

PESTICIDE USAGE IN NORTHERN IRELAND

Survey Report 167

Soft Fruit Crops

1998

A National Statistics Publication

**Department of Agriculture
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PESTICIDE USAGE SURVEY REPORT 167

NORTHERN IRELAND

SOFT FRUIT CROPS

1998

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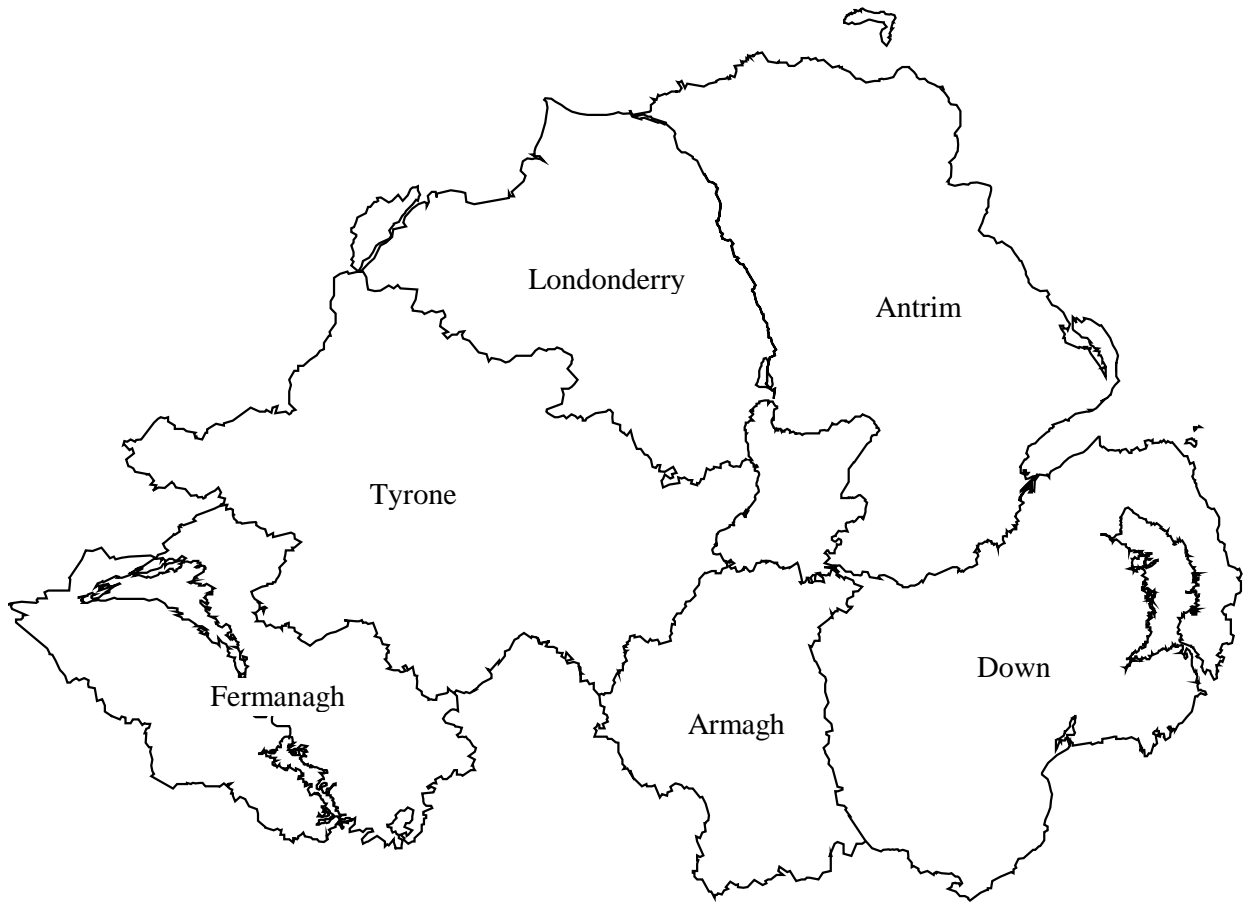
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The County Regions Of Northern Ireland



SUMMARY

This is the second survey presenting information on pesticide usage practices on soft fruit crops grown in Northern Ireland, providing comparative data to that obtained from the previous survey conducted in 1990 (Kidd *et al.*, 1994). Data was collected from 59 soft fruit growers throughout the Province, representing 92% of holdings and 96% of the area of soft fruit crops grown in Northern Ireland in 1998. The main soft fruit crops included strawberries, raspberries, with smaller areas of black and red currants, blackberries, gooseberries, loganberries and tayberries.

The data have been raised to give estimates of national pesticide usage.

Strawberries accounted for 77% of the total area of soft fruit grown, 66% of strawberry crops were grown in Counties Tyrone and Armagh.

A total of 311 kilograms of pesticides were applied to 282 spray hectares of soft fruit crops. Pesticides were applied to 96% of the total area of soft fruit crops.

Fungicides, applied to 55% of the total pesticide-treated area, represented 61% of the total pesticide usage by weight. The phenylsulfamide fungicide dichlofluanid continued to be the most extensively used fungicide accounting for approximately 45% of the fungicide-treated area used in the control of *Botrytis* and mildews. Myclobutanil and iprodione were also frequently used.

Herbicides were applied to 22% of the total pesticide-treated area, with paraquat accounting for 37% of the herbicide-treated area applied mainly for general weed control.

Insecticides accounted for 15% of the pesticide-treated area and only 5% of the total weight of pesticides applied. Organophosphorus insecticide active ingredients represented 50% of the area treated with this pesticide group, with chlorpyrifos representing 22% of the insecticide-treated area. Dimethoate and the carbamate insecticide, pirimicarb individually represented 18% of the insecticide-treated area. Bifenthrin was also frequently used. Most insecticide applications were for aphid control.

The molluscicides were applied to 8% of the pesticide-treated area accounting for 3% of the total weight of pesticides applied. Of the two molluscicide active ingredients recorded for slug control metaldehyde and methiocarb, the latter was most commonly used on soft fruit crops.

Biological control methods used for insect pests were not previously recorded in 1990. In 1998 use of these methods represented 1.0% of the total pesticide-treated area.

A total of 74 products including two biological controls, comprising 60 active ingredients were recorded in this survey.

INTRODUCTION

The Department of Agriculture and Rural Development for Northern Ireland (DARD), as a participant in the UK Working Party on Pesticide Usage Surveys, conducts a programme of surveys to examine pesticide usage in all sectors of the agricultural industry. The information on pesticide usage practices is principally collected for consideration for the Advisory Committee on Pesticides. In addition, the information may be used by those involved in residue testing, for public information and to evaluate future trends in pesticide usage.

This is the second survey examining pesticide usage practices in soft fruit crops in Northern Ireland. Results from the previous survey, conducted in 1990 (Kidd *et al.*, 1994), are included in this report for comparative purposes.

A list of published Northern Ireland Pesticide Usage Survey reports is shown in Appendix 1.

METHODS

The sample of holdings to be surveyed as selected from the Northern Ireland Agricultural Census, June 1998 (Anon., 1999).

A preliminary letter was sent to growers explaining the purpose of the survey. Of the possible 64 growers, 59 holdings were visited between May and July 1998 and data relating to pesticide usage was collected by personal interview. The data collected included; the target crop, area treated, pesticide used and the number of treatments. The growers perceived reasons for pesticide use were also recorded but may not always seem appropriate. The data were entered using onto a CLIPPER-compiled dBase IV program. Validated data were downloaded to an ICL mainframe computer for analysis using SPSS software.

