-0.51 (mallard ducks), 12 (bobwhite quail) ²⁶	0.38 (rainbow trout), 0.24 (bluegill sunfish) ²²	toxic to bees*
isazofos	40 – 60*	toxic*	0.01 (bluegill sunfish)*	toxic*
oxamyl	5.4*	4.18 (bobwhite quail)*	4.2 (rainbow trout)*	toxic*

Table 10: Toxicity of Plant Growth Regulators to rats, birds, aquatic organisms, and bees

Active Ingredients	Oral LD ₅₀ rats (mg/kg)	Oral LD ₅₀ birds (mg/kg)	LC ₅₀ (96hr exposure) aquatic organisms (mg/L)	Oral LD ₅₀ bees
butralin	12 600 (albino rats)*	>10 000 (Japanese quail and mallard ducks)*	[48 hr LC50] 4.2 (bluegill sunfish), 3.4 (rainbow trout)*	-
chlormequat chloride	883*	555 (Japanese quail)*	[72 hr] >1000 (mirror carp)*	non-toxic*
ethyl 1-naphthalene acetate	3850*	-	-	-
mepiquat chloride	1420*	non-toxic to hens, wildfowl*	4300 (trout)*	non-toxic*
paclobutrazol	2000 (male rats)*	>7900 (mallard ducks)*	27.8 (rainbow trout)*	[acute oral NOEL] >0.002*

Table 11: Environmental Fate of Pesticides

	Active Ingredient	Metabolites (in plants or soil)	Metabolites (in animals)	Half-life in soil and groundwater	Half-life in water	Potential for Uptake
FUNGICIDES	benomyl	2-aminobenzimidazole (in plants); carbendazim, 2-aminobenzimidazole, 5-hydroxycarbendazim (in soil)*	carbendazim, 5-hydroxy-2-benzimidazole carbamate ¹⁷	3-6mths (turf), 6-12mths (bare soil) ²⁷	rapidly degrades to carbendazim (t _{1/2} 2mths) ¹⁷	absorbed by plants, 48-97% accum. for 21-23 days ²⁷
	chlorothalonil	4-hydroxy-2,5,6-trichloroisophthalonitrile (in plants)*	4-hydroxy-2,5,6-trichloroisophthalonitrile*	1-3mths (depending on moisture content and temperature) ²⁸	-	-
	copper oxychloride	-	-	-	-	-
	copper sulphate pentahydrate	-	-	-	-	-
	fluazifop-P-butyl	fluazifop-P (in plants)*	-	<1wk*	-	-
	fosetyl	-	-	-	-	-
	hexaconazole	-	-	-	-	-
	imazalil	-	-	150 days ²⁹	-	-
	mancozeb	ethylene thiourea, (in plants) ³⁰	ethylenethiourea, carbon disulfide ³⁰	1-7 days ³¹	1-2 days (pH 6-8) ³²	-
	metalaxyl	-	-	70 days ²⁹	1 wk ³³	foliar applications absorbed through the leaves and stems; not directly absorbed from the soil ³⁴
	propiconazole	1,2,4-triazole*	-	40-70 days (aerobic soils at 25 °C)*	25-85 days (aerobic aquatic systems)*	-
	zineb	-	-	-	-	-
HERBICIDES	2,4-D	-2,4-dichlorophenol -> 4-chlorocatechol -> 1,2,4-benzenetriol -> insoluble mixture of polyquinoidhumic acids (by photolysis)	-	<7days ³⁵	1wk - several weeks in oxygenated conditions ⁹	uptake is through leaves, stems, and roots ³⁶
	ametryn	-	-	70-250days ^{37/12}	-	absorbed and broken down into non-toxic substances by tolerant plants and to a lesser extent by sensitive plants ¹²
	asulam	-	-	6-14 days*	-	-