RESULTS AND DISCUSSION

CROPS

The total number of holdings in the population, the number of holdings sampled and the area of soft fruit crops sampled are shown in Table 1. Data from 59 holdings provided 186 examples of 7 crop types. The growers visited represented 92% of holdings and 96% of the area of soft fruit crops grown

in Northern Ireland in 1998. The main soft fruit crops were strawberries, raspberries, while smaller areas of black and red currants, blackberries, gooseberries, loganberries and tayberries were also recorded.

The regional distribution of soft fruit crops grown in Northern Ireland is shown in Table 2, (Figure 1). Approximately 32% of the total area of soft fruit crops was grown in County Tyrone, 27% in County Down, 24 % in County Armagh, 10% in County Londonderry and 7% in County Antrim. No holdings growing soft fruit crops were recorded in County Fermanagh in 1998.

Strawberries accounted for 77% of the total area of soft fruit crops. Of which 70% were field grown and 30% were grown under protection in either glasshouses, high or low poly-tunnels. Raspberries accounted for 18% of the total area of soft fruit crops grown. While the remaining area was distributed between small areas of black and red currants 3%, gooseberries 1%, blackberries, loganberries and tayberries collectively accounting for 1% of the total area of soft fruit crops (Table 2, Figure 2).

REGIONAL PESTICIDE USAGE

While County Tyrone represented 32% of the total area of soft fruit crops, this region accounted for 36% of the pesticide-treated area (Tables 2 & 3). Counties Armagh and Tyrone collectively accounted for 84% of molluscicide applications. Biological control agents were recorded solely in use in Counties Armagh and Down.

PESTICIDE USAGE ON CROPS

Pesticides were applied to 96% of the total area of soft fruit crops with a mean of three applications

STRAWBERRIES

Pesticide applications to strawberries represented 83% of the total pesticide treated area (74% of the weight of pesticides used). Fungicides accounted for 56% (67%), herbicides 18% (23%), insecticides 16% (6%) and molluscicides 10% (4%).

Strawberries were categorised into outdoor or protected crops, and recorded findings are as follows.

Outdoor strawberries (Table 13)

This crop accounted for over 50% of all soft fruit grown in the province.

Fungicides accounted for 51% of the pesticide-treated area (64% of the weight of pesticide applied).

Spray applied to control fruit rot (*Botrytis*) accounted for 46% of the fungicide-treated area.

Dichlofluanid, the most commonly used active ingredient was applied to 61% of the fungicide-treated area of outdoor strawberry crops. Myclobutanil was also commonly used.

The control of mildew and *Botrytis* accounted for 90% of all pesticide applications in this group.

Paraquat, the most extensively used herbicide active ingredient, was applied to 37% of the herbicide-treated area, mainly for general weed control. Simazine was applied to 18% of the treated area principally to control weeds but also as a desiccant and ground-sealer.

Insecticides, used to control aphids, were applied to 66% of the insecticide-treated area. The use of organophosphate active ingredients contributed to 57% of the insecticide-treated area, with the most extensively used active ingredient being chlorpyrifos, accounting for 28% of the treated area and 59% of the weight of pesticide applied. The active ingredients dimethoate and the carbamate, pirimicarb were also commonly used.

Metaldehyde and methiocarb were the two molluscicides recorded, with the latter accounting for 70% of the area treated with molluscicide and 36% of the weight of molluscicide active ingredients applied.

Protected strawberries (Table 14)

Protected strawberries accounted for 23% of all soft fruit crops recorded in Northern Ireland in 1998.

Fungicides accounted for 35% of the pesticide-treated area (18% of the weight of pesticides applied). Fungicides, used to control mildew and *Botrytis*, were applied to 92% of the fungicide treated area. The fungicide active ingredient most extensively used was iprodione accounting for 28% of the treated area and 27% of the weight of pesticide applied. The active ingredients myclobutanil and dichlofluanid were also commonly used.

The most extensively used herbicide active ingredients for general weed control, were paraquat, also used as a ground-sealer (43%) and glyphosate (20%) used also for ground preparation prior to planting.

Aphid control accounted for 58% of all applications to the insecticide-treated area, with control of two-spotted spider mite accounting for 33%. The organophosphate chlorpyrifos was the most extensively used insecticide active ingredient accounting for 21% of the insecticide-treated area and 41% of the quantity of insecticides applied. The active ingredients bifenthrin and dimethoate were also extensively used.

The molluscicides, metaldehyde and methiocarb were applied to 7% of the pesticide-treated area of protected strawberries.

The two biological controls recorded used in protected strawberries were *Amblyseius* spp. to treat tarsonemid mite and *Phytoseiulus persimilis* for two spotted spider mite. Applications of biological control agents accounted for approximately 2% of the pesticide treated area for this crop.

RASPBERRIES (Table 15)

Raspberries accounted for 18% of the total area of soft fruit grown in Northern Ireland in 1998. The proportion of crop treated with fungicide was 46% (42% of the weight of pesticide applied), herbicide 45% (53%), insecticide 7% (5%), molluscicide 1% (<1%).

The most extensively used fungicide active ingredient was dichlofluanid accounting for 77% of the fungicide treated area and 96% of the weight of fungicide active ingredient applied, primarily applied to control *Botrytis* and mildews.

Paraquat, applied mainly for general weed control but also for ground preparation before planting, accounted for 34% of the herbicide-treated area (11% of the weight of pesticide applied) was the active ingredient most extensively used. The active ingredient bromacil was also frequently used.

Insecticides were applied to a relatively small proportion of the treated area (7%), mainly to control aphids. The three insecticide active ingredients recorded in use on this crop were malathion (most extensively used accounting for 72% of the insecticide-treated area), deltamethrin and dimethoate individually representing 14% of the treated insecticide area of this crop.

Methiocarb was the only molluscicide recorded in use on raspberries.

BLACK AND REDCURRANTS (Table 16)

Black and redcurrants accounted for 3% of the area of soft fruit grown in the province for this year. Approximately 25% of this crop did not receive any pesticide applications. Fungicides were the most extensively used pesticide type representing 43% of the pesticide treated area (31% of the weight of pesticide applied), herbicides 41% (64%) and insecticides 16% (6%).

The fungicide active ingredient dichlofluanid was the most extensively used, representing 73% of the fungicide-treated area (90% of the weight of fungicide active ingredient applied), to control mildew

and *Botrytis*. The active ingredients bupirimate and myclobutanil were also recorded, controlling 'American gooseberry mildew'.

An estimated 92% of the active ingredients applied to the herbicide-treated area were for general weed control. Control of blackcurrant gall mite (*Cecidophyopsis ribis*) accounted for 30% of the insecticide-treated area with the active ingredients chlorpyrifos, malathion and pirimicarb, used to control aphids collectively accounting for 70% of the insecticide-treated area of black and redcurrants.

No molluscicides were recorded used on this crop.

OTHER SOFT FRUIT CROPS (Tables 17-20)

Other soft fruit crops comprised blackberries, gooseberries, loganberries and tayberries, accounting for approximately 2% of all soft fruit grown in Northern Ireland in 1998.

Fungicides accounted for 58% of the pesticide treated area for these crops collectively, herbicides 37% and insecticides 4%. Biological control applied only to the gooseberry crop accounted for 1% of the pesticide-treated area.

The most extensively used fungicide active ingredient was dichlofluanid representing 56% of the fungicide-treated area, and 94% of the weight of pesticide used, and was used on all crops. The active ingredients bupirimate and myclobutanil were used on gooseberry crops, to control mildews.

Paraquat, applied for general weed control, was the most extensively used herbicide on all minor crops. The active ingredient bromacil was also frequently used and accounted for 28% of the weight of herbicide active ingredients used.

Malathion and pirimicarb were the only recorded insecticide active ingredients used to control aphids on gooseberries and tayberries.

COMPARISON WITH THE PREVIOUS SURVEY (Table 21)

The area of fruit grown in 1998 (48.73hectares) reduced significantly from 1990 (74.99hectares). This was reflected in the pesticide usage, which saw the quantity of fungicide decrease by 32%, herbicides decreased by 52% and insecticides by 15% when compared with 1990. The quantity of molluscicides used however, increased five fold during the same period.

The fungicide active ingredient dichlofluanid was the most extensively used, in both 1990 and 1998.

Figure 1 The regional distribution of soft fruit crops grown in Northern Ireland in 1998

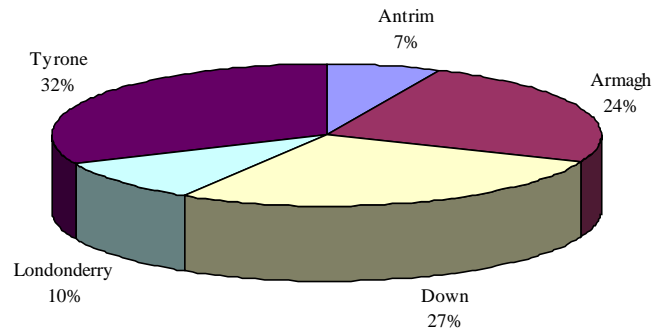
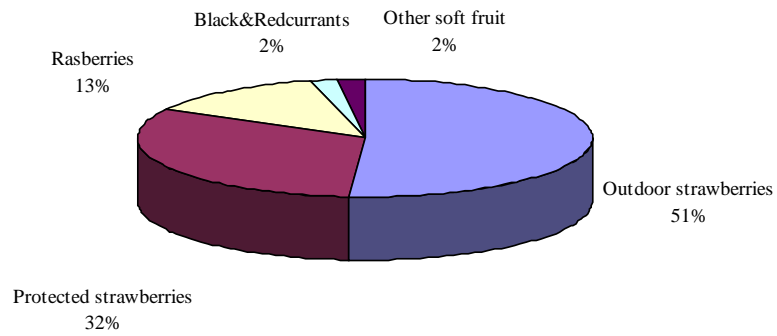


Figure 2 Utilization of the soft fruit area grown in Northern Ireland in 1998



No biological controls were recorded in use in the previous survey.

Table 1 The number of holdings and the area of soft fruit crops sampled in Northern Ireland in 1998.

County	Total number of holdings	Number of holdings sampled	Area of crops sampled (ha)
Antrim	6	6	3.21
Armagh	29	24	9.87
Down	8	8	13.37
Fermanagh	0	0	-
Londonderry	4	4	4.77
Tyrone	17	17	15.45
Northern Ireland	64	59	46.67

Table 2 The regional distribution of soft fruit crops grown in Northern Ireland in 1998 (hectares).

Crop type	County					Northern Ireland
	Antrim	Armagh	Down	Londonderry	Tyrone	
Outdoor strawberries	1.70	5.95	6.12	2.13	10.03	25.93
Protected strawberries	0.30	5.17	0.68	1.70	3.52	11.37
Raspberries	1.08	0.45	4.92	0.84	1.50	8.79
Black & redcurrants	0.06	0.24	0.90	0.10	0.20	1.50
Blackberries	.	.	0.20	.	.	0.20
Gooseberries	0.02	0.12	0.25	.	0.20	0.59
Loganberries	.	.	0.15	.	.	0.15
Tayberries	0.05	.	0.15	.	.	0.20
All crops	3.21	11.93	13.37		15.45	48.73

Table 3 Estimated area (spray hectares) of soft fruit crops treated regionally in Northern Ireland with each pesticide group.

County	Fungicides	Herbicides	Insecticides	Molluscicides	Biological controls	All pesticides
Antrim	8.38	6.77	1.11	.	.	16.26
Armagh	34.53	7.64	15.02	9.86	1.45	68.50
Down	25.64	28.46	6.87	3.77	0.05	64.79
Londonderry	24.27	3.32	4.12	.	.	31.71
Tyrone	61.27	15.61	14.13	9.33	.	100.34
Northern Ireland	154.09	61.80	41.25	22.96	1.50	281.60

Table 4 Total area (spray hectares) of soft fruit crops in Northern Ireland 1998 treated with each pesticide group.

Crop type	Fungicides	Herbicides	Insecticides	Molluscicides	Biological controls	Total area treated (sp ha)
Outdoor strawberries	78.44	30.99	18.72	16.38	.	144.53
Protected strawberries	53.72	10.12	18.77	6.09	1.45	90.15
Raspberries	17.14	17.00	2.79	0.49	.	37.42
Black & redcurrants	2.09	1.96	0.80	.	.	4.86
Blackberries	0.60	0.24	.	.	.	0.84
Gooseberries	1.40	0.71	0.12	.	0.05	2.28
Loganberries	0.30	0.34	.	.	.	0.64
Tayberries	0.40	0.44	0.05	.	.	0.89
All crops	154.09	61.80	41.25	22.96	1.50	281.60

Table 5 The total quantities (kilograms) of each pesticide type used on soft fruit crops in northern Ireland 1998.

Crop type	Fungicides	Herbicides	Insecticides	Molluscicides	All pesticides
Outdoor strawberries	121.68	40.44	6.60	6.74	175.46
Protected strawberries	34.73	12.16	6.22	3.17	56.27
Raspberries	27.34	34.75	3.46	0.11	65.66
Black & redcurrants	2.07	4.33	0.32	.	6.72
Blackberries	1.35	0.42	.	.	1.77
Gooseberries	0.42	1.61	0.02	.	2.05
Loganberries	0.68	0.65	.	.	1.33
Tayberries	0.85	1.26	0.02	.	2.12
All crops	189.11	95.62	16.64	10.01	311.38

Table 6 The basic area (hectares) of soft fruit crops treated with each pesticide type in Northern Ireland 1998.

Crop type	Fungicides	Herbicides	Insecticides	Molluscicides	Biological controls	All pesticides
Outdoor strawberries	20.78	13.67	13.83	15.52	.	24.92
Protected strawberries	10.78	5.18	9.93	5.19	0.48	11.18
Raspberries	5.97	6.24	2.79	0.49	.	8.21
Black & redcurrants	0.91	0.87	0.68	.	.	1.13
Blackberries	0.20	0.08	.	.	.	0.20
Gooseberries	0.54	0.43	0.12	.	0.05	0.59
Loganberries	0.10	0.08	.	.	.	0.14
Tayberries	0.15	0.14	0.05	.	.	0.20
All crops	39.43	26.68	27.40	21.20	0.53	46.57

Table 7 The proportional area (%) of soft fruit crops treated with each pesticide type.

Crop type	Fungicides	Herbicides	Insecticides	Molluscicides	Biological controls	All pesticides
Outdoor strawberries	80.2%	52.7%	53.3%	59.9%	.	96.1%
Protected strawberries	94.8%	45.6%	87.4%	45.7%	4.3%	98.3%
Raspberries	67.9%	71.0%	31.7%	5.5%	.	93.4%
Black & redcurrants	60.7%	57.8%	45.4%	.	.	75.4%
Blackberries	100.0%	40.0%	.	.	.	100.0%
Gooseberries	91.7%	72.6%	20.3%	.	8.5%	100.0%
Loganberries	66.7%	53.3%	.	.	.	93.3%
Tayberries	75.0%	70.0%	25.0%	.	.	100.0%

Table 8 The number of spray applications to soft fruit crops in Northern Ireland in 1998.