	Active Ingredient	Metabolites (in plants or soil)	Metabolites (in animals)	Half-life in soil and groundwater	Half-life in water	Potential for Uptake
	atrazine	hydroxyatrazine, amino acid conjugates (in tolerant plants)*	-	60-100days ³⁸	-	absorbed mainly through roots of plants, but also through foliage; accumulates in tips and leaves; incr. uptake of arsenic ¹⁵
	bromacil	-	5-bromo-3-sec-butyl-6-hydroxymethyluracil*	60 days – 8 mths ²⁹	2 mths (clean river water) ³⁹	rapidly taken up by roots, slightly by leaves ⁴⁰
	diquat	-	-	-	-	-
	diuron	-	-	1 - 12 mths (depending on soil type and humidity) ⁴¹	-	readily absorbed through the root systems of plants but also through leaves and stems ⁴²
	fluazifop-butyl	fluazifop (in soil, plants)*	-	<1wk*	-	-
	glyphosate	aminomethylphosphonic acid (in soil)*	-	47 days ^{29 40}	12 days - 10 wks ⁴³	translocated throughout the plants including the roots ¹⁷
	glyphosate-trimesium					
	hexazinone	-	-	90 days ⁴⁴	-	readily absorbed in the root zone and translocated throughout the plant ¹⁴
	imazaquin	-	-	-	5.5 mths (at pH 9) ⁴⁵	rapidly absorbed by roots and foliage and translocates through both phloem and xylem ^{46 45}
	linuron	3,4-dichloroaniline, carbon dioxide (in soil) ⁴⁷	-	60 days ⁴⁸	-	more readily absorbed by roots from soil application, than by leaves from foliar application ⁴²
	metolachlor	-	-	30 days*	>200 days (highly acidic water), 97 days (highly basic water) ⁴⁹	absorbed through shoots and roots ⁴⁰
	metribuzin	-	-	60 days ³⁸	7 days (pond water) ⁴⁰	absorbed by leaves, but primarily roots; translocated upwards, concentrated in roots, stems, leaves ¹⁴
	metsulfuron	2-(aminosulfonyl)benzoate, 2-(aminosulfonyl)benzoic acid (in plants)*	-	30 days ⁵⁰	29.1 days ⁵¹	rapidly absorbed by roots and foliage ⁵²
	MSMA (sodium hydrogen methylarsonate)	-	-	-	-	-
	paraquat	1-methyl-4-carboxypyridinium chloride and methylamine hydrochloride* (in plants)	-	>1000 days ^{29 40}	-	-

	Active Ingredient	Metabolites (in plants or soil)	Metabolites (in animals)	Half-life in soil and groundwater	Half-life in water	Potential for Uptake
	sethoxydim	-	-	25 days*	<1hr (by photodegradation) ; 40 days (by hydrolysis, pH7, 20 °C) ⁵³	rapidly absorbed by roots and leaves and moves both upward and downward from point of absorption ⁴⁰
	terbutylazine	-	-	30-90 days*	-	-
	terbutryn	hydroxy terbutryn† (in soil)	-	14-28 days*	180-240 days*	-
	trifluralin	-	-	-	-	is not translocated; inhibits growth of roots and shoots when absorbed by newly germinated weed seedlings ⁴⁰
INSECTICIDES	abamectin	-	-	1 wk (unshaded soil surface) ^{54 18} , 2wks - 2mths (dark aerobic conditions) ⁵⁴	12hrs (water), ⁵⁴ 4days (artificial pondwater), 2-4wks (pond sediment) ¹⁸	is not absorbed by plants ¹⁸
	amitraz	N-methyl-N'-(2,4-xylyl)-formamidine*	U-40481, 2,4-dimethylformanilide, 2,4-dimethylaniline, 4-formamido-3-methylbenzoic acid, 4-amino-3-methylbenzoic acid*	>1day ¹⁷	-	-
	carbaryl	1-naphthol	1-naphthol, glucuronic acid conjugate*	7-14 days (sandy loam), 14-28 (clay loam) ⁵⁵	varies greatly with water acidity, 10 days at pH7 ⁵⁵	absorbed; degraded by hydrolysis inside plants; short residual life of 2 wks ⁵⁶
	chlorpyrifos	3,5,6-trichloropyridin-2-ol -> organochlorine comp'ds, carbon dioxide (in soil)*	3,5,6-trichloro-2-pyridinol, monoethyl chlorpyrifos*	60-120 days*	-	-
	cypermethrin	3-phenoxybenzoic acid*	-	4 days - 8 weeks (in aerobic soils) ^{57 58 59}	5 days (river water)*	-
	cyromazine	melamine (in plants)*	-	-	-	-
	dazomet	methyl(methylaminomethyl)dithiocarbamic acid -> methyl isothiocyanate -> formaldehyde, hydrogen sulfide, methylamine (in soil)*	-	-	-	-
	diazinon	diazoxon (in soil)*	diethyl thiophosphate, diethyl phosphate*	2 - 4 weeks ⁶⁰	12 hrs (highly acidic soln), 6 mths (neutral soln) ⁶¹	absorbed by plant roots and translocated to other parts of the plant ⁶²