Crop type	Fungicides	Herbicides	Insecticides	Molluscicides	Biological controls
Outdoor strawberries	3.68	2.18	1.44	1.06	.
Protected strawberries	4.77	2.08	1.96	1.17	3.00
Raspberries	2.66	2.67	1.00	1.00	.
Black & redcurrants	2.33	3.34	1.20	.	.
Blackberries	3.00	3.00	.	.	.
Gooseberries	2.42	1.58	1.00	.	1.00
Loganberries	3.00	4.67	.	.	.
Tayberries	2.67	3.75	1.00	.	.

Table 9 Estimated area (spray hectares) of soft fruit crops treated with pesticide formulations in Northern Ireland 1998.

Pesticide formulation	Outdoor strawberries	Protected strawberries	Raspberries	Black & Redcurrants	Blackberries	Gooseberries	Loganberries	Tayberries	Total area treated (sp ha)
Fungicides									
Bupirimate	3.30	3.30	0.80	0.40	.	0.40	.	.	8.11
Carbendazim	.	0.50	.	.	.	.	.	.	0.53
Chlorothalonil	.	0.50	.	.	.	.	.	.	0.54
Copper oxychloride/metalaxyl	0.60	.	.	.	.	.	.	.	0.60
Dichlofluanid	47.50	5.50	13.20	1.50	0.60	0.20	0.30	0.40	69.27
Fenarimol	1.80	2.60	.	.	.	.	.	.	4.47
Fenhexamid	2.40	0.40	.	.	.	.	.	.	2.82
Fenpropimorph	.	0.20	1.20	.	.	.	.	.	1.40
Fosetyl-aluminium	3.90	1.00	.	.	.	.	.	.	4.84
Iprodione	4.90	15.10	.	.	.	.	.	.	20.06
Mancozeb/metalaxyl	.	.	0.80	.	.	.	.	.	0.80
Myclobutanil	12.40	13.50	0.40	0.20	.	0.80	.	.	27.27
Pyrifenox	0.40	4.20	.	.	.	.	.	.	4.54
Pyrimethanil	.	2.10	.	.	.	.	.	.	2.07
Sulphur	1.20	2.70	.	.	.	.	.	.	3.87
Thiram	.	1.30	.	.	.	.	.	.	1.27
Unknown fungicide	.	0.90	0.80	.	.	.	.	.	1.64
All fungicides	78.4	53.72	17.1	2.1	0.6	1.4	0.3	0.4	154.09

Table 9(contd.) Estimated area (spray hectares) of soft fruit crops treated with pesticide formulations in Northern Ireland 1998.

Pesticide formulation	Outdoor strawberries	Protected strawberries	Rasp-berries	Black & Redcurrants	Black-berries	Goose-berries	Logan-berries	Tay-berries	Total area treated (sp ha)
Herbicides									
Bromacil	.	.	4.10	.	0.10	.	0.08	0.09	4.30
Chlorthal-dimethyl	0.30	0.60	.	.	.	.	.	.	0.88
Clopyralid	0.20	.	.	.	.	.	.	.	0.20
Dicamba/mecoprop/triclopyr	0.10	.	.	.	.	.	.	.	0.10
Dichlobenil	.	.	0.20	0.10	.	< 0.01	.	0.05	0.41
Diquat	0.30	0.10	.	.	.	.	.	.	0.38
Ethofumesate	0.20	.	.	.	.	.	.	.	0.20
Glufosinate-ammonium	0.70	0.20	0.10	< 0.01	.	.	.	.	0.96
Glyphosate	1.30	2.00	1.70	0.10	.	< 0.01	0.04	0.05	5.24
Isoxaben	1.40	.	.	0.30	.	0.10	.	.	1.76
Lenacil	2.70	.	.	.	.	.	.	.	2.72
MCPA	0.30	.	.	.	.	.	.	.	0.32
Napropamide	1.90	.	.	0.30	.	0.10	.	.	2.26
Oxadiazon	.	1.10	1.70	0.10	.	.	0.04	0.05	3.00
Paraquat	11.60	4.30	5.80	0.40	0.20	0.10	0.14	0.15	22.65
Pendimethalin	0.20	.	.	.	.	.	.	.	0.24
Phenmedipham	1.00	.	.	.	.	.	.	.	0.97
Propachlor	0.80	.	0.10	.	.	.	.	.	0.88
Propyzamide	2.30	0.30	1.00	0.40	.	0.30	.	.	4.21
Simazine	5.60	1.50	2.20	0.20	.	< 0.01	0.04	0.05	9.70
Triclopyr	0.10	.	0.20	.	.	.	.	.	0.32
Unknown herbicide	.	.	.	0.10	.	.	.	.	0.10
All herbicides	31.00	10.10	17.00	2.00	0.20	0.70	0.34	0.44	61.80

Table 9 (cont.) Estimated area (spray hectares) of soft fruit crops treated with pesticide formulations in Northern Ireland 1998.

Pesticide formulation	Outdoor strawberries	Protected strawberries	Rasp-berries	Black & Redcurrants	Black-berries	Goose-berries	Logan-berries	Tay-berries	treated (sp ha)
Insecticides									
Bifenthrin	1.70	3.80	.	.	.	.	.	.	5.49
Chlorpyrifos	5.20	3.90	.	0.10	.	.	.	.	9.21
Clofentezine	.	0.10	.	.	.	.	.	.	0.07
Cypermethrin	0.70	1.90	.	.	.	.	.	.	2.61
Deltamethrin	.	.	0.40	.	.	.	.	.	0.40
Demeton-S-methyl	0.80	0.90	.	.	.	.	.	.	1.65
Dicofol/tetradifon	.	1.60	.	.	.	.	.	.	1.63
Dimethoate	4.40	2.60	0.40	.	.	.	.	.	7.38
Endosulfan	.	.	.	0.20	.	.	.	.	0.24
Fenbutatin oxide	0.20	0.70	.	.	.	.	.	.	0.99
Fenpropathrin	0.40	0.80	.	.	.	.	.	.	1.17
Gamma-HCH	.	0.10	.	.	.	.	.	.	0.12
Heptenophos	.	<0.01	.	.	.	.	.	.	0.01
Malathion	0.20	0.20	2.00	< 0.01	.	< 0.01	.	0.05	2.55
Pirimicarb	4.80	2.10	.	0.40	.	0.10	.	.	7.31
Tetradifon	.	0.10	.	.	.	.	.	.	0.14
Unknown insecticide	0.30	.	.	.	.	.	.	.	0.28
All insecticides	18.70	18.73	2.80	0.80	.	0.10	.	0.05	41.25

Table 9 (cont.) Estimated area (spray hectares) of soft fruit crops treated with pesticide formulations in Northern Ireland 1998.

Pesticide formulation	Outdoor strawberries	Protected strawberries	Rasp-berries	Black & Redcurrants	Black-berries	Goose-berries	Logan-berries	Tay-berries	Total area treated (sp ha)
Molluscicides									
Metaldehyde	3.60	2.10	.	.	.	.	.	.	5.71
Methiocarb	11.50	3.80	0.50	.	.	.	.	.	15.80
Unknown molluscicide	1.30	0.10	.	.	.	.	.	.	1.45
All molluscicides	16.40	6.10	0.50	.	.	.	.	.	22.96
Biological controls									
<i>Amblyseius</i> spp.	.	0.50	.	.	.	.	.	.	0.48
<i>Bacillus thuringiensis</i>	.	.	.	.	.	0.10	.	.	0.05
<i>Phytoseiulus persimilis</i>	.	0.50	.	.	.	.	.	.	0.48
Unknown biological control	.	0.50	.	.	.	.	.	.	0.48
All biological controls	.	1.40	.	.	.	0.10	.	.	1.50
All pesticides	144.50	90.10	37.40	4.90	0.80	2.30	0.64	0.90	281.60

Table 10 Estimated quantity (kilograms) of pesticide formulations used on soft fruit crops in northern Ireland 1998.

Pesticide formulation	Outdoor strawberries	Protected strawberries	Rasp-berries	Black & Redcurrants	Black-berries	Goose-berries	Logan-berries	Tay-berries	Total quantity (kg)
Fungicides									
Bupirimate	1.2	1.1	0.3	0.2	.	0.1			2.8
Carbendazim	.	0.2	.	.	.	.			0.2
Chlorothalonil	.	1.4	.	.	.	.			1.4
Copper oxychloride/metalaxyl	2.5	.	.	.	.	.			2.5
Dichlofluanid	99.9	12.5	26.1	1.9	1.4	0.2	0.7	0.8	143.4
Fenarimol	0.1	0.1	.	.	.	.			0.2
Fenhexamid	1.9	0.3	.	.	.	.			2.2
Fenpropimorph	.	0.1	0.9	.	.	.			1.0
Fosetyl-aluminium	9.2	3.3	.	.	.	.			12.4
Iprodione	3.7	9.3	.	.	.	.			13.0
Mancozeb/metalaxyl	.	.	.	.	.	.			.
Myclobutanil	0.9	1.1	< 0.1	< 0.1	.	0.1			2.2
Pyrifenox	0.1	0.5	.	.	.	.			0.6
Pyrimethanil	.	1.1	.	.	.	.			1.1
Sulphur	2.4	2.4	.	.	.	.			4.8
Thiram	.	1.4	.	.	.	.			1.4
Unknown fungicide	.	.	.	.	.	.			.
All fungicides	121.7	34.7	27.3	2.1	1.4	0.4	0.7	0.8	189.1

Table 10 (cont.) Estimated quantity (kilograms) of pesticide formulations used on soft fruit crops in Northern Ireland 1998.

Pesticide formulation	Outdoor strawberries	Protected strawberries	Rasp-berries	Black & Redcurrants	Black-berries	Goose-berries	Logan-berries	Tay-berries	Total quantity (kg)
Herbicides & desiccants									
Bromacil	.	.	15.9	.	0.3	.	0.4	0.4	16.9
Chlorthal-dimethyl	1.2	3.4	.	.	.	.	.	.	4.6
Clopyralid	<0.0	.	.	.	.	.	.	.	0.0
Dicamba/mecoprop/triclopyr	<0.0	.	.	.	.	.	.	.	0.0
Dichlobenil	.	.	2.0	1.8	.	0.6	.	0.5	4.9
Diquat	0.2	< 0.1	.	.	.	.	.	.	0.2
Ethofumesate	<0.0	.	.	.	.	.	.	.	0.0
Glufosinate-ammonium	0.4	0.1	< 0.1	< 0.1	.	.	.	.	0.6
Glyphosate	1.9	2.9	2.5	0.3	.	< 0.1	0.1	0.1	7.6
Isoxaben	0.3	.	.	0.1	.	< 0.1	.	.	0.4
Lenacil	5.6	.	.	.	.	.	.	.	5.6
MCPA	0.4	.	.	.	.	.	.	.	0.5
Napropamide	6.0	.	.	0.8	.	0.3	.	.	7.1
Oxadiazon	.	1.2	2.9	0.2	.	.	0.1	0.1	4.4
Paraquat	9.0	2.5	3.7	0.2	0.1	0.1	<0.1	0.1	15.8
Pendimethalin	0.2	.	.	.	.	.	.	.	0.2
Phenmedipham	0.6	.	.	.	.	.	.	.	0.6
Propachlor	3.4	.	0.7	.	.	.	.	.	4.1
Propyzamide	3.3	0.4	1.7	0.6	.	0.5	.	.	6.5
Simazine	7.8	1.6	5.2	0.4	.	0.1	0.1	0.1	15.3
Triclopyr	0.1	.	0.2	.	.	.	.	.	0.3
Unknown herbicide	.	.	.	.	.	.	.	.	.
All herbicides	40.4	12.2	34.7	4.3	0.4	1.6	0.7	1.3	95.6

Table 10 (cont.) Estimated quantity (kilograms) of pesticide formulations used on soft fruit crops in Northern Ireland 1998.

Pesticide formulation	Outdoor strawberries	Protected strawberries	Rasp-berries	Black & Redcurrants	Black-berries	Goose-berries	Logan-berries	Tay-berries	Total quantity (kg)
Insecticides									
Bifenthrin	0.1	0.1	.	.	.	.	.	.	0.2
Chlorpyrifos	3.9	2.5	.	0.1	.	.	.	.	6.5
Clofentezine	.	< 0.1	.	.	.	.	.	.	< 0.1
Cypermethrin	<0.1	0.1	.	.	.	.	.	.	0.1
Deltamethrin	.	.	< 0.1	.	.	.	.	.	< 0.1
Demeton-S-methyl	0.2	0.2	.	.	.	.	.	.	0.3
Dicofol/tetradifon	.	1.7	.	.	.	.	.	.	1.8
Dimethoate	1.4	0.7	0.1	.	.	.	.	.	2.2
Endosulfan	.	0.0	.	0.2	.	.	.	.	0.2
Fenbutatin oxide	<0.1	0.1	.	.	.	.	.	.	0.2
Fenpropathrin	.	0.1	.	.	.	.	.	.	0.1
Gamma-HCH	.	< 0.1	.	.	.	.	.	.	< 0.1
Heptenophos	.	< 0.1	.	.	.	.	.	.	< 0.1
Malathion	<0.1	0.1	3.3	0.0	.	< 0.1	.	<0.1	3.5
Pirimicarb	1.0	0.5	.	0.1	.	< 0.1	.	.	1.6
Tetradifon	.	< 0.1	.	.	.	.	.	.	< 0.1
Unknown insecticide	.	.	.	.	.	.	.	.	.
All insecticides	6.6	6.2	3.5	0.4	.	< 0.1	.	<0.1	16.7
Molluscicides									
Metaldehyde	4.3	2.4	.	.	.	.	.	.	6.7
Methiocarb	2.4	0.8	0.1	.	.	.	.	.	3.3
Unknown molluscicide	.	.	.	.	.	.	.	.	.
All molluscicides	6.7	3.2	0.1	.	.	.	.	.	10.0
All pesticides	175.5	56.3	65.7	6.7	1.8	2.0	1.3	2.1	311.4

Table 11 The fifty active ingredients most extensively used on soft fruit crops in Northern Ireland 1998, prioritised by treated area (spray hectares).