	Active Ingredient	Metabolites (in plants or soil)	Metabolites (in animals)	Half-life in soil and groundwater	Half-life in water	Potential for Uptake
	endosulfan	?corresponding sulfate (in plants)*	?-hydroxyendosulfan, endosulfandioli*	50 days ⁶³	1 day (strongly alkaline conditions) ⁶⁴	-
	ethoprophos	-	-	87 days (humus containing soil [pH 4.5]), 14 - 28 days (sandy loam [pH 7.2 - 7.3])*	-	-
	fenpropathrin	-	-	-	2.7 wks (river water)*	-
	imidacloprid	in soil stepwise degraded to 6-chloronicotinic acid - >carbon dioxide*	-	48-190 days ⁶⁵	>31 days (at pH 5, 7, 9) ⁶⁵	penetrates the plant and moves from the stem to the tips of the plant ⁶⁶
	lambda cyhalothrin	-	-	4-12 wks ^{67 68 69}	-	-
	malathion	-	malaoxon*	1-25 days ⁶⁰	<1 wk ⁶¹	-
	methomyl	-	methomyl methylol, oxime, sulfoxide, sulfoxide oxime; - > acetonitrile, carbon dioxide*	14 days (soil), 25 wks (groundwater) ⁵⁵	6 days (surface water) ⁵⁵	absorbed by roots and translocated ⁵⁵
	n-octyl bicycloheptene dicarboximide					
	permethrin	-	glucoside conjugate*	30-38 days ^{58 59}	-	-
	piperonyl butoxide	-	dihydroxyphenyl compound*	-	-	-
	pirimiphos-methyl	O-2-ethylamino-6-methylpyrimidin-4-yl O,O-dimethyl phosphorothioate* (in plants)	-	<30 days*	-	-
	profenofos	-	-	-	-	-
NEMATOCID ES	cadusafos	-	-	45 days estimated (in silty clay, sandy loam soils)*	-	-
	carbofuran	-	2,3-Dihydro-2,2-dimethyl-3-keto-7-hydroxybenzofuran*	30-120 days ⁵⁵	8.2 wks (pH 7.0, 25 °C), 1.0 wks (pH 8.0, 25 °C) ⁵⁵	-
	isazofos	-	-	-	-	-

	Active Ingredient	Metabolites (in plants or soil)	Metabolites (in animals)	Half-life in soil and groundwater	Half-life in water	Potential for Uptake
	oxamyl	-	methyl N-hydroxy-N',N'-dimethyl-1-thiooxamimidate; N,N'-dimethyl-1-cyanoformamide -> N,N-dimethyloxamic acid*	7 days*	1-2 days ⁷⁰	absorbed by leaves and roots and translocated ²²
PLANT GROWTH REGULATORS	butralin	carbon dioxide*	carbon dioxide*	-	-	-
	chlormequat chloride	-	-	-	-	-
	ethyl 1-naphthalene acetate	-	-	-	-	-
	maneb	ethylene thiourea, (in plants) ³⁰	ethylene diamine, ethylene(bis)thiurammonosulfide, and ethylenethiourea ⁷¹	12-36 days ⁷²	< 1hr (anaerobic conditions) ⁷²	-
	mepiquat chloride	-	-	-	-	-
	paclobutrazol	-	-	-	-	-

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