	Active ingredient	Area treated (sp ha)
1.	Dichlofluanid	69.27
2.	Myclobutanil	27.27
3.	Paraquat	22.65
4.	Iprodione	20.06
5.	Methiocarb	15.80
6.	Simazine	9.70
7.	Chlorpyrifos	9.21
8.	Bupirimate	8.11
9.	Dimethoate	7.38
10.	Pirimicarb	7.31
11.	Metaldehyde	5.71
12.	Bifenthrin	5.49
13.	Glyphosate	5.24
14.	Fosetyl-aluminium	4.84
15.	Pyrifenox	4.54
16.	Fenarimol	4.47
17.	Bromacil	4.30
18.	Propyzamide	4.22
19.	Sulphur	3.87
20.	Oxadiazon	3.00
21.	Fenhexamid	2.82
22.	Lenacil	2.72
23.	Cypermethrin	2.61
24.	Malathion	2.55
25.	Napropamide	2.26
26.	Pyrimethanil	2.07
27.	Tetradifon	1.78
28.	Isoxaben	1.76
29.	Demeton-S-methyl	1.65
30.	Dicofol	1.63
31.	Metalaxyl	1.40
32.	Fenpropimorph	1.40
33.	Thiram	1.27
34.	Fenpropathrin	1.17
35.	Fenbutatin oxide	0.99
36.	Phenmedipham	0.97
37.	Glufosinate-ammonium	0.96
38.	Propachlor	0.88
39.	Chlorthal-dimethyl	0.88
40.	Mancozeb	0.80
41.	Copper oxychloride	0.60
42.	Chlorothalonil	0.54
43.	Carbendazim	0.53
44.	Phytoseiulus persimilis(bc)	0.48
45.	Amblyseius spp(bc)	0.48
46.	Triclopyr	0.42
47.	Dichlobenil	0.41
48.	Deltamethrin	0.40
49.	Diquat	0.38
50.	Mcpa	0.32

Table 12 The fifty active ingredients most extensively used on soft fruit crops in Northern Ireland 1998, prioritised by weight (kilograms).

Active ingredient	Quantity used (kg)
1. Dichlofluanid	143.43
2. Bromacil	16.92
3. Paraquat	15.76
4. Simazine	15.31
5. Iprodione	12.98
6. Fosetyl-aluminium	12.44
7. Glyphosate	7.64
8. Napropamide	7.10
9. Metaldehyde	6.71
10. Chlorpyrifos	6.51
11. Propyzamide	6.46
12. Lenacil	5.63
13. Dichlobenil	4.91
14. Sulphur	4.76
15. Chlorthal-dimethyl	4.60
16. Oxadiazon	4.38
17. Propachlor	4.13
18. Malathion	3.49
19. Methiocarb	3.30
20. Bupirimate	2.84
21. Dimethoate	2.22
22. Myclobutanil	2.18
23. Fenhexamid	2.16
24. Copper oxychloride	1.73
25. Pirimicarb	1.56
26. Thiram	1.41
27. Chlorothalonil	1.36
28. Dicofol	1.28
29. Pyrimethanil	1.11
30. Fenpropimorph	0.97
31. Metalaxyl	0.74
32. Pyrifenox	0.62
33. Phenmedipham	0.62
34. Glufosinate-ammonium	0.56
35. Tetradifon	0.50
36. MCPA	0.45
37. Isoxaben	0.39
38. Triclopyr	0.32
39. Demeton-s-methyl	0.31
40. Bifenthrin	0.21
41. Carbendazim	0.20
42. Diquat	0.20
43. Pendimethalin	0.17
44. Endosulfan	0.17
45. Fenbutatin oxide	0.17
46. Fenarimol	0.17
47. Fenpropathrin	0.12
48. Cypermethrin	0.07
49. Clopyralid	0.02
50. Ethofumesate	0.02

Table 13 Outdoor strawberries: pesticide-treated area (spray hectares), quantities of pesticides applied (kilograms) and reasons for use.

Pesticide formulation	Botrytis	Mildew	Red core	Disease prevention	Mildew / Botrytis	General weed control	Annual broadleaved & grass weeds	Ground preparation	Sealer	Desiccation	Total area treated (sp ha)	Basic area treated (ha)	Total quantity applied (kg)
Fungicides													
Bupirimate	.	3.34	.	.	.	.	.	.	.	.	3.34	2.9	1.17
Copper oxychloride/metalaxyl	.	.	0.60	.	.	.	.	.	.	.	0.60	0.6	2.48
Dichlofluanid	30.40	.	.	3.43	13.67	.	.	.	.	.	47.50	17.4	99.86
Fenarimol	.	1.82	.	.	.	.	.	.	.	.	1.82	0.9	0.07
Fenhexamid	2.42	.	.	.	.	.	.	.	.	.	2.42	1.2	1.85
Fosetyl-aluminium	.	0.04	2.21	1.60	.	.	.	.	.	.	3.85	2.7	9.17
Iprodione	3.33	.	.	0.40	1.20	.	.	.	.	.	4.93	2.3	3.70
Myclobutanil	.	9.76	.	.	2.63	.	.	.	.	.	12.38	7.2	0.93
Pyrifenox	.	0.24	.	.	0.14	.	.	.	.	.	0.39	0.4	0.08
Sulphur	.	1.21	.	.	.	.	.	.	.	.	1.21	1.2	2.39
All fungicides	36.15	16.41	2.81	5.43	17.64	.	.	.	.	.	78.44		121.68
Herbicides													
Chlorthal-dimethyl	0.26	0.06	.	.	.	0.32	0.2	1.24
Clopyralid	0.20	.	.	.	.	0.20	0.2	0.02
Dicamba/mecoprop/triclopyr	0.10	.	.	.	.	0.10	0.1	0.03
Diquat	0.28	0.28	0.3	0.15
Ethofumesate	0.20	.	.	.	.	0.20	0.2	0.02
Glufosinate-ammonium	0.70	.	.	.	.	0.70	0.7	0.40
Glyphosate	0.41	.	0.80	.	0.05	1.26	1.3	1.88
Isoxaben	1.41	.	.	.	.	1.41	1.4	0.31
Lenacil	2.72	.	.	.	.	2.72	2.7	5.63
MCPA	0.32	.	.	.	.	0.32	0.3	0.45
Napropamide	1.91	.	.	.	.	1.91	1.9	6.00
Paraquat	9.76	.	.	0.61	1.22	11.60	8.1	8.96
Pendimethalin	0.24	.	.	.	.	0.24	0.2	0.17
Phenmedipham	0.27	0.70	.	.	.	0.97	1	0.62
Propachlor	0.70	0.06	.	.	.	0.76	0.6	3.39
Propyzamide	2.31	.	.	.	.	2.31	2.3	3.25
Simazine	4.59	0.50	.	0.50	.	5.58	4.3	7.79
Triclopyr	0.12	.	.	.	.	0.12	0.1	0.12
All herbicides	26.21	1.32	0.80	1.11	1.55	30.99		40.44

Table 13 (cont.) Outdoor strawberries: pesticide-treated area (spray hectares), quantities of pesticides applied (kilograms) and reasons for use.

Pesticide formulation	Two-spotted spider mite	Pest control	Aphids	Weevils	Slugs	Total area treated (sp ha)	Basic area treated (ha)	Total quantity applied (kg)
Insecticides								
Bifenthrin	1.33	0.40	.	.	.	1.74	1.40	0.07
Chlorpyrifos	.	2.02	1.22	1.96	.	5.20	3.90	3.88
Cypermethrin	.	.	0.75	.	.	0.75	0.40	0.02
Demeton-S-methyl	.	.	0.76	.	.	0.76	0.80	0.15
Dimethoate	.	.	4.40	.	.	4.40	4.20	1.35
Fenbutatin oxide	0.24	.	.	.	.	0.24	0.20	0.02
Fenpropathrin	0.40	.	.	.	.	0.40	0.40	0.04
Malathion	.	.	0.20	.	.	0.20	0.20	0.05
Pirimicarb	.	.	4.75	.	.	4.75	4.80	1.02
Unknown insecticide	0.04	.	0.24	.	.	0.28	0.30	-
All insecticides	2.02	2.42	12.33	1.96	.	18.72		6.60
Molluscicides								
Metaldehyde	.	.	.	.	3.58	3.58	3.60	4.30
Methiocarb	.	.	.	.	11.48	11.48	11.50	2.44
Unknown molluscicide	.	.	.	.	1.33	1.33	1.30	-
All molluscicides	.	.	.	.	16.38	16.38		6.74

Table 14 Protected Strawberries: pesticide-treated area (spray hectares), basic area treated (hectares), quantities of pesticides applied (kilograms) and reasons for use.

Pesticide formulation	<i>Botrytis</i>	Mildew	Red core	Disease prevention	Mildew / <i>Botrytis</i>	General weed control	Ground preparation	Sealer	Total area treated (sp ha)	Basic area treated (ha)	Total quantity applied (kg)
Fungicides											
Bupirimate	.	2.23	.	.	1.02	.	.	.	3.25	2.3	1.09

Carbendazim	0.53	.	.	.	.	.	.	0.53	0.3	0.20
Chlorothalonil	0.54	.	.	.	.	.	.	0.54	0.4	1.36
Dichlofluanid	4.70	.	.	0.30	0.51	.	.	5.51	2.5	12.49	
Fenarimol	.	2.64	.	.	.	.	.	2.64	1.3	0.09
Fenhexamid	0.40	.	.	.	.	.	.	0.4	0.2	0.31
Fenpropimorph	.	0.20	.	.	.	.	.	0.20	0.2	0.07
Fosetyl-aluminium	.	.	0.99	.	.	.	.	0.99	1.0	3.28
Iprodione	10.50	.	.	1.00	3.63	.	.	15.13	5.9	9.29	
Myclobutanil	.	9.08	.	.	4.42	.	.	13.5	6.2	1.12	
Pyrifenox	0.14	2.48	.	.	1.53	.	.	4.16	2.9	0.55	
Pyrimethanil	0.70	.	.	0.86	0.51	.	.	2.07	1.5	1.11	
Sulphur	.	2.66	.	.	.	.	.	2.66	1.0	2.36
Thiram	0.71	0.56	.	.	.	.	.	1.27	0.6	1.41
Unknown fungicide	.	.	.	0.88	.	.	.	0.88	0.4	-	
All fungicides	18.22	19.85	0.99	3.04	11.62	.	.	.	53.72	34.72	
Herbicides											
Chlorthal-dimethyl	0.56	0.56	0.60	3.36
Diquat	0.10	.	.	0.10	0.10	0.04
Glufosinate-ammonium	0.17	.	.	0.17	0.20	0.13
Glyphosate	1.80	0.24	.	2.04	1.40	2.87
Oxadiazon	1.11	.	.	1.11	1.10	1.18
Paraquat	4.12	.	0.20	4.32	3.20	2.50
Propyzamide	0.27	.	.	0.27	0.30	0.44
Simazine	1.47	.	0.07	1.55	1.50	1.64
All herbicides	9.04	0.24	0.83	10.12		12.16

Table 14 (cont.) Protected Strawberries: pesticide-treated area (spray hectares), basic area treated (hectares), quantities of pesticides applied (kilograms) and reasons for use.

Pesticide formulation	Tarsonemid mite	Two-spotted spider mite	Aphids	Weevils	Slugs	Total area	Basic area	Total quantity applied
						treated (sp ha)	treated (ha)	(kg)
Insecticides								
Bifenthrin	.	2.75	1.01	.	.	3.75	3.1	0.14

Chlorpyrifos	.	.	2.06	1.84	.	3.89	2.8	2.54
Clofentezine	.	0.07	.	.	.	0.07	0.1	0.02
Cypermethrin	.	.	1.86	.	.	1.86	1.5	0.05
Demeton-S-methyl	.	.	0.88	.	.	0.88	0.9	0.16
Dicofol/tetradifon	.	1.63	.	.	.	1.63	1.6	1.75
Dimethoate	.	.	2.59	.	.	2.59	2.6	0.74
Fenbutatin oxide	.	0.75	.	.	.	0.75	0.7	0.14
Fenpropathrin	.	0.77	.	.	.	0.77	0.8	0.08
Gamma-HCH	.	.	0.12	.	.	0.12	0.1	< 0.01
Heptenophos	.	.	0.01	.	.	0.01	0	0.01
Malathion	.	.	0.24	.	.	0.24	0.2	0.08
Pirimicarb	.	.	2.06	.	.	2.06	1.6	0.47
Tetradifon	.	0.14	.	.	.	0.14	0.1	0.04
All insecticides	.	6.11	10.82	1.84	.	18.76		6.22
Molluscicides								
Metaldehyde	.	.	.	.	2.13	2.13	2.1	2.41
Methiocarb	.	.	.	.	3.84	3.84	3.8	0.76
Unknown molluscicide	.	.	.	.	0.12	0.12	0.1	.
All molluscicides	.	.	.	.	6.09	6.09		3.17
Biological controls								
<i>Amblyseius</i> spp	0.48	.	.	.	.	0.48	0.5	-
<i>Phytoseiulus persimilis</i>	.	0.48	.	.	.	0.48	0.5	-
Unknown biological control	.	.	0.48	.	.	0.48	0.5	-
All biological controls	0.48	0.48	0.48	.	.	1.45		-

Table 15 Raspberries: pesticide-treated area (spray hectares), basic area treated (hectares), quantities of pesticides applied (kilograms) and reasons for use.

Pesticide type formulation	Root rot	<i>Botrytis</i>	Mildew	Disease prevention	Mildew / <i>Botrytis</i>	General weed control	Annual		Pest control	Aphids	Slugs	Total area treated (sp ha)	Basic area treated (ha)	Total quantity applied (kg)
							broad-leaved & grass weeds	Ground preparation						
Fungicides														
Bupirimate	.	.	.	0.8	.	.	.	.	.	.	0.8	0.4	0.28	
Dichlofluanid	.	4.37	2.76	0.9	5.16	.	.	.	.	.	13.19	5.2	26.12	

Fenpropimorph	.	.	.	1.2	.	.	.	.	.	.	1.2	0.6	0.90
Mancozeb/metalaxyl	0.8	.	.	.	.	.	.	.	.	.	0.8	0.8	.
Myclobutanil	.	.	0.39	.	.	.	.	.	.	.	0.39	0.4	0.04
Unknown fungicide	.	.	.	0.76	.	.	.	.	.	.	0.76	0.8	-
All fungicides	0.8	4.37	3.15	3.66	5.16	.	.	.	.	.	17.14		27.34
Herbicides														
Bromacil	.	.	.	.	.	4.05	.	.	.	.	4.05	4	15.86
Dichlobenil	.	.	.	.	.	0.2	.	.	.	.	0.20	0.2	1.99
Glufosinate-ammonium	.	.	.	.	.	0.05	.	.	.	.	0.05	0.1	0.03
Glyphosate	.	.	.	.	.	1.72	.	.	.	.	1.72	1.7	2.48
Oxadiazon	.	.	.	.	.	1.7	.	.	.	.	1.70	1.7	2.88
Paraquat	.	.	.	.	.	4.98	.	0.80	.	.	5.78	4.5	3.74
Propachlor	.	.	.	.	.	0.12	.	.	.	.	0.12	0.1	0.75
Propyzamide	.	.	.	.	.	0.84	0.15	.	.	.	0.99	1	1.66
Simazine	.	.	.	.	.	2.14	0.05	.	.	.	2.19	2.2	5.18
Triclopyr	.	.	.	.	.	0.2	.	.	.	.	0.20	0.2	0.19
All herbicides	.	.	.	.	.	16.01	0.20	0.80	.	.	17		34.75
Insecticides														
Deltamethrin	.	.	.	.	.	.	.	.	0.4	.	0.4	0.4	0.006
Dimethoate	.	.	.	.	.	.	.	.	.	0.39	0.39	0.4	0.124
Malathion	.	.	.	.	.	.	.	.	.	2	2	2	3.331
All insecticides	.	.	.	.	.	.	.	.	0.4	2.39	.	2.79	3.46
Molluscicides														
Methiocarb	0.49	0.49	0.5	0.107
All molluscicides	.	.	.	.	.	.	.	.	.	.	0.49	0.49	0.107

Table 16 Black & red currants: pesticide-treated area (spray hectares), basic area treated (hectares), quantities of pesticides applied (kilograms) and reasons for use.

Pesticide type & formulation	Annual							Total area treated (sp ha)	Basic area treated (ha)	Total quantity applied (kg)
	American gooseberry mildew	<i>Botrytis</i>	Mildew	General weed control	broadleaved and grass weeds	Big bud mite	Aphids			
Fungicides										
Bupirimate	0.36	.	.	.	.	.	.	0.36	0.1	0.181
Dichlofluanid	.	0.73	0.8	.	.	.	.	1.53	0.8	1.87
Myclobutanil	0.2	.	.	.	.	.	.	0.2	0.2	0.018

All fungicides	0.56	0.73	0.8	.	.	.	.	2.09		2.07
Herbicides										
Dichlobenil	.	.	.	0.12	.	.	.	0.12	0.1	1.823
Glufosinate-ammonium	.	.	.	0.04	.	.	.	0.04	0	0.005
Glyphosate	.	.	.	0.12	.	.	.	0.12	0.1	0.27
Isoxaben	.	.	.	0.1	0.15	.	.	0.25	0.3	0.05
Napropamide	.	.	.	0.25	.	.	.	0.25	0.3	0.788
Oxadiazon	.	.	.	0.1	.	.	.	0.1	0.1	0.167
Paraquat	.	.	.	0.4	.	.	.	0.4	0.4	0.207
Propyzamide	.	.	.	0.35	.	.	.	0.35	0.4	0.595
Simazine	.	.	.	0.24	.	.	.	0.24	0.2	0.422
Unknown herbicide	.	.	.	0.1	.	.	.	0.1	0.1	.
All herbicides	.	.	.	1.81	0.15	.	.	1.96		4.327
Insecticides										
Chlorpyrifos	.	.	.	.	.	.	0.12	0.12	0.1	0.087
Endosulfan	.	.	.	.	.	0.24	.	0.24	0.2	0.17
Malathion	.	.	.	.	.	.	0.04	0.04	0	0.011
Pirimicarb	.	.	.	.	.	.	0.4	0.4	0.4	0.056
All insecticides	.	.	.	.	.	0.24	0.56	0.8		0.324

Table 17 Blackberries: pesticide-treated area (spray hectares), basic area treated (hectares), quantities of pesticides applied (kilograms) and reasons for use.

Pesticide formulation	General weed control	Mildew / Botrytis	Total area treated (sp ha)	Basic area treated (ha)	Total quantity applied (kg)
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Fungicides					
Dichlofluanid		0.6	0.6	0.2	1.35
All fungicides	.	0.6	0.6		1.35
Herbicides					
Bromacil	0.08	.	0.1	0.1	0.288
Paraquat	0.16	.	0.2	0.1	0.134
All herbicides	0.24	.	0.2		0.422

Table 18 Gooseberries: pesticide-treated area (spray hectares), basic area treated (hectares), quantities of pesticides applied (kilograms) and reasons for use.

Pesticide formulation	American gooseberry mildew	Botrytis	Mildew	General weed control	Annual broadleaved and grass weeds	Pest control	Aphids	Total area treated (sp ha)	Basic area treated (ha)	Total quantity applied (kg)
Fungicides										
Bupirimate	0.36	.	.	.	.	.	.	0.36	0.1	0.127
Dichlofluanid	.	0.2	.	.	.	.	.	0.24	0.2	0.218
Myclobutanil	0.6	.	0.2	.	.	.	.	0.8	0.4	0.072
All fungicides	0.96	0.2	0.2	.	.	.	.	1.4		0.417
Herbicides										
Dichlobenil	.	.	.	0.04	.	.	.	0.04	0	0.608
Glyphosate	.	.	.	0.01	.	.	.	0.01	0	0.014
Isoxaben	0.1	.	.	0.1	0.1	0.025
Napropamide	.	.	.	0.1	.	.	.	0.1	0.1	0.315
Paraquat	.	.	.	0.11	.	.	.	0.11	0.1	0.082
Propyzamide	.	.	.	0.3	.	.	.	0.3	0.3	0.51
Simazine	.	.	.	0.05	.	.	.	0.05	0	0.056
All herbicides	.	.	.	0.61	0.1	.	.	0.71		1.609
Insecticides										
Malathion	0.02	0.02	0	0.007
Pirimicarb	0.1	0.1	0.1	0.014
All insecticides	0.12	0.12		0.021
Biological controls										
<i>Bacillus thuringiensis</i>	0.05	.	0.05	0.1	.
All biological controls	0.05	.	0.05		.

Table 19 Loganberries: pesticide-treated area (spray hectares), basic area treated (hectares), quantities of pesticides applied (kilograms) and reasons for use.

Pesticide formulation	General weed control	Mildew / Botrytis	Total area treated (sp ha)
Fungicides			
Dichlofluanid	.	0.3	0.3
All fungicides	.	0.3	0.3
Herbicides			
Bromacil	0.08	.	0.08
Glyphosate	0.04	.	0.04
Oxadiazon	0.04	.	0.04
Paraquat	0.14	.	0.14
Simazine	0.04	.	0.04
All herbicides	0.34	.	0.34

Table 20 Tayberries: pesticide-treated area (spray hectares), basic area treated (hectares), quantities of pesticides applied (kilograms) and reasons for use.

Pesticide formulation	Botrytis	Mildew / Botrytis	General weed control	Aphids	Total area treated (sp ha)	Basic area treated (ha)	Total quantity applied (kg)	Total quantity applied (kg)
¹Fungicides								
Dichlofluanid	0.1	0.3	.	.	0.4	0.2	0.845	0.845
All fungicides	0.1	0.3	.	.	0.4		0.845	0.845
Herbicides								
Bromacil	.	.	0.1	.	0.09	0.1	0.412	0.412
Dichlobenil	.	.	0.1	.	0.05	0.1	0.496	0.496
Glyphosate	.	.	0.1	.	0.05	0.1	0.072	0.072
Oxadiazon	.	.	0.1	.	0.05	0.1	0.084	0.084
Paraquat	.	.	0.15	.	0.15	0.1	0.069	0.069
Simazine	.	.	0.05	.	0.05	0.1	0.127	0.127
All herbicides	.	.	0.44	.	0.44		1.261	1.261
Insecticide								
Malathion	.	.	.	0.05	0.05	0.1	0.017	0.017

All insecticides

.

.

.

0.05

0.05

0.017

0.017

Table 21 Comparison of pesticide usage on soft fruit crops in 1990 & 1998, spray hectares of formulations and quantities (kg of active ingredients) used

	1990		1998	
	sp ha of formulations	Quantity kg	sp ha of formulations	Quantity kg
Fungicides	171.37	277.61	154.09	189.1
Herbicides	159.4	199.54	61.8	95.6
Insecticides	33.71	19.61	41.25	16.7
Molluscicides	8.83	1.79	22.96	10
<i>Area of all soft fruit crops (ha)</i>	373.31		281.6	

